SGI® Onyx® 350 Visualization System User's Guide

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About This Guide

This guide provides information for the SGI Onyx 350 visualization systems. The Onyx 350 systems differ from previous SGI 300 series visualization systems in the following ways:

- The Onyx 350 visualization systems offer a compute module or a combined graphics and compute module (using an internally-mounted InfinitePerformance graphics pipe).
- 2U "MPX" option modules are available for system memory and PCI-X expansion.
- Onyx 350 systems can be ordered with different types of graphics interfaces; InfiniteReality and InfinitePerformance graphics are covered in this guide (only one type may be used within each system).
- Each Onyx 350 compute/graphics/MPX "module" has PCI-X capability.
- 17U "short rack" systems are available with Onyx 350 InfinitePerformance visualization systems.
- Compositor options are available with all Onyx 350 InfinitePerformance visualization systems.
- Digital media options are available with Onyx 350 InfiniteReality and InfinitePerformance visualization systems.

This guide is written for owners, system administrators, and users of SGI Onyx 350 visualization systems. General knowledge of computers and computer operation is presumed.

Important Information

This section contains information on general guidelines and warnings you should be aware of while working with your Onyx 350 visualization system.

As a general warning, you are asked to have your SGI system support engineer (SSE) perform all the setup, addition or replacement of parts, cabling, and service of your SGI Onyx 350 visualization system, with the exception of the following items that you can perform yourself:

- Using your L1 or L2 controller displays to enter commands and perform system functions such as powering on and powering off as described in this guide.
- Adding and replacing PCI and PCI-X cards as described in this guide.
- Adding and replacing disk drives as described in this guide.
- Removing and replacing the module power supplies.
- Removing and replacing DIMMs.
- Removing and replacing the system modules in the rack.

Chapter Descriptions

The following topics are covered in this guide:

- Chapter 1, “System Overview,” provides a general overview of the SGI Onyx 350 visualization systems and gives details about the individual standard and optional components that make up the system. Examples of system configurations (how the components connect physically) are provided.
- Chapter 2, “Installation and Operation,” includes power-on and off procedures and other important operating information.
- Chapter 3, “Compute Module,” describes the module used as the base module for all InfiniteReality visualization systems. This module could also be used as a non-graphics compute expansion module in an InfinitePerformance visualization system.
- Chapter 4, “InfinitePerformance Graphics and Compute Module,” describes the functions and connectors of the combined InfinitePerformance graphics and compute module.
- Chapter 5, “InfiniteReality Graphics Module,” covers the two-pipe InfiniteReality graphics module that is combined with the compute module(s) and other optional modules to provide a high-performance visualization system.
- Chapter 6, “Memory and PCI Expansion Module,” describes the features of the optional MPX module. This NUMAlink connected option provides expanded

DIMM memory, serial ports, and PCI or PCI-X slots without the expense of additional processors.

- Chapter 7, “Installing and Removing Customer-replaceable Units,” gives instructions for the various maintenance and upgrade procedures you can perform.
- Chapter 8, “Troubleshooting,” contains instructions for troubleshooting the Onyx 350 visualization systems.
- Appendix A, “Technical Specifications and Pinouts” contains environmental and physical specifications as well as connector pinouts.
- Appendix B, “Safety Information and Regulatory Specifications” contains safety and regulatory warnings.

Related Publications

The following documents may be helpful or of interest to users or administrators of the Onyx 350 products:

- *PCI Expansion Module User’s Guide* (P/N 007-4499-00*x*)
- *SGI Total Performance 900 Storage System User’s Guide* (P/N 007-4428-00*x*)
- *SGI Total Performance 9100 (2Gb TP9100) Storage System User’s Guide* (P/N 007-4522-00*x*)
- *SGI TP9400 and SGI TP9500 RAID Owner’s Guide* (P/N 007-4304-00*x*)
- *SGI Origin 350 Server User’s Guide* (P/N 007-4566-00*x*)
- IRIX man pages
- IRIX release notes (as applicable)

You can obtain SGI documents, 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.
- If it is installed on your SGI system, you can use InfoSearch, an online tool that provides a more limited set of online books, release notes, and man pages. With an IRIX system, select **Help** from the Toolchest, and then select **InfoSearch**. Or you can type **`infosearch`** on a command line.

- You can also view release notes by typing either **grelnotes** or **relnotes** on a command line.
- You can also view man pages by typing **man** <*title*> on a command line.

SGI systems include a set of IRIX 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 CD-ROM) and are displayed using the `man` command. For example, to display the man page for the `Add_disk` command, type the following on a command line:

```
man Add_disk
```

References in the documentation to these pages include the name of the command and the section number in which the command is found. For example, "Add_disk(1)" refers to the `Add_disk` command and indicates that it is found in section 1 of the IRIX reference.

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)` and `makewhatis(1M)`.

Conventions

The following conventions are used throughout this document:

Convention	Meaning
`Command`	This fixed-space font denotes literal items such as commands, files, routines, path names, signals, messages, and programming language structures.
variable	The italic typeface denotes variable entries and words or concepts being defined. Italic typeface also is used for book titles.
`user input`	This 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.
GUI element	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.

Product Support

SGI provides a comprehensive product support and maintenance program for its products, as follows:

- If you are in North America, contact the Technical Assistance Center at 1 800 800 4SGI or contact your authorized service provider.
- If you are outside North America, contact the SGI subsidiary or authorized distributor in your country.

Reader Comments

If you have comments about the technical accuracy, content, or organization of this document, contact SGI. Be sure to include the title and document number of the manual with your comments. (Online, the document number is located in the front matter of the manual. In printed manuals, the document number is located at the bottom of each page.)

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- Use the Feedback option on the Technical Publications Library website:

  http://docs.sgi.com

- Contact your customer service representative and ask that an incident be filed in the SGI incident tracking system.

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  Technical Publications
  SGI
  1600 Amphitheatre Pkwy., M/S 535
  Mountain View, CA 94043-1351

- Send a fax to the attention of “Technical Publications” at +1 650 932 0801.

SGI values your comments and will respond to them promptly.

System Overview

This chapter provides an overview of your Onyx 350 visualization system. This chapter covers the basic physical, electrical, and mechanical aspects of the Onyx 350 visualization systems. Standard controls and connectors are described and illustrated along with major components that go in the system chassis. These visualization systems are nearly always installed in a rack (or racks) housing a number of base and optional modules. These might include additional graphics pipes, other compute modules, mass storage, or memory and PCI/PCI-X interface modules.

Note: This guide generically refers to Onyx 350 visualization systems as Onyx 350 systems regardless of the type of graphics used.

Figure 1-1 shows an example of an Onyx 350 InfiniteReality graphics system and some of the optional modules that are available. These systems use the same NUMA3 architecture as the SGI Onyx 3000 series systems. The Onyx 350 visualization system is composed of separate, but interconnected, functional units called “modules.”

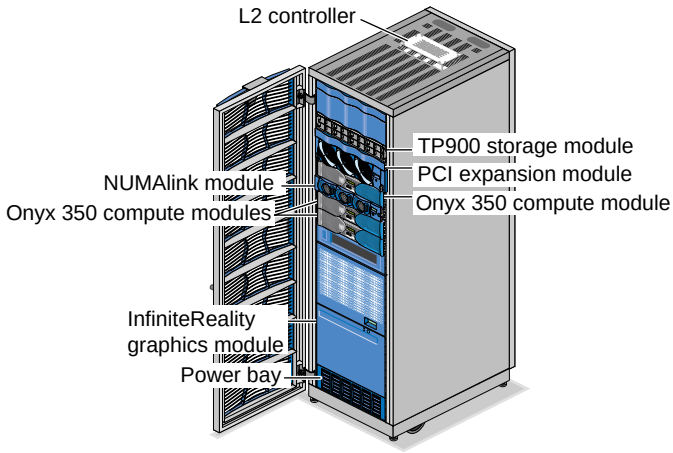

Figure 1-1 Example of Onyx 350 InfiniteReality Visualization System

As with other Onyx series systems, the Onyx 350 visualization system is generally installed and operated in a rack in your lab or server room.

Note: The NUMAlink, SGI Total Performance (TP900) storage, and 4U PCI expansion modules are optional modules. The 4U PCI expansion module does not support PCI-X functionality and must always be ordered with an optional power bay.

This modular design allows you to customize your system to meet your specific graphics requirements. For example, you can choose to have single or multiple InfiniteReality or InfinitePerformance graphics pipes.

This chapter consists of the following sections:

System Features

The Onyx 350 systems come installed in either a short (17U) or tall (39U) rack configuration. You may also order the individual Onyx 350 InfinitePerformance module as a "standalone" unit that may be installed in your own existing SGI rack or other mounting system.

Note: All Onyx 350 systems ordered with InfiniteReality graphics are shipped in a 39U rack or racks.

Table 1-1 lists the functional descriptions of the standard and optional modules that make up an SGI Onyx 350 visualization system.

Table 1-1 Module Descriptions

Module	Description
InfiniteReality (IR) graphics module	Contains 1 or 2 (IR) graphics pipes.
Onyx 350 compute module	Provides the compute and I/O functionality for the system.
Onyx 350 compute and InfinitePerformance (IP) graphics module	Combines system compute and I/O functionality with 1 IP graphics pipe (not used in IR graphics based systems).
NUMAlink module (optional) (required for systems with more than 8 processors)	Allows expansion and scaling of systems beyond 8 processors or 2 graphics pipes.
L2 controller module	Provides rack-level control in NUMAlink-based systems.
TP900 storage module (optional)	Provides additional disk storage.
4U PCI expansion module (optional)	Provides 12 PCI slots in a 4U enclosure.
Power bay module (optional)	Provides power to the optional 4U PCI expansion module.

Note: An Onyx 350 visualization system requires a power bay only if it contains an optional 12-slot 4U PCI expansion module.

Two types of systems are discussed in the following subsections:

- Onyx 350 with InfiniteReality graphics
- Onyx 350 with InfinitePerformance graphics

SGI Onyx 350 with InfiniteReality Graphics Features

Figure 1-1 on page 1 shows an example of the Onyx 350 with InfiniteReality Graphics. The Onyx 350 graphics system has the following features when equipped with InfiniteReality graphics:

- Scalable growth of memory, I/O bandwidth, and processor compute power.
- As many as 8 InfiniteReality graphics pipes.
- As many as 8 monitors on each IR graphics pipe.
- The Onyx 350 supports two configurations: a one or two-module "base" configuration and a NUMAlink configuration. For all configurations, one compute module is required for each IR graphics pipe.
- Optional high-speed NUMAlink module interconnect that links the Onyx 350 compute modules, MPX modules, and PCI expansion modules together (at a peak rate of up to 3200 MB/s bidirectionally, 1600 MB/s in each direction).

The base configuration is a single-rack system that consists of the following components:

- 1 or 2 Onyx 350 compute modules (2, 4, 6, or 8 processors total)
- 1 InfiniteReality graphics module with 1 or 2 graphics pipes
- 1 L2 controller module with AC power supply
- 1 or more 2U memory and PCI expansion (MPX) modules (optional)
- 1 or more TP900 storage modules (optional)
- 1 power distribution unit (PDU)
- 1 4U PCI expansion module (optional)
- 1 power bay (required when the system contains a 4U PCI expansion module)
- A monitor, USB keyboard, and mouse

Note: This system does not include a NUMAlink module.

A NUMAlink configuration is a single- or multiple-rack system that consists of the following components:

- 2 to 8 Onyx 350 compute modules (2 to 32 processors)
- 1 to 8 InfiniteReality graphics modules (1 to 8 graphics pipes)
- 1 NUMAlink module
- 1 L2 controller
- 1 or more TP900 storage modules (optional)
- 1 to 4 PCI or MPX expansion modules (optional)
- 1 PDU

- 1 power strip or second PDU (required if more than 10 receptacles are needed)
- 1 power bay (required if the system has a DC-powered 4U PCI expansion module)
- A monitor, USB keyboard, and mouse

In both configurations, the InfiniteReality graphics pipeline(s) connects to the XIO port of an Onyx 350 compute module(s).

SGI Onyx 350 With InfinitePerformance Graphics Features

The Onyx 350 visualization system has the following features when equipped with the combined compute and InfinitePerformance graphics modules:

- Scalable growth of memory, I/O bandwidth, and processor compute power.
- Support for 1 to 8 InfinitePerformance (IP) graphics pipes.
- 2 to 8 64-bit RISC processors in base systems, and 4 to 32 processors in NUMAlink systems.
- Support for 1 or 2 IP pipes in a base system.
- Support for 1 to 8 IP pipes in a NUMAlink system.
- Optional high-speed NUMAlink module interconnect that links the Onyx 350 compute modules, MPX modules, and PCI expansion modules together (at a peak rate of up to 3200 MB/s bidirectionally, 1600 MB/s in each direction).
- Optional compositor modules enabling 2, 3, or 4 InfinitePerformance graphics pipes to output to a single display or device.

The base configuration is a one- or two-module system that consists of the following:

- 1 or 2 Onyx 350 graphics/compute or option modules with 2 to 8 total system processors and one or two InfinitePerformance graphics pipes. Note that digital media options or compute-only modules may substitute for one graphics pipe.
- Monitor, USB keyboard and mouse.
- Rackmounting hardware kit (for SGI or third-party racks).
- 1 L2 controller (optional)
- Compositor module (optional)
- 1 or more TP900 storage modules (optional)

Note: This configuration can be ordered with an SGI rack, or mounted in customer equipment as required. This system does not include a NUMAlink module.

An Onyx 350 NUMAlink configuration is a single- or multiple-rack system that consists of the following components:

- 1 to 8 Onyx 350 graphics/compute modules (up to 32 processors)
- 1 to 8 InfinitePerformance graphics pipes (digital media options or compute-only modules may substitute for individual graphics pipes)
- 1 NUMAlink module
- 1 L2 controller (required)
- 1 or more compositor modules (optional)
- 1 or more TP900 storage modules (optional)
- 1 to 4 memory and PCI-X (MPX) expansion modules (optional)
- 1 PDU
- 1 power strip or second PDU (required when more than 10 power receptacles are needed)
- One to four 4U PCI expansion modules (optional) and 1 power bay (required when the system contains 1 or more DC-powered 4U PCI expansion modules)
- A monitor, USB keyboard, and mouse

System Functional Architecture

Figure 1-2 on page 7 shows a functional block diagram example of the SGI Onyx 350 system. Note that this example shows the InfinitePerformance graphics interface, which is not present in the Onyx 350 compute module used with InfiniteReality graphics.

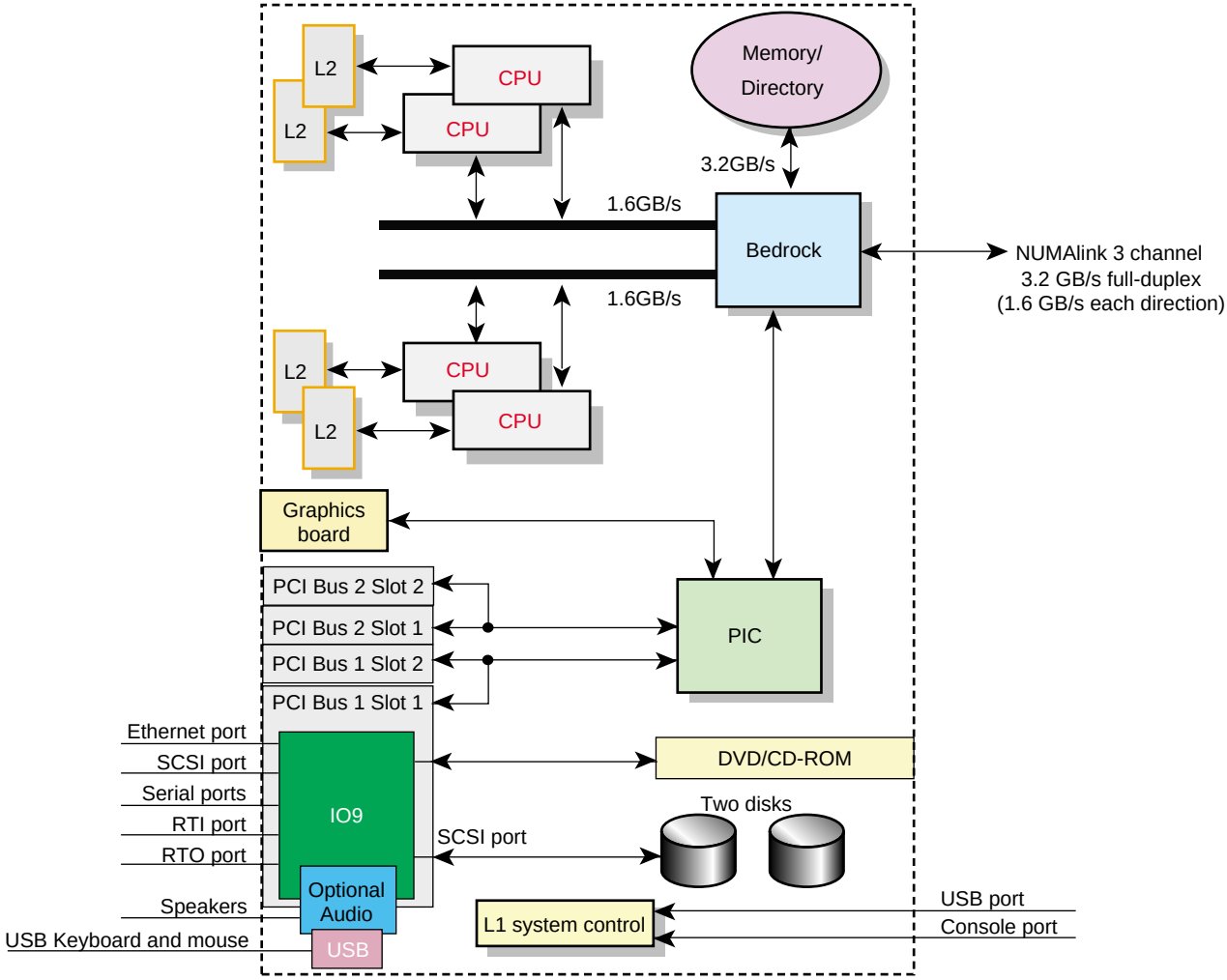

Figure 1-2 Functional Block Diagram of a Basic IP Graphics System

Standard System Components

The Onyx 350 graphics system base module (with IO9 PCI board) features the following standard components:

- 1 system disk (in base module) additional drive optional
- Front-mounted L1 system controller display
- 10/100/1000 Mbit Ethernet connector
- 4-connector USB keyboard/mouse PCI card
- 4 standard 9-pin serial ports
- External SCSI connector

Optional module features include the following:

- 2 PCI audio options (basic or professional)
- Internal CD/DVD-ROM option drive
- Second (redundant) power supply

Figure 1-3 shows the front controls and the system components behind the doors.

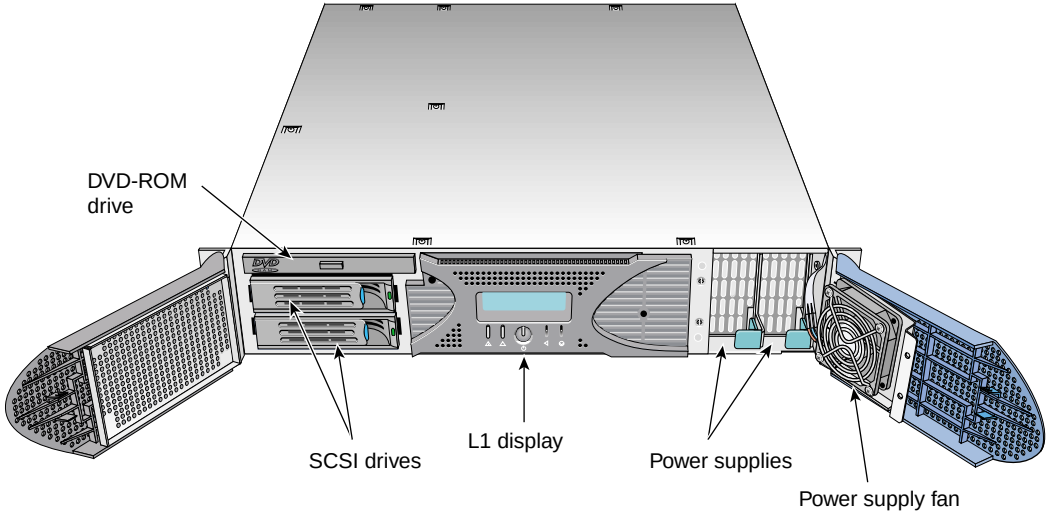

Figure 1-3 Onyx 350 System Module Front View

Rack Chassis Description

A base Onyx 350 InfinitePerformance module can be ordered without an accompanying SGI rack. All InfiniteReality graphics systems come installed in an SGI 39U tall rack (one U is 1.75 in. [4.45 cm]) and a 17U rack is available with all Onyx 350 InfinitePerformance graphics systems. Both rack types are industry-standard 19-inch racks.

Both racks, as shown in Figure 1-4, have front and rear doors that have keylocks to prevent unauthorized access of the system. The racks also have cable entry/exit areas at the bottom of the racks and cable management hardware in the rear of the racks. Both types are mounted on four casters, two of which are swivel casters.The base of the racks have seismic tie-down attachment points. The base of the tall rack also has leveling pads.

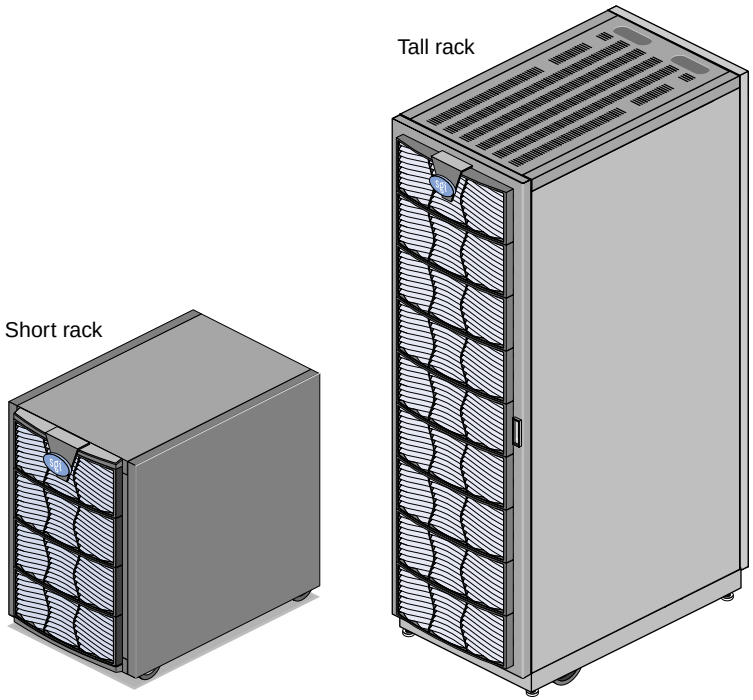

Figure 1-4 SGI 17U and 39U Racks

Power Components

If shipped pre-installed in an SGI rack system, the Onyx 350 products can have one or two power distribution units (PDUs). The second PDU is added to the system if more than 10 AC power receptacles are needed within the rack. Each module comes with its own power cable. See the example in Figure 1-5 on page 11.

The PDU inputs AC voltage from an external power receptacle and it can output AC voltage to the compute module, NUMAlink module, optional TP900 storage modules, USB hub, power bay module, and power strip.

Note: A graphics-only rack used with some InfiniteReality systems does not have PDUs, because the IR graphics module always plugs into a wall outlet.

Optional PDU

The optional power distribution unit exists in a rack system only if the system requires 11 to 15 AC power receptacles. The secondary PDU inputs AC voltage from the main system PDU and it can output AC voltage to the compute/graphics modules, NUMAlink module, MPX module, optional TP900 storage modules, USB hub, and optional power bay module.

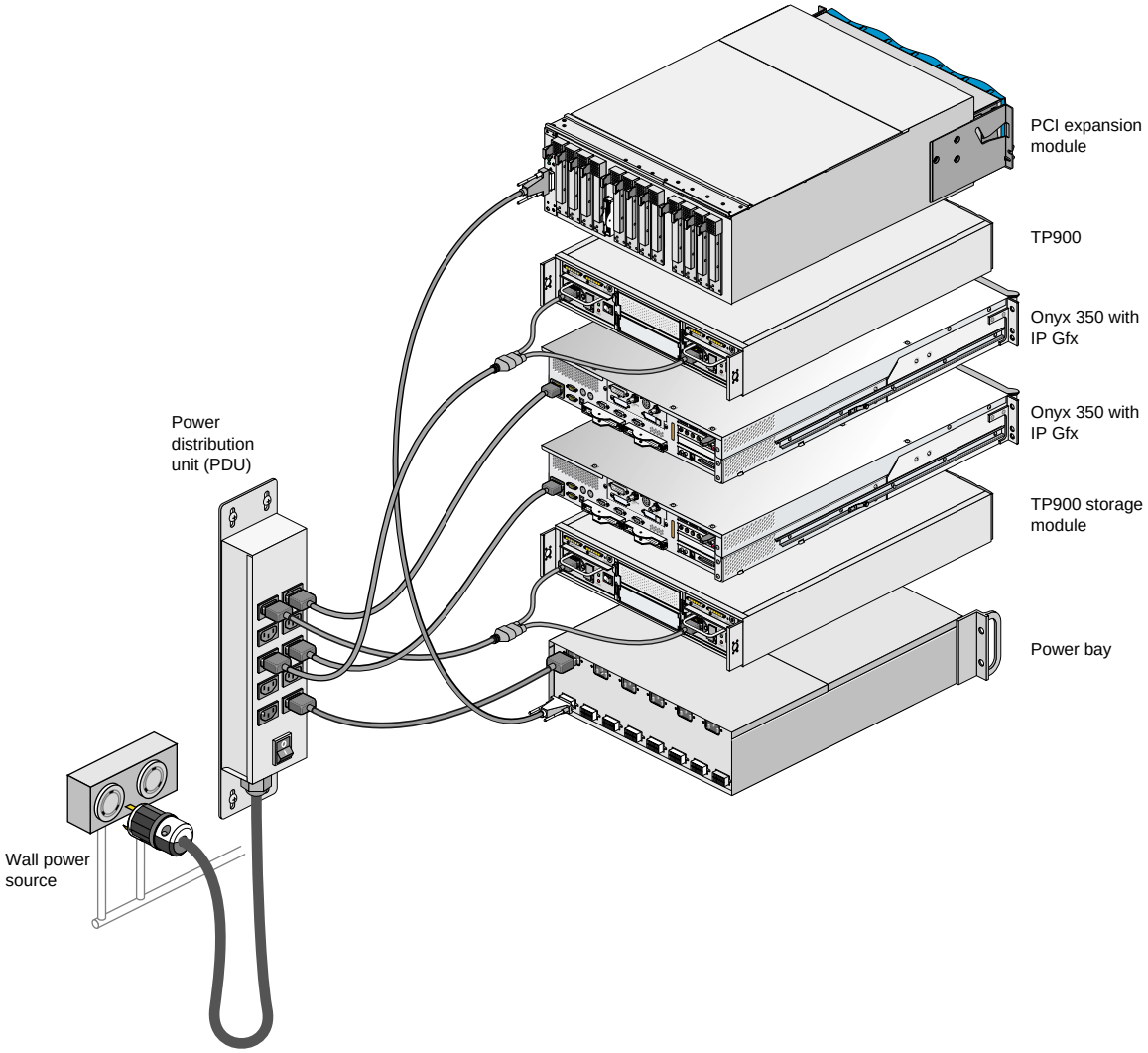

Figure 1-5 Power Distribution Example

Optional System Components

This section briefly describes the major system options for the Onyx 350 graphics products, as follows:

NUMAlink Module

The NUMAlink module, shown in Figure 1-6 on page 13, is an air-cooled device that transfers messages between the compute modules via the NUMAlink 3 interconnect. This module is required for systems that contain more than two compute/graphics modules (or additional MPX or PCI expansion modules).

The NUMAlink module consists of eight ports; four ports can connect up to four compute or compute/graphics modules. The other four ports, which carry USB signals, can connect to compute modules, MPX modules, or PCI expansion modules.

Note: The USB signals enable the compute modules and the PCI expansion modules to communicate with the L2. The compute modules and/or MPX modules that connect to the four ports that do not carry USB signals communicate with the L2 controller via a USB hub.

The NUMAlink module receives AC power from a PDU or power strip. Note that the front of the NUMAlink module appears to display three cooling fans; however, only the middle and right fans are present.

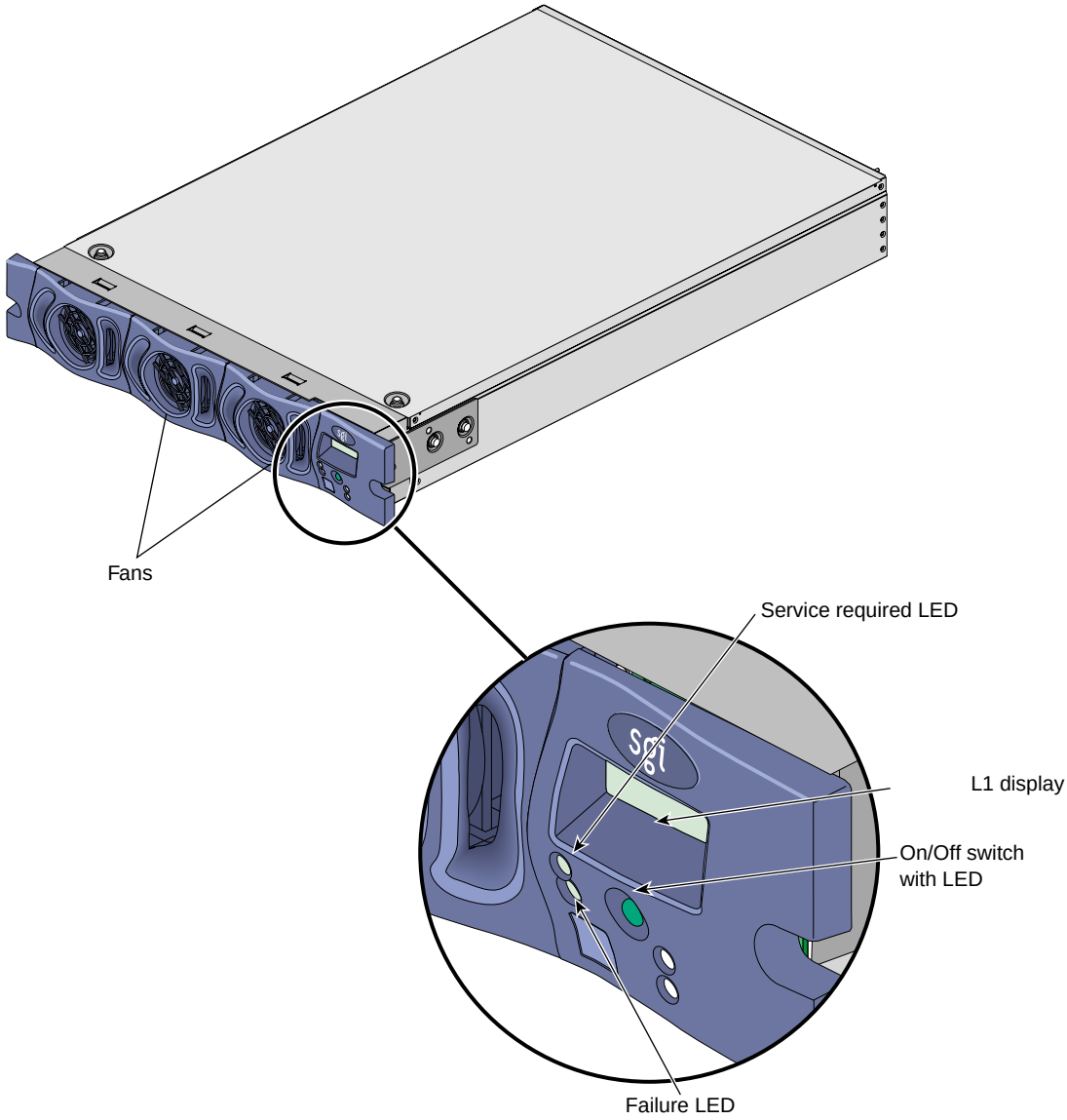

Figure 1-6 Optional NUMAlink Module

4U PCI Expansion Module

The 4U PCI expansion module is available with Onyx 350 systems regardless of the type of graphics used in your particular system. For additional information on the 4U PCI expansion module, see the *PCI Expansion Module User's Guide* (P/N 007-4499-00*x*).

The PCI expansion module, shown in Figure 1-7, contains six buses (buses 1 through 6) that can seat as many as twelve PCI cards. Each bus has two PCI slots that are labeled 1 and 2.

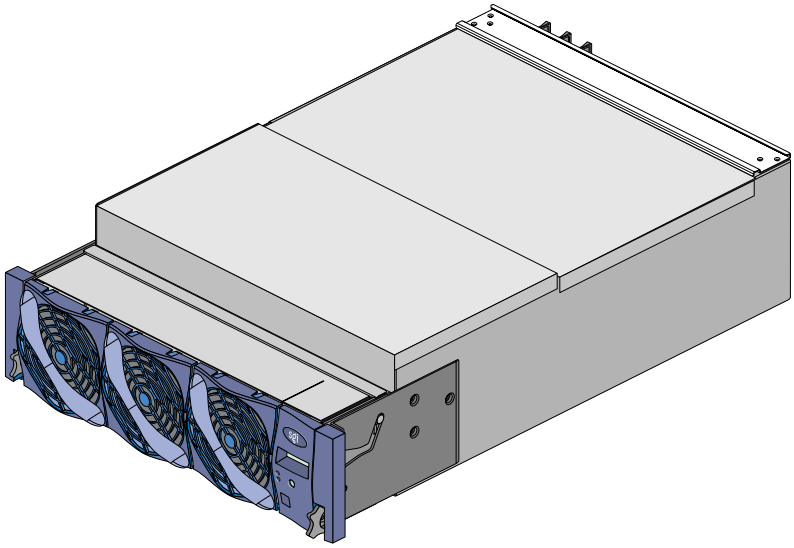

Figure 1-7 4U PCI Module Option

USB Hub Option

The USB hub routes information between the L2 control emulator and the following components:

- 4 compute/graphics modules and/or MPX modules that connect to NUMAlink module ports 1, 6, 7, and 8 (the ports that do not carry USB signals)
- InfiniteReality graphics module(s)

Note that the appearance of the USB hub might differ from the one shown in Figure 1-8.

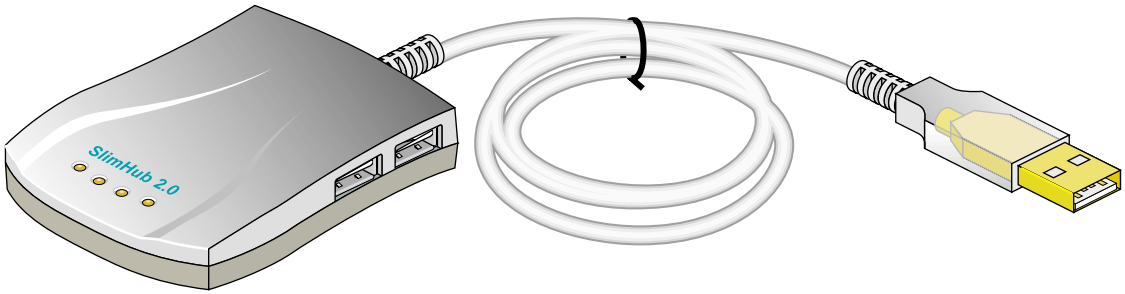

Figure 1-8 USB Hub Example

Mass Storage Options

The base compute module contains two disk-drive bays. SGI offers additional mass storage options for your Onyx 350 products as follows:

- For a SCSI (small computer system interface) JBOD (just a bunch of disks) solution, SGI offers the SGI Total Performance 900 (TP900) storage module. Two SCSI disks can also be added to each system expansion module (requires IO9 PCI cards).
- For a Fibre Channel solution that supports both JBOD and RAID configurations, SGI offers the 2Gb SGI Total Performance 9100 (2Gb TP9100) storage system.
- For Fibre Channel RAID solutions, SGI offers the SGI Total Performance 9400 (TP9400) storage system and the SGI Total Performance 9500 (TP9500) storage system.

These solutions are discussed in the subsections that follow.

TP900 Storage Option

The SGI TP900 storage module is a 2U-high 8-drive storage system that provides compact, high-capacity, high-availability JBOD storage. The enclosure backplane connects the 8 drives on one SCSI bus. As an option, the storage module can also be configured on two SCSI buses (2 strings of 4 drives).

For additional information on this option, see the *SGI Total Performance 900 Storage System User's Guide* (P/N 007-4428-00*x*).

This storage module has the following features:

- It mounts in a standard 19-in. rack, and is available in factory-installed configurations.
- It uses SCSI Parallel Interface 3 (SPI-3) capable low profile (1-inch high) 3.5-inch disk drives.
- Its drive carriers accept SGI qualified 10,000- or 15,000-RPM U160 SCSI disk drives.

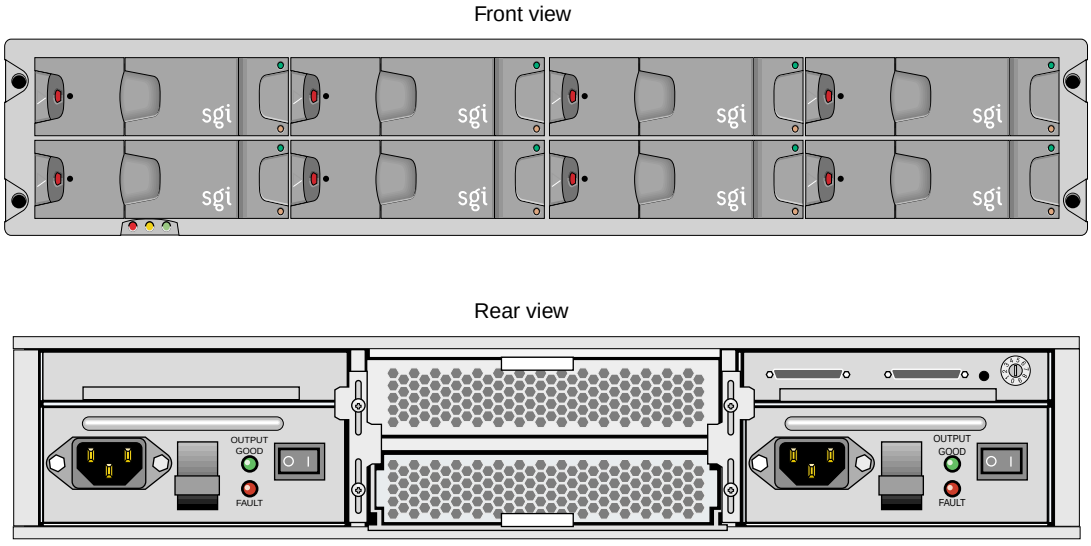

Figure 1-9 TP900 Storage System Option

2Gb TP9100 RAID and JBOD Storage Options

The 2Gb TP9100, shown in Figure 1-10 on page 17, is an entry-level RAID storage array that is easily expandable and comes in either a deskside tower or a rackmounted configuration. You can start with a basic JBOD configuration and later add RAID controllers or you can start with a RAID configuration.

The 2Gb TP9100 storage system connects to the compute module via an optional SGI Fibre Channel PCI card(s).

For additional information on these SGI mass storage options, see the *SGI Total Performance 9100 (2Gb TP9100) Storage System User's Guide* (P/N 007-4522-00*x*).

