

# SGI® Prism™ XL System Hardware User's Guide

Document Number 007-5707-001

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## Record of Revision

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# About This Guide

This guide provides an overview of the architecture, general operation and descriptions of the major components that compose the SGI® Prism XL systems. It also provides the standard procedures for powering on and powering off the system, basic troubleshooting information, and important safety and regulatory specifications.

## Audience

This guide is written for owners, system administrators, and users of SGI Prism XL computer systems.

It is written with the assumption that the reader has a good working knowledge of computer hardware and computer systems.

## Important Information



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**Warning:** To avoid problems that could void your warranty, your SGI or other approved system support engineer (SSE) should perform all the setup, addition, or replacement of parts, cabling, and service of your SGI Prism XL system, with the exception of the following items that you can perform yourself:

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- Using your system console or network access workstation to enter commands and perform system functions such as powering on and powering off, as described in this guide.
- Adding or replacing full-height and half-height PCIe cards in the dual-node “stick” enclosures or 2U head node.
- Removing and replacing the stick enclosure power supply.
- Adding and replacing disk drives in the 2U head node or optional storage modules used with your system and using the ESI/ops panel (operating panel) on optional mass storage.

## Chapter Descriptions

The following topics are covered in this guide:

- Chapter 1, “Startup and Operation Procedures,” provides instructions for powering on and powering off your system.
- Chapter 2, “Prism XL System Interconnect Overview,” describes the function of the chassis management controllers (CMC) and provides overview instructions for operating the controllers.
- Chapter 3, “System Overview,” provides environmental and technical information needed to properly set up and configure the blade systems.
- Chapter 4, “Rack Information,” describes the system’s rack features.
- Chapter 5, “Prism XL Head Node Server” describes all the controls, connectors and LEDs located on the front and rear of the stand-alone “head” nodes. An general description of the server functions is also provided.
- Chapter 6, “Basic Troubleshooting,” provides recommended actions if problems occur on your system.
- Appendix A, “Technical Specifications and Pinouts,” provides physical, environmental, and power specifications for your system. Also included are the pinouts for the non-proprietary connectors.
- Appendix B, “Safety Information and Regulatory Specifications,” lists regulatory information related to use of the blade cluster system in the United States and other countries. It also provides a list of safety instructions to follow when installing, operating, or servicing the product.

## Related Publications

The following documents are relevant to and can be used with the SGI Prism XL series of computer systems:

- *SGI Rackable H2106-G7 System User's Guide*, (P/N 007-5683-00x)

This guide covers general operation, configuration, and servicing of the 2U H2106-G7 head node(s) used in the SGI Prism XL systems. This 2U head node is a four-processor single-serverboard system based on the AMD® Opteron™ 6100 series processors. The head node uses up to six hard disk drives and can hold up to 32 memory DIMMs.

- *SGI Management Center Quick Start Guide*  
(P/N 007-5672-00x)

This document may be helpful to users or administrators of SGI systems using the SGI Management Center interface. The guide provides introductory information on configuration, operation and monitoring of your system using the management center software.

- *SGI Management Center System Administrator's Guide*  
(P/N 007-5642-00x)

This guide is intended for system administrators who work with the SGI Management Center software GUI to manage and control SGI systems. Depending on your system configuration and implementation, this guide may be helpful to other system users. The manual is written with the assumption the user has a good working knowledge of Linux.

- Man pages (online)

Man pages locate and print the titled entries from the online reference manuals.

You can obtain SGI documentation, release notes, or man pages in the following ways:

- See the SGI Technical Publications Library at <http://docs.sgi.com>. Various formats are available. This library contains the most recent and most comprehensive set of online books, release notes, man pages, and other information.
- RHEL documentation is available at:  
<https://www.redhat.com/docs/manuals/enterprise/>
- The release notes, which contain the latest information about software and documentation in this release, are in a file named README.SGI in the root directory of the SGI ProPack for Linux Documentation CD.
- You can also view man pages by typing **man <title>** on a command line.

SGI systems include a set of Linux man pages, formatted in the standard UNIX “man page” style. Important system configuration files and commands are documented on man pages. These are found online on the internal system disk (or DVD) and are displayed using the `man` command. For example, to display a man page, type the request on a command line:

**`man commandx`**

References in the documentation to these pages include the name of the command and the section number in which the command is found. For additional information about displaying man pages using the `man` command, see `man(1)`. In addition, the `apropos` command locates man pages based on keywords. For example, to display a list of man pages that describe disks, type the following on a command line:

**`apropos disk`**

For information about setting up and using `apropos`, see `apropos(1)`.



## Conventions

The following conventions are used throughout this document:

<b>Convention</b>	<b>Meaning</b>
Command	This fixed-space font denotes literal items such as commands, files, routines, path names, signals, messages, and programming language structures.
<i>variable</i>	The italic typeface denotes variable entries and words or concepts being defined. Italic typeface is also used for book titles.
<b>user input</b>	This bold fixed-space font denotes literal items that the user enters in interactive sessions. Output is shown in nonbold, fixed-space font.
[ ]	Brackets enclose optional portions of a command or directive line.
...	Ellipses indicate that a preceding element can be repeated.
man page(x)	Man page section identifiers appear in parentheses after man page names.
<b>GUI element</b>	This font denotes the names of graphical user interface (GUI) elements such as windows, screens, dialog boxes, menus, toolbars, icons, buttons, boxes, fields, and lists.

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- Send mail to the following address:

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46600 Landing Parkway  
Freemont, California 94538

SGI values your comments and will respond to them promptly.

# Startup and Operation Procedures

This chapter explains how to operate your new system in the following sections:

- “Precautions” on page 1
- “Console Connections” on page 3
- “Powering the System On and Off” on page 4
- “Monitoring Your Server” on page 9

## Precautions

Before operating your system, familiarize yourself with the safety information in the following sections:

- “ESD Precaution” on page 1
- “Safety Precautions” on page 2

## ESD Precaution

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**Caution:** Observe all ESD precautions. Failure to do so can result in damage to the equipment.

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Wear an SGI-approved wrist strap when you handle an ESD-sensitive device to eliminate possible ESD damage to equipment. Connect the wrist strap cord directly to earth ground.

## Safety Precautions



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**Warning:** Before operating or servicing any part of this product, read the “Safety Information” on page 61.

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**Danger:** Keep fingers and conductive tools away from high-voltage areas. Failure to follow these precautions will result in serious injury or death. The high-voltage areas of the system are indicated with high-voltage warning labels.

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**Caution:** Power off the system only after the system software has been shut down in an orderly manner. If you power off the system before you halt the operating system, data may be corrupted.

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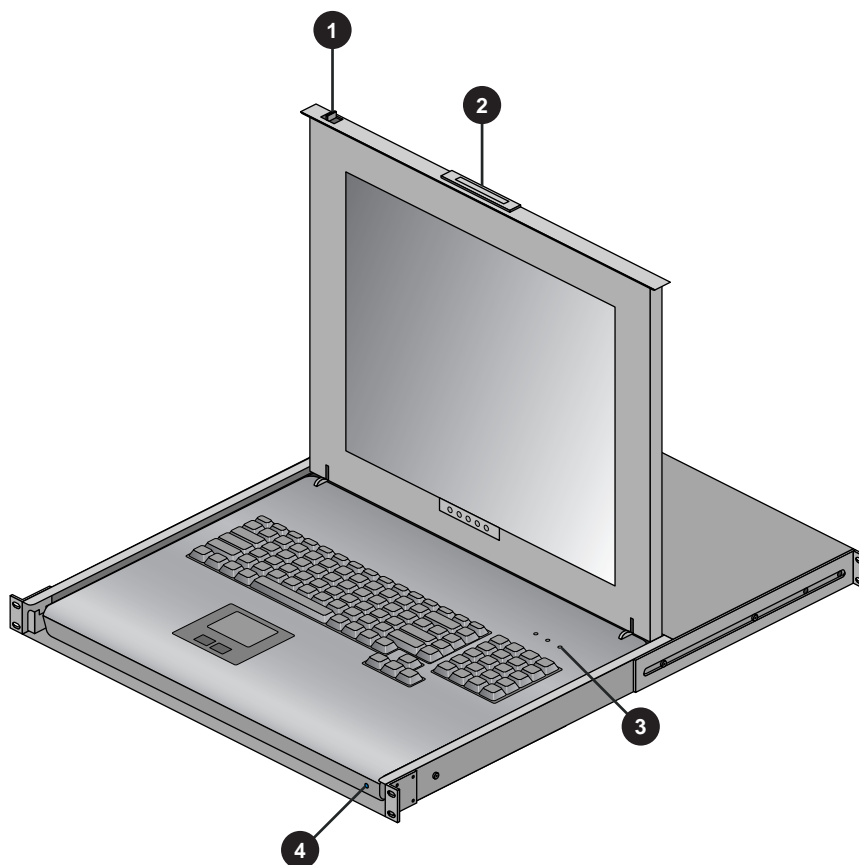
**Warning:** If a lithium battery is installed in your system as a soldered part, only qualified SGI service personnel should replace this lithium battery. For a battery of another type, replace it only with the same type or an equivalent type recommended by the battery manufacturer, or an explosion could occur. Discard used batteries according to the manufacturer’s instructions.

---

## Console Connections

The flat panel console option (see Figure 1-1) has the following listed features:

1. **Slide Release** - Move this tab sideways to slide the console out. It locks the drawer closed when the console is not in use and prevents it from accidentally sliding open.
2. **Handle** - Used to push and pull the module in and out of the rack.
3. **LCD Display Controls** - The LCD controls include On/Off buttons and buttons to control the position and picture settings of the LCD display.
4. **Power LED** - Illuminates blue when the unit is receiving power.

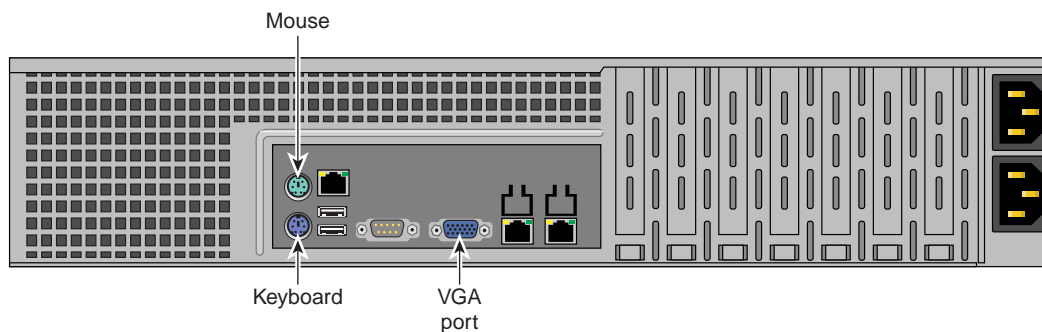


**Figure 1-1** Flat Panel Rackmount Console Option

A console is defined as a connection to the system (to the head node) that provides administrative access to the cluster. SGI offers a rackmounted flat panel console option that attaches to the administrative node's video, keyboard and mouse connectors.

A console can also be a LAN-attached personal computer, laptop or workstation (RJ45 Ethernet connection). Serial-over-LAN is enabled by default on the head node server and normal output through the RS-232 port is disabled. In certain limited cases, a dumb (RS-232) terminal could be used to communicate directly with the administrative server. This connection is typically used for service purposes or for system console access in smaller systems, or where an external ethernet connection is not used or available. Check with your service representative if use of an RS-232 terminal is required for your system.

The flat panel rackmount or other optional VGA console connects to the head node's video and keyboard/mouse connectors as shown in the example in Figure 1-2.



**Figure 1-2** Head Node Video Console Connection Example

## Powering the System On and Off

This section explains how to power on and power off the Prism XL system, as follows:

- “Preparing to Power On” on page 5
- “Powering-On and Off From the SGI Management Center Interface” on page 8

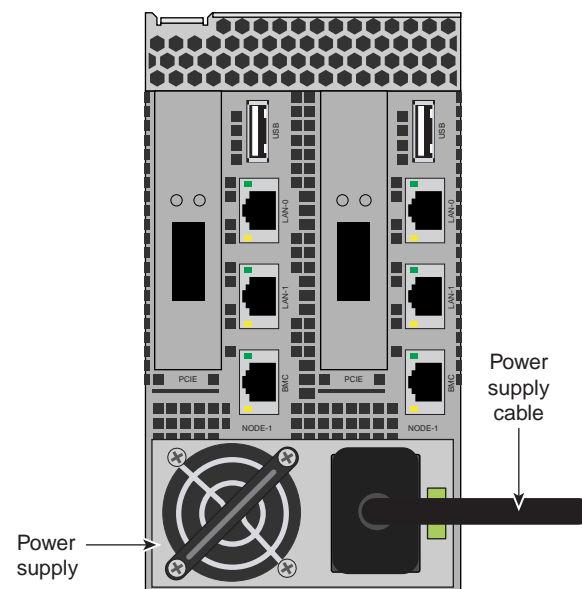
Entering commands from a system console, you can power on and power off individual compute enclosures (known as sticks), or the entire system.

When using the SGI cluster manager software, you can monitor and manage your server from a remote location.

