SGI® Graphics Cluster™ Hardware User's Guide

007-4399-001

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About This Guide

The SGI Graphics Cluster provides low-cost semi-immersive graphics capabilities for visual simulation and virtual reality applications. The SGI Graphics Cluster uses either the Linux or Windows NT operating system and incorporates proprietary or optional hardware and software from SGI.

This guide is written for owners and administrators of SGI Graphics Cluster systems. Some system components can be installed, removed, or replaced by owners and administrators; this guide provides instructions for these procedures.

This guide presumes that the user has some familiarity with the operating system of the system ordered and with graphics, but no special training is presumed.

This guide consists of the following chapters and appendices:

- Chapter 1, "SGI Graphics Cluster Features and Capabilities"

  This chapter introduces features of the SGI Graphics Cluster.

- Chapter 2, "SGI Graphics Cluster Master and Channel Nodes"

  This chapter describes master and channel nodes and their major components. It shows system board layout and front and rear panel details, and gives information on other internal devices.

- Chapter 3, "SGI Graphics Cluster Administration"

  This chapter contains basic system administration reference information, gives directions for hardware system startup, and lists operating system references.

- Chapter 4, "Adding and Replacing Nodes"

  This chapter explains how to add a channel node to SGI Graphics Cluster systems, and how to replace nodes. It also covers slide rail installation.

- Chapter 5, "Adding and Replacing SGI Graphics Cluster System Components"

  This chapter explains how to replace or add drives, the drive cage, expansion cards, chassis fans, and memory modules.

- Chapter 6, “Troubleshooting”

  This chapter explains system error messages and suggests solutions for problems that might occur.

- Appendix A, “Technical Specifications”

  This appendix contains physical and electrical specifications and connector pinouts.

- Appendix B, “Regulatory Information”

  This appendix provides regulatory information.

An index completes this guide.

Other Related Documents

Other manuals for the SGI Graphics Cluster are available on the documentation CD. These are as follows:

- The *SGI Graphics Cluster Quick Start Guide* (007-4313-001)

  In addition, a printed version of this manual is shipped with SGI Graphics Cluster systems.

- *SGI ImageSync User’s Guid*e (007-4465-001)
- *SGI DataSync Programmer’s Guide* (007-4463-001)
- *SGI SynaptIQ Administrator’s Guide* (007-4464-001)

To obtain SGI documentation on the Web, see the SGI Technical Publications Library at http://techpubs.sgi.com.

Manuals for the network switch and for optional equipment are provided by the manufacturer of that product. The master node of the SGI Graphics Cluster Series 12 has a SoundBlaster Live! Value sound card; you can download its manual free from the manufacturer’s web site, http://www.soundblaster.com.

Conventions

These type conventions and symbols are used in this guide:

Table i Type Conventions

Convention	Meaning
Helvetica Bold	Hardware labels
`Fixed-width type`	Error messages, prompts, and onscreen text
`Bold fixed-width type`	User input, including keyboard keys (printing and nonprinting); literals supplied by the user in examples, code, and syntax statements
" "	(Double quotation marks) On-screen menu items and references in text to document section titles or chapter titles

Reader Comments

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SGI Graphics Cluster Features and Capabilities

The SGI Graphics Cluster provides low-cost semi-immersive graphics capabilities for visual simulation and virtual reality applications. The product is available in two models, the SGI Graphics Cluster Series 11 and the SGI Graphics Cluster Series 12. Each model consists of a single master node, multiple visual channel nodes (each with a commercial graphics card), and an Ethernet backbone, including a network switch. The SGI Graphics Cluster uses either the Linux or Windows NT operating system and incorporates proprietary hardware and software from SGI.

Each model of the SGI Graphics Cluster is available in two formats:

- Short rack with one master node, a network switch, and as many as three visual channel nodes
- Tall rack with one master node, a network switch, and as many as seven visual channel nodes

This chapter introduces the SGI Graphics Cluster systems, in these sections:

Basic Hardware Features

Figure 1-1 shows an example of a tall rack for the SGI Graphics Cluster.

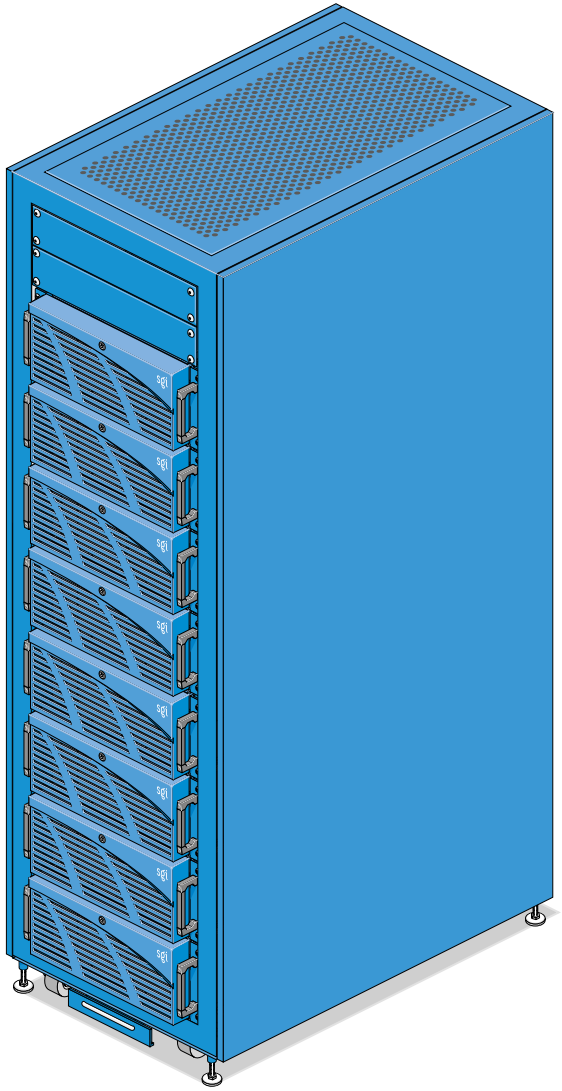

Figure 1-1 SGI Graphics Cluster Tall Rack

Figure 1-2 shows an example of a short rack for the SGI Graphics Cluster.

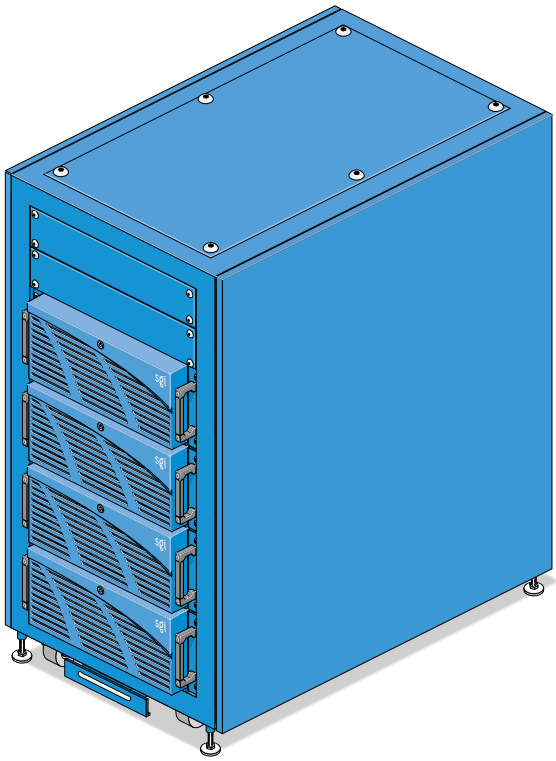

Figure 1-2 SGI Graphics Cluster Short Rack

The tall rack comes with a 220-V power distribution unit (PDU); the short rack comes with either a 120-V PDU or a 220-V PDU.

This section introduces SGI Graphics Cluster hardware in the following sections:

- “Nodes” on page 4
- “System Networking” on page 6
- “Storage” on page 6
- “Audio” on page 6

Nodes

An SGI Graphics Cluster *node* is a rackmounted IA-32 workstation running either Windows NT or Red Hat Linux. Nodes are of two types: master and channel.

- The *master node* is the main compute node in the system; it handles all system synchronization and provides a network gateway. Each base rack has only one master node, positioned at the bottom of the rack.

  The master node is available in two formats: single-CPU, used in the SGI Graphics Cluster Series 11, and dual-CPU, used in the SGI Graphics Cluster Series 12. The master node has standard input and output devices, such as monitor, keyboard, and mouse. In the SGI Graphics Cluster Series 12, the master node is at the head of the SGI ImageSync daisy chain.

- A *channel node* is the primary graphics element in the system. Each channel node can drive a single display or can be combined with other channel nodes to drive a large display.

  The short rack can include as many as three channel nodes; the tall rack accommodates as many as seven channel nodes.

In the SGI Graphics Cluster Series 12, each master and channel node includes a commercial graphics card and an SGI ImageSync card. These cards are designed to work together to communicate with the SGI ImageSync network. Chapter 2 describes the nodes and their components in detail.

Figure 1-3 diagrams an example of connections within an SGI Graphics Cluster system.

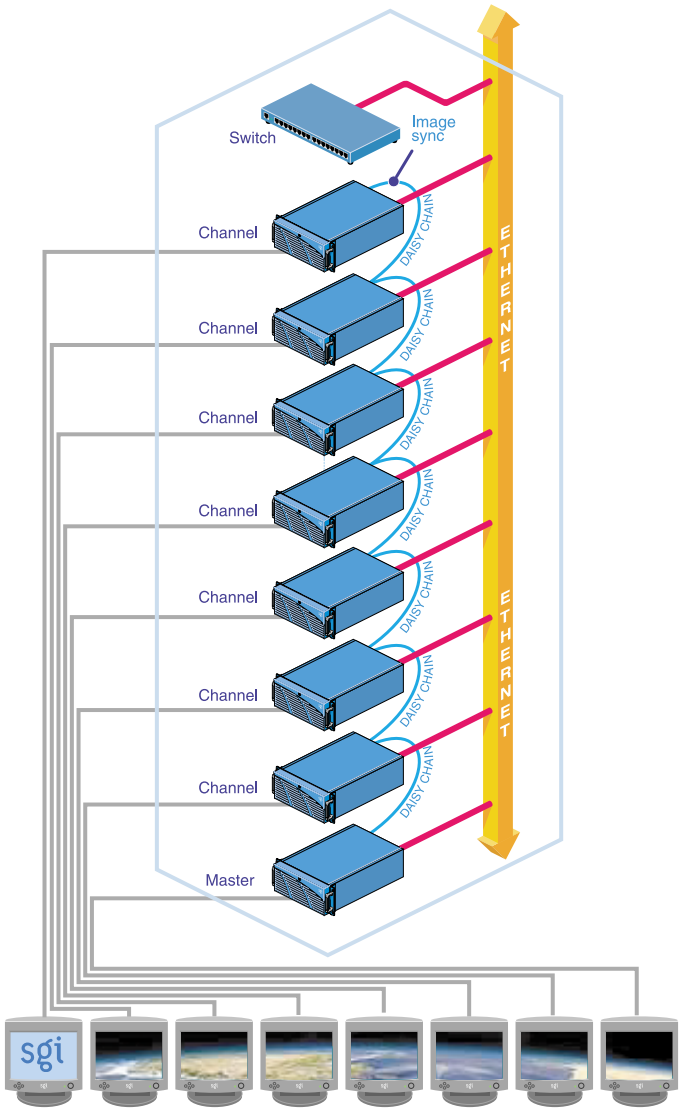

Figure 1-3 SGI Graphics Cluster Series 12 Example System Connections

System Networking

Each SGI Graphics Cluster system includes a 100-Base-T Ethernet switch for system networking; an optional gigabit Ethernet switch can be added, for example, for connection to a storage area network.

The network switch, which is standard in each SGI Graphics Cluster, is described in the documentation provided by its manufacturer.

For complete IP address information, see "Channel Names and Addresses" on page 28.

Storage

Each node includes a CD-ROM disk drive, a 3.5-inch floppy disk drive, and a hard disks. Additional internal storage options are available. In addition, optional networked storage can be connected via an optional gigabit Ethernet switch.

Audio

The audio on the motherboards is disabled in the SGI Graphics Cluster nodes. The master node of the SGI Graphics Cluster Series 12 has a SoundBlaster Live! Value sound card; you can download its manual free from the manufacturer's web site, http://www.soundblaster.com.

On the master node of an SGI Graphics Cluster running Linux, the audio card is factory set to snd-card-0 and the onboard audio is disabled.

Note: For use with the audio card ports on the master node of an SGI Graphics Cluster Series 12 (or SGI Graphics Cluster Series12 with a customer-added sound card), SGI supports audio cables no longer than 3 meters. For uses requiring cables longer than 3 m, you can convert to balanced audio using an unbalanced-to-balanced converter such as Balance Buddy from Rane Corporation or FP-UBC2 from Radio Design Labs, or do active conversion to AES digital audio.

SGI Graphics Cluster Series 11

The SGI Graphics Cluster Series 11 is designed as an entry-level system. It provides easy administration and is an ideal solution where video synchronization is of little importance. The master node in the SGI Graphics Cluster Series 11 has a single CPU and runs either Linux or Windows NT 4.0. See “System Software” on page 8 for a list of software included with each operating system.

SGI Graphics Cluster Series 12

The SGI Graphics Cluster Series 12 is the premier member of the SGI Graphics Cluster family. It is ideal for cost-effective multichannel solutions with existing graphics cluster-enabled applications. The master node in the SGI Graphics Cluster Series 12 has dual CPUs, an audio card, and ImageSync technology, including the SGI ImageSync card (described in “SGI ImageSync Card (SGI Graphics Cluster Series 12 Systems Only)” on page 22) and software. The SGI Graphics Cluster Series 12 runs either Linux or Windows NT. See “System Software” on page 8 for a list of software included with each operating system.

System Software

Guides included with the SGI Graphics Cluster describe the system software in detail and explain how to use it for specific tasks. Each software module is designed to support the developer and the end user. It provides the critical flexibility of allowing use of some, all, or none of the modules so that you can customize your work environment.

Both the SGI Graphics Cluster Series 11 and the Graphics Cluster Series 12 are available with either the Red Hat 7.1 Linux operating system or with Windows NT 4.0 with Service Pack 6A operating system. The Linux operating system includes XFS for Red Hat 7.1. For information on the operating systems, see the books listed in "System Administration References" on page 36.

Table 1-1 summarizes software included with SGI Graphics Cluster systems.

Table 1-1 System Software

System	Software
SGI Graphics Cluster Series 11, Linux	Red Hat 7.1 Linux operating system XFS (filesystem) for Red Hat 7.1 System manuals Acrobat Reader
SGI Graphics Cluster Series 12, Linux	Red Hat 7.1 Linux operating system XFS (filesystem) for Red Hat 7.1 SGI ImageSync SGI DataSync SGI ClusterFly SGI SynaptIQ System manuals Acrobat Reader
SGI Graphics Cluster Series 11, Windows NT	Windows NT 4.0 with Service Pack 6A Drivers for motherboard, sound card, graphics card, network card System manuals Acrobat Reader
SGI Graphics Cluster Series 12, Windows NT	Windows NT 4.0 with Service Pack 6A SGI ImageSync system drivers Drivers for motherboard, sound card, graphics card, network card System manuals Acrobat Reader

Figure 1-4 diagrams software architecture.

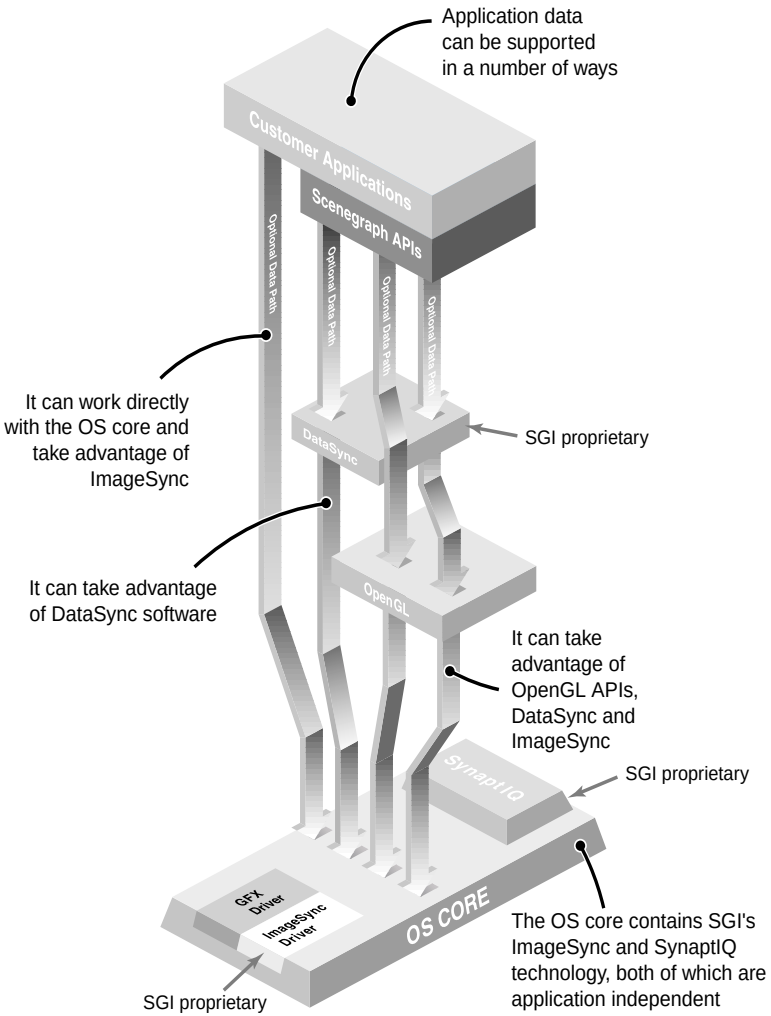

Figure 1-4 SGI Graphics Cluster Software Architecture

Options

If your system is ordered with fewer than the maximum number of channels (three for a short rack, seven for a tall rack), you can order additional channel nodes and install them by following the instructions in this guide. Additional monitors (CRT and flat panel) are also available, as are country-specific keyboards and rack power cables.

Additional storage for the SGI Graphics Cluster is available from SGI, as follows:

- Additional SCSI disk drives
- Additional removable disk drives
- DDS4 DAT tape drive

Chapter 4 in this guide contains instructions on installing additional storage options.

Upgrades for the graphics cards in the systems will be available; check with your SGI service representative. An upgrade from the SGI Graphics Cluster Series 11 to the SGI Graphics Cluster Series 12 is not available.

SGI Graphics Cluster Master and Channel Nodes

This chapter describes the SGI Graphics Cluster master node and channel nodes, in these sections:

Figure 2-1 shows a node from the front and from the rear.

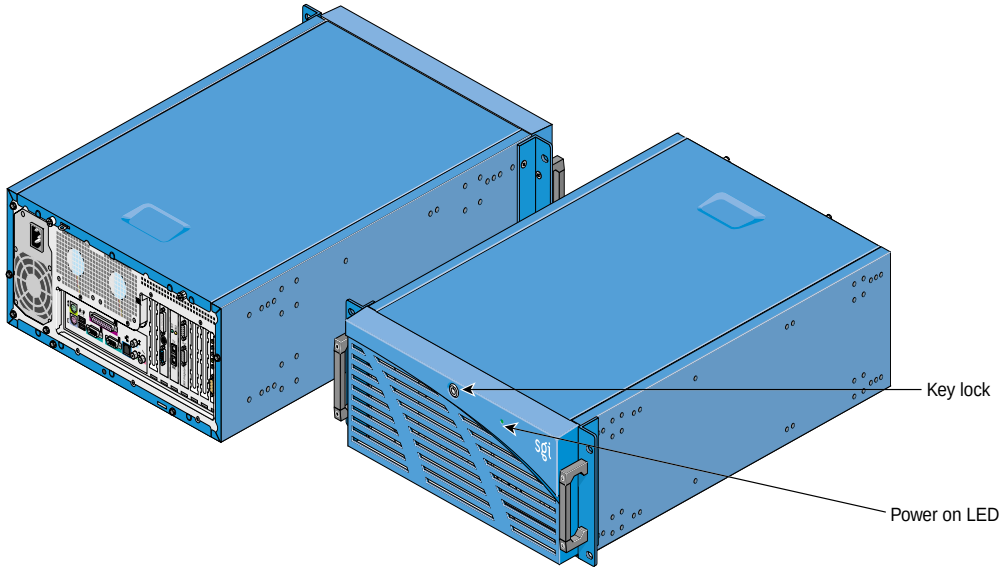

Figure 2-1 SGI Graphics Cluster Node

Figure 2-2 shows the interior of a node.

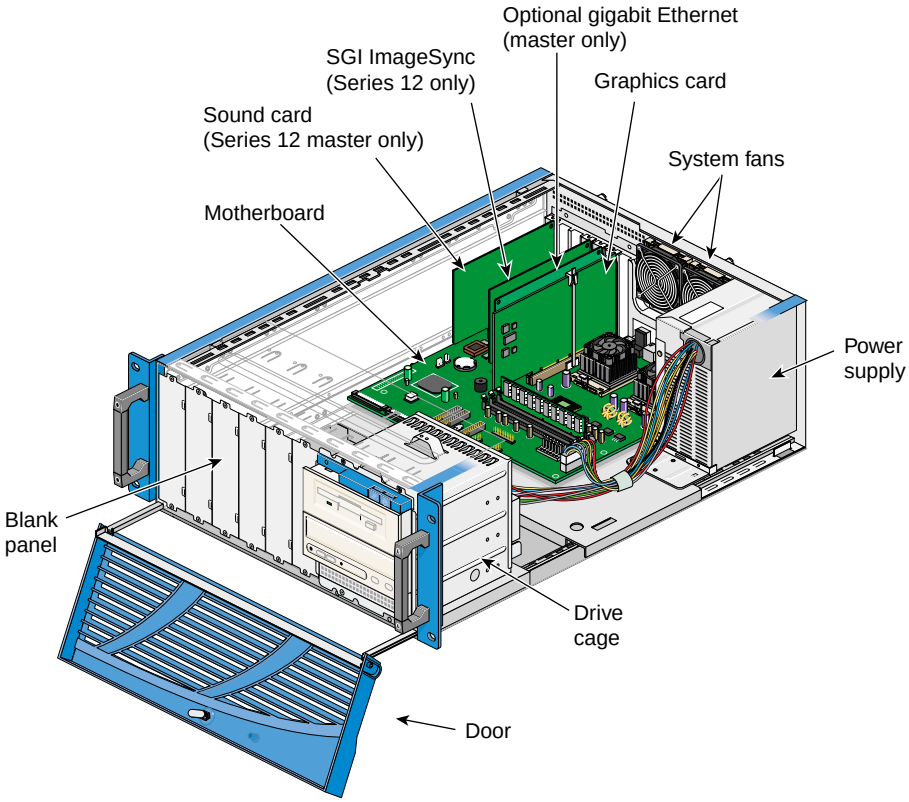

Figure 2-2 Node Interior

Motherboard (System Board)

The motherboard is mounted directly on the base of the chassis. Figure 2-3 points out motherboard features.

