Sun™ Enterprise™ Cluster System Hardware Site Preparation, Planning, and Installation Guide

Sun microsystems

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Preface

This manual provides installation instructions for Sun™ Enterprise™ Cluster systems. These instructions are designed for a qualified trained service provider and/or system administrator with networking knowledge.

Using UNIX Commands

This document may not contain information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices.

For this information, see one or more of the following:

- *Solaris 2.x Handbook for SMCC Peripherals*
- AnswerBook™ online documentation for the Solaris™ 2.x software environment
- Other software documentation that you received with your system

Typographic Conventions

TABLE P-1   Typographic Conventions

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

Shell Prompts

TABLE P-2   Shell Prompts

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

Related Documentation

TABLE P-3   Sun Enterprise Cluster System Documents

Title	Part Number
Sun Cluster 2.2 Software Planning and Installation Guide	805-4239
Sun Cluster System 2.2 System Administration Guide	805-4238
Sun Enterprise Cluster System Hardware Service Manual	805-6512
Sun Cluster 2.2 API Developers Guide	805-4241
Sun Cluster 2.2 Cluster Volume Manager Guide	805-4240
Sun Cluster 2.2 Error Messages Manual	805-4242
Sun Cluster 2.2 Release Notes	805-4243
Rackmount Placement Matrix	805-4748

TABLE P-4   Software Documents

Title	Part Number
Solstice DiskSuite 4.2 User's Guide	805-5961
Solstice DiskSuite 4.2 Installation and Product Notes	805-5960
Solstice DiskSuite 4.2 Reference Guide	805-5962
Platform Notes: RAID Manager User's Guide	805-1636
SMCC SPARC Hardware Platform Guide Solaris 2.6	802-7289
Sun Enterprise Volume Manager 2.5 Manual Set	825-4025
Sun Enterprise Volume Manager 2.5 User's Guide	805-1603
Sun Enterprise Volume Manager 2.5 Installation Guide	805-1604
Sun Enterprise Volume Manager 2.5 Release Notes	805-1605
Sun Enterprise Volume Manager 2.5 Product Notes	805-1606
Sun Enterprise Volume Manager 2.5 System Administrator's Guide	805-1607
RAID Manager User's Guide	805-1636
SunVTS Version 2.1 Users Guide Solaris 2.6	805-3011

Cautions and Notes

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

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

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

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.

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

Sun Documentation on the Web

The docs.sun.com[sm] web site enables you to access Sun technical documentation on the Web. You can browse the docs.sun.com archive or search for a specific book title or subject at:

```
http://docs.sun.com
```

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We are interested in improving our documentation and welcome your comments and suggestions. You can email your comments to us at:

```
docfeedback@sun.com
```

Please include the part number of your document in the subject line of your email.

Product Description

1.1 Standard Features

Sun Enterprise clustered systems support various hardware platforms, including Sun Enterprise 1, 2, 250, 450, 3*x*000 through 6*x*000, and 10000 (TABLE 1-1). These systems are used in enterprise-wide, mission-critical database applications.

Sun Enterprise clustered systems support several database products. For information on products supported, refer to the applicable system administration guide for your type of database service.

A cluster consists of two or more compute nodes (servers). Communication between nodes is accomplished by using redundant SCI or FastEthernet private network links.

Note – When three or more nodes are installed, SCI switches or FastEthernet hubs are employed to enable communication among nodes.

Coupling the databases increases performance and database availability.

The database services are implemented on clustered platforms using one or more of the following redundant disk arrays (see TABLE 1-1):

- Sun StorEdge™ MultiPack 2
- SPARCstorage Array Model 100 series
- SPARCstorage Array Model 200s or 210s, which are used with SPARCstorage RSM™ units (removable storage media) units, or 9-Gbyte differential disk trays
- Sun StorEdge™ A1000 and D1000
- Sun StorEdge A3*x*00
- Sun StorEdge A5000

Sun Enterprise clustered systems are designed for reliability and serviceability. They have no single point of failure and can be repaired and maintained online. For functional block diagrams of clustered systems see FIGURE 1-6 through FIGURE 1-24.

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

The database volumes are stored on two or more disk arrays. The disk arrays are cross-connected to the servers. Database volumes are mirrored across multiple disk arrays for high availability. The maximum number of storage arrays that can be installed is determined by the number of available connection slots on the servers.

1.2   Topology

Refer to the *Sun Cluster 2.2 System and Administrative Guide,* which details the topology of supported configurations for nodes, disk storage devices, and associated hardware.

1.3   Sun Enterprise Cluster Configurations

TABLE 1-1   Configurations Supported Using Solaris 2.6 and Subsequent Compatible
Versions (and all SHWP versions)

Platform	Description
	Private interconnects
All platforms[1]	SunFastEthernet™ (SFE)
All platforms[1] (except the Sun Enterprise 250 and 450)	Scalable Coherent Interface (SCI)
All platforms[1]	Sun Quad FastEthernet™ (QFE)
	Storage devices
Sun Enterprise 1, 2, 250, 450 and 3*x*00	MultiPack 2: uses SCSI-2[2] cards mounted on I/O boards as host adapters; uses SCSI-2 cabling as required
All platforms[1] (except the Sun Enterprise 250 and 450)	SPARCstorage Array Model 100 and 200 Series; uses FC/OMs as host adapters mounted on I/O or system boards, on-board optical slot, or FC/S cards; uses fiber optic cabling as required.
Sun Enterprise 2, 250, 450, and 3*x*00 through 6*x*00	A1000 and D1000: uses UDWIS/S mounted on I/O boards as host adapters; uses D-SCSI cabling as required
Sun Enterprise 1, 2, 250, 450, 3*x*00 through 6*x*00, and 10000	A3*x*00 with RAID Manager RM6.1.1: uses UDWIS/S mounted on I/O boards as host adapters; uses D-SCSI cabling as required
Sun Enterprise 2, 3*x*00 through 6*x*00, and 10000	A5000: uses GBICs as host adapters; mounted either on FC-100 cards residing on I/O or system boards or using I/O+ boards on-board optical port; uses FC-AL cabling as required
	Parallel databases
All platforms[1]	Informix XPS 8.1/8.11/8.2
All platforms[1]	Oracle OPS 7.3.3/7.3.4/8.0.3/8.0.4/8.0.5
	HA databases
All platforms[1]	Informix 7.20x/7.23x/7.30
All platforms[1]	Oracle 7.2.2.x (x>=3)/7.3.2.x/7.3.3.x/7.3.4.x/8.0.3/ 8.0.4/8.0.5

TABLE 1-1 Configurations Supported Using Solaris 2.6 and Subsequent Compatible Versions (and all SHWP versions) *(Continued)*

Platform	Description
All platforms[1]	Sybase System 11.0x/11.5
HA services	
All platforms[1]	HA NFS 3.0/DNS/HTTP v201/NEWS v20/MAIL v201
Volume manager	
All platforms[1]	CVM 2.2.1 (used with OPS)
All platforms[1]	SEVM 3.0 (used with Sybase, Informix, and HA databases)
Miscellaneous	
All platforms[1]	Vxfs 3.2.x

Notes:

1. Sun Enterprise 1, 2, 250, 450, 3x00 through 6x00, and 10000

2. Sun Enterprise 250 and 450 use PCI-based SCSI

The main hardware difference between platform configurations is that the terminal concentrator is either rackmounted or stand-alone.

Note – In a Sun Enterprise 10000 cluster, the terminal concentrator is not required since its functionality is provided by the system service processor (SSP).

In a cluster environment, disk arrays can be one of several types:
- Sun StorEdge MultiPack 2
- SPARCstorage Array
   - Model 100 Series
   - Model 200 Series with RSM units or Differential SCSI trays
- Sun StorEdge A1000 and D2000
- Sun StorEdge A3x00
- Sun StorEdge A5000

For Sun Enterprise 3x00 through 6x00 systems, the main system cabinets use SPARCstorage Array Model 112s. For Sun Enterprise 10000 systems, up to three RSM disk trays can be installed in the main system cabinet. For expanded systems, the disk arrays can be:
- Sun StorEdge MultiPack 2s
- SPARCstorage Array Model 200s with SPARCstorage RSM units or 9-Gbyte disk drive trays
- Sun StorEdge A3x00s
- Sun StorEdge A5000s

The SPARCstorage Array Model 210 Series for expanded systems with RSM units can be mounted in an Ultra Enterprise™ expansion cabinet or in a 420 expansion cabinet.

See FIGURE 1-6 through FIGURE 1-26 for typical block diagrams of supported configurations.
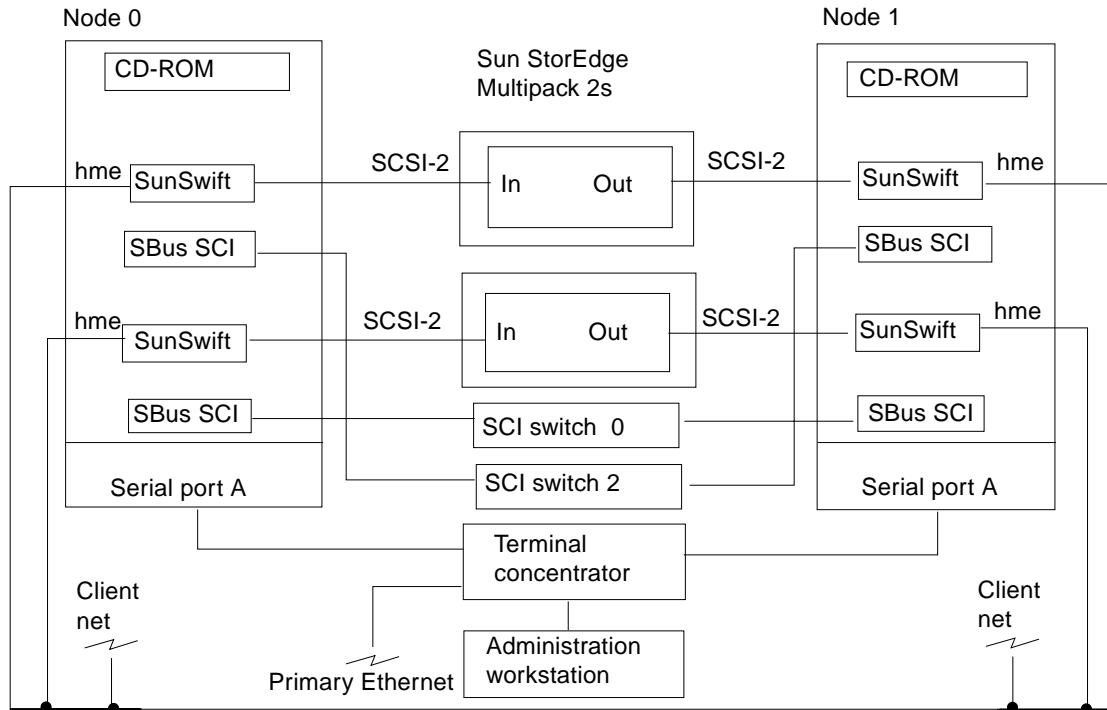
FIGURE 1-1   Typical Sun Enterprise 2 Two-Node Cluster Using Sun StorEdge MultiPack 2s
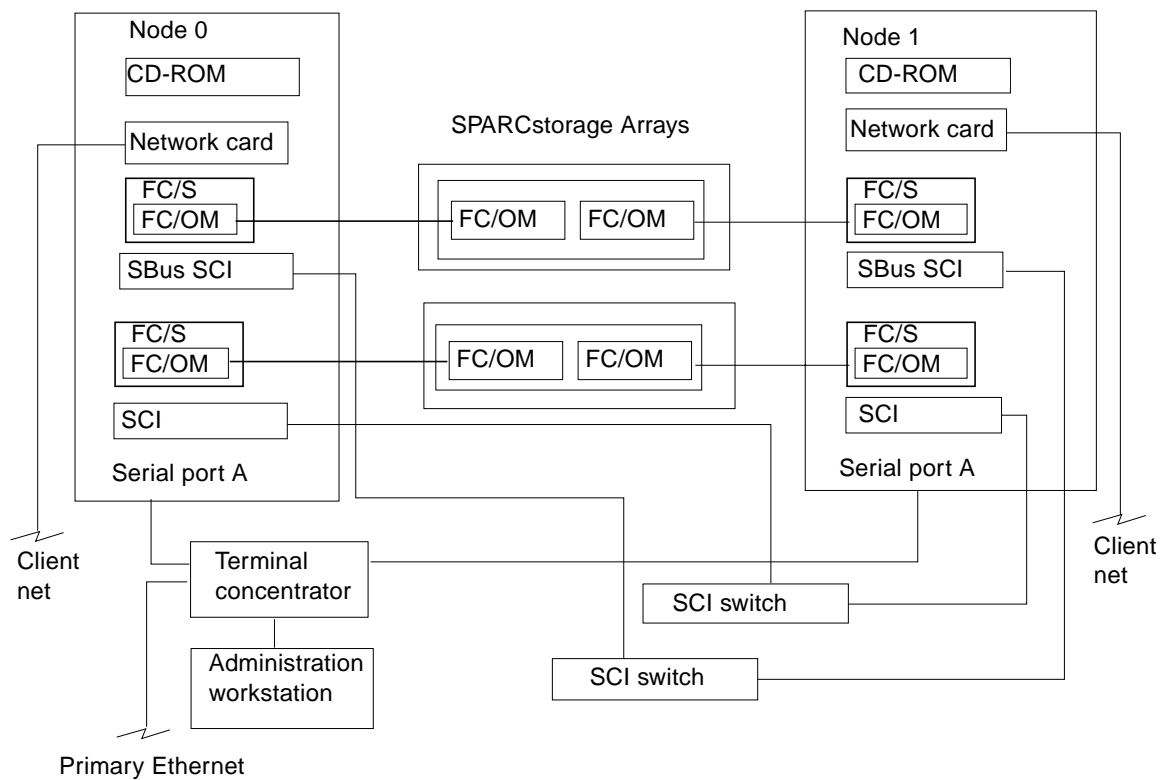
FIGURE 1-2   Typical Sun Enterprise 2 Two-Node Cluster Using SPARCstorage Arrays

Client Ethernet

Node 0

CD-ROM

Internal disk

Ethernet

SCSI-2

SCSI-2

Serial port A

Ethernet

Ethernet

Private net cables

Node 1

CD-ROM

Internal disk

Ethernet

Ethernet

Ethernet

SCSI-2

SCSI-2

Serial port A

Terminal concentrator

Primary Ethernet

Administration workstation

Sun StorEdge A3x00

SCSI-2

In   Out

SCSI-2

SCSI-2

In   Out

SCSI-2
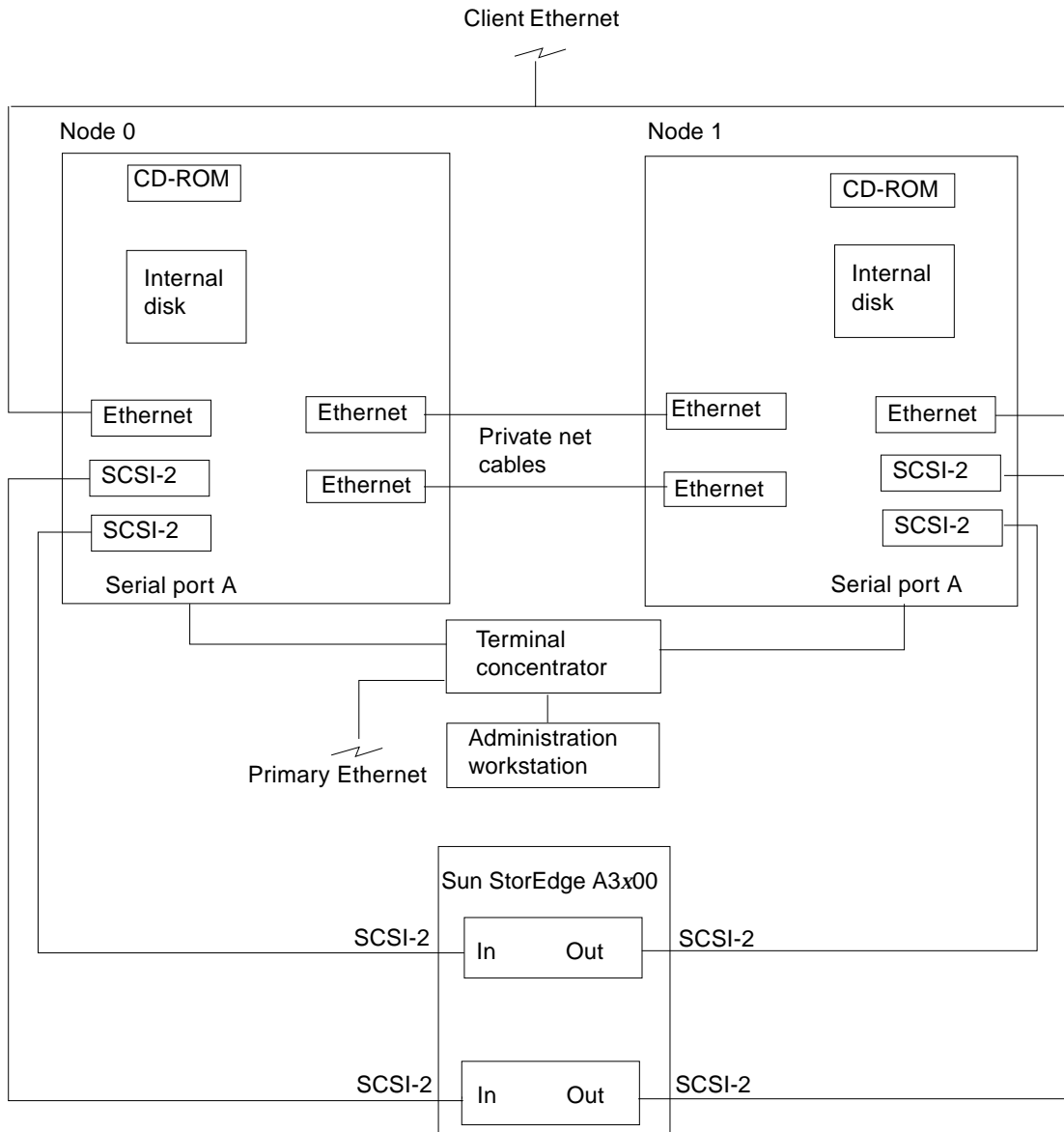
FIGURE 1-3   Typical Sun Enterprise 2 Two-Node Cluster Using Sun StorEdge A3x00

Client Ethernet

```
Node 0                                        Node 1

  ┌──────────┐                                   ┌──────────┐
  │  CD-ROM  │                                   │  CD-ROM  │
  └──────────┘                                   └──────────┘

  ┌──────────┐                                   ┌──────────┐
  │ Internal │                                   │ Internal │
  │   disk   │                                   │   disk   │
  └──────────┘                                   └──────────┘

  ┌──────────┐      ┌──────────┐   ┌──────────┐      ┌──────────┐
  │ Ethernet │      │ Ethernet │   │ Ethernet │      │ Ethernet │
  └──────────┘      └──────────┘   └──────────┘      └──────────┘
                                  Private net
  ┌──────────┐                      cables         ┌──────────┐
  │  GBIC 0  │      ┌──────────┐   ┌──────────┐     │  GBIC 0  │
  └──────────┘      │ Ethernet │   │ Ethernet │     └──────────┘
                    └──────────┘   └──────────┘
  ┌──────────┐                                      ┌──────────┐
  │  GBIC 1  │                                      │  GBIC 1  │
  └──────────┘                                      └──────────┘

  Serial port A                                     Serial port A
```

Terminal
concentrator

Administration
workstation

Primary Ethernet

FC-AL

Sun StorEdge A5000	
A0	A1
B1	B0

FC-AL

FC-AL

Sun StorEdge A5000	
A0	A1
B1	B0

FC-AL
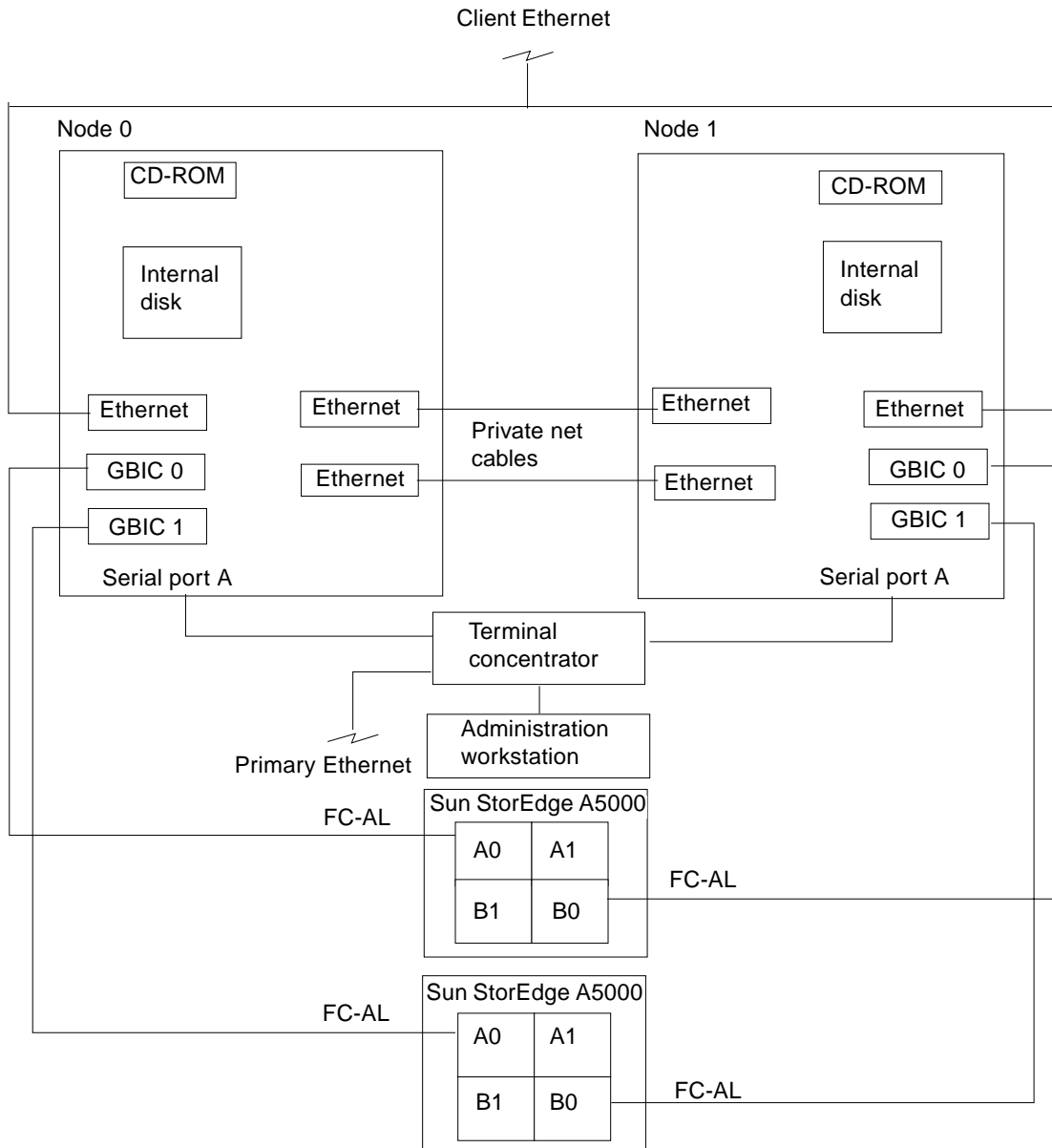
FIGURE 1-4   Typical Sun Enterprise 2 Two-Node Cluster Using Sun StorEdge A5000s

Client Ethernet

Node 0

CD-ROM

Internal disk

Ethernet

SCSI-2

SCSI-2

Serial port A

Node 1

CD-ROM

Internal disk

Ethernet

Ethernet

Private net cables

Ethernet

Ethernet

Ethernet

SCSI-2

SCSI-2

Serial port A

Terminal concentrator

Primary Ethernet

Administration workstation

Sun StorEdge Multipack 2s

SCSI-2   In   Out   SCSI-2

SCSI-2   In   Out   SCSI-2
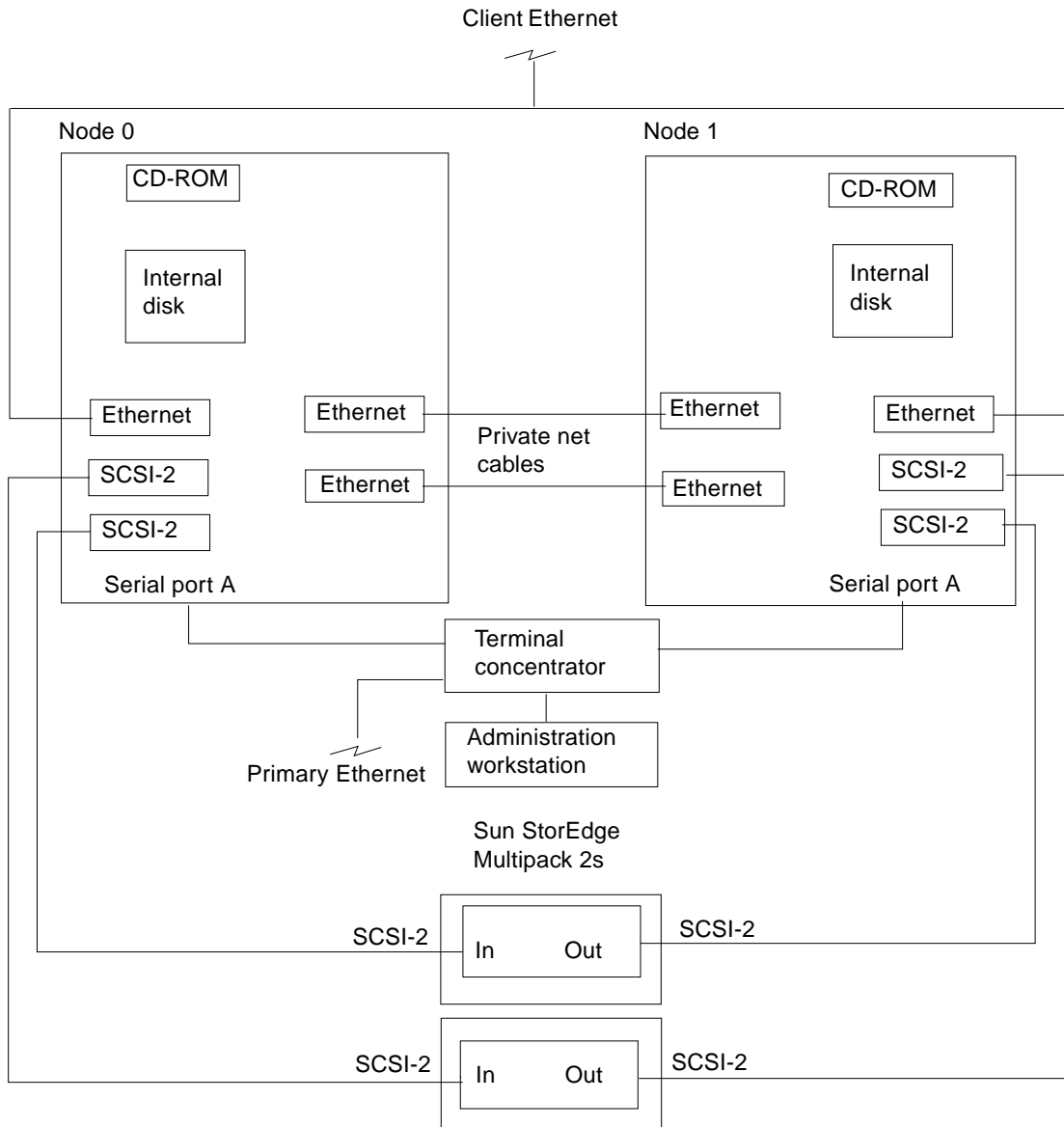
FIGURE 1-5   Typical Sun Enterprise 450 Two-Node Cluster Using Sun StorEdge MultiPack 2s

Node 0
- Tape/CD-ROM
- I/O bd 1
  - SBus SCI
  - Network card
  - FC/OM
- I/O bd 3
  - FC/OM
  - SBus SCI
- Clock bd
  Serial port A

Node 1
- Tape/CD-ROM
- I/O bd 1
  - SBus SCI
  - Network card
  - FC/OM
- I/O bd 3
  - FC/OM
  - SBus SCI
- Clock bd
  Serial port A

Private network

SPARCstorage arrays
- FC/OM FC/OM
- FC/OM FC/OM

Fiber optic

Private network

Terminal concentrator

Administration workstation

Client network

Primary Ethernet
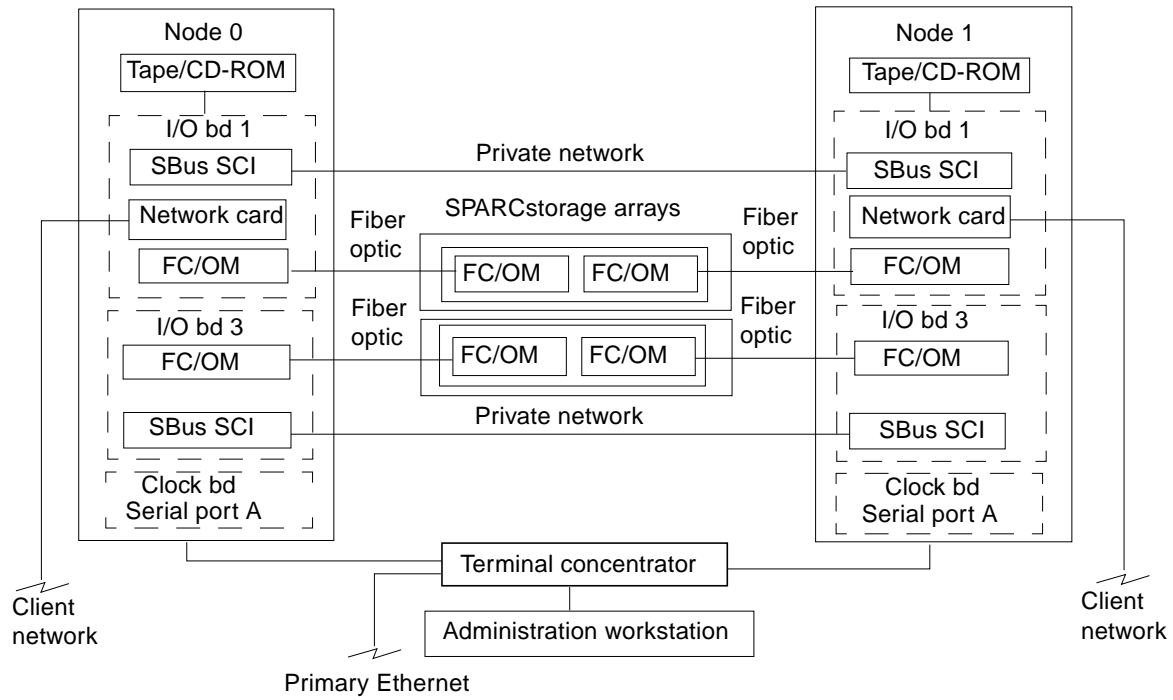
Note: FC/OMs can be mounted using onboard optical ports or FC/S cards

FIGURE 1-6   Typical Sun Enterprise 3*x*00 Through 6*x*00 Two-Node Cluster Using SPARCstorage Arrays

Node 0
Tape/CD-ROM
I/O bd 1
Network card
FC/OM
I/O bd 3
FC/OM
Clock bd
Serial port A

SPARCstorage Arrays
Fiber optic
FC/OM   FC/OM
Fiber optic

Fiber optic
FC/OM   FC/OM
Fiber optic

Node 1
Tape/CD-ROM
I/O bd 1
Network card
FC/OM
I/O bd 3
FC/OM
Clock bd
Serial port A

Client network

Client network

Terminal concentrator
Administration workstation

Primary Ethernet

Node 2
Clock bd
Serial port A
Tape/CD-ROM
I/O bd 1
Network card
FC/OM
I/O bd 3
FC/OM

SPARCstorage Arrays
Fiber optic
FC/OM   FC/OM
Fiber optic

Fiber optic
FC/OM   FC/OM
Fiber optic

Node 3
Clock bd
Serial port A
Tape/CD-ROM
I/O bd 1
Network card
FC/OM
I/O bd 3
FC/OM

Note: See FIGURE 1-25 (SCI) or FIGURE 1-26 (FastEthernet) for four-node switched private net connections.