## Preparing to Power On

To prepare to power on your system, follow these steps:

1. Check to ensure that the cabling between the rack's power distribution units (PDUs) and the wall power-plug receptacles are secure at both ends.
2. For each individual stick that you want to power on, make sure that the power cables are plugged into all the stick power supplies correctly, see the example in Figure 1-3. Setting the circuit breakers on the PDUs to the "On" position will apply power to the stick. Note that each stick stays powered on as long as there is power coming into the unit. Turn off the PDU breaker switch that supplies voltage to the stick and/or remove the power supply cable if you want to remove all power from the unit.



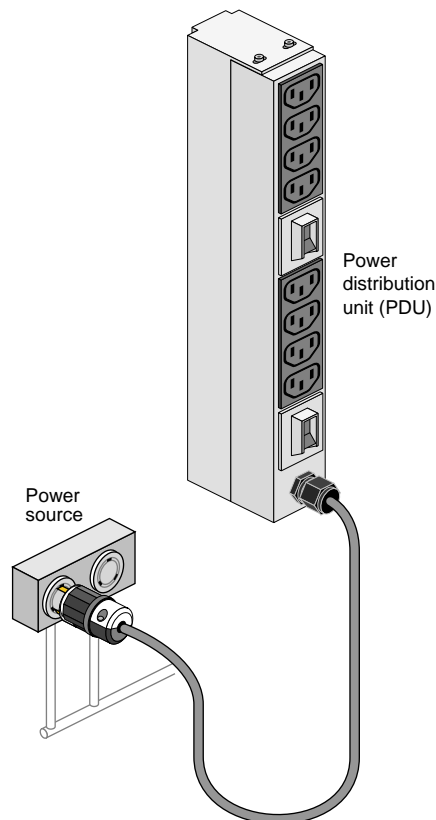
**Figure 1-3** Compute Stick Power Supply Cable Location Example

3. If you plan to power on a system that includes optional mass storage enclosures, make sure that the power switch on the rear of each PSU/cooling module (one or two per enclosure) is in the **1** (on) position.
4. Make sure that all PDU circuit breaker switches (see the examples in Figure 1-4, and Figure 1-5 on page 7) are turned on to provide power when the system is booted up.

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**Note:** Certain PDU models have multiple circuit breaker switches; ensure that each switch on the PDU that has power cables connected is set to “On” or “Off” as required.

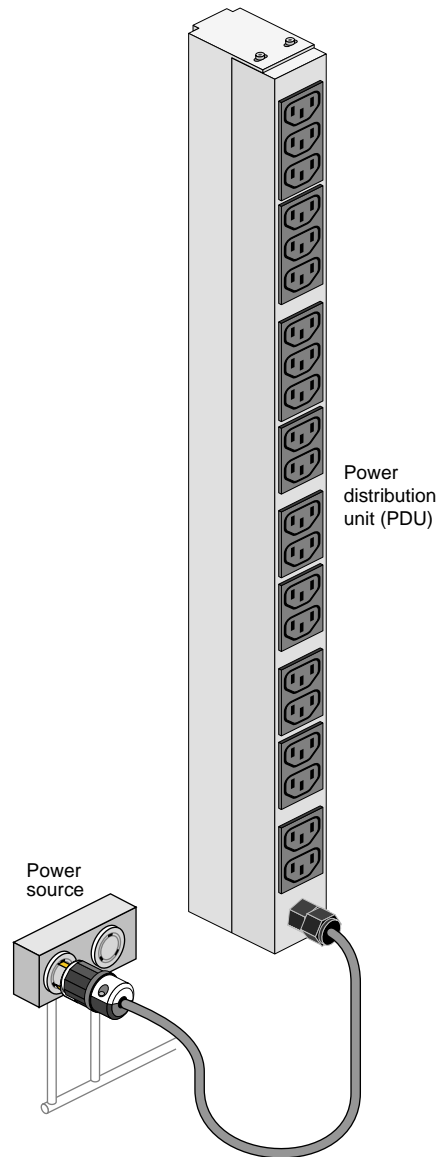
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**Figure 1-4** Eight-Outlet Single-Phase PDU Example

Figure 1-5 on page 7 shows an example of the three-phase PDU.





**Figure 1-5** Three-Phase PDU Example

## Powering-On and Off From the SGI Management Center Interface

The power-on and off procedure varies with your system setup. See the *SGI Management Center Quick Start Guide* (P/N 007-5672-00x) if you need help working with SGI Management Center.

The SGI Management Center interface (GUI) is a cluster server monitoring and management system. The SGI Management Center provides status metrics on operational aspects for each node (slice) in a system. The interface can also be customized to meet the specific needs of individual systems.

Commands issued from the SGI Management Center interface are typically sent to all connected slices (compute nodes) in the system (up to a maximum 126) depending on set parameters. SGI Management Center services are started and stopped from scripts that exist in */etc/init.d*

SGI Management Center, is commonly installed in */opt/sgi/sgimc*, and is controlled by one of these services—this allows you to manage SGI Management Center services using standard Linux tools such as `chkconfig` and `service`.

If your SGI Management Center interface is not already running, or you are bringing it up for the first time, use the following steps:

1. Power on the server (head node) running the SGI Management Center interface.
2. Open an ssh or other terminal session command line console to the head node server using a remote workstation or local VGA terminal.
3. Use the information in the section “Preparing to Power On” on page 5 to ensure that all sticks and any optional system components are supplied with power and ready for bring up.
4. Log in to the head node server as `root` (the default password is **sgisgi**).
5. On the command line, enter `mgrclient` and press **Enter**.  
The SGI Management Center Login dialog box is displayed.
6. Enter a user name (`root` by default) and password (`root` by default) and click **OK**.  
The SGI Management Center interface is displayed.
7. The power on (green button) and power off (red button) are located in the middle of the SGI Management Center GUI’s Tool Bar - icons which provide quick access to common tasks and features.

See the *SGI Management Center System Administrator’s Guide* (P/N 007-5642-00x) for a complete description of system commands.

## Monitoring Your Server

You can monitor your Prism XL cluster from the following sources:

- An optional flat panel rackmounted monitor with PS2 keyboard/mouse can be connected to the “head” server node for basic monitoring and administration of the system. See the section “Console Connections” on page 3 for more information.
- You can attach an optional LAN-connected console via secure shell (ssh) to an Ethernet port adapter on the head node. You will need to connect either a local or remote workstation/PC to the IP address of the head node server to access and monitor the system via IPMI.

See the Console Management section in the *SGI Tempo System Administrator's Guide*, (P/N 007-4993-00x) for more information on the open source console management package.

These console connections enable you to view the status and error messages generated by your Prism XL cluster system. You can also use these consoles to input commands to manage and monitor your system.

---

**Note:** Each system uses a variable number of Ethernet and/or InfiniBand switches to support the number of sticks used and the type of interconnect topology required.

---



## Prism XL System Interconnect Overview

This chapter describes the interaction and functions of system interconnect components in the following sections:

- “Cluster Interconnect Overview” on page 11
- “Interconnect Switch Features” on page 14
- “Using the 1U Console Option” on page 17

### Cluster Interconnect Overview

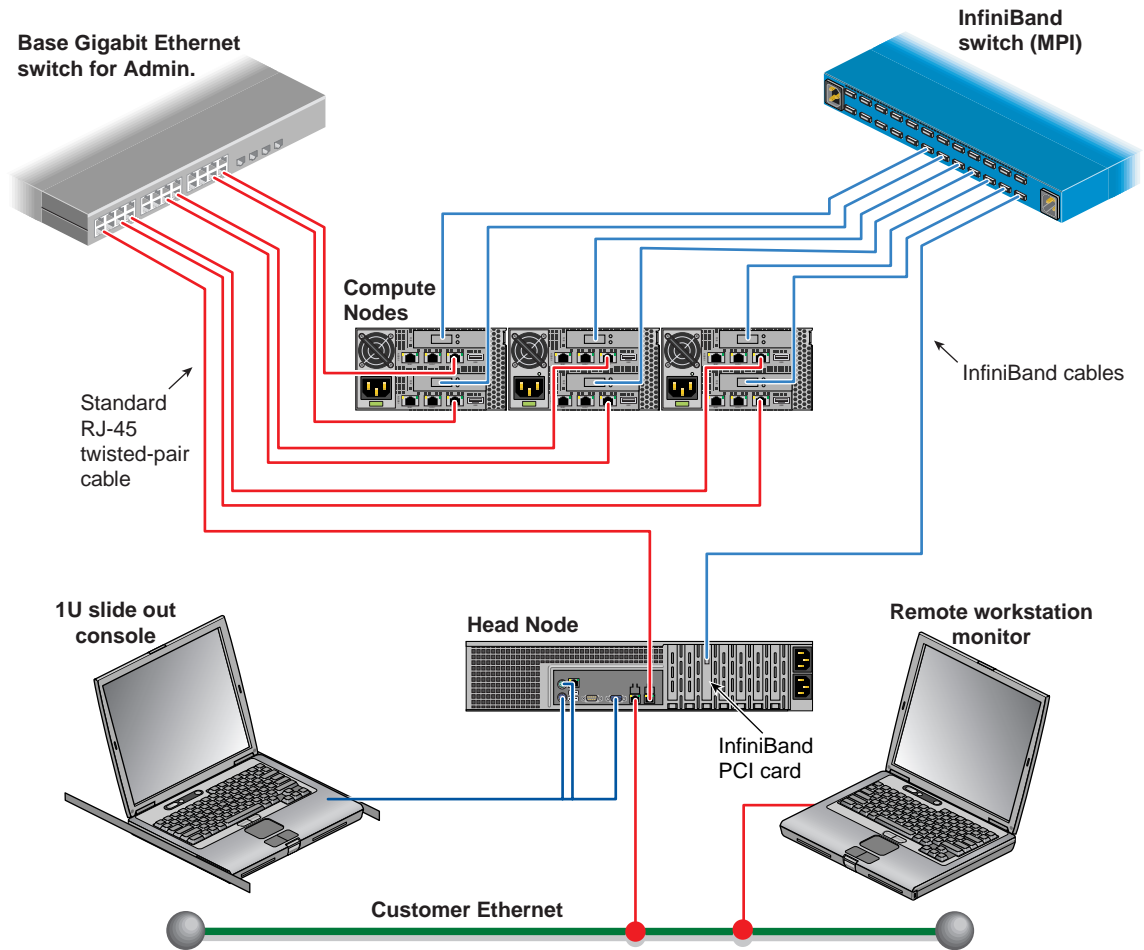
Each SGI Prism XL cluster system is comprised of three primary hardware components:

- The STIX architecture (self-contained compute nodes with PCIe accelerators)
- Head node running the SGI Management Center and acceleration environment software
- Interconnect network fabric (consisting of InfiniBand and Gigabit Ethernet switches)

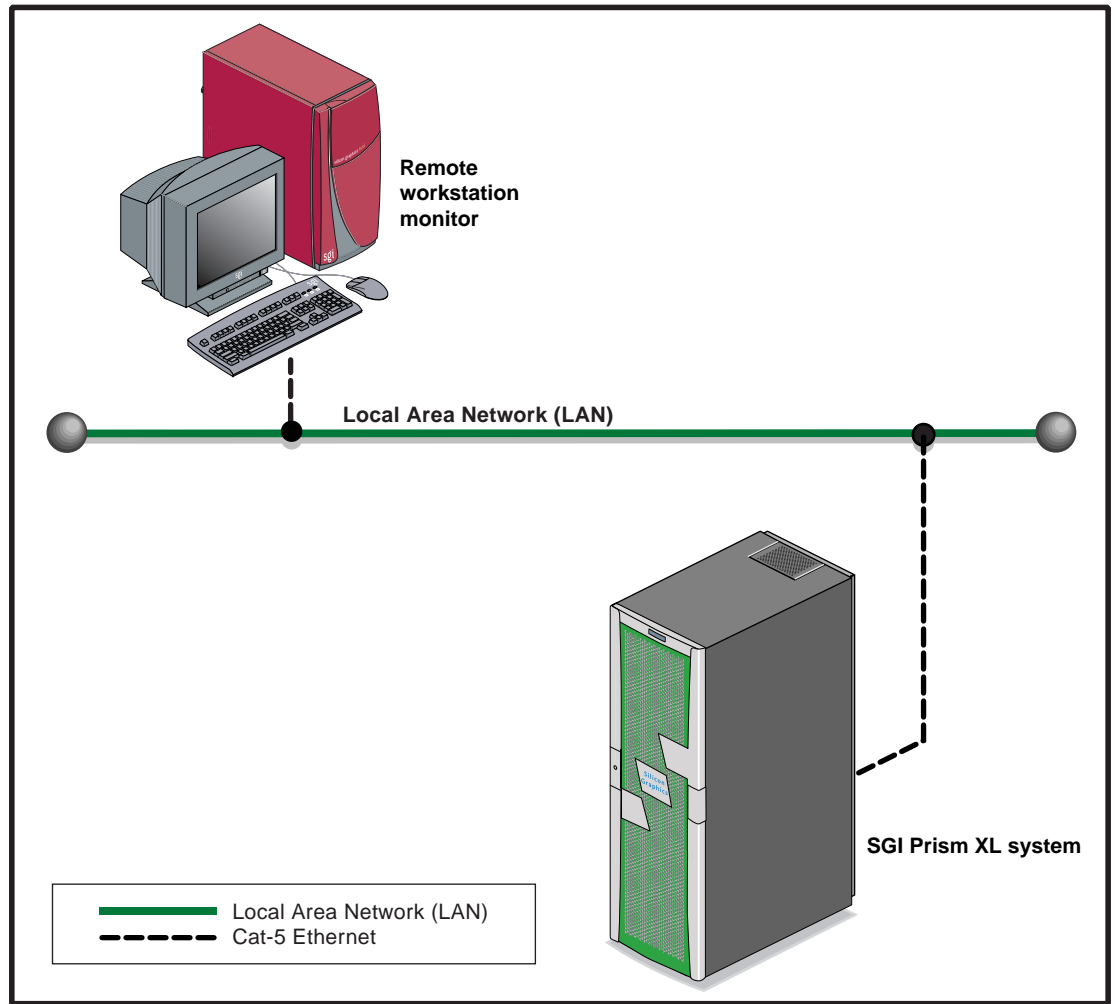
The “sticks” are the identical self-contained computing systems that run the primary processes and applications. These compute nodes are connected to each other and to the head node server through the interconnect network, consisting of Ethernet and InfiniBand switches; see Figure 2-1 on page 12 for an example. Messages and instructions are passed across this network between the processes.

