Ultra™ Enterprise™ 2 Cluster Hardware Service Manual

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Preface

This manual provides servicing instructions for the Ultra™ Enterprise™ 2 Clusters. These instructions are designed for experienced and qualified maintenance personnel.

How This Book Is Organized

Part 1 — System Information

Chapter 1, **"Product Description"** describes the clusters standard features, system configurations, and internal and external options.

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 software.

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

Part 3 — Preparing for Service

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

Chapter 7, **"Shutdown and Restart Procedures,"** contains procedures for shutting down and restarting the Ultra Enterprise 2 server, SPARCstorage™ Array, SPARCstorage MultiPack, and the terminal concentrator.

Part 4 — Subassembly Removal and Replacement

Chapter 8, **"Internal Access,"** provides a guide to the procedures necessary to access system components during removal and replacement.

Chapter 9, **"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, "Connector Pinouts and Cabling," provides a list of pinouts and cabling for Ultra Enterprise 2 Cluster Server specific items.

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

When You Need Help with UNIX Commands

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

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

- Shutting down the system
- Booting the system

- Configuring devices
- Other basic software procedures

See one or more of the following:

- *Solaris 2.x Handbook for SMCC Peripherals* contains Solaris™ 2.x software commands.

- *AnswerBook*™ on-line documentation system for the complete set of documentation supporting the Solaris 2.x operating environment.

- Other software documentation that you received with your system.

Typographic Conventions

The following table the typographic changes used in this book.

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

Shell Prompts in Command Examples

Table P-1 shows the default system prompt and superuser prompt for the C shell, Bourne shell, and Korn shell.

Table P-1 Default System and Superuser Prompt

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	`#`

Related Documentation

Table P-2 lists the documents which contain information that may be helpful to the system administrator and service provider.

Table P-2 List of Related Documentation

Product Family	Title	Part Number
Ultra 2 Server Series	*Sun Ultra 2 Series Hardware Setup Instructions*	**802-5933**
	Sun Ultra 2 Series Installation Guide	802-5934
	Sun Ultra 2 Series Service Manual	802-2561
SPARCstorage Array 100	*SPARCstorage Array 100 Installation and Service Binder Set*	**825-2513**
	SPARCstorage Array *Model 100 Series* Installation Manual	801-2205
	SPARCstorage Array *Model 100 Series* Service Manual	801-2206
	SPARCstorage Array Regulatory Compliance Manual	801-7103
	SPARCstorage Array 100 User's Guide Binder Set	**825-2514**
	SPARCstorage Array Configuration Guide	802-2041
	SPARCstorage Array User's Guide	802-2042
	SPARCstorage Array Product Note	802-2043

<p align="center">*Table P-2*   List of Related Documentation *(Continued)*</p>

Product Family	Title	Part Number
SPARCstorage Array 200	*SPARCstorage Array 200 Manuals*	
	SPARCstorage Array *Model 200 Series* Installation Manual	802-2027
	SPARCstorage Array *Model 100 Series* Service Manual	802-2028
	SPARCstorage Array Battery and Prom Installation Note	801-2029
	SPARCstorage Array Regulatory Compliance Manual	802-2031
SPARCstorage MultiPack	*SPARCstorage MultiPack Installation Guide*	**802-4427**
	SPARCstorage MultiPack User's Guide	802-4428
	SPARCstorage MultiPack Installation Supplement	802-4429
	SPARCstorage MultiPack Service Manual	802-4430
Ultra Enterprise 2 Cluster HA	*Ultra Enterprise 2 Cluster HA Document Binder Set*	**825-3494**
	Getting Started (roadmap)	802-6317
	Solstice HA 1.3 User's Guide	805-0317
	Ultra Enterprise 2 Cluster Hardware Planning and Installation Manual	802-6313
	Solstice HA 1.3 Software Programmer's Guide	*805-0318*
	Ultra Enterprise 2 Cluster Hardware Service Manual	802-6316
	Solstice HA 1.3 New Product Information	805-0629
Ultra Enterprise 2 Cluster PDB	*Ultra Enterprise 2 Cluster PDB Preparation Binder Set*	**825-3833**
	Getting Started (roadmap)	805-0428
	Ultra Enterprise Cluster PDB Software Planning and Installation Guide	802-6790
	Ultra Enterprise 2 Cluster PDB Hardware Planning and Installation Manual	802-6313

Table P-2   List of Related Documentation *(Continued)*

Product Family	Title	Part Number
	Ultra Enterprise 2 Cluster PDB System Binder Set	**825**-**3834**
	Ultra Enterprise Cluster PDB Administration Guide	802-6784
	Ultra Enterprise Cluster PDB Volume Manager Administration Guide	802-6785
	Ultra Enterpris 2 Cluster Hardware Service Manual	802-6316
	Ultra Enterprise Cluster Messages PDB Binder Set	**825**-**3783**
	Ultra Enterprise Cluster PDB Error Messages Manual	802-6792
	Ultra Enterprise PDB 1.2 Release Notes *(shipped with Ultra Enterprise PDB 1.2 CD-ROM)*	802-6793
Terminal Concentrator	**Terminal Concentrator Binder Set**	**825**-**2227**
	Terminal Concentrator Installation Notes	801-6127
	Terminal Concentrator General Reference Guide	801-5972
Solstice Disksuite	**Solstice Disksuite 4.1 Binder Set**	**851**-**2369**
	Solstice Disksuite 4.1 User's Guide	802-4215
	Solstice Disksuite 4.1 Reference Guide	802-6724
	Solstice Disksuite 4.1 Installation/Product Notes	802-7196
SunVTS Diagnostic	**SunVTS 2.0 User's Guide**	**802**-**7221**
Other Referenced Manuals	*Disk Drive Installation Manual for the SPARCstorage Array Model 100 Series*	801-2207
	SBus Quad Ethernet Controller Manual	801-7123
	Fibre Channel SBus Card Installation Manual	801-6313
	Fibre Channel Optical Module Installation Manual	801-6326
	SunSwift SBus Adapter User's Guide	802-6021

Notes, Cautions, and Warnings

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

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

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

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

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

Ordering Sun Documents

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

Country	Telephone	Fax
Belgium	02-720-09-09	02-725-88-50
Canada	800-873-7869	800-944-0661
France	0800-90-61-57	0800-90-61-58
Germany	01-30-81-61-91	01-30-81-61-92
Holland	06-022-34-45	06-022-34-46
Japan	0120-33-9096	0120-33-9097
Luxembourg	32-2-720-09-09	32-2-725-88-50
Sweden	020-79-57-26	020-79-57-27
Switzerland	0800-55-19-26	0800-55-19-27
United Kingdom	0800-89-88-88	0800-89-88-87
United States	1800-873-7869	1800-944-0661

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If a card is not available, you can email or fax your comments to us. Please include the part number of your document in the subject line of your email or fax message.

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

Product Description 1≡

Ultra Enterprise 2 Clusters are configured to support the Solstice™ High Availability (HA) 1.3 software and the Parallel Database (PDB) 1.2 software. Two different basic cluster configurations are available. One configuration uses SPARCstorage Arrays for multihost data storage. The other configuration uses SPARCstorage MultiPacks. Both configurations support the HA and PDB software packages and use the internal onboard hard disk as the boot device, which can be mirrored if a second drive is provided.

Other minor differences exist between the HA and PDB configurations. These differences are in the network interconnects, both public and private.

Both HA and PDB software provide online serviceability. Online serviceability enables system administrators to take one node of the cluster off-line for repair or routine maintenance while the data services remain available from the other node.

1.1 *Ultra Enterprise 2 Cluster Using SPARCstorage Arrays*

The Ultra Enterprise 2 Cluster is implemented on the Ultra Enterprise 2 Server platform using either two SPARCstorage Array Model 100 Series disk arrays. Two identical compute nodes and a shared set of disk arrays comprise a cluster. Figure 1-1 is a functional block diagram of the *Ultra Enterprise 2 Cluster* using SPARCstorage Arrays. This diagram shows the HA configuration using SQECs and onboard Ethernet connectors for the Private Nets.

Primary public
network

Primary public
network

Node 0

Node 1

Boot 0 — Boot 1 — CD-ROM

Boot 0 — Boot 1 — CD-ROM

Enet — hme0

Private
net 1 & 2

hme0 — Enet

qe1 — SQEC — qe0

qe0 — SQEC — qe1

Multihost disks

SPARCstorage Arrays (2)

FC/S

FC/S

System board

FC/OM — FC/OM — FC/OM — FC/OM — System board

FC/OM — FC/OM — FC/OM — FC/OM

Serial port A

Serial port A

Port 2 — Terminal
concentrator — Port 3
Ethernet port

1. The second boot drive and
the CD-ROM are optional
devices

Port 1

2. The UltraSPARC processor
speed and the DIMM size
should be the same on both
nodes.

Administration terminal or
workstation

Primary public
network

Figure 1-1   Ultra Enterprise 2 Cluster using SPARCstorage Arrays -
Functional Block Diagram

1.1.1 Minimum Hardware Required for an Ultra Enterprise 2 Cluster Using SPARCstorage Arrays.

Figure 1-2 shows the minimum hardware required to support the PDB 1.2 or Solstice HA 1.3 software using SPARCstorage Arrays.

Terminal concentrator

Ultra Enterprise 2 Servers

Administration workstation

SPARCstorage Arrays
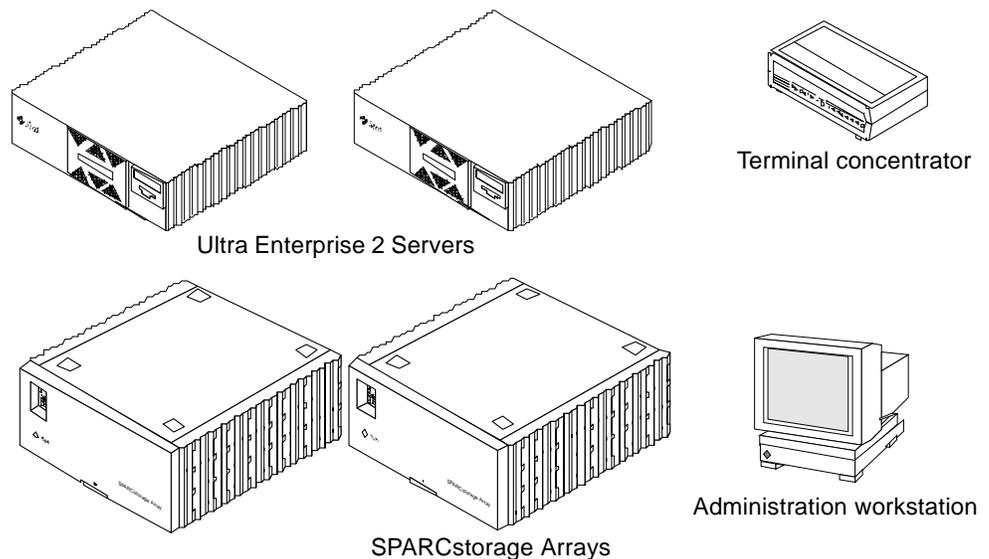
Figure 1-2   Ultra Enterprise 2 Cluster Hardware

- Two Ultra Enterprise 2 Servers, each containing:
  - One Ultra SPARC™ processor modules
  - 64-Mbyte RAM
  - 2.1-Gbyte internal disk drive
  - Two Fibre Channel SBus (FC/S) cards, each equipped with one fibre Channel Optical Module (FC/OM)
  - One SBus Quad Ethernet Controller (SQEC) card for HA or two SunSwift cards for PDB
- Two Sun Private Network cables
- Two SPARCstorage Arrays (SSAs) with six disk drives in each array
  - Four fiber-optic cables
- Terminal concentrator (supports up to three two-node clusters)

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- Three serial cables
- Administration workstation
- Ethernet cables

1.1.2 Ultra Enterprise 2 Cluster Optional Devices

- SunFastEthernet™ (SFE) SBus card for the public network (HA only)

- SunFDDI™ 5.0 SAS/DAS SBus card for the public network (HA only

- CD-ROM drive

- Additional disk drives (second boot drive and disk drives in SPARCstorage Arrays)

- Tape drive

- SCI SBus Adapter card for the private net (PDB only)

1.2 Ultra Enterprise 2 Cluster Using SPARCstorage MultiPacks

The Ultra Enterprise 2 Cluster can be implemented on the Ultra Enterprise 2 Server platform using two to four six- or twelve-drive SPARCstorage MultiPacks. Figure 1-3 is a functional block diagram of the Ultra Enterprise 2 Cluster using two SPARCstorage MultiPacks and SunSwift hme connections for the Private Nets. This configuration supports both the HA 1.3 and PDB 1.2 software.
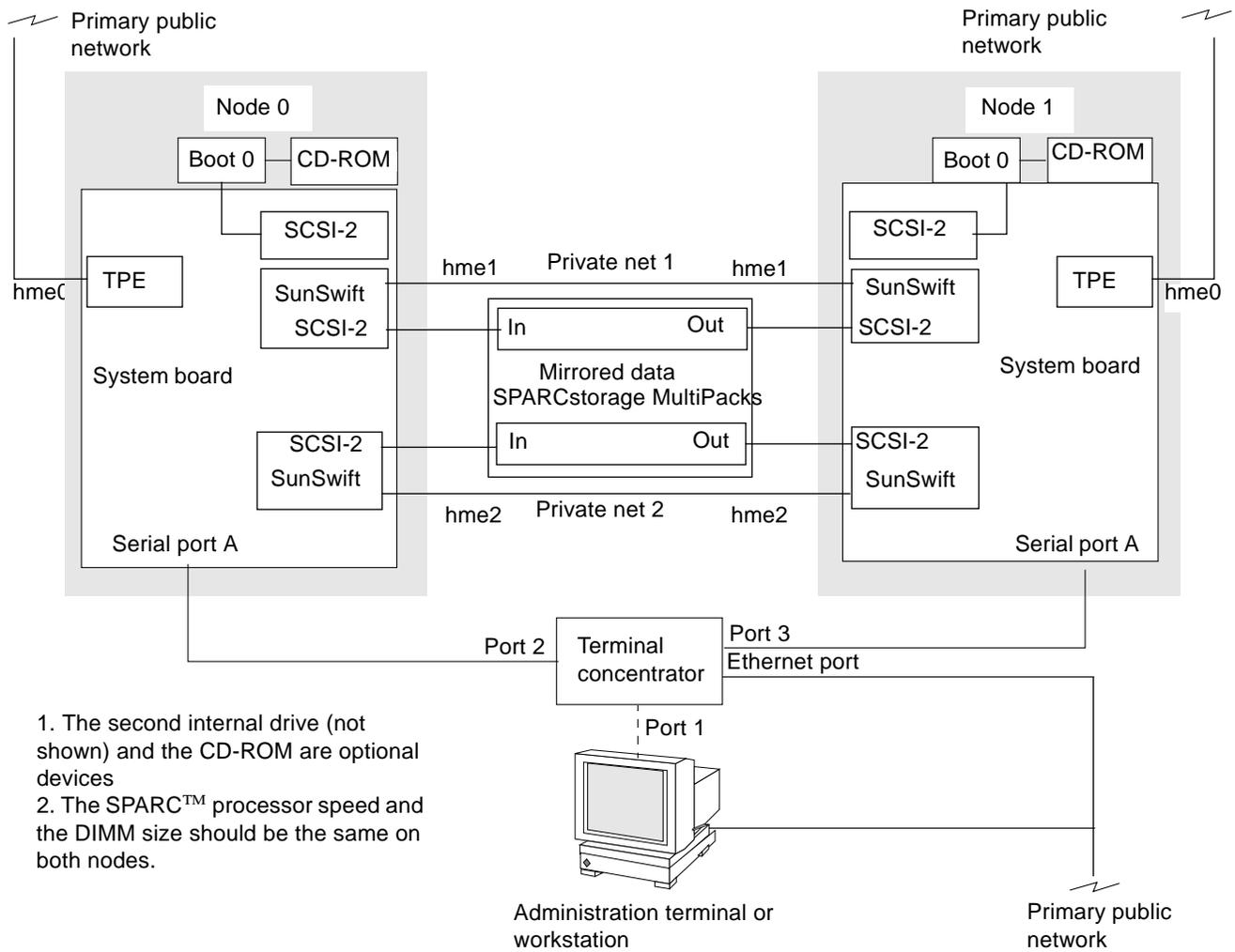
Figure 1-3   Ultra Enterprise 2 Cluster using MultiPacks -
Functional Block Diagram

1.2.1 Minimum Hardware Required for an Ultra Enterprise 2 Cluster using SPARCstorage MultiPacks

Figure 1-4 shows the minimum hardware required to support the HA 1.3 or PDB 1.2 software.

