

SGI™ Onyx® 300 Graphics System User's Guide

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CONTRIBUTORS

Written by Nancy Heller and Dick Brownell

Illustrated by Dan Young and Kelly Begley

Edited by Cindi Leiser

Production by Karen Jacobson

Engineering contributions by David Diederichs, Mark Koneazny, Jeff Milo, Dave North, Troy Patrow, Paul Pedersen, Keith Rich, Gary Spilde, Brian Stickney, and Michael Wright

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About This Guide

This guide provides an overview of the components that make up the SGI Onyx 300 graphics system and it describes how to operate this system. Specifically, it provides the following information:

- Chapter 1, "Introduction"
- Chapter 2, "Operation Procedures"
- Chapter 3, "Configurations"
- Chapter 4, "Troubleshooting"
- Appendix A, "Technical Specifications"
- Appendix B, "Regulatory Specifications"

An index completes this guide.

Audience

This guide is written for owners, system administrators, and users of the SGI Onyx 300 graphics system. It is written with the assumption that the reader has a general knowledge of computers and computer operations.

Your SGI system support engineer (SSE) should perform the addition or replacement of parts and service of your SGI Onyx 300 graphics system, with the exception of the following tasks that you may perform yourself:

- Connecting the following components to your system: monitor, keyboard, mouse, speakers, and system console.
- Using your system console to enter commands and perform system functions such as powering on and powering off.
- Installing and removing disk drives.
- Using the On/Off, reset, and non-maskable interrupt (NMI) switches on the front panel of an SGI Onyx 300 compute module.

Information Sources

This section lists SGI documents that are relevant to the setup and use of the SGI Onyx 300 graphics system, as follows:

- *SGI Onyx 300 Graphics System User's Guide* (this manual) (hard copy shipped with system)
- *SGI Origin 300 System with NUMALink Module User's Guide*
- *PCI Expansion Module User's Guide*
- *SGI Total Performance 900 Storage System User's Guide*
- *IRIX Admin Software Installation and Licensing Guide*
- Other SGI documentation
- Man pages (online)
- IRIX Release Notes (on CD)

SGI Onyx 300 Graphics System User's Guide

Use this guide to become familiar with your graphics system and to learn how to operate, monitor, maintain, and troubleshoot the system. This guide contains information on installing and replacing disk drives and on connecting the following components to your system: monitors, keyboards, mice, speakers, and a system console.



Warning: To ensure your safety and protect your system, do not add or replace any components that this guide does not designate as customer replaceable. Contact your SGI system support engineer (SSE) to install any hardware components that are not designated as customer replaceable in this guide.

SGI Origin 300 System with NUMalink Module User's Guide

This guide provides information about the SGI Origin 300 system that contains a NUMalink module. It describes how to operate, monitor, maintain, and troubleshoot the system. It also contains L1 and L2 controller commands that you may need to operate your Onyx 300 graphics system.

PCI Expansion Module User's Guide

This guide provides information about how to operate, monitor, maintain, and troubleshoot the PCI expansion module. This module is an optional component that provides additional I/O capabilities for the Onyx 300 graphics system.

SGI Total Performance 900 Storage System User's Guide

This guide provides information about how to operate and maintain the SGI Total Performance 900 (TP900) storage system. This system is an optional component that provides a SCSI (small computer system interface) JBOD (just a bunch of disks) storage solution for the Onyx 300 graphics system.

IRIX Admin: Software Installation and Licensing Guide

This is the complete reference guide on using the installation program, *inst*, to install software. For information on using the Software Manager to install software, refer to the online *Personal System Administration Guide*.

Other SGI Documentation

You can access other SGI documentation in either of the following two ways:

- SGI manuals are available in various formats at:
<http://techpubs.sgi.com>
- If you have an SGI workstation running IRIX software, you can use the online documentation package called the *IRIS InSight* online viewer. Select **Online Books** from the Help toolchest. You will see bookshelves for end-user, developer, and administration manuals. Double-click the name of a book to open it. For descriptions of hard-copy manuals that are available for purchase, double-click **Documentation Catalog**.

Online Man Pages

Your system includes a set of IRIX online manual pages, which are formatted in the standard UNIX “man page” style. These man pages are located 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, enter the following command at a shell prompt:

```
man Add_disk
```

Man pages document important system configuration files and commands. References in SGI documentation to these pages include the name of the command and the section number in which the command is located. For example, “`Add_disk(1)`” refers to the `Add_disk` command and indicates that it is located in section 1 of the IRIX reference.

For additional information about displaying reference 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, enter the following command at a shell prompt:

```
apropos disk
```

For information about setting up and using `apropos`, see the `apropos(1)` and `makewhatis(1M)` man pages.

Release Notes

You can view the release notes for various SGI products and software subsystems by using one of two utilities:

```
relnotes    Text-based viewer for online release notes.  
grelnotes   Graphics viewer for online release notes.
```

To see a list of available release notes, type the following command at a shell prompt:

```
relnotes
```

For more information, see the `relnotes(1)` and `grelnotes(1)` man pages.

Product Support

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

- If you are in North America and want support for your SGI supported products, contact the Technical Assistance Center at +1 800 800 4SGI or your authorized service provider.
- If you are outside North America, please contact the SGI subsidiary or authorized distributor in your country.

Conventions

This document uses the following conventions:

Convention	Meaning
<code>command</code>	This fixed-space font denotes literal items such as commands, files, routines, path names, signals, messages, and programming language structures.
<i>variable</i>	Italic typeface denotes variable entries and words or concepts being defined.
user input	This bold, fixed-space font denotes literal items that the user enters in interactive sessions. Output is shown in nonbold, fixed-space font.
[]	Brackets enclose optional portions of a command or directive line.
...	Ellipses indicate that a preceding element can be repeated.
<code>manpage(x)</code>	Man page section identifiers appear in parentheses after man page names.

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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Introduction

The SGI Onyx 300 graphics system offers visualization and supercomputing in one system. This system uses the same NUMA3 architecture as the SGI Onyx 3000 series systems. The SGI Onyx 300 graphics system is a rackmounted system that is composed of separate, but interconnected, functional units called “modules.” Figure 1-1 shows the modules that are available with the graphics system.

Note: The NUMAlink, SGI Total Performance (TP900) storage, and PCI expansion modules are optional modules; however, the NUMAlink module cannot be ordered as part of an upgrade.

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 graphics modules to meet your needs.

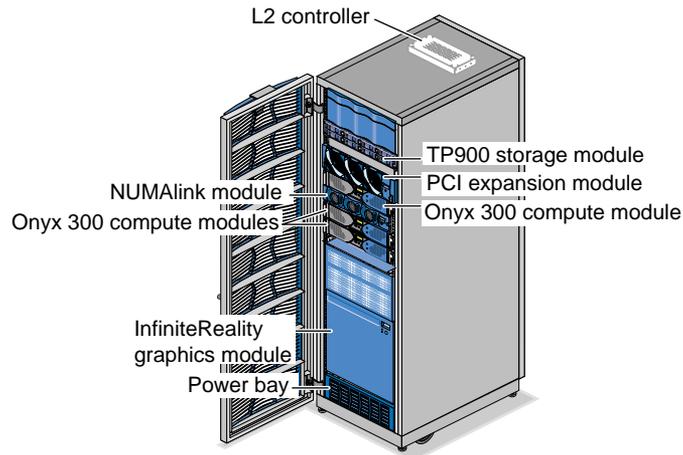


Figure 1-1 SGI Onyx 300 Graphics System

Table 1-1 lists the functional descriptions of the modules that compose the SGI Onyx 300 graphics system.

Table 1-1 Module Description

Module	Description
InfiniteReality graphics module	Contains one or two graphics pipes.
Onyx 300 compute module	Provides the compute functionality and base I/O for the system.
Power bay module	Provides power to the L2 controller, NUMALink module, and PCI expansion module
L2 controller module	Provides rack-level control
NUMALink module (optional)	Routes information between the Onyx 300 compute modules and the PCI expansion modules
PCI expansion module (optional)	Provides 12 PCI slots
TP900 storage module (optional)	Provides additional storage

The Onyx 300 graphics system has the following features:

- Scalable growth of memory and I/O bandwidth as well as processor compute power.
- As many as eight InfiniteReality graphics pipes.
- As many as eight monitors on each pipe.
- High-speed NUMALink interconnect that links the Onyx 300 compute modules, NUMALink module, and PCI expansion modules together (a peak rate of 3200 MB/s bidirectionally, 1600 MB/s in each direction).

The Onyx 300 system supports two configurations: a base configuration and a NUMAlink configuration. For both configurations, one Onyx 300 compute module is required for each graphics pipe.

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

- 1 or 2 Onyx 300 compute modules (2, 4, 6, or 8 processors)
- 1 InfiniteReality graphics module with 1 or 2 graphics pipes
- 1 L2 controller module
- 1 power bay module that contains 2 power supplies
- 1 or more TP900 storage modules (optional)
- 1 PCI expansion module (optional)

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 300 compute modules (4 to 32 processors)
- 1 to 8 InfiniteReality modules (1 to 8 graphics pipes)
- 1 NUMAlink module
- 1 L2 controller
- 1 power bay that contains 2 power supplies
- 1 or more TP900 storage modules (optional)
- 1 to 4 PCI expansion modules (optional)

In both configurations, the InfiniteReality graphics module connects to the XIO port of an Onyx 300 compute module as shown in Figure 1-2.

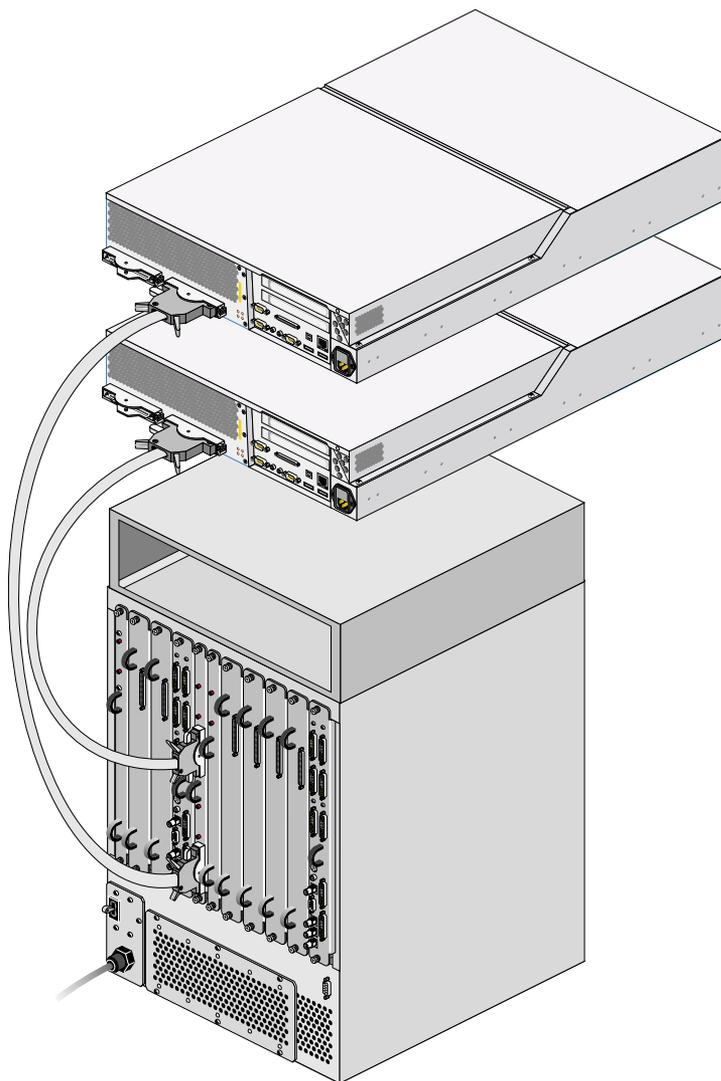


Figure 1-2 InfiniteReality Graphics Module Connected to Onyx 300 Compute Modules

The XIO port of the Onyx 300 compute module connects to the Ktown2 board of the InfiniteReality graphics module as shown in Figure 1-3. In simplified terms, the Ktown2 board converts the data that it receives from the compute module to differential signal levels and passes the signals to the Geometry Engine processor. This processor creates the polygons that are superimposed on the flat image to make it look three dimensional. After it creates the polygons, the Geometry Engine processor passes the polygons to the raster manager (RM). The RM processes the polygons by adding color, texture, and other elements that make the image look real. The RM passes the image to the display generator (DG) for formatting so that the image can be displayed on a monitor.