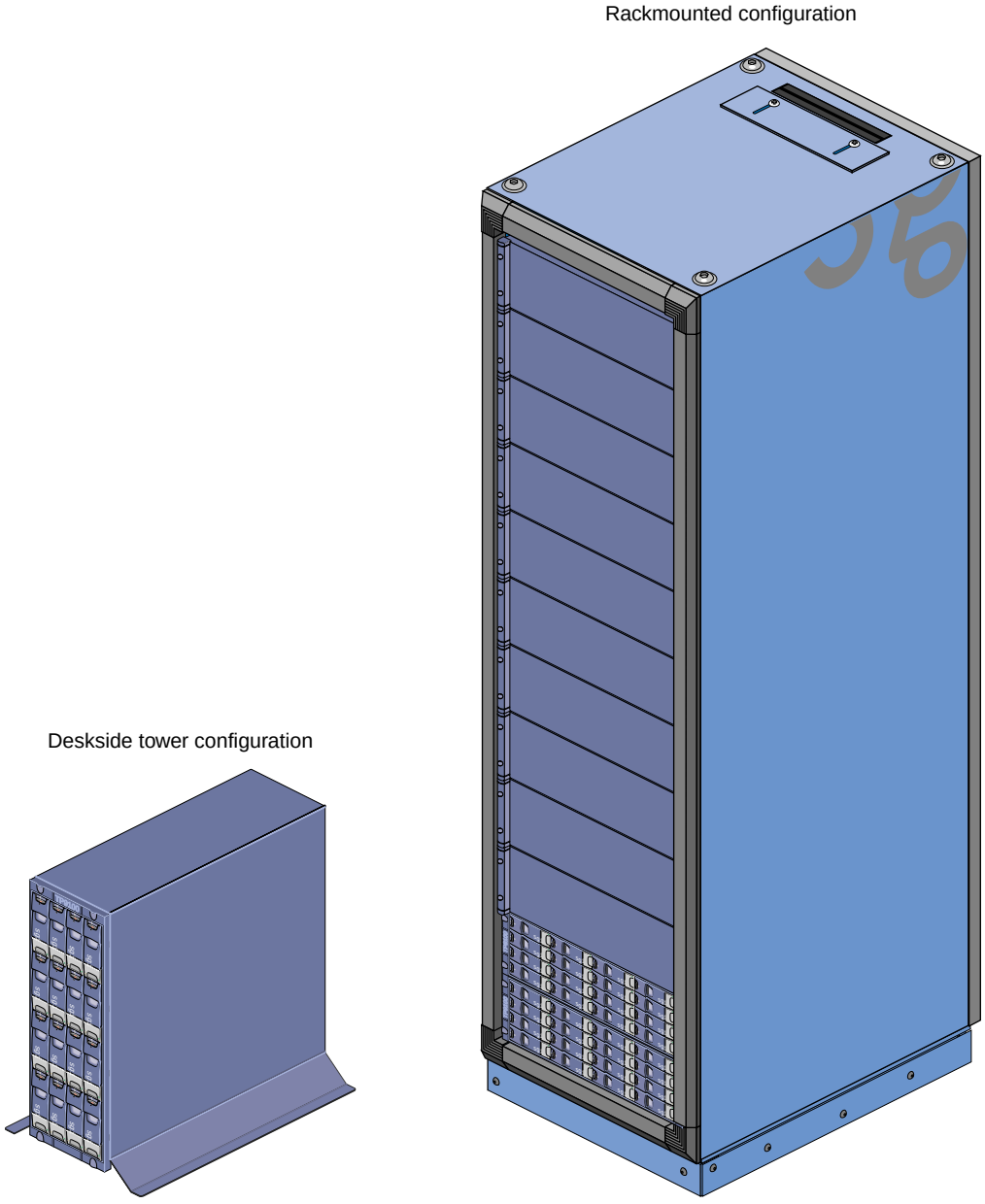

Figure 1-10 2Gb TP9100 Mass Storage Options

TP9400 and TP9500 Storage Options

The TP9400, shown in Figure 1-11, and the TP9500 are highly scalable RAID storage subsystems. Each of these systems has a very large and expandable storage capacity that can grow to match storage requirements without disruption to normal processing activities.

Continuous availability enables all active components to be configured redundantly and installed "hot" as customer-replaceable or expansion units.

The TP9400 and TP9500 storage systems connect to compute modules via optional SGI Fibre Channel PCI cards in the Onyx 350 visualization systems.

For additional information on these SGI mass storage options, see the *SGI TP9400 and SGI TP9500 RAID Owner's Guide* (P/N 007-4304-00*x*).

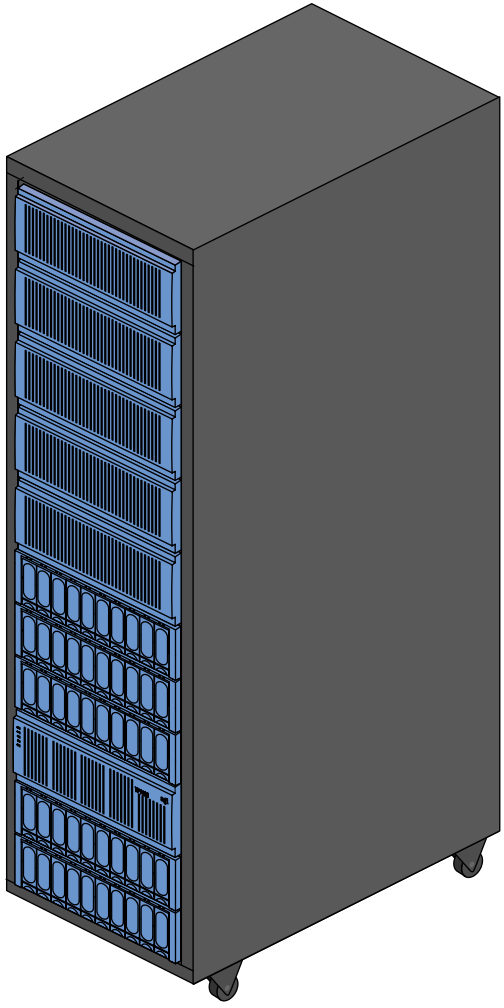

Figure 1-11 Example of TP9400/TP9500 Storage Option

Installation and Operation

This chapter explains how to access and use the basic hardware interfaces and operating controls on your new system. Details on properly powering the system on or off are provided near the end of the chapter.

Your Onyx 350 system comes with SGI professional installation services. Optional setup of keyboards, mice, speakers, and monitors is provided in case you need to reconfigure or add to your installation. Always start by reading the precautions in the next section.

See the following sections to reconfigure or add to your system installation:

- "Connecting Monitors" on page 23
- "Connecting Keyboard and Mouse" on page 26
- "Connecting Optional Speakers" on page 32

See the following sections to properly power your system on and off and to monitor your system:

- "Powering the System On and Off" on page 32
- "Monitoring the System" on page 46

Precautions

Before using your system, familiarize yourself with the safety information in this section. For additional safety and regulatory information, see Appendix B.

ESD Precautions

Observe electrostatic discharge (ESD) precautions during the entire installation process to eliminate possible ESD damage to the equipment.

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

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

Safety Precautions

Warning: Before installing, operating, or servicing any part of this product, read the safety information in Appendix B.

Observe the following safety measures when working with your system.

- Do not move the system while it is connected to power.

Warning: 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.

- Ensure that a qualified electrician has properly installed the power receptacles.
- Power off the system only after the system software has been shut down in an orderly manner.
- Set all circuit breakers to the OFF (0) position before you unplug or plug in the system power cord(s).

Caution: If you power off the system before you halt the operating system, data may be corrupted or lost.

Connecting Monitors

Your Onyx 350 graphics system comes with a choice of monitor types and sizes. Depending on your application and system requirements, you may have one or more of the following:

- High-resolution SuperWide (1920 x 1200-pixel) 24-inch CRT monitor
- 21-inch CRT monitor
- 18-inch LCD display
- 22-inch LCD display

InfiniteReality graphics system monitors connect to the DG5 board located in the IR graphics module via a 30-ft. (9.1-m) 13W3 monitor cable.

InfinitePerformance graphics systems use the DVI monitor connector on the rear of the graphics/compute module. It can connect using either of the following:

- Digital (LCD) display DVI-D connection cable
- Analog DVI-A cable to a CRT or LCD display

Caution: Ensure that the electrical rating on the monitor label matches the outlet voltage range (100–120 VAC or 220–240 VAC) before you plug in the monitor.

When you use a monitor in locations that do not have the appropriate outlets, contact your SGI system support engineer (SSE) before plugging in the monitor power cable.

Plug in and turn on your monitor as described in the documentation that accompanies your monitor.

Note: If you are using a monitor that was not shipped with your Onyx 350 graphics system and it has adjustable RGB connectors, ensure that they are in the 75-ohm position; otherwise, the monitor displays incorrect colors.

Connecting the InfiniteReality Graphics Monitor

The default monitor resolution supported by the Onyx 350 graphics system SuperWide monitor is 1920 x 1200 at 66 Hz. The maximum output bandwidth is approximately 300 Mpix/s. With two monitors, the transfer rate of each monitor at a resolution of 1920 x 1200 at 66 Hz is approximately 188 Mpix/s. If you connect more than two monitors, you must use a combination of low- and high-resolution monitors that are within the limit of 300 Mpix/s.

To change the default video format for your monitor, use the `setmon` command. For more information about the `setmon` command options, see the `setmon(1G)` man page.

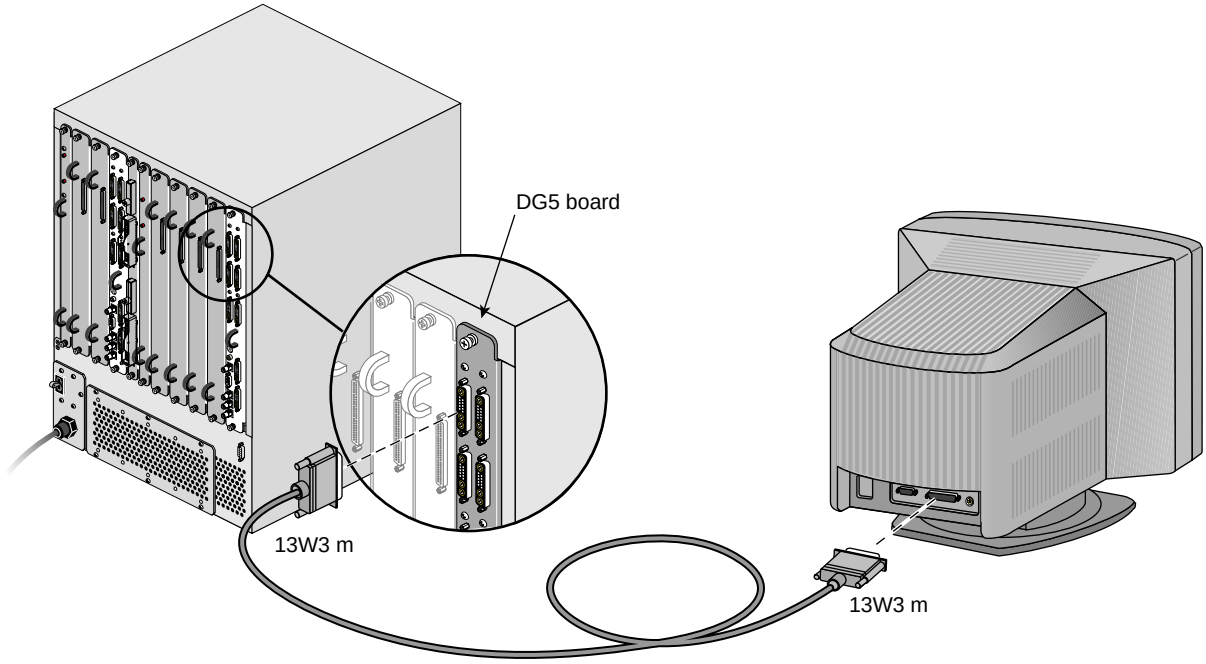

Figure 2-1 InfiniteReality Monitor-to-DG5 Connection

Connecting the InfinitePerformance Graphics Monitor

Use the Digital Video Interface-Integrated (DVI-I) to VGA cable to connect the DVI-I (analog and digital) InfinitePerformance graphics board to a VGA connector on a 24- or 21-inch VGA CRT monitor. Optional digital LCD monitors use a digital DVI-D cable.

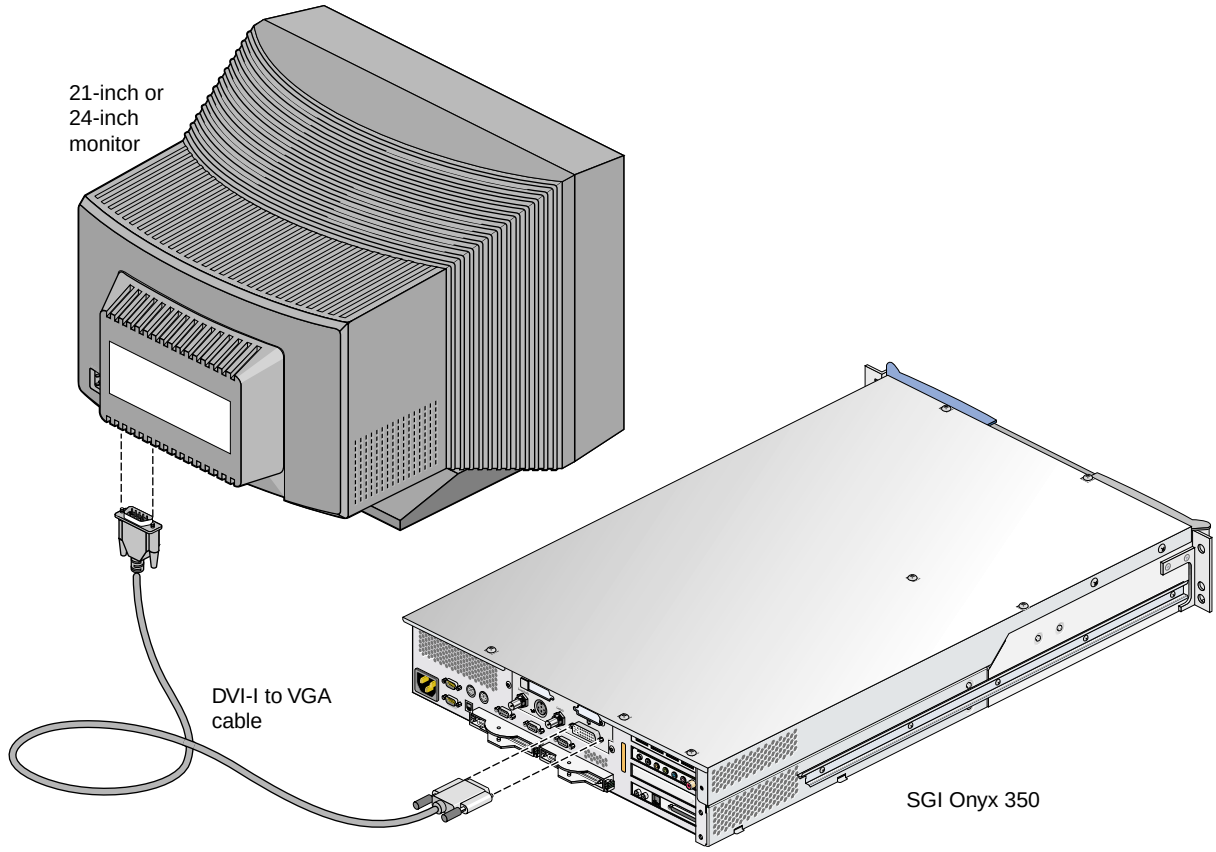

Figure 2-2 Connecting InfinitePerformance DVI-I to a Monitor

Connecting Keyboard and Mouse

To use your monitor, your graphics system is shipped with a standard 101-key USB keyboard and a USB mouse. You can plug the keyboard and mouse directly into the USB connectors of an Onyx 350 compute module (see Figure 2-3), or you can use a USB extender that allows you to place the keyboard and mouse up to 328.68 feet (100 m) from the Onyx 350 compute module (see Figure 2-4). The subsections that follow discuss these additional keyboard and mouse topics:

- "Configuring the USB Keyboard and Mouse" on page 28
- "Configuring the PS/2 Keyboard and Mouse" on page 29
- "Reconfiguring the Keyboard and Mouse Manually" on page 30

Note: You can have one keyboard and one mouse per standard graphics pipe (up to a maximum of eight per system). The optional local extender (LEX) receives AC power from the power distribution unit (PDU) in the rack. A 6-ft. (1.82-m) adapter cable connects the extender's power adapter to the PDU. The remote extender (REX) does not use an external power source.

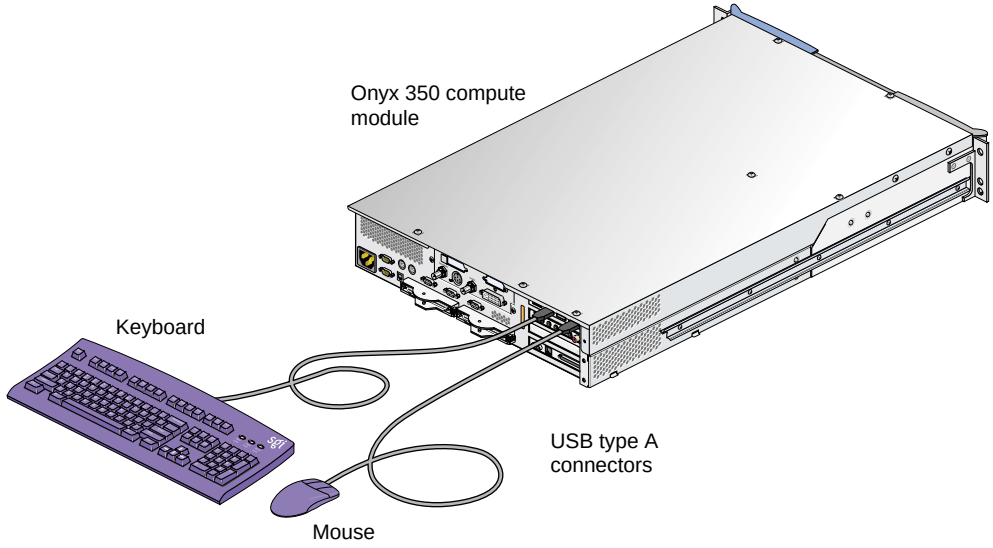

Figure 2-3 Keyboard and Mouse Connected Directly to Compute Module

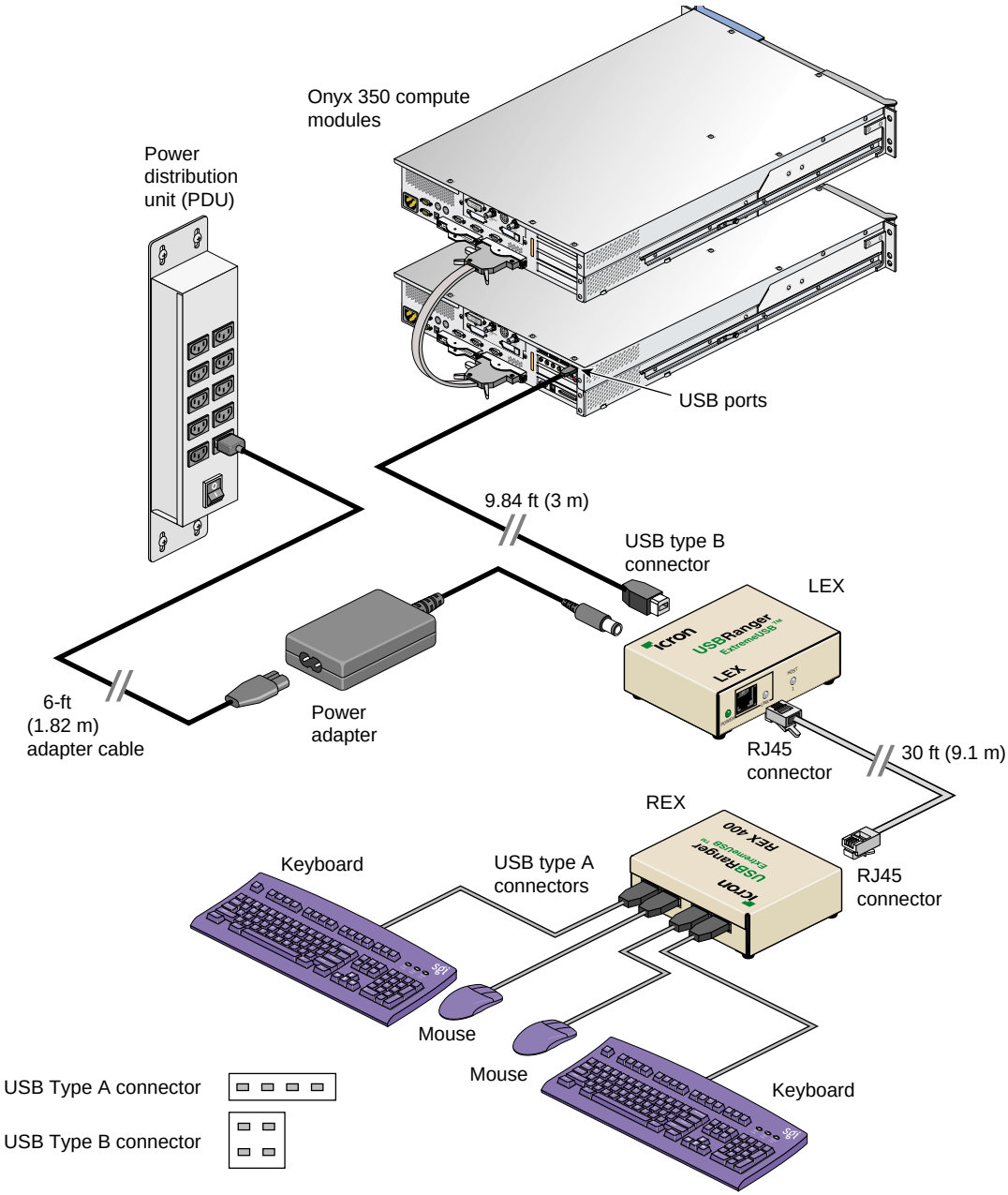

Figure 2-4 Keyboard and Mouse Connected via Optional USB Extender

Configuring the USB Keyboard and Mouse

The `ioconfig(1m)` command establishes logical device numbers for each keyboard and mouse in an Onyx 350 system. When the system first initializes the USB hardware, it scans each USB bus looking for devices. Initially, these devices are assigned a device ID of -1. Later in the boot process, the `ioconfig(1m)` command assigns device IDs based on the contents of the file `/etc/ioconfig.conf`.

If the device is already represented in `ioconfig.conf`, the associated device ID is assigned. If the device is new (not already in `ioconfig.conf`), a new device ID is allocated and assigned, and a corresponding entry is appended to the `ioconfig.conf` file.

Each line in the `ioconfig.conf` file is a two-column entry. The left column is the numeric logical device ID (`0` in our example), and the right column is the hardware path pointing to the device. Note the following example:

```
0 /hw/module/001c01/IXbrick/xtalk/15/pci-x/usb/0/1/keyboard
0 /hw/module/001c01/IXbrick/xtalk/15/pci-x/usb/0/2/mouse
```

The device IDs are unique only among devices of a given type. Different device types may use overlapping device IDs.

For USB devices, the hardware path is divided into two parts: the `USB controller prefix`, and the `USB relative path`. The `controller prefix` is the portion of the path up to and including the component “usb.” Note the following example:

```
/hw/module/001c13/IXbrick/xtalk/15/pci-x/4/usb
```

The `controller prefix` encodes the hardware components leading to the USB controller. In the previous example, the controller path indicates that there is a USB controller at PCI slot 4 of the compute module located at 001c13.

The `USB relative path` is the portion of the path after the “usb” component. This path indicates the path leading from the controller to the actual device. The path is a series of numeric components terminated with a device type. The numeric components represent USB hub port numbers. You can think of the ’/’ separator as representing a hub and the numeric component as a port on that hub.

Multiple numeric components represent multiple layers of USB hubs, with the leftmost component representing the root hub, or the hub built into the USB controller.

The following example indicates a keyboard device attached to port 1 of a hub, which is attached to port 1 of the root hub:

```
.../usb/1/1/keyboard
```

The following example shows a mouse attached to port 2 of the same hub:

```
.../usb/1/2/mouse
```

You can use the `hinv` command to display the ID of a device. See the `hinv(1)` man page for additional information. Note that the `hinv` command only confirms the presence of the devices.

The device ID of a keyboard or mouse determines under which `/dev/input` directory the keyboard or mouse is placed. A keyboard or mouse with device ID `0` will be placed under `/dev/input` (for historical reasons), while a device with an ID greater than `0` will be placed under `/dev/inputX` (where X is the numeric device ID).

When the X Window System server starts, the `-devdir` option controls which directory is searched for input devices. By default, `/dev/input` is used.

Configuring the PS/2 Keyboard and Mouse

Onyx 350 base modules come standard with four USB ports and two PS/2 ports. The default connection for keyboard and mouse is USB. This way, multi-pipe systems will allow up to eight simultaneous, independent users to be connected to the system (may require optional USB hubs). For backwards compatibility with existing infrastructures, it is also possible to use PS/2 as the primary keyboard/mouse connection instead. In this case the following setup changes need to be considered.

The keyboard/mouse entries in `/etc/ioconfig.conf` are added automatically during hardware discovery at boot time. By default, the USB entries will get automatically added first, followed by the PS/2 entries. At subsequent reboots, the existing entries in `/etc/ioconfig.conf` will not be changed, but additional entries will be added using the next higher logical device numbers. For example, these entries might appear after booting a system with a USB keyboard/mouse pair connected to the same module (001c01) as the PS/2 keyboard/mouse pair:

```
0 /hw/module/001c01/IXbrick/xtalk/15/pci-x/0/1/keyboard
0 /hw/module/001c01/IXbrick/xtalk/15/pci-x/0/1/mouse
1 /hw/module/001c01/IXbrick/xtalk/15/pci-x/0/1/pckb
1 /hw/module/001c01/IXbrick/xtalk/15/pci-x/0/1/pcms
```

For Onyx 350, the USB connections take precedence over the PS/2 connections regardless of the brick order.

If the opposite order is desired, you may edit the `/etc/ioconfig.conf` to contain the following:

```
0 /hw/module/001c01/IXbrick/xtalk/15/pci-x/0/1/pckb
0 /hw/module/001c01/IXbrick/xtalk/15/pci-x/0/1/pcms
1 /hw/module/001c01/IXbrick/xtalk/15/pci-x/0/1/keyboard
1 /hw/module/001c01/IXbrick/xtalk/15/pci-x/0/1/mouse
```

The numbers on the left in this file determine the ordering of the connections. After you edit the file, new numbers will take effect at the next reboot, or at the next usage of the `ioconfig -f /hw` command.

Reconfiguring the Keyboard and Mouse Manually

If it becomes necessary to reconfigure the keyboard or mouse layout, manual configuration is necessary. Reasons for reconfiguration may include the following:

- Adding a new keyboard and mouse
- Adding hubs
- Moving a keyboard and mouse

To reconfigure the keyboard and mouse setup, follow these steps:

1. Run `/usr/gfx/stopgfx` to shut down the graphics subsystem.
2. Add or move devices as necessary.
3. Run `/sbin/ioconfig -f /hw` to assign temporary device IDs.
4. Edit the `/etc/ioconfig.conf` file.
5. Re-run `/sbin/ioconfig -f /hw` if you made changes in step 4.
6. Restart the graphics subsystem using the command `/usr/gfx/startgfx`.

Steps 4 and 5 allow you to bind the devices in your new configuration to the correct IDs. Because a keyboard and mouse with the same ID are put in the same `/dev/inputX` directory, you must ensure that the keyboard and mouse pair used by a given X server has the same ID.

Because `ioconfig` does not know what device IDs to assign automatically for new devices, step 3 may not assign the correct IDs. You can change the device IDs manually by editing `/etc/ioconfig.conf` and then re-running `ioconfig`. The `/dev/input/keyboard` and `/dev/input/mouse` entries are always created, even if a keyboard and/or mouse with device ID `0` are not present. This allows the default X server to run without a keyboard or mouse physically attached for manufacturing checkout purposes.

Running the `ioconfig.conf` command or rebooting the system causes new keyboards and mice to be added to the `ioconfig.conf`files using the next higher device IDs. Steps 4 and 5 are only needed if you change the device IDs.

To move keyboards or mice to different ports, follow steps 4 and 5. Otherwise the old location information remains (within the `ioconfig.conf` file)even after the new positions are added.

Note: If you boot the system in this mode and plug in a keyboard or mouse after the system is running, you must restart the graphics system (repeat steps 1, 3, and 6 from the previous sequence) to use the devices.

If the `ioconfig.conf` file needs to be re-created using all the default device IDs, rename or remove the `ioconfig.conf` file and reboot the system. At system startup all operational devices plugged into the system are put into a new `ioconfig.conf` file.

Connecting Optional Speakers

Your Onyx 350 is available with different optional audio interfaces and speaker sets. If your system speakers were set up by SGI professional services, the optional audio speakers should be ready to use. If you need to alter the Onyx 350 audio/speaker setup, follow the information in the document that comes with your speakers to properly site, install, and operate them.

Powering the System On and Off

The following sections describe how to power on and power off individual modules or your entire Onyx 350 system as follows:

- "Connecting the Main Power Cable to the Rack System" on page 33
- "Connecting the System Modules to a Power Source" on page 33
- "Powering On" on page 38
- "Powering Off" on page 43

Note: The following information applies to the InfiniteReality graphics modules, Onyx 350 compute modules, the NUMAlink module, and PCI expansion modules. You must manually power on a TP900 storage module by placing the power switch(es) in the **|** position. See Figure 2-5.

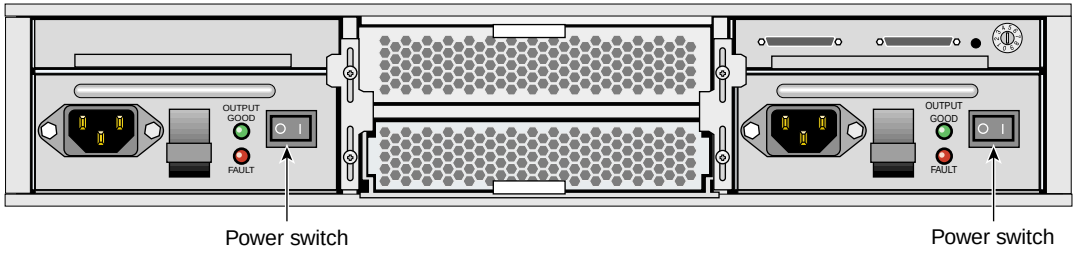

Figure 2-5 TP900 Power Switch (**|** Position)

Connecting the Main Power Cable to the Rack System

To reconnect your system power if it has been unplugged, follow these steps:

1. Ensure that the circuit breaker on the power distribution unit is in the OFF (**O**) position.
2. Connect the power cord to a grounded power outlet. Plugging in the power cord grounds the rack.

Connecting the System Modules to a Power Source

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

1. Confirm that the power cables between the following components are secure:
   - Between the InfiniteReality graphics module(s) and the external power receptacle(s) (see Figure 2-6).
   - Between the power bay and the following modules: DC-powered 4U PCI expansion module(s), and L2 controller module (see Figure 2-6).

     Note: When the system does not contain an optional DC-powered module, the L2 controller does not receive power from a power bay; instead, it receives power from a power supply. This power supply receives AC voltage from a PDU or power strip and converts the voltage to 48 VDC, which is the input voltage that the L2 controller requires.

   - Between the power distribution unit (PDU) and the following components:
     - Onyx 350 compute or compute/graphics module(s) or optional MPX modules
     - optional AC-powered NUMAlink module, USB hub, or TP900 module(s)
     - L2 controller power supply, power bay, or optional additional PDU
   - Between the PDU and the external power receptacle.

Figure 2-6 shows the connection between an InfiniteReality graphics module and an external power receptacle. It also shows the PDU and power bay connections to the other components within a system that contains a DC-powered NUMAlink module.

Connect the system modules to the power distribution unit (PDU) in your system rack.

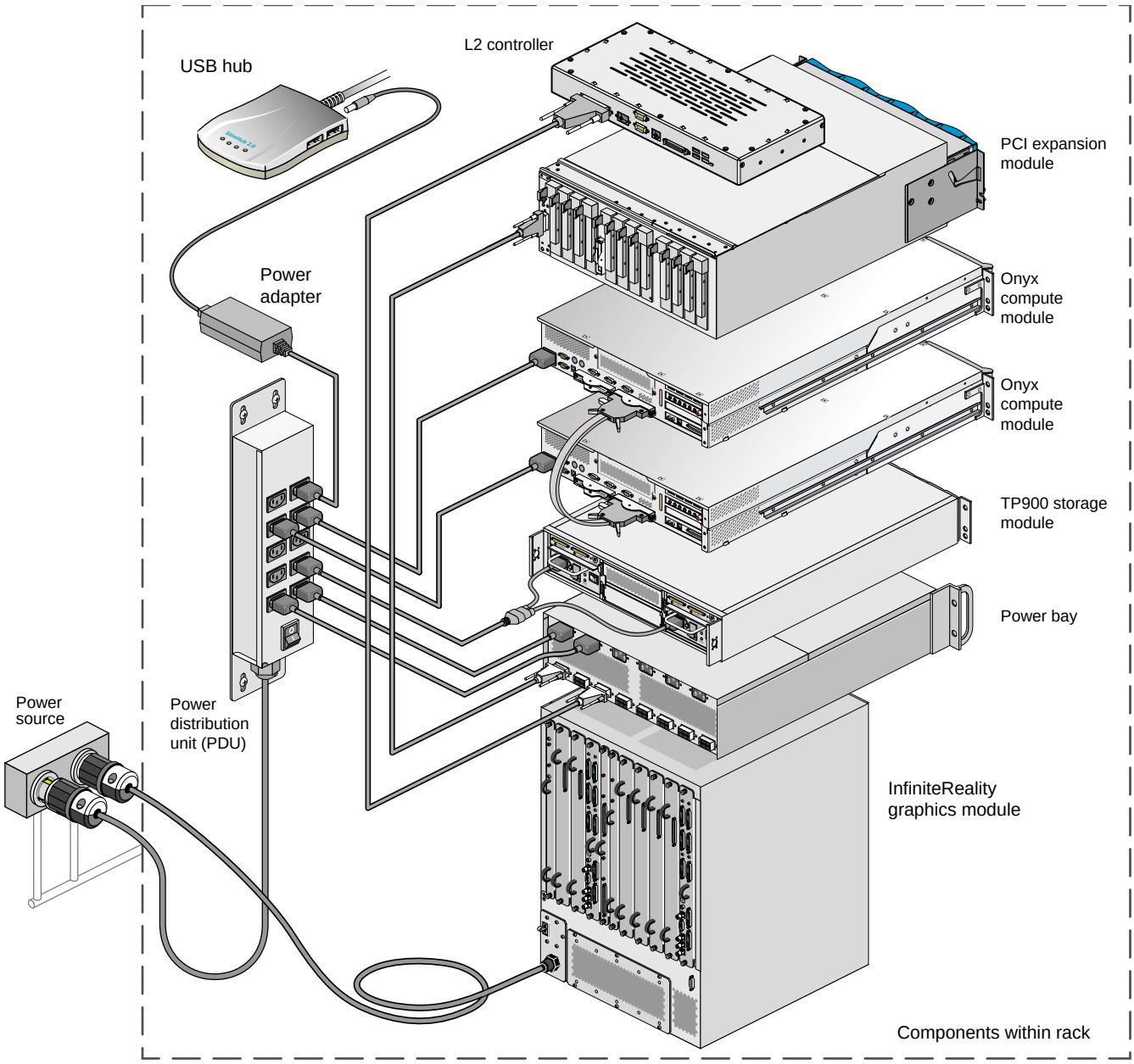

Figure 2-6 Example of Power Connection in IR System with DC-powered 4U PCI Module

2. Confirm that the cables between the L2 controller and the InfiniteReality graphics module are secure (see Figure 2-7)

Note: If the InfiniteReality graphics module resides in a separate rack, the graphics module connects to a USB hub; the USB hub connects to the L2 controller. The USB hub shown in the illustration may be different than the one installed in your system.

If your system does not have a NUMAlink module, the Onyx 350 compute/graphics modules connect directly to the L2 controller (see Figure 2-8).

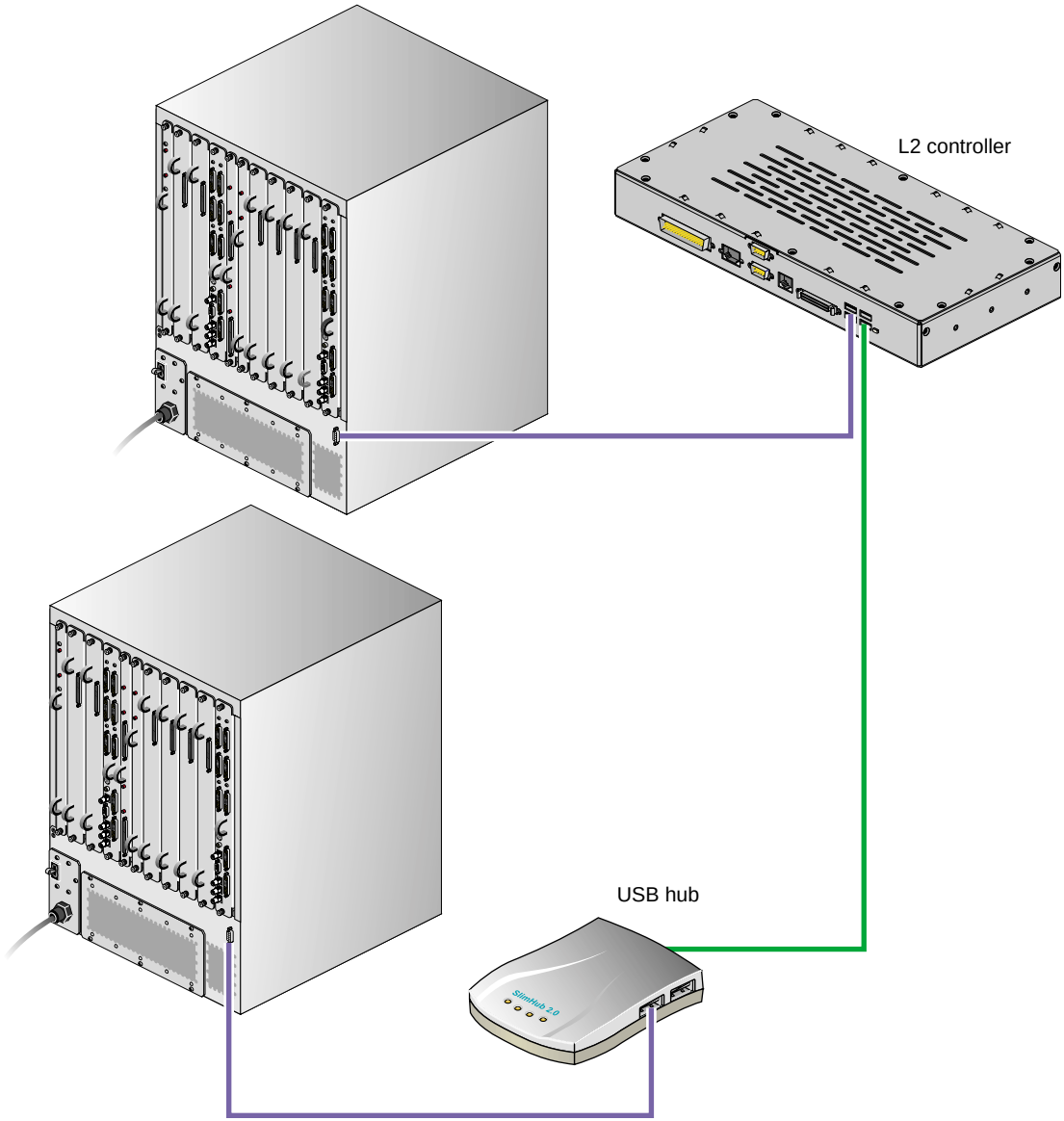

Figure 2-7 Example of Connections Between InfiniteReality and L2 Controller

Figure 2-8 shows how the Onyx 350 compute/graphics modules in an InfiniteReality graphics system that does **not** contain a NUMAlink module connect to an L2 controller. The top module communicates with the L2 controller via its NUMAlink connection to the bottom Onyx 350 compute/graphics module. Likewise, if a system contains one compute/graphics module and one 4U PCI expansion module, the 4U PCI expansion module connects to the L2 controller via its NUMAlink connection to the Onyx 350 compute/graphics module as shown in Figure 2-9.