- Two Ultra Enterprise 2 Servers, each containing:
  - One SPARC processor module
  - 64-Mbyte DIMM for HA; 128-Mbyte DIMM for PDB
  - Two SunSwift™ SBus Adapter cards
- Two Sun Private Net cables
- Two six- or twelve-disk SPARCstorage MultiPacks
  - Four SCSI-2 cables
- Terminal concentrator (supports up to three two-node clusters)
  - Three serial cables
- Administration workstation
- Ethernet cables

Ultra 2 Servers

Terminal concentrator

SPARCstorage MultiPacks

Administration workstation
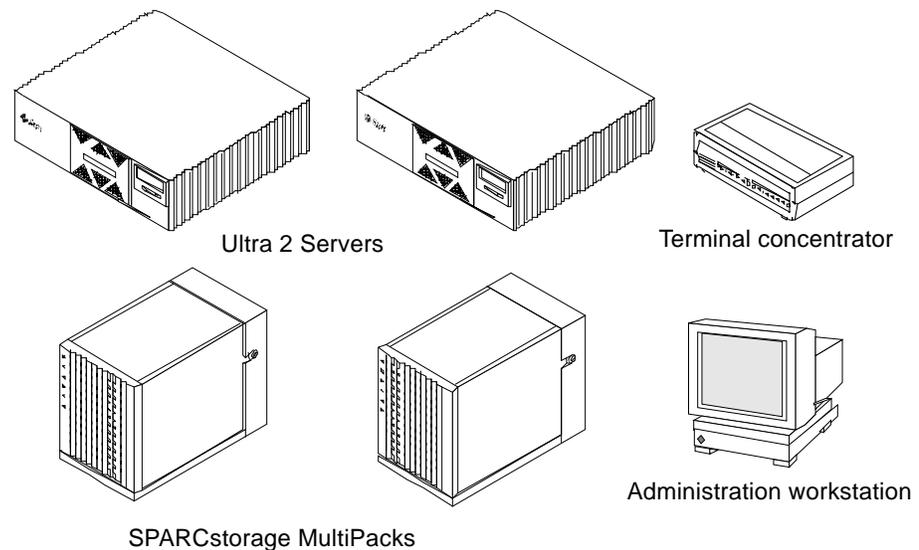
Figure 1-4   Ultra Enterprise 2 Cluster Hardware

1.2.2 Ultra Enterprise 2 Cluster Optional Devices

- CD-ROM drive
- Additional disk drives (second internal drive and disk drives in SPARCstorage MultiPacks)
- Tape drive
- SunFastEthernet (SFE) SBus card for the public net (HA only)
- SunFDDI 5.0 SAS/DAS SBus card for the public net (HA only)
- SCI SBus Adapter card for the private net (PDB only)

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Troubleshooting Overview 2

An Ultra Enterprise 2 Cluster comprises redundant, online components that operate continuously when an assembly or device fails. To maintain the high level of availability, failed components must be replaced as soon as possible. Usually, single-node cluster operation must continue during maintenance procedures.

2.1   Troubleshooting a Remote Site

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

```
% telnet terminal concentrator name
```

The normal response is:

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

If you get the following message:

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

two possibilities exist:

- The port is busy (being used by someone else).
- The port is not accepting network connections because the terminal concentrator settings are incorrect. Refer to the *Ultra Enterprise 2 Cluster Hardware Planning and Installation Guide*, Section 6.4 "Resetting the Terminal Concentrator Configuration Parameters."

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

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

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

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

If you see the preceding message, the port is in use. You can use the `cli who` command to determine which node has the port. If you see the following message, the port is misconfigured:

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

To correct the problem:

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

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

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

After you reset the port, it should be configured correctly. If not, refer to Section 3.6.6, "Resetting the Terminal Concentrator Configuration Parameters." For additional details on terminal concentrator commands, refer to the *Terminal Concentrator General Reference Guide,* part number 801-5972.

2.2 Troubleshooting Philosophy

Note – Ultra Enterprise 2 clusters have redundant, online components, which can continue system operation even through failure, repair, and relocation of one assembly or device. However, to maintain a high level of availability, failed components should be replaced as soon as possible.

Ultra Enterprise 2 clusters have two identical system nodes joined into a cluster. You must take several service precautions to maintain cluster operation during maintenance procedure. For most hardware repair operations, the node with the faulty part must be removed from the cluster as indicated in Section 2.3, "Maintenance Authorization." Additionally, the system administrator may have to perform related software tasks, before and following the removal of a node from the cluster.

For example, instances of the database application on a node may have to be halted prior to removing a node from the cluster to prevent the cluster operation from terminating. Or, pertinent software tasks may have to be performed after replacing a disk drive or a controller and prior to or after

rejoining a node to the cluster. For these and other software-specific tasks, refer to the *Solstice HA 1.3 User's Guide* or the *Ultra Enterprise 2 Cluster PDB Systerm Administration Guide.*

2.3   Maintenance Authorization

The site system administrator must be contacted to remove a node from the cluster and, after maintenance, to return the node to cluster membership. Additionally, the system administrator performs all necessary related software tasks. The procedures in this manual identify points where the system administrator must be contacted.

Note – The equipment owner's administrative requirements supersede the procedures contained in this document.

2.4   HA/PDB Differences

Depending upon the type of cluster, HA or PDB, there are differences in the disk access model, as to whether it is shared, as in a PDB cluster, or non-shared, as in an HA cluster. Additionally the PDB cluster supports a Cluster Monitor GUI whereas the HA cluster does not. Refer to Section 2.5, "Troubleshooting Flow in an HA Cluster," or Section 2.7, "Troubleshooting Flow in a PDB Cluster," depending upon the type of cluster you are troubleshooting.

2.5   Troubleshooting Flow in an HA Cluster

2.5.1   HA Node Takeover

The Solstice HA software enables one node to take over when a critical hardware or software failure is detected. When a failure is detected, an error message is sent to the system console. When a takeover occurs, the node assuming control becomes the I/O master for the diskset of the failed node and redirects the clients of the failed node to itself. The troubleshooting flow for a takeover is shown in Figure 2-1.

Service provider notified

Service provider:

Fault detected

Solstice HA software:

Requests system administrator to prepare node for service

Migrates diskset

Isolates fault; for hardware, re-fers to Chapter 3, "Hardware, Troubleshooting;" for software refers to Chapter 4, "Software Troubleshooting"

Restores data service

Migrates logical node name

Shuts down applicable assembly; refers to Chapter 7, "Shutdown and Restart Procedures"

Acknowledges configuration

Replaces faulty part using Chap-ter 9, " Major Subassemblies'

Migrates logical node name

Requests system administra-tor to return node to cluster

Services requests and returns surviving node to client

System administrator performs switchover

Cluster returns to HA (both nodes up)

Figure 2-1   HA Node Takeover Troubleshooting Flow Diagram

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2.5.2 HA Node Switchover

System administrators can manually direct one system to take over the data services for the other node. This is referred to as a switchover (refer to the *Solstice HA 1.3 User's Guide*).

2.5.3 HA Failures Without Takeover

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

1. You will be contacted by the system administrator to replace a defective part or to further isolate a system problem to a failed part.

2. Have the system administrator prepare the applicable assembly containing the failed part for service.

3. Isolate the fault to the smallest replaceable part.

4. Shut down the assembly containing the defective part.

5. Replace the failed part.

6. Have the system administrator return the repaired assembly to the cluster.

2.5.4 HA Fault Classes and Principal Assemblies

Ultra 2 Cluster HA Server troubleshooting depends on several different principal assemblies and classes of faults. The fault classes and their associated assemblies are:

- SPARCstorage Array faults
  - Data disks
  - Array controller
  - Fibre Channel Optical Modules (FC/OM)
  - Fibre Channel SBus cards (FC/S)
  - Fiber-optic cables and interfaces
  - Power supply

- SPARCstorage MultiPack faults
  - Data disk drives
  - SCSI-2 cables and SunSwift SBus Adapters

- Ultra Enterprise 2 Server faults
  - Boot disk(s)
  - System board
  - UltraSPARC™ processor module(s)
  - DIMMs
  - Power supply
  - Fibre Channel Optical Modules (FC/OM)
  - Fibre Channel SBus cards (FC/S)
  - SBus Quad Ethernet Controller card/interface (SQEC)
  - Public Net SBus card

- Cluster faults
  - Private net cables and interfaces
  - Terminal concentrator and serial connections
  - Public network connections

- Software faults
  - Application program crash
  - System crash (panic)
  - System hang (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 `hastat` should be checked regularly. For more information on the `hastat` command, refer to the *Solstice HA 1.3 User's Guide.*

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2.5.5 HA Device Troubleshooting Cross Reference

Table 2-1 lists the system devices and corresponding troubleshooting manuals.

Table 2-1   HA Device to Troubleshooting Cross Reference

Device	Reference	Part Number
SPARCstorage MultiPack	SPARCstorage MultiPack Service Manual Chapter 2, "Diagnostics for Troubleshooting"	802-4430
SPARCstorage Array Controller Fiber-optic-connector Fibre Channel Optical Module	*SPARCstorage Array Model 100 Series Service Manual,* Chapter 2, "Troubleshooting"	802-2206
Ultra Enterprise 2 Server	*Ultra 2 Series Service Manual,* Chapter 2, "SunVTS" as well as Chapter 3, "Troubleshooting Procedures"	802-2561
Terminal concentrator	Section 3.6, "Terminal Concentrator and Serial Connection Faults"	802-6316
SBus Quad Ethernet Controller	*SBus Quad Ethernet Controller Manual*	801-7123
SunSwift SBus Adapter card	*SunSwift SBus Adapter Installation User's Guide*	802-6021

2.5.6 HA Error Messages/Symptoms

Table 2-2 lists error messages or symptoms, probable cause, and troubleshooting references.

Table 2-2 HA Error Messages and Symptoms

Error Message/Symptom	Probable Cause	Cluster Service Reference	Troubleshooting Reference
Processor/Node			
Either node reboots; boot disk failure; loss of performance meter response from one node	Ultra 2 Server	Section 3.4, "Node Failures	*Ultra 2 Series Service Manual*
Private Net			
`/var/adm/messages.0Apr 23 12:04:52 ha-jan unix: hme0: Link Down - cable problem?`	Cable	For cabling details, See *Ultra 2 Server Hardware Planning and Installation Manual*, Chapter 5 "Hardware Installation.".	
`/var/adm/messages.0Apr 23 12:04:52 ha-jan unix: qe0: No carrier - twisted pair cable problem or disabled hub link test?`	SQEC or cable	Section 3.5.1, "Private Network Failure"	*SBus Quad Ethernet Controller Manual*
`/var/adm/messages.0Apr 23 12:04:52 ha-jan unix: hme1: Link Down - cable problem?`	SunSwift card	For cabling details, See *Ultra 2 Server Hardware Planning and Installation Manual*, Chapter 5 "Hardware Installation."	*SunSwift SBus Adapter User's Guide*
Public Network			
`/var/adm/messages.0Apr 23 12:04:52 ha-jan unix: qe1: No carrier - twisted pair cable problem or disabled hub link test?`	Public net, SQEC, or cable	Section 3.5.2, "Public Network Failure"	Refer to your public network documentation. *SBus Quad Ethernet Controller Manual*
`var/adm/messages.0Apr 23 12:04:52 ha-jan unix: hme0: Link Down - cable problem?`	Onboard TPE interface, cable, or public network	Section 3.4, "Node Failures" For cabling details, See *Ultra 2 Server Hardware Planning and Installation Manual*, Chapter 5 "Hardware Installation.".	Refer to your public network documentation. *Sun Ultra 2 Series Service Manual*

Table 2-2   HA Error Messages and Symptoms *(Continued)*

Error Message/Symptom	Probable Cause	Cluster Service Reference	Troubleshooting Reference
`soc.link.5010` `Fiber Channel is OFFLINE;` `c2t4d8a2 failed` (See PDB Error Messages Manual and SPARCstorage Array Messages for additional messages.)	Disk array, cable, or disk drive	Section 3.2, "SPARCstorage Array and Optical Connections Faults"	*SPARCstorage Array Model 100 Series Service Manual*
Terminal Concentrator			
No messages from one of the nodes on the system console; no messages from either node on the system console	Terminal concentrator	Section 3.6, "Terminal Concentrator and Serial Connection Faults"	

2.5.7 HA Device Replacement Cross-Reference

Table 2-3 lists the devices and corresponding documents that contain the applicable replacement procedures.

Table 2-3   HA Device Replacement Cross-Reference

Device	Reference	Document Part No.

Ultra 2 Server
    Power supply
    Boot disk
    System board
    SBus card
    DSIMM
    CPU module
	Ultra 2 Series Service Manual, Chapter 8, "Major Subassemblies"
	"Chapter 9, "Storage Devices"
	"System Board and Component Replacement
		802-2561

Optical Module	*Fibre Channel Optical Module Installation Guide*	801-6326
FC/S SBus card	*Fibre Channel SBus Adapter card Installation Guide*	801-6313

SPARCstorage Array
    Controller
    Disk drives
    Power supply
	SPARCstorage Array Model 100 Series Service Manual, Chapter 5. "Major Subassemblies" and the *Disk Drive Installation Manual for the SPARCstorage Array*	802-2206
		
		801-2207

SPARCstorage MultiPack disk drives	*SPARCstorage Multipack Service Manual,* Chapter 3, "Parts Replacement"	801-4430
SunSwift SBus Adapter card	*SunSwift SBus Adapter Installation User's Guide*	802-6021
SCI	*SCI SBus Adapter User's Guide*	802-7103

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2.6   *PDB Cluster GUIs*

Three Graphical User Interfaces (GUIs) enable the system administrator to facilitate troubleshooting the Cluster Control Panel (`ccp`), the Cluster Console (`cconsole`), and the Cluster Monitor (`clustmon`). See Table 2-4 for a brief description of each GUI; refer to the *Ultra Enterprise Cluster PDB Administration Guide* for more detailed information.

Table 2-4   Graphical User Interfaces

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

2.7   *Troubleshooting Flow in a PDB Cluster*

The following troubleshooting procedures are based on console access for both nodes. Refer to the *Ultra Enterprise 2 Cluster PDB Administration Guide* for console access.

The troubleshooting presented in this section of the manual is based on error messages displayed on the system administration console, Cluster Monitor, or other sources. In addition, the Cluster Monitor GUI displays information and graphics that can be used to isolate faults. To maintain the system in high-availability mode, troubleshooting should be accomplished in the following order:

1. Checking system Console or Cluster Monitor messages and troubleshooting instructions to determine principle assembly at fault.