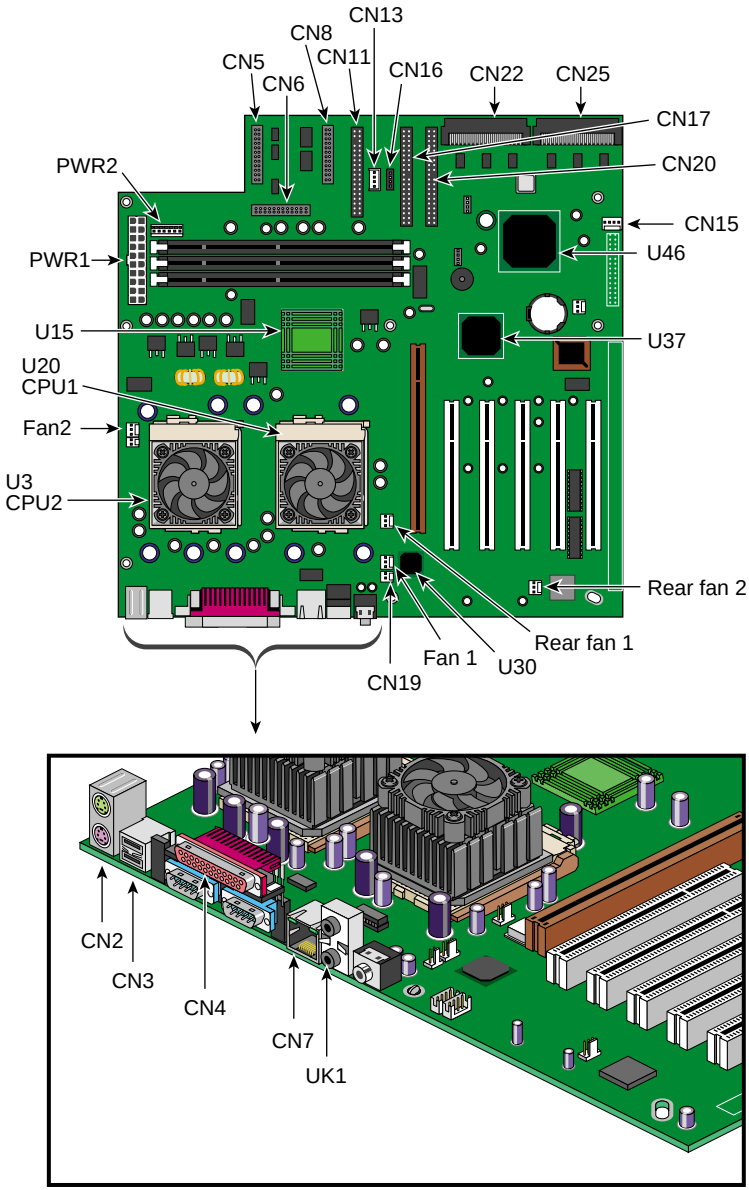

Figure 2-3 Node Motherboard Features

Table 2-1 summarizes the motherboard components. most of which are shown in Figure 2-3.

Table 2-1 Motherboard Components

Item	Description
BU1	Internal buzzer
BT1	Battery
CN1	CPU socket 1 thermal sensor connector
CN2	Above: PS/2 mouse port Below: PS/2 keyboard port
CN4	Above: Parallel port Left: Serial port 1 (COM2) Right: Serial port 2 (COM1)
CN5	BMC connector
CN6	Multi connector
CN7	LAN jack (RJ-45)
CN8	BMC connector
CN9	Wake on LAN connector
CN11	FDD connector
CN12	CPU socket 2 thermal sensor connector
CN13	12C connector
CN15	System fan connector
CN16	BP connector
CN17	IDE 1 connector
CN18	AGP slot
CN19	CD in connector
CN20	IDE 2 connector
CN21	Fax voice connector

Table 2-1 (continued) Motherboard Components

Item	Description
CN22	SCSI channel B connector (68-pin) (Ultra 160/m)
CN25	SCSI channel A connector (68-pin) (Ultra 160/m)
CN26	System fan connector
CNX7	System fan connector
DIMM1-3	DIMM slots
UK1	Microphone in
JP1	CPU socket 2 fan connector
JP2	CPU socket 1 fan connector
JP3	SCSI channel A terminator 1-2 On (default) 2-3 Off
JP3X	SCSI channel B terminator 1-2 On (default) 2-3 Off
JP4	Onboard buzzer external speaker 1-2 Onboard buzzer (default) 2-3 External speaker
PCI1-5	PCI slots
PWR1	ATX power supply connector
PWR2	ATX power supply connector
U3	CPU socket 2
U15	Apollo Pro 133A chipset
U20	CPU socket 1
U30	Intel 82559 LAN chipset
U37	Apollo Pro 133A chipset
U46	Adaptec AIC-7899 chipset
WKUP1	Wake on Ring connector

For expandability, the motherboard includes one AGP (Accelerated Graphics Port) Pro bus, five PCI bus slots, and three DIMM sockets that allow memory installation to a maximum of 1 GB, using synchronous DRAM (SDRAM) DIMMs.

For connectivity, the motherboard supports a speaker-out/line-out, and microphone-in port. Other standard connectivity features are two NS16C550 UART serial ports, one enhanced parallel port with Enhanced Parallel Port/Extended Capabilities Port (EPP/ECP) support, a diskette drive interface, and two embedded hard disk interfaces.

Other features include the following:

- System clock/calendar with battery backup
- Auxiliary power connector for 300W SPS and ATX power supply
- Advanced Server Management (ASM) and LAN Desk Client Management (LDCM) controller chipsets
- Autoranging power supply
- Two system fans at the rear; power supply fan

This section introduces motherboard features, as follows:

- "Processor" on page 16
- "Onboard Memory" on page 17
- "LAN Subsystem" on page 17
- "Expansion Slots" on page 17
- "Hardware Management Support" on page 19

Processor

The SGI Graphics Cluster motherboard supports 133-MHz front side host bus frequencies for single or dual Pentium III processors running at 1 GHz. Two Flip-Chip Pin Grip Array (FC-PGA) sockets on the motherboard each support a Pentium III processor running at 1 GHz. The motherboard of a node in the SGI Graphics Cluster Series 11 has one socket occupied by a Pentium III processor; a node in the SGI Graphics Cluster Series 12 has processors in both sockets.

Onboard Memory

The three DIMM sockets on board allow memory upgrades to a maximum of 1 GB using 256- and 512-MB registered ECC synchronous DRAM (SDRAM) DIMMs. For data integrity, the default setting of the ECC (error-correction code) function of the memory system in BIOS is enabled. “Installing and Removing Memory Modules” on page 88 has instructions for removing and installing DIMMs.

Note: The SDRAM works at 3.3 volts only; 5-volt memory devices are not supported. The motherboard supports 100-MHz and 133-MHz ECC registered SDRAMs only; 66-MHz SDRAMs are not supported. Only SGI tested memory is supported. See http://www.sgi.com for a list of supported memory.

LAN Subsystem

Another cost-effective feature for network solutions is the integration of Intel’s 82559 10/100 Mbps Fast Ethernet controller, which supports the following features:

- Advanced Configuration and Power Interface (ACPI) 1.20A-based power management
- Wake on Magic Packet
- Wake on Interesting Packet
- Wake on LAN (WOL)
- Advanced System Management Bus (SMB)-based manageability
- Wired for Management (WfM) 2.0 compliance
- IP checksum assist, PCI 2.2 compliance
- PC 98, PC 99, and Server 99 compliance

Expansion Slots

The motherboard has two types of expansion slots, Peripheral Component Interconnect (PCI) and Accelerated Graphics Port (AGP), as pointed out in Figure 2-4.

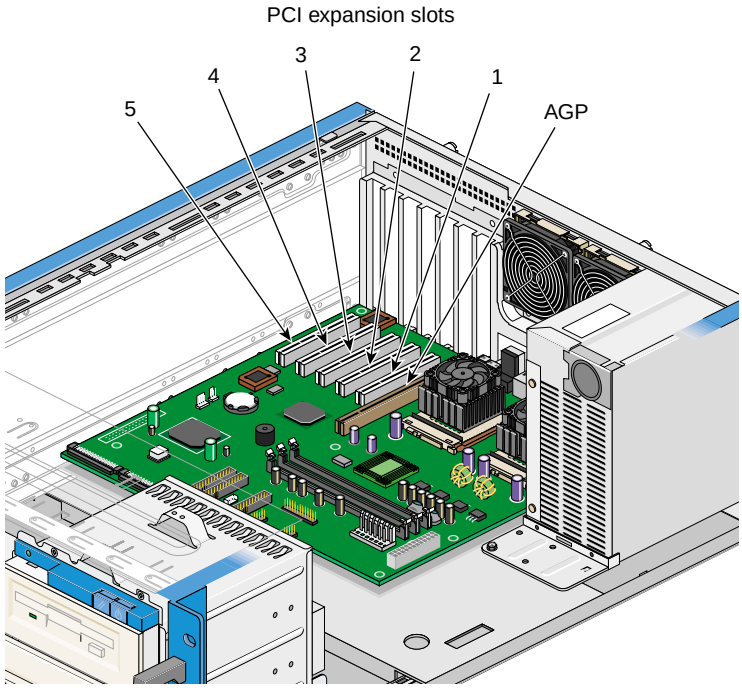

Figure 2-4 Expansion Slots

The slots are as follows:

- AGP Pro 50 bus

  Developed to support 3D graphic applications, AGP has a 32-bit wide channel that runs at 66 MHz quad pumped, which translates into a total bandwidth of 1.06 GB/sec (1.056 GB/sec), which is four times the bandwidth of PCI buses (133 MB/sec). AGP also accesses the main memory directly, allowing 3D textures to be stored in main memory as well as in video memory. Each node has an AGP Pro 50 slot that enables users to install both AGP or AGP Pro cards in the system.

  In the SGI Graphics Cluster nodes, this slot is occupied by the graphics card.

- PCI bus

  The motherboard has five PCI slots that support 32-bit 33-MHz PCI devices.

Expansion cards in the SGI Graphics Cluster reside in specific slots, as outlined in Table 2-2.

Table 2-2 Expansion Slots and Cards in the SGI Graphics Cluster

Slot	Card
AGP	Graphics card
PCI slot 1 (closest to the AGP slot)	Optional gigabit Ethernet card
PCI slot 2	SGI ImageSync card; SGI Graphics Cluster Series 12 only
PCI slot 3	Network interface card (secondary Ethernet), master node only; included with SGI Graphics Cluster Series 12
PCI slot 4	Empty; available for customer option
PCI slot 5 (closest to the chassis wall)	Commercial audio card: included with master node of SGI Graphics Cluster Series 12

Hardware Management Support

The motherboard supports a user-configurable power management function that conforms to the power-saving standards of the U.S. Environmental Protection Agency (EPA) Energy Star program. It also offers plug and play, which helps prevent configuration problems and makes the system more user-friendly.

Disk Drives

Each node in an SGI Graphics Cluster includes SCSI, IDE, and diskette drive interfaces. A drive cage in each node holds three 5.25-inch drive bays, all externally accessible from the front of the node. Figure 2-5 shows drives in a node.

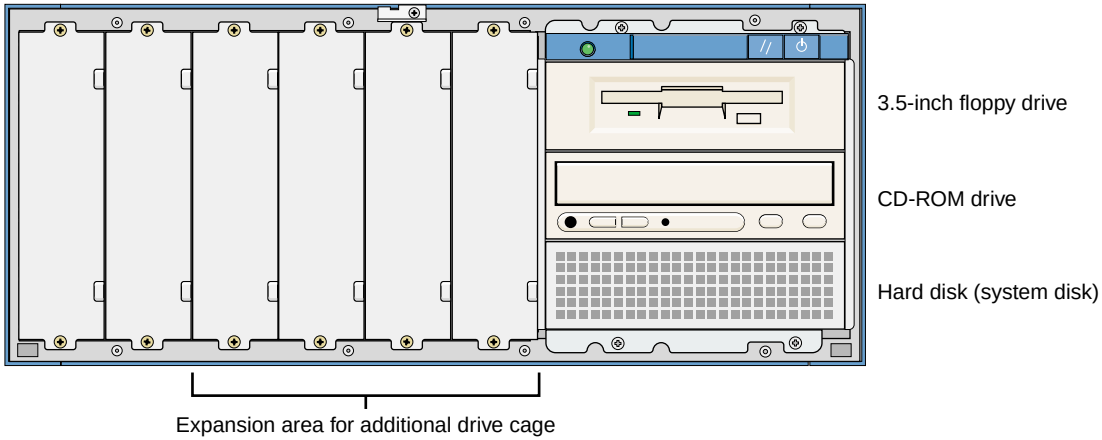

Figure 2-5 Factory-installed Drives

The SCSI controller chipset supports two Ultra 160 SCSI channels (channels A and B); the interface for each of these is a 68-pin connector on the motherboard. Channel A is cabled to the system drive in the existing drive cage; Channel B accommodates additional SCSI drives, such as a DAT tape drive.

An additional drive cage and one or two drives can be added (see "Options" on page 10); these can be ordered from SGI. This guide contains instructions for installing the drive cage and drives, and for replacing drives.

Ports

Figure 2-6 shows the ports on the node rear panel.

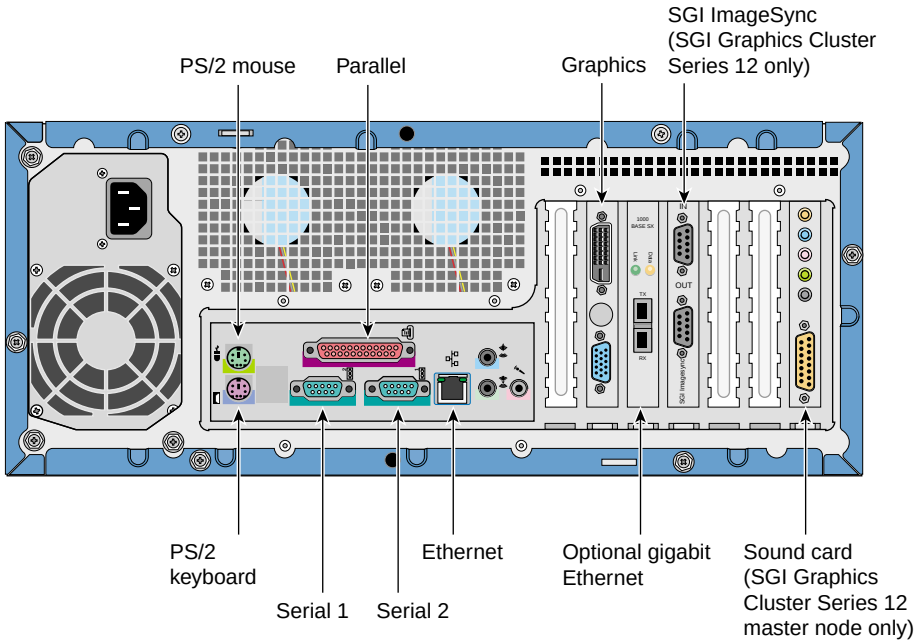

Figure 2-6 Ports on an SGI Graphics Cluster Series 12 Node

For pinouts, see Appendix A. For information on system PCI cards, see “Expansion Slots” on page 17.

Note: Audio ports on the SGI Graphics Cluster motherboard are disabled. USB port functionality is not supported in the SGI Graphics Cluster. The S-VHS port on the graphics card is not supported.

For use with the audio card ports on the master node of an SGI Graphics Cluster Series 12, SGI supports audio cables no longer than 3 meters. For uses requiring cables longer than 3 m, you can perform an active conversion to AES digital audio, or convert

to balanced audio using an unbalanced-to-balanced converter such as Balance Buddy from Rane Corporation or FP-UBC2 from Radio Design Labs.

Graphics Card

Each master and channel node includes a commercial graphics card. In the SGI Graphics Cluster Series 12 system, this AGP card works with SGI ImageSync technology. Upgrades for the graphics cards in the systems will be available; check with your SGI service representative

SGI ImageSync Card (SGI Graphics Cluster Series 12 Systems Only)

Each node in an SGI Graphics Cluster Series 12 system includes an SGI ImageSync card. The SGI ImageSync card in the master node provides master synchronization signals to the SGI ImageSync card in each node in the SGI Graphics Cluster Series 12 system.

SGI ImageSync daisy-chain cabling is:

- From the master node **OUT** port to channel0 **IN** port
- From channel0 **OUT** port to channel1 **IN** port
- From channel1 **OUT** port to channel2 **IN** port, and so on

See Figure 2-7.

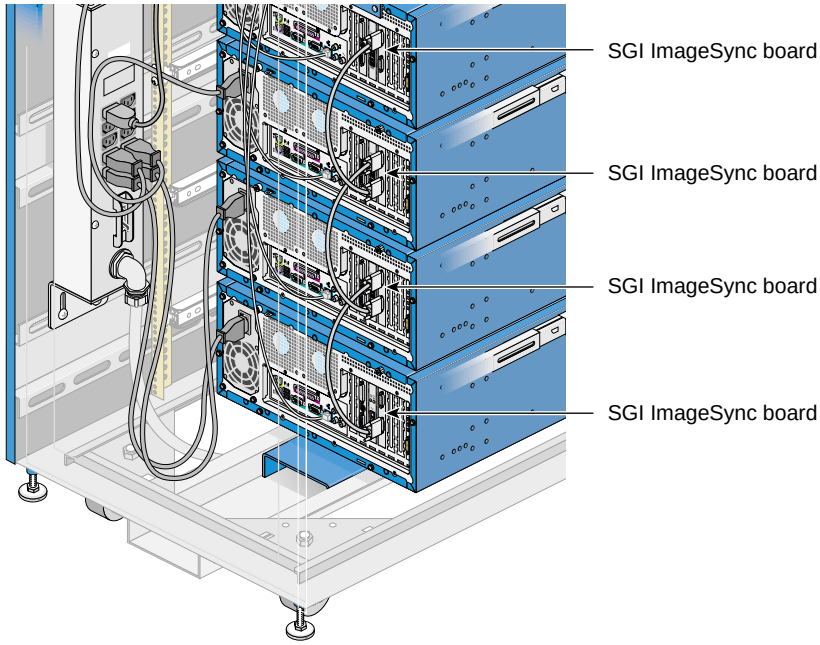

Figure 2-7 SGI ImageSync Connectivity

SGI Graphics Cluster Administration

The SGI Graphics Cluster includes basic software tools for administering the system. This chapter explains how to use them for system startup and other tasks, and includes a list of system administration references. The chapter consists of these sections:

Note: For information on using SGI ImageSync, SGI DataSync, or SGI Clusterfly, consult the manuals for those products; see the documentation CD included with the SGI Graphics Cluster.

Safety Instructions

Read these instructions carefully.

1. Follow all warnings and instructions marked on the product and noted in this and other documentation included with the product.
2. Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
3. Do not use this product near water.
4. Do not place this product or components of this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.

5. Slots and openings in the bottom of the cabinet and the back or front of the components are provided for ventilation, reliable operation, and protection from overheating. These openings must not be blocked or covered. This product should never be placed near or over a radiator or heat register, or in a built-in installation unless proper ventilation is provided.
6. This product should be operated from the type of power indicated on the marking label. If you are not sure of the type of power available, consult your dealer or local power company.
7. Do not allow anything to rest on the power cord. Do not locate this product where persons will walk on the cord.
8. Do not use extension cords with the SGI Graphics Cluster.
9. Never push objects of any kind into this product through cabinet slots as the objects may touch dangerous voltage points or short out parts that could result in a fire or electric shock. Never spill liquid of any kind on the product.
10. Do not attempt to service this product yourself except as noted in this guide. Opening or removing covers of node and switch internal components may expose you to dangerous voltage points or other risks. Refer all servicing to qualified service personnel.
11. Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
    - When the power cord or plug is damaged or frayed.
    - If liquid has been spilled into the product.
    - If the product has been exposed to rain or water.
    - If the product does not operate normally when the operating instructions are followed. Adjust only those controls that are covered by the operating instructions, because improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to normal condition.
    - If the product has been dropped or the cabinet has been damaged.
    - If the product exhibits a distinct change in performance, indicating a need for service.

12. Replace the lithium battery on the motherboard only with the same type or an equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions. There is a danger of explosion if the battery is incorrectly replaced.

Warning: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

13. Use only the proper type of power supply cord set (provided with the system) for this unit.

User, Group, and Home Directory Definitions

Table 3-1 summarizes the settings for each Linux node as set up at the factory.

Table 3-1 Factory Settings (Linux)

Setting	Value
User	gcadmin (Graphics Cluster admin)
User ID	501
Groups: Primary Secondary	 adm sys
Home directory	`/home/gcadmin`
Shell	`/bin/bash`
Password	sgisgi

Channel Names and Addresses

Channel names are as follows:

- master-channel
- channel0
- channel1
- channel2
- channel3
- channel4
- channel5
- channel6

On the master node of an SGI Graphics Cluster Series 12 running Linux, the following applies:

- If an optional network interface PCI card (NIC) is present, it is eth0 and the onboard NIC is eth1.
- If an optional gigabit Ethernet card is present, it is the last NIC: eth1 if no network interface PCI card is present, or eth2 if a network interface PCI card is present.

If no gigabit Ethernet card is present in the SGI Graphics Cluster, addresses are as shown in Table 3-2.

Table 3-2 IP Addresses, No GigaBit Ethernet Card Present

Node Name	Address
master-channel	127.0.0.1 (eth0); 10.0.2.1 (eth1)
channel0	10.0.2.10 (eth0)
channel1	10.0.2.11 (eth0)
channel2	10.0.2.12 (eth0)
channel3	10.0.2.13 (eth0)
channel4	10.0.2.14 (eth0)

Table 3-2 (continued) IP Addresses, No GigaBit Ethernet Card Present

Node Name	Address
channel5	10.0.2.15 (eth0)
channel6	10.0.2.16 (eth0)

If a gigabit Ethernet card is present in the SGI Graphics Cluster, addresses are as shown in Table 3-3.

Table 3-3 IP Addresses, GigaBit Ethernet Card Present

Node Name	Address	Gigabit Ethernet Node Name	Gigabit Ethernet Address
master-channel	127.0.0.1 (eth0); 10.0.2.1 (eth1)	g0-master-channel	192.168.1.1 (eth2)
channel0	10.0.2.10 (eth0)	g0-channel0	192.168.1.10 (eth1)
channel1	10.0.2.11 (eth0)	g0-channel1	192.168.1.11 (eth1)
channel2	10.0.2.12 (eth0)	g0-channel2	192.168.1.12 (eth1)
channel3	10.0.2.13 (eth0)	g0-channel3	192.168.1.13 (eth1)
channel4	10.0.2.14 (eth0)	g0-channel4	192.168.1.14 (eth1)
channel5	10.0.2.15 (eth0)	g0-channel5	192.168.1.15 (eth1)
channel6	10.0.2.16 (eth0)	g0-channel6	192.168.1.16 (eth1)

SGI ImageSync reads the Windows NT registry for a list of the channel IP addresses, as follows:

- For Linux, these addresses are in `/etc/channel_list`. These node names and IP addresses are reflected in `/etc/hosts`.
- For Windows NT, these addresses are in `HKLM\System\CurrentControlSet\Services\ImageSync\Parameters: ImageSync`.

