

# *SPARCcluster™ High Availability Server Service Manual*



The Network Is the Computer™

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# Contents

---

Preface .....	xv
<i>Part 1 —System Information</i>	
<b>1. Product Description .....</b>	<b>1-1</b>
1.1 Features .....	1-2
1.2 SPARCcluster 1000HA Server Configuration .....	1-5
1.3 SPARCcluster 2000HA Server Configuration .....	1-6
1.4 Internal Options .....	1-7
1.4.1 SPARCcluster 1000HA Server .....	1-7
1.4.2 SPARCcluster 2000HA Server .....	1-7
1.4.3 SPARCstorage Array Model 100 Series .....	1-8
1.5 External Options .....	1-9
1.5.1 SPARCcluster 1000HA Server .....	1-9
1.5.2 SPARCcluster 2000HA Server .....	1-10
1.5.3 SPARCstorage Array Model 100 Series .....	1-10
<i>Part 2 —Troubleshooting</i>	

---

<b>2. Troubleshooting Overview</b> .....	<b>2-1</b>
2.1 SPARCcluster Architecture .....	2-1
2.2 Maintenance Authorization .....	2-1
2.3 Troubleshooting a Remote Site .....	2-1
2.4 Troubleshooting Flow .....	2-2
2.4.1 Takeover .....	2-2
2.4.2 Switchover .....	2-2
2.4.3 Failures Where There is no Takeover .....	2-2
2.5 Fault Classes/Principal Assemblies .....	2-4
2.6 Error Messages/Symptoms .....	2-5
2.7 Device to Troubleshooting Cross Reference .....	2-6
2.8 Device Replacement Cross Reference .....	2-7
<b>3. Hardware Troubleshooting</b> .....	<b>3-1</b>
3.1 Solaris Reconfiguration Reboots .....	3-2
3.2 SPARCstorage Array/Optical Connections Faults .....	3-2
3.2.1 Multi-disk Errors From Both Nodes on the Same SPARCstorage Array .....	3-3
3.2.2 Multiple Disk Errors or Disk Communication Error For One Node Only .....	3-4
3.2.3 SPARCstorage Array Fails to Communicate .....	3-5
3.3 Node Failures .....	3-12
3.3.1 System Board, Control Board, and Boot Disk .....	3-12
3.3.2 <code>prtdiag</code> Command .....	3-13
3.3.3 Using <code>probe scsi</code> Command .....	3-15
3.4 Network Failures .....	3-17

---

3.4.1	Private Net Failure (SunFastEthernet) . . . . .	3-17
3.4.2	Client Net Failure . . . . .	3-20
3.5	Terminal Concentrator/Serial Connection Faults . . . . .	3-20
3.5.1	System Indicators . . . . .	3-21
3.5.2	Serial Connections. . . . .	3-22
3.5.3	Intermittent Router Problems . . . . .	3-22
3.5.4	Terminal Concentrator Flow Diagrams . . . . .	3-23
3.5.5	Additional Troubleshooting Tips . . . . .	3-27
<b>4.</b>	<b>Software Troubleshooting</b> . . . . .	<b>4-1</b>
4.1	Software Faults . . . . .	4-2
4.1.1	Operating System Failures. . . . .	4-2
4.1.2	Solstice HA Failures . . . . .	4-2
4.1.3	SPARCstorage Array Failures . . . . .	4-2
4.1.4	Oracle Failures. . . . .	4-2
4.1.5	NFS Failures. . . . .	4-2
<b>5.</b>	<b>Diagnostics</b> . . . . .	<b>5-1</b>
5.1	Failure Diagnosis and Confirmation of Component Repair Using SunVTS/SunDiag . . . . .	5-1
5.2	Verify HA Configuration using hacheck Command . . . . .	5-1
<i>Part 3 —Preparing for Service</i>		
<b>6.</b>	<b>Safety and Tools Requirements</b> . . . . .	<b>6-1</b>
6.1	Safety Precautions . . . . .	6-1
6.2	Symbols . . . . .	6-2
6.3	System Precautions. . . . .	6-4

---

6.4 Tools Required .....	6-5
<b>7. Shutdown and Restart Procedures .....</b>	<b>7-1</b>
7.1 SPARCcluster 1000HA Server .....	7-2
7.1.1 System Cabinet .....	7-2
7.1.2 Processor .....	7-4
7.1.3 SPARCstorage Array .....	7-8
7.1.4 Terminal Concentrator .....	7-11
7.2 SPARCcluster 2000HA Server .....	7-11
7.2.1 System Cabinet .....	7-11
7.2.2 Processor Shutdown/Startup .....	7-17
7.2.3 SPARCstorage Array .....	7-19
7.2.4 Boot Disks .....	7-20
7.2.5 Terminal Concentrator .....	7-20

*Part 4 —Subassembly Removal and Replacement*

<b>8. Internal Access .....</b>	<b>8-1</b>
8.1 SPARCserver 1000HA Server .....	8-2
8.1.1 Rear Screen Panel .....	8-2
8.1.2 Vented Front Panels .....	8-3
8.2 SPARCcenter 2000HA Server .....	8-4
8.2.1 Cabinet Panels .....	8-4
8.2.2 Hinged Door (System Cabinet Only) .....	8-5
8.2.3 Vented Front Panels .....	8-5
8.2.4 Rear Screen Panel .....	8-6
8.2.5 Side Panels .....	8-7

---

8.2.6 Kick Panel .....	8-8
8.2.7 Stabilizer Bar .....	8-9
<b>9. Major Subassemblies .....</b>	<b>9-1</b>
9.1 SPARCcluster 1000HA Server .....	9-2
9.1.1 System Board and Components .....	9-2
9.1.2 Boot Disks .....	9-2
9.1.3 SPARCstorage Array .....	9-2
9.1.4 Blower Assembly .....	9-3
9.1.5 Terminal Concentrator .....	9-5
9.1.6 Cabling .....	9-7
9.2 SPARCcluster 2000HA Server .....	9-8
9.2.1 System Board and Components .....	9-8
9.2.2 SPARCstorage Array .....	9-8
9.2.3 Boot Disks .....	9-9
9.2.4 Terminal Concentrator .....	9-11
9.2.5 Cabling .....	9-12
 <i>Part 5 —Illustrated Parts Breakdown</i>	
<b>10. Illustrated Parts Breakdown .....</b>	<b>10-1</b>
10.1 SPARCcluster 1000HA Server .....	10-3
10.2 SPARCcluster 2000HA Server .....	10-5
 <i>Part 6 —Appendixes, Glossary, and Index</i>	
<b>A. Product Specifications .....</b>	<b>A-1</b>
A.1 Physical Specifications .....	A-1
A.1.1 SPARCcluster 1000HA Server .....	A-2

---

A.1.2	SPARCcluster 2000 HA Server . . . . .	A-3
A.2	Electrical Specifications . . . . .	A-4
A.2.1	SPARCcluster 1000HA Server . . . . .	A-4
A.2.2	SPARCcluster 2000HA Server . . . . .	A-5
A.3	Environmental Specifications . . . . .	A-6
<b>B.</b>	<b>Connector Pinouts and Cabling . . . . .</b>	<b>B-1</b>
B.1	SPARCstorage Array Fiber Optic Cables . . . . .	B-1
B.2	Terminal Concentrator Ports . . . . .	B-1
B.2.1	RJ-45 Serial Port Connectors . . . . .	B-1
B.2.2	Public Ethernet Connector . . . . .	B-3
B.3	Private Net Cables (Short/Long) . . . . .	B-4
<b>C.</b>	<b>SCSI Targeting . . . . .</b>	<b>C-1</b>
<b>D.</b>	<b>SPARCstorage Array Firmware and Device Driver Error Messages . . . . .</b>	<b>D-1</b>
D.1	Message Formats . . . . .	D-1
D.2	System Configuration Errors . . . . .	D-2
D.2.1	soc Driver . . . . .	D-3
D.3	Hardware Errors . . . . .	D-4
D.4	Informational Messages: . . . . .	D-10
D.5	Internal Software Errors . . . . .	D-12
	Index . . . . .	Index-1



## *Figures*

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Figure 1-1	SPARCcluster HA Server Block Diagram Based on SPARCserver 1000 .....	1-3
Figure 1-2	SPARCcluster HA Server Block Diagram Based on SPARCcenter 2000 .....	1-4
Figure 1-3	SPARCcluster 1000HA Server Cabinet .....	1-5
Figure 1-4	SPARCcluster 2000HA Server Cabinets .....	1-6
Figure 2-1	Takeover Troubleshooting Flow Diagram .....	2-3
Figure 3-1	Both Nodes Have Errors on Same SPARCstorage Array .....	3-3
Figure 3-2	Multiple Disk Errors One Node Only .....	3-4
Figure 3-3	LCD Display .....	3-6
Figure 3-4	Private Net 0 Failure .....	3-18
Figure 3-5	Private Net 0 Troubleshooting .....	3-19
Figure 3-6	Private Net 0 Troubleshooting Continued .....	3-20
Figure 3-7	Indicator Locations .....	3-21
Figure 3-8	Troubleshooting Flow Diagram Overview .....	3-23
Figure 3-9	Branch A: Telnet to Terminal Concentrator Does Not Succeed .....	3-24

---

Figure 3-10	Branch A1: Terminal Concentrator Doesn't Respond to Ping Command . . . . .	3-25
Figure 3-11	Branch B: Terminal Concentrator Can't Connect to a Node . .	3-26
Figure 3-12	Branch B.1: Single Node Not Responding . . . . .	3-27
Figure 7-1	Key Switch Positions . . . . .	7-2
Figure 7-2	AC Distribution Unit Power Switch . . . . .	7-3
Figure 7-3	Key Switch Positions . . . . .	7-5
Figure 7-4	Processor AC Power Switch and Plug . . . . .	7-5
Figure 7-5	Reset Switch and Front Panel Status LEDs . . . . .	7-7
Figure 7-6	SPARCstorage AC Power Switch and AC Plug . . . . .	7-9
Figure 7-7	LCD Display While Powering On the System . . . . .	7-10
Figure 7-8	Terminal Concentrator (Rear View) . . . . .	7-11
Figure 7-9	Key Switch Positions (Cabinet Front View) . . . . .	7-12
Figure 7-10	AC Distribution Unit Power Switch (Cabinet Rear View) . . .	7-13
Figure 7-11	Local/Remote Switch Location . . . . .	7-15
Figure 7-12	System Reset Switch . . . . .	7-16
Figure 7-13	Power Supply Cable Location . . . . .	7-18
Figure 8-1	Rear Screen Panel Removal and Replacement . . . . .	8-2
Figure 8-2	Removing the Vented Panels . . . . .	8-3
Figure 8-3	Opening the Hinged Door — System Cabinet . . . . .	8-5
Figure 8-4	Removing the Vented Panels . . . . .	8-6
Figure 8-5	Rear Screen Panel Removal . . . . .	8-7
Figure 8-6	Removing the Side Panels . . . . .	8-8
Figure 8-7	Removing the Kick Panel . . . . .	8-9
Figure 8-8	Stabilizer Bar . . . . .	8-10

---

Figure 9-1	Blower Assembly Removal/Replacement. . . . .	9-4
Figure 9-2	Removing Terminal Concentrator Screws . . . . .	9-5
Figure 9-3	Swinging Terminal Concentrator Out of Cabinet. . . . .	9-6
Figure 9-4	Removing/Replacing Terminal Concentrator Cabling . . . . .	9-6
Figure 9-5	Terminal Concentrator Mounting Detail . . . . .	9-7
Figure 9-6	Boot Disk Removal/Replacement. . . . .	9-10
Figure 9-7	Terminal Concentrator Removal/Replacement . . . . .	9-12
Figure 10-1	SPARCcluster 1000HA Server . . . . .	10-3
Figure 10-2	SPARCcluster 2000HA Server . . . . .	10-5
Figure B-1	Serial Port RJ-45 Receptacle . . . . .	B-2
Figure B-2	15-pin Ethernet Receptacle. . . . .	B-3
Figure B-3	Twisted Pair Ethernet RJ-45 Receptacle . . . . .	B-4



## *Tables*

---

Table P-1	Related Documents . . . . .	xvii
Table P-2	Typographic Conventions . . . . .	xix
Table P-3	Shell Prompts . . . . .	xix
Table 2-1	Error Message/Symptom . . . . .	2-5
Table 2-2	Device Troubleshooting Cross Reference . . . . .	2-6
Table 2-3	Device Replacement Cross Reference . . . . .	2-7
Table 3-1	POST Codes . . . . .	3-6
Table 6-1	Safety Precautions . . . . .	6-2
Table 8-1	Cover Removal by Assembly . . . . .	8-4
Table 10-1	SPARCcluster 1000HA/2000HA Server List of Replacement Parts . . . . .	10-1
Table 10-2	Principle Assembly Part Replacement Reference . . . . .	10-2
Table 10-3	SPARCcluster 1000HA Server Parts List . . . . .	10-4
Table 10-4	SPARCcluster 2000HA Server Parts List . . . . .	10-6
Table A-1	SPARCcluster 1000HA Server Physical Specifications . . . . .	A-2
Table A-2	SPARCcluster 1000HA Server Clearance and Service Access . . . . .	A-2

---

Table A-3	SPARCcluster 2000 High Availability Server Physical Specifications . . . . .	A-3
Table A-4	SPARCcluster 2000 High Availability Server Clearance and Service Access . . . . .	A-3
Table A-5	SPARCcluster 1000HA Server Electrical Specifications. . . . .	A-4
Table A-6	Electrical Specifications for the Expansion Cabinet Housing Five SPARCstorage arrays. . . . .	A-4
Table A-7	SPARCcluster 2000HA Server Electrical Specifications. . . . .	A-5
Table A-8	Environmental Limits . . . . .	A-6
Table B-1	Serial Port Pin/Signal Allocations . . . . .	B-2
Table B-2	Ethernet Transceiver Port Pin/Signal Allocations . . . . .	B-3
Table B-3	Private Ethernet Pinout/Signals . . . . .	B-4

# *Preface*

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## *How This Book Is Organized*

This manual provides service instructions for SPARCcluster™ High Availability (HA) systems, including factory- and customer-assembled systems. These instructions are designed for experienced and qualified maintenance personnel.

### *Part 1 —System Information*

**Chapter 1, “Product Description”** describes SPARCcluster HA 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, “Hardware Troubleshooting”** provides procedures for the isolation of various faults relative to major system components.

**Chapter 4, “Software Troubleshooting”** Describes software troubleshooting and provides references to lists of error messages generated by the various software types, such as High Availability Oracle® and NFS.

**Chapter 5, “Diagnostics”** describes on-line diagnostics and scripts for verifying hardware installation.

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### *Part 3 —Preparing for Service*

**Chapter 6, “Safety and Tools Requirements”** provides safety precautions and a list of required tools.

### *Part 4 —Subassembly Removal and Replacement*

**Chapter 7, “Internal Access”** provides panel removal procedures necessary to access system components during removal and replacement.

**Chapter 8, “Major Subassemblies”** contains procedures for the removal and replacement of system subassemblies and parts.

### *Part 5 —Illustrated Parts Breakdown*

**Chapter 10, “Illustrated Parts Breakdown”** provides illustrations of the major replaceable parts in a system and lists part numbers.

### *Part 6 —Appendixes and Index*

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

**Appendix B, “Connector Pinouts and Cabling”** provides a list of pinouts and cabling for SPARCcluster HA specific items.

**Appendix C, “SCSI Targeting”** provides SCSI targeting information for the two boot disks contained in a SPARCcluster 2000HA system.

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



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## Related Books

The following documents contain information that may be helpful to the system administrator and service provider.

Table P-1 Related Documents

<b>Product Family</b>	<b>Title</b>	<b>Part Number</b>
<b>SPARCcenter 2000</b>	<b>SPARCcenter 2000 Binder Set</b>	<b>825-1509</b>
	<i>SPARCcenter 2000 Installation Manual</i>	801-6975
	<i>SPARCcenter 2000 Service Manual</i>	801-2007
	<i>SPARCcenter 2000 Storage Device User's Guide</i>	801-7009
	<i>SPARCcenter 2000 Regulatory Compliance Manual</i>	801-3051
<b>SPARCserver 1000</b>	<b>SPARCserver 1000 Binder Set</b>	<b>825-1725</b>
	SPARCserver 1000 System Installation Manual	801-2893
	SPARCserver 1000 System Service Manual	801-2895
	SPARCserver 1000 Storage Device User's Guide	801-2198
	SPARCserver 1000 Regulatory Compliance Manual	801-2892
<b>SPARCstorage Array 100</b>	<b>SPARCstorage Array 100 Installation and Service Set</b>	<b>825-2513</b>
	<i>SPARCstorage Array Model 100 Series Installation Manual</i>	801-2205
	<i>SPARCstorage Array Model 100 Series Service Manual</i>	801-2206
	<i>SPARCstorage Array Regulatory Compliance Manual</i>	801-7103
<b>SPARCcluster 1000 and SPARCcluster 2000 High Availability</b>	<b>SPARCcluster High Availability Planning and Installation Binder Set</b>	<b>825-2741</b>
	<i>Getting Started (roadmap document)</i>	802-3513
	<i>SPARCcluster High Availability Server Software Planning and Installation Manual</i>	802-3509
	<i>SPARCcluster High Availability Server Hardware Planning and Installation Manual</i>	802-3510
	<i>SunVTS Version 0.8 User's Guide</i>	802-3686

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Table P-1 Related Documents (Continued)

<b>Product Family</b>	<b>Title</b>	<b>Part Number</b>
	<b><i>SPARCcluster High Availability Administration and ServiceBinder Set</i></b>	<b>825-3068</b>
	<i>Getting Started (roadmap document)</i>	802-3513
	<i>SPARCcluster High Availability Server Software Administration Guide</i>	802-3511
	<i>SPARCcluster High Availability Server Service Manual</i>	802-3512
	<i>SPARCcluster High Availability System Release Notes</i>	802-4760
<b><i>Terminal Concentrator</i></b>	<b><i>Terminal Concentrator Binder Set</i></b>	<b>825-2227</b>
	<i>Terminal Concentrator Installation Notes</i>	801-6127
	<i>Terminal Concentrator General Reference Guide</i>	801-5972
<b><i>Solstice Disksuite</i></b>	<b><i>Solstice Disksuite Binder Set</i></b>	<b>825-3065</b>
	<i>Solstice Disksuite 4.0 Administration Guide</i>	802-2422
	<i>Solstice Disksuite Tool 4.0 User's Guide</i>	802-1724
<b><i>Oracle7™</i></b>	<i>Oracle documents per Oracle</i>	
<b><i>Other Referenced Manuals</i></b>	<i>Disk Drive Installation Manual for the SPARCstorage Array Model 100 Series</i>	801-2207
	<i>SunFastEthernet Adapter User Guide</i>	801-6109
	<i>Fibre Channel SBus Card Installation Manual</i>	801-6313
	<i>Fibre Channel Optical Module Installation Manual</i>	801-6326
	<i>FSBE/S SBus Card Manual</i>	800-7508
	<i>Multi-Disk-Pack Installation and Service Guide</i>	801-6119

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## What Typographic Changes Mean

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

Table P-2 Typographic Conventions

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

## Shell Prompts in Command Examples

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

Table P-3 Shell Prompts

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

---

## Notes, Cautions, and Warnings



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**Warning** – This equipment contains lethal voltage. Accidental contact can result in serious injury or death.

---



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**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.

---

# *Part 1 — System Information*

---

Chapter 1    Product Description



## *Product Description*

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Solstice™ High Availability 1.0 (Solstice HA) is a software product that provides fault-tolerant support and automatic data service failover for specific dual-server hardware configurations. The configurations will recover from server, disk, and network failures, as well as software failures.

Solstice HA uses Solstice DiskSuite™ 4.0 software to provide the diskset, mirroring, concatenation, striping, hot spare disks, file system growing, and UNIX file system logging capabilities.

Solstice HA allows configurations to be either symmetric or asymmetric. In the asymmetric configuration, one of the systems acts as a hot standby for the other system. In symmetric configurations both servers can be actively offering data services.

The data services provided by Solstice High Availability are:

- Highly available NFS®, Sun's distributed computing file system (Solstice High Availability/HA-NFS)
- Highly available ORACLE® database management system (Solstice High Availability/HA-ORACLE)

---

**Note** – A cluster is comprised of two identical compute nodes.

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The SPARCcluster HA server family consists of two products, the SPARCcluster 1000 and SPARCcluster 2000 HA systems. The systems are implemented on SPARCserver™ 1000 or SPARCcenter™ 2000 server platforms using redundant SPARCstorage™ array 100 systems.

## 1.1 Features

The key features of the Solstice HA software package include:

- Tolerance of single-point software failures or crashes
- Tolerance of single-point hardware faults
- Appearance of continuous availability of data service (NFS clients will only see “Server Not Responding” messages during a takeover)
- Automatic detection of system and data service failure
- Automatic takeover, recovery, and service restoration
- Automatic post-takeover redirection of HA-NFS clients
- Automatic restart of fault monitoring on a server after it is repaired

Additionally, Solstice HA provides online serviceability which enables administrators to take an appropriately configured server offline for repair or routine maintenance while the data services remain available from the other server in the configuration.

Figure 1-1 and Figure 1-2 depict functional block diagrams of SPARCcluster HA servers based on the SPARCserver 1000 and SPARCcenter 2000, respectively.