FIGURE 1-7   Typical Sun Enterprise 3x00 Through 6x00 Four-Node Cluster Using SPARCstorage Arrays
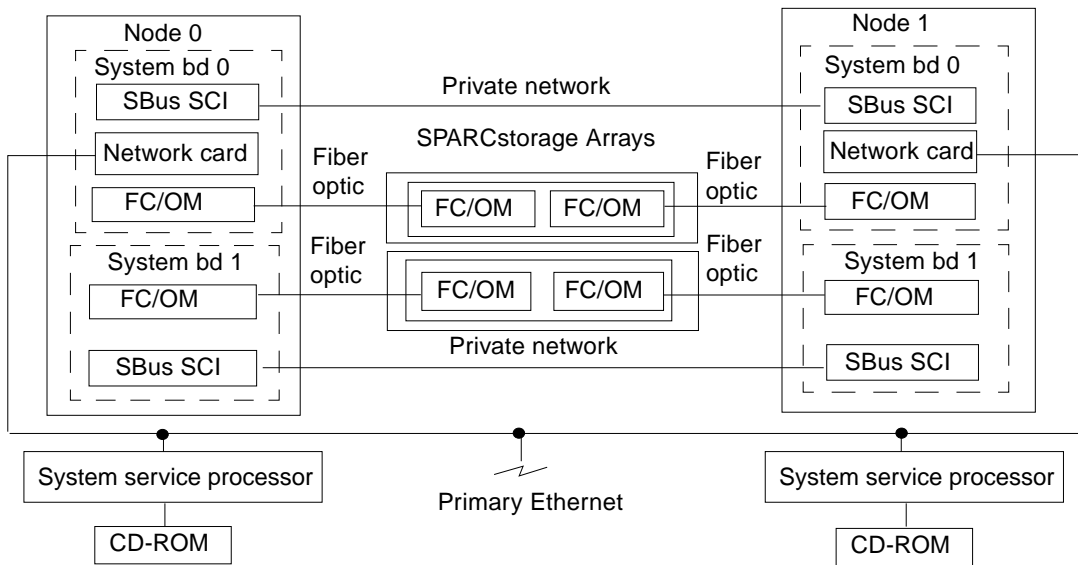
Note: FC/OMs can be mounted using FC/S cards.

FIGURE 1-8   Typical Sun Enterprise 10000 Two-Node Cluster Using SPARCstorage Array
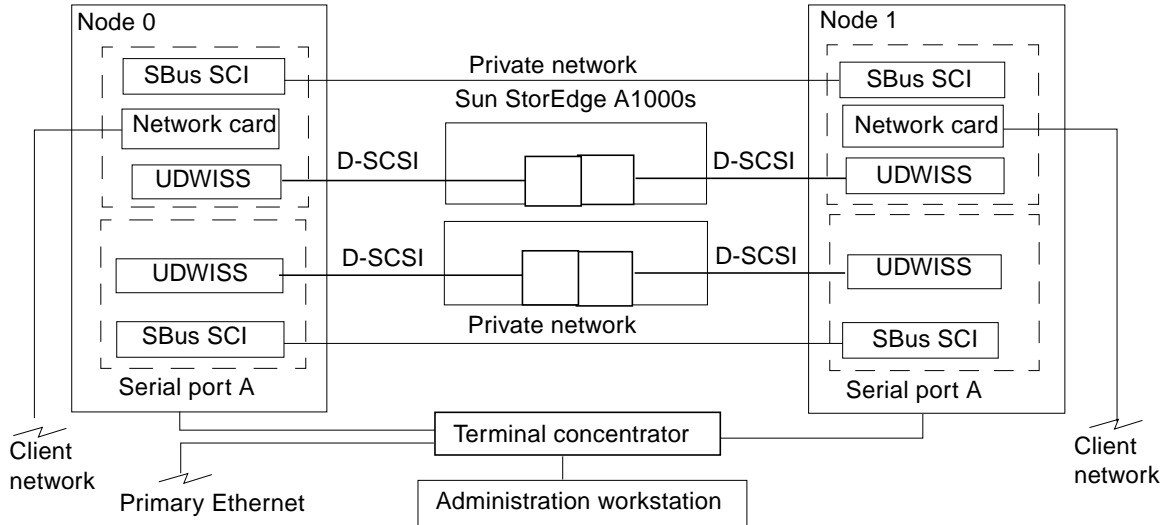
Note: Refer to Table 1-1 for a listing of supported platforms.

FIGURE 1-9   Typical Two-Node Cluster Using Sun StorEdge A1000

Node 0
- SBus SCI
- Network card
- UDWISS
- UDWISS
- SBus SCI

Private network

D-SCSI

D-SCSI

Node 1
- SBus SCI
- Network card
- UDWISS
- UDWISS
- SBus SCI

D-SCSI

D-SCSI

Private network

Sun StorEdge A1000

Sun StorEdge A1000

Sun StorEdge A1000

Sun StorEdge A1000

Client network

Client network
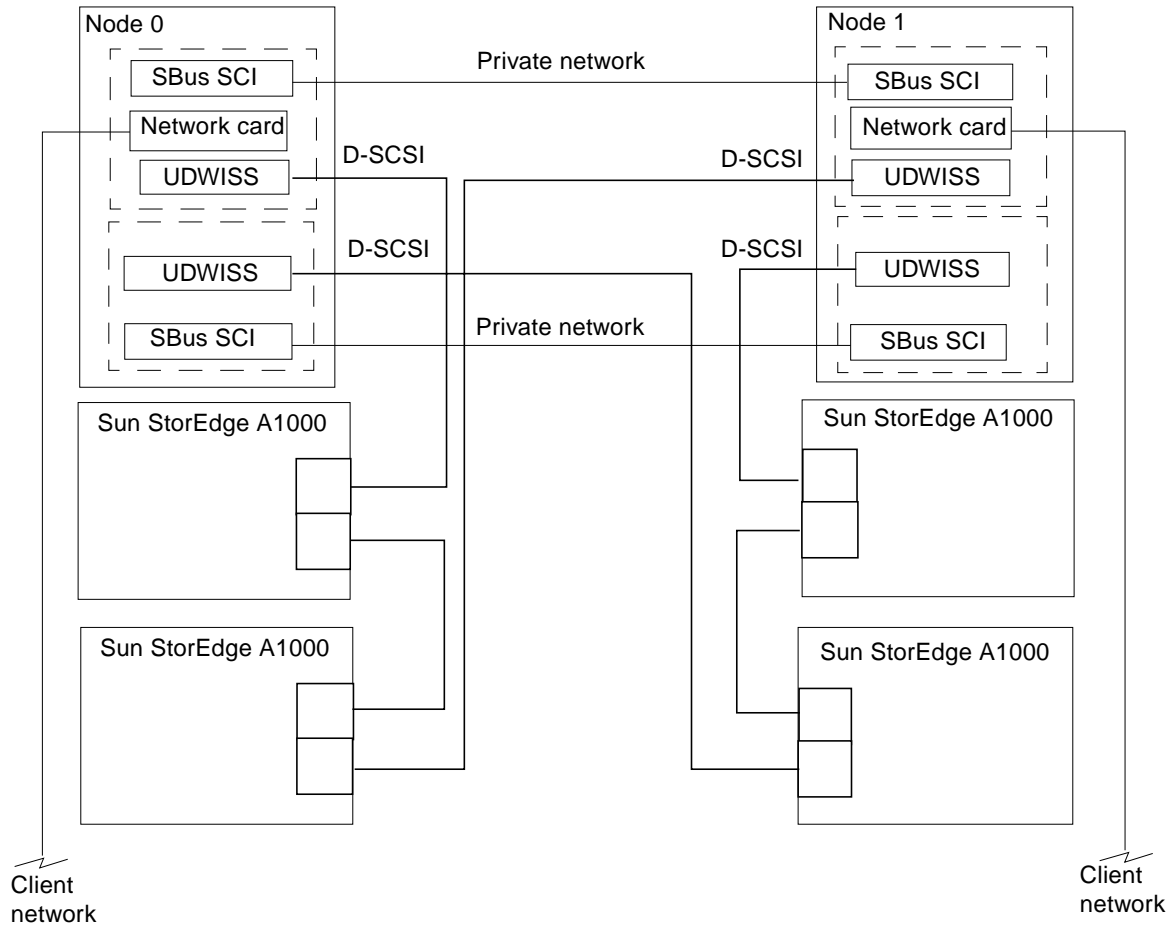
Note: Refer to Table 1-1 for a listing of supported platforms.

FIGURE 1-10 Typical Two-Node Cluster Using Daisy-Chained Sun StorEdge A1000s

Node 0
   SBus SCI
   Network card
   UDWISS
   UDWISS
   SBus SCI
Serial port A

Private network
Sun StorEdge A1000s
D-SCSI
D-SCSI
Private network

Node 1
   SBus SCI
   Network card
   UDWISS
   UDWISS
   SBus SCI
Serial port A

D-SCSI
D-SCSI

Client network
Primary Ethernet
Terminal concentrator
Administration workstation
Client network
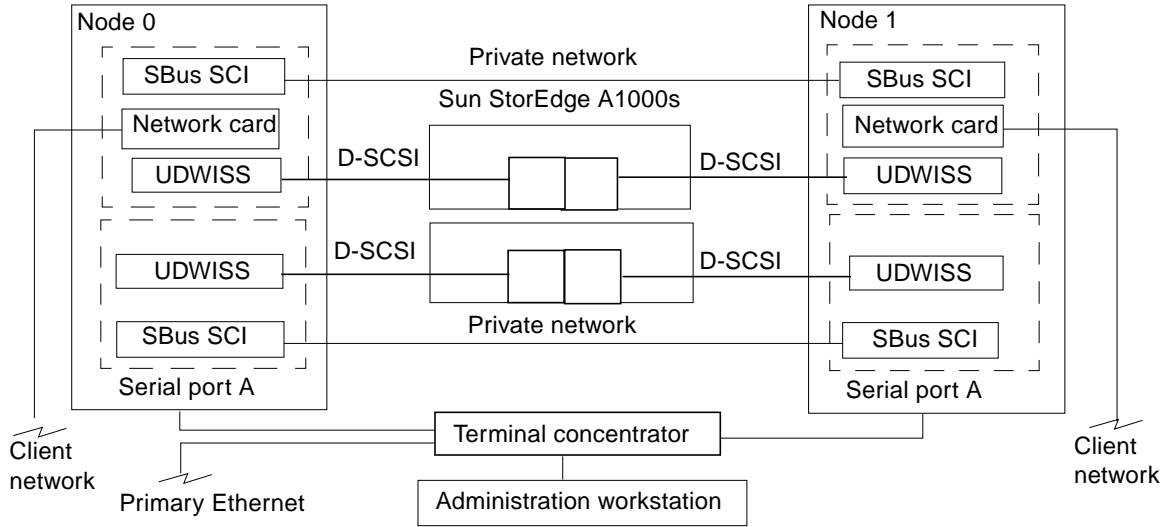
Note: Refer to Table 1-1 for a listing of supported platforms.

FIGURE 1-11 Typical Two-Node Cluster Using Sun StorEdge A1000 (Single SCSI Bus)

Node 0

SBus SCI	
Network card	
UDWISS	

Private network

Sun StorEdge D1000

D-SCSI

D-SCSI

UDWISS	
SBus SCI	

Private network

Sun StorEdge D1000

D-SCSI

D-SCSI

D-SCSI

Serial port A

Client
network

Primary Ethernet

Node 1

SBus SCI	
Network card	
UDWISS	

UDWISS	
SBus SCI	

Serial port A

Client
network

Terminal concentrator

Administration workstation
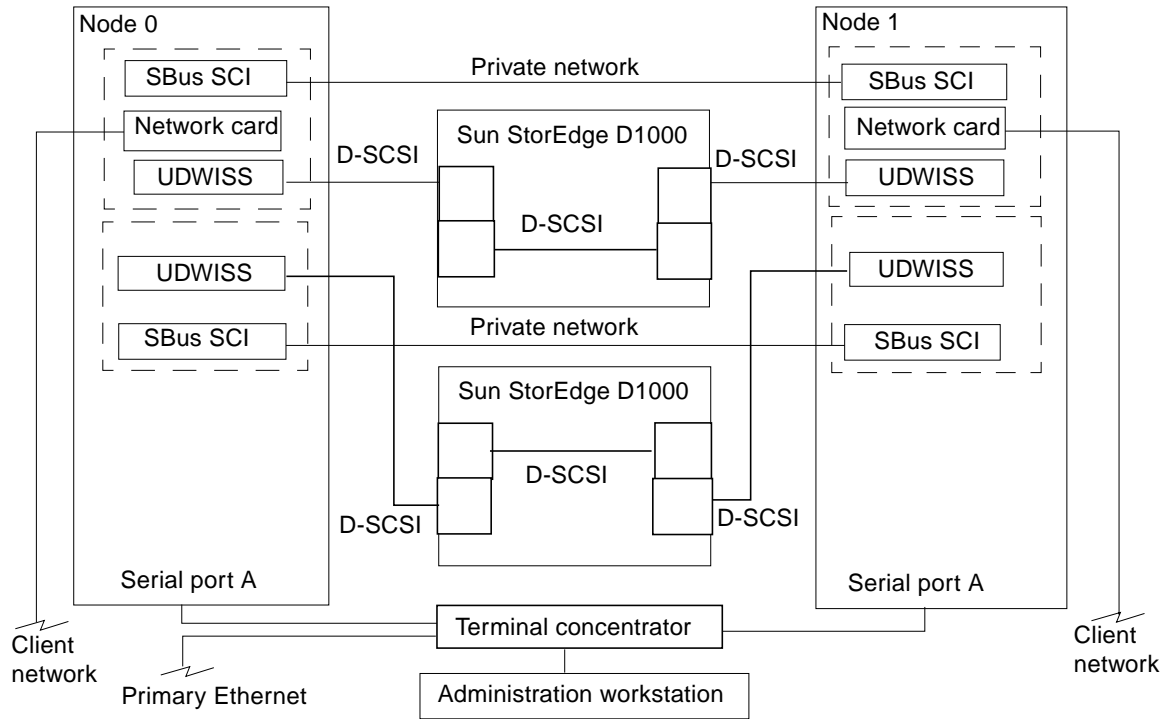
Note: Refer to Table 1-1 for a listing of supported platforms.

FIGURE 1-12 Typical Two-Node Cluster Using Sun StorEdge D1000 (Dual SCSI Bus)
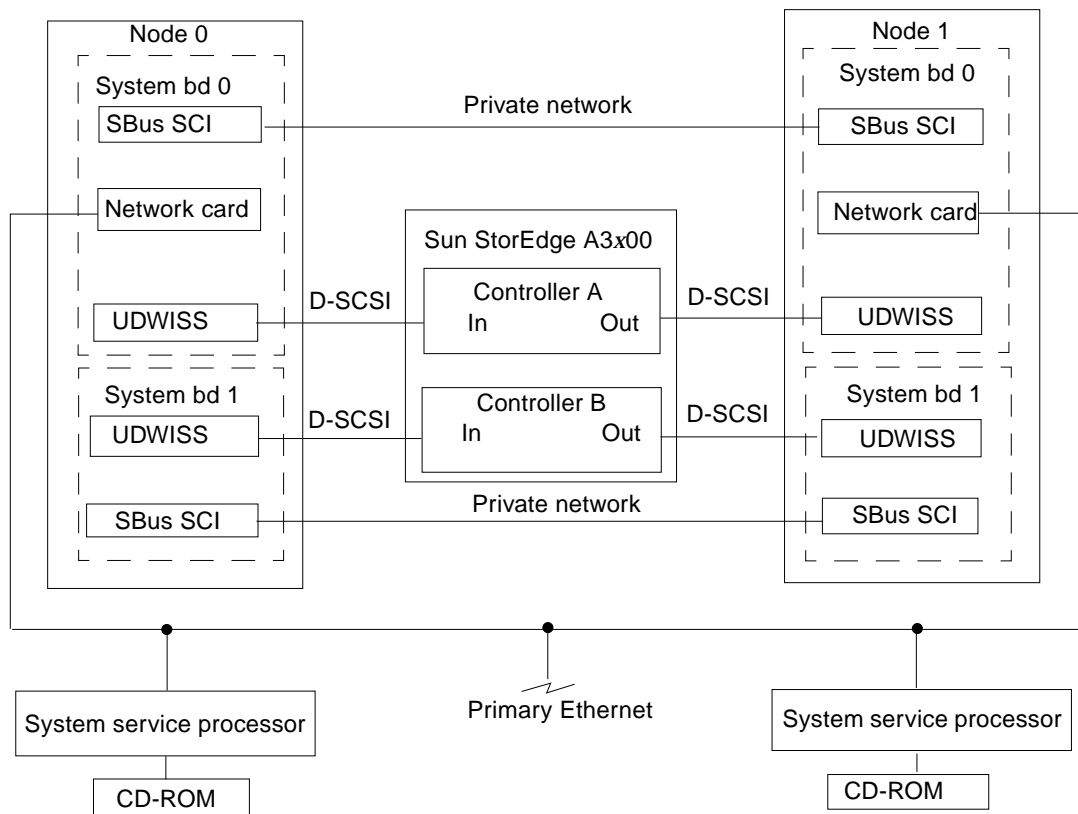
FIGURE 1-13 Typical Sun Enterprise 10000 Two-Node Cluster Using Sun StorEdge A3*x*00
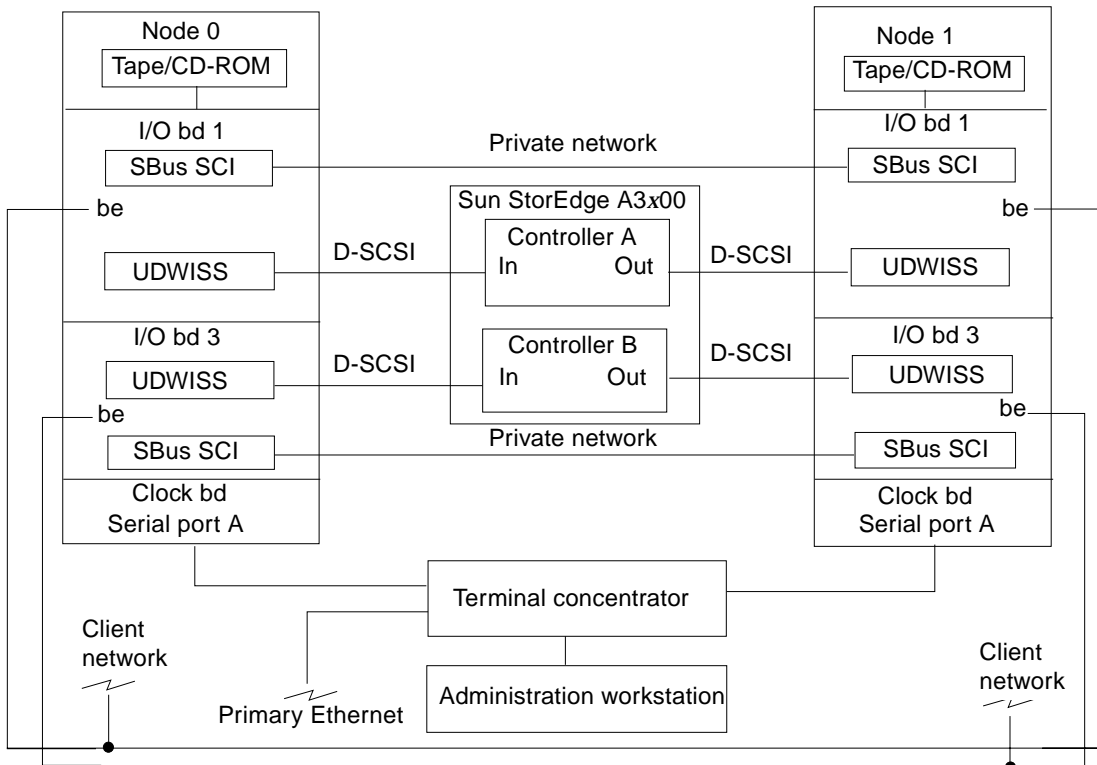
FIGURE 1-14 Typical Sun Enterprise 3*x*00 Through 6*x*00 Two-Node Cluster Using Sun StorEdge A3*x*00
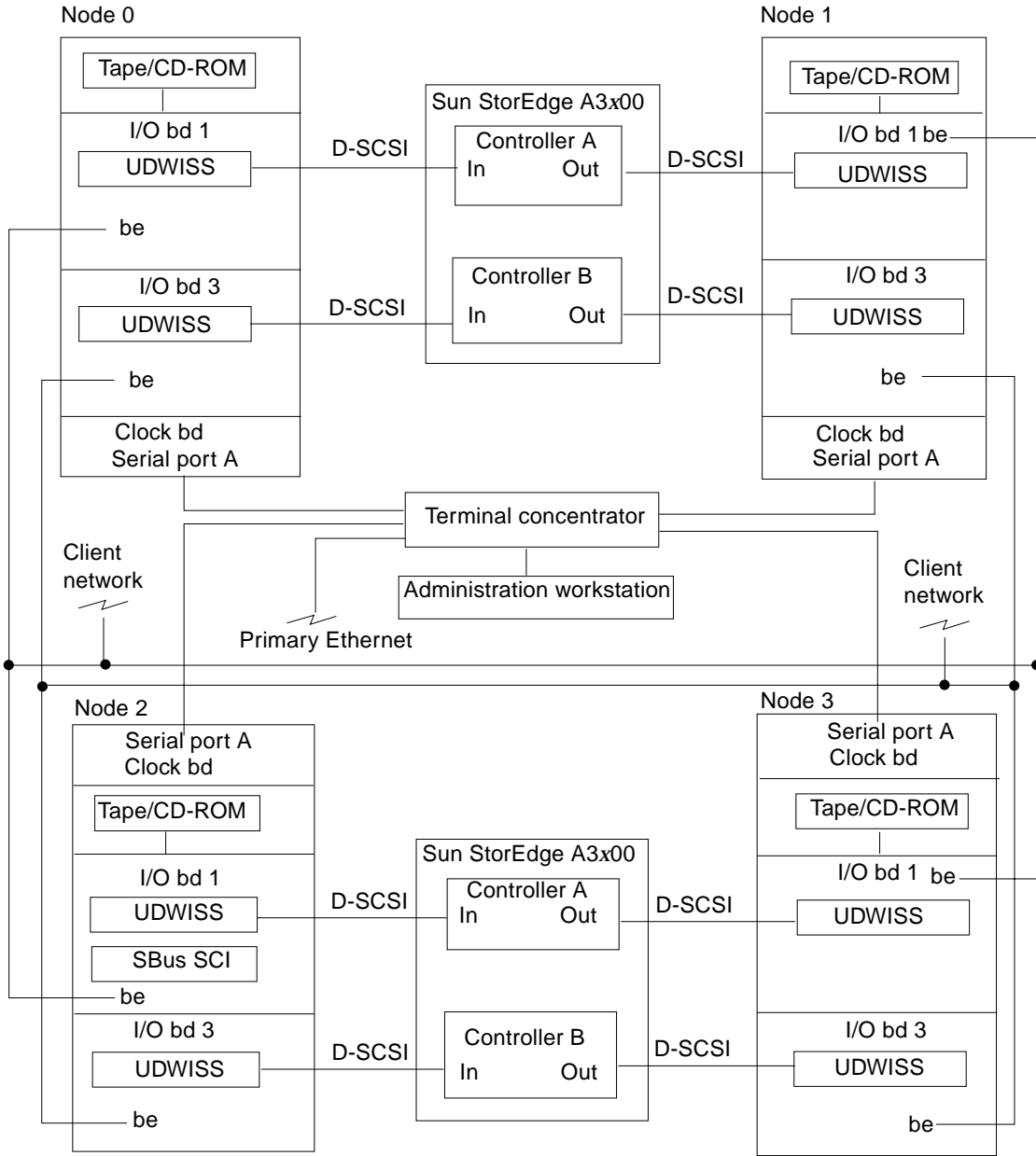
Note: See FIGURE 1-25 (SCI) or FIGURE 1-26 (FastEthernet) for four-node switched private net connections.