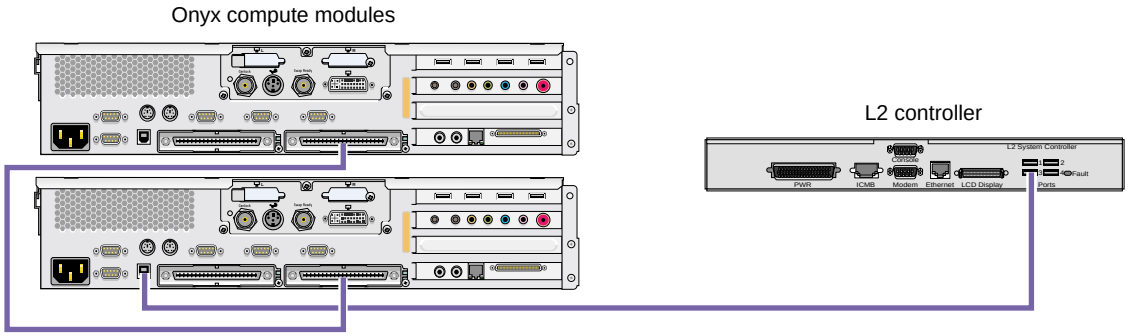

Figure 2-8 Onyx 350 Compute/Graphics Module Connections to Optional L2 Controller

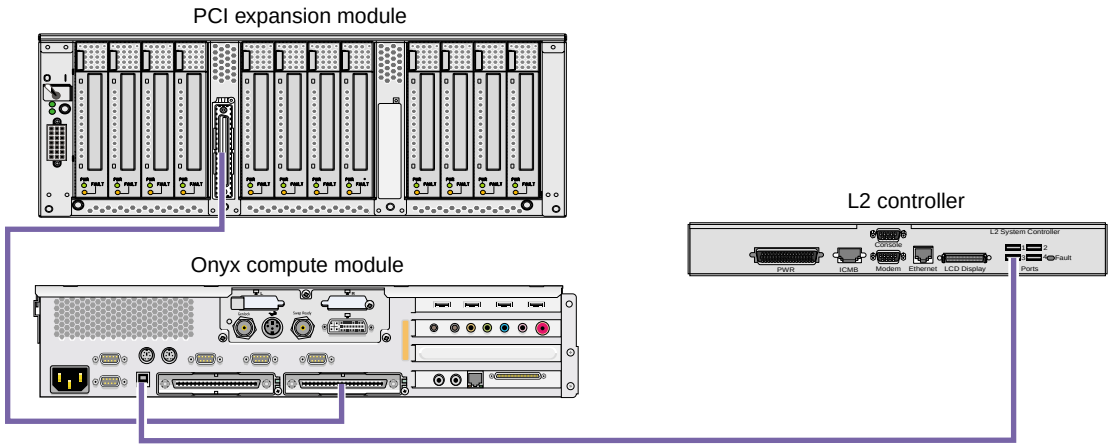

Figure 2-9 4U PCI Expansion Graphics System Connection to Optional L2 Controller

Note: The L2 controller is optional for IP systems without the NUMAlink module.

3. Ensure that the power switch on any optional DC-powered 4U PCI expansion module that you want to power on is set to the On (|) position. The power switch is located in the upper-left corner of the module (see Figure 2-9). This switch enables the L1 controller of the DC-powered 4U PCI expansion module(s) to power on after you turn on the circuit breaker of the PDU.

   Note: The Onyx 350 compute/graphics, MPX, and AC-powered NUMAlink modules do not have power switches; when the PDU circuit breaker is on, their L1 controllers are powered on.

   Note: Complete the power preparation steps in this section before you set the power switch of the InfiniteReality graphics module to the ON position. The InfiniteReality graphics module does not plug into the PDU; therefore, when you set the power switch to the ON position, the L1 controller of the graphics module powers on.

4. Ensure that the power receptacles for the IR graphics module (if installed) and the PDU are sourced and grounded from the same breaker box. For additional information on this topic, contact your SGI system support engineer (SSE).

Note that the L2 controller comes standard with all NUMAlink-connected Onyx 350 InfinitePerformance and InfiniteReality systems.

Powering On

This section explains how to power on the system either at the system console or with the power buttons.

Powering On at the System Console

Caution: Do not allow the difference in ground potential between two racks that are connected together with the NUMAlink or Xtown2 cables to exceed 250 millivolts (0.25 V), or severe equipment damage can result.

Warning: Turn off equipment before you install or remove power cords. The rackmount system operates on 200-240 VAC. Use extreme caution when you work around this voltage.

To power on the graphics system at the system console, follow these steps:

1. If the monitors and other peripherals are equipped with voltage select switches, verify that they are set for the appropriate AC voltage and plug them in. Note that they are normally plugged into sources outside the rack system.
2. Turn on the circuit breaker switch of the PDU as shown in Figure 2-10.

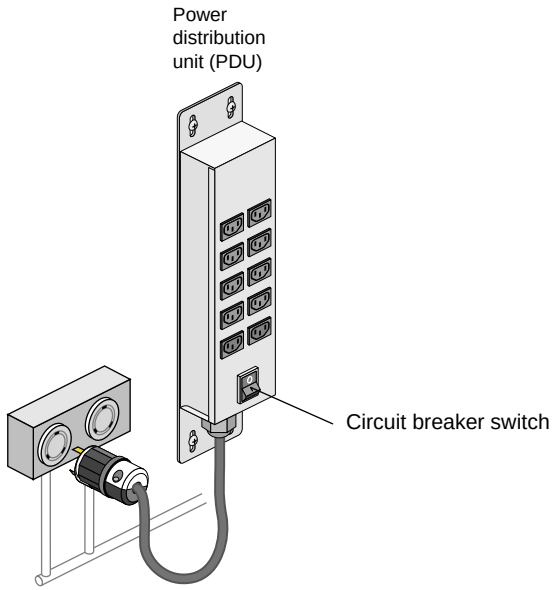

Figure 2-10 PDU Circuit Breaker Switch

3. Set the power switch of the InfiniteReality graphics module (if applicable) to the ON position. Figure 2-11 shows the location of the power switch.

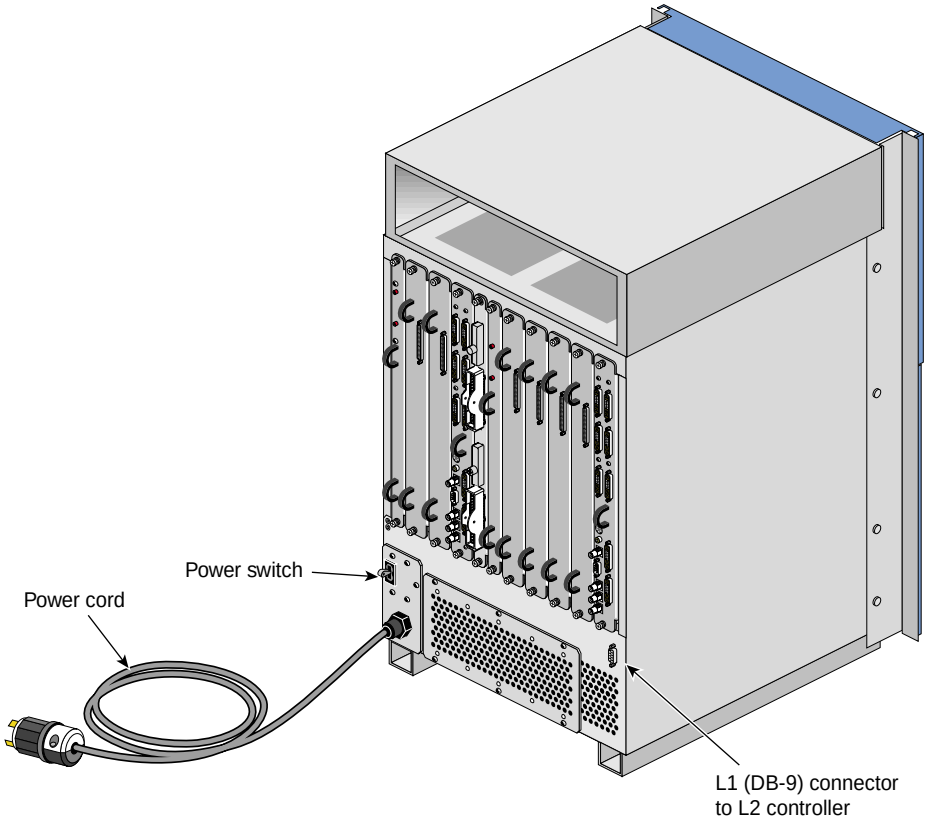

Figure 2-11 InfiniteReality Graphics Module Power Switch

4. Verify that all of the L1 controllers display "L1 running." If any L1 controllers are not running, contact your SGI system support engineer (SSE).
5. At the system console, access the L2 controller by entering the following command:

   ```
   $> /stand/sysco/bin/l2term
   ```

6. From the L2 prompt, display the system configuration by entering the following command:

   ```
   L2> cfg
   ```

This command lists the modules that the L2 controller detects in the system and their system controller addresses. If a module that you want to power on does not appear in the list, it will not power on. Ensure that the module's L1 controller is running and that it is cabled properly.

7. From the L2 prompt (L2>), power on an individual module by entering the following command. (If you want to power on the entire system, proceed to step 8.)

   ```
   L2> r <rack#> s <slot#> pwr u
   ```

   For example, to power on an Onyx 350 compute module in rack 1, slot 18, enter the following command:

   ```
   L2> r 1 s 18 pwr u
   ```

   The slot number is the unit number of the module within the rack. For more information about L1 and L2 controller commands and unit numbers, see the *SGI L1 and L2 Controller Software User's Guide* (P/N 007-3938-00*x*).

   If you want to power on several selected modules of a rack at the same time, you must enter the rack number followed by the slot numbers of the modules that you want to power on. For example, to power on the modules in slots 18, 20, and 22, enter the following command:

   ```
   L2> r 1 s 18,20,22 pwr u
   ```

8. If you want to power on the entire system, enter the following command:

   ```
   L2> pwr u
   ```

   (The default setting for the `pwr u` command is all racks and slots.)

9. When the L2 prompt appears, you will not see the output that is produced during the power-on procedure unless you redirect the keyboard input from the L2 controller to the normal console by entering the following:

   ```
   L2> ctrl-d
   ```

10. When the power-on procedure completes, the System Maintenance Menu appears on the system console or the graphics monitor. Select **Start System** (option 1) to boot the IRIX operating system.

Powering On with Power Buttons

If your system does not have a system console, you can power on your system manually by using power buttons. Each module that has an L1 controller has a power button with an LED; this button is located on the front of the module (see Figure 2-12). The TP900 storage module power switch(es) are located at the rear of the module (refer again to Figure 2-5 on page 32).

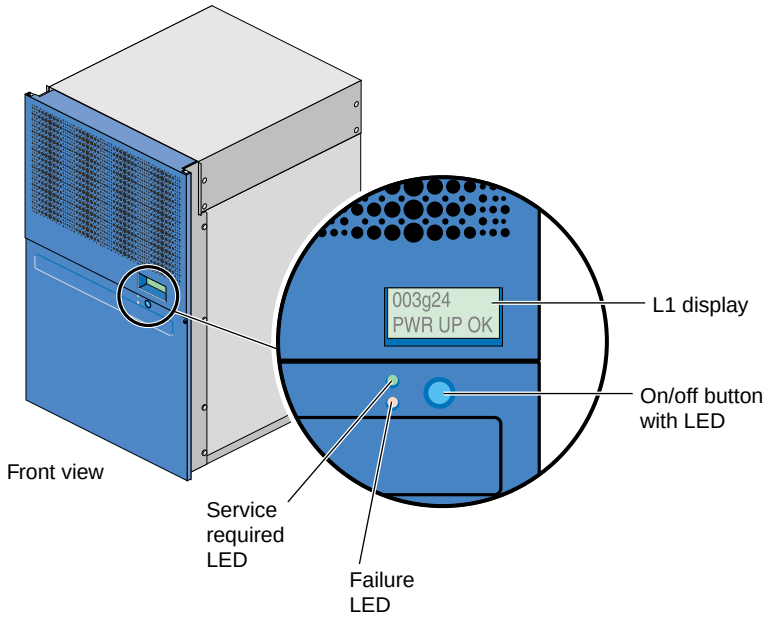

Figure 2-12 Front View of InfiniteReality Graphics Module

To power on the graphics system, follow these steps:

1. If the monitors and other peripherals are equipped with voltage select switches, verify that they are set for the appropriate AC voltage and plug them in. Note that they are normally plugged into sources outside the rack system.
2. Turn on the circuit breaker switch of the PDU.
3. Set the power switch(es) of any InfiniteReality graphics module(s) to the ON position as shown in Figure 2-11.
4. Set the power switch(es) of the TP900 storage module(s) to the ON position.

5. Verify that all of the L1 controllers display “L1 running.” If any L1 controllers are not running, recheck the power connections. If the power is properly connected and the system does not respond, contact your SGI system support engineer (SSE).
6. Press the power buttons that are located on the front of the modules that you want to power on. Always power on any 4U PCI expansion or InfiniteReality graphics modules first. Next, power on the NUMAlink module and then any other optional modules. Last, power on the Onyx 350 compute/graphics modules starting with the base unit or “global master” (usually the lowest compute module in the rack).

   The power button LEDs illuminate when the modules are powered on.
7. When the power-on procedure completes, the System Maintenance menu appears on the graphics monitor. Select **Start System** (option 1) to boot the IRIX operating system.

Powering Off

This section explains how to power off individual modules or your entire system either at the system L2 controller console or with the power buttons.

Note: The system should be powered off only for routine maintenance or repair.

The following information applies only to InfiniteReality graphics modules, Onyx 350 compute/graphics modules, the optional NUMAlink module, and MPX expansion modules.

You must manually power off the TP900 storage module by placing the power switch(es) in the **0** position, see Figure 2-13.

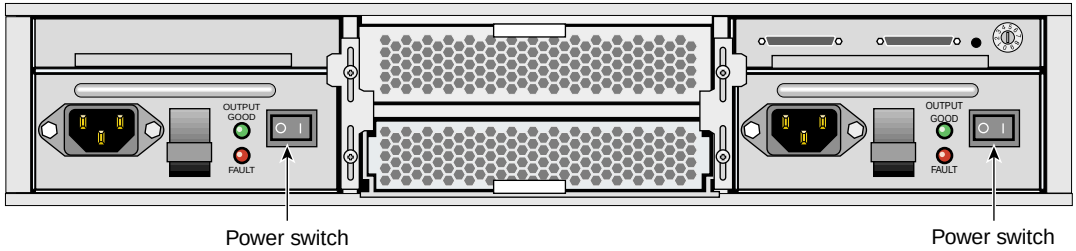

Figure 2-13 TP900 Power Switch (**0** Position)

Powering Off at the System Console

To power off your system at the system console, follow these steps:

1. Shut down the IRIX operating system by entering the following command:

   ```
   # init 0
   ```

2. To access the L2 prompt, direct the keyboard input to the L2 controller by entering the following:

   ```
   $> ctrl-t
   ```

3. From the L2 prompt (L2>), power off an individual module by entering the following command. (If you want to power off the entire system, proceed to step 4.)

   ```
   L2> r <rack#> s <slot#> pwr d
   ```

   For example, to power off an Onyx 350 compute module in rack 1, slot 18, enter the following command:

   ```
   L2> r 1 s 18 pwr d
   ```

   The slot number is the unit number of the module within the rack. For more information about L2 commands and unit numbers, see the *SGI L1 and L2 Controller Software User's Guide* (P/N 007-3938-00*x*).

   If you want to power off several selected modules from the rack at the same time, enter the rack number followed by the slot numbers of the modules that you want to power off. For example, to power off the modules in slots 18, 20, and 22, enter the following command:

   ```
   L2> r 1 s 18,20,22 pwr d
   ```

4. If you want to power off all of the modules within the rack, enter the following command:

   ```
   L2> pwr d
   ```

   (The default setting for the `pwr d` command is all racks and slots.)

   "Powered Down" appears on the L1 display when the module is powered off. The L1 controller is still powered on.

5. To power off an L1 controller of a DC-powered 4U PCI expansion, or InfiniteReality graphics module, set the power switch to the OFF position. The power switch of the DC-powered 4U PCI expansion module is located in the upper-left corner of the rear of the module. The power switch of the InfiniteReality graphics module is located in the lower-left corner of the rear of the module.

Note: The Onyx 350 compute and AC-powered NUMAlink modules do not have power switchs. To power off their L1 controllers, (and cut off all AC power to the unit) unplug the individual modules from the PDU.

Powering Off with Power Buttons (Without L2)

Note: The system should be powered off only for routine maintenance or repair.

To manually power off a system with no L2 controller (using power buttons), follow these steps:

1. Shut down the IRIX operating system by entering the following command:

   ```
   # init 0
   ```

2. Press the power buttons on the front of the modules that you want to power off. You can power off the modules in any order.
3. To power off an L1 controller of a DC-powered 4U PCI expansion, or InfiniteReality graphics module, set the power switch to the OFF position. The power switch of the DC-powered 4U PCI expansion module is located in the upper-left corner of the rear of the module. The power switch of the InfiniteReality graphics module is located in the lower-left corner of the rear of the module.
4. To remove all AC power from the system modules, move the switch on the rack's PDU to the off position. Alternately, you can disconnect the power cable from the back of an individual module.

Note: The Onyx 350 compute/graphics modules and optional AC-powered NUMAlink modules do not have power switchs. To power off their L1 controllers, (and cut off all AC power to the unit), unplug the individual modules from the PDU.

Monitoring the System

You can monitor your SGI Onyx graphics system from the following sources:

- You can view individual module (IR graphics, compute, MPX, NUMAlink, and 4U PCI expansion) status and error messages by using each module's L1 controller display. For example, you can determine whether the fans of a particular module are operating properly.
- You can monitor the status of the optional TP900 storage modules by viewing the LEDs on the front and the rear of the modules.

L1 and L2 Controllers

The location and basic connection/functions of the L1 and optional L2 controllers have been generally discussed and illustrated in this chapter. For more information on using these system controllers, see the *SGI L1 and L2 Controller Software User's Guide* (P/N 007-3938-00*x*). For information on replacing an L1 controller, see the section "Replacing an L1 Controller Display" in Chapter 7.

Installing Optional Components

Your system is available with several optional components. For a complete list of options, check with your SGI sales representative. You may need to install these optional components after you set up your system. For more information on installing these optional components, see Chapter 7, "Installing and Removing Customer-replaceable Units."

Compute Module

This chapter describes the function and physical components of the compute module. It also describes the possible system configurations and the technical specifications for this module. Specifically, this chapter includes the following information.

The SGI Onyx 350 system uses two types of compute modules, as follows:

Base compute module. This module is your system's primary compute module where your system's operating system resides. (Every system must have a base compute module.) The base compute module provides processors, memory, and PCI/PCI-X slots to connect I/O devices. It also comes standard with a factory-installed SCSI disk drive, a PCI 4-port USB card, an IO9 PCI card, and an internal serial daughter card that provides various I/O ports to your system.

System expansion compute module. This module in contrast to the base compute module, comes with processors, memory, and PCI/PCI-X slots, but the SCSI disk drive(s) and IO9 card are optional.

Note: In this chapter, the term "compute module" refers to both types of compute modules. Keep in mind that some of the features that are standard for the base compute module are optional for the system expansion compute modules. When information is applicable to only one of the two types of modules, that will be specified.

System Features

A single 2U base compute module can connect directly to an InfiniteReality Onyx 350 graphics pipe; or it can be rackmounted with other optional modules to create an Onyx 350 system with more functionality. The base compute module consists of 2 or 4 64-bit MIPS RISC (reduced instruction set computer) processors and from 1 to 8 GB of local memory available on two to eight dual inline memory modules (DIMMs). An optional read-only CD/DVD drive is available in any compute module that has an IO9 installed.

This base compute module can also be combined with one or more of the following optional modules to expand the function of the system:

- The system expansion compute module, which is interconnected to the base compute module via a NUMAlink 3 cable, adds processors, memory, and four PCI and PCI-X card slots to your system. It may or may not include an IO9 card. If it includes an IO9 card, it will take up the lowermost PCI/PCI-X slot. (The new combined single system created by connecting the base compute module with a system expansion compute module can include 4, 6, or 8 processors with local memory of up to 16 GBs.)
- The 4U PCI expansion module adds PCI slots, but no processors, no memory, and no IO9 card. There are two versions of the PCI expansion module: one module has 12 PCI slots that support 3.3-V or universal PCI cards and the other module has 6 PCI slots that support 5-V or universal PCI card and 6 slots that support 3.3-V or universal PCI cards. For more information about this module, see the *PCI Expansion Module User's Guide (5.0-V Support and/or 3.3-V Support)*, 007-4499-00*x*.
- The 2U memory and PCI expansion (MPX) module can provide extra memory and four PCI/PCI-X card slots to your system. See Chapter 6, "Memory and PCI Expansion Module," for details about this module.
- The TP900 storage module can provide additional storage to the system. See the *SGI Total Performance 900 Storage System User's Guide* (007-4428-00*x)*, for details about this module. The model 350 supports RAID and other optional mass storage options.
- The NUMAlink module connects two to eight compute modules. See "NUMAlink Module" on page 12 for details about this module.

Figure 3-1 shows a front panel and side views of the compute module.

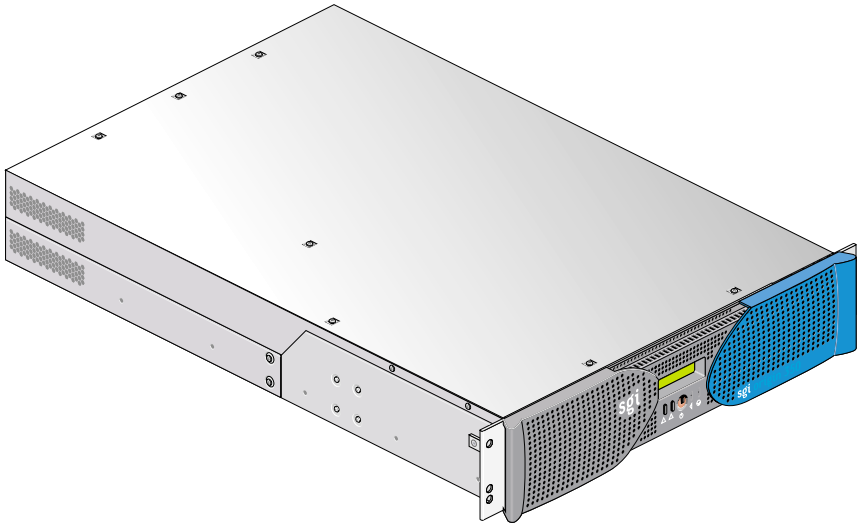

Figure 3-1 Front and Side Views of a Compute Module

The compute module includes the following features:

- An L1 controller to manage and monitor functions of the compute module such as system temperature. The module includes an L1 controller display that shows system processes and error messages.
- An optional internal read-only slim-line CD/DVD-ROM drive, and 1 or (optionally) 2 hard disk drives.
- Up to 2 power supplies. The second power supply, which is optional, is a redundant supply.
- 1 NUMAlink 3 port to connect to your system to a system expansion compute module, an MPX module, or a 4U PCI expansion module.
- Supports 1 Crosstown2 XIO port that enables the module to connect to an InfiniteReality graphics pipeline.
- 4 PCI/PCI-X card slots on two buses. These are 64-bit slots that can house 33-MHz and 66-MHz PCI cards, or 66-MHZ and 100-MHz PCI-X cards. Note that a PCI-X card runs at full speed only when the card on that same PCI bus runs at the same speed. Each bus will run only as fast as the lowest-speed card installed.

- Your system's primary "base" compute module comes standard with an IO9 PCI card that is installed in the lowermost (PCI slot 1) of the module's PCI slots. Inclusion of the IO9 on the bus limits bus speed to 66 MHz. Note that the optional internal CD/DVD drive supported by the IO9 is a read-only device.

  Note: For I/O expandability, the compute module can connect to a peer-attached PCI expansion module, which adds 12 PCI slots to your system.

- 2 DB-9 serial ports. One labeled **L1 console port** (console and diagnostic port) that enables you to connect a system console to the L1 controller on the compute module. The second serial port, labeled **Serial port 0,** connects serial devices to the compute module.
- 1 type B USB (Universal Serial Bus) L1 port that is used to connect the compute module to an L2 controller.
- A factory-installed serial daughtercard that includes 2 PS/2 connectors and 3 DB9 serial ports to connect RS-232/RS-422 serial devices to the system.
- An IO9 card that provides the following connectors and functions to your compute module:
  - A real-time interrupt input (RTI) port and a real-time interrupt output (RTO) port.
  - One 10/100/1000 BaseT Ethernet port.
  - A 68-pin VHDCI Ultra3 SCSI connector. The IO9 card supports two internal SCSI disk drives that have a peak data transfer speed of up to 160 MB/s between the disks and system memory. (For storage expandability, the compute module can connect to a 2U 8-disk Ultra3/160 SCSI JBOD TP900 storage system.)

Table 3-1 compares Onyx 300 systems with Onyx 350 systems.

Table 3-1 Comparing Onyx 300 and Onyx 350 Systems

System Feature	Onyx 300 System Base module	Onyx 300 System Expansion module	Onyx 350 System Base module	Onyx 350 System Expansion module
MIPS RISC processors	2 or 4	2 or 4	2 or 4	2 or 4
Memory	1GB to 4 GB	1 GB to 4 GB	1 GB to 8 GB	1 GB to 8 GB
I/O expansion slots	2 64-bit slots for 33-MHz or 66-MHz PCI cards.	2 64-bit slots for 33- MHz or 66-MHz PCI cards.	1 64-bit slot available for 33/66-MHz PCI or 66/100-MHz PCI-X cards. 1 slot for 33/66-MHz PCI only. [a]	1 64-bit slots available for 33/66-MHz PCI or 66/100-MHz PCI-X cards.
Serial ports	2 DB-9 RS-232 or RS-422 serial ports.	2 DB-9 RS-232 or RS-422 serial ports.	4 DB-9 RS-232 or RS-422 serial ports	1 port
L1 console port	1 DB-9 serial L1 console port to connect a console to the module.	1 DB-9 serial L1 console port to connect a console to the module.	1 DB-9 serial L1 console port to connect a console to the module.	1 DB-9 serial L1 console port to connect a console to the module.
3.5-inch drive bays	2	2	2	2 (with optional IO9 board)
CD/DVD (read-only)	None - external option available	None - external option available	One (optional)	One (with optional IO9 board)
USB type A ports (optional daughtercard)	2 USB type A ports to connect keyboards and mice.	2 USB type A ports to connect keyboards and mice.	4 USB type A ports to connect keyboards and mice.	USB type A ports to connect keyboards and mice (optional).
PS/2 ports	None	None	2 PS/2 ports	None
USB L1 port (type B)	1 USB type B L1 port to connect the module to an L2 controller.	1 USB type B L1 port to connect the module to an L2 controller.	1 USB type B L1 port to connect the module to an L2 controller.	1 USB type B L1 port to connect the module to an L2 controller.

Table 3-1 Comparing Onyx 300 and Onyx 350 Systems **(continued)**

System Feature	Onyx 300 System Base module	Onyx 300 System Expansion module	Onyx 350 System Base module	Onyx 350 System Expansion module
NUMAlink port	1	N/A (Used to link with base module or NUMAlink module)	1	N/A (Used to link with base module or NUMAlink module)
XIO port	1	1	1	1
Power supplies	1	1	1 (optional second supply available).	1 (optional second supply available).
Ethernet port	1 10/100BaseT port	1 10/100BaseT ports	1 standard 10/100/1000BaseT port	1 (optional) 10/100/1000BaseT port[b]
SCSI channel (internal)	1 Ultra3 SCSI, 160 MB/s	1 Ultra3 SCSI, 160 MB/s	1 Ultra3 SCSI, 160 MB/s	1 optional Ultra3 SCSI
SCSI channel (external)	1 Ultra3 SCSI (VHDCI)	1 Ultra3 SCSI (VHDCI)	1 external Ultra3 SCSI (VHDCI)	1 Ultra3 SCSI optional with IO9
RT interrupt input port	1	1	1	1 (with IO9)
RT interrupt output port	1	1	1	1 (with IO9)

a. The fourth (bottom-most) slot is used for factory-installed IO9 card only. The slot next to it is limited to use of a 64-bit 33-MHz or 66-MHz PCI card.

b. The additional Ethernet, SCSI, and RT interrupt connectors are available only if the expansion compute module includes an optional IO9 card.

Compute Module Architecture

The compute module architecture includes the following components shown in Figure 3-2 on page 53 and discussed in the following subsections:

- "IP53 Node Board" on page 54
- "IO9 Card" on page 57
- "Interface Board with a Daughtercard" on page 58

- "PCI Riser Card" on page 58
- "DVD-ROM" on page 59
- "Disk Drives" on page 59
- "Power Supplies" on page 59

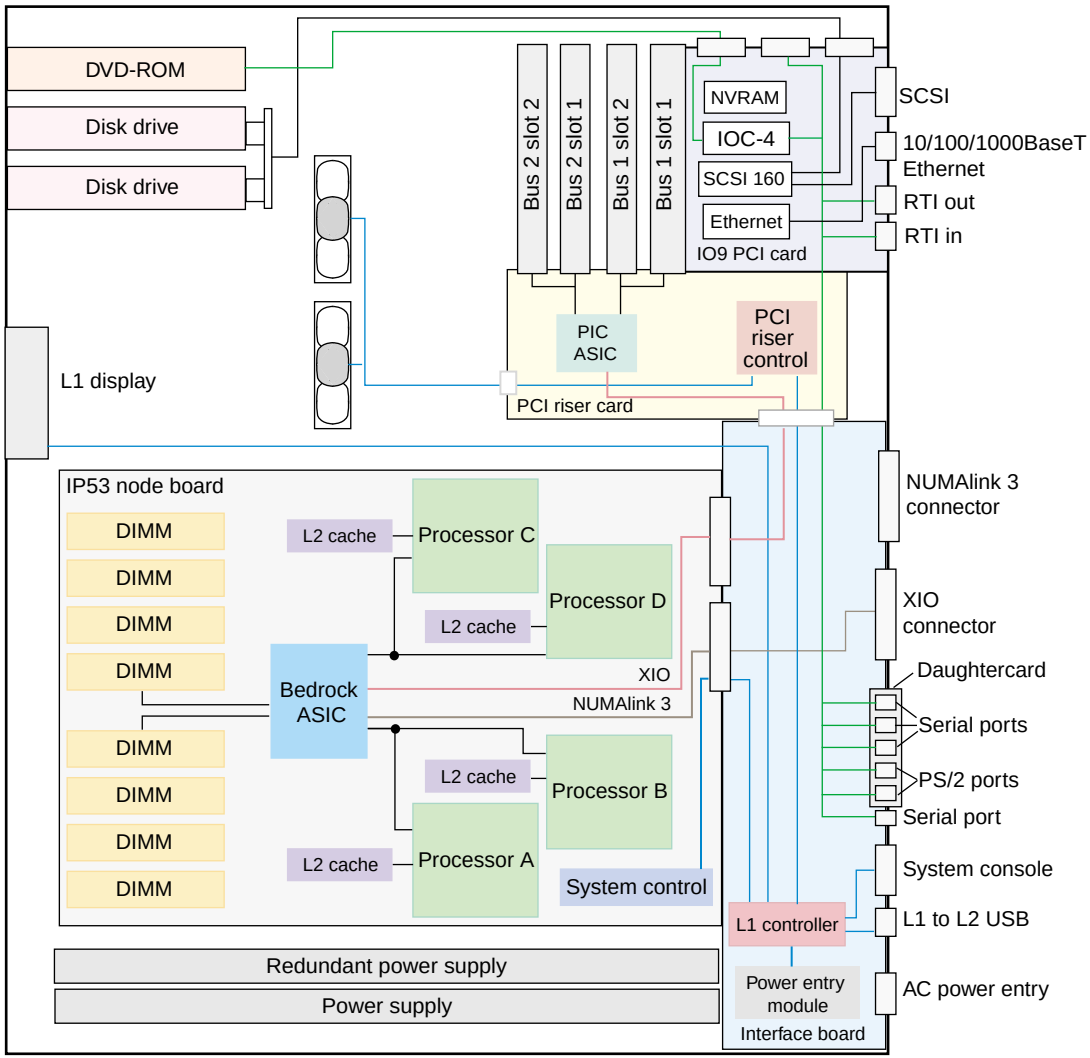

Figure 3-2 Block Diagram of a Base Compute Module

IP53 Node Board

The IP53 node board consists of the following components:

- Up to four processors (labeled CPU in Figure 3-3).
- Primary and secondary (L2) cache. The primary cache is internal to the processor. The L2 cache is labeled SRAM in Figure 3-3.
- Local memory (DIMMs).
- Bedrock ASIC.

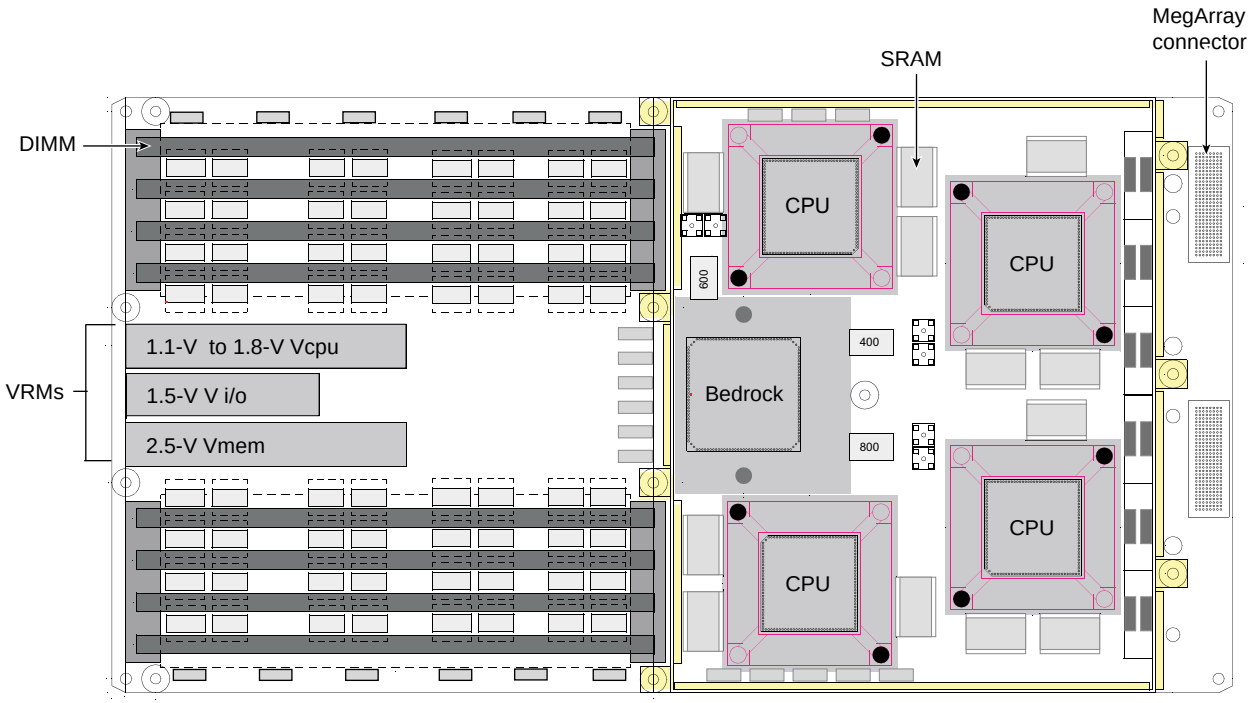

Figure 3-3 IP53 Node Board

Processors (CPUs)

The 64-bit system processors are soldered to the IP53 node board. Each processor implements the 64-bit MIPS IV instruction set architecture. It fetches and decodes four

instructions per cycle and issues the instructions to five fully pipelined execution units. It predicts conditional branches and executes instructions along the predicted path.

The processor also uses a load/store architecture in which the processor does not operate on data that is located in memory; instead, it loads the memory data into its registers and then operates on the data. When the processor is finished manipulating the data, the processor stores the data in memory.

Primary and Secondary Cache

To reduce memory latency, a processor has access to two on-chip 32-KB L1 (primary) caches (one cache is for data and the other cache is for instructions) and an off-chip L2 (secondary) cache. The L1 caches are located within the processor for fast, low-latency access of instructions and data. The base compute module supports a 4MB L2 cache.

Note: The IP53 node boards use SECDED ECC to protect data when transferred to/from secondary cache, main memory, and directory memory.

The IP53 node boards use parity to protect data when transferred between a processor and primary cache and to protect system commands sent between the Bedrock ASIC and a processor.

Local Memory (DIMMs)

Each compute module has from 1 to 8 GB of local memory, which includes main memory and directory memory for cache coherence. Local memory is provided by DIMMs, which contain double data rate synchronous dynamic random-access memory (DDR SDRAM chips), installed in two or more DIMM slots located on the compute module.

These eight DIMM slots are laid out into one group of even-numbered slots 0, 2, 4, and 6 and a second group of odd-numbered slots 1, 3, 5, and 7, as shown in Figure 3-4.

DIMMs are installed or removed one per DIMM slot, and two at a time, so that the two DIMMs installed provide local memory, or remove local memory, for the same pair of banks. For example, you could install a DIMM in slot 0 and another in slot 1 to provide local memory for banks 0 and 1. And conversely, you could remove a DIMM from slot 0 and another from slot 1 in order to remove local memory from banks 0 and 1.

The two DIMMs that compose a bank pair must be the same size; however, the bank pairs can differ in size.

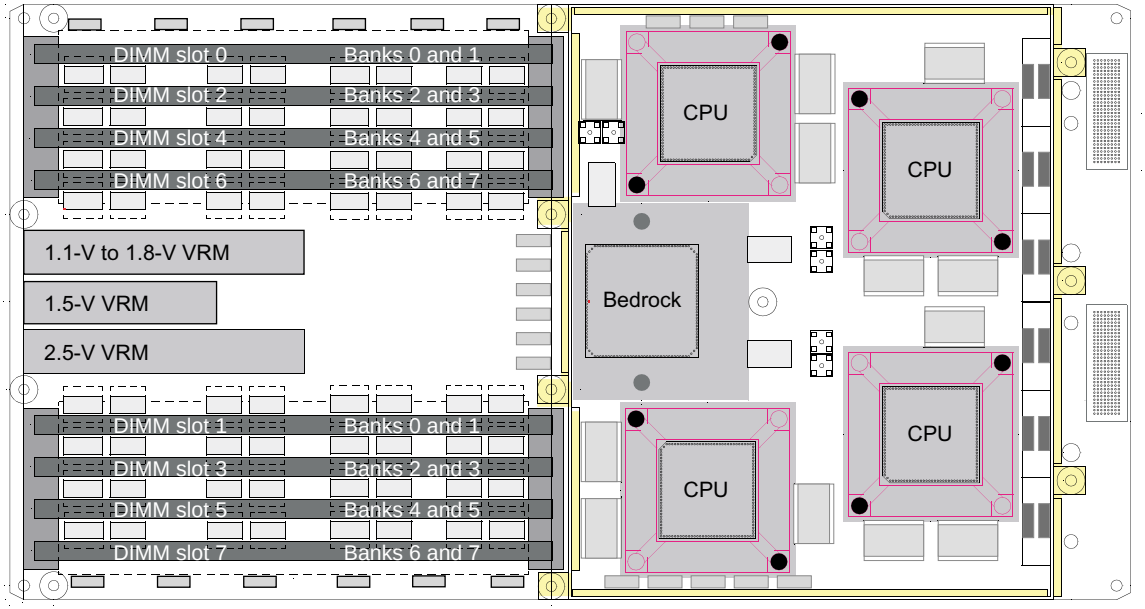

Figure 3-4 Local Memory Layout

Table 3-2 lists the DIMM sizes that IP53 node boards support.

Table 3-2 Memory DIMM Specifications

DIMM Capacity	Chip Capacity	Total Memory Capacity
512 MB	128 MB	2 DIMMs (1 bank pair) - 1 GB 8 DIMMs (4 bank pairs) - 4 GB
1 GB	256 MB	2 DIMMs (1 bank pair) - 2 GB 8 DIMMs (4 bank pairs) - 8 GB

Bedrock ASIC

The Bedrock ASIC enables communication among the processors, memory, network, and I/O devices. It controls all activity within the node board (for example, error correction and cache coherency). The Bedrock ASIC also supports page migration.

The Bedrock ASIC consists of the following:

- **1 central crossbar (XB)** provides connectivity between the Bedrock ASIC interfaces.
- **2 processor interfaces (PI_0 and PI_1)**. Each processor interface communicates directly with two processors. When the node board contains two processors, only one processor interface is used.
- **1 memory/directory interface (MD)** controls all memory access.
- **1 network interface (NI)** is the interface between the crossbar unit and the NUMAlink 3 interconnect.
- **1 I/O interface (II)** that allows I/O devices to read and write memory (direct memory access [DMA] operations) and allows the processors within the system to control the I/O devices (PIO operations).
- **1 local block (LB)** services processor I/O (PIO) requests that are local to the Bedrock ASIC.

IO9 Card

The IO9 PCI card, which resides in bus 1, slot 1 (the lowermost slot) of the base compute module, provides the base I/O functionality for the system.

Note: The expansion compute module can be ordered with an IO9 PCI card. This card resides in bus 1, slot 1.

The IO9 PCI card has the following connectors:

- External VHDCI 68-pin SCSI connector.
- 1 10/100/1000BaseT Ethernet connector.
- 1 real-time interrupt output (RTO) connector and 1 real-time interrupt input (RTI) connector.

The IO9 card also contains an IOC-4 ASIC that supports the following features:

- 1 (internal only) IDE channel for the optional CD/DVD-ROM drive.
- 4 serial ports.
- 2 PS/2 ports.

Note: The PS/2 ports and three serial ports are located on a daughtercard.

- NVRAM and time-of-day clock.