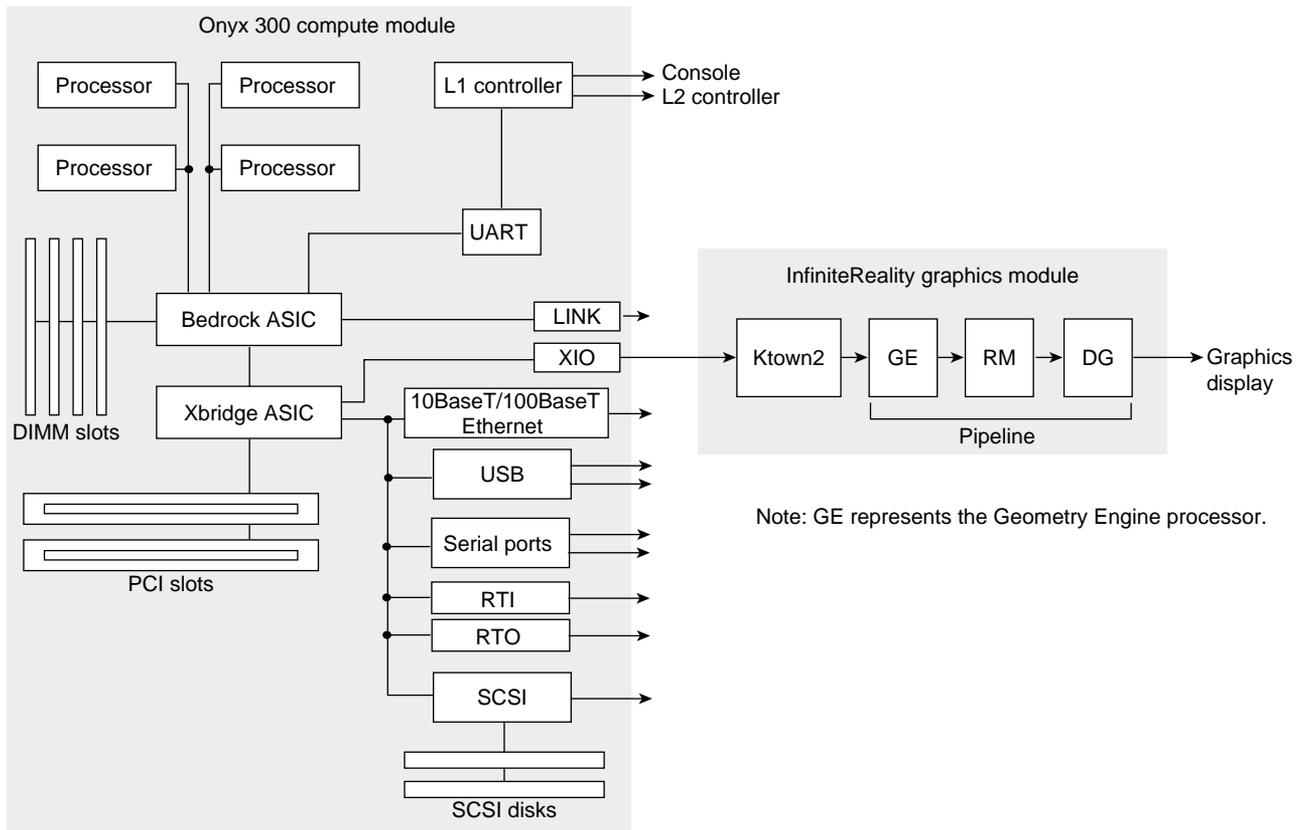


Figure 1-3 Onyx 300 Graphics System Block Diagram

The following subsections provide detailed descriptions for the standard and optional system components.

Note: Because the base configuration does not use the NUMAlink module, the NUMAlink module is described as an optional system component.

Standard System Components

The SGI Onyx 300 system consists of the following standard components, as shown in Figure 1-4.

- InfiniteReality graphics module
- Onyx 300 compute module
- 39U rack
- L2 controller module
- Power bay module
- Power distribution unit (PDU) (not shown in Figure 1-4)
- Monitor, keyboard, and mouse
- USB extender (not shown in Figure 1-4)

Note: The modules of the SGI Onyx 300 graphics system are not interchangeable with the SGI Onyx 3000 series bricks.

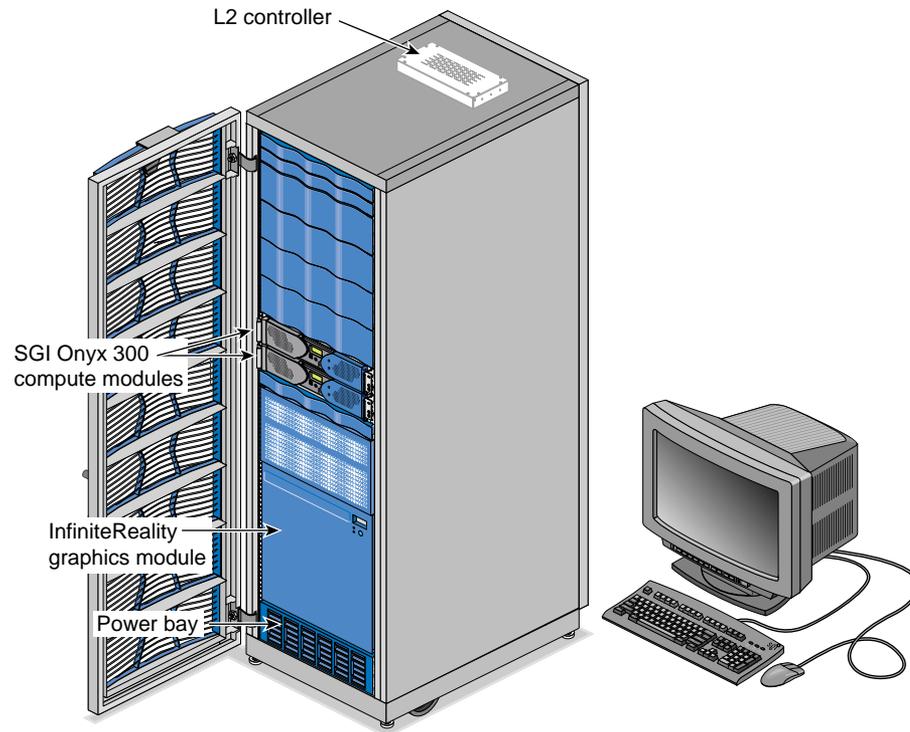


Figure 1-4 Standard System Components

InfiniteReality Graphics Module

The InfiniteReality graphics module is a one- or two-pipe, rackmounted graphics interface that requires 18U of space within a rack. The maximum number of InfiniteReality graphics pipes contained in an Onyx 300 graphics system is eight. Figure 1-5 shows the front and rear views of the graphics module.

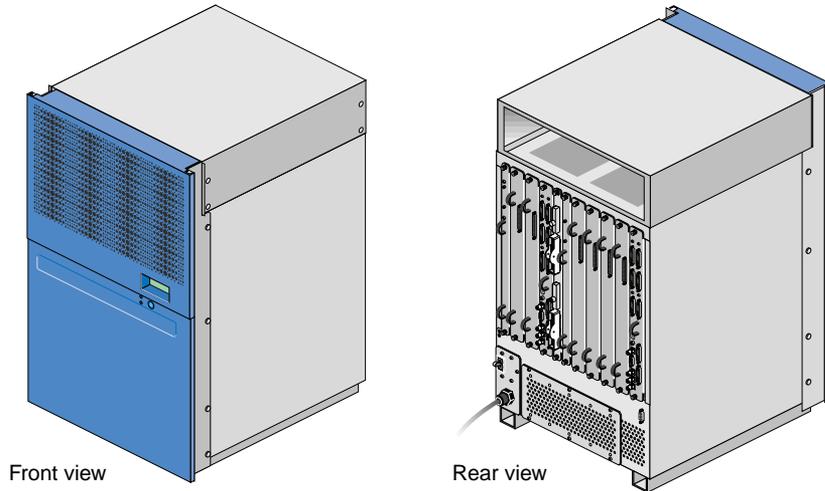


Figure 1-5 Front and Rear Views of InfiniteReality Graphics Module

Front Components

The InfiniteReality graphics module contains the following front-panel items (refer to Figure 1-6):

- **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 switch with LED** enables you to manually power on and power off the module.
- **L1 controller LEDs:**
 - **On/Off switch 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.

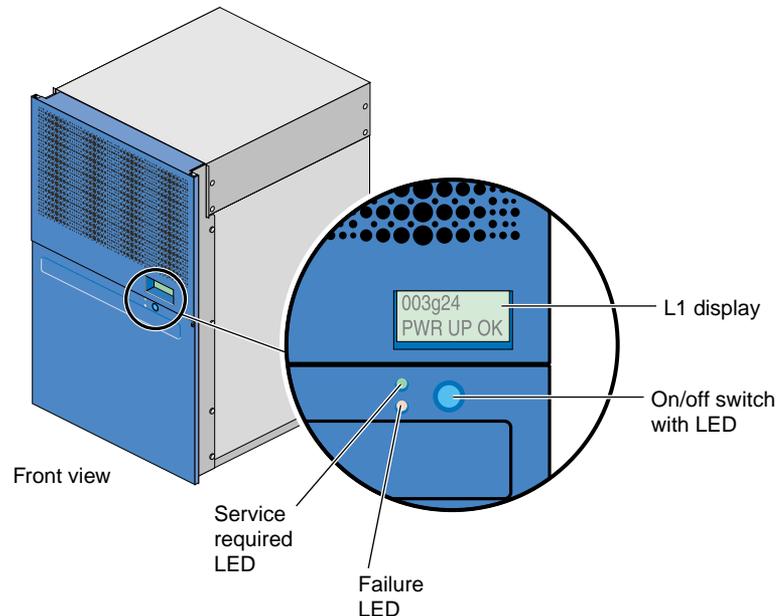


Figure 1-6 Front Components

Rear Components

The InfiniteReality graphics module has the following rear-panel items, as shown in Figure 1-7:

- **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 220 Vac power receptacle.
- **11 board slots** that house a Ktown2 board and one or two InfiniteReality graphics pipes. As you face the rear panel, the boards are located as follows:
 - **Six rightmost slots (pipe 0)** support a Geometry Engine processor board; one, two, or four raster manager (RM) boards; and a display generator (DG) board.
 - **Four leftmost slots (pipe 1)** support a Geometry Engine processor board, one or two RM boards, and a DG board.
 - **Ktown2 board with two connectors** is located between pipe 0 and pipe 1. It contains two connectors. The top connector connects pipe 0 (six rightmost slots) to an Onyx 300 compute module. The bottom connector connects pipe 1 (four leftmost slots) to an Onyx 300 compute module.
- **L1 (USB) connector** attaches the InfiniteReality graphics module to the L2 controller.