Starting the System

This section explains how to start the system, in these subsections:

Powering On the System

To start the SGI Graphics Cluster system, follow these steps:

1. Check that all external cabling is firmly seated.
2. Power on the monitor cabled to the master node; power on the peripherals as desired.
3. Open the rack rear door and check that the following cabling is firmly seated:
   - System switch Ethernet cabling and switch power cable
   - Optional switch Ethernet cabling and switch power cable
   - SGI ImageSync daisy-chain cabling: from the master node **OUT** port to channel0 **IN** port; from channel0 **OUT** port to channel1 **IN** port; from channel1 **OUT** port to channel2 **IN** port, and so on (see Figure 3-1)

4. Turn on rack power using the breaker switch on the power distribution unit (PDU); see Figure 3-1.

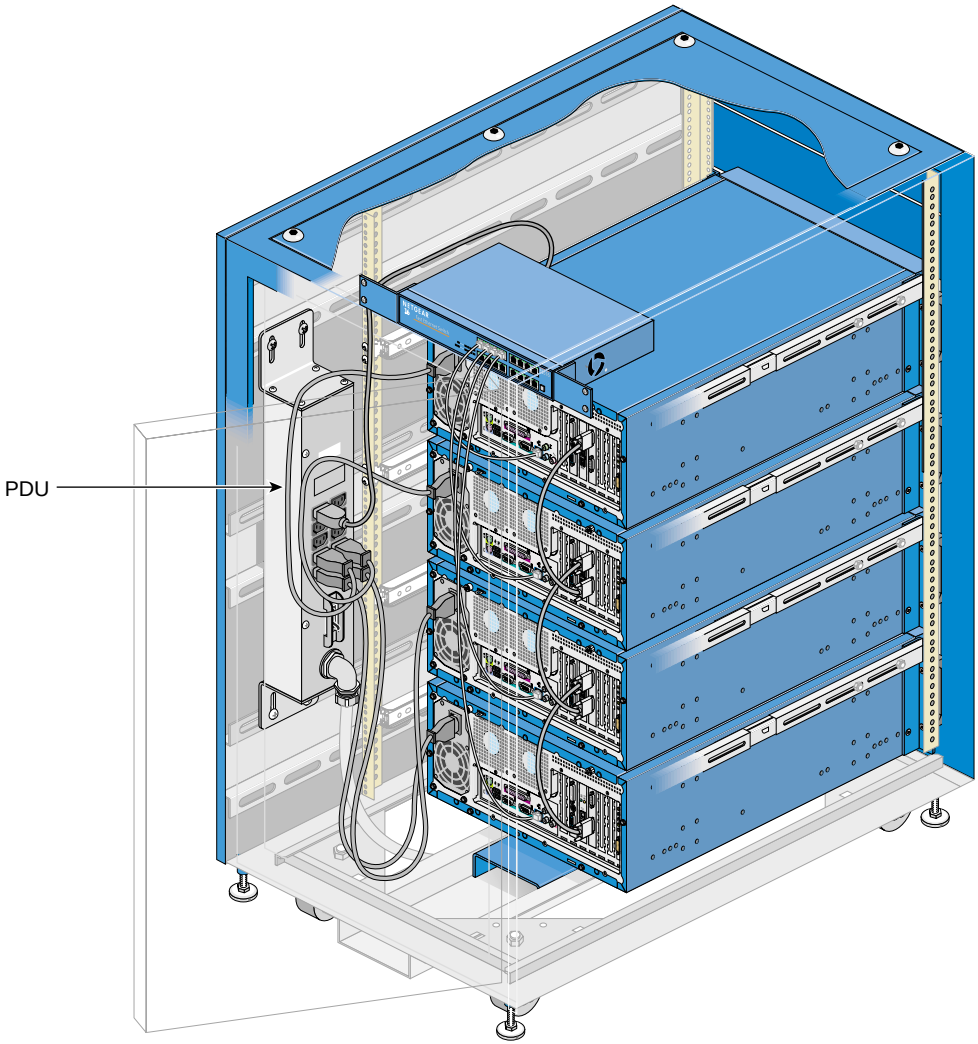

Figure 3-1 Rack Power Distribution Unit

5. At the back of the rack, check that the switch link LEDs illuminate.

If an LED does not illuminate, it might indicate that the node to which this Ethernet cable is connected is not receiving power, because it is powered off or because its power cable is not plugged in or defective.

6. Power on each node in the system, starting with the master node at the bottom of the rack, as follows:

   - Unlock the node bezel using the key provided. The keys (two for each node) are shipped attached to the rack door; the keys are identical.
   - Pull the bezel out and away from the node, and swing the bezel down, as shown in Figure 3-2.

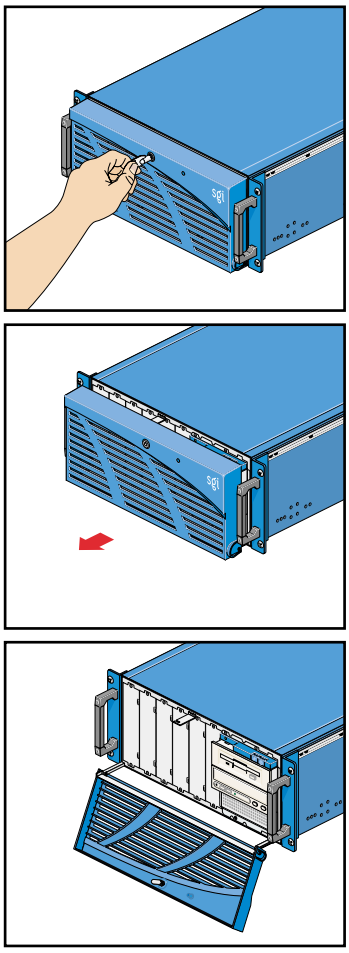

Figure 3-2 Opening a Node Bezel

- Power on the node by pressing the button at the far right above the floppy disk drive; see Figure 3-3.

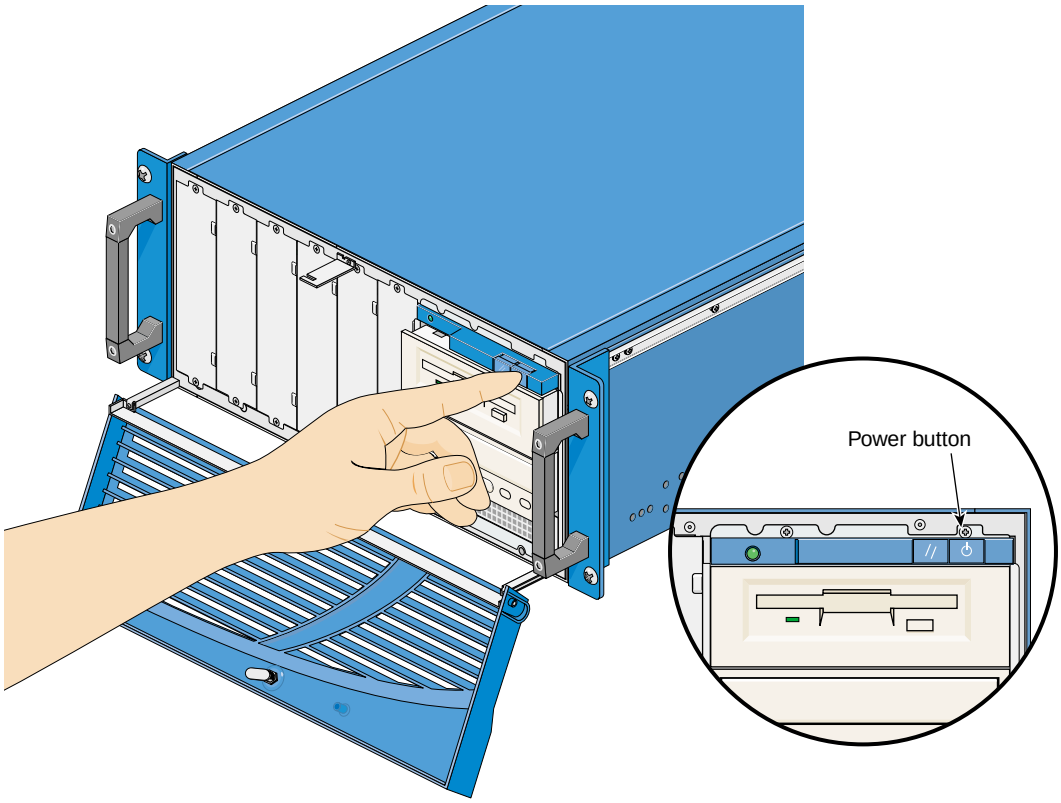

Figure 3-3 Powering On the Node

Linux System Administration Tools

SGI has set up a cluster administration account, `gcadmin`, for your use. The password is **`sgisgi`**. Each channel is set to autologin to the `gcadmin` account, and displays a desktop when the system is fully booted.

The pconsole Administration Tool

SGI provides the command-line tool `pconsole`, which enables the administrator to execute Linux commands on all channels in unison. Documentation for `pconsole` is in `/usr/share/doc/pconsole`.

To start a `pconsole` session, open a terminal window. At the prompt, type the following:

```
pconsole.sh channel0 channel1
```

Note that the channel names end with the letter l and a numeral, in these cases, 0 (zero) and 1 (one).

Other Linux Administration Tools

SGI preloads the following tools that you may find useful:

- `pcp`: Performance Co-Pilot
- `rsync`: remote file transfer tool
- `autologin`: allows automatic login upon boot
- `wu-ftpd`: FTP daemon
- `ntp`: network time protocol

Documentation for these tools and others on the system disk are on the system disk in `/usr/share/doc`. The license for SGI Performer is included in a packet.

For further Linux configuration information, see *Linux in a Nutshell*, Ellen Siever, Stephen Spainhour, Jessica P. Hekman, and Stephen Figgins, third edition, O'Reilly & Associates, 2000, ISBN 0-596-00025-1.

Windows NT Administration

You must install Windows NT to meet the acceptance requirements of Microsoft EULA. All drivers, and Service Pack 6a are installed during this procedure. The Windows NT license is included with the operating system packet.

SGI suggests following accepted Windows NT administration procedures for setting up networking and domain controllers. Subnetworks that meet RFC specifications are available at 10.0.2.xxx and 192.168.1.xxx.

For further Windows NT configuration information, see the reference works listed in this chapter.

System Administration References

Useful system administration references for Linux are as follows:

- *Essential System Administration*, AEleen Frisch, second edition, O'Reilly& Associates, 1995; ISBN 1-56592-127-,; http://www.oreilly.com/catalog/esa2/
- *Linux in a Nutshell*, Ellen Siever, Stephen Spainhour, Jessica P. Hekman, and Stephen Figgins, third edition, O'Reilly & Associates, 2000, ISBN 0-596-00025-1, http://www.oreilly.com/catalog/linuxnut3/
- *Linux Network Administrator's Guide*, Olaf Kirch and Terry Dawson, second edition, O'Reilly & Associates, 2000; ISBN 1-56592-400-2, http://www.oreilly.com/catalog/linag2/

Useful system administration reference works for Windows NT are as follows:

- *Windows NT in a Nutshell*, Eric Pearce, O'Reilly & Associates, 1997; ISBN 1-56592-251-4, http://www.oreilly.com/catalog/winnut/
- *Essential Windows NT System Administration*, AEleen Frisch, O'Reilly & Associates, 1998; ISBN 1-56592-274-3, http://www.oreilly.com/catalog/esawinnt/
- *DNS on Windows NT*, Paul Albitz, Matt Larson, and Cricket Liu, O'Reilly & Associates, 1998, ISBN 1-56592-511-4, http://www.oreilly.com/catalog/dnswinnt/

Adding and Replacing Nodes

This chapter consists of the following sections:

Note: For procedures in this chapter, you need a #2 Phillips screwdriver. Attaching slide rails to the rack also requires a nut driver. It is strongly recommended that an additional person assist in removing a node from a rack.

Preparing a Node for Component Replacement or Addition

This section explains the following:

Opening a Node Bezel

For some operations, such as removing or replacing disk drives, you must open the node bezel. Follow these steps:

1. Unlock the node bezel using the key provided. The keys (two for each node) are shipped attached to the rack door; the keys are identical.
2. Pull the bezel out and away from the node, and swing the bezel down, as shown in Figure 4-1.

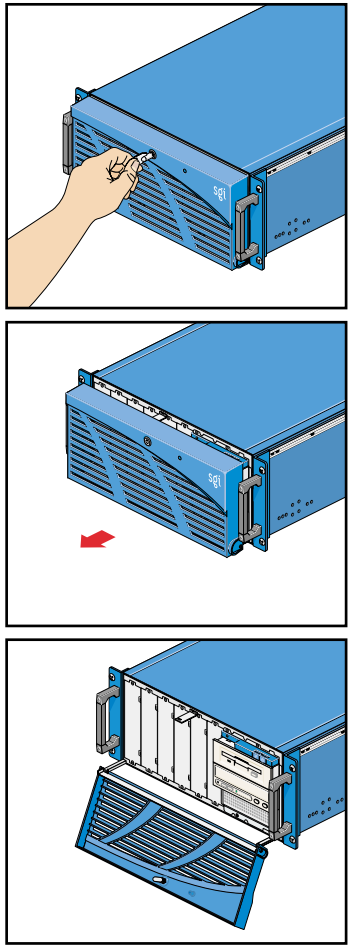

Figure 4-1 Opening a Node Bezel

Pulling a Node Out of the Rack

To replace a component in a node, it is usually sufficient to pull the node out from the rack on its extensible slide rails, where it locks into place. To pull a node out of the rack so that it can be worked on, follow these steps:

Warning: When adding or servicing equipment in the rack, do not pull out more than two nodes at a time.

1. Make sure all users are logged off the affected system(s) and that data is backed up, if necessary. Shut down the system with the appropriate administrative tools.
2. Open the node bezel by following the instructions in “Opening a Node Bezel” on page 38.
3. Power off the node with the button at the far right above the floppy disk drive; see Figure 4-2.

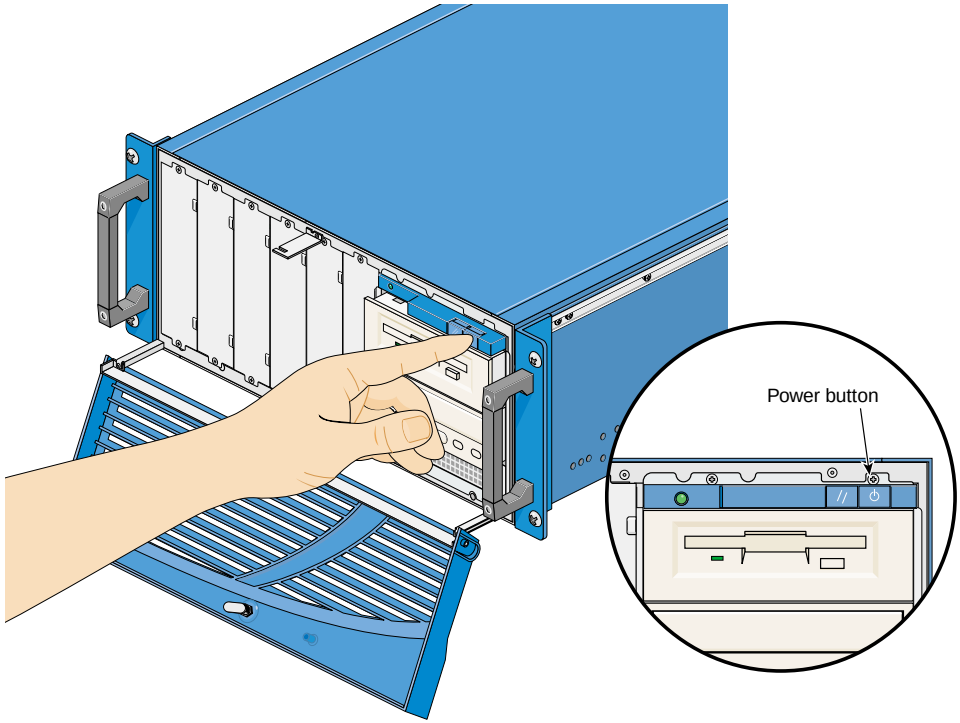

Figure 4-2 Powering Off the Node

4. At the back of the rack, detach the node's power cable from its socket on the node. See Figure 4-3.

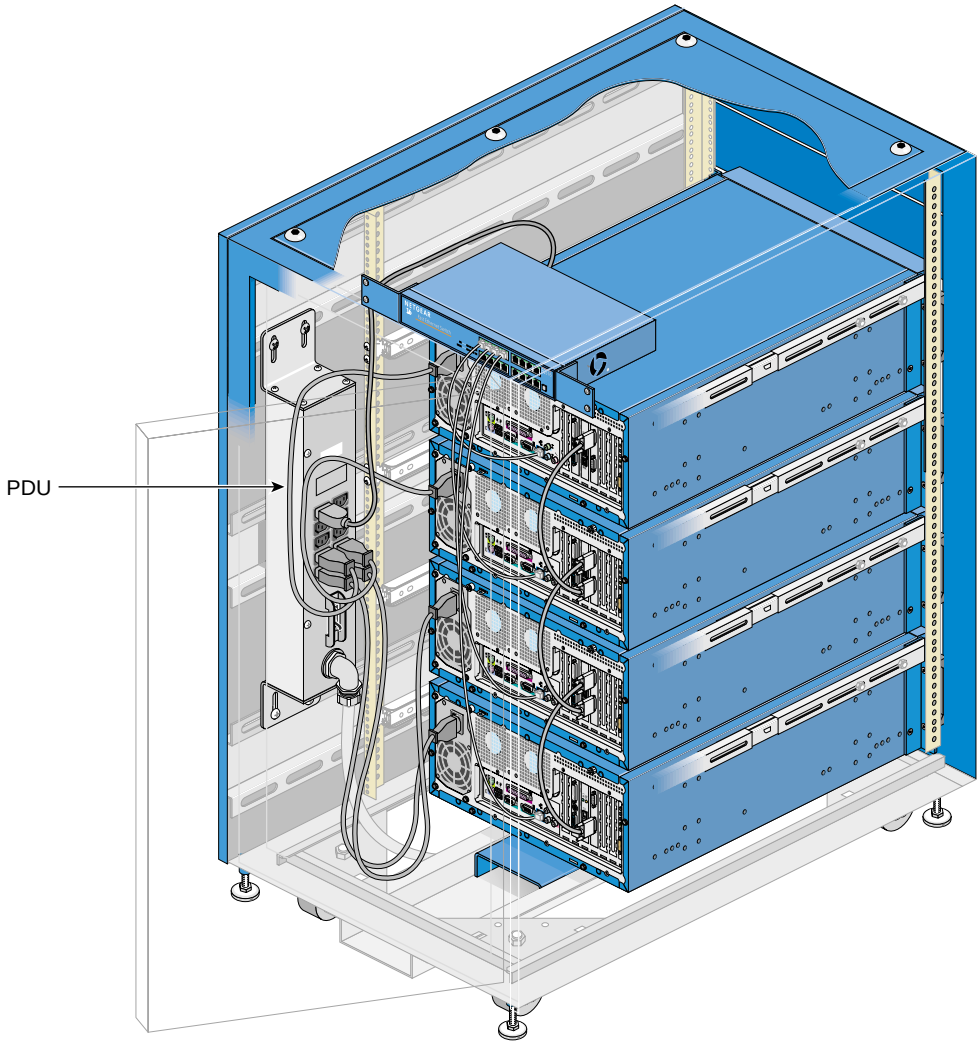

Figure 4-3 Node Power Cables

5. For an SGI Graphics Cluster Series 12 system, disconnect the daisy-chain cable from the node's external SGI ImageSync connector; see Figure 4-4. Channel nodes are daisy-chained to the nodes above and below.

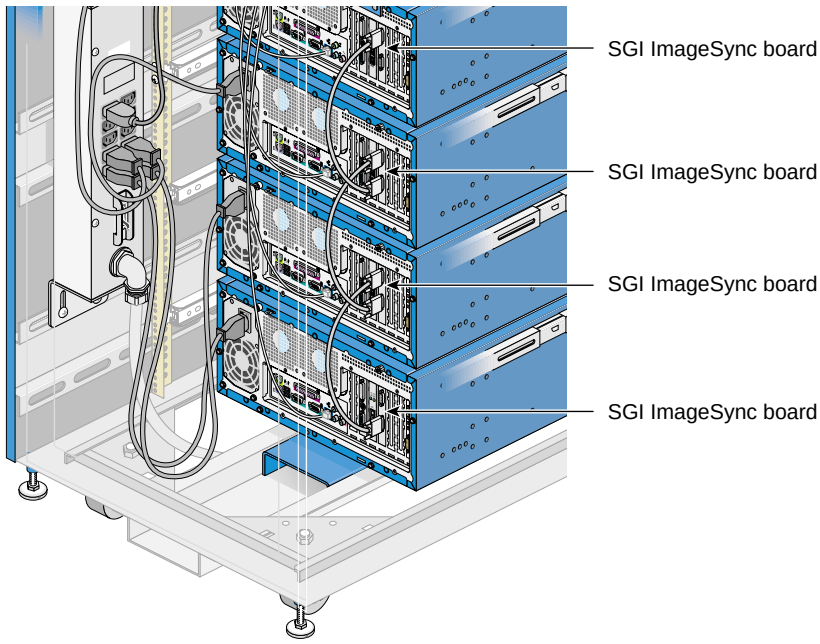

Figure 4-4 Disconnecting the External SGI ImageSync Cable, SGI Graphics Cluster Series 12 System

6. Disconnect other cables, such as those for peripherals, Ethernet, and external options.

7. If you are pulling out a node, pull out the rack's anti-tip shelf; see Figure 4-5.

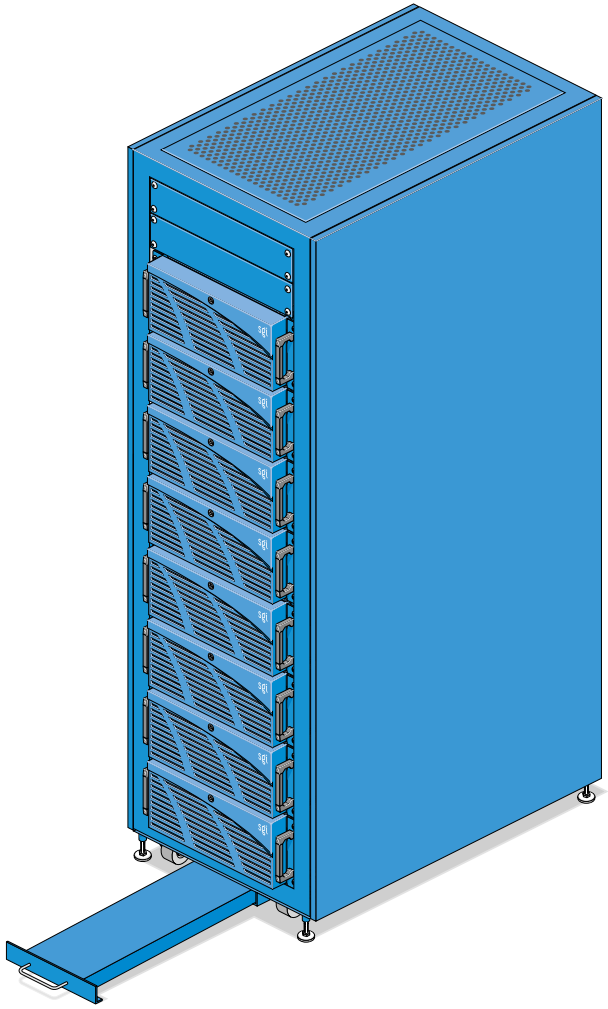

Figure 4-5 Pulling Out the Anti-tip Shelf

Warning: Be sure to pull out the anti-tip shelf before you pull out a node. Failure to do so can result in the rack tipping over. Never pull out more than two nodes at a time.