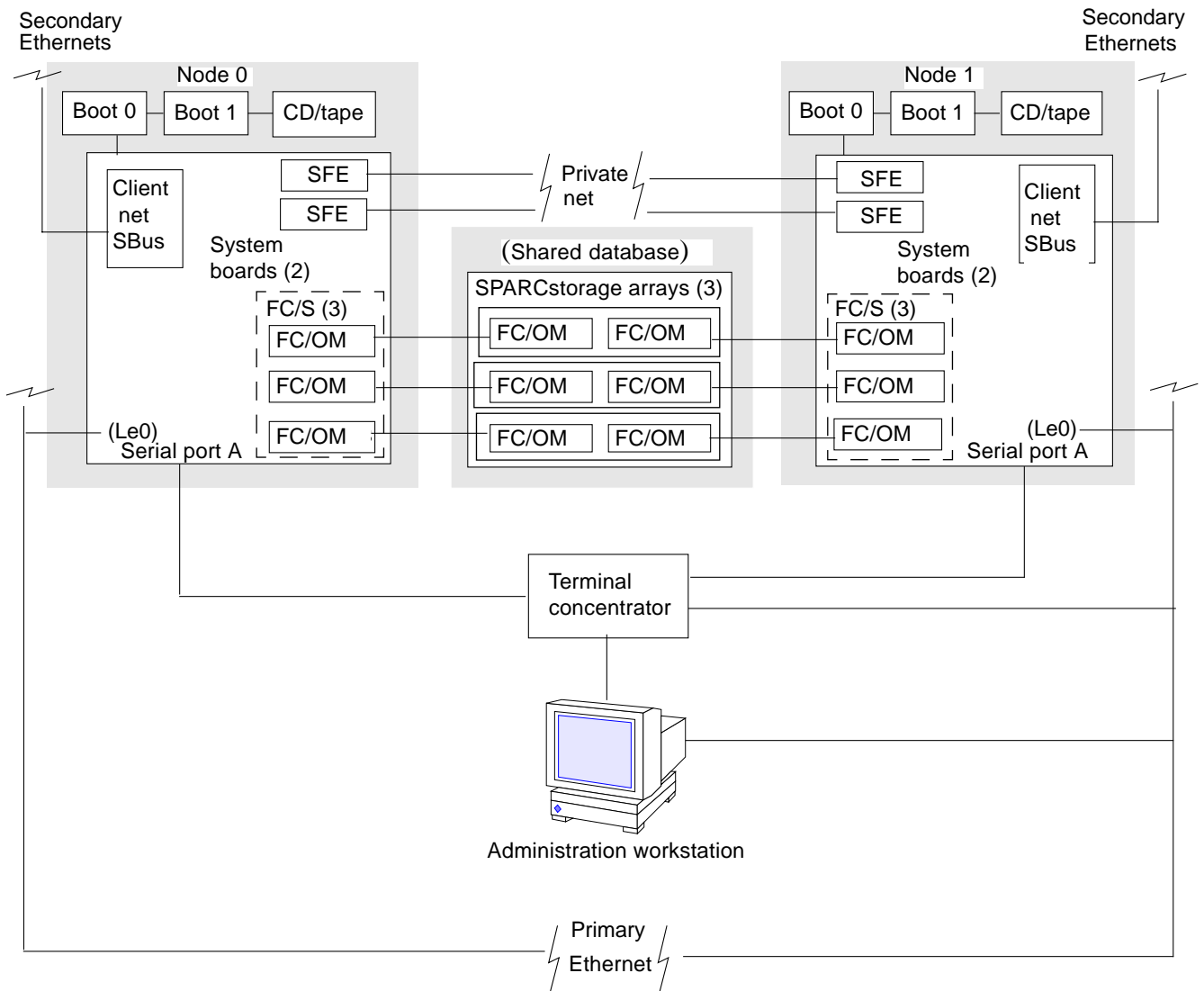


Figure 1-1 SPARCcluster HA Server Block Diagram Based on SPARCserver 1000

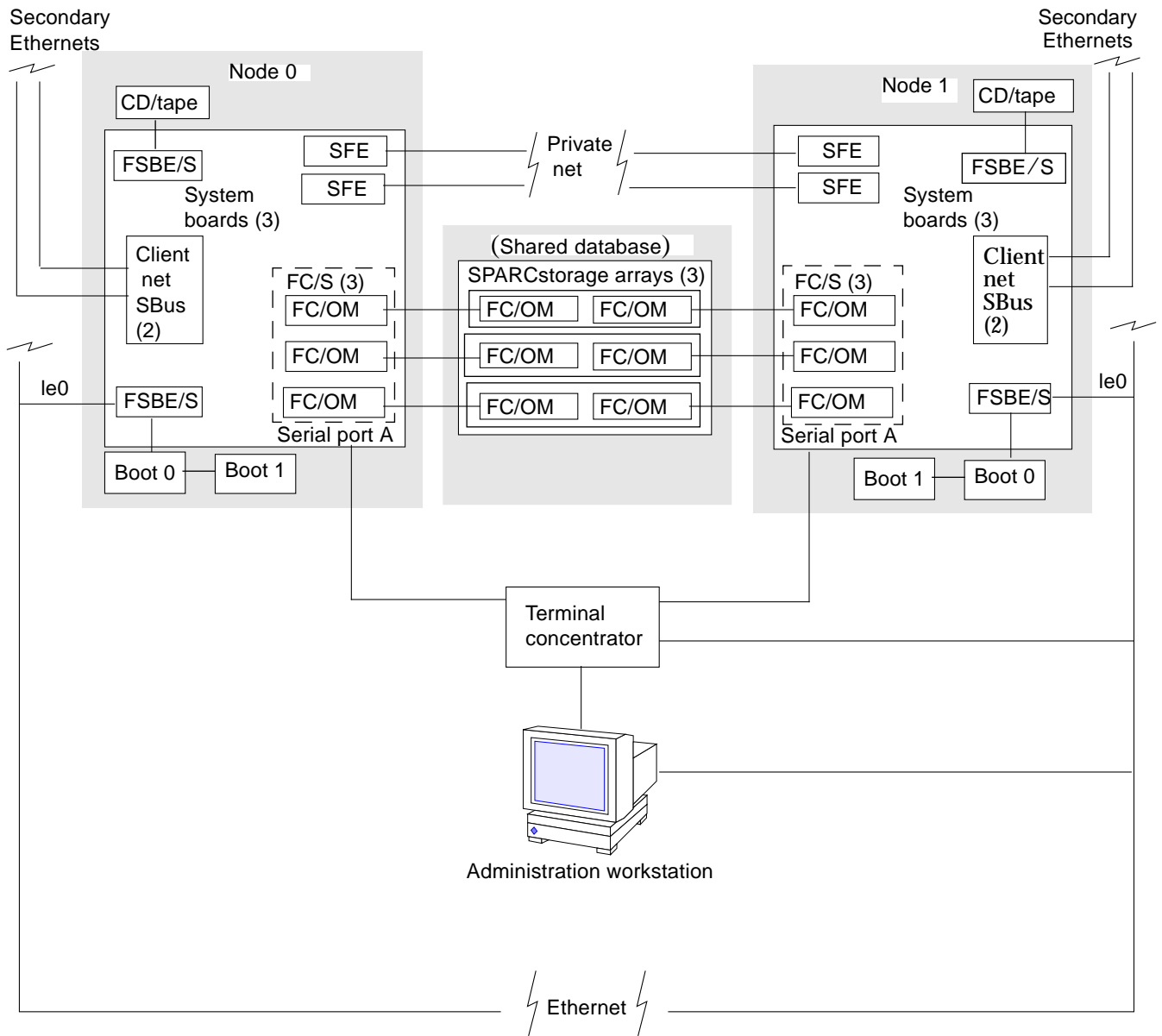


Figure 1-2 SPARCcluster HA Server Block Diagram Based on SPARCcenter 2000

## 1.2 SPARCcluster 1000HA Server Configuration

Figure 1-3 shows the SPARCserver 1000 hardware configuration required to support the Solstice HA software. 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
- Three SPARCstorage arrays
- Six fiber optic cables
- Six 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)

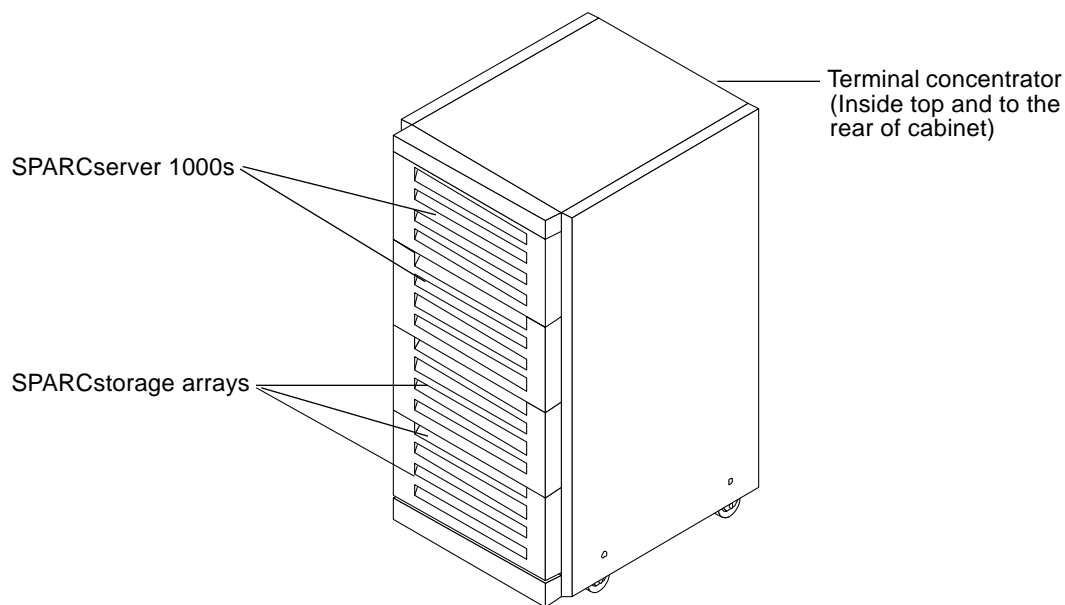


Figure 1-3 SPARCcluster 1000HA Server Cabinet

### 1.3 SPARCcluster 2000HA Server Configuration

Figure 1-4 shows the SPARCcenter 2000 server hardware configuration required to support the Solstice HA software. The minimum configuration is:

- Two SPARCcenter 2000s, each equipped with:
  - Three system boards
  - Six processor modules
  - 256 Mbyte RAM
- Three SPARCstorage arrays
- Six FC/OM SBus cards
- Terminal concentrator
- Six 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

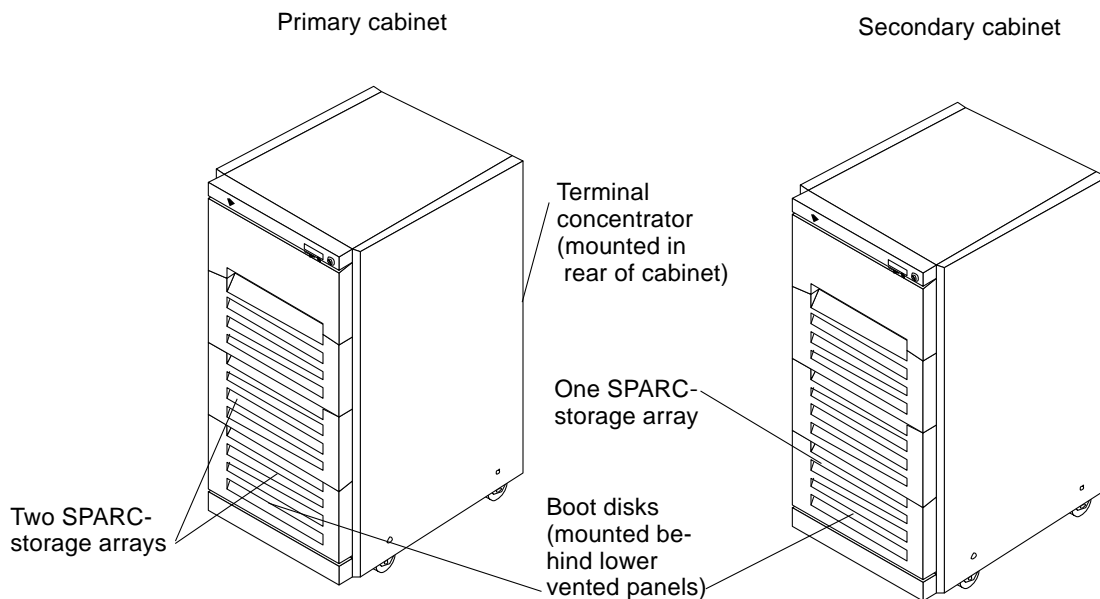


Figure 1-4 SPARCcluster 2000HA Server Cabinets

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## 1.4 Internal Options

The following internal options can be purchased for SPARCcluster HA servers.

### 1.4.1 SPARCcluster 1000HA Server

#### 1.4.1.1 System Board Options (Expansion of Existing Nodes)

- SPARCserver 1000, system board with two SuperSPARC™ processors, no memory
- SPARCserver 1000, system board with no processors or memory

#### 1.4.1.2 Memory Options

- 32-Mbyte ECC memory expansion SIMMs
- 64-Mbyte ECC memory expansion SIMMs
- 128-Mbyte ECC memory expansion SIMMs

#### 1.4.1.3 Processor Options

- SM61 SuperSPARC® processor with one SuperSPARC processor and SuperCache™ for the SPARCserver 1000 or 1000E

#### 1.4.1.4 SBus Options

- Fast SCSI-2/Buffered Ethernet card (FSBE/S)
- SBus Quad Ethernet Controller (SQEC)
- SunFastEthernet Adapter SBus Card

### 1.4.2 SPARCcluster 2000HA Server

#### 1.4.2.1 System Board Options (System Expansion)

- SPARCcenter 2000E, system board with two SuperSPARC processors, 2-Mbyte SuperCache each, no memory
- SPARCcenter 2000, system board with no processors or memory

#### *1.4.2.2 Memory Options*

- 64-Mbyte ECC memory expansion SIMMs
- 256-Mbyte ECC memory expansion

#### *1.4.2.3 Processor Options*

- SM61-2, SuperSPARC processors with one SuperSPARC+ processor and 2-Mbyte SuperCache for SPARCcenter 2000 or 2000E

#### *1.4.2.4 Tape Drives*

- 14-Gbyte 8mm tape internal drive
- 20-Gbyte 4mm tape auto-loader internal drive
- 150-Mbyte 1/4-inch internal SCSI tape drive

#### *1.4.2.5 SBus Options*

- SBus Quad Ethernet Controller (SQEC)
- SunFastEthernet adapter SBus card
- Fast SCSI-2/buffered Ethernet card (FSBE/S)

### *1.4.3 SPARCstorage Array Model 100 Series*

#### *1.4.3.1 Optional SPARCstorage Array Model 101*

- 6.3-Gbyte (6 x 1.05-Gbyte Fast/Wide SCSI-2 Disk) single connector SPARCstorage array, with 2-meter Fiber Optic cable
- 18.9-Gbyte (18 x 1.05-Gbyte Fast/Wide SCSI-2 Disk) single connector SPARCstorage array, with 2-meter Fiber Optic cable
- 31.5-Gbyte (30 x 1.05-Gbyte Fast/Wide SCSI-2 Disk) single connector SPARCstorage array, with 2-meter Fiber Optic cable

#### *1.4.3.2 Optional SPARCstorage Array Model 100 Accessories*

- 1.05-Gbyte Single Connector Fast/Wide SCSI-2 Disk/2.1-Gbyte Disk
- 6.3-Gbyte (6 x 1.05-Gbyte Single Connector Fast/Wide SCSI-2 Disks)
- Fibre Channel/SBus Host Adapter, Single-Channel Host Connection for the SPARCstorage array

- Fibre Channel Optical Module, Second Fibre Channel port for use on either the SPARCstorage array or the Fibre Channel/SBus Host Adapter
- 2-meter Fiber Optic cable
- 15-meter Fiber Optic cable
- Rack Mount Kit for one SPARCserver 1000 system or one SPARCstorage array

## 1.5 External Options

The following external options can be purchased for SPARCcluster HA servers.

### 1.5.1 SPARCcluster 1000HA Server

#### 1.5.1.1 HA Cluster Foundation Package, 1000

- Four SunFastEthernet Adapters SBus cards
- One SPARCstorage array
- Two 1.05 Gbyte SPARCstorage array disks
- Four Fibre Channel SBus cards
- Three Fibre Channel Optical Modules
- One SPARCstation™ 4
- One Data Center Expansion Cabinet
- One Terminal Concentrator
- Five Rack Mount Kits
- One CD ROM
- Special and SunFastEthernet™ cables, power cords
- Three 2-meter Fiber Optic cables

#### 1.5.1.2 Mass Storage Options

- 20-Gbyte 4mm auto-loader with data center tray
- 14-Gbyte 8mm tape internal drive
- Multi-Tape backup tray with one 14-Gbyte 8mm tape internal drive
- Front-Load 1/2-inch tape for the Expansion Cabinet
- 20-Gbyte 4mm auto-loader internal backup tape
- 56-inch Data Center Expansion Cabinet
- Rack-mount kit

## *1.5.2 SPARCcluster 2000HA Server*

### *1.5.2.1 HA Cluster Foundation Package, 2000*

- Four SunFastEthernet Adapter SBus cards
- One SPARCstorage array
- Two 1.05 Gbyte SPARCstorage array disks
- Four Fibre Channel Interface SBus cards
- Three 15-meter Fiber Optic cable
- Three 2-meter Fiber Optic cables
- Three Fibre Channel Optic Modules
- One SPARCstation 4
- One Terminal Concentrator
- Three Rack Mount Kits
- Two FSBE SBus cards
- Four 1.05 Gbyte desktop storage pack
- One CD ROM
- Special and SunFastEthernet cables, power cords

### *1.5.2.2 Mass StorageSPARCcluster support services package Options*

- 14-Gbyte 8mm tape internal drive
- Multi-Tape backup tray with one 14-Gbyte 8mm tape internal drive
- Front-Load 1/2-inch tape for the expansion cabinet
- 20-Gbyte 4mm auto-loader with data center tray
- 20-Gbyte 4mm tape auto-loader internal drive
- 56-inch Data center expansion cabinet
- Ballast kit

## *1.5.3 SPARCstorage Array Model 100 Series*

### *1.5.3.1 Optional SPARCstorage Array Model 101*

- 6.3-Gbyte (6 x 1.05-Gbyte Fast/Wide SCSI-2 Disk) single connector SPARCstorage array, with 2-meter Fibre Optic cable
- 18.9-Gbyte (18 x 1.05-Gbyte Fast/Wide SCSI-2 Disk) single connector SPARCstorage array, with 2-meter Fibre Channel cable
- 31.5-Gbyte (30 x 1.05-Gbyte Fast/Wide SCSI-2 Disk) single connector SPARCstorage array, with 2-meter Fibre Optic cable



### ***1.5.3.2 Optional SPARCstorage Array Model 100 Accessories***

- 1.05-Gbyte SC Fast/Wide SCSI-2 Disk/2.1-Gbyte Disk
- 6.3-Gbyte (6 x 1.05-Gbyte SC Fast/Wide SCSI-2 Disks)
- Fibre Channel/SBus Host Adapter, Single-Channel Host Connection for the SPARCstorage array
- Fibre Channel Optical Module, Second Fibre channel port for use on either the SPARCstorage array or the Fibre Channel/SBus Host Adapter
- 2-meter Fiber Optic cable
- 15-meter Fiber Optic cable
- Rack-mount Kit for one SPARCserver 1000 system or one SPARCstorage array



## *Part 2 — Troubleshooting*

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Chapter 2	Troubleshooting Overview
Chapter 3	Hardware Troubleshooting
Chapter 4	Software Troubleshooting
Chapter 5	Diagnostics



## *Troubleshooting Overview*

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### *2.1 SPARCcluster Architecture*

A SPARCcluster HA Server is comprised of redundant, on-line components, which can continue system operation through failure, repair, and relocation of one assembly or device. To maintain a high level of availability, failed components should be replaced as soon as possible. Also, service precautions must be taken to maintain cluster operation while maintenance is being accomplished. See the section on “Maintenance Authorization.”

### *2.2 Maintenance Authorization*

The site system administrator must be contacted to prepare a node for maintenance 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.

### *2.3 Troubleshooting a Remote Site*

Use telnet to communicate with either node in a cluster.

## 2.4 Troubleshooting Flow

### 2.4.1 Takeover

The Solstice HA software allows one node to takeover when a critical hardware or software failure is detected. When a failure is detected, an error message is generated to the system console and, if required, the service provider is notified (depending upon the system maintenance contract). When a takeover occurs, the node assuming control becomes the I/O master for the disksets on the failed node and redirects the clients of the failed node to itself. The troubleshooting flow for a takeover is further depicted in Figure 2-1.

### 2.4.2 Switchover

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

### 2.4.3 Failures Where There is no Takeover

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



---

**Warning** - DO NOT plug a keyboard directly to a node system board. If a keyboard is plugged 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, plugging 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 system administrator to return the repaired assembly to the cluster.

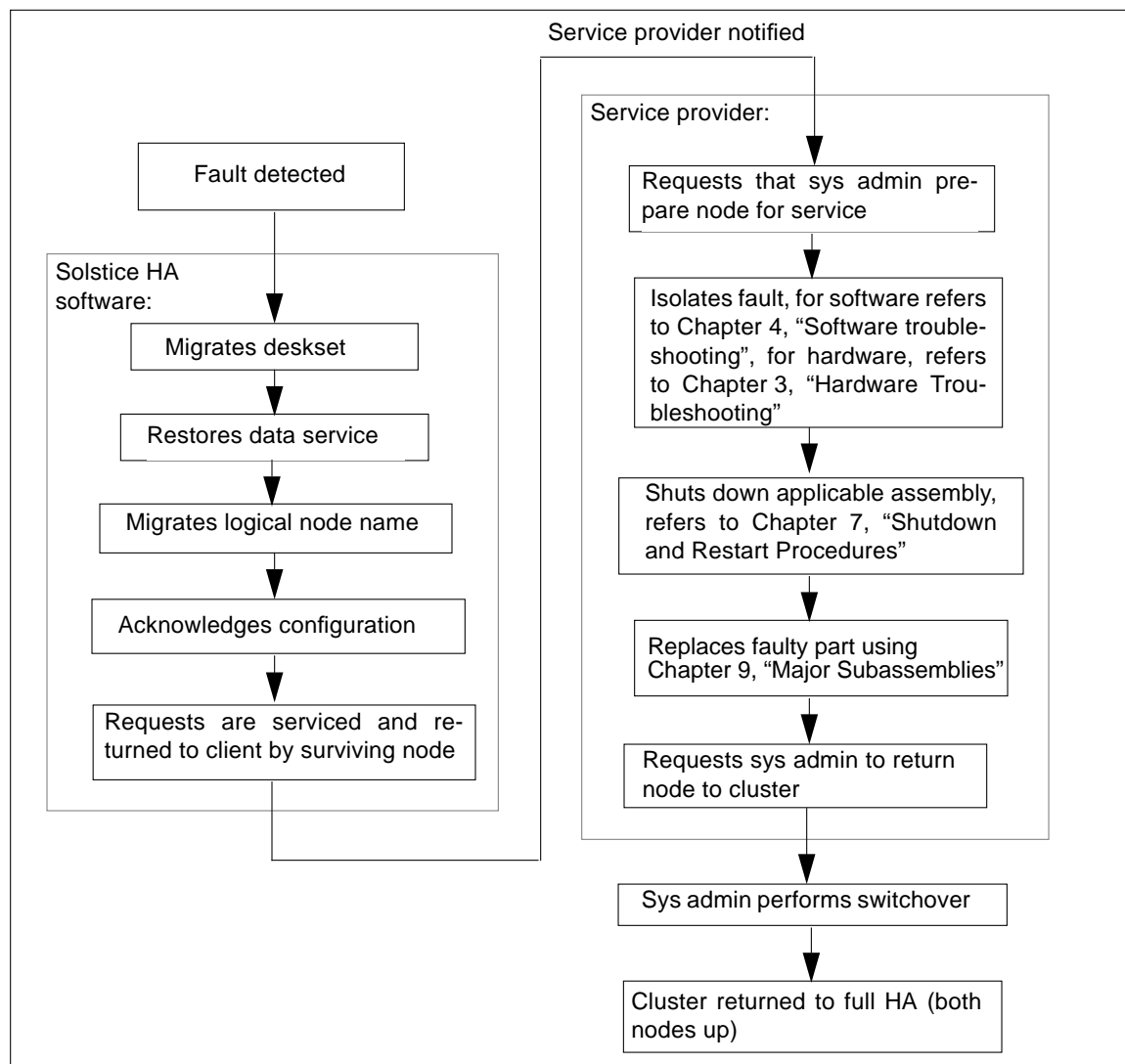


Figure 2-1 Takeover Troubleshooting Flow Diagram

## 2.5 Fault Classes/Principal Assemblies

SPARCcluster HA 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
  - Controller
  - Fibre Channel Optical Module
  - Fibre Channel SBus card
  - Fiber optic cables/interfaces
- Node (SPARCcenter 2000 or SPARCserver 1000) faults
  - Boot disk
  - System board
  - Control board
  - Fibre Channel Optical Module
  - Fibre Channel SBus card
  - Fiber optic cables/interfaces
  - Client net Sbus card
  - Client net/connections
  - SunFastEthernet SBus card/interfaces (SunFastEthernet)
- Terminal concentrator/serial connections faults
- Software faults
  - Application program died
  - System crash (panic)
  - Hung system (lock up)
  - Cluster-wide failures

All troubleshooting begins at the system console. The console should be checked regularly, as should any other source of operator information. For example, the output of the `hastat` command should be checked regularly. For more information on the `hastat` command, refer to the *SPARCcluster High Availability Software Administration Guide*.



## 2.6 Error Messages/Symptoms

Table 2-1 lists error messages or symptoms together with the probable cause and troubleshooting reference.