FIGURE 1-15 Typical Sun Enterprise 3*x*00 Through 6*x*000 Four-Node Cluster Using Sun StorEdge A3*x*00s
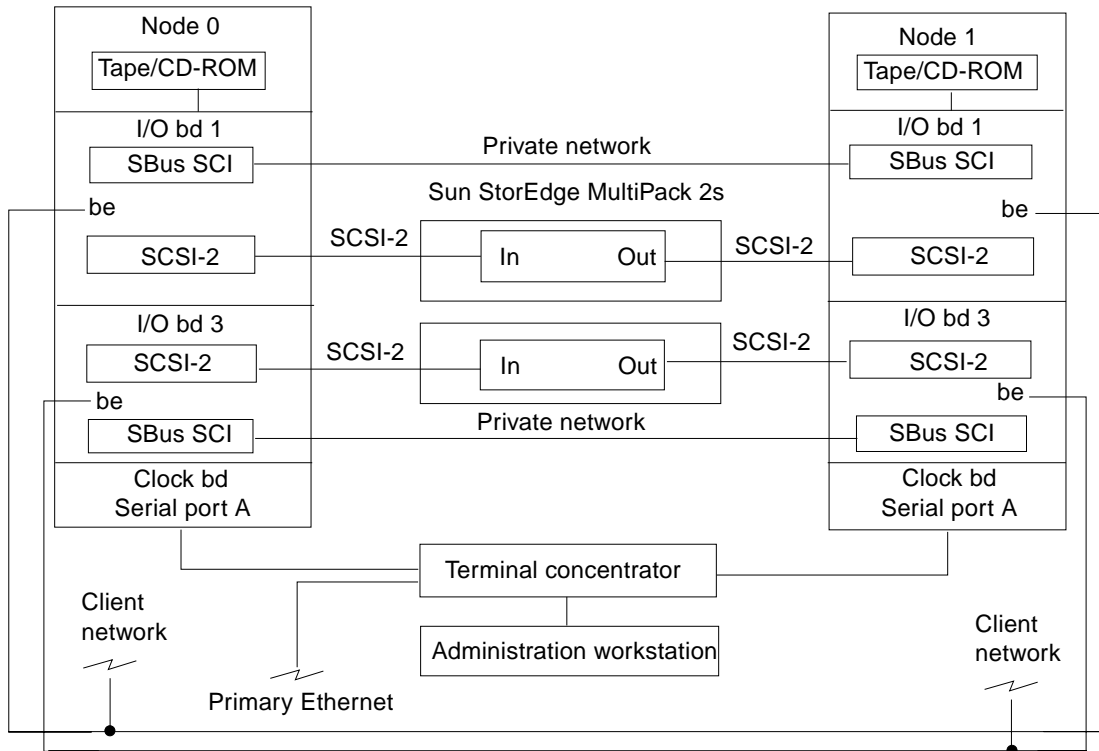
FIGURE 1-16 Typical Sun Enterprise 3*x*00 Two-Node Cluster Using Sun StorEdge
MultiPack 2s
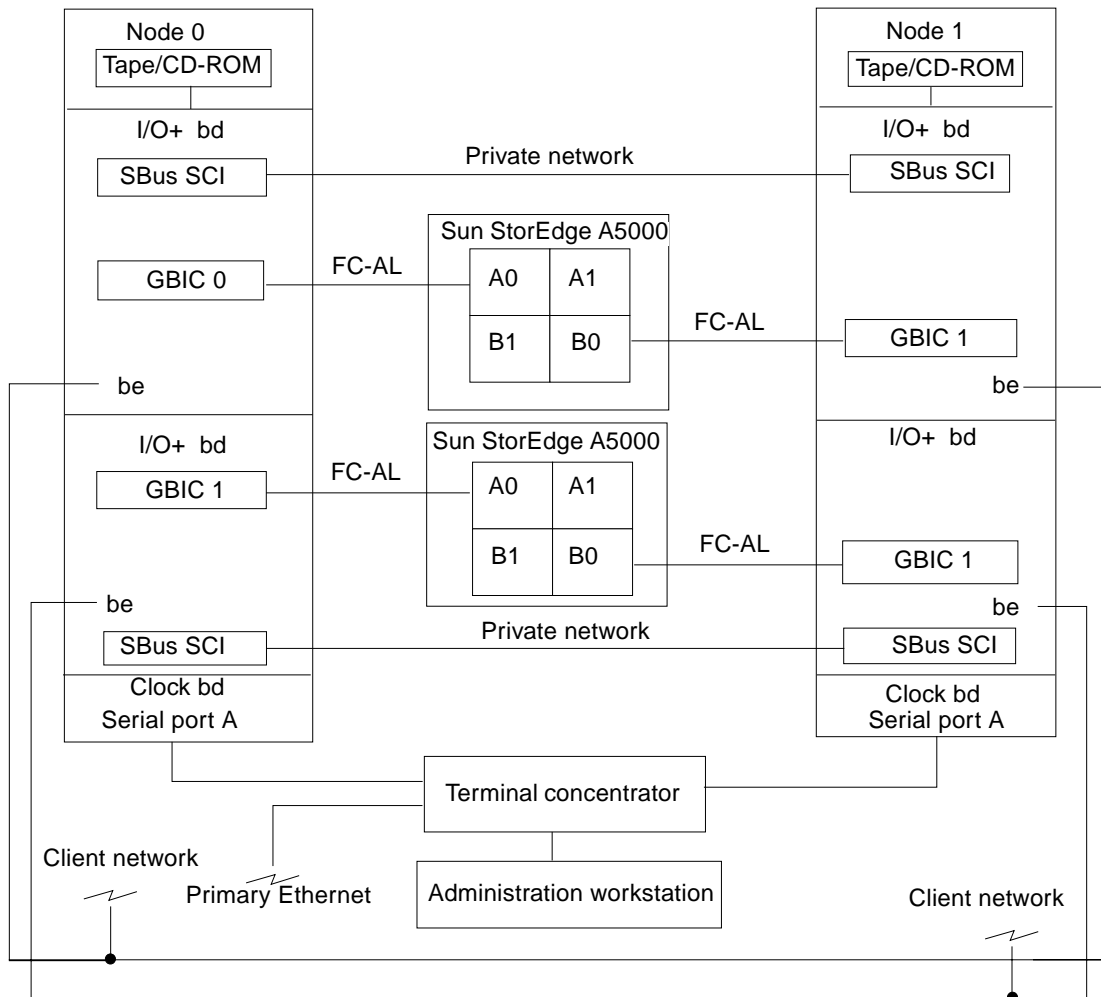
Note: GBICs can be mounted using onboard optical ports or FC-100 cards.

FIGURE 1-17 Typical Sun Enterprise 3*x*00 Through 6*x*00 Two-Node Cluster Using Sun StorEdge A5000s
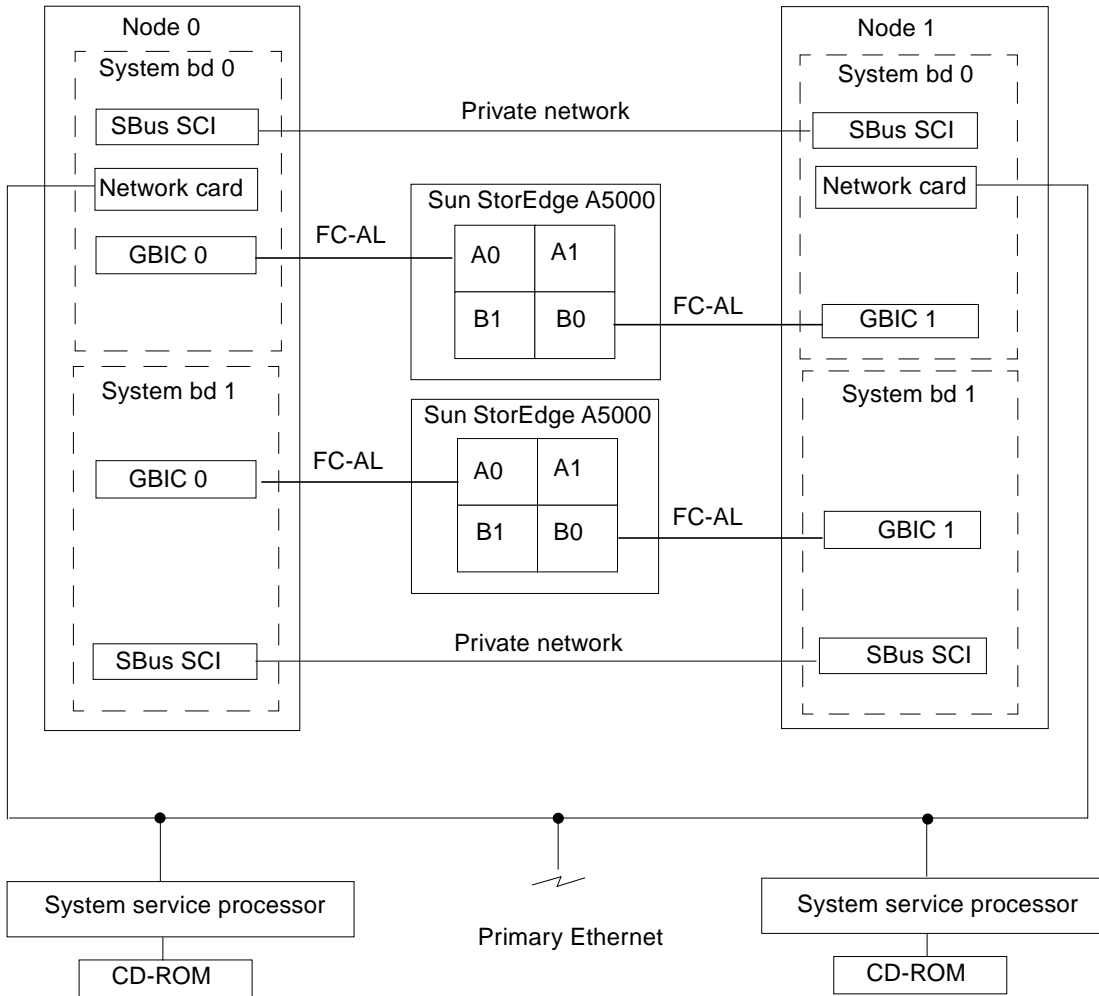
Note: GBICs can be mounted using FC-100 cards.

FIGURE 1-18 Typical Sun Enterprise 10000 Two-Node Cluster Using Sun StorEdge A5000s
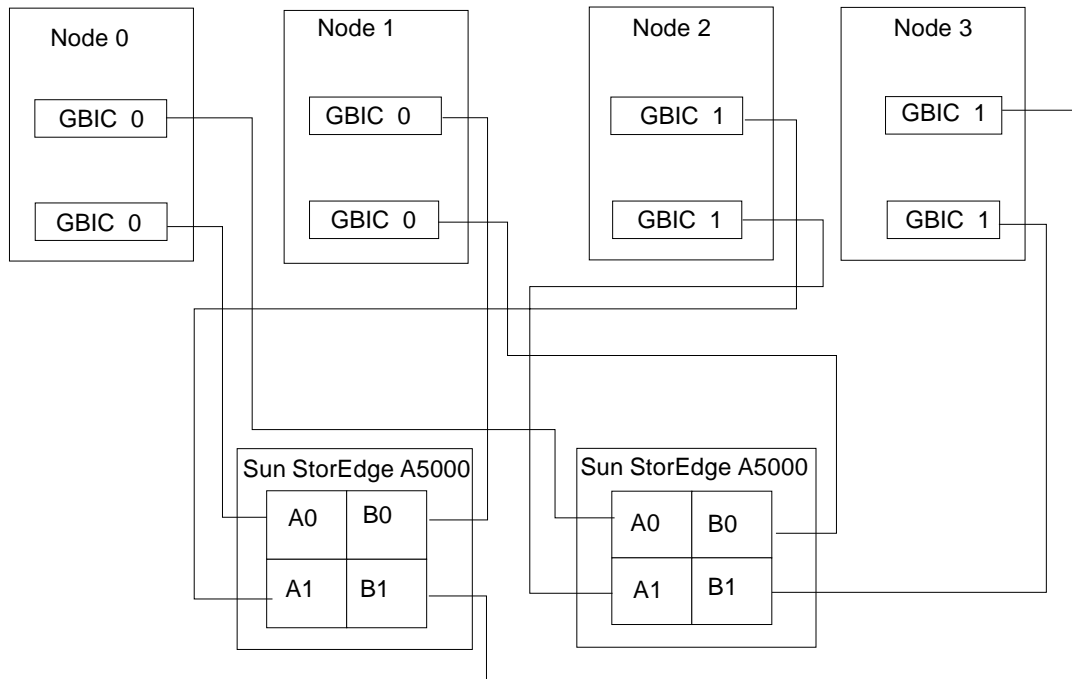
Notes: 1. GBICs are located on I/O boards for Sun Enterprise 3*x*00 through 6*x*00 systems; on system boards for the Sun Enterprise 10000s. GBICs can also be mounted using onboard optical ports for I/O+ boards or on FC-100 cards.
2. See FIGURE 1-25 (SCI) or FIGURE 1-26 (FastEthernet) for four-node switched private net connections.

FIGURE 1-19 Typical Sun Enterprise Four-Node Cluster Using Sun StorEdge A5000s
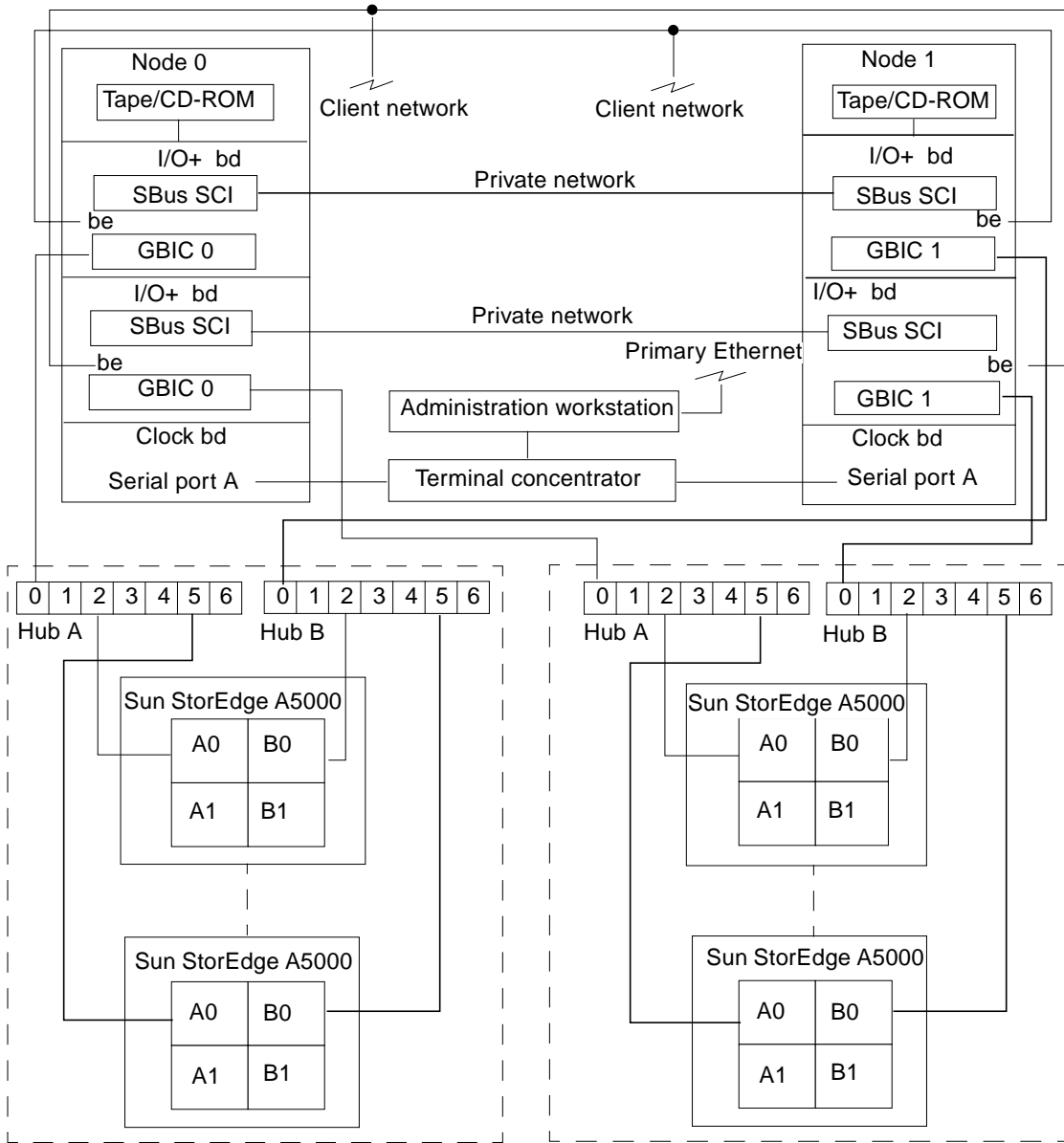
Note: GBICs can be mounted using onboard optical ports or FC-100 cards

FIGURE 1-20 Typical Sun Enterprise 3x00 Through 6x00 Two-Node Cluster Using Sun StorEdge A5000s with Hubs
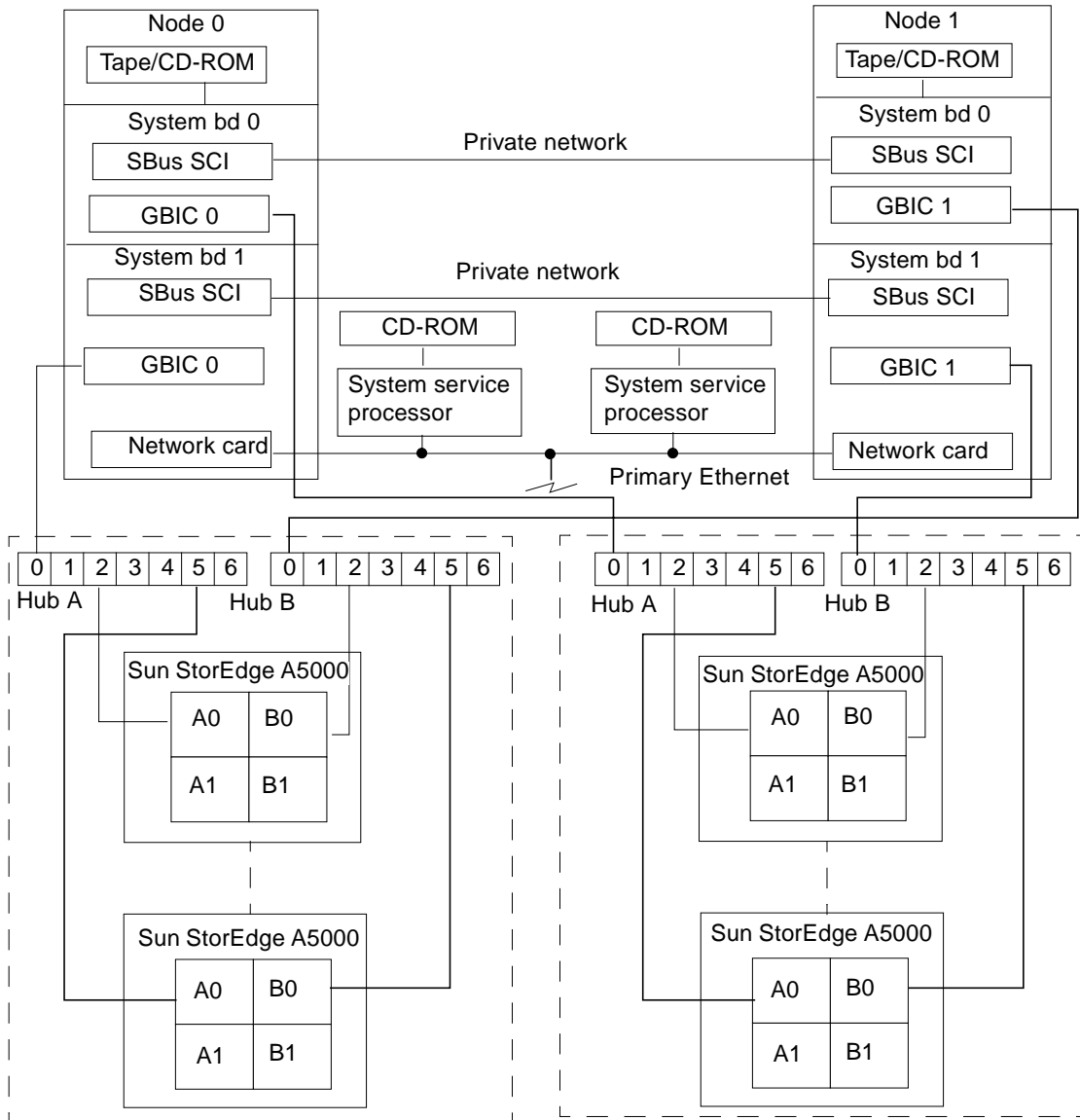
Note: GBICs can be mounted using FC-100 cards.

FIGURE 1-21 Typical Sun Enterprise 10000 Two-Node Cluster Using Sun StorEdge A5000s With Hubs
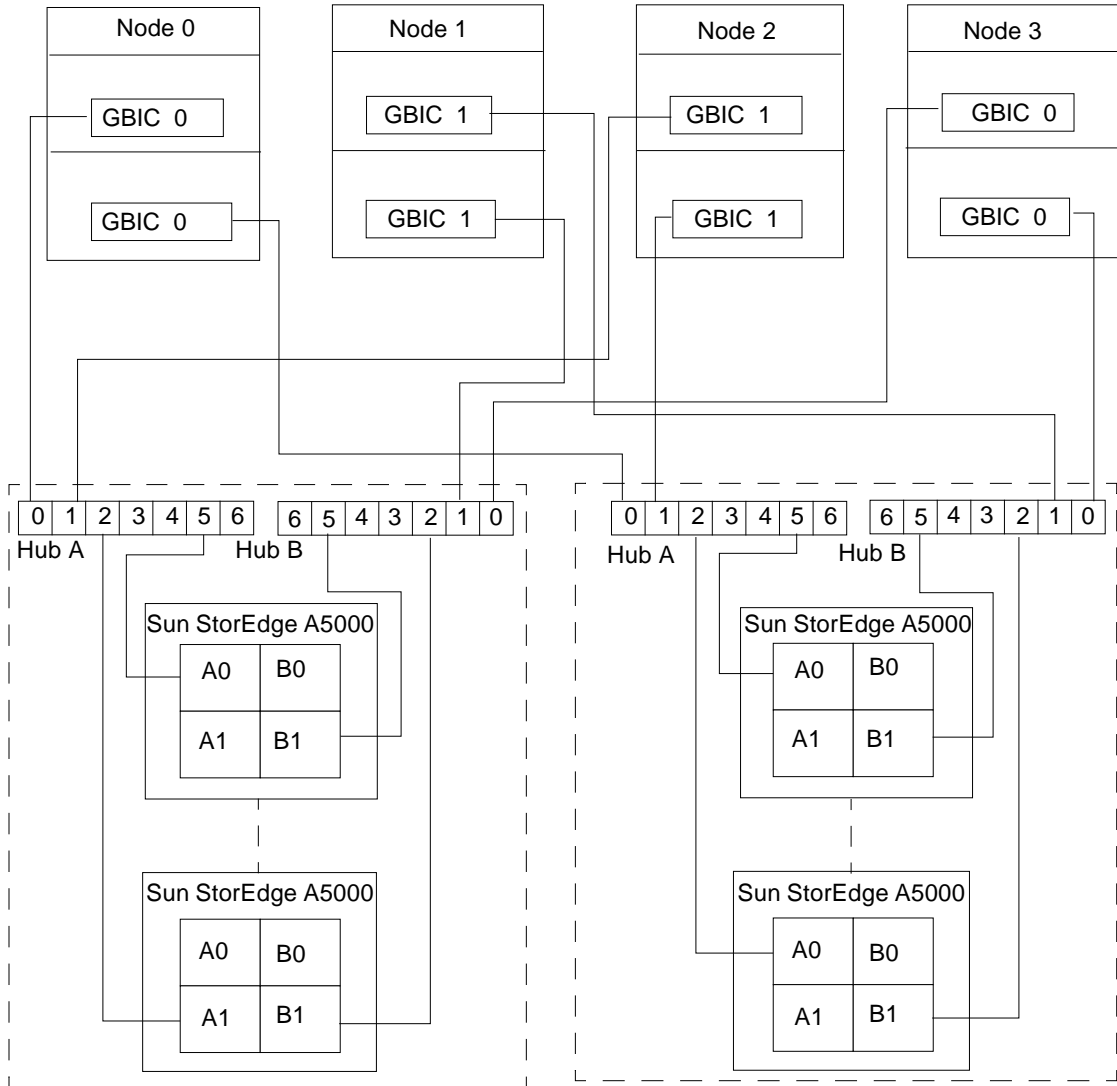
Notes: 1. GBICs are located on I/O boards for Sun Enterprise 3x00 through 6x00 systems; on system boards for the Sun enterprise 10000. GBICs can also be mounted using onboard optical ports for I/O+ boards or on FC-100 cards.

2. See FIGURE 1-25 (SCI) or FIGURE 1-26 (FastEthernet) for four-node switched private net connections.

FIGURE 1-22 Typical Sun Enterprise 3x00 Through 6x00 Four-Node Cluster Using Sun StorEdge A5000s With Hubs
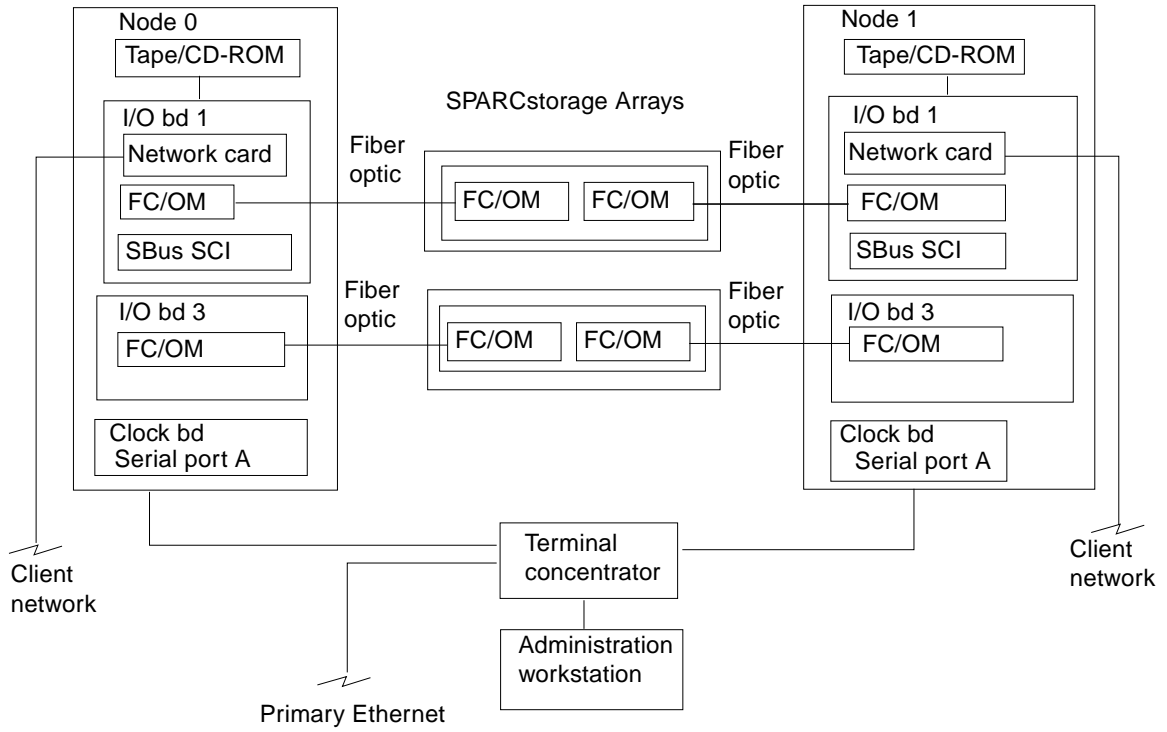
Note: See FIGURE 1-17 for two-node switched private net connections.

FIGURE 1-23 Typical Sun Enterprise 3*x*00 Through 6*x*00 Two-Node Cluster Using SPARCstorage Arrays
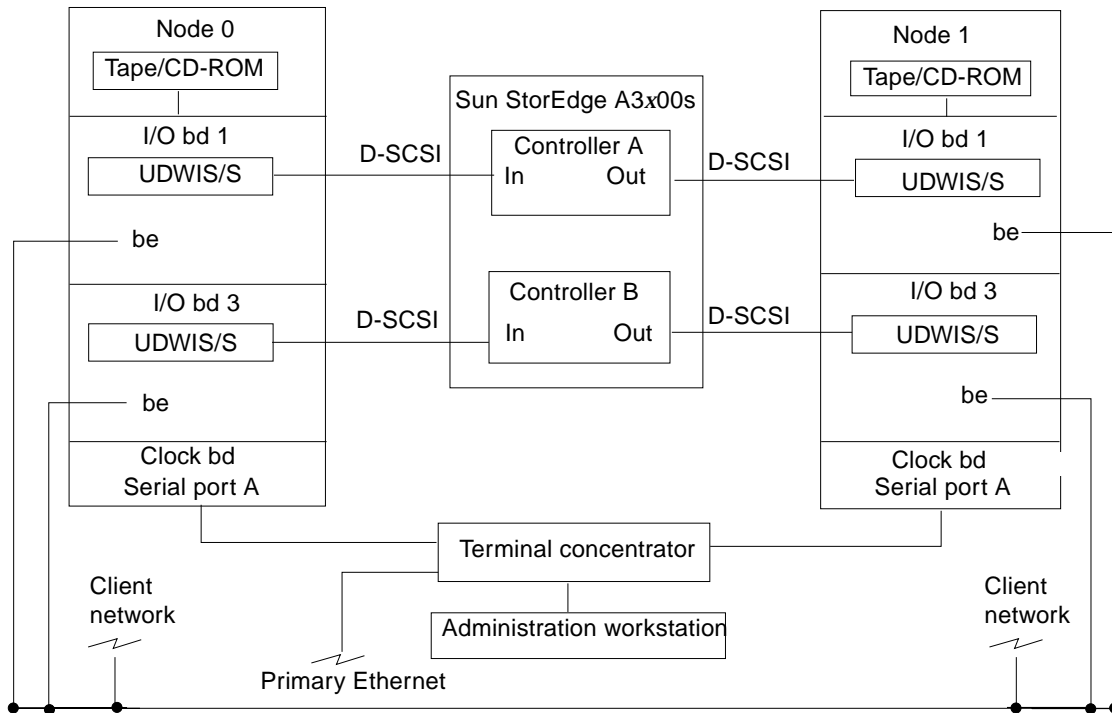
Note: See FIGURE 1-17 for two-node switched private net connections.