8. To free the node from the rack chassis so that it can be pulled out, remove the two screws at each side of the node. These screws are above and below each handle; see Figure 4-6. Retain the screws.

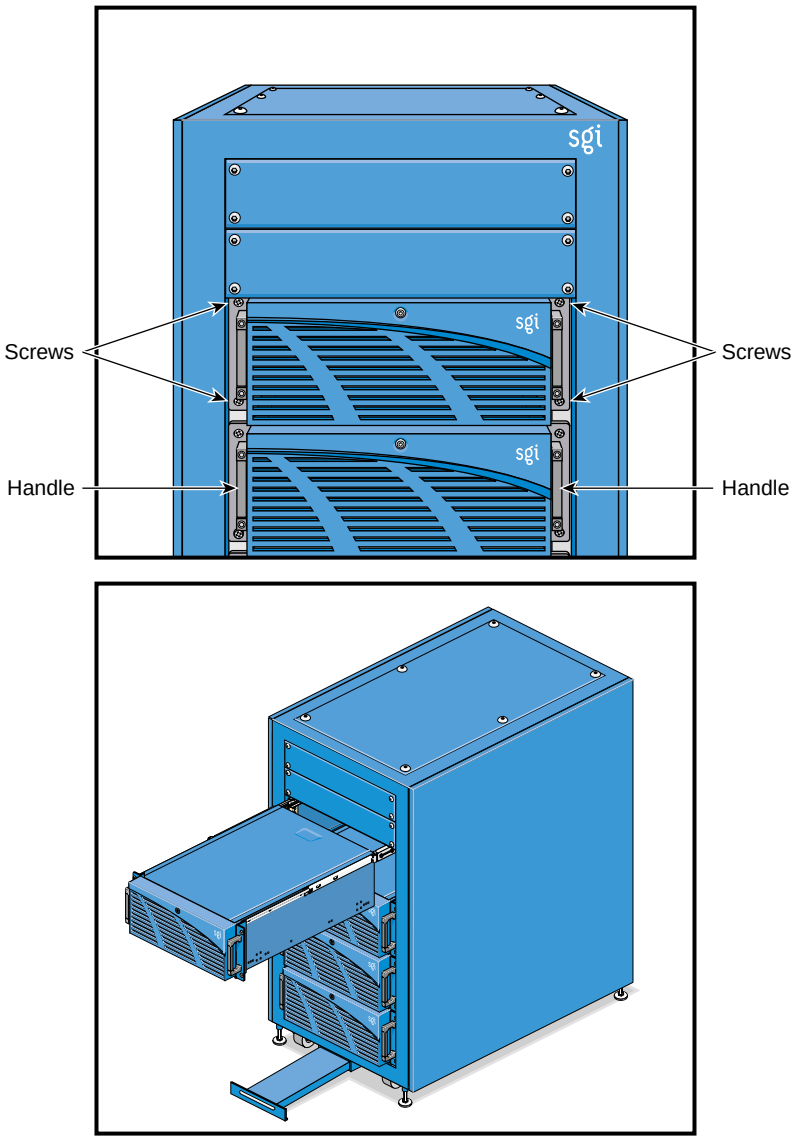

Figure 4-6 Freeing a Node from a Rack

9. Using the node's handles, pull the node out of the rack; see Figure 4-7.

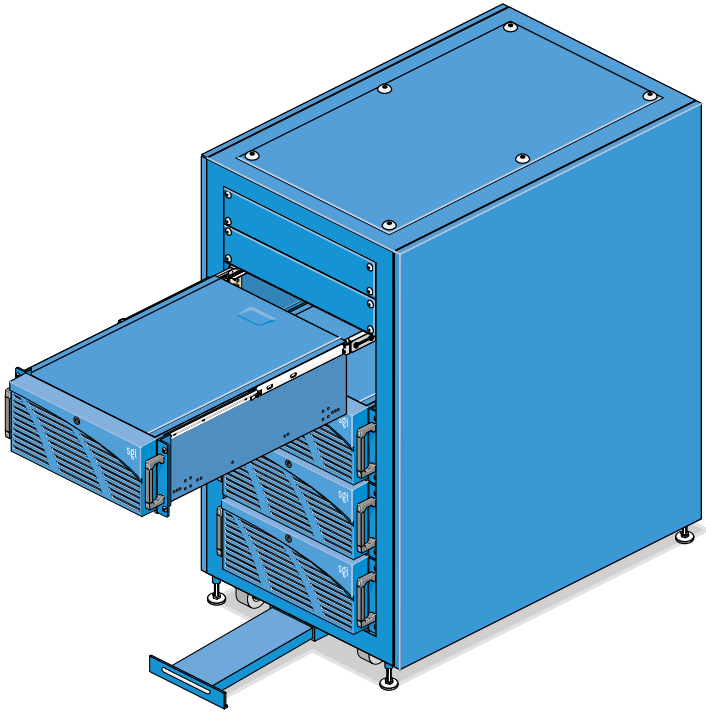

Figure 4-7 Pulling a Node Out of a Rack

Once the node's slide rails are fully extended, they lock in place.

Note: To push the node back into the system, push in the lever on each slide rail; see Figure 4-9 on page 47.

Removing a Node Cover

Once you have pulled a node out of the rack as explained in "Pulling a Node Out of the Rack" on page 39, or you have removed from the rack as explained in "Removing a Node from a Rack" on page 46, follow these steps to remove the node's cover:

1. Loosen the two captive screws at the back of the node; see Figure 4-8.

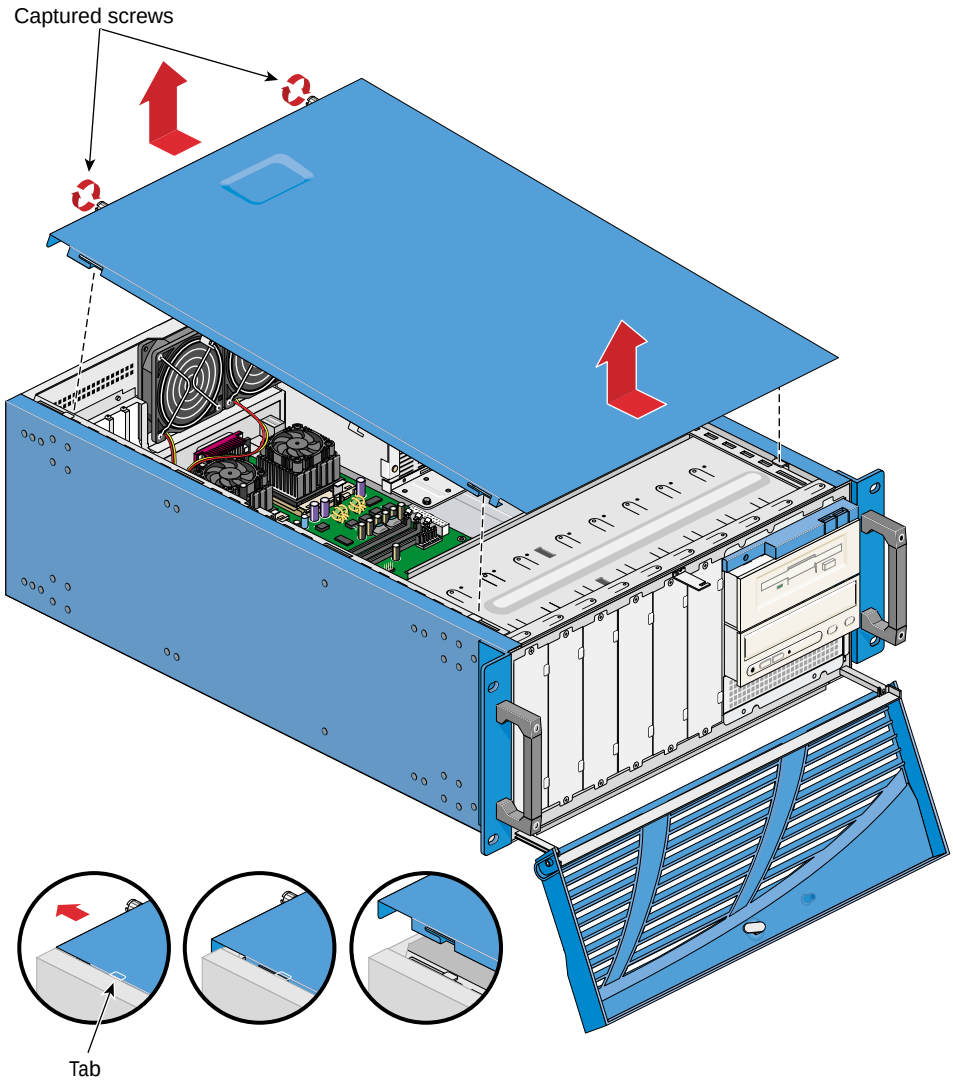

Figure 4-8 Removing a Node Cover

2. Pull the node cover a centimeter or two (about half an inch) toward the back of the node; see Figure 4-8.

3. Lifting up on the back of the node cover, pull it up and away from the node; see Figure 4-8.

Note: To replace the node cover, reverse the steps in this subsection.

Removing a Node from a Rack

A node with a minimum complement of disk drives weighs about 14.5 kg (32 lbs).

Note: Although each SGI Graphics Cluster node is usually under 15.5 kg (34 lbs) it is strongly recommended that a second person assist you in removing and adding nodes.

To remove a node from a rack, follow these steps:

1. Locate a work surface that can accommodate the node.

   If you are returning the node to Silicon Graphics, have ready the packaging for returning the node to Silicon Graphics. This packaging is available from SGI field service offices.

Warning: When adding or servicing equipment in the rack, do not pull out more than two nodes at a time.

2. Pull the node out of the rack by following all the steps in "Pulling a Node Out of the Rack" on page 39.

   If you are replacing the node immediately, you can leave the external SGI ImageSync cable connected to the next node. If you are not replacing the node immediately, connect the SGI ImageSync cable to the next node in the series. Remove and store the unused SGI Image Sync cable. The nodes of the SGI Graphics Cluster Series 12 must be daisy-chained for SGI_ImageSync to function.

3. To extend the slide rails fully so that you can pull the node all the way out, use your thumbs to push in the levers on the rail at each side of the node as you pull out the node; see Figure 4-9.

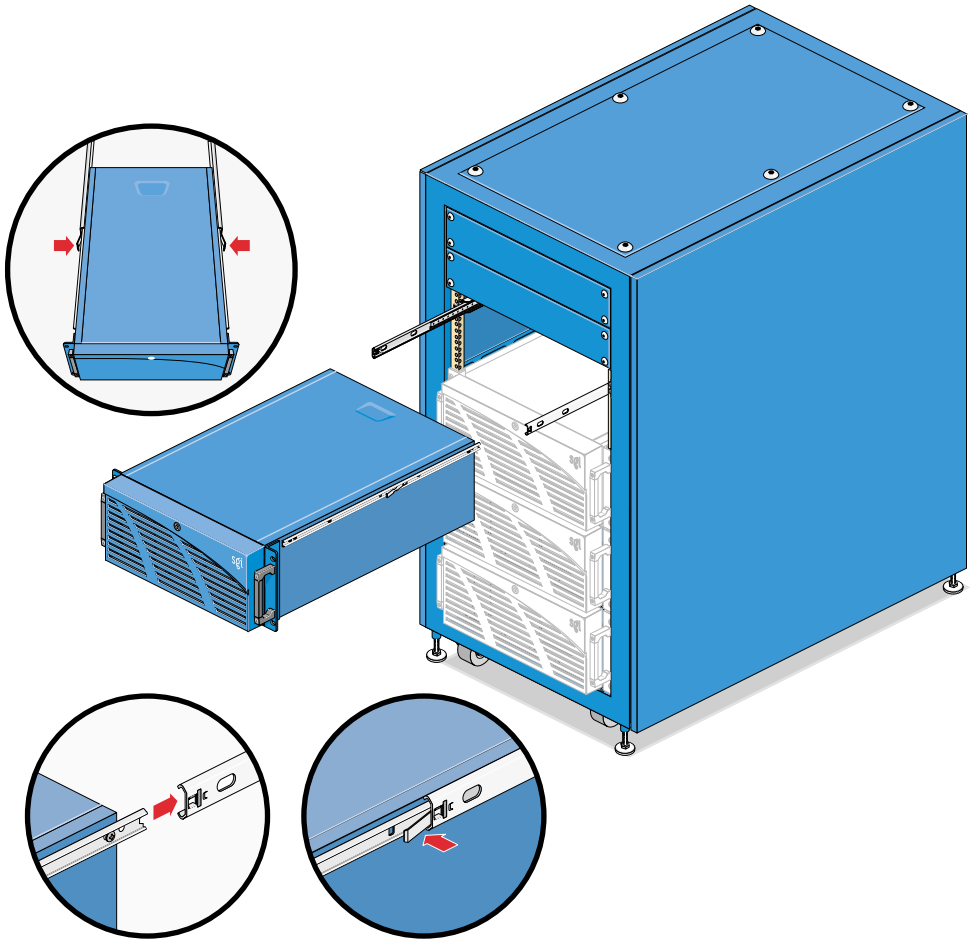

Figure 4-9 Slide Rail Levers

4. Release the levers and pull the node forward off the slides; see Figure 4-9. Lift out the node and place it on the work surface.

5. If you are removing a node and not replacing it immediately, you can install a 4U node blanking plate in the rack; see Figure 4-10.

   Blanking plates are available from SGI.

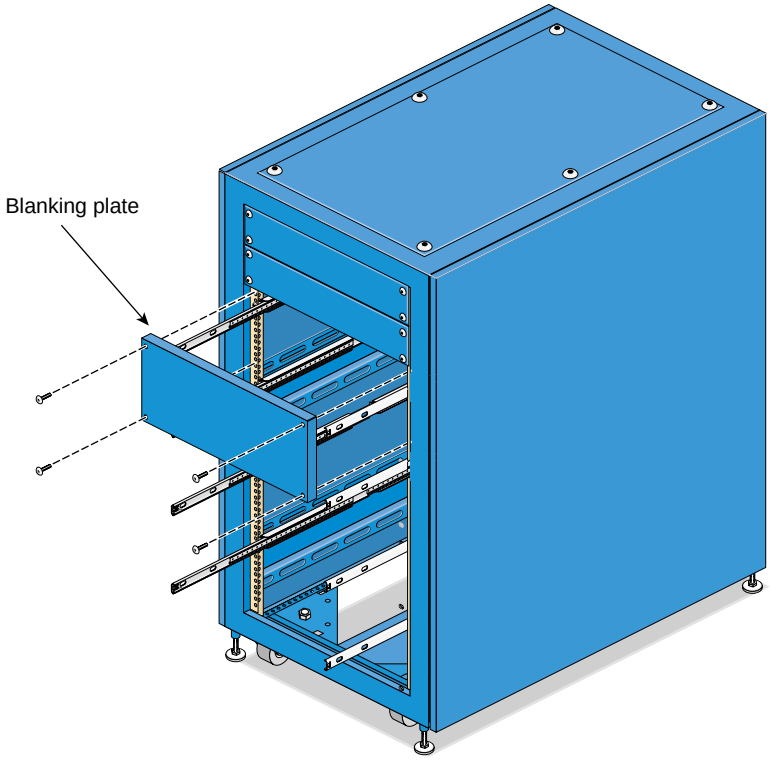

Figure 4-10 Installing Node Blanking Plate

6. If you are replacing a node and have no slide rails for the new node, remove the slide rails to install on the replacement node. See “Attaching Sliders to a Node” on page 49 for instructions.
7. Package the node and return it to SGI or your service provider.

For instructions on inserting a node into a rack, see “Adding a Node” on page 54.

Attaching Slide Rails and Sliders

This section explains:

- "Attaching Sliders to a Node" on page 49
- "Attaching Slide Rails to a Rack" on page 50

For procedures in this section, you need the following:

- #2 Phillips screwdriver
- Nut driver

Note: These instructions require removal of the node from the rack. It is strongly recommended that a second person assist in removing and adding nodes to a rack.

Attaching Sliders to a Node

To attach sliders to a node, follow these steps:

1. Have ready both three-part units of the slide rail pair and their hardware. Remove the inner part (slider) of each unit; set the bracket and outer part (slide rail) aside.

   Note: If you are replacing a node, you can attach the sliders from the node you are replacing onto the replacement node.

2. Remove the node from the rack by following the instructions in "Removing a Node from a Rack" on page 46, and place it on a work surface.
3. Starting at the front of the node chassis, align the first hole of the slider with the second hole of the chassis. Make sure the disconnect lever faces away from the system.

4. Secure each slider with screws, as shown in Figure 4-11.

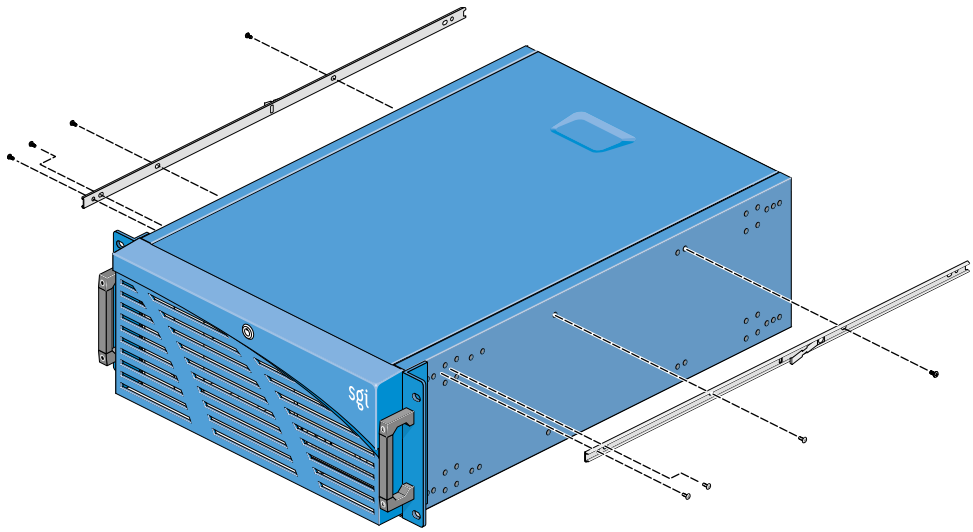

Figure 4-11 Attaching Sliders with Node Screws

Attaching Slide Rails to a Rack

To attach slide rails to a rack so that you can add a new node, follow these steps:

1. Have ready the two slide rails and their hardware, including the two brackets. The two inner parts (sliders) are attached to the node.
2. Prepare the rack as follows:
   - Power off the rack with its circuit breaker; unplug the rack.
   - If necessary for easier access, pull out the node that is next to the space where you want to attach the new slide rails. Pull out the rack's anti-tip shelf; see Figure 4-5 on page 42.

Warning: Be sure to pull out the anti-tip shelf before pulling out a node. Failure to do so can result in the rack tipping over.

   - Remove the screws that will interfere with the slide rails.

- To accommodate a 4U node, measure 7 inches (12 holes).
- Remove the screws from the inside holes on the rear rails, and replace them in the outside holes.
- Tighten the top and bottom screws by hand and realign them. The outside of the front rail should be 69.8 cm (27.5 inches) to the outside of the back rail.
- Torque the screws to 32 in-lbs.

3. Attach the slide rail mounting brackets to the slide rails, as follows.
   - Place two screws in the first and third holes on the front of the outer slide rail, and align the bracket so the screws protrude through the slotted hole on the bracket. Place the flat washer, lock washer, and nut on the screw.
   - Place two screws through the two holes on the back end of the slide rail, and align the bracket so the screws protrude through the slotted hole. Place a flat washer, lock washer, and nut on the screws.
   - Push both brackets towards the center of the slide rail so both outside screws are against the end of the slotted opening in the bracket. Use a nut driver and screwdriver to tighten the screws.
   - Repeat these steps for all slide rails needed (one set per system).
4. Install the slide rails in the rack, as follows (see Figure 4-12):
   - At the front of the rack, place a shoulder washer on four screws (10-32 x 3/8), align the slide to the proper rail holes, hold a clip nut on the backside of the slide, and place a screw (with shoulder washer) through the front of the rail.
   - Thread the screw into the clip nut until the shoulder washer engages the hole in the rail. Hold out and up on the slide while hand-tightening the screws.
   - Place the second screw the same way.
   - At the back of the rack, repeat these steps for the back of the slide.
   - Repeat for the other slide rail of the pair. When all slide rails are installed, torque all screws to 32 in-lbs. Do not overtighten the screws.