Table 2-1 Error Message/Symptom

Error Message/Symptom	Probable Cause	Cluster Service Reference	Troubleshooting Reference
		<b>Nodes</b>	
Either node reboots; boot disk failure; loss of performance meter response from one node	SPARCcenter 2000 or SPARCserver 1000	Section 3.3, "Node Failures	<i>SPARCcenter 2000/SPARCserver 1000 System Service Manual</i>
		<b>Private Net</b>	
Either node reboots; boot disk failure; loss of performance meter response from one node	SPARCcenter 2000 or SPARCserver 1000	Section 3.3, "Node Failures	<i>SPARCcenter 2000/SPARCserver 1000 System Service Manual</i>
be0 no carrier-transceiver cable problem? ; be0 no response	SunFastEthernet	Section 3.4.1, "Private Net Failure (SunFastEthernet)"	<i>SunFastEthernet Adapter User Guide</i>
		<b>Client Network</b>	
qe0 no carrier -transceiver cable problem?; qe0 no response	Client net	Refer to your client network documentation	As applicable
		<b>Public Network</b>	
le0 no carrier-transceiver cable problem?; le0 no response	Cable	(See Chapters 9 and 10 of the SPARCcluster HA Hardware Planning and Installatin Manual for cable detail.)	Not applicable

Table 2-1 Error Message/Symptom (Continued)

Error Message/Symptom	Probable Cause	Cluster Service Reference	Troubleshooting Reference
soc.link.5010 soc#: port: # Fibre Channel is OFFLINE; c2t4d8s2 failed (see Appendix D for additional messages)	Disk	<b>SPARCstorage Array</b>	<i>SPARCstorage Array Model 100 Series Service Manual</i>
		Section 3.2, "SPARCstorage Array/Optical Connections Faults"	
No messages for one of the nodes on the system console; no messages from either node on the system console	Terminal concentrator	<b>Terminal Concentrator</b>	
		Section 3.5, "Terminal Concentrator/Serial Connection Faults"	

## 2.7 Device to Troubleshooting Cross Reference

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

Table 2-2 Device Troubleshooting Cross Reference

Device/Trouble Area	Reference	Part Number
Array Controller/Fibre Optic Connector/ Fibre Channel Optical Module	<i>SPARCstorage Array Model 100 Series Service Manual</i> (Chapter 2 "Troubleshooting")	801-2206
Disk drive	<i>SPARCstorage Array Model 100 Series Service Manual</i>	801-2206
Terminal concentrator	<i>SPARCcluster HA Server Service Manual</i> (Section 3.5, "Terminal Concentrator/Serial Connection Faults")	802-3512
SPARCcenter 2000	<i>SPARCcenter 2000 Service Manual</i> (Chapter 2, "Troubleshooting Overview")	801-2007
SPARCserver 1000	<i>SPARCserver 1000 System Service Manual</i> (Chapter 2, "Troubleshooting Overview")	801-2895
SunFastEthernet adapter	<i>SunFastEthernet Adapter User Guide</i> (Appendix C, "Running Diagnostics")	801-6109

## 2.8 Device Replacement Cross Reference

Table 2-3 refers to devices and replacement procedures.

Table 2-3 Device Replacement Cross Reference

Device	Cross Reference	Part Number	
		SPARCserver 1000	SPARCcenter 2000
Disk drive	<i>Disk Drive Installation Manual for the SPARCstorage Array</i>	801-2207	801-2207
Optical Module	<i>Fibre Channel Optical Module Installation Manual</i>	801-6326	801-6326
SunFastEthernet	<i>SunFastEthernet Adapter User Guide</i>	801-6109	801-6109
System board, control board, power supply, SPARC module, boot disk	<i>SPARCcenter 2000 or SPARCserver 1000 System Service Manual</i>	801-2007	801-2895



# Hardware Troubleshooting



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 *SPARCcluster High Availability Server Software Administration Guide*. The procedures within this chapter indicate when the system administrator's assistance is needed.

**Warning** – Be sure you have read and understand Section 3.1, “Solaris Reconfiguration Reboots,” before attempting to reconfiguration reboot after hardware component replacement.

The following table lists the procedures contained in this chapter:

<i>Solaris Reconfiguration Reboots</i>	<i>page 3-2</i>
<i>SPARCstorage Array/Optical Connections Faults</i>	<i>page 3-2</i>
<i>Multi-disk Errors From Both Nodes on the Same SPARCstorage Array</i>	<i>page 3-3</i>
<i>Multiple Disk Errors or Disk Communication Error For One Node Only</i>	<i>page 3-4</i>
<i>SPARCstorage Array Fails to Communicate</i>	<i>page 3-5</i>
<i>Node Failures</i>	<i>page 3-12</i>
<i>System Board, Control Board, and Boot Disk</i>	<i>page 3-12</i>
<i>Network Failures</i>	<i>page 3-17</i>
<i>Private Net Failure (SunFastEthernet)</i>	<i>page 3-17</i>
<i>Client Net Failure</i>	<i>page 3-20</i>
<i>Terminal Concentrator/Serial Connection Faults</i>	<i>page 3-20</i>

<i>System Indicators</i>	<i>page 3-21</i>
<i>Serial Connections</i>	<i>page 3-22</i>
<i>Intermittent Router Problems</i>	<i>page 3-22</i>
<i>Terminal Concentrator Flow Diagrams</i>	<i>page 3-23</i>

### 3.1 Solaris Reconfiguration Reboots

---

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

---

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

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

### 3.2 SPARCstorage Array/Optical Connections Faults

System console messages indicate a node has a defective disk, controller, or cable. First isolate the fault using the procedures in the following two sections, if the fault matches the section heading. Otherwise proceed to Section 3.2.3, “SPARCstorage Array Fails to Communicate” and proceed as directed.

### 3.2.1 Multi-disk Errors From Both Nodes on the Same SPARCstorage Array

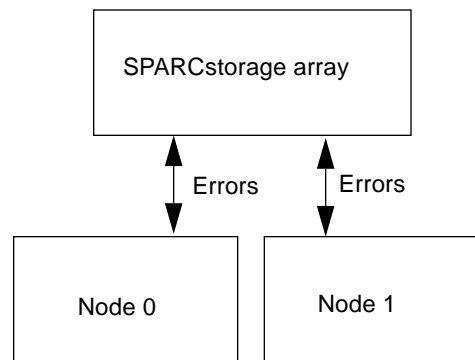


Figure 3-1 Both Nodes Have Errors on Same SPARCstorage Array

---

**Note** – The following procedure isolates a probable failure of a SPARCstorage array controller board.

---

1. Check AC and DC lights on disk power supply. Refer to the *SPARCstorage Array Model 100 Series Service Manual*. If light display is normal, proceed to step 2.
2. Contact the system administrator and request that the node be prepared for replacement of a controller in a SPARCstorage array.
3. Bring the SPARCstorage array down as described in Chapter 7, “Shutdown and Restart Procedures.”
4. Replace the controller board as described in Chapter 5 of the *SPARCstorage Array Model 100 Series Service Manual*.
5. Bring the SPARCstorage array tray up as described in Chapter 7, “Shutdown and Restart Procedures.”
6. Contact the system administrator and indicate that the node is ready to be returned to the cluster following replacement of a controller in a SPARCstorage array.

### 3.2.2 Multiple Disk Errors or Disk Communication Error For One Node Only

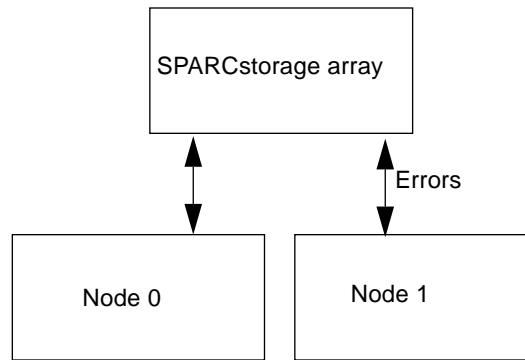


Figure 3-2 Multiple Disk Errors One Node Only

---

**Note** – The following procedure isolates a probable failure of a single disk, or the path to the disk, for example, an optical cable or a fibre channel optical module on the node or on the SPARCstorage array.

---



---

**Note** – You can remove and replace a disk drive, without powering off the SPARCstorage array. It is necessary only to pull out the tray that the drive is in.

---

1. **Contact the system administrator and request that the node be prepared for replacement of a disk.**
2. **Replace the defective disk drive as described in Chapter 5 of the *SPARCstorage Array Model 100 Series Service Manual*.**
3. **Contact the system administrator and request that the node be returned to the cluster.**
4. **If the disk drive errors still exist after replacing the drive, proceed to the next section and isolate the problem to its probable cause.**



### 3.2.3 SPARCstorage Array Fails to Communicate

If a SPARCstorage Array is not communicating with a node, begin troubleshooting by making a physical inspection.

1. **Ensure that the SPARCstorage Array subsystem is connected to a working power outlet.**
2. **Check the power cord connection of the SPARCstorage Array power supply.**
3. **Check the on/off switch of the power supply.**
4. **Ensure that the fiber optic cable is properly connected at both the node and SPARCstorage Array subsystem.**

If the node and the SPARCstorage Array subsystem are still not communicating, then one of the following components is probably faulty:

- Fiber optic cable connecting the node to the SPARCstorage array
- FC/OM on the node
- Fibre Channel SBus (FC/S) card on the node
- FC/OM on the SPARCstorage array
- Array controller on the SPARCstorage array

Follow these instructions to determine if one of the preceding components has failed:

1. **Contact the system administrator and request that the node be prepared for troubleshooting, which will require the shutdown of a SPARCstorage array.**
2. **Shutdown the SPARCstorage array as described in Chapter 7, “Shutdown and Restart Procedures.”**
3. **Go to the controller board at the rear of the SPARCstorage array and set the DIAG switch to DIAG EXT.**  
Setting the DIAG switch to DIAG EXT provides more thorough testing, but it also causes the array to take longer to boot.
4. **Press the Reset switch to reset the SPARCstorage array.**

5. Check the front panel LCD display and see if a SPARCstorage array-specific POST code is displayed in the alphanumeric portion of the LCD display.

Figure 3-3 shows the location of the alphanumeric portion of the LCD and Table 3-1 lists the POST codes specific to the SPARCstorage array.

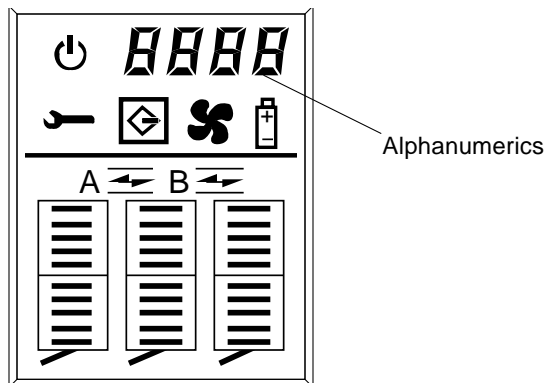


Figure 3-3 LCD Display

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 SPARCstorage array-specific POST code displayed, set the DIAG switch back to DIAG, then go to step 6.
- If you see a SPARCstorage array-specific POST code displayed, set the DIAG switch back to DIAG, then replace the indicated component as described in Chapter 5 of the *SPARCstorage Array Model 100 Series 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 shutdown the processor for the node.**

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

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

**7. Enter the following commands at the `ok` prompt:**

```
ok true to diag-switch?
ok true to fcode-debug?
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 displays enter the following:

```
ok show-devs
```

The following example is for a SPARCcluster 1000 populated with 2 system boards 0 and 1. System board 0 has a QEC and an FC/S in SBus slots 1 and 3, respectively; system board 1 has a QEC in SBus slot 1 and FC/S(s) in slots 2 and 3. You should see output similar to the following:

```
/io-unit@f,e1200000/sbi@0,0/SUNW,soc@3,0
/io-unit@f,e1200000/sbi@0,0/SUNW,soc@2,0
/io-unit@f,e1200000/sbi@0,0/qec@1,20000
/io-unit@f,e0200000/sbi@0,0/SUNW,soc@3,0
/io-unit@f,e0200000/sbi@0,0/qec@1,20000
```

**9. Locate the lines in the output that give information on the FC/S cards installed in the node.**

You can find the 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:

```
/io-unit@f,e1200000/sbi@0,0/SUNW,soc@3,0
```

tells you that an FC/S card is installed in SBus slot 3 of system board 1.

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

**11. Determine what the SBus slot number is for that FC/S card.**

Refer to the processor service manual that came with your 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 processor service manual that came with your 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. Enter the following at the `ok` prompt:**

```
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,e1200000/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 11 again to select the FC/S card again.

---

**13. Enter the following at the `ok` prompt:**

```
ok soc-post
```

- If you see a message saying that the test *passed*, go to step 13.
- 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 processor service manual that came with your 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 fiber optic cable from the FC/OM on the node.**

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

**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 processor service manual that came with your 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.

---

**Note** – Because the SPARCstorage array diagnostics can only check the FC/OMs on the node, 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 node.

---

- 19. Remove the loopback connector from the FC/OM on the node.**
- 20. Remove the FC/OM(s) from the FC/S card in the node.**  
Refer to the processor service manual that came with your system for the necessary 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 node.**  
Refer to Chapter 5 of the *SPARCstorage Array Model 100 Series Service Manual*, for those instructions.
- 22. Install the FC/OM(s) from the SPARCstorage array onto the FC/S card in the node.**
- 23. Install the FC/OM(s) from the FC/S card on the node into the SPARCstorage array.**
- 24. Install the loopback connector on the FC/OM on the node.**

**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 processor service manual that came with your system. Following replacement of the FC/OM, contact the system administrator and indicate that the node is ready to be returned to the cluster following component replacement.

**26. Replace the fiber optic cable.**

Refer to Chapter 5 of the *SPARCstorage Array Model 100 Series Service Manual*, for those instructions.

- 27. Replace the cable and then bring up the applicable SPARCstorage array, refer to 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 node still can’t 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, refer to Chapter 7, “Shutdown and Restart Procedures.”**
- 31. Replace the array controller.**
- 32. Bring up the applicable SPARCstorage array, refer to 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.**

### **3.3 Node Failures**

#### **3.3.1 System Board, Control Board, and Boot Disk**

For a system board, control board, and boot disk failures, messages on the system console will identify the defective node and system board slot. A system board fault can then be further isolated using the `prtdiag` command as described in Section 3.3.2, “`prtdiag` Command.”

This class of faults can be further 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 1000HA system and the *SPARCcenter 2000 System Service Manual* for a SPARCcluster 2000HA 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.

- For the SPARCcluster 1000HA: reference Section 7.1.2, “Processor.”
- For the SPARCcluster 2000HA: reference Section 7.2.2, “Processor Shutdown/Startup.”

- 3. Replace the defective device as indicated in the applicable service manual.**

Refer to the *SPARCserver 1000 System Service Manual* for a SPARCcluster 1000HA system and the *SPARCcenter 2000 Service Manual* for a SPARCcluster 2000HA system.



- 
4. **Bring up the applicable processor, refer to 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 defective part.**

### 3.3.2 `prtdiag` Command

The `prtdiag` command is the preferred tool for locating replaceable board components.

---

**Note** - `prtdiag` is a UNIX command. It can only be accessed if the OS is booted and running on the machine in question. `prtdiag` resides in `/usr/kvm`.

---

Following is an example of the command and its output, actual output will differ.

```

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

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

No failures found in System
=====

```

As shown above, `prtdiag` displays the status of the 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

### 3.3.3 Using `probe scsi` Command

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

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

Once the system is halted, several system messages are displayed. When the messages finish, one of the following two conditions exists; respond as appropriate:

- If the `ok` prompt is displayed; proceed to step 3.
- If the screen below is displayed:

```
Type b (boot), c (continue), or n (new command mode)>
```

**2. Type the following:**

```
> n
```

This yields the `ok` prompt.

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

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

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

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

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

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

---

**Note** – The SPARCcluster 1000 has no SBus slot 0, this position is reserved for the onboard SCSI-2 host for SCSI tray devices.

---

For example:

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

**4. Verify the drive in question is listed.**

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

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

```
ok reset
```

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

---

## 3.4 Network Failures

### 3.4.1 Private Net Failure (*SunFastEthernet*)

---

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

---

System console messages indicate that one of the private nets has failed. For example, the output of the `hastat` command will indicate if there are problems with the private nets. Also, the Message Log (at the bottom of the `hastat` display output) or the `/var/adm/messages` file should be checked for private net related error messages. The use of the `hastat` command and the `/var/adm/messages` file is detailed in Chapter 3 of the *SPARCcluster High Availability Server Software Administration Guide*.

Supplemental troubleshooting can be found in the *SunFastEthernet Adapter User Guide*. Also, see Section 3.4.1.1, “One or Both Nodes Up and Running in a Cluster.”

#### 3.4.1.1 One or Both Nodes Up and Running in a Cluster

In the following example (see Figure 3-4) both nodes are up and running in a cluster, private net 0 has failed and the HA software has recovered on private net 1.

To find the actual designations for the private net ports on a node:

♦ Use the `netstat -i` command on each node to determine which private links `be0` and/or `be1` are available. For example, for node 0:

```
node0# netstat -i
Name Mtu  Net/Dest      Address      Ipkts  Ierrs    Opkts  Oerrs Collis  Queue
be0  1500  204.152.64.0 node0-priv0   642650  0        266563  1     25477  0
be1  1500  204.152.65.0 node0-priv1   642650  0        266563  1     25477  0
-----
-----
```

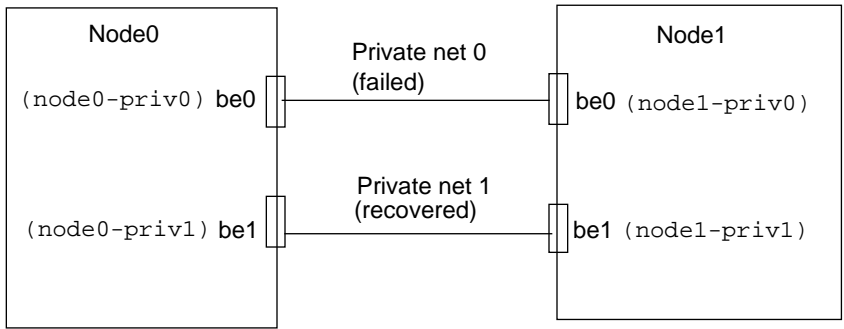


Figure 3-4 Private Net 0 Failure

To troubleshoot private net 0 to a defective card or cable, use the following procedure:

n  
**Note** – In the following procedure, node1 is removed from the cluster. When there is one node remaining in a cluster, HA software will continue sending messages across the private nets. The following procedure uses these message packets to confirm communication between the nodes.

1. Contact the system administrator and request that a node be prepared for removal from the cluster.
2. For this example, assume that the HA software recovers on node 1. Refer to Figure 3-5 and remove the private net 1 cable (cable between the be1 ports of both nodes).
3. Connect the private net 0 cable (cable for failed net) between the be0 port of node 0 and the be1 port of node 1.

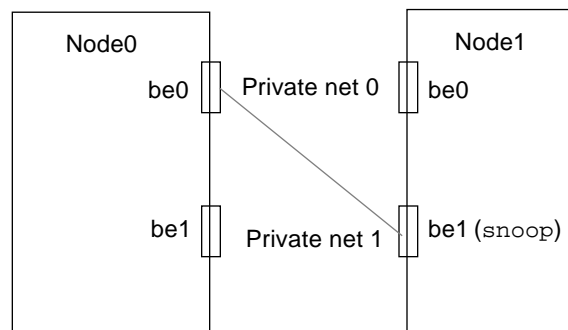


Figure 3-5 Private Net 0 Troubleshooting

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

```
node1# snoop -d be1
```

**5. If the following string is returned as a result of the `snoop` command, then the SBus card for the be0 port on node 1 is most likely defective. This message string indicates that the be0 port of node 0 as well as the private net 0 cable are functional.**

In this instance, request that the system administrator rejoin node0 to the cluster and then remove node1 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.

```
node0-priv0 > node1-priv1 UDP D=6666 S=6666 LEN=120
```

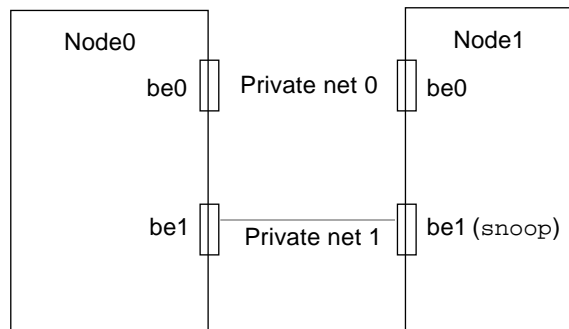


Figure 3-6 Private Net 0 Troubleshooting Continued

6. If the string indicated in step 5 is not returned by the `snoop` command, then connect the private net 0 cable between the be1 ports of both nodes. Following this, continue using the `snoop` command on node 1 (`snoop` will be run as initiated in step 4 until interrupted by a `CTRL C`).
7. If the message string indicated in step 5 is repeated, then the be0 port on node 0 is most likely defective, as this message indicates that the private net 0 cable is functional. In this instance, replace the related SBus card in node 0 and then indicate to the system administrator that node 0 is ready to be returned to the cluster.
8. If the message string indicated in step 5 is *not* returned, then the private net 0 cable is most likely defective.

### 3.4.2 Client Net Failure

Messages on the system console 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.

## 3.5 Terminal Concentrator/Serial Connection Faults

---

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

---



Terminal concentrator faults can be isolated using the diagrams depicted in Section 3.5.4, “Terminal Concentrator Flow Diagrams” as well as the information contained in Section 3.5.5, “Additional Troubleshooting Tips.”

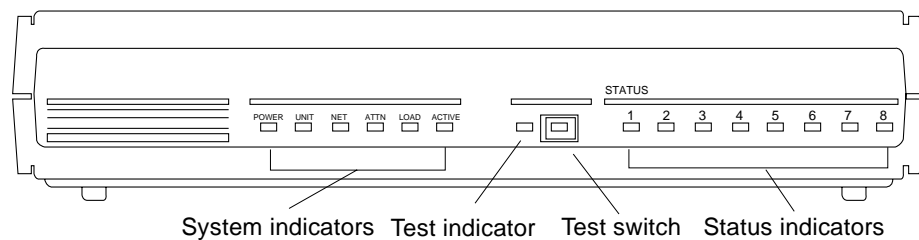


Figure 3-7 Indicator Locations

### 3.5.1 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.

### 3.5.2 *Serial Connections*

Serial connections between the terminal concentrator and each node may be isolated by the troubleshooting flow diagrams in Section 3.5.4, “Terminal Concentrator Flow Diagrams.”

### 3.5.3 *Intermittent Router Problems*

If you experience the following:

- 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.
- Also, the terminal concentrator shows no signs of rebooting.