2. Contacting system administrator to remove a node from the cluster.

3. Isolating fault to smallest replaceable component.

4. Shutting down specific disk tray, system node, or terminal concentrator.

5. Replacing defective component.

6. Contacting system administrator to return node to cluster.

This troubleshooting flow is shown in Figure 2-2.
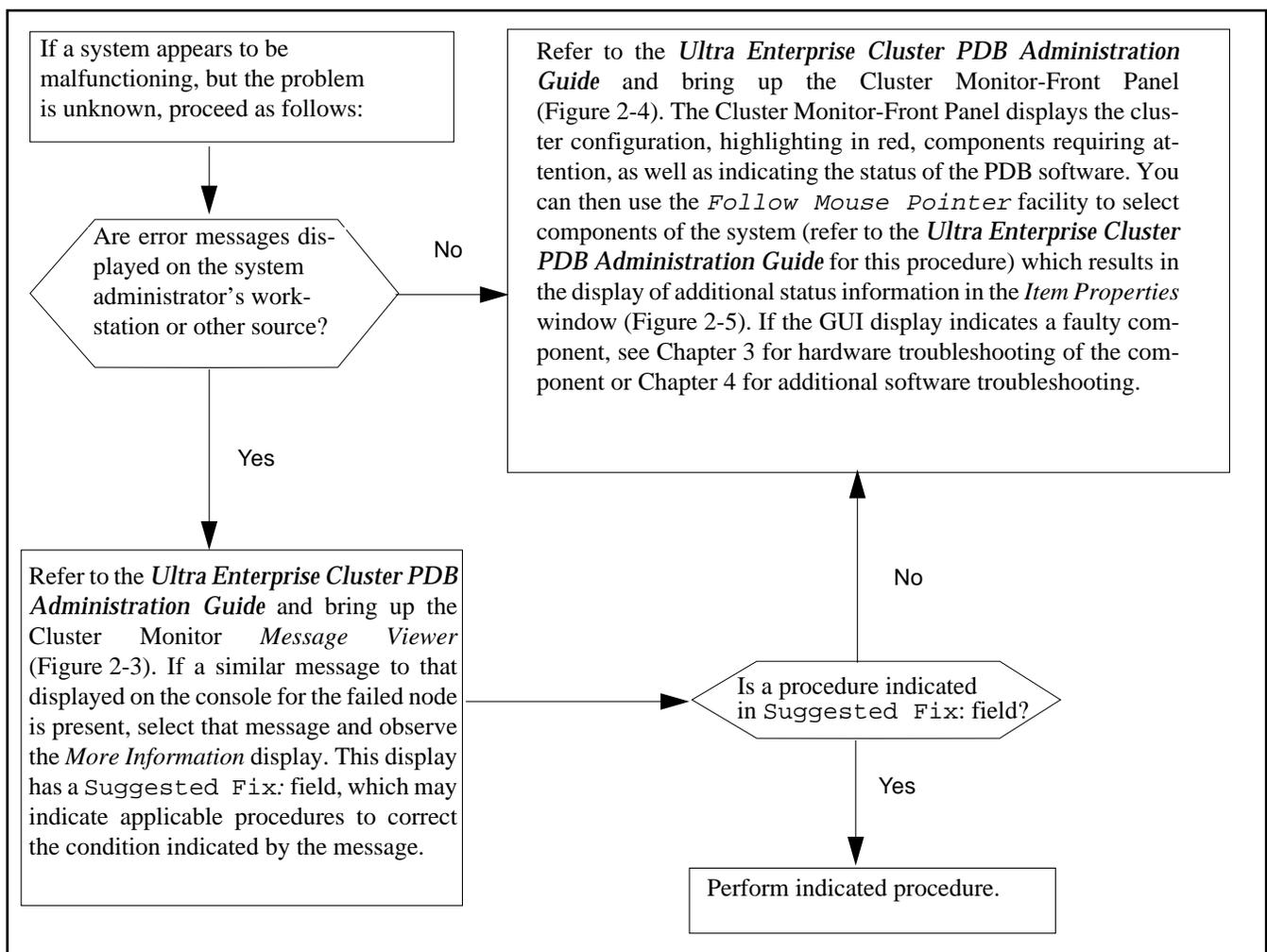
Figure 2-2   PDB Cluster Troubleshooting Flow Diagram
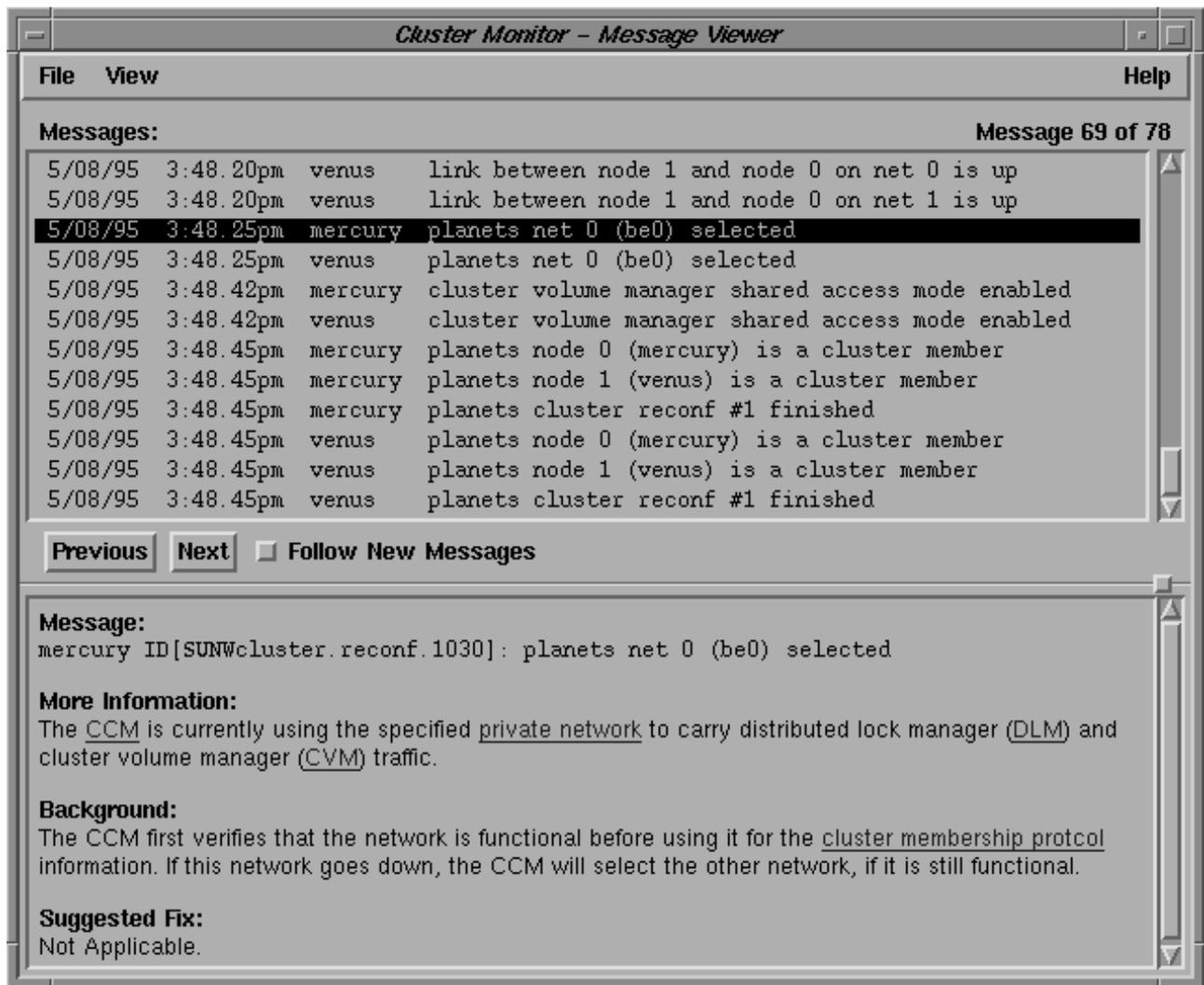
Figure 2-3   PDB Cluster Monitor Message Viewer Window

Menu bar

Graphical picture area

Footer area
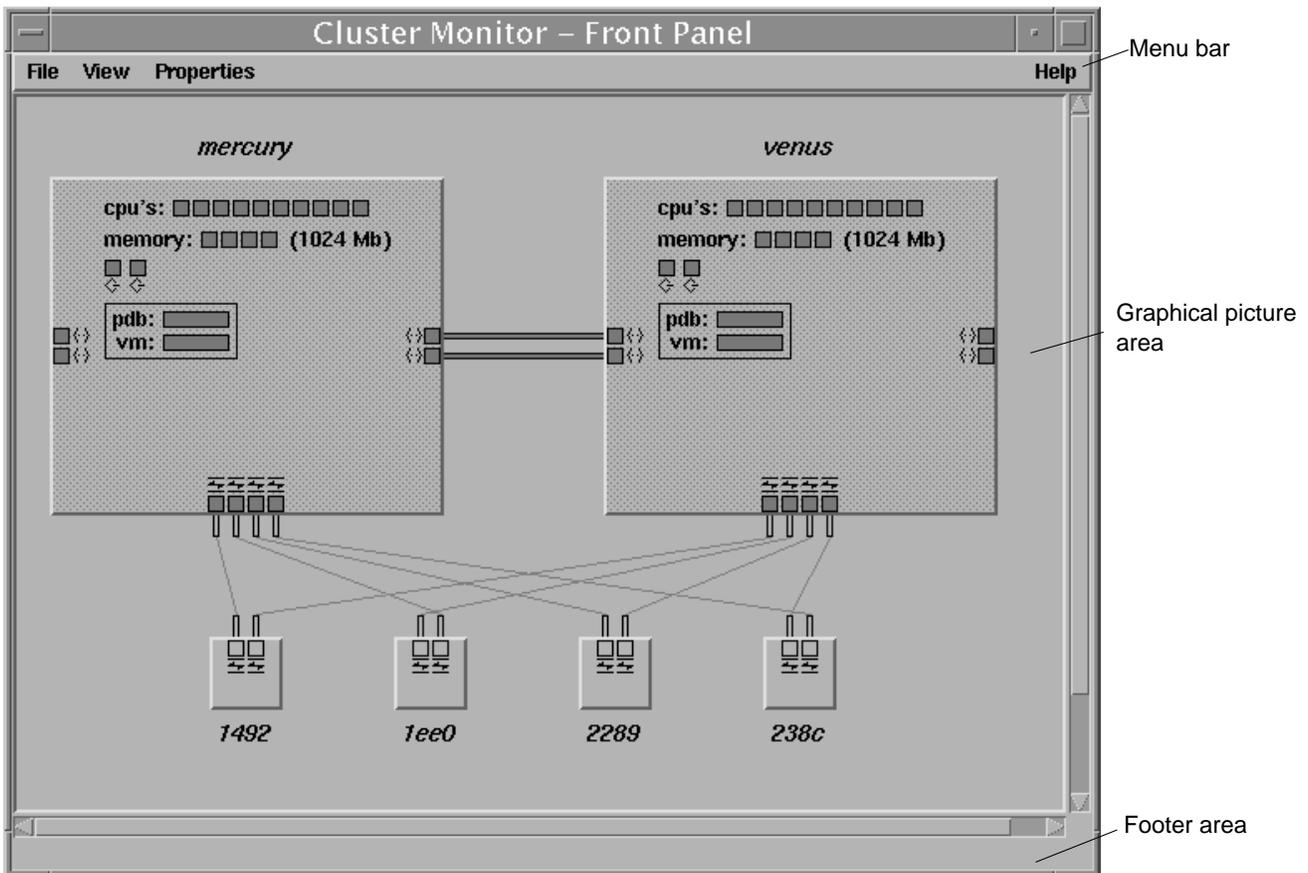
Figure 2-4   PDB Cluster Monitor-Front Panel
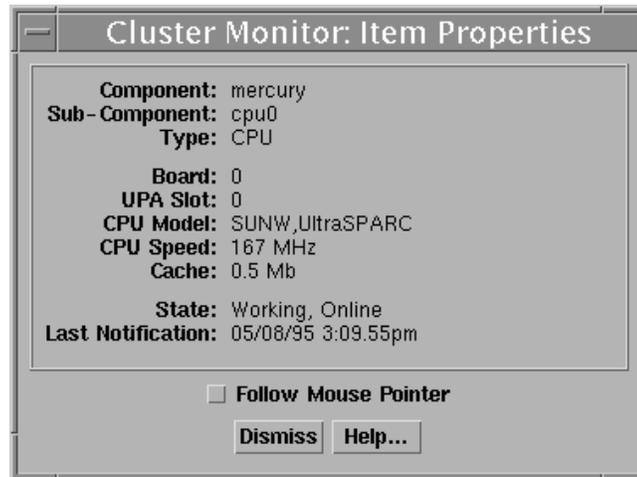
Figure 2-5   PDB Cluster Monitor Item Properties Window

2.7.1 PDB Fault Classes and Principal Assemblies

Ultra Enterprise 2 PDB Cluster troubleshooting is dependent on several different principal assemblies and classes of faults. The fault classes and their associated assemblies are:

- SPARCstorage MultiPack faults
  - Data disk drives
  - SCSI-2 cables and SunSwift SBus Adapters

- SPARCstorage Array faults
  - Data disks
  - Array controller
  - Fibre Channel Optical Modules (FC/OM)
  - Fibre Channel SBus cards (FC/S)
  - Fiber-optic cables and interfaces
  - Power supply

- Ultra Enterprise 2 Server faults
  - Power supply
  - Boot disk drive and SCSI cable
  - UltraSPARC CPU modules
  - DIMMs

- SBus cards
- SunSwift SBus Adapter cards
- System board
- Fibre Channel Optical Modules (FC/OM)
- Fibre Channel SBus cards (FC/S)
- SBus Quad Ethernet Controller card/interface (SQEC)
- Public Net SBus card
- SCI SBus Adapter card

- Cluster Faults
  - Terminal concentrator/serial connections
  - Private net connections

- Software faults
  - Application program died
  - System crash (panic)
  - Hung system (lock up)
  - Cluster wide failures

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

2.7.2 PDB Device Troubleshooting Cross-Reference

Table 2-5 cross references devices to the appropriate troubleshooting manual.

Table 2-5 PDB Device Troubleshooting Cross-Reference

Device/Trouble Area	Reference	Part Number
SPARCstorage MultiPack	SPARCstorage MultiPack Service Manual Chapter 2, "Diagnostics for Troubleshooting"	802-4430
SPARCstorage Array 　Controller 　Fiber-optic- 　　connector 　Fibre Channel 　　Optical Module	*SPARCstorage Array Model 100 Series Service Manual,* Chapter 2, "Troubleshooting" *SPARCstorage Array Model 200 Series Service Manual*	802-2206 802-2028
Terminal concentrator	Section 3.6, "Terminal Concentrator and Serial Connection Faults"	
Ultra Enterprise 2 Server	*Ultra 2 Series Service Manual,* Chapter 2. "SunVTS" and Chapter 3, "Troubleshooting Procedures"	802-2561
SBus Quad Ethernet Controller	*SBus Quad Ethernet Controller Manual,* Appendix C, "Running Diagnostics"	801-7123
SunSwift SBus Adapter card	*SunSwift SBus Adapter Installation User's Guide*	802-6021
SCI	*SCI SBus Adapter User's Guide*	802-7103

2.7.3 PDB Error Messages/Symptoms

Refer to the *Ultra Enterprise PDB Cluster Error Messages Manual.*

2.7.4 PDB Device Replacement Cross-Reference

Table 2-6 references devices to replacement procedures.

Table 2-6   PDB Device Replacement Cross-Reference

Device/Trouble Area	Reference	Part Number

Ultra 2 Server
  Power supply
  Boot disk
  System board
  SBus card
  DIMM
  CPU module
	Ultra 2 Series Service Manual, Chapter 8, "Major Subassemblies"
	"Chapter 9 "Storage Devices"
	"System Board and Component Replacement
		802-2561

SBus Quad Ethernet Controller	*SBus Quad Ethernet Controller Manual*	801-7123
SunSwift SBus Adapter card	*SunSwift SBus Adapter Installation and User's Guide*	802-6021
Optical Module	*Fibre Channel Optical Module Installation Guide*	801-6326
FC/S SBus card	*Fibre Channel SBus Adapter card Installation Guide*	801-6313

SPARCstorage Array
  Controller
  Disk drives
  Power supply
	SPARCstorage Array Model 100 Series Service Manual, Chapter 5. "Major Subassemblies" and the *Disk Drive Installation Manual for the SPARCstorage Array*	802-2206
		
		801-2207

SPARCstorage MultiPack disk drives	*SPARCstorage Multipack Service Manual,* Chapter 3, "Parts Replacement"	801-4430

☰ 2

Hardware Troubleshooting 3≡

Prior to servicing 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 *Solstice HA 1.3 User's Guide* or the *Ultra Enterprise Cluster PDB Administration Guide*). The procedures in this chapter indicate when the system administrator's assistance is needed.

Before you attempt a reconfiguration reboot after hardware component replacement, read Section 3.1, "Solaris Reconfiguration Reboot".

The following table lists the locations of the procedures. If you are viewing this in the AnswerBook online documentation viewing system, place your cursor on the desired procedure or location and double-click the SELECT button on your mouse to go directly to the task.