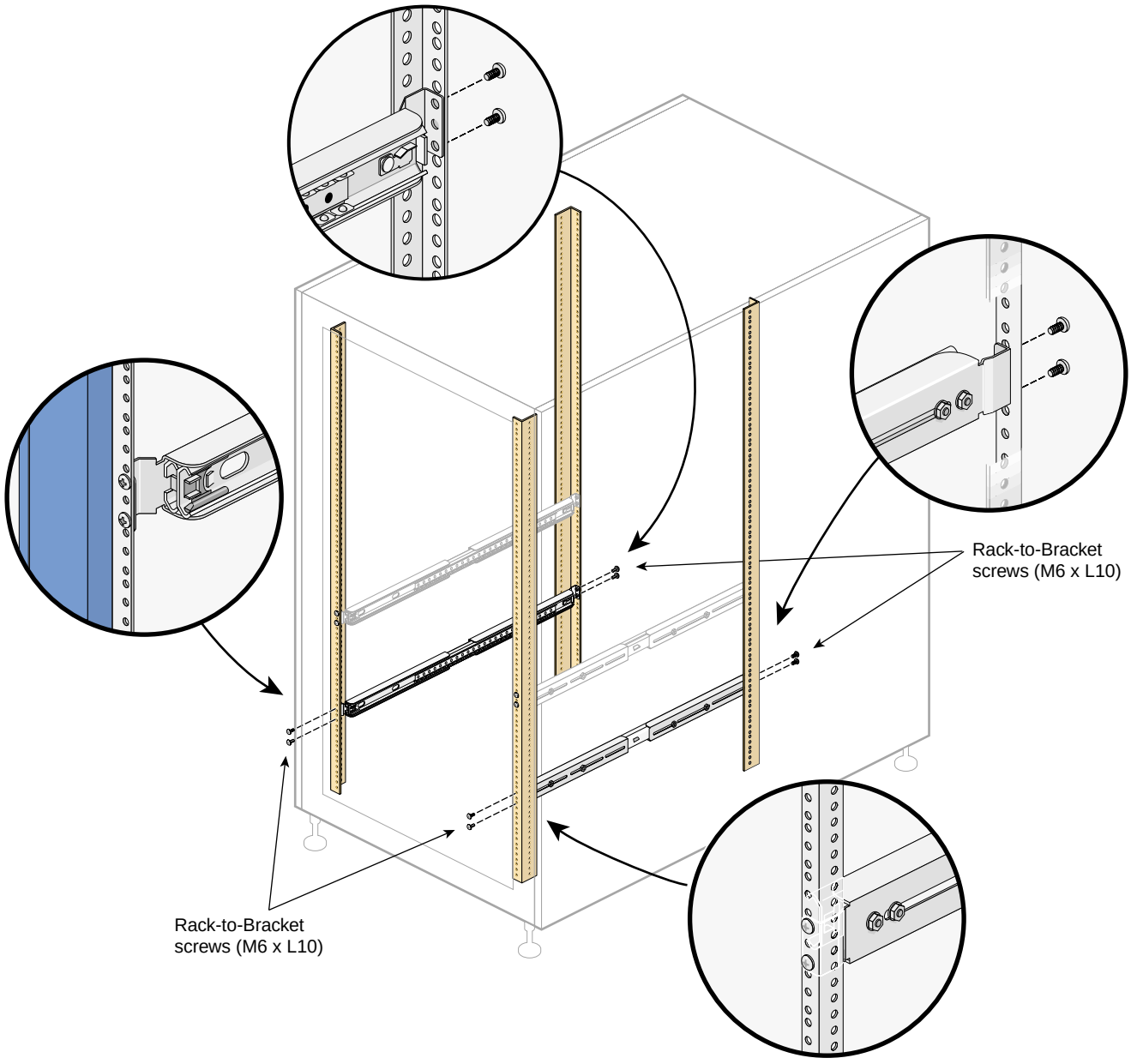

Figure 4-12 Attaching Slide Rails to Rack

5. Install clip nuts, as follows:
   - Align the top hole of the clip nut on the inside of the rail with the second hole up from the slide.
   - Secure with one screw/shoulder washer and torque to 10 in-lbs.
   - Repeat for each slide on both sides of the rack. See Figure 4-13.

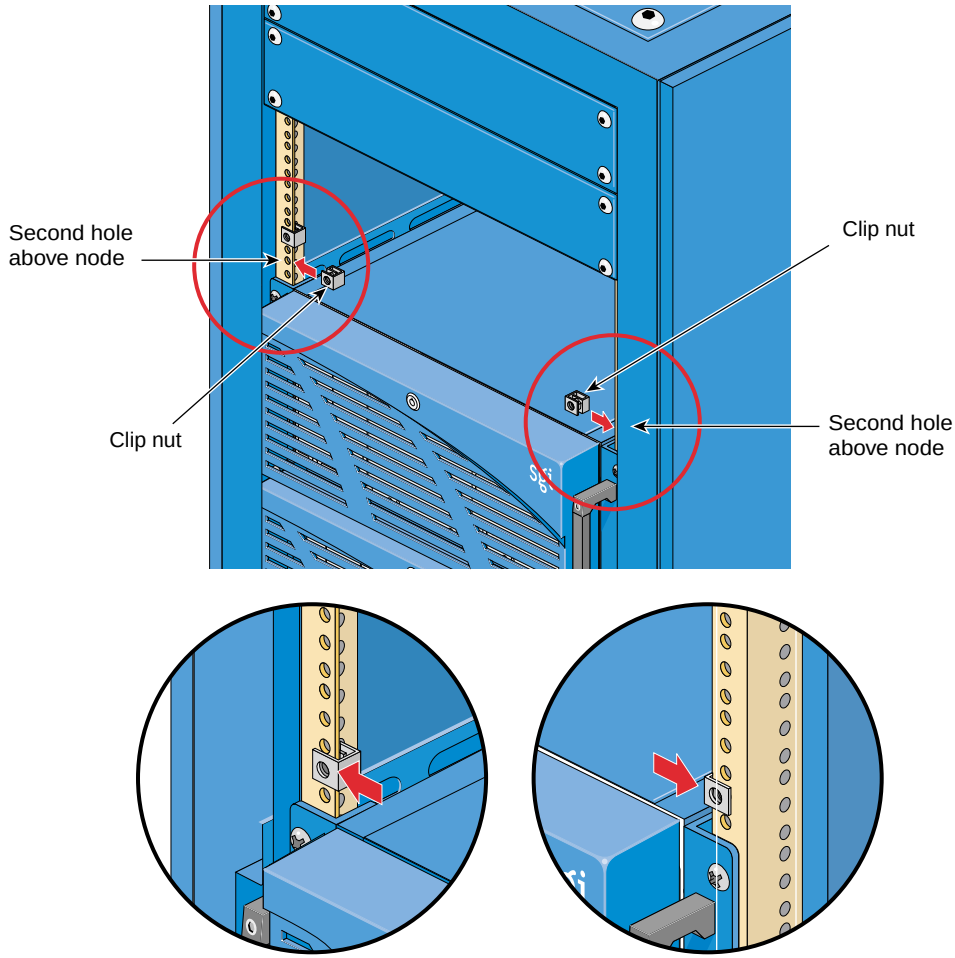

Figure 4-13 Attaching Clip Nuts

The lower hole of the clip nut is used later to secure the chassis to the rack.

Adding a Node

A node with a minimum complement of disk drives weighs about 14.5 kg (32 lbs).

Note: Although each SGI Graphics Cluster node is usually under 15.5 kg (34 lbs) it is strongly recommended that a second person assist you in removing and adding nodes.

This section explains how to add a new node or install a replacement node, in these subsections:

- "Preparing the Node and Rack for Node Installation" on page 54
- "Installing the Node in the Rack" on page 57
- "Cabling the Node and Finishing" on page 59

For each node, make sure you have the following items:

- One set of slide rails
- The node's power cable
- Ethernet cable for switch
- SGI ImageSync daisy-chain cable for SGI Graphics Cluster Series 12 systems

Note: If you are replacing a node that was just removed, you can use the existing cabling.

Preparing the Node and Rack for Node Installation

To prepare a node for installation, follow these steps:

1. Attach sliders to the new node by following the instructions in "Attaching Slide Rails and Sliders" on page 49. If you are replacing a node, you can use the sliders from the node you are replacing.
2. Make sure all users have logged off the affected systems; power off each node in the rack.
3. Power off the rack with its circuit breaker; unplug the rack.

4. If you are adding a new node, remove the 4U node blanking plate at the front of the rack in the 4U space where the node will be placed. See Figure 4-14.

Note: The new node must be placed in the lowest available 4U space in the rack.

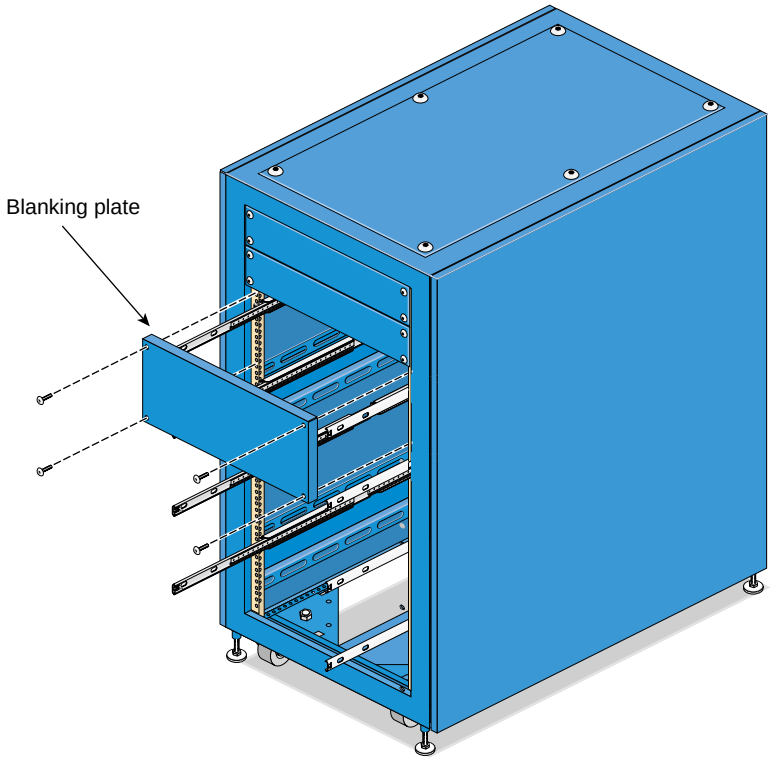

Figure 4-14 Removing a Node Blanking Plate

5. If you are adding a new node and the rack does not yet have slide rails to accommodate the new node, install slide rails by following the instructions in "Attaching Slide Rails and Sliders" on page 49.

6. Pull out the rack's anti-tip shelf; see Figure 4-15.

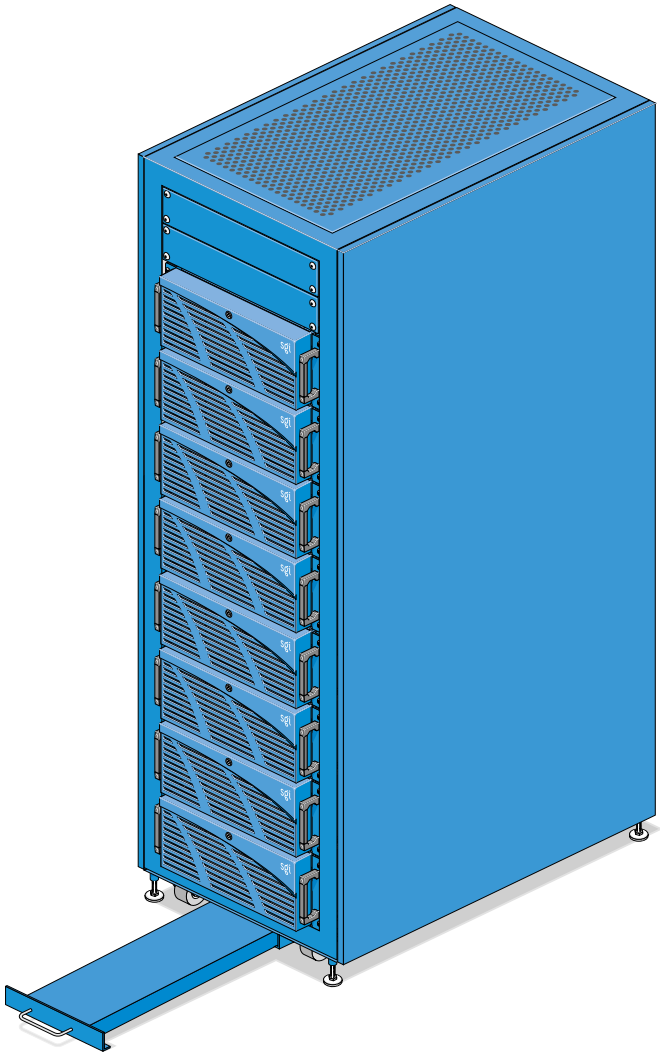

Figure 4-15 Pulling Out the Anti-tip Shelf

Warning: Be sure to pull out the anti-tip shelf before pulling out a node. Failure to do so can result in the rack tipping over.

Installing the Node in the Rack

To install the node in the rack, follow these steps:

1. In the rack, push in the levers on each slide rail for the node and pull out each slide rail until it is fully extended, as shown in Figure 4-16. Make sure each slide rail is fully extended and locked into place.

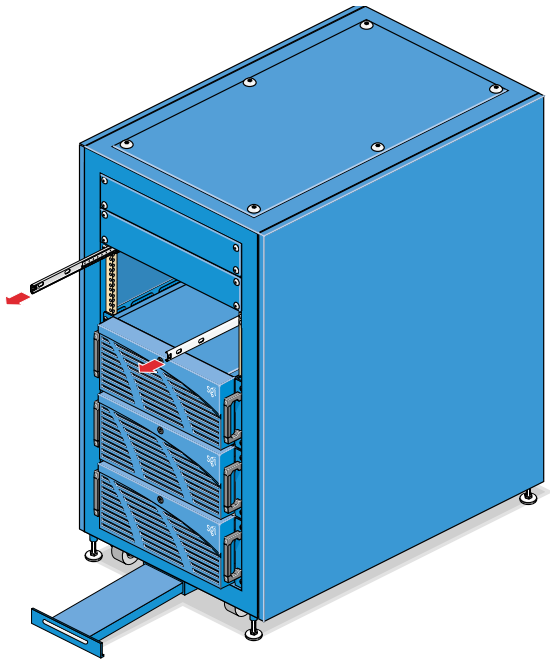

Figure 4-16 Extending Slide Rails

2. Carefully align sliders at the rear of the node with the ends of the slide rails. After the node has been slid onto the rails, the node should latch onto them.

Note: Although the SGI Graphics Cluster nodes are under 15.5 kg (34 lbs), it is strongly recommended that a second person assist in this operation.

---

3. Carefully begin pushing the node into the rack until the disconnect levers engage.
4. Release the disconnect levers and continue pushing the node into the rack until it is fully seated.

5. Secure the node to the rack chassis by screwing in the two screws at each side of the node. These screws are above and below each handle; they thread into clip nuts in the rack's slide rails. See Figure 4-17.

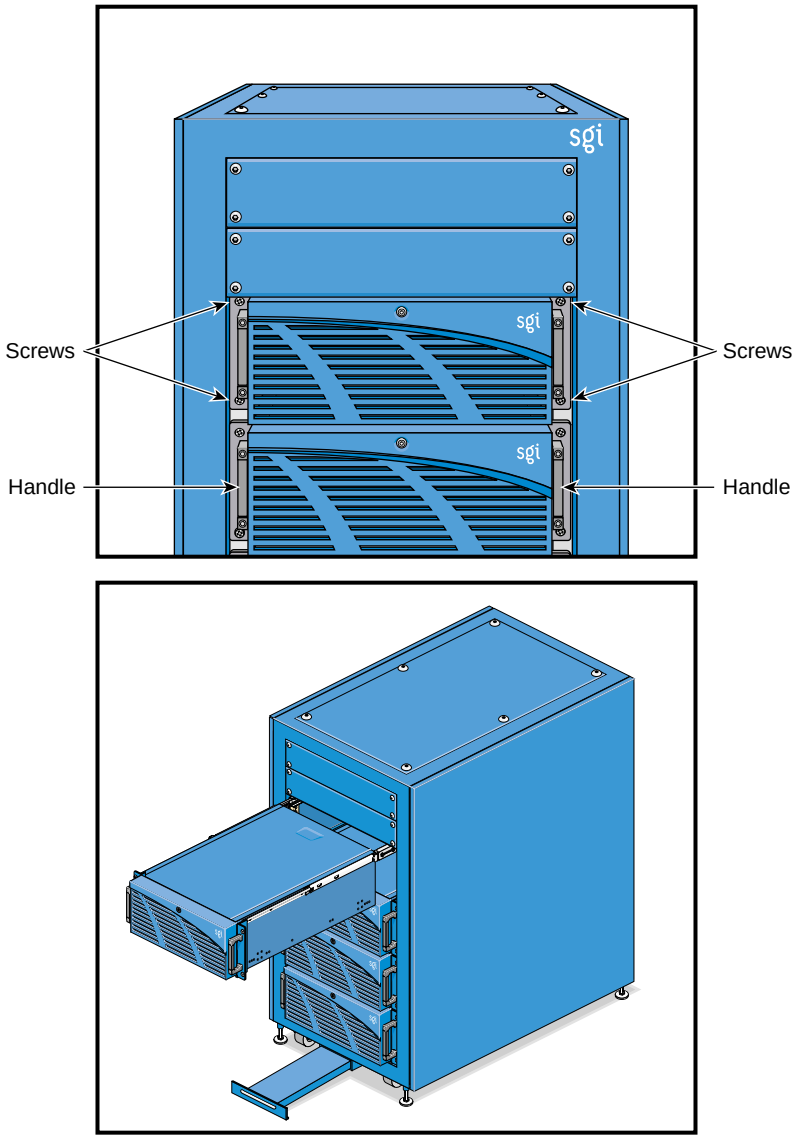

Figure 4-17 Securing the Node to the Rack Chassis

Cabling the Node and Finishing

To cable the node in the system and attach its input and output peripherals, follow these steps:

1. For each node, make sure that you have on hand:
   - The node's power cable
   - Ethernet cable for the switch
   - SGI ImageSync daisy-chain cable for SGI Graphics Cluster Series 12 systems
   - Fiber optic cabling for optional gigabit Ethernet switch, if applicable
   - Cabling for peripherals, such as video cabling

   Note: If you are replacing a node that was just removed, you can use the existing cabling.

2. Attach the node's power cable to the rack's PDU; see Figure 4-18.

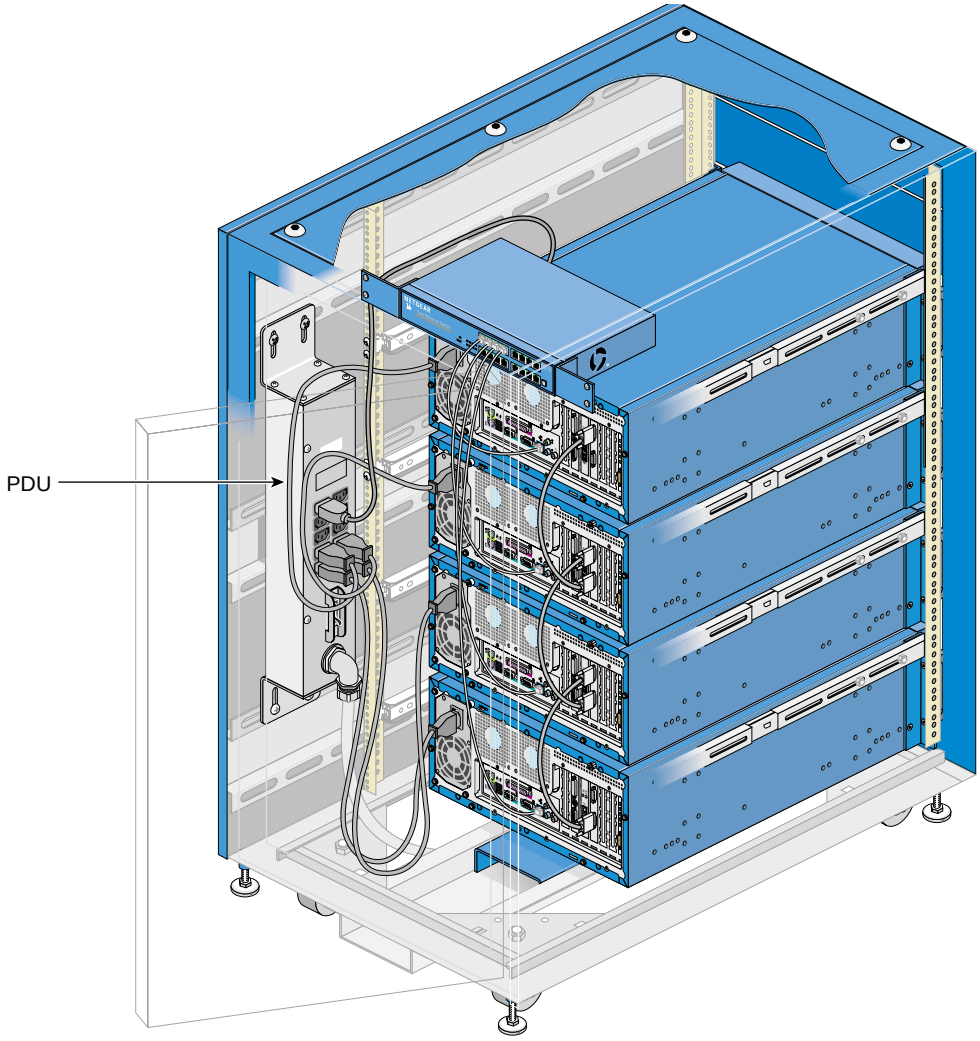

Figure 4-18 Connecting a Node AC Power Cable

3. For a tall rack, place the node's power cable into the harness.

Caution: Do not turn on the node power at this time.

4. Attach the node's daisy-chain (external) SGI ImageSync cable to the adjacent node. See Figure 4-19.

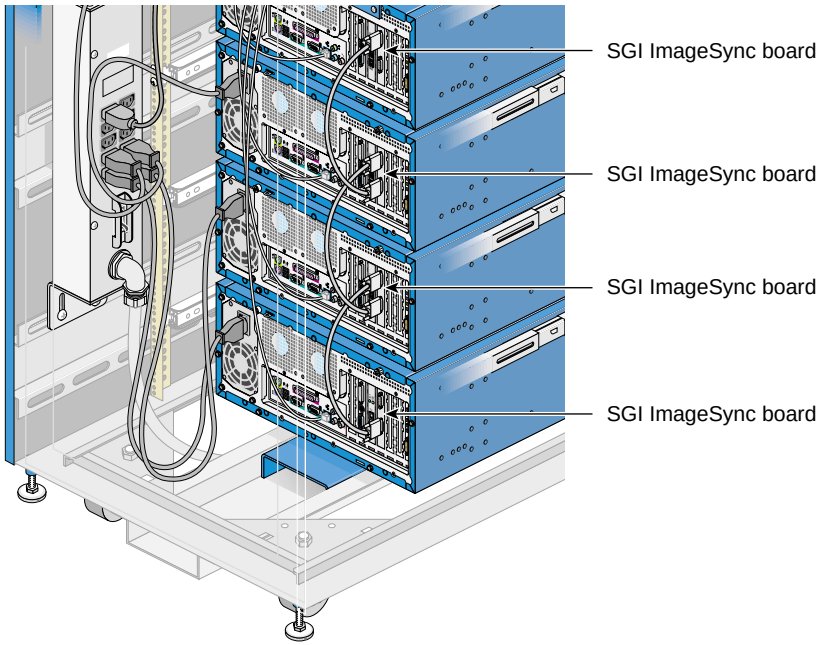

Figure 4-19 Connecting SGI ImageSync External Cabling, SGI Graphics Cluster Series 12 System

5. If you are replacing a master node, do the following:
   - Connect the keyboard and mouse.
   - Connect the Ethernet cable; plug the other end into a port on the rack's switch.
   - Connect the fiber optic cabling for the optional gigabit Ethernet switch, if applicable.
   - Connect the HD15 video cable to the system as shown in Figure 4-20.
   - Connect the monitor to the power source if it is not already connected.
   - Connect other peripherals as appropriate.