The solution to this problem is to establish a default route within the terminal concentrator and disable the routed feature. The routed feature must be disabled to prevent the default route from being lost. The procedure is as follows:

**1. Telnet to the terminal concentrator and become superuser as follows:**

```
$ 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 prompt enter the following:**

```
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
```

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
```

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

**3. Disable the router feature using the `set` command as follows:**

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

**4. Boot the terminal concentrator:**

```
annex# boot
```

### 3.5.4 Terminal Concentrator Flow Diagrams

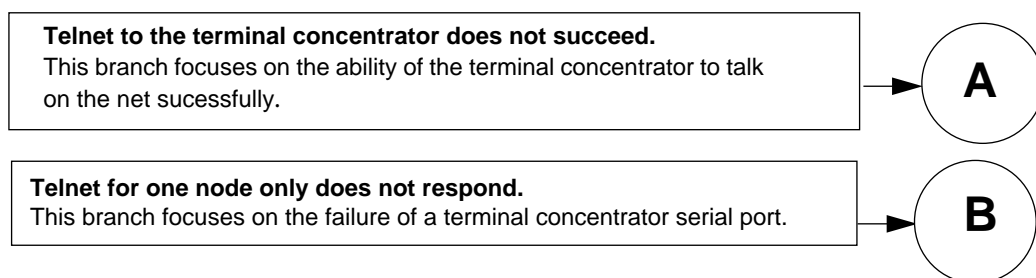


Figure 3-8 Troubleshooting Flow Diagram Overview

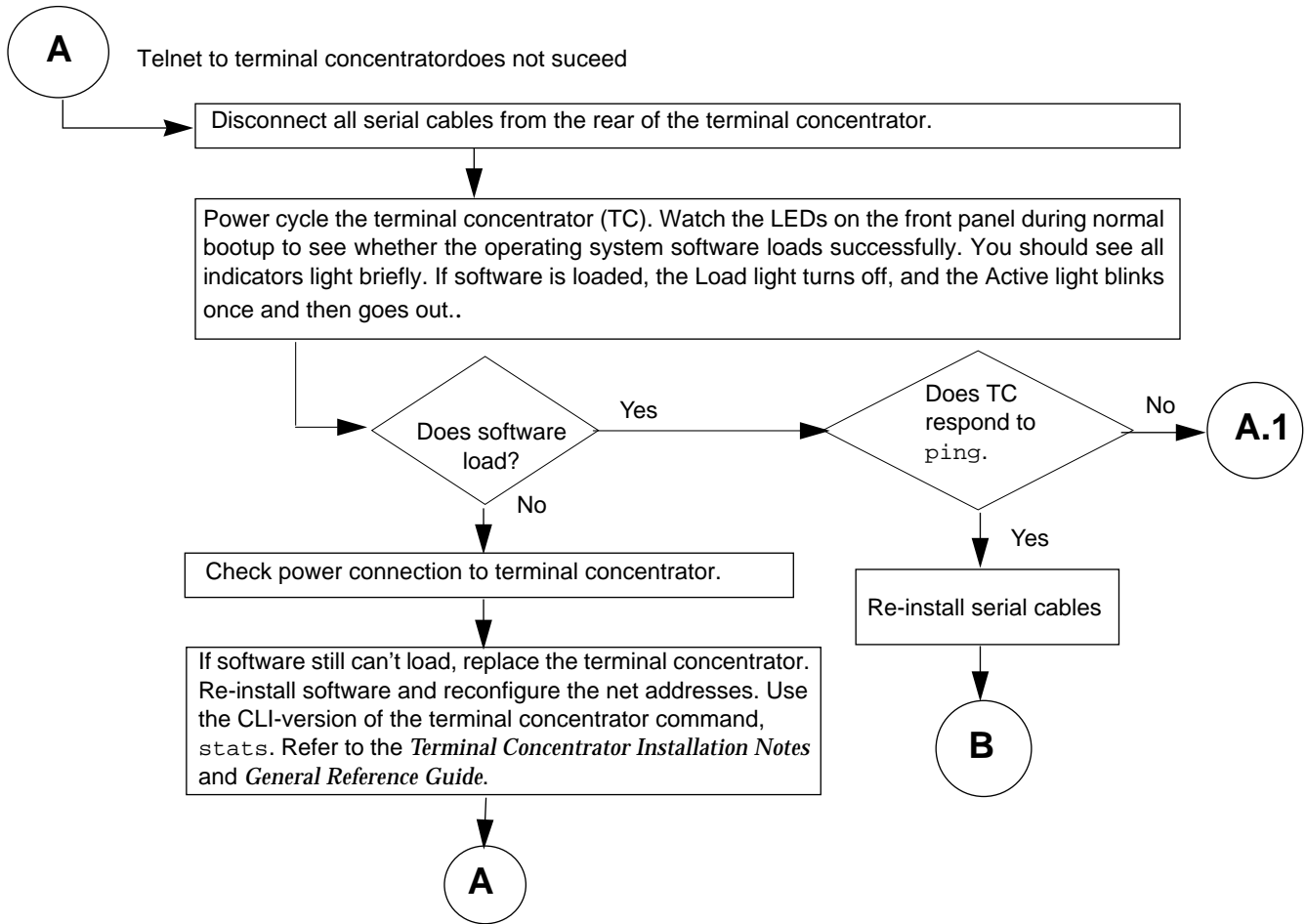


Figure 3-9 Branch A: Telnet to Terminal Concentrator Does Not Succeed

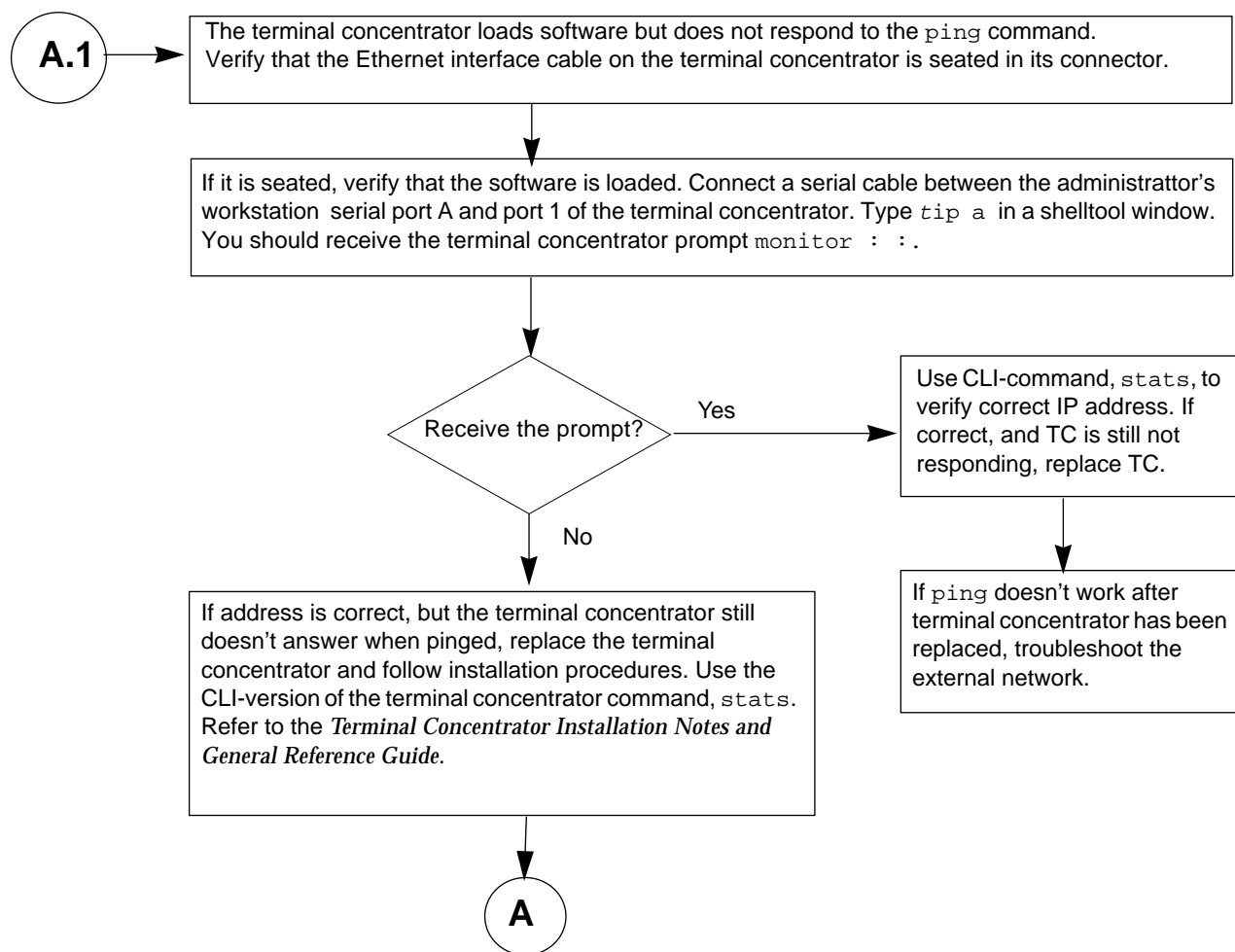


Figure 3-10 Branch A1: Terminal Concentrator Doesn't Respond to Ping Command

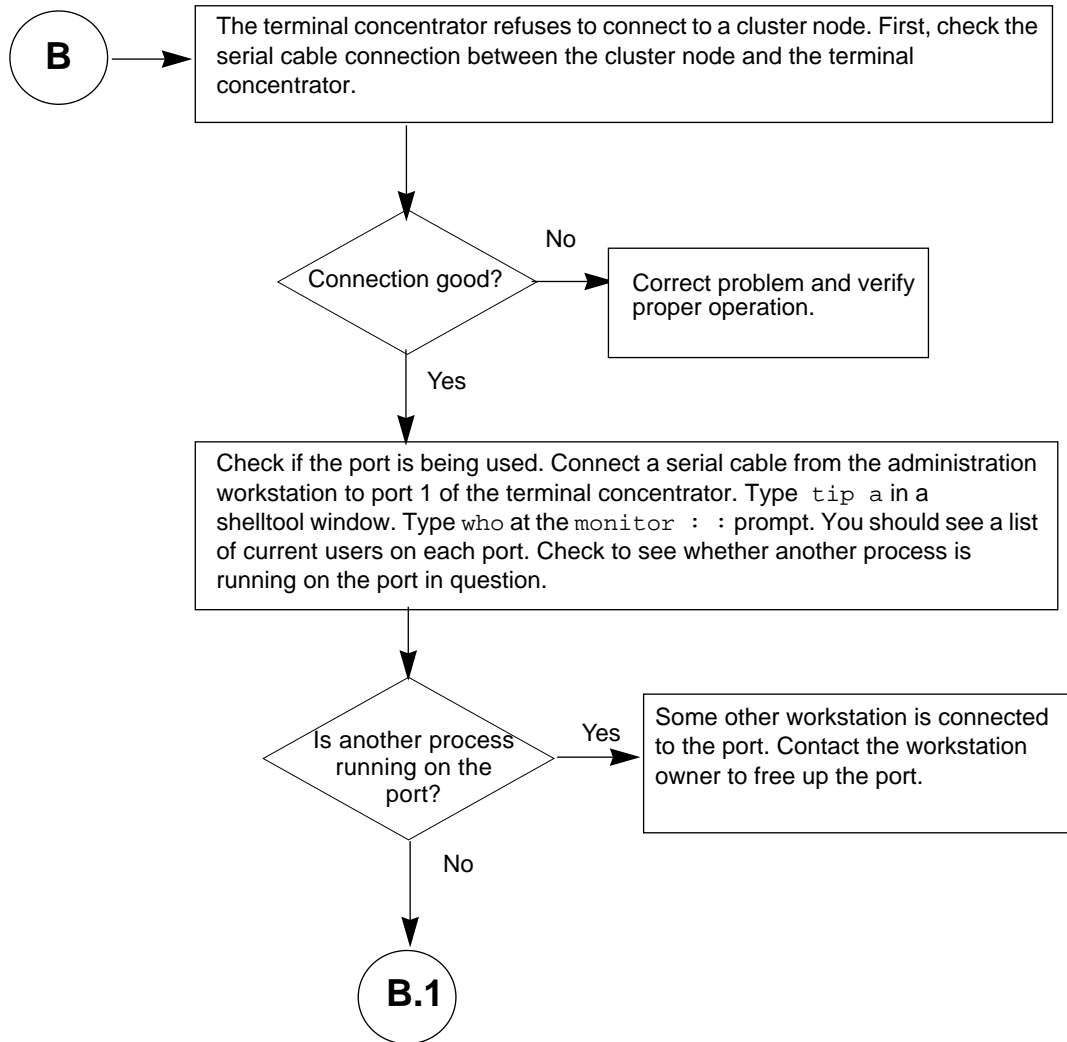


Figure 3-11 Branch B: Terminal Concentrator Can't Connect to a Node

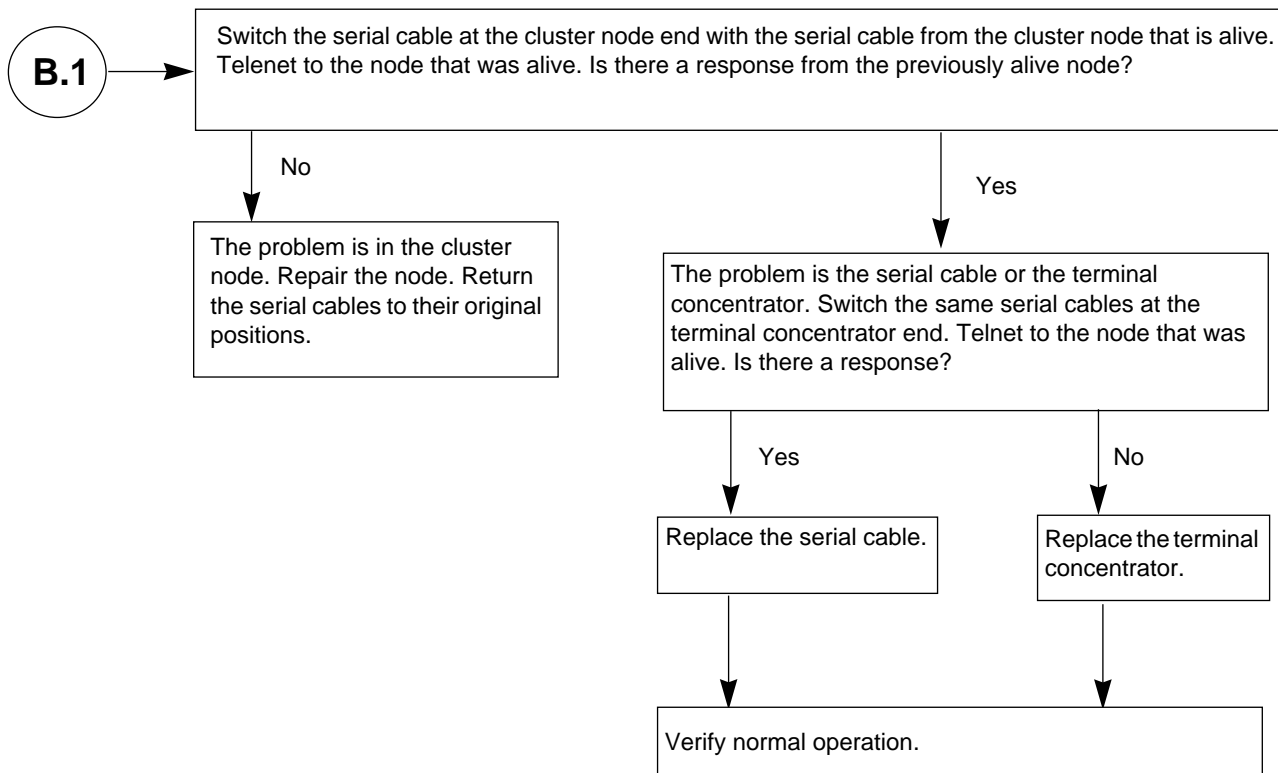


Figure 3-12 Branch B.1: Single Node Not Responding

### 3.5.5 Additional Troubleshooting Tips

#### 3.5.5.1 Terminal Concentrator Indicators

The eight status indicators on the terminal concentrator (Figure 3-7) indicate activity on the serial ports (after POST has passed). Messages from the node should cause the appropriate port LED (2 through 5) to blink. Text entered into the administration workstation should also cause the LED to blink. This can be useful when trying to determine whether the terminal concentrator, node, or cable is bad.

### 3.5.5.2 Terminal Concentrator System Information

The ROM monitor command, `config`, allows you to verify the hardware and software revisions of the terminal concentrator. Press the reset button, and after 5 seconds, press the test button.

When the `monitor::` prompt appears, type:

```
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 3
```



## *Software Troubleshooting*

---



Generally, most software problems will manifest themselves as messages on the system console. The system console displays messages from the following sources:

- Operating environment (Solaris)
- Database software (Oracle)
- Cluster HA operating software
- SPARCstorage array firmware and device driver
- Network File System (NFS)
- Solstice DiskSuite

Much of the fault management in SPARCcluster HA server configurations is performed by the Solstice HA software. While the underlying SPARCcluster architecture ensures no single point of hardware failure and redundant paths to all components, failures are detected, isolated, and recovered using software.

## 4.1 *Software Faults*

### 4.1.1 *Operating System Failures*

To determine the severity and content of operating system related error messages, refer to the Solaris documentation that came with your system.

Example message:

```
node0 # Unix: Link down - cable problem?
```

### 4.1.2 *Solstice HA Failures*

For a listing of error messages related to the Solstice HA software, refer to Appendix A in the *SPARCcluster High Availability Software Planning and Installation Manual*

### 4.1.3 *SPARCstorage Array Failures*

For a listing of error messages specific to SPARCstorage array firmware and device drivers, refer to Appendix D in this manual.

### 4.1.4 *Oracle Failures*

To determine the severity and content of Oracle related error messages, refer to the Oracle RDBMS documentation that came with your system.

### 4.1.5 *NFS Failures*

To determine the severity and content of NFS related error messages, refer to the Solaris documentation that came with your system. For example, the *NFS Administration Guide*.

### ***5.1 Failure Diagnosis and Confirmation of Component Repair Using SunVTS/SunDiag***

For initial installation and hardware configuration confirmation and component diagnosis, before HA Server software has been installed, refer to Chapter 6 of the *SPARCcluster High Availability Server Software Administration Guide* for instructions on installing SunVTS. For other hardware component diagnosis and repair confirmation, refer to the documentation for the component for use of SunDiag.

### ***5.2 Verify HA Configuration using `hacheck` Command***

The Solstice HA `hacheck` command is used to verify system configurations. Refer to Chapter 11 of the *SPARCcluster High Availability Server Software Planning and Installation Guide* for more information regarding this command; refer to Appendix A of the same manual for information concerning error messages associated with the `hacheck` command.



## *Part 3 — Preparing for Service*

---

Chapter 6      Safety and Tools Requirements

Chapter 7      Shutdown and Restart Procedures



## *Safety and Tools Requirements*

---



### *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
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.



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

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

Wear anti-static wrist straps when handling any magnetic storage devices or system boards.

Only use properly grounded power outlets as described in the *SPARCcluster High Availability Server Hardware Planning and Installation*.



**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.

---

### 6.3 System Precautions



**Warning** – This equipment contains lethal voltages. Accidental contact can result in serious injury or death.

---



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

---

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

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



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

---

---

## 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, 13mm
- Sun ESD mat
- Grounding wrist strap
- Needlenose pliers
- Removal tool, pin/socket
- Digital multimeter (DMM)
- 7mm nutdriver
- Loopback connector



## Shutdown and Restart Procedures



Performing shutdown and startup tasks are necessary for the performance of the subassembly removal and replacement procedures. These procedures are specifically structured for a high availability system. At appropriate points, references will indicate that the system administrator be contacted. For example, to remove a node from a cluster in preparation for service, to rejoin a node to the cluster after servicing or, to perform certain necessary software tasks prior to maintenance of various system components. Thus, highly available data services are maintained.

Procedure	SPARCcluster 1000	SPARCcluster 2000
<i>System Cabinet</i>	<i>page 7-2</i>	<i>page 7-11</i>
<i>Shutdown</i>	<i>page 7-2</i>	<i>page 7-4</i>
<i>Startup</i>	<i>page 7-4</i>	<i>page 7-13</i>
<i>Processor</i>	<i>page 7-4</i>	<i>page 7-17</i>
<i>Shutdown</i>	<i>page 7-4</i>	<i>page 7-17</i>
<i>Startup</i>	<i>page 7-4</i>	<i>page 7-17</i>
<i>SPARCstorage Array</i>	<i>page 7-8</i>	<i>page 7-19</i>
<i>Complete Array Shutdown</i>	<i>page 7-8</i>	<i>page 7-19</i>
<i>Complete Array Startup</i>	<i>page 7-9</i>	<i>page 7-19</i>
<i>Single Drive/Tray Shutdown</i>	<i>page 7-11</i>	<i>page 7-19</i>
<i>Single Drive/Tray Startup</i>	<i>page 7-11</i>	<i>page 7-20</i>
<i>Terminal Concentrator</i>	<i>page 7-11</i>	<i>page 7-20</i>

<i>Boot Disks</i>	<i>page 7-20</i>
<i>Power Off</i>	<i>page 7-20</i>
<i>Power On</i>	<i>page 7-20</i>

## 7.1 SPARCcluster 1000HA Server

### 7.1.1 System Cabinet



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

#### 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 risk of electrical shock to personnel exists.



**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.

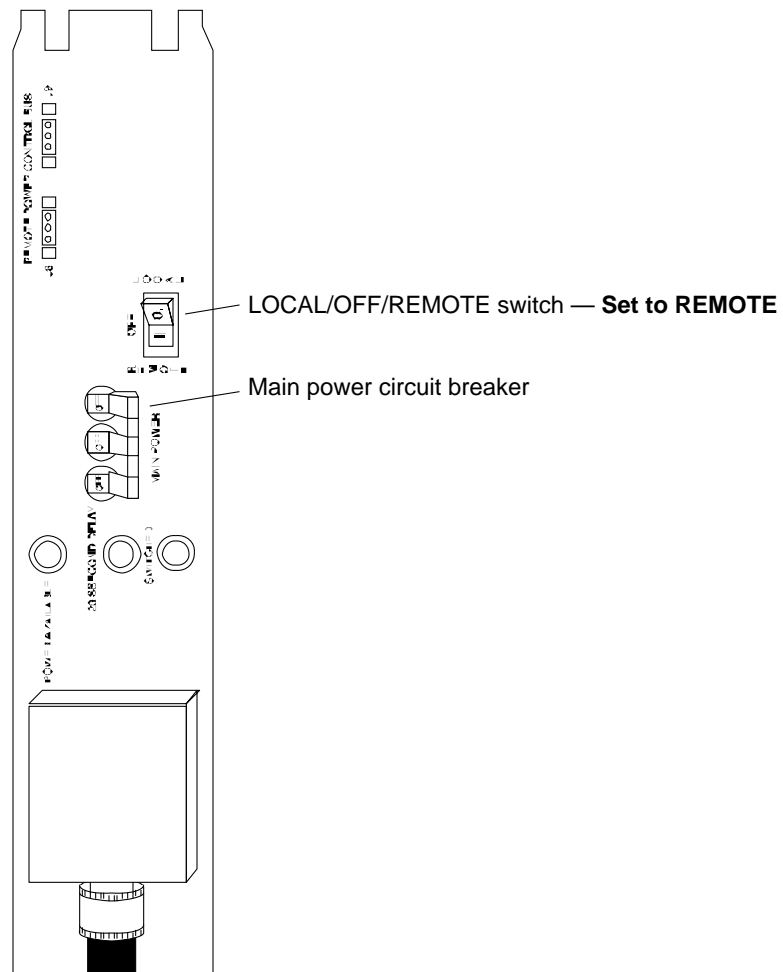


Figure 7-2 AC Distribution Unit Power Switch

### 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/OFF/REMOTE switch is in the REMOTE position.**  
Refer to Figure 7-2.
3. **Turn the AC power switch on the expansion cabinet rear to ON.**  
Refer to 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 node that the processor is in from the cluster. The processor can then be shutdown as indicated in the following procedure.



---

**Caution** – To avoid damaging internal circuits, do not disconnect or plug in any cable while power is applied to the system. Exceptions to this are the fiber optic and private net cables.