FIGURE 1-24 Typical Sun Enterprise 3x00 Through 6x00 Two-Node Cluster Using Sun StorEdge A3x00s
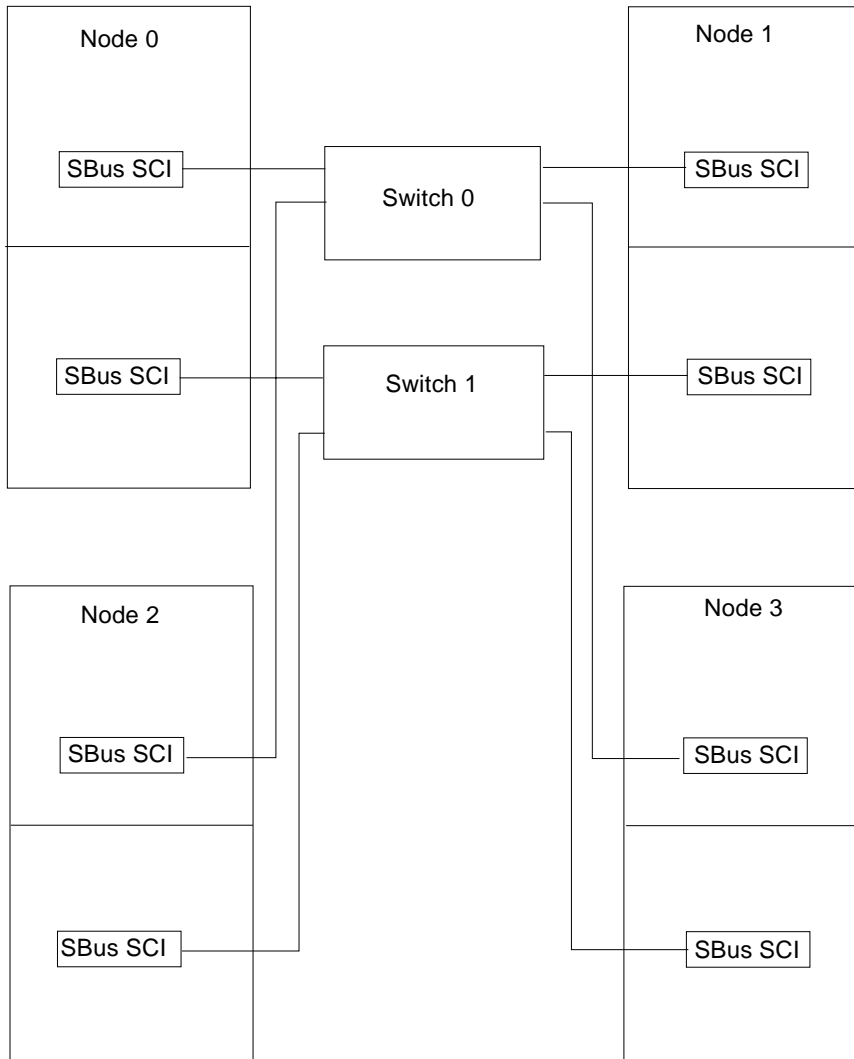
Note: SBus SCI cards are located on I/O boards for Sun Enterprise 3x00 through 6x00s; on system boards for the Sun Enterprise 10000s.

FIGURE 1-25 Typical Four-Node Sun Enterprise Clusters Using Switched SCI Private Nets
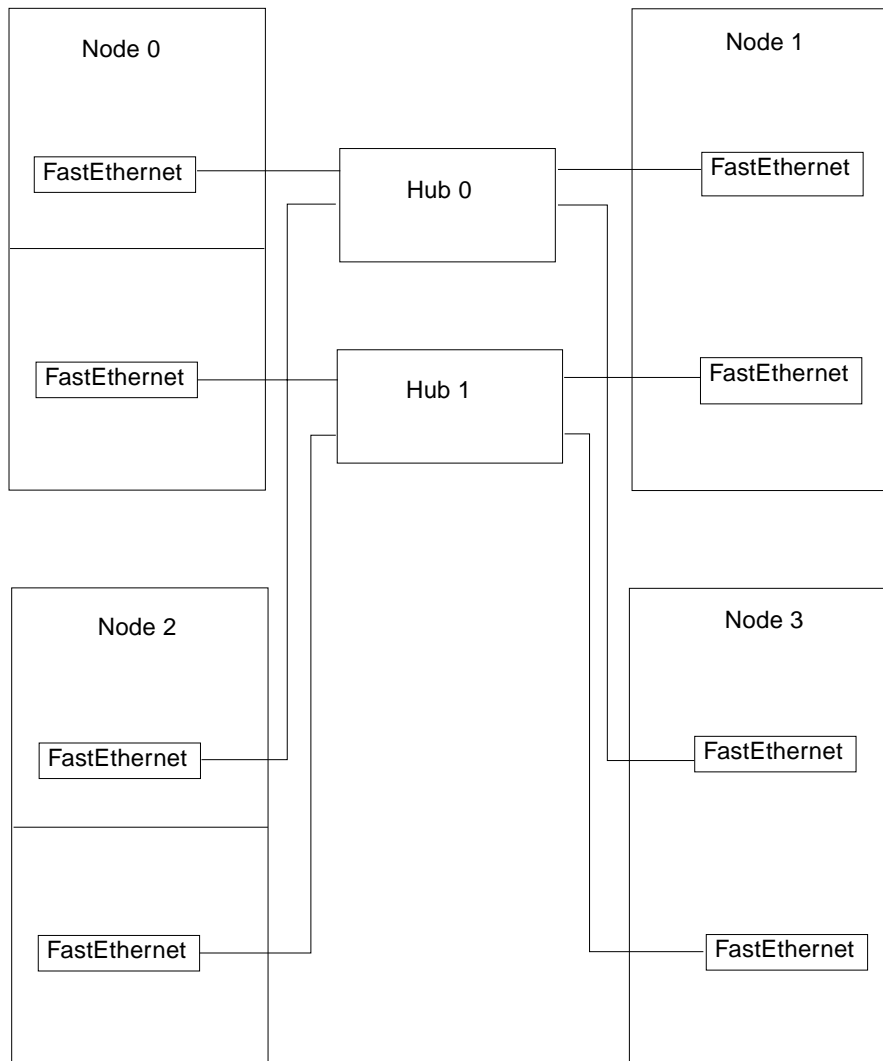
Note: FastEthernet SBus cards are located on I/O boards for Sun Enterprise 3x00 through 6x00s; on system boards for the Sun Enterprise 10000s. The FastEthernet card can be either SunSwift™ or SunFastEthernet; or, for the Sun Enterprise 3x00 through 6x00, the I/O+ board FastEthernet port can be used.

FIGURE 1-26 Typical Four-Node Sun Enterprise Clusters Using FastEthernet Private Net With Hubs

1.4 Scalability

1.4.1 Nodes

A basic cluster consists of two nodes. A Sun Enterprise Cluster system may be ordered also as a three- or four-node cluster.

The nodes communicate using redundant SCI or FastEthernet private network links. In three- or four-node clusters using SCI, two SCI switches enable communication among all nodes; for clusters using FastEthernet, two hubs are used. In parallel database services, the number of processors, memory, and I/O bandwidth increases with the introduction of one or two more nodes.

1.4.2 Database Storage

You can expand the system by adding additional disk array configurations. These are housed in three types of expansion racks. The disk arrays can be:

■ Sun StorEdge MultiPack 2
■ Two or four SPARCstorage Array 200 series units hosting four or six SPARCstorage™ RSM™ units
■ Two or four SPARCstorage Array 200 series units hosting four or six differential SCSI disk tray units
■ Sun StorEdge A1000 and D1000
■ Sun StorEdge A3x00
■ Sun StorEdge A5000

1.4.3 SCI Switches

For a three- or four-node cluster, two switch units are required. See FIGURE 1-25 and FIGURE 1-26 for example configurations. Additional switches can be added to boost throughput, eliminate hardware communication as a potential bottleneck, or to support a heavier workload.

1.4.4 Terminal Concentrator

The terminal concentrator in conjunction with the Sun Cluster Manager can support multiple cluster configurations.

Checklists and Planning for Hardware, Power, and Networks

This chapter gives specific information and checklists to use when you inventory each type of Sun Enterprise Cluster system. Chapter 2 sections include:

2.1　Sun Enterprise 1 and 2 Systems

2.1.1　General Description

TABLE 2-1　Requirements for Sun Enterprise 1 and 2 Systems

Device	Per Node Min	Max	Per Cluster System Min	Max[1]	Comment
For Sun Enterprise 1 only FastEthernet private net					
FastEthernet hub	–	–	2	2	Optional for two nodes; required for three or more nodes
SunSwift or SunFastEthernet SBus Adapter 2.0	2	2	8	8	SBus cards mounted on motherboards
cabling:					
1m, Ethernet 5m, Ethernet	2	2	8	8	As required
For Sun Enterprise 2 only FastEthernet private net					
FastEthernet hub	–	–	2	2	Optional for two nodes; required for three or more nodes
SunSwift or SunFastEthernet SBus Adapter 2.0	2	4	8	16	SBus cards mounted on motherboards
cabling:					
1m, Ethernet 5m, Ethernet	2	2	8	8	As required
For SCI private net (Sun Enterprise 2; not recommended for Sun Enterprise 1)					
SCI-B SBus Adapter	2	2	8	8	Each node is configured with 2 SCI cards
cabling:					
2m, SCI cable 5m, SCI cable 10m, SCI cable	2	2	8	8	As required
SCI switch	–	–	2	2	Optional for two nodes; required for three or more nodes

TABLE 2-1   Requirements for Sun Enterprise 1 and 2 Systems *(Continued)*

Device	Per Node		Per Cluster System		Comment
	Min	Max	Min	Max[1]	
Disk arrays					
Sun StorEdge MultiPack 2	–	–	2	14	Uses SCSI-2 cards mounted on motherboards as host adapters; uses SCSI-2 cabling as required
SPARCstorage Array	–	–	2	28	With two FC/OM; uses host adapters mounted on node motherboards; uses fiber-optic cabling as required
Sun StorEdge A1000 and D1000 (Sun Enterprise 2 only)	–	–	2	4	Uses UDWIS/S mounted on node motherboards as host adapters; uses D-SCSI cabling as required
Sun StorEdge A3*x*00	–	–	1	6	Uses UDWIS/S mounted on node motherboards as host adapters; uses D-SCSI cabling as required
Sun StorEdge A5000 (Sun Enterprise 2 only)	–	–	2	24	Uses GBICs as host adapters; mounted on node motherboards; uses FC-AL cabling as required
Disk array host adapters (mounted on motherboards)					
FC/OM optical modules	2	-	8	-	For SPARCstorage Arays; mounted on FC/S cards
UDWISS	2	-	8	-	For Sun StorEdge A3*x*00s
GBIC (Sun Enterprise 2 only)	2	-	8	-	For Sun StorEdge A5000s; mounted on FC-100 cards
SCSI-2	2	-	8	-	For Sun StorEdge MultiPack 2s
Processor components					
Sun Enterprise 1 or 2 System	1	1	2	4	Chassis not mounted in a rack
Each with 1 Ultra SPARC™ processor module and 128 Mbytes RAM	1	2	2	8	
Motherboards in nodes	2	3	4	12	Configured with SCI or FastEthernet cards as well as the disk array host adapter; see this table for disk array host adapter listing
Additional assemblies					
Terminal concentrator	–	–	1	1	Installed in customer-defined location

TABLE 2-1 Requirements for Sun Enterprise 1 and 2 Systems *(Continued)*

Device	Per Node		Per Cluster System		Comment
	Min	Max	Min	Max[1]	
cabling:					
RS-232 serial cable long, PN 530-2152 short PN 530-2151	1	1	2	4	
Administration workstation	–	–	1	1	Installed in customer-defined location

1. Based on four nodes.

2.1.2 Checklist

TABLE 2-2 Checklist for Sun Enterprise 1 and 2 Systems

Category	Item	Per Node Quantity		Per Cluster Quantity	
		Planned	On Hand	Planned	On Hand
Processor components	Sun Enterprise 1 or 2 System (nodes)				
	CPU/Memory board with 1 UltraSPARC module and 128 Mbytes RAM				
Disk array host adapters	FC/OM modules mounted on FC/S cards for SPARCstorage Array Model 100 and 200 Series				
	UDWIS/S for Sun StorEdge A1000 and D1000				
	UDWIS/S for Sun StorEdge A3x00s				
	GBICs mounted on FC-100s for Sun StorEdge A5000s				
	SCSI-2 for MultiPack 2				
Cables	Terminal concentrator				
	Private net (SCI or FastEthernet)				
	Fiber optic (SPARCstorage Array)				
	D-SCSI (Sun StorEdge A3x00)				

TABLE 2-2 Checklist for Sun Enterprise 1 and 2 Systems *(Continued)*

Category	Item	Per Node Quantity		Per Cluster Quantity	
		Planned	On Hand	Planned	On Hand
	FC-AL (Sun StorEdge A5000; Sun Enterprise 2 only)				
	SCSI-2 (Sun StorEdge MultiPack 2)				
Expansion cabinets	For hosts using SPARCstorage Array Model 200 series with SPARCstorage RSM units or Differential SCSI disk trays				
	For hosts using Sun StorEdge A3x00s				
	For hosts using Sun StorEdge A5000s				
Private net switching and adapter cards	SCI switch or FastEthernet hub (three or more nodes) SCI or FastEthernet cards				
Additional assemblies	Administration workstation with monitor				
	Terminal concentrator				

2.2 Sun Enterprise 250 and 450 Systems

2.2.1 General Description

TABLE 2-3   Requirements for Sun Enterprise 250 and 450 Systems

Device	Per Node		Per Cluster System		Comment
	Min	Max	Min	Max[1]	
For FastEthernet private net					
FastEthernet hub	–	–	2	2	Optional for two nodes; required for three or more nodes
SunSwift PCI	2	2	4	8	Mounted on motherboards
cabling:					
1m, Ethernet 5m, Ethernet	2	2	4	8	As required
Disk arrays					
Sun StorEdge MultiPack 2	–	–	2	14	Uses SCSI-2 cards mounted on motherboards as host adapters; uses SCSI-2 cabling as required
Sun StorEdge A1000 and D1000	–	–	2	Maximum of 8 for Sun Enterprise 250; 450 maximum of 20	Uses UDWIS/S mounted on node motherboards as host adapters; uses D-SCSI cabling as required
Sun StorEdge A3x00	–	–	1	6	Uses UDWIS/S mounted on node motherboards as host adapters; uses D-SCSI cabling as required
Disk array host adapters (mounted on motherboards)					
FC/OM optical modules	2	–	8	-	For SPARCstorage Arrays, mounted on FC/S cards
UDWISS	2	–	8	-	For Sun StorEdge A3x00s
GBIC	2	–	8	-	For Sun StorEdge A5000s; mounted on FC-100 cards

TABLE 2-3 Requirements for Sun Enterprise 250 and 450 Systems *(Continued)*

Device	Per Node Min	Per Node Max	Per Cluster System Min	Per Cluster System Max[1]	Comment
SCSI-2	2	–	8	–	For Sun StorEdge MultiPack 2s
Processor components					
Sun Enterprise 250 or 450 System	1	1	2	4	Chassis not mounted in a rack
Each with 1 UltraSPARC™ processor module, 128 Mbytes RAM and a 2.1-Gbyte internal disk drive	1	2	2	8	
Motherboards in nodes	2	3	4	12	Configured with FastEthernet cards as well as the disk array host adapters; see this table for disk array host adapter listing
Additional assemblies					
Terminal concentrator	–	–	1	1	Installed in customer-defined location
cabling:					
RS-232 serial cable long, PN 530-2152 short PN 530-2151	1	1	2	4	
Administration workstation	–	–	1	1	Installed in customer-defined location

1. Based on four nodes.

2.2.2 Checklist

TABLE 2-4 Checklist for Sun Enterprise 250 and 450 Systems

Category	Item	Per Node Quantity Planned	Per Node Quantity On Hand	Per Cluster Quantity Planned	Per Cluster Quantity On Hand
Processor components	Sun Enterprise 250 and 450 System (nodes) each with:				
	1 UltraSPARC module and 128 Mbytes RAM				
	2.1-Gbyte internal disk drive				
Disk array host adapters	SCSI-2 for MultiPack 2				

TABLE 2-4 Checklist for Sun Enterprise 250 and 450 Systems *(Continued)*

Category	Item	Per Node Quantity		Per Cluster Quantity	
		Planned	On Hand	Planned	On Hand
	UDWIS/S for Sun StorEdge A1000, D1000 and A3x00				
Cables	Terminal concentrator				
	Private net (FastEthernet)				
	SCSI-2 (Sun StorEdge MultiPack 2)				
	D-SCSI (Sun StorEdge A1000, D1000 and A3x00)				
Expansion cabinets	For hosts using Sun StorEdge A3x00s				
Private net switching and adapter cards	FastEthernet hub (three or more nodes) FastEthernet cards				
Additional assemblies	Administration workstation with monitor				
	Terminal concentrator				

2.3 Sun Enterprise 3x00 Systems

2.3.1 General Description

TABLE 2-5   Requirements for Sun Enterprise 3x00 Systems

Device	Per Node Min	Per Node Max	Per Cluster System Min	Per Cluster System Max[1]	Comment
	For FastEthernet private net				
FastEthernet hub	–	–	2	2	Optional for two nodes; required for three or more nodes
SunSwift or SunFastEthernet SBus Adapter 2.0	2	2	8	8	Mounted on I/O boards (for I/O+ boards the on-board FastEthernet port can be used)
cabling:					
1m, Ethernet 5m, Ethernet	2	2	8	8	As required
	For SCI private net				
SCI switch	–	–	2	2	Optional for two nodes; required for three or more nodes
SCI-B SBus Adapter	2	2	8	8	I/O boards in slots 1 and 3 are configured with SCI cards
cabling:					
2m, SCI cable 5m, SCI cable 10m, SCI cable	2	2	8	8	As required
	Disk arrays				
Sun StorEdge MultiPack 2	–	–	2	14	Uses SCSI-2 cards mounted on I/O boards as host adapters; uses SCSI-2 cabling as required
SPARCstorage Array	–	–	2	28	With 2 FC/OM; uses host adapters mounted on I/O boards, either on-board optical slots or FC/S cards; uses fiber-optic cabling as required

TABLE 2-5 Requirements for Sun Enterprise *3x*00 Systems *(Continued)*

Device	Per Node		Per Cluster System		Comment
	Min	Max	Min	Max[1]	
Sun StorEdge A1000 and D1000	–	–	2	9	Uses UDWIS/S mounted on I/O boards as host adapters; uses D-SCSI cabling as required
Sun StorEdge A3*x*00	–	–	1	6	Uses UDWIS/S mounted on I/O boards as host adapters; uses D-SCSI cabling as required
Sun StorEdge A5000	–	–	2	24	Uses GBICs as host adapters; mounted either on FC-100 card residing on I/O board or using I/O+ board on-board optical port; uses FC-AL cabling as required
Disk array host adapters (mounted on I/O boards)					
FC/OM optical modules	2	–	8	–	For SPARCstorage Arrays; mounted either using on-board optical ports or FC/S cards
UDWIS/S	2	–	8	–	For Sun StorEdge A1000, D1000 and A3*x*00s
GBIC	2	–	8	–	For Sun StorEdge A5000s; mounted either on FC-100 card or using I/O+ board on-board optical port
SCSI-2	2	–	8	–	For Sun StorEdge MultiPack 2s
Processor components					
Sun Enterprise 3*x*00 System	1	1	2	4	Chassis not mounted in a rack
CPU/Memory boards, each with 2 UltraSPARC™ (UltraSPARC IIs for 3500) modules and 256 Mbytes RAM	1	2	2	8	Installed in slot 0
I/O boards (I/O or I/O+)	2	3	4	12	I/O boards in slots 1 and 3 are configured with SCI or FastEthernet cards (for I/O+ boards use on-board FastEthernet) as well as the disk array host adapters; see this table for disk array host adapter listing
Power/cooling modules (PCMs)	3	3	6	12	One for every two boards
Additional assemblies					
Terminal concentrator	–	–	1	1	Installed in customer-defined location

TABLE 2-5 Requirements for Sun Enterprise *3x*00 Systems *(Continued)*

Device	Per Node		Per Cluster System		Comment
	Min	Max	Min	Max[1]	
cabling:					
RS-232 serial cable long, PN 530-2152 short PN 530-2151	1	1	2	4	
Administration workstation	–	–	1	1	Installed in customer-defined location

1. Based on four nodes.

2.3.2 Checklist

TABLE 2-6 Checklist for Sun Enterprise *3x*00 Systems

Category	Item	Per Node Quantity		Per Cluster Quantity	
		Planned	On Hand	Planned	On Hand
Processor components	Sun Enterprise 3*x*00 System (nodes)				
	CPU/Memory board with 2 UltraSPARC modules and 256 Mbytes RAM (128 Mbytes min.)				
	I/O board				
	Power/cooling module (PCMs)				
Disk array host adapters	FC/OM modules mounted on FC/S cards for SPARCstorage Arrays Model 100/200 Series				
	UDWIS/S for Sun StorEdge A3*x*00s				
	GBICs mounted on FC-100s for Sun StorEdge A5000s				
	SCSI-2 for Sun StorEdge MultiPack 2				
Cables	Terminal concentrator				
	Private net (SCI or FastEthernet)				
	Fiber optic (SPARCstorage Arrays)				
	D-SCSI (Sun StorEdge A3*x*00)				
	FC-AL (Sun StorEdge A5000)				
	SCSI-2 (Sun StorEdge MultiPack 2)				

TABLE 2-6   Checklist for Sun Enterprise *3*x00 Systems *(Continued)*

Category	Item	Per Node Quantity		Per Cluster Quantity	
		Planned	On Hand	Planned	On Hand
Expansion cabinets	For hosts using SPARCstorage Array Model 200 series with SPARCstorage™ RSM™ units or Differential SCSI disk trays				
	For hosts using Sun StorEdge A3x00s				
	For hosts using Sun StorEdge A5000s				
Private net switching and adapter cards	SCI switch or FastEthernet hub (three or more nodes) SCI or FastEthernet cards				
Additional assemblies	Administration workstation with monitor				
	Terminal concentrator				

2.4   Sun Enterprise *4*x00 Systems

2.4.1   General Description

TABLE 2-7   Requirements for Sun Enterprise *4*x00 Systems

Device	Per Node		Per Cluster System		Comment
	Min	Max	Min	Max[1]	
For FastEthernet private net					
FastEthernet hub	–	–	2	2	Three or more nodes
SunSwift or SunFastEthernet SBus Adapter 2.0	2	2	8	8	Mounted on I/O boards; for I/O+ boards the on-board FastEthernet port can be used
cabling:					
1m, Ethernet 5m, Ethernet	2	2	8	8	
For SCI private net					
SCI switch	–	–	2	2	Three or more nodes
SCI-B SBus Adapter	2	2	8	8	I/O boards in slots 1 and 3 are configured with SCI cards
cabling:					
2m, SCI cable 5m, SCI cable 10m, SCI cable	2	2	8	8	
Disk arrays					
SPARCstorage Array	–	–	2	36	Each equipped with 2 FC/OM; uses host adapters mounted on I/O boards, either using on-board optical slots or FC/S cards
fiber-optic cabling					As required
Sun StorEdge A3*x*00	–	–	1	18	Uses UDWIS/S mounted on I/O boards as host adapters
D-SCSI cabling					As required

TABLE 2-7   Requirements for Sun Enterprise *4*x00 Systems *(Continued)*

Device	Per Node		Per Cluster System		Comment
	Min	Max	Min	Max[1]	
Sun StorEdge A5000	–	–	2	48	Uses GBICs as host adapters; mounted either on FC-100 card residing on I/O board or using I/O+ board on-board optical port
FC-AL cabling					As required
Processor components					
Sun Enterprise 4x00 System	1	1	2	4	Chassis not mounted in a rack
CPU/Memory boards, each with 2 UltraSPARC modules and 256 Mbytes RAM	1	1	2	24	
I/O boards (I/O or I/O+)	2	7	4	28	I/O boards in slots 1 and 3 are configured with SCI or FastEthernet cards (for I/O+ boards, use on-board FastEthernet) as well as the disk array host adapters; see this table for disk array host adapter listing
Power/cooling modules (PCMs)	3	4	6	16	One for every 2 boards
Disk array host adapters (mounted on I/O boards)					
FC/OM optical modules	2	–	8	–	For SPARCstorage Arrays, mounted either using on-board optical ports or FC/S cards
UDWIS/S	2	–	8	–	For Sun StorEdge A3x00s
GBIC	2	–	8	–	For Sun StorEdge A5000s; mounted either on FC-100 card or using I/O+ board on-board optical port
Additional assemblies					
Terminal concentrator	–	–	1	1	Installed in customer-defined location
cabling:					
RS-232 serial cable long, PN 530-2152 short PN 530-2151	1	1	2	4	
Administration workstation	–	–	1	1	Installed in customer-defined location

1. Based on four nodes.

2.4.2   Checklist

TABLE 2-8   Checklist for Sun Enterprise *4x*00 Systems

Category	Item	Per Node Quantity		Per Cluster Quantity	
		Planned	On Hand	Planned	On Hand
Processor components	Sun Enterprise 4*x*00 System (nodes)				
	CPU/Memory board with 2 UltraSPARC modules and 256 Mbytes RAM (128 Mbytes min.)				
	I/O board				
	Disk board				
	Power/cooling module (PCMs)				
	FC/S SBus card				
Disk array host adapters	FC/OM modules mounted on FC/S cards for SPARCstorage Array Model 100 and 200 Series				
	UDWIS/S for Sun StorEdge A3*x*00s				
	GBICs mounted on FC-100s for Sun StorEdge A5000s				
Cables	Terminal concentrator				
	SCI or FastEthernet				
	Fiber optic (SPARCstorage Arrays)				
	D-SCSI (Sun StorEdge A3*x*00)				
	FC-AL (Sun StorEdge A5000)				
System cabinet	SPARCstorage Array units				
Expansion cabinet	For hosts using SPARCstorage Array Model 200 series with SPARCstorage RSMs or Differential SCSI trays				
	For hosts using Sun StorEdge A3*x*00s				
	For hosts using Sun StorEdge A5000s				

TABLE 2-8   Checklist for Sun Enterprise *4*x00 Systems *(Continued)*

Category	Item	Per Node Quantity		Per Cluster Quantity	
		Planned	On Hand	Planned	On Hand
Private net switching and adapter cards	SCI switch or FastEthernet hub (three or more nodes) SCI or FastEthernet cards				
Additional assemblies	Terminal concentrator				
	Administrative workstation				

2.5   Sun Enterprise 5x00 Systems

2.5.1   General Description

TABLE 2-9   Requirements for Sun Enterprise 5x00 Systems

Device	Per Node Min	Per Node Max	Per Cluster System Min	Per Cluster System Max[1]	Comment
For FastEthernet private net					
FastEthernet hub	–	–	2	2	Optional two nodes; required for three or more nodes
SunSwift or SunFastEthernet SBus Adapter 2.0	2	2	8	8	Mounted on I/O boards; for I/O+ boards the on-board FastEthernet port can be used
cabling:					
1m, Ethernet 5m, Ethernet	2	2	8	8	
For SCI private net					
SCI switch	-	-	2	2	Optional two nodes; required for three or more nodes
SCI-B SBus Adapter	2	2	8	8	I/O boards in slots 1 and 3 are configured with SCI cards
cabling:					
2m, SCI cable 5m, SCI cable 10m, SCI cable	2	2	8	8	
Disk arrays					
SPARCstorage Array	–	–	2	36	Each equipped with 2 FC/OM host adapter; uses FC/OMs mounted on I/O boards as host adapters
fiber-optic cabling					As required
Sun StorEdge A3x00	–	–	1	18	Uses UDWIS/S as host adapters
D-SCSI cabling					As required

TABLE 2-9   Requirements for Sun Enterprise 5x00 Systems *(Continued)*

Device	Per Node Min	Per Node Max	Per Cluster System Min	Per Cluster System Max[1]	Comment
Sun StorEdge A5000	–	–	2	48	Uses GBICs mounted on I/O+ boards as host adapters
FC-AL cabling					As required
Rackmount kit	1	3	2	24	Mounts one SPARCstorage Array 100 Series chassis
Disk array host adapter (mounted on I/O boards)					
FC/OM optical modules	2	–	8	–	For SPARCstorage Arrays; mounted either using on-board optical ports or FC/S cards
UDWIS/S	2	–	8	–	For Sun StorEdge A3x00s
GBIC	2	–	8	–	For Sun StorEdge A5000s; mounted either on FC-100 card or using I/O+ board on-board optical port
Cable set other	–	–	1	1	
Processor components					
Sun Enterprise 5x00 System	1	1	2	4	
CPU/Memory boards, each with 2 UltraSPARC modules 256 Mbytes RAM	1	1	2	24	
I/O boards (I/O or I/O +)	2	7	4	28	I/O boards in slots 1 and 3 are configured with SCI or FastEthernet cards (for I/O+ boards use on-board FastEthernet) as well as the disk array host adapters; see this table for disk array host adapter listing
Power/cooling modules (PCMs)	3	4	6	16	One for every two boards
Additional assemblies					
Terminal concentrator	–	–	1	1	Installed in customer-defined location
cabling: RS-232 serial cable long, PN 530-2152 short PN 530-2151	1	1	2	4	
Administration workstation	–	–	1	1	Installed in customer-defined location

1. Based on four nodes.

2.5.2   Checklist

TABLE 2-10   Checklist for Sun Enterprise *5x*00 Systems

Category	Item	Per Node Quantity		Per Cluster Quantity	
		Planned	On Hand	Planned	On Hand
Processor components	Sun Enterprise 5*x*00 System (nodes)				
	CPU/Memory board with 2 UltraSPARC modules and 256 Mbytes RAM (128 Mbytes min.)				
	I/O board				
	Disk board				
	Power/cooling module (PCMs)				
	Administration workstation				
Disk array host adapters	FC/OM modules mounted on FC/S cards for SPARCstorage Arrays Model 100/200 series				
	UDWIS/S for Sun StorEdge A3*x*00s				
	GBICs mounted on FC-100s for Sun StorEdge A5000s				
Cables	Terminal concentrator				
	SCI or FastEthernet				
	Fiber optic (SPARCstorage Arrays)				
	D-SCSI (Sun StorEdge A3*x*00)				
	FC-AL (Sun StorEdge A5000)				
System cabinet	SPARCstorage Array units				
	Rackmount kit				
Expansion cabinet	SPARCstorage Array 200 series units with SPARCstorage RSM units or Differential SCSI disk trays				
	Sun StorEdge A3*x*00				
	Sun StorEdge A5000				