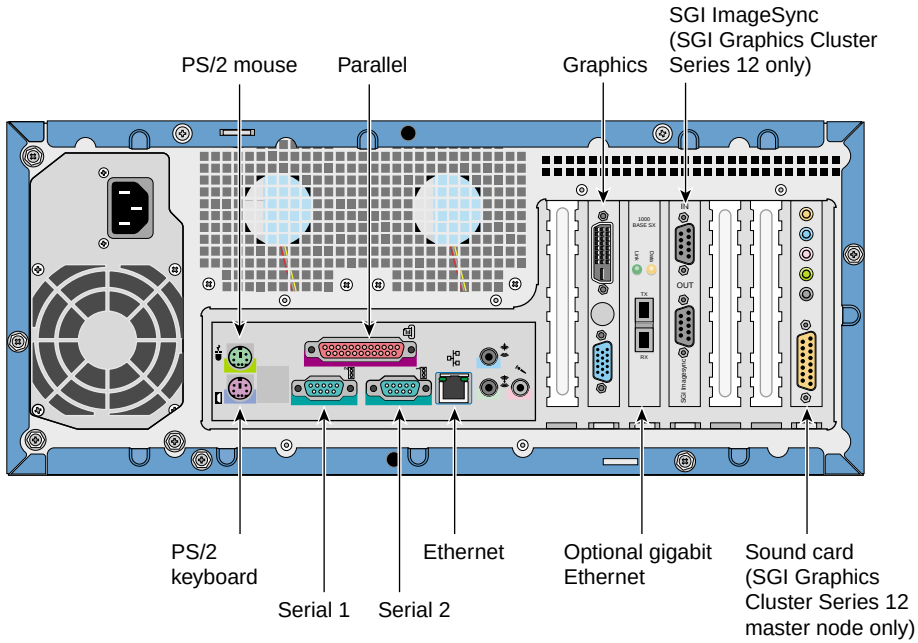

Figure 4-20 Master Node Connectors

Note: Audio ports on the SGI Graphics Cluster motherboard are disabled. USB port functionality is not supported in the SGI Graphics Cluster. The S-VHS port on the graphics card is not supported.

6. Plug in the rack and turn it on with the circuit breaker on the PDU. Push in the anti-tip shelf.
7. Turn on the master node by pressing the power button on the front panel (see Figure 4-2 on page 39). Turn on each channel node.
8. Follow the instructions in Chapter 3, “SGI Graphics Cluster Administration” and also in system software manuals, as needed, to configure the node and reconfigure the system.

Replacing or Adding a Switch

The system switch and the optional gigabit Ethernet switch must be inserted into the rack at an angle to get past the rack rear door. Therefore, if the rack has the full complement of channel nodes, you must remove the top node to make room to insert the switch(es). An alternative is to remove the door; see "Removing the Rack Rear Door" on page 65.

Note: To install an optional gigabit Ethernet switch, an additional person is required.

To replace or add a network switch, follow these steps:

1. Make sure all users have logged off the affected systems. Power off the nodes. Power off the rack with its circuit breaker.
2. Pull out the anti-tip shelf; see Figure 4-15 on page 56.

Warning: Be sure to pull out the anti-tip shelf before pulling out a node. Failure to do so can result in the rack tipping over.

3. If the rack has the full complement of channel nodes, remove the top node to make room to insert the switch; follow steps in "Removing a Node from a Rack" on page 46. This step is necessary because the Ethernet switch included with the system must be inserted at an angle. An alternative is to remove the door; see "Removing the Rack Rear Door" on page 65.
4. If you are replacing the system Ethernet switch and an optional gigabit Ethernet switch is present, you might need to remove optical cables to access the system Ethernet switch.
5. If you are adding or replacing an optional gigabit Ethernet switch, remove the Ethernet switch included with the system. This step is necessary because the gigabit Ethernet switch must be inserted at an angle. Follow these steps:
   - Disconnect the cables from the system Ethernet switch. Disconnect the switch power cable, which is routed around the side of the rack, between the rack rails and the rack chassis wall. You can leave these cables in place and connected at their other ends.
   - Unscrew the rack mount screws that hold the system Ethernet switch to the rack rails.

- Remove the switch from the rack.

6. Route the power cord for the new switch between the rack rails and the rack chassis wall, and plug it into the PDU.
7. If you are adding a gigabit Ethernet switch, install it in the rack:
   - Remove the two 2U panels at the front of the rack.
   - Angle the switch into the rack and place it in the top 1U space in the rack; see Figure 4-21.

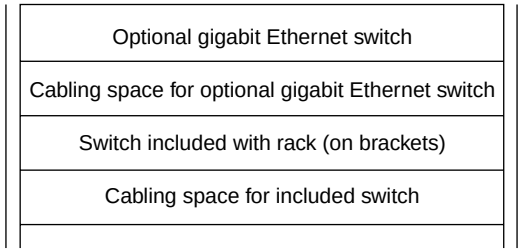

Figure 4-21 Switch Placement in Rack

   - With a second person holding the switch in position, bolt the mounting brackets on the rear of the gigabit Ethernet switch to the rack rails.
8. Reinsert the original system switch in the third 1U space from the top of the rack. Secure it to the rack rails. Recable it.
9. Attach the power cords to the switch(es).
10. Cable the nodes to the new switch.
11. If the top node was removed, replace it and cable it.
12. Replace the two 2U panels on the front of the rack, if you have removed them. Replace the rear door, if you have removed it.
13. Power on both switches.
14. Power on the nodes; power on the rack. Push in the anti-tip shelf.
15. If you have not already done so, configure the network IP and host settings.
16. Follow instructions in the switch manual for switch configuration.

Removing the Rack Rear Door

Removing the rear door on the short or tall rack can facilitate switch installation or replacement, especially where the door cannot be opened fully.

The rack rear door has lift-off hinges and a quick disconnect terminal on the door end of the ground wire. To remove the door, follow these steps:

1. Open the door to the 90 degree position.
2. Disconnect ground wire from door.
3. Lift the door straight up off the hinges.

   For a tall rack, you can lift up on the bottom of the door with the top of your foot.

When you reinstall the door, do not forget to reattach the ground wire.

Adding and Replacing SGI Graphics Cluster System Components

This chapter explains how to add or replace components in a node. It consists of these sections:

Following ESD Precautions

Follow electrostatic discharge (ESD) precautions when you handle components or work inside a node. Electronic equipment can be irreparably damaged by ESD. Always follow these preventative measures when handling a system component:

- Remove a component from its antistatic bag only when you are about to install it.
- If you must handle a component before installation, do not place it on surfaces that produce ESD (carpeting, for example), or near devices that create static electricity.
- Attach a wrist grounding strap before handling electronic components. Wrist grounding straps are available at most electronic component stores.

Replacing or Adding a Drive or Drive Cage

To replace a drive in a node, you remove the drive cage (rotational module), remove the drive in question, install the replacement drive, and replace the drive cage in the chassis. For this procedure, you need the following:

- #2 Phillips screwdriver
- Grounding wrist strap

This section explains how to replace a 5.25-inch or 3.5-inch drive, and also how to replace or add a drive cage, in these subsections:

Note: If you are adding drives to a new drive cage, note that you cannot add more than two drives to the additional optional drive cage.

Removing a Drive Cage from a Node Chassis

To remove the system drive cage, follow these steps:

1. If you are not replacing the drive cage immediately, have ready four bezel blanking plates.

Caution: If a drive cage is missing, bezel blanking plates must be installed for proper emissions control.

2. Make sure adequate room on the workbench is available for the drive cage.
3. Make sure all users have logged off the affected node. Shut down the node with the appropriate administrative tools.
4. Open the node bezel (see "Opening a Node Bezel" on page 38) and power off the node; see Figure 3-3 on page 34 for the button location.

5. Remove the node top cover by following the instructions in "Removing a Node Cover" on page 44.
6. Attach a static wrist strap to a grounded connection on your system.
7. Disconnect all cables from drives in the cage; see Figure 5-1.
   - SCSI drives: Detach the SCSI ribbon cable at the drive end; detach the drive power cable.
   - Floppy drive in the system drive cage: Detach the power cable (red, black, black, yellow) from the drive; detach the floppy drive cable from the motherboard.
   - CD-ROM drive in the system drive cage: Detach the IDE cable at the drive end. Detach the power cable.
   - Root drive in the system drive cage: Detach the SCSI connection at the drive end. Detach the power cable from the drive.
   - Front panel LED and switches in the system drive cage: Detach the three-headed power supply cable from the motherboard.

   If you are not replacing the drive immediately, you can detach its cables at the other end as well.

Note: Figures in this section show details for the original drive cage shipped from the factory; however, instructions and details apply also to an optional second drive cage, except where noted.

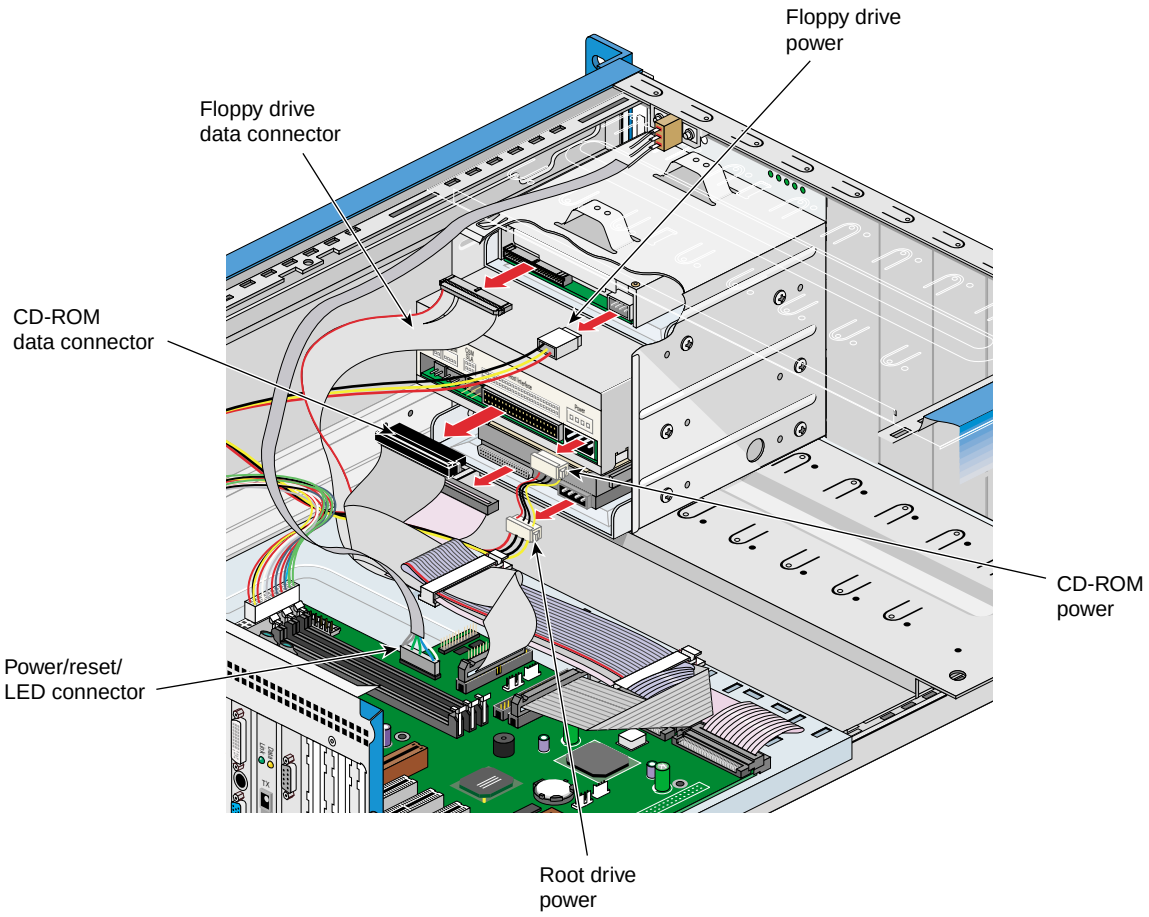

Figure 5-1 Internal Drive Cabling

Note: It is a good idea to note carefully all cabling that you detach.

8. Unscrew the four screws (two on top flange, two on bottom flange) that attach the front of the drive cage to the front of the node chassis; see Figure 5-2.

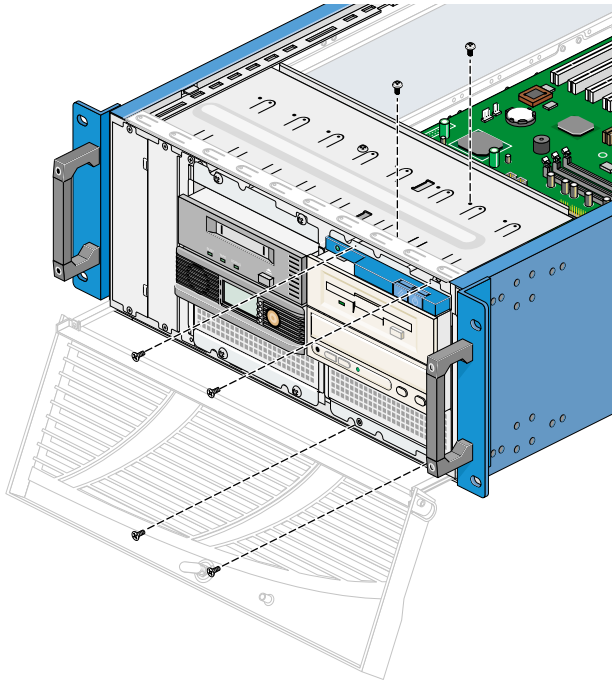

Figure 5-2 Unscrewing the Drive Cage

9. Remove the two screws at the top of the drive cage; see Figure 5-2.

10. Pull up on the chassis top panel slightly to free the drive cage from the clips on the top panel, and push the drive cage forward and out of the chassis, as shown in Figure 5-3.

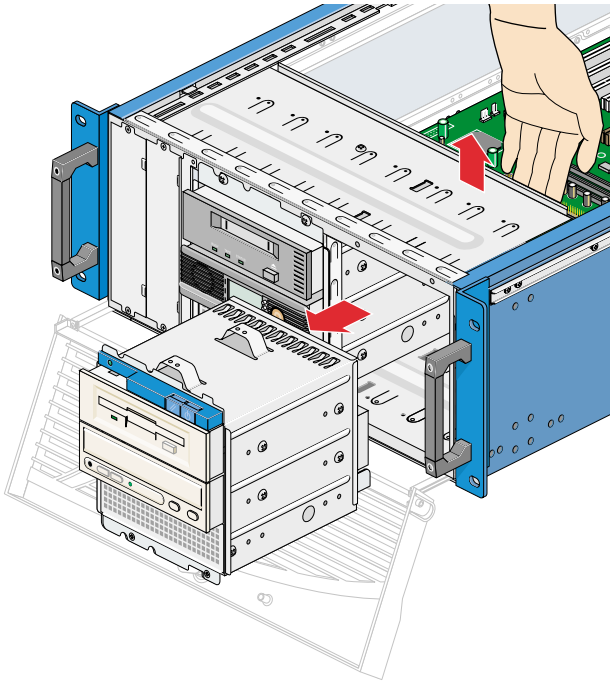

Figure 5-3 Removing the Drive Cage

11. If you are removing an optional second drive cage and not replacing it right away, install four blanking plates at the front of the node, starting at the left side of the node chassis front. Screw in each one at the top and the bottom; see Figure 5-4.

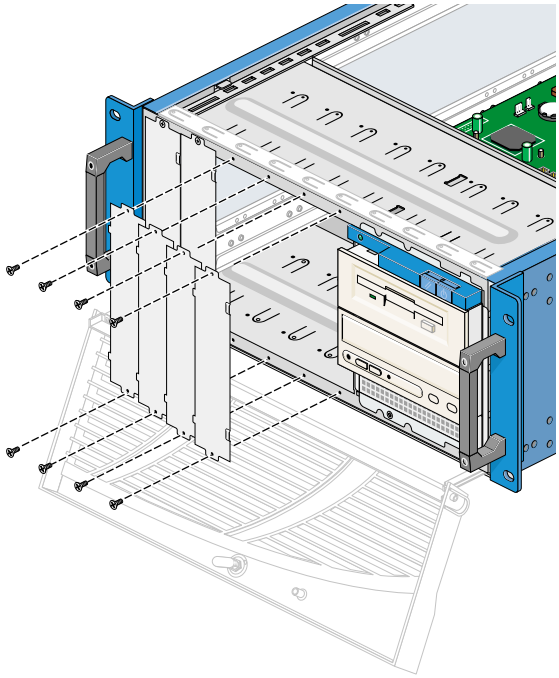

Figure 5-4 Installing Bezel Blanking Plates

Caution: If a second drive cage is not present, bezel blanking plates must be installed for proper emissions control.

Removing a Drive from a Drive Cage

To remove a drive from a drive cage, follow these steps:

1. If you are not replacing the drive immediately, have ready a drive filler plate.

Caution: If a drive is missing, a filler plate must be installed in the drive cage for proper emissions control.

2. Unscrew the two screws on each side of the drive cage that secure the drive, as shown in Figure 5-5.

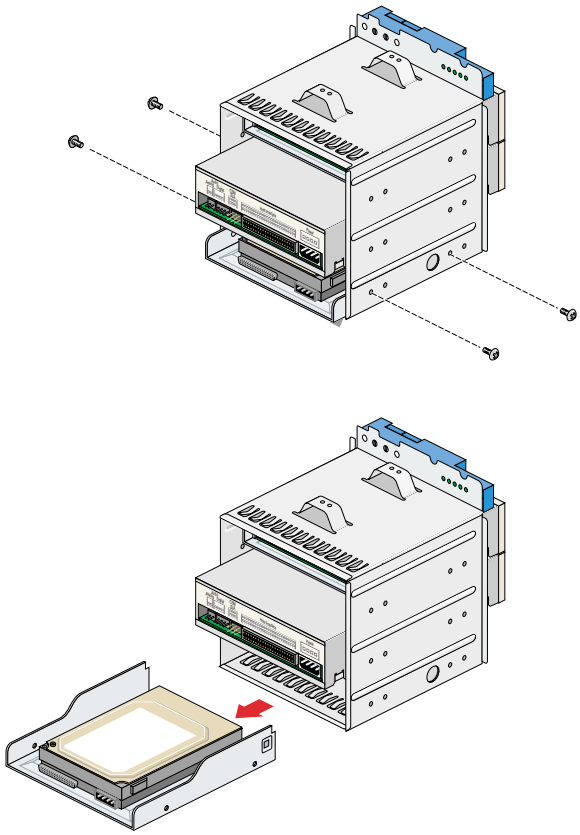

Figure 5-5 Removing a Drive from the Drive Bay

3. If you are not replacing the drive, install a drive filler plate in the drive bay. Secure it with a screw at either end.

Caution: If a drive is missing, a filler plate must be installed for proper emissions control.

Installing a Drive in the Drive Cage

The drive cage included in the chassis ships with three drives (floppy drive, CD-ROM drive, and system drive); all are nonremovable.

The node chassis accommodates one additional drive cage, available from SGI as an option; it holds two additional drives (removable or nonremovable). Nonremovable drives from SGI are premounted on drive sleds for the SGI Graphics Cluster drive cages.

Note: You cannot add more than two drives to the additional optional drive cage.

To replace or add a drive, follow these steps:

1. If you are installing a drive in a drive cage that is already in the node chassis, remove the drive cage from the node by following the instructions in "Removing a Drive Cage from a Node Chassis" on page 68.
2. Have ready the new drive and all its cables.
3. Select a drive bay for the new drive in the drive cage.

   If you are installing a removable drive or a tape drive in an optional new drive cage, remove the screws at the right and left ends of the blanking plate for the drive bay you select.

   Do not remove the blanking plate if you are installing a drive that can be inserted from the rear of the drive cage, such as a nonremovable drive.

   Note: In an optional additional drive cage, drives are installed in the top two drive bays only. No drive can occupy the bottom drive bay.

4. Insert the drive into the rear of the selected drive bay. A removable drive can be inserted from either direction.
5. Align holes in the drive with holes in the sides of the drive cage. Screw the drive into the drive cage with four screws (two on each side of the drive cage), as shown in Figure 5-5. Screws are included with the drive.

Caution: Screws included with various drives are not interchangeable. Be sure to use only the screws included with the option.

Replacing or Adding a Drive Cage

A new optional drive cage includes the following:

- SCSI ribbon cable
- Narrow blanking panel
- Optional drive, as ordered (hard disk, tape drive, or other); nonremovable drives are premounted on drive sleds
- Sufficient screws

Note: If you must remove the node because it is awkward to add the drive cage to it, ask another person to help you remove and replace the node.

To replace (reinstall) a drive cage or to add a new optional drive cage in a node chassis, follow these steps:

1. With the drive cage on a work surface, install any drives needed in the drive cage; see "Installing a Drive in the Drive Cage" on page 75.
2. Pull out the node in which you are installing the drive cage by following the instructions in "Preparing a Node for Component Replacement or Addition" on page 37. Remove the node cover.

   Note: If it is awkward to work on the node in the rack, ask another person to help you remove it from the rack and to replace it in the rack. Follow the instructions in "Removing a Node from a Rack" on page 46.

3. If you are adding a new drive cage, follow these steps:
   - Working from right to left, remove the four vertical blanking plates from the front of the node chassis; see Figure 5-6.

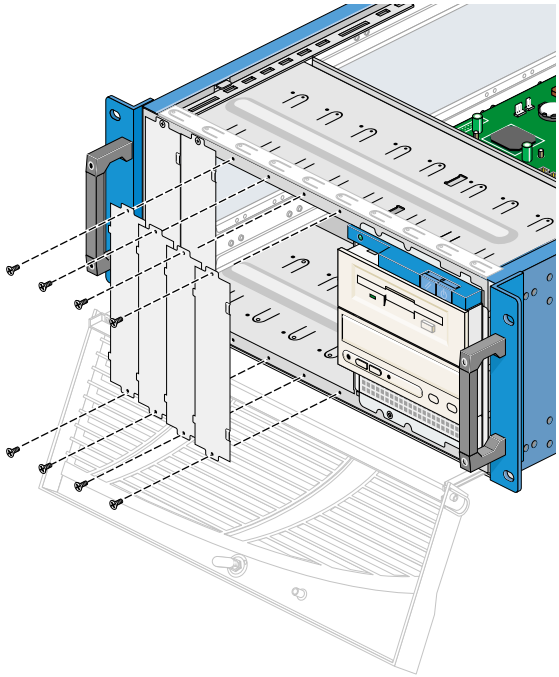

Figure 5-6 Removing Drive Blanking Plates from the Node Chassis

- At the front of the node, attach the narrow plate included with the new drive cage; screw in the plate at the top and bottom, as shown in Figure 5-7.

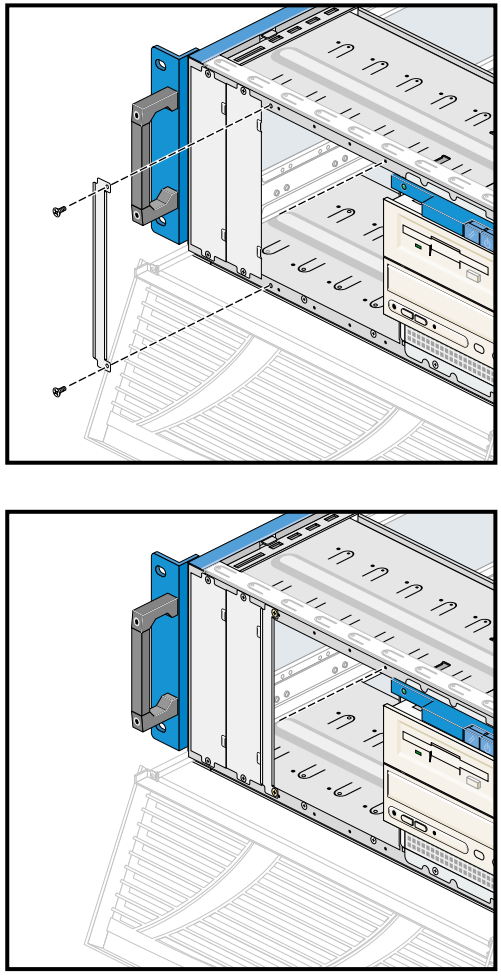

Figure 5-7 Attaching the Narrow Blanking Plate for a New Drive Cage

4. Push the drive cage into the chassis. The drive cage clicks into place; clips at the top of the chassis hold it in place. See Figure 5-3 on page 72.