---

#### 7.1.2.1 Shutdown

1. **Halt the system using the appropriate commands.**
2. **Wait for the system-halted message and the boot monitor prompt.**



3. Turn the key switch on the front of the server to the Standby position (fully counterclockwise). Refer to Figure 7-3.

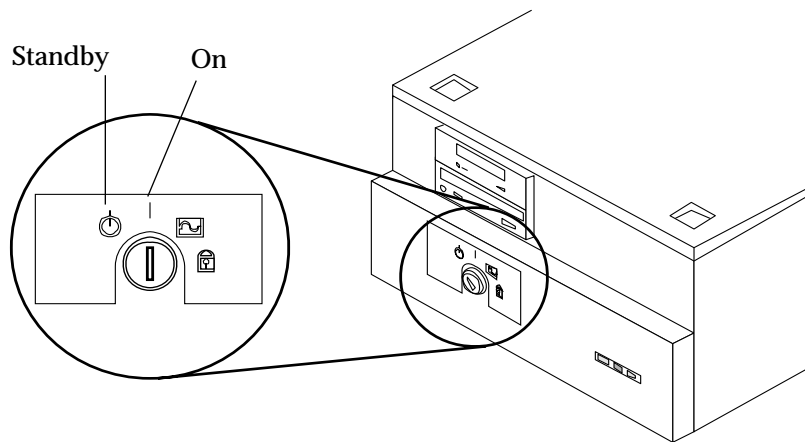


Figure 7-3 Key Switch Positions

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

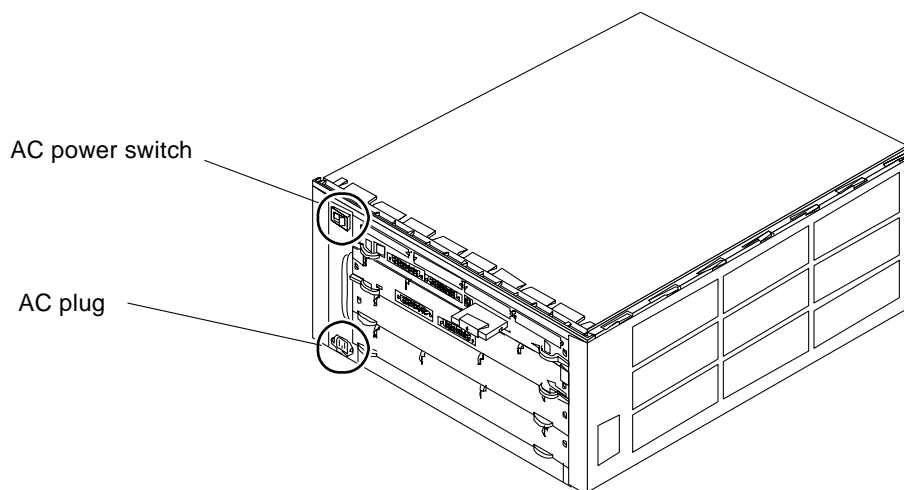


Figure 7-4 Processor AC Power Switch and Plug

### 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.**
2. **Turn on the AC power switch on the rear panel.**
3. **Turn the key switch to the on position.**  
See Figure 7-3. 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.



---

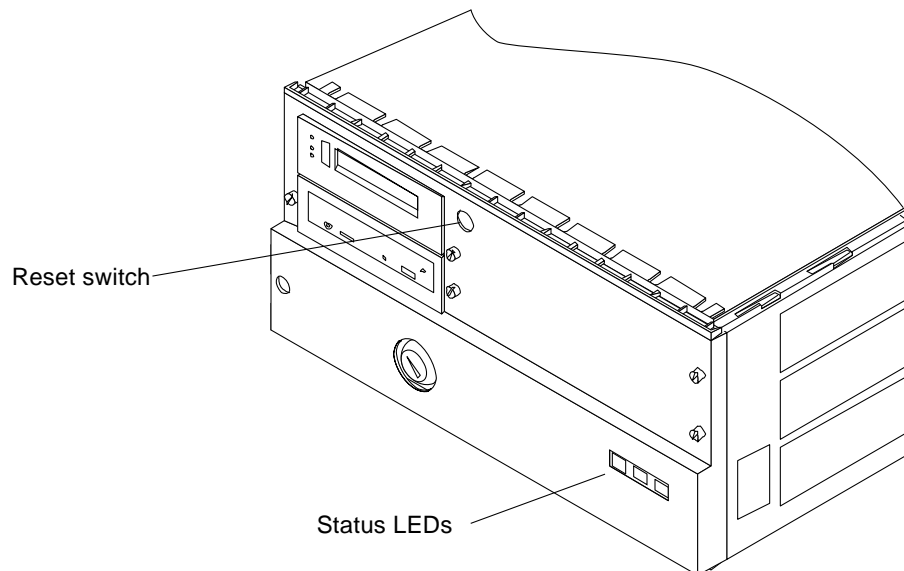
**Warning** – Never move the system when the power is on. Failure to heed this warning may result in catastrophic disk drive failure. Always power the system off before moving it.

---

4. **Watch the system console for possible error messages from the POST diagnostic program.**  
POST tests subassemblies in the server and some interface paths between subassemblies.
5. **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. Following a successful boot, request that the system administrator rejoin the node to the cluster.
  - If you wish to run diagnostics again, or if the system hangs, you need to press the reset switch.

**6. To activate the reset switch:**

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 7-5.



*Figure 7-5* Reset Switch and Front Panel Status LEDs



**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.

**7. Once the system successfully boots, request that the system administrator rejoin the node to the cluster.**

### 7.1.3 SPARCstorage Array

A SPARCstorage array contains three drive trays and each tray contains ten drives. 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, spin down only the drives in the tray containing the drive to be replaced as described in Section 7.1.3.3, “Single Drive/Tray Shutdown.”

#### 7.1.3.1 Complete Array Shutdown



---

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

---

- 1. Prior to powering down a complete SPARCstorage array, you must first request that the system administrator prepare the array for service (indicate component to be replaced) and then spin down all drives in the array trays.**
- 2. Once the system administrator has prepared the array for servicing and spun down all drives in the array trays, turn off the AC power switch on the rear of the SPARCstorage Array 100 Series chassis.**  
See Figure 7-8.

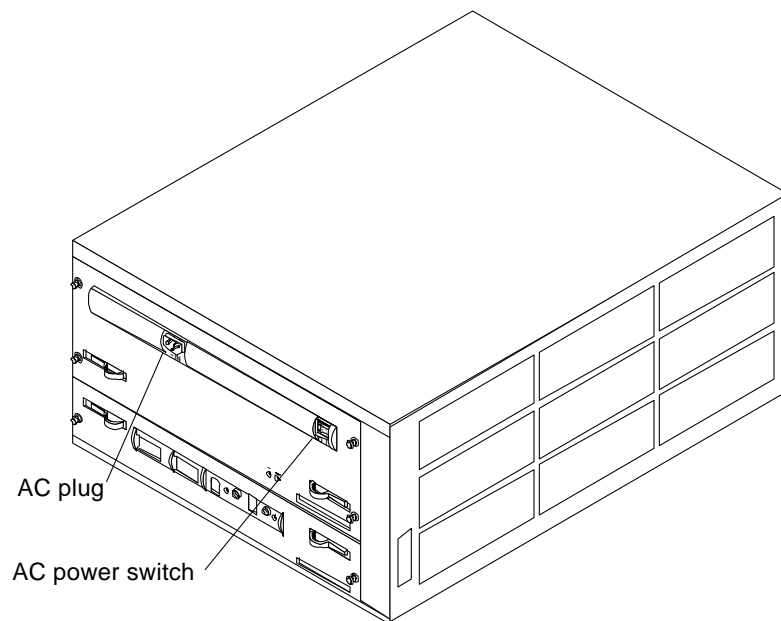


Figure 7-6 SPARCstorage AC Power Switch and AC Plug

### 7.1.3.2 Complete Array Startup



**Warning** – Never move the SPARCstorage Array 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.

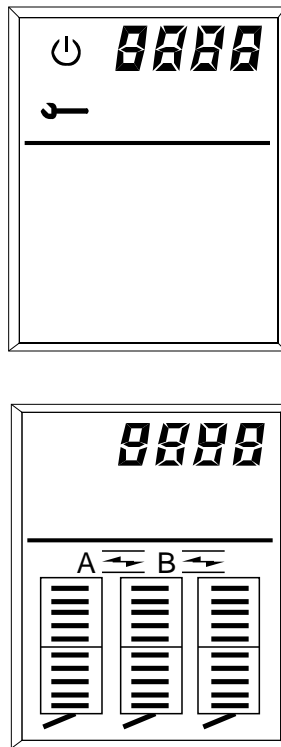
#### 1. Begin with a safety inspection.

- a. **Ensure that the SPARCstorage array AC power switch is off.**  
See Figure 7-8.
- b. **Verify that the power cord is plugged into the chassis and a wall socket.**  
See Figure 7-8.

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 7-7.



- 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 3.2.3, “SPARCstorage Array Fails to Communicate” 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 fiber icons, which indicate the status of the fiber 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 7-7 LCD Display While Powering On the System

It may take some time for a SPARCstorage array to boot up, depending on the total number of disk drives in the SPARCstorage array.

For example, a SPARCstorage array with eighteen disk drives may take 15 – 30 seconds to boot up, while a SPARCstorage array with thirty disks drives may take up to 2 minutes to boot up.

**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.**

### 7.1.3.3 Single Drive/Tray Shutdown

**Note** – The procedure for a single disk is the same as that for a tray, that is, prior to replacing a disk within a tray, you must first spin down all drives in the tray.

First request that the system administrator prepare the SPARCstorage array containing the disk or tray and then spin down all drives in the tray. Once all drives in the tray are stopped, remove the tray to access individual drives for service.

### 7.1.3.4 Single Drive/Tray Startup

Request that the system administrator start all drives in the tray or in the tray for the disk.

## 7.1.4 Terminal Concentrator

To power the terminal concentrator on or off, use the power switch on the back panel as depicted in Figure 7-8.

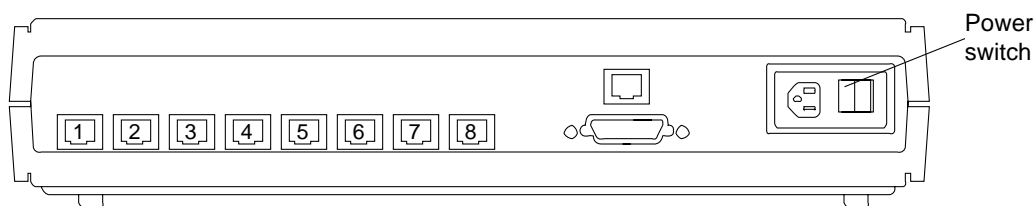


Figure 7-8 Terminal Concentrator (Rear View)

## 7.2 SPARCcluster 2000HA Server

### 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 and perform the indicated procedure for the system component you want to shutdown or start up.

---

### 7.2.1.1 Shutdown

1. **Turn the front panel key switch to  $\text{⏻}$  (the standby position).**  
See Figure 7-9.
2. **Turn the AC distribution unit power switch to Off.**  
The unit is at the rear of the cabinet. See Figure 7-10.

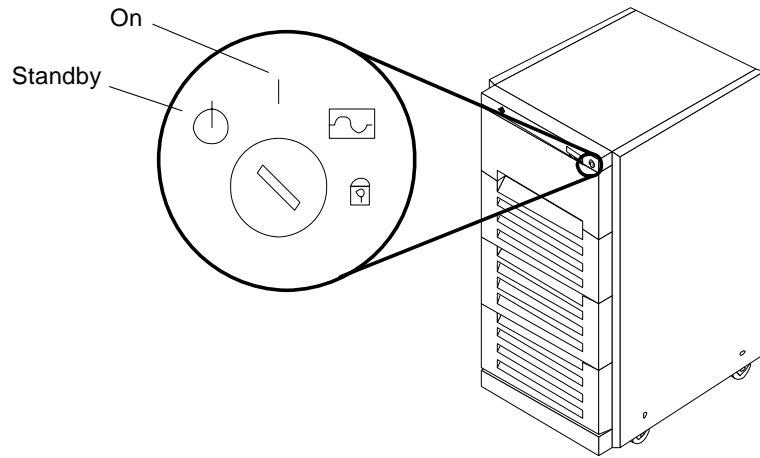


Figure 7-9 Key Switch Positions (Cabinet Front View)



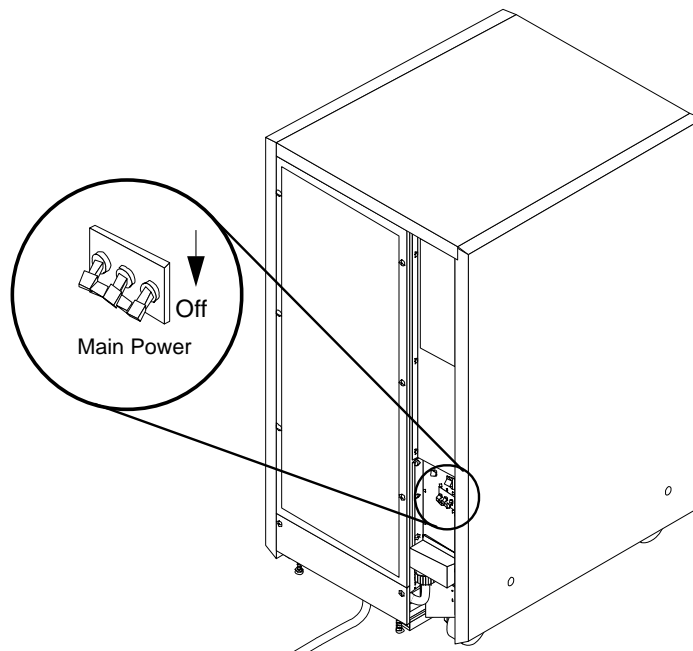



Figure 7-10 AC Distribution Unit Power Switch (Cabinet Rear View)

### 7.2.1.2 Startup

---

**Note** – As the system starts up, watch the system console for error messages from the POST diagnostic program.

---

- 1. The system key switch must be turned to  (the standby position).**  
See Figure 7-9.
- 2. Turn the LOCAL/REMOTE switch is in the REMOTE position.**  
See Figure 7-11.

**3. Turn on the power switch on the AC distribution unit. See Figure 7-10.**

---

**Note** – It will take approximately 90 seconds for the terminal concentrator to boot once the key switch is positioned on as indicated in the next step. Following successful booting of the concentrator, you can then bring up the processor on the system console in preparation for viewing POST/boot messages as indicated in step 5..

---

**4. Turn the key switch to | (the power-on position). See Figure 7-9.**

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.

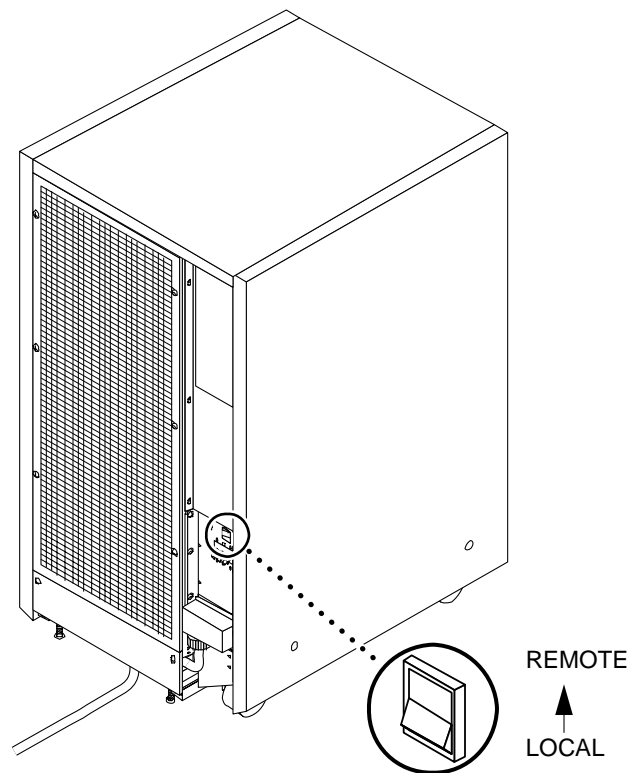


Figure 7-11 Local/Remote Switch Location



**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.

**5. Watch the system console 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.

---

- 6. To start POST again, or if the system hangs, press the reset switch on the back of the front panel.**  
See Figure 7-5.

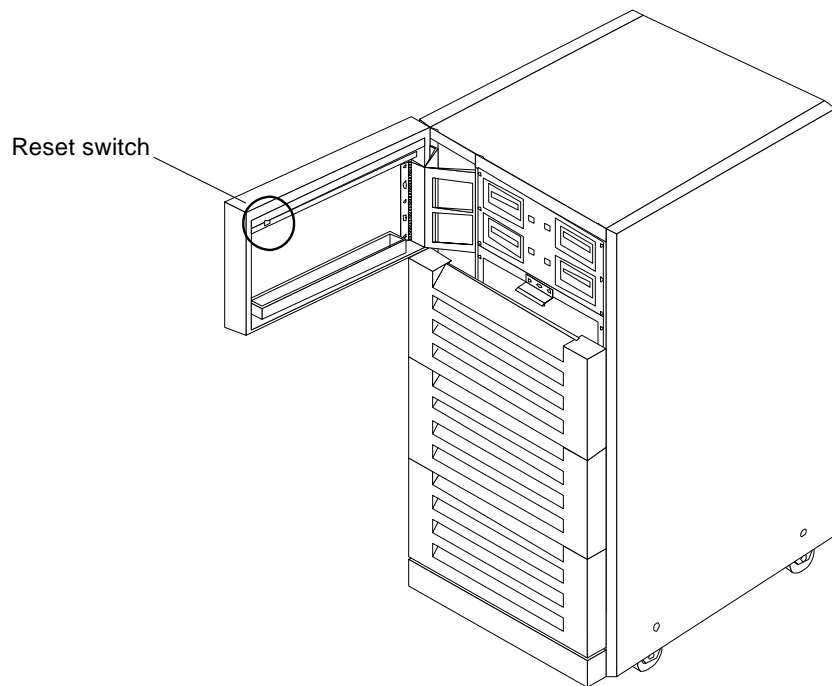


Figure 7-12 System Reset Switch

- 7. 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.**
- 8. 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/Startup

You can power down a SPARCcluster 2000HA processor without powering down the associated SPARCstorage arrays, if the power distribution unit Local/Remote switch is in the Local position. With the switch in the Local position, the AC outlets (for the SPARCstorage arrays) will be powered regardless of the front panel key switch position. You can then turn the processor off using the key switch.

If you want to further ensure that power is removed from the processor, check that the Local/Remote switch is in the Local position and then unplug the power supply as indicated in the following procedure.


1. **Request that the system administrator remove the node for the processor from the cluster and then halt the operating system as follows:**
2. **Halt the system using the appropriate commands.**
3. **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 in this procedure until you ensure that the Local/Remote switch on the Power Sequencer is in the LOCAL position. This is normally set to the Remote position as a function of initial system installation, refer to the *SPARCcluster HA Server Hardware Planning and Installation Manual*. If it is the Remote position, the Power Distribution unit and the SPARCstorage arrays will power off, due to a sensing circuit, when the Power Supply is unplugged.

---

4. **If you are not sure that the Local/Remote switch on the power supply is in the Local position, proceed as follows:**  
Refer to Figure 7-13 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.
5. **Refer to Figure 7-13 and place the Local/Remote switch on the Power Sequencer in the LOCAL position.**
6. **Unplug the power cord from the rear of the Power Supply and then turn the front panel key switch to  (the standby position).**  
The logic bay and main blower will power off. You may now service the logic bay as described in the *SPARCcenter 2000 Service Manual*.

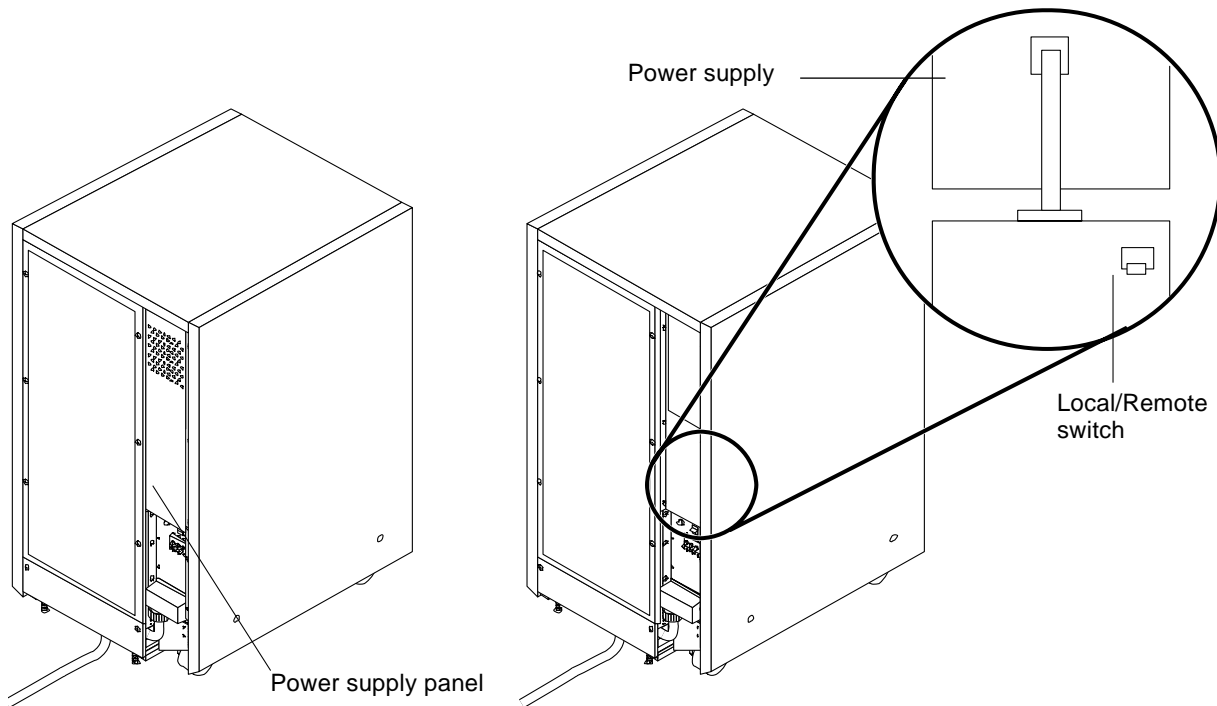


Figure 7-13 Power Supply Cable Location

**7. To restore power, plug the power cord into the Power Supply and then replace the Power Supply cover.**

**8. Turn the key switch to | (the power-on position).**

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.

**9. Watch the system console 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.

---

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

See Figure 7-5.

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

### ***7.2.3 SPARCstorage Array***

Same as that described for the SPARCserver 1000HA Server, see Section 7.1.3, “SPARCstorage Array.”

#### ***7.2.3.1 Complete Array Shutdown***

Same as that described for a SPARCcluster 1000HA Server, refer to Section 7.1.3.1, “Complete Array Shutdown”

#### ***7.2.3.2 Complete Array Startup***

Same as that described for a SPARCcluster 1000HA Server, refer to Section 7.1.3.2, “Complete Array Startup.”

#### ***7.2.3.3 Single Drive/Tray Shutdown***

Same as that described for a SPARCcluster 1000HA Server, refer to Section 7.1.3.3, “Single Drive/Tray Shutdown.”

### 7.2.3.4 *Single Drive/Tray Startup*

Same as that described for a SPARCcluster 1000HA Server, refer to Section 7.1.3.4, “Single Drive/Tray Startup.”

## 7.2.4 *Boot Disks*

---

**Note** – If a single boot disk is to be replaced, back up the disk to be replaced and then power off *both* disks using the power switch located on the back of the boot disk enclosure.

---

### 7.2.4.1 *Power Off*

1. **Before powering a boot disk off for service, request that the system administrator remove the node for the disk from the cluster and then backup the data contained on the disk to be replaced.**
2. **Once the disk is backed up, power off the processor for the boot disk as indicated in Chapter 7, Section 7.2.2, “Processor Shutdown/Startup”.**
3. **Use the power switch on the back panel of the boot disk enclosure to power off both disks.**

### 7.2.4.2 *Power On*

1. **To power on the boot disks after replacement of a disk, use the power switch on the rear of the boot disk enclosure.**
2. **Once both disks are powered on, power on the processor as indicated in Chapter 7, Section 7.2.2, “Processor Shutdown/Startup.”**
3. **Request that the system administrator restore data to the replaced disk and then rejoin the node to the cluster.**

## 7.2.5 *Terminal Concentrator*

To power the terminal concentrator on or off use the power switch on the back panel as depicted in Figure 7-8.



## *Part 4 — Subassembly Removal and Replacement*

---

Chapter 8      Internal Access

Chapter 9      Major Subassemblies



## Internal Access



The tables and illustrations on the following pages augment the removal and replacement procedures.