The system interconnect network does not connect to the “outside world” because mixing external and cluster internal network traffic could impact application performance. The head node is connected to the interconnect network and also to the “outside world”, typically the local area network (LAN), see Figure 2-2 on page 13 for an example.

See the *SGI Management Center Quick Start Guide* (P/N 007-5672-00x) for an introduction to cluster software available to manage the Prism XL.



**Figure 2-1** Prism XL System Switch Interconnect Example



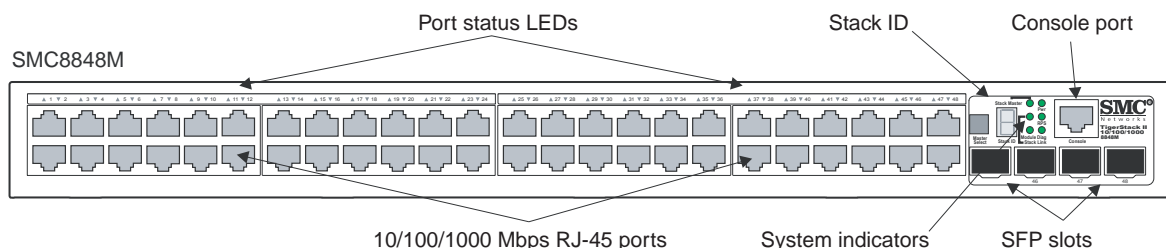
**Figure 2-2** System Network Access Example

## Interconnect Switch Features

The SGI Prism XL acceleration cluster uses both Gigabit Ethernet and InfiniBand switches as interconnect fabric. Figure 2-3 shows an example Gigabit Ethernet switch.

### Ethernet Switch Overview

The Gigabit aggregate switch provides cost-effective, gigabit ethernet switching for bandwidth-intensive networks that require advanced switching features. The Prism XL switches employ a wire-speed, non-blocking switching fabric. This permits simultaneous wire-speed transport of multiple packets at low latency on all ports. The switches also feature full-duplex capability on all ports.



**Figure 2-3** Prism XL Administrative Gigabit Ethernet Switch Example

### Web or Telnet Access to Maintenance Port on the Gigabit Ethernet Switch

Your switch setup is configured in the factory before shipment and should be accessible via telnet or a web browser. The switch can be a single switch or a stacked primary/secondary combination. You can connect to a console directly from the head node through the administration network using telnet.

To access the switch via telnet: **telnet 10.0.20.1**

Login as the administrator: login **admin** passwd: **admin**

Web access would be: <http://10.0.20.1>



## Web or Telnet Access to the Compute-Traffic Gigabit Ethernet Switch

The Gigabit Ethernet switch is configured with the IP address shown below when used with a NAS option or message passing interface (MPI) traffic. The switch can be a single switch or a stacked primary/secondary combination.

To access the switch via telnet: **telnet 172.16.20.1**

Login as the administrator: login **admin** passwd: **admin**

Web access would be: <http://172.16.20.1>

## Serial Access to the Ethernet Switch

Use of a serial interface to the switch should only be needed if the factory assigned IP address for the switch has been somehow deleted, altered or corrupted. Otherwise, use of the web or telnet access procedure is recommended. To use a serial interface with the switch, connect a laptop, or PC to the switch's console port. Locate the console port on the switch and use the steps that follow for access.

1. Establish a command line interface (CLI) and list the port connection settings:

Port Settings

Bits Per Second=19200

Data bits=8

Parity=None

Stop Bits=1

Flow Control=none

2. In order to verify and save any new settings type the following:

```
console# show running-config (make sure your settings are intact)
```

```
console# copy running-config startup-config (it will ask for a file name)
```

```
console# file name? startup
```

---

**Note:** Any changes made to the switch port settings through the serial interface or Web interface are **not** saved unless the previous steps have been executed.

---

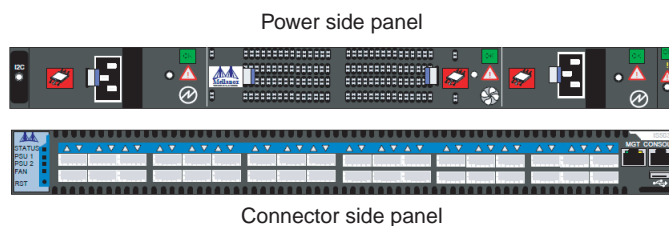
3. You can power-cycle the switch by disconnecting and reconnecting its power cable.

## InfiniBand Switch Overview

The 36-port InfiniBand switch systems provide a very high performing fabric solution by delivering high bandwidth and low latency to the Prism XL cluster. The systems can carry converged InfiniBand network data traffic with the combination of assured bandwidth and granular quality of service. The Prism XL switch systems provide up to 40Gb/s full bidirectional bandwidth per port. When combined with 36 ports, these system switches provide one of the densest switching fabric systems available for medium to large size clusters.

The switch comes pre-installed with all necessary firmware and is configured for standard operation within an InfiniBand fabric. This switch requires an InfiniBand compliant Subnet Manager running on the host as the standard SGI configuration.

Figure 2-4 shows the power side panel and connector side panel views of the 36-port InfiniBand switch. The top view shows port configurations for the switch systems, the dual hot-swap power supplies, and hot-swap fan module. The lower (connector side) view shows the Ethernet RJ45 connector, RJ45 connector for connecting to a host PC, USB connector, and various status LEDs. Note that unmanaged switches have an I2C RJ45 connector.



**Figure 2-4** InfiniBand Switch Example Front and Rear Views

The Connector side of each switch has 36 IB ports. These are placed in two rows, 18 ports to a row, see Figure 2-5 for an example of the port numbering. Note that the bottom row ports are “flipped” from the top row. This means the bottom row connectors plug in opposite to the top row port orientation.

1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35
2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36

**Figure 2-5** InfiniBand Switch Port Numbering

## InfiniBand Switch Connect and IP Address

The following subsection lists the factory IP address settings for your InfiniBand switch or switch “stack” used with the cluster.

### Web or Telnet Access to the InfiniBand Switch

Your InfiniBand switch setup is configured in the factory before shipment and should be accessible via telnet or a web browser. Note that an unmanaged switch is accessible only with use of an I2C adapter cable and should only be accessed by a trained administrator.

---

**Note:** There might be only one managed InfiniBand switch when multiple InfiniBand switches are used in multi-rack configurations.

---

To access the managed InfiniBand switch via telnet: **telnet 10.0.21.1**

Login as the administrator: login **admin** passwd: **123456**

Web access would be: <http://10.0.21.1>

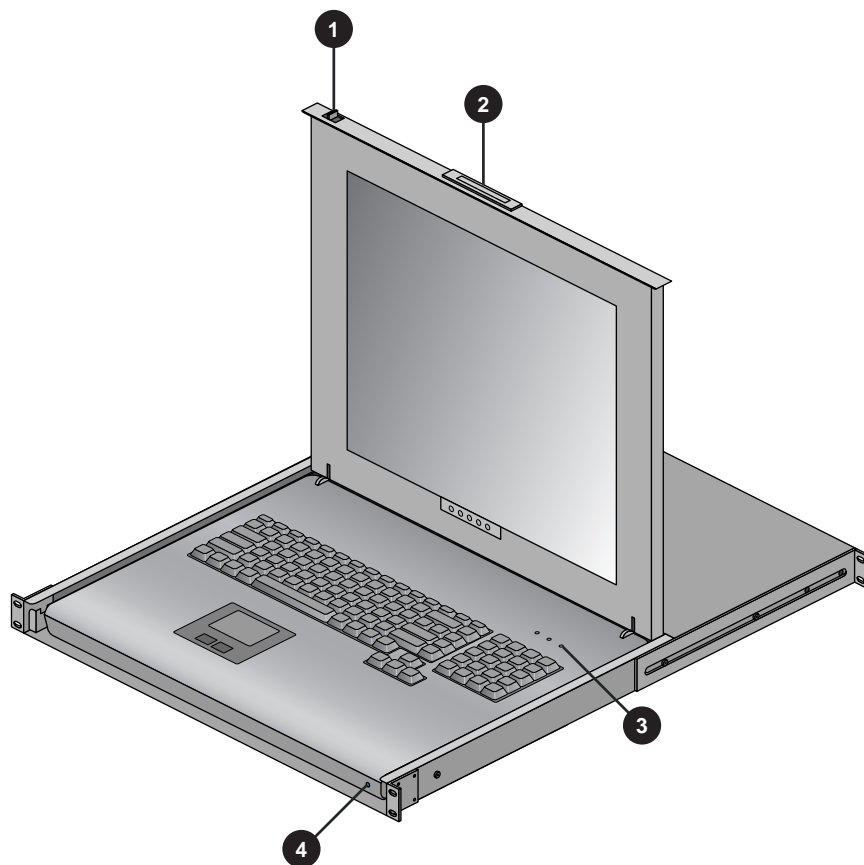
`javaws` (java Webstart) is required for use of the InfiniBand fabric GUI.

## Using the 1U Console Option

The SGI optional 1U console is a rackmountable unit that includes a built-in keyboard/touchpad, and uses a 17-inch (43-cm) LCD flat panel display of up to 1280 x 1024 pixels. The 1U console attaches to the head node server using PS/2 and HD15M connectors (see Figure 1-2 on page 4) or to an optional KVM switch (not provided by SGI). The 1U console is basically a “dumb” VGA terminal, it cannot be used as a workstation or loaded with any system administration program. See the section “Console Connections” on page 3 for more information on using the 1U console.

The 27-pound (12.27-kg) console automatically goes into sleep mode when the cover is closed.

The flat panel console (see Figure 2-6 on page 18) has the features listed below the figure.



**Figure 2-6** Optional 1U System Console

1. **Slide Release** - Move this tab sideways to slide the console out. It locks the drawer closed when the console is not in use and prevents it from accidentally sliding open.
2. **Handle** - Used to push and pull the module in and out of the rack.
3. **LCD Display Controls** - The LCD controls include On/Off buttons and buttons to control the position and picture settings of the LCD display.
4. **Power LED** - Illuminates blue when the unit is receiving power.

## System Overview

This chapter provides an overview of the physical and architectural aspects of your SGI Prism XL accelerator-enabled cluster. The system is built around SGI's new STIX Architecture allowing an accelerator-agnostic, power-efficient cluster server infrastructure in a small-footprint rack.

The Prism XL system is built on a network-connected group of “sticks” (dual-node enclosures) clustered together as an integrated system. The cluster is managed through the SGI Management Center software package installed on the system’s “head node” server. Each stick contains two “slices.” A slice consists of a full-length, full-height, double wide PCIe Gen2 x16 slot and a single-socket (C32) AMD 4100-powered node board. The stick’s built-in fans and auto-sensing power supply can detect ambient changes and keep the unit operating in most environments. Each “slice” has up to two 2.5 in SATA disk drives and two optional 1.8 inch solid-state disks (SSDs), allowing large amounts of data storage in a single stick. There are two available GigE ports on each slice (node) and each Prism XL cluster comes with a fully-configured GigE network.

The SGI Prism XL systems can run parallel programs using a message passing tool like the Message Passing Interface (MPI). The Prism XL cluster system uses a distributed memory scheme as opposed to a shared memory system like that used in the SGI Altix UV family of high-performance compute servers. Instead of passing pointers into a shared virtual address space, parallel processes in an application pass messages and each process has its own dedicated processor and address space.

This chapter consists of the following sections:

- “System Components” on page 20
- “System Architecture” on page 23

## System Components

The Prism XL cluster system features the following major components:

- **Tall rack.** This is a custom rack used for both the compute and I/O rack. Up to 63 sticks can be installed in each rack in a multi-rack system. Head nodes require 2U of space reserved in a rack, individual Gigabit Ethernet and InfiniBand switches require 1U of space each. 42U tall racks are available depending on configuration ordered. See Chapter 4 for additional information on system racks used with the SGI Prism XL.