Interface Board with a Daughtercard

The interface board contains the following components:

- L1 controller logic.
- Power supply interface.
- IO9 expansion connectors; connects to the serial daughter card that contains DB-9 connectors (serial ports) and DIN-6 connectors (PS/2 ports).
- NUMAlink connector.
- XIO connector.
- Voltage regulator modules (VRMs).
- Connectors to the IP53 node board and the PCI riser card.

PCI Riser Card

The PCI riser card provides the following:

- PCI ASIC.
- A connector that connects the PCI riser card to the IP53 motherboard.
- A connector that connects the IP53 motherboard with the IO9 card, and a 50-pin AMP connector that connects to the IO9 card.
- 1 nonstandard PCI/PCI-X connector that connects to the IO9 card.

- 4 PCI/PCI-X card slots (64 bit, 3.3 V) and a slot for an InfinitePerformance graphics board or optional digital media boards. (The slot for the graphics/digital media board is located on the backside of the PCI riser card.)

DVD-ROM

The compute module can contain an optional slim-line DVD-ROM that also has CD-ROM capabilities.

Note: The CD/DVD-ROM is a read-only unit that requires an IO9 PCI card.

The CD/DVD-ROM is located at the front left side of the module (above the disk drives).

Disk Drives

The base compute module supports one or two sled-mounted Ultra3 SCSI disk drives that have a peak data transfer speed of up to 140 MB/s between the disks and system memory. The two disks connect to a SCSI backplane. The SCSI backplane connects to the internal SCSI 160 logic on the IO9 PCI card.

Note: An expansion compute module can also be ordered with SCSI disk drives. This configuration requires an IO9 PCI card.

The system supports different disk drive storage capacities and both 10,000-RPM and 15,000-RPM drives are available.

The disk drives are located at the front left side of the module (below the optional CD/DVD-ROM location). The master (standard) drive is the bottom drive.

Power Supplies

The base compute module, the expansion compute module, or the MPX module, can contain one or two power supplies; the second power supply is optional. The power supply can input 110-220 VAC and output 500 W (12 VDC, 5 VDC, and 3.3 VDC).

Power supplies are hot-swappable only when two units are installed and working in a module. They are located at the front right side of the module. The primary power supply is the left supply and the optional second power supply installs in the right side of the power bay.

External Components

This section describes the external components of the compute module, which are located in the front and rear panels.

Front Panel Items

This section describes the front panel controls and indicators of the compute module, as shown in Figure 3-5. Note the need for a paper clip to actuate the reset or NMI functions.

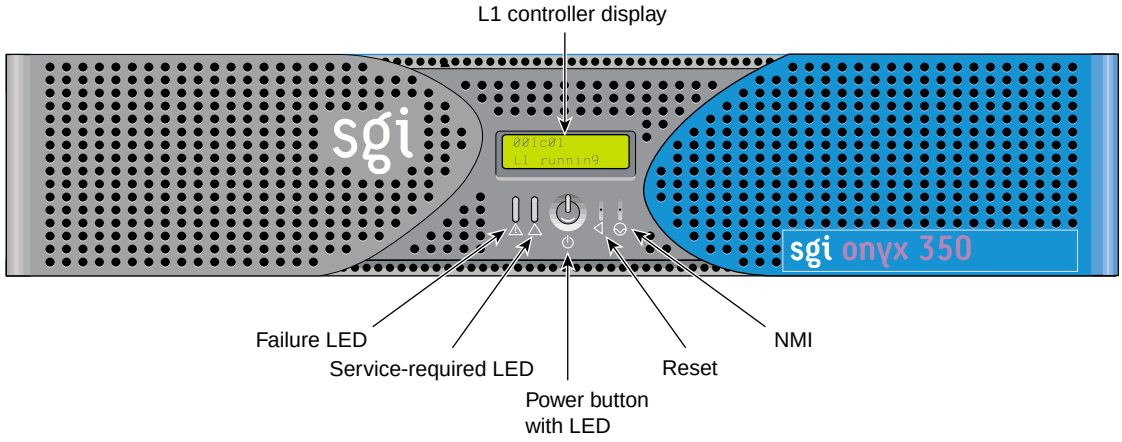

Figure 3-5 Front Panel Items

The front panel of the module has the following items:

- **L1 controller display.** A liquid crystal display (LCD) that displays status and error messages that the L1 controller generates.

  Note: See the *SGI L1 and L2 Controller Software User's Guide* (007-3938-00x) for more information on the L1 controller.

- **Power button with LED**. Press this button to power on the internal components. Alternatively, you can power on the internal components using an optional system console. The LED illuminates green when the internal components are on.
- **Reset**. Actuate this switch (with the end of a paper clip) to reset the internal processors and ASICs. The reset will cause a memory loss. (See the NMI switch information that follows to perform a reset without losing memory.)
- **NMI switch**. Actuate the NMI (non-maskable interrupt) switch (with the end of a paper clip) to reset the internal processors and ASICs without losing memory. Register data and memory are stored in a `/var/adm/crash` file.
- **Service-required LED**. This LED illuminates yellow to indicate that an item has failed or is not operating properly, but the compute module is still operating.
- **Failure LED**. This LED illuminates red to indicate that a failure has occurred and that the module is down.
- **Drive LEDs**. These LEDs illuminate green to indicate drive activity.

Rear Panel Items

This section describes the rear panel connectors, PCI/PCI-X slots, and LEDs of the base module, as shown in Figure 3-6.

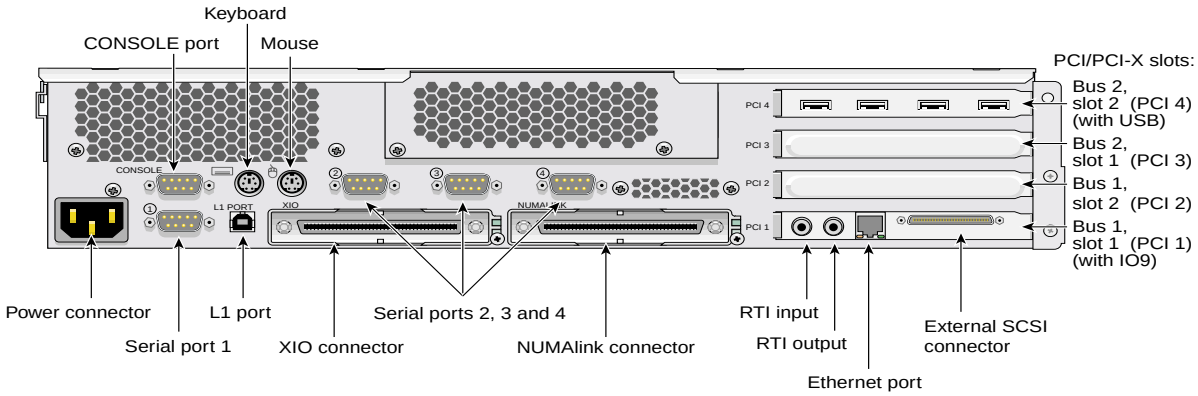

Figure 3-6 Rear Panel Items

The rear panel of the compute module has the following items:

- **Power connector.** This connector connects the base compute module to an AC power outlet.
- **Serial port 0.** This DB9 RS-232/RS-422 serial port connects a serial device to the compute module.
- **L1 console port.** This DB-9 serial port (console and diagnostic port) enables you to connect a system console to the L1 controller on the compute module.
- **L1 port (USB type B).** This universal serial bus (USB) type B connector connects the compute module's L1 controller to an optional L2 controller.
- **LINK connector.** This NUMAlink 3 connector (labeled **NI**) connects the base compute module to an expansion compute module (a second module, with or without an IO9 card) or to a NUMAlink module. This connection is made with a NUMAlink 3 cable at 1.6 GB/s in each direction.
  - **NUMAlink 3 LED.** The NUMAlink 3 connector has 2 LEDs. One LED lights yellow to indicate that the compute module and the expansion compute module or NUMAlink module (router) to which it is connected are powered on.

The other LED (located to the right of the NUMAlink 3 connector) lights green when the link between the compute module and the module to which it is connected is established.

- **XIO connector**. This Crosstown2 connector (labeled **II**) connects the base compute module to a PCI expansion module or InfiniteReality graphics pipeline. This connection is made with a NUMAlink 3 cable at 800 MB/s in each direction.
  - **XIO connector LEDs.** The XIO connector has 2 LEDs. One LED lights yellow to indicate that both the compute module and the PCI expansion module or InfiniteReality graphics pipeline to which the compute module is connected are powered on. The other LED lights green when the compute module link to the PCI expansion module or graphics pipeline is established.
- **PCI/PCI-X slots 1, 2, 3, and 4.** 2 of these slots are on one bus, and 2 slots are on another. These 64-bit slots can house 33-MHz and 66-MHz PCI cards or 66 MHz, and 100 MHz PCI-X cards. (See SGI Supportfolio at http://support.sgi.com for an updated list of supported cards.) The bottom-most slot houses an IO9 PCI card.

Note: If you run PCI and PCI-X cards on the same bus at the same time, the PCI-X card will run in PCI mode. If you run cards of different speeds on the same bus, the highest speed card will run at the speed of the slower card. For example, if a card is running at 100-MHz in one slot of a bus and a card running at 33-MHz is installed in the second slot of the same bus, both cards will run at 33-MHz.

The factory-installed serial daughtercard provides the following connectors:

- **Two PS/2 ports**.
- **Serial ports 2, 3, and 4**. These 3 DB9 RS-232/RS-422 serial ports are used to connect serial devices to the compute module.

The factory-installed IO9 card provides the following connectors:

- **RT interrupt input and output.** RTO (output) enables the compute module to interrupt an external device. RTI (input) enables an external device to interrupt the compute module.

- **Ethernet port (10/100/1000 MB).** This autonegotiating 10BaseT/100BaseT/1000BaseT twisted-pair Ethernet port connects the compute module to an Ethernet network.
- **SCSI connector.** This 68-pin VHDCI external SCSI port, which is internally connected to a second internal SCSI disk drive, enable you to connect SCSI devices to the compute module. See SGI Supportfolio at http://support.sgi.com for an updated list of supported SCSI devices.

The factory-installed USB PCI card provides the following:

- **4 USB ports.** The card provides USB connectors for keyboard/mouse use.

Internal Components and Features

The internal components of the compute module are described in the following sections:

- "IP53 Motherboard" on page 64
- "Dual Inline Memory Modules (DIMMs)" on page 65
- "IO9 Card" on page 67
- "SCSI Backplane Board and Disk Drive Options" on page 67

IP53 Motherboard

The IP53 motherboard houses the following components:

- **2 or 4 MIPS RISC processors** (each processor has a secondary (L2) cache).
- **8 dual inline memory module (DIMM) slots** to install DIMMs to provide 1 to 8 GB of main memory to local memory bank pairs on your system. See "Dual Inline Memory Modules (DIMMs)" on page 65 for detailed information on DIMMs.
- **PIC ASIC** (application-specific integrated circuit) is the interface between the Bedrock ASIC and the PCI/PCI-X slots.
- **Bedrock ASIC** (or hub ASIC) enables communication between the processors, memory, and I/O devices.
- **Serial ID EEPROM** contains component information.
- **L1 controller logic** monitors and controls the environment of the compute module (for example, fan speed, operating temperature, and system LEDs). See the *SGI L1 and L2 Controller Software User's Guide* (007-3938-00*x*) for more information on the L1 controller.

- **5 VRMs** that convert the incoming voltages to the voltage levels required by the components.
- **Light-emitting diodes (LEDs)** provide information about the NUMAlink port and the XIO interface connectors as follows:
  - 2 NUMAlink 3 LEDs, controlled by the L1 controller
  - 2 XIO LEDs, controlled by the L1 controller

Note: Ports and LEDs are described in detail in "Rear Panel Items" on page 62.

Dual Inline Memory Modules (DIMMs)

Each compute module has from 1 to 8 GB of local memory, which includes main memory and directory memory for cache coherence.

Local memory is provided by DIMMs, which contain double data rate synchronous dynamic random-access memory (DDR SDRAM) chips, installed in two or more DIMM slots located on the compute module.

These eight DIMM slots are laid out into one group of even-numbered slots 0, 2, 4, and 6 and a second group of odd-numbered slots 1, 3, 5, and 7, as shown in Figure 3-7 on page 66.

DIMMs are installed one per DIMM slot, and two at a time, so that the two DIMMs installed provide local memory for the same pair of banks. Table 3-3 lists the DIMM slots and the corresponding bank pairs to which local memory is provided when DIMMs are installed:

Table 3-3 DIMMs and Bank Pairs

DIMM in Slot Number	Provides Local Memory for Bank Pair Numbers
0[a]	0 and 1
1	0 and 1
2	2 and 3
3	2 and 3

Table 3-3 DIMMs and Bank Pairs **(continued)**

DIMM in Slot Number	Provides Local Memory for Bank Pair Numbers
4	4 and 5
5	4 and 5
6	6 and 7
7	6 and 7

a. The first two DIMMs must be installed in DIMM slot 0 and DIMM slot 1.

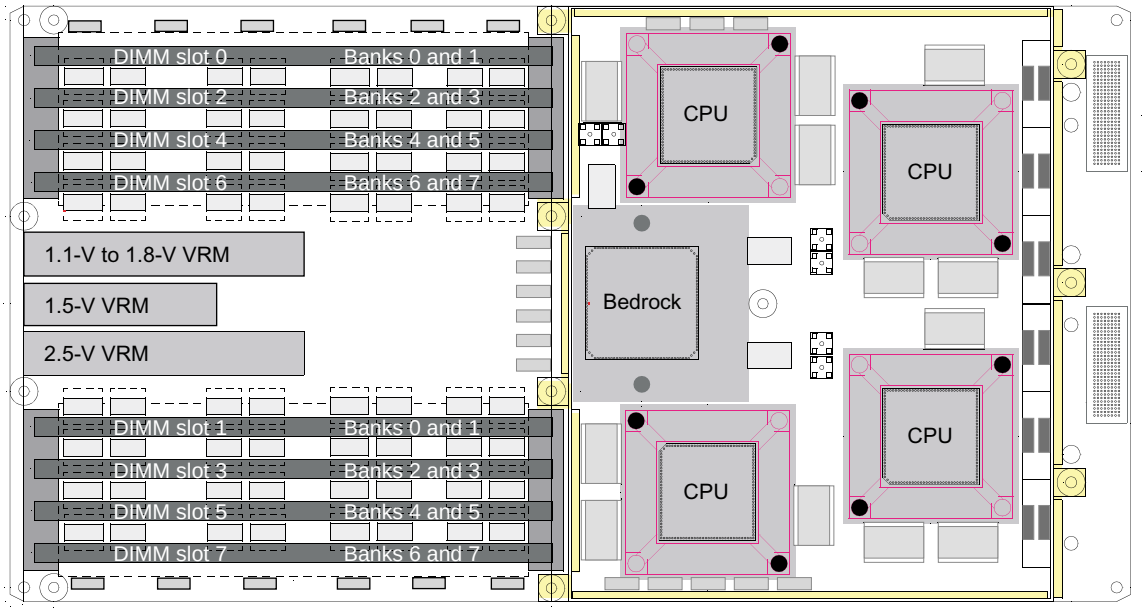

Figure 3-7 Layout of DIMM Slots and Local Memory Banks

IO9 Card

The IO9 card provides I/O interface functions, the I/O connectors to the system backpanel, and the L1 controller functions.

The IO9 card has the following connectors:

- 1 internal and one external 68-pin VHDCI SCSI port connector.
- 1 10BaseT/100BaseT/1000BaseT auto-selecting Ethernet connector.
- 1 real-time interrupt output (RTO) port and 1 real-time interrupt input (RTI) port.

Note: Ports and LEDs are described in detail in "Rear Panel Items" on page 62.

SCSI Backplane Board and Disk Drive Options

The SCSI backplane provides a connection point between the internal SCSI interface cable connected to the IO9 board and up to two disk drives. The SCSI backplane supports Ultra3 SCSI LVD disks with a peak transfer rate of 160 MB/s. The chassis accommodates up to two sled-mounted 3.5-inch by 1-inch Ultra3 SCSI LVD drives. The system supports both 10,000-RPM and 15,000-RPM disk drives.

See SGI Supportfolio at http://support.sgi.com for an updated list of supported drives.

System Configuration

This section lists the internal compute module configuration options, such as the number of DIMMs that can be installed in the compute module to increase its local memory.

This section also lists external compute module configuration options that can enhance the performance of the Onyx 350 system. For example, the compute module can connect to a 2U TP900 storage system to expand storage, or it can connect to a PCI expansion module to increase I/O capabilities.

Internal Configurations

PCI and PCI-X cards, disk drives, power supplies, and memory (DIMMs) are the configurable internal components of the compute module.

Processor upgrades can only be installed by trained SGI system support engineers (SSEs).

As a customer, you can configure PCI and PCI-X cards, disk drives, and memory. Chapter 4, "Installing and Removing Customer-replaceable Units," provides instructions for installing and removing these items to reconfigure your module.

Warning: To prevent personal injury, or damage to your system, only trained SGI system support engineers (SSEs) can service or configure internal components of the compute module that are not specifically listed as serviceable and configurable by customers.

External Configurations

The base compute module can be configured with the following optional items to expand its function:

- The system expansion compute module, which is interconnected to the base module via a NUMAlink 3 cable, adds processors, memory, and 4 PCI/PCI-X card slots. It may or may not include an IO9 card. (If you combine the base compute module with the system expansion compute module, you can create a single system that includes 4, 6, or 8 processors, with up to 16 GB of local memory, and seven PCI/PCI-X card slots.)
- The 4U PCI expansion module adds PCI slots, but no processors, no memory, and no IO9 card. There are two versions of the PCI expansion module: one module has 12 PCI slots that support 3.3-V or universal PCI cards, and the other module has 6 PCI slots that support 5-V or universal PCI cards and 6 slots that support 3.3-V or universal PCI cards. For more information about this module, see the *PCI Expansion Module User's Guide (5.0-V Support and/or 3.3-V Support)*, 007-4499-00*x*.
- The optional 2U memory and PCI/PCI-X expansion (MPX) module provides extra memory and 4 PCI/PCI-X card slots to your system. See Chapter 6, "Memory and PCI Expansion Module," for details about this module.

- The TP900 storage module, provides additional storage to the system. See *SGI Total Performance 900 Storage System User's Guide*, 007-4428-00*x*, for details about this module. The Onyx 350 system supports optional RAID and other storage modules. See "Optional System Components" in Chapter 1 for additional detail.
- The NUMAlink module connects two or more compute modules. See "NUMAlink Module" in Chapter 1 for more information about this optional module.
- If your system uses InfiniteReality (IR) graphics, you may expand the number of graphics pipes by adding 1 or more IR graphics modules. See Chapter 5 for more information on the IR graphics module.

The Onyx 350 system can be configured many different ways to satisfy your computing needs. This section shows two sample configurations.

Figure 3-8 shows an Onyx 350 system rackmounted in a 17U rack that includes the following items:

- A 2U base compute/graphics module with up to 4 processors, 8 GB of local memory, and three PCI/PCI-X card slots (the fourth lowermost slot comes with a factory installed IO9 PCI card).
- A 4U PCI expansion module (plus power bay) that adds 12 PCI card slots.
- A TP900 module that adds optional mass storage capability.

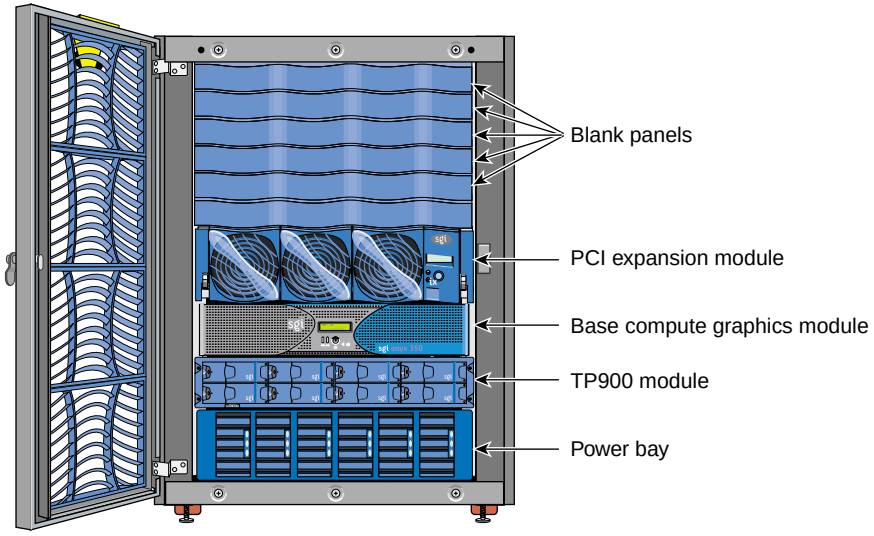

Figure 3-8 System with One Base Compute Module, One 4U PCI Expansion Module, and One TP900 Module

Figure 3-9 shows an Onyx 350 system rackmounted in a 17U rack that includes the following items:

- A 2U base compute module with up to 4 processors, 8 GB of local memory, and 3 PCI/PCI-X card slots the fourth (lowermost) slot comes with a factory-installed IO9 PCI card.
- A 2U system expansion compute module that adds up to four processors, 8 GB of local memory, and 4 PCI/PCI-X card slots.
- One 2U NUMAlink module for expanded system connectivity.
- One 4U PCI expansion module that adds 12 PCI card slots.
- One MPX expansion module.

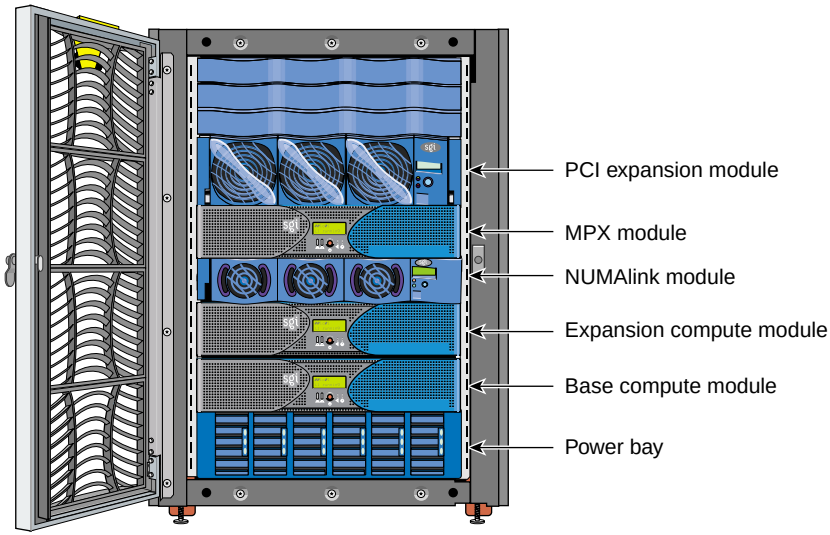

Figure 3-9 System with Base Compute Module, System Expansion Compute Module, MPX module, and 4U PCI Expansion Module

Bandwidth Specifications

Table 3-4 lists the bandwidth characteristics of the Onyx 350 compute module.

Table 3-4 Bandwidth Characteristics of the Compute Module

Characteristic	Peak Bandwidth	Sustainable Bandwidth
LINK channel	3.2 GB/s full duplex 1.6 GB/s each direction	~1420 MB/s each direction
Xtown2 channel	2.4 GB/s full duplex 1.2 GB/s each direction	~1066 MB/s half duplex ~1744 MB/s full duplex, ~872 MB/s each direction
Main memory	3200 MB/s	3200 MB/s
SYSAD	1600 MB/s	~1400 MB/s

For additional system technical specifications, see Appendix A.

InfinitePerformance Graphics and Compute Module

The Onyx 350 InfinitePerformance (IP) graphics and compute module integrates a single InfinitePerformance graphics pipe with a compute module. Each IP graphics pipe in a system can support a single-user display, or the pipes can be connected to an optional compositor. The compositor allows the combined graphics power of two or more IP pipes to be directed to a single display, projector, or other device.

As with the standard Onyx 350 compute module, the IP graphics/compute module supports both PCI and PCI-X protocol, USB keyboard and mouse connections, and optional base or professional audio cards.

The following sections describe the function and physical components of the InfinitePerformance graphics module. All other components on the module function as described in the information on the Onyx 350 compute module. See Chapter 3, for more information. Note that Onyx 350 systems always use USB connections as the standard keyboard/mouse connection.

Note: Because of the placement of the IP graphics card within the module, the option of a redundant cooling fan or DigitalMediaPro DM3 option is not available with this unit.

The following sections describe the Onyx 350 InfinitePerformance (IP) compute and graphics module:

Product Overview

The 2U-high compute module with InfinitePerformance (IP) graphics has two free PCI/PCI-X card slots to support an optional audio or other PCI or PCI-X card. The other two PCI slots are occupied by the standard USB keyboard/mouse card and IO9 card.

Note that only the first (referred to as the "base") IP graphics compute module in your system will have the IO9 PCI interface card, internal serial daughter card, and USB card installed as standard features. You will plug the system USB keyboard/mouse into this module. The optional audio card connections will differ based on the type ordered; an example is shown in Figure 4-1. Note that the connector labeled "Digital out" is the audio output. The figure also shows the location and ports on the IP graphics card, USB card, IO9 interface card, and optional base audio card.

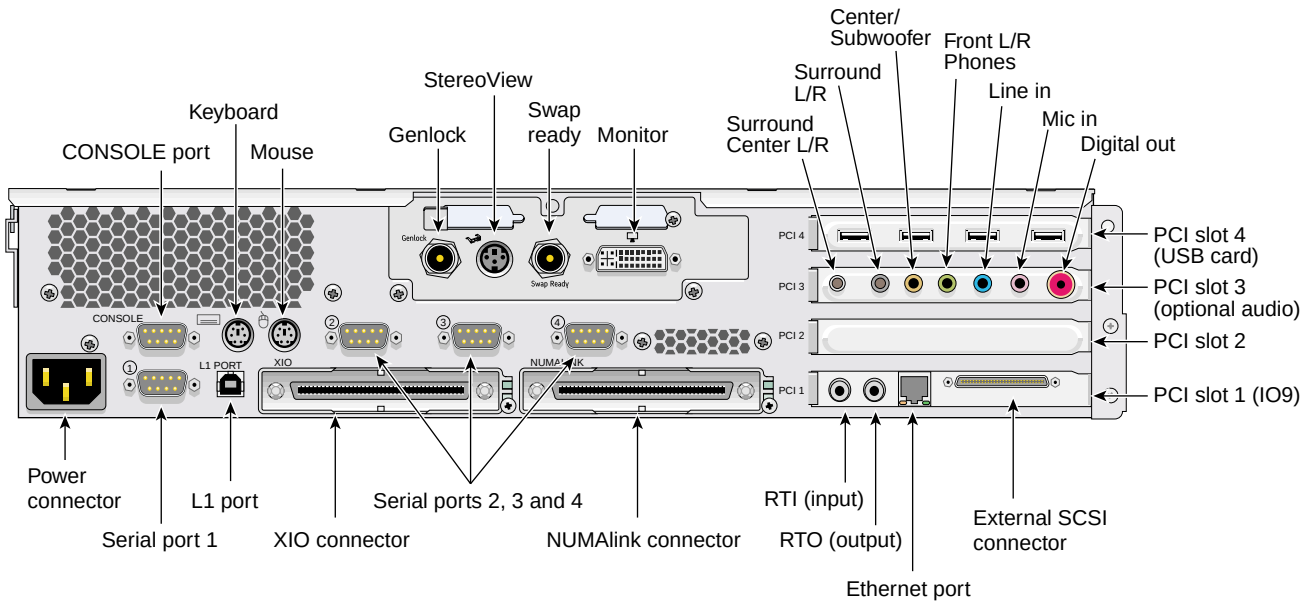

Figure 4-1 InfinitePerformance, IO9, USB, and Optional Base Audio in the Base Module

Your Onyx 350 IP graphics module can interconnect to one additional module to make a second IP graphics interface available (a two-pipe system). An optional NUMAlink module is available for interconnecting additional graphics or other optional modules. A maximum of eight IP graphics pipes are supported in the Onyx 350.

Figure 4-2 shows a block diagram of the Onyx 350 with IP graphics.

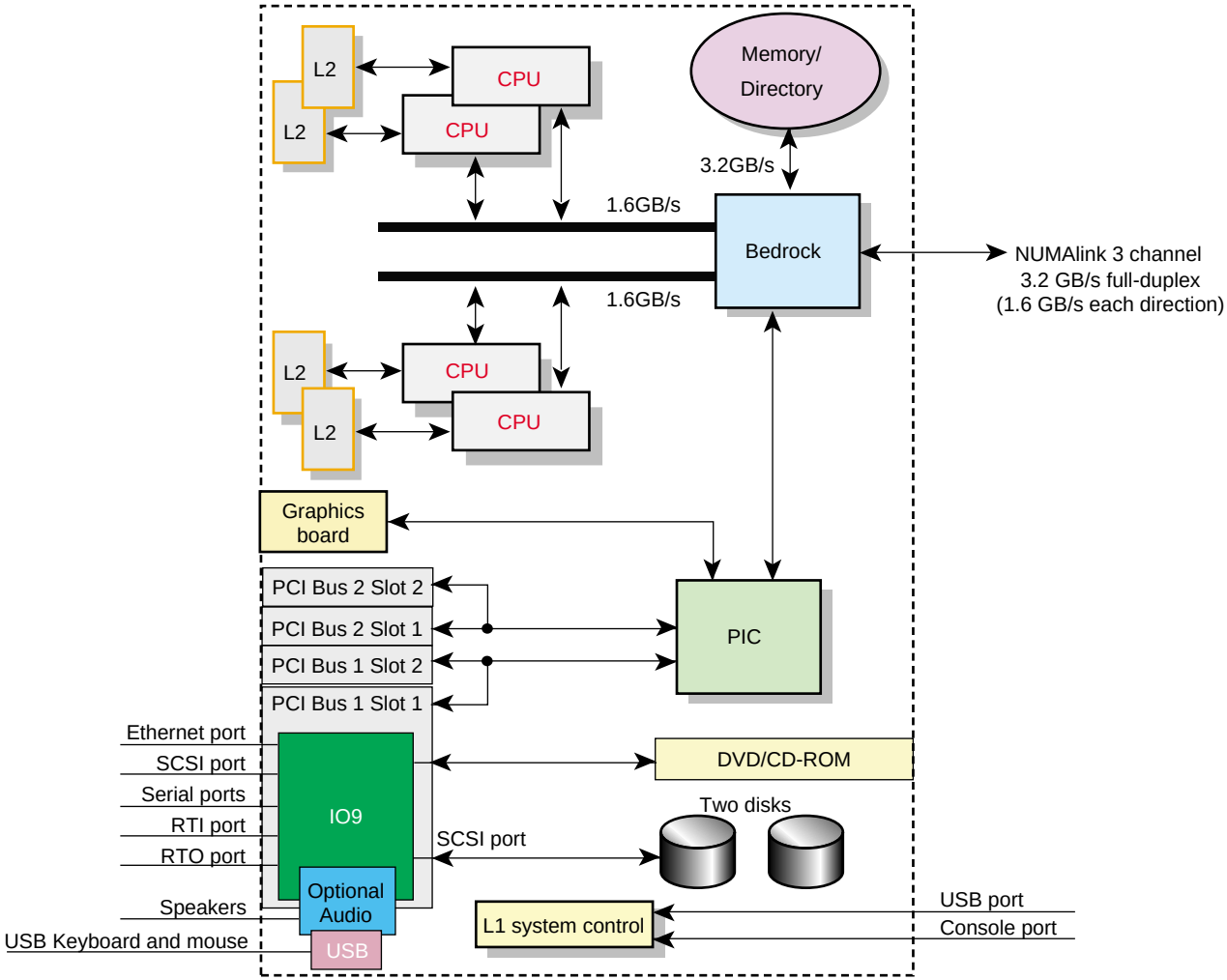

Figure 4-2 Block Diagram of the Onyx 350 Graphics and Compute Module

External Components

This section describes the external connectors on the back of the InfinitePerformance graphics pipe supported by your Onyx 350 IP system.

Genlock Port

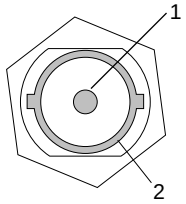

Figure 4-3 Genlock Port Pinouts

Table 4-1 shows the cable pinout assignments for the graphics board Genlock port.

Table 4-1 Genlock Pinout Assignments

Pin	Assignment
1	Genlock input/output video or 3.3V TTL signal levels
2	Signal return ground

Stereo View Port

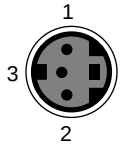

Figure 4-4 Stereo View Port and Pinouts

Table 4-2 shows the cable pinout assignments for the graphics board Stereo View port.

Table 4-2 Stereo View Pinout Assignments

Pin	Assignment
1	+12V DC output to StereoView device
2	Ground
3	Stereo left/right Eye signal (1=left, 0=right) (STEREO_LEFT)

Swap-Ready Port

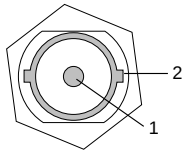

Figure 4-5 Swap-Ready Port and Pinouts

Table 4-3 shows the cable pinout assignments for the graphics board Swap-Ready port.

Table 4-3 Swap-Ready Pinout Assignments

Pin	Assignment
1	Swapbuffer Gang Sync open collector I/O
2	Signal return ground

DVI-I Video/Monitor Port

Figure 4-6 shows the DVI-I video port.

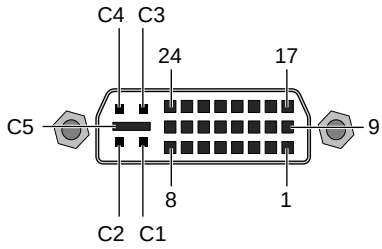

Figure 4-6 DVI-I Port and Pinouts

Table 4-4 shows the port pinout assignments for DVI-I port(s).

Table 4-4 DVI-I Video Port Pinout

Pin	Assignment	Pin	Assignment
1	DATA 2-	16	HOT_POWER
2	DATA2+	17	DATA 0-
3	SHIELD 2/4	18	DATA 0+
4	DATA 4-	19	SHIELD 0/5
5	DATA 4+	20	DATA 5-
6	DDC_CLOCK	21	DATA 5+
7	DDC_DATA	22	SHIELD CLOCK
8	VSYNC	23	CLOCK -
9	DATA 1-	24	CLOCK +
10	DATA1+	C1	A_RED
11	SHIELD 1/3	C2	A_GREEN
12	DATA 3-	C3	A_BLUE
13	DATA 3+	C4	HYNSC
14	DDC_POWER	C5	A_GROUND2
15	A_GROUND1	C6	A_GROUND3

Dual Channel Display (DCD) Option

Most of the product options you might use in your Onyx 350 system will be either PCI-based or installed in an additional module.

An option that can be ordered with your Onyx 350 IP system without use of an additional module is the Silicon Graphics Dual Channel Display daughterboard (hereinafter referred to as “DCD”) With the DCD, you can expand your viewing area by displaying graphics and text output from one graphics card to two monitors. You can also use the DCD to connect a single monitor. An example of the daughterboard is shown in Figure 4-7.

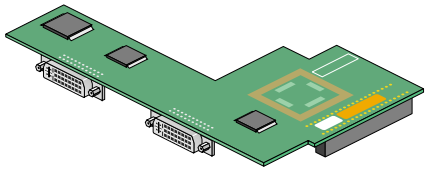

Figure 4-7 Dual Channel Display Daughterboard (DCD)

The DCD connects to the daughterboard slot on the InfinitePerformance graphics board. If you did not order your DCD option from the factory, it must be installed by a trained SGI field service representative on site.

The two DVI-I video/monitor connectors on the DCD option have the same pinouts as those described in Table 4-4 on page 78.

Connecting Monitor Cables to the DCD

Before connecting your monitor(s) to the DCD, ensure that you have the proper cables to match your monitor type, either DVI-D (digital) or DVI-A (analog). To connect monitors to the DCD, see Figure 4-8 and use the following steps:

1. Connect the left monitor's cable to the left video connector (channel 0) on the DCD.
2. Channel 0 drives the left monitor with the image from the top of the frame buffer.
3. Connect the right monitor's cable to the right connector (channel 1) on the DCD.
4. Channel 1 drives the right monitor with the image from the bottom of the frame buffer.
5. Tighten the thumbscrews on both sides of each video connector.

Note: To ensure proper cursor movement, make sure you connect the monitor cables to the correct video connectors on the rear of your system graphics board.

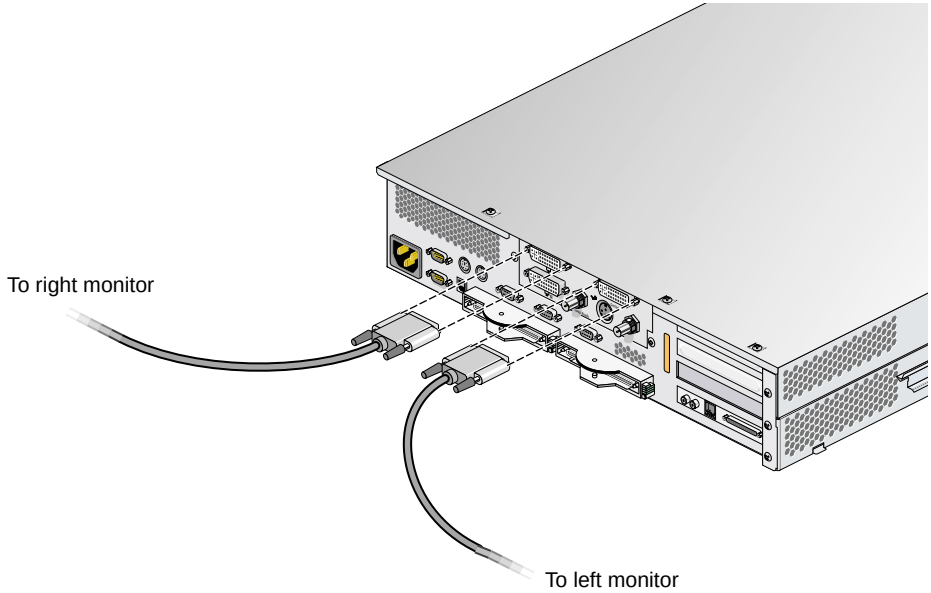

Figure 4-8 Connecting the Monitor Signal Cables to the DCD

Connecting the Monitor Power Cables and Powering On Your System

Connect the power cable for each monitor as follows (see Figure 4-9):

1. Connect the female end of the power cable to the power connector on the back of the monitor.
2. Plug the male end into a three-prong grounded electrical outlet.
3. Plug your system's power cord into an electrical outlet.
4. Power on your system.
5. Press the power switch on the left monitor, and then press the power switch on the right monitor to power on the monitors.

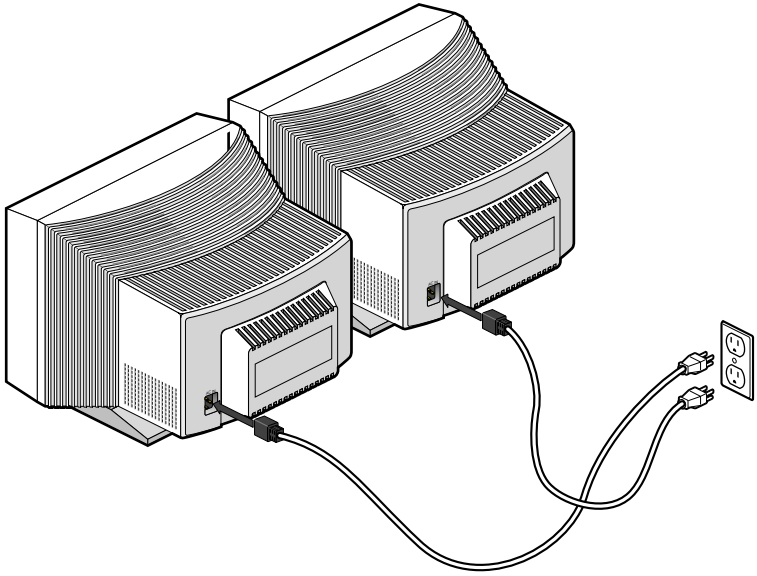

Figure 4-9 Connecting the Monitor Power Cables

For basic information on configuring the DCD, proceed to the next section.

Enabling and Disabling the DCD Settings

When the X server starts, it checks the user-defined display setting to ensure that it is valid for the current hardware configuration. If a display setting is not specified or if it is invalid, the X server automatically selects the default setting. If you do not want to use the default setting, follow these steps:

Note: Make sure that both of the monitors that are connected to a single DCD have the same or similar display capabilities.

---

1. Open a UNIX shell.
2. Start **`xsetmon`**.

   The Graphics Back End Control window appears, as shown in the example in Figure 4-10.