TABLE 2-10   Checklist for Sun Enterprise *5*x00 Systems *(Continued)*

Category	Item	Per Node Quantity		Per Cluster Quantity	
		Planned	On Hand	Planned	On Hand
Private net switching and adapter cards	SCI switch or FastEthernet hub (three or more nodes) SCI or FastEthernet cards				
Additional assemblies	Terminal concentrator				
	Administrative workstation				

2.6 Sun Enterprise *6*x00 Systems

2.6.1 General Description

TABLE 2-11   Requirements for Sun Enterprise *6*x00 Systems

Device	Per Node Min	Max	Per Cluster System Min	Max[1]	Comment
For FastEthernet private net:					
FastEthernet hub	–	–	2	2	Optional two nodes; required for three or more nodes
SunSwift or SunFastEthernet SBus Adapter 2.0	2	2	8	8	Mounted on I/O boards; for I/O+ boards the on-board FastEthernet port can be used
cabling:					
1m, Ethernet 5m, Ethernet	2	2	8	8	
For SCI private net:					
SCI switch	-	-	2	2	Optional two nodes; required for three or more nodes
SCI-B SBus Adapter	2	2	8	8	I/O boards in slots 1 and 3 are configured with SCI cards
cabling:					
2m, SCI cable 5m, SCI cable 10m, SCI cable	2	2	8	8	
Disk arrays					
SPARCstorage Array	–	–	2	56	Each equipped with 2 FC/OM host adapters; uses FC/OMs mounted on I/O boards as host adapters
fiber-optic cabling					As required
Sun StorEdge A3*x*00	–	–	1	36	Uses UDWIS/S as host adapters
D-SCSI cabling					As required

TABLE 2-11   Requirements for Sun Enterprise *6x*00 Systems *(Continued)*

Device	Per Node		Per Cluster System		Comment
	Min	Max	Min	Max[1]	
Sun StorEdge A5000	–	–	2	72	Uses GBICs mounted on I/O+ boards as host adapters
FC-AL cabling					As required
Rackmount kit	1	2	2	12	Mounts one SPARCstorage Array 100 Series chassis
Cable set other	–	–	1	1	
Disk array host adapters (mounted on I/O boards)					
FC/OM optical modules	2	–	8	–	For SPARCstorage Arrays; mounted either using on-board optical ports or FC/S cards
UDWIS/S	2	–	8	–	For Sun StorEdge A3*x*00s
GBIC	2	–	8	–	For Sun StorEdge A5000s; mounted either on FC-100 card or using I/O+ board on-board optical port
Processor components					
SunEnterprise 6*x*00 System	1	1	2	4	
CPU/Memory boards, each with 2 UltraSPARC modules 256 Mbytes RAM	1	1	2	56	
I/O boards (I/O or I/O +)	2	15	4	60	I/O boards in slots 1 and 3 are configured with SCI or FastEthernet cards (for I/O+ boards, use on-board FastEthernet) as well as the disk array host adapters; see this table for disk array host adapter listing
Power/cooling modules (PCMs)	3	8	6	32	One for every two boards
Additional assemblies					
Terminal concentrator	–	–	1	1	Installed in customer-defined location
cabling: RS-232 serial cable; long, PN 530-2152 short PN 530-2151	1	1	2	4	
Administration workstation	–	–	1	1	Installed in customer-defined location

1. Based on four nodes.

2.6.2   Checklist

TABLE 2-12   Checklist for Sun Enterprise 6*x*00 Systems

Category	Item	Per Node Quantity		Per Cluster Quantity	
		Planned	On Hand	Planned	On Hand
Processor components	Sun Enterprise 6*x*00 System (nodes)				
	CPU/Memory board with 2 UltraSPARC modules and 256 Mbytes RAM (128 Mbytes min.)				
	I/O board				
	Disk board				
	Power/cooling module (PCMs)				
Disk array host adapters	FC/OM modules mounted on I/O boards for SPARCstorage Arrays UDWIS/S for Sun StorEdge A3*x*00s GBICs mounted on I/O+ boards for Sun StorEdge A5000s				
Cables	Terminal concentrator				
	SCI or FastEthernet				
	Fiber optic (SPARCstorage Array)				
	D-SCSI (Sun StorEdge A3*x*00)				
	FC-AL (Sun StorEdge A5000)				
System cabinet	SPARCstorage Array units				
	Rackmount kit				
Expansion cabinet	SPARCstorage Array 200 series units with SPARCstorage RSM unit or Differential SCSI disk trays				
	Sun StorEdge A3*x*00s				
	Sun StorEdge A5000s				
Private net switching and adapter cards	SCI switch or FastEthernet hub (three or more nodes) SCI or FastEthernet cards				
Additional assemblies	Terminal concentrator				
	Administrative workstation				

2.7 Sun Enterprise 10000 Systems

2.7.1 General Description

TABLE 2-13   Requirements for Sun Enterprise 10000 Systems

Device	Per Node		Per Cluster System		Comment
	Min	Max	Min	Max[1]	
For FastEthernet private net					
FastEthernet hub	–	–	2	2	Optional two nodes; required for three or more nodes
SunSwift or SunFastEthernet SBus Adapter 2.0	2	2	8	8	Mounted on system boards 0 and 1
cabling:					
1m, Ethernet 5m, Ethernet	2	2	8	8	
For SCI private net					
SCI switch	-	-	2	2	Optional two nodes; required for three or more nodes
SCI-B SBus Adapter	2	2	8	8	System boards in slots 0 and 1 are configured with SCI cards
cabling:					
2m, SCI cable 5m, SCI cable 10m, SCI cable	2	2	8	8	
Disk arrays					
SPARCstorage Array	–	–	2	56	Each equipped with 2 FC/OM host adapters; uses FC/OMs mounted on FC/S cards as host adapters
fiber-optic cabling					As required
Sun StorEdge A3x00 system	–	–	1	31	Each equipped with 2 controllers; uses UDWIS/S as host adapters
D-SCSI cabling					As required

TABLE 2-13   Requirements for Sun Enterprise 10000 Systems *(Continued)*

Device	Per Node		Per Cluster System		Comment
	Min	Max	Min	Max[1]	
Sun StorEdge A5000	–	–	2	10	Uses GBICs mounted on SBus FC-100 cards
Disk array host adapters (mounted on system boards)					
FC/S SBus card	2	–	8	–	For SPARCstorage Arrays; used to mount two FC/OM optical modules
FC/OM optical modules	2	–	8	–	For SPARCstorage Arrays; mounted on FC/S cards
UDWIS/S	2	–	8	–	For Sun StorEdge A3*x*00s
GBIC	2	–	8	--	For Sun StorEdge A5000s; mounted on SBus FC-100 cards
SBus FC-100	2	–	8	–	For Sun StorEdge A5000; used to mount two GBICs
Cable set	–	–	1	4	
Processor components					
Sun Enterprise 10000 System	1	1	2	4	
System boards, each with processor modules; up to 16 Gbytes RAM I/O channels	4	16	16	64	System boards in slots 0 and 1 are configured with SCI cards
Control boards	1	2	16	32	
Power modules	4	8	16	32	
Power sequencer	1	–	8	–	Located in peripheral trays
Peripheral power supply	1	–	8	–	
Fan modules	10	16	40	64	
Additional Assemblies					
System service processor	–	–	1	1	

1. Based on four nodes.

2.7.2 Checklist

TABLE 2-14 Checklist for Sun Enterprise 10000 Systems

Category	Item	Per Node Quantity		Per Cluster Quantity	
		Planned	On Hand	Planned	On Hand
Processor components	Sun Enterprise 10000 System (nodes)				
	System board				
	AC input modules				
	Power supplies				
	Fan trays				
	System service processor				
Disk array host adapters	FC/OM modules mounted on FC/S cards for SPARCstorage Array Model 100 and 200 series				
	UDWIS/S for Sun StorEdge A3x00				
	GBICs mounted on FC-100 cards for Sun StorEdge A5000s				
Cables	Private net (SCI or FastEthernet)				
	Fiber optic (SPARCstorage Array)				
	D-SCSI (Sun StorEdge A3x00)				
	FC-AL (Sun StorEdge A5000)				
System cabinet	SPARCstorage Array 200 series units				
	Rackmount kit				
Expansion cabinet	SPARCstorage Array 200 series units with SPARCstorage RSM units or Differential SCSI disk trays				
	Sun StorEdge A3x00s				
	Sun StorEdge A5000s				
Private net switching and adapter cards	SCI switch or FastEthernet hub (three or more nodes) SCI or FastEthernet cards				
System service processor					

2.8   Specifications

Refer to the documentation that came with your host system or disk arrays for the environmental, physical, and electrical specifications.

2.9   Floor Space Planning

Floor space and other requirements for the Sun Enterprise Cluster systems are:

- Cabinets require approximately three feet of space in the front and three feet of space at the back for access by service personnel.
- Power and interface cables should be kept 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.
- SPARCstorage Arrays can be located up to 2 kilometers (1.24 miles) from the system cabinets.
- System cabinets can be located up to 10 meters (33 feet) from each other.

2.9.1   Sun Enterprise 1, 2, 250, and 450 Systems

Table top space and other requirements are:

- The units require approximately 12 to 14 cm (3 in.) of space on each side and 1m (3 ft) 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.

Access: 1m (3 feet)

Rear

12–14 cm
(3 in)

SCI switches
Servers
• Node 0, 1
• Node 2, 3
Disk Arrays 1
& 2

12–14 cm
(3 in)

Top view
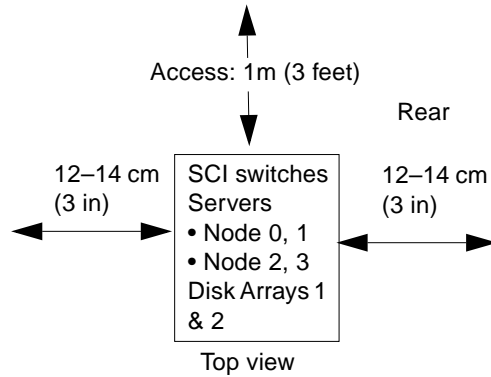
FIGURE 2-1   Sun Enterprise 2 Cluster with SPARCstorage Arrays

Access: 1m (3 feet)

Rear

SCI switch
Server A, B
• Node 0, 1
• Disk array 1

12–14 cm
(3 in)

SCI switch
Server A, B
• Node 0, 1
• Disk array 2

Top view
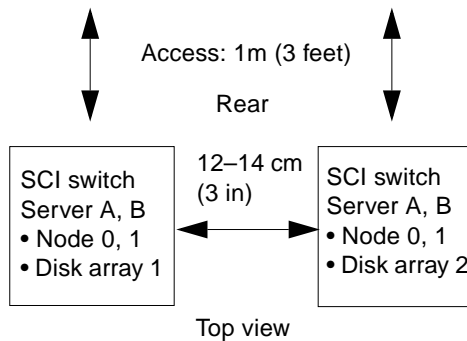
FIGURE 2-2   Sun Enterprise 1, 2, 250, and 450 with SPARCstorage Arrays

2.9.2   Sun Enterprise 3x00 System

Use the following guidelines to prepare a location for your server:

- The server unit requires approximately 3 feet (94 cm) of space in the front and back for access by service personnel (FIGURE 2-3).

- A minimum space of 6 inches (16 cm) is required on both sides of the server to afford adequate air flow.

Note – To avoid exhaust air recirculation, do not put systems or peripherals next to each other.

■ Keep power and interface cables clear of foot traffic. Route cables inside walls, under the floor, through the ceiling, or in protective channels. Route interface cables away from motors and other sources of magnetic or radio frequency interference.
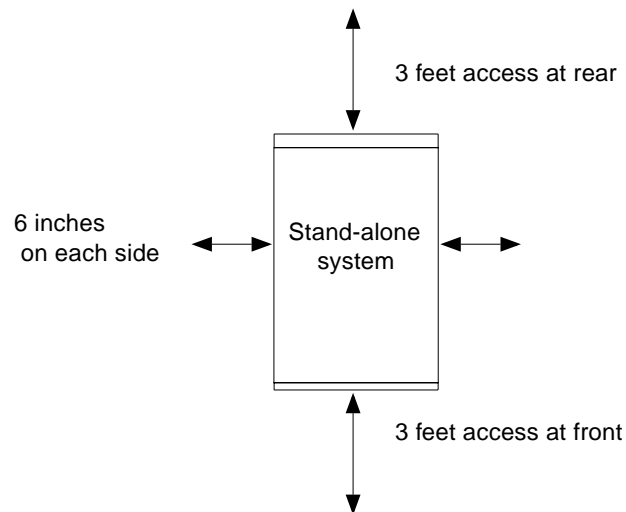
FIGURE 2-3   Stand-alone Server Access Areas—Top View

2.9.3   Sun Enterprise 4*x*00 System

The Sun Enterprise 4*x*00 system is designed to sit on the floor, on a caster base, or on a desk or table.

Note – Do not stack multiple Sun Enterprise 4*x*00 systems so that they sit directly on top of each other, resting on the top cover of the system below.

Use the following guidelines to prepare a location for your server:

■ The server unit requires approximately 3 feet (94 cm) of space in the front and back for access by service personnel (FIGURE 2-3).

■ A minimum space of 6 inches (16 cm) is required on both sides of the server to afford adequate air flow.

Note – To avoid exhaust air recirculation, do not put systems or peripherals next to each other.

■ Keep power and interface cables clear of foot traffic. Route cables inside walls, under the floor, through the ceiling, or in protective channels. Route interface cables away from motors and other sources of magnetic or radio frequency interference.

2.9.4   Sun Enterprise 5*x*00 and 6*x*00 Systems

Determine the floor plan layout for your installation.

FIGURE 2-4 and FIGURE 2-5 are examples of floor plans for the minimum and maximum configurations, respectively.
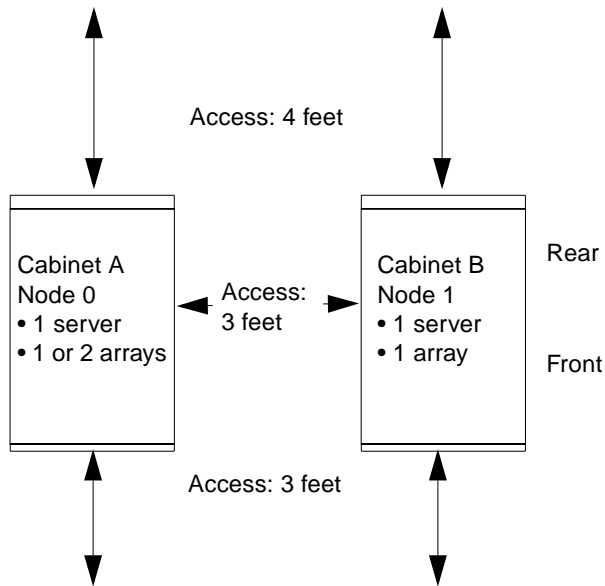
FIGURE 2-4   Sun Enterprise 5*x*00 and 6*x*00 Floor Plan Example Minimum Configuration— Top View
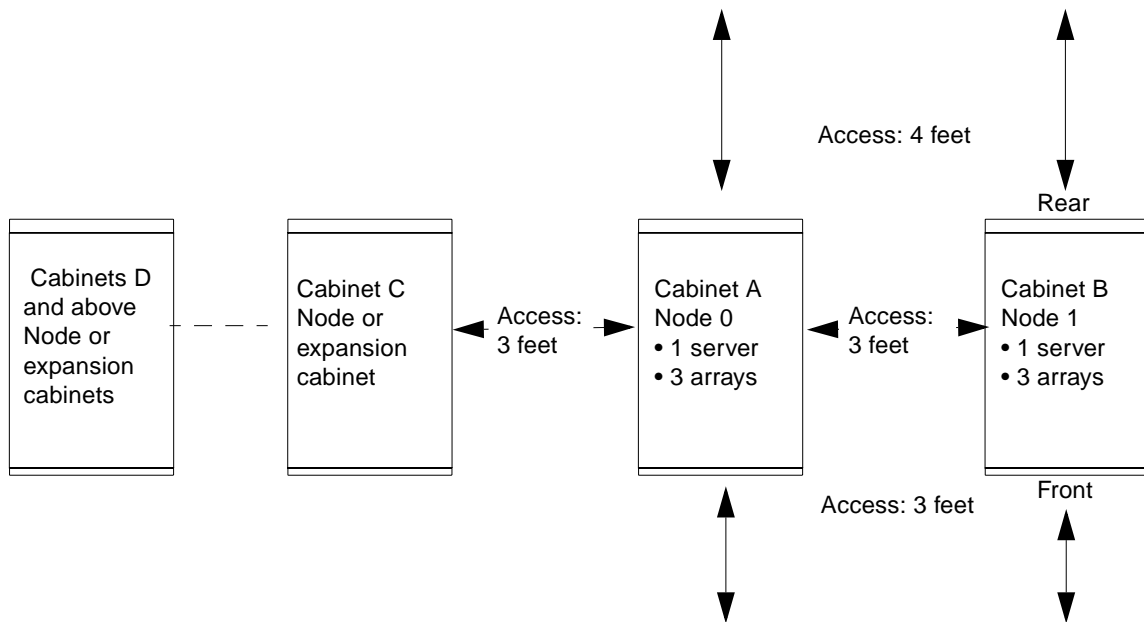
FIGURE 2-5   Sun Enterprise 5*x*00 and 6*x*00 Floor Plan Maximum Configuration—Top View

2.9.5   Sun Enterprise 10000 System

Determine the floor plan layout for your installation.

FIGURE 2-6 shows examples of floor plans for minimum and maximum configurations, respectively.

Note – For additional information, refer to the *Sun Enterprise 10000 System Site Planning Guide.*

Sample configuration A

Rear

Access:
3 feet

Processor
cabinet

Expansion
cabinet

Access:
3 feet

Front

Sample configuration C

Sample configuration B

. . .

Sample configuration D
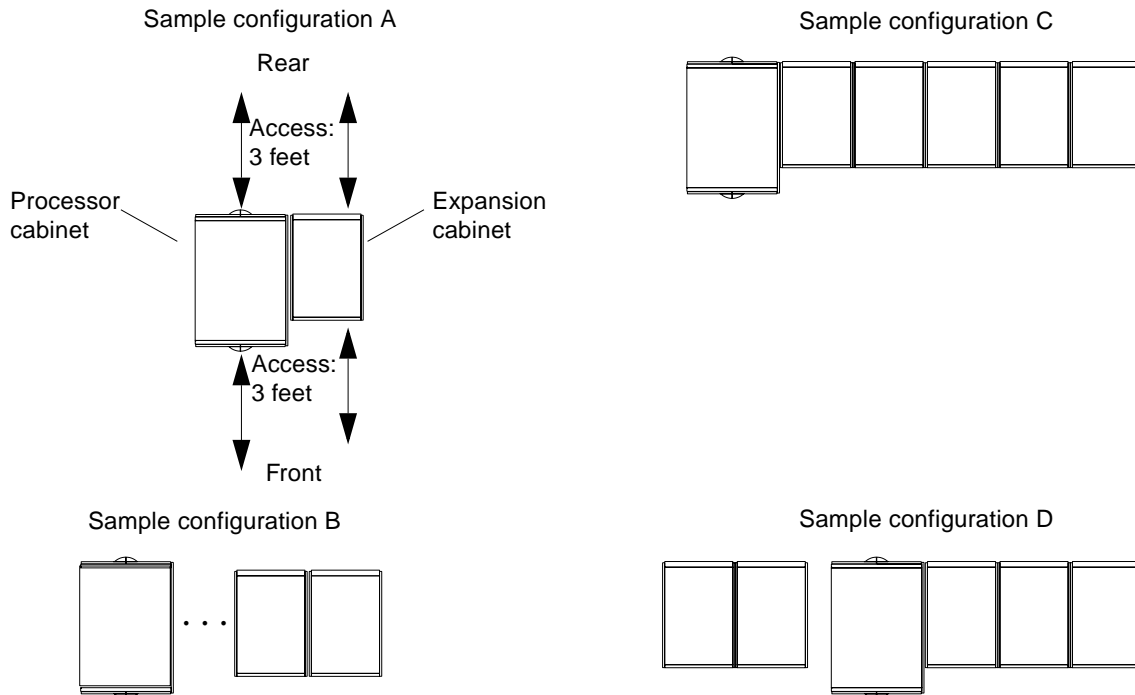
FIGURE 2-6   Sun Enterprise 10000 Server Floor Plan Example Configurations—Top View

2.10   Power Requirements and Options

Each cabinet should have a dedicated computer room AC breaker panel. The
cabinets should not share this breaker panel with unrelated equipment. Each system
cabinet has a single power cord that supplies AC power to the internal power
distribution unit.

Note – The Sun Enterprise 10000 may have more than one power cord.

Internal components (terminal concentrator, boot disks, server chassis, and
SPARCstorage Arrays—as appropriate) are connected into the power distribution
unit.

Provisions are made within the cabinets for connecting all rackmounted components. However, if desired, rackmounted components in the cabinets can be connected to appropriate power outlets external to the cabinets to increase availability.

The following electrical circuit requirements apply:

- Sun Enterprise 5*x*00 cabinet (one of two)—each cabinet houses one server and one, two, or three SPARCstorage Arrays
- Sun Enterprise 6*x*00 cabinet (one of two)—each cabinet houses one server and one or two SPARCstorage Arrays
- Sun Enterprise 10000 cabinet (one of two)—each cabinet houses one server and up to three Sun StorEdge A3*x*00 units
- Expansion cabinet—housing two SPARCstorage Array Model 200 Series and four RSM devices or other supported disk arrays such as the Sun StorEdge A3*x*00 or the Sun StorEdge A5000

Caution – Do not power other electrical equipment from the cabinet AC power distribution unit; system reliability may be adversely affected.

2.10.1   Sun Enterprise 1, 2, 250, and 450 Systems

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, PCI bus cards, CD-ROM drive) receive DC power from an internal power supply.

Note – All external components (terminal concentrator, SPARCstorage Arrays or Sun StorEdge MultiPack 2s, and the system administration workstation) can be connected to individual power outlets to increase 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 2-15.

TABLE 2-15 Base Configuration Power Requirements

Unit Name	Number of outlets
Sun Enterprise 1 and 2	4 (1 per node)
Sun Enterprise 450	2 (1 per node)
SPARCstorage Arrays	4 (1 per SPARCstorage Array)
Sun StorEdge MultiPack 2s	4 (1 per SSM)
Sun StorEdge A3*x*00	2 (1 per A3*x*00)
SCI switch	2 (1 per SCI)
Terminal concentrator	1
System administration workstation	1

2.10.2   Sun Enterprise 5*x*00 and 6*x*000 Systems

Each cabinet requires a 30A circuit. The cabinet is powered by the cable, as shown in FIGURE 2-7.
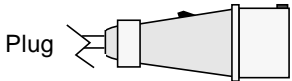
For connector requirements, see TABLE 2-16.

Detachable cable

FIGURE 2-7   Sun Enterprise 5*x*00 and 6*x*00 Power Connector and Detachable Cable

TABLE 2-16 Platform and Chassis Connector Requirements

Platform	Type: International	Type: U.S.	Comment
All platforms, SPARCstorage Array 100 Series, SPARCstorage Array 200 Series, or Multi-disk Pack	By country	NEMA 5-15P Plug Power connector	One per node chassis. One per storage array chassis. Country kits provided with international shipments include the proper cables for the country of destination.
Sun Enterprise 5*x*00 and 6*x*00, Expansion Cabinets	30A, single phase IEC 309 Plug Power connector	NEMA L6-30P Plug Power connector	One per node cabinet. One per expansion cabinet.

2.10.3   Sun Enterprise 10000 Systems

- Each cabinet requires three to five 30A circuits. For power connections, refer to the *Sun Enterprise 10000 System Installation Manua*l. For connector requirements, see TABLE 2-16.

2.11 Campus Clustering for SPARCstorage Arrays

One of the Sun Enterprise Cluster features is campus clustering. Campus clustering is a cluster configuration that provides geographic site separation and enables recovery from certain types of failures that is localized to a part of the campus. There are specific hardware requirements. For additional information, contact your local SunService representative or your local SunService[SM] Authorized Service Provider.

2.12 Ethernet Networks

2.12.1 Ethernet Design Considerations

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

2.12.1.1 Preparing the Public and Client Networks

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.

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 ft). If cables connect together through a wall socket, the combined length should not exceed 100 meters. FIGURE 2-8 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.
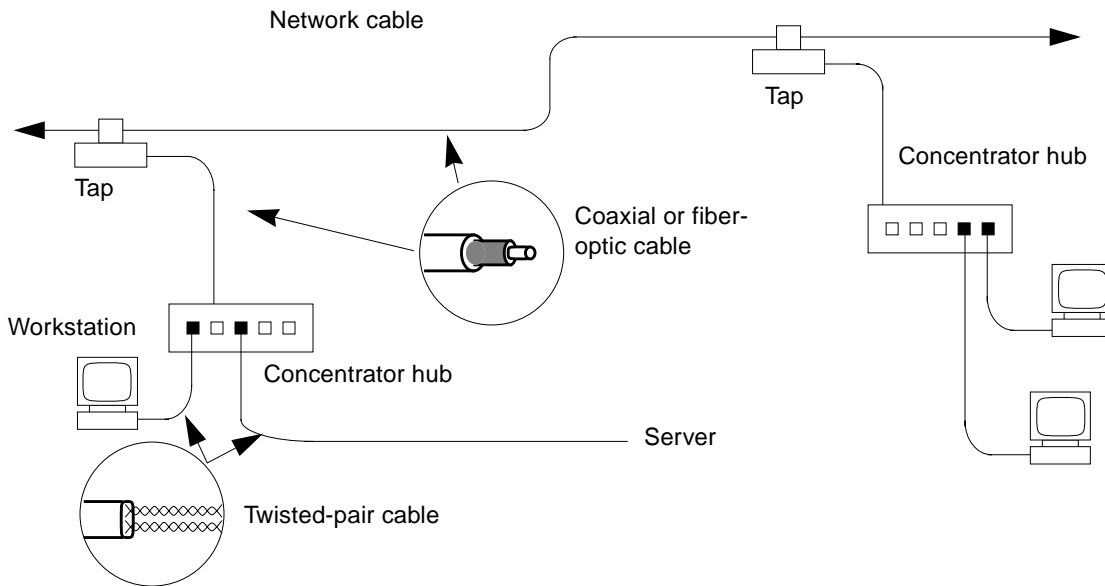
FIGURE 2-8   Example of 10BASE-T (Twisted-pair) Ethernet

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.

Coxial Ethernet Cabling

For small Ethernet installations, you can purchase 15-meter lengths of Ethernet cable from Sun Microsystems. Use these 15-meter lengths only as single pieces; not as extensions with other cables. These branch cables come with two transceiver types:

- Vampire tap
- N-type in-line

Workstations can serve as gateways between physically separate Ethernet links. When a gateway is in place, users perceive a single logical network and have transparent access to all the systems on both physical networks.

A gateway workstation has one Ethernet connection to each separate Ethernet cable. The software that performs the inter-network routing is included in the standard Solaris software release.

Coaxial cable
or optical fiber

Tap
Tap   Network cable

Server

Workstation
Concentrator hub
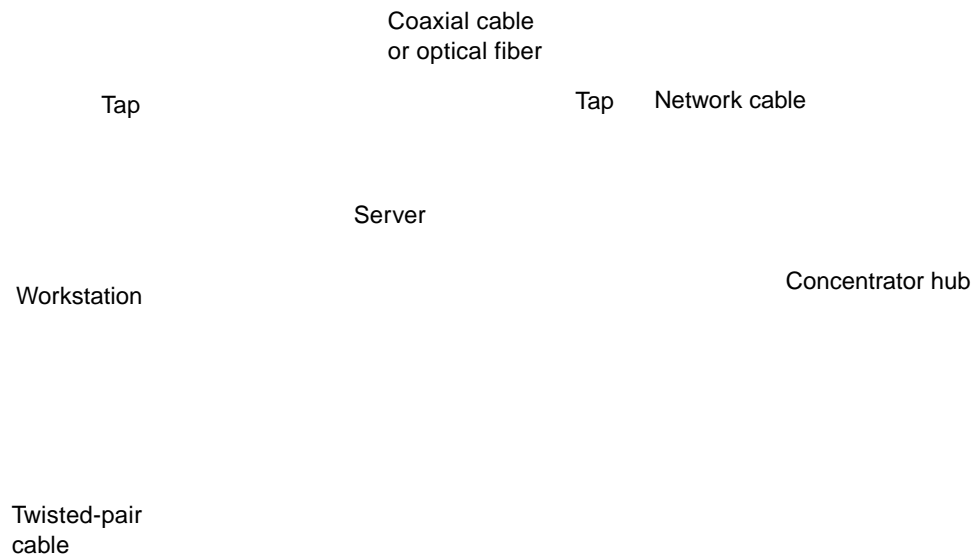
Twisted-pair
cable

FIGURE 2-9   Example of 10 ⁄ 100BASE-T (Twisted-pair) Ethernet

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

2.12.1.2   Private Node-to-Node Network

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

2.12.2   Serial Cables RS-232C and RS-423A

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

Differences between the two standards are noted in TABLE 2-17, 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 2-17   Open-Circuit Voltages

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

TABLE 2-17 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.