5. Screw in the two screws that attach the drive cage to the top of the node. Screw in the four screws (two on top flange, two on bottom flange) that attach the front of the drive cage to the front of the node chassis. Snap the top plastic panel back onto the drive cage to cover the screws. See Figure 5-8.

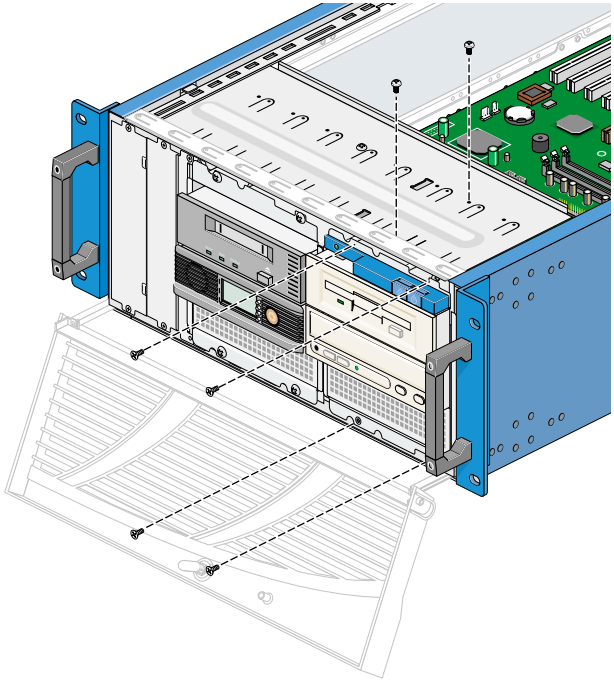

Figure 5-8 Securing a Drive Cage in a Node

6. Cable the drives as follows:

   - SCSI drive: Attach the single connector on the SCSI ribbon cable to the SCSI connector on the motherboard. Attach one of the connectors along the cable to the SCSI connector on the drive. The connectors are keyed.

     Remove the tie wrap from the power cables and select a power cable that reaches the drive; connect it.

   - Floppy drive: Attach the IDE floppy drive cable to the drive. Attach a power cable (red, black, black, yellow) from the node's power supply to the drive.

- CD-ROM: Connectors are labeled on the drive's panel.

  Attach the IDE cable at the drive end. Attach a power cable. Attach an IDE cable from the drive to an IDE connector on the motherboard.

- Root drive: Attach the SCSI connection at the drive end. Attach a power cable.

  Attach the single end of the three-headed power supply cable (white-blue, white-green, gray-gray) to the connector on the root drive. Attach the three-headed end as shown in Figure 5-9.

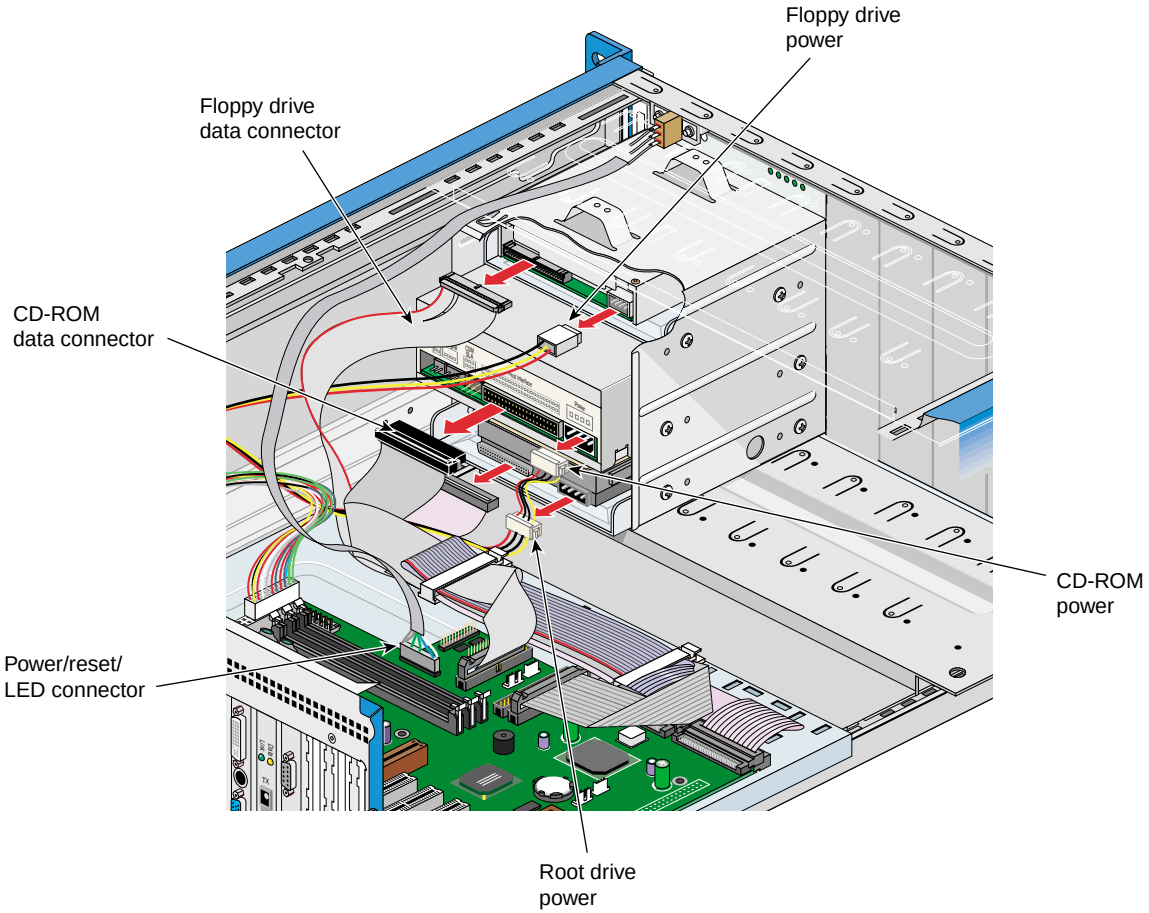

Figure 5-9 Internal Drive Cabling

7. Replace the node's top panel as described in "Removing a Node Cover". Push the node back into the rack as described in "Pulling a Node Out of the Rack" on page 39. Recable the node as described in "Cabling the Node and Finishing" on page 59.

Replacing Fans

To remove and replace a system fan, follow these steps:

1. Open the node bezel (see "Opening a Node Bezel" on page 38) and power off the node; Figure 3-3 on page 34 shows the location of the button.
2. Remove the node top cover, following instructions in "Removing a Node Cover" on page 44.
3. Attach a static wrist strap to a grounded connection on your system.

4. Disconnect the fan cable from the motherboard; see Figure 5-10.

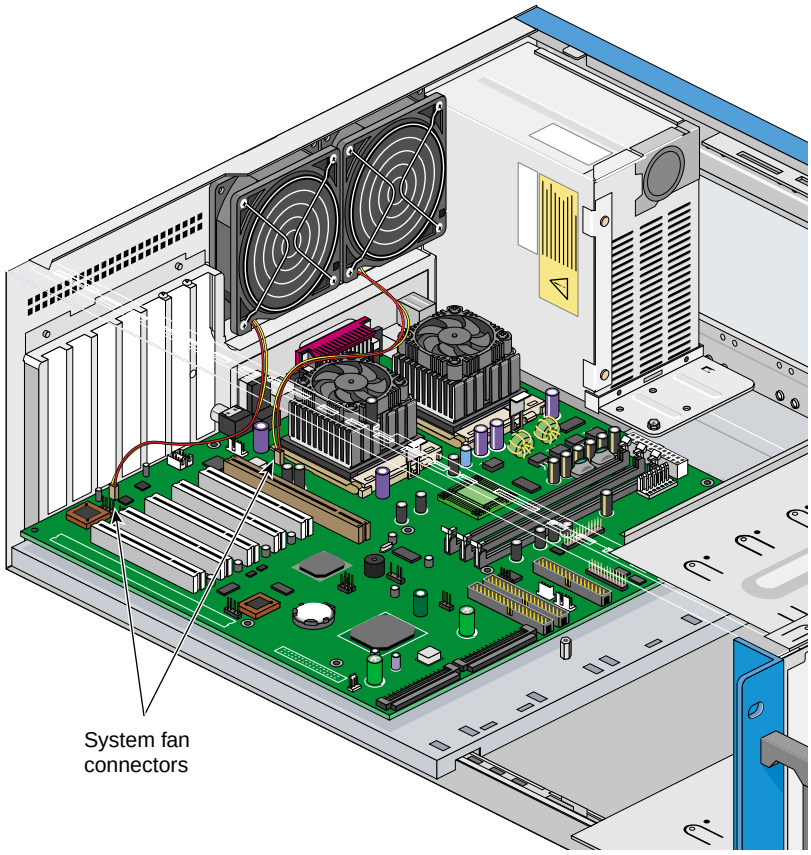

Figure 5-10 System Fan Cables

Note: The cable of the left fan is routed under the PCI cards. After pulling the fan cable connector off the motherboard, you can gently pull the cable under the cards, or you can temporarily remove the cards if desired.

5. At the back of the node chassis, unscrew the four screws (one in each corner) that secure the fan to the chassis back; see Figure 5-11. Retain the screws for the replacement fan.

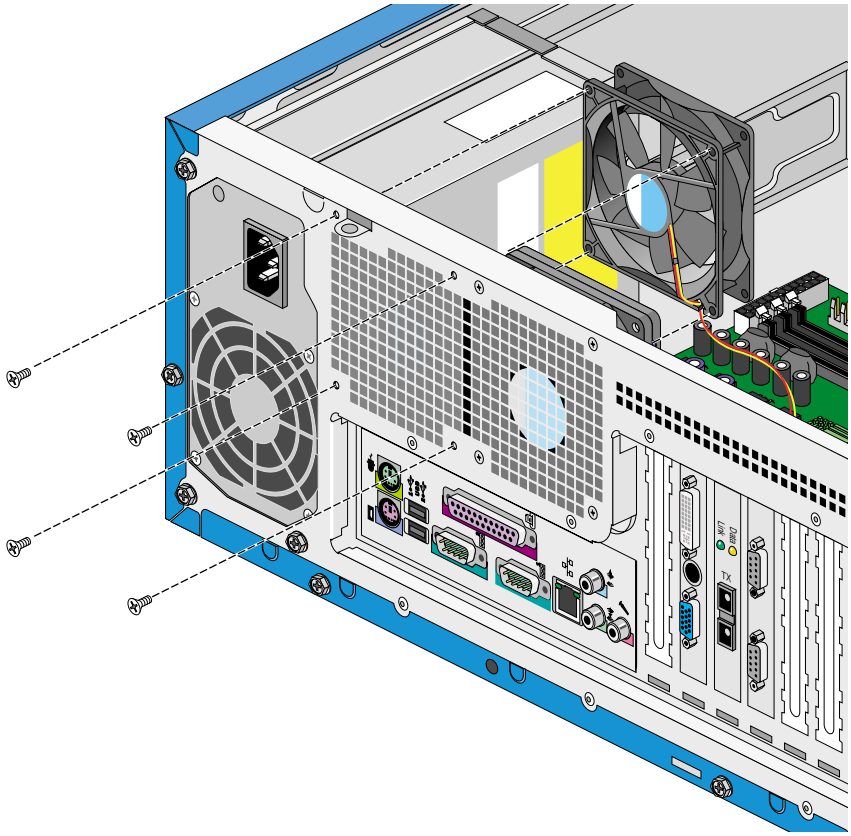

Figure 5-11 Unscrewing a Fan from the Chassis Rear

6. Carefully remove the fan from the system without touching any system component.
7. Insert the replacement fan into the chassis; screw it in with the reserved screws.

8. Connect the fan cable; see Figure 5-10. For the fan closest to the expansion slots, you might have to lift the cards out of the slots to route the cable.

Replacing or Adding Expansion Cards

This section describes how to install and remove PCI and AGP cards.

Follow electrostatic discharge (ESD) precautions. Electronic equipment can be irreparably damaged by ESD:

- Remove a card from its antistatic bag only when you are ready to install it.
- If must handle a card before installation, do not place it on surfaces that produce ESD (carpeting, for example), or near devices that create static electricity.

Note: In an SGI Graphics Cluster Series 12 node, do not remove or replace the graphics card that is in the AGP slot; do not remove the SGI ImageSync card. For these procedures, contact your service representative.

Installing an Expansion Card

Expansion cards in the SGI Graphics Cluster occupy specific slots, as outlined in Table 5-1.

Table 5-1 Expansion Slots and Cards in the SGI Graphics Cluster

Slot	Card
AGP	Graphics card
PCI slot 1 (closest to the AGP slot)	Optional gigabit Ethernet card
PCI slot 2	SGI ImageSync card; SGI Graphics Cluster Series 12 only
PCI slot 3	Network interface card (secondary Ethernet), master node only; included with SGI Graphics Cluster Series 12
PCI slot 4	Empty; available for customer option
PCI slot 5 (closest to the chassis wall)	Commercial audio card: included with master node of SGI Graphics Cluster Series 12

Note: The motherboard has six expansion slots; a seventh slot cover to the left of the AGP slot accommodates additional ports on an AGP card. However, in an SGI Graphics Cluster node, the AGP slot is occupied by the graphics card.

To install an expansion card, follow these steps:

1. With the node powered off and pulled out of the rack and with the node's top panel off, attach a static wrist strap to a grounded connection on your system.
2. Locate an empty expansion slot on the motherboard; Figure 5-12 numbers the PCI slots.

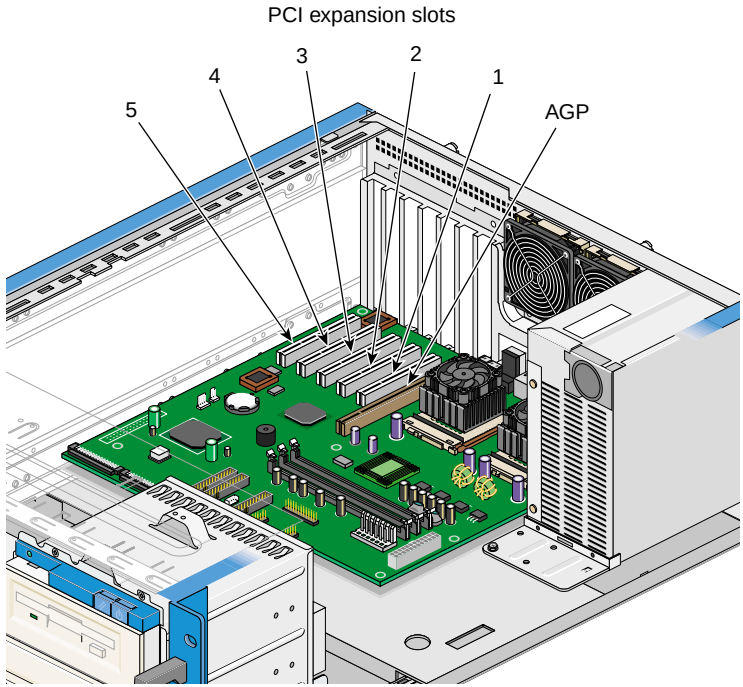

Figure 5-12 Expansion Slots

Note: In an SGI Graphics Cluster Series 12 node, do not remove or replace the graphics card that is in the AGP slot; do not remove the SGI ImageSync card. For these procedures, contact your service representative.

3. Remove the slot cover (metal bracket) for the empty expansion slot. Retain the screw for use with the new card.

Note: It is a good idea to retain slot covers in case cards must be removed and no new cards are inserted into the slots.

4. Unwrap the expansion card; do not touch the card's connector. Insert the card carefully and firmly into the slot. Make sure that the card is properly seated.
5. Secure the card to the housing with the screw from the slot cover.

Removing an Expansion Card

To remove an expansion card, follow these steps:

1. If you are removing a card but not inserting another in the slot, have ready a slot cover.

Caution: If a card is missing, a slot cover must be installed to minimize radiated emissions.

2. With the node's top panel off, attach a static wrist strap to a grounded connection on the system.
3. Remove the retaining screw for the expansion card you are removing.

Note: In an SGI Graphics Cluster Series 12 node, do not remove or replace the graphics card that is in the AGP slot; do not remove the SGI ImageSync card. For these procedures, contact your service representative.

4. Gently and evenly pull the card straight up and out of the slot.
5. If you are not installing another card in the empty slot, install a slot cover in the expansion slot opening, and screw it in.
6. Replace the top panel as shown in "Removing a Node Cover" on page 44.

When the system is turned on, the BIOS automatically detects and assigns resources to the new device.

Installing and Removing Memory Modules

The three 168-pin sockets on the motherboard support SDRAM registered ECC DIMMs. You can install 256-MB or 512-MB (single- or double-density) DIMMs for a maximum of 1 GB of system memory. Each DIMM socket is independent from the others; you can install DIMMs with different capacities to form different configurations.

Note: The SDRAM works at 3.3 volts only; 5-volt memory devices are not supported. This motherboard supports 100-MHz and 133-MHz SDRAM. However, they cannot be used at the same time in the system.

Warning: Using both 100-MHz and 133-MHz SDRAM together might cause your system to malfunction. For a qualified DIMM vendor list, please contact your SGI representative.

To install a DIMM, align it with an empty slot and press it in until the holding clips secure the DIMM in place, as shown in Figure 5-13.

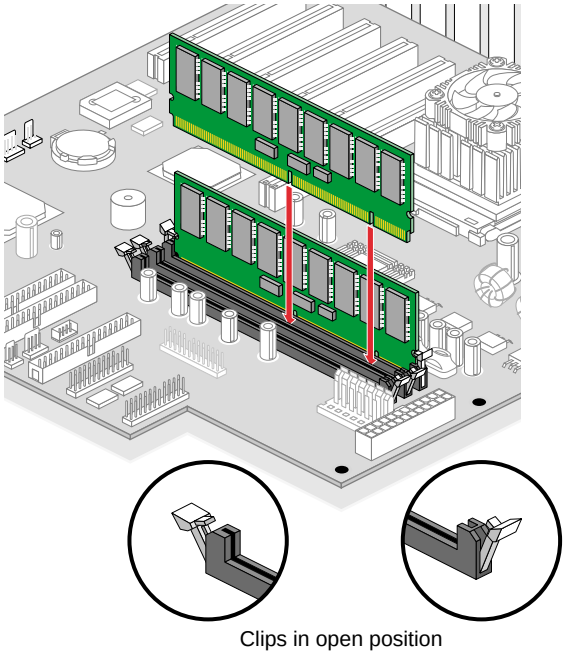

Figure 5-13 Installing a DIMM

Note: The DIMM socket is slotted to ensure proper installation. If you insert a DIMM but it does not completely fit, you may have inserted it the wrong way. Reverse the orientation of the DIMM.

To remove a DIMM, press the holding clips on both sides of the socket outward to release the DIMM, as shown in Figure 5-13. Place your fingertips on the top of the DIMM before you press the holding clips to gently disengage the DIMM from the socket.

The system automatically detects the amount of memory installed. For configuration information, consult a reference work on your cluster's operating system, as follows:

- *Linux in a Nutshell*, Ellen Siever, Stephen Spainhour, Jessica P. Hekman, and Stephen Figgins, third edition, O'Reilly & Associates, 2000, ISBN 0-596-00025-1
- *Windows NT in a Nutshell*, Eric Pearce, O'Reilly & Associates, 1997; ISBN 1-56592-251-4, or *Essential Windows NT System Administration*, second edition, AEleen Frisch, O'Reilly & Associates, 1998, ISBN 1-56592-274-3

Troubleshooting

This chapter consists of the following sections:

System Error Messages and Remedies

A system error message indicates a problem with the computer itself and normally appears during the power-on self-test (POST), before the operating system prompt appears. Table 6-1 lists the error messages alphabetically and indicates corrective actions.

Note: For instructions on using the BIOS, see "Changing BIOS Settings" on page 94.

Table 6-1 System Error Messages

Message	Action
`CMOS battery bad`	Replace the lithium battery or contact your service provider.
`CMOS checksum error`	Enter the BIOS. load the defaults, save the configuration, and exit.
`CPU BIOS update code mismatch`	Contact your service provider.

Table 6-1 (continued) System Error Messages

Message	Action
`Diskette drive controller error or not installed floppy disk controller error`	Check and connect both ends of the floppy drive cable.
`Diskette drive error`	Check the CMOS settings in the BIOS; check the floppy drive cable connections.
`Diskette drive A type mismatch floppy drive error`	Enter the BIOS and select the proper floppy drive type.
`Diskette drive B type mismatch floppy drive B error`	Enter the BIOS and select the proper floppy drive type.
`ECC facility fail`	SDRAM might be bad. Contact your service provider.
`Equipment configuration error`	Modify memory configuration. Contact your service provider.
`Expansion ROM allocation failed`	Contact your service provider.
`Hard disk controller error`	Enter the BIOS or check the hard disk cable connection.
`IRQ setting error`	Enter the BIOS to make sure that there are no IRQ device conflicts.
`I/O parity error`	Contact your service provider.
`I/O resource conflict(s)`	Check the serial and parallel ports to make sure that there are no IRQ and I/O address conflicts.
`I²C interface or device(s) error, system halt`	Shut down the system and disconnect the power cable, or contact your service provider.
`PS/2 keyboard error or no keyboard connected`	Check the keyboard connection to the master node.
`PS/2 keyboard interface error`	Replace the keyboard or contact your service provider.
`PS/2 pointing device error`	Check the pointing device (mouse) connection to the master node.
`PS/2 pointing device interface error`	Enter the BIOS and check the pointing device.
`Memory Error at: MMMM:SSSS:OOO (W:XXXX, R:YYYY) where: M: MB, S: segment, O: offset, X/Y: write/read pattern`	Contact your service provider.
`Memory resource conflict(s)`	Contact your service provider.

Table 6-1 (continued) System Error Messages

Message	Action
`Memory size mismatch CPU clock mismatch`	Check the memory size based on the system specifications. Enter the BIOS. load the defaults, save the configuration, and exit. If the message reappears, contact your service provider.
`NVRAM checksum error`	Contact your service provider.
`Onboard pointing device interface error`	Replace the pointing device or contact your service provider.
`Real time clock error`	Enter the BIOS and set the time and date.
`RAM parity error`	Contact your service provider.
`64K system management memory bad`	Contact your service provider.
`SMRAM not exist`	Contact your service provider.
`Press Esc to turn off NMI, any key to reboot`	Press **Esc** to disregard the NMI error. Press any other key to reboot the system. If this message appears repeatedly, contact your service provider.