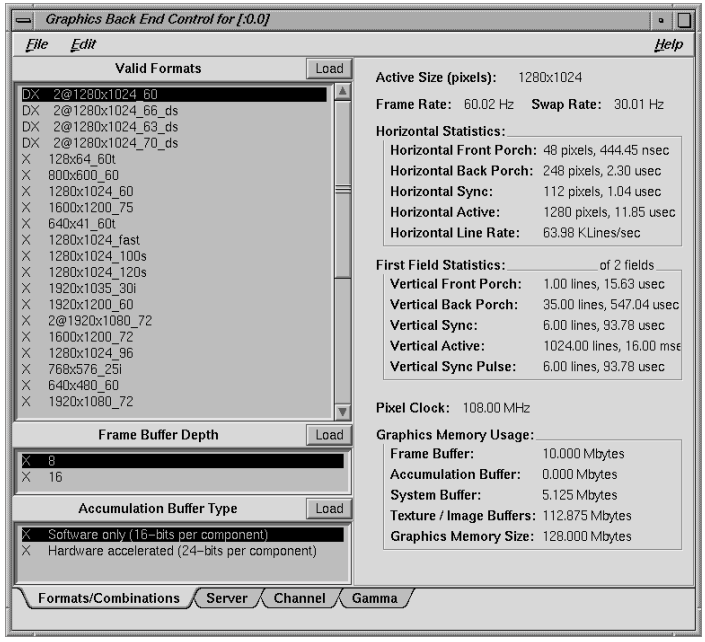

Figure 4-10 Graphics Back End Control Window

3. To enable dual channel mode, select a DCD setting from the **Valid Formats** field. To disable dual channel mode, select a single channel display setting from the **Valid Formats** field.

   Note: DCD settings have a "2@" prefix. Single channel display settings do not have a "2@" prefix.

4. Click the **Load** button next to the **Valid Formats** title bar.

   If your display setting has the character *D* in the first column, a confirmation dialog box will appear, as shown in the example in Figure 4-11.

   Note: If you select a display setting that does not show the character *D* in the first column, you must log out, and then log in again to activate the settings, as explained later in step 6.

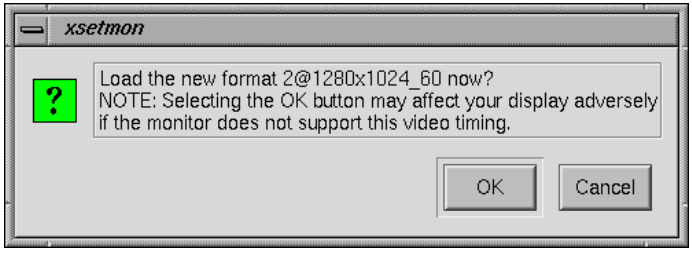

Figure 4-11 Load Confirmation Dialog Box

5. Click **OK** to confirm your display setting.

   Another dialog box will appear that asks if you want to use this display setting as the power-on default, as shown in the example in Figure 4-12.

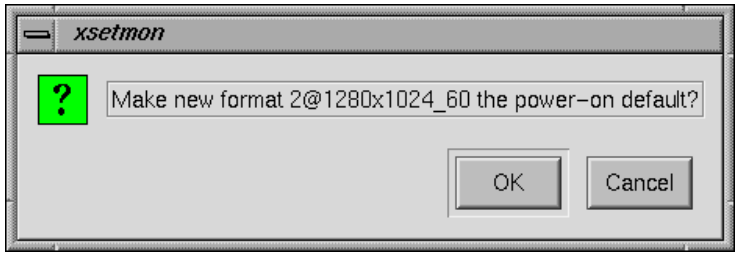

Figure 4-12 Power-on Default Dialog Box

6. Click **OK** to use the new display setting as the power-on default, or click **Cancel** to retain the current power-on default.

   If you click **OK**, the new display setting is immediately activated.

Note: If your specified display setting does not show the character *D* in the first column, a confirmation dialog box asks if you want to use this display setting as the power-on default. Click **OK** to confirm. The new display setting is activated the next time you log in.

Selecting DCD Buffer Settings

1. Select the desired frame buffer depth in the Graphics Back End Control window (see Figure 4-13), and then click the **Load** button.

   A dialog box appears that asks if you want to use this frame buffer depth as the power-on default, as shown in the example in Figure 4-13.

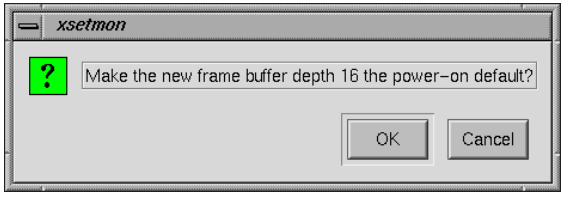

Figure 4-13 Frame Buffer Confirmation Dialog Box

2. Click **OK** to use this frame buffer depth as the power-on default, or click **Cancel** to retain the current default.

If you click **OK**, another dialog box appears that says you must log out for the new settings to take effect, as shown in Figure 4-14.

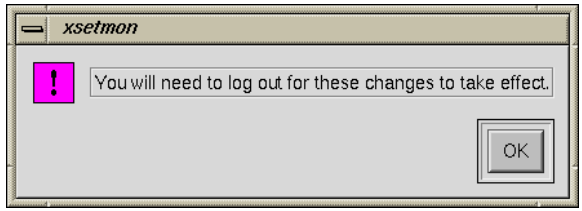

Figure 4-14 Log Out Dialog Box

3. Click **OK** in the dialog box.
4. Select the desired Accumulation Buffer Type in the Graphics Back End Control window (see Figure 4-10), and then click the **Load** button.

   A dialog box appears that asks if you want to use this accumulation buffer type as the power-on default, as shown in the example in Figure 4-15.

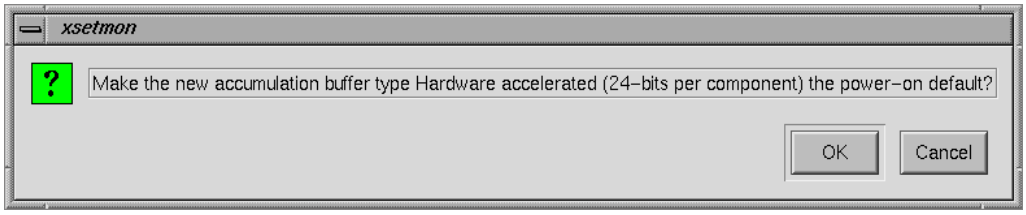

Figure 4-15 Accumulation Buffer Confirmation Dialog Box

5. Click the **OK** button to use this accumulation buffer type as the power-on default, or click the **Cancel** button to retain the current default.

   If you click **OK**, a dialog box appears that says you must log out for the new settings to take effect, as shown earlier in Figure 4-14.
6. Click **OK** in the dialog box.
7. Exit **`xsetmon`** and close all active applications.
8. Log out and then log in again to activate your new settings.

Specifying the Maximum Size of a DCD Window

Because the DCD provides a large logical display (for example, 2560 x 1024), some applications use all the available space and display a single window across both of your monitors. If this happens, you can specify the maximum size of a window as follows:

1. As root, use an editor such as NEdit to open the file `/usr/lib/X11/app-defaults/4DWm`.
2. Under 4Dwm Specific Appearance and Behavior Resources, enter the following:

   ```
   *maximumMaximumSize: 1280x984
   ```

   This constrains the maximum window size to 1280 x 1024. The 40-pixel vertical difference is for the title bar and the top and bottom window borders.
3. Save the file and exit the editor.
4. Restart Window Manager by logging out and logging back in, or by selecting **Toolchest** > **System** > **Utilities** > **Restart Window Manager** and clicking **OK**.

The above procedure limits the size of a maximized window, but the entire window may not appear on one of your monitors. To display the window on one of your monitors, click the **Maximize** button, and then move the window to the desired monitor.

Resetting DCD Window Positions

The DCD displays a single logical screen across two monitors. Most applications position the popup windows near the main window, or near the cursor. However, some applications center their popup windows. When such applications are in dual-channel mode, one half of the window appears on one monitor, and the other half of the window appears on the other monitor, as shown in Figure 4-16.

To work around this, modify the application's resources, as follows:

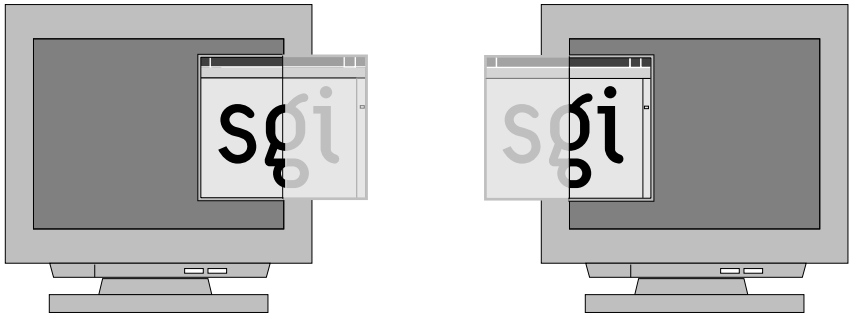

Figure 4-16 Overlapping Windows

To launch an application in a specific location, add the **-geometry** option to the command line. For example, the following command opens a window with the upper left-hand corner of the window 30 pixels from the left of the screen and 200 pixels from the top of the screen.

```
xterm  -geometry +30+200
```

If you are using a resolution of 1280 x 1024 and you want to place a window on the second display, add 1280 to the first number. Note the following example:

```
xterm  -geometry +1310+200
```

You can also set this X resource in **$HOME/.Xdefaults**. For example, the following command forces all XWsh windows to open with the upper left-hand corner of the window 30 pixels from the left of the screen and 200 pixels from the top of the screen.

```
XWsh*geometry: +30+200
```

XWsh is the application's Classname.

In addition, you can use the Window Setting control panel to set specific window locations or to specify the window's last (continuous) position before you log out. To do this, select **Toolchest** > **Desktop** > **Customize** > **Windows**.

Moving Windows between Monitors

When you move a window from one monitor to the other, the window follows the cursor as it jumps between screens. However, as it moves across, a section of the window is clipped. For example, as you move a window from the left monitor to the right monitor, the right edge of the window is clipped to the left edge of the right monitor, as shown in Figure 4-17.

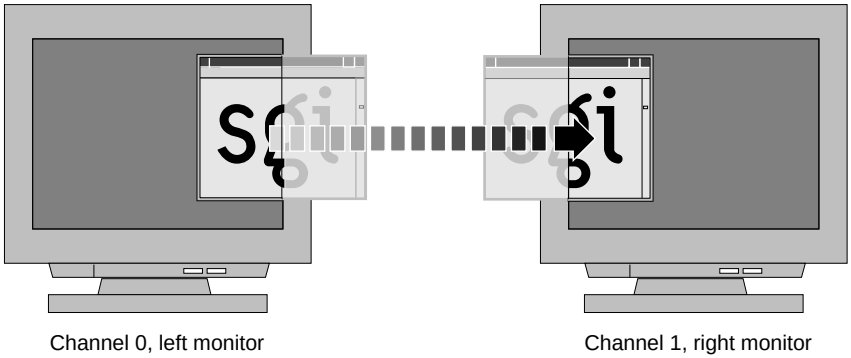

Figure 4-17 Moving a Window between Monitors

InfiniteReality Graphics Module

The Onyx 350 InfiniteReality graphics module is a one- or two-pipe rackmounted graphics interface that requires 18U of space within a rack. The Onyx 350 graphics system supports a maximum of 8 InfiniteReality graphics pipes. Figure 5-1 shows the front and rear views of the graphics module.

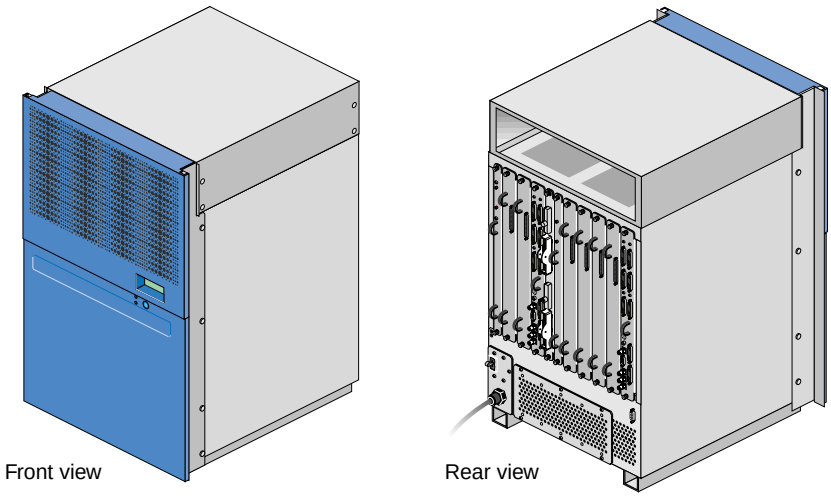

Figure 5-1 Front and Rear Views of InfiniteReality Graphics Module

This chapter describes this graphics module in the following sections:

Front Components

The InfiniteReality graphics module contains the following front panel items (see Figure 5-2):

- **L1 display** is a 2-line by 12-character liquid crystal display (LCD) that displays status and error messages that the L1 controller generates.
- **On/Off button with LED** enables you to manually power on and power off the module.
- **L1 controller LEDs** function as follows:
  - **On/Off button LED** illuminates green when the internal components are powered on.
  - **Service-required LED** illuminates orange to indicate that an item is not functioning properly, but the InfiniteReality graphics module is still operating.
  - **Failure LED** illuminates red to indicate that a failure has occurred and the InfiniteReality graphics module is down.

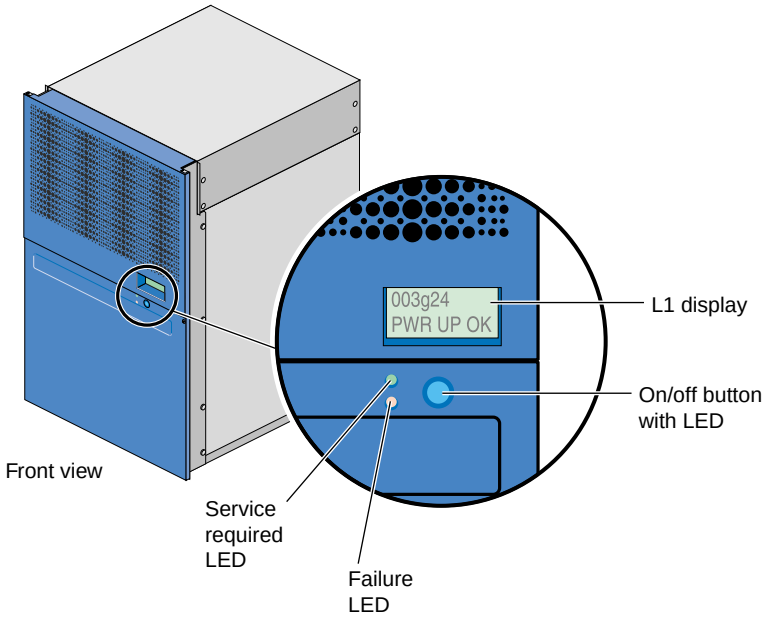

Figure 5-2 Front Components

Rear Components

The InfiniteReality graphics module has the following rear panel items, as shown in Figure 5-3:

- **Power switch** powers on the L1 controller when moved to the On (**1**) position; moving it to the OFF (**0**) position powers off the L1 controller.
- **PWR (power) cord** attaches to an external 200-240 VAC power receptacle.
- **11 board slots** that house a Ktown2 board and 1 or 2 InfiniteReality graphics pipes. As you face the rear panel, the boards are located as follows:
  - **6 rightmost slots (pipe 0)** support a Geometry Engine processor board; 1, 2, or 4 raster manager (RM) boards; and a display generator (DG) board.
  - **4 leftmost slots (pipe 1)** support a Geometry Engine processor board, 1 or 2 RM boards, and a DG board.
  - **Ktown2 board with 2 connectors** is located between pipe 0 and pipe 1. The top connector connects pipe 0 (6 rightmost slots) to an Onyx 350 series compute module. The bottom connector connects pipe 1 (4 leftmost slots) to an additional compute module.
- **L1 (USB) connector** attaches the InfiniteReality graphics module to the L2 controller.

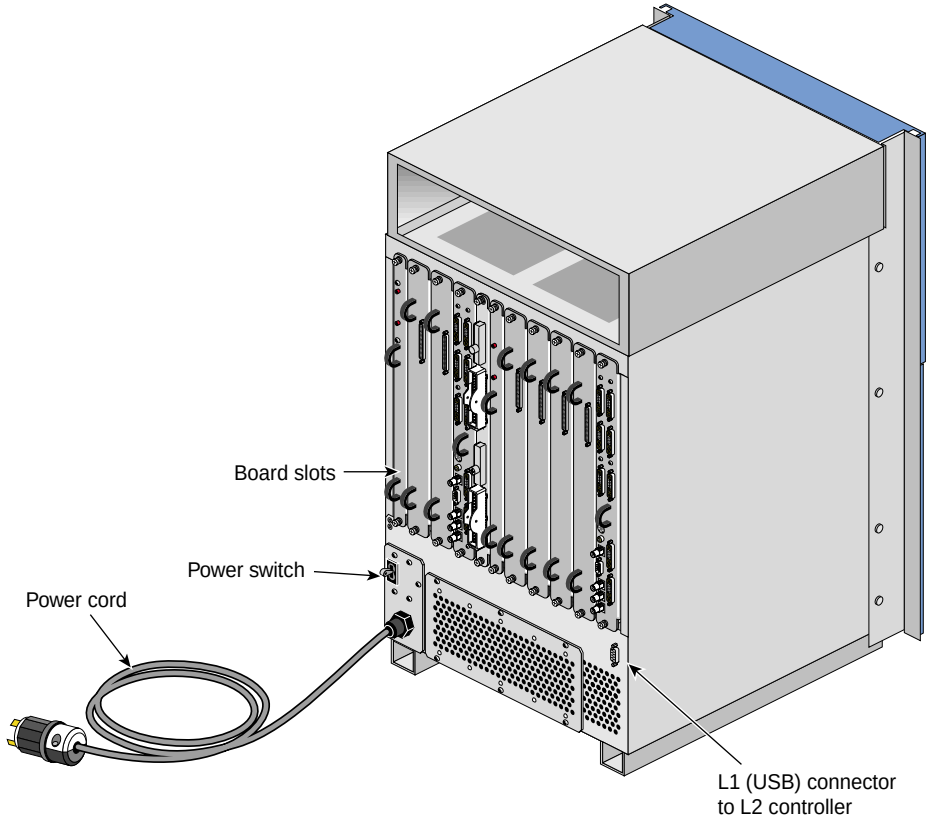

Figure 5-3 Rear Components

The InfiniteReality graphics module contains the following:

- InfiniteReality board set
- L1 controller
- Power supply
- Midplane

InfiniteReality Board Set

The Onyx 350 graphics system can support different InfiniteReality board sets. All of the InfiniteReality board sets consist of the following board types (see Figure 5-4):

- Ktown2
- Geometry Engine (GE)
- Raster manager (RM)
- Display generator (DG5)

Note: The InfiniteReality board sets are distinguished from each other primarily by the types of GE and/or RM boards that they contain. Check with your SGI sales or service representative to confirm any compatibility questions.

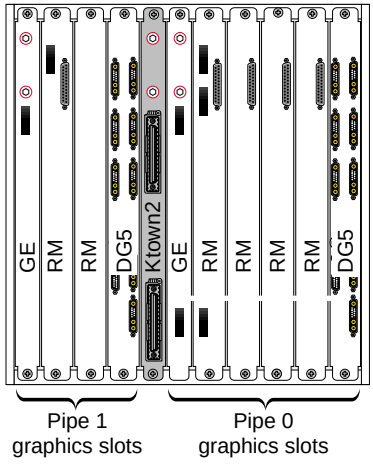

Figure 5-4 InfiniteReality Board Set

The Ktown2 board, which is physically located between the two pipes, provides two Crosstown2 (Xtown2) connections. The top Xtown2 connector is for the right pipe; the bottom Xtown2 connector is for the left pipe (see Figure 5-5). The Xtown2 connectors connect to the XIO port of the Onyx 350 compute modules.

Each graphics module requires one Ktown2 board so that the graphics module can convert the data it receives from the host processors to differential signal levels.

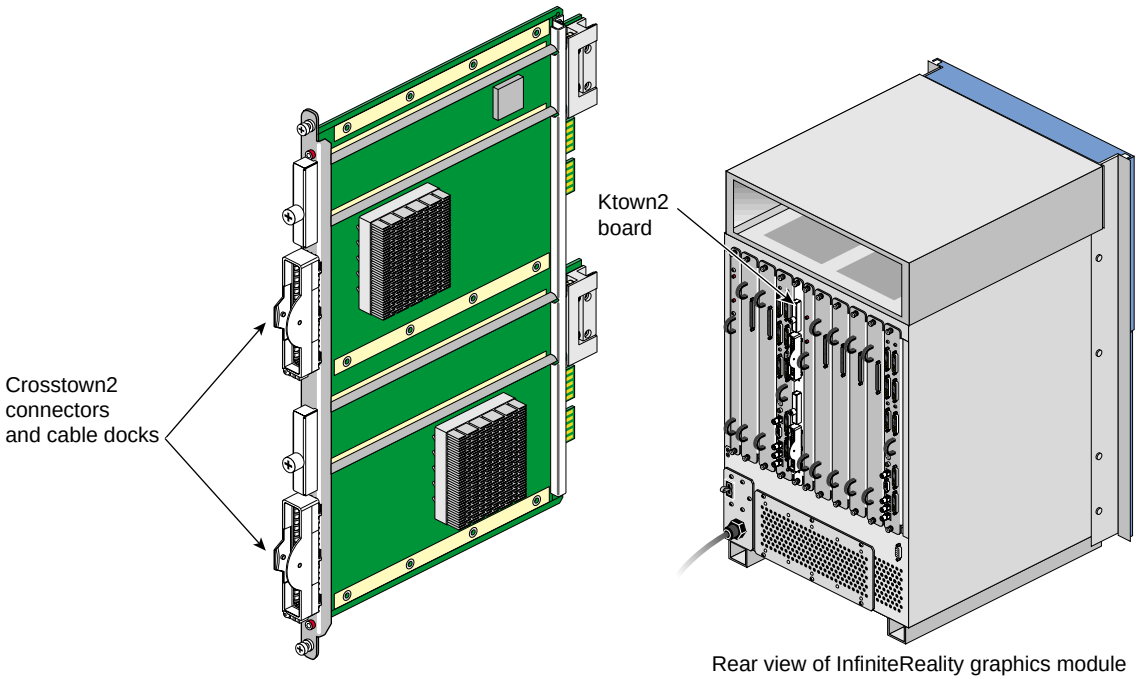

Figure 5-5 Ktown2 Board

The GE (Geometry Engine) board contains four processors that process OpenGL commands and vertex data that the GE board receives from the host processors (see Figure 5-6). Each pipe contains one GE board.

The GE board creates polygons and performs basic geometric transformation, lighting calculations, and other processes that make an image look normal to the human eye. The mathematical processes that occur in the GE board are measured in polygons per second (the unit for the rate at which data moves through the graphics pipe).

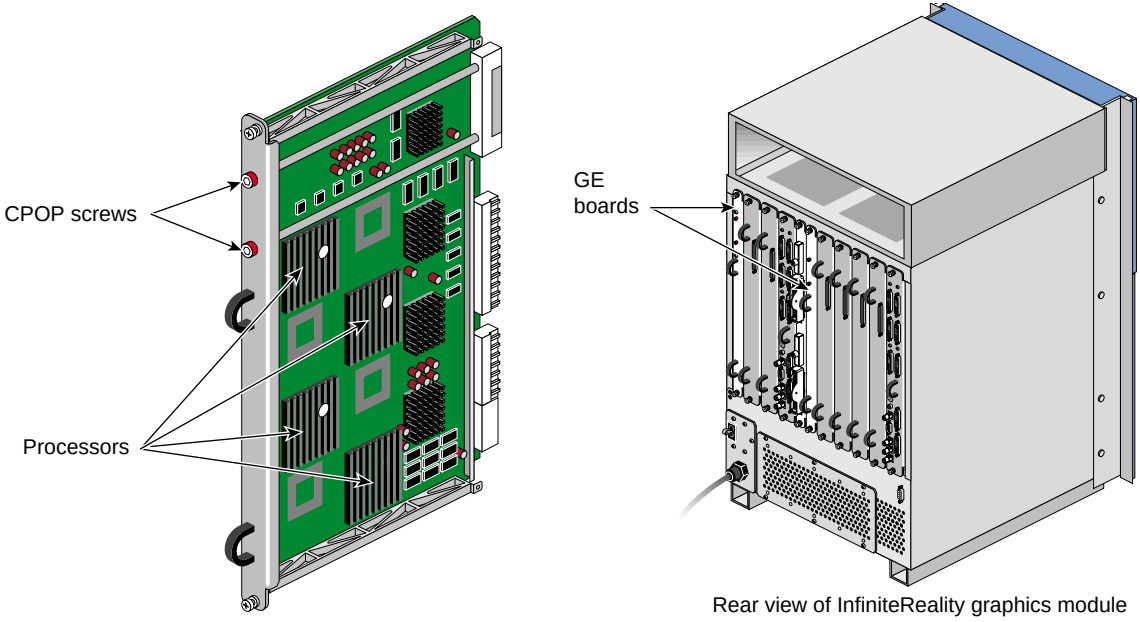

Figure 5-6 GE (Geometry Engine) Board

The RM (raster manager) boards have the following characteristics:

- Contain the main memory of the graphics system
- Provide the frame buffer
- Manage anti-aliasing
- Provide appropriate levels of screen resolution
- Contain texture memory (TM), which contains textures that can be applied to an image

Each InfiniteReality graphics module supports two graphics pipes: a 2-RM pipe and a 4-RM pipe. The 2-RM pipe, which is physically located to the left of the Ktown2 board, contains one or two RM boards. The 4-RM pipe, which is physically located to the right of the Ktown2 board, contains one, two, or four RM boards.

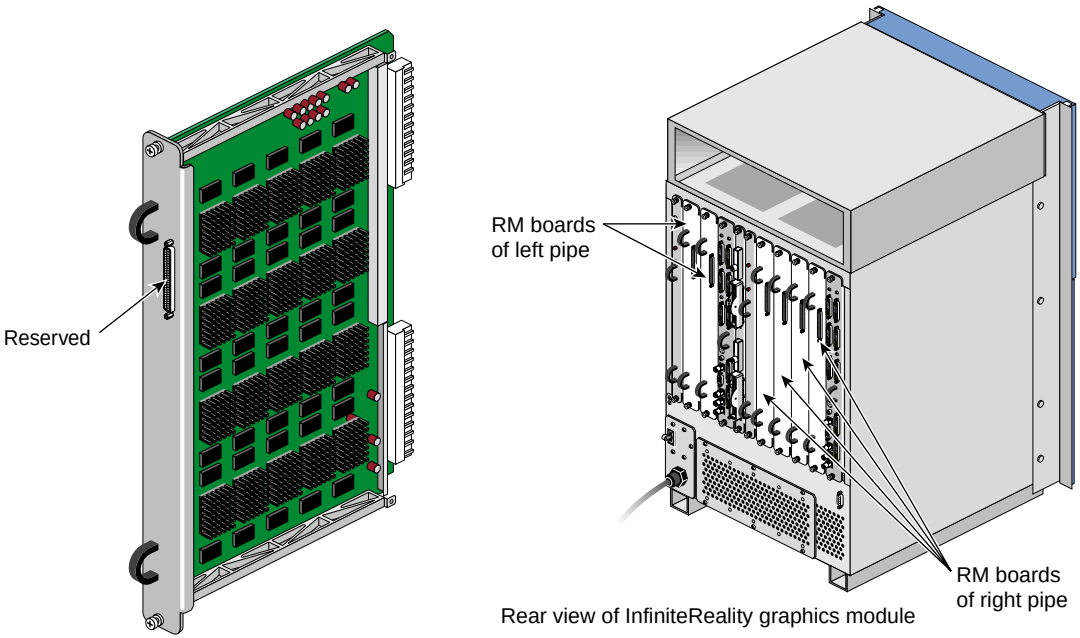

Figure 5-7 RM (Raster Manager) Board

The DG5 (display generator) board formats images so that they can be displayed on a monitor or delivered to other devices. The DG5 board has the following characteristics:

- Converts digital data to analog
- Handles all pixel clocking, genlocking, and cursor display functions
- Performs the role of functional manager
- Connects to the graphics display(s)

Each pipe contains one DG5 board. Figure 5-8 shows an example of the optional DG5-8 display generator.

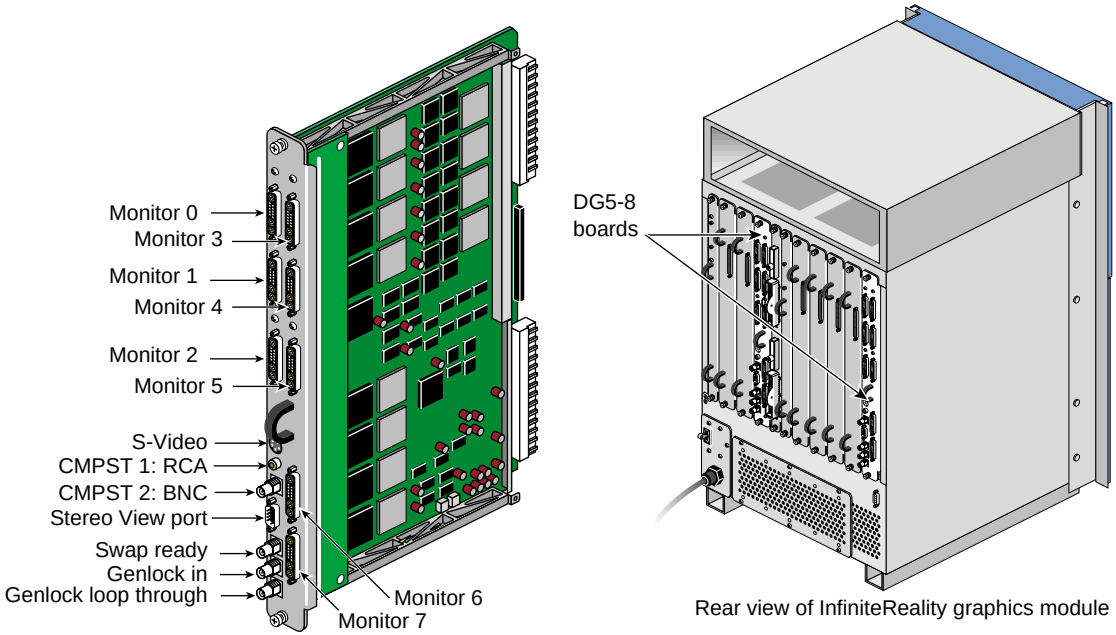

Figure 5-8 DG5 (Display Generator) Board

The Onyx 350 graphics system supports the DG5 options listed in Table 5-1.

Table 5-1 DG5 Options

Option Name	Description
DG5-2	Default DG5 board that is configured with each graphics pipe. It has two high-resolution video outputs that can connect to two monitors. This option does not have a daughtercard.
DG5-2/DPLEX	DG5-2 board with a digital video multiplexer (DPLEX) daughtercard that enables multiplexing of two or more graphics pipes (referred to as a *hyperpipe*). The output of the graphics pipes is sent to a single monitor or other video input device.
DG5-2/HDGVO	DG5-2 board with a daughtercard that provides high-definition real-time graphics-to-video output.
DG5-2/DDO2	DG5-2 board with a daughtercard that is used for custom hardware-in-the-loop (HITL) simulations.
DG5-8	DG5 board that has eight high-resolution video outputs that can connect to eight monitors. This option has a VIO5H daughtercard.

The DG5 options have the standard connections that are listed in Table 5-2.

Table 5-2 DG5 Standard Connections

Label	Type	Function
Monitors 0 through X	13W3	Variable high-resolution monitor outputs
S-Video	4-pin mini-DIN	Interface to SVHS VCR or monitor
CMPST 1	RCA jack	Interface to composite monitor or VCR
CMPST 2	BNC	Interface to composite monitor or VCR
Stereo View	9-pin sub-D	Interface to Stereo View goggles
Swap-ready	BNC	Interface to other graphics pipes
Genlock in	BNC	Interface to house sync or other pipes
Genlock loop-through	BNC	Loop-through connection

L1 Controller

The L1 controller performs various functions for the InfiniteReality graphics module; for example, the L1 controller monitors the voltage and temperature of the module. The L1 controller display, which is located on the front of the graphics module (see Figure 5-9), is a liquid crystal display (LCD) that displays error and status messages that the L1 controller generates.

The L1 controller also has the following button and LEDs:

- **On/Off button with LED** enables you to manually power on and power off the module. The LED illuminates green when the internal components are powered on.
- **Service required LED** illuminates orange to indicate that an item is not functioning properly, but the InfiniteReality graphics module is still operating.
- **Failure LED** illuminates red to indicate that a failure has occurred and the InfiniteReality graphics module is down.

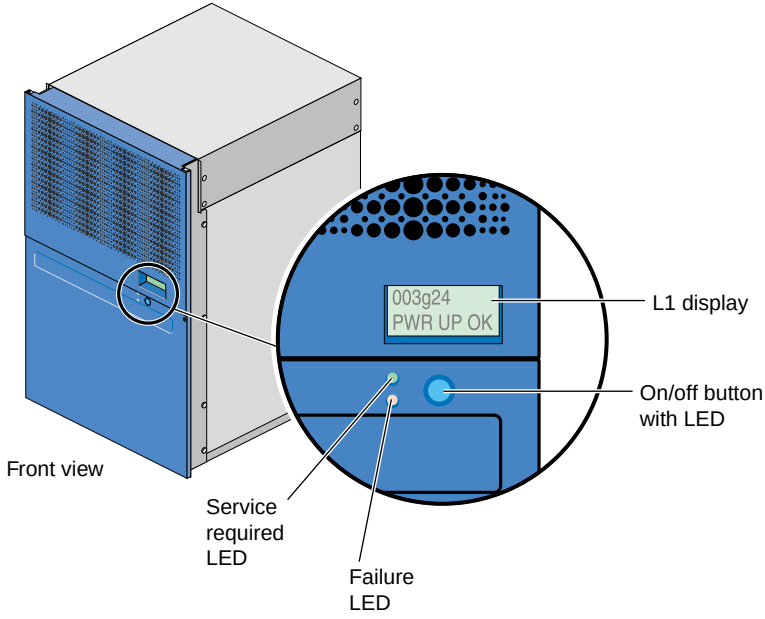

Figure 5-9 L1 Controller Display, On/Off Button, and LEDs

Midplane

The midplane provides connections for the board set, power supply, and L1 controller (see Figure 5-10).

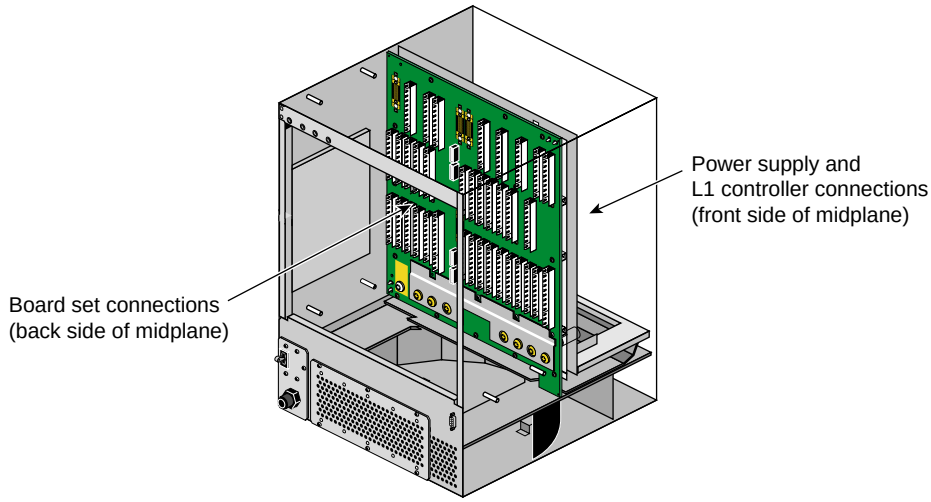

Figure 5-10 Midplane

Power Supply

The InfiniteReality graphics module has its own power supply, which requires an external 200-240 VAC power receptacle. The power supply is located on the front side of the midplane (see Figure 5-10).

Memory and PCI Expansion Module

The Onyx 350 memory and PCI expansion module (hereinafter referred to as the MPX module) offers additional NUMAlink connected memory and four slots of PCI/PCI-X expansion for all Onyx 350 systems. As with the standard Onyx 350 compute module, the MPX module supports both PCI and PCI-X protocols.

The following sections describe the optional Onyx 350 MPX module:

Product Overview

The 2U-high MPX module has four available PCI card slots to support optional PCI or PCI-X cards. Memory DIMMs and capacity are exactly as those of the Onyx 350 compute module.

Figure 6-1 on page 102 shows a front panel and side view of the MPX module.

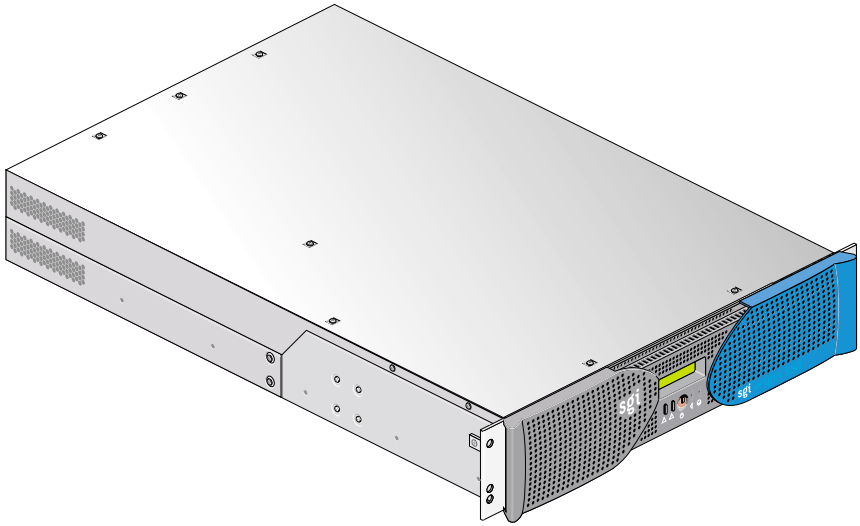

Figure 6-1 Front and Side Views of an MPX Module

External Components

This section describes the external features and connectors on the MPX module as follows:

- An L1 controller to manage and monitor the functions of the MPX module, such as system temperature. The system includes an L1 controller display system that processes error messages.
- Supports 1 or (optionally) 2 power supplies. The second power supply is redundant.
- Supports 1 L1 port (USB type B) connector that can connect the module to an L2 controller.
- Has 1 NUMAlink port to connect to a compute module (see Figure 6-2).
- Supports 1 Crosstown2 XIO port.
- 1 console port. This RS-232 DB-9 serial connector can connect a system console to a monitor and manage your system.

- Contains 4 PCI and PCI-X card slots on 2 buses. These 64-bit slots can house 33-MHz and 66-MHz PCI cards, or 66-MHZ and 100-MHz PCI-X cards.

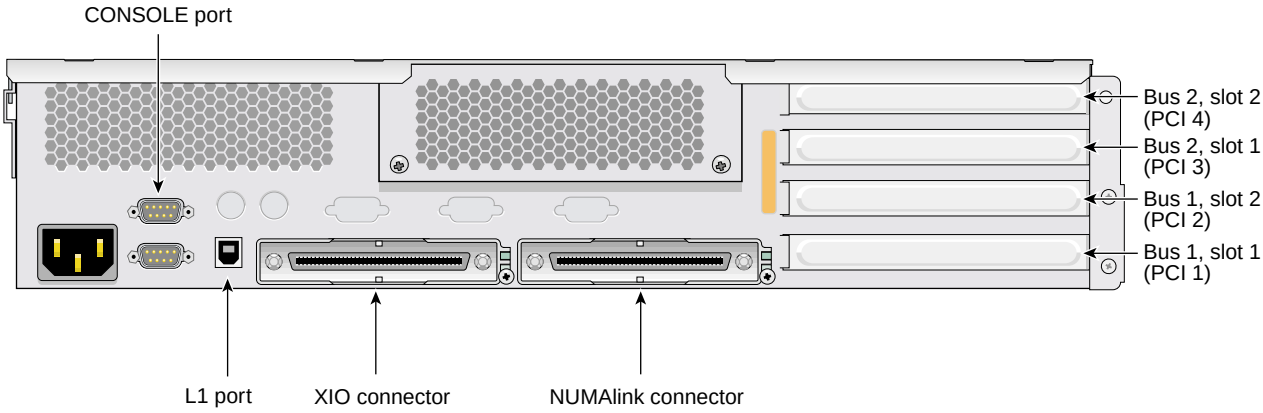

Figure 6-2 Rear Panel of the Onyx 350 MPX Module

Product Options and Upgrades

The product options you might use in your Onyx 350 system will either be memory or PCI based when installed in an MPX module. PCI and PCI-X cards and memory (DIMMs) are the configurable internal components of the MPX module that end-users may upgrade or replace.

