Ultra™ Enterprise™ Cluster Hardware Planning and Installation Guide

THE NETWORK IS THE COMPUTER™

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Contents

1. Component Checklist. 1-1

2. Site Preparation and Planning 2-1

2.1 Space Planning 2-1

2.2 Power Requirements and Options 2-2

2.3 Ethernet Networks 2-3

2.3.1 Public Network 2-3

2.3.2 Private Node-to-Node Network 2-3

2.3.3 Ethernet Design Considerations 2-3

2.3.4 Preparing the Public Network. 2-6

2.4 Serial Cables 2-8

2.4.1 RS-232C / RS-423A 2-8

2.4.2 Cable Requirements 2-8

3. Hardware Configurations 3-1

3.1 SBus Card Complements 3-1

3.1.1 Terminal Concentrator 3-12

3.1.2 Administration Workstation 3-12
3.1.3 Public Network 3-12
3.1.4 Private Network (Node 0 to Node 1) 3-12
3.1.5 SPARCstorage Arrays. 3-13
3.1.6 SPARCstorage MultiPacks 3-14
3.2 Setting `scsi-initiator-id` on an Ultra Enterprise 2 Cluster 3-14
4. Powering Off and On System Components 4-1
4.1 Powering Off the Terminal Concentrator 4-2
4.2 Powering Off a SPARCstorage Array. 4-2
4.3 Powering Off a SPARCstorage MultiPack. 4-3
4.4 Powering Off an Ultra Enterprise 2 Server 4-3
4.5 Powering On the Terminal Concentrator 4-4
4.6 Powering On a SPARCstorage Array. 4-4
4.7 Powering On a SPARCstorage MultiPack 4-6
4.8 Powering On an Ultra Enterprise 2 Server 4-6
4.9 Reading POST Messages and Boot Messages 4-7
5. Hardware Installation 5-1
5.1 Preparing the System Components 5-1
5.2 Installing the Ultra Enterprise 2 Cluster 5-2
5.2.1 Preparing the SPARCstorage Arrays 5-2
5.2.2 Connecting the Power 5-2
5.2.3 Installing the SBus Cards 5-4
5.2.4 Installing the Terminal Concentrator 5-5

5.3 Cabling the System 5-6
5.3.1 Connecting the Administration Workstation. 5-6
5.3.2 Connecting the Terminal Concentrator 5-6
5.3.3 Connecting Public Nets Using the Network SBus Cards 5-7
5.3.4 Connecting Private Nets Using SQEC and Onboard Ethernet Ports 5-7
5.3.5 Connecting the Private Nets Using SunSwift SBus Adapter Cards 5-8
5.3.6 Connecting the Private Nets Using SCI SBus Adapter Cards. 5-9
5.3.7 Installing Second FC/OM Optical Modules in SPARCstorage Arrays. 5-9
5.3.8 Labeling Fiber-Optic Cables 5-9
5.3.9 Cabling the SPARCStorage Arrays 5-10
5.3.10 Cabling the SPARCstorage MultiPacks 5-12
5.4 Finishing Up 5-12
6. Terminal Concentrator Setup 6-1
6.1 Configuring the Terminal Concentrator 6-1
6.2 Checkpoint to Verify Terminal Concentrator Setup 6-5
6.3 Setting the Port Parameters. 6-5
6.3.1 Determining if the Port Type Variable Must Be Set. 6-5
6.3.2 Port Parameters Procedure 6-7
7. Hardware Acceptance Test. 6-11
7.1 SunVTS 6-11
7.1.1 Verifying Hardware Installation 6-12

7.1.2 Running the Final SunVTS Functional Test 6-18
7.2 Acceptance Test Criteria 6-18
7.3 Next Step 6-18

Figures

Figure 2-1 Ultra Enterprise 2 Cluster Layout for SPARCstorage Arrays Example 1 (Top View) 2-2

Figure 2-2 Ultra Enterprise 2 Cluster Layout for SPARCstorage Arrays Example 2 (Top View) 2-2

Figure 2-3 Connecting Twisted-Pair Ethernet to N-type Coaxial Cable 2-5

Figure 2-4 Ethernet Cabling Length — Example Using N-type Cable 2-6

Figure 2-5 Example of 10BASE-T (Twisted-Pair) Ethernet. 2-7

Figure 3-1 SBus Card Slot Positions - Configuration 1 for HA Clusters Using SPARCstorage Arrays 3-1

Figure 3-2 SBus Card Slot Positions - Configuration 2 for PDB Clusters Using SPARCstorage Arrays. 3-2

Figure 3-3 SBus Card Slot Positions - Configuration 3 for PDB Clusters Using SPARCstorage Arrays. 3-2

Figure 3-4 SBus Card Slot Positions - Configuration 4 for HA and PDB Clusters Using SPARCstorage MultiPacks 3-3

Figure 3-5 SBus Card Slot Positions - Configuration 5 for HA and PDB Clusters Using SPARCstorage MultiPacks 3-3

Figure 3-6 SBus Card Slot Positions - Configuration 6 for HA and PDB Clusters Using SPARCstorage MultiPacks 3-4
Figure 3-7 Cluster Cabling - Configuration 1 for HA Clusters 3-5
Figure 3-8 Cluster Cabling- Configuration 2 for PDB Clusters Using SunSwift for the Private Net 3-6
Figure 3-9 Cluster Cabling- Configuration 3 for PDB Clusters Using SCI for the Private Net 3-7
Figure 3-10 Cluster Cabling - Configuration 4 for HA and PDB Clusters Using SunSwift for the Private Networks 3-8
Figure 3-11 Cluster Cabling - Configuration 4 for PDB Clusters Using SCI for the Private Networks..... 3-9
Figure 3-12 Cluster Cabling - Configuration 5 for HA and PDB Clusters. 3-10
Figure 3-13 Configuration 6 for HA and PDB Clusters 3-11
Figure 4-1 Power-On LCD Display 4-5
Figure 5-1 SPARCstorage Array AC Power Connector, Labeling and Switch Locations..... 5-3
Figure 5-2 SPARCstorage MultiPack AC Power Connector and Switch Locations 5-3
Figure 5-3 Ultra 2 Server AC Power Connector and Switch Location ... 5-4
Figure 5-4 Terminal Concentrator AC Power Connector and Switch Location..... 5-4
Figure 5-5 Connecting the Administration Workstation to the Terminal Concentrator 5-6
Figure 5-6 Connecting the Terminal Concentrator and Public Network. 5-7
Figure 5-7 Node-to-Node Sun Private Net Cable Connections Using SQEC Cards and Onboard Ethernet Ports..... 5-8
Figure 5-8 Node-to-Node Sun Private Net Cable Connections Using SunSwift Cards 5-9
Figure 5-9 Node-to-Node Sun Private Net Cable Connections Using SCI Cards 5-9

Figure 5-10 SPARCstorage Array Fiber-Optic Cable Connection 5-11
Figure 6-1 Terminal Concentrator Test Button and LED Location 6-2
Figure 6-2 Determining the Terminal Concentrator Version 6-6

Tables

Table 1-1 System Components Required for Ultra Enterprise 2 Clusters Using SPARCstorage Arrays 1-1

Table 1-2 Checklist for Planned and Available Components for Ultra Enterprise 2 Clusters Using SPARCstorage Arrays 1-3

Table 1-3 Required System Components for Ultra 2 Server for Clusters Using MultiPacks 1-4

Table 1-4 Checklist for Planned and Available Component or Ultra Enterprise 2 Clusters Using MultiPacks. 1-5

Table 2-1 Base Configuration Power Requirements 2-3

Table 2-2 Ethernet Cabling Limitations for N-type Coaxial Cable 2-5

Table 2-3 Open Circuit Voltages. 2-8

Table 2-4 Generic Pinouts for Sun System Boards and Communications Products 2-10

Table 3-1 SBus Card Complement for HA and PDB Clusters Using SPARCstorage Arrays. 3-4

Table 3-2 SBus Card Complement for HA and PDB Clusters Using SPARCstorage MultiPacks 3-4

Table 3-3 SCSI Initiator ID Settings 3-15

Table 3-4 `nvramrc` Editor Keystroke Commands. 3-15

Table 5-1 Fiber-Optic Cable Connections for Configuration 1 (HA) . . . 5-10
Table 5-2 Fiber-Optic Cable Connections for Configuration 2 (PDB). . . 5-11

Preface

This manual provides installation instructions for customer-assembled Ultra™ Enterprise™ 2 Clusters. These instructions are designed for a qualified service-trained service provider and/or system administrator with networking knowledge.

For information on troubleshooting installation problems, refer to the *Ultra Enterprise 2 Cluster Hardware Service Manual.*

How This Book Is Organized

Part 1 — Planning

Chapter 1, "Component Checklist," provides checklists to verify that you have all the items that are necessary to complete the installation.

Chapter 2, "Site Preparation and Planning," provides guidelines and information for preparing the site.

Chapter 3, "Hardware Configurations" provides configuration information for the server**.**

Part 2 — Hardware Installation

Chapter 4, "Powering Off and On System Components" provides procedures for powering the systems off and on.

Chapter 5, “Hardware Installation” contains instructions for interconnecting the major components of the system.

Part 3 — Terminal Concentrator Setup

Chapter 6, “Terminal Concentrator Setup,” has instructions for configuring the terminal concentrator.

Chapter 7, “Hardware Acceptance Test,” has instructions for performing a hardware acceptance test.

Part 4 — Index

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 viewing 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

Table P-1 describes the typographic changes used in this book.

Table P-1 List of Typographic Changes

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-2 shows the default system prompt and superuser prompt for the C shell, Bourne shell, and Korn shell.

Table P-2 Default System and Superuser Prompts

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

Related Documentation

Table P-3 lists documents which contain information that may be helpful to the system administrator and service provider.

Table P-3 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
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

Table P-3 List of Related Documentation *(Continued)*

Product Family	Title	Part Number
	Solstice HA 1.3 Programmer's Guide	*805-0318*
	Ultra Enterprise 2 Cluster Hardware Service Manual	802-6316
	Solstice HA 1.3 New Product Information (Shipped with Solstice HA 1.3 CD-ROM)	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
	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 Enterprise Cluster 2 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 Manuals	801-7123

Table P-3 List of Related Documentation *(Continued)*

Product Family	Title	Part Number
	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

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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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Component Checklist 1

The Ultra Enterprise 2 Clusters have six basic configurations that support Solstice™ High Availability (HA) 1.3 or Parallel Data Base (PDB™) 1.2 software. Table 1-1 and Table 1-2 contain lists of the system components required for SPARCstorage Array configurations. Table 1-3 and Table 1-4 contain lists of the system components required for SPARCstorage™ MultiPack™ configuration. Before you begin installation, use the checklist in Table 1-2 or Table 1-4 to ensure that all of the required components are available .

Table 1-1 System Components Required for Ultra Enterprise 2 Clusters Using SPARCstorage Arrays

Device	Configuration 1 (HA)	Configuration 2 (PDB)	Configuration 3 (PDB)	Comments
Ultra Enterprise Server 2 (nodes)	2	2	2	
UltraSPARC™ 2 processor module	1 or 2 per node or server	1 or 2 per node or server	1 or 2 per node or server	Each node must be equipped with identical processor modules.
Memory	128 Mbyte (64 Mbyte per server) to 1 Gbyte (512 Mbyte per server)	256 Mbyte (128 Mbyte per server) to 1 Gbyte (512 Mbyte per server)	256 Mbyte (128 Mbyte per server) to 1 Gbyte (512 Mbyte per server)	Each node should be equipped with an identical amount and type of memory.
SBus Quad Ethernet Controller (SQEC) cards	2 (1 per node or server)	0	0	Not used in PDB configuration.

Table 1-1 System Components Required for Ultra Enterprise 2 Clusters Using SPARCstorage Arrays *(Continued)*

Device	Configuration 1 (HA)	Configuration 2 (PDB)	Configuration 3 (PDB)	Comments
Network SBus card SunFDDI™ 5.0 SAS/DAS or SunFastEthernet™)	1per node - optional	0	0	Optional card. Cannot be used in Configuration 2 or 3 because all SBus slots are in use.
SPARCstorage™ Array 100	2	2	2	Each equipped with 2 FC/OMs.
FC/S card	4 (2 per node)	4 (2 per node)	4 (2 per node)	Each equipped with 1 FC/OM.
FC/OM optical modules	2 (1 per node) (0 for standard configuration)	2 (1 per node)	2 (1 per node)	
Terminal concentrator	1	1	1	
RS-232C Cables[1]	3	3	3	Connects nodes to terminal concentrator.
Ethernet cables	3	3	3	Connects nodes and terminal concentrator to public network.
SunSwift™ SBus Adapter card or SCI SBus Adapter card	0	4 (2 per node)	4 (2 per node)	
Sun™ private network cables	2 (onboard Ethernet)	2 if using Sunswift or 2 SCI cables	2 if using SunSwift or 2 SCI cables	Connects nodes to each other.
Fiber-optic cables[2]	4 (6 optional)	4	4	Connects nodes to SPARCstorage Arrays.

1. One of these cables can be used temporarily to connect the administration workstation to the terminal concentrator during installation setup.

2. One fiber-optic cable is supplied with each SPARCstorage Array.

Table 1-2 Checklist for Planned and Available Components for Ultra Enterprise 2 Clusters Using SPARCstorage Arrays

Category	Item	Quantity Planned	Quantity Available
Servers	Ultra Enterprise 2 Server Part Number 600-3734	_____	_____
	UltraSPARC 2 processor modules	_____	_____
	Memory	_____	_____
SBus cards	SBus Quad Ethernet Controller (SQEC) card Part Number 605-1520	_____	_____
	SunSwift SBus Adapter card Part Number 605-1568	_____	_____
	SCI SBus Adapter card Part Number 530-2345	_____	_____
	Fibre Channel SBus (FC/S) card Part Number 595-3213	_____	_____
	Fibre Channel Optical Module (FC/OM) Part Number 595-3214	_____	_____
	Network (Sun FDDI 4.0 SAS or SunFastEthernet SFE)	_____	_____
Database storage	SPARCstorage Array 100 units	_____	_____
System administration	System administration workstation or terminal	_____	_____
	Terminal concentrator Part Number 370-1434	_____	_____
Cables	RS-232C serial cable, 2 meter, Part Number 530-2151	_____	_____
	RS-232C serial cable, 5 meter, Part Number 530-2152	_____	_____
	Ethernet cable, standard Part Number 530-2150	_____	_____
	Sun private net cable, 1 meter, Part Number 530-2149	_____	_____

Table 1-2 Checklist for Planned and Available Components for Ultra Enterprise 2 Clusters Using SPARCstorage Arrays *(Continued)*

Category	Item	Quantity Planned	Quantity Available
	Sun private net cable, 5 meter, Part Number 530-2150	_____	_____
	Sun private net cable, SCI, 2 meter Part Number 530-530-2360	_____	_____
	Sun private net cable, SCI, 5 meter Part Number 530-530-2361	_____	_____
	Sun private net cable, SCI, 10 meter Part Number 530-530-2362	_____	_____
	Fiber-optic cable, 2 meter, Part Number 537-1004	_____	_____
	Fiber-optic cable, 15 meter, optional Part Number 595-3379 (537-1006)	_____	_____

Table 1-3 Required System Components for Ultra 2 Server for Clusters Using MultiPacks

Device	Configuration 4 (HA/PDB)	Configuration 5 (HA/PDB)	Configuration 6 (HA/PDB)	Comments
Ultra Server 2 (nodes)	2	2	2	
UltraSPARC 2 processor module	1 or 2	1 or 2	1 or 2	Each node must be equipped with identical processor modules.
Memory	128 Mbyte (64 Mbyte per server) to 1 Gbyte (512 Mbyte per server (256 Mbyte min. required for PDB))	128 Mbyte per server) to 1 Gbyte (512 Mbyte per server) (256 Mbyte min. required for PDB))	128 Mbyte per server) to 1 Gbyte (512 Mbyte per server) (256 Mbyte min. required for PDB))	Each node should be equipped with an identical amount and type of memory.
SunSwift SBus Adapter card	4 (2 per node)	6 (3 per node)	8 (4 per node)	

Table 1-3 Required System Components for Ultra 2 Server for Clusters Using MultiPacks *(Continued)*

Device	Configuration 4 (HA/PDB)	Configuration 5 (HA/PDB)	Configuration 6 (HA/PDB)	Comments
SCI SBus Adapter card	0 2 (optional)	0 2 (optional)	0 2 (optional)	Optional card. Can only be used in PDB configurations
SPARCstorage MultiPack	2	3	4	Each equipped with two 2-GByte or 4-GByte hard drives minimum.
Terminal concentrator	1	1	1	
RS-232C Cables[1]	3	3	3	Connects nodes to terminal concentrator
Public net Ethernet cables	3	3	3	Connects nodes and terminal concentrator to public network
Sun private net cables	2	2	2	Connects nodes to each other
SCSI-2 cables[2]	4	6	8	Connects nodes to SPARCstorage MultiPacks

1. One of these cables can be used temporarily to connect the administration workstation to the terminal concentrator during installation setup.