<i>SPARCserver 1000HA Server</i>	<i>page 8-2</i>
<i>Rear Screen Panel</i>	<i>page 8-2</i>
<i>SPARCcenter 2000HA Server</i>	<i>page 8-4</i>
<i>Cabinet Panels</i>	<i>page 8-4</i>
<i>Hinged Door (System Cabinet Only)</i>	<i>page 8-5</i>
<i>Vented Front Panels</i>	<i>page 8-5</i>
<i>Rear Screen Panel</i>	<i>page 8-6</i>
<i>Side Panels</i>	<i>page 8-7</i>
<i>Kick Panel</i>	<i>page 8-8</i>
<i>Stabilizer Bar</i>	<i>page 8-9</i>

## 8.1 SPARCserver 1000HA Server

### 8.1.1 Rear Screen Panel

To remove the rear screen panel:

1. **Remove the two #10 Phillips screws securing the main panel to the frame.**  
See Figure 8-1.
2. **Tilt the top of the main panel out and lift it free of the chassis. Set the panel aside.**  
The bottom of the main rear screen panel has a flange that holds it in place. You must lift the panel out of the chassis.

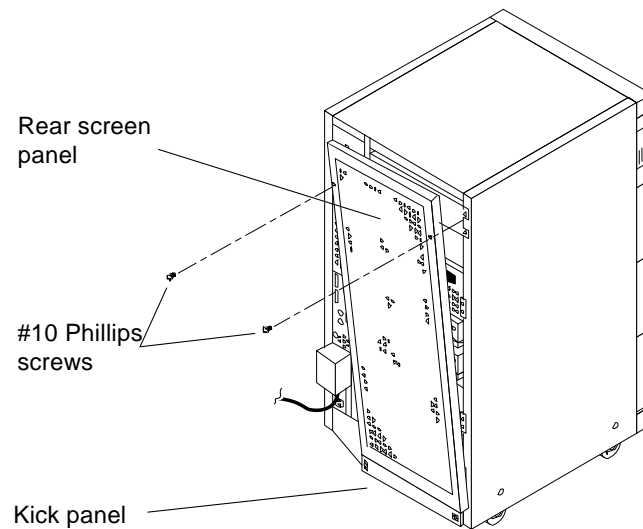


Figure 8-1 Rear Screen Panel Removal and Replacement

To replace the rear screen panel:

1. **Insert the main panel so the bottom flange engages behind the top of the kick panel.**
2. **Tilt the panel flush against the frame and secure the panel to the chassis with two #10 Phillips screws.**

### 8.1.2 Vented Front Panels



**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.

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

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.**

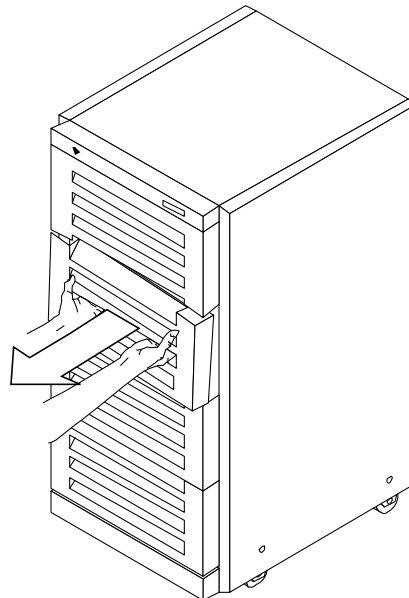


Figure 8-2 Removing the Vented Panels

To replace a panel:

1. **Place the panel against the chassis with ball studs aligned with the catches on the panel.**

Tap or press both sides of the panel into place.

## 8.2 SPARCcenter 2000HA Server

### 8.2.1 Cabinet Panels

**Note** – All panels on the system and expansion cabinets can be removed in the same way with the following exception: the hinged front panel is absent on the expansion cabinet and is replaced by a vented front panel.

The SPARCcenter 2000HA server cabinet outer panels consist of the following:

- Hinged door (system cabinet only)
- Vented front panels (three on the system cabinet, four on the expansion cabinet)
- Rear screen panel
- Side panels (2)
- Kick panel
- Stabilizer bar

To determine which panels you need to remove to access replaceable parts, use Table 8-1. For locations of the panels see Figure 8-3 through Figure 8-7.

Table 8-1 Cover Removal by Assembly

	Hinged Doors	Vented Front Panels	Rear Screen	Left Side Panel	Right Side Panel	Kick Panel
Control Board	X	X				
Power Distribution Unit				X		X
External Cables			X			X
System Board			X			
SPARCstorage Array 100		X	X			
Terminal Concentrator		X				

## 8.2.2 Hinged Door (System Cabinet Only)

- ◆ **Grasp the door at the upper-right corner and pull towards you firmly.**  
See Figure 8-3.

The door is secured closed by clips and ball studs at the side opposite of the hinge.

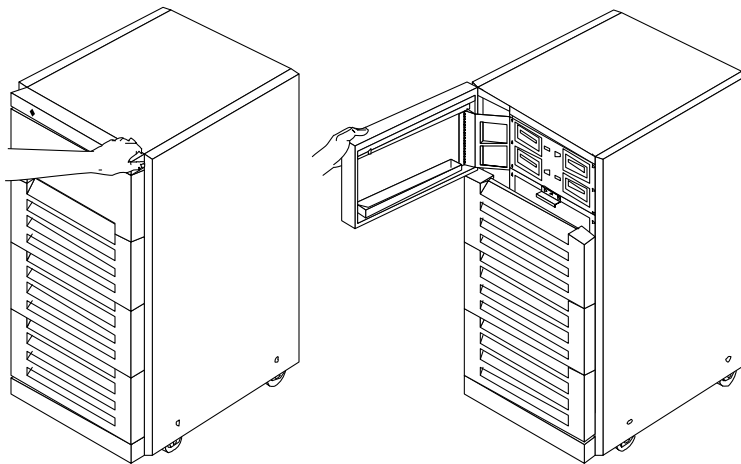


Figure 8-3 Opening the Hinged Door — System Cabinet

## 8.2.3 Vented Front Panels



**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.

The three vented front panels can be removed in the same manner. They are retained by chassis-mounted ball studs that mate with catches on the panel backside.

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 8-4.

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

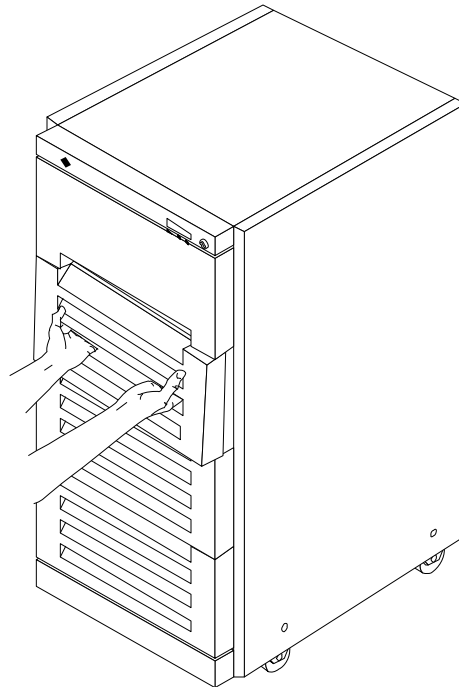


Figure 8-4 Removing the Vented Panels

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.

### 8.2.4 Rear Screen Panel

To remove the rear screen panel:

1. Remove the two #10 Phillips screws securing the panel to the frame. See Figure 8-5.



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.

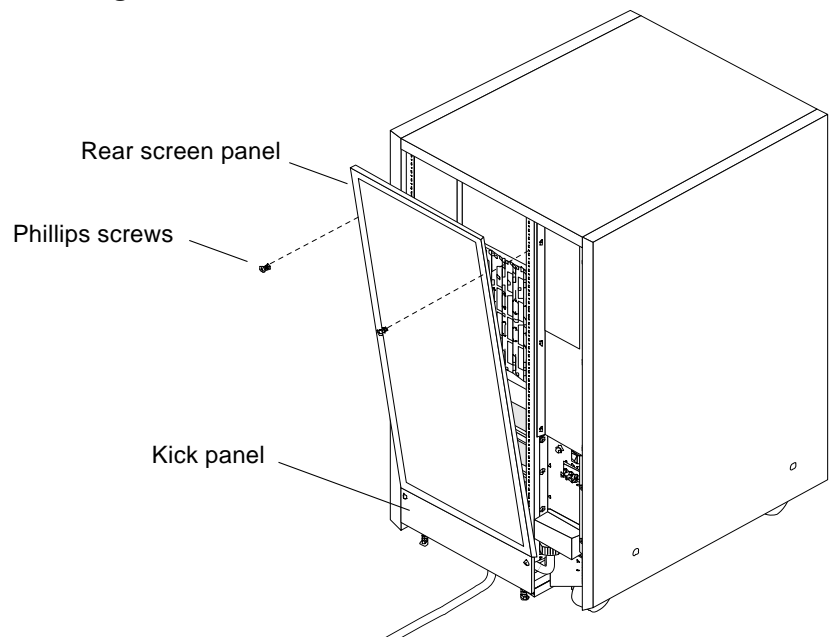


Figure 8-5 Rear Screen Panel Removal

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.

### 8.2.5 Side Panels

To remove the left and right side panels:

1. Loosen two slot-head captive screws near the panel base.
2. Tilt the panel bottom out.

3. **Lift the panel up until free of the tabs at the top of the chassis.**  
Set the panel aside.

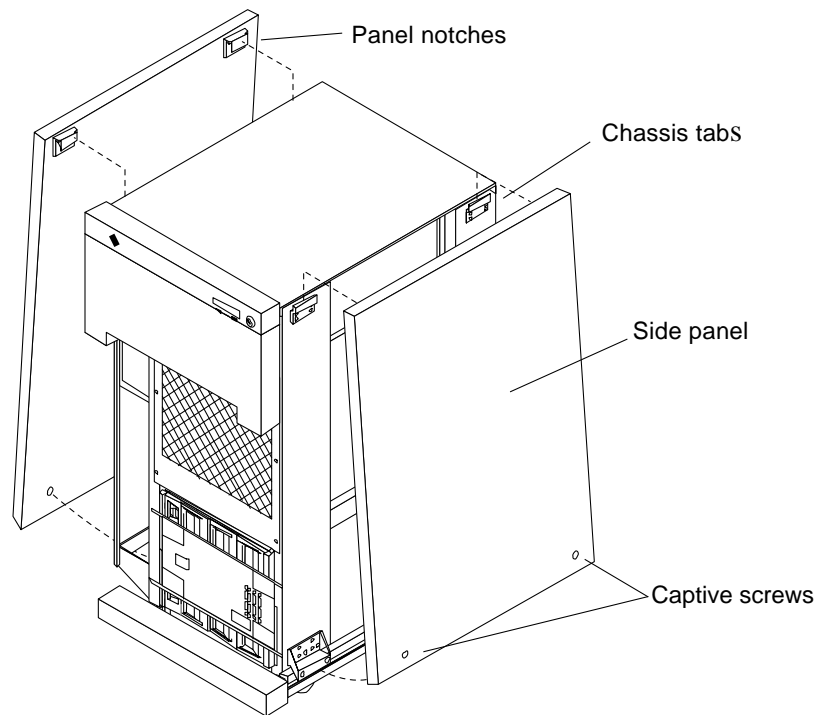


Figure 8-6 Removing the Side Panels

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.**

### 8.2.6 Kick Panel

To remove the kick panel:

- ◆ **Loosen the two captive screws. See Figure 8-7.**

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.**

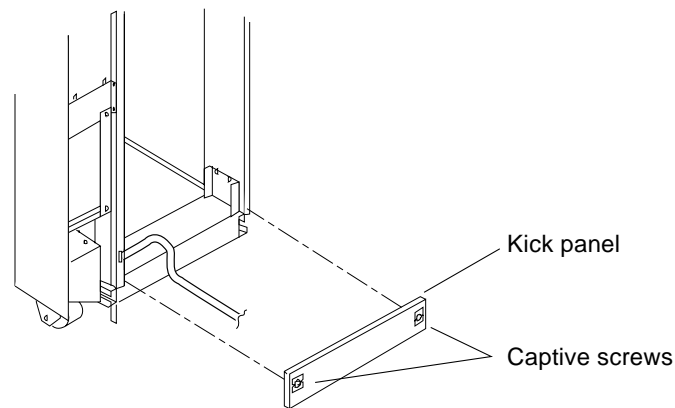


Figure 8-7 Removing the Kick Panel

### 8.2.7 Stabilizer Bar



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

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

- 1. Extend the stabilizer bar fully from the bottom of the cabinet.**  
See Figure 8-8.
- 2. Screw the two stabilizer bar levelling pads down until they are  $\frac{1}{8}$ - to  $\frac{1}{4}$ -inch (3 to 6 mm) above the floor.**  
Ensure both pads are at equal heights. This clearance allows the stabilizer bar to slide in and out easily, yet catch the cabinet if it should begin to tilt.

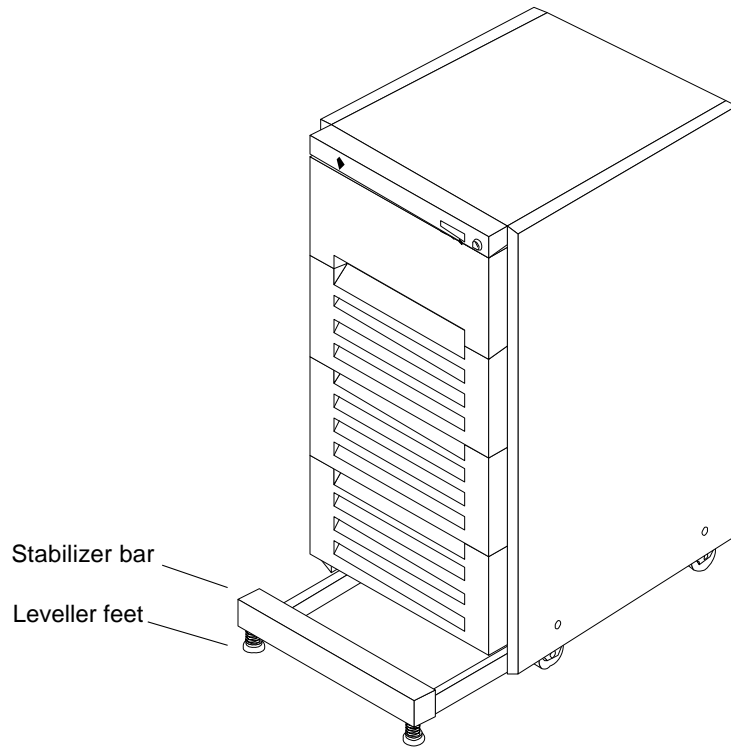


Figure 8-8 Stabilizer Bar

## Major Subassemblies



This chapter supplies the information necessary to remove and reinstall the replaceable parts that are unique for SPARCcluster HA Servers. For non-unique replaceable parts you will be referred to the applicable service manual. The contents of this chapter are as follows:

Procedure	SPARCcluster 1000	SPARCcluster 2000
<i>System Board and Components</i>	<i>page 9-2</i>	<i>page 9-8</i>
<i>SPARCstorage Array</i>	<i>page 9-2</i>	<i>page 9-8</i>
<i>Trays and Disk Drives</i>	<i>page 9-2</i>	<i>page 9-8</i>
<i>Major Subassemblies</i>	<i>page 9-3</i>	<i>page 9-9</i>
<i>Blower Assembly</i>	<i>page 9-3</i>	
<i>Boot Disks</i>	<i>page 9-2</i>	<i>page 9-9</i>
<i>Terminal Concentrator</i>	<i>page 9-5</i>	<i>page 9-11</i>
<i>Cabling</i>	<i>page 9-7</i>	<i>page 9-12</i>

## 9.1 SPARCcluster 1000HA Server

### 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 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 *SPARCserver 1000 System Service Manual*.
2. **After a part or system board has been replaced, power the processor on as indicated in Chapter 7, “Shutdown and Restart Procedures”.**

### 9.1.2 Boot Disks

---

**Note** – The boot disks for the SPARCcluster 1000 are located in the SCSI tray assembly.

---

1. **Shut the processor down as described in Chapter 7, “Shutdown and Restart Procedures”.**  
Once the processor has been shutdown, remove and replace the boot disks by following the procedures described in Chapter 11 of the *SPARCserver 1000 System Service Manual*.
2. **After a boot disk has been replaced, power the processor on as indicated in Chapter 7, “Shutdown and Restart Procedures”.**

### 9.1.3 SPARCstorage Array

#### 9.1.3.1 Trays and Disk Drives

1. **Shut disk tray down as described in Chapter 7, “Shutdown and Restart Procedures”.**
2. **Replace defective drive as described in Chapter 5 of the *SPARCstorage Array Model 100 Series Service Manual*.**
3. **Bring disk tray up as described in Chapter 7, “Shutdown and Restart Procedures”.**

### 9.1.3.2 Major Subassemblies

1. Shut disk tray down as described in Chapter 7, “Shutdown and Restart Procedures”.
2. Replace defective subassembly as described in Chapter 5 of the *SPARCstorage Array Model 100 Series Service Manual*.
3. Bring disk tray up as described in Chapter 7, “Shutdown and Restart Procedures”.

### 9.1.4 Blower Assembly

The blower assembly for the SPARCcluster 1000HA is located in the front of the main cabinet behind the two upper vented panels. To remove and replace this unit:

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. **Remove four screws, two on the top of the unit and two on the bottom, and then remove and tilt the unit so that you can remove the power cord, see Figure 9-1.**  
Drape the removed power cord on the chassis so it will not be displaced.

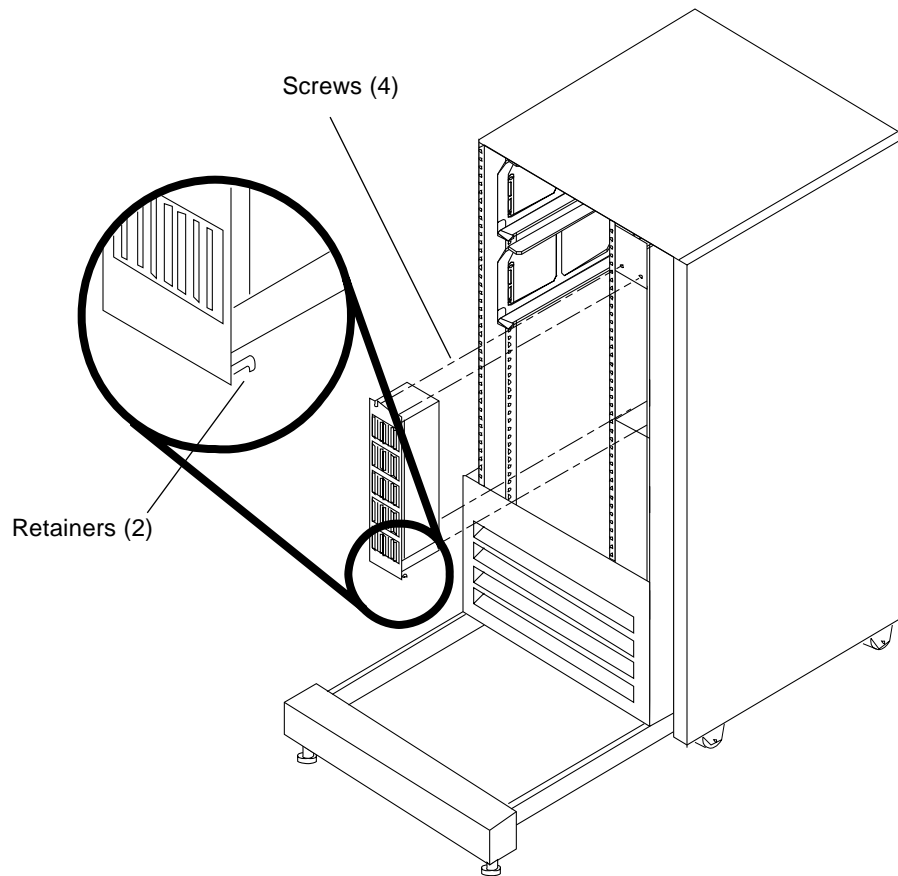


Figure 9-1 Blower Assembly Removal/Replacement

3. Plug the power cord (female end) into the rear of the replacement unit.
4. Tilt the blower up and then insert the bottom of the unit through the opening so that retainers on the blower bottom engage the sheet metal at the bottom of the blower opening.
5. Place the blower flush to the cabinet while replacing the four screws removed in step 2.



### 9.1.5 Terminal Concentrator

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.

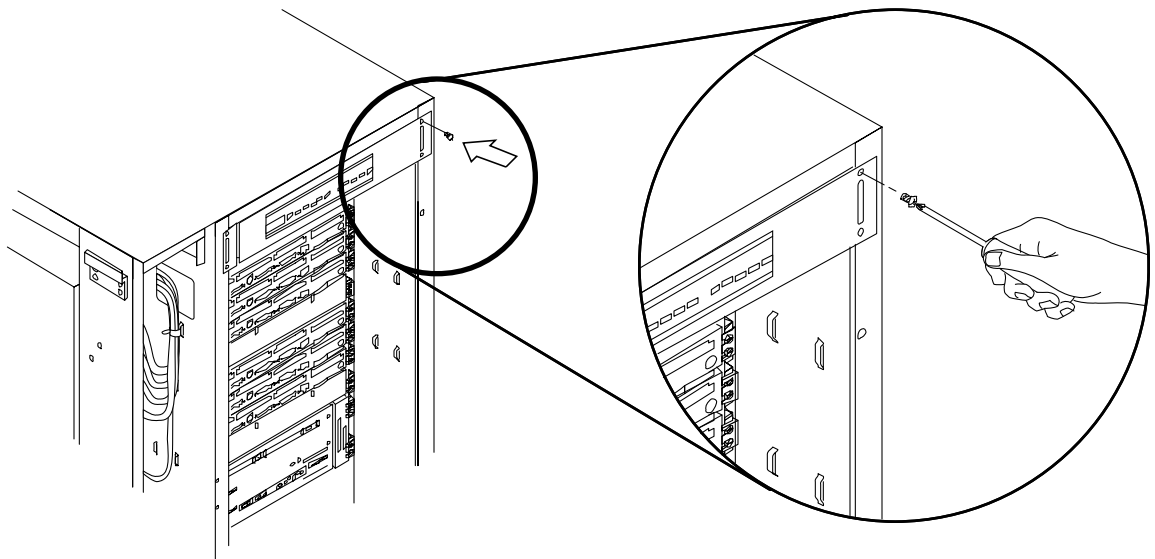


Figure 9-2 Removing Terminal Concentrator Screws

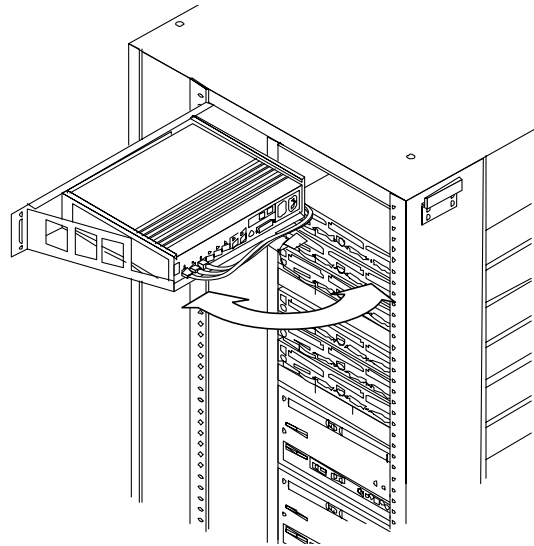


Figure 9-3 Swinging Terminal Concentrator Out of Cabinet

6. Power the terminal concentrator off by using the power switch located on the back panel, see Figure 9-4.
7. Remove power and serial cables from the terminal concentrator as shown in Figure 9-4.