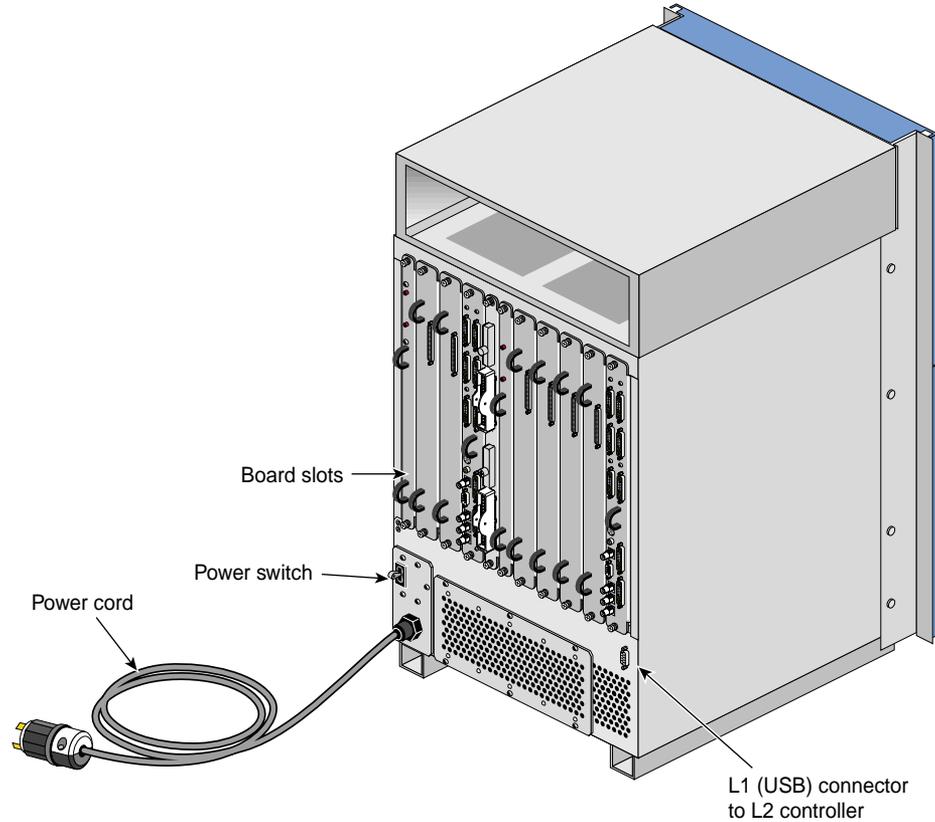


Figure 1-7 Rear Components

The InfiniteReality graphics module contains:

- InfiniteReality, InfiniteReality2, or InfiniteReality3 board set

Note: The InfiniteReality3 board set is the default board set for the Onyx 300 graphics system.

- L1 controller
- Power supply
- Midplane

InfiniteReality3 Board Set

The InfiniteReality3 board set consists of the following board types (refer to Figure 1-8):

- Ktown2
- Geometry Engine (GE16-4)
- Raster manager (RM10)
- Display generator (DG5)

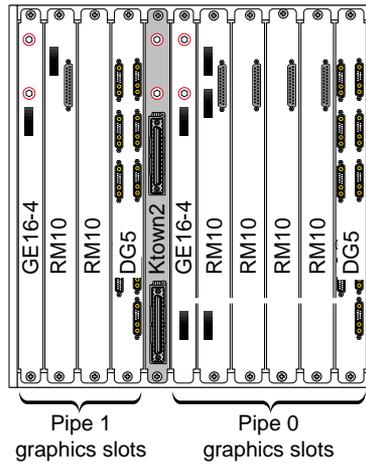


Figure 1-8 InfiniteReality3 Board Set

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 (refer to Figure 1-9). The Xtown2 connectors connect to the XIO port of the Onyx 300 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.

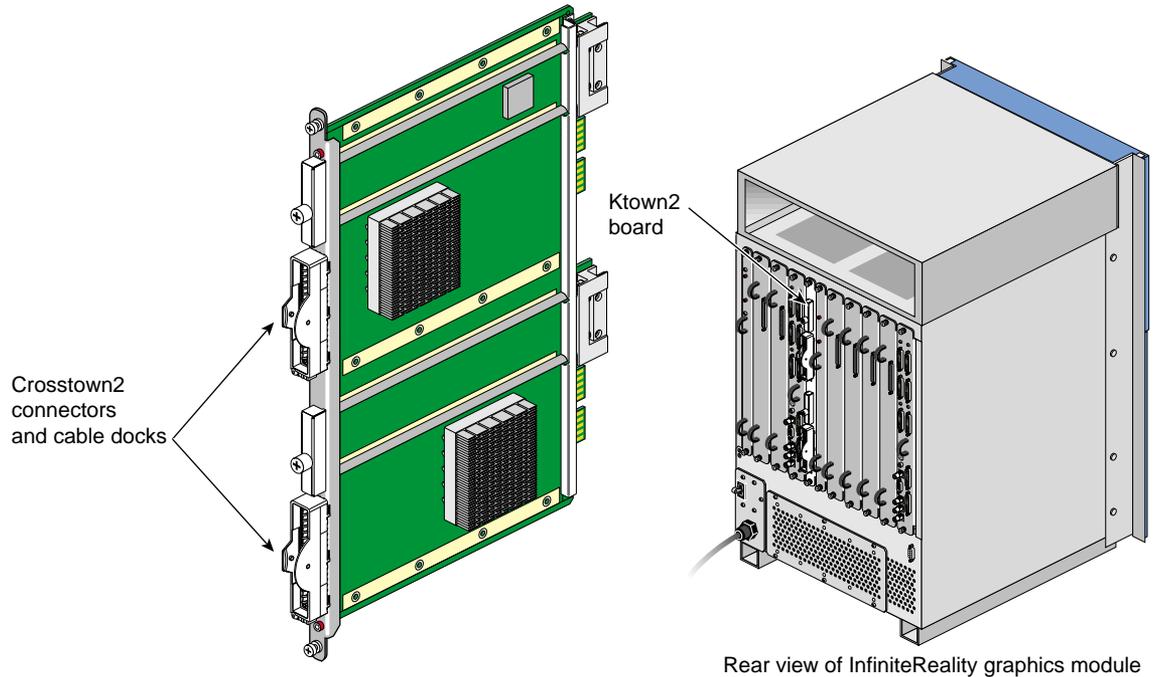


Figure 1-9 Ktown2 Board

The GE16-4 (Geometry Engine) board contains four processors that process OpenGL commands and vertex data that it receives from the host processors (refer to Figure 1-10). Each pipe contains one GE16-4 board.

The GE16-4 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 take place in the GE16-4 board are measured in polygons per second; the unit for the rate at which data moves through the graphics pipe.

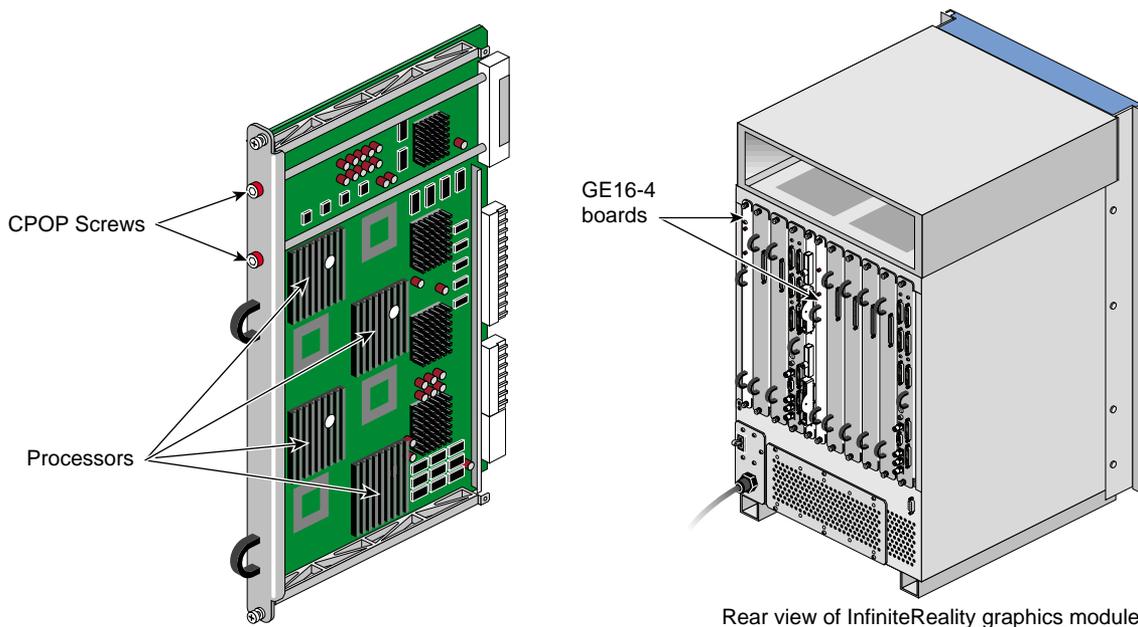


Figure 1-10 GE16-4 Board

The RM10 (raster manager) boards:

- 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 RM10 boards. The 4-RM pipe, which is physically located to the right of the Ktown2 board, contains one, two, or four RM10 boards.

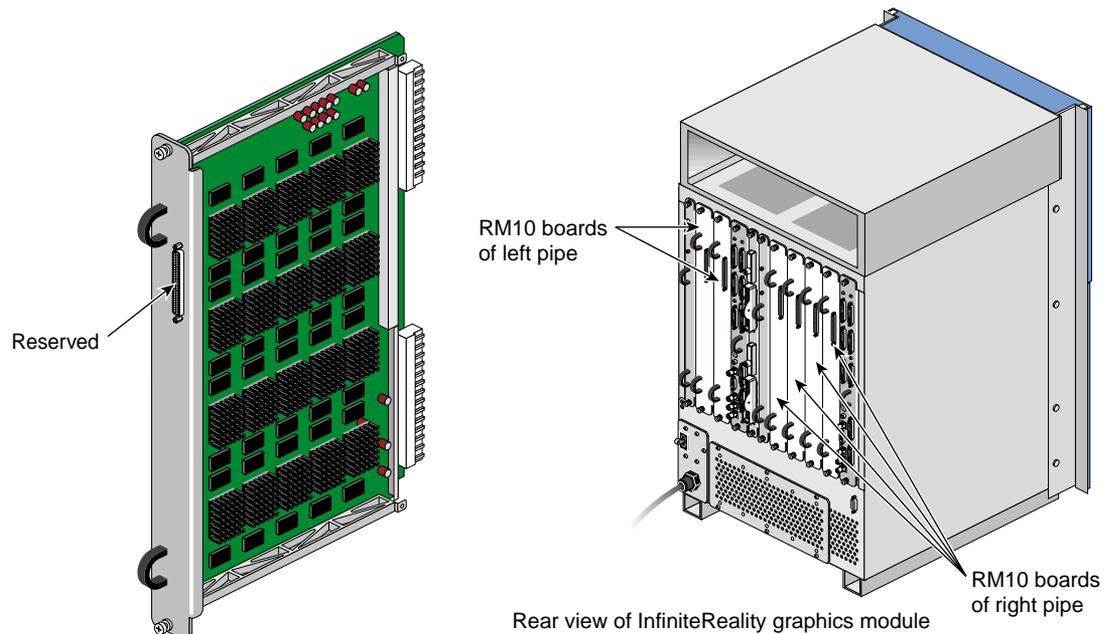


Figure 1-11 RM10 Board

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

- 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

The default monitor resolution supported by the InfiniteReality2 and InfiniteReality3 board sets and the SuperWide monitor is 1920 x 1200 at 66 MHz. The maximum output bandwidth is approximately 300 Mpix/s. For two monitors, the transfer rate 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.

Each pipe contains one DG5 board (refer to Figure 1-12).