---

**Note:** While the 42U tall rack can technically support up to 63 installed sticks, stand-alone systems require room to support switch hardware. A maximum of 54 sticks would normally be installed in a rack with the expectation of supporting switch fabric hardware in the rack.

---

- **Stick Compute Unit.** This enclosure contains the compute/memory, PCIe accelerator slots, disk drives, optional solid state disks (SSDs) and networking PCIe cards. Note the optional half-height PCIe slots are generally used for network interconnect.

---

**Note:** PCIe options may be limited, check with your SGI sales or support representative.

---

- **Gigabit Ethernet switch.** The Gigabit Ethernet switches used in the Prism XL accelerator cluster are primarily for administrative functionality within the cluster. See Chapter 2 for more information on Ethernet switch use within the system.
- **InfiniBand interconnect fabric switch.** The InfiniBand switch(es) provide the main data transfer fabric for the system and support high-speed converged InfiniBand network data traffic switching to the cluster. See Chapter 2 for additional information on the IB switch.

## Compute Stick Features

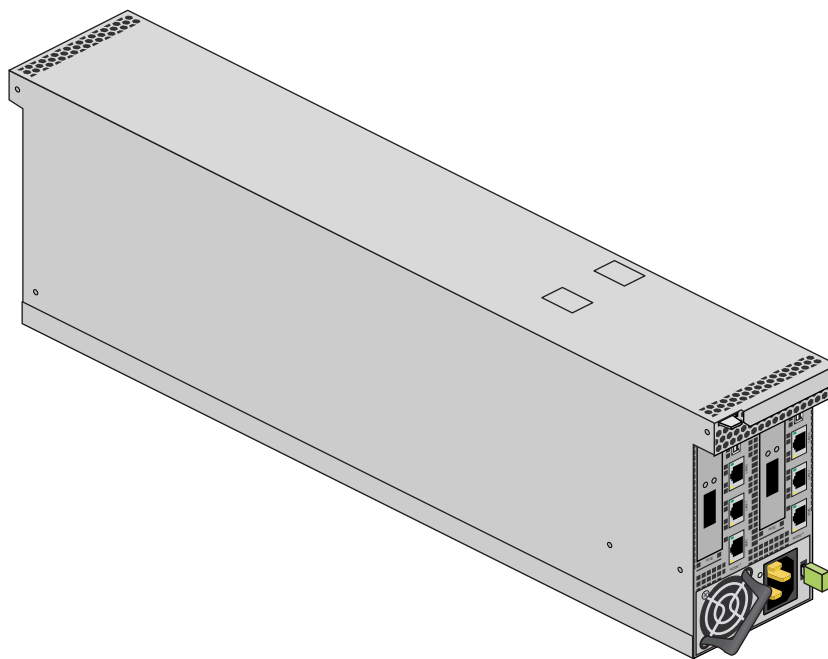
The basic enclosure within the Prism XL system is the dual-node “stick”. Each stick enclosure supports two AMD based compute nodes with two x16 PCIe accelerator slots that support a number of different accelerator cards. Check with your SGI sales or service representative for a complete list of supported accelerator card options. Two additional low-profile x8 PCIe cards (generally used for I/O and networking) are supported in each stick.

A hardware accelerator is a separate computational device (mounted on a PCIe card) that is connected to the node’s Central Processing Unit (CPU). A hardware accelerator is basically a co-processor that contains massive numbers of functional units, together with memory and is

connected to a CPU to cause a dramatic increase in processing speed. Note that the accelerator does not replace the CPU but compliments the CPU. Parts of the code that can be processed in “parallel” are sent to the accelerators.

A 19-inch rack for this cluster server houses all stick enclosures (up to 45 sticks), switches (up to 8 InfiniBand and 2 GigE), plus the cluster head node server in a single rack.

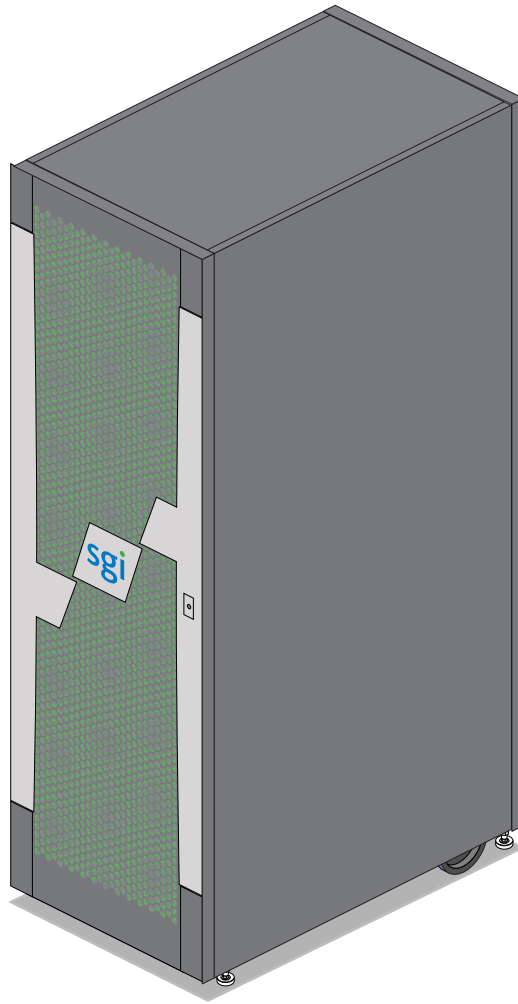
Figure 3-1 shows an example of the compute/memory/PCIe accelerator “stick”.



**Figure 3-1** “Stick” Compute/Memory/PCIe Acceleration Enclosure Example

The SGI Prism XL system requires a minimum of one tall rack (see Figure 3-2 on page 22) with enough single-phase or 3-phase power distribution units (PDUs) to provide outlets for the sticks and accompanying support hardware installed in the rack. Each single-phase PDU has 8 outlets. The three-phase PDU has 21 outlets. The head node requires one or two outlets depending on configuration.

You can also add additional RAID and non-RAID disk storage to your rack system and this should be factored into the number of required outlets.



**Figure 3-2** Tall System Rack Example



## System Architecture

The Prism XL system is a switch-interconnected cluster that scales PCIe-based accelerators to very large “petascale” processing levels.

### System Switches

Two types of switches are offered in the Prism XL system. Gigabit Ethernet switches are primarily used as an “administrative” interconnect. Optionally, a small Prism XL cluster could use gigabit Ethernet switches for both administrative and message passing fabric functionality.

InfiniBand switches are primarily used for delivering high bandwidth and low latency interconnect between the compute nodes and head node. Transfer rates up to 40 gigabits per second are possible.

Chapter 2, “Prism XL System Interconnect Overview” includes additional descriptive information on the system switches.

### Modularity and Scalability

The Prism XL acceleration systems are modular cluster systems. The components are primarily housed in two-node building blocks referred to as “sticks”. Other “free-standing” SGI compute servers “head nodes” are used to provision, access and administer the Prism XL cluster systems. Additional optional mass storage may be added to the systems.

You can add different types of PCIe options to a system rack to achieve the desired system configuration. You can configure and scale the systems around accelerator processing capability, memory size or InfiniBand fabric I/O capability. The air-cooled sticks offer two complete nodes in each enclosure. A water-chilled rack option expands a single rack’s compute density with added heat dissipation capability for the Prism XL components.

### Reliability, Availability, and Serviceability (RAS)

The Prism XL cluster system components have the following features to increase the reliability, availability, and serviceability (RAS) of the systems.

- **Power and cooling:**
  - Optional redundant power supplies are available in the system head nodes.
  - A rack-level water chilled cooling option is available for systems with high-density configurations.
  - Sticks have overcurrent protection at the node and power supply level.
- **System monitoring:**
  - Stick level BMCs monitor the internal voltage, power and temperature of the nodes.
  - Each stick power supply has a failure LED that indicates the power status; LEDs are readable at the end of the stick.
  - Systems support remote console and maintenance activities.
- **Error detection and correction**
  - External memory transfers are protected by cyclical redundancy correction (CRC) error detection. If a memory packet does not checksum, it is retransmitted.
  - Nodes exceed SECDED standards by detecting and correcting 4-bit and 8-bit DRAM failures.
  - Detection of all double-component 4-bit DRAM failures occur within a pair of DIMMs.
  - 32-bits of error checking code (ECC) are used on each 256 bits of data.
  - Automatic retry of uncorrected errors occurs to eliminate potential soft errors.
- **Power-on and boot:**
  - Automatic testing occurs after you power on the system nodes. (These power-on self-tests or POSTs are also referred to as power-on diagnostics or PODs).
  - Processors and memory are automatically de-allocated when a self-test failure occurs.
  - Boot times are minimized.

## Optional System Components

Availability of optional components for the systems may vary based on new product introductions or end-of-life components. Some options are listed in this manual, others may be introduced after this document goes to production status. Check with your SGI sales or support representative for the most current information on available product options not discussed in this manual.

## Rack Information

This chapter describes the physical characteristics of the tall (40U and 42U) Prism XL system racks in the following sections:

- “Introduction” on page 25
- “Prism XL System Rack Overview” on page 26
- “The 42U Tall Rack” on page 27

### Introduction

At the time this document was published only the tall (42U) rack (shown in Figure 4-1 on page 28) was approved for standard use with Prism XL systems. Additional customized racks may be available, check with your SGI sales or service representative.

## Prism XL System Rack Overview

At time of publication all Prism XL system racks were tall racks offering the following features and components:

- **Front and rear door.** The front door uses a key lock for security purposes that should open all the front doors in a multi-rack system. Note that the front door and rear door locks are keyed differently. Racks equipped with an optional water-chilled rear door do not use a rear-door lock.

The rear door has a push-button key lock to prevent unauthorized access to the system. The rear doors have a master key that locks and unlocks all rear doors in a system made up of multiple racks. You cannot use the rear door key to secure the front door lock.

- **Cable entry/exit area.** Cable access openings are located in the front floor and top of the rack. System cable management occurs in the front, rear and top of the rack. I/O and power cables normally pass through the bottom of the rack. Note that single-rack systems do not generally require top access cable management. Rear cable connections will also be required for optional storage modules installed in the same rack with the Prism XL sticks. Optional inter-rack communication cables pass through the top of the racks.
- **Rack structural features.** The rack is mounted on four casters; the two rear casters swivel. There are four leveling pads available at the base of the rack. The base of the rack also has attachment points to support an optional ground strap, and/or seismic tie-downs.
- **Power distribution units in the rack.** The number of outlets required in each rack will vary, a minimum of one 8-outlet PDU is required for a single-rack system:
  - 2 outlets for two sticks
  - 2 outlets for the head node server (head nodes with single-power supply configurations may be available - check with your SGI sales or service representative)
  - 4 outlets for two switches

---

**Note:** Each stick uses one power supply to provide voltage to both internal nodes (slices).

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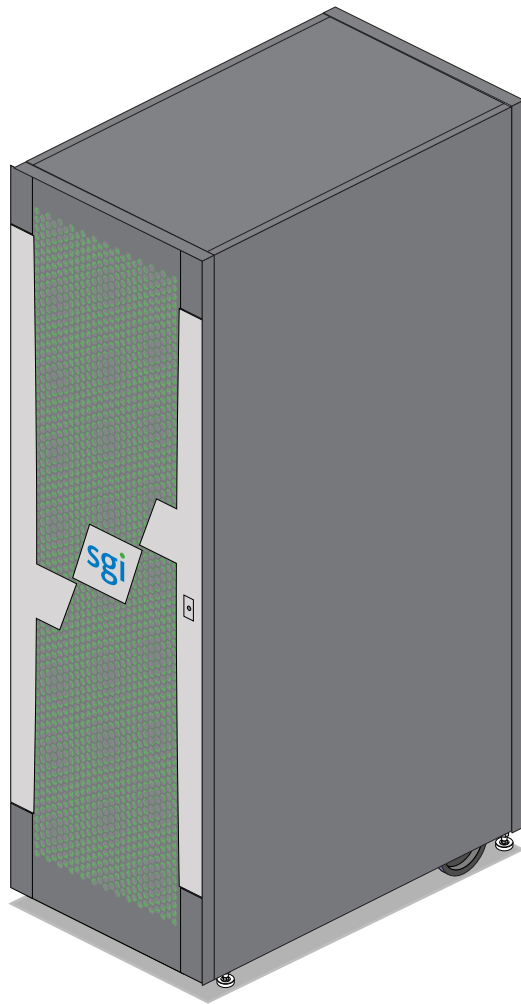
## The 42U Tall Rack

The 42U tall rack accommodates the maximum number of sticks and allows a 2U space to accommodate a head node or other optional equipment within a single rack.

Table 4-1 provides the basic specifications for the 42U Prism XL system rack.