2. One SCSI-2 cable is supplied with each SPARCstorage MultiPack.

Table 1-4 Checklist for Planned and Available Component or Ultra Enterprise 2 Clusters Using MultiPacks

Category	Item	Quantity Planned	Quantity Available
Servers	Ultra 2 Server PN 600-3734	_____	_____
	UltraSPARC 2 processor module	_____	_____
	Memory	_____	_____
	Internal CD-ROM 595-3489	_____	_____

Table 1-4 Checklist for Planned and Available Component or Ultra Enterprise 2 Clusters Using MultiPacks *(Continued)*

Category	Item	Quantity Planned	Quantity Available
	SunSwift SBus Adapter card (SCSI-2 and Private Net) PN 605-1568	_____	_____
	Network (Sun FDDI 4.0 SAS or SunFastEthernet SFE)	_____	_____
Database storage	SPARCstorage MultiPack	_____	_____
System administration	System administration workstation or terminal	_____	_____
	Terminal concentrator	_____	_____
Cables	RS-232 serial, 2 meter, PN 530-2151	_____	_____
	RS-232 serial, 5 meter, PN 530-2152	_____	_____
	Ethernet, standard	_____	_____
	Sun private net, 1 meter, PN 530-2149	_____	_____
	Sun private net, 5 meter, PN 530-2150	_____	_____
	Sun private net, SCI, 2 meter PN530-2360	_____	_____
	Sun private net, SCI, 5 meter PN530-2361	_____	_____
	Sun private net, SCI, 10 meter PN530-2362	_____	_____
	SCSI-2 Fast/Wide Single-ended, 0.8 meter PN 530-1884	_____	_____
	SCSI-2 Fast/Wide Single-ended, 2 meter PN 530-1885	_____	_____

Site Preparation and Planning 2

2.1 Space Planning

Table top space and other requirements are:

- The units require approximately 12–14 cm (3 in.) of space on each side and 1 meter (three feet) of space at the back for access by service personnel.
- Keep power and interface cables out of the way of foot traffic. Cables can be routed inside walls, under the floor, through the ceiling, or in protective channels. Interface cables should be routed away from motors and other sources of magnetic or radio frequency interference.
- Locate servers up to 100 meters (330 feet) from each other using twisted pair Ethernet cables for the Private Networks.

Note – Servers cannot be more than 2 meters (6.6 ft) apart when using Multipacks.

- Locate SPARCstorage Arrays up to 2 kilometers (1.24 miles) from the servers. Locate MultiPacks up to 2 meters (6.6 ft.) from the servers.
- Determine the layout for installation of your Ultra Enterprise 2 Cluster. Figure 2-1 and Figure 2-2 are examples of layouts.

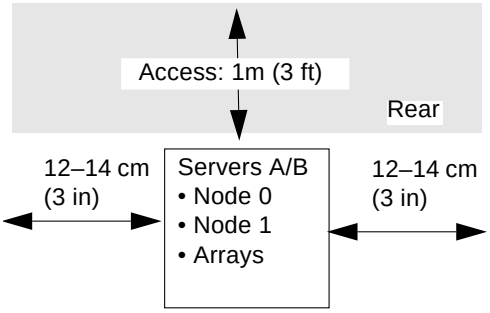


Figure 2-1 Ultra Enterprise 2 Cluster Layout for SPARCstorage Arrays Example 1 (Top View)

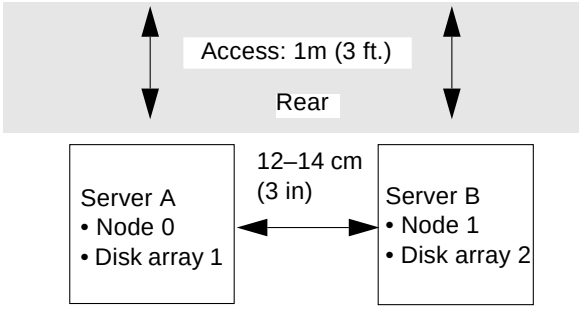


Figure 2-2 Ultra Enterprise 2 Cluster Layout for SPARCstorage Arrays Example 2 (Top View)

2.2 Power Requirements and Options

Each server should have a dedicated AC breaker panel and each of the main components should have a separate breaker. The servers should not share this breaker panel with related equipment. Each server has a single power cord that supplies AC power to the internal power supply. Internal components (disk drives, SBus cards, CD-ROM drive) receive DC power from an internal power supply.

Note – All external components (Terminal Concentrator, SPARCstorage Arrays or MultiPacks, and the system administration workstation) can be connected to individual power outlets to increase high availability.

Each server requires a 15A/125V (North America) or a 10A/250V (international) circuit. Use standard NEMA AC connectors. See *Power Cord Select Product Note*, part number 801-7173 and Table 2-1.

Table 2-1 Base Configuration Power Requirements

Unit Name	Number of outlets
Ultra Enterprise 2 Servers	2 (1 per node)
SPARCstorage Arrays	2 (1 per SSA)
SPARCstorage MultiPacks	2 (1 per SSM)
Terminal Concentrator	1
System Administration Workstation	1

2.3 Ethernet Networks

2.3.1 Public Network

Except for the Terminal Concentrator, which requires 10BASE-T or AUI Ethernet, this network is per customer choice. Currently, the mode of network communication is 10/100BASE-T.

2.3.2 Private Node-to-Node Network

Ultra Enterprise 2 Server Clusters follow the IEEE standard for 10/100BASE-T or AUI Ethernet. However, the SQEC SBus card only supports the 10BASE-T standard.

2.3.3 Ethernet Design Considerations

Note the following details when designing your Ethernet network:

- Use standard 802.3, 50-ohm Ethernet cable, capable of a 10/100-megabit/second transmission rate.
- Cable purchased in bulk should have marks on the casing every 2.5 meters.
- Attach transceivers, taps, and/or repeaters *only* at the 2.5 meter intervals on the cable.

- The maximum length of any standard Ethernet cable segment is 500 meters. This may consist of one continuous piece of cable or segments, but the segments must be in factors of 2.5 meters. (Spacing taps closer or farther apart disrupts cable impedance characteristics.) Cut the Ethernet cable only at 2.5-meter marks.
- The minimum length of any segment is approximately 24 meters.
- Connect the cable sheath conductor to earth ground.
- The distance between transceivers and/or taps must be in increments of 2.5 meters, and no closer than 2.5 meters from each other, and no farther apart than 500 meters.
- The path between two transceivers and/or taps cannot have more than one repeater.
- Install 50-ohm terminators on all ends of the Ethernet cable. Install the terminators in a transceiver outlet or at the end of the cable (for example, in the last transceiver at the end of the cable).
- The transceiver cable between the transceiver and workstation or terminal should be no longer than 50 meters.

If planning a large network (more than 40 workstations), you can improve local performance by grouping and connecting workstation-client clusters in small physical networks with gateway workstations to create your larger logical network.

Arranging workstation-client clusters according to work function, like engineering, accounting, and so on, is one possible scheme. Smaller networks (fewer than 40 workstations) may not benefit from this scheme. Figure 2-3 shows the elements used in the installation process.

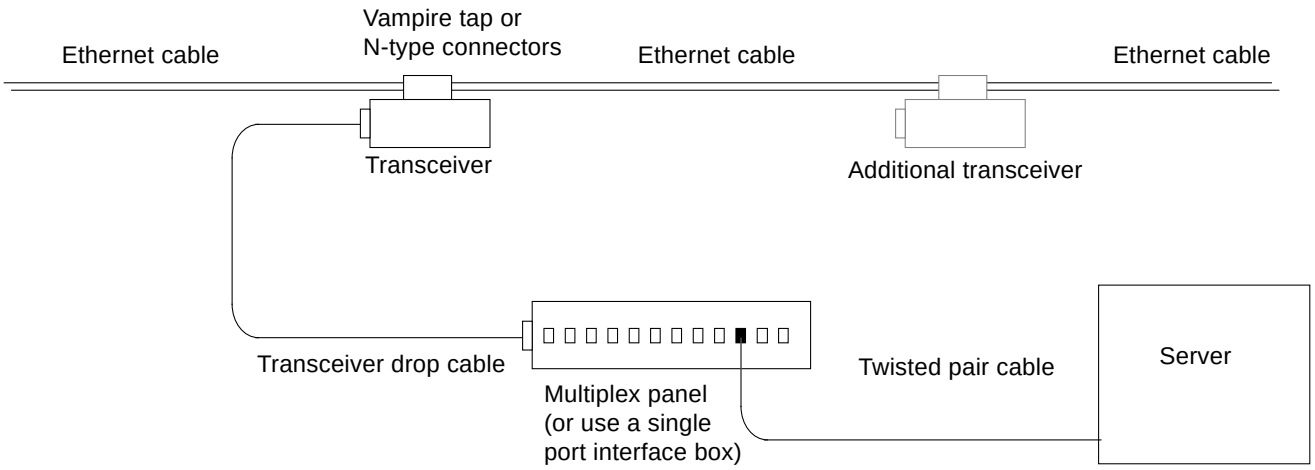


Figure 2-3 Connecting Twisted-Pair Ethernet to N-type Coaxial Cable

Determine whether to install a terminator. See Table 2-2, which lists the cabling limitations for Ethernet.

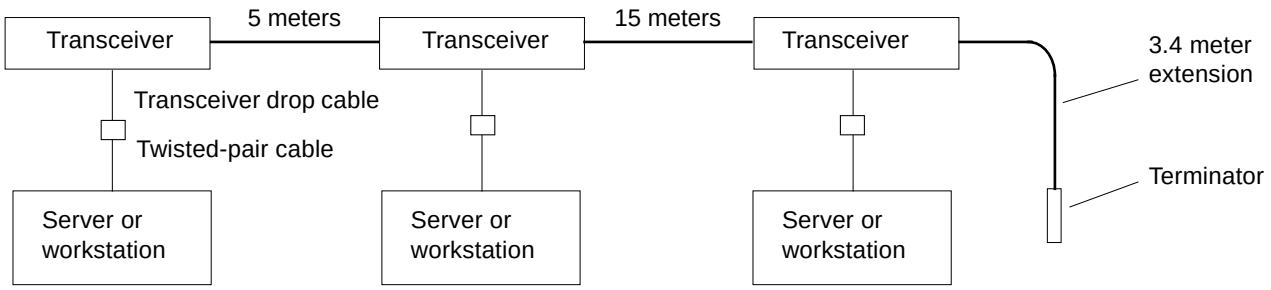
Table 2-2 Ethernet Cabling Limitations for N-type Coaxial Cable

Cable Segment	**Length in Meters**
Allowed contiguous length of cable segments	23.4, 70.2, 117.0, and 500.0[1]
Distance between transceivers (multiples-of)	2.5[2]
Minimum length of coaxial cable segments	23.4
Maximum length of transceiver “drop” cable	50.0

1. Finite lengths (as constrained by transmission line phenomena). Minimum length = 23.4M; maximum = 500M. If cable falls shorter than one of these values, add cable to achieve next-highest value.

2. Transceivers are placed at intervals of 2.5 meters, or multiples of 2.5 meters along the Ethernet cable.
Example: transceivers are connected 2.5 meters apart, not 2.0 meters.
Example: transceivers are connected 15.0 meters apart (6 multiples of 2.5 meters), not 14.0 meters.

Figure 2-4 is an example of a typical network setup. The server system can be any one of the systems in this figure.



Note: 5 meters + 15 meters + 3.4 meter extension = 23.4 meters minimum length allowed.

Figure 2-4 Ethernet Cabling Length — Example Using N-type Cable

If a terminator is required, install a 50-ohm terminator on the unused transceiver N connector or the end of the coaxial cable. Use a female double N-type connector.

Note – Sun equipment conforms to the Ethernet 10/100BASE-T standard, which states that the link test function should always be enabled on both the node and the hub. If you have problems verifying the connection between your Sun equipment and your hub, you need to verify that your hub also has the link test function enabled. Refer to the troubleshooting chapter in the applicable server system service manual and the manual provided with your hub for more information about the link test function.

2.3.4 Preparing the Public Network

Sun Microsystems follows the IEEE standard for 10/100BASE-T Ethernet, also known as twisted-pair Ethernet.

For 10/100BASE-T, two pairs of unshielded wires connect to each workstation or a server. One pair transmits and the other receives. The 10/100BASE-T cable is made up of twisted pairs. These cables use RJ-45 connectors.

The cable connects the computer to a hardware interface called a hub. A coaxial or fiber-optic cable connects the hub to the network. Single- and multiple-connection hubs are available commercially.

The maximum length of twisted-pair cables is 100 meters (330 feet). If cables connect together through a wall socket, the combined length should not exceed 100 meters. Figure 2-5 summarizes implementation of twisted-pair Ethernet.

Set up the Ethernet using Sun-supplied or third-party components. For best results, read the applicable manufacturer's instructions.

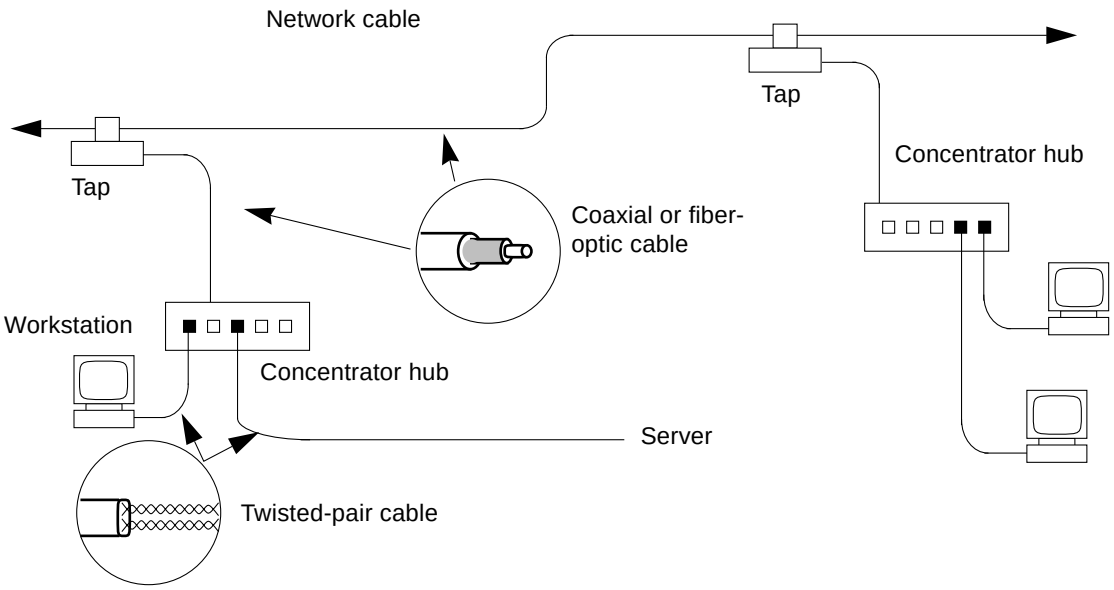


Figure 2-5 Example of 10BASE-T (Twisted-Pair) Ethernet

Note – Multiplexer boxes require a transceiver when used with the Ethernet applications described here. Although these transceivers are compatible with Sun equipment, Sun Microsystems does not guarantee the performance of any component not purchased from Sun.

Note – Many transceivers are compatible with both level-1 and level-2 Ethernet. To operate these transceivers with Sun equipment, set the device for level-2 operation using the manufacturer's instructions.

2.4 Serial Cables

2.4.1 RS-232C/RS-423A

This section addresses asynchronous cables used to connect your Sun servers and workstation to the terminal concentrator. Most systems allow you to select between two EIA interface standards, RS-232C or RS-423A.

Differences between the two standards are noted in Table 2-3, but an overlap in values of certain parameters exists. When interconnecting RS-423A with RS-232C circuits, remember that performance is limited to that of RS-232C.