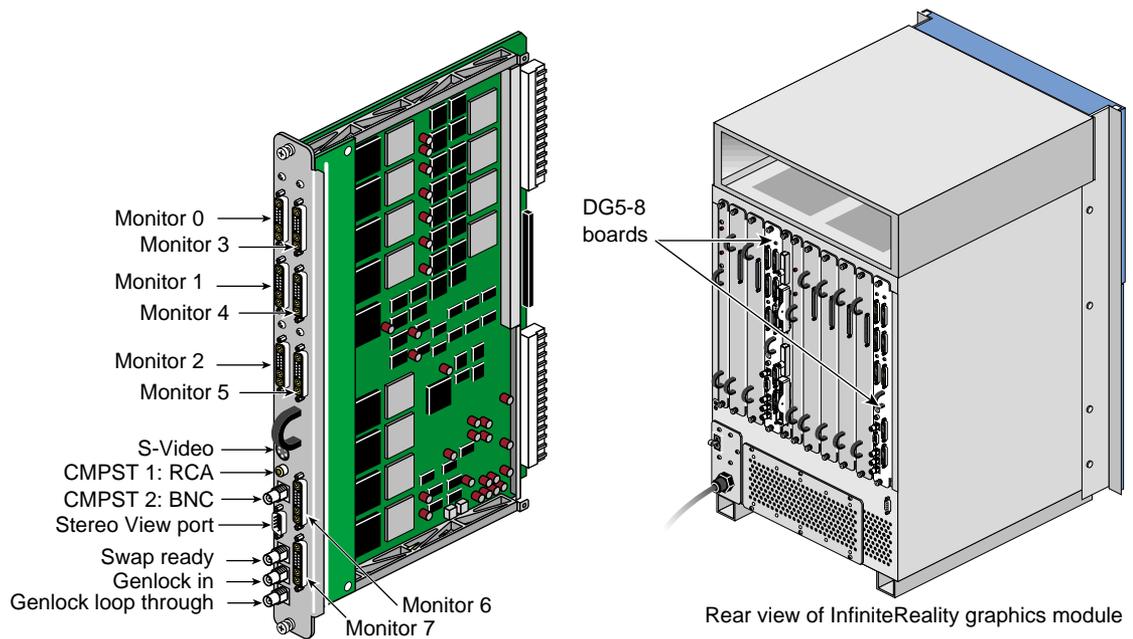


Figure 1-12 DG5 Board

The Onyx 300 graphics system supports six DG5 options (refer to Table 1-2).

Table 1-2 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 <i>hyperpipe</i>). The output of the graphics pipes is sent to a single monitor or other video input device.
DG5-2/GVO	DG5-2 board with a daughtercard that provides real-time graphics-to-video output.
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 1-3.

Table 1-3 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, (refer to Figure 1-13) is a liquid crystal display (LCD) that displays error and status messages that the L1 controller generates.

The L1 controller also has the following switch and LEDs:

- On/Off switch 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.

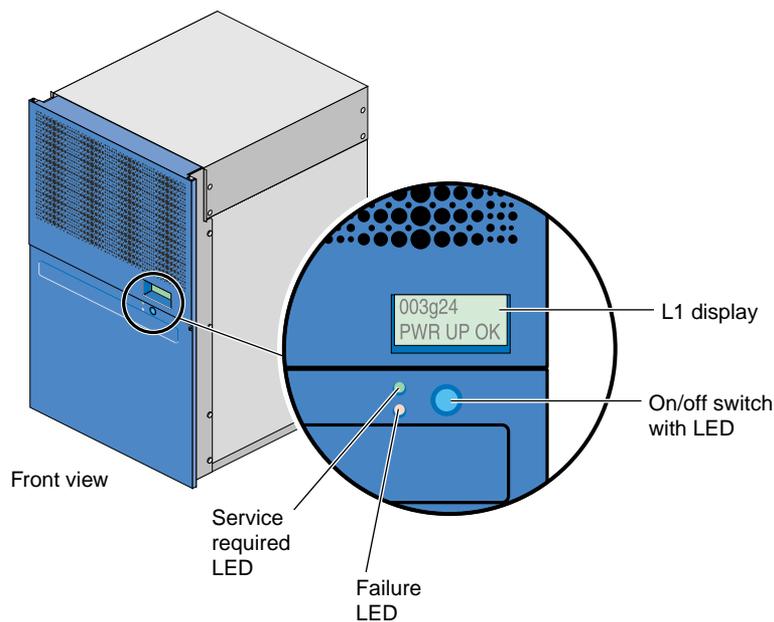


Figure 1-13 L1 Controller Display, Switch, and LEDs

Midplane

The midplane provides connections for the board set, power supply, and L1 controller (refer to Figure 1-14).

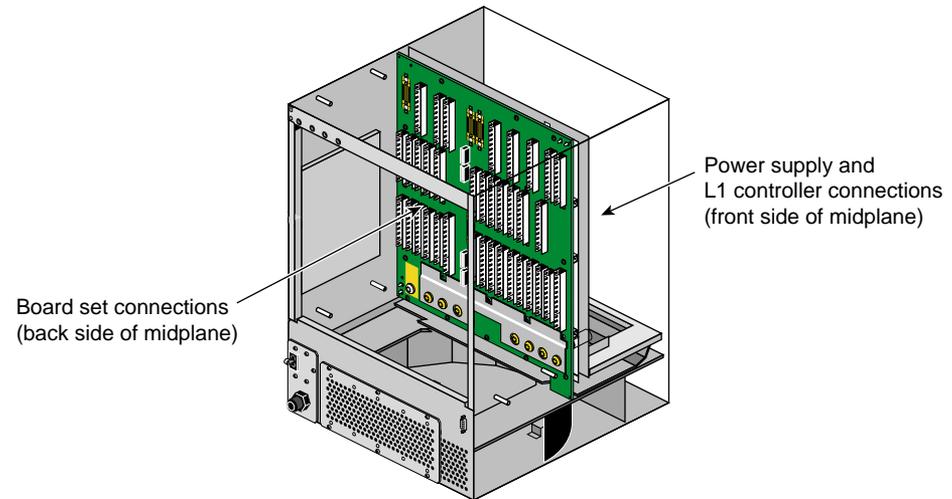


Figure 1-14 Midplane

Power Supply

The InfiniteReality graphics module has its own power supply, which requires an external 220 Vac power receptacle. The power supply is located on the front side of the midplane (refer again to Figure 1-14).

SGI Onyx 300 Compute Modules

The Onyx 300 compute modules provide the compute functionality for the system. The base configuration of the SGI Onyx 300 system consists of one or two Onyx 300 compute modules. The NUMALink configuration consists of two to eight Onyx 300 compute modules. The number of required compute modules depends on the number of graphics pipes in the system. Each graphics pipe is paired with a compute module.

Each compute module consists of:

- Two or four 64-bit MIPS RISC processors
- 2 MB of secondary cache per processor
- 512 MB to 4 GB of memory
- One or two sled-mounted Ultra3 SCSI disk drives
- Zero to two PCI cards

Note: A compute module is not limited to two disk drives or two PCI slots. The compute module can connect to external devices that expand the I/O and storage capabilities. Information about these devices is provided in “Optional System Components” on page 34.

Each compute module also contains an L1 controller that provides the following services:

- Controls and sequences power
- Controls and monitors the environment
- Initiates a reset
- Stores identification and configuration information

These compute modules communicate with each other via the NUMALink 3 interconnect. They communicate with the graphics modules via their XIO ports.

Figure 1-15 shows the front and rear views of an SGI Onyx 300 compute module.

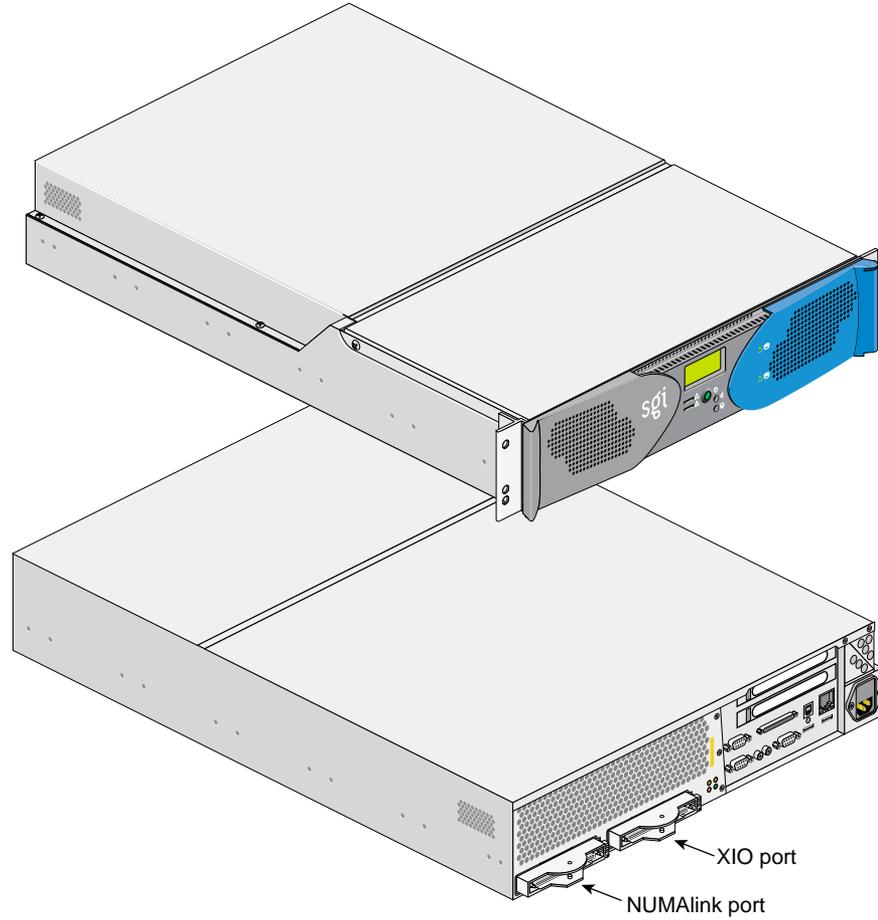


Figure 1-15 Front and Rear Views of an SGI Onyx 300 Compute Module

Front Chassis Components

Figure 1-16 illustrates the front controls and indicators of the SGI Onyx 300 compute module.

- **L1 controller display** is a liquid crystal display (LCD) that displays status and error messages that the L1 controller generates.
- **On/Off switch with LED** enables you to manually power on and power off the Onyx 300 compute module. Alternatively, you can power on and off the compute module at a system console. The LED illuminates green when the internal components are on.
- **Reset button** resets the internal processors, ASICs, and memory.

Note: This reset causes memory loss. (Refer to the non-maskable interrupt [NMI] to perform a reset without losing memory.)

- **Non-maskable interrupt (NMI) button** resets the internal processors and ASICs without losing memory. Register data and memory are stored in a `/var/adm/crash` file.
- **Service required LED** illuminates yellow to indicate that an item has failed or is not operating properly, but the system is still operating.
- **Failure LED** illuminates red to indicate that a failure has occurred and the compute module is down.
- **Drive LEDs** illuminate green to indicate drive activity.

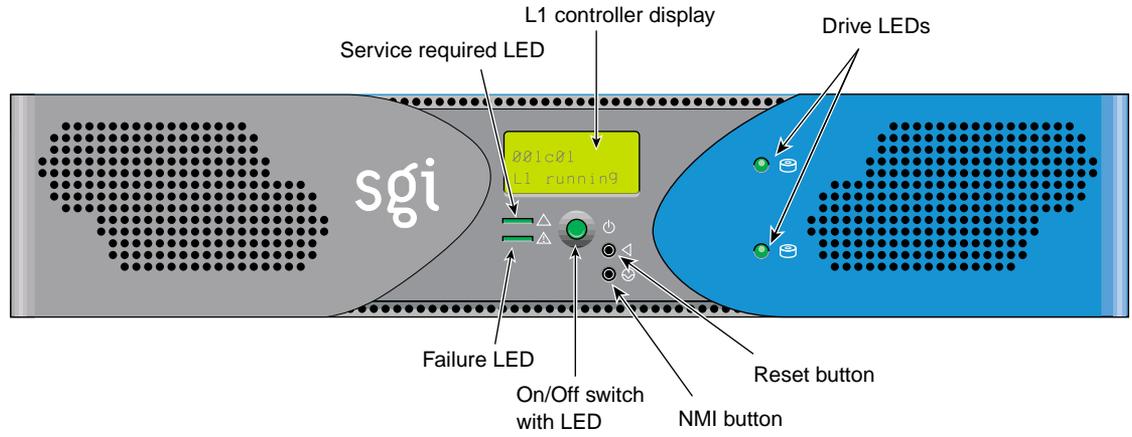


Figure 1-16 Front Controls and Indicators

Rear Chassis Components

Figure 1-17 illustrates the rear panel I/O ports and features of the SGI Onyx 300 compute module.