DIMMs or PCI/PCI-X cards are upgraded or replaced in exactly the same way as the Onyx 350 compute or compute/graphics modules. See Chapter 7 for detailed information on these topics.

Important Notes

If you run PCI and PCI-X cards on the same bus at the same time, the PCI-X card will run in PCI mode. And if you run cards of different speeds on the same bus, the highest-speed card will run at the speed of the slower card. For example, if a card is running at 100 MHz in one slot of a bus, and a card is running at 33 MHz in the second slot of the same bus, both cards will run at 33 MHz.

Installing and Removing Customer-replaceable Units

This chapter provides safety instructions to follow when using and maintaining your system. It describes how to install and remove a module's customer-replaceable units (CRUs), as follows:

Safety Instructions

Before you perform any type of maintenance to your system, read the following safety instructions:

- Follow all warnings and instructions marked on the product and noted in this and other documentation included with the product.
- Unplug this product from the power outlet before you clean it. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
- Do not use this product near water.
- 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.
- Slots and openings on the cabinet and components are provided for ventilation, reliable operation, and protection from overheating of the product. These slots and

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.

- 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.
- Do not allow anything to rest on the power cord. Do not locate this product where persons will walk on the cord.
- Do not use extension cords with your SGI system.
- Never push objects of any kind into this product through cabinet slots because 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.
- Do not attempt to service this product yourself except as noted in this guide. Opening or removing covers of internal components may expose you to dangerous voltage points or other risks. Refer all servicing to qualified service personnel.
- Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
  - If the power cord or plug is damaged or frayed.
  - If the product has been exposed to rain, water, or other type of liquid.
  - If the product does not operate normally when the operating instructions are followed.

    Note: 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, which indicates a need for service.
- Only qualified service personnel should replace a soldered lithium battery in the Onyx 350, and only with the same type or an equivalent type recommended by the

manufacturer. See the Lithium Battery Statement in Appendix B for more information. The battery can explode if it is replaced incorrectly.

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

Caution: Electronic equipment can be irreparably damaged by electrostatic discharge (ESD). Always follow these preventive measures when you handle a system component:- Remove a component from its antistatic bag only when you are ready to install it.- If you 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 static wrist strap to a grounded connection on your system when you install or remove a component.

Removing a Module and Accessing Internal Components

To access and remove/replace internal system components, power off the system as described in "Powering the System On and Off" in Chapter 2, and then use the follow these steps:

1. Unfasten the two screws that hold the module to the front of the rack.
2. Disconnect all cables from the rear of the module.
3. Carefully slide it forward out of the rack until it is stopped by the safety latches.
4. If removing, adding, or replacing a PCI/PCI-X card, follow the additional steps in "Installing and Removing PCI and PCI-X Cards" on page 109.
5. Remove the ten Phillips screws as shown in Figure 7-1 and lift the hinged cover.
6. Follow the instructions in this chapter for adding/removing the internal components, such as PCI cards or memory DIMMs.

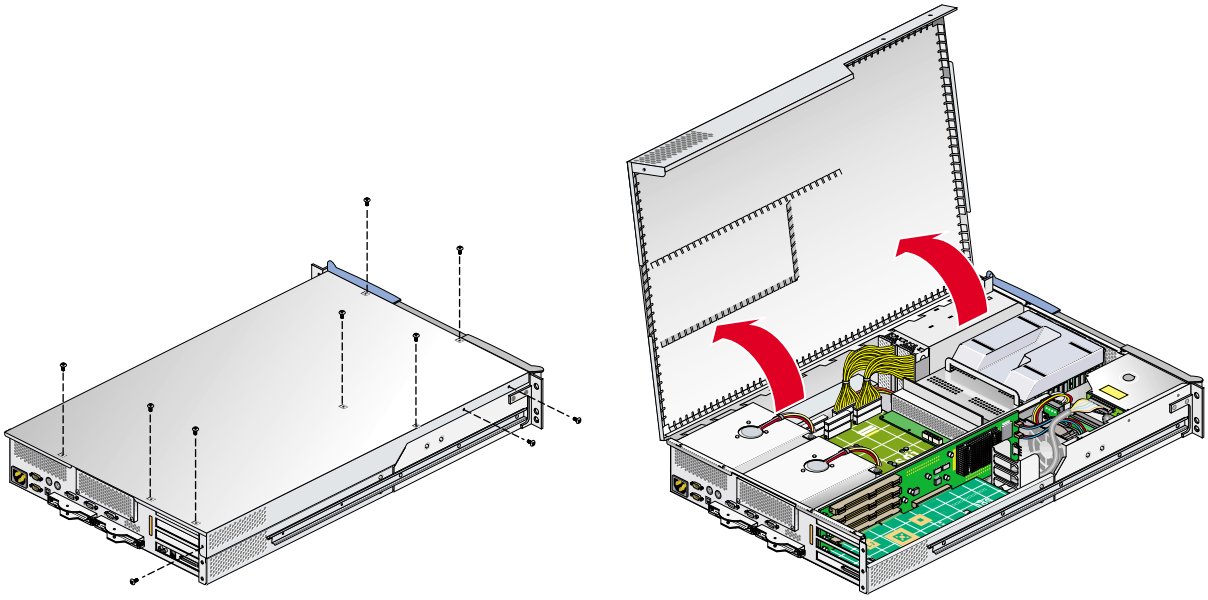

Figure 7-1 Removing the Top Cover Screws on the Module

7. After completing the procedure(s) needed, close and secure the module by replacing the cover and tightening the ten screws, as shown in Figure 7-2.
8. Slide the module back into the rack and secure it at the front of the rack with the two screws you removed in step 1.
9. Move to the back of the rack and reconnect all cables to the rear of the unit before powering on the system.

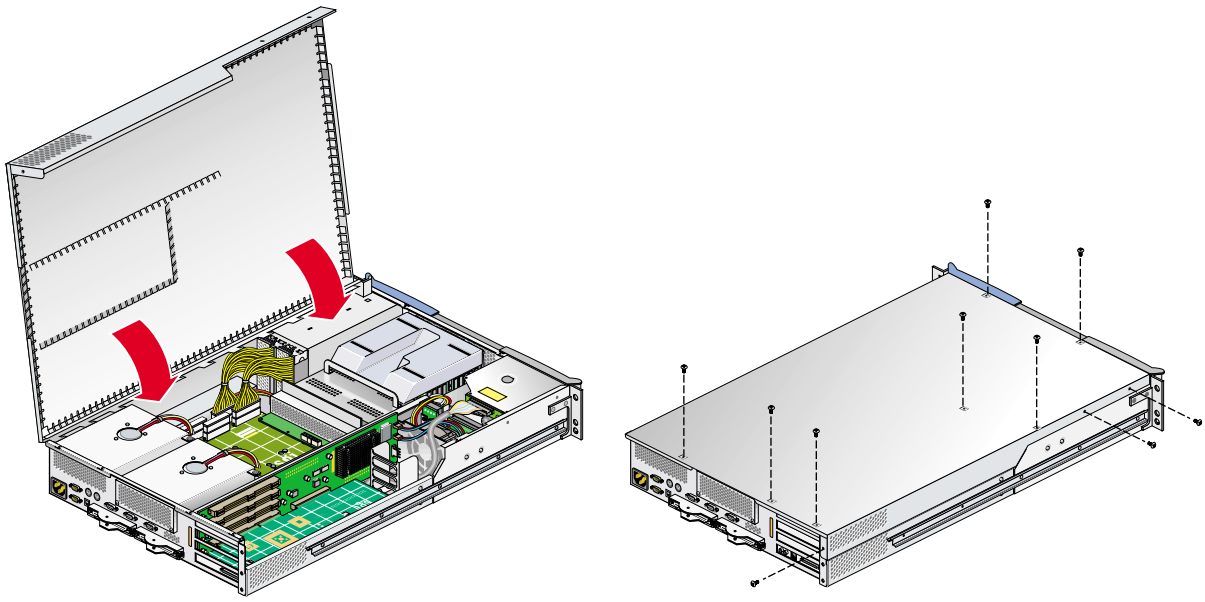

Figure 7-2 Closing and Replacing the Module's Top Cover

Installing and Removing PCI and PCI-X Cards

Your system module and various optional modules in your system support PCI and PCI-X cards. The following instructions, which describe how to install and remove a PCI or PCI-X card in the Onyx base 350 module, can be used to install PCI and PCI-X cards onto other modules in your system. Figure 7-3 shows the location of the PCI and PCI-X card slots in the module. Note that these instructions do not cover the optional 4U PCI module.

For an updated list of supported PCI and PCI-X cards, see SGI Supportfolio Online at: http://support.sgi.com.

This section explains how to perform the following procedures:

- Installing a new card
- Removing/replacing a card

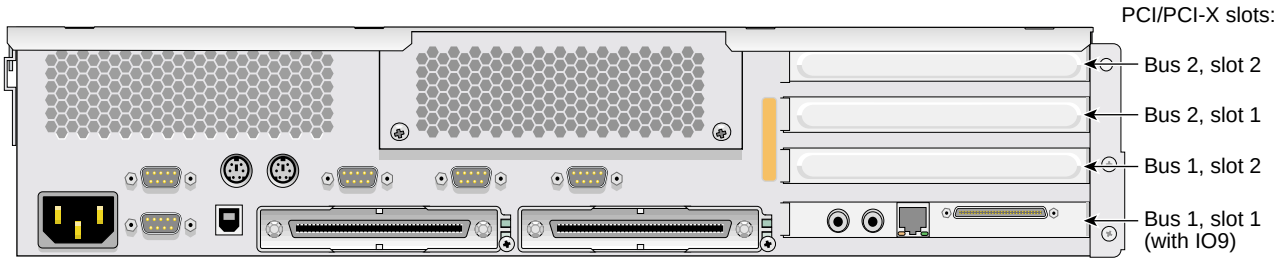

Figure 7-3 PCI and PCI-X Card Slots Located in the Rear Panel of the Module

To install a PCI or PCI-X card, follow these steps:

1. Power off the module. For instructions on how to power off the module, see "Powering the System On and Off" on page 32.
2. Complete the first three steps in "Removing a Module and Accessing Internal Components" on page 107.

Warning: Components may be hot. To avoid injury, allow the components to cool for approximately five minutes before you proceed with these instructions.

3. If you are installing a card in one of the two lowermost card slots, you must also remove the module completely from the rack and remove its left-side rail and lower support bracket Otherwise, go on to step 6.
   - Using two people, depress the locking latches on either side of the module and pull the unit out completely (see Figure 7-4).
   - Move the module to a sturdy table or other non-static work surface.

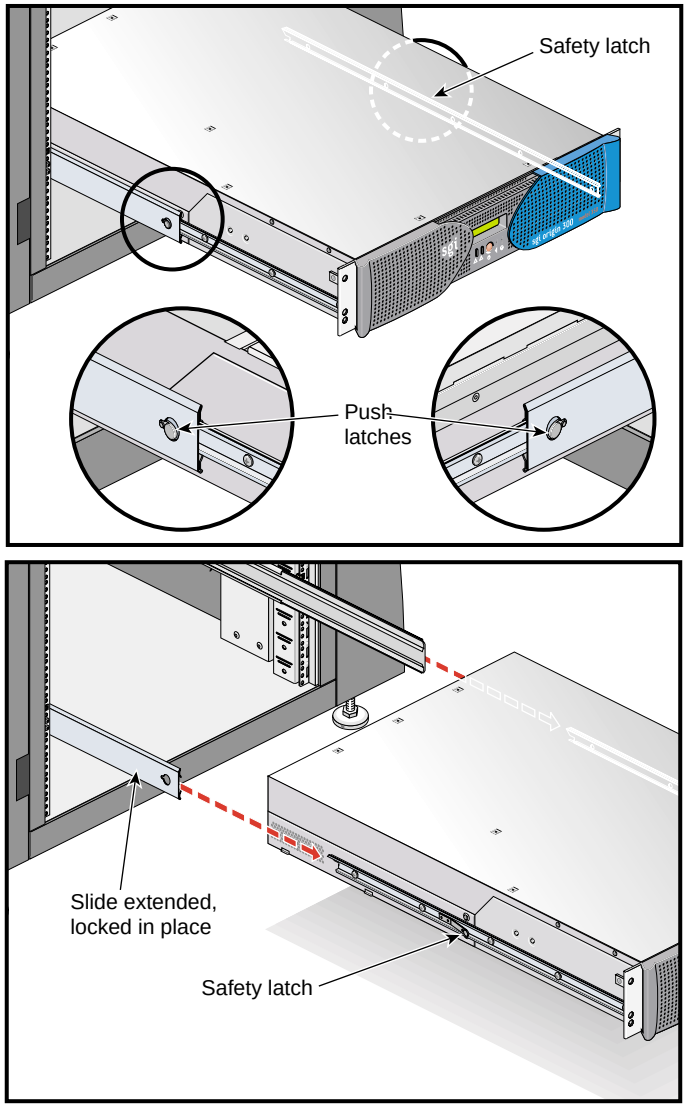

Figure 7-4 Releasing the Safety Latches

4. Remove the chassis side rail by unscrewing the five Phillips screws, as shown in Figure 6-3.

Caution: Depending on the type, the module may or may not have a factory-installed IO9 card, which always comes installed in the lowermost slot. To prevent damage to your system, only a trained SGI service support engineer can install or remove an IO9 card.

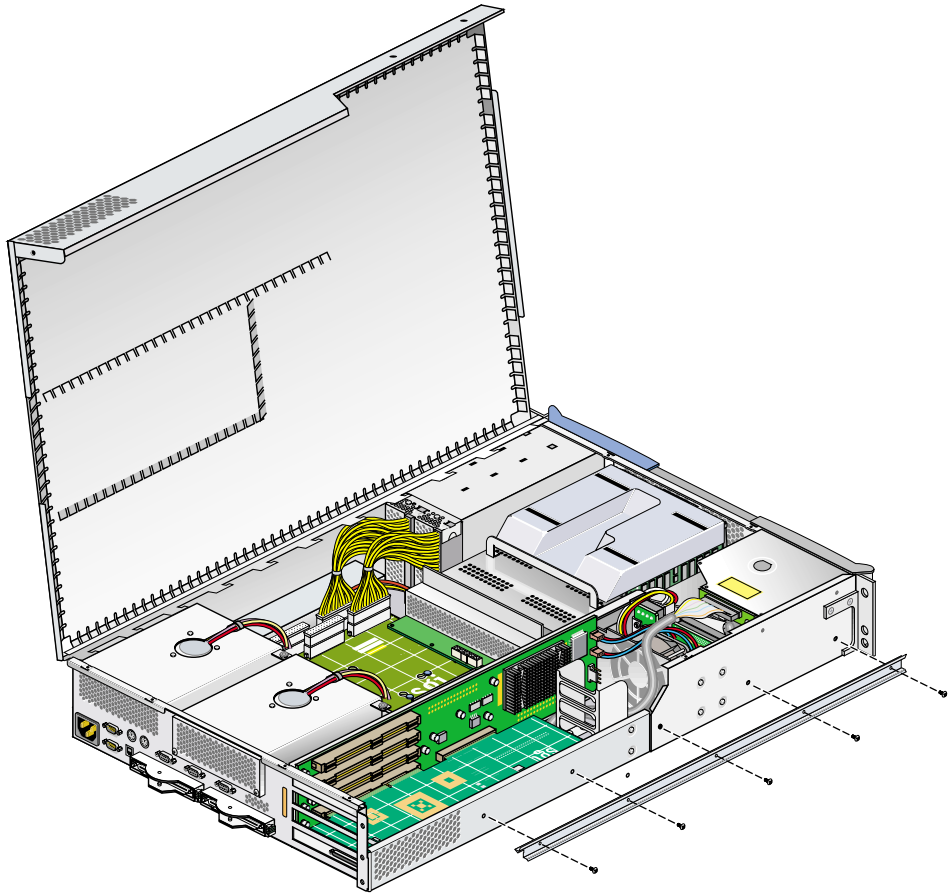

Figure 7-5 Removing the Chassis Rail

5. Remove the lower PCI/PCI-X support bracket that covers the two lowermost slots, as shown in Figure 7-6, by removing the four Phillips screws.

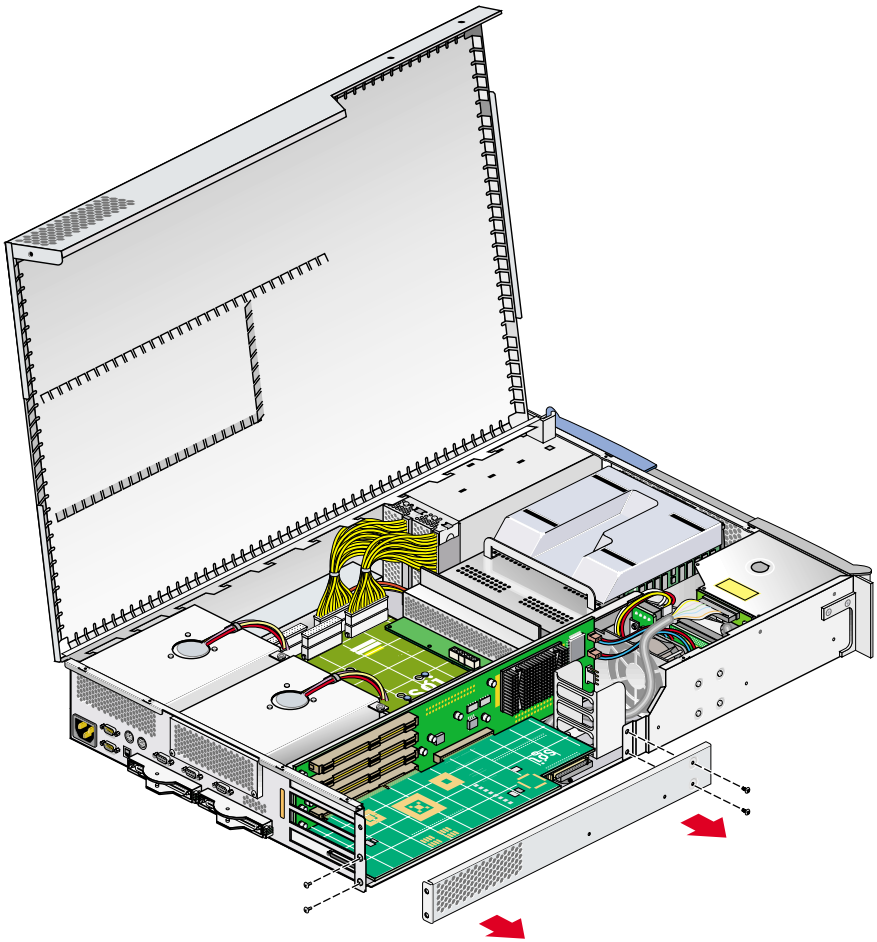

Figure 7-6 Removing the Lower PCI/PCI-X Support Bracket

6. To add a new card to the module, follow these steps:
   - Remove the blanking plate retention screw (see Figure 7-7 on page 114).
   - Extract the blanking plate from the chassis.

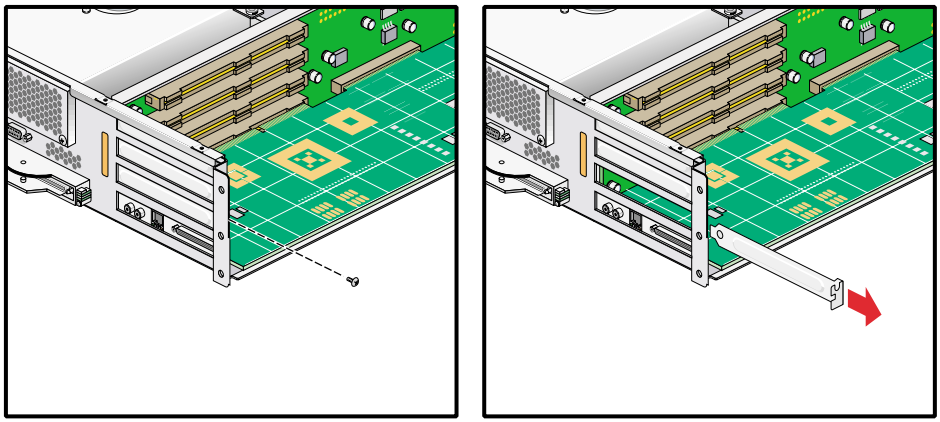

Figure 7-7 Removing a Blanking Plate

7. To remove and replace a PCI card from a module, undo the retaining screw holding the card in place and extract it, as shown in Figure 7-8.

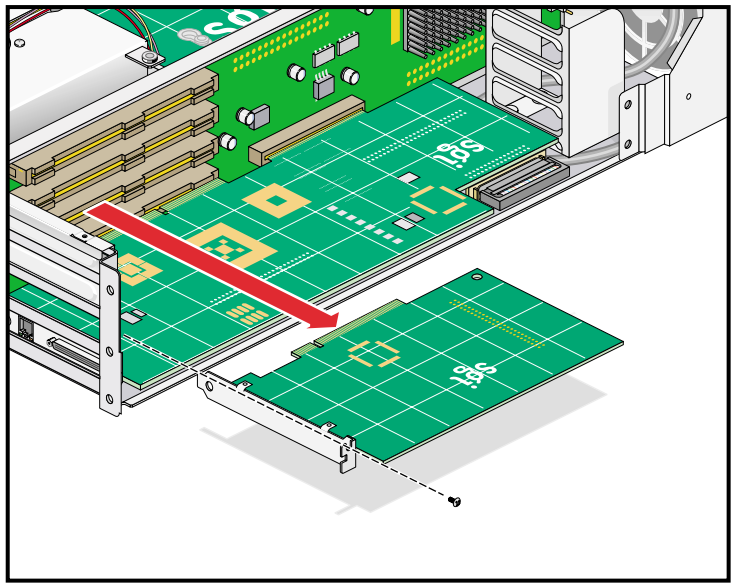

Figure 7-8 Removing the Retaining Screw and Extracting a Card

8. To replace the card you removed, carefully insert it into the slot and screw in the retention screw, as shown in Figure 7-9. If you are not replacing the card you have removed, proceed to the next step.

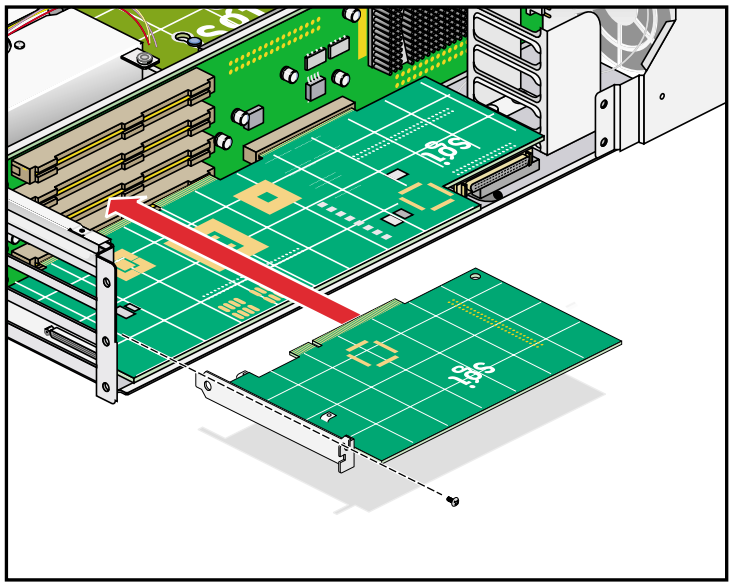

Figure 7-9 Installing the Card and Retaining Screw

9. If you have removed a card from one of the upper three slots (and will not be replacing it with another) place a blanking plate to cover the slot and screw in the retaining screw, as shown in Figure 7-10.

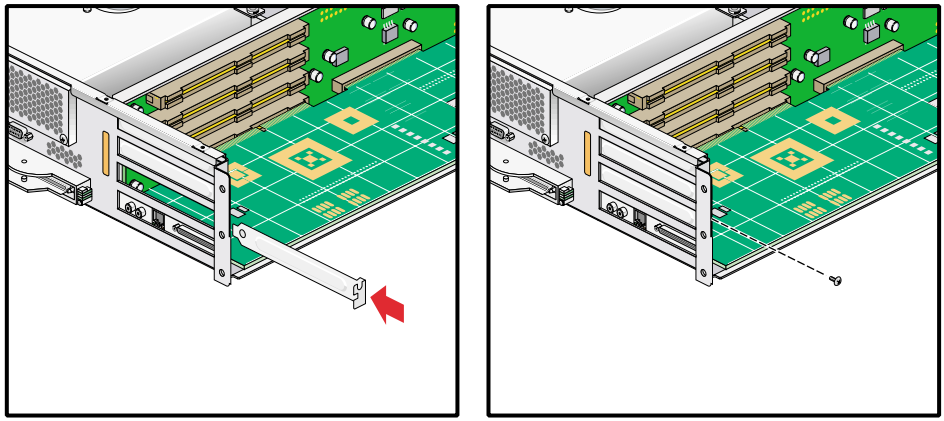

Figure 7-10 Installing a Blanking Plate

10. If you removed or installed a card in one of the two bottom-most card slots, complete the following two substeps. Otherwise, proceed to step 11.
    - Replace the lower PCI/PCI-X support bracket that covers the two bottom-most slots and screw in the four Phillips screws as shown in Figure 7-11 on page 117.
    - Reattach the chassis side rail using the five screws you removed (see Figure 7-5 on page 112).

Caution: To prevent pinching and damaging of the IDE and SCSI cables, make sure that both of these cables are tucked underneath the IO9 card and safely away from the lower PCI/PCI-X support bracket that you are replacing.

11. Close the hinged cover on the system and screw in the ten Phillips screws you had removed to secure the cover, as shown in Figure 7-2 on page 109.
12. Using two people, slide the module back into the rack.
13. Install the two screws that secure the module to the front rails of the rack.
14. Install all of the cables at the rear of the module.
15. Power on the system. For instructions on how to power on, see "Powering the System On and Off" in Chapter 2.

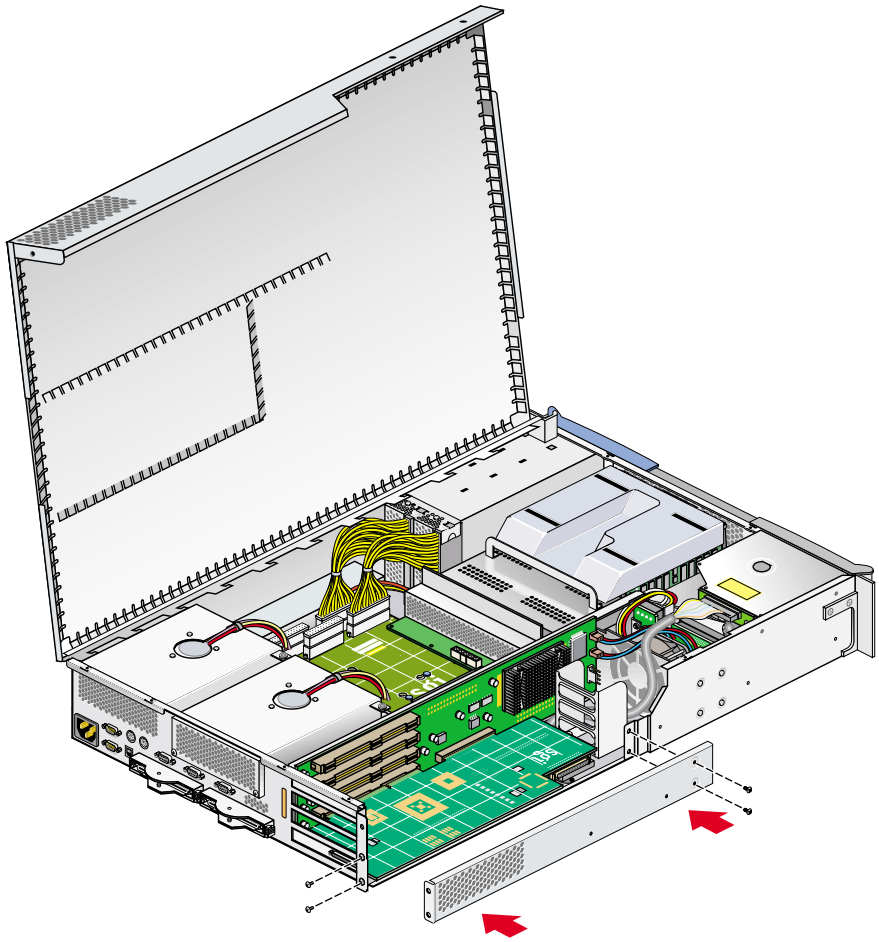

Figure 7-11 Replacing the Lower PCI/PCI-X Support Bracket

Installing and Removing Disk Drives

Each Onyx 350 base compute module can contain one or two sled-mounted Ultra3 SCSI disk drives (see Figure 7-12).

Note: A system expansion compute module may or may not contain disk drives. These modules require an optional IO9 PCI card in order to support SCSI disk drives.

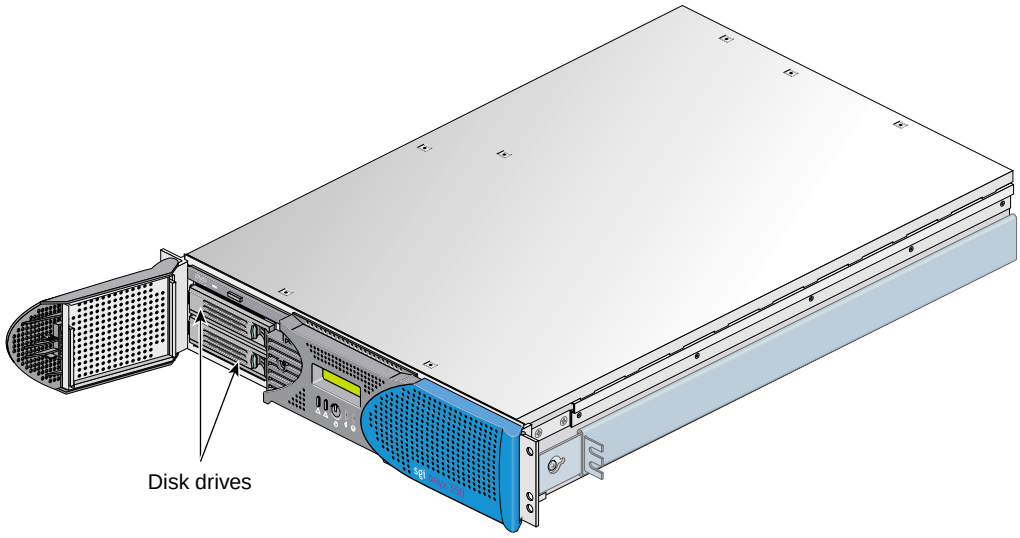

Figure 7-12 Disk Drive Locations

Installing a Disk Drive

To install a disk drive, follow these steps:

1. Open the bezel door as far as it will open. Position the drive assembly so that it engages the bay guide rails.
2. With the locking handle fully swung open, gently push the drive into the bay until the locking handle engages with the left side of the bay opening, as shown in Figure 7-13A.

   Note: If you will have only one disk drive in your system, it should be located in the bottom-most slot.

3. Swing the locking handle towards the chassis until the locking handle engages the latch, as shown in Figure 7-13B and Figure 7-13C.
4. Close the bezel door as shown in Figure 7-13D.

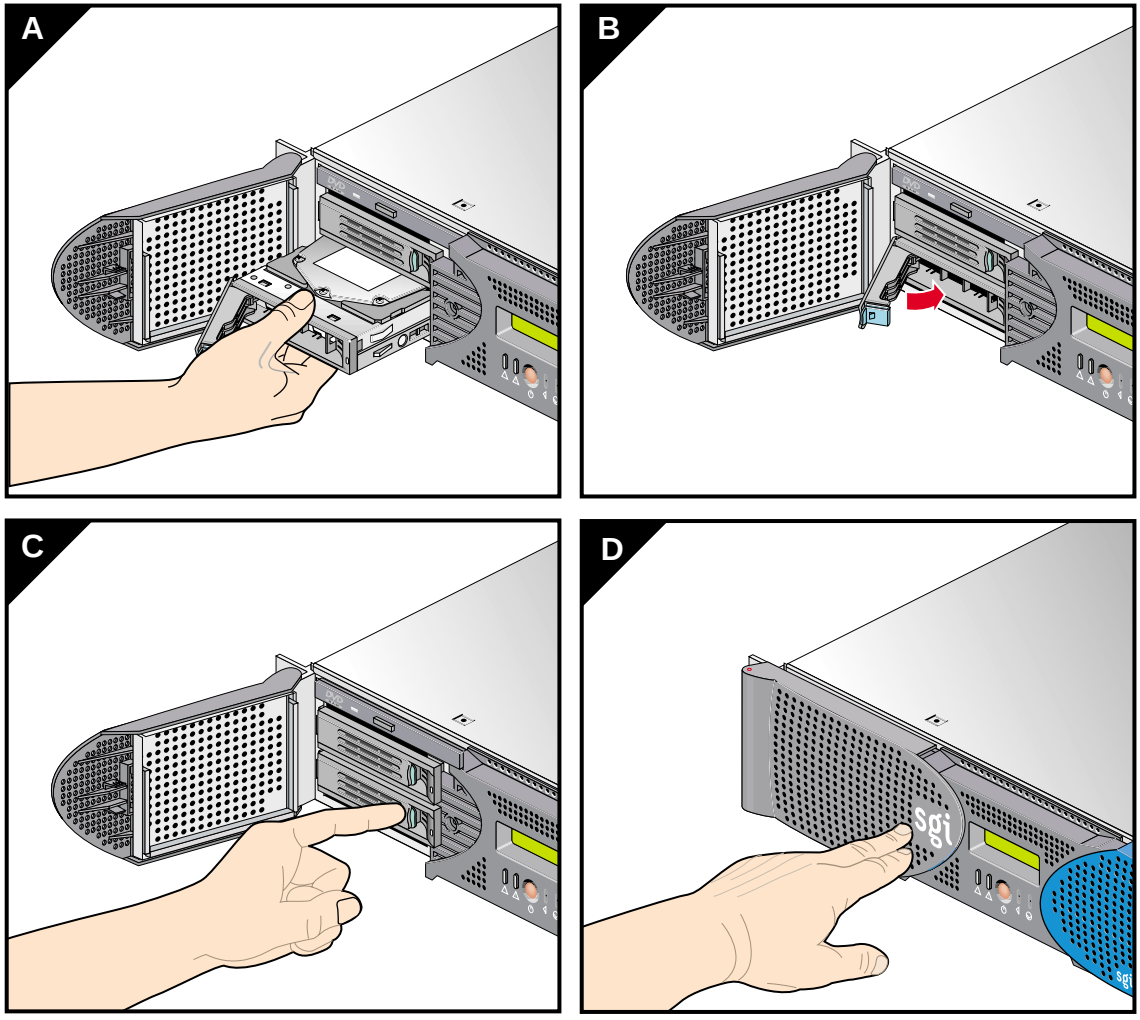

Figure 7-13 Installing a Disk Drive

Removing Disk Drives

To remove a disk drive, follow these steps:

1. If you are replacing a data drive, ensure that the drive has spun down before you remove it.
2. If you are replacing the system drive, you must first halt the operating system using a command such as `/etc/shutdown` or `/etc/halt` and then power off the module, as follows:

   - To power off the module indicated at the L1 prompt (001c01-L1, for example), enter the following command. (If you want to power off the peer-attached module, proceed to the next step.)

     ```
     001c01-L1> power down
     ```

   - To power off the module that is connected to the module indicated at the L1 prompt (001c01-L1, for example), enter the following command:

     ```
     001c01-L1> ctc power down
     ```

3. Open the bezel door located on the left side of the front panel of the module, as shown in Figure 7-14A. (Make sure that you open the door as far as it will open.)
4. Remove the drive by depressing the locking handle with your forefinger (see Figure 7-14B) and swing open the locking handle away from the chassis until the handle disengages the drive connector from the backplane connector (see Figure 7-14C).

   Note: If you will have only one disk drive, it should be located in the bottom-most slot.

5. Carefully slide the drive out of the bay (refer to Figure 7-14D) and gently place it on a flat ESD-safe surface. (Do not use the handle to pull the drive out of the bay.)
6. If you are replacing the disk drive, proceed to "Installing a Disk Drive" on page 119, for installation instructions. (After you have replaced the disk drive, return to step 8 for instructions to power on your module.) If you are not replacing the disk drive, proceed to the next step.
7. Close the bezel door.
8. Power on the module, as follows:

   - To power on the module indicated at the L1 prompt (001c01-L1, for example), enter the following command. (If you want to power on the peer-attached module, proceed to the next step.)

```
001c01-L1> power up
```

- To power on the module that is connected to the module indicated at the L1 prompt (001c01-L1, for example), enter the following command:
  ```
  001c01-L1> ctc power up
  ```

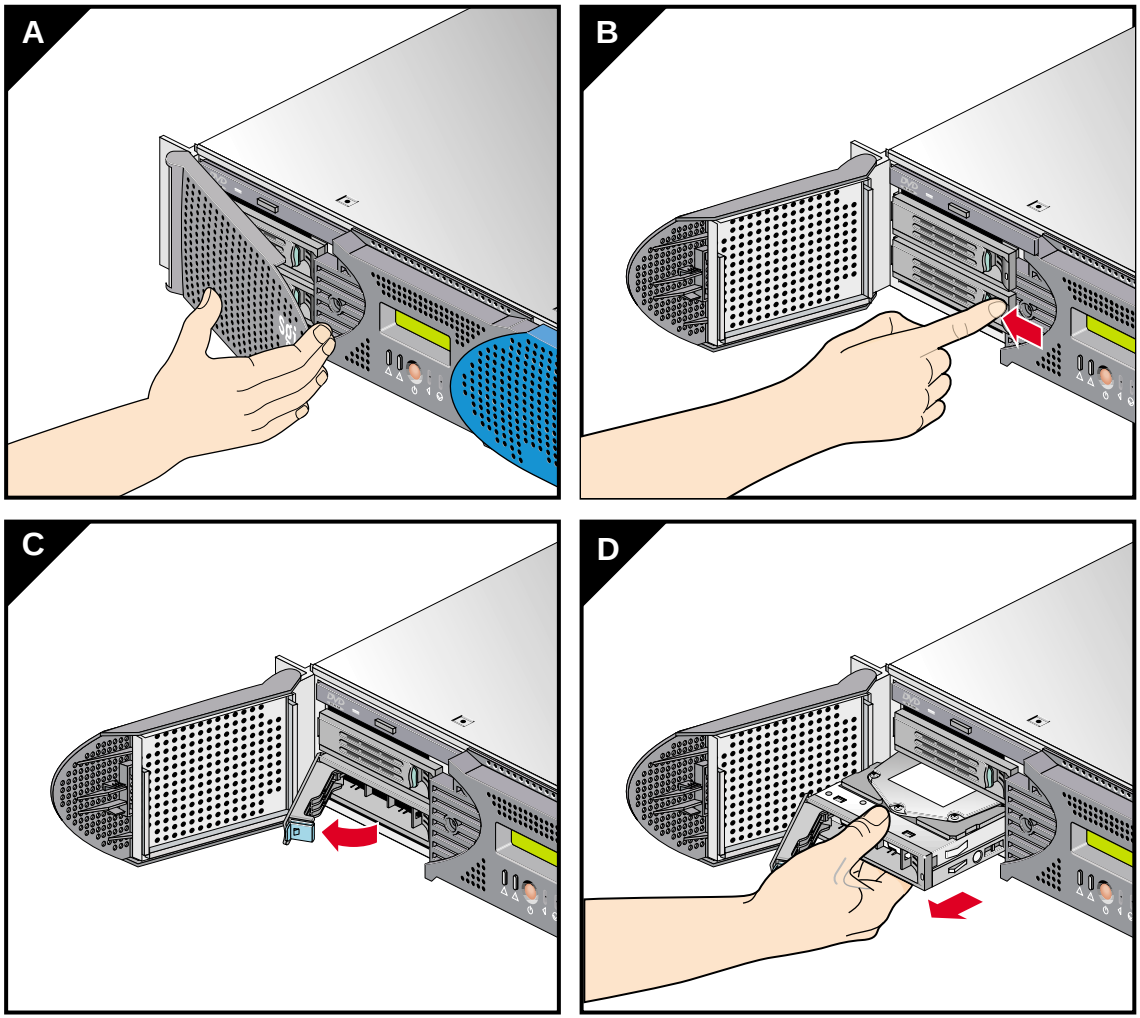

Figure 7-14 Removing a Disk Drive

Installing and Removing DIMMs

Memory is contained on cards that are referred to as DIMMs (dual inline memory modules). Each Onyx 350 system expansion compute module or MPX module can contain two, four, six, or eight DIMMs installed on eight DIMM slots located on the module.