Table 2-3 Open Circuit Voltages

	Open Circuit Voltages		
Recommended Standard	**Minimum**	**Maximum**	**Without Damage**
RS-232C	3.0V	25.0V	25.0V
RS-423A	4.0V	6.0V	12.0V

Table 2-3 shows a common operating area between ±4.0 and ±6.0 volts. However, there are differences between the two standards involving rise time, data rate, and cable length specifications.

RS-232C specifies that the rise time through the ± 3 volt transition should not exceed 4% of the signal element duration.

RS-423A generally requires much slower rise times, which are specified from 10%-90% of the total signal amplitude to reduce cross talk for operation over longer distances.

2.4.2 Cable Requirements

Evaluate the routing of cables to all equipment. Keep cable runs short to increase interface reliability. Other considerations include:

- Make cable runs to equipment outside the computer room as direct as possible.
- Place equipment in the computer room to minimize cable run length to units outside the room.

- Where necessary, plan extra cable length to:
  - Allow cables to be routed clear of strong radio frequency interference (RFI) fields
  - Allow system expansion or relocation
  - Allow service personnel access

2.4.2.1 *Cable Length*

Where possible, use short serial-interface cables for 9600 baud. Longer cables can be used, provided the resultant load capacitance, measured at the interface point and including the signal terminator, does not exceed 2500 picofarads. The maximum cable length is 100 meters.

For further information see “EIA STANDARD RS-232C” and “EIA STANDARD RS-423A.” EIA RS-232C cabling specification is available from:

Electronics Industries Association
2001 I Street N.W.
Washington, D.C. 20006 USA
Phone: (202) 457-4900

Note – Sun Microsystems cannot guarantee proper system operation when maximum specified cable lengths are exceeded.

2.4.2.2 *Shield Ground (Drain)*

Some interface applications require use of shielded cable to minimize radio frequency interference (RFI) or for other reasons. When you use shielded cable, connect the shield to frame ground at one or both ends depending on the specific application.

Note – On Sun Microsystems DB-25 connectors, the shield ground lead can be connected to Pin 1 at the Sun system end (Protective Ground).

2.4.2.3 *Generic Pinouts*

Table 2-4 provides a cross-reference of pinouts for Sun workstations to standard EIA RS-232C and CCITT designations.

Table 2-4 Generic Pinouts for Sun System Boards and Communications Products

Pin #	**Signal Description**	**Designation**	
(25 pin)		**EIA**	**CCITT**
1	Protective Ground	AA	101
2	Transmitted Data	BA	103
3	Received Data	BB	104
4	Request To Send	CA	105
5	Clear To Send	CB	106
6	Data Set Ready	CC	107
7	Signal Ground	AB	102
8	Data Carrier Detect	CF	109
15	Transmit Clock In (DCE Source)	DB	114
17	Receive Clock In (DCE Source)	DD	115
20	Data Terminal Ready	CD	108.2
24	Transmit Clock Out (DTE Source)	DA	113

Hardware Configurations 3

This chapter describes the cluster configuration requirements and contains interface and cabling information for five basic cluster configurations with two different private network options. Use these as a guide to assembling your cluster.

3.1 SBus Card Complements

Figure 3-1 through Figure 3-6 and Table 3-1 and Table 3-2 identify the SBus card complements and slot positions by type for each of the possible configurations. Install the appropriate quantity and types of SBus cards in each node of your system.

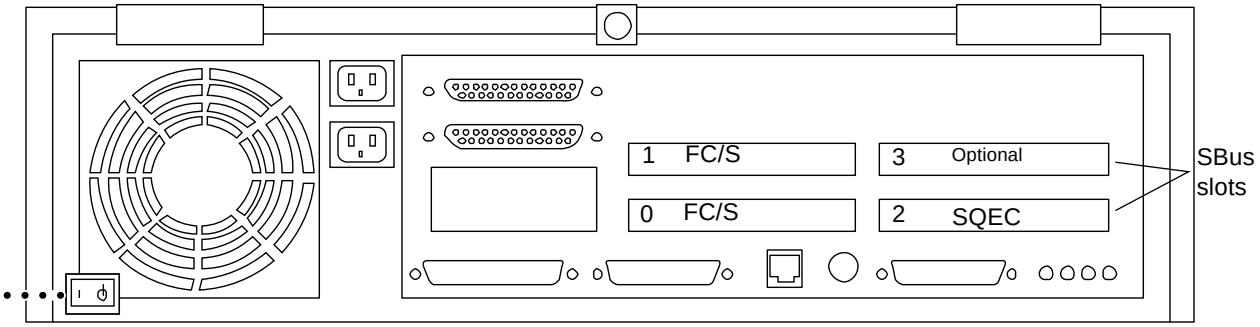


Figure 3-1 SBus Card Slot Positions - Configuration 1 for HA Clusters Using SPARCstorage Arrays

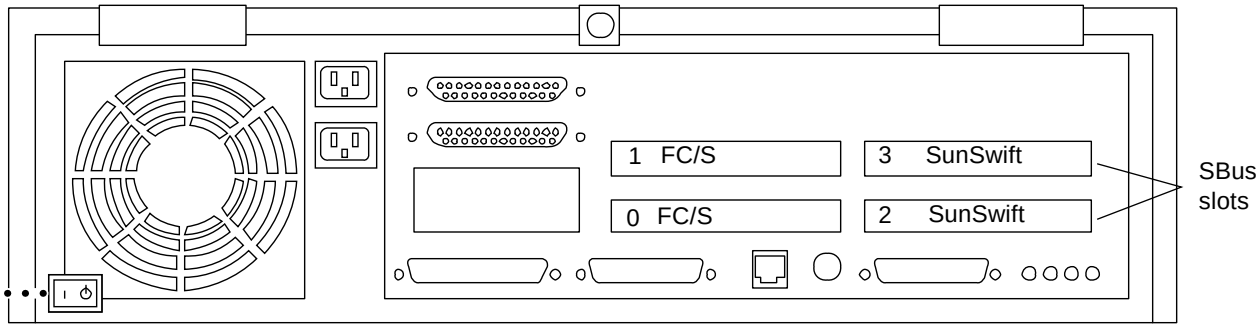


Figure 3-2 SBus Card Slot Positions - Configuration 2 for PDB Clusters Using SPARCstorage Arrays

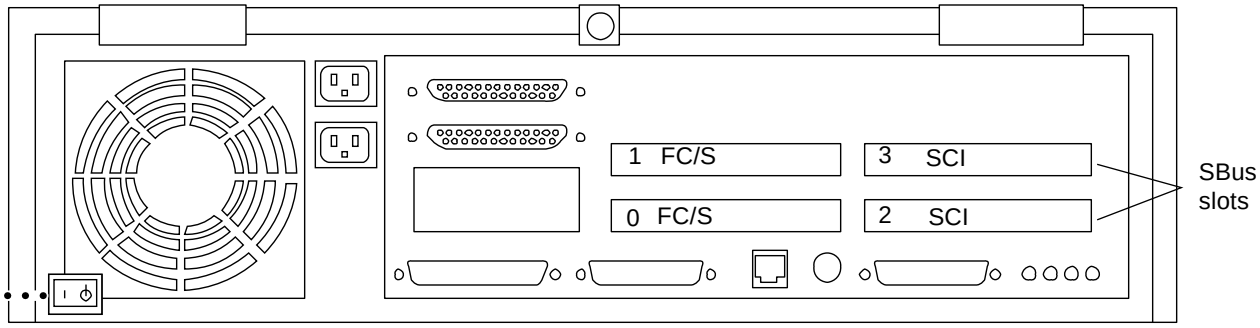


Figure 3-3 SBus Card Slot Positions - Configuration 3 for PDB Clusters Using SPARCstorage Arrays

Note – For all configurations, the SBus card complement in both nodes must be identical.

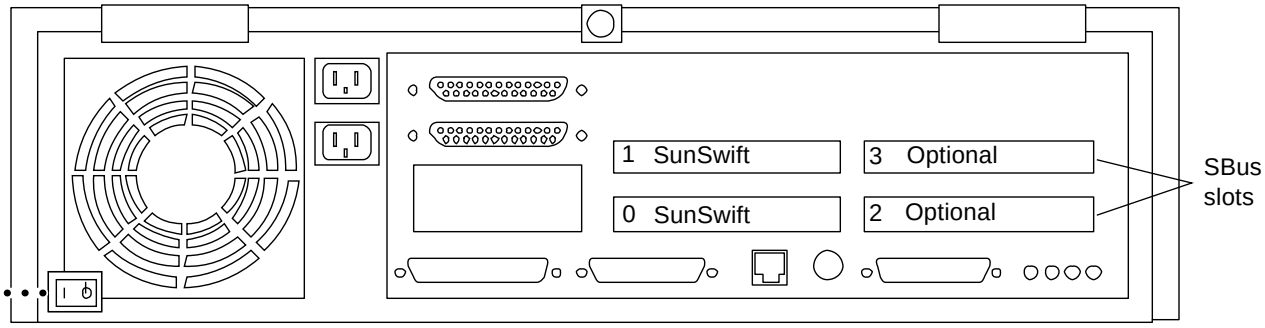


Figure 3-4 SBus Card Slot Positions - Configuration 4 for HA and PDB Clusters Using SPARCstorage MultiPacks

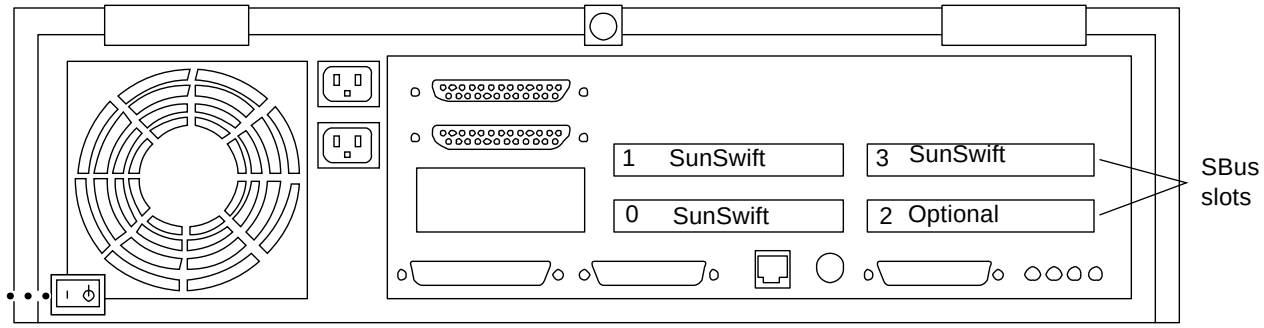


Figure 3-5 SBus Card Slot Positions - Configuration 5 for HA and PDB Clusters Using SPARCstorage MultiPacks

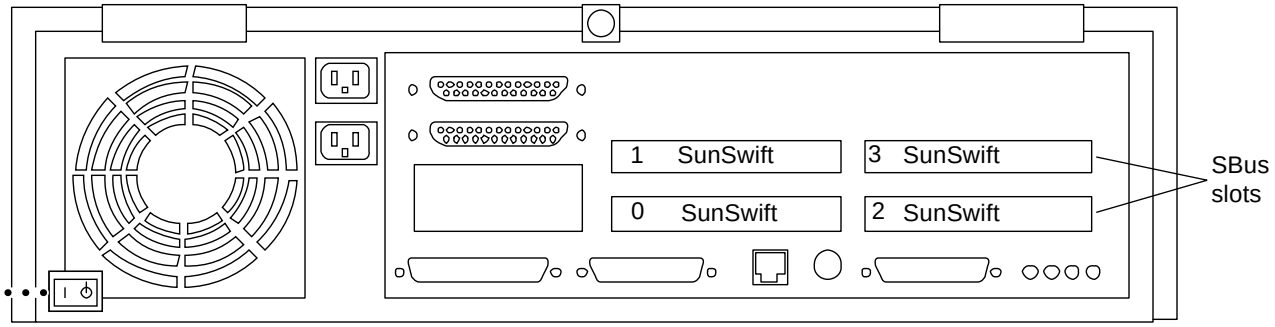


Figure 3-6 SBus Card Slot Positions - Configuration 6 for HA and PDB Clusters Using SPARCstorage MultiPacks

Table 3-1 SBus Card Complement for HA and PDB Clusters Using SPARCstorage Arrays

SBus Card	**Configuration 1** per node **(HA)**	**Configuration 2** per node **(PDB)**	**Configuration 3 per node (PDB)**
SQEC	1	0	0
FC/S	2 (3rd optional[1])	2	2
SunSwift	0	2	0
SCI	0	0	2
FDDI or SFE	1 (optional)	0	0

1. Optional SBus card can be and FC/S card or a network card

Table 3-2 SBus Card Complement for HA and PDB Clusters Using SPARCstorage MultiPacks

SBus Card	**Configuration 4** per node	**Configuration 5** per node	**Configuration 6** per node
SunSwift	2	3	4
SCI	2[1]	0	0
FDDI or SFE	2 (optional)	1 (optional)	0

1. SCI cards can only be used for Private Networks in PDB configurations.

Figure 3-7 through Figure 3-13 show the cabling for the cluster configurations. Section 5.3, “Cabling the System” contains detailed cabling procedures.