Solaris Reconfiguration Reboot	*page 3-2*
SPARCstorage Array and Optical Connections Faults	*page 3-3*
Multidisk Errors from Both Nodes on the Same SPARCstorage Array	*page 3-3*
Multiple Disk Errors or Disk Access Error For One Node Only	*page 3-4*
SPARCstorage Array Fails to Communicate	*page 3-5*
MultiPack and SCSI Connection Faults	*page 3-12*
Multidisk Errors from Both Nodes on the Same SPARCstorage MultiPack	*page 3-13*
Multiple Disk Errors or Disk Access Error For One Node Only	*page 3-14*
Node Failures	*page 3-14*
System Board and Boot Disk	*page 3-14*

☰ *3*

3.1   Solaris Reconfiguration Reboot

⚠ **Caution** – If the controller in the SPARCstorage Array is replaced, the system administrator must reprogram the original World Wide Name (WWN) in the new controller. If this isn't done correctly, the DiskSuite™ software will not recognize the new controller and the system administrator will not be able to return the node to the cluster. For WWN reprogramming procedures, refer to the *Solstice HA 1.3 User's Guide* or the *Ultra Enterprise Cluster PDB Administration Guide,* as applicable.

Note – It is not necessary to perform a reconfiguration reboot to add disks to an existing SPARCstorage Array or MultiPack. For this procedure, refer to the *Solstice HA 1.3 User's Guide* or the *Ultra Enterprise Cluster PDB Administration Guide,* as applicable. Avoid performing Solaris reconfiguration reboots when any hardware (especially a SPARCstorage Array, SPARCstorage MultiPack or other disks) is not operational (powered off or otherwise inoperable).

A reconfiguration reboot is performed using the OBP `boot -r` command or by creating the file `/reconfigure` on the server and then rebooting. The reconfiguration reboot will change the device special files in `/devices` and `symlinks` in `/dev/dsk` and `/dev/rdsk` associated with the disk devices. A reconfiguration reboot may not restore the original controller/minor unit numbering if the hardware configuration has changed; for example if a FC/S card has been relocated or the WWN of a disk array controller is incorrect, thus causing Solstice DiskSuite to reject the disks. Once the original numbering is restored, Solstice DiskSuite will be able to access the associated metadevices.

3.2 SPARCstorage Array and Optical Connections Faults

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

3.2.1 Multidisk Errors from Both Nodes on the Same SPARCstorage Array
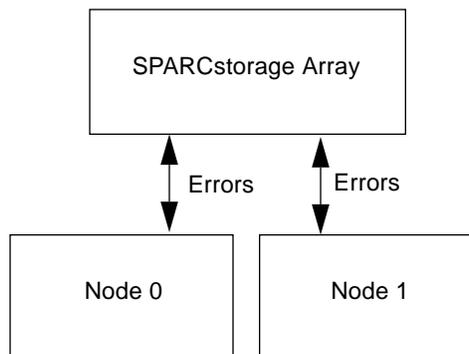
Figure 3-1   Errors on Both Nodes on Same SPARCstorage Array

To isolate the probable failure to a SPARCstorage Array controller board:

1. **Check the AC and DC lights on the disk array power supply.**
   Refer to the *SPARCstorage Array Model 100 Series Service Manual*. If the light display is normal, proceed to step 2. Otherwise, check the AC power or the power supply.

2. **Have the system administrator prepare the cluster for replacement of a controller in a SPARCstorage Array.**

3. **Shut down the SPARCstorage Array as described in Section 7.3.1, "Complete Disk Array Shutdown."**

4. **Replace the controller board as described in the *SPARCstorage Array Model 100 Series Service Manual.***

5. **Bring up the array tray as described in Section 7.3.4, "Single Drive and Tray Startup"**

6. **Have the system administrator return the node to the cluster.**

3.2.2 Multiple Disk Errors or Disk Access Error For One Node Only
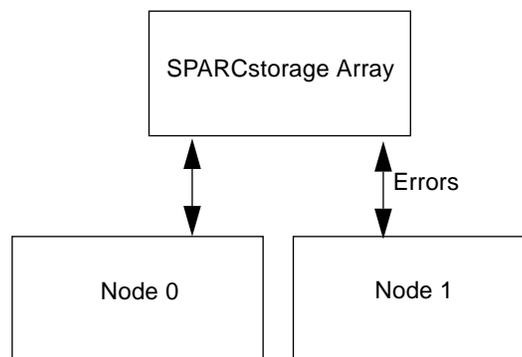
Figure 3-2   Multiple Disk Errors on One Node

Note – You can remove and replace a disk drive without powering off the disk array. You only need to pull out the tray in which the drive is located.

To isolate a failed 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:

1. **Have the system administrator prepare the node for disk replacement.**

2. **Replace the defective disk drive as described in the *SPARCstorage Array Model 100 Series Service Manual.***

3. **Have the system administrator return the node to the cluster.**

4. **If disk drive errors still exist after the drive is replaced, proceed to the next section to isolate the problem.**

3.2.3 SPARCstorage Array Fails to Communicate

If a SPARCstorage Array is not communicating with a node, do a physical inspection with the following steps:

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 power supply AC power switch.**

4. **Ensure that the fiber-optic cable is connected properly at both ends.**

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

*   Fiber-optic cable connecting the node to the SPARCstorage Array
*   FC/S card or FC/OM module in the node
*   FC/OM module in the SPARCstorage Array
*   Array controller in the SPARCstorage Array

To determine if one of the preceding components has failed:

1. **Ask the system administrator to prepare the node for troubleshooting, which requires shutting down the SPARCstorage Array.**

2. **Shut down the SPARCstorage Array as described in Section 7.3.1, "Complete Disk Array Shutdown."**

3. **Set the DIAG switch on the rear of the SPARCstorage Array 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 there is a specific POST code for the SPARCstorage Array 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 SPARCstorage Array POST codes

Alphanumeric display
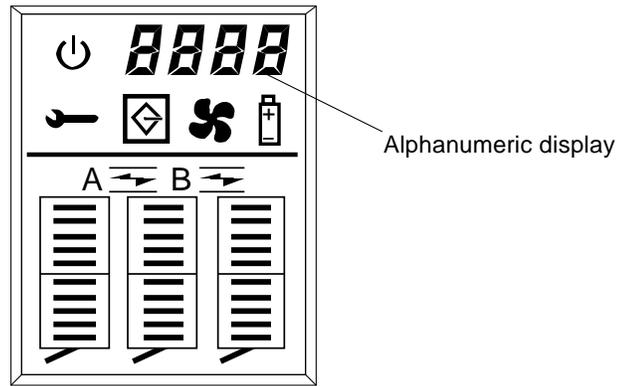
Figure 3-3   LCD Display on SPARCstorage Array

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 POST code displayed, set the DIAG switch back to DIAG, then go to step 6.
- If you see a SPARCstorage Array POST code displayed, set the DIAG switch back to DIAG, then replace the indicated component as described in Chapter 5, Major Subassemblies in the *SPARCstorage Array Model 100 Series Service Manual.* Notify the system administrator that the node is ready to be returned to the cluster following component replacement.

Caution – If you replace the array controller, the system administrator must reprogram the new controller with the original World Wide Name (WWN). If this number is incorrect, the Solstice DiskSuite software will not recognize the new controller and the disk array cannot be rejoined to the cluster. For WWN reprogramming procedures, refer to the *Solstice HA 1.3 User's Guide* or the Ultra Enterprise *PDB Cluster Administration Guide,* as applicable.

---

6. Log on as superuser and shut down 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. Immediately press Control-] to get the telnet prompt, and then enter the following:

```
telnet> send break
```

After the ok prompt is displayed, enter the following:

```
ok show-devs
```

SBus slot 2 of the system board has an SQEC and SBus slots 0, 1 and 3 have an FC/S. You should see output similar to the following output:

```
/sbus@1f,0/SUNW,soc@1,0
/sbus@1f,0/SUNW,soc@0,0
```

9. **Locate the lines in the output that list the 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 the SBus slot in which the FC/S card is installed. For example, looking at the preceding output, the first line

```
/sbus@f,/SUNW,soc@1,0
```

tells you that an FC/S card is installed in SBus slot 1.

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

11. **Determine what the SBus slot number is for that FC/S card.**
For more information on SBus slot numbers for your system, refer to the *Ultra 2 Series Service Manual.*

   - If you can find an entry in the `show-devs` output for the FC/S card installed in that SBus slot, go to Step 12.
   - If you *cannot* find an entry in the `show-devs` 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 *Ultra 2 Series Service Manual.* Following replacement of the FC/S card, have the system administrator return the node to the cluster.

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. The path must be preceded by a double open quote (`"`) and a space. Thus, using the previous output as an example, you would enter:

```
ok " /sbus@f,/SUNW,soc@1,0" select-dev
```

---

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

```
ok soc-post
```

- If you see the message *passed*, go to Step 14. For example:

```
ok soc-post
SOC POST Test -- Passed
```

- If you see the message *failed*, replace the FC/S card in that SBus slot according to the instructions in the processor service manual that came with your system. Following replacement of the FC/S card, have the system administrator return the node to the cluster.

14. Disconnect the fiber-optic cable from the FC/OM on the node.

15. Install the loopback connector (part number 130-2837-01) from the ship kit 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" silk screened on the outside of the FC/S card. Do only steps18a and 18b in loopback mode.

Note – Due to a silk screening error, the "A" and "B" on the outside of the FC∕S card are reversed, so the command to test slot A will actually test the FC∕OM in the slot labeled B and vice versa.

18. *Only* **test the slots that contain an FC/OM:**

    a. **If slot A has an FC/OM, enter the following at the** ok **prompt:**

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

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

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

    • If you see the message *passed*, go to Step 20.
    • If you see the message *failed*, 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, have the system administrator return the node to the cluster.

Note – The SPARCstorage Array diagnostics can only check the FC∕OMs on the node. Therefore, in the following steps you switch the FC∕OMs from the SPARCstorage Array with the FC∕OMs from the FC∕S card on the node.

19. **Repeat steps 8 through 18 for each FC/OM module. Steps 13, 14, and 16 can be skipped.**

20. **Remove the loopback connector from the FC/OM on the node.**

21. **Power down the node and disk array.**

22. **Remove the FC/OM(s) from the FC/S card in the node.**
    For the necessary instructions, refer to the *Ultra 2 Serie*s *Service Manual.*

23. **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, Major Subassemblies in the *SPARCstorage Array Model 100 Series Service Manual,* for those instructions.

24. **Swap the FC/OM(s) from the SPARCstorage Array and the FC/S card in the node.**

25. **Power up the disk array and node.**

26. **Install the loopback connector on the FC/OM on the node.**

27. **Test *only* the slots that contain an FC/OM.**

Caution – Do not run the loopback tests on a FC/OM that is not looped back. This action may cause disk errors or unpredictable results.

---

    a. **If slot A has an FC/OM, enter the following at the** ok **prompt:**

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

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

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

- If you see the message *passed*, go to Step 28.
- If you see the message *failed*, replace the FC/OM from the appropriate slot on the FC/S card. Following replacement of the FC/OM, have the system administrator return the node to the cluster.

28. **Replace the fiber-optic cable.**
    Refer to Chapter 5, "Major Subassemblies" in the *SPARCstorage Array Model 100 Series Service Manual*, for cable replacement instructions.

29. **Replace the cable and bring up the applicable disk array.**
    See Section 7.3.2, "Complete Disk Array Startup".

30. **At the** `ok` **prompt, enter the following commands:**

```
ok false to diag-switch?
ok false to fcode-debug?
ok Ctrl ]
telnet > send break

ok reset
```

31. **Have the system administrator return the node to the cluster.**

32. **If the node still does not communicate with the SPARCstorage Array, have the system administrator prepare the node for replacement of a controller in a SPARCstorage Array.**

33. **Take down the SPARCstorage Array.**
    See Section 7.3.1, "Complete Disk Array Shutdown".

Caution – If you replace the array controller, the system administrator must reprogram the new controller with the original World Wide Name (WWN). If this number is incorrect, the Solstice DiskSuite software will not recognize the new controller and the disk array cannot be rejoined to the cluster. For WWN reprogramming procedures, refer to the *Solstice HA 1.3 User's Guide* or the *PDB Cluster Administration Guide,* as applicable.

---

34. **Replace the array controller.**

35. **Bring up the applicable disk array.**
    See Section 7.3.2, "Complete Disk Array Startup".

36. **Have the system administrator return the node to the cluster.**

3.3 *MultiPack and SCSI Connection Faults*

The Cluster Monitor messages indicate when a node has a failed MultiPack. Isolate the fault using the procedures in the following sections. In addition, refer to the *SPARCstorage MultiPack Service Manual* and the *Solstice HA 1.3 User's Guide* or *Ultra Enterprise Cluster PDB Administration Guide.*

> **Note** – Do not use the `probe-scsi` command as this can cause the system to hang at the boot-prom monitor.

3.3.1 *Multidisk Errors from Both Nodes on the Same SPARCstorage MultiPack*
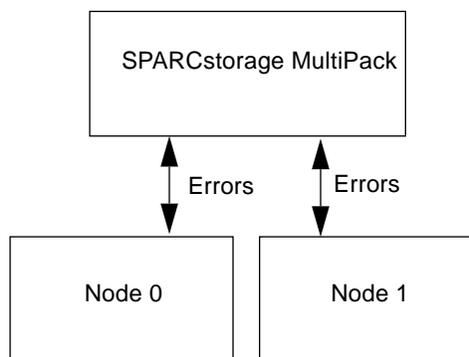
Figure 3-4   Errors on Both Nodes on Same SPARCstorage MultiPack

To isolate the probable failure to a SPARCstorage MultiPack:

1. **Check the power-on LED on the MultiPack.**
   Refer to the *SPARCstorage MultiPack Service Manual.* If the LED display is normal, proceed to step 2. Otherwise, check the AC power or the power supply.

2. **Check that the front panel LEDs are lit.**
   Check that the light LEDs match the corresponding installed drive in the MultiPack.

3. **Check the SCSI ID switch.**
   If the MultiPack has six drives installed, check that the ID switch is fully in either the 1-6 SCSI target address position or the 9-14 SCSI target address position. Refer to Appendix B, SCSI Bus Information in the *SPARCstorage MultiPack Service Manual.*

4. **Check the SCSI cables to the MultiPack.**
   Check that both ends of the SCSI cables are connected.

3.3.2 Multiple Disk Errors or Disk Access Error For One Node Only

```
        ┌────────────────────────────┐
        │   SPARCstorage MultiPack   │
        │                            │
        └──────┬──────────────┬──────┘
               ↕              ↕  Errors
        ┌────────────┐  ┌────────────┐
        │            │  │            │
        │   Node 0   │  │   Node 1   │
        │            │  │            │
        └────────────┘  └────────────┘
```
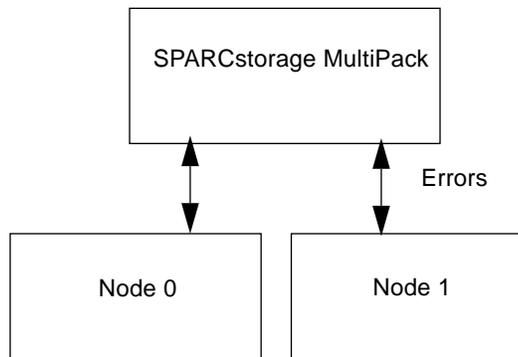
Figure 3-5   Multiple Disk Errors on One Node Only

To replace a SCSI controller on the node:

1. **Have the system administrator prepare the node for SCSI controller replacement.**
   See Section 7.1.2, "Server Shutdown with SPARCstorage MultiPacks and a Spare Ultra Enterprise 2 Server".

2. **Replace the defective SCSI controller.**
   Refer to the *Ultra 2 Series Service Manual.*

3. **Have the system administrator return the node to the cluster.**
   See Section 7.1.3, "Server Startup".

3.4 Node Failures

3.4.1 System Board and Boot Disk

For system board or boot disk failures, messages on the system console or Cluster Monitor identify the malfunctioning node.