- **Power connector** attaches to a power cord that connects the module to an AC power outlet.
- **LINK connector** (NUMAlink connector) connects the compute module to another compute module, a NUMAlink module, or a PCI expansion module. This connection is made with a NUMAlink 3 cable at 1.6 GB/s in each direction.
- **XIO connector** connects to the InfiniteReality graphics module.
- **L1 console port** (DB-9, RS-232, console and diagnostic port) connects the compute module's L1 controller to a system console that contains SGIconsole software.
- **USB L1 port** (universal serial bus) connects the compute module's L1 controller to the L2 controller.
- **PCI slots 1 and 2** house PCI cards. The two PCI 2.2-compliant slots are configured on one bus. The PCI bus supports both 32- and 64-bit modes at 33 or 66 MHz. Refer to the SGI Supportfolio Online home page at <http://support.sgi.com> for an updated list of supported PCI cards.
- **Serial ports 1 and 2** (DB-9, RS-232, or RS-422 connectors) can be used as COM ports to connect modems or other serial devices.
- **USB ports 1 and 2** connect auxiliary equipment such as a keyboard or a mouse.
- **RT interrupt input and output** (real-time interrupts) are used by the graphics cards to keep the graphics synchronized.
- **Ethernet port** (autonegotiating 10BaseT or 100BaseT Ethernet port) connects the compute module to an Ethernet network.
- **External SCSI connector** (68-pin VHDCI external SCSI port) connects to SCSI devices (for example, TP900 storage module). Refer to the SGI Supportfolio Online home page at <http://support.sgi.com> for an updated list of supported SCSI devices.
- **Heartbeat LEDs** (four, one for each processor) indicate processor activity.

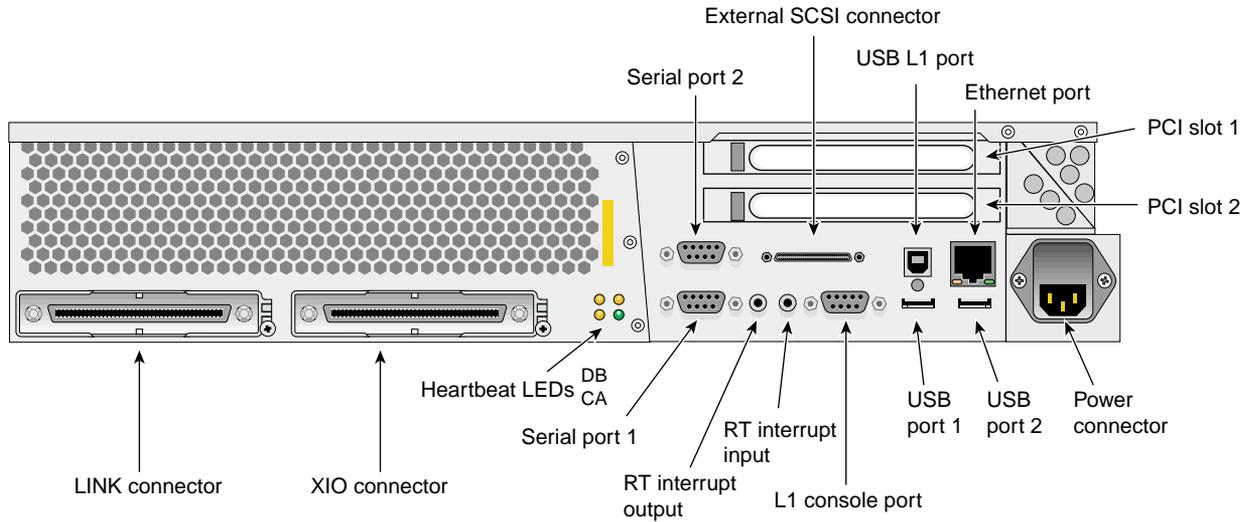


Figure 1-17 Rear I/O Ports and Features

Rack

The modules that compose the SGI Onyx 300 system reside in one or more 39U racks.

Note: One unit (U) is equal to 1.75 in. (4.445 cm). (refer to Figure 1-18).

The components within the rack are identified by the lowest unit number that they occupy. For example, the top Onyx 300 compute module shown in Figure 1-18 is identified as U24.

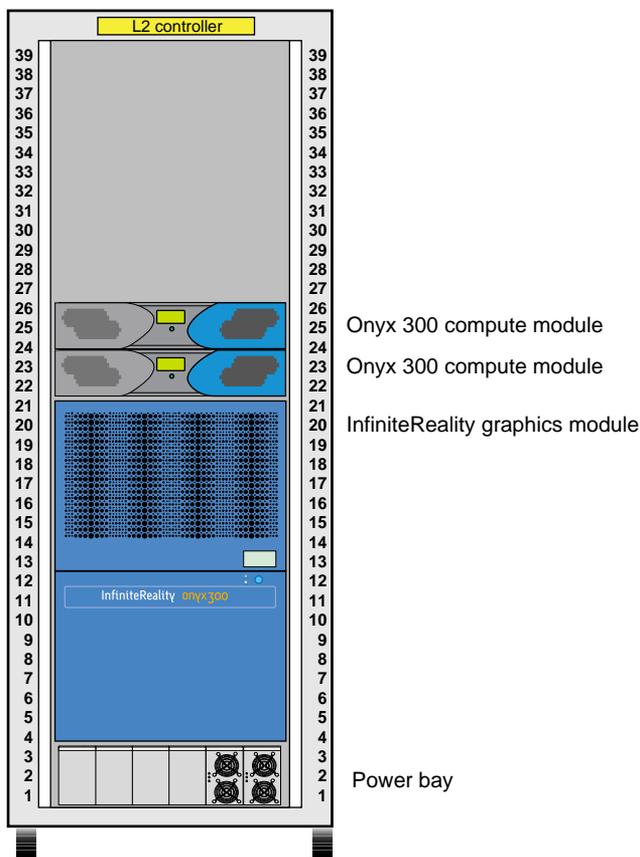


Figure 1-18 Unit Numbering within Rack

The 39U rack has the following characteristics:

- 19-in. mounting rails to support the components within the rack
- Front and rear doors
- Cable management hardware in the rear of the rack
- Mounted on four castors, two of which are swivel castors
- Seismic tie-down attachment points
- Leveling pads

Figure 1-19 shows the front view of the 39U rack.

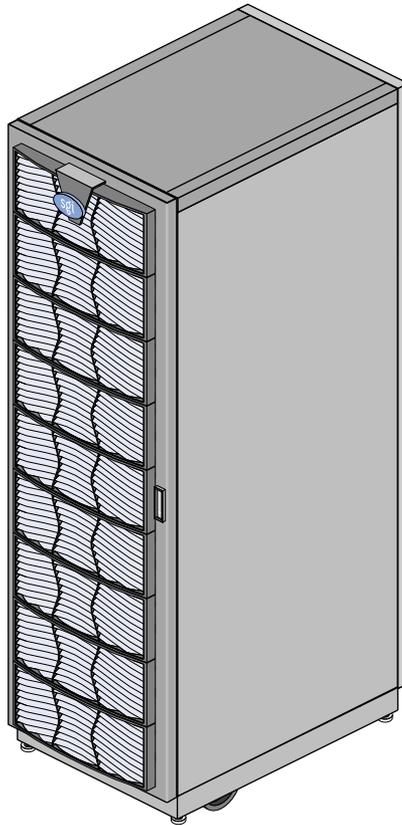


Figure 1-19 Front View of the 39U Rack

Power Distribution Units (PDUs) and Power Bay Module

The power components of the SGI Onyx 300 graphics system consist of one or two power distribution units (PDUs) (refer to Figure 1-20) and one power bay module (refer to Figure 1-21). The number of PDUs depends on the number of modules within the rack. The PDU inputs AC voltage from an external power receptacle and outputs AC voltage to the Onyx 300 compute modules, the power bay module, the local USB extender, optional TP900 storage modules, and optional USB hub.

The power bay module converts the AC voltage to 48 Vdc and 12 Vdc standby voltage and outputs this voltage to the optional NUMAlink module, the L2 controller, and optional PCI expansion modules. The 48 Vdc powers on the NUMAlink module, the PCI expansion modules, and the L2 controller. The 12 Vdc standby voltage powers on the L1 controller logic within the NUMAlink module and the PCI expansion modules.

The power bay module can house up to six power supplies; however, the Onyx 300 graphics system requires only two power supplies. Each power supply inputs single-phase AC power and outputs a maximum of 950 W at 48 Vdc and 42 W at 12 Vdc standby.

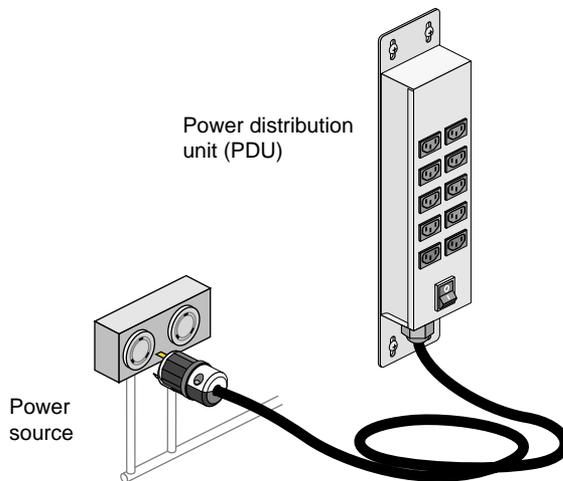


Figure 1-20 Power Distribution Unit

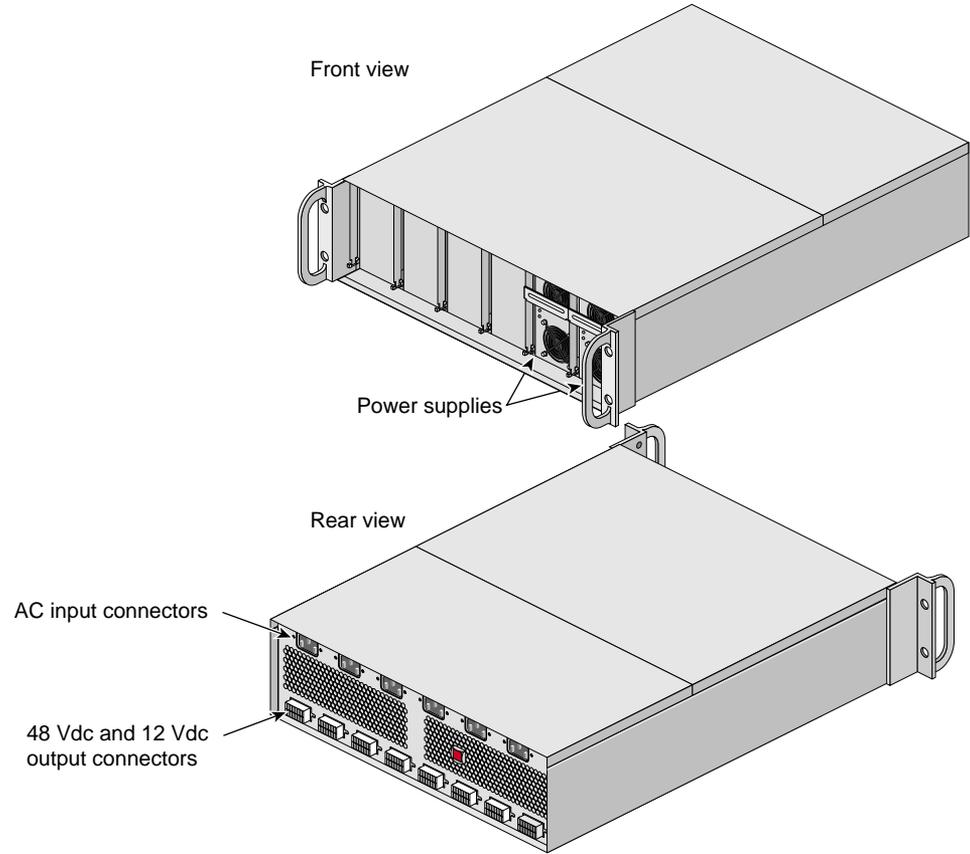


Figure 1-21 Power Bay Module

L2 Controller Module

The L2 controller module, shown in Figure 1-22, is a rack-level controller that performs the following functions:

- Controls resource sharing
- Controls L1 controllers
- Maintains controller configuration and topology information
- Enables remote maintenance
- Routes data between upstream and downstream devices, as follows:

Upstream devices (for example, the system console) provide control for the system, initiate commands for the downstream devices, and act on the messages that they receive from downstream devices.