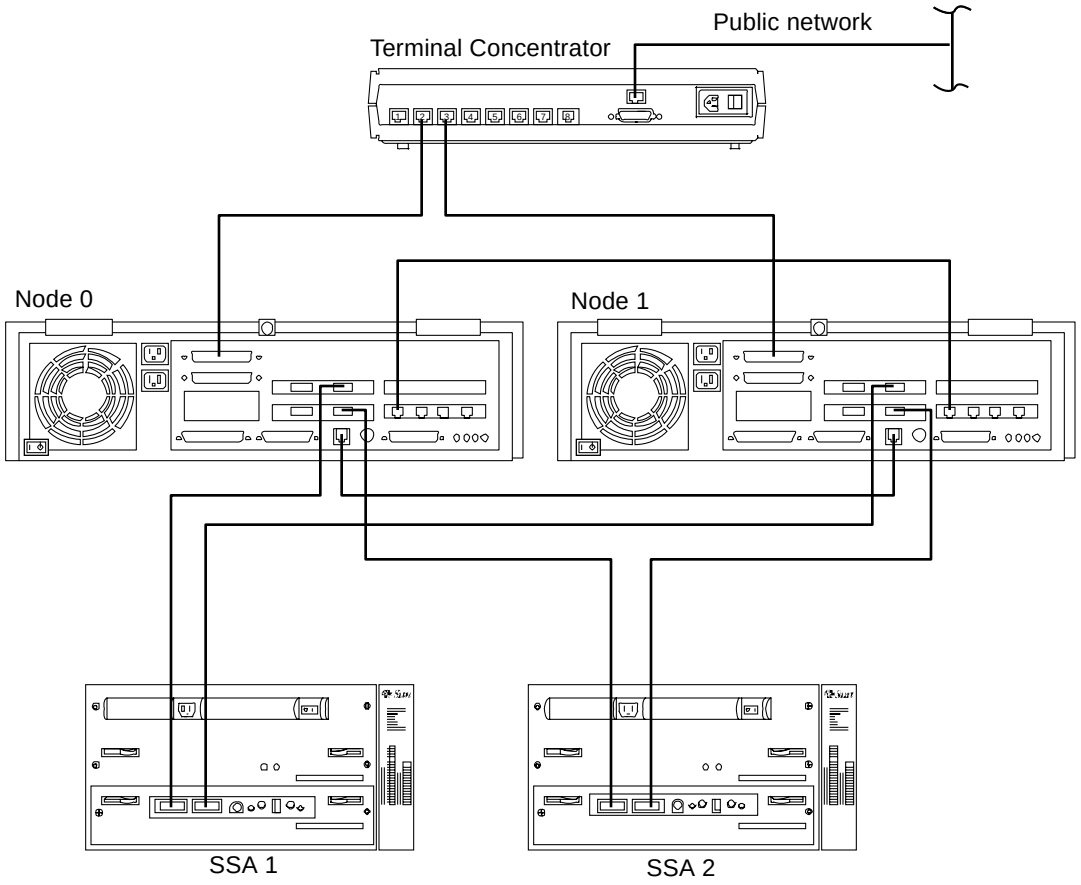


Figure 3-7 Cluster Cabling - Configuration 1 for HA Clusters

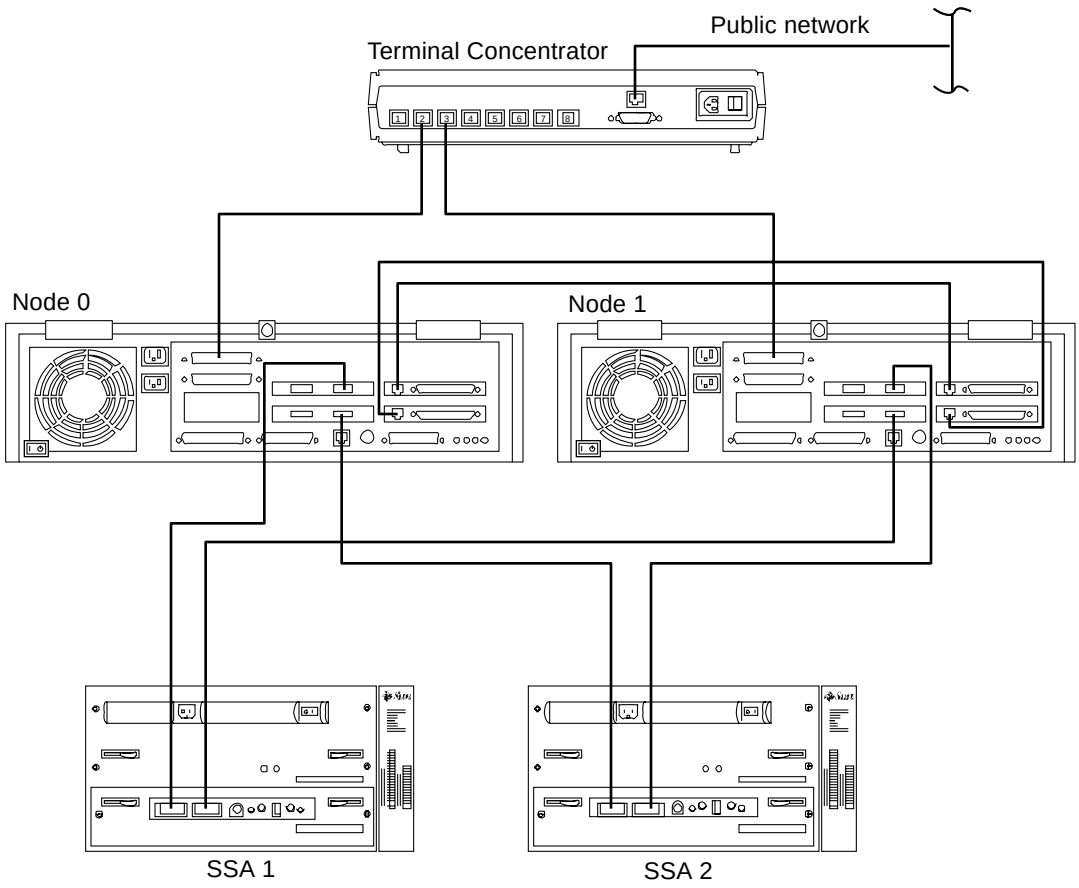


Figure 3-8 Cluster Cabling- Configuration 2 for PDB Clusters Using SunSwift for the Private Net

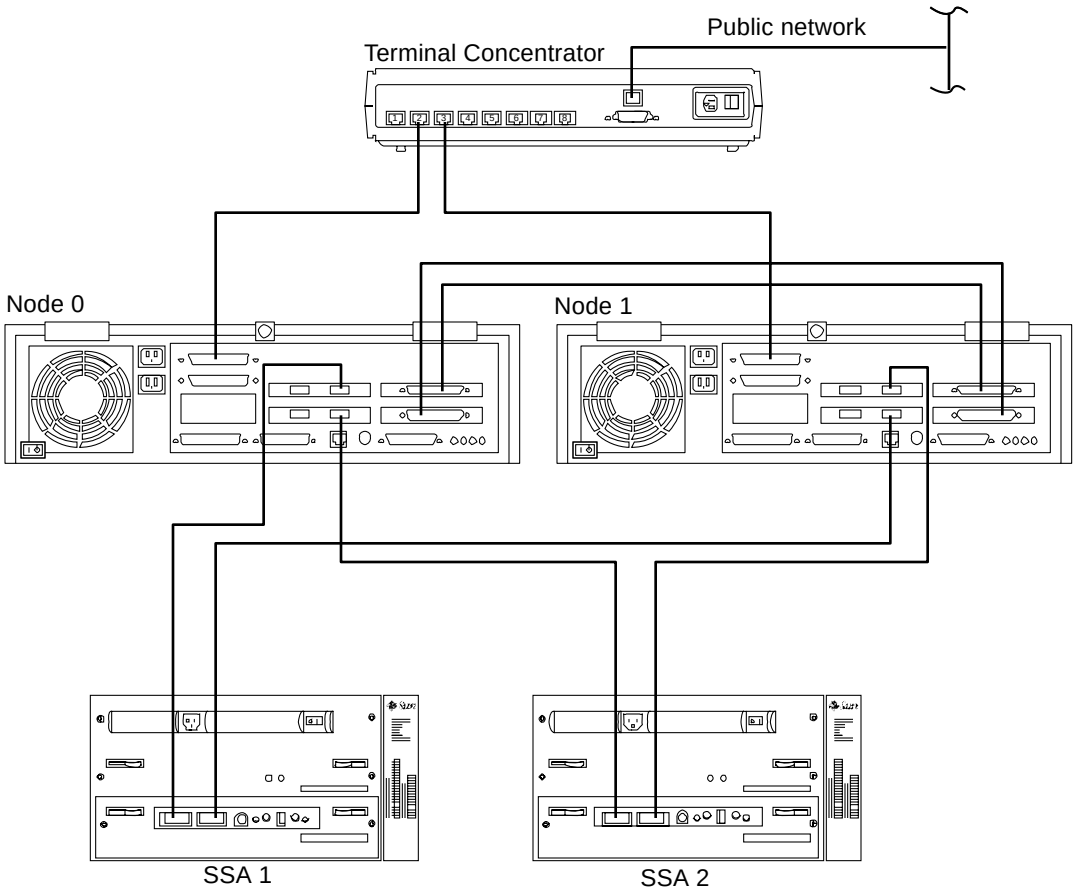


Figure 3-9 Cluster Cabling- Configuration 3 for PDB Clusters Using SCI for the Private Net

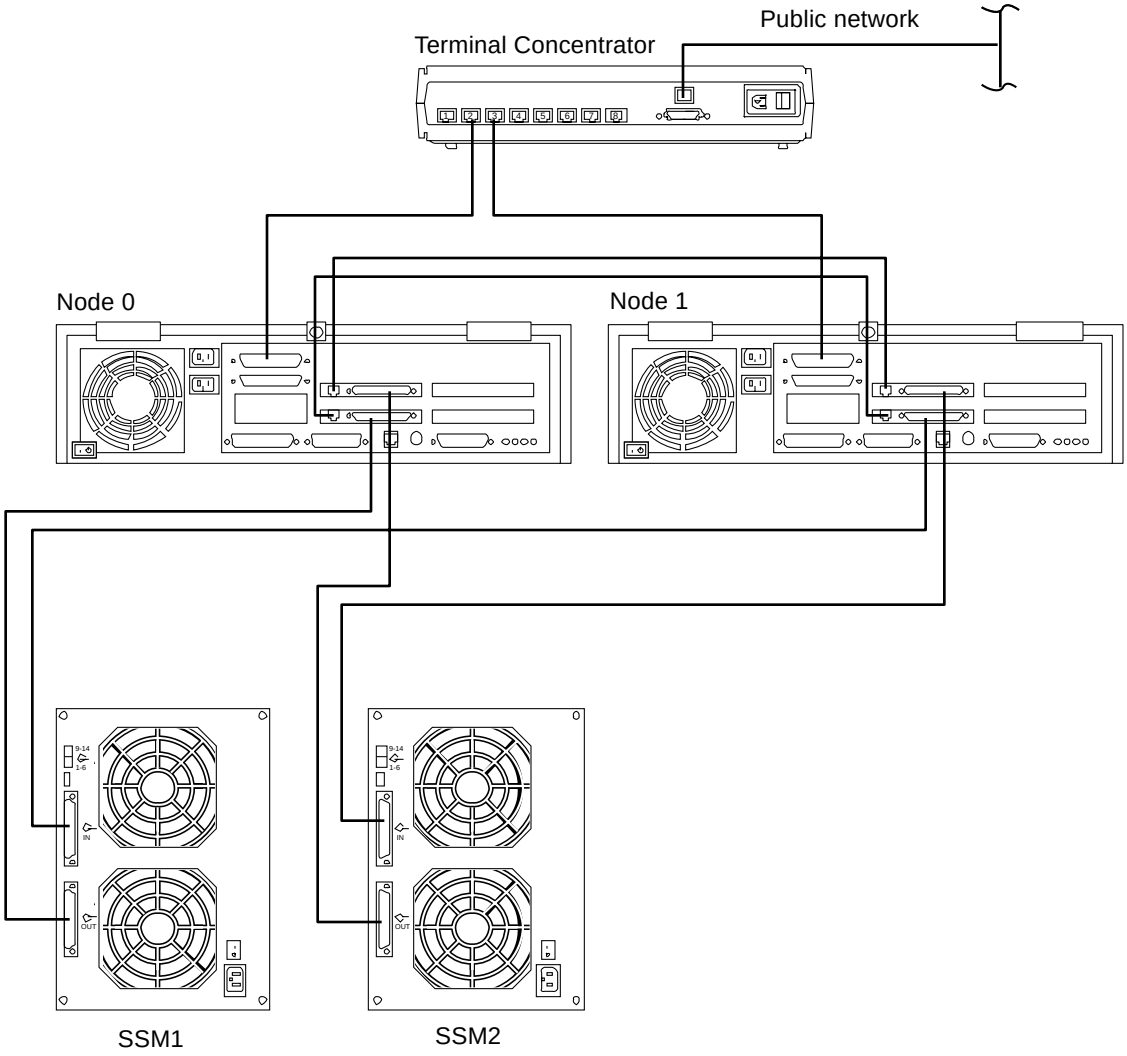


Figure 3-10 Cluster Cabling - Configuration 4 for HA and PDB Clusters Using SunSwift for the Private Networks

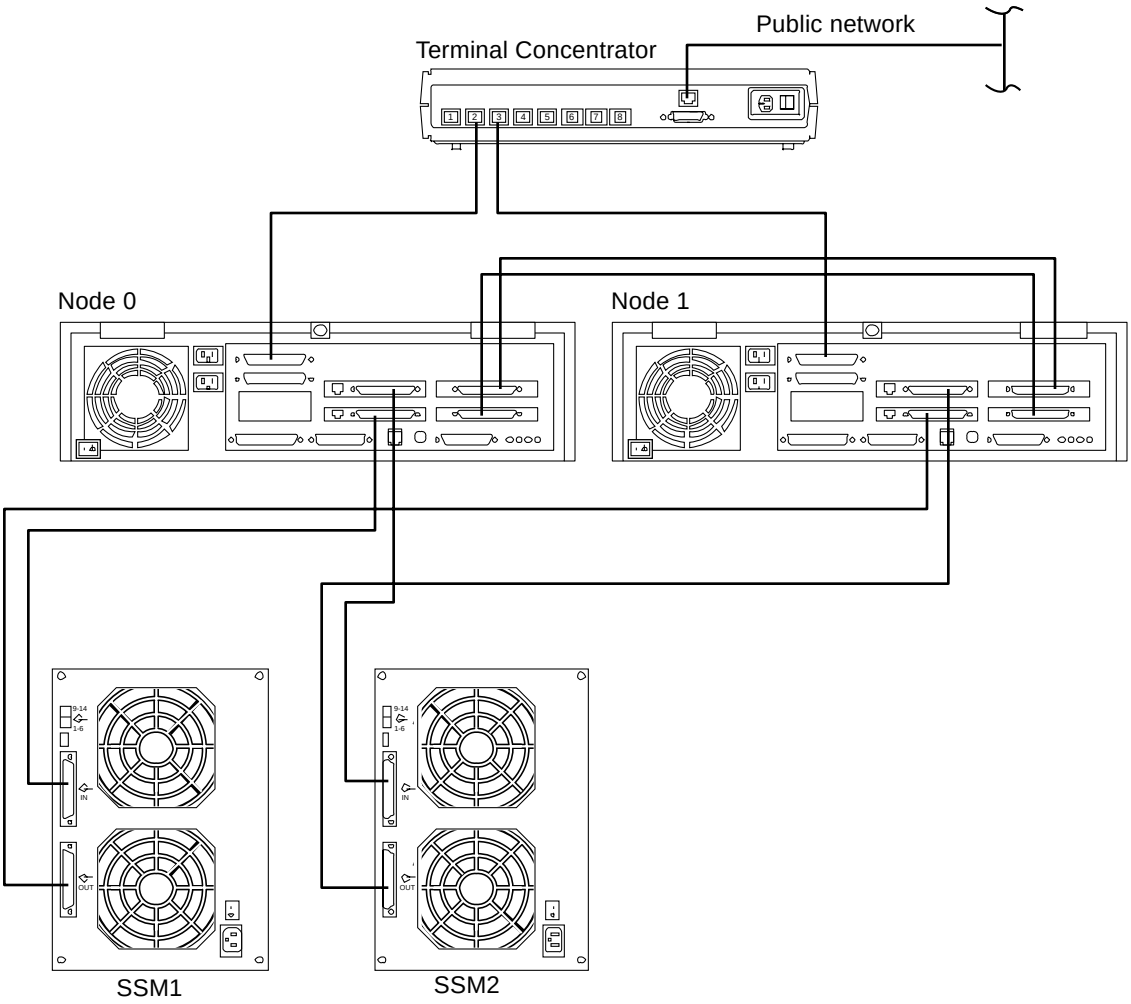


Figure 3-11 Cluster Cabling - Configuration 4 for PDB Clusters Using SCI for the Private Networks