You can further isolate this class of faults, by referring to the troubleshooting procedures in the *Ultra 2 Series Service Manual.*

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

1. **Have the system administrator prepare the node for replacement of a processor part.**

2. **After the node has been removed from the cluster, you can shut down the server to replace a defective boot disk, system board, UltraSPARC processor module, SBus card, SIMM, and so forth.**
   Use the server shutdown procedure to avoid interrupting other cluster components. See Section 7.1.1, "Server Shutdown with SPARCstorage Arrays."

3. **Replace the defective device as indicated in the** *Ultra 2 Series Service Manual.*

4. **Bring up the applicable server,**
   See Section 7.1.3, "Server Startup".

5. **Have the system administrator return the node to the cluster.**

3.4.2 Using the `probe-scsi` *Command*

Use this command to verify operation of a new or replaced SCSI-2 device.

Note – Do not use the `probe-scsi` command in a PDB system as this can cause the system to hang at the boot-prom monitor.

---

1. **Have the system administrator remove the node from the cluster and halt it.**
   After the system halts, several system messages are displayed. When the messages finish, the `ok` prompt is displayed.

```
ok probe-scsi-all
This command may hang the system if a Stop-A or halt command
has been executed.  Please type reset-all to reset the system
before executing this command.
Do you wish to continue? (y/n) y
/sbus@1f,0/SUNW,fas@2,8800000
Target 2
  Unit 0   Disk     SEAGATE ST32550W SUN2.1G041600000000
                    Copyright (c) 1995 Seagate
                    All rights reserved ASA2
Target 3
  Unit 0   Disk     SEAGATE ST32550W SUN2.1G041600000000
                    Copyright (c) 1995 Seagate
                    All rights reserved ASA2
Target 4
  Unit 0   Disk     SEAGATE ST32550W SUN2.1G041600000000
                    Copyright (c) 1995 Seagate
                    All rights reserved ASA2

Target 5
  Unit 0   Disk     SEAGATE ST32550W SUN2.1G041600000000
                    Copyright (c) 1995 Seagate
                    All rights reserved ASA2
Target 8
  Unit 0   Disk     SEAGATE ST32550W SUN2.1G041600000000
                    Copyright (c) 1995 Seagate
                    All rights reserved ASA2
Target 9
  Unit 0   Disk     SEAGATE ST32550W SUN2.1G041600000000
                    Copyright (c) 1995 Seagate
                    All rights reserved ASA2
/sbus@1f,0/SUNW,fas@0,8800000
Target 2
  Unit 0   Disk     SEAGATE ST32550W SUN2.1G041600000000
                    Copyright (c) 1995 Seagate
                    All rights reserved ASA2
Target 3
  Unit 0   Disk     SEAGATE ST32550W SUN2.1G041600000000
                    Copyright (c) 1995 Seagate
                    All rights reserved ASA2
.
.
```

2. **At the** `ok` **prompt, enter the appropriate command to probe the system for SCSI-2 devices.**
   To probe all SCSI-2 devices installed in the system, type:

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

   The preceding command displays a list of drives. The example shown below is for a Ultra Enterprise 2 Cluster.

3. **Verify that the drive in question is listed.**
   The `Target #` lines identify the SCSI-2 addresses of installed devices. If the address is listed for the device in question, installation was successful. If the address is absent, run the appropriate diagnostics to identify the problem.

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

```
ok reset
```

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

5. **Have the system administrator return the node to the cluster.**

3.5   Network Failures

3.5.1 Private Network Failure

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

In an HA cluster, System console messages or unlit green LEDs on the SQEC cards indicate that one of the private networks has failed. For example, the output of the `hastat` command will indicate if there are problems with the private networks. Also, the Message Log (at the bottom of the `hastat` display

output) or the `/var/adm/messages` file should be checked for private network related error messages. The use of the `hastat` command and the `/var/adm/messages` file is described in the *Solstice HA 1.3 User's Guide.*

For supplemental troubleshooting procedures, refer to the *SBus Quad Ethernet Controller Manual* and the *SunSwift SBus Adapter Installation and User's Guide.* Also, see the following section.

One or Both Nodes Up and Running in a Cluster

In the following example (Figure 3-6) both nodes are up and running in a cluster, private net 1 has failed, and the software continues to use private net 2.

Caution – Do not replace a cable without first running `netstat` and saving the output.

To confirm the designations for the private network ports on a node:

♦ **Use the** `netstat -i` **command on each node to determine which private links are available.**
   For example, for node 0 with private nets on `hme0` and `qe0`.

```
# netstat -i
Name  Mtu   Net/Dest        Address        Ipkts    Ierrs Opkts   Oerrs Collis Queue
lo0   8232  loopback        localhost      1042674  0     1042674 0     0      0
hme0   1500 204.152.64.0    ha-lewis-priv1 564258   0     563153  719   59     0
qe0    1500 204.152.65.0    ha-lewis-priv2 248295   0     247619  1     0      0
qe1    1500 mpk17-network-75 ha-lewis      3723131  0     1345255 0     22784  0
qe1:1 1500 mpk17-network-75 relo-lewis     0        0     0       0     0      0
qe1:2 1500 mpk17-network-75 relo-martin    0        0     0       0     0      0
#
```
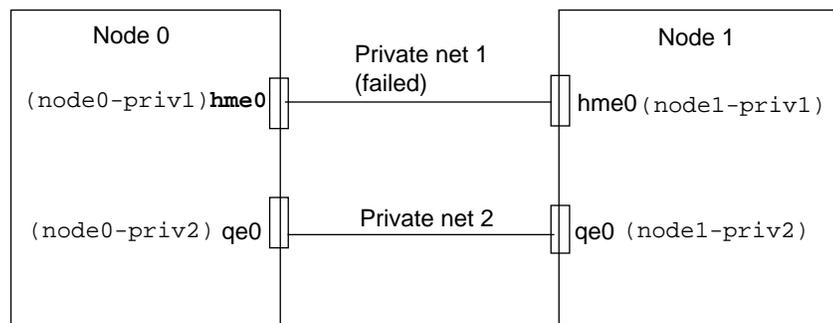
Figure 3-6   Private Net 1 Failure

To troubleshoot private net 1 to a defective card or cable in an HA cluster:

1. **Have the system administrator prepare a node for removal from the cluster.**

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

   For this example, assume that the software recovers on private net 2 (Figure 3-7).

2. **Remove the private net 2 cable (cable between the qe0 ports of both nodes).**

3. **Connect the private net 1 cable (cable for failed net) between the hme0 port of node 0 and the qe0 port of node 1.**

Node 0

hme0   Private net 1   hme0

Node 1

qe0   Private net 2   qe0 (snoop)
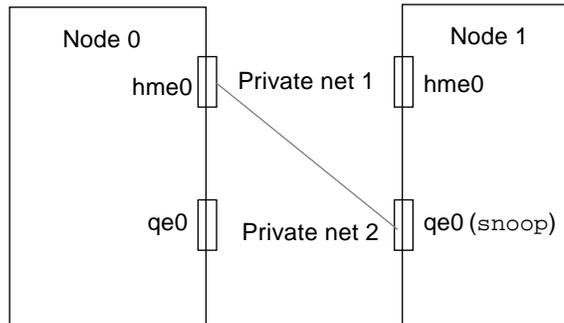
Figure 3-7   Private Net 1 Troubleshooting, Part 1

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

```
node1# snoop -d qe0
```

If the following string is returned by snoop, most likely the onboard le0 port on node 1 is defective. This message string indicates that the le0 port of node 0 and the cable for private net 1 cable are functional.

• In this instance, request that the system administrator remove node 1 prior to replacing the related SBus card. Once the card is replaced, indicate to the system administrator that node 1 is ready to be returned to the cluster.

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

Node 0

hme0   Private net 1   hme0

Node 1

qe0   Private net 2   qe0 (`snoop`)
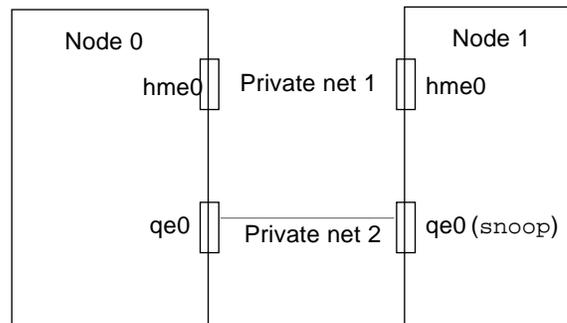
Figure 3-8   Private Net 1 Troubleshooting, Part 2

- If the string indicated in step 5 is not returned by the `snoop` command, then connect the private net 1 cable between the qe0 ports of both nodes.

5. **Following this, continue using the** `snoop` **command on node 1 (**`snoop` **will be run as initiated in step 5 until interrupted by a** `CTRL C`**).**

   - If the message string indicated in step 5 is repeated, then the le0 port on node 0 is most likely defective, as this message indicates that the private net 1 cable is functional.Replace the system board in node 0, and have the system administrator return node 0 to the cluster.

   - If the message string indicated in step 5 is *not* returned, then the private net 1 cable is probably defective.

Note – In an HA cluster check the green LEDs (labeled 0, 1, 2, and 3) on the SQEC cards in both nodes to verify that private net 2 has not failed. The 0 LED on both SQEC cards (private net 2) should be lighted.

3.5.2 Public Network 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 public network interface.

3.6 Terminal Concentrator and Serial Connection Faults

> **Note** – It is not necessary to stop or remove either node from a cluster to replace the terminal concentrator.

Isolate terminal concentrator faults using the diagrams depicted in Section 3.6.4, "Terminal Concentrator Flow Diagrams," as well as the information contained in Section 3.6.5, "Additional Troubleshooting Tips."
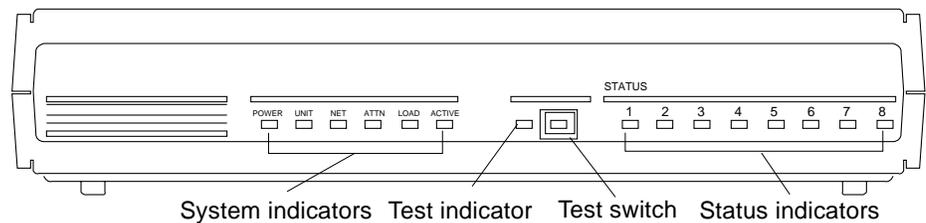
Figure 3-9   Terminal Concentrator Indicator Locations

3.6.1 System Indicators

Figure 3-9 shows 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.

3.6.2 Serial Connections

Isolate serial connections between the terminal concentrator and each node by using the troubleshooting flow diagrams in Section 2.5, "Troubleshooting Flow in an HA Cluster."

3.6.3 Intermittent Router Problems

If you experience either of the following conditions:

• Terminal concentrator connections made via routers exhibit intermittent problems, while connections from hosts on the same network as the terminal concentrator continue to work normally.

• The terminal concentrator shows no signs of rebooting.

Establish a default route within the terminal concentrator and disable the routed feature. You must disable the routed feature to prevent the default route from being lost. To disable the routed feature:

1. `Telnet` **to the terminal concentrator and log on as superuser:**

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

Rotaries Defined:
     cli

Enter Annex port name or number: cli

Annex Command Line Interpreter   *   Copyright 1991 Xylogics, Inc.

annex: su
Password:
annex#
```

2. At the terminal concentrator prompt, enter:

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

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

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

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

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

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

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

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

4. Boot the terminal concentrator:

```
annex# boot
```

3.6.4 Terminal Concentrator Flow Diagrams

```
┌─────────────────────────────────────────────────────┐
│ Telnet to the terminal concentrator does not succeed.│      ⟶  ( A )
│ This branch focuses on the ability of the terminal   │
│ concentrator to talk on the net successfully.        │
└─────────────────────────────────────────────────────┘

┌─────────────────────────────────────────────────────┐
│ Telnet for one node only does not respond.           │      ⟶  ( B )
│ This branch focuses on the failure of a terminal     │
│ concentrator serial port.                            │
└─────────────────────────────────────────────────────┘
```

Figure 3-10 Terminal Concentrator Troubleshooting Flow Diagram
Overview

A — Telnet to terminal concentrator does not succeed.

Disconnect all serial cables from the rear of the terminal concentrator.

Power cycle the terminal concentrator (TC). Watch the LEDs on the front panel during normal boot to see whether the operating system software loads successfully. All indicators should light briefly. If software is loaded, the Load light turns off, and the Active light blinks once and then goes out.

Does software load?

Yes

Does TC respond to ping?

No — **A.1**

No

Check power connection to terminal concentrator.

If software still cannot load, replace the terminal concentrator. Re-install software and reconfigure the net addresses. Use the CLI-version of the terminal concentrator command, stats. Refer to the *Terminal Concentrator Installation Notes and General Reference Guide*.

Yes

Re-install serial cables

B

A

Figure 3-11 Branch A: Telnet to Terminal Concentrator Does Not Succeed

A.1 → The terminal concentrator loads software but does not respond to the `ping` command.
Verify that the Ethernet interface cable on the terminal concentrator is seated in its connector.

If it is seated, verify that the software is loaded. Connect a serial cable between the administration workstation serial port A and port 1 of the terminal concentrator. Type `tip a` in a shell tool window. The terminal concentrator prompt `monitor::` should be displayed.

Prompt displayed?

Yes → Use CLI-command, `stats`, to verify correct IP address. If correct, and TC is still not responding, replace TC.

If `ping` doesn't work after terminal concentrator has been replaced, troubleshoot the external network.

No → If address is correct, but the terminal concentrator still does not answer when pinged, replace the terminal concentrator and follow installation procedures. Use the CLI-version of the terminal concentrator command, `stats`. Refer to the *Terminal Concentrator Installation Notes and General Reference Guide*.

A

Figure 3-12 Branch A1: Terminal Concentrator Does Not Respond
to `ping` Command

The terminal concentrator does not connect to a cluster node. First, check the serial cable connection between the cluster node and the terminal concentrator.

B

Connection good? — No → Correct problem and verify proper operation.

Yes

Check if the port is being used. Connect a serial cable from the administration workstation to port 1 of the terminal concentrator. Type `tip a` in a shell tool window. Type `who` at the `monitor::` prompt. You should see a list of current users on each port. Check to see whether another process is running on the port in question.

Is another process running on the port? — Yes → Some other workstation is connected to the port. Contact the workstation owner to free up the port.

No

B.1

Figure 3-13   Branch B: Terminal Concentrator Cannot Connect
                to a Node

B.1 → Switch the serial cable at the cluster node end with the serial cable from the cluster node that is alive. `Telnet` to the node that was alive. Is there a response from the previously alive node?

No

Yes

The problem is in the cluster node. Repair the node. Return the serial cables to their original positions.

The problem is the serial cable or the terminal concentrator. Switch the same serial cables at the terminal concentrator end. `Telnet` to the node that was alive. Is there a response?

Yes

No

Replace the serial cable.

Replace the terminal concentrator.

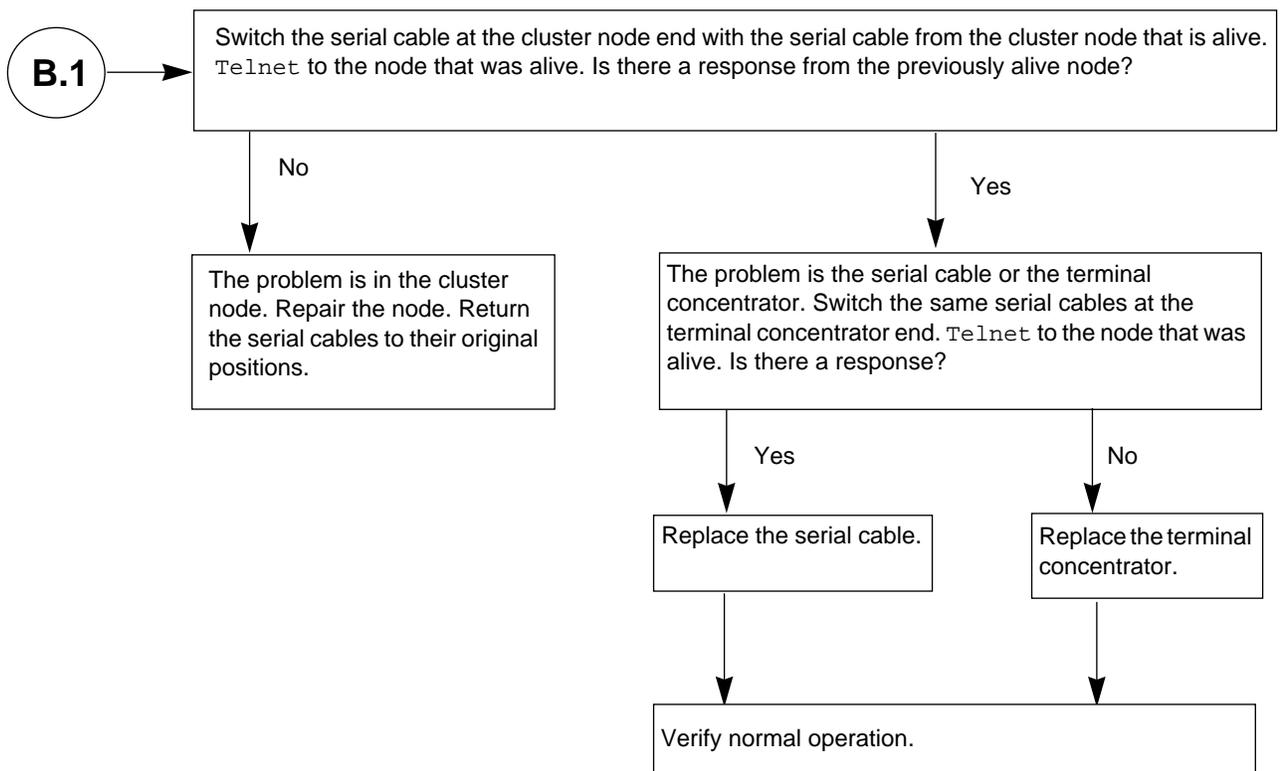Verify normal operation.

Figure 3-14   Branch B.1: Single Node Not Responding

3.6.5 Additional Troubleshooting Tips

3.6.5.1 Terminal Concentrator Indicators

After POST has passed, the eight status indicators on the terminal concentrator (Figure 3-9) indicate activity on the serial ports. Messages from the node should cause the appropriate port LEDs (2 and 3) to blink. Text entered into the administration workstation should also cause the LEDs to blink. This can be useful when trying to determine whether the terminal concentrator, node, or cable is bad.

3.6.5.2 Terminal Concentrator System Information

The ROM monitor command, `config`, enables you to verify the hardware and software revisions of the terminal concentrator.

1. Press the reset button, and after 5 seconds, press the test button.
The `config` command must be issued from a terminal connected to port 1 of the terminal concentrator.

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