**Table 4-1** 42U Rack Technical Specifications

<b>Characteristic</b>	<b>Specification</b>
Height	78.74 in. (200 cm)
Width	24 in. (61 cm)
Depth	40 in. (101.6 cm) Depth expands with optional water cooling
Weight (full)	~1700 lbs (772.7 kg) approximate



**Figure 4-1** 42U Tall Rack Example

## Prism XL Head Node Server

This chapter describes the function and physical components of the administrative server that runs the SGI Management Center software (also known as the head node) in the following sections:

- “Overview” on page 29
- “Head Node Server Control Panel” on page 31
- “Head Node Features” on page 32

For purposes of this chapter “head node” is used as a catch-all phrase to describe the stand-alone server that acts as a management infrastructure controller. The specialized functions this server performs within the system primarily include:

- Administration and management
- Compute node provisioning functions

Under certain circumstances, head nodes provide services, such as:

- Fabric management
- Login
- Batch
- I/O gateway (storage)

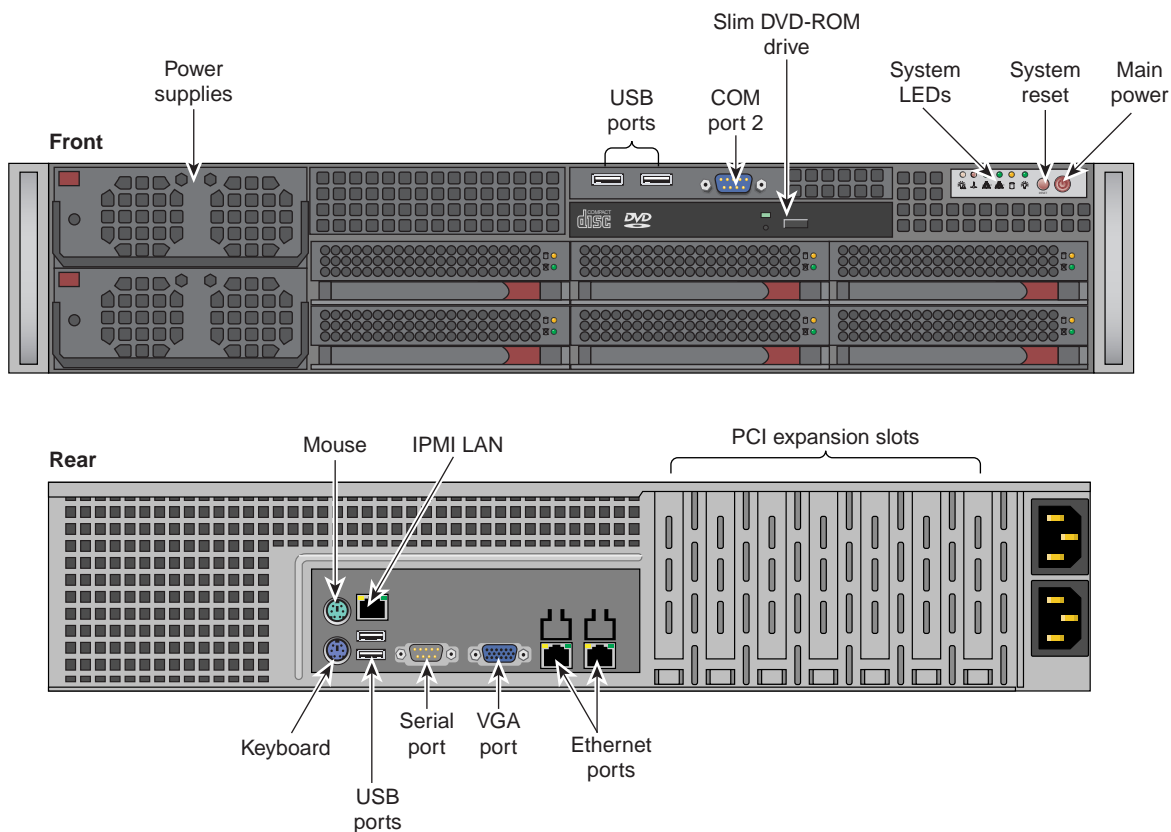
### Overview

The head node is connected to the interconnect network and also to the “outside world”, typically via the local area network (LAN). The head node is the point of submittal for all MPI application runs in the cluster. An MPI job is started from the head node and the sub-processes are distributed to the cluster compute nodes from the head node. The main process on the head node will wait for the sub-processes to finish.

The stick enclosures each containing two slices (compute nodes) are identical computing systems that run the primary processes of MPI applications. These compute nodes are connected to each other through high-speed switches that support the interconnect network.

The network interconnect components are Gigabit Ethernet and InfiniBand. The MPI messages are passed across this network between the processes. This compute node network does not connect directly to the “outside world” because mixing external and internal cluster network traffic could impact application performance.

User interfaces include the Compute Cluster Administrator, the Compute Cluster Job Manager, and a Command Line Interface (CLI). Management services include job scheduling, job and resource management, Remote Installation Services (RIS), and a remote command environment.

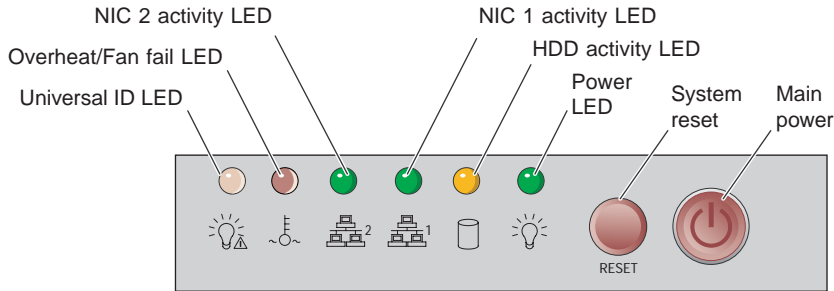


**Figure 5-1** Head Node Front and Rear Components



## Head Node Server Control Panel

The head node is the cluster system’s primary interface to the “outside world”, typically a local area network (LAN). The server’s control panel features are shown in Figure 5-2.



**Figure 5-2** Head Node Server Control Panel Diagram

**Table 5-1** System Head Node control panel functions

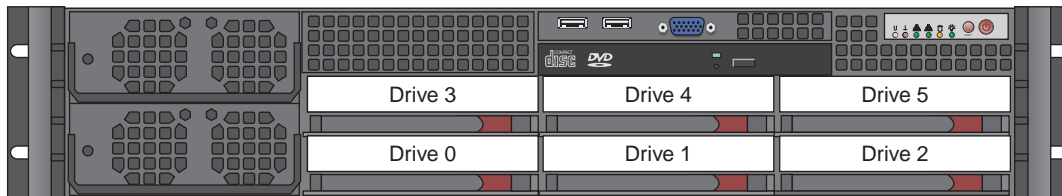
Functional feature	Functional description
Universal information LED	This multi-color LED blinks red quickly, to indicate a fan failure and blinks red slowly for a power failure. A continuous solid red LED indicates a CPU is overheating. This LED will be on solid blue or blinking blue when used for UID (Unit Identifier).
System over temp LED	This red LED lights up to indicate a system over temperature condition.
NIC 2 Activity LED	Indicates network activity on LAN 2 when flashing green.
NIC 1 Activity LED	Indicates network activity on LAN 1 when flashing green.
Disk activity LED	Indicates drive activity when flashing.
Power LED	Indicates power is being supplied to the server’s power supply units.
Reset button	Pressing this button reboots the server.
Power button	Pressing the button applies/ removes power from the power supply to the server. Turning off power with this button removes main power but keeps standby power supplied to the system.

## Head Node Features

The head node server is an AMD based system that offers the following technical features:

- Four 8-core or 12-core AMD 6100 series Opteron processors
- 32 DIMM slots (eight per processor) that support DDR3 1333/1066/800 MHz SDRAM
- Six SATA or SAS disk drives (optional RAID is supported) see Figure 5-3
- Two low-profile PCI Express 2.0 x16 slots and two low-profile PCI Express 2.0 x8 slots
- Standard PS/2 mouse and keyboard ports and two gigabit Ethernet ports
- Integrated Matrox G200 video controller providing a 16MB DDR2 graphics interface through the system VGA connector
- Optional redundant power supply (80+ Gold rated)

For more information on operating, troubleshooting or upgrading your Prism XL head node server, see the *SGI Rackable H2106-G7 System User's Guide*, (P/N 007-5683-00x). For information on using the cluster administrative software (SGI Management Center) see the *SGI Management Center System Administrator's Guide*, (P/N 007-5642-00x).



**Figure 5-3** Drive Locations in the Head Node Server

## Basic Troubleshooting

This chapter provides the following sections to help you troubleshoot your system:

- “Troubleshooting Chart” on page 34
- “LED Status Indicators” on page 35

## Troubleshooting Chart

Table 6-1 lists recommended actions for basic problems that can occur. To solve problems that are not listed in this table, contact your SGI system support engineer (SSE).

**Table 6-1** Troubleshooting Chart

<b>Problem Description</b>	<b>Recommended Action</b>
The system will not power on.	<p>Ensure that the power cords of all the sticks, switches and the head node are seated properly in the power receptacles.</p> <p>Ensure that the PDU circuit breakers are on and properly connected to the wall source.</p> <p>If all the power cords are plugged in and the circuit breaker is on, contact your SSE for additional guidance.</p>
An individual stick enclosure will not power on.	<p>Ensure the power cable of the stick is plugged in firmly at both ends and the PDU is powered on.</p> <p>View the LED output on the rear of the power supply - if it shows amber (yellow) there may be a problem with the supply. Contact your SSE for additional guidance.</p>
The system will not boot the operating system.	Contact your SSE.
The PWR LED of a stick's populated PCIe slot is not illuminated.	Reseat the PCIe card. If the problem is not resolved, replace the PCIe card or contact your PCIe supplier for additional guidance.
The Fault LED of a populated PCIe slot is illuminated (on).	Reseat the PCIe card. If the fault LED remains on, replace the PCIe card.
The red or amber LED of a disk drive is on.	Replace the disk drive.

## LED Status Indicators

There are a number of LEDs on the system components that can help you detect, identify and potentially correct functional interruptions in the system.

The following subsections describe these LEDs and ways to use them to understand potential problem areas.

### Power Supply LEDs

Each stick's power supply has a single bi-color (green/amber) status LED located between the power plug and supply fan.

The LED will either light green or amber (yellow), or flash green or yellow to indicate the status of the individual supply. See Table 6-2 for a complete list.

**Table 6-2** Power Supply LED States

Power supply status	Green LED	Amber LED
No AC power to the supply	Off	Off
Power supply has failed	Off	On
Power supply problem warning	Off	Blinking
AC available to supply (standby) but stick is off	Blinking	Off
Power supply on (stick on)	On	Off

This type of information can be useful in helping your administrator or service provider identify and quickly correct hardware problems.



## Remove and Replace Procedures

This chapter provides information about installing and removing components from your SGI system, as follows:

- “Maintenance Precautions and Procedures” on page 37
- “Removing a Stick from the Rack Enclosure” on page 39
- “Prism XL Stick Power Supply Remove and Replace” on page 40
- “Removing the Top Cover From the Stick Enclosure” on page 42
- “Adding or Replacing PCIe Cards in the Stick Enclosure” on page 45

## Maintenance Precautions and Procedures

This section describes how to open the system node enclosures “sticks” for maintenance and upgrade, protect the components from static damage, and return the system to operation. The following topics are covered:

- “Preparing the System for Maintenance or Upgrade” on page 38
- “Returning the System to Operation” on page 38



---

**Warning:** To avoid problems that could void your warranty, your SGI or other approved system support engineer (SSE) should perform all the setup, addition, or replacement of parts, cabling, and service of your SGI Prism XL system, with the exception of the following items that you can perform yourself:

---

- Using your system console or network access workstation to enter commands and perform system functions such as powering on and powering off, as described in this guide.
- Removing or replacing the power supply in a Prism XL stick enclosure.
- Installing, removing or replacing PCIe cards.

## Preparing the System for Maintenance or Upgrade

Depending on the size of your system and the number of sticks that you need to service or upgrade, you may want to power down the entire system - follow these steps:

---

**Note:** Powering the system off is not a requirement when replacing a single component or stick. However, the affected stick should be taken off-line and the power disengaged at the source.

---

1. If you are logged on to the system, log out. Follow standard procedures for gracefully halting the operating system.
2. Go to the section “Powering the System On and Off” in Chapter 1 if you are not familiar with power down procedures.
3. After the system is powered off, locate the power distribution unit(s) (PDUs) in the rack and turn off the circuit breaker switches on each PDU.

## Returning the System to Operation

When you finish installing or removing components, return the system to operation as follows:

1. Turn each of the PDU circuit breaker switches to the “on” position.
2. Power up the system. If you are not familiar with the proper power down procedure, review the section “Powering the System On and Off” in Chapter 1.
3. Verify that the LEDs on the system power supplies turn on and illuminate green which indicates that the power-on procedure is progressing properly.

If your system does not boot correctly, see “Troubleshooting Chart” in Chapter 6, for troubleshooting procedures.



## Removing a Stick from the Rack Enclosure

For most remove and replace procedures it will be necessary to remove the stick enclosure from the internal rack housing where the unit is installed. The rack housing is a kind of enclosed shelf that houses the sticks side-by-side. A standard 19-inch rack uses a housing three sticks wide.

The remove/replace procedures in the following subsections may require removal of the stick from the rack housing and some require taking the top cover off the unit (see “Removing the Top Cover From the Stick Enclosure” on page 42) to access the internal components.