Downstream devices (for example, L1 controllers) perform the actions specified by the L2 controller commands, send responses to the L2 controller that indicate the status of the commands, and send error messages to the L2 controller.

The L2 controller has the following connectors (refer to Figure 1-22):

- Power connector that connects the L2 controller to the power bay module
- RS-485 connector that is not used
- Two RS-232 ports (DB-9) that connect the L2 controller to a modem
- 10BaseT Ethernet port that connects the L2 controller to an Ethernet hub (system console that contains SGIconsole software)
- Rack display port that is not used
- Four USB ports; these ports can connect the L2 controller to the following components:
 - NUMAlink module
 - USB hub
 - Onyx 300 compute module
 - InfiniteReality graphics module

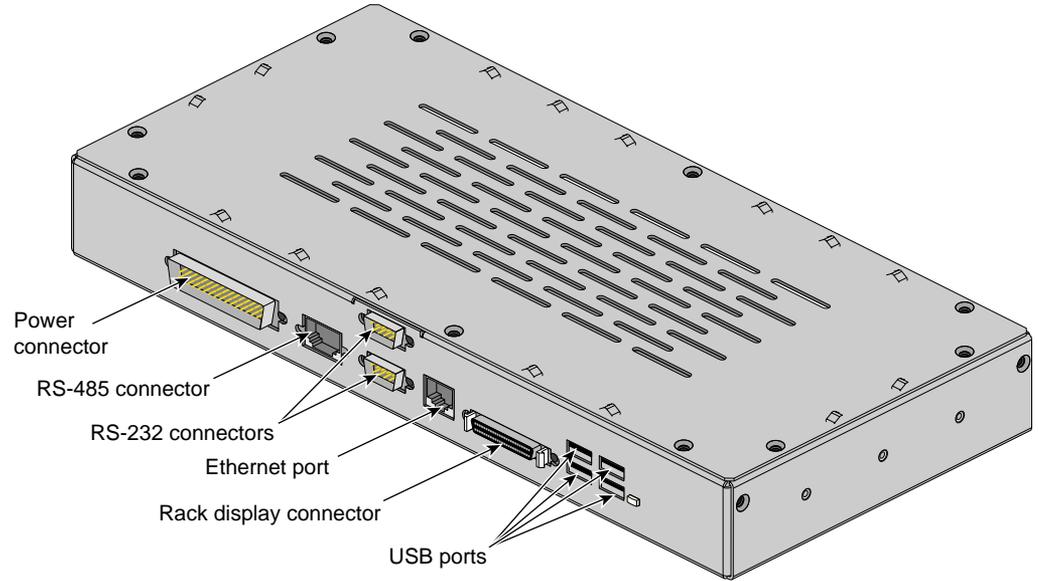


Figure 1-22 Front View of the L2 Controller

Monitor, Keyboard, and Mouse

Every SGI Onyx 300 graphics system is configured with one 24-inch SuperWide graphics monitor, a standard USB 101-key international keyboard, and a three-button USB mouse. Refer to Figure 1-23.

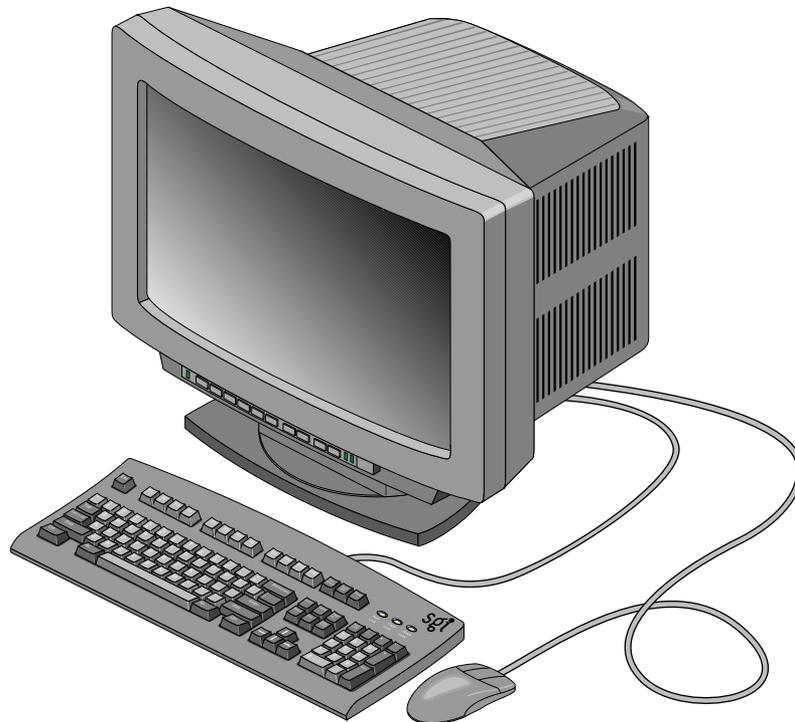


Figure 1-23 Graphics Monitor with Keyboard and Mouse

USB Extender

The USB extender enables you to place the keyboard and mouse up to 100 meters (328 ft) from the Onyx 300 compute module. The standard configuration provides a 30-ft cable. The USB extender consists of two components: a local extender (LEX) and a remote extender (REX). The LEX receives AC power from the PDU in the rack. The REX does not use an external power source.

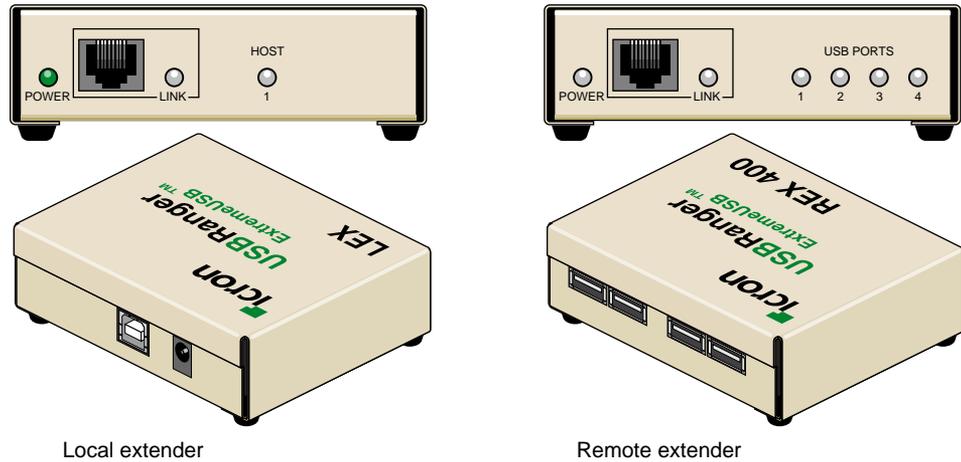


Figure 1-24 Local and Remote Extenders

Optional System Components

The Onyx 300 graphics system can contain the following optional components, which are discussed in the subsections that follow.

- NUMAlink module
- PCI expansion modules
- Storage expansion modules
- Tape devices
- USB hub
- CD-ROM
- Genelec bi-amplified speakers
- Radical audio PCI card

NUMAlink Module

The NUMAlink module, shown in Figure 1-25, is an air-cooled device that transfers messages between the Onyx 300 compute modules via the NUMAlink 3 interconnect. This module is required for graphics systems that contain more than two graphics pipes.

The NUMAlink module consists of eight ports; four ports can connect to four Onyx 300 compute modules. The other four ports, which carry USB signals, can connect to Onyx 300 compute modules or PCI expansion modules.

Note: The USB signals enable the Onyx 300 compute modules and the PCI expansion modules to communicate with the L2 controller. The Onyx 300 compute modules that connect to the four ports that do not carry USB signals communicate with the L2 controller via a USB hub.

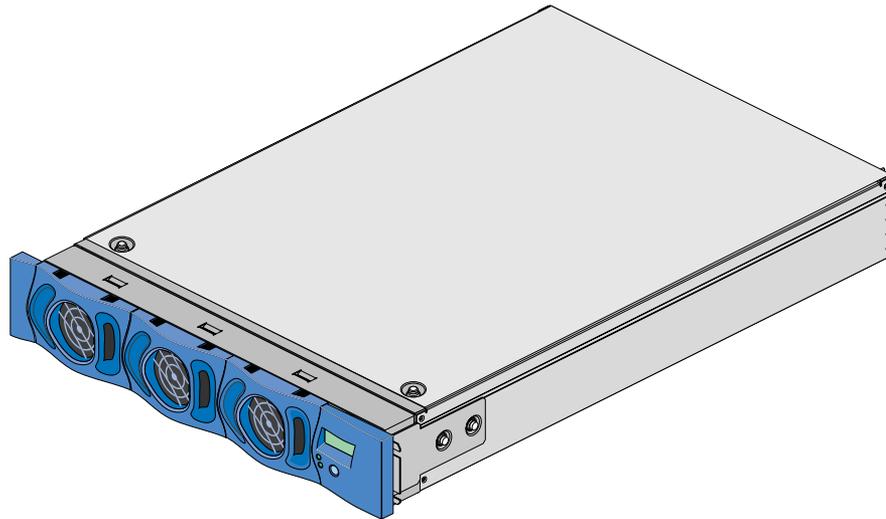


Figure 1-25 NUMAlink Module

Front Components

The NUMAlink module contains the following front-panel items (refer to Figure 1-26):

- **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 switch with LED** enables you to manually power on and power off the module.
- **L1 controller LEDs:**
 - **On/Off switch LED** illuminates green when the internal components are powered on.
 - **Service required LED** illuminates orange to indicate that an item is not functioning properly (for example, a fan is off), but the NUMAlink module is still operating.
 - **Failure LED** illuminates red to indicate that a failure has occurred and the NUMAlink module is down.
- **Fans** that provide N+1 redundant cooling for the module.

Note: The front of the NUMAlink module appears to display three cooling fans; however, only the middle and right fans are present.