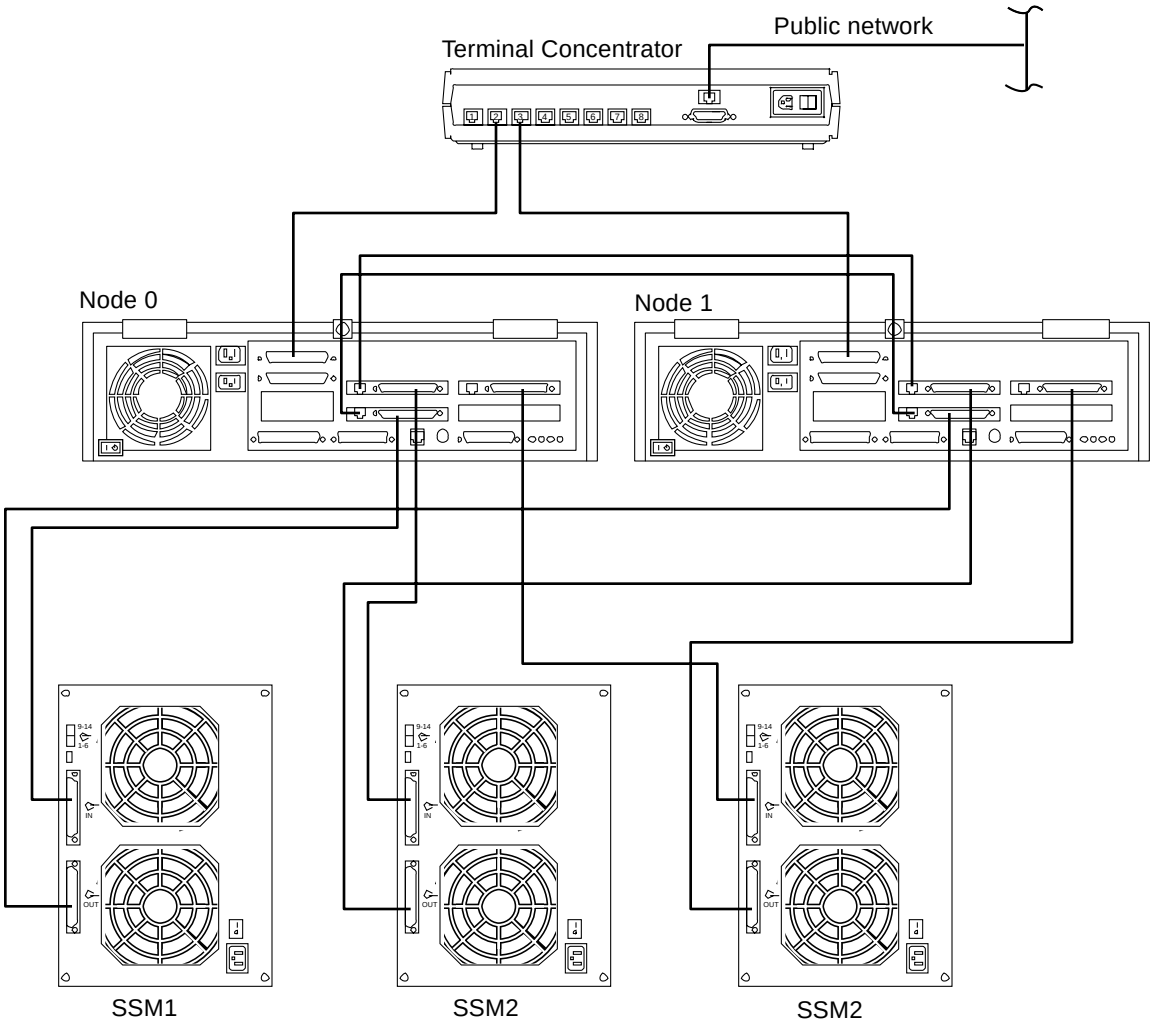


Figure 3-12 Cluster Cabling - Configuration 5 for HA and PDB Clusters

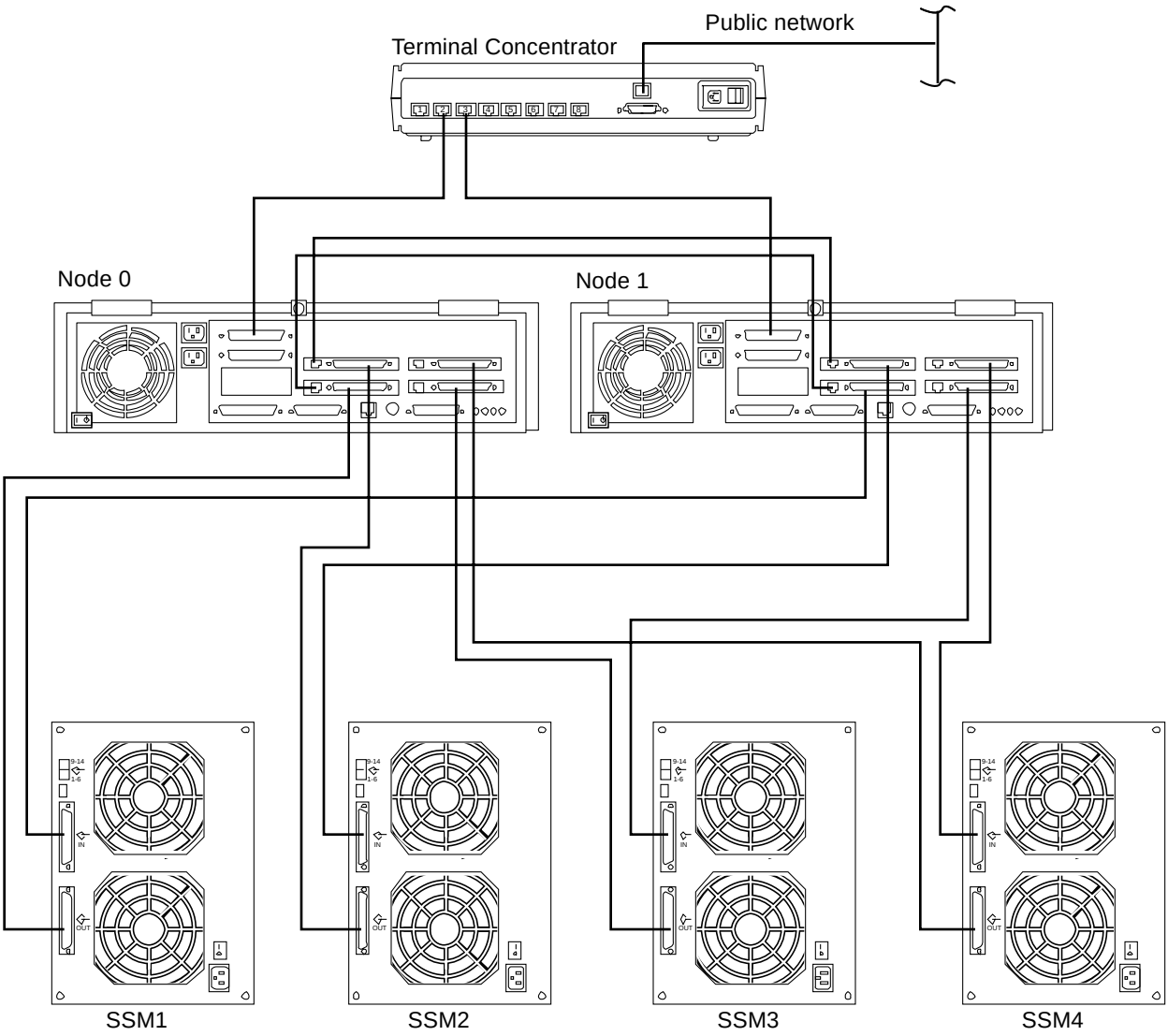


Figure 3-13 Configuration 6 for HA and PDB Clusters

3.1.1 Terminal Concentrator

The Terminal concentrator can support three clusters. This unit connects to:

- Node 0 and node 1 through a serial adapter cable connected to Serial A port on the system boards in each node
- The public network

3.1.2 Administration Workstation

The administration workstation connects to:

- The terminal concentrator directly through a serial adapter cable
- The public network

Cabling details are illustrated in Section 5.3.1, “Connecting the Administration Workstation.”

3.1.3 Public Network

HA and PDB clusters have two public network connections. One of these connects the terminal concentrator to the public network so that both nodes can be accessed from administration workstation. The other one connects the nodes to the network so that clients can access the nodes directly. In cluster HA configurations using SPARCcluster Storage Arrays, this connection is made via the second port on the SQEC or the FDDI option. In HA and Cluster PDB configurations using SPARCstorage MultiPacks, this connection is made via the onboard Ethernet port.

3.1.4 Private Network (Node 0 to Node 1)

The two nodes are connected over two private network links. These two links eliminate the possibility of a single point of failure. Sun Private Network cables must be used. For SunSwift cards, use 2-meter (part number 530-2149) or 5-meter (part number 530-2150) Sun private net cables. For SCI cards (PDB only), use 2-meter (part number 530-2309), 5 meter (part number 530-2310), or 10-meter (part number 530-2311) Sun private net SCI cables.

3.1.4.1 HA Clusters

SQEC and onboard connections

In each node, communication is performed by a 10 Mbit/sec SQEC card and a 100 MBit/sec onboard Ethernet port. Two SQEC cards support one link of the cluster. The onboard Ethernet ports support the other link. The two cables connect the two nodes directly—no hubs are used. Cabling details are illustrated in Section 5.3.4, “Connecting Private Nets Using SQEC and Onboard Ethernet Ports.

SunSwift connections

In each node, communication is performed by ports on the SunSwift SBus Adapter cards. Two SBus cards support one link of the cluster and two additional cards support the other link. Two cables connect the two nodes directly—no hubs are used. Cabling details are illustrated in Section 5.3.5, “Connecting the Private Nets Using SunSwift SBus Adapter Cards”

3.1.4.2 PDB Clusters

In each node, communication is performed by ports on the SunSwift SBus Adapter cards or by SCI SBus Adapter cards. Two SBus cards support one link of the cluster and two additional cards support the other link. Two cables connect the two nodes directly—no hubs are used. Cabling details are illustrated in Section 5.3.5, “Connecting the Private Nets Using SunSwift SBus Adapter Cards” or Section 5.3.6, “Connecting the Private Nets Using SCI SBus Adapter Cards.”

3.1.5 SPARCstorage Arrays

Connection to the SPARCstorage Arrays is over fiber-optic cables. You will need four to six fiber-optic cables to connect the arrays to the nodes. Figure 3-7 through Figure 3-8 show the cable runs. Cabling details are illustrated in Section 5.3.9, “Cabling the SPARCStorage Arrays.”

3.1.6 SPARCstorage MultiPacks

Connection to the SPARCstorage MultiPacks is over SCSI-2 cables. You will need four to eight cables total or two to four per node and two to four SunSwift SBus Adapter cards to connect the MultiPacks to the nodes. Figure 3-9 through Figure 3-13 show the cable runs.

3.2 Setting `scsi-initiator-id` on an Ultra Enterprise 2 Cluster

Caution – After reviewing the first part of this section, complete the procedure on node1 *before* any MultiPacks are connected to the node.

The SPARCstorage MultiPacks in an Ultra-2 cluster are dual-ported to the cluster hosts by simple SCSI connections. Unlike SPARCstorage Arrays, the SPARCstorage MultiPacks do not have any intelligent controllers associated with them. Therefore, it is essential that all devices on a single SCSI chain have a unique target ID (alternately known as the `scsi-initiator-id`). This ID not only includes all the disks in a MultiPack, but also the two hosts (or more precisely, the SunSwift™ adapter cards) to which the SCSI cables are connected from the MultiPack.

Note – If target IDs on a SCSI chain are not unique, the system may hang during the boot sequence or experience frequent SCSI bus resets.

Since the factory default `scsi-initiator-id` for all adapter cards on the system is 7, it is suggested that the `scsi-initiator-id` for all the SunSwift cards on one host be 7 and those on the other host be set to 6. Therefore, the procedure outlined below must be done on only one of the cluster hosts.

The easiest way to accomplish this configuration is to set the Initiator ID for one of the cluster hosts to 6 and then to change the `scsi-initiator-id` for the on-board SCSI controller to 7. This configuration is set from the OpenBoot™ PROM (OBP) Monitor.

Table 3-3 SCSI Initiator ID Settings

Controller Instance	Cluster Node A Initiator ID	Cluster Node B Initiator ID
0 (internal)	7	7
1	7	6
2	7	6

Setting Up the `nvramrc` *Script in the OBP Monitor*

The OpenBoot PROM Monitor builds its own device tree based on the devices attached to the system when the boot sequence is invoked. The OBP Monitor has a set of default aliases for the commonly occurring devices in the system.

A `nvramrc` script contains a series of OpenBoot PROM commands that are executed during the boot sequence. It is assumed that this file is nonexistent and will be created. The steps to create or edit a `nvramrc` script are similar. You need to be familiar with `nvramrc` Editor Keystroke Commands. Table 3-4 lists the most useful commands.

Table 3-4 `nvramrc` Editor Keystroke Commands

Keystroke	Command
^N	Go to next line
^P	Go to previous line
^A	Go to beginning line
Carriage Return	Insert after current line
^K	Delete until end of line
^R	Replace the current line
^C	Save and exit editor

Note – The caret symbol ^ in the preceding table indicates that you should press the Control key and the next character simultaneously. For example, to move to the next line, press the Control key and the n key together.

In the following example, you are changing the `scsi-initiator-id`s for the SunSwift cards associated with the MultiPacks on cluster host node1.

Caution – Complete this procedure on node1 *before* any MultiPacks are connected to it.

1. Enter the OBP Monitor by shutting down the system:

```
# shutdown -g0 -y -i0
```

2. Set the NVRAM parameters to the default values.

```
ok set-defaults
Setting NVRAM parameters to default values.
ok
```

3. Set the `scsi-initiator-id` to 6.

```
ok setenv scsi-initiator-id 6
scsi-initiator-id = 6
ok
```

4. Enter the `nvedit` command to create and store an `nvramrc` script.
The line numbers (`0:`, `1:`, and so on) are printed by the OpenBoot PROM Monitor. See Table 3-4 for the `nvramrc` editor keystroke commands.

```
ok nvedit
0: dev scsi
1: 7 encode-int " scsi-initiator-id" property
2: device-end [Control-c]
ok
```

Caution – Insert exactly one space after the double quote and before `scsi-initiator-id`.

5. Store or discard the changes.

The changes you make using the `nvedit` command are done on a temporary copy of the `nvramrc` script. You can continue to edit this copy without risk. Once you are through editing, save the modifications. If you are not sure about the changes, discard them. If, for any reason, you do not want to save the contents of the `nvedit` buffer, type:

```
ok nvquit
ok
```

To store the changes, type:

```
ok nvstore
ok
```

Note – Before proceeding any further, you must have successfully created the `nvramrc` script and saved it by using `nvstore`.

6. Verify the contents of the `nvramrc` script you created in Step 4.

```
ok printenv nvramrc
nvramrc =  dev scsi
7 encode-int " scsi-initiator-id" property
device-end
ok
```

If the output differs from what you have entered, go back to Step 4 and edit `nvramrc` again.

7. **Do a test of the** `nvramrc` **script by entering the** `nvramrc evaluate` **command. Verify the** `scsi-initiator-id` **of the host.**

```
ok nvramrc evaluate
ok printenv scsi-initiator-id
scsi-initiator-id =   6
ok
```

8. **If the overall** `scsi-initiator-id` **for this host is not 6, then repeat Step 3 before continuing with the verification.**

9. **Verify that the** `nvramrc` **script works properly. If the** `scsi-initiator-id` **for the on-board SCSI controller is not set to 7, then re-edit the** `nvramrc` **script by repeating Step 4 and Step 5.**

```
ok cd scsi
ok .properties
hm-rev                   00 00 00 22
scsi-initiator-id        00000007
device_type              scsi
clock-frequency          02625a00
intr                     00000020 00000000
interrupts               00000020
reg                      0000000e 08800000 00000010
                        0000000e 08810000 00000040
name                     SUNW,fas
ok
```

In the preceding output, the `scsi-initiator-id` has a value of `00000007` so the script worked properly.

10. **Instruct the OpenBoot PROM Monitor to use the** `nvramrc` **script.**

```
ok setenv use-nvramrc? true
ok printenv use-nvramrc?
use-nvramrc? =        true
ok
```

11. **On the cluster host node2, verify that the** `scsi-initiator-id` has a value of **7.**

```
ok printenv scsi-initiator-id
scsi-initiator-id =   7
ok printenv use-nvramrc?
use-nvramrc? =        false
ok
```

If the output is not 7 and `false`, repeat this procedure on node2 to set the `scsi-initiator-id` to 7 on this node.

```
ok setenv scsi-initiator-id 7
and/or
ok setenv use-nvramrc ? false
```

12. **Load the patches for the fas driver (`104246-02`) and the sd driver (`103622-02`) on *both* nodes in the cluster.**

13. **Connect the MultiPacks to both hosts and reboot both systems using the `-r` option.**

```
ok boot -r
```

You have completed the last step of the OBP Monitor setup.

3

Powering Off and On System Components

4

For the following procedures, you may need to install an administration workstation. See Section 5.3.1, “Connecting the Administration Workstation” for this procedure.

Warning – Before performing the procedures in this section, the power for all components must be turned off or risk of electrical shock exists.

Caution – Performing these procedures on a server node in an “online” cluster could cause irrecoverable data loss and a system crash. Use these power off/on procedures ***only*** for servers that are:

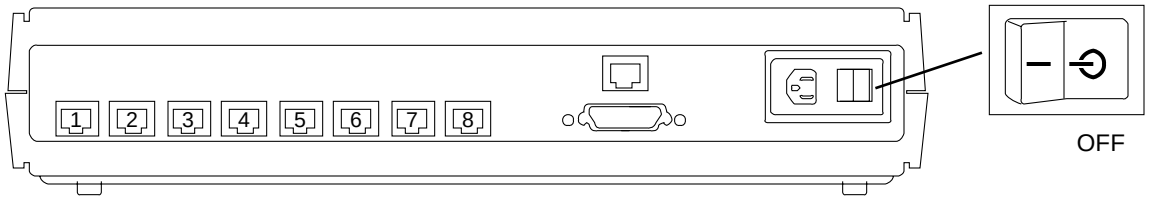
- Newly installed or in process of being installed
- ***NOT*** running the HA data services

Note – When using the procedures in this section, you are powering off the server you are currently installing. This system has neither users nor data files to be concerned with. For powering off or on a server that is operating as a node in a live cluster, refer to the *Solstice HA 1.3 User’s Guide* or the *Ultra Enterprise Cluster PDB Administration Guide*.