2.12.2.1   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 in a way to minimize cable run length to units outside the room.

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

2.12.2.2   Cable Length

Where possible, use short serial-interface cables for 9600 baud. You can use longer cables, provided the resulting load capacitance, measured at the interface point and including the signal terminator, does not exceed 2500 picofarads.

For further information, see "*EIA STANDARD RS-232C*" and "*EIA STANDARD RS-423-A.*" EIA RS-232C cabling specification are 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.

2.12.2.3   Shield Ground (Drain)

Some interface applications require shielded cable to minimize radio frequency interference (RFI). 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 cable end connecting to Sun equipment (this serves as protective ground).

Powering Off and On

Caution – Some users may elect to power internal cabinet components, like SPARCstorage Arrays, the terminal concentrator, and so forth, from an external power source (a power circuit other than from the cabinet internal AC power distribution unit). These components, if connected to an external power source, will remain powered even after the cabinet AC distribution unit is turned off. Examine the system to verify that no component is externally powered before proceeding. If any component is externally powered, turn the component off using the On/Off switch at the rear of the component in question. Failure to turn off externally powered components poses a risk of equipment damage and/or personnel hazard from electrical shock.

Caution – Use the power off and on procedures in the manuals that came with your platform *only* for systems that are newly installed or in the process of being installed. Do *not* use these procedures on a cluster that is running a real application database and processing live transactions.
Performing these procedures on a system serving as a node in an online cluster poses great threat of irrecoverable data loss and a system crash.
For procedures regarding turning a system off or on that is operating as a node in a live cluster, refer to the *Sun Enterprise Cluster System Hardware Service Manual.*

3.1 Reading POST Messages and Boot Messages

For each server system installed in the expansion cabinet, refer to the appropriate installation and/or service manual. Read the section covering power-on self-test (POST) messages and boot messages to interpret messages for that server.

Also, for each storage chassis installed in the expansion cabinet, refer to the installation and/or service manual for the server acting as node to that storage chassis. Messages presented by this server encompass power-on and boot behavior of the storage chassis in question. For additional clarification, refer to the installation and or service manual for the storage chassis itself.

Hardware Installation

Cluster hardware installation information is presented in the following sections:

- Preparing Servers—page 4-1
- Connecting the Power Cords—page 4-1
- Installing Disk Arrays—page 4-2
    - Installing Sun StorEdge MultiPack 2s—page 4-2
    - Installing SPARCstorage Arrays—page 4-7
    - Installing Sun StorEdge A1000 and D1000s—page 4-9
    - Installing Sun StorEdge A3x00s—page 4-10
    - Installing Sun StorEdge A5000s—page 4-10
- Installing Terminal Concentrator—page 4-11
- Installing SCI Switches or FastEthernet Hubs—page 4-15
- Configuring the System, I/O, and Motherboards—page 4-17
- Cabling System Components—page 4-17

4.1 Preparing Servers

1. **Unpack and inventory the equipment. For a list of equipment, see Chapter 2 "Checklists and Planning for Hardware, Power, and Network Requirements" .**

2. **Move the cabinets to their designated installation locations.**

   For site planning guidelines, see Chapter 2, "Checklists and Planning for Hardware, Power, and Networks."

4.2 Connecting the Power Cords

Refer to the documentation that came with your server platform.

4.3   Installing Disk Arrays

The database(s) for these systems are implemented on clustered platforms using one or more of the following redundant disk arrays:

- Sun StorEdge MultiPack 2
- SPARCstorage Array Model 100 series
- SPARCstorage Array Model 200s or 210s, which are used with SPARCstorage RSM™ units (removable storage media), or 9-Gbyte differential disk trays
- Sun StorEdge A1000/D1000
- Sun StorEdge A3x00
- Sun StorEdge A5000

4.3.1   Installing Sun StorEdge MultiPack 2s

Note – Host adapters for these storage devices are SCSI-2 SBus cards.

Caution – Before connecting Sun StorEdge MultiPack 2s, set the `scsi-initiator-ids` as decribed in the following sections. For instructions on installing Sun StorEdge MultiPack 2s for your system, refer to the *SPARCstorage MultiPack Installation Manual*. For 6–slot Sun StorEdge MultiPack 2s you must change the SCSI IDs to the 9–14 range.

4.3.1.1   Setting `scsi-initiator-id`

Why Change `scsi-initiator-id`

Shared storage in clusters uses the Multi-Initiator capability of the SCSI specification. PCI systems use PCI host adapter cards for the SCSI interface. Otherwise, the operation is the same as in SBus systems. The `scsi-initiator-id` must be changed because *you cannot have two controllers (or SCSI devices) with the same* SCSI ID *on the same* SCSI *chain*. This is true for all shared storage.

However, the `scsi-initiator-id` of controllers that link private storage should be returned to 7 or it will conflict with the SCSI ID 6 of the CD-ROM. Use the switch on the back of the MultiPack to change this.

The normal documented procedure for setting up dual-hosted MultiPacks is to set the `scsi-initiator-id` for one node to 6 and then reset specific SCSI adapters (the ones that are not attached to the dual-hosted disks) to 7. The `scsi-initiator-id` for the other node attached to the disk must be left at the default setting (7). This approach may be somewhat error-prone because you can get SCSI errors if you do not reset *ALL* of the adapters that are *NOT* attached to the dual-hosted disks to 7.

A method that works well is to leave the `scsi-initiator-id` for both nodes at 7. Then, set the `scsi-initiator-id` for ONLY the adapters that are connected to the dual-hosted disk to 6 on one of the nodes (usually the second node).

4.3.1.2 Which `scsi-initiator-id` to Change and What to Set It To

Leave the `scsi-initiator-id` of one node set to the default (7) and change the `scsi-initiator-id` to 6 for the other node. *Do NOT change jumper settings on any SCSI device (CD-ROM).*

Caution – Do NOT change the `scsi-initiator-id` to **8**. This action will cause a conflict with some other storage devices (D1000).

When to Change `scsi-initiator-id`

You must change the `scsi-initiator-id` *before* you connect the shared storage. If the storage has already been connected, disconnect it first.

How to Change `scsi-initiator-id`

Only change the `scsi-initiator-id` on one node in the chain of the dual-hosted SCSI device. At the `ok` (OpenBoot PROM) prompt, use the `probe-scsi-all` command to identify the controllers connected to shared storage and those connected to private storage. You may have to `reset-all` first, in order to make the `probe-scsi-all` command work. Depending on your configuration, there are two methods of doing this.

First, identify the SCSI adapters by entering the following from the boot PROM:

```
ok probe-scsi-all
/pci@6,4000/scsi@3,
/pci@6,4000/scsi@3
Target 2
    Unit 0   Disk      SEAGATE ST32171W SUN2.1G7462
Target 3
    Unit 0   Disk      SEAGATE ST32171W SUN2.1G7462

/pci@6,4000/scsi@2,1
Target 2
    Unit 0   Disk      SEAGATE ST32171W SUN2.1G7462
Target 3
    Unit 0   Disk      SEAGATE ST32171W SUN2.1G7462
```

Method 1

If more controllers are connected to private storage than controllers connected to shared storage; more `scsi-initiator-id` 7s than `scsi-initiator-id` 6s; or more private storage controllers than shared storage controllers, then:

Note – Steps 1 through 5 should be done on one of the nodes attached to the disk. Step 6 needs to be done on both nodes (assuming you are not using Ultra SCSI).

1. **Edit or create the** `nvramrc` **to set the** `scsi-initiator-id` **to 6 for these devices. From the OBP enter:**

```
ok nvedit
ok probe-all install-console banner
ok cd /pci@6,4000/scsi@3
ok 6 " scsi-initiator-id" integer-property
ok device-end
ok cd /pci@6,4000/scsi@2,1
ok 6 " scsi-initiator-id" integer-property
ok device-end
```

2. **Press** `ctrl-c`, **and store the** `nvramrc`:

```
ok nvstore
```

3. **Evaluate the** `nvramrc`**:**

```
ok nvramrc evaluate
```

4. **Set the system to use the** `nvramrc`**:**

```
ok setenv
```

5. **Reset:**

```
ok reset-all
```

6. **Edit the** `/etc/system` **file (on both nodes) and add the following line to set fast/wide SCSI (disable Ultra SCSI):**

```
set scsi_options=0x3f8
```

7. **Boot both systems and verify that you can see the multi-hosted disks from both nodes.**

Method 2

If there are more controllers connected to shared storage than controllers connected to private storage; more `scsi-initiator-id` 6s than `scsi-initiator-id` 7s; or more shared storage controllers than private storage controllers:

1. **Set the global** `scsi-initiator-id` **to 6:**

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

2. **Edit or create the** `nvramrc` **script and set the** `scsi-initiator-id` **of the controllers connected to private storage to 7. The line numbers (**`0:`**,** `1:`**, and so on) are printed by the OBP; for example:**

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

```
nvedit
0: probe-all
1: cd /sbus@70,0/SUNW,fas@1,8800000
2: 7 encode-int " scsi-initiator-id" property
3: device-end
4: cd /sbus@70,0/QLGC,isp@0,10000
5: 7 encode-int " scsi-initiator-id" property
6: device-end
7: cd /sbus@50,0/SUNW,fas@1,8800000
8: 7 encode-int " scsi-initiator-id" property
9: device-end
10: install-console
11: banner [Control C]
ok
```

In this example you have set three controller `scsi-initiator-id`s to 7. Your script may be different because you will be resetting controllers that were listed by the `probe-scsi-all` command.

The following is an example of the internal/external controllers in a Sun Enterprise 250 and 450:

```
ok probe-scsi-all
/pci@1f,4000/scsi@3 (internal controller)
/pci@1f,4000/pci@4/SUNW,isptwo@4 (external controller)
/pci@1f,4000/scsi@5 (external controller)
```

3. **Store or discard the changes.**

   The changes you make through the `nvedit` command are done on a temporary copy of the `nvramrc` script. You can continue to edit this copy without risk. When you have completed your edits, save the changes. If you are not sure about the changes, discard them.

   ■ To store the changes:

```
ok nvstore
ok
```

- To discard the changes:

```
ok nvquit
ok
```

4. **Create and store the** `nvramrc` **script:**

```
ok set use-nvramrc? = true
ok reset-all
```

5. **Connect the shared storage devices and then reboot the system:**

```
ok boot -r
```

4.3.2   Installing SPARCstorage Arrays

Two or more SPARCstorage Arrays can be installed in a cluster. To install
SPARCstorage Arrays in a rack, see Appendix A. Otherwise proceed as follows:

1. **Locate the DIAG switch on the SPARCstorage Array rear panel** (FIGURE 4-1**).**

2. **Ensure that the DIAG switch is set to DIAG and not to DIAG EXT.**

Note – Do not use the DIAG EXT position, as it will invoke extended diagnostics
and prevent the SPARCstorage Array from booting. Use DIAG only for normal
operation.

Serial number label

A   B

DIAG switch
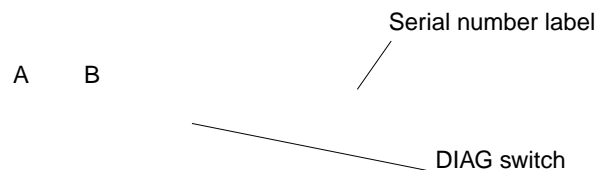
FIGURE 4-1   SPARCstorage Array Voltage Rating on the Serial Number Label

3. **Locate the serial number label** (FIGURE 4-1**) on the rear panel of the chassis.**

4. **Check the electrical ratings label on the serial number label. Verify that the stated rating matches your AC input voltage.**

   TABLE 4-1 provides maximum system operating voltage and frequency ranges and lists current requirements at nominal line voltage for a cabinet in maximum configuration.

TABLE 4-1 SPARCstorage Array 100 Series Nominal Power and Maximum Current Parameters

Configuration	Nominal AC Input Voltage Range–Single Phase	Operating Range	Operating Frequency Range	Maximum Current Requirement	Power Supply Output
North American	100–120 VAC	90–264 VAC	47–63 Hz	6.5A	460W
International	220–240 VAC	90–264 VAC	47–63 Hz	6.5A	460W

5. **Connect the power cords.**

   Connect a power cord at the rear of each chassis (FIGURE 4-2).

AC receptacle

A   B

On/Off switch

FIGURE 4-2 SPARCstorage Array AC Power Connector and Power Switch

6. **Connect the power cords to the power source.**

   For Sun Enterprise 3x00s through 6x00s, use the power sequencer shown in FIGURE 4-3.

Node 0   Node 1

Blower assemblies   Blower
                                           assemblies

SPARCstorage   SPARCstorage
Array 4   Array 5

SPARCstorage   SPARCstorage
Array 2   Array 3
                SPARCstorage
Terminal   Array 0   Terminal   SPARCstorage
concentrator   concentrator   Array 1
(node 0 only)   (node 0 only)
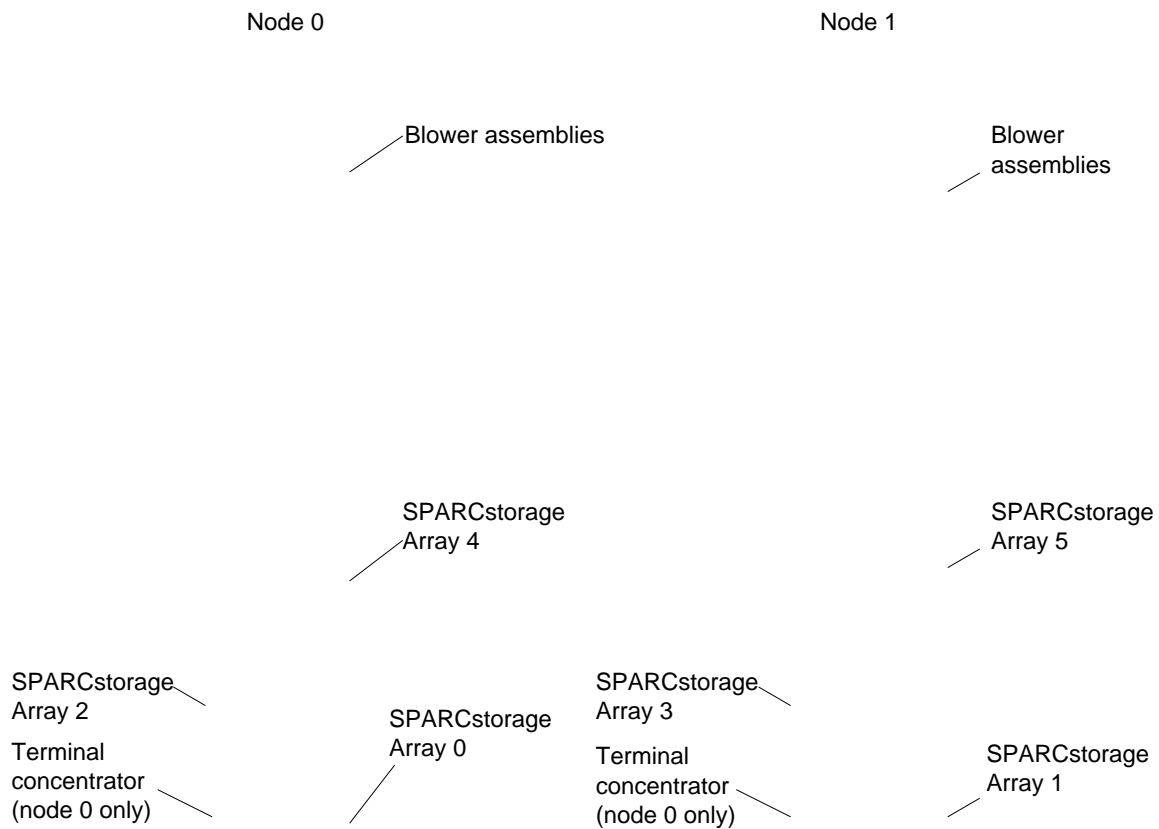
FIGURE 4-3 Connecting SPARCstorage Arrays and the Terminal Concentrator Into the
Power Sequencer(s)

**a. Route the power cords to the designated power sequencer and dress the power
cords as required; roll any excess cord and secure it using cable ties.**

**b. Connect the power cords from the chassis to the power distribution unit. Use
the switched outlets identified in** FIGURE 4-3 **for SPARCstorage Array 0 and 1.**

4.3.3 Installing Sun StorEdge A1000 and D1000s

Note – Host adapters for these units are UDWIS/S SBus cards.

For instructions on installing disks, refer to the *Sun StorEdge A1000/D1000 Installation, Operations, and Service Manual.* For instructions on rackmounting these units, refer to the *Sun StorEdge A1000/D1000 Rackmount Installation Guide.*

4.3.4   Installing Sun StorEdge A3*x*00s

Note – Do not turn cache mirroring OFF on an A3x00; this can sometimes cause data corruption during a hard failover.

Note – Any LUN with a duplicate serial ID cannot be used as a quorum device. A new LUN must be created for the quorum device, or a different storage device must be used.

Note – Host adapters for this storage cabinet are UDWIS/S SBus cards.

Caution – Set the `scsi-initiator-ids` before connecting Sun StorEdge A3*x*00s. This procedure is the same as that described for setting the `scsi-initiator-ids` for MultiPack 2s, described in Section 4.3.1.1 "Setting `scsi-initiator-id`".

For information on rackmounting disk arrays in Sun StorEdge A3*x*00 cabinets, see the *Sun StorEdge A5000 Rackmount Installation Card.* For instructions on installing disk arrays in StorEdge A3*x*00 cabinets, refer to the *Sun StorEdge System Manual.*

4.3.5   Installing Sun StorEdge A5000s

Note – , mounted on system I/O+ boards or FC-100 cards.

For informatinon on rackmounting disk arrays in Sun StorEdge A5000 cabinets, refer to Appendix A " "Rackmounted Disk Arrays and Hubs ". For instructions on installing disk arrays in Sun StorEdge A5000 cabinets, refer to Chapter 2 of the *Sun Enterprise Network Array Installation and Service Manual.*

4.4 Installing Terminal Concentrator

4.4.1 Sun Enterprise 1, 2, 250, 450, 3*x*00, and 4*x*00

1. **The terminal concentrator for the platforms can be stand-alone. You can install the terminal concentrator up to 100 meters (33 ft) from the Sun Enterprise server. However, for convenience, the unit should be placed near the servers.**

2. **Connect the power cord** FIGURE 4-7**.**

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

4. **Put the terminal concentrator in its designated location.**

4.4.2 Sun Enterprise 3*x*00 through 6*x*00

1. **Install the terminal concentrator bracket hinge in the primary cabinet.**

   a. **Locate the hinge portion of the terminal concentrator bracket assembly.**

   b. **Loosely install two locator screws in the right-side rail in the rear of the cabinet. Thread them into holes 8 and 29, as shown in** FIGURE 4-4**.**

   Note – The locator screws will accept the slotted holes in the hinge piece.

   ---

   c. **Place the slotted holes of the hinge over the locator screws and let the hinge drop into place.**

   d. **Install the screws in holes 7 and 28.**

   Tighten these screws, as well as those in holes 8 and 29 (FIGURE 4-4).

Holes 29, 28

Boss pins (2 each)

Holes 8, 7

Screws
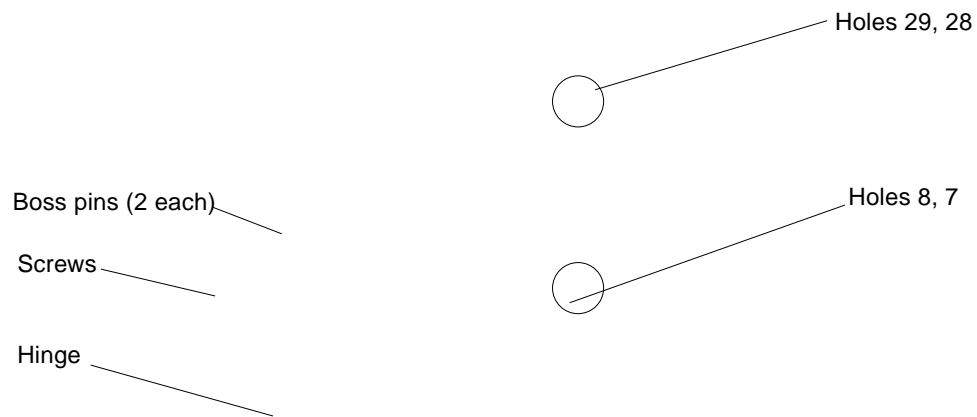
Hinge

FIGURE 4-4   Installing the Terminal Concentrator Hinge

2. Install the terminal concentrator in the bracket and assemble the bracket.

   **a. Place the side pieces of the bracket against the terminal concentrator
   (**FIGURE 4-5**).**

   **b. Lower the terminal concentrator (with side pieces) onto the bottom plate. Align
   the holes in the side pieces with those in the bottom plate.**

Nuts (6)

Side piece
(2 each)

Terminal concentrator

Bottom plate
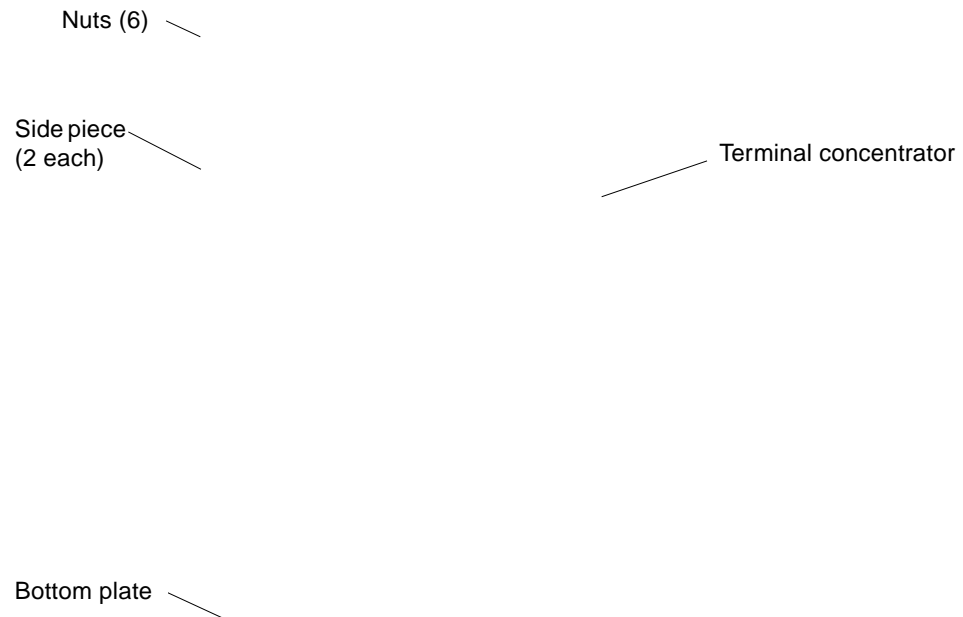
FIGURE 4-5   Assembling the Terminal Concentrator Bracket

c. Install and tighten three nuts on threaded studs penetrating through each side plate.

This completes the assembly of the bracket assembly.

3. Install the terminal concentrator bracket onto the hinge in the chassis.

a. Turn the terminal concentrator bracket on its side so the hinge holes and cable connectors face right.

b. Align the bracket holes with the boss pins in the hinge assembly and drop the bracket onto the hinge (FIGURE 4-6**).**

4. Install the keeper screw in the shorter boss pin to ensure the assembly will not be accidently knocked off the hinge.

FIGURE 4-6   Terminal Concentrator Installed on the Hinge

5. **Connect the power cord to the terminal concentrator as shown in** FIGURE 4-7**; connect the other end to the power distribution unit.**

Power cord

Connectors
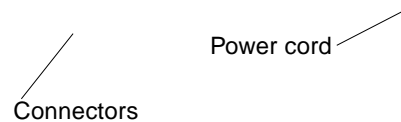
FIGURE 4-7   Terminal Concentrator Cable Locations

6. **Close the terminal concentrator bracket and install screws in holes 8 and 29 on the left–side rail.**

4.4.3   Sun Enterprise 10000

For Sun Enterprise Clusters using Sun Enterprise 10000s, the system service processor (SSP) replaces the terminal concentrator.

4.5   Installing SCI Switches or FastEthernet Hubs

For three or more nodes using SCI as the private net, two SCI switch units must be installed to provide means of communication among all nodes in the cluster. For clusters using FastEthernet, two hubs (customer–supplied) provide communication between all nodes.

4.5.1 SCI Switch

Note – Two SCI switches can be optionally installed for two nodes.

Connect the AC power cord into an AC power outlet (FIGURE 4-16).

SCI switch
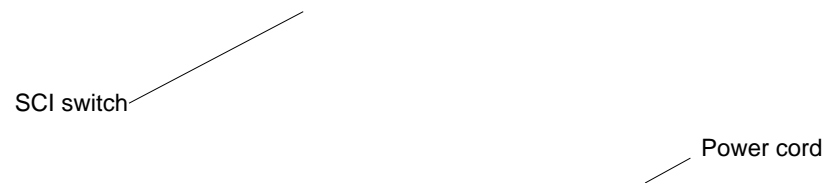
Power cord

FIGURE 4-8   Connecting SCI Switch Power

4.5.2 FastEthernet Hub

Customer supplied.

4.6 Power Cooling Modules (Sun Enterprise 3x00 through 6x00 only)

In Sun Enterprise 3x00 through 6x00 systems, power cooling modules (PCMs) provide power and cooling to the one or two boards installed adjacent to them. Every board, or pair of board, must be supported by an adjacent PCM. Refer to the documentation that came with your host system for PCM requirements.

4.7 Configuring the System, I/O, and Motherboards

4.7.1 Sun Enterprise 1, 2, 250, and 450

For instructions on configuring the motherboard for SBus (Sun Enterprise 1 and 2 only) or PCI (Sun Enterprise 250 and 450 only) cards, refer to the documentation that came with your system.

4.7.2 Sun Enterprise 3*x*00 Through 6*x*00

For instruction*s* on removing and installing Clock, Disk, I/O, or CPU/Memory boards, refer to the documentation that came with your system.

4.7.3 Sun Enterprise 10000

For instructions on removing and installing system boards, refer to the documentation supplied with the system boards or the *Sun Enterprise 10000 System Component Replacement Guide.*

4.8 Cabling System Components

4.8.1 Cluster Cabling

TABLE 4-2 lists cluster cabling specifications. Procedures for connecting each cable follow the table.

Note – For fiber optic cable connections, see TABLE 4-5.

TABLE 4-2   Cable Connections (Except Fiber Optic)

System	From Node 0	From Node 1	To	Interface Type
All	SCI SBus port		Node 1 SCI SBus port	SCI cable
		SCI SBus card	Node 0 SCI SBus port	SCI cable
	Serial port A		Terminal concentrator port 2	Serial
		Serial port A	Terminal concentrator port 3	Serial
	Administration workstation Serial A		Terminal concentrator port 1	Serial
	Administration workstation Ethernet port		Client net Ethernet	AUI or RJ-45

4.8.2   Administration Workstation Cabling

> ⚠ **Caution –** *Do not* connect a keyboard directly into a host system board (Sun Enterprise 10000) or a clock board (Sun Enterprise 3*x*000 through 6*x*000). If a keyboard is connected into one of these boards, it then becomes the default for console input, thus preventing input from the system administration workstation/ terminal concentrator serial port. Connecting a keyboard directly into a host system/ clock board while power is applied to the host sends a break signal to the Solaris operating environment, just as if you had typed a Stop (L1)-A on the keyboard.

1. **Connect serial cable (PN 530-2152) between the terminal concentrator, Port 1 and the administration workstation RS-232 connector (**FIGURE 4-9**).**

Client net Ethernet

Administration workstation   RS-232 to RJ-45   Terminal concentrator
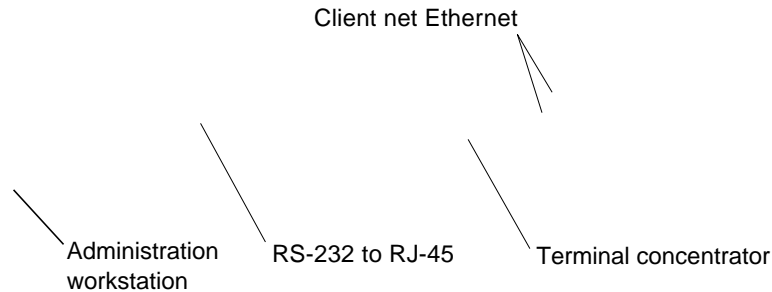
Note: Applicable to Sun Enterprise 3x00 and 4x00; Sun
Enterprise 5x00 and 6x00 are mounted vertically.

FIGURE 4-9   Connecting the Administration Workstation

2. Connect the client network Ethernet cable to the administration workstation Ethernet socket.

4.8.3   Terminal Concentrator Cabling

The following sections detail cabling the terminal concentrator to the various platform types.

Note – You can connect two nodes from another cluster to ports 6 and 7 if you want the Administrative workstation to monitor another cluster.

4.8.3.1   Sun Enterprise 1, 2, 250, and 450

Note – For this procedure, use four serial cables, each with an RJ-45 connector on one end and a DB-25 connector on the other.