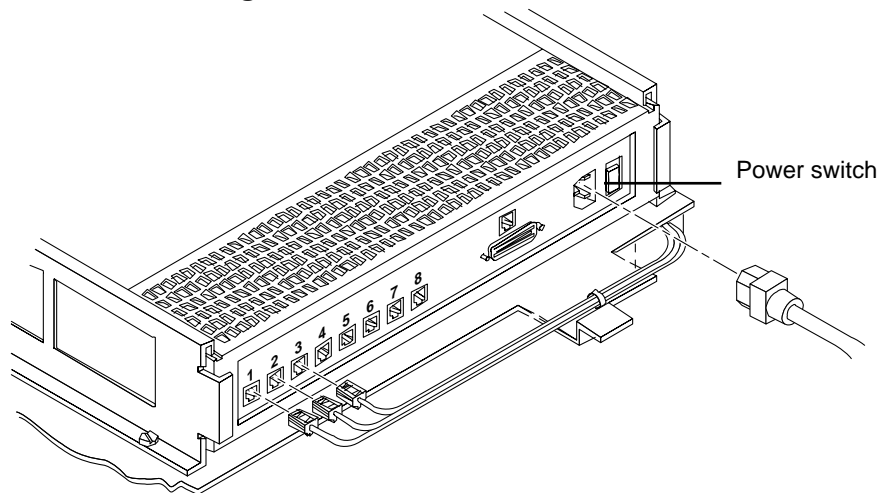


Figure 9-4 Removing/Replacing Terminal Concentrator Cabling

- 8. Remove the Phillips screw that secures the terminal concentrator plenum assembly to the bayonet hinge.**

Refer to detail in Figure 9-5.

- 9. 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.

- 10. 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.

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

To replace the terminal concentrator, reverse the preceding instructions.

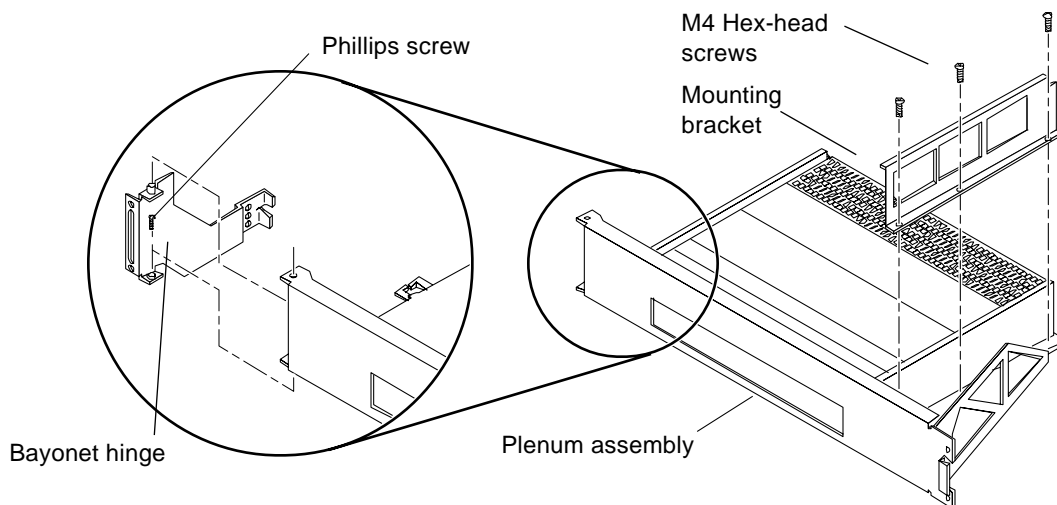


Figure 9-5 Terminal Concentrator Mounting Detail

### 9.1.6 Cabling

Refer to Chapter 9 of the *SPARCcluster HA Server Planning and Installation Manual* for details on cabling the terminal concentrator, the private net and the SPARCstorage array optical connections.

## 9.2 SPARCcluster 2000HA Server

### 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 shutdown of the processor without shutting down associated SPARCstorage arrays.
2. **Once the processor is shutdown, remove and replace a system board or any replacable 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 the processor on as indicated in Chapter 7, “Shutdown and Restart Procedures”.**

### 9.2.2 SPARCstorage Array

#### 9.2.2.1 Trays and Disk Drives

1. **Shut disk tray down as described in Chapter 7, “Shutdown and Restart Procedures”.**
2. **To gain access to the disk trays in a SPARCstorage array, first remove the lower vented panel from the cabinet front.**
  - a. **Grasp the panel under the vent on one side and pull out far enough to just disengage the ball studs.**
  - b. **Repeat this procedure on the other side of the vents to disengage and remove the panel. Set the panel aside.**
3. **Remove the two right-hand mounting screws securing the boot disk bracket to the chassis and then swing the bracket out and to the left. See Figure 9-6.**



---

**Caution** – Use care when removing disk trays from a SPARCstorage array, so that the two boot disks and cabling are not damaged.

---

4. **Remove and replace defective drive as described in Chapter 5 of the *SPARCstorage Array Model 100 Series Service Manual*.**
5. **Swing the disk mounting bracket closed and then secure the bracket to the chassis using the two screws removed in step 3.**
6. **Replace the vented panel by placing the panel against the chassis with ball studs aligned with the catches on the panel.**  
Tap or press both sides of the panel into place.
7. **Bring disk tray up as described in Chapter 7, "Shutdown and Restart Procedures".**

### 9.2.2.2 Major Subassemblies

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**Note** – Some subassembly replacements, such as a controller board, require special software tasks, refer to the *SPARCcluster High Availability Server Software Administration Guide*.

---

1. **Shut disk tray down as described in Chapter 7, "Shutdown and Restart Procedures".**
2. **Replace defective subassembly as described in Chapter 5 of the *SPARCstorage Array Model 100 Series Service Manual*.**
3. **Bring disk tray up as described in Chapter 7, "Shutdown and Restart Procedures".**

### 9.2.3 Boot Disks

Two boot disks are mounted in the lower front of each SPARCcluster 2000HA cabinet directly behind the lower vented panel. The disks are mounted together in a single enclosure (Multi-Disk Pack) that is in turn mounted in a hinged bracket that swings out for access. The Multi-Disk Pack is secured to the hinged bracket with a holding plate.

Both boot disks and the associated processor should be powered off during replacement of a single disk. The data on the disk that is to be replaced should be backed up prior to powering off the disk. To replace a boot disk:

1. Power down the boot disks as described in Chapter 7, "Shutdown and Restart Procedures".
2. Remove the lower vented panel from the cabinet front.
  - a. Grasp the panel under the vent on one side and pull out far enough to just disengage the ball studs.
  - b. Repeat this procedure on the other side of the vents to disengage and remove the panel. Set the panel aside.
3. Remove the two right-hand mounting screws securing the boot disk bracket to the chassis and then swing the bracket out and to the left as shown in Figure 9-6.

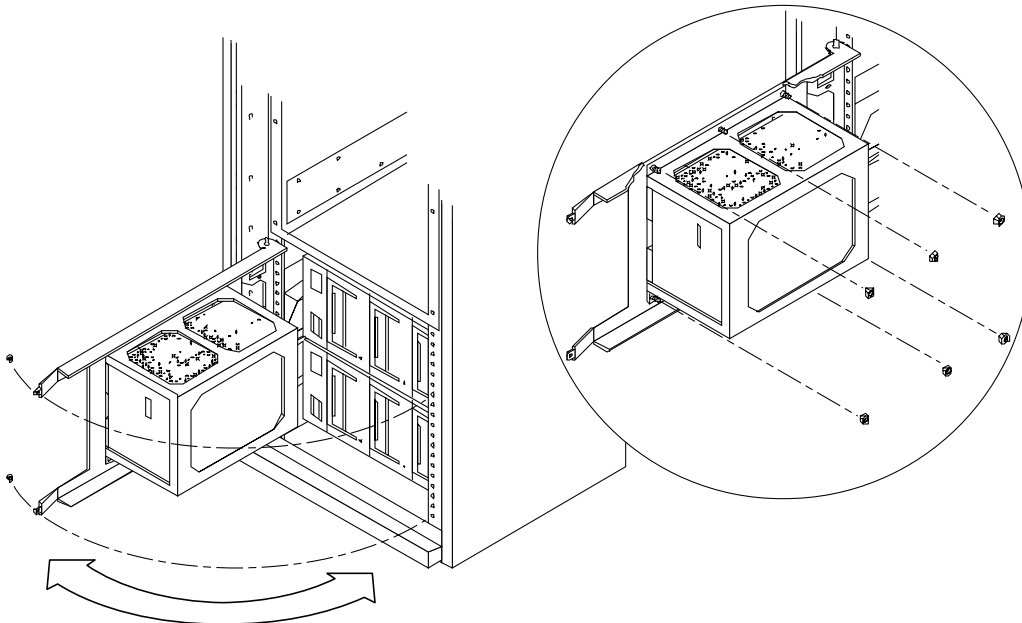


Figure 9-6 Boot Disk Removal/Replacement

4. Use the power switch located on the back panel of the boot disk enclosure to power off both disks and then remove the SCSI cable connecting the Multi-Disk Pack to the computer system.



**Caution** – Once the nuts are removed as described in the following step, the enclosure holding both disks will be free of the bracket. Use caution when replacing either disk.

5. **Remove three nuts from each side of the holding plate as shown in Figure 9-6, and then remove the Multi-Disk Pack.**
6. **Replace the desired disk.**  
Refer to the *Multi-Disk Pack Installation and Service Guide* for the disk replacement procedure as well as the procedure for determining the present SCSI target ID for the disk. Refer to Appendix C for the SCSI addresses for the boot disks and reset the disk address if necessary.
7. **Secure the Multi-Disk Pack to the bracket using the six nuts removed in step 5.**
8. **Replace the SCSI cable to the Multi-Disk Pack and then power on both units using the power switch on the rear of the Multi-Disk Pack.**
9. **Swing the disk mounting bracket closed, and then secure the bracket to the chassis using the two screws removed in step 3.**
10. **Replace the vented panel by placing the panel against the chassis with ball studs aligned with the catches on the panel.**  
Tap or press both sides of the panel into place.
11. **Power on the boot disks as described in Chapter 7, “Shutdown and Restart Procedures”.**

### 9.2.4 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 right side.**  
To gain access, remove the two securing screws and then swing the bracket out and to the right. See Figure 9-7.
2. **Power the terminal concentrator off by using the power switch located on the back panel of the unit.**  
See Figure 9-4.
3. **Remove power and serial cables from unit.**  
See Figure 9-4.

4. Remove three nuts from each of the terminal concentrator side brackets, and then remove the terminal concentrator from the cabinet mounting bracket.

See Figure 9-7.

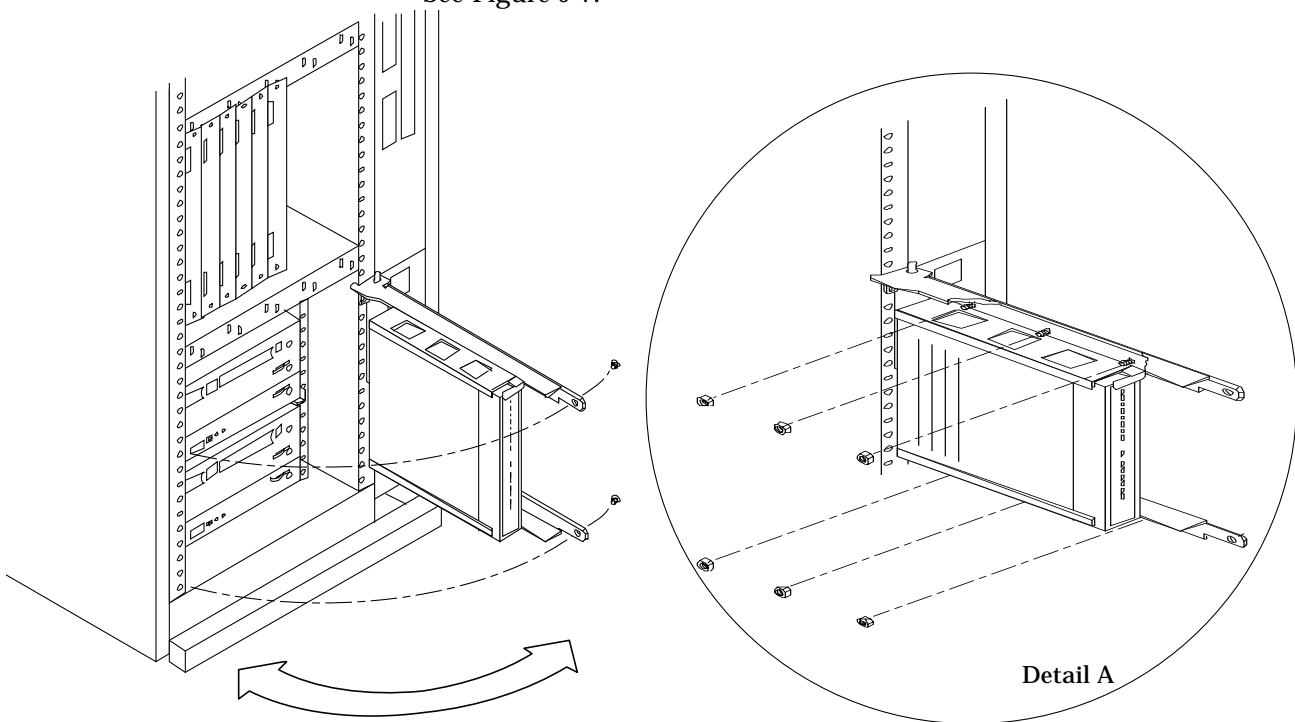


Figure 9-7 Terminal Concentrator Removal/Replacement

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

### 9.2.5 Cabling

**Note** – To access SPARCstorage array cabling, first open and swing the terminal concentrator out of the way as described within step 1 of Section 9.2.4, “Terminal Concentrator.”

Refer to Chapter 10 of the *SPARCcluster High Availability Server Hardware Planning and Installation Manual* for details on cabling the terminal concentrator, the private net, and the SPARCstorage array optical connections.



## *Part 5 — Illustrated Parts Breakdown*

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Chapter 10      Illustrated Parts Breakdown



## Illustrated Parts Breakdown

The tables and illustrations on the following pages augment the removal and replacement procedures. Table 10-1 provides a list of replaceable parts unique to a SPARCcluster HA server. For information on replaceable parts within a principle assembly, refer to Tables 10-2, 10-4, and 10-5.

*Table 10-1* SPARCcluster 1000HA/2000HA Server List of Replacement Parts

Replacement part	Server Part Number	
	SPARCcluster 1000HA	SPARCcluster 2000HA
Boot disk		595-3766
SunFastEthernet SBus card	595-3378	595-3378
SunFastEthernet cable:		
Short cable	530-2149	530-2149
Long cable	530-2150	530-2150
Terminal concentrator	370-1434	370-1434
Terminal concentrator cabling:		
(long)	530-2151	530-2151
(short)	530-2152	530-2152

*Table 10-1 SPARCcluster 1000HA/2000HA Server List of Replacement Parts (Continued)*

Replacement part	Server Part Number	
	SPARCcluster 1000HA	SPARCcluster 2000HA
15m fiber optic cable	537-1006	537-1006
2m fiber optic cable	537-1004	537-1004
Blower assembly	370-1983	

*Table 10-2 Principle Assembly Part Replacement Reference*

Assembly	Reference	
	SPARCcluster 1000HA Server	SPARCcluster 2000 HA Server
Processor	<i>SPARCserver 1000 System Service Manual</i>	<i>SPARCcenter 2000 System Service Manual</i>
SPARCstorage array	<i>SPARCstorage Array Service Manual</i>	<i>SPARCstorage Array Service Manual</i>
Cabinet		
AC Distribution Unit	<i>SPARCserver 1000 System Service Manual</i>	<i>SPARCcenter 2000 Service Manual</i>
DC power supply	<i>SPARCserver 1000 System Service Manual</i>	<i>SPARCcenter 2000 Service Manual</i>
Workstation (SPARCstation 4)	<i>SPARCstation 4 Service Manual</i>	<i>SPARCstation 4 Service Manual</i>

## 10.1 SPARCcluster 1000HA Server

Figure 10-1 depicts a SPARCcluster 1000HA server. Table 10-3 lists replaceable parts.

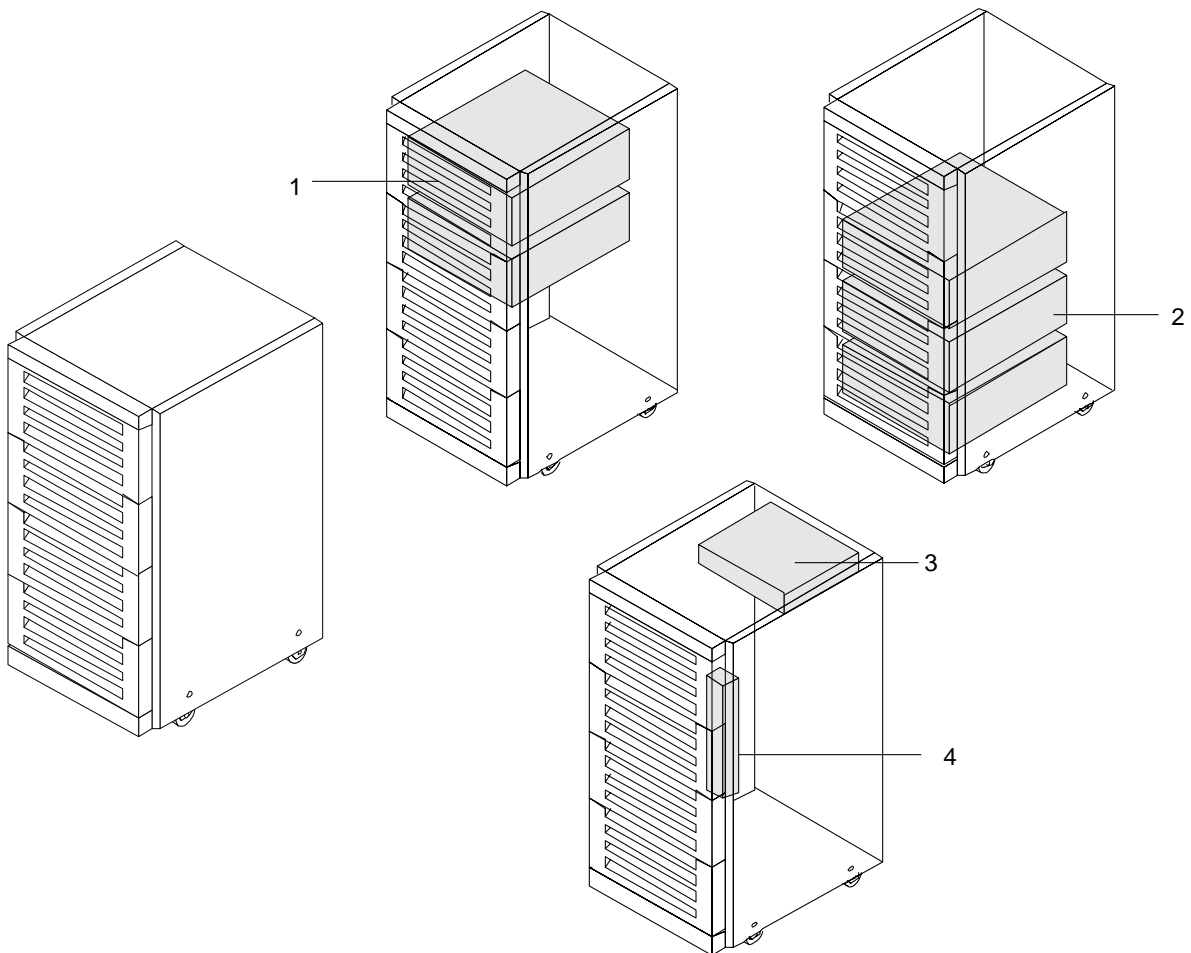


Figure 10-1 SPARCcluster 1000HA Server

Table 10-3 SPARCcluster 1000HA Server Parts List

Key	Description	Part Number or Exploded View Reference
1	SPARCserver 1000 (2)	<i>SPARCserver 1000 System Service Manual</i>
	System board (2)	<i>SPARCserver 1000 System Service Manual</i>
	Boot disk (2)	<i>SPARCserver 1000 System Service Manual</i>
2	SPARCstorage array (3)	<i>SPARCstorage Array Model 100 Series Service Manual</i>
	Workstation (SPARCstation 4)	<i>SPARCstation 4 Service Manual</i>
3	Terminal concentrator	370-1434
	Terminal concentrator cabling	(See Chapter 9 of the <i>SPARCcluster High Availability Server Hardware Planning and Installation Manual</i> for cable detail)
	(long)	530-2151
	(short)	530-2152
4	Fan tray	370-1983
	Cabinet	
	AC distribution unit	<i>SPARCserver 1000 System Service Manual</i>
	SunFastEthernet SBus card	595-3378
	SunFastEthernet cable:	(See Chapter 9 of the <i>SPARCcluster High Availability Server Hardware Planning and Installation Manual</i> for cable detail)
	Short cable	530-2149
	Long cable	530-2150
	Fiber optic cables:	(See Chapter 9 of the <i>SPARCcluster High Availability Server Hardware Planning and Installation Manual</i> for cable detail.)
	15m	537-1006
	2m	537-1004

## 10.2 SPARCcluster 2000HA Server

Figure 10-2 depicts a SPARCcluster 2000HA server. Table 10-4 lists replaceable parts.

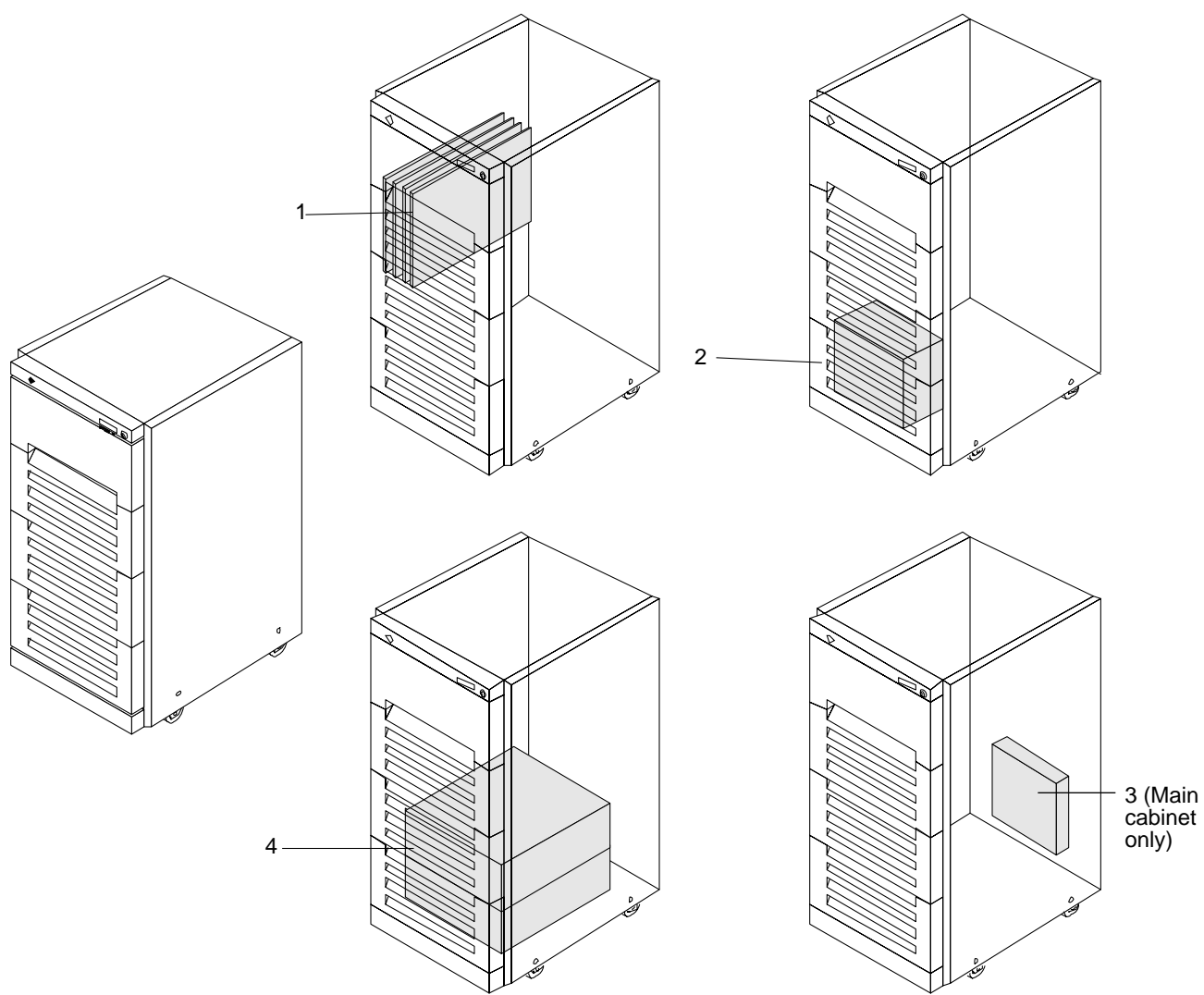


Figure 10-2 SPARCcluster 2000HA Server

Table 10-4 SPARCcluster 2000HA Server Parts List

Key	Description	Part Number or Exploded View Reference
1	System board (3)	<i>SPARCcenter 2000 System Service Manual</i>
2	Boot disk (2)	595-3766
	Workstation (SPARCstation 4)	<i>SPARCstation 4 Service Manual</i>
3	Terminal concentrator	370-1434
	Terminal concentrator cabling:	(See Chapter 10 of the <i>SPARCcluster High Availability Server Hardware Planning and Installation Manual</i> for cable detail.)
	(long)	530-2151
	(short)	530-2152
4	SPARCstorage array (3)	<i>SPARCstorage Array Model 100 Series Service Manual</i>
	Cabinet	
	AC distribution unit	<i>SPARCcenter 2000 System Service Manual</i>
	DC power supply	<i>SPARCcenter 2000 System Service Manual</i>
	SunFastEthernet SBus card	595-3378
	SunFastEthernet cable:	(See Chapter 10 of the <i>SPARCcluster High Availability Server Hardware Planning and Installation Manual</i> for cable detail.)
	Short cable	530-2149
	Long cable	530-2150
	Fiber optic cables:	(See Chapter 10 of the <i>SPARCcluster High Availability Server Hardware Planning and Installation Manual</i> for cable detail.)
	15m	537-1006
	2m	537-1004



## *Part 6 — Appendixes, Glossary, and Index*

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Appendix A	Product Specifications
Appendix B	Connector Pinouts and Cabling
Appendix C	SCSI Targeting
Appendix D	SPARCstorage Array Firmware and Device Driver Error Messages
Index	



# Product Specifications



This section provides the environmental, physical, and electrical specifications for the SPARCcluster 1000 and SPARCcluster 2000 High Availability Servers. The contents of this Appendix are as follows:

<i>Physical Specifications</i>	<i>page A-1</i>
<i>SPARCcluster 1000HA Server</i>	<i>page A-2</i>
<i>SPARCcluster 2000 HA Server</i>	<i>page A-3</i>
<i>Electrical Specifications</i>	<i>page A-4</i>
<i>SPARCcluster 1000HA Server</i>	<i>page A-2</i>
<i>SPARCcluster 2000HA Server</i>	<i>page A-5</i>
<i>Environmental Specifications</i>	<i>page A-6</i>



**Caution** – Make no mechanical or electrical modifications to the cabinets. Sun is not responsible for the regulatory compliance if a cabinet is modified.