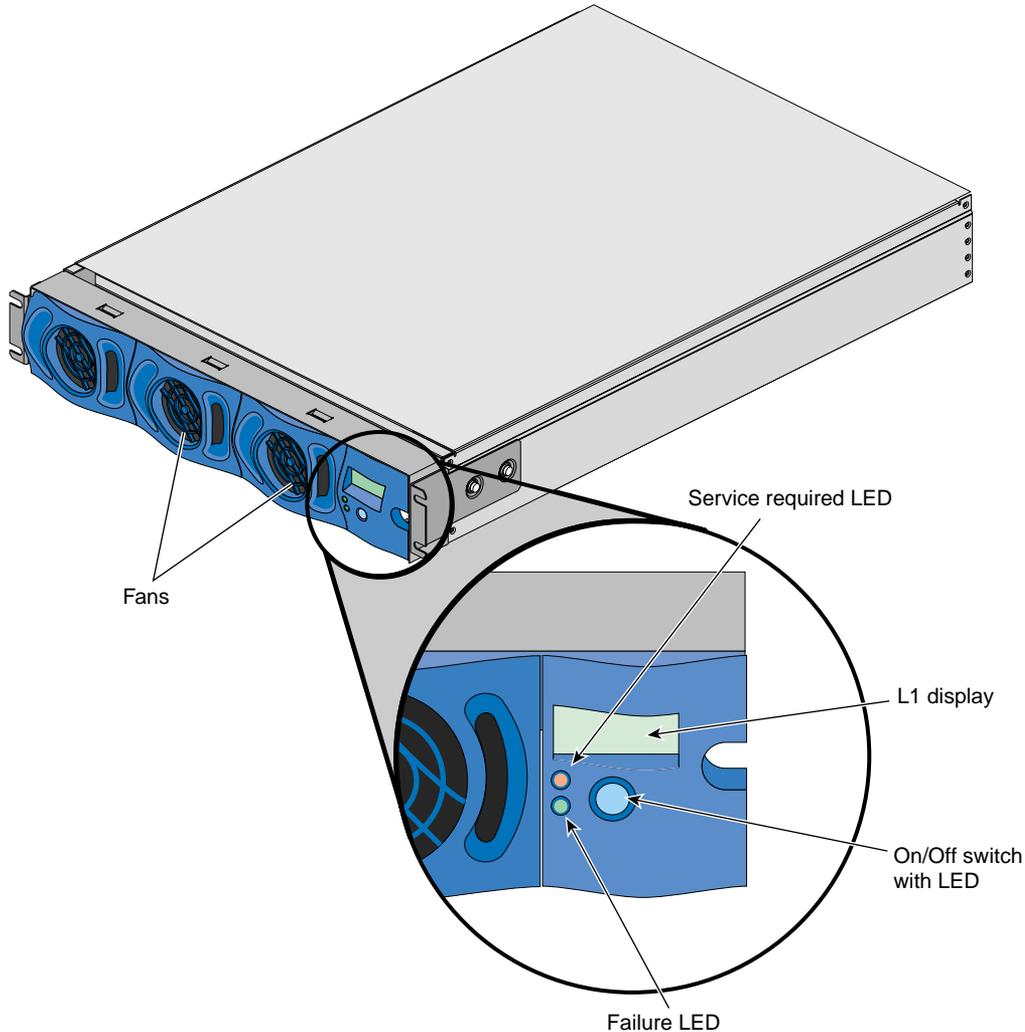


Figure 1-26 Front View of NUMAlink Module

Rear Components

The NUMAlink module has the following rear panel items (refer to Figure 1-27):

- **Power switch** powers on the L1 controller when moved to the **1** position; moving it to the **0** position powers off the L1 controller.
- **12 VDC LED** illuminates green when the power switch is in the On position and the power bay supplies 12 Vdc to the module.
- **48 VDC LED** illuminates green when the power bay supplies 48 Vdc to the module at the request of the L1 controller.
- **PWR (power) connector** attaches to the power bay module via a DC power cable.
- **L1 port connector** connects the NUMAlink module to the L2 controller. The USB hub receives the USB signals from the L2 controller via this port and distributes these USB signals to the L1 controllers of the Onyx 300 compute modules and PCI expansion modules that are attached to ports 2, 3, 4, and 5.
- **LINKS R TO R connectors** (also referred to as ports 1, 6, 7, and 8 or A, F, G, and H) connect Onyx 300 compute modules to the NUMAlink module.
- **LINKS R TO R and C TO R connectors** (also referred to as ports 2, 3, 4, and 5 or B, C, D, and E) connect Onyx 300 compute modules and/or PCI expansion modules to the NUMAlink module.

Besides NUMAlink signals, ports 2, 3, 4, and 5 transfer USB signals between the USB hub of the NUMAlink module and the L2 controller.

- **LINK connector LEDs.** Each NUMAlink connector has two LEDs:
 - The green LED illuminates to indicate that a cable is connected properly between the NUMAlink module and another module.
 - The yellow LED illuminates to indicate that the L1 controller detected the “Remote Power OK” signal from the module on the other end of the cable.

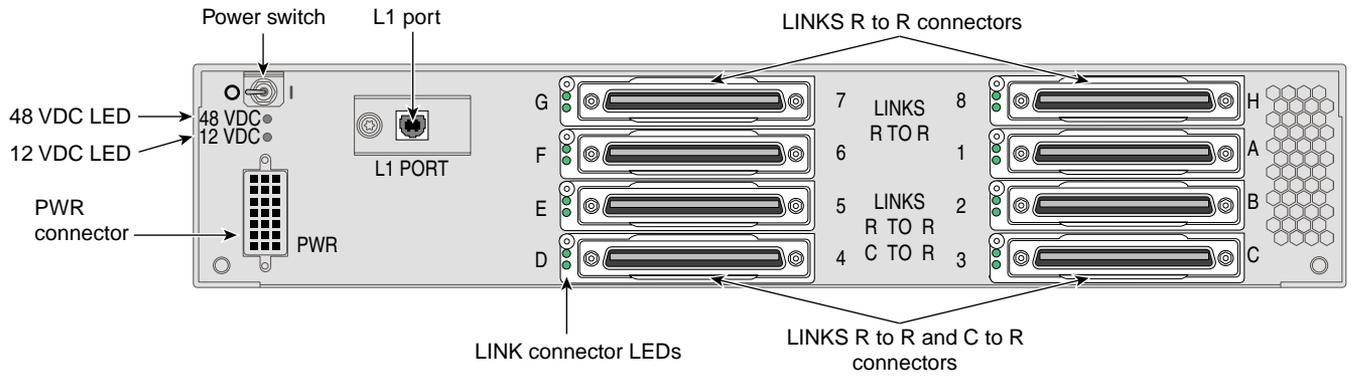


Figure 1-27 Rear View of NUMAlink Module

PCI Expansion Modules

Each Onyx 300 compute module contains two PCI slots; however, you can expand your I/O capabilities by adding one to four PCI expansion modules to your system. The following rules indicate how many PCI expansion modules you can add to your system:

- You can add one PCI expansion module to a system that contains two to seven compute modules.
- You can add two PCI expansion modules to a system that contains two to six compute modules.
- You can add three PCI expansion modules to a system that contains three to five compute modules.
- You can add four PCI expansion modules to a system that contains four compute modules.

The PCI expansion module, shown in Figure 1-28, contains six buses (buses 1 through 6) that can seat as many as twelve 3.3-V or universal PCI cards. Each bus has two PCI slots (refer to Figure 1-29) that are labeled 1 and 2 and that support either two 33-MHz PCI cards or two 66-MHz PCI cards.

The PCI expansion module connects to an Onyx 300 compute module via the LINK (NI) port or a NUMAlink module.

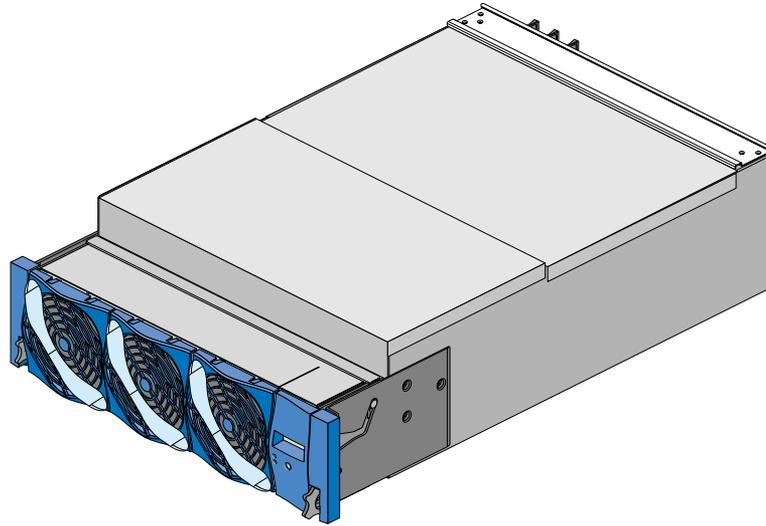


Figure 1-28 PCI Expansion Module

Figure 1-29 shows the PCI card slot numbering on the PCI expansion module.

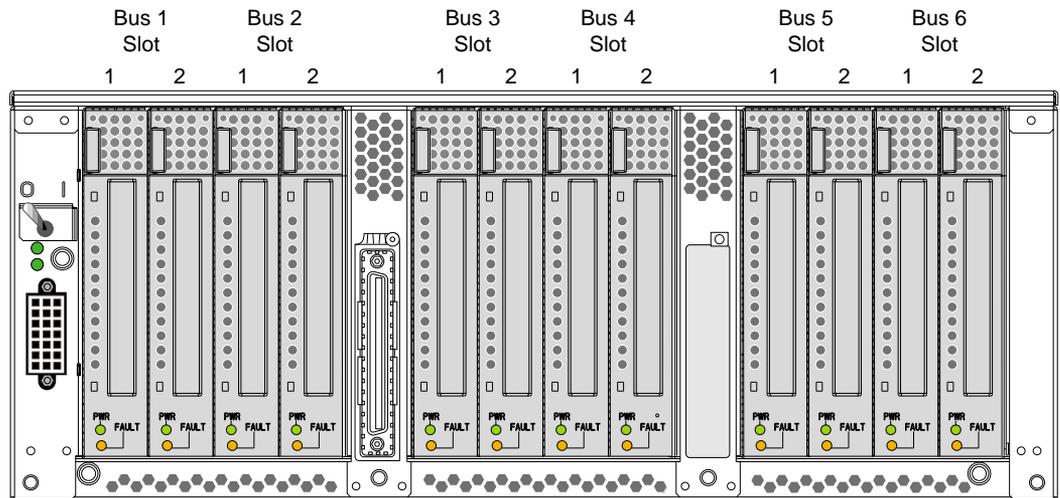


Figure 1-29 PCI Expansion Module PCI Card Slot Numbering

Front Components

The PCI expansion module contains the following front-panel items (refer to Figure 1-30):

- **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 switch with LED** enables you to manually power on and power off the module.
- **L1 controller LEDs:**
 - **On/Off switch LED** illuminates green when the internal components are powered on.
 - **Service required LED** illuminates orange to indicate that an item is not functioning properly (for example, a fan is off), but the PCI expansion module is still operating.
 - **Failure LED** illuminates red to indicate that a failure has occurred and the PCI expansion module is down.
- **Three fans** that provide N+1 redundant cooling for the module.

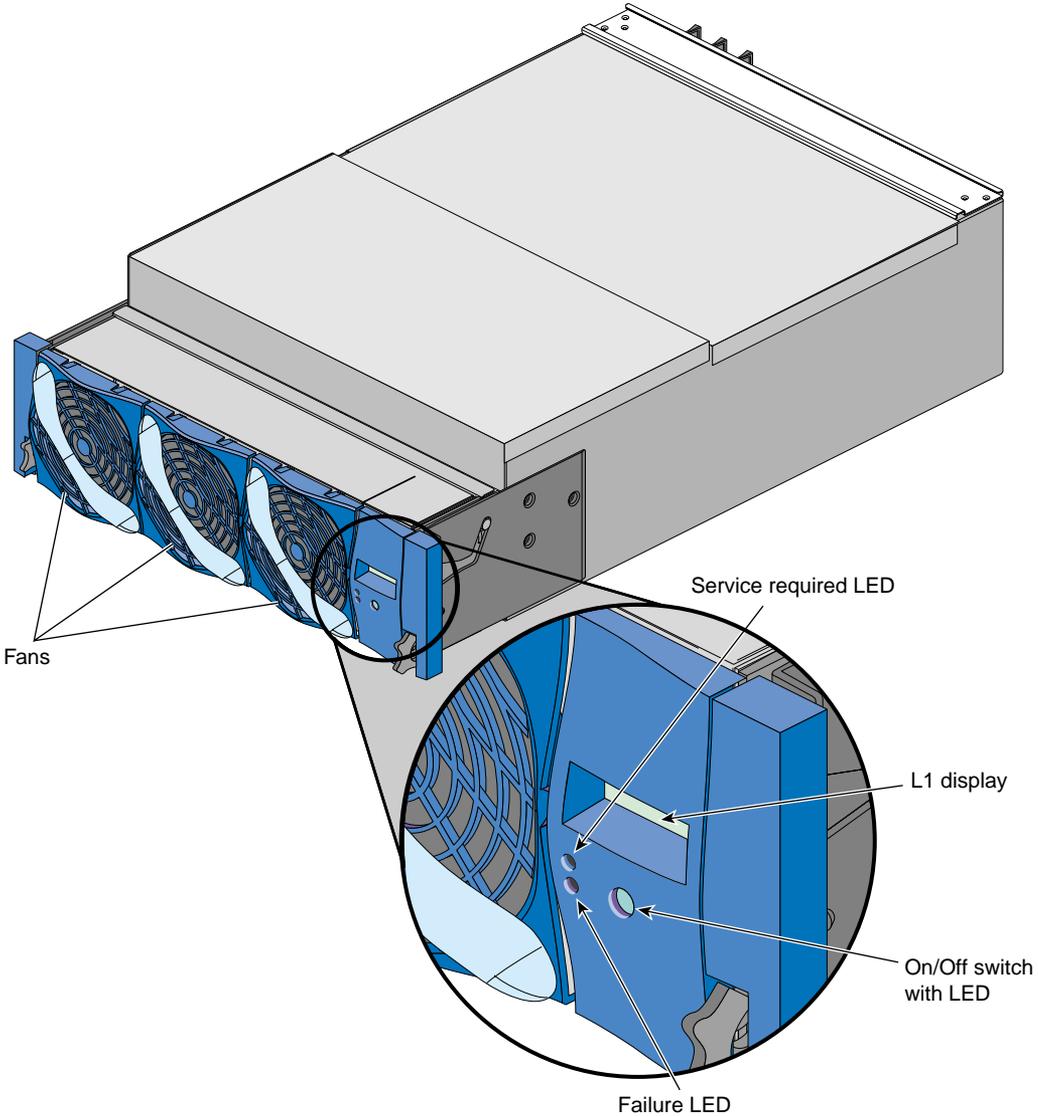


Figure 1-30 Front View of PCI Expansion Module

Rear Components

The PCI expansion module has the following rear-panel items (refer to Figure 1-31):