These eight DIMM slots are organized into a group of even-numbered slots 0, 2, 4, and 6 and a group of odd-numbered slots 1, 3, 5, and 7, as shown in Figure 7-15 on page 125.

DIMMs are installed one per DIMM slot, and two at a time, so that the two DIMMs installed provide local memory for the same pair of banks. For example, you can install a DIMM in slot 0 and another in slot 1 (this adds memory to bank pairs 0 and 1). Table 7-1 lists the DIMM slots and the corresponding bank pairs to which local memory is provided when DIMMs are installed:

Table 7-1 DIMMs and Bank Pairs

DIMM in Slot Number	Provides Local Memory for Bank Pair Numbers
0[a]	0 and 1
1	0 and 1
2	2 and 3
3	2 and 3
4	4 and 5
5	4 and 5
6	6 and 7
7	6 and 7

a. The first two DIMMs must be installed in DIMM slot 0 and DIMM slot 1.

You must follow these guidelines when installing DIMMs:

- Memory is increased or decreased in two-DIMM increments only.

- The two DIMMs that make up a bank pair must be the same memory size; however, each pair of DIMMs can differ in memory size from another pair.
- The first two DIMMs must be installed in DIMM slot 0 and DIMM slot 1. Subsequent DIMMs can be installed into any bank pairs as long as the two DIMMs are installed so that they provide local memory for the same bank pair. For example, you can install a DIMM in slot 2 and a DIMM in slot 3 to provide local memory for banks 2 and 3, install DIMMs in slots 4 and 5 to provide memory for banks 4 and 5, or install DIMMs in slots 6 and 7 to provide memory for banks 6 and 7.

Note: The DIMMs used in the Onyx 350 module, the system expansion compute module, and the MPX module, are not compatible with the DIMMs used in Origin 200, SGI Origin 2000 series, Onyx2, O2, or Octane systems.

- The Onyx 350 system supports the following memory kits:
  - 1-GB kit with integrated directory memory.
  - 2-GB kit with integrated directory memory.

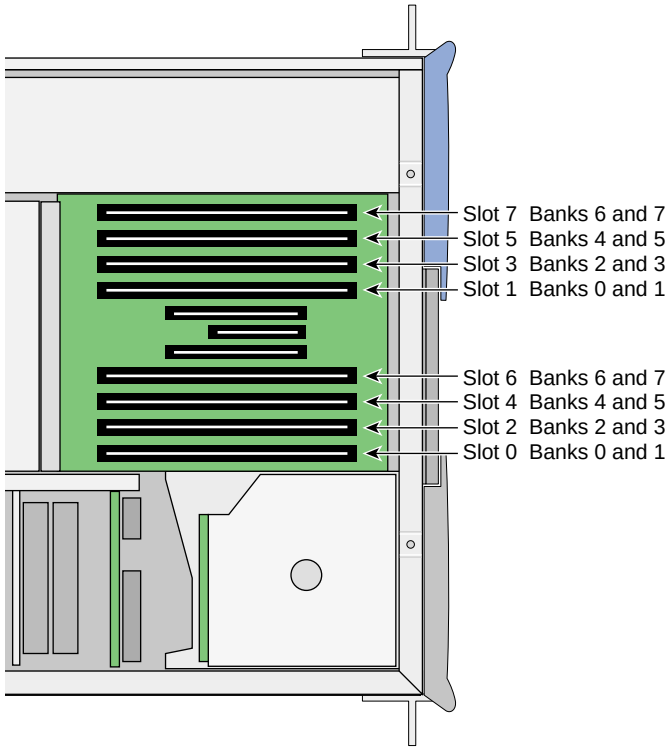

Figure 7-15 Layout of DIMM Slots and Local Memory Banks

Caution: Electronic equipment can be irreparably damaged by electrostatic discharge (ESD). Always follow these preventive measures when you handle a system component:

- Remove a component from its antistatic bag only when you are ready to install it.

- If you 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 static wrist strap to a grounded connection on your system when you install or remove a component.

Installing a DIMM

To install a DIMM, follow these steps:

1. Power off the system. For instructions, see "Powering the System On and Off" in Chapter 2.
2. Disconnect all of the cables at the rear of the module.
3. Remove the two screws that secure the module to the front rails of the rack.
4. Disconnect all cables at the rear of the module.
5. Slide the module forward and out of the rack (see Figure 7-4).

Warning: Components may be hot. To avoid injury, allow the components to cool for approximately five minutes before you proceed with these instructions.

6. To access the DIMMs, remove the ten Phillips screws, as shown in Figure 7-16 and lift open the hinged cover.

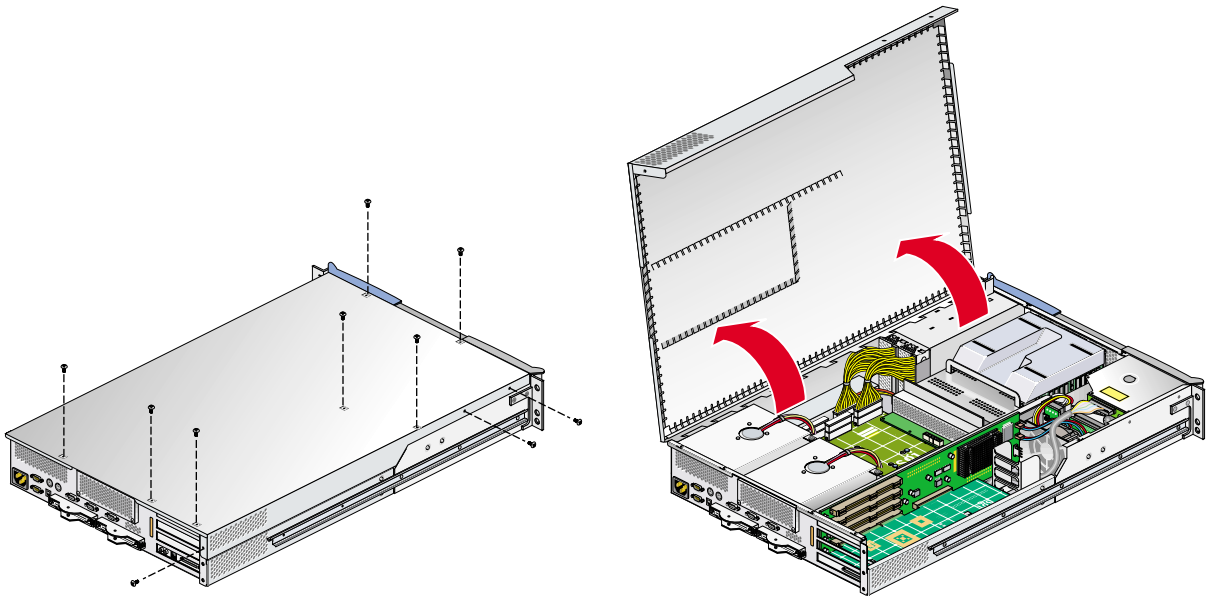

Figure 7-16 Opening Module Cover to Install DIMMs

7. Remove the plastic air baffle covering the DIMMs, as shown in Figure 7-17.

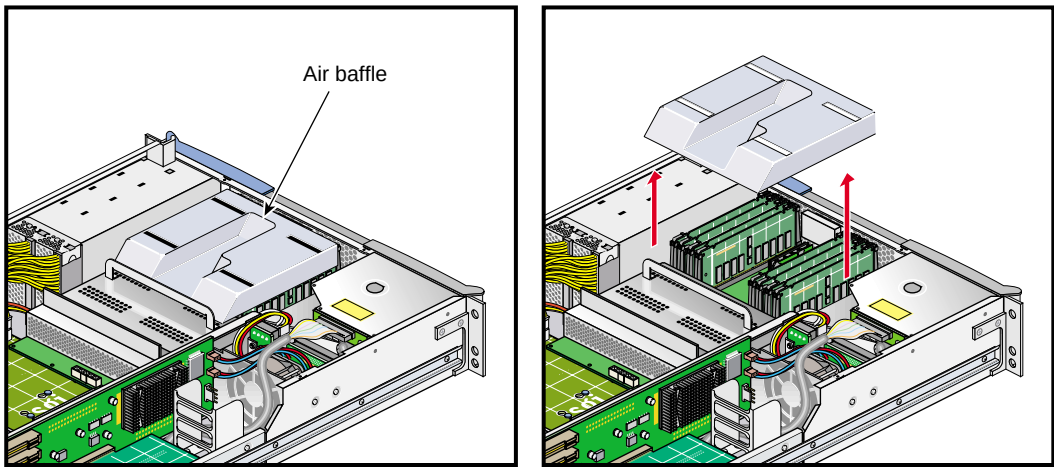

Figure 7-17 Removing the Plastic Air Baffle

8. Install the DIMM, as follows (see Figure 7-18):
   a. Open the ejector latches.
   b. Hold the DIMM only by its edges and remove it from its antistatic package.
   c. Align the three notches in the bottom edge of the DIMM with the keyed socket.
   d. Insert the bottom edge of the DIMM into the socket, and then press down on the DIMM until it seats correctly. Use extreme care when you install a DIMM. If you apply too much pressure, you can damage the socket.
   e. Gently push the plastic ejector latches down to secure the DIMM, as shown in Figure 7-18. When the DIMM is fully seated in the connector, the ejector latches snap into place.
9. Replace the plastic air baffle.
10. Attach the hinged cover and secure it with the ten Phillips screws.
11. Slide the module back into the rack.
12. Install the two screws that secure the module to the front rails of the rack.
13. Reconnect all of the cables at the rear of the module.
14. Power on the system. For instructions on how to power on the system, see "Powering the System On and Off" in Chapter 2.

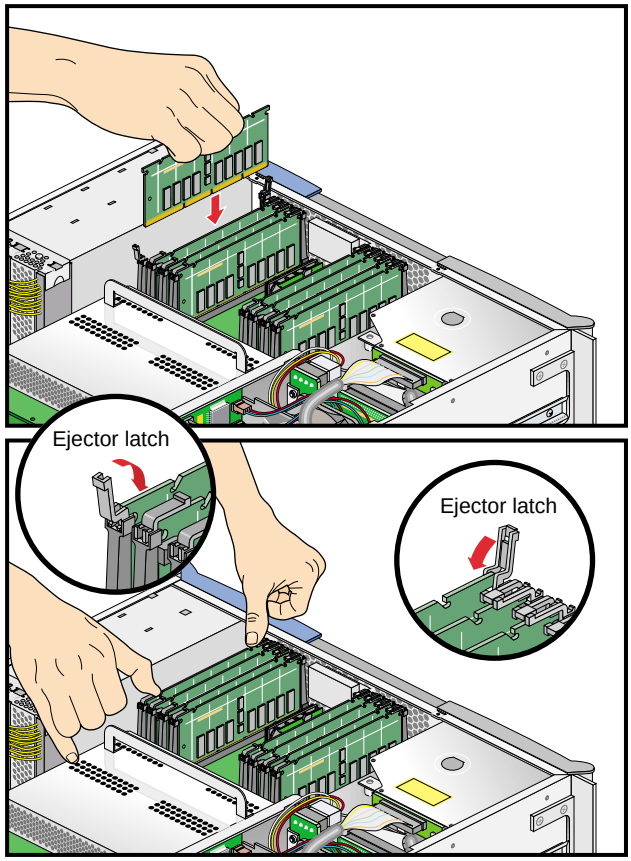

Figure 7-18 Inserting a DIMM

Removing a DIMM

To remove a DIMM, follow these steps:

1. Power off the system. For instructions on how to power off, refer to "Powering the System On and Off" in Chapter 2.
2. Disconnect all of the cables at the rear of the module.

Warning: Components may be hot. To avoid injury, allow the components to cool for approximately five minutes before you proceed with these instructions.

3. Remove the two screws that secure the module to the front rails of the rack.
4. Disconnect all cables at the rear of the system.
5. Slide the module from the rack until it is stopped by the safety latches.
6. To access the DIMMs, remove the ten Phillips screws shown in Figure 7-19 and open the hinged cover.

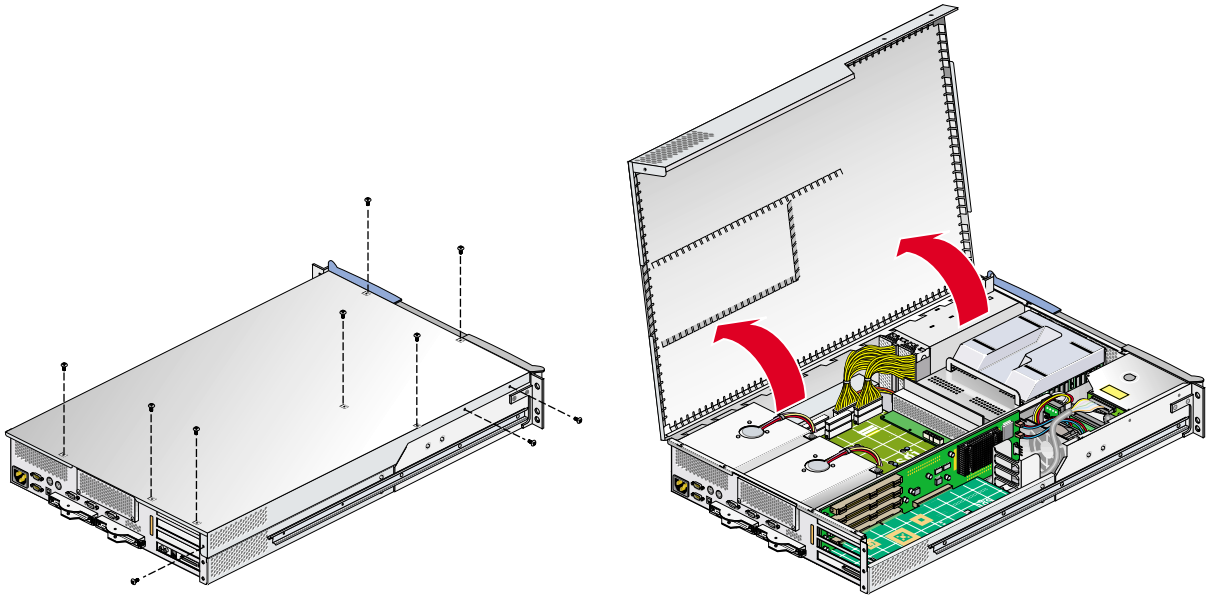

Figure 7-19 Opening the Module

7. Remove the plastic air baffle covering the DIMMs, as shown in Figure 7-20.

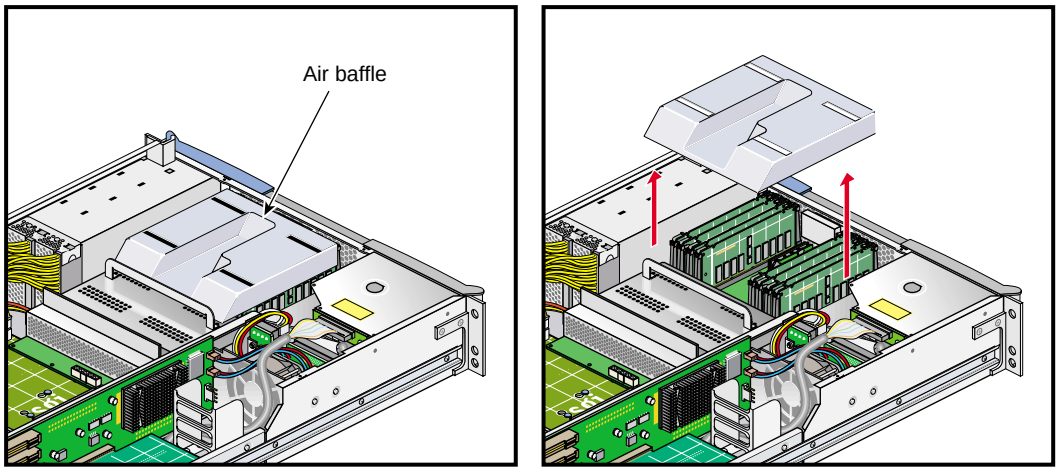

Figure 7-20 Removing the Plastic Air Baffle

8. Remove the DIMM, as follows (see Figure 7-21):
   a. Lift the two ejector latches simultaneously to disengage the DIMM from its connector.
   b. Carefully grasp the DIMM and pull it up and out of the guide rails.

   Note: Hold the DIMM only by its edges. Be careful not to touch its components or gold edge connectors.

   c. Place the DIMM on an ESD-safe surface.
9. Insert a new DIMM as described in “Installing a DIMM” on page 126.
10. Replace the plastic air baffle.
11. Attach or close the hinged cover and secure it with the ten Phillips screws.
12. Using two people, slide the module back into the rack.
13. Install the two screws that secure the module to the front rails of the rack.
14. Reconnect all of the cables at the rear of the module.

15. Power on the system. For instructions on how to power on, see "Powering the System On and Off" in Chapter 2.

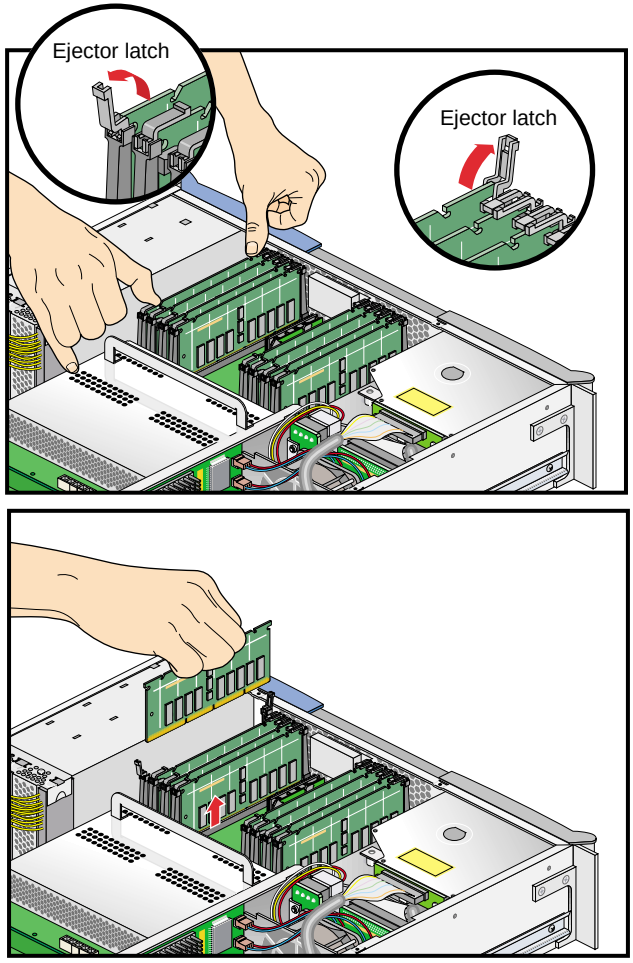

Figure 7-21 Removing a DIMM

Replacing an L1 Controller Display

The L1 controller, which is used to monitor and manage the Onyx 350 visualization system, has a display located on the front panel as shown in Figure 7-22. Every Onyx 350 is factory-shipped with an L1 controller display. This section describes how to replace an L1 controller display panel.

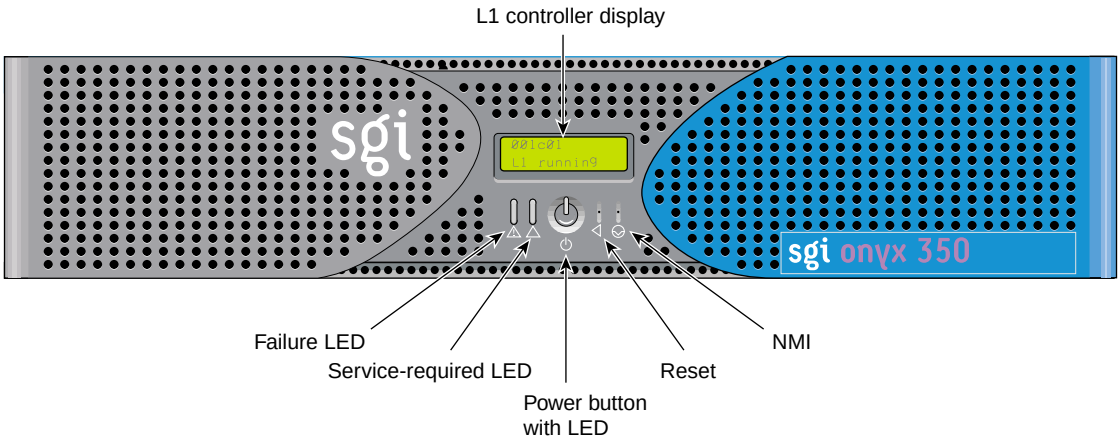

Figure 7-22 L1 Controller Display on the Module Front Panel

To replace an L1 controller display, follow these steps:

1. Power off the system. For instructions on how to power off the system, see "Powering the System On and Off" in Chapter 2.
2. Disconnect all of the cables at the rear of the module.

Warning: Components may be hot. To avoid injury, allow the components to cool for approximately five minutes before you proceed with these instructions.

3. Remove the two screws that secure the module to the front rails of the rack.
4. Slide the module from the rack until it is stopped by the safety latches.

5. To access the area where the L1 display is replaced, remove the ten Phillips screws shown in Figure 7-23 and lift and open the hinged cover.

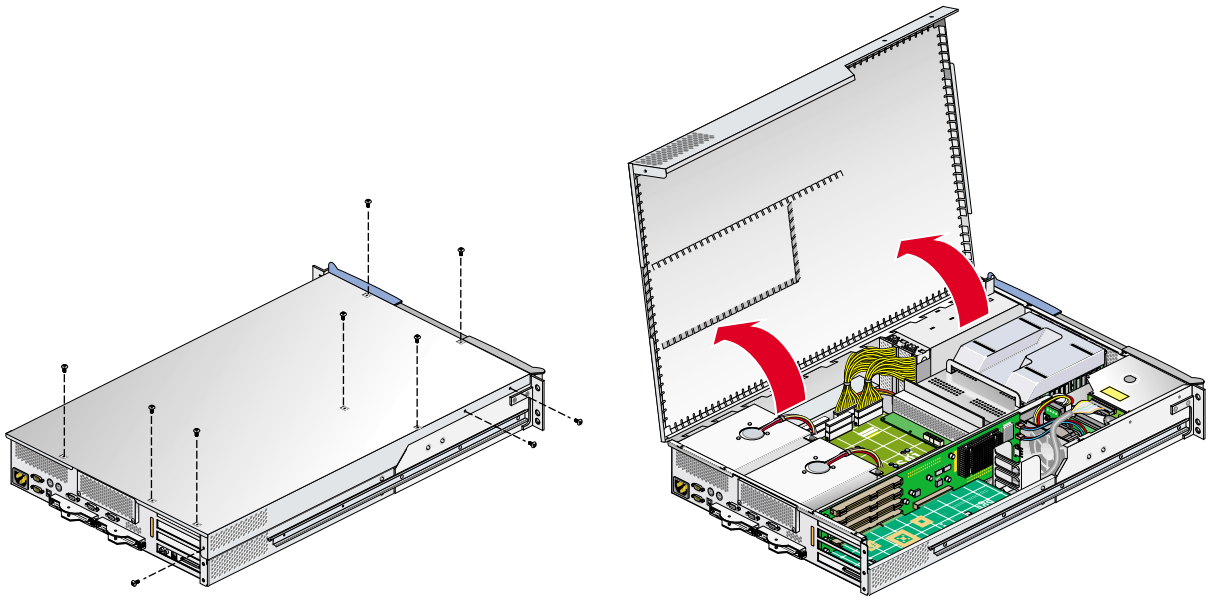

Figure 7-23 Opening the Module to Access the L1 Controller Display

6. On the front panel of your system, remove the front bezel by unscrewing the two Phillips screws holding the bezel to the chassis, as shown in Figure 7-24A.
7. Holding the L1 display cover with one hand, unscrew the single Phillips screw holding the L1 display cover to the chassis, as shown in Figure 7-24B. Gently unhook and pull away the L1 display cover from the chassis.
8. Unscrew the two Phillips screws holding the L1 controller display panel to the L1 display protective cover, as shown in Figure 7-24C.
9. Gently disconnect the L1 controller cable from the connector on the L1 controller display, as shown in Figure 7-24D.

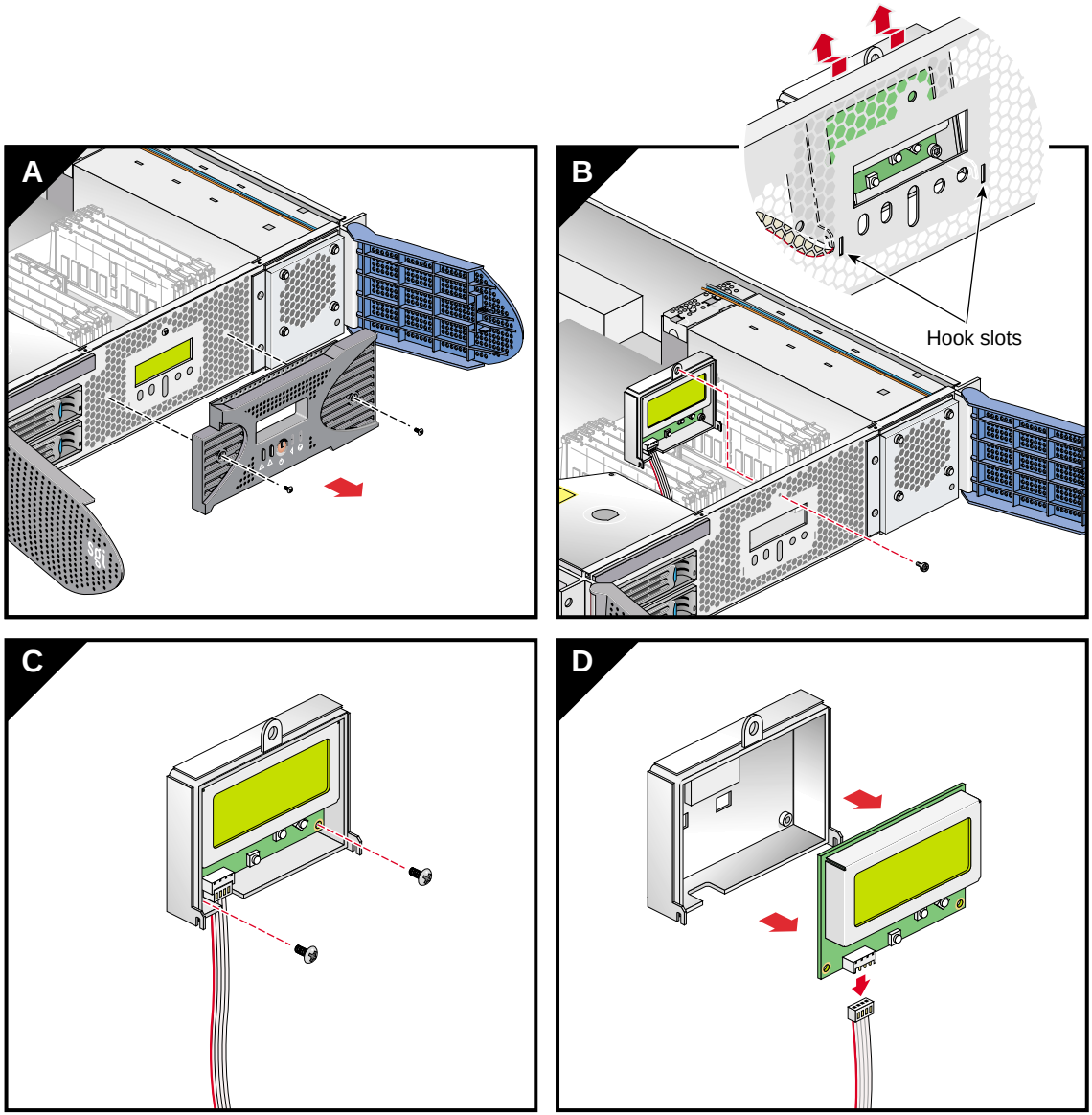

Figure 7-24 Removing the L1 Controller Display Panel

10. Connect the L1 controller cable to the connector on the new L1 controller display, making sure that the red stripe is to your left, as shown in Figure 7-25A.
11. Align the two screw holes on the L1 controller display with the holes on the L1 display protective cover and screw in the two Phillips screws, as shown in Figure 7-25B.

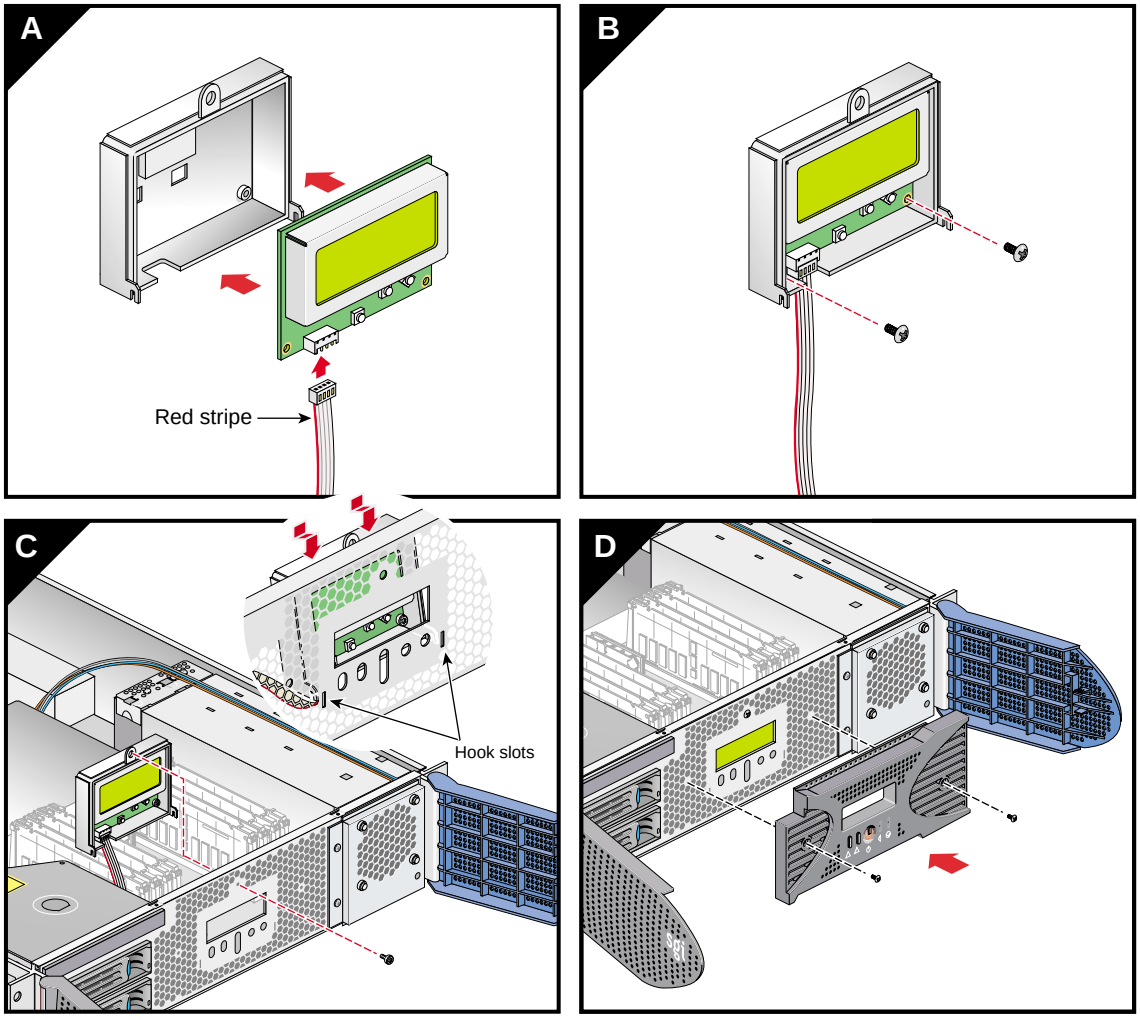

Figure 7-25 Installing an L1 Controller Display Panel

12. Hook in the L1 display protective cover onto the slots on the front chassis.
13. Holding the L1 display cover up against the front chassis, screw in the Phillips screw as shown in Figure 7-25C.
14. Replace the front bezel onto the front chassis of the system by screwing in the two Phillips screws holding the bezel to the chassis, as shown in Figure 7-25D.
15. Attach the hinged cover and secure it to the module with the ten Phillips screws.
16. Slide the module back into the rack.
17. Install the two screws that secure the module to the front rails of the rack.
18. Install all of the cables at the rear of the module.
19. Power on the system. For instructions on how to power on, see "Powering the System On and Off" in Chapter 2.

Replacing Power Supplies

Each Onyx 350, compute, compute/graphics, or MPX module can contain one or two sled-mounted power supplies (see Figure 7-26). The second is an optional supply.

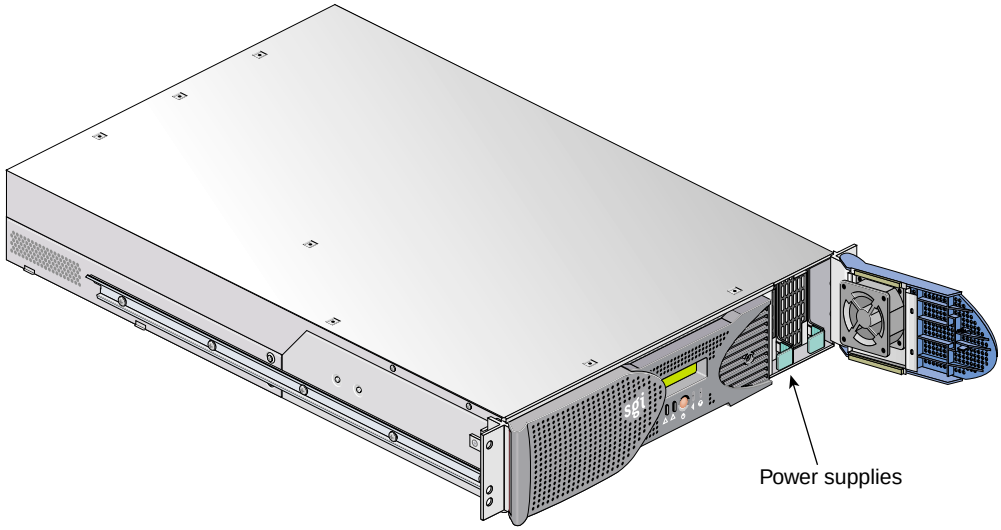

Figure 7-26 Power Supplies Location

Use the LED located on the front (towards the top) of the power supply to read the condition of the power supply. Table 7-2 shows the LED status and the power supply condition it indicates.

Table 7-2 Power Supply LED Status and Condition

LED Status	Power Supply Condition Indicated
Off	If your system has one power supply, it indicates that the power supply is not receiving AC power. If your system has two power supplies, the LED on both power supplies would be Off, and it would indicate that both power supplies are not receiving AC power. Power supplies will not be receiving AC power because either the module is not plugged into power, or an electrical fuse has blown.
Amber	This indicates a fault condition for one of the following reasons: - In a system with two power supplies, one of the power supplies is not receiving AC power. - The voltage limit has been exceeded. - The temperature limit has been exceeded. - The current limit has been exceeded.
Blinking green	The power supply is receiving AC power, but the primary DC power has not yet activated.
Green	The power supply is operating properly.

To replace a power supply, follow these steps:

1. Power off the system, as described in "Powering the Server System On and Off" on page 53.
2. Remove the power supply that needs replacement as follows:
    a. Swing open the bezel door on the right side of the module front panel. With a Phillips screw driver, unscrew the two screws on the screen cover as shown in Figure 1-2A.
    b. Swing open the screen cover as shown in Figure 1-2B.
    c. Disengage the power supply from the power supply bay by pushing the interior release button to the right and pulling up and out on the green-colored handle lock as shown in Figure 7-27C.
    d. Gently pull out the power supply from the chassis until it clears the power supply bay (see Figure 7-27D). Place the supply on an ESD-safe surface.

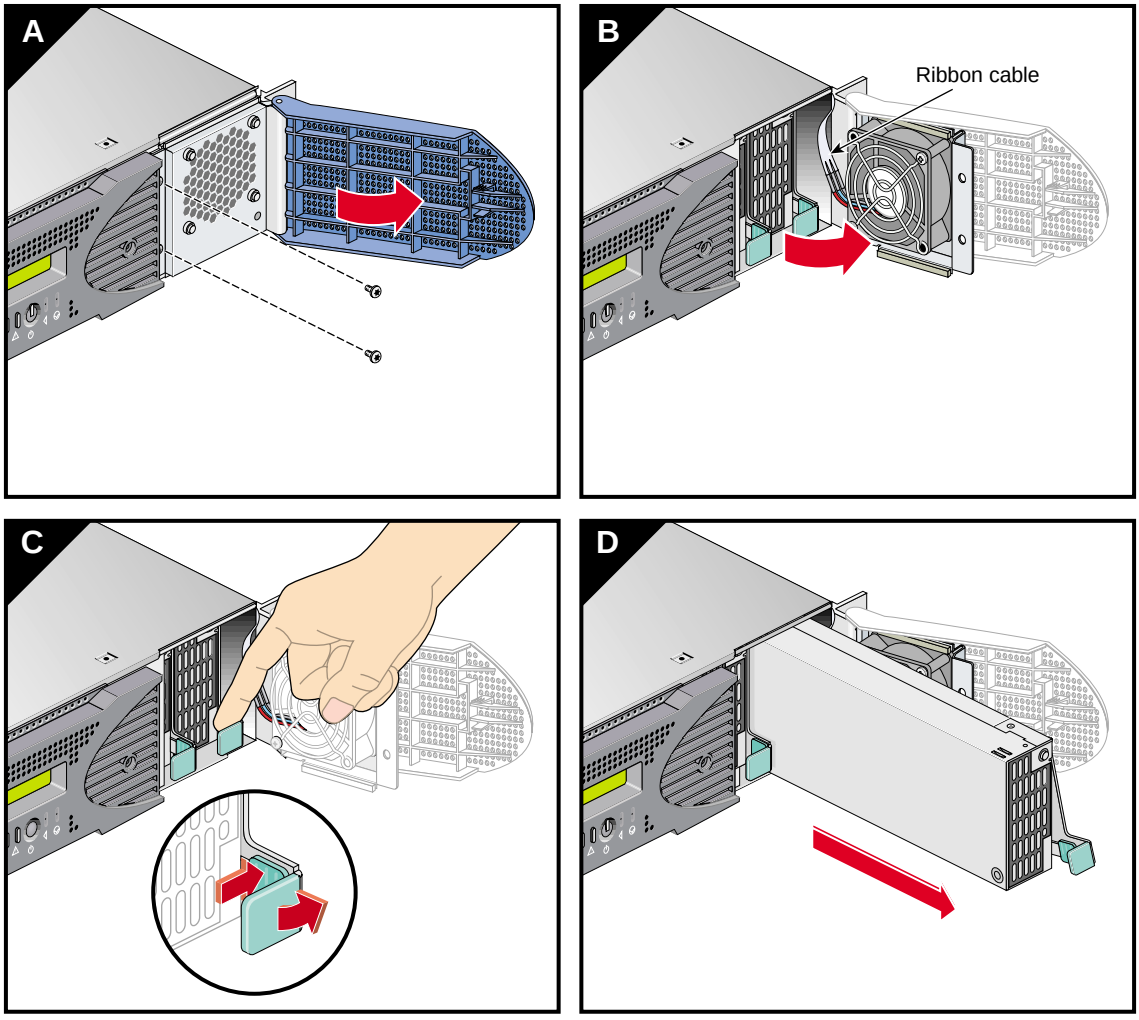

Figure 7-27 Removing a Power Supply

Caution: When installing or removing a power supply from the chassis, make sure not to snag the power supply fan's ribbon cable.

3. Install the replacement power supply, as follows:

a. Position the supply in the slot with the power supply handle pulled up (fully opened), and then gently push the power supply into the bay (see Figure 7-28A).

b. Push in and down on the green-colored handle and snap the power supply into place, as shown in Figure 7-28B.

c. After you have installed the power supply, swing the screen cover until it closes as shown in Figure 7-28C.

Caution: When closing the screen cover, make sure that the cover does not clip or pinch the power supply fan's ribbon cable.

d. Screw in the two Phillips screws that you had removed as shown in Figure 7-28D, and close the bezel door.

4. Power on the system, as described in the "Powering the System On and Off" in Chapter 2.

Note: A power supply bay must have either a power supply installed or a baffle filler in place so that the module's air cooling can operate properly.