---

1. Connect a serial cable between Serial A port on the node 0 and terminal concentrator, port 2 (use FIGURE 4-10 **for Sun Enterprise 1 and 2s; use** FIGURE 4-11 **for Sun Enterprise 250 and 450s).**

Repeat Step 1 for all remaining nodes using ports 3, 4, and 5, as needed.

2. Connect the public network Ethernet cable to the RJ-45 connector on the right side of the terminal concentrator.

Ethernet ports

Node 0   Node 2

Node 1   Node 3
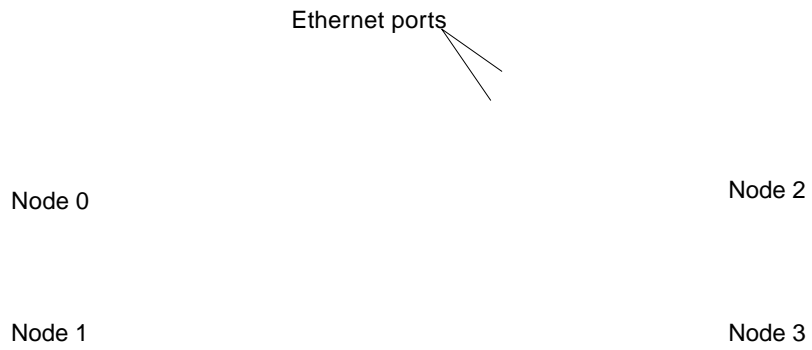
FIGURE 4-10 Connecting the Terminal Concentrator to Sun Enterprise 1 and 2 Nodes

Ethernet ports

Node 0   Node 1
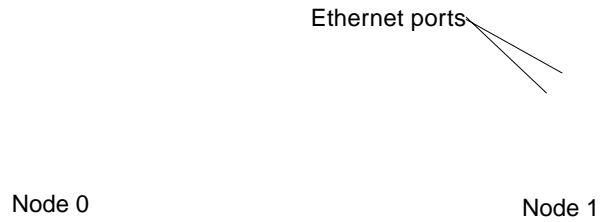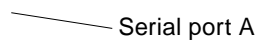
FIGURE 4-11 Connecting the Terminal Concentrator to Sun Enterprise 250 and 450 Nodes

4.8.3.2   Sun Enterprise 3*x*00 Through 6*x*00 Four-Node Cluster

Using the 530-2152 (5-Meter) or 530-2151 (1-Meter) cable:

1. **Connect Node 0 by connecting the DB-25 end of the cable into the Serial A port on the clock board in node 0** (FIGURE 4-12) **and the RJ-45 end to the terminal concentrator, port 2** (FIGURE 4-13)**.**

Serial port A

FIGURE 4-12 Serial Port A on the Clock Board (Sun Enterprise 3*x*00 through 6*x*00)

2. Connect Node 1 by connecting the DB-25 end of the cable into the Serial A port on the clock board in node 1 and the RJ-45 end to terminal concentrator, port 3 (FIGURE 4-13**).**

3. Repeat Step 2 above to connect nodes 2 and 3 to terminal concentrator ports 4 and 5, respectively.

4. Connect the public net Ethernet cable to the RJ-45 or DB-25 connector as appropriate on the terminal concentrator.

Administration workstation

Terminal concentrator

Node 0

Public net Ethernet

Node 1
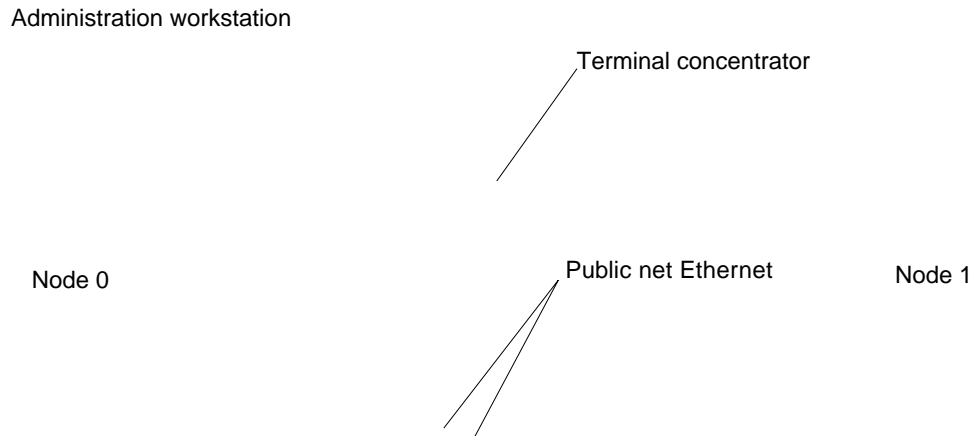
FIGURE 4-13 Node Interface to the Terminal Concentrator

4.8.4 Private Net Cabling

A cluster can have two, three, or four nodes. Clusters comprised of three or more nodes must use switches (SCI–based private nets) or hubs (Ethernet–based private nets). Private nets are connected in a similar manner, regardless of platform type, with one exception: the location of the host adapters may differ by platform. For instance, in Sun Enterprise 1 and 2 platforms the host adapters are mounted on the motherboards; in Sun Enterprise 3*x*00 through 6*x*00s, the host adapters are mounted on system and I/O boards, respectively. For two-node clusters, proceed to the next section; for three or four node clusters, proceed to Section 4.8.4.2.

4.8.4.1 Two-Node Clusters

Refer to FIGURE 4-14 for a typical two–node cluster based on SCI or Ethernet private nets. TABLE 4-3 details connecting an SCI or Ethernet–based private net based on specific platforms.
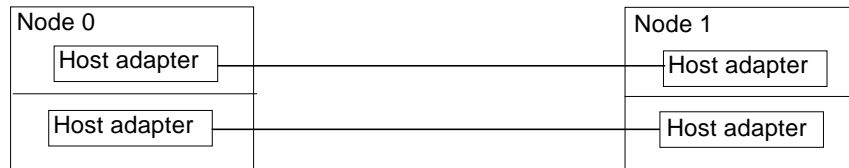
Note: Host adapter is either SCI for SCI–based nets or SunFastEthernet/SunSwift for Ethernet–based nets.

FIGURE 4-14 Typical Two-Node Sun Enterprise Cluster Private Nets

TABLE 4-3 Two-Node Private Network Cabling

Option	Node 0 Host Adapter	Cable	Node 1 Host Adapter
Sun Enterprise 1 and 2			
Ethernet[1]	SBus slot 0	Ethernet[2]	SBus slot 0
	SBus slot 1	Ethernet[2]	SBus slot 1
SCI	SBus slot 0	SCI[3]	SBus slot 0
	SBus slot 1	SCI[3]	SBus slot 1
Sun Enterprise 10000			
Ethernet[1]	System bd 0, SBus slot 1	Ethernet[2]	System bd 0, SBus slot 1
	System bd 1, SBus slot 2	Ethernet[2]	System bd 1, SBus slot 2
SCI	System bd 0, SBus slot 1	SCI[3]	System bd 0, SBus slot 1
	System bd 1, SBus slot 2	SCI[3]	System bd 1, SBus slot 2
SE3x00 through 6x00			
Ethernet[1]	I/O slot 1, on-board RJ-45	Ethernet[2]	I/O slot 1, on-board RJ-45
	I/O slot 3, on-board RJ-45	Ethernet[2]	I/O slot 3, on-board RJ-45
SCI	I/O slot 1, SBus slot 0	SC3[3]	I/O slot 1, SBus slot 0
	I/O slot 3, SBus slot 0	SCI[3]	I/O slot 3, SBus slot 0

TABLE 4-3 Two-Node Private Network Cabling *(Continued)*

Option	Node 0 Host Adapter	Cable	Node 1 Host Adapter

Notes

1. The FastEthernet SBus host adapters can be either SunSwift or SunFastEthernet 10/100 SBus Adapter 2.0; Sun Enterprise 3x00 through 6x00 systems can use the on-board Ethernet ports on the I/O+ boards

2. P/N 530-2149 9 (1-meter) or 530-2150 (5-meter); Sun cables, not interchangeable with standard Ethernet cables.

3. P/N 530-2360 (2-meter), 530-2361 (5-meter), or 530-2362 (10-meter).

4.8.4.2 Three-or Four-Node Clusters

Refer to FIGURE 4-15 or FIGURE 4-16 for a typical three- or four-node cluster based on SCI or Ethernet private nets, respectively. See TABLE 4-4 which details connecting three- or four-node clusters comprised of specific platforms for SCI- or Ethernet-based private nets using switches (SCI) or hubs (Ethernet). Clusters based on Sun Enterprise 5x00 and 6x00s using SCI-based private nets must use additional bracket supports that mount cable restraint brackets (which support the SCI cables); refer to Section 4.8.4.3 "Sun Enterprise 5x00 and 6x00 SCI Cable Bracket Installation."
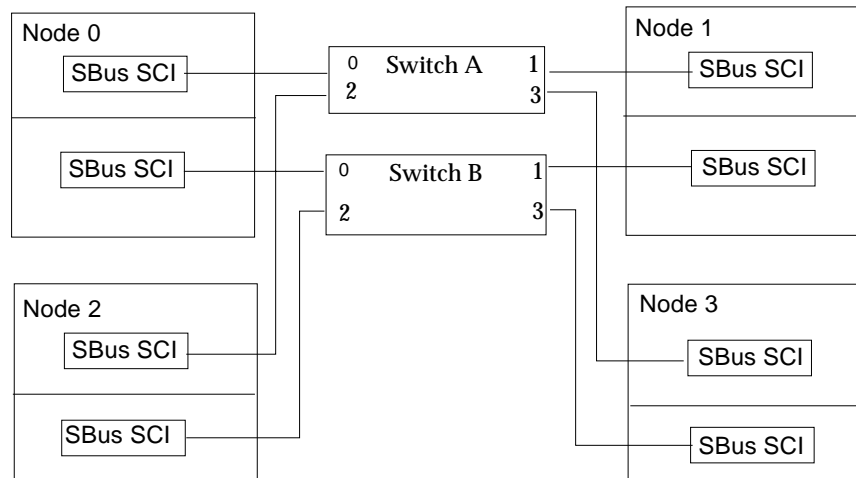
FIGURE 4-15 Typical Four-Node Sun Enterprise Clusters Using Switched SCI Private Nets
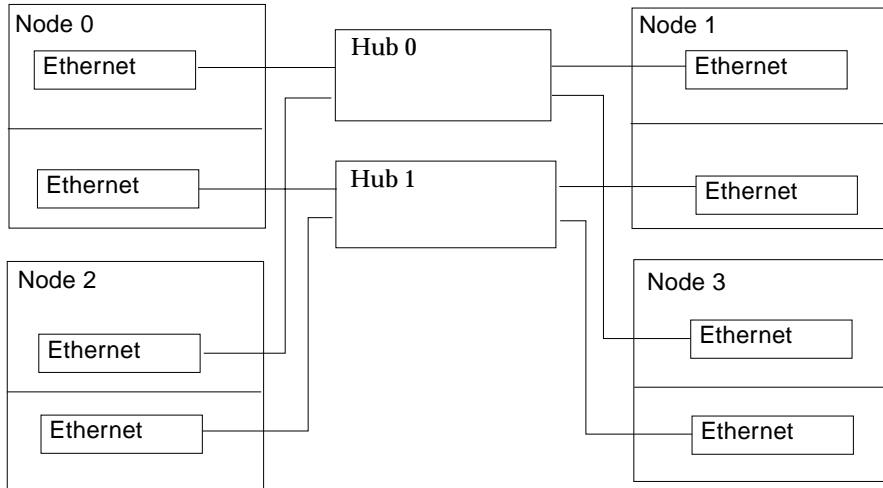
FIGURE 4-16 Typical Four-Node Sun Enterprise Clusters Using Ethernet Private Net With Hubs

TABLE 4-4   Three- or Four-Node SCI/Ethernet Private Network Cabling

Option	Cable	Host Adapters				Switch Port	
		Node 0	Node 1	Node 2	Node 3	A	B
Sun Enterprise 1 and 2							
Ethernet	Ethernet[1]	SBus slot 0	SBus slot 0				
	Ethernet[1]	SBus slot 1	SBus slot 1				
SCI	SCI[2]	SBus slot 0	SBus slot 0				
	SCI[2]	SBus slot 1	SBus slot 1				
Sun Enterprise 10000							
Ethernet	Ethernet[1]	System bd 0, SBus slot 1	System bd 0, SBus slot 1				
	Ethernet[1]	System bd 1, SBus slot 2	System bd 1, SBus slot 2				
SCI	SCI[2]	System bd 0, SBus slot 0				0	
	SCI[2]	System bd 1, SBus slot 0					0

Option	Cable	Host Adapters				Switch Port	
		Node 0	Node 1	Node 2	Node 3	A	B
	SCI²		System bd 0, SBus slot 0			1	
	SCI²		System bd 1, SBus slot 0				1
	SCI²			System bd 0, SBus slot 0		2	
	SCI²			System bd 1, SBus slot 0			2
	SCI²				System bd 0, SBus slot 0	3	
	SCI²				System bd 1, SBus slot 0		3
Sun Enterprise 3x00 through 6x00							
Ethernet	Ethernet¹	I/O slot 1, on-board RJ-45	I/O slot 1, on-board RJ-45				
	Ethernet¹	I/O slot 3, on-bd RJ-45	I/O slot 3, on-board RJ-45				
SCI	SCI²	I/O slot 1, SBus slot 0				0	
	SCI²	I/O slot 3, SBus slot 0					0
	SCI²		I/O slot 1, SBus slot 0			1	
	SCI²		I/O slot 3, SBus slot 0				1
	SCI²			I/O slot 1, SBus slot 0		2	
	SCI²			I/O slot 3, SBus slot 0			2
	SCI²				I/O slot 1, SBus slot 0	3	
	SCI²				I/O slot 3, SBus slot 0		3

TABLE 4-4   Three- or Four-Node SCI/Ethernet Private Network Cabling *(Continued)*

		Host Adapters				Switch Port	
Option	Cable	Node 0	Node 1	Node 2	Node 3	A	B
Notes:							
1. Use standard TPE cabling							
2. P/N 530-2360 (2-meter), 530-2361 (5-meter), or 530-2362 (10-meter)							

4.8.4.3 Sun Enterprise 5*x*00 and 6*x*00 SCI Cable Bracket Installation

SCI cable installation is identical to installation in a Sun Enterprise Cluster comprised of Sun Enterprise 4*x*00s or 3*x*00s, except that cable brackets must be installed to support the cables in the rack. Install these brackets as shown in FIGURE 4-17.

Note – The cable bracket incorporates a track on the top and the bottom (one for each cable) to support the SCI cables, which are both thick and stiff. These tracks mechanically form and support the SCI cables. This track enables the bracket to hold the cable connector flush against the SCI host connector, and to isolate the connection from cable inflexibility, twist, or pull.

---

1. **At the rear of the cabinet, loosely install two screws in the rack in holes 58.**

   Install one at the left and one at the right. These screws will accept the slotted holes in the cable bracket.

2. **Orient the bracket with the narrow portion of the slotted holes up and the cable track opening to the left (**FIGURE 4-17**).**

SCI cable for I/O board 1

SCI cable for I/O board 3
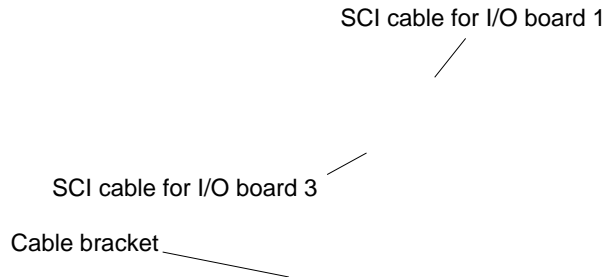
Cable bracket

FIGURE 4-17 Installing the Two SCI Cables in the Cable Bracket

3. **Lay the cable for I/O board 1 into the top of the bracket with the connector toward the left and facing away from you; form the cable into the curved track built into the top of the bracket.**

4. **Install two cable clamps using two plastic rivets to secure the clamps to the brackets.**

5. **Repeat Steps 2 through 4 for the bottom cable.**

   Install the cable in the track on the underside of the bracket and secure.

6. **Install the bracket with cables on the rack as shown in** FIGURE 4-18**.**

   a. **Align the cable connectors with the mating connectors on the I/O boards; do not force the connectors onto the host connectors at this time.**

   b. **Adjust the cables in the tracks as required to enable the bracket surface to mate flush against the rack.**

      Adjust the cables so the slotted holes in the bracket fit over the screws installed in Step 1. Allow the bracket to rest on the screws but do not tighten.

7. **Connect the cable connectors into the hosts.**

   Examine the cable connector-to-host spacing. Adjust the cables in the tracks as required to enable the top and bottom connectors to mate with the hosts.

8. **Tighten the screws to secure the bracket to the rack.**

Note – The SCI bracket automatically aligns the cable connectors to the SCI SBus cards in I/O board slots 1 and 3; SBus position 0.

!
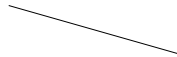
Caution – Tighten the screws carefully or connector damage may occur. Readjust the cables in the tracks as required to prevent the cable from binding as the screws are tightened.

9. **Ensure that the connectors are secure and that no excessive force is placed on the cable, connector, or I/O board.**

10. **Repeat this procedure for all remaining nodes.**

SCI cable
bracket

FIGURE 4-18 SCI Cable Bracket Installation

4.8.5 Internal SCSI Devices Cabling

4.8.5.1 Sun Enterprise 1, 2, 250, and 450

Refer to the documentaion that came with your server platform.

4.8.5.2 Sun Enterprise 3*x*00 Through 6*x*00

● **Install a terminator on the SCSI connector of the I/O board located in slot 1
(**FIGURE 4-19**).**
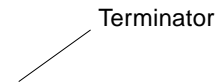
Terminator

FIGURE 4-19 SCSI Terminator Installation on the I/O Board

4.8.6 SPARCstorage Array Cabling

4.8.6.1 Installing the Second FC/OM Optical Module in all SPARCstorage Arrays

The SPARCstorage Arrays are delivered with one FC/OM optical module installed.
You must install the second module in the SPARCstorage Array using instructions
provided with the module.

4.8.6.2   Fiber-Optic Cable Labeling

● **Label the fiber-optic cables prior to installation.**

Put labels with the node and SPARCstorage Array information imprinted on it on both ends of each cable. Use FIGURE 4-20 as a guide.

Labeling ensures accurate installation and eases system reconfiguration and expansion later.

4.8.6.3   Fiber-Optic Cable Installation

1. **Connect one end of the fiber-optic cable into the FC/OM in the I/O board and the other end into the FC/OM connector on the SPARCstorage Array rear panel.**

   Connect node 0 into connector A and node 1 into connector B. Repeat to connect both nodes to both SPARCstorage Arrays. See TABLE 4-5 for a listing of all cable connections.

2. **Repeat Step 1 for all FC/OM cables.**

3. **Use cable ties to dress and secure all cables as required.**

NODE 0   NODE 1

Array 0   Array 1

FIGURE 4-20 SPARCstorage Array 0 and 1 Connection Example

Keys

Key notches

Keys (hidden)

Key notches
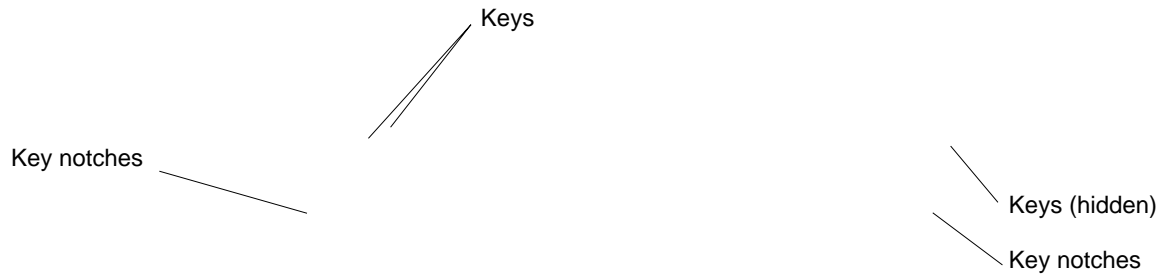
FIGURE 4-21 SPARCstorage Array Fiber-Optic Cable Connection

TABLE 4-5 Node to SPARCstorage Array Cable Connection Example

I/O Board	From Node 0 FC/OM	From Node 1 FC/OM	To SPARCstorage Array
1	On-board		0 port A
		On-board	0 port B
3	On-board		1 port A
		On-board	1 port B
5	On-board		2 port A
		On-board	2 port B
1	SBus slot 1		3 port A
		SBus slot 1	3 port B
3	SBus slot 1		4 port A
		SBus slot 1	4 port B
5	SBus slot 1		5 port A
		SBus slot 1	5 port B
1	SBus slot 2		6 port A
		SBus slot 2	6 port B
3	SBus slot 2		7 port A
		SBus slot 2	7 port B

4.8.7 Sun StorEdge A3*x*00 Cabling

For a typical configuration, refer to Chapter 1 of the Sun StorEdge A3*x*00 System Manual. For cabling instructions, see FIGURE 4-22.

Controller 1 (A)
SCSI connection to node 0 — 〜〜〜   〜〜〜 Controller module

SCSI connection to node 1 ———

Controller 2 (B)
SCSI connection to node 2 —   Drive trays

SCSI connection to node 3 —
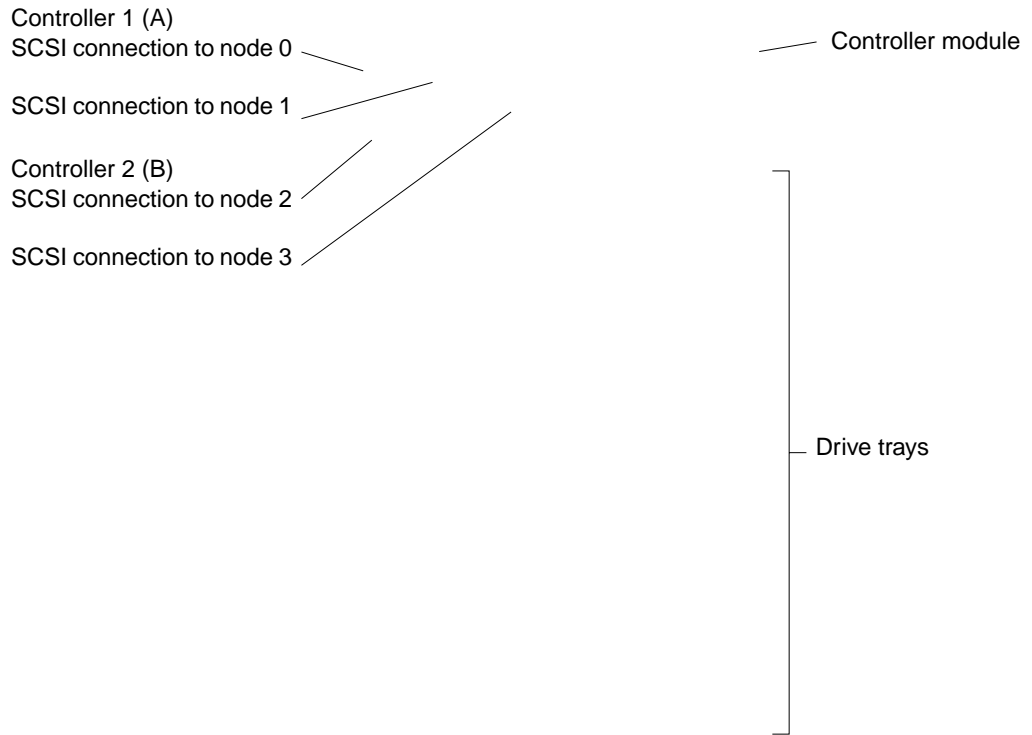
FIGURE 4-22 Connecting the D-SCSI Cables to the Controller Module

For direct connectivity configurations, see Appendix D, "Direct Connectivity."

4.8.8 Sun StorEdge A5000 Cabling

Sun StorEdge A5000s use fiber-optic cabling and GBICs, which are mounted on adapter interface boards.

The ends of the fiber-optic cables are keyed with notches, as depicted in FIGURE 4-23, to prevent improper insertion. For detailed connection instructions refer to the *Sun StorEdge A5000 Installation and Service Manual.*

Notches

Keys
(on bottom)
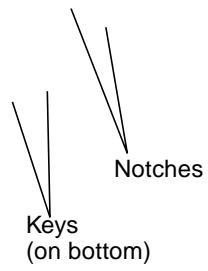
FIGURE 4-23 Keyed Fiber-Optic Cable

Configuring the Terminal Concentrator and Installing the Software

Configuration and installation procedures are found in the following section:

5.1 Configuring the Terminal Concentrator

1. **From the administration workstation or system service processor, edit the** `/etc/remote` **file and add the following:**

```
# tc\:dv=/dev/term/a:br#9600:el=^C^S^Q^U^D:ie=%$:oe=^D:
```

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. For more information, see the documentation supplied with your workstation.

2. **Tip to serial port A on the administration or system service processor:**

```
# tip tc
```

3. **Verify that the server and the terminal concentrator are powered on and that the cabinet keyswitch (if applicable) is in the ON position.**

4. **Reset the terminal concentrator.**

   Press the Test button on the front panel for three or more seconds until the Power LED blinks rapidly. Release the button (FIGURE 5-1).

   Power LED   Test LED (orange)   Test button

   FIGURE 5-1   Terminal Concentrator Test Button

5. **Within 30 seconds, press the Test button again.**

   Note – Verify that the orange Test LED lights to ensure the unit is in test mode.

   The terminal concentrator performs a self-test, which lasts about 30 seconds. Messages display on the terminal screen. If the network connection is not found, press the q key to stop the message. When the terminal concentrator boot completes successfully, the front panel LEDs light as shown in TABLE 5-1.

   TABLE 5-1   Front Panel LEDs Indicating a Successful Boot

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

If the boot fails, the LEDs on the front panel may light in one of the modes shown in TABLE 5-2.

TABLE 5-2 Front Panel LEDs Indicating a Failed Boot

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
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 indicate failures other than those listed in TABLE 5-2, refer to the *Sun Enterprise Cluster System 2.0 Service Manual.*

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

7. **Upon successful 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 following example, the broadcast address is the terminal concentrator address with the host portion set to 255 or all ones.

```
monitor:: addr
Enter Internet address [<uninitialized>]:: 172.25.80.6
  Internet address: 172.25.80.6
Enter Subnet mask [255.255.0.0]:: 255.255.255.0
  Subnet mask: 255.255.255.0
Enter Preferred load host Internet address [<any host>]::
172.25.80.6

 *** Warning: Load host and Internet address are the same ***
   Preferred load host address: 172.25.80.6
Enter Broadcast address [0.0.0.0]:: 172.25.80.255
   Broadcast address: 172.25.80.255
Enter Preferred dump address [0.0.0.0]:: 172.25.80.6
    Preferred dump address: 172.25.80.6
Select type of IP packet encapsulation (ieee802/ethernet)
[<ethernet>]::
    Type of IP packet encapsulation: <ethernet>
Load Broadcast Y/N [Y]:: n
   Load Broadcast: N
```

8. **After the** addr **session, power-cycle the terminal concentrator. Load and Active lights should blink for a bit; then Load light will go off. Now, you should be able to** ping **the terminal concentrator from the administrative workstation or the system service processor (SSP).**

Note – All IP addresses are referenced as samples.

Note – If the monitor:: prompt does not show after you power cycle the terminal concentrator, press the Test button for 5 seconds until the power LED flashes.

---

9. Configure ports 1–8 of the terminal concentrator from admin mode:

```
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 imask_7bits Y
  You may need to reset the appropriate port, Annex subsystem
or
          reboot the Annex for changes to take effect.
admin : set port=2-7 mode slave
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 one minute.

5.1.1   Connecting Host to Terminal Concentrator

1. Connect node 0 cable to port 2.

2. Connect node 1 cable to port 3.

3. Connect node 2 cable to port 4.

4. Connect node 3 cable to port 5.

   At this point you can access the system consoles via the terminal concentrator.

1. Login to the system consoles.

2. Add the following directories to your path: `/sbin, /usr/sbin, /etc/vx/bin, /opt/SUNWpnm/bin`, and `/opt/SUNWcluster/bin`. Add `/opt/SUNWcluster/man` to your `MANPATH`.

5.1.2   Accessing the SSP on Sun Enterprise 10000 Platforms:

1. Log in to the SSP.

2. At the prompt type:

```
netcom
trying to connect...
connected>
```

3. Enter Shift~@ to unlock the console and get write permission.

5.1.3   Setting Port Parameters

The type variable for each port must be set to `dial_in imask_7bits`
(followed by `Y`). If it is set to `hardwired`, the 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.

5.1.3.1   Determining If the Port Type Variable Must Be Set

1. Find the Sun label on the top panel of the terminal concentrator (FIGURE 5-2**).**

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 5.1.3.2 "Setting the Port Parameters."**

Sun label:
• 9520 or higher denotes the type variable is correct
• 9519 or lower denotes the variable must be reset

Sun serial number label
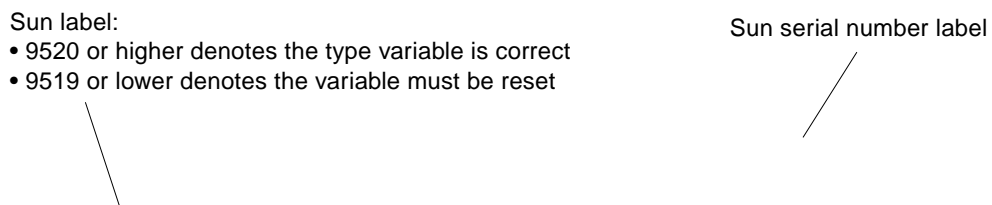
FIGURE 5-2   Determining the Terminal Concentrator Version

5.1.3.2   Setting the Port Parameters

● **Using an administration workstation, set the port parameters by substituting your host name for** `planets-tc` **as shown in the following example：**

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

```
admin-ws# telnet terminal concentrator name
Trying terminal concentrator IP address
Connected to planets-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: 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 imask_7bits Y
  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 causes the terminal concentrator to reboot. The terminal concentrator
will be unavailable for about one minute.