```
monitor:: config

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
```

3.6.6 Resetting the Terminal Concentrator Configuration Parameters

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

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

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

Before starting, you will need the following:

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

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

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

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

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

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

```
# tip a
connected
```

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

---

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

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

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

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

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

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

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

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

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

monitor::
```

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

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

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

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

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

monitor::
```

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

```
monitor:: seq

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

    Ethernet: net

    SELF:  self


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

monitor::
```

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

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

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

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

12. Set the following port parameters.

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

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

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

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

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

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

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

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

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

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

Software Troubleshooting *4*

Much of the fault management is performed by the Solstice HA or the PDB cluster software. While the underlying hardware architecture ensures that there is no single point of hardware failure and there are redundant paths to all components, the software detects, isolates, and recovers from failures.

4.1 Troubleshooting Solstice HA 1.3 Software

Most software problems are manifested as messages on the system console which displays messages from the following sources:

- Solaris operating environment
- Solstice HA cluster software
- SPARCstorage Array firmware and device driver
- NFS (Sun's distributed computing file system) and other data services
- Solstice DiskSuite

4.2 Troubleshooting PDB Software

Most software problems are manifested as messages on the Cluster Monitor, which displays messages from the following sources:

- Solaris operating environment
- PDB cluster software
- SPARCstorage MultiPack device driver
- SPARCstorage Array firmware and device driver
- Cluster Volume Manager

- VxVm

4.3 Software Faults

4.3.1 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. The following message is a sample message:

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

4.3.2 Solstice HA 1.3

For a listing of error messages related to the Solstice HA software, refer to Appendix A of the *Solstice HA 1.3 User's Guide.*

4.3.3 PDB Failures

For an explanation of the error messages related to the PDB software, refer to Chapter 4 of the *Ultra Enterprise Cluster PDB Administration Guide* and the *Ultra Enterprise Cluster PDB Error Messages Manual.*

4.3.4 SPARCstorage Array Failures

For a listing of error messages specific to SPARCstorage Array firmware and device drivers, see Appendix B, "Firmware and Device Driver Error Messages" and the *Ultra Enterprise PDB Error Messages Manual.*

4.3.5 SPARCstorage MultiPack Failures

Error messages are displayed on the system console.

4.3.6 NFS or Other Data Service 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.* For information on other data services, refer to the applicable administration guide.

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Diagnostics 5≡

5.1 Failure Diagnosis and Confirmation of Component Repair Using SunVTS

Before the PDB software is installed, use the SunVTS™ diagnostic for initial hardware configuration confirmation and component diagnosis during server hardware installation.

SunVTS is packaged with the Solaris operating system. For instructions on installing and using SunVTS, refer to the *SunVTS 2.0 User's Guide.*

5.2 Verify HA 1.3 Configuration Using the `hacheck(1m)` *Command*

The Solstice HA 1.3 `hacheck` command verifies system configurations. For more information regarding this command, refer to the Solstice HA 1.3 User's *Guide;* for information concerning the error messages associated with the `hacheck` command, refer to Appendix A of the same manual.

5.3 Verify PDB Configuration

Use the Cluster Monitor-Front Panel for a graphic representation of the cluster (see Figure 2-4 on page 2-15). Use the `pdbconf` script to verify the cluster, the private network interface, and the quorum device.

For additional information, refer to the *Ultra Enterprise Cluster PDB Software Planning and Installation Guide*

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Safety and Tools Requirements 6≡

6.1 Safety Precautions

For your protection, observe the following safety precautions while repairing 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.

- 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.

To protect both yourself and the equipment, observe the precautions in Table 6-1.

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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 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	A risk of personal injury, data loss, or equipment damage exists. 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.
	PROTECTIVE EARTH	Protective earth conductor.

**FUSE REPLACEMENT
MARKING**

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

6.3 System Precautions

Prior to servicing this equipment, ensure that you are familiar with the following precautions.

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

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

Only use properly grounded power outlets as described in the *Ultra Enterprise 2 Cluster Hardware Planning and Installation Guide.*

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

Caution – Power off the equipment as directed in Chapter 7, "Shutdown and Restart Procedures," before performing any of the procedures described in this book.

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

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

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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 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 tools and test equipment required to service the server:

- Screwdriver, Phillips #1
- Screwdriver, Phillips #2
- Screwdriver, slotted, 3/16 inch
- Sun ESD mat
- Grounding wrist strap
- Needlenose pliers
- Digital multimeter (DMM)
- SPARCstorage Array loopback connector (part number 130-2837-01)

Shutdown and Restart Procedures 7≡

Performing shutdown and startup tasks are necessary for subassembly removal and replacement procedures. These procedures are specifically structured for a high availability or parallel database 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 necessary software tasks prior to maintenance of various system components. Thus, the database services are maintained.

The following table lists the locations of the procedures. If you are viewing this using the AnswerBook on-line documentation viewing system, place your cursor on the desired procedure or location and double-click the SELECT button on your mouse to go directly to the task.

Ultra Enterprise 2 Server	*page 7-2*
Server Shutdown with SPARCstorage Arrays	*page 7-2*
Server Shutdown with SPARCstorage MultiPacks and a Spare Ultra Enterprise 2 Server	*page 7-3*
Server Startup	*page 7-6*
Component Replacement without a Spare Ultra Enterprise 2 Server	*page 7-7*
To avoid damaging internal circuits, do not connect or disconnect any cable while power is applied to the system except the private network cables.	*page 7-7*
Server Startup	*page 7-10*
SPARCstorage Array	*page 7-10*

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7.1 Ultra Enterprise 2 Server

7.1.1 Server Shutdown with SPARCstorage Arrays

1. **Have the system administrator remove the node from the cluster.**

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

2. **Halt the system using the appropriate commands.**

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

4. **Turn off the AC power switch on the back of the server, (Figure 7-1).**
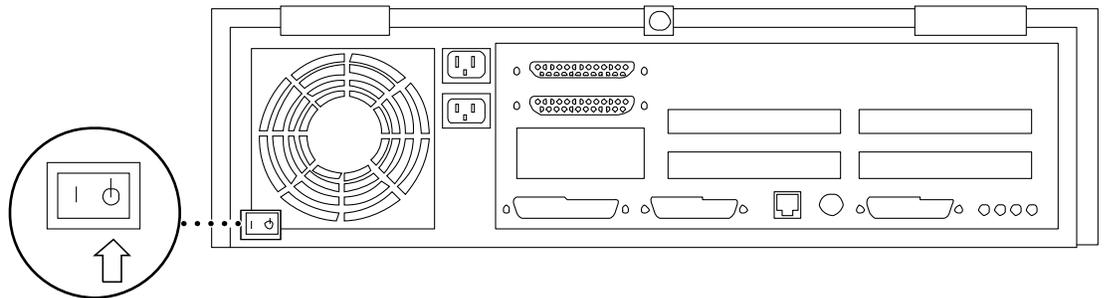
Figure 7-1   Server AC Power Switch

7.1.2 Server Shutdown with SPARCstorage MultiPacks and a Spare Ultra Enterprise 2 Server

For the procedure to remove the root disk from the node to be removed and to install the disk into the new node, refer to the *Ultra Enterprise Cluster PDB Administration Guide or the Solstice HA 1.3 User's Guide.*

1. Have the system administrator remove the node from the cluster. The server can then be shut down as indicated in the following procedure.

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

2. Halt the system using the appropriate HA or PDB commands.

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

4. Turn off the AC power switch on the back of the server (Figure 7-1).

5. Disconnect the private net cables (Figure 7-2).

6. Use the running node to detach one of the MultiPacks.
Use the vxdiskadm command of the CVM or VxVm to detach the MultiPack (Figure 7-2).

.
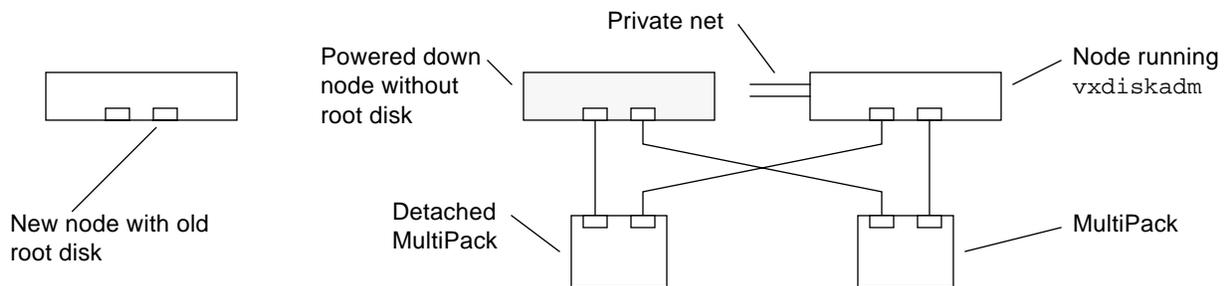
Figure 7-2 First MultiPack Detached

7. Power off the detached storage device (Figure 7-14).

**8. Physically disconnect the SCSI cable that goes from the detached
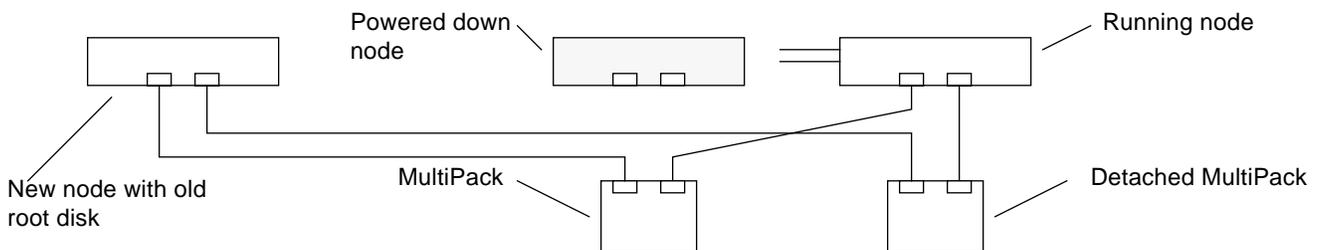MultiPack to the powered down node at the powered down node
(Figure 7-3).**
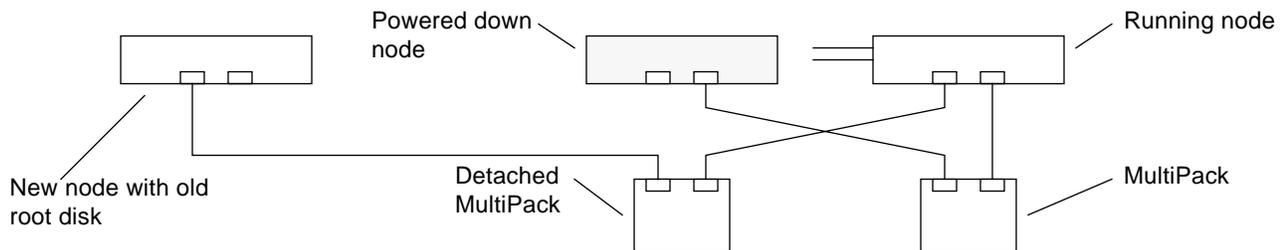
Figure 7-3   First SCSI Cable Attached to the New Node

**9. Connect the SCSI cable from the detached MultiPack to the new node
(Figure 7-3).**

10. Power up the detached MultiPack.

11. Use the running node to attach the MultiPack.
Use the vxdiskadm command of the CVM or VxVm to attach the MultiPack
(Figure 7-4).
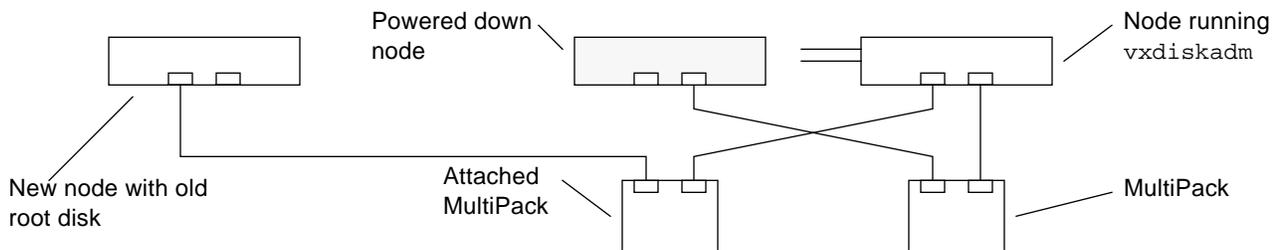
Figure 7-4   First MultiPack Attached

12. Use the running node to detach the next MultiPack (Figure 7-5).
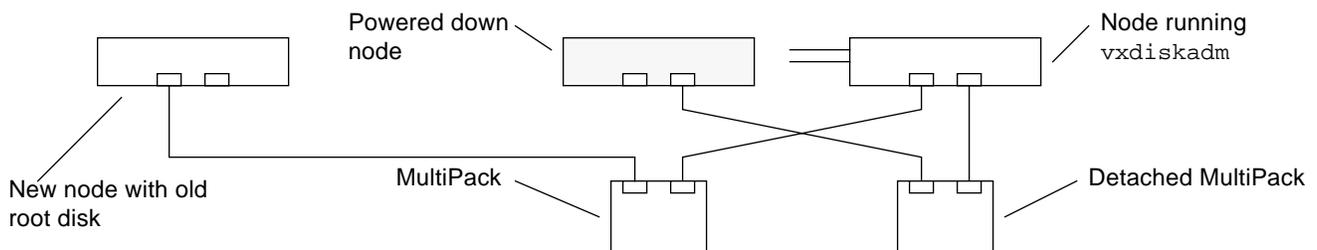
Figure 7-5   Second MultiPack Detached

13. Power off the detached MultiPack.

14. Physically disconnect the SCSI cable that goes from the detached MultiPack to the powered down node at the powered down node (Figure 7-6).

Figure 7-6   Second SCSI Cable Attached to the New Node

15. Connect the SCSI cable from the detached MultiPack to the new node (Figure 7-6).

16. Power up the detached MultiPack.

17. Use the running node to attach the MultiPack (Figure 7-7).
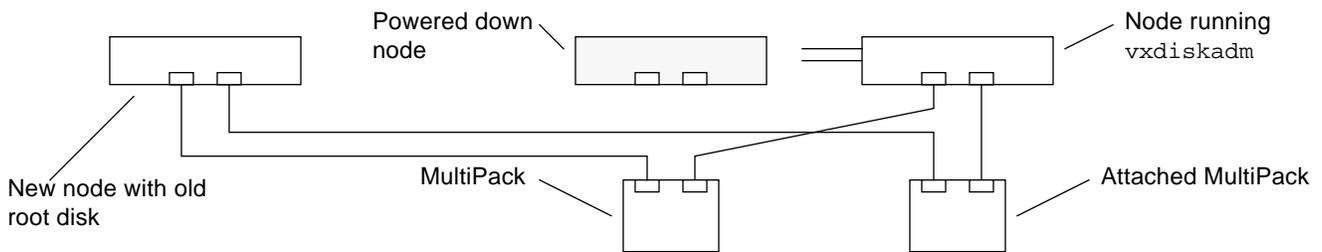
Figure 7-7   Second MultiPack Attached

18. Connect the private net cables (Figure 7-8).
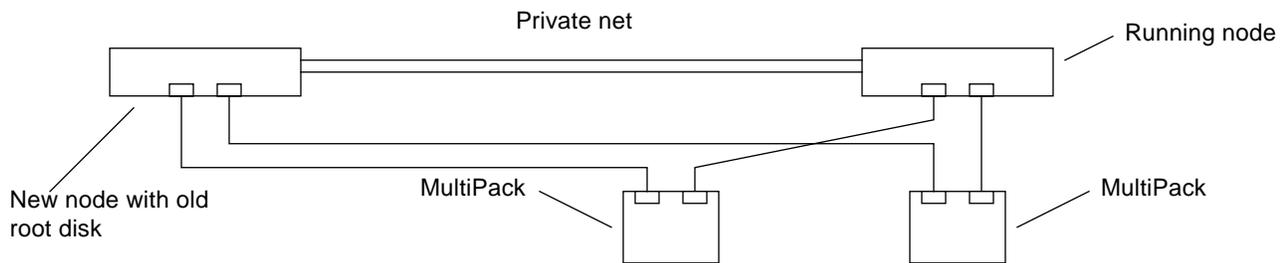
Figure 7-8   New Node in the Cluster

19. Have the system administrator rejoin the node to the cluster.

7.1.3   Server Startup

1. Begin with a safety inspection.

    a. Ensure that the AC power switch on the rear of the server is off (Figure 7-1).

    b. Verify the power cord is connected to the correct facilities power outlet.

2. Turn the AC power switch to ON (|).
You will hear the fans begin to turn and the green LED on the front of the server will light.

> ⚠️ **Warning** – After the system starts, do not move or attempt to move the server while the system power is on. Failure to heed this caution can result in catastrophic disk drive failure. Always power the server off completely before you attempt to move the server.

3. **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.

4. **If no faults exist at the conclusion of testing, the system boots. Following a successful boot, have the system administrator rejoin the node to the cluster.**
   If you want to run diagnostics again, or if the system hangs, try aborting the system. If that fails, power cycle the server.