## A.1 Physical Specifications

Physical specifications are presented in the tables which follow.

### A.1.1 SPARCcluster 1000HA Server



**Caution** – Make no mechanical or electrical modifications to the cabinets. Sun is not responsible for the regulatory compliance if a cabinet is modified.

Table A-1 SPARCcluster 1000HA Server Physical Specifications

	U.S.	Metric	Comments
Height	56 in	143 cm	
Width	30 in	77 cm	
Depth	39 in	99 cm	
Weight: Main cabinet	650 lb	300 kg	Approximate weight — depending upon configuration
Weight: Expansion cabinet	1000 lb	455 kg	Approximate weight — depending upon configuration
Power cord	15 ft	4.6m	

Table A-2 SPARCcluster 1000HA Server Clearance and Service Access

	U.S.	Metric
Front	36 in	92 cm
Rear	36 in	92 cm
Left	36 in	92 cm
Right	36 in	92 cm

### A.1.2 SPARCcluster 2000 HA Server



**Caution** – Make no mechanical or electrical modifications to the cabinets. Sun is not responsible for the regulatory compliance if a cabinet is modified.

Table A-3 SPARCcluster 2000 High Availability Server Physical Specifications

	U.S.	Metric	Comments
Height	56 in	143 cm	
Width	30 in	77 cm	
Depth	39 in	99 cm	
Weight	900 lb	360 kg	Approximate weight — depending upon configuration
Power cord	15 ft	4.6m	

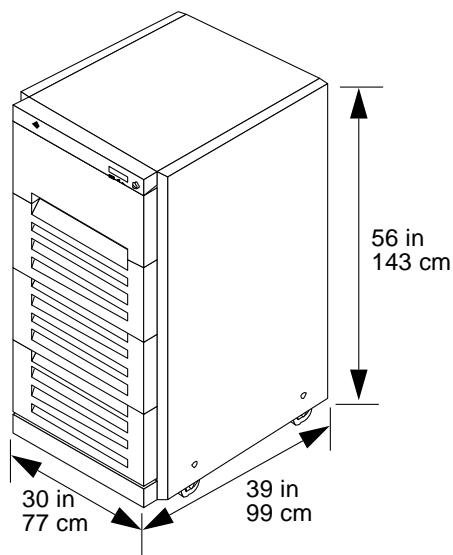


Table A-4 SPARCcluster 2000 High Availability Server Clearance and Service Access

	U.S.	Metric
Front	36 in	92 cm
Rear	36 in	92 cm
Left	36 in	92 cm
Right	36 in	92 cm

## A.2 Electrical Specifications

### A.2.1 SPARCcluster 1000HA Server

Table A-5 provides specifications for the system cabinet equipped with two SPARCserver 1000E systems and three SPARCstorage arrays.

*Table A-5* SPARCcluster 1000HA Server Electrical Specifications

Parameter		Value
<b>Input current</b>	<b>Voltage range</b>	200-240 VAC
	Current, maximum	17A at 220 VAC input
	Current frequency range	47-63 Hz
Input power rating	Total continuous power	3480W
Volt-Ampere rating		3740 VA
BTU rating		11,850 BTU
Power factor		0.91-0.96
Plug type	U.S.	NEMA L6-30P for 200-240 VAC
	International	32A, single phase IEC 309, connected for 220-240 VAC

Table A-6 provides specifications for an expansion cabinet equipped with five SPARCstorage arrays.

*Table A-6* Electrical Specifications for the Expansion Cabinet Housing Five SPARCstorage arrays

Parameter		Value
<b>Input current</b>	<b>Voltage range</b>	200-240 VAC
	Current, maximum	24A at 220 VAC input
	Current frequency range	47-63 Hz
Input power rating	Total continuous power	5016W
Volt-Ampere rating		5280 VA
BTU rating		17,104 BTU

*Table A-6* Electrical Specifications for the Expansion Cabinet Housing Five SPARCstorage arrays (*Continued*)

Parameter		Value
Power factor		0.91-0.96
Plug type	U.S.	NEMA L6-30P for 200-240 VAC
	International	32A, single phase IEC 309, connected for 220-240 VAC

### A.2.2 SPARCcluster 2000HA Server

Table A-7 provides specifications for one (of the two) server cabinets equipped with two SPARCstorage arrays.

*Table A-7* SPARCcluster 2000HA Server Electrical Specifications

Parameter		Value
<b>Input current</b>	<b>Voltage range</b>	200-240 VAC
	Current, maximum	24.7A at 220VAC input
	Current frequency range	47-66 Hz
Input power rating	Total continuous power	5100 W
Volt-Ampere rating		5430 VA
BTU rating		17,390 BTU
Power factor		0.91-0.96
Plug type	U.S.	NEMA L6-30P for 200-240 VAC
	International	32A, single phase IEC 309, connected for 220-240 VAC

**Note** – The electrical specifications for the expansion cabinet are the same as that described in Table A-6 for the 1000HA server expansion cabinet.

### A.3 Environmental Specifications

The environmental specifications for both the SPARCcluster 1000HA and SPARCcluster 2000HA servers are the same. Avoid temperature extremes and keep the work area clean. Maintain the operating conditions shown below:

Table A-8 Environmental Limits

Specification	Operating		Nonoperating	
	U.S.	Metric	U.S.	Metric
Temperature	50° to 86°F	10° to 30°C	-4° to 140°F	-20° to 60°C
Altitude	10,000 ft	3,048 m	40,000 ft	12,192 m
Humidity	20% to 80% RH	5% to 95% RH	20% to 80% RH	5% to 95% RH

Sun suggests installing the SPARCcluster HA servers in a computer room environment. Computer room installation provides security access to computers and stored information and affords control over environmental factors such as temperature, humidity, and airborne dust. Computer room installation also protects equipment from fire, flood, or other danger originating in the building.



## *Connector Pinouts and Cabling*

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### *B.1 SPARCstorage Array Fiber Optic Cables*

Refer to the *SPARCcluster High Availability Server Hardware Planning and Installation Manual* for information on connecting SPARCstorage arrays to a node using the fiber optic cables. Refer to Chapter 9 for a SPARCcluster 1000 HA server; Chapter 10 for a SPARCcluster 2000HA server.

### *B.2 Terminal Concentrator Ports*

Refer to the *SPARCcluster High Availability Server Hardware Planning and Installation Manual* to connect serial ports on the terminal concentrator to the system console and the serial ports on your system nodes. Refer to Chapter 9 for a SPARCcluster 1000HA server and to Chapter 10 for a 2000HA server.

#### *B.2.1 RJ-45 Serial Port Connectors*

Port 1 of the terminal concentrator is designated as the terminal concentrator 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.

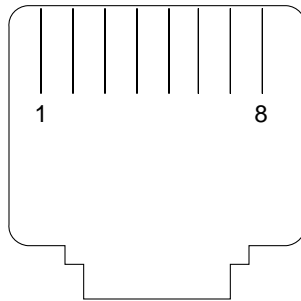


Figure B-1 Serial Port RJ-45 Receptacle

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 AUI Ethernet transceiver port on the terminal concentrator. The port receptacle is shown in Figure B-2, pin allocations are given in Table B-2.

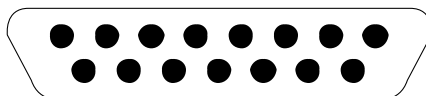


Figure B-2 15-pin Ethernet Receptacle

Table B-2 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 Net Cables (Short/Long)

Both nodes in an HA system are connected via two private nets using two special (either short or long) Ethernet cables. The cables are twisted pair, Category Type 5. Refer to the *SPARCcluster High Availability Server Hardware Planning and Installation Manual* to cable the private nets on your system. Refer to Chapter 9 for a SPARCcluster 1000HA server and to Chapter 10 for a 2000HA server. The pinout for these cables is as listed in Table B-3.

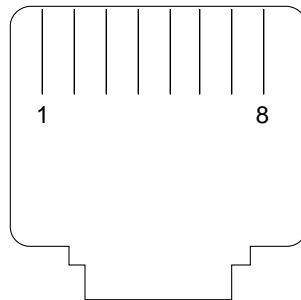


Figure B-3 Twisted Pair Ethernet RJ-45 Receptacle

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*

---



The SCSI target IDs for the two SPARCcluster 2000 boot disks contained in the Multi-Disk Pack should be 0 for boot disk 1 and 1 for boot disk 2. To verify what address a drive has, and to change the setting if necessary, refer to the *Multi-Disk Pack Installation and Service Guide*.



# *SPARCstorage Array Firmware and Device Driver Error Messages*



This appendix gives error messages specific to the SPARCstorage Array.

## *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 following discussion, messages will be 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 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.

## *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's 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.wnn.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 `ssacli.lm` man pages for more information).

```
soc.wnn.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.wnn.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 adaptor.

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 adaptor, Fibre Channel Optical Module, fibre 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<sup>12</sup> bits). If you see this message, clean the fibre optic cable according to the instructions given in the *SPARCstorage Array Service Manual*. If the problem still exists, replace either the fibre 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 timeout period. Within the timeout period, if the link should become usable again, any waiting I/O operations will be resumed. However, if the timeout should expire before the link becomes operational, any I/O operations will fail.

The latter message (timeout) means that the host adapter microcode has detected a timeout 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 an 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 “offline” in case the link should return to an operable state, so that pending operations can be completed. However, if a sufficient time elapses following the transition of the link to “offline” without a corresponding “online” 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 1994
```

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_ioiclass
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
```

## *Glossary*

---

The terminology used in this manual includes the following:

### **Asymmetric configuration**

A configuration that contains a single diskset. In an asymmetric configuration, one server acts as the default master of the diskset and the other server acts as a hot standby.

### **Concatenation**

A metadvice created by sequentially mapping blocks on several physical slices (partitions) to a logical device. Two or more physical components can be concatenated. The slices are accessed sequentially rather than interlaced (as with stripes).

### **Data service**

A network service that implements read-write access to disk-based data from clients on a network. Examples of data services include NFS and ORACLE\*SERVER. The data service may be composed of multiple processes that work together.

### **Default master**

The server that is master of a diskset if both servers rebooted simultaneously. The default master is specified when the system is initially configured.

### **Diskset**

A group of disks that move as a unit between the two servers in a Solstice HA configuration.

---

**DiskSuite**

See Solstice DiskSuite.

**Fault detection**

Solstice HA programs that detect two types of failures. The first type includes low-level failures such as system panics and hardware faults (that is, failures that cause the entire server to be inoperable). These failures can be detected quickly. The second type of failures are related to data service, such as HA-ORACLE or HA-NFS. These types of failures take longer to detect.

**HA-NFS**

Highly available NFS. HA-NFS provides highly available remote mount service, status monitor service, and network locking service.

**HA-ORACLE**

HA-DBMS for ORACLE\*SERVER.

**Heartbeat**

A periodic message sent between the two membership monitors to each other. Lack of a heartbeat after a specified interval and number of retries may trigger a takeover.

**Highly available data service**

A data service that appears to remain continuously available, despite single-point failures of server hardware or software components.

**Hot standby**

In an asymmetric (single diskset) configuration, the machine that is not the current master of the diskset. If both servers reboot simultaneously, the hot standby will not master the diskset and thus will not be running any Solstice HA data services.

**Local disks**

Disks attached to a Solstice HA server but not included in a diskset. The local disks contain the Solaris 2.4 distribution and the Solstice HA and DiskSuite software packages. Local disks must not contain data exported by the Solstice HA data service.

---

**Logical host**

A diskset and its collection of logical host names and their associated IP addresses. Each logical host is mastered by one physical host at a time.

**Logical host name**

The name assigned to one of the logical network interfaces. A logical host name is used by clients on the network to refer to the location of data and data services. The logical host name is the name for a path to the logical host. Because a host may be on multiple networks, there may be multiple logical host names for a single logical host.

**Logical network interfac**

In the Internet architecture, a host may have one or more IP addresses. Solstice HA configures up additional logical network interfaces to establish a mapping between several logical network interfaces and a single physical network interface. This allows a single physical network interface to respond to multiple logical network interfaces. This also enables the IP address to move from one Solstice HA server to the other in the event of a takeover or haswitch(1M), without requiring additional hardware interfaces.

**Master**

The server with exclusive read and write access to a diskset. The current master host for the diskset runs the data service and has the logical IP addresses mapped to its Ethernet address.

**Membership monitor**

A process running on both Solstice HA servers that monitors the servers. The membership monitor sends and receives heartbeats to its sibling host. The monitor can initiate a takeover if the heartbeat stops. It also keeps track of which servers are active.

**Metadevice**

A group of components accessed as a single logical device by concatenating, striping, mirroring, or logging the physical devices. Metadevices are sometimes called pseudo devices.

**Metadevice state database**

Information kept in nonvolatile storage (on disk) for preserving the state and configuration of metadevices.

---

**Metadevice state database replica**

A copy of the state database. Keeping multiple copies of the state database protects against the loss of state and configuration information. This information is critical to all metadevice operations.

**Mirroring**

Replicating all writes made to a single logical device (the mirror) to multiple devices (the submirrors), while distributing read operations. This provides data redundancy in the event of a failure.

**Multi-host disk**

A disk configured for potential accessibility from multiple servers. Solstice HA software enables data on a multi-host disk to be exported to network clients via a highly available data service.

**Sibling host**

One of the two physical servers in a Solstice HA configuration.

**Solstice HA**

See Solstice High Availability.

**Solstice High Availability**

A software package that enables two machines to act as read-write data servers while acting as backups for each other.

**Solstice DiskSuite**

A software product that provides data reliability through disk striping, concatenation, mirroring, UFS logging, dynamic growth of metadevices and file systems, and metadevice state database replicas.

**Stripe**

Similar to concatenation, except the addressing of the component blocks is interlaced on the slices (partitions), rather than placed sequentially. Striping is used to gain performance. By striping data across disks on separate controllers, multiple controllers can access data simultaneously.

**Submirror**

A metadevice that is part of a mirror. See also mirroring.

---

**Switchover**

The coordinated moving of a logical host (diskset) from one operational Solstice HA server to the other. A switchover is initiated by an administrator using the `haswitch(1M)` command.

**Symmetric configuration**

A Solstice HA configuration that contains two disksets. In a symmetric configuration, each server is the default master for one diskset.

**Takeover**

The automatic moving of a logical host from one Solstice HA server to the other after a failure has been detected. The Solstice HA server that has the failure is forced to give up mastery of the logical host.

**Trans device**

A pseudo device responsible for managing the contents of a UFS log.

**UFS**

An acronym for the UNIX file system.

**UFS logging**

Recording UFS updates to a log (the logging device) before the updates are applied to the UFS (the master device).

**UFS logging device**

The component of a trans device that contains the UFS log.

**UFS master device**

The component of a trans device that contains the UFS file system.





# *Index*

---

## **Numerics**

10Base5 connector, B-3

## **A**

AC power switch  
cabinet, 7-2

adjust  
levelling pads, 8-9  
stabilizer bar, 8-9

## **B**

boot disks  
power off, 7-20  
power on, 7-20

## **C**

cabinet  
AC power switch, 7-3  
key switch, 7-2

## **D**

definition of terms, G-11 to ??  
disk drive  
caution, 7-15  
tray

safety, 8-9

drive  
test manually, 7-16, 7-19

## **E**

Ethernet  
connector  
10Base5, B-3  
terminal concentrator, B-3

## **H**

height adjust, levelling pads, 8-9

## **K**

key switch  
cabinet, 7-2  
location, 7-6  
kick panel *See* panel, remove, kick

## **L**

leveling pads, adjust, 8-9

## **N**

n, 7-19, 7-20  
network

- 
- primary, B-3
- O**
- options
    - external
      - SPARCcluster 1000HA, 1-9
      - SPARCcluster 2000HA, 1-10
    - internal
      - SPARCcluster 1000HA, 1-7
      - SPARCcluster 2000HA, 1-7
- P**
- panel
    - rear, 8-2
    - remove
      - hinged front, open, 8-5
      - kick, 8-8
      - rear screen, 8-6
      - side, 8-7
    - replace
      - rear screen, 8-7
      - side, 8-8
  - ping command, 3-25
  - pinout
    - 10Base5, B-3
    - RJ45 serial, B-2
    - terminal concentrator, B-1
  - POST
    - LEDs
      - front panel, 7-15, 7-19
    - restart, 7-16, 7-19
  - power
    - cabinet AC switch, 7-3
  - primary network
    - connection, B-3
- R**
- rear screen panel *See* panel, remove
  - remove
    - panel
      - hinged front, open, 8-5
      - kick, 8-8
    - rear screen, 8-6
    - side, 8-7
    - vented front, 8-3, 8-5
  - removing and replacing
    - rear panel, 8-2
  - replace
    - panel
      - rear screen, 8-7
      - side, 8-8
      - vented front, 8-4, 8-6
  - reset
    - switch, initiate POST, 7-16, 7-19
  - restart
    - POST, 7-16, 7-19
  - RJ45 connector pinout, B-2
- S**
- safety, 6-1 to 6-4
  - SBus
    - card
      - test manually, 7-16, 7-19
  - SCSI targeting
    - SPARCcluster 2000HA boot disks, C-1
  - security
    - computer room access, A-6
  - serial port connector
    - pinout, B-2
    - terminal concentrator, B-1
  - side panels *See* panel, remove
  - Solstice DiskSuite
    - introduction, 1-1
  - Solstice HA
    - introduction, 1-1
    - online serviceability, 1-2
  - Solstice HA data services, 1-1
  - Solstice HA features, 1-2
  - SPARCcluster 1000HA
    - cabling, replacing, 9-7
    - configurations, 1-5
    - fan assembly, replacing, 9-3
    - processor

- 
- replacing system board and components, 9-2
  - startup, 7-6
  - SPARCstorage array, 7-8
    - complete array shutdown, 7-8
    - complete tray startup, 7-9
    - replacing major subassemblies, 9-3
    - replacing trays and drives, 9-2
    - single drive/ tray startup, 7-11
    - single drive/tray shutdown, 7-11
  - system cabinet, 7-2
    - shutdown, 7-2
    - startup, 7-4
  - terminal concentrator, 7-11
    - replacement of, 9-5
  - SPARCcluster 2000HA, 7-11
    - boot disks
      - power off, 7-20
      - power on, 7-20
      - replacement of, 9-9
    - cabling
      - replacing, 9-12
    - configurations, 1-6
    - processor
      - replacing system board and components, 9-8
    - processor shutdown/startup, 7-17
    - SPARCstorage array
      - complete array shutdown, 7-19
      - complete array startup, 7-19
      - replacing major subassemblies, 9-9
      - replacing trays and disks, 9-8
      - single disk/tray shutdown, 7-19
      - single disk/tray startup, 7-20
    - system cabinet, 7-11
      - shutdown, 7-12
      - startup, 7-13
    - terminal concentrator, 7-20
      - replacement of, 9-11
  - specifications
    - environmental, A-1
    - temperature, A-1, A-6
  - stabilizer bar
    - adjust, 8-9
    - safety, 8-9
  - stats command, 3-25
  - swapping cables, algorithm, 3-27
  - switch
    - key
      - cabinet, 7-4
      - reset, initiate POST, 7-16, 7-19
- ## T
- target
    - address
      - SPARCcluster 2000HA boot disks, C-1
  - temperature specifications, A-1, A-6
  - terminal concentrator
    - Ethernet, pinout, B-3
    - indicator LEDs, 3-27
    - serial pinout, B-1
  - testing
    - drive
      - SBus card, 7-16, 7-19
  - tip hardware command, 3-25, 3-26
  - tools required, 6-5
  - tray
    - use stabilizer bar, 8-9
  - troubleshooting
    - hardware
      - SPARCstorage Array
        - disk data path, 3-4
  - troubleshooting
    - error messages
      - SPARCstorage Array, D-1
        - device driver, D-1
        - firmware, D-1
      - error messages, list of, 2-5
      - fault classes, 2-4
      - flow, 2-2
      - hardware, 3-1
        - network
          - client net, 3-20

---

- private, 3-17
- network failures, 3-17
- node failures
  - boot disks, 3-12
  - control board, 3-12
  - system board, 3-12
- serial connections, 3-20
- SPARCstorage Array, 3-5
  - controller board, 3-3
- SPARCstorage Array/Optical connections, 3-2
- terminal concentrator, 3-20
  - flow diagrams, 3-23
- maintenance authorization, 2-1
- overview, 2-1
- principal assemblies, 2-4
- remote site, 2-1
- software, 4-1
  - operating system, 4-2
  - Oracle, 4-2
  - SPARCstorage Array, 4-2
- symptoms, list of, 2-5

## V

- vented front panel, 8-3, 8-5

## *Revision History*

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<b>Revision</b>	<b>Dash</b>	<b>Date</b>	<b>Comments</b>
802-3512-10	-10	October 1995	FCS draft

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- The procedures were well documented.

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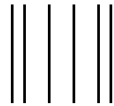
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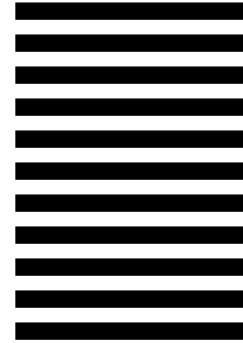
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