4

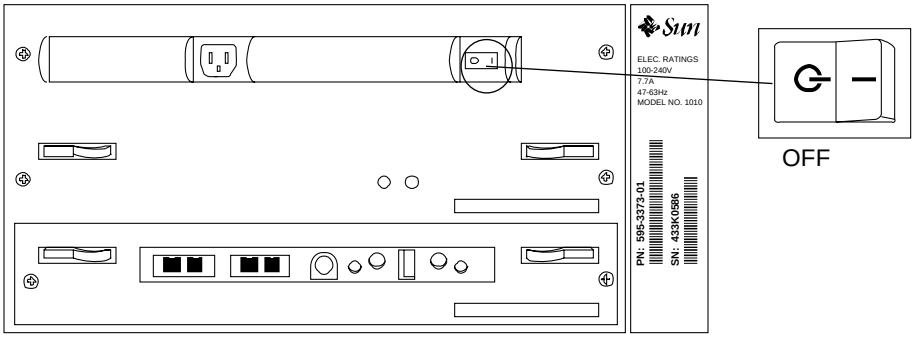
4.1 Powering Off the Terminal Concentrator

♦ **Set the rear panel AC power switch to OFF.**



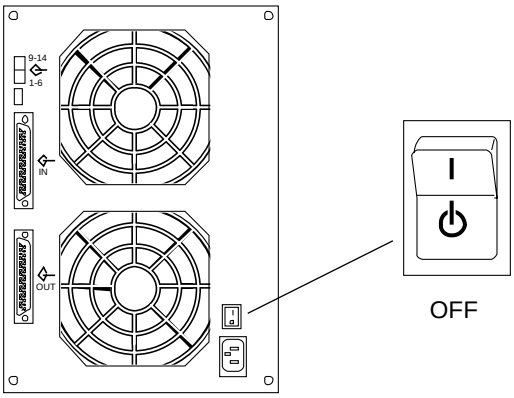
4.2 Powering Off a SPARCstorage Array

♦ **Set the rear panel AC power switch to OFF.**



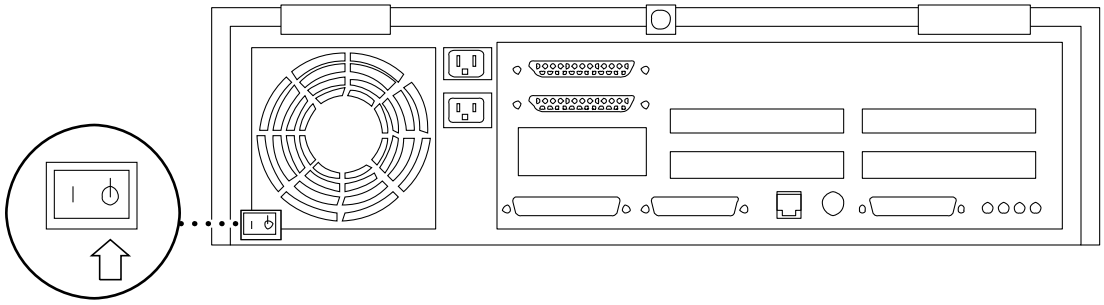
4.3 Powering Off a SPARCstorage MultiPack

♦ **Set the rear panel AC power switch to OFF.**



4.4 Powering Off an Ultra Enterprise 2 Server

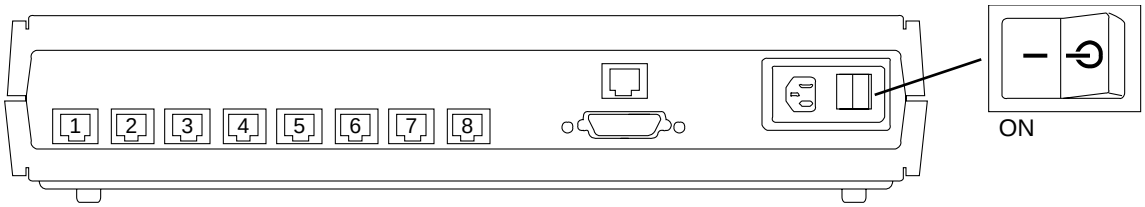
♦ **Set the rear panel AC power switch to OFF.**



Caution – Before attempting to install SBus cards in the servers, turn off the AC power, but leave the power cord plugged into the utility outlet to ground the unit.

4.5 Powering On the Terminal Concentrator

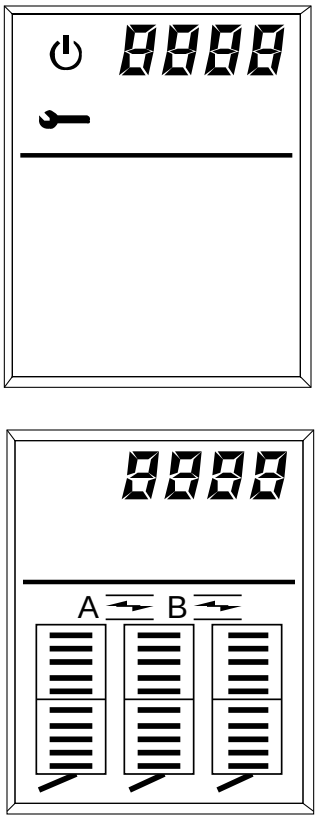
♦ **Set the rear panel AC power switch to ON.**
The lamp on the front panel lights as the terminal concentrator boots. The terminal concentrator is ready when the LOAD indicator on the front panel goes off.



4.6 Powering On a SPARCstorage Array

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

1. **Begin with a safety inspection.**
   a. **Ensure that the SPARCstorage Array AC power switch is OFF.**
   b. **Verify that the power cord is connected to the chassis and a wall socket.**
2. **Set the AC power switch to ON.**
   You should hear the fans begin to turn.
3. **Watch the front panel LCD display.**
   When powering on, the LCD displays the icons shown in Figure 4-1. It may take some time for a disk array to boot, depending on the total number of disk drives in the array. For example, an array with 18 disk drives may take several minutes to boot, whereas an array with 30 disks drives may take much longer to boot.



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

  If problems are detected during POST, an error code is flashed continuously on the alphanumeric LCDs. See Section 3.2.3,"SPARCstorage Array Fails to Communicate," in the *Ultra Enterprise 2 Cluster Service Manual* for a listing and explanation of the POST error codes.

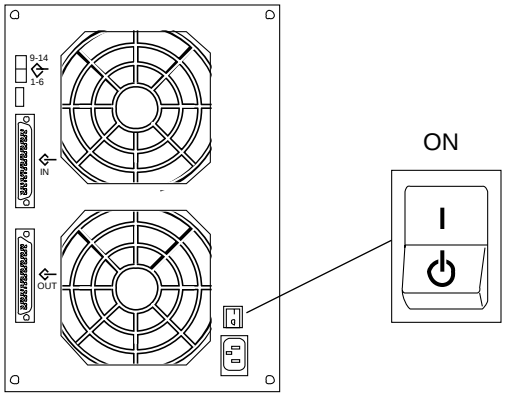
- After POST is completed, the following will be displayed in this order:
  - The last four digits of the World Wide Name for the particular SPARCstorage Array.
  - One or two fiber icons, which indicate the status of the fiber links.
  - A drive icon (solid bar) for each installed drive in the drive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

Figure 4-1 Power-On LCD Display

4.7 Powering On a SPARCstorage MultiPack

Caution – Never move a SPARCstorage MultiPack when the power is on. Failure to heed this warning may 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.**
   b. **Verify that the power cord is connected to the chassis and a wall socket.**
2. **Set the AC power switch to ON.**
   You should hear the fans begin to turn.

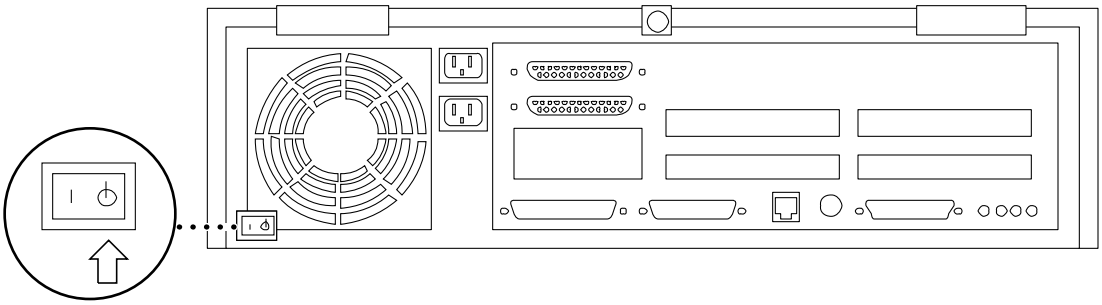


4.8 Powering On an Ultra Enterprise 2 Server

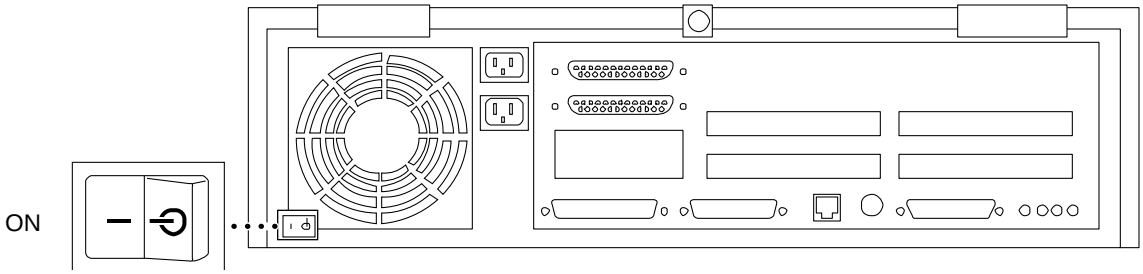
Caution – Never move the server when the system power is on. Excessive movement can cause a catastrophic failure of the internal disk drive (s). Always power the server OFF before moving it.

1. **Begin with a safety inspection.**
   a. **Ensure that the rear panel AC power switch is OFF.**

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



2. Set the AC power switch to ON.
You will hear the fan spinning up and see the green LED on the front of the server light up.



4.9 Reading POST Messages and Boot Messages

Refer to the server installation and / or service manual. Read the sections covering Power-On Self-Test (POST) messages and boot messages to interpret the messages.

4

Hardware Installation 5

5.1 Preparing the System Components

1. **If you have not already done so, unpack and inventory the equipment.**
   See Chapter 1, “Component Checklist,” for a list of equipment.
2. **Move the equipment to its designated installation location.**
   For site planning guidelines, see Chapter 2, “Site Preparation and Planning.”
3. **Ensure that the AC power switches on all system components are OFF.**
   See Chapter 4, “Powering Off and On System Components.”

Warning – Risk of electrical shock exists. Before you perform the procedures in this section, turn off the power for all components.

5.2 Installing the Ultra Enterprise 2 Cluster

The cluster contains two identically configured Ultra Enterprise 2 Servers and two or three SPARCstorage Arrays or two to four SPARCstorage MultiPacks, depending the type of cluster software being supported. Each SPARCstorage Array or MultiPack should have a minimum of six disk drives.

Note – You can locate SPARCstorage Arrays up to 2 km (1. 24 mile) from the servers. MultiPacks can be only be located up to 2 meters (6.6ft.) from the servers.

5.2.1 Preparing the SPARCstorage Arrays

1. **Locate the DIAG switch on the array rear panel (Figure 5-1).**
2. **Ensure that the DIAG switch is set to DIAG.**
   Do not use the DIAG EXT position as it invokes extended diagnostics and increases the system boot time. Use the DIAG position for normal operation.
3. **Locate the serial number label on the rear panel of the chassis (Figure 5-1).**
4. **Check the electrical ratings label on the serial number label. Verify that the stated rating matches your AC input voltage.**

5.2.2 Connecting the Power

1. **Ensure that the AC power switches on all system components are OFF.**
2. **Connect the server, SPARCstorage Array and terminal concentrator power cords.**
   Connect a power cord at the rear of each system component (Figure 5-1 through Figure 5-4).

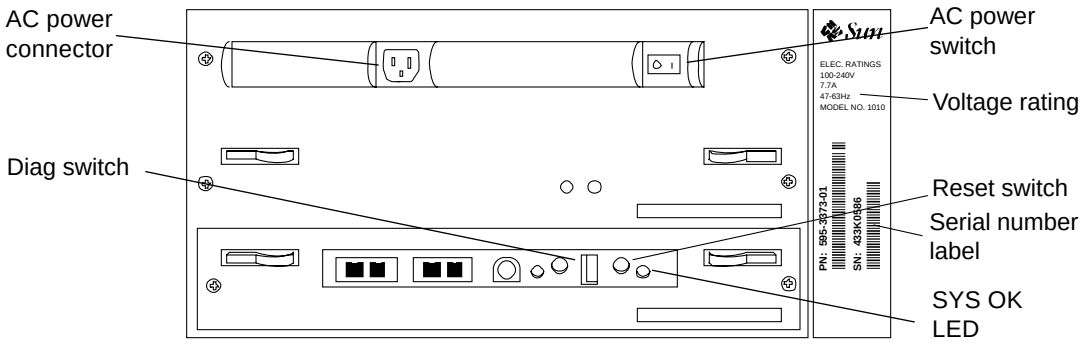


Figure 5-1 SPARCstorage Array AC Power Connector, Labeling and Switch Locations

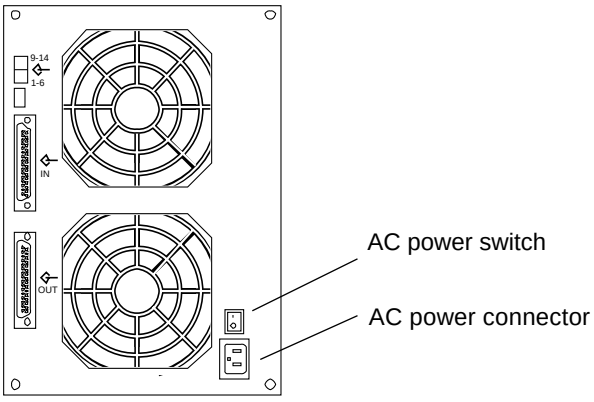


Figure 5-2 SPARCstorage MultiPack AC Power Connector and Switch Locations

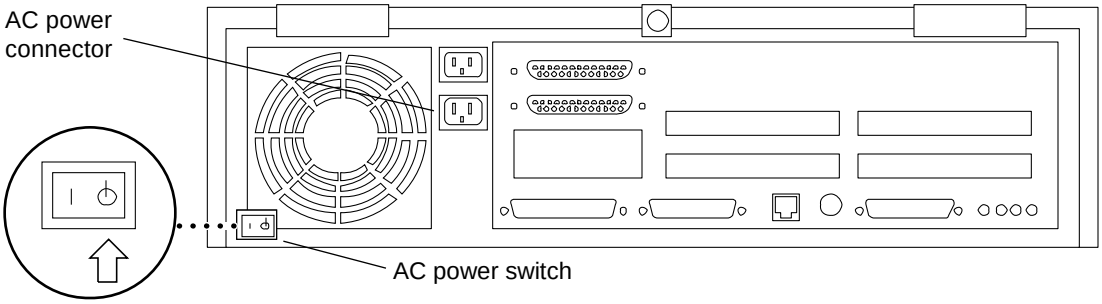


Figure 5-3 Ultra 2 Server AC Power Connector and Switch Location

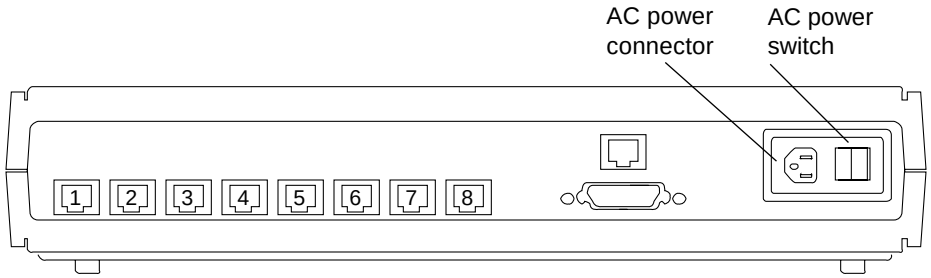


Figure 5-4 Terminal Concentrator AC Power Connector and Switch Location

5.2.3 *Installing the SBus Cards*

You can install the SBus cards or other required devices now. For SBus card configurations, see Chapter 3, “Hardware Configurations.” For SBus card installation procedures, refer to documentation supplied with the SBus card(s) or the *Ultra 2 Series Installation Guide*.

Note – Configure the system board in each server identically; that is, install the same SBus cards in the same SBus slots in both server nodes. For configuration 5, see Chapter 3, “Hardware Configurations.” Install a filler panel in any unused SBus slots.

---

1. **If you are using FC/S cards, install the appropriate number of FC/OMs in each FC/S card.**

Note – Due to a silk screening error, the “A” and “B” on the outside of the FC/S card are reversed. Unless otherwise specified, the FC/OM module must be installed in the real slot A, which is labeled B.