As a general rule, an error message of `Press F1 to continue` is caused by a configuration problem (see "Changing BIOS Settings" on page 94) or by a loose cable (see "Checking Cabling" on page 94). An equipment malfunction is more likely to cause a fatal error, that is, complete system failure.

If you perform the corrective steps in Table 6-1 and still receive an error message, the cause may be an equipment malfunction. If you are sure that your configuration values are correct and your battery is in good condition, the problem may be a damaged or defective chip. In either case, contact an authorized service center for assistance.

Changing BIOS Settings

The BIOS utility allows you to view your system's configuration settings. The system is configured at the factory. You do not need to enter the BIOS when starting the computer unless you receive an error message.

The BIOS program loads configuration values into the battery-backed nonvolatile memory called CMOS RAM, a memory area that is not part of the system RAM. If you repeatedly receive error messages, the battery may be bad. In this case, the system cannot retain configuration values in CMOS. Ask a qualified technician for assistance.

To enter the BIOS, press **`Ctrl Alt Esc`** simultaneously to enter the BIOS setup menu.

Checking Cabling

On rare occasions, cables are damaged from frequent or careless uncabling and recabling operations. Make sure that the pins on the connector are not bent.

To check internal cabling, power off the node and remove the node cover by following all instructions in "Preparing a Node for Component Replacement or Addition" on page 37. Check that the internal cables are securely attached to the correct connectors.

Solving Disk Problems

If you cannot access a new disk, the disk may not be properly formatted. Consult a system administration guide for disk formatting instructions; see "System Administration References" on page 36.

Troubleshooting Video Problems (SGI Graphics Cluster Series 12)

If no video output is present on an attached monitor or other video peripheral, the external SGI ImageSync might be unseated or incorrect. Follow these steps:

1. At the back of the rack, check that the SGI ImageSync cable on the master node at the bottom of the rack is plugged into the **OUT** port on the master node SGI ImageSync card; see Figure 6-1.

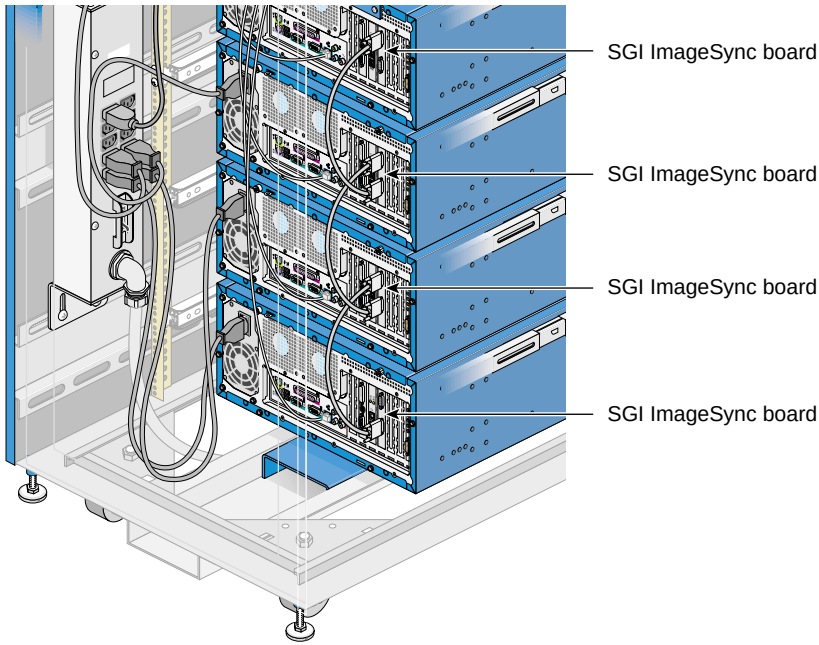

Figure 6-1 External SGI ImageSync Cable, SGI Graphics Cluster Series 12 System

2. Check that this cable is plugged into the **IN** port on the SGI ImageSync card on the next node (channel0); see Figure 6-1.
3. Check that the next SGI ImageSync cable connects the **OUT** port of the channel0 node with the **IN** port on the SGI ImageSync card on the next node up in the rack (channel1).
4. Continue checking the daisy-chaining for all SGI ImageSync cabling in the rack.
5. If the problem persists, call your service provider.

Troubleshooting Node Problems

This section explains node problems and suggests solutions.

- The `pconsole` program starts, claims to attach, and goes away.

  Check the network cable on the 10-Base-T or 100-Base-T Ethernet switch to ensure that the master channel is plugged in and active.

- When a node is powered on, it opens the CD-ROM tray

  The CD-ROM drive has a broken tray switch. Replace the CD-ROM drive.

- When a node is powered on, its screen remains blank and the splash screen is not displayed

  Press the reset switch on the node.

  If the node still maintains a blank screen, no sync is present. Power off the node, disconnect it, pull it out of the rack (see "Pulling a Node Out of the Rack" on page 39), and ensure that the graphics card is properly seated in the AGP slot.

Warning: Be sure to pull out the anti-tip shelf before you pull out a node. Failure to do so can result in the rack tipping over. Never pull out more than two nodes at a time.

  If the problem remains, call your service provider.

- When a node is powered on, it fails to come up and the power indicator is dim.

  Power off the node, disconnect it, and pull it out of the rack (see "Pulling a Node Out of the Rack" on page 39). Reseat the SGI ImageSync card.

  If the problem persists, verify that the floppy power cable is correctly connected and is not offset by one pin.

- During use, a monitor goes into standby mode.

  Remove the monitor cable and attach it to a different system. If the monitor comes back on, reattach the monitor cable to the original node. If the monitor remains on, replace the VGA cable; it may have a broken wire.

  If the problem persists, attach a different monitor and cable to the node to verify the problem. Reboot the node to see if the problem persists.

- When the node is powered on, no system disk is found.

  Power off the node, remove cables, pull out the anti-tip shelf, and pull out the affected node (see "Pulling a Node Out of the Rack" on page 39). Reseat the SCSI cable connector onto the hard drive.

Troubleshooting Sound Card Problems (SGI Graphics Cluster Series 12 Only)

For sound card problems, consult the manual for the SoundBlaster Live! Value sound card. You can download the manual for this card free from the manufacturer's web site, http://www.soundblaster.com.

This section explains sound card problems and suggests solutions.

- On a Linux system, the sound card does not function.

  Verify that the sound card's master and PCM channels are not muted and that gains are raised. See http://www.alsa-project.org for other troubleshooting advice.

- On a Windows NT system, the network on the master channel stops working.

  Ping the master node and other nodes. If the master node can ping itself but not other nodes, power off the node, disconnect it, pull it out of the rack (see "Pulling a Node Out of the Rack" on page 39), and remove the sound card.

Warning: Be sure to pull out the anti-tip shelf before you pull out a node. Failure to do so can result in the rack tipping over. Never pull out more than two nodes at a time.

  Reattach cables and boot up. Verify network functionality.

  If the problem persists, reinstall Windows NT; if the problem still persists, replace the sound card.

Technical Specifications

This appendix summarizes technical specifications for SGI Graphics Cluster systems, in these sections:

Rack Physical Specifications

Table A-1 shows the physical specifications for the SGI Graphics Cluster.

Table A-1 Rack Physical Specifications

Specification	Short Rack	Tall Rack
Height	Operating: 96.5 x 61 x 94 cm (38 x 24 x 37 in.); 20 U Shipping: 142 x 88.9 x 138.4 cm (56 x 35 x 54.5 in.)	Operating:180.3 x 61 x 94 cm (71 x 24 x 37 in.); 36 U Shipping: 142 x 88.9 x 198 cm (56 x 35 x 78 in.)
Weight	Operating maximum: 188 kg (414 lbs) Shipping maximum: 271 kg (598 lbs)	Operating maximum: 308.4 kg (680 lbs) Shipping maximum: 392 kg (864 lbs)
Temperature	Operating: +5 °C (+41 °F) to +35 °C (+95 °F) Nonoperating: -10 °C (+14 °F) to +60 °C (+149 °F)	Operating: +5 °C (+41 °F) to +35 °C (+95 °F) Nonoperating: -10 °C (+14 °F) to +60 °C (+149 °F)
Humidity	20% - 80% RH, noncondensing	20% - 80% RH, noncondensing
Shock	Operating: Two shocks at 68 in/sec (6-in. drop height), ten at 28 in./sec (1-in. drop) Shipping: 9-in. rotational edge drop, all four edges of pallet base	Operating: Two shocks at 68 in/sec (4-in. drop height), ten at 28 in./sec (1-in. drop) Shipping: 9-in. rotational edge drop, all four edges of pallet base

Table A-1 (continued) Rack Physical Specifications

Specification	Short Rack	Tall Rack
Vibration	Sine sweep 3-200-3 Hz, .50 G input at 1 oct/min. Dwell at 4 lowest resonant Hz for 15 min. each at .50 G (input) Random vibration: Operating: utilize ISTA truck/air 1.15 grams spectra in normal axis only Shipping: utilize ISTA truck/air 1.15 grams spectra in normal axis only for 1 min. fixtured, 30 min. unfixtured	Sine sweep 3-200-3 Hz, .50 G input at 1 oct/min. Dwell at 4 lowest resonant Hz for 15 min. each at .50 G (input) Random vibration: Operating: utilize ISTA truck/air 1.15 grams spectra in normal axis only Shipping: utilize ISTA truck/air 1.15 grams spectra in normal axis only for 1 min. fixtured, 30 min. unfixtured

Rack Power Consumption

The tall rack comes with a 220-V power distribution unit (PDU); the short rack comes with either a 120-V PDU or a 240-V PDU. The PDU is rated as shown in Table A-2.

Table A-2 AC Power Specifications for Fully Loaded Systems

Classification	120-V PDU in Short Rack, One Master, Three Channels	220-V PDU in Tall Rack, One Master, Seven Channels
Voltage	100-140 V; single-phase autoranging, 60 Hz	200-240 V; single-phase autoranging, 60 Hz
Current draw	7.1 A	6.01 A
Maximum power consumption	790 W	1305 W

Thermal Dissipation

Each node in the SGI Graphics Cluster has two system fans. Each processor in each node also has its own fan. The SGI Graphics Cluster Series 11 has one processor with a fan; the SGI Graphics Cluster Series 12 has two processors, each with a fan.

A fully configured SGI Graphics Cluster in a tall rack under maximum workload (1,305 W) can produce approximately 4,450 Btu/hour, requiring 0.3708 tons of cooling.

Air temperature measurements around the rack may vary.

Node Specifications

Table A-3 shows the physical environment specifications for a node in the SGI Graphics Cluster.

Table A-3 Node Physical Specifications

Specification	Value
System dimensions	Width: 42.9 cm (16.9 in.) Height: 17.3 cm (6.8 in.) Depth: 63.6 cm (25.05 in.) with bezel closed; 60.4 cm (23.8 in.) not counting bezel
Vibration	Operating: 0.38 mm (0.015 in.), 5-16.2 Hz; 0.2 G, 16.2-250 Hz Nonoperating: 0.6 G, 5-27.1 Hz; 0.4 mm (0.016 in.), 27.1-50 Hz; 2 G, 50-500 Hz
Weight	14.5 kg (32 lbs) (dual-CPU configuration)

Node Port Pinouts

This section contains port pinout information for the following node ports, in these sections:

Keyboard Port

An SGI Graphics Cluster node uses a standard PS/2 keyboard port, as shown in Figure A-1.

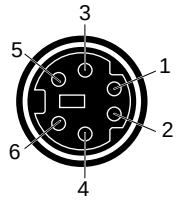

Figure A-1 Keyboard Port Pinout

Table A-4 shows the cable pinout assignments for the keyboard port.

Table A-4 Keyboard Port Pinout

Pin	Assignment
1	Keyboard Data
2	(Reserved)
3	Ground
4	Keyboard Power (+5V)
5	Keyboard Clock
6	(Reserved)

Mouse Port

An SGI Graphics Cluster node uses a standard PS/2 mouse port, as shown in Figure A-2.

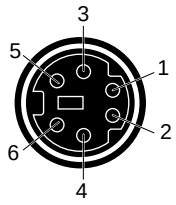

Figure A-2 Mouse Port Pinout

Table A-5 shows the cable pinout assignments for the mouse port.

Table A-5 Mouse Port Pinout

Pin	Assignment
1	Mouse Data
2	(Reserved)
3	Ground
4	Mouse Power (+5V)
5	Mouse Clock
6	(Reserved)

Video-out Ports

The graphics card in the SGI Graphics Cluster node supports a DB15 HD video port and a DVI-D port.

Figure A-3 shows the DB15 HD port.

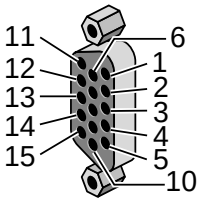

Figure A-3 DB15 HD Port Pinout

Table A-6 shows the port pinout assignments for the DB15 HD port.

Table A-6 DB15 HD Port Pinout

Pin	Assignment	Pin	Assignment
1	Red	9	No Connect
2	Green	10	Ground
3	Blue	11	Ground
4	Ground	12	IIC Data
5	Ground	13	Horizontal Sync
6	Red Return	14	Vertical Sync
7	Green Return	15	IIC Clock
8	Blue Return		

Table A-7 shows the cable pinout assignments for the DVI-D connector.

Table A-7 DVI-D Pinouts

Pin	Assignment	Pin	Assignment
1	T.M.D.S. Data2-	13	T.M.D.S. Data3+
2	T.M.D.S. Data2+	14	+5V Power
3	T.M.D.S. Data2/4 Shield	15	Ground (for +5V)
4	T.M.D.S. Data4-	16	Hot Plug Detect
5	T.M.D.S. Data4+	17	T.M.D.S. Data0-
6	DDC Clock	18	T.M.D.S. Data0+
7	DDC Data	19	T.M.D.S. Data0/5 Shield
8	Not connected	20	T.M.D.S. Data5-
9	T.M.D.S. Data1-	21	T.M.D.S. Data5+
10	T.M.D.S. Data1+	22	T.M.D.S. Clock Shield
11	T.M.D.S Data1/3 Shield	23	T.M.D.S. Clock+
12	T.M.D.S. Data3-	24	T.M.D.S. Clock-

Serial Ports

An SGI Graphics Cluster node serial port uses a standard PC-compatible pinout. The serial port supports data rates from 300 bits per second (bps) to 115.2 Kbps. Figure A-4 shows the serial port.

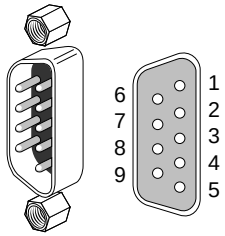

Figure A-4 Serial Port Pinout

Table A-8 shows cable pinout assignments for the serial ports.

Table A-8 Serial Port Pinout

Pin	Assignment	Description
1	DCD	Data Carrier Detect
2	RD	Receive Data
3	TD	Transmit Data
4	DTR	Data Terminal Ready
5	SG	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9	RI	Ring Indicator

Parallel Port

An SGI Graphics Cluster node uses a standard DB25 1284 EPC parallel port, as shown in Figure A-5.

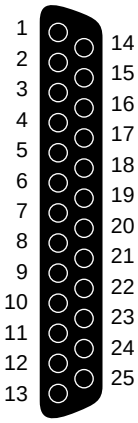

Figure A-5 Parallel Port Pinout

Table A-9 shows the cable pinout assignments for the parallel port.

Table A-9 Parallel Port Pinout

Pin	Assignment	Pin	Assignment	Pin	Assignment
1	Strobe	10	Ack	19	Ground
2	Data 0	11	Busy	20	Ground
3	Data 1	12	Error	21	Ground
4	Data 2	13	Select	22	Ground
5	Data 3	14	AutoFd	23	Ground
6	Data 4	15	Fault	24	Ground
7	Data 5	16	Init	25	Ground
8	Data 6	17	SelectIn		
9	Data 7	18	Ground		

Ethernet Port

An SGI Graphics Cluster node has an RJ45 port for 10-Base-T or 100-Base-TX twisted-pair Ethernet. The port autoselects the speed (10 Mbps or 100 Mbps) and type (half-duplex or full-duplex) at bootup, based on what it is connected to. Figure A-6 shows the Ethernet port.

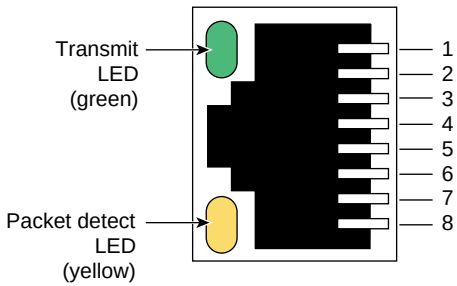

Figure A-6 Ethernet Port Pinouts

Table A-10 shows the cable pinout assignments for the Ethernet port.

Table A-10 Ethernet Port Pinout

Pin	Assignment
1	Transmit+
2	Transmit–
3	Receive+
4	(Reserved)
5	(Reserved)
6	Receive–
7	(Reserved)
8	(Reserved)

Audio Ports

The audio on the node motherboards is disabled in the SGI Graphics Cluster. The master node of the SGI Graphics Cluster Series 12 has a commercial audio card.

An SGI Graphics Cluster node uses a 3.5 mm mini jack stereo microphone port, an analog line-level audio input port, and an analog line-level audio output port.

For use with the audio card ports on the master node of an SGI Graphics Cluster Series12, SGI supports audio cables no longer than 3 meters. For uses requiring cables longer than 3 m, you can convert to balanced audio using an unbalanced-to-balanced converter such as Balance Buddy from Rane Corporation or FP-UBC2 from Radio Design Labs, or do active conversion to AES digital audio.

For port information for the sound card on the SGI Graphics Cluster Series12 master node, see the manufacturer's manual for the product, which is a SoundBlaster Live! Value sound card. You can download the manual for this card free from the manufacturer's web site, http://www.soundblaster.com.

Table A-11 shows the port pinout information for the mic-in, line-in, and line-out ports.

Table A-11 Mic-in, Line-in, Line-Out Port Pinouts

Connector	Tip	Ring	Sleeve
Mic-in	L	R	Ground
Line-in	L	R	Ground
Line-out	L	R	Ground

Figure A-7 shows the mic-in port.

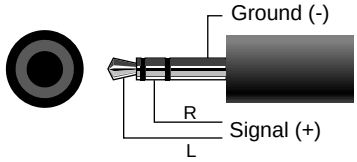

Figure A-7 Mic-in Port

Figure A-8 shows the line level port.

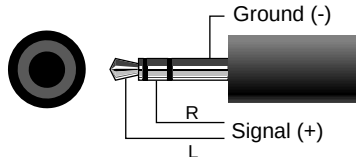

Figure A-8 Line Level Port

Regulatory Information

This appendix contains regulatory information for the SGI Graphics Cluster in the following sections:

Manufacturer's Regulatory Declarations

The SGI Graphics Cluster products conform to several national and international specifications and European Directives listed on the "Manufacturer's Declaration of Conformity." The CE insignia displayed on each device is an indication of conformity to the European requirements.

Caution: Each SGI Graphics Cluster system has several governmental and third-party approvals, licenses, and permits. Do not modify this product in any way that is not expressly approved by SGI. If you do, you may lose these approvals and your governmental agency authority to operate this device.

System Model Number

The CMN (model) number for each SGI Graphics Cluster rack is shown on a label on the rack chassis.

CE Notice and Manufacturer's Declaration of Conformity

The “CE” symbol indicates compliance of the device to directives of the European Community. A “Declaration of Conformity” in accordance with the standards has been made and is available from SGI upon request.

Electromagnetic Emissions

This section includes electromagnetic emissions statements.

FCC Notice (USA Only)

This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by using one or more of the following methods:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

Caution: Changes or modifications to the equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Industry Canada Notice (Canada Only)

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique német pas de perturbations radioélectriques dépassant les normes applicables aux appareils numériques de Classe A préscrites dans le Règlement sur les interferences radioélectriques établi par le Ministère des Communications du Canada.

VCCI Notice (Japan Only)

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Shielded Cables

The SGI Graphics Cluster is FCC-compliant under test conditions that include the use of shielded cables. Your cluster and any peripherals you purchase from SGI have shielded cables. Shielded cables reduce the possibility of interference with radio, television, and other devices. If you use any cables that are not from SGI, ensure that they are shielded. Telephone cables do not need to be shielded. Twisted-pair Ethernet cables are not shielded.

Monitor cables supplied with your system use additional filtering molded into the cable jacket to reduce radio frequency interference. Always use the cable supplied with your system. If your monitor cable becomes damaged, obtain a replacement cable from SGI.

Electrostatic Discharge

SGI designs and tests its products to be immune to the effects of electrostatic discharge (ESD). ESD is a source of electromagnetic interference and can cause problems ranging from data errors and lockups to permanent component damage.

It is important that you keep all the covers and doors, including the plastics, in place while you are operating the system. The shielded cables that came with the SGI Graphics Cluster and its peripherals should be installed correctly, with all thumbscrews fastened securely.

An ESD wrist strap may be included with some products, such as memory or PCI upgrades. Use the wrist strap when installing these upgrades to prevent the flow of static electricity; it should protect your system from ESD damage.

Laser Compliance Statements

The CD-ROM drive in this computer is a Class 1 laser product. The CD-ROM drive's classification label is located on the drive.

Warning: Invisible laser radiation when open. Avoid exposure to beam.

Warning: Attention: Radiation du faisceau laser invisible en cas d'ouverture. Evitter toute exposition aux rayons.

Warning: Vorsicht: Unsichtbare Laserstrahlung, Wenn Abdeckung geöffnet, nicht dem Strahl aussetzen.

Warning: **Advertencia: Radiación láser invisible al ser abierto. Evite exponerse a los rayos.**

Warning: **Advarsel: Laserstråling vedåbning se ikke ind i strålen**

Warning: **Varo! Lavattaessa Olet Alttina Lasersåteilylle**

Warning: **Varning: Laserstrålning når denna del år öppnad ålå tuijota såteeseenstirra ej in i strålen.**

Warning: **Varning: Laserstrålning nar denna del år öppnadstirra ej in i strålen.**

Warning: **Advarsel: Laserstråling nar deksel åpnesstirr ikke inn i strålen.**

Lithium Battery Statements

The motherboard in each node contains a lithium battery.

Warning: **Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.**

Warning: **Advarsel!: Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Léver det brugte batteri tilbage til leverandøren.**

Warning: **Advarsel: Eksplosjonsfare ved feilaktig skifte av batteri. Benytt samme batteritype eller en tilsvarende type anbefalt av apparatfabrikanten. Brukte batterier kasseres i henhold til fabrikantens instruksjoner.**

Warning: **Varning: Explosionsfara vid felaktigt batteribyte. Anvãnd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera anvãnt batteri enligt fabrikantens instruktion.**

Warning: **Varoitus: Päristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.**

Warning: **Vorsicht!: Explosionsgefahr bei unsachgemäßen Austausch der Batterie. Ersatz nur durch denselben oder einen vom Hersteller empfohlenem ähnlichen Typ. Entsorgung gebrauchter Batterien nach Angaben des Herstellers.**

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