7.2 Component Replacement without a Spare Ultra Enterprise 2 Server

If a spare UltraEnterprise 2 is unavailable for service maintenance, the failed server undissociated MultiPack can be shut down as described in this section. The procedures in this section assume that Node 0 is the failed node and MP 0 is the MultiPack attached to Node 0.

> ⚠️ **Caution** – To avoid damaging internal circuits, do not connect or disconnect any cable while power is applied to the system except the private network cables.

Table 7-1 Shutdown Procedure Summary

Replaceable Unit	Perform Steps
Ultra 2 Processor Board	1 to 9
CPU module or memory, power Supply and cable, internal disk (SD1) tape drive, CD, Floppy, SCI card	1 and 2
SunSwift SBus card, SCSI cable	1 to 6
SCI cable	Can be replaced live

≡ 7

7.2.1 Server Shutdown

> **Note** – If you will not be disconnecting any SCSI connection to the MultiPack, only perform steps 1 through 5.

1. **Have the system administrator remove the node from the cluster and halt the failed node (0) using the appropriate HA or PDB procedure.**
   Wait for the system-halted message and the boot monitor prompt.

2. **Turn off the AC power switch on the back of the failed node (Figure 7-1).**

3. **Disconnect the private net cables (Figure 7-2).**

4. **Use the running node (Node 1) to detach one of the MultiPacks using the appropriate procedure:**

   a. **For PDB, use the** `vxdiskadm` **command of the CVM or VxVm to detach the MultiPack from the failed node (Figure 7-9) as described in the** *Ultra Enterprise Cluster PDB Volume Manager Administration Guide.*

   b. **For HA, prepare the MultiPack for service as described in the** *Solstice HA User's Guide.*
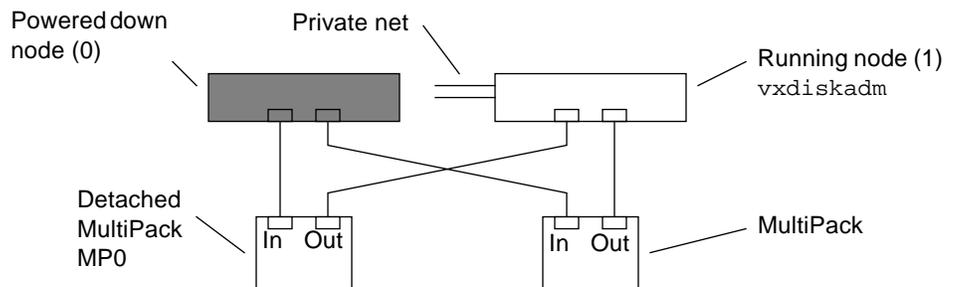
Figure 7-9   Private Nets Detached

5. **Power off the detached MultiPack (Figure 7-14).**

> **Note** – If you are replacing a SunSwift card, install the new card and stop here.

6. **Physically disconnect the SCSI cable that goes from the detached and powered down MultiPack to the powered down node. (Figure 7-10).**
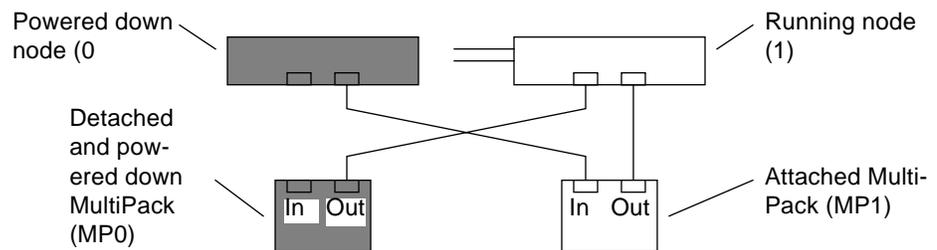
Figure 7-10   First SCSI Cable Detached

7. If the remaining cable between the working Node 1 and the powered down MultiPack is connected to the SCSI Out port, reconnect it to the SCSI In port. (Figure 7-11).
This will allow the MultiPack to automatically terminate the SCSI bus in this single host configuration.
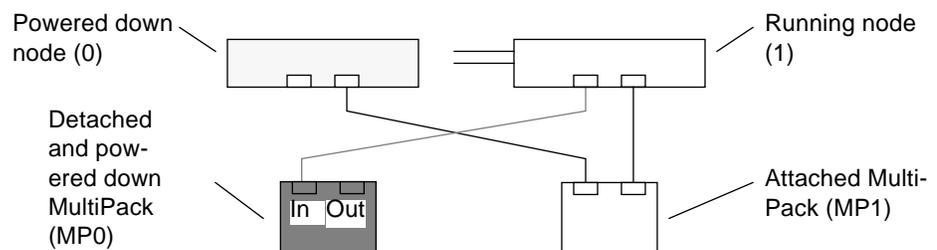

Figure 7-11   SCSI Cable Moved from Out Port to In port

8. Power up the detached MultiPack (MP0) and wait for all disks in the MultiPack to become ready.

9. Reattach the detached MultiPack (MP0) to the running node.

   a. For PDB, use the `vxdiskadm` **command of the CVM or VxVm to attach the MultiPack to the running node as described in the** *Ultra Enterprise Cluster PDB Volume Manager Administration Guide.*

   b. For HA, prepare the MultiPack for cluster operation as described in the *Solstice HA User's Guide.*

10. **Repeat steps 4 through 9 for all Multipacks attached to the system.**

11. **Repair the node.**

7.2.2 Server Startup

After the failed node is repaired, reconnect it to the cluster as follows:

1. **Perform steps 4 through 6 in reverse order to make sure the cables are connected to the right In and Out ports on the MultiPack.**

2. **Reconnect the Private Net cables.**

3. **Power on and boot up the repaired node (node 0).**

4. **Have the system administrator rejoin the node to the cluster.**

7.3 SPARCstorage Array

A SPARCstorage Array Model 100 contains three drive trays and a SPARCstorage Array Model 200 contains six drive trays; each tray contains up to 10 drives. To replace a single drive or tray in a SPARCstorage Array, you do not have to power down the array. Instead, you can spin down only the drives in the tray containing the drive to be replaced. See Section 7.3.3, "Single Drive and Tray Shutdown."

7.3.1 Complete Disk Array Shutdown

⚠️ **Caution** – Do not disconnect the power cord from the utility outlet 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 have the system administrator prepare the array for servicing (indicate which component is going to be replaced), and then spin down all drives in the array trays.**

2. **After 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 array, (Figure 7-12).**
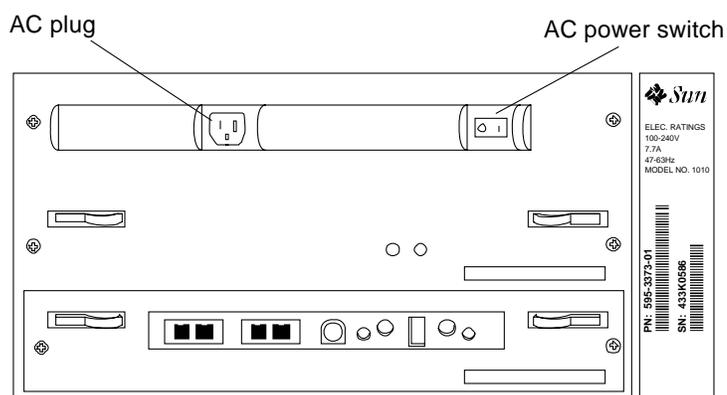
AC plug   AC power switch

Figure 7-12 SPARCstorage Array AC Power Switch and AC Plug

7.3.2 *Complete Disk Array Startup*

⚠ **!**

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

1. **Begin with a safety inspection.**

    a. **Ensure that the SPARCstorage Array AC power switch is off, (Figure 7-12).**

    b. **Verify that the power cord is connected to the chassis and a wall socket.**

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 7-13.

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

For example, a SPARCstorage Array with 18 disk drives may take several minutes to boot, while a SPARCstorage Array with 30 disks drives may take much longer to boot.

4. After POST has completed, ask the system administrator to restart all drive trays within the array, and then rejoin the node to the cluster.
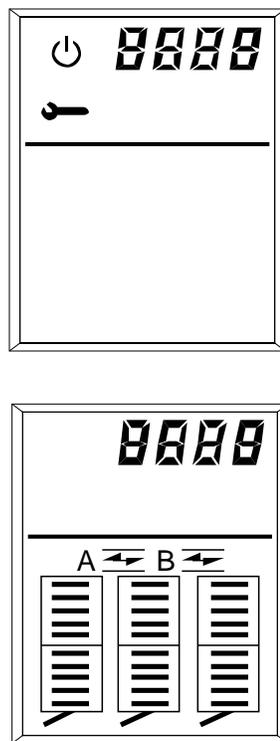
- During the power-on self-test (POST), the POST and service icons are displayed in the upper left corner of the LCD display. The four alphanumeric LCDs display the code for the currently running POST test.

  If problems are detected during POST, an error code flashes continuously on the alphanumeric LCDs. See Section 3.2.3, "SPARCstorage Array Fails to Communicate" for a listing and explanation of POST error

- After POST is completed, the following information will be displayed in this order:
  - The last four digits of the World Wide Name for the particular SPARCstorage Array.
  - 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 7-13   LCD Display While Powering On the System

7.3.3 Single Drive and 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.

1. **Have the system administrator prepare the SPARCstorage Array containing the disk or tray for servicing and spin down all drives in the tray.**

2. **Once all drives in the tray have stopped, remove the tray to access individual drives for service.**

7.3.4 Single Drive and Tray Startup

1. **Ask the system administrator to start all drives in the tray.**

2. **Resynchronize the mirrors in the that tray to put the disks in the tray back in service.**

7.4 SPARCstorage MultiPack

Refer to the *SPARCstorage MultiPack Service Manual.*

7.4.1 Single Drive Shutdown

The SPARCstorage MultiPack contains up to 12 drives. To replace a drive you do not have to power down the MultiPack.

1. **Have the system administrator prepare the SPARCstorage MultiPack for servicing.**

2. **Replace the drive as directed in the** *SPARCstorage MultiPack Service Manual.*

7.4.2 Complete MultiPack Shutdown

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

1. **Prior to powering down a complete SPARCstorage MultiPack, you must first have the system administrator prepare the MultiPack for servicing (indicate which MultiPack is going to be replaced).**

2. **After the system administrator has prepared the MultiPack for servicing, turn off the AC power switch on the MultiPack, (Figure 7-14).**
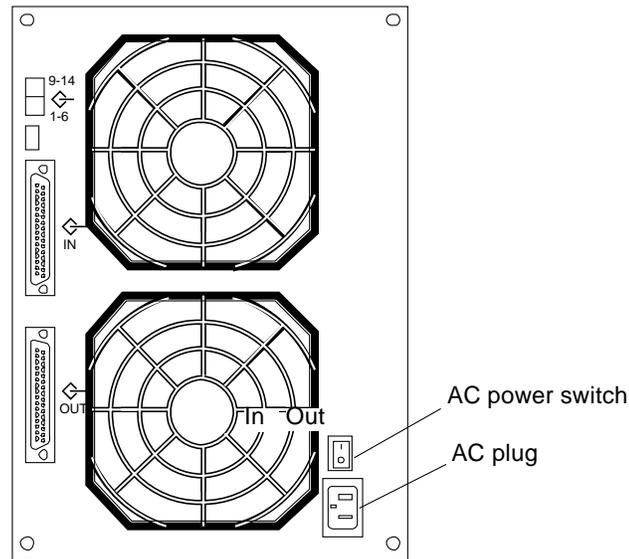
Figure 7-14   SPARCstorage MultiPack AC Power Switch and AC Plug

7.4.3 Complete MultiPack Startup

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

1. **Begin with a safety inspection.**

   a. **Ensure that the SPARCstorage MultiPack AC power switch is off (Figure 7-14).**

   b. **Verify that the power cord is connected to the chassis and a wall socket.**

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

3. **Watch the front panel LEDs.**
   When powering on, the LEDs light to indicate which drive bays have drives installed.

It may take a few minutes for a SPARCstorage MultiPack t become ready, depending on the total number of disk drives.

7.5 Terminal Concentrator

To power the terminal concentrator on or off, use the power switch on the back panel as depicted in Figure 7-15. The power indicator on the front panel is lit when the power is on (Figure 7-16).
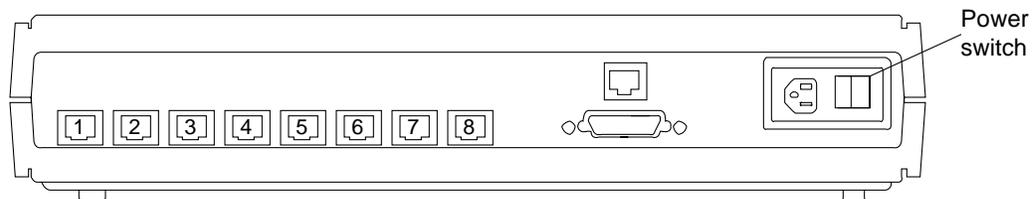
Figure 7-15 Terminal Concentrator (Rear View)
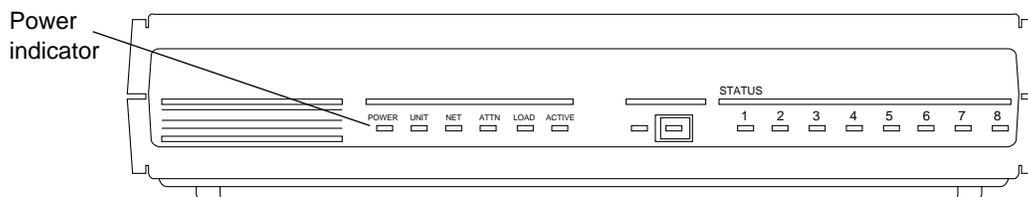
Figure 7-16 Terminal Concentrator (Front View)

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Internal Access 8≣

Use Table 8-1 and Table 8-1 as a guide to determine the action you must take before you can access the Field Replaceable Unit (FRU).

Note – For all power down and power up procedures also refer to the *Ultra Enterprise Cluster PDB Administration Guide.*

Table 8-1 Ultra Enterprise 2 Assembly Access

FRU Item	Replace live	Power Down Node
Memory	No	Yes
Internal Disk(s)	No	Yes
CPU	No	Yes
Mother board	No	Yes
Power supply	No	Yes
CD/Tape/Floppy	No	Yes
SunSwift	No	Yes
SCI SBus adapter	No	Yes
SCI SBus cable	Yes	No
Power cable	No	Yes

Table 8-2   SPARCstorage MultiPack Assembly and Accessories Access

FRU Item	Replace live	Power Down MultiPack
Disk drive	Yes	
Power supply	No	Yes
Ethernet cable	Yes	
Power cable	No	Yes
SCSI cable	No	Yes
Terminal Concentrator	Yes	
Serial cable	Yes	

Table 8-3   Terminal Concentrator Access

FRU Item	Replace live	Power Down MultiPack
Terminal Concentrator	Yes	
Serial cable	Yes	

For internal access procedures, refer to the service manuals that came with your system. Table 8-4 lists the applicable manuals.

Table 8-4   List of Service Manuals

Description	Part Number Reference	Document Part Number
Ultra 2 Server	*Ultra 2 Series Service Manual*	801-5933
FC/S SBus card	595-3213	801-6316
FC/OM module	595-3214	801-6326
SQEC SBus card	605-1520	801-7123
SunSwift SBus card	595-2345	802-6021
SPARCstorage Array	*SPARCstorage Array Model 100 Series Service Manual*	802-2206
	SPARCstorage Array Model 200 Series Service Manual	802-2028
Disk Drive	*Disk Drive Installation Manual for the SPARCstorage Array Model 100 Series*	801-2207
SPARCstorage MultiPack and disk drive	*SPARCstorage MultiPack Service Manual*	802-4430

Table 8-4 List of Service Manuals *(Continued)*

Description	Part Number Reference	Document Part Number
System administration workstation or terminal	Service manual provided with equipment	
Terminal concentrator	370-1434 (See *Ultra Enterprise Cluster PDB Hardware Planning and Installation Manual*, Chapter 5, "Hardware Installation" for cabling details)	802-6313
Fiber-optic and SCSI-2 cables	(See *Ultra Enterprise Cluster PDB Hardware Planning and Installation Manual*, Chapter 5, "Hardware Installation" for cable details.)	802-6313

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Major Subassemblies 9≡

This chapter supplies the information necessary to remove and reinstall the replaceable parts that are unique to Ultra Enterprise 2 Clusters. For non-unique replaceable parts, you will be referred to the appropriate service manual.

The following table lists the locations of the procedures. If you are viewing this in AnswerBook, place your cursor on the desired procedure or location and click the SELECT button on your mouse twice to go directly to the task.

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9.1   Ultra Enterprise 2 Server

1. **Shut the server down as described in Section 7.1, "Ultra Enterprise 2 Server."**

2. **Once the server has been shut down, remove and replace the system board, any replaceable part on the system board, the boot disk, or the power supply by following the procedures described in the *Ultra 2 Series Service Manual.***

3. **After parts replacement, power on the server as indicated in Section 7.1.3, "Server Startup."**

9.2   SPARCstorage Array

9.2.1 Disk Drives

Replace the defective drive as described in the *SPARCstorage Array Model 100 Series Service Manual.*

9.2.2 Major Subassemblies

1. **Shut the disk tray down as described in Section 7.3.1, "Complete Disk Array Shutdown" and Section 7.3.3, "Single Drive and Tray Shutdown".**

2. **Replace the defective subassembly as described in the *SPARCstorage Array *Model 100 Series* Service Manual.***

3. **Bring up the disk tray as described in Section 7.3.2, "Complete Disk Array Startup" and Section 7.3.4, "Single Drive and Tray Startup".**

9.3   SPARCstorage MultiPack

9.3.1 Disk Drives

Replace the defective drive as described in the *SPARCstorage MultiPack User's Guide.*

9.3.2 Power Supply

1. **Shut the down the MultiPack as described in Section 7.4.2, "Complete MultiPack Shutdown".**

2. **Replace the defective subassembly as described in the *SPARCstorage MultiPack User's Guide.***

3. **Bring up the MultiPack as described in Section 7.4.3, "Complete MultiPack Startup".**

9.4 Terminal Concentrator

1. **Power off the terminal concentrator by using the AC power switch located on the back panel (Figure 9-1).**

2. **Remove the power, network, and serial cables from the terminal concentrator.**

Serial connectors   Network connectors   Power Switch