2. **Load the system board in each Ultra Enterprise 2 Server with the appropriate SBus cards.**
   See Chapter 3, “Hardware Configurations.”

5.2.4 *Installing the Terminal Concentrator*

You can install the terminal concentrator up to 100 meters (33 ft) from the Ultra 2 Server. However, for convenience, the unit should be placed near the servers.

- **Connect the power cord.**
  Plug the terminal concentrator power cord into a utility outlet.

5.3 Cabling the System

5.3.1 Connecting the Administration Workstation

1. **Connect a serial cable (part number 530-2152 or 530-2151) between the terminal concentrator, port 1 (RJ-45) and the administration workstation Serial port A socket (Figure 5-5).**
2. **Connect the public network Ethernet cable to the administration workstation Ethernet socket.**

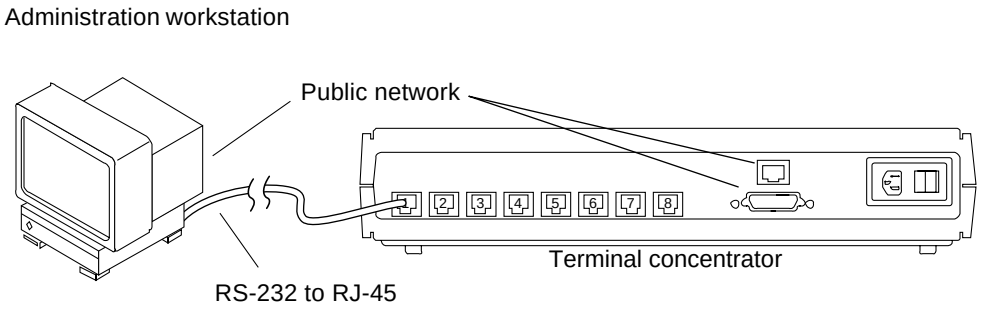


Figure 5-5 Connecting the Administration Workstation to the Terminal Concentrator

5.3.2 Connecting the Terminal Concentrator

Note – For this procedure, use two serial cables, each with an RJ-45 connector on one end and a DB25 connector on the other.

1. **Connect a serial cable between Serial A port on the node 0 and the terminal concentrator, port 2 (Figure 5-6).**
2. **Connect a second serial cable between Serial A port on the node 1 and the terminal concentrator, port 3.**
3. **Connect the public network Ethernet cable into the RJ-45 connector on the right side of the terminal concentrator.**

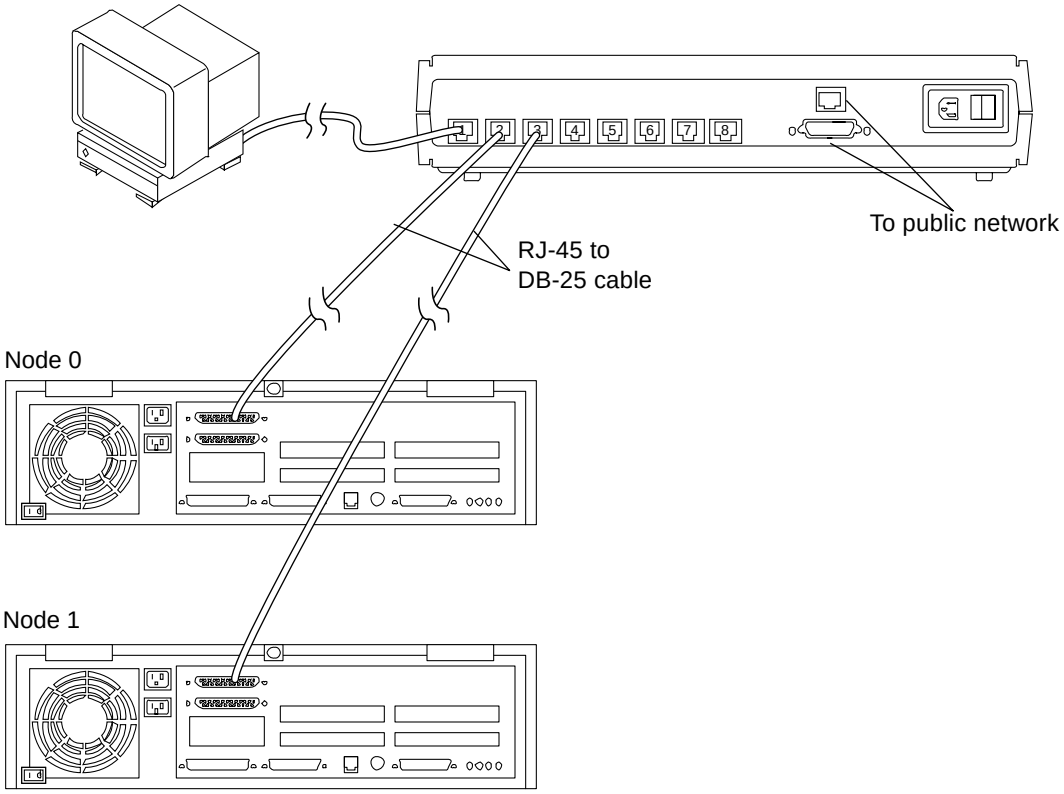


Figure 5-6 Connecting the Terminal Concentrator and Public Network

5.3.3 Connecting Public Nets Using the Network SBus Cards

- **Connect the public network cables to the appropriate connectors on the onboard Ethernet port and network SBus cards you installed.**

5.3.4 Connecting Private Nets Using SQEC and Onboard Ethernet Ports

1. **Using two 2-meter (part number 530-2149) or 5-meter (part number 530-2150) Sun private net cables, connect node 0 to node 1 (Figure 5-7).**

Note – For this HA configuration connect the first private net cable to the onboard RJ-45 Ethernet connection on both nodes.

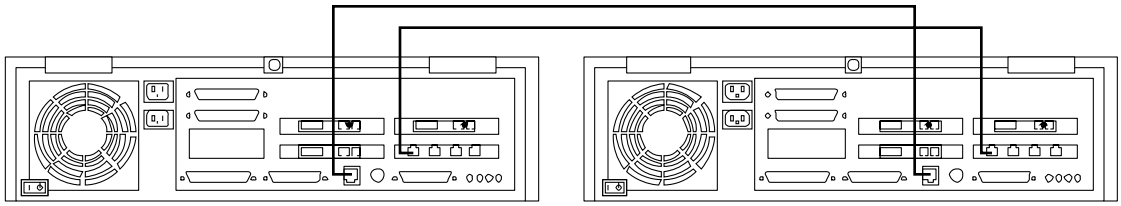


Figure 5-7 Node-to-Node Sun Private Net Cable Connections Using SQEC Cards and Onboard Ethernet Ports

Note – Sun private net cables are not interchangeable with standard Ethernet cables.

2. **Connect a private net cable between the RJ-45 Ethernet connector on the SQEC SBus card in slot 2 of both nodes.**

3. **Connect a second private net cable between the onboard RJ-45 Ethernet connector of both nodes.**

5.3.5 *Connecting the Private Nets Using SunSwift SBus Adapter Cards*

- **Using two 2-meter (part number 530-2149) or 5-meter (part number 530-2150) Sun private net cables, connect node 0 to node 1. (Figure 5-8).**

Note – Sun private net cables are not interchangeable with standard Ethernet cables.

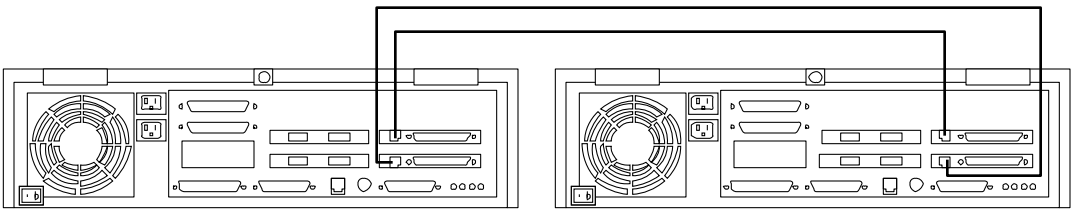


Figure 5-8 Node-to-Node Sun Private Net Cable Connections Using SunSwift Cards

5.3.6 Connecting the Private Nets Using SCI SBus Adapter Cards

- **Using two 2-meter (part number 530-2360), 5-meter (part number 530-2361) or 10-meter (part number 530-2362) Sun private net SCI cables, connect node 0 to node 1 (Figure 5-9).**

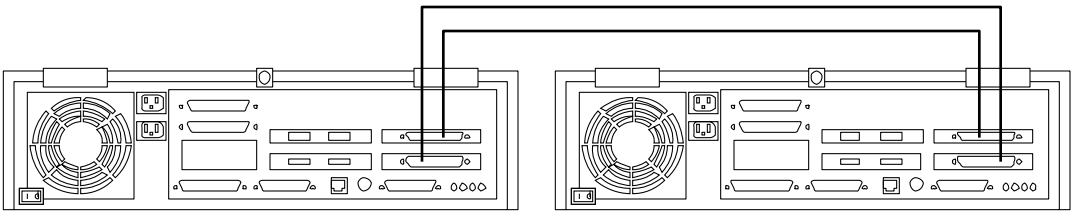


Figure 5-9 Node-to-Node Sun Private Net Cable Connections Using SCI Cards

5.3.7 Installing Second FC/OM Optical Modules in SPARCstorage Arrays

The disk arrays are delivered with one FC/OM optical module installed. Install the second module in the array, using the instructions provided with the module.

5.3.8 Labeling Fiber-Optic Cables

The fiber-optic cables should be labeled prior to installation. Labeling ensures accurate installation and eases system reconfiguration and expansion later.

5.3.9 *Cabling the SPARCStorage Arrays*

The instructions in this section are for the SPARCStorage Array 100s. If you are installing RSM or SCSI disk trays, see the applicable installation manuals provided with the hardware for cabling instructions.

Note – Due to a silk screening error, the “A” and “B” on the outside of the FC/S card are reversed. Unless otherwise specified, the FC/OM module must be installed in the real slot A, which is labeled B.

---

1. **Connect one end of a fiber-optic cable into the FC/OM on the SBus card.**
   See Figure 5-10 for cable type and connection details.
2. **Connect the other end of the fiber-optic cable into the FC/OM connector on the disk array rear panel.**
   Connect node 0 into connector A and node 1 into connector B.
3. **Repeat steps 1 and 2 for all FC/OM cables to be connected.**
   See Table 5-1 through Table 5-2 for a listing of all cable connections.

Table 5-1 Fiber-Optic Cable Connections for Configuration 1 (HA)

From Server	To SPARCstorage Array
Node 0 SBus slot 0, FC/OM A	**SSA 1, FC/OM A**
Node 0 SBus slot 1, FC/OM B	**SSA 2, FC/OM A**
Node 1 SBus slot 0,FC/OM A	**SSA 1, FC/OM B**
Node 1 SBus slot 1, FC/OM B	**SSA 2, FC/OM B**

Table 5-2 Fiber-Optic Cable Connections for Configuration 2 (PDB)

From Server	To SPARCstorage Array
Node 0 SBus slot 0, FC/OM A	**SSA 1, FC/OM A**
Node 0 SBus slot 1, FC/OM A	**SSA 2, FC/OM A**
Node 1 SBus slot 0, FC/OM A	**SSA 1, FC/OM B**
Node 1 SBus slot 1, FC/OM A	**SSA 2, FC/OM B**

4. Dress and secure all cables using cable ties as required.

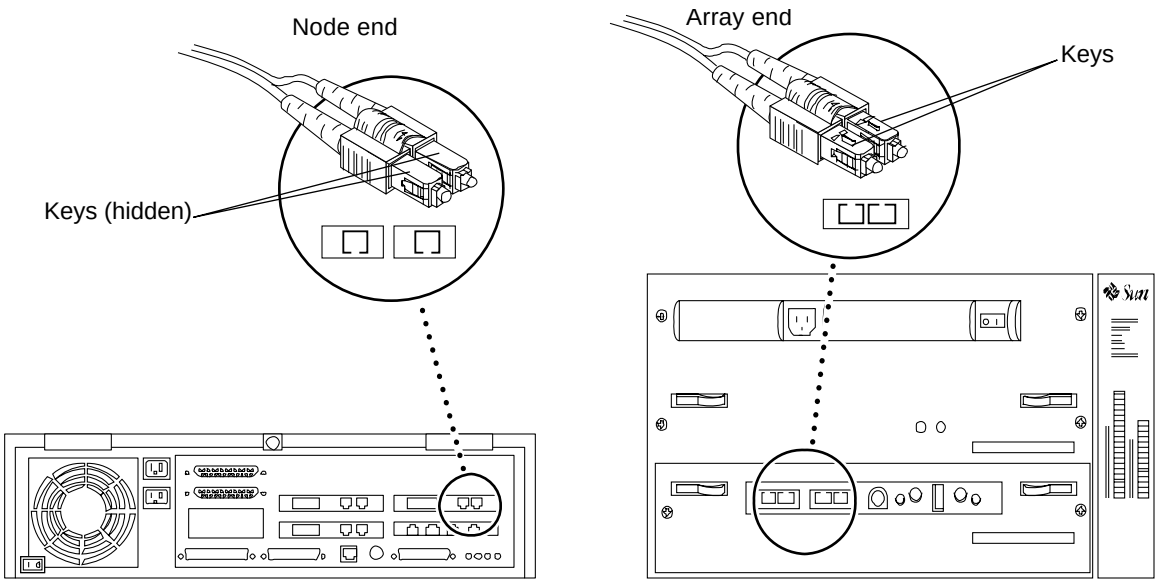


Figure 5-10 SPARCstorage Array Fiber-Optic Cable Connection

5.3.10 Cabling the SPARCstorage MultiPacks

- **Using 0.8-meter (part number 530-1884) or 2-meter (part number 530-1885) SCSI-2 Fast/Wide Single-ended cables, connect the SPARCstorage MultiPacks to the nodes as shown in the applicable cabling diagram in Chapter 3, "Hardware Configurations."**

5.4 Finishing Up

For terminal concentrator configuration procedures, proceed to Chapter 6, "Terminal Concentrator Setup and Hardware Acceptance Test Procedures."

For other software installation, refer to the *Solstice HA 1.3 User's Guide* or the *Ultra Enterprise Cluster PDB Software Installation Guide.*

Terminal Concentrator Setup 6

6.1 Configuring the Terminal Concentrator

1. **Edit the contents of the `/etc/remote` file on the administration workstation, and create the following line:**

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

2. **From the administration workstation, type the following command to connect the workstation serial port TTYA to terminal concentrator port 1:**

```
# tip a
```

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

---

3. **Verify that the terminal concentrator power is ON.**

4. **Reset the terminal concentrator.**
   Depress the Test button on the front panel for three or more seconds until the Power LED blinks rapidly. Release the button. See Figure 6-1.

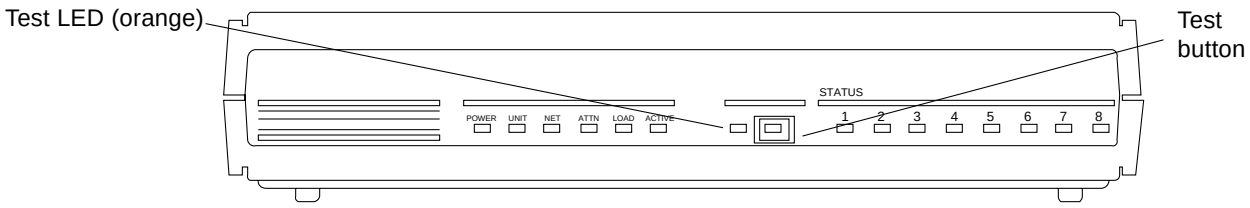


Figure 6-1 Terminal Concentrator Test Button and LED Location

5. **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::
```

The terminal concentrator performs a self-test that lasts about 30 seconds. Messages are displayed on the terminal screen. If the network connection is not found, press the `q` key to stop the message. When terminal concentrator boot completes successfully, the front panel LEDs light as shown:

Power (Green)	Unit (Green)	Net (Green)	Attn (Amber)	Load (Green)	Active (Green)
ON	ON	ON	OFF	OFF	Intermittent blinking

If boot fails, the LEDs on the front panel may light in one of these modes:

Mode	Power (Green)	Unit (Green)	Net (Green)	Attn (Amber)	Load (Green)	Active (Green)
Hardware failure	ON	Blinking	OFF	Blinking	OFF	OFF
Network test failure	ON	ON	Blinking	OFF	OFF	Intermittent blinking

Mode	Power (Green)	Unit (Green)	Net (Green)	Attn (Amber)	Load (Green)	Active (Green)
Network test aborted, or net command failed	ON	ON	OFF	Blinking	OFF	Intermittent blinking
Booted wrong image	ON	ON	ON	Blinking	OFF	OFF
Other failure	One or more Status LEDs (1–8) are ON					

If the LEDs denote another mode of failure, refer to the *Ultra Enterprise 2 Cluster Hardware Service Manual*.

6. **Check the connector to the public net to verify that it is connected correctly.**

7. **Upon power-on, the** `monitor::` **prompt is displayed. Use the** `addr` **command to assign an IP address, subnet mask, and network address to the terminal concentrator.**
   In the example that follows, the broadcast address is the terminal concentrator address with the host portion set to 255 or all ones.