---

**Note:** No special tools are required to remove the stick from the rack housing.

---

1. Access the front of the rack and shut down the power to the stick being removed by turning off the PDU supplying voltage to the unit.
2. Unplug the power cable from the stick and disconnect all I/O or data cables attached to the front of the enclosure. Be sure to label them for re-installation purposes.
3. Access the rear of the rack and disconnect any I/O or data cables connected to the PCIe boards on the stick you are removing. Label all connectors to ensure proper re-installation.
4. Grasp the flange and/or power supply handle at the end of the stick and pull the unit straight out until the half-moon safety lock engages the back of the internal rack housing.
5. The unit will lock when it is about 3/4 of the way out of the rack housing; depress the half moon lock to release the stick completely.
6. Support the stick from beneath and carefully remove it completely from the internal housing.
7. Set the stick on a level static-free work surface.

## Prism XL Stick Power Supply Remove and Replace

There is a single power supply (located at the front of the rack) used in each SGI Prism XL stick. The supply supports both slices (nodes) housed in the stick. Use the following steps and illustration to remove and replace a power supply if you have determined that the unit has failed or is malfunctioning:

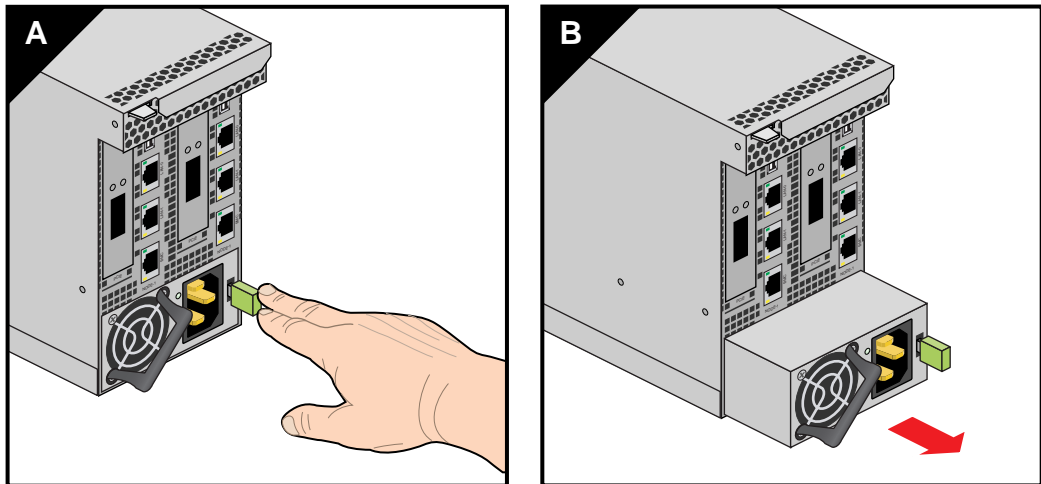
1. Gracefully shut down the stick (or system), use the information in Chapter 1 as needed.
2. Open the system rack doors and turn off the PDU breaker switch that supports the stick being serviced, then unplug the power cord from the power supply in the stick.

---

**Important:** There is no On/Off switch on the power supply itself, power must be cut at the PDU.

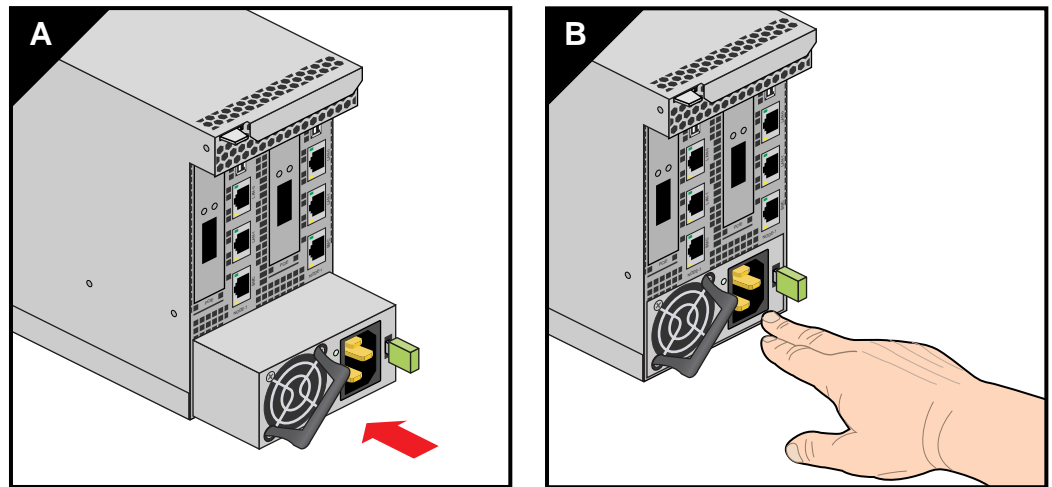
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3. If needed, use the information in “Removing a Stick from the Rack Enclosure” on page 39 to extract the stick from the rack enclosure.
4. Grasp the power supply handle (over the fan) and pull the power supply locking lever towards the fan to unlock the supply (see Figure 7-1).
5. Pull the supply straight out of the stick, using your other hand to support it from beneath if possible.



**Figure 7-1** Prism XL Stick Power Supply Remove Example

6. Position the new power supply in the same orientation as the one removed and slide it into the stick enclosure until it is fully seated.
7. Reverse the steps in “Removing a Stick from the Rack Enclosure” on page 39 as needed to replace the stick in the rack.
8. Plug the power supply line back into the unit and turn on the PDU breaker switch that supplies power to the stick.
9. Use the SGI Management Center software to bring the slices (nodes) in the stick back online.



**Figure 7-2** Stick Power Supply Replacement Example

## Removing the Top Cover From the Stick Enclosure

In order to perform many of the remove/replace procedures documented in the following subsections you must first remove the sheetmetal top cover from the stick.

---

**Note:** You will need a Phillips (cross-head) screwdriver to remove the top cover from the stick.

---

1. Using a Phillips head screwdriver, remove the 8 screws that hold the sheetmetal top cover of the stick in place. See Figure 7-3 on page 43 for an example of the screw locations.
2. Place the screws in a cup or other container to make them easily available.
3. Lift the sheetmetal cover off the stick and set it aside (see Figure 7-4 on page 44).
4. Go to the subsection covering the component(s) you wish to remove or replace.

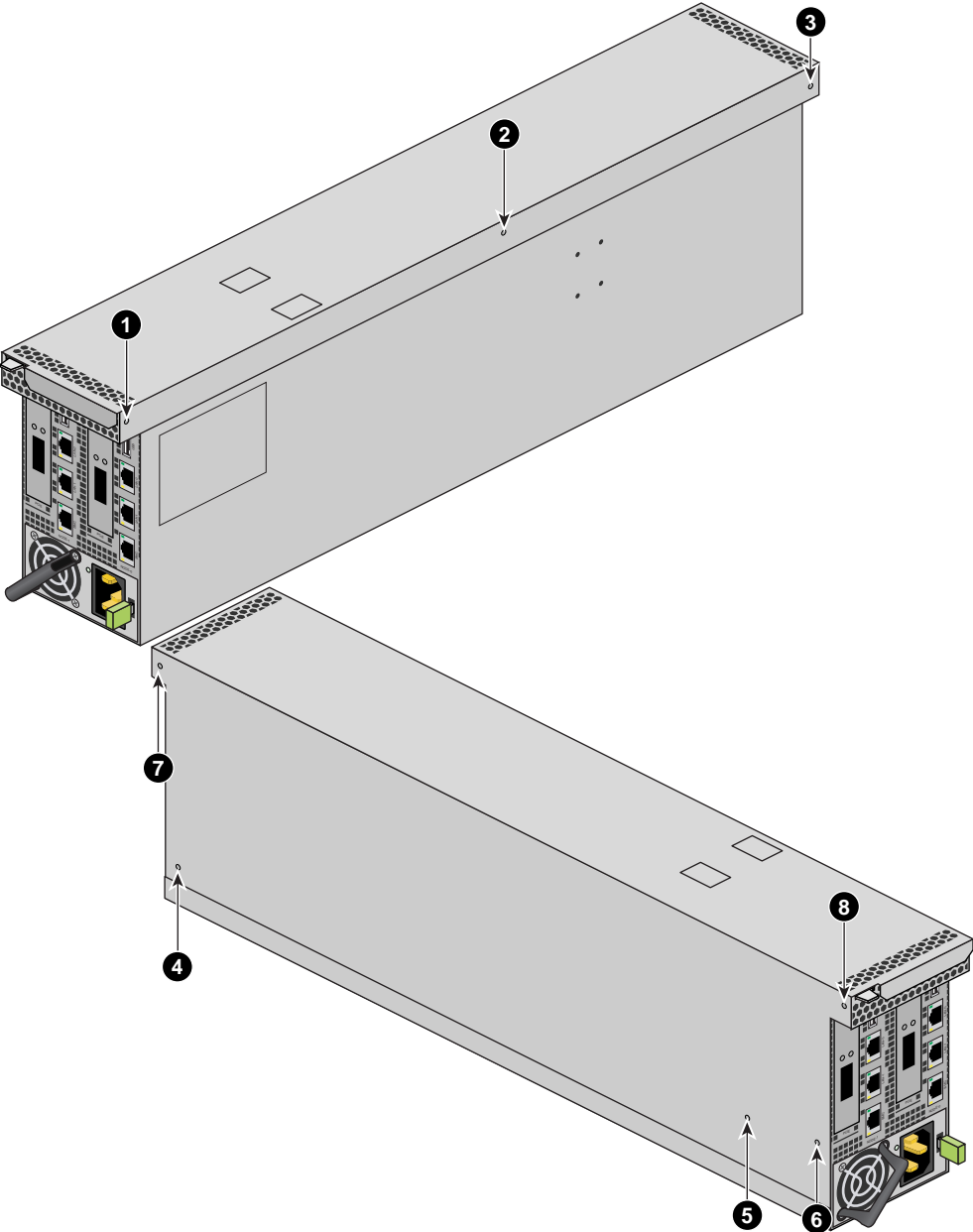
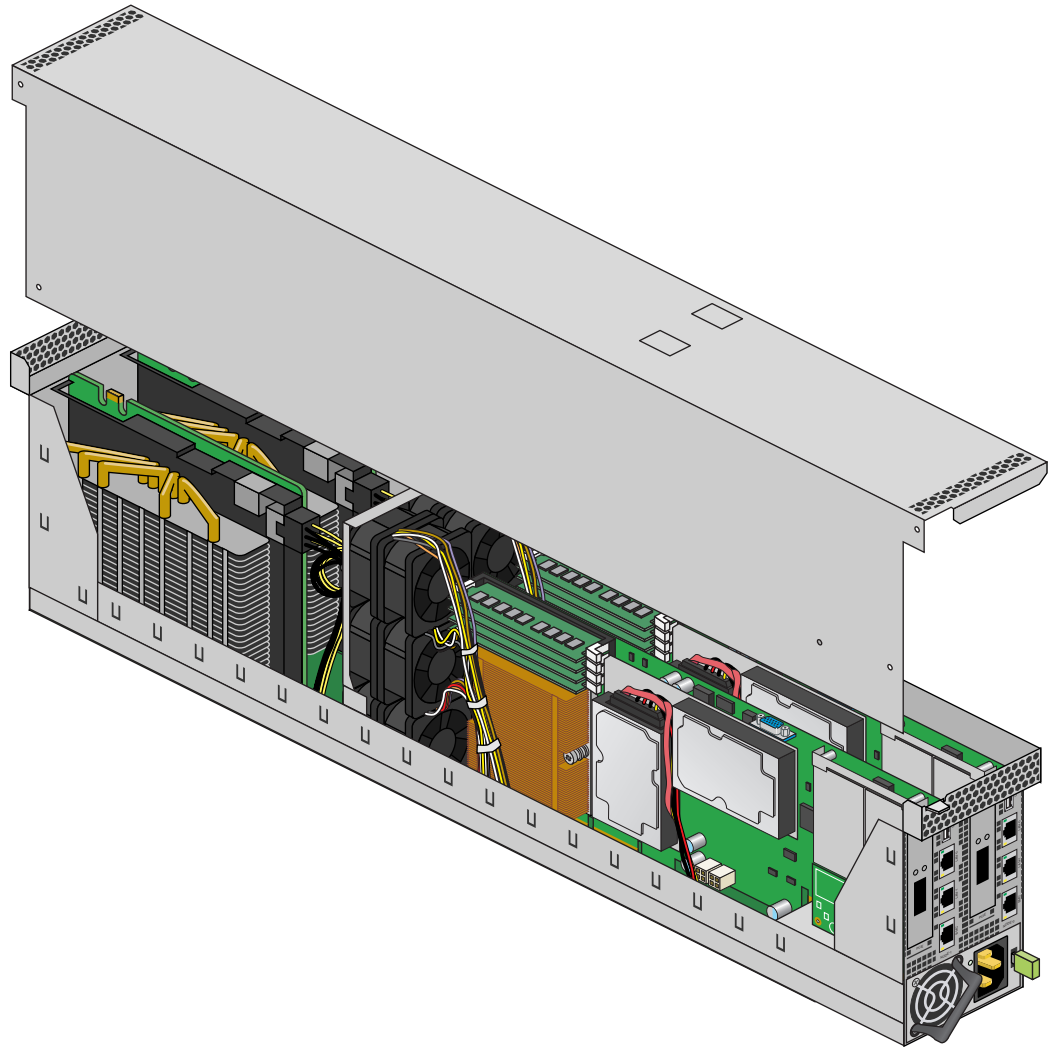


Figure 7-3 Stick Enclosure Top Cover Screws



**Figure 7-4** Removing the Stick's Top Cover

## Adding or Replacing PCIe Cards in the Stick Enclosure



---

**Warning:** Before installing, operating, or servicing any part of this product, read the “Safety Information” on page 61.