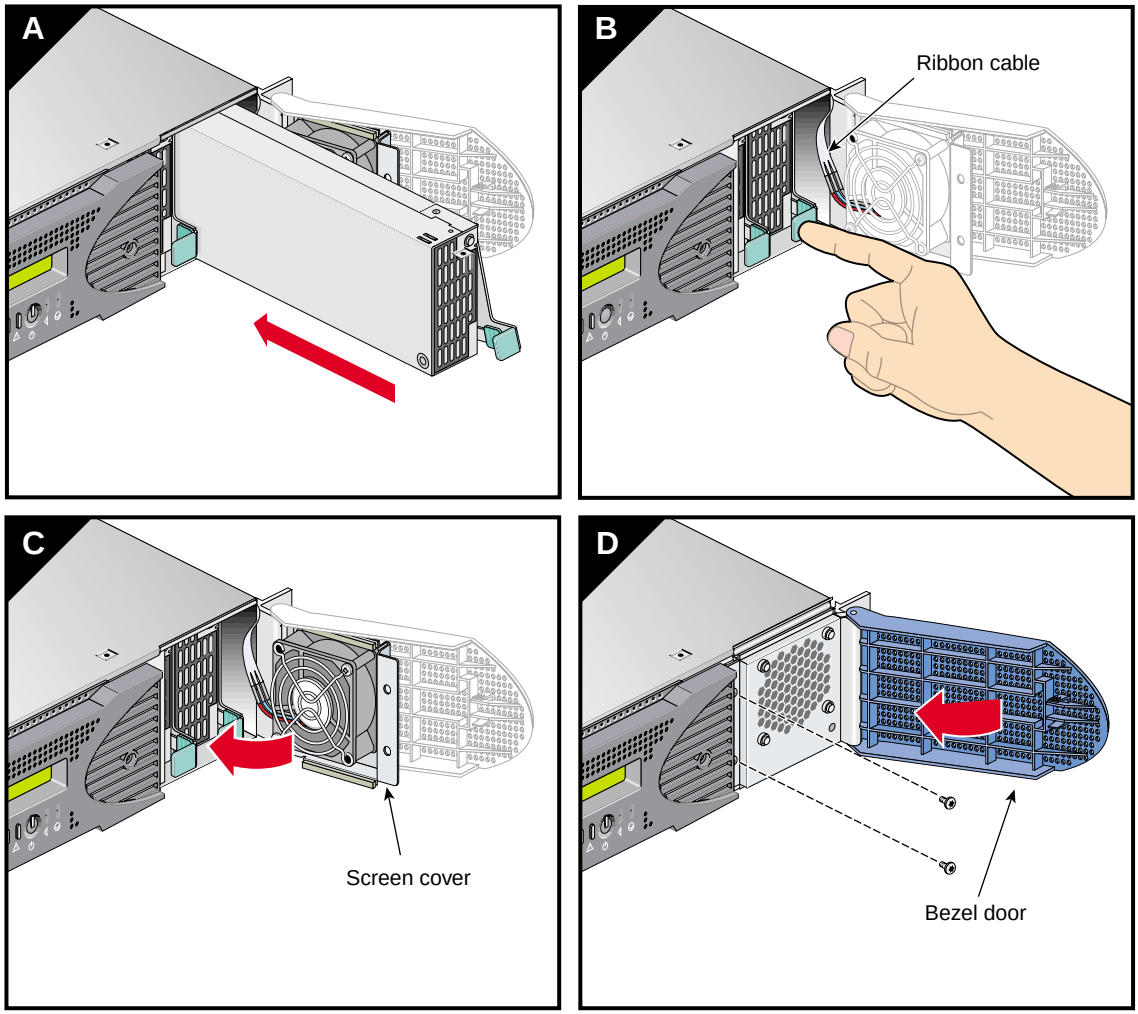

Figure 7-28 Example of Power Supply Replacement

Troubleshooting

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

Troubleshooting Chart

Table 8-1 lists recommended actions for problems that can occur on your system. For problems that are not listed in this table, use the SGI Electronic Support system to help solve your problem or contact your SGI system support engineer (SSE). More information about the SGI Electronic Support system is provided later in this chapter.

Table 8-1 Troubleshooting Chart

Problem Description	Recommended Action
The system will not power on.	Ensure that the power cord of the PDU is seated properly in the power receptacle. Ensure that the PDU circuit breaker is on. If the power cord is plugged in and the circuit breaker is on, contact your SSE.
An individual module will not power on.	Ensure that the power switch at the rear of the module is on (position 1). View the L1 display; see Table 8-2 if an error message is present. If the L1 controller is not running, contact your SSE. Check the connection between the module and its power source.
The system will not boot the operating system.	Contact your SSE.
The service-required LED illuminates on a module.	View the L1 display of the failing module; see Table 8-2 for a description of the error message.
The failure LED illuminates on a module.	View the L1 display of the failing module; see Table 8-2 for a description of the error message.
The green or yellow LED of a NUMAlink port (rear of NUMAlink module) is not illuminated.	Ensure that the NUMAlink cable is seated properly on the NUMAlink module and the destination module.
The PWR LED of a populated PCI slot is not illuminated.	Reseat the PCI card.
The fault LED of a populated PCI slot is illuminated (on).	Reseat the PCI card. If the fault LED remains on, replace the PCI card.

Table 8-1 Troubleshooting Chart **(continued)**

Problem Description	Recommended Action
The system status LED of the TP900 is amber.	Contact your SSE.
The power status LED of the TP900 is amber.	Contact your SSE to replace the power supply module. The power supply module also has an amber LED that indicates a fault.
The cooling status LED of the TP900 is amber.	Contact your SSE to replace the cooling module. The cooling module also has an amber LED that indicates a fault.
The amber LED of a disk drive is on.	Replace the disk drive.

L1 Controller Error Messages

Table 8-2 lists error messages that the L1 controller generates and displays on the L1 display. This display is located on the front of the Origin 300 base modules, the NUMAlink module, and the PCI expansion modules.

Note: In Table 8-2, a voltage warning occurs when a supplied level of voltage is below or above the nominal (normal) voltage by 10 percent. A voltage fault occurs when a supplied level is below or above the nominal voltage by 20 percent.

Table 8-2 L1 Controller Messages

L1 System Controller Message	Message Meaning and Action Needed
Internal voltage messages:	
ATTN: x.xV high fault limit reached @ x.xxV	30-second power-off sequence for the module.
ATTN: x.xV low fault limit reached @ x.xxV	30-second power-off sequence for the module.
ATTN: x.xV high warning limit reached @ x.xxV	A higher than nominal voltage condition is detected.
ATTN: x.xV low warning limit reached @ x.xxV	A lower than nominal voltage condition is detected.
ATTN: x.xV level stabilized @ x.xV	A monitored voltage level has returned to within acceptable limits.
Fan messages:	
ATTN: FAN # x fault limit reached @ xx RPM	A fan has reached its maximum RPM level. The ambient temperature may be too high. Check to see if a fan has failed.
ATTN: FAN # x warning limit reached @ xx RPM	A fan has increased its RPM level. Check the ambient temperature. Check to see if the fan stabilizes.
ATTN: FAN # x stabilized @ xx RPM	An increased fan RPM level has returned to normal.

Table 8-2 L1 Controller Messages **(continued)**

L1 System Controller Message	Message Meaning and Action Needed
Temperature messages: low alt.	
ATTN: TEMP # advisory temperature reached @ xxC xxF	The ambient temperature at the module's air inlet has exceeded 30 °C.
ATTN: TEMP # critical temperature reached @ xxC xxF	The ambient temperature at the module's air inlet has exceeded 35 °C.
ATTN: TEMP # fault temperature reached @ xxC xxF	The ambient temperature at the module's air inlet has exceeded 40 °C.
Temperature messages: high alt.	
ATTN: TEMP # advisory temperature reached @ xxC xxF	The ambient temperature at the module's air inlet has exceeded 27 °C.
ATTN: TEMP # critical temperature reached @ xxC xxF	The ambient temperature at the module's air inlet has exceeded 31 °C.
ATTN: TEMP # fault temperature reached @ xxC xxF	The ambient temperature at the module's air inlet has exceeded 35 °C.
Temperature stable message:	
ATTN: TEMP # stabilized @ xxC/xxF	The ambient temperature at the module's air inlet has returned to an acceptable level.
Power off messages:	
Auto power down in xx seconds	The L1 controller has registered a fault and is shutting down. The message displays every five seconds until shutdown.
Base module appears to have been powered down	The L1 controller has registered a fault and has shut down.

SGI Electronic Support

SGI Electronic Support provides system support and problem-solving services that function automatically, which helps resolve problems before they can affect system availability or develop into actual failures. SGI Electronic Support integrates several services so they work together to monitor your system, notify you if a problem exists, and search for solutions to the problem.

Figure 8-1 shows the sequence of events that occurs if you use all of the SGI Electronic Support capabilities.

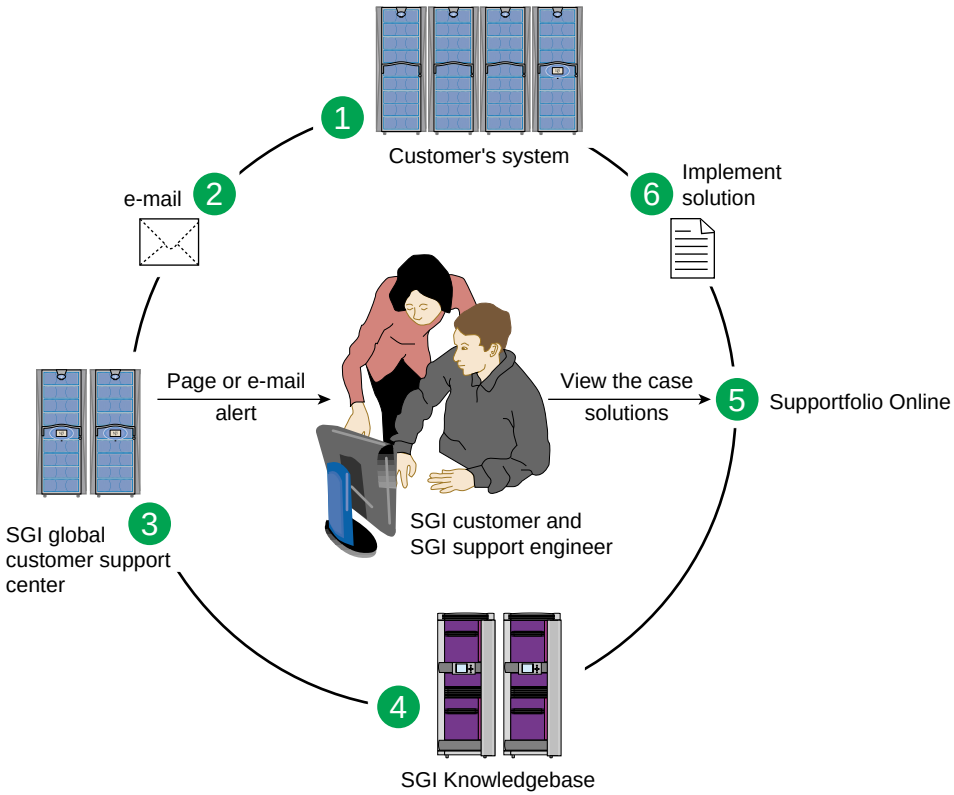

Figure 8-1 Full Support Sequence

The sequence of events can be described as follows:

1. Embedded Support Partner (ESP) monitors your system 24 hours a day.
2. When a specified system event is detected, ESP notifies SGI via e-mail (plain text or encrypted).
3. Applications that are running at SGI analyze the information, determine whether a support case should be opened, and open a case if necessary. You and SGI support engineers are contacted (via pager or e-mail) with the case ID and problem description.
4. SGI Knowledgebase searches thousands of tested solutions for possible fixes to the problem. Solutions that are located in SGI Knowledgebase are attached to the service case.
5. You and the SGI support engineers can view and manage the case by using Supportfolio Online as well as search for additional solutions or schedule maintenance.
6. Implement the solution.

Most of these actions occur automatically, and you may receive solutions to problems before they affect system availability. You also may be able to return your system to service sooner if it is out of service.

In addition to the event monitoring and problem reporting, SGI Electronic Support monitors both system configuration (to help with asset management) and system availability and performance (to help with capacity planning).

The following three components compose the integrated SGI Electronic Support system:

SGI Embedded Support Partner (ESP) is a set of tools and utilities that are embedded in the IRIX operating system. ESP can monitor a single system or group of systems for system events, software and hardware failures, availability, performance, and configuration changes, and then perform actions based on those events. ESP can detect system conditions that indicate potential problems, and then alert appropriate personnel by pager, console messages, or e-mail (plain text or encrypted). You also can configure ESP to notify an SGI call center about problems; ESP then sends e-mail to SGI with information about the event.

SGI Knowledgebase is a database of solutions to problems and answers to questions that can be searched by sophisticated knowledge management tools. You can log on to SGI Knowledgebase at any time to describe a problem or ask a question. Knowledgebase searches thousands of possible causes, problem descriptions, fixes, and how-to instructions for the solutions that best match your description or question.

Supportfolio Online is a customer support resource that includes the latest information about patch sets, bug reports, and software releases.

The complete SGI Electronic Support services are available to customers who have a valid SGI Warranty, FullCare, FullExpress, or Mission-Critical support contract. To purchase a support contract that allows you to use the complete SGI Electronic Support services, contact your SGI sales representative. For more information about the various support contracts, see the following website:

http://www.sgi.com/support/customerservice.html

For more information about SGI Electronic Support, see the following website:

http://www.sgi.com/support/es

Technical Specifications and Pinouts

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

Environmental System Specifications

Table A-1 lists the environmental specifications of the Onyx 350 system.

Table A-1 Environmental Specifications

Characteristic	Specification
Temperature, operating	+5 °C (+41 °F) to +35 °C (+95 °F) (up to 1,500 m / 5,000 ft) +5 °C (+41 °F) to +30 °C (+86 °F) (1,500 m to 3,000 m / 5,000 ft to 10,000 ft)
Temperature, non-operating	-40 °C (-40 °F) to +60 °C (+140 °F)
Humidity	10% to 95% RH, noncondensing
Altitude	Sea level to 40,000 ft (nonoperating) Sea level to 10,000 ft (3,000 m) (operating)

Compute/Graphics Module Specifications

Table A-2 lists the bandwidth characteristics of the compute module.

Table A-2 Bandwidth Characteristics of the Compute Module

Characteristic	Peak Bandwidth	Sustainable Bandwidth
LINK channel	3.2 GB/s full duplex 1.6 GB/s each direction	~1420 MB/s each direction
Xtown2 channel	2.4 GB/s full duplex 1.2 GB/s each direction	~1066 MB/s half duplex ~1744 MB/s full duplex, ~872 MB/s each direction
Main memory	3200 MB/s	3200 MB/s
SYSAD	1600 MB/s	~1400 MB/s

Table A-3 summarizes the general features of the compute module.

Table A-3 General Features of the Compute Module

Feature	Base Compute Module	Expansion Compute Module
MIPS RISC processor	2 or 4	2 or 4
Memory	1 GB to 8 GB	1 GB to 8 GB
Expansion slot	1 PCI, 2 PCI-X	4 PCI-X
Serial port	4	1[a]
Ethernet port	One 10/100/1000 BaseT	[b]
SCSI port (internal)	1 Ultra3 SCSI, 160 MB/s	**
SCSI port (external)	1 Ultra3 SCSI (VHDCI)	**
3.5-in. drive bay	2	**
L1 to L2 USB port	1	1
RT interrupt input port	1	**
RT interrupt output port	1	**
L1 console port	1	1
NUMAlink 3 port	1 (1.6 GB/s each direction)	1 (1.6 GB/s each direction)
XIO port	1 (800 MB/s each direction)	1 (800 MB/s each direction)

a. 2-port SIO cards can be added to the expansion compute module to increase the number of serial ports.

b. These ports are available only when the module contains an IO9 PCI card.

The specifications for the InfinitePerformance compute/graphics module are the same as those listed for the compute module (see Table A-3). Additional connectors of the base (primary) IP compute/graphics module and the expansion compute/graphics module are listed in Table A-4.

Note that Onyx 350 systems using InfinitePerformance (IP) graphics do not connect to InfiniteReality or other graphics modules. Each system supports only one type of graphics interface.

Table A-4 InfinitePerformance Compute/Graphics Module Connectors

Feature	Specification
USB ports	4 (on PCI card)
InfinitePerformance gfx option	1 (internal only)
IP DVI monitor connector	1 (15 pin) supports DVI-A and DVI-D
IP Swap-ready	1 (BNC)
IP Stereo View	1
IP Genlock	1 (BNC)

Table A-5 lists the specifications for the compute module.

Table A-5 Compute/Graphics Module Specifications

Characteristic	IP Gfx Module Specification	Compute Module Specification
Height	3.44 in. (8.8 cm)	3.44 in. (8.8 cm)
Width	17.06 in. (43.36 cm)	17.06 in. (43.36 cm)
Depth	27 in. (68.6 cm) (with bezel)	27 in. (68.6 cm) (with bezel)
Weight	~39.5 lb (17.9 kg) to 42.5 lb (19.3 kg)	~41.5 lb (18.9 kg) to 44.5 lb (20.2 kg)
Noise	6 Bels sound power, up to 30 °C	6 Bels sound power, up to 30 °C
Heat dissipation	1700 Btu/hr average	1315 Btu/hr average
Input power	120/240 VAC autosensing (~563 W)	120/240 VAC autosensing (~563 W)

MPX Module Specifications

Table A-6 lists the bandwidth characteristics of the MPX module.

Table A-6 Bandwidth Characteristics of the MPX Module

Characteristic	Peak Bandwidth	Sustainable Bandwidth
LINK channel	3.2 GB/s full duplex 1.6 GB/s each direction	~1420 MB/s each direction
Xtown2 channel	2.4 GB/s full duplex 1.2 GB/s each direction	~1066 MB/s half duplex ~1744 MB/s full duplex, ~872 MB/s each direction
Main memory	3200 MB/s	3200 MB/s
SYSAD	1600 MB/s	~1400 MB/s

Table A-7 lists the specifications for the MPX module.

Table A-7 MPX Module specifications

Characteristic	Specification
Height	3.44 in. (8.8 cm)
Width	17.06 in. (43.36 cm)
Depth	26.4 in. (67.05 cm) (with bezel)
Weight	~36 lb (16.36 kg)
Input power	120/240 VAC autosensing (~563 W)

PCI Expansion Module Specifications

Table A-8 lists the bandwidth characteristics of the PCI expansion module.

Table A-8 Bandwidth Characteristics of the 4U PCI Expansion Module

Characteristic	Peak Bandwidth
NUMAlink channel	1.2 GB/s each direction

Table A-9 lists the specifications of the 4U PCI expansion module.

Table A-9 4U PCI Expansion Module Specifications

Characteristic	Specification
Height	7.0 in. (177.8 mm)
Width	17.5 in. (444.5 mm)
Depth	27.5 in. (698.5 mm)
Weight	60 lb (27.22 kg)
Input power	+48 VDC (~250 W)

NUMAlink Module Specifications

Table A-10 lists the bandwidth characteristics of the NUMAlink module.

Table A-10 Bandwidth Characteristics of the NUMAlink Module

Characteristic	Peak Bandwidth	Sustainable Bandwidth
LINK channel	3.2 GB/s full duplex 1.6 GB/s each direction	~1420 MB/s each direction

The NUMAlink module requires 2U of space within the rack and has the specifications that are listed in Table A-11.

Table A-11 NUMAlink Module Specifications

Characteristic	Specification
Height	3.3 in. (83.82 mm)
Width	17.38 in. (441.45 mm)
Depth	27.5 in. (698.5 mm)
Weight	20 lb (9.1 kg)
Input power	110/220 VAC (~60 W)

Rack Specifications

The Onyx 350 system can be housed in short (17U) or tall (39U) racks.

Note: One U is 1.75 in. (4.45 cm).

Table A-12 lists the specifications of the short rack.

Table A-12 Short Rack Specifications (with Skins)

Characteristic	Specification
Height	36.06 in. (916 mm)
Width	25.38 in. (645 mm)
Depth	40.63 in. (1032 mm)
Weight (maximum)	488 lb (221 kg)
Shipping weight (maximum)	563 lb (255 kg)

Table A-13 lists the specifications of the tall rack.

Table A-13 Tall Rack Specifications

Characteristic	Specification
Height	75.82 in. (1925.83 mm)
Width	23.62 in. (599.95 mm)
Depth	41.25 in. (1048.00 mm)
Weight (maximum)	1,100 lb (499 kg)
Shipping weight (maximum)	1,281 lb (581 kg)

TP900 Storage Module Specifications

Table A-14 lists the specifications of the TP900 storage module.

Table A-14 TP900 Storage Module Specifications

Characteristic	Specification
Height	3.37 in. (85.7 mm)
Width	17.6 in. (447 mm)
Depth	21.46 in. (545 mm)
Input power	100 - 254 VAC (~175 W)
Weight: Maximum configuration Empty enclosure	 48.5 lb (22 kg) 14.3 lb (6.5 kg)

Power Bay Module Specifications

The power bay requires 3U of space within the rack. Table A-15 lists the specifications for the power bay.

Table A-15 Power Bay Module Specifications

Characteristic	Specification
Height	5.118 in. (130 mm)
Width	17.5 in. (443 mm)
Depth	23.898 in. (607 mm)
Weight (with two power supplies)	42 lb (19.05 kg)

Table A-16 lists the specifications of the power supplies.

Table A-16 Power Supply Specifications

Characteristic	Specification
Height	4.86 in. (123.5 mm)
Width	2.74 in. (69.50 mm)
Depth	13.67 in. (347.30 mm)
Weight	7.5 lb (3.38 kg)

USB Hub Specifications

Table A-17 lists the specifications of the USB hub.

Table A-17 USB Hub Specifications

Characteristic	Specification
Height	0.688 in. (17.475 mm)
Width	2.5 in. (63.5 mm)
Depth	3.25 in. (82.55 mm)

Non-proprietary I/O Port Specifications

This section provides pin assignment information for the non-proprietary connectors on the following components:

- Compute module (base and expansion)
- MPX module
- L2 controller
- NUMAlink module
- TP900 storage module
- USB hub
- DB-9 connector
- RJ45 connector
- External SCSI port connector
- Stereo jack connector
- USB type A connector
- USB type B connector
- Serial cable
- Serial port adapter cables

Compute Module Connectors

Table A-18 lists the non-proprietary connectors on the rear panel of the compute module.

Table A-18 Compute Module Connectors

Port	Connector	Pin Assignments
Serial ports 1 through 4[a]	DB9	See Figure A-6 on page 164
L1 console port	DB9	See Figure A-6 on page 164
Ethernet port (IO9 only)	RJ45	See Figure A-7 on page 164
External SCSI port (with IO9 only)	SCSI 68-pin VHDCI	See Figure A-8 on page 165 and Table A-22 on page 166
RT interrupt input and output ports (IO9 only)	Stereo jack	See Figure A-9 on page 168 and Table A-23 on page 168
USB L1 port	USB type B	See Figure A-11 on page 170 and Table A-25 on page 170

a. Serial ports 2, 3, and 4 reside on an internal daughtercard. An IO9 must be present to use serial ports 1 through 4.

MPX Module

Table A-19 lists the non-proprietary connectors on the rear panel of the MPX module (see Figure A-1). Note that the serial port shown in the figure does not function unless an optional IO9 PCI card is installed in the MPX.

The third column of the table indicates where you can find the pin assignments for these connectors.

Table A-19 MPX Module Connectors

Port	Connector	Pin Assignments
Serial port	DB9	See Figure A-6 on page 164
L1 console port	DB9	See Figure A-6 on page 164
USB L1 port	USB type B	See Figure A-11 on page 170 and Table A-25 on page 170

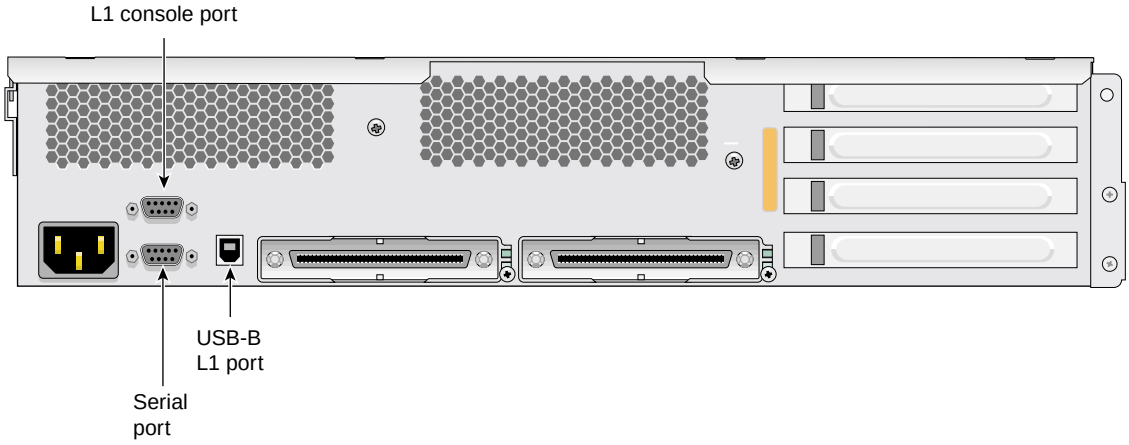

Figure A-1 Non-proprietary Connectors on Rear Panel of MPX Module

L2 Controller

Table A-20 lists the non-proprietary connectors on the rear panel of the L2 controller (refer to Figure A-2). The third column of the table indicates where you can find the pin assignments for these connectors.

Table A-20 L2 Controller Connectors

Port	Connector	Pin Assignments
Console (serial port)	DB9	See Figure A-6 on page 164
Modem (serial port)	DB9	See Figure A-6 on page 164
Ethernet port	RJ45	See Figure A-7 on page 164
L1 ports (four ports)	USB type A	See Figure A-10 on page 169 and Table A-24 on page 169

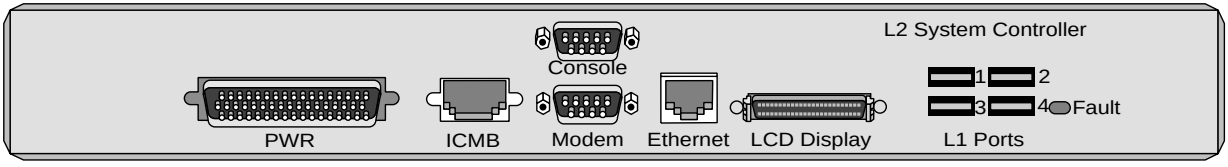

Figure A-2 Non-proprietary Connectors on Rear Panel of L2 Controller

NUMAlink Module

Figure A-3 shows the L1 port (USB type B connector) on the rear panel of the NUMAlink module. For the pin number locations of the connector, refer to Figure A-11 on page 170; Table A-25 on page 170 lists the pin assignments.

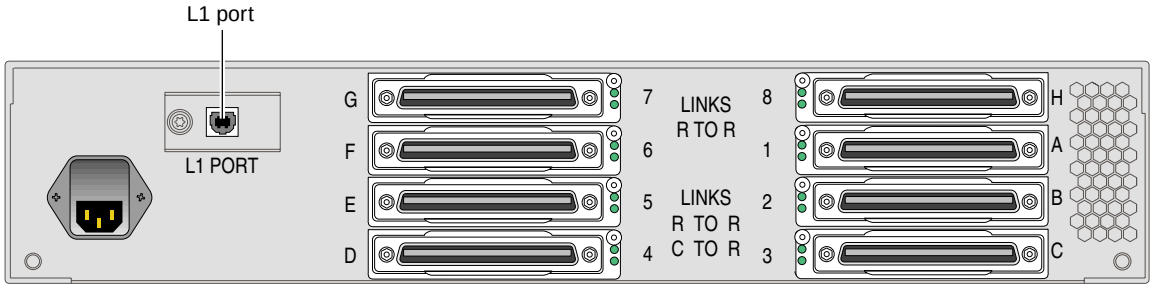

Figure A-3 Non-proprietary Connector on Rear Panel of NUMAlink Module

TP900 Storage Module

Figure A-4 shows the two SCSI port connectors on the rear panel of the TP900 storage module. Figure A-8 on page 165 shows how the pin numbers are distributed on the SCSI connector, and Table A-22 on page 166 lists the pin assignments.

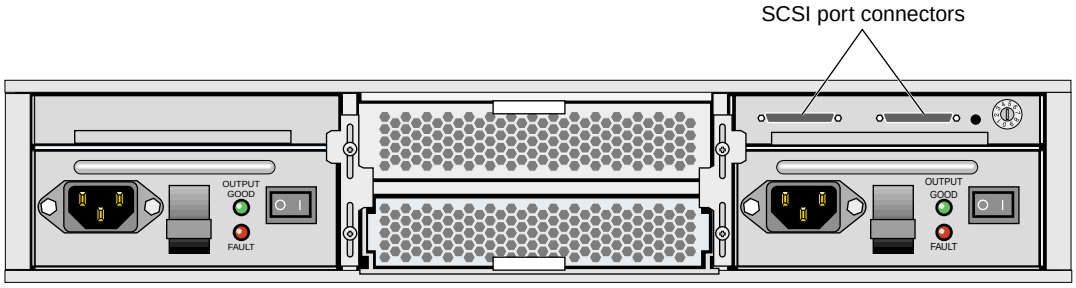

Figure A-4 Non-proprietary Connectors on Rear Panel of TP900 Storage Module

USB Hub

The USB hub (see Figure A-5) has four USB type A connectors, two connectors on each side of the hub. Figure A-10 on page 169 shows how the pin numbers are distributed on the USB type A connector, and Table A-24 on page 169 lists the pin assignments.

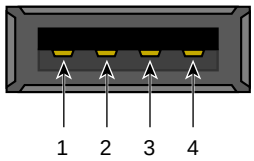

Figure A-5 USB Hub Type A Connectors

DB9 Connector

Figure A-6 shows the DB9 connector pin assignments.

This connector is used for the L1 console port and serial port(s) of the compute module. It is also used as the console and modem ports of the L2 controller.

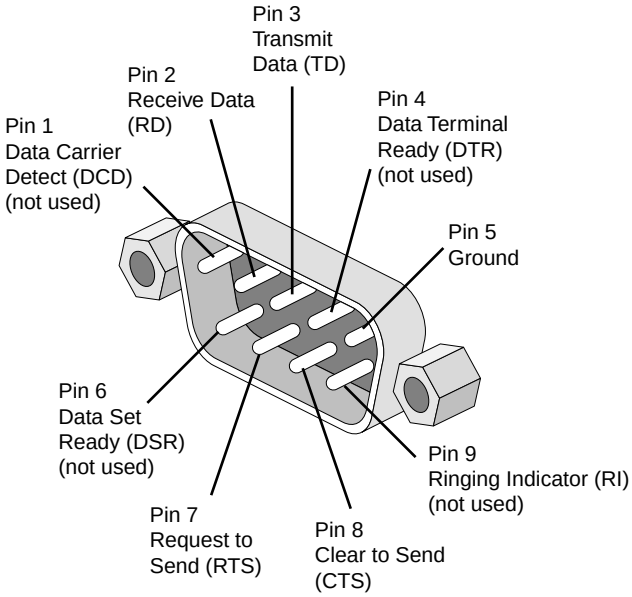

Figure A-6 DB9 Connector Pin Assignments

RJ45 Connector

Figure A-7 shows the pin locations for the RJ45 connector on the IO9 PCI card and the L2 controller.

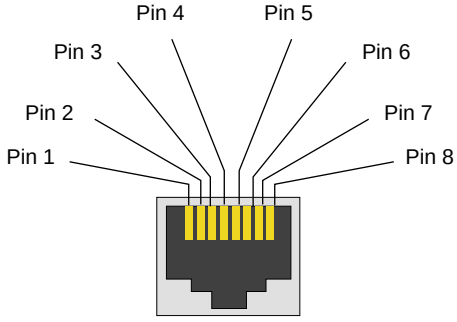

Figure A-7 RJ45 Connector Pin Assignment

Table A-21 shows the pin assignments for the RJ-45 connector.

Table A-21 Ethernet Connector Pin Assignments

10/100BaseT Ethernet Pinouts Pin	10/100BaseT Ethernet Pinouts Assignment	1000BaseT Ethernet Pinouts Pin	1000BaseT Ethernet Pinouts Assignment
1	Transmit +	1	Transmit/Receive 0+
2	Transmit –	2	Transmit/Receive 0–
3	Receive +	3	Transmit/Receive 1+
4	Not used	4	Transmit/Receive 2+
5	Not used	5	Transmit/Receive 2–
6	Receive –	6	Transmit/Receive 1–
7	Not used	7	Transmit/Receive 3+
8	Not used	8	Transmit/Receive 3–

External SCSI Port Connector

Figure A-8 shows the external SCSI VHDCI connector pin locations for the external SCSI connector. This connector is used on the IO9 PCI card and the TP900 storage module.

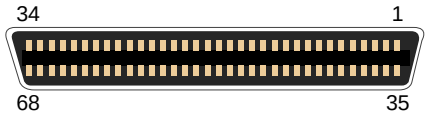

Figure A-8 Pin Number Locations for External SCSI Port

Table A-22 lists the pin assignments for this SCSI connector.

Table A-22 SCSI VHDCI Pin Assignments

Pin Number	Signal Name	Pin Number	Signal Name
1	+DB (12)	35	-DB (12)
2	+DB (13)	36	-DB (13)
3	+DB (14)	37	-DB (14)
4	+DB (15)	38	-DB (15)
5	+DB (P1)	39	-DB (P1)
6	+DB (0)	40	-DB (0)
7	+DB (1)	41	-DB (1)
8	+DB (2)	42	-DB (2)
9	+DB (3)	43	-DB (3)
10	+DB (4)	44	-DB (4)
11	+DB (5)	45	-DB (5)
12	+DB (6)	46	-DB (6)
13	+DB (7)	47	-DB (7)
14	+DB (P0)	48	-DB (P0)
15	Ground	49	Ground
16	DIFFSENS	50	Ground
17	TERMPWR	51	TERMPWR
18	TERMPWR	52	TERMPWR
19	Reserved	53	Reserved
20	Ground	54	Ground
21	+ATN	55	-ATN
22	Ground	56	Ground
23	+BSY	57	-BSY

Table A-22 SCSI VHDCI Pin Assignments **(continued)**

Pin Number	Signal Name	Pin Number	Signal Name
24	+ACK	58	-ACK
25	+RST	59	-RST
26	+MSG	60	-MSG
27	+SEL	61	-SEL
28	+CD	62	-CD
29	+REQ	63	-REQ
30	+IO	64	-IO
31	+DB (8)	65	-DB (8)
32	+DB (9)	66	-DB (9)
33	+DB (10)	67	-DB(10)
34	+DB (11)	68	-DB (11)

Stereo Jack Connector Conductor

Figure A-9 shows the stereo jack connector conductors that are used for the RT interrupt input and RT interrupt output ports of the IO9 PCI card.

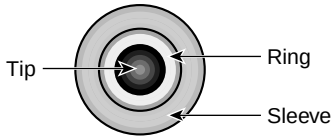

Figure A-9 Stereo Jack Connector Conductor

Table A-23 lists the conductor assignments for the stereo jack connector.

Table A-23 Conductor Assignments for Stereo Jack Connector

Conductor	Function
Tip	+5 V
Ring	Interrupt (active low)
Sleeve	Chassis ground and cable shield

USB Type A Connector

Figure A-10 shows the USB type A connector that is used for USB ports 1 through 4 of the L2 controller and the four USB ports on the USB hub that connect to the compute and/or MPX modules.

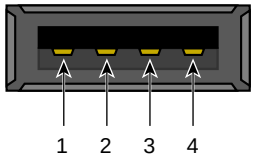

Figure A-10 Pin Number Locations for USB Type A Connector

Table A-24 lists the pin assignments.

Table A-24 Pin Assignments for USB Type A Connectors

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

USB Type B Connector

Figure A-11 shows the USB type B connector that is used for the USB L1 port of the compute module and the L1 port on the NUMAlink module. Table A-25 lists the pin assignments.

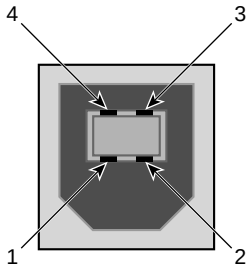

Figure A-11 Pin Number Locations for USB Type B Connector

Table A-25 Pin Assignments for USB Type B Connector

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

Serial Device Cable

For serial devices, use a 3-wire standard PC cable. Table A-26 shows the cable connector pinout assignments for this cable.

Note: For a 3-wire cable and no hardware flow control modem, you must use the /dev/ttyd* command devices in the configuration files. For more detailed information, see the serial man page. To access the man page, select **Help > InfoSearch > Man pages** from the Toolchest, or place the cursor in the console window and type the following:

```
man serial
```

Table A-26 Printer/Dumb Terminal Cable Pinout

Signal Description	Pin Number DB9 Connector (Female)	Pin Number DB-25 Connector (Male)
	1	Not connected
RXD	2	2
TXD	3	3
	4	Not connected
GND	5	7
	6	Not connected
	7	Not connected
	8	Not connected
	9	Not connected

Serial Port Adapter Cables

The system's serial ports conform to the PC standard pinout for EIA standard RS-232 signals. The purpose of the adapter cable is to allow the system to use standard PC serial devices. Table A-27 shows the adapter cable pinout for a standard PC or Macintosh serial port.

Table A-27 Female DB9 to Female MiniDIN8 Adapter Cable Pinout

From: Female DB	To: MiniDIN8	PC Signal	Macintosh Signal
1	7	DCD	GPi
2	5	RD	RxD-
3	3	TD	TxD-
4	1	DTR	TxD+
5	4	SG	SG
6	8	DSR	RxD+
7	6	RTS	HSKo
8	2	CTS	HSKi
9	Unused	RI	Unused

The purpose of the following adapter cable is to support ANSI/SMPTE Standard 107M-1992.

Table A-28 shows the pinout for a female DB9 to female DB9 adapter cable.

Table A-28 Female DB9 to Female DB9 Adapter Cable Pinout

Female DB-9 Connected to Workstation	Female DB-9 Connected to Peripheral
1	Unused
2	To DB9 -2 (RxD-)
3	To DB9-8 (TxD-)
4	Unused
5	To DB9-6 and DB9-4 (GND)
6	To DB9-7 (RxD+)
7	To DB9-3 (TxD+)
8	Unused
9	Unused

Note: For more detailed information, see the `serial` man page. To access it, open an IRIX shell and enter the following:

```
man serial
```

You can also access man pages by selecting **Help** > **InfoSearch** and entering the following:

```
man serial
```

Safety Information and Regulatory Specifications

This appendix provides the following information for the Onyx 350 system:

General 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 persons 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:
    - If 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. 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.
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. Always use at least two people to move a rack.
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 Appendix:

Manufacturer's Regulatory Declarations

Onyx 350 graphics systems 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 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 Numbers

The CMN (model) number for the system is shown on the system label on the unit. The series number is on the serial number label on the back of the system. You may need both the series number and CMN number to obtain the Manufacturer's Declaration of Conformity from SGI.

Manufacturer's Declaration of Conformity

Look at the regulatory label on the system to determine your CMN (model) number. The serial number label determines your series number. You may need both of these numbers to identify your Manufacturer's Declaration of Conformity.

To obtain the Manufacturer's Declaration of Conformity from SGI, you must either provide the CMN number to your local SGI sales representative or contact the Technical Assistance Center at 1 800 800 4SGI.

CE Notice

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 Notices

This equipment has been tested and found to comply with the limits of a Class A device, pursuant to 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: These Class A 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 users will be required to correct the interference at their 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, the user is encouraged to try to correct the interference with one or more of the following measures:

- 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.

This device also complies with Class A electromagnetic emissions limits of C.I.S.P.R. Publication 22, Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology 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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Chinese Class A Regulatory Notice

警告使用者：

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策．

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.

Shielded Cables

SGI Onyx 350 graphics systems are FCC-compliant under test conditions that include the use of shielded cables between the system and its peripherals. Your system and any peripherals that 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 require shielding.

Optional monitor cables that are supplied with your system use additional filtering molded into the cable jacket to reduce radio frequency interference. Always use the cable that is 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 that range from data errors and lockups to permanent component damage.

While you are operating the system, it is important that you keep all the covers and doors, including the plastics, in place. The shielded cables that came with the system 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 you install these upgrades to prevent the flow of static electricity; it is designed to protect your system from ESD damage.

Lithium Battery Statement

Only qualified service personnel should replace a soldered lithium battery in the Onyx 350 visualization system.

Warning: Replace the battery with the same or equivalent type as recommended by the 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. 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.

Laser Compliance Statements

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

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