```
monitor:: addr

Enter Internet address [<uninitialized>]::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]::your network 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]::<return>

monitor::
```

8. **Verify that the terminal concentrator boots from itself instead of the network.**
   To do this, type the following commands at the `monitor::` prompt and press Return after verifying the correct settings shown in the second screen display.

```
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:: image
    Enter Image name [(ip)“oper.52.enet”,(mop) ”OPER_52_ENET.SYS”]:: <return>
    Enter TFTP Load directory [“[“ “]”]:: <return>
    Enter TFTP Dump path/filename [“dump.0.0.0.0]::<return>

monitor::
```

9. **Quit the `tip` program by entering:**

```
monitor:: <return>
monitor:: ~. (tilde and period)
```

10. **Use the power switch on the back of the terminal concentrator to turn the terminal concentrator off momentarily, and then on again.**
    A power cycle will reboot the terminal concentrator. The terminal concentrator is ready when the Load light on the front panel goes off.

Note – For more information about commands available on the terminal concentrator, see the *Terminal Concentrator General Reference Guide.*

11. **Disconnect the serial cable from the administration workstation.**
    The cable is no longer needed.

6.2 Checkpoint to Verify Terminal Concentrator Setup

Verify your installation up to this point.

`telnet` to the terminal concentrator over the network by typing:

```
% telnet terminal concentrator name
```

The normal response is:

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

- If you do not get the preceding message, `ping` the host system by typing:

```
# ping terminal concentrator name
```

- If the system does not respond, reset the *ip_address* and *subnet mask* settings and verify your installation again.

6.3 Setting the Port Parameters

The type variable for each port must be set to `dial_in`. If it is set to `hardwired`, cluster console may be unable to detect when a port is already in use. The next section explains how to determine if the port type variable must be set.

6.3.1 Determining if the Port Type Variable Must Be Set.

Perform this procedure to see if you must set the *port type* variable.

1. **Find the Sun label on the top panel of the terminal concentrator (Figure 6-2).**
2. **Examine the serial number to see if it is in the lower serial number range.** The serial number consists of seven digits, followed by a dash and ten more digits.

- If the numbers after the dash start with 9520 or higher, the *port type* variable is set correctly — no action is required.
- If the numbers after the dash start with 9519 or lower, the *port type* variable must be changed.

3. **If you must change the port type variable, use the procedure in Section 6.3.2, “Port Parameters Procedure.”**

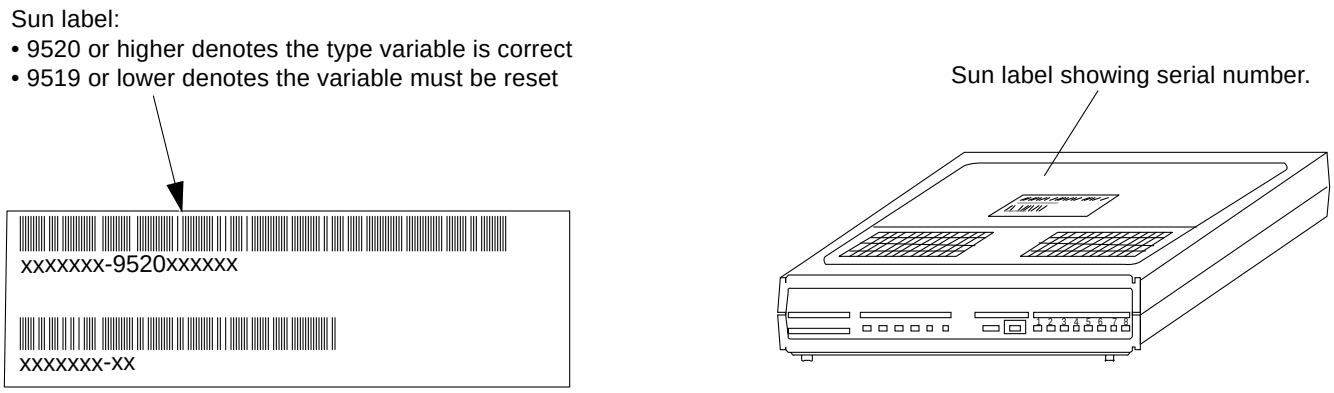


Figure 6-2 Determining the Terminal Concentrator Version

6.3.2 Port Parameters Procedure

Using an administration workstation, perform these steps to set the port parameters.

Note – Make sure that the terminal concentrator is powered on and has completed booting.

```
admin-ws# telnet terminal concentrator name
Trying terminal concentrator IP address
Connected to terminal concentrator name
Escape character is '^]'.


Rotaries Defined:
    cli                                 -

Enter Annex port name or number: cli


Annex Command Line Interpreter  *  Copyright 1991 Xylogics, Inc.

annex: su
Password: type the password (default password is the terminal concentrator
IP address)
annex# admin
Annex administration MICRO-XL-UX R7.0.1, 8 ports
admin : set port=1-8 type dial_in
  You may need to reset the appropriate port, Annex subsystem or
        reboot the Annex for changes to take effect.
admin : quit
annex# boot
bootfile:  <return>
warning:   <return>
```

Note – This will cause the terminal concentrator to reboot. Thus, the terminal concentrator will be unavailable for about a minute.

6

Hardware Acceptance Test 7

Completion and sign-off of this acceptance test by both the installer and the site client is a mutual declaration that *operational acceptance of all nodes of the cluster hardware with associated components, cabling and installation is completed, checked, and approved.*

Perform the acceptance test after:

- Installation of all hardware and cabling is complete
- Installation of the Solaris operating system, including
  - System administration workstation installation
  - Terminal concentrator configuration
- Installation of the SunVTS™ diagnostic program

Perform the acceptance test using the procedures presented in the following sections.

7.1 SunVTS

SunVTS™ is one of the online diagnostics tools for the Ultra Enterprise 2 Server Cluster. For details on running SunVTS, refer to the *SunVTS 2.0 User's Guide* and Section 7.1.2, "Running the Final SunVTS Functional Test."

A utility within SunVTS, `vtsprobe`, is used to verify installation of system hardware, SPARCstorage Arrays, private net devices, network, and interfaces. See Section 7.1.1, "Verifying Hardware Installation."

Caution – Run SunVTS only during installation while no cluster software is running. At this stage, use SunVTS only to verify that the hardware configuration is correct. If you run SunVTS while the cluster software is running, it may interfere with cluster software operation.

7.1.1 Verifying Hardware Installation

To verify hardware configuration, the following three prerequisites must be satisfied. Both nodes must have:

- Updates for Solaris Operating Environment 2.5.1 for Sun Microsystems Computer Company installed
- SPARCstorage Array package installed
- `SUNWvts` package installed

Perform the following steps on a selected node, then repeat this procedure on the other node:

1. Become superuser and then change directories:

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

2. Set the following environment variables:
For a Bourne shell:

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

For a C shell:

```
hostname # setenv BYPASS_FS_PROBE 1
```

3. Enter the following command to start the SunVTS kernel:

```
# ./vtsk
```

The SunVTS kernel then probes system devices and awaits commands from an interface.

Note – The following error message may be displayed if you are executing the `./vtsk` command for the second time, such as when directed to in the final step of this procedure.

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

If this error message occurs, enter the following:

```
# ps -ef|grep vtsk (find the process id of vtsk)
# kill -INT <vtsk pid>(kill and restart the SunVts kernel)
# ./vtsk
```

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

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

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

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

```
 Network
le0(nettest)
Port Address: Unknown
Host ID: 80500419
Domain Name : nn.nn.nn.com
qe0(nettest)
Port Address: Unknown
Host ID: 80500419
Domain Name : nn.nn.nn.com
```

6. **If the data listed for the private net devices does not match the build configuration, check and correct any cabling errors and then repeat steps 1 through 5.**

7. **Verify that there is a response (under the Network heading) to the `vtsprobe` command for any network interface devices that you have installed. Consult the documentation supplied with your network interface card to determine the correct entry for your device.**

8. **If you are using SPARCstorage Arrays, verify that the response to the** `vtsprobe` **command is similar to the following:**

```
ssa0(plntest)
       Worldwide Name: 08002018375f
       Disks Attached: c1t0d0 c1t0d1 c1t1d0 c1t1d1 c1t2d0
       : c1t2d1 c1t3d0 c1t3d1 c1t4d0 c1t4d1
       : c1t5d0 c1t5d1

ssa1(plntest)
       Worldwide Name: 0800201cad8e
       Disks Attached: c2t0d0 c2t0d1 c2t1d0 c2t1d1 c2t2d0
        c2t2d1 c2t3d0 c2t3d1 c2t4d0 c2t4d1
        c2t5d0 c2t5d1
```

   If the data listed for the SPARCstorage Arrays does not match the build configuration, check and correct any cabling errors and then repeat steps 1 through 8.

9. **Perform step a. or b. for the appropriate device.**

a. For each disk listed under a SPARCstorage Array, Verify that the response to the `vtsprobe` command is similar to the following:

```
SparcStorageArray(pln0)

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

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

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

If the data listed for the disks does not match that shown under the corresponding SPARCstorage Array entry, check and correct the cabling and then repeat steps 1 through 9.

b. For each disk listed under a SPARCstorage MultiPack, verify that the response to the `vtsprobe` command is similar to the following:

```
SCSI-Devices(fas0)
        c1t2d0(disktest)
                Capacity: 1.98GB
                Controller: fas0
                Vendor: SEAGATE
                SUN Id: ST32550W SUN2.1G
                Firmware Rev: 0414
                Serial Number: 01262300
        c1t3d0(disktest)
                Capacity: 1.98GB
                Controller: fas0
                Vendor: SEAGATE
                SUN Id: ST32550W SUN2.1G
                Firmware Rev: 0414
                Serial Number: 01296541
        c1t4d0(disktest)
                Capacity: 1.98GB
                Controller: fas0
                Vendor: SEAGATE
                SUN Id: ST32550W SUN2.1G
                Firmware Rev: 0414
                Serial Number: 01285966
        c1t8d0(disktest)
                Capacity: 1.98GB
```

If the data listed for the disks does not match that shown under the corresponding SPARCstorage MultiPack entry, check and correct the cabling and then repeat steps 1 through 9.

10. **Compare the `probe_maps` generated by each node. Check and verify the World Wide Name (WWN) of each SPARCstorage Array. Check and compare the disk logical name and capacity for all disks under the corresponding SPARCstorage Array.**
If there is not an identical match, recheck the cabling and other disk array components, repair any problems you find, and repeat the preceding steps. To run a final system functional check, run SunVTS using the procedure in Section 7.1.2, “Running the Final SunVTS Functional Test.”

7.1.2 Running the Final SunVTS Functional Test

1. Become superuser and then change directories:

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

2. Enter:

```
# ./sunvts
```

A TTY-based SunVTS control panel will be displayed. After the TTY interface is displayed, direct the cursor to the “start” button and press Return to start SunVTS system testing. Allow for one system pass of the SunVTS run. For details of how to run SunVTS, refer to *SunVTS 2.0 User’s Guide.*

7.2 Acceptance Test Criteria

This acceptance test has completed successfully if the data listed for all hardware components match the corresponding build configurations. *If this statement is not true, the system has failed acceptance test.*

7.3 Next Step

Hardware and basic software installation are complete. If hardware problems were found, for example a failed or improperly installed SBus card, fiber-optic cable, disk array, FC/OM or controller, and SCSI-2 cable, the `/dev` and `/devices` directories on the nodes may not match. You may need to reload Solaris to create the correct directory entries.

Then, install the cluster software as directed in the *Solstice HA 1.3 User’s Guide* or the *Ultra Enterprise Cluster PDB Software Planning and Installation Guide,* and start the cluster software.

Index

A

administration workstation
  connections, 3-12, 5-6

B

boot messages, 4-7

C

cable connection
  fibre optic, 5-10, 5-11
cable connections
  list of, 5-10, 5-11
cables
  administration workstation, 5-6
  Ethernet, 5-6
  general requirements, 2-8
  private network, 3-12, 5-7
  SPARCstorage Arrays, 5-10
  terminal concentrator, 5-6
checklist
  required components using MultiPacks, 1-4
  required components using SPARCStorage Arrays, 1-1
clusters supported
  by terminal concentrator, 3-12
commands
  `addr`, 6-3
  `image`, 6-4
  `ping`, 6-5
  `seq`, 6-4
components
  available, 1-3
  checklists, 1-1, 1-3, 1-4
configuration requirements
  system, 3-1
configurations
  1 thru 6
    cabling, 3-4
  terminal concentrator, 6-1
connections
  administration workstation, 3-12, 5-6
  power, 5-2
  private net, in HA clusters, 3-13
  private net, in PDB clusters, 3-13
  private network, 3-12, 5-7
    using SCI card, 5-9
    using SunSwift Ethernet port, 5-8, 5-9
  public network, 5-6
  SPARCstorage Arrays, 3-13, 5-10
  terminal concentrator, 3-12, 5-5, 5-6

D

designing Ethernet networks, 2-3
disk drive, caution, 4-6

E

Ethernet cable
  private network, 3-12
Ethernet networks
  designing, 2-3

F

FC/OM module
  installing 2nd module
    SPARCstorage Array, 5-9
  installing modules
    in SBus cards, 5-4
fiber optic cables
  labeling, 5-9

I

installation
  FC/OM module
    2nd module in SPARCstorage Arrays, 5-9
  FC/OM modules in SBus cards, 5-4
  SBus cards, 5-4
inventory checklist, 1-1
IP address, setting, 6-3

L

label
  fiber optic cables, 5-9
LCD display, 4-5
LEDs
  terminal concentrator, 6-2
location
  terminal concentrator, 5-5

P

population
  SBus card
    configuration 1, 3-1
    configuration 3, 3-3
    configuration 4, 3-3
    configuration 6, 3-4
    configurations 1, 2 and 3, 3-4
POST messages, 4-7
power
  connection, 5-2
  requirements, 2-2
power off
  server, one node, 4-3
  SPARCstorage Array, 4-2
  SPARCstorage MultiPack, 4-3
  terminal concentrator, 4-2
power on
  server, one node, 4-6
  SPARCstorage Array, 4-4
  SPARCstorage MultiPack, 4-6
  terminal concentrator, 4-4
preparation
  public network
    Ethernet, 2-6
private network
  cables, 3-12, 5-7
  connections, 5-7
    using SunSwift Ethernet port, 5-8, 5-9
public network
  connections, 5-6

R

reboot
  terminal concentrator, 6-4
requirements, power, 2-2

S

SBus, 3-1
SBus cards
  installation, 5-4
set, on terminal concentrator
  IP address, 6-3
  network address, 6-3

subnet mask, 6-3
site preparation
space planning, 2-1
SPARCstorage Arrays
configuration, 3-13
connection, 5-10
FC/OM modules
installation of 2nd module, 5-9
preparing, 5-2
SunVTS, 6-11
running, 6-11
verifying hardware configuration, 6-11
system components
checklist, 1-3

T

terminal concentrator
booting, 6-3
clusters supported, number of, 3-12
configuration, 6-1
connections, 3-12, 5-5, 5-6
front panel and LEDs, 6-2
location, 5-5
powering on, 4-4
reboot, 6-4
set
IP address, 6-3
network address, 6-3
subnet mask, 6-3
setup verification, 6-5
turning on, 4-4
turning off
server, one node, 4-3
SPARCstorage Array, 4-2
SPARCstorage MultiPack, 4-3
terminal concentrator, 4-2
turning on
server, one node, 4-6
SPARCstorage Array, 4-4
terminal concentrator, 4-4

V

verifying
configuration, terminal concentrator, 6-5