```
  1   2   3   4   5   6   7   8
```
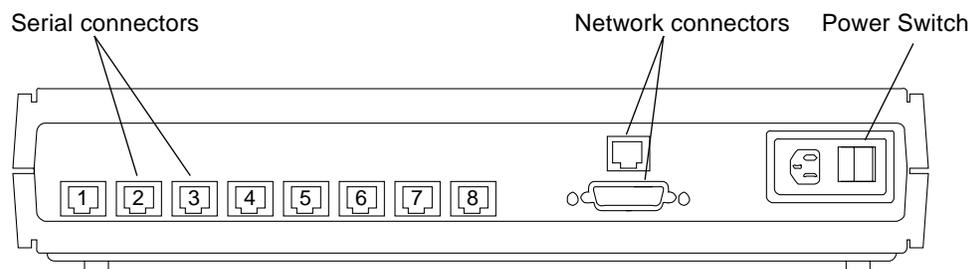
Figure 9-1   Terminal Concentrator Connector and Power Switch Location

3. **Remove the defective terminal concentrator.**

4. **Install the new terminal concentrator:**

   a. **Connect the power, network, and serial cables to the terminal concentrator.**

   b. **Power on the terminal concentrator by using the AC power switch located on the back panel (Figure 9-1).**

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9.5 Cluster Cabling

Refer to Chapter 7 of the *Ultra Enterprise 2 Cluster Hardware Planning and Installation Guide* for details on cabling the terminal concentrator, the private networks, and the SPARCstorage Array optical connections or SPARCstorage MultiPack SCSI-2 connections.

Illustrated Parts Breakdown 10

Figure 10-1 shows the main components of the Ultra Enterprise 2 Cluster. Table 10-1 lists the replaceable parts and the documents in which the replacement procedures are located.
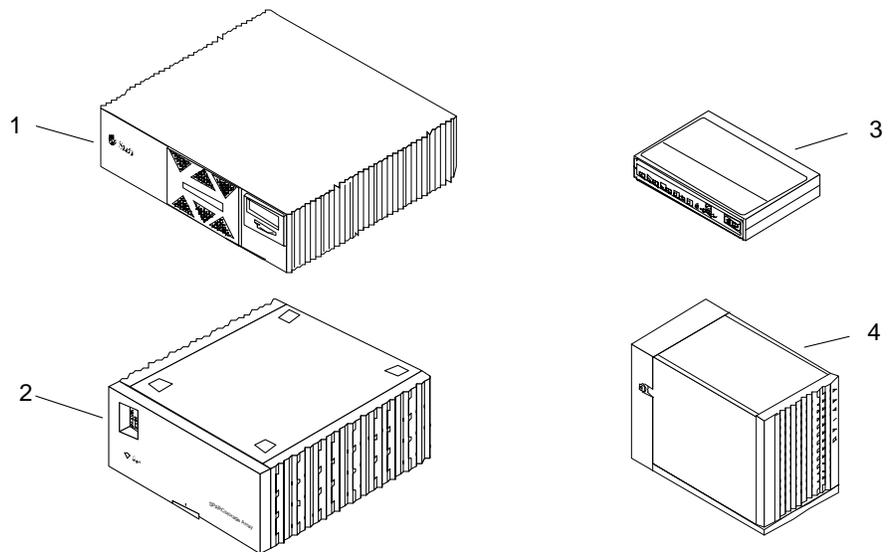
Figure 10-1 Ultra Enterprise 2 Cluster - Main Components

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Table 10-1 Replaceable Parts List and Documentation Cross Reference

Key	Description	Part Number Reference	Document Part Number
1	Ultra 2 Server	*Ultra 2 Series Server Service Manual*	802-2561
	FC/S SBus card	595-3213	801-6316
	SQEC SBus card	605-1520	801-7123
	FC/OM module	595-3214	801-6326
	SunSwift SBus card	605-1568	802-6021
	SCI SBus Adapter	530-2345 See *Ultra Enterprise 2 Cluster Hardware Planning and Installation Manual*, Chapter 5, "Hardware Installation" for cabling details.	802-6313
	2m, SCI cable 5m, SCI cable 10m, SCI cable	530-2360-01 530-2361-01 530-2362-01	
	Private net cables 1 meter, Ethernet 5 meter, Ethernet	530-2149 530-2150	
2	SPARCstorage Array	*SPARCstorage Array Model 100 Series Service Manual*	802-2206
		SPARCstorage Array Model 200 Series Service Manual	802-2028
		See *Ultra Enterprise 2 Cluster Hardware Planning and Installation Manual*, Chapter 5, "Hardware Installation" for cabling details.	802-6313
	Disk drive		801-2207
	Fiber-optic cables	See *Ultra Enterprise 2 Cluster Hardware Planning and Installation Manual*, Chapter 5, "Hardware Installation" for cabling details.	801-6313
	2 meter cable	537-1004	

Table 10-1 Replaceable Parts List and Documentation Cross Reference *(Continued)*

Key	Description	Part Number Reference	Document Part Number
	15 meter cable	537-1006	
	System administration workstation or terminal	Service manual provided with equipment	
	Serial port 1 to terminal concentrator cable	*530-2151* or 530-2152	
3	Terminal concentrator	370-1434	802-6314
	Terminal concentrator cabling:	See *Ultra Enterprise 2 Cluster Hardware Planning and Installation Manual*, Chapter 5, "Hardware Installation" for cabling details.	802-6313
	2 meter serial cable	530-2152	
	5 meter serial cable	530-2151	
4	SPARCstorage MultiPack	*SPARCstorage MultiPack Service Manual*	802-4430
	SCSI_2 cable	530-1804 or 530-1805	

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Connector Pinouts and Cabling $\quad$ *A* ≡

A.1 SPARCstorage Array Fiber-Optic Cables

Refer to Chapter 6 of the *Ultra Enterprise 2 Cluster Hardware Planning and Installation Manual* for information on connecting SPARCstorage Arrays to a node using the fiber-optic cables.

A.2 Terminal Concentrator Ports

Refer to the Chapter 6 of the *Ultra Enterprise 2 Cluster 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.

A

A.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 A-1 and the pin allocations are given in Table A-1.
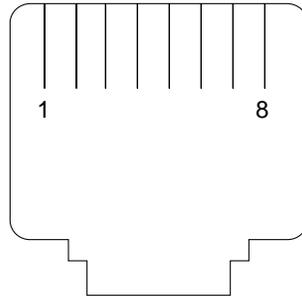
Figure A-1 Serial Port RJ-45 Receptacle

Table A-1 Serial Port Pinout and Signals

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

A.2.2 Public Network Connector

The primary public Ethernet network connects to the AUI Ethernet transceiver port on the terminal concentrator. The port receptacle is shown in Figure A-2; pin allocations are given in Table A-2.
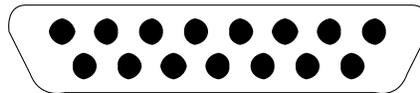
Figure A-2   15-pin Ethernet Receptacle

Table A-2   Ethernet Port Pinout and Signals

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

≡ *A*

A.3 Private Network Cables

The nodes in an HA configuration are connected via two private nets using two special Ethernet cables. The cables are twisted pair, Category Type 5. For private net cabling information, refer to *Ultra Enterprise 2 Cluster Hardware Planning and Installation Guide.* The pinout for these cables is shown in Figure A-3, and listed in Table A-3.
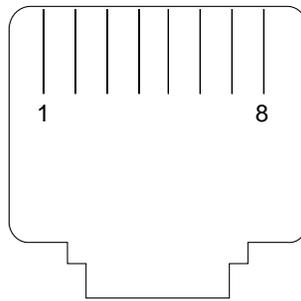
Figure A-3   Twisted Pair Ethernet RJ-45 Receptacle

Table A-3   Private Ethernet Port Pinout and 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		

A.4   SPARCstorage MultiPack SCSI-2 Cables

Refer to Appendix B of the *SunSwift SBus Adapter Installation and User's Guide* for information on the SCSI-2 Connector Signals.

A

Firmware and Device Driver Error Messages B ≡

B.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
```

≡ *B*

In the *Ultra Enterprise 2 Cluster PDB Error Messages Manual* messages are presented with the message ID and the message text, even though the message ID is not displayed on the console. The character # implies a numeric quantity and ... implies a string of characters or numbers. The prefix ID[SUNWssa] is implied and is not shown.

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

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

B.2 System Configuration Errors

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

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

B.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).

B.2.2 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.

B.3   Hardware Errors

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

B.3.1 soc driver

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

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

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

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

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

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

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

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

For reference, the expected message is:

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

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

≡ B

```
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
```

B.3.2 pln Driver

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

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

```
Transport error:   FCP_RSP_CMD_TIMEOUT
```

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

```
Transport error:   FCP_RSP_CMD_OVERRUN
```

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

```
Transport error:  FCP_RSP_SCSI_PORT_ERR
```

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

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

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

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

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

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

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

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

```
Timeout recovery failed, resetting
```

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

```
reset recovery failed
```

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

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B.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.

B.4.1 soc Driver

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

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

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

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

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

- A temporary burst of errors on the fibre cable. In this case, the "OFFLINE" message should be followed by an "ONLINE" message shortly afterwards.

- Unplugging of the fibre channel cable from either the host adapter or the SPARCstorage Array

- Powering off a connected SPARCstorage Array

- Failure of a Fibre Channel Optical Module in either the host adapter or the SPARCstorage Array

- Failure of an optical cable

- Failure of a SPARCstorage Array controller

- Failure of a host adapter card

Note that any pending I/O operations to the SPARCstorage Array will be held by the driver for a period of time (one to two minutes) following a link "off-line" in case the link should return to an operable state, so that pending

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operations can be completed. However, if sufficient time elapses following the transition of the link to "off-line" without a corresponding "on-line" transition, the driver will fail the I/O operations associated with the formerly connected SPARCstorage Array.

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

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

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

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

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

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

B.4.2 pln Driver

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

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

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

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

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

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

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

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

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

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

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

```
Link errors detected
```

A number of retryable errors may have occurred on the fibre channel link. This message may be displayed if the number of link errors exceeds the allowable link bit error rate (1 bit/10^{12} bits). If you see this message, clean the fiber-optic

cable according to the instructions given in the *SPARCstorage Array 100 Service Manual.* If the problem still exists, replace either the fiber-optic cable or the Fibre Channel Optical Module.

B.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.

B.5.1   soc Driver

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

B.5.2   pln Driver

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

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