---

This section provides instructions for adding or replacing a PCIe card in your system compute stick. To maximize the operating efficiency of your cards, be sure to read all the introductory matter before beginning the installation.



---

**Caution:** To protect the PCIe cards from ESD damage, SGI recommends that you use a grounding wrist strap while installing the card.

---

### Overview of PCI Express (PCIe) Operation

This section provides a brief overview of the PCI Express (PCIe) technology available with your system. PCI Express has both compatibility and differences with older PCI/PCI-X technology. Check with your SGI sales or service representative for more detail on specific PCI Express board options available with your system. At time of publication there were no PCI-X options available with your SGI Prism XL system.

PCI Express is compatible with PCI/PCI-X in the following ways:

- Compatible software layers
- Compatible device driver models
- Same basic board form factors
- PCIe controlled devices appear the same as PCI/PCI-X devices to most software

PCI Express technology is different from PCI/PCI-X in the following ways:

- PCI Express uses a point-to-point serial interface vs. a shared parallel bus interface used in older PCI/PCI-X technology
- PCIe hardware connectors are not compatible with PCI/PCI-X, (see Figure 7-5)
- Potential sustained throughput of x16 PCI Express is approximately four times that of the fastest PCI-X throughputs



**Figure 7-5** Comparison of PCI/PCI-X Connector with PCI Express Connectors

PCI Express technology uses two pairs of wires for each transmit and receive connection (4 wires total). These four wires are generally referred to as a lane or x1 connection - also called “by 1”. SGI Prism XL PCIe technology is available up to a x16 connector (64 wires) or “by 16” in PCI Express card slots. This technology will support PCIe boards that use connectors up to full-height double-wide size and x16 speeds. Table 7-1 shows this concept.

---

**Note:** Two of the PCIe slots supported are limited to half-height PCIe cards at maximum x8 transfer rates. These slots are primarily used to support networking cards.

---

**Table 7-1** SGI Prism XL Stick PCIe Lane Support

<b>SGI x16 PCIe Connectors</b>	<b>Support levels in stick chassis</b>
x1 PCIe cards	Supported in all slots
x2 PCIe cards	Supported in all slots
x4 PCIe cards	Supported in all slots
x8 PCIe cards	Supported in all slots
x16 PCIe cards	Supported in two slots
x32 PCIe cards	Not supported

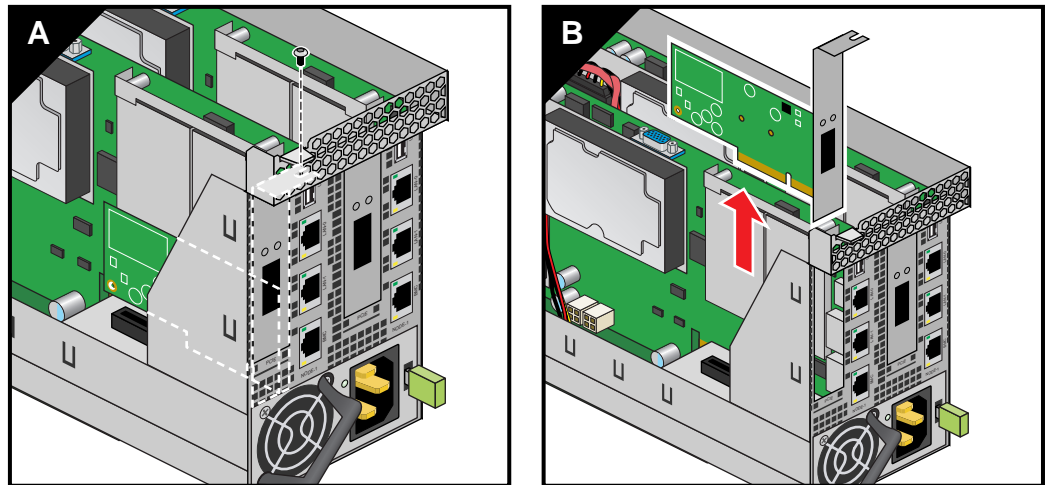


## Installing or Replacing Half-Height PCIe Cards in the Chassis

The half-height x8 PCIe cards are located at the front of the enclosure directly adjacent to each of the node boards. Note that the PCIe slots located at the rear of the stick are full-height units intended primarily for accelerator cards. Remove and replace information for the full-height cards is listed in the following subsection “Remove and Replace Full-Height PCIe Cards” on page 48.

You can install or replace the half-height PCIe cards using the following steps and illustrations:

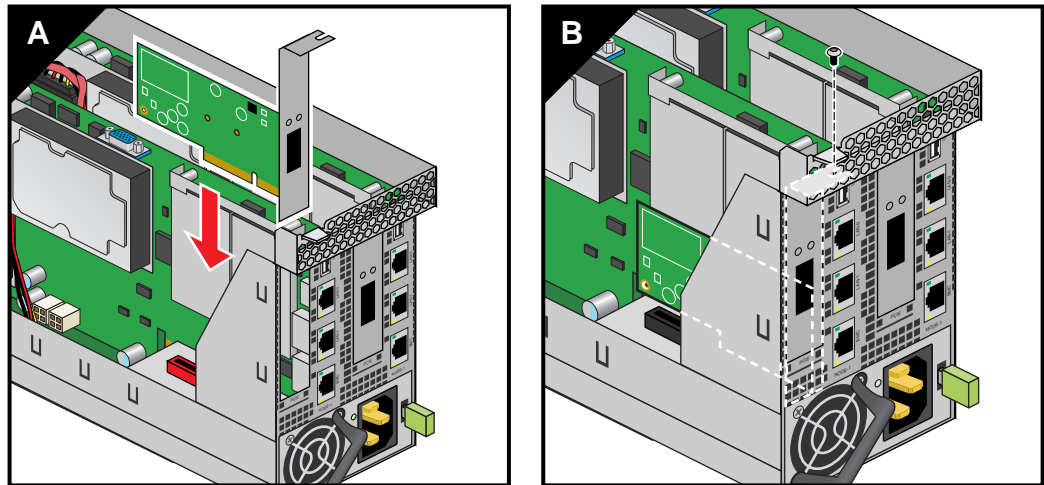
1. Power down the stick and disconnect the cord from the unit.
2. Remove all data cables attached to the stick and label them for reinstallation purposes.
3. Remove the stick from the rack enclosure using the information in “Removing a Stick from the Rack Enclosure” on page 39.
4. Remove the enclosure’s top cover using the information in “Removing the Top Cover From the Stick Enclosure” on page 42.
5. Remove the retention screw at the front of the enclosure that holds the PCIe card in place.
6. Extract the half-height PCIe card from the slot and place on a static-safe surface.



**Figure 7-6** Half-Height PCIe Card Remove Example

7. Install the new/replacement PCIe card as applicable and secure with the retention screw removed in step 5.

8. Restore the stick to operational status by reversing the extraction procedures.



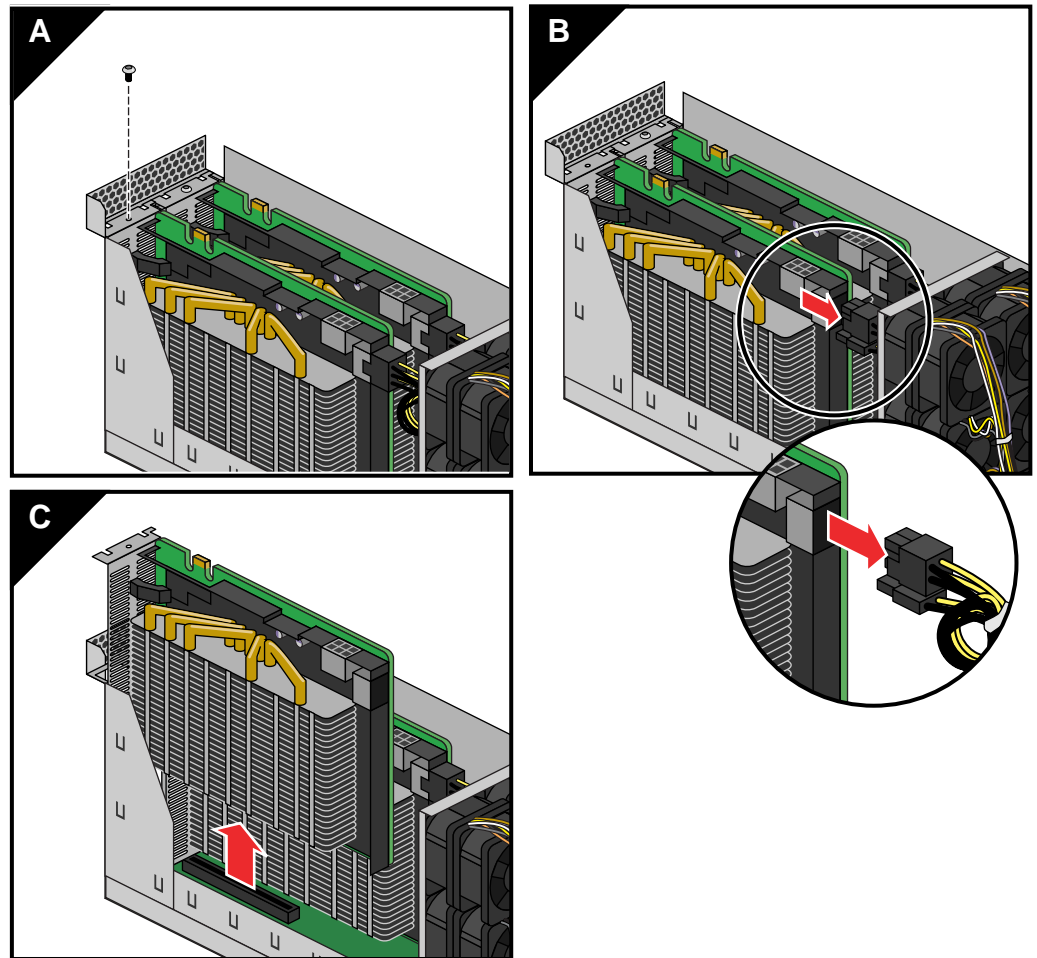
**Figure 7-7** Install/Replace a New Half-Height PCIe Card Example

## Remove and Replace Full-Height PCIe Cards

Removing or replacing the full-height PCIe/accelerator cards requires extraction of the stick from the rack. Use the following steps and illustrations to remove and/or replace a card:

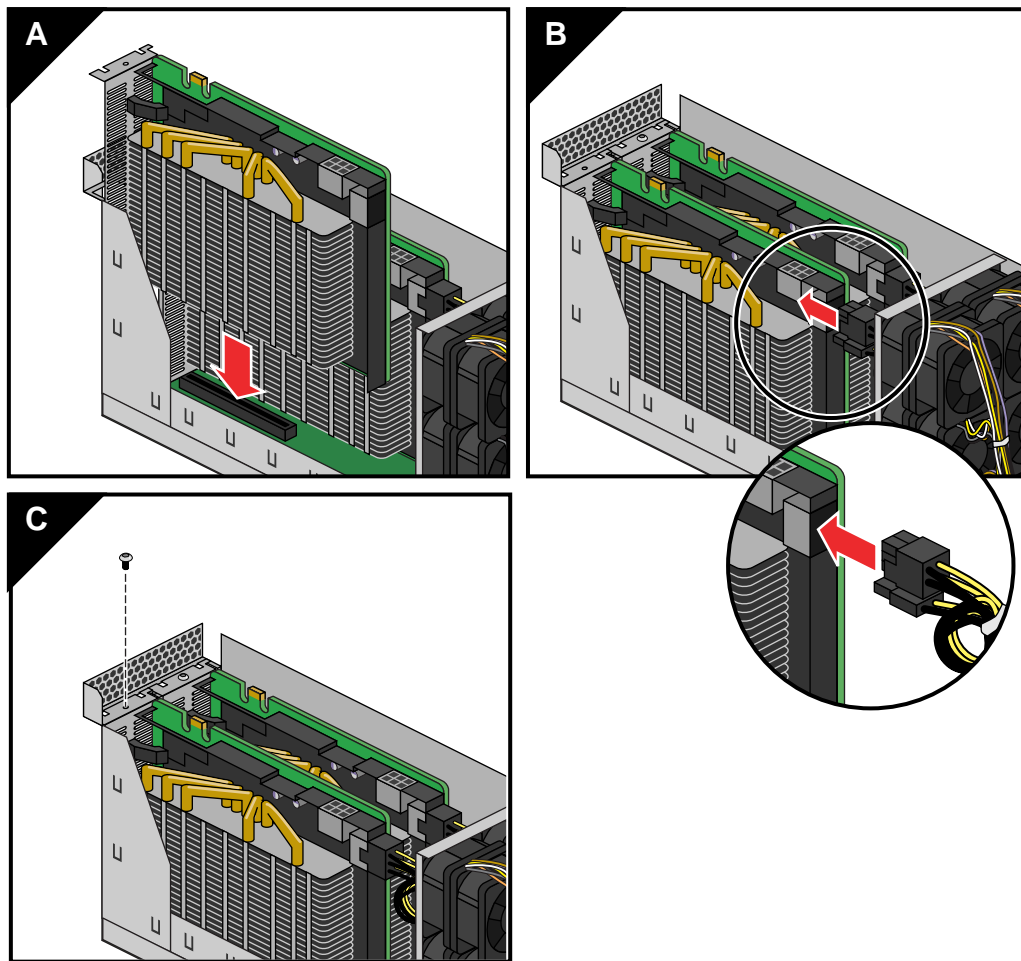
1. Power down the stick and disconnect the cord from the unit.
2. Disconnect all data cables from the stick and label them for reinstallation purposes.
3. Remove the stick from the rack enclosure using the information in “Removing a Stick from the Rack Enclosure” on page 39.
4. Remove the enclosure’s top cover using the information in “Removing the Top Cover From the Stick Enclosure” on page 42.
5. Locate and remove the retention screw at the end of the enclosure that holds the PCIe accelerator card.
6. Remove the power/data cables from the end of the accelerator card (nearest the fan assembly).