5.1.4 Resetting Terminal Concentrator Configuration Parameters

For this procedure, refer to the *Sun Enterprise Cluster System Hardware Service Manual*,
Chapter 3.

5.2 Installing Solaris 2.6 and Subsequent Compatible Versions of Operating Environments

For information on installing the Solaris 2.6 and subsequent compatible operating environments on the nodes from the Solaris CD and the SMCC Updated CD, refer to the applicable Hardware Platform Guide.

Note – The Solaris operating environment installed on both nodes must match the operating environment version level installed on the system administration workstation.

The operating environment is installed during hardware installation to facilitate running the SunVTS™ diagnostic system. SunVTS is used to verify that the hardware was installed correctly.

5.3 Acceptance Test

At this point, establish an important installation milestone. 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) has been completed, checked, and approved.

Note – This acceptance test is designed to prove that the physical installation was performed correctly and completely. It is *not* the intent of the acceptance test to prove system fault detection capabilities, nor to inject failures (for example) and then to monitor the results.

Perform the acceptance test after:
- All hardware is installed and cabling is complete
- The Solaris operating environment is installed, including:
    - Installation of the system administration workstation
    - Configuration of the terminal concentrator

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

5.3.1   Using SunVTS

SunVTS is one of the online diagnostics tools for Sun Enterprise Clusters servers.

A SunVTS utility, `vtsprobe`, is used to verify installation of system hardware, SPARCstorage Arrays, private net devices, and network interfaces. See Section 5.3.1.1 "Verifying Hardware Installation."

Caution – Only run SunVTS when no database application software is running. Only use SunVTS at this stage to verify that the hardware configuration is correct. Do not attempt to use SunVTS to validate software configuration. If you run SunVTS while database application software is running, unpredictable results may occur.

Note – SunVTS must be run separately on each node. There is no provision for running SunVTS on both nodes at the same time. When you are done running SunVTS on one node, repeat the process on the other node.

5.3.1.1   Verifying Hardware Installation

There are four prerequisites for the procedure that follows:
- Both nodes have the Solaris 2.6 operating environment installed.
- Both nodes have the applicable disk array package installed.
- Both nodes have a routing table established for the private interconnect.
- Both nodes have the SunVTS package installed.

1. **Become superuser and change directories:**

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

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

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

■ For a C shell:

```
% setenv BYPASS_FS_PROBE 1
```

Become superuser and type:

```
# ./vtsk
```

Executing the ./vtsk command starts the SunVTS kernel. The SunVTS kernel 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, type the following:

```
# ps -ef|grep vtsk (find process id of vtsk)
# kill -INT vtsk pid
# ./vtsk
```

3. **Wait a few minutes to enable** vtsk **to finish probing the system, and then initiate a** probe_map **file using the** vtsprobe **command.**

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

As shown in the preceding example, the output of the vtsprobe command, which can be lengthy, is redirected to a file (/tmp/probe_map) for later viewing. The vtsprobe command without modifiers will produce a console screen output.

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

```
Network
        hme1(nettest)
        Port Address: Unknown
        Host ID: 80500419
        Domain Name : nn.nn.nn.com
        hme2(nettest)
        Port Address: Unknown
        Host ID: 80500419
        Domain Name : nn.nn.nn.com
```

If the data listed for the private net devices does not match the build configuration, check and correct any cabling errors, and repeat Steps 1 through 4.

5. **Verify that there is a response (under the Network heading) to the** `vtsprobe` **command for any network interface devices installed.**

Consult documentation supplied with your network interface card to determine the correct entry for your device.

6. **Verify that the response to the** `vtsprobe` **command is similar to the following for the disk array that you installed. The following example is applicable if SPARCstorage Arrays were installed:**

```
ssa4(plntest)
      Vendor Id : SUN
      Product Id : SSA210
      Product Rev : 1.0
      Firmware Rev : 3.6
      Serial Number : 00000078BB2B
      Disks Attached : c3t2d6 c3t2d5 c3t2d4 c3t2d3 c3t2d2
      c3t2d1 c3t2d0 c3t1d0
```

If the data listed for the SPARCstorage Arrays does not match the build configuration, check and correct any cabling errors, and repeat Step 1 through Step 6.

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

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

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

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

If the data listed for the disks does not match that shown under the corresponding SPARCstorage Array, the disk may be bad. In this case, you may have to type `boot -r` to rebuild the device tree. Then, repeat Steps 1 through 7.

8. **Compare the** `probe_maps` **generated by each node.**

9. **Check and verify WWN of each SPARCstorage Array.**

10. **Check and compare disk logical name and capacity for all disks under the corresponding SPARCstorage Array.**

   If there is not an identical match, replace the SPARCstorage Array controller and/or disks if necessary.

   Note – Logical disk names may differ on the two nodes.

   ---

11. **To run a final system functional check, run SunVTS using the procedure in Section 5.3.1.2 "Running SunVTS—Sun Enterprise 3x00 through 6x00."**

5.3.1.2　Running SunVTS—Sun Enterprise 3*x*00 through 6*x*00

Run a final functional test of the system using SunVTS. For Sun Enterprise 10000, proceed to Section 5.3.1.3 "Running SunVTS—Sun Enterprise 10000."

1. Become superuser and change directories:

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

2. Invoke SunVTS in one of the following ways:

- If you logged in on the server console port (the serial console port connected through the terminal concentrator), type:

```
# ./sunvts
```

- To use a window-based interface to remotely execute SunVTS (SunVTS 2.0 supports the OPEN LOOK and Common Desktop Environment [CDE] windowing environments), from the administration workstation window system, type:

```
# ./sunvts -h ha_host_name
```

This enables you to monitor the server *ha_host_name* in the CDE environment.

- In the OpenWindows environment, type:

```
# ./sunvts -l -h ha_host_name
```

- To run in the TTY interface mode, type:

```
# ./sunvts -t -h ha_host_name
```

If the system does not have a frame buffer, 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 the *SunVTS 2.1 User's Guide Solaris 2.6.*

5.3.1.3   Running SunVTS—Sun Enterprise 10000

Run a final functional test of the system using SunVTS.

To run SunVTS and configure the local and network variables, the server must first boot as described in Section 2 of the *Ultra Enterprise 10000 Host Hardware and Software Installation Guide.*

SunVTS can test the overall functionality of all system parts (processor and I/O). An overnight SunVTS run is considered ideal, but 4 to 24 hours is appropriate as a system test.

1. **Start SunVTS by logging in to the host as** `root`:

```
# csh
# setenv DISPLAY ssp_hostname:0.0
# /opt/SUNWdiag/bin/sunvts &
```

If SunVTS fails to initialize, you may need to install SunVTS as described in Section 2 of the *Ultra Enterprise 10000 Host Hardware and Software Installation Guide.*

2. **After the SunVTS screen is displayed, select** `Options File`.

3. **When prompted for an option file name, type:** `Default`.

4. **Select** `load` **to load the Default options file.**

Note – After the option file is loaded, verify that all disk tests are properly configured; that `fstests` is being run on actual mounted partitions; and that you are not testing the same dual-ported disk drives from multiple controllers.

The option files are located in the `/var/adm/sunvtslog/options` directory. For more information, refer to the SunVTS AnswerBook documentation.

5. **Display the SunVTS window and check the devices shown in the Control Panel against the devices you know to be physically present in the system.**

Refer to the Control Panel section of the SunVTS documentation if there is a discrepancy.

Starting SunVTS often serves as a quick check for most hardware devices. If you have just installed a device and reconfigured your machine accordingly, the SunVTS test for that device can confirm proper installation.

Also, if SunVTS fails to display a device that you know is physically present in your system, there is a problem and you should recheck your installation carefully.

6. Click the Start Button.

Or, if you have enabled the Auto Start option from the Set SunVTS Options menu and saved an options file, you can start SunVTS by typing:

```
# sunvts -o options_filename
```

7. Monitor the status of SunVTS. Verify that the system is running and that no test failures are occurring.

5.3.2   Acceptance Test Criteria

The acceptance test has completed successfully if the data listed for all hardware components matches the corresponding build configurations.

If this is not true, the system has failed the acceptance test. Verify that the hardware and software are installed properly.

5.4   Software Installation

For these procedures, refer to the Sun Cluster 2.2 Software Planning and Installation Guide.

Rackmounted Disk Arrays and Hubs

For procedures specific to your platform type on rackmounting your particular disk array or hub into your system or expansion cabinet, refer to the documentation that came with your disk array or hub. Also, refer to the *Rackmount Placement Matrix* manual for screw hole and chassis placement instructions specific to the different disk arrays and hubs versus the type of platform used.

Note – Cabinet cooling is an important factor. Use only the hole numbers specified in the *Rackmount Placement Matrix.* These hole numbers determine array spacing for proper ventilation.

Configuring the SCI SBus Adapter Cards and Switches

The SCI host device uses the concept of *rings* in which two or more *nodes* (SCI SBus cards) are mutually connected. In a given ring, one host device is designated as *scrubber*. Assignment as scrubber is accomplished by setting the on-board *scrubber jumper*. The scrubber performs certain ring maintenance functions. The scrubber host always resides in the primary cabinet, node 0.

This appendix provides procedures for assigning scrubber settings and installing the SCI SBus cards into systems that are switched or unswitched.

- Scrubber Assignment—page B-1
- SCI `Nodeid` Values—page B-5
- SCI Driver Installation and Configuration—page B-6
- SCI Card Troubleshooting—page B-7

B.1 Scrubber Assignment

The following procedures are for all supported platforms with the exception of the Sun Enterprise 250 and 450, which are PCI-based platforms.

Note – The B version of the SCI SBus card is required to operate with this system. The version card is identified as follows:
• The letter "B" appears on the faceplate in the area near the connector.
• The serial number is 4000 or higher.

B.1.1 Two-Node SCI-Unswitched Clusters

1. **Assign two SCI cards as scrubbers by installing the jumpers in the On position, as indicated in** FIGURE B-1.

2. **Install the two scrubber-assigned SCI cards onto the Node 0 board locations as indicted in** TABLE B-1. **To install the SCI card, refer to the documentation that came with your server.**

TABLE B-1 Node 0 Scrubber Card Assignment

Platform	Board Location
Sun Enterprise 3*x*00 through 6*x*00	I/O board 1, SBus slot 0; I/O board 3, SBus slot 0
Sun Enterprise 10000	System board 0, SBus slot 0; system board 1, SBus slot 0
Sun Enterprise 1 and 2	Motherboard (use SBus slots 2 and 3 in each node)

Scrubber
jumper — Designates card as nonscrubber

Designates card as scrubber
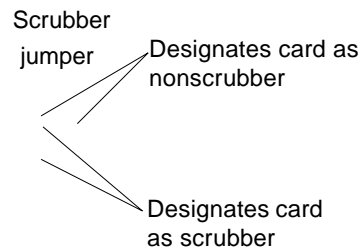
Component side view

FIGURE B-1 Scrubber Jumper Positions

3. **Examine the two cards that are** *not* **assigned as scrubbers. Ensure the jumpers are in the Off position as shown in** FIGURE B-2.

4. **Install the nonscrubber SCI cards onto the Node 1 board locations as indicated in** TABLE B-2**. Refer to the documentation that came with your platform to install the SCI card.**

TABLE B-2   Node 1 Nonscrubber Card Asignment

Platform	Board Location
Sun Enterprise 3x00 through 6x00	I/O board 1, Sbus slot 0; I/O board 3, SBus slot 0
Sun Enterprise 10000	System board 0, SBus slot 0; system board 1, SBus slot 0
Sun Enterprise 1 and 2	Motherboard (use SBus slots 2 and 3 in each node)

The resulting installation is represented in FIGURE B-2.

Note – SCI cables are available in lengths of two, five, or ten meters; part numbers 530-2576, 530-2577, and 530-2578, respectively.

Scrubber on

Scrubber off

On

Scrubber on

Off

Scrubber off
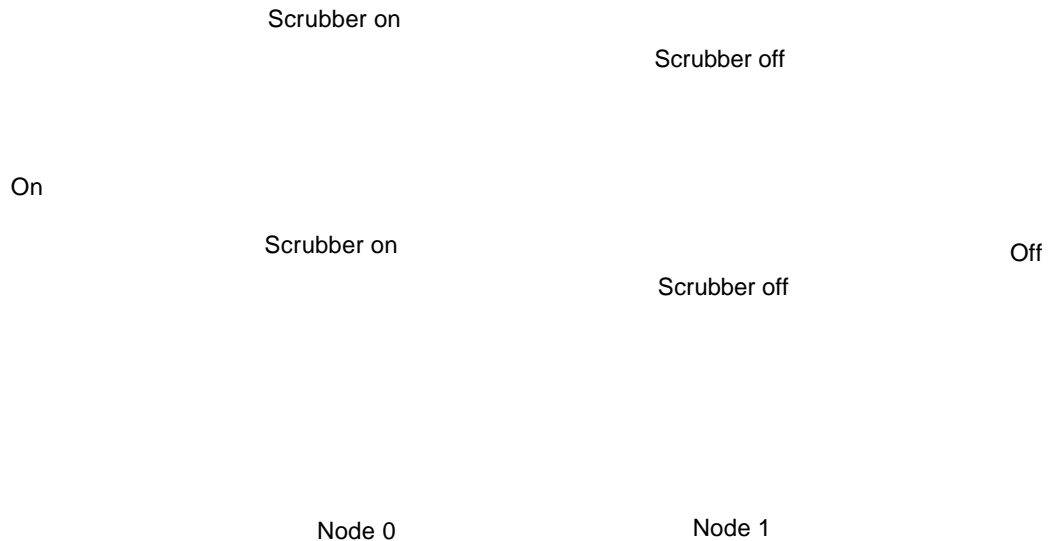
Node 0

Node 1

FIGURE B-2 Two-Node Unswitched Cluster—SCI SBus Card Configuration in Node 0 and Node 1

B.1.1.1 Two-Node SCI-Switched Clusters

1. **In all four cards, install the jumper to dedicate them as scrubbers.**

   Install the jumpers in the On position as shown in FIGURE B-1.

2. **Nodes 0 and 1: install the SCI SBus cards in the board locations as indicated in** TABLE B-3**.**

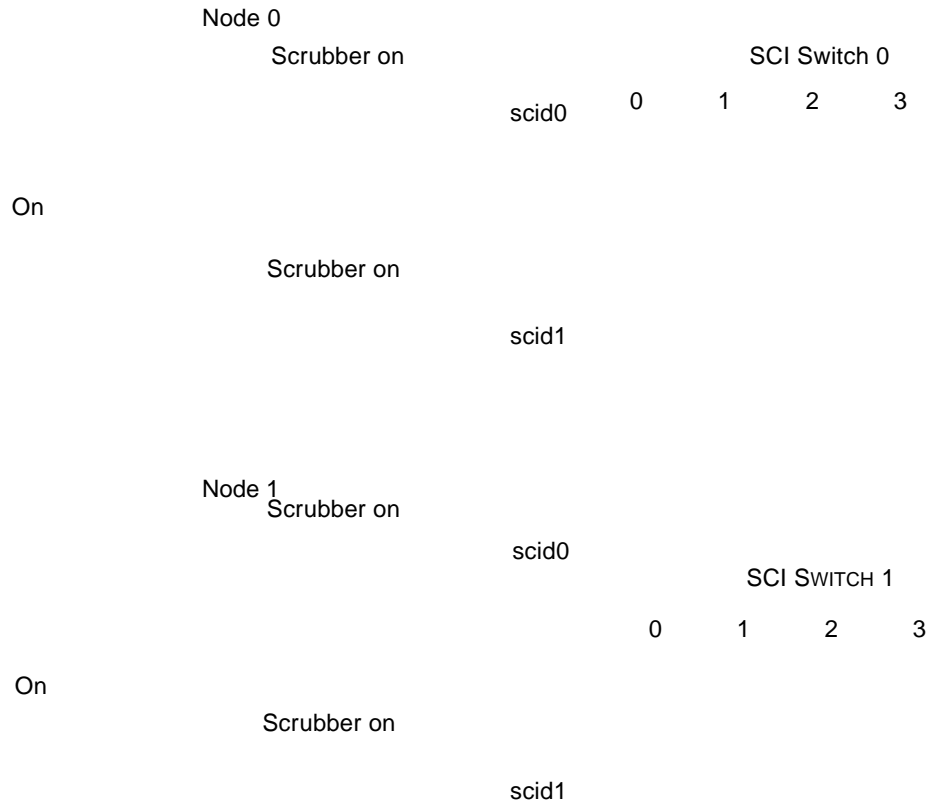   **TABLE B-3** Node 0/1 Scrubber Card Assignment

Platform	Board Location
Sun Enterprise 3x00 through 6x00	I/O board 1, SBus slot 0; I/O board 3, SBus slot 0
Sun Enterprise 10000	System board 0, SBus slot 0; system board 1, SBus slot 0
Sun Enterprise 1 and 2	Motherboard (use SBus slots 2 and 3 in each node)

   The resulting installation is represented in FIGURE B-3.

   Note – SCI cables are available in lengths of two, five, or ten meters.

Node 0
Scrubber on   SCI Switch 0

scid0   0   1   2   3

On

Scrubber on

scid1

Node 1
Scrubber on

scid0

SCI S<small>WITCH</small> 1

0   1   2   3

On

Scrubber on

scid1

FIGURE B-3 Two-Node Switched Cluster—SCI SBus Card Configuration in Node 0 and Node 1

B.2   SCI `Nodeid` Values

SCI cards use `nodeids` as hardware addresses. Unique `nodeid` values must be assigned to each card during software configuration (FIGURE B-4).

Note – `Nodeids` are the equivalent of Ethernet addresses for SCI.
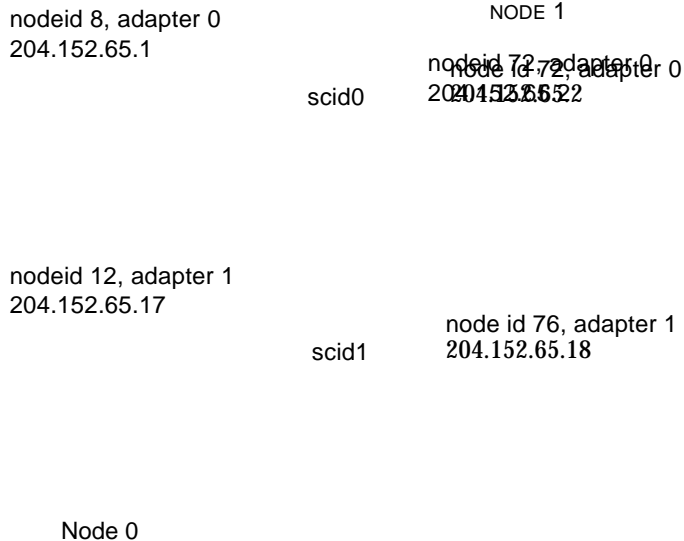
---

nodeid 8, adapter 0
204.152.65.1

NODE 1

nodeid 72, adapter 0
204.152.65.2

scid0

nodeid 12, adapter 1
204.152.65.17

node id 76, adapter 1
204.152.65.18

scid1

Node 0

FIGURE B-4 `nodeid`, Adapter Number, and IP Assignment for Each SCI SBus Card

B.3 SCI Driver Installation and Configuration

1. **Install the software using** `sciinstall`**. Specify SCI as the network interface.** `sciinstall` is loaded from the cluster software CD.

2. **Configure the** `nodeid`**, adapter number, and firmware for all SCI SBus cards.**

3. **Reboot both systems (nodes):**

```
reboot
```

4. **Start the cluster:**

```
ecsadmin startnode
```

B.4 SCI Card Troubleshooting

If the system is booted with one or more faulty SCI cards, the problem can be diagnosed as follows:

1. **With the system powered off, remove the board on which the adapter card is mounted and note the serial numbers of the adapter cards that are physically installed. Reinsert the board and power on the system.**

   For more information, refer to the Sun Enterprise Cluster System Hardware Service Manual.

2. **Run** `/opt/SUNWsci/bin/sciadm` **and enter the** `identify` **command.**

   This command displays the firmware version, `FCode` version, and serial number of each adapter board found.

3. **Compare the number of cards found by** `sciadm` **against the number of adapters physically installed.**

   Two cards should be displayed in the output. If they are not displayed, there is at least one bad card in the system.

4. **Compare the adapter board serial numbers from the output of the** `identify` **command, to the serial number on each adapter card physically installed.**

   Note which serial number(s) is displayed. Cards that do not have their serial numbers displayed are bad and need replacement.

   During power-on/reboot/reset, a banner (containing the word `FCode`) will be printed from each SCI card *twice*, if the SCI cards are working properly.

   The following are three sample console messages (which are not saved in the message file):

1. Both SCI cards are working in the system (this particular system has both SBus2 and SBus2b cards):

```
rebooting...
Resetting ...

SBus-to-SCI (SBus2) Adapter - 9029
FCode 9029 $Revision: 1.22 $  - d9029_09 $Date: 1996/07/15 11:51:19 $

Executing SCI adapter selftest.    Adapter OK.

DOLPHIN SBus-to-SCI (SBus2b) Adapter - 9029, Serial #5017
FCode 9029 $Revision: 2.3 $  - d9029_52 $Date: 1996/10/30 07:47:53 $

Executing SCI adapter selftest.    Adapter OK.
screen not found.
Can't open input device.
Keyboard not present.  Using ttya for input and output.

SBus-to-SCI (SBus2) Adapter - 9029
FCode 9029 $Revision: 1.22 $  - d9029_09 $Date: 1996/07/15 11:51:19 $

Executing SCI adapter selftest.    Adapter OK.

DOLPHIN SBus-to-SCI (SBus2b) Adapter - 9029, Serial #5017
FCode 9029 $Revision: 2.3 $  - d9029_52 $Date: 1996/10/30 07:47:53 $

Executing SCI adapter selftest.    Adapter OK.

Sun Ultra 1 SBus (UltraSPARC 167MHz), No Keyboard
```

2. Only one SCI card is working in the system:

```
rebooting...
Resetting ...

DOLPHIN SBus-to-SCI (SBus2b) Adapter - 9029, Serial #5017
FCode 9029 $Revision: 2.3 $ - d9029_52 $Date: 1996/10/30 07:47:53
$

Executing SCI adapter selftest.    Adapter OK.
screen not found.
Can't open input device.
Keyboard not present.  Using ttya for input and output.

DOLPHIN SBus-to-SCI (SBus2b) Adapter - 9029, Serial #5017
FCode 9029 $Revision: 2.3 $ - d9029_52 $Date: 1996/10/30 07:47:53
$

Executing SCI adapter selftest.    Adapter OK.

Sun Ultra 1 SBus (UltraSPARC 167MHz), No Keyboard
```

3. No SCI cardsare working in the system:

```
rebooting...
Resetting ...

screen not found.
Can't open input device.
Keyboard not present.  Using ttya for input and output.

Sun Ultra 1 SBus (UltraSPARC 167MHz), No Keyboard
```

Note – If one or both SCI cards do not show up during boot time, check the physical installation of the cards; this may solve the problem. Otherwise, the SCI cards may be damaged and should be returned. For assistance, contact your local SunService representative or your local SunService Authorized Service Provider.

Mixed Compute Platforms

Sun Enterprise Cluster systems can be assembled from hosts of different platform types that can have different type processors. When creating a non-homogeneous cluster, however, a possible consequence can be lower than expected compute power. This can be a result of reduced compatibility and equivalency among hosts. Thus, nodes should be of equivalent processor, memory, and I/O capacity, as large disparities in configurations between nodes can offset performance.

This appendix provides examples of platforms and processors that may be joined to create a cluster. This appendix is not comprehensive. It is possible to create a cluster that includes platform(s) not found or documented here.

- Platform and Processor Equivalency—page C-1
- Node-to-Node Cabling Instructions—page C-2
- Sample Clusters—page C-3

C.1 Platform and Processor Equivalency

The I/O connections must be identical for the two nodes; however, the processor and memory configurations need not be identical. The larger the disparity, the greater the probability that the two nodes will not boot at the same rate, which can affect startup from a cold start. For example, after a total system power failure, the larger node can take longer to boot. This can result in the smaller node starting without detecting the larger node, and then becoming the master of the logical hosts.

C.2 Node-to-Node Cabling Instructions

The following table is a guide to illustrations showing node-to-node cabling between mixed servers.

TABLE C-1   Sun Enterprise Platform Combinations

Host Platform	...to Host Platform	See Figure...
Sun Enterprise 3*x*00	Sun Enterprise 5*x*00/4*x*00	FIGURE C-1
Sun Enterprise 3000	Sun Enterprise 6*x*00	FIGURE C-2
Sun Enterprise 5000/4000	Sun Enterprise 6*x*00	FIGURE C-3

C.3 Sample Clusters

FIGURE C-1 Sun Enterprise 3*x*00 to Sun Enterprise 5*x*00/4*x*00 Node-to-Node Connection

FIGURE C-2   Sun Enterprise 3*x*00 to Sun Enterprise 6*x*00 Node-to-Node Connection

FIGURE C-3   Sun Enterprise 5*x*00/4*x*00 to Sun Enterprise 6*x*00 Node-to-Node Connection

Direct Connectivity

Sun Enterprise Cluster systems can support direct connectivity to Sun StorEdge
A3*x*00s and Sun StorEdge A5000s.

D.1 Supported Configurations

D.1.1 Nodes

The Sun Enterprise Cluster system supports two, three, or four nodes.

D.1.2 Storage Chain

The maximum length of a storage chain is two Sun StorEdge A3*x*00s or two Sun
StorEdge A5000s.

D.1.3 Configurations

D.1.3.1 Two-Node System with Non-Linked Storage Units

In this configuration (FIGURE D-1):

■ More than one storage device can be used.

Two controllers are used for the storage device. This is done to increase the failover capacity—enabling one Sun StorEdge A3x00 System to be logically equivalent to two storage devices with regard to availability.

■ The nodes can be connected without an SCI switch.

SCI switch 0   SCI switch 1
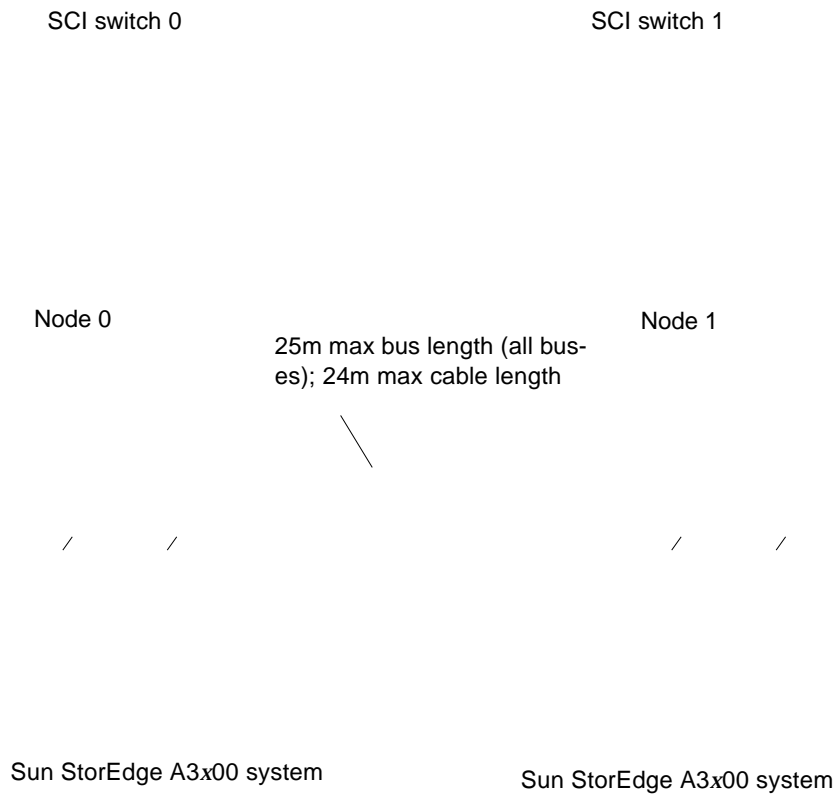
Node 0   Node 1

25m max bus length
(all buses): 24m max
cable length

Sun StorEdge A3x00 system

FIGURE D-1   Two-Node System With Non-Linked Storage Units

D.1.3.2 Two-Node System With Linked Storage Units

This configuration is like the non-linked configuration; except that two storage units are connected together. Connections between the storage units are shown in FIGURE D-2.

SCI switch 0   SCI switch 1

Node 0   Node 1

25m max bus length (all bus-
es); 24m max cable length

Sun StorEdge A3*x*00 system   Sun StorEdge A3*x*00 system

FIGURE D-2   Two-Node System With Linked Storage Units

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Revision History

Revision	Dash	Date	Comments
A	10	March 1999	FCS
50	06	October 1998	2.2 Beta