7. Grasp the card assembly ends with both hands and pull the PCIe/accelerator card straight up from the slot (see Figure 7-8) and place on a static-safe surface. Note that you may need to “rock” the accelerator card assembly slightly to pull it from the PCIe slot.



**Figure 7-8** Full-Height PCIe Card Removal Example

8. Install the new/replacement PCIe card (see Figure 7-9 on page 50) and secure with the screw removed in step 5. Be sure to plug in the power/data cables at the end of the card.
9. Restore the stick to operational status by reversing the extraction procedures.



**Figure 7-9** Replacing a Full-Height PCIe Card Example

---

## Technical Specifications and Pinouts

This appendix contains technical specification information about your system, as follows:

- “Compute Stick Specifications” on page 51
- “System-level Specifications” on page 52
- “Single-Rack Physical and Power Specifications” on page 53
- “Environmental Specifications” on page 54
- “I/O Port Specifications” on page 55

### Compute Stick Specifications

Each compute stick enclosure houses two complete compute modules. Table A-1 lists the specific features of the stick.

**Table A-1** Compute Stick Specifications

Category	Specification
Length	37.125 in. (94.3 cm)
Width	5.78 in. (14.68 cm)
Height	3.34 in. (8.5 cm)
Weight	~21 lbs. (9.54 kg)
PCIe slots	Two double-wide (full height) x16 and two low-profile x8
CPUs	Two AMD C32 processors (one on each node board)
Drives	Up to four SATA hard disks, plus up to four solid-state drives (SSDs)
Power supply	One 1050 Watt (80+ Gold rated)

## System-level Specifications

Table A-2 summarizes the Prism XL system configuration ranges. Note that each C32 processor socket houses eight or 12 processor “cores”. Each stick supports two x16 accelerator PCIe cards.

**Table A-2** System Configuration Ranges

<b>Category</b>	<b>Minimum</b>	<b>Maximum</b>
GPUs	2 double-wide GPU cards	Up to 126 double-wide PCIe accelerator cards in a rack
Processors	2 processors (eight or 12 cores per processor)	Up to 756 processor cores in a rack
Stick compute enclosure	1 per rack	Up to 44 in a single rack system. Up to 63 in multi-rack systems.
Slice DIMM capacity	2 DIMMs per slice (node). Four are recommended.	Eight DIMMs per stick (four per slice)
Gigabit Ethernet switches	One	Two in a single-rack system
InfiniBand switches	One optional	Eight in a single-rack system

## Single-Rack Physical and Power Specifications

Table A-3 shows the physical specifications of the Prism XL system rack. See Chapter 4 for additional rack related technical information.

**Table A-3** System Physical Specifications

<b>System Features (single rack)</b>	<b>Specification</b>
Weight (full) maximum	~1700 lbs.(772.7 kg) for the 42U rack (approximate)
Shipping weight maximum	~1800 lbs. (818.2 kg) approximate
Voltage range	North America/International
Nominal	200-240 VAC /230 VAC
Tolerance range	180-264 VAC /180-254 VAC
Frequency	North America/International
Nominal	50/60 Hz /50 Hz
Tolerance range	47-63 Hz /47-63 Hz
Phase required	Single-phase or 3-phase
Power cable	12 ft. (3.66 m) pluggable cords
Shipping dimensions	Height: 81.375 in. (206.7 cm) Width: 48 in. (121.9 cm) Depth: 54 in. (137.1 cm) Note that depth and system weight are increased with water-cooled systems.
Access requirements	
Front	48 in. (121.9 cm)
Rear	48 in. (121.9 cm)
Side	None

## Environmental Specifications

Table A-4 lists the environmental specifications of the system.

**Table A-4** Environmental Specifications

<b>Feature</b>	<b>Specification</b>
Temperature tolerance (operating)	+5 °C (41 °F) to +35 °C (95 °F) (up to 1500 m / 5000 ft.) +5 °C (41 °F) to +30 °C (86 °F) (1500 m to 3000 m /5000 ft. to 10,000 ft.)
Temperature tolerance (non-operating)	-40 °C (-40 °F) to +60 °C (140 °F)
Relative humidity	10% to 80% operating (no condensation) 8% to 95% non-operating (no condensation)
Cooling requirement	Ambient air or optional water cooling
Maximum altitude	10,000 ft. (3,049 m) operating 40,000 ft. (12,195 m) non-operating



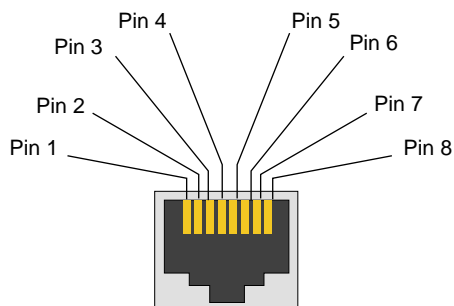
## I/O Port Specifications

This section contains specifications and port pinout information for the base I/O ports of your system and system head node, as follows:

- “Ethernet Port” on page 56
- “USB Type A Connector” on page 57
- “Serial Ports” on page 58

## Ethernet Port

The system auto-selects the Ethernet port speed and type (duplex vs. half-duplex) when the server is booted, based on what it is connected to. Figure A-1 shows the Ethernet port.



**Figure A-1** Ethernet Port

Table A-5 shows the cable pinout assignments for the Ethernet port operating in 10/100-Base-T mode and also operating in 1000Base-T mode.

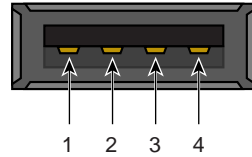
**Table A-5** Ethernet Pinouts

Ethernet 10/100Base-T Pinouts		Gigabit Ethernet Pinouts	
Pins	Assignment	Pins	Assignment
1	Transmit +	1	Transmit/Receive 0 +
2	Transmit -	2	Transmit/Receive 0 -
3	Receive +	3	Transmit/Receive 1 +
4	NU	4	Transmit/Receive 2 +
5	NU	5	Transmit/Receive 2 -
6	Receive -	6	Transmit/Receive 1 -
7	NU	7	Transmit/Receive 3 +
8	NU	8	Transmit/Receive 3 -

NU = Not used

## USB Type A Connector

Figure A-2 shows the universal serial bus (USB) type A connector is provided on each of the individual nodes (slice) that supports general USB connections. Table A-6 lists the pin assignments for the USB type A connector.



**Figure A-2** Pin Number Locations for USB Type A Connector

**Table A-6** Pin Assignments for USB Type A Connector

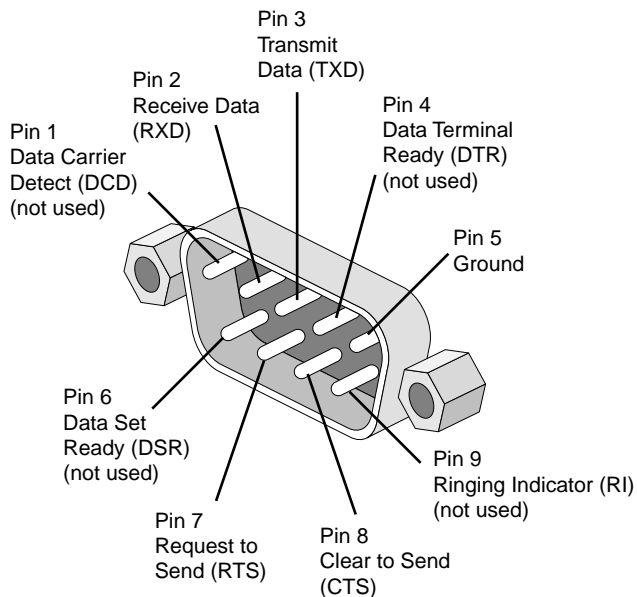
Signal	Color	Pin Number
VCC	Red	1
-Data	White	2
+Data	Green	3
Ground	Black	4

## Serial Ports

Each system head node has a 9-pin serial interface connector. These ports are capable of transferring data at rates as high as 230 kbps. Other features of the ports include the following:

- Programmable data, parity, and stop bits
- Programmable baud rate and modem control

Figure A-3 shows an example serial port.



**Figure A-3** Serial Port Connector

Table A-7 shows pinout assignments for the 9-pin male DB-9 connector.

**Table A-7** Serial Port Pinout

<b>Pin</b>	<b>Assignment</b>	<b>Description</b>
1	DCD	Data carrier detect
2	RXD	Receive data
3	TXD	Transmit data
4	DTR	Data terminal ready
5	GND	Signal ground
6	DSR	Data set ready
7	RTS	Request to send
8	CTS	Clear to send
9	RI	Ring indicator



## Safety Information and Regulatory Specifications

This appendix provides safety information and regulatory specifications for your system in the following sections:

- “Safety Information” on page 61
- “Regulatory Specifications” on page 63

### Safety Information

Read and follow these instructions carefully:

1. Follow all warnings and instructions marked on the product and noted in the documentation included with this product.
2. Unplug this product 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 system are provided for ventilation. To ensure reliable operation of the product and to protect it 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 people will walk on the cord.
8. Never push objects of any kind into this product through cabinet slots as they 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.

9. 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.
10. 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 since 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.
11. If a lithium battery is a soldered part, only qualified SGI service personnel should replace this lithium battery. For other types, replace it only with the same type or an equivalent type recommended by the battery manufacturer, or the battery could explode. Discard used batteries according to the manufacturer's instructions.
12. Use only the proper type of power supply cord set (provided with the system) for this unit.
13. Do not attempt to move the system alone. Moving a rack requires at least two people.
14. Keep all system cables neatly organized in the cable management system. Loose cables are a tripping hazard that cause injury or damage the system.



## Regulatory Specifications

The following topics are covered in this section:

- “CMN Number” on page 63
- “CE Notice and Manufacturer’s Declaration of Conformity” on page 63
- “Electromagnetic Emissions” on page 64
- “Shielded Cables” on page 66
- “Electrostatic Discharge” on page 66
- “Laser Compliance Statements” on page 67
- “Lithium Battery Statements” on page 68

This SGI system conforms to several national and international specifications and European Directives listed on the “Manufacturer’s Declaration of Conformity.” The CE mark insignia displayed on each device is an indication of conformity to the European requirements.



---

**Caution:** This product 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.

---

### CMN Number

The model number, or CMN number, for the system is on the system label, which is mounted inside the rear door on the base of the rack.

### 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 provides the contents of electromagnetic emissions notices from various countries.

### 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 you will be required to correct the interference at your 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 your 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 n'émet pas de perturbations radioélectriques dépassant les normes applicables aux appareils numériques de Classe A prescrites dans le Règlement sur les interférences radioélectriques établi par le Ministère des Communications du Canada.

**VCCI Notice (Japan Only)**

この装置は、情報処理装置等電波障害自主規制協議会 (VCCI) の基準に基づくクラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

**Figure B-1** VCCI Notice (Japan Only)

**Korean Class A Regulatory Notice**

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며 만약 잘못 판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

**Figure B-2** Korean Class A Regulatory Notice

## Shielded Cables

This SGI system is FCC-compliant under test conditions that include the use of shielded cables between the system and its peripherals. Your system 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.

Optional 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 unit 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. The wrist strap is used during the installation of these upgrades to prevent the flow of static electricity, and it should protect your system from ESD damage.

## Laser Compliance Statements

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



**Warning:** Avoid exposure to the invisible laser radiation beam when the device is open.



**Warning:** Attention: Radiation du faisceau laser invisible en cas d'ouverture. Eviter 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 Lasersäteilylle



**Warning:** Varning: Laserstrålning när denna del är 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



---

**Warning:** If a lithium battery is a soldered part, only qualified SGI service personnel should replace this lithium battery. For other types, replace the battery only with the same type or an equivalent type recommended by the battery manufacturer, or the battery could explode. 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. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

---



---

**Warning:** Varoitus: Päristö 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.

---