- **Power switch** powers on the L1 controller when moved to the **1** position; moving it to the **0** position powers off the L1 controller.
- **12 Vdc LED** illuminates green when the power switch is in the On position and the power bay supplies 12 Vdc to the module.
- **48 Vdc LED** illuminates green when the power bay supplies 48 Vdc to the module at the request of the L1 controller.
- **PWR (power) connector** attaches to the power bay via a DC power cable.
- **PCI slots** seat the PCI cards. Each slot has two LEDs:
 - **PWR (power) LED** illuminates green when the PCI card carrier is installed securely and is receiving power.
 - **Fault LED** illuminates orange when a fault occurs with the PCI card.
- **NUMAlink connector** attaches the PCI expansion module to a NUMAlink module or an Onyx 300 compute module via a NUMAlink cable.
- **Bulkhead filler plate** covers the unused connector slot so that air flows properly through the module.

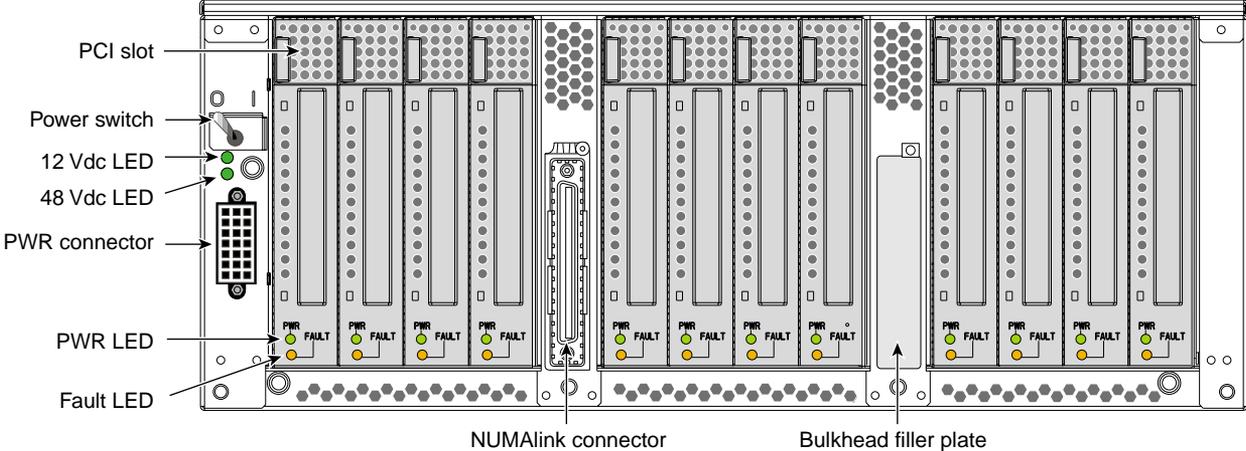


Figure 1-31 Rear View of PCI Expansion Module

Storage Expansion

Each Onyx 300 compute module contains two disk-drive bays; however, you can add additional storage to the system 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.
- For a Fibre Channel solution that supports both JBOD and RAID configurations, SGI offers the SGI Total Performance 9100 (TP9100) storage system.
- For a Fibre Channel RAID solution, SGI offers the SGI Total Performance 9400 (TP9400) storage system.

These solutions are discussed in the subsections that follow.

SGI TP900 Storage Module

The SGI TP900 storage module, shown in Figure 1-32, is a 2U-high 8-drive storage system that provides compact, high-capacity, high-availability JBOD storage for supported SGI compute modules. 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 (two strings of four drives).

This storage module has the following features:

- Low cost
- Mounts in a standard 19-in. rack; available in factory-installed configurations
- Uses SCSI Parallel Interface 3 (SPI-3) capable Low Profile (1-inch high) 3.5-inch disk drives
- Drive carriers that accept SGI-qualified 10,000 or 15,000 RPM U160 SCSI disk drives

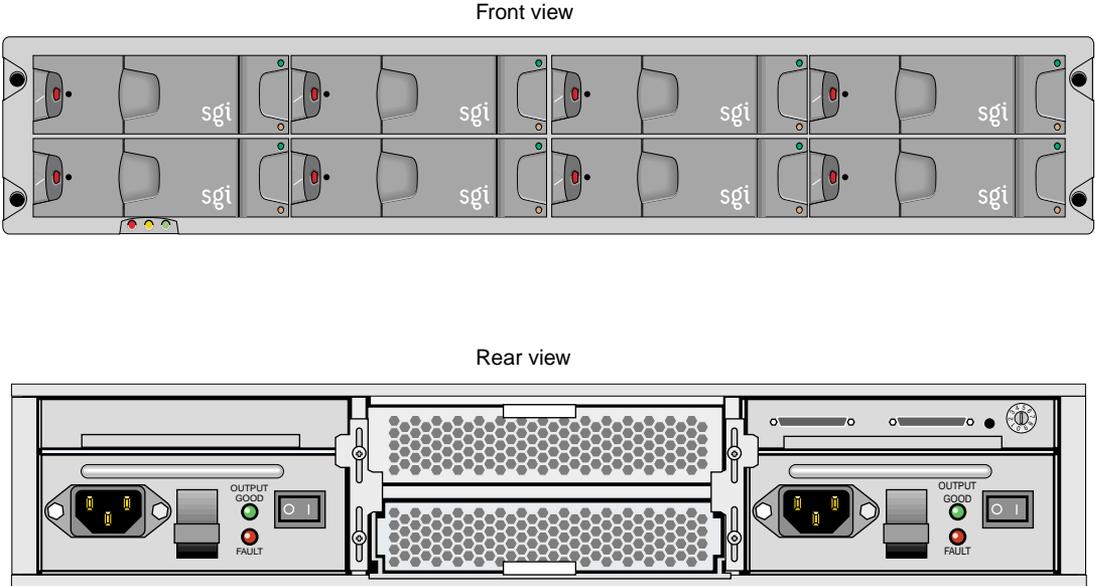


Figure 1-32 SGI TP900 Storage Module

The front of the SGI TP900 chassis consists of eight drive bays that contain either disk drive carrier modules or dummy carrier modules. The front of the TP900 is four bays wide by two bays high. The drive bays are numbered 1 and 2 from top to bottom and 1 to 4 from left to right. Refer to Figure 1-33.

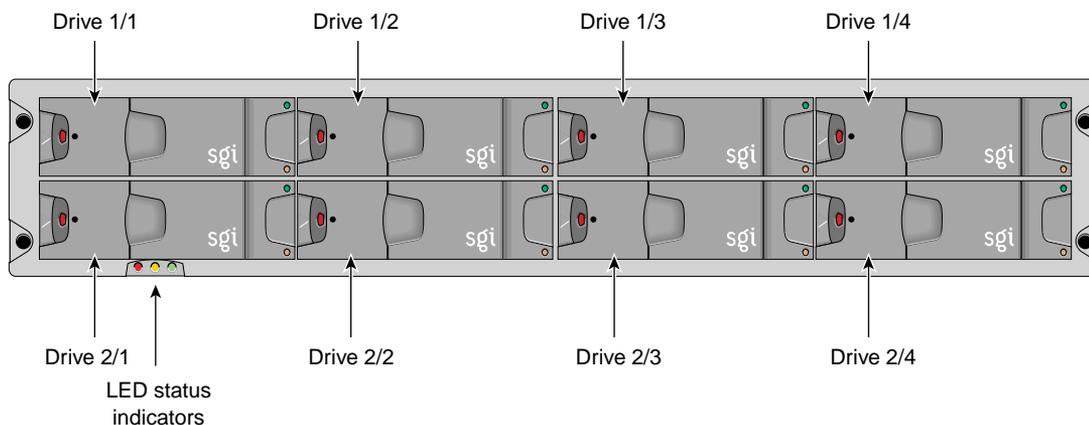


Figure 1-33 Front View of TP900 Storage Module

The front of the chassis also contains three LED status indicators. Table 1-4 provides more information about these LEDs.

Table 1-4 Status LEDs

LED	Status
System status	Green signifies that power is applied to the enclosure. Amber signifies that the ESI processor has failed.
Power status	Green signifies that the power supplies are functioning normally. Amber signifies a power supply failure.
Cooling status	Green signifies that all fans are functioning normally. Amber signifies a fan failure.

The rear of the TP900 storage module contains six bays that house power supply, cooling, and SCSI I/O modules. Refer to Figure 1-34. The rear of the TP900 storage module is three bays wide by two bays high. The bays are numbered 1 and 2 from top to bottom and 1 to 3 from right to left.

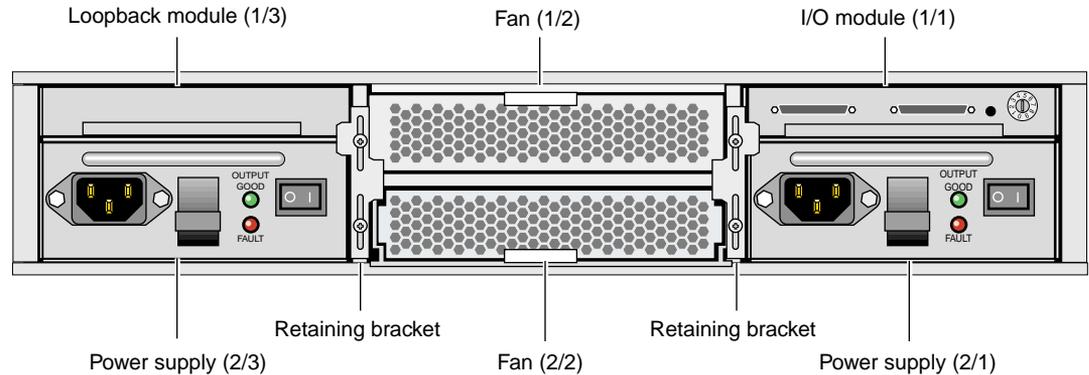


Figure 1-34 Rear View of TP900 Storage Module

The TP900 rear bays house the following components:

- **1 or 2 power supply modules** (The second power supply is optional.)
Power supply voltage operating ranges are nominally 115 V or 230 V and are selected automatically. The power supply module contains two LEDs that are located on the front panel of the power supply. The green LED indicates power output. The amber LED indicates a power supply failure.
- **1 or 2 input/output (I/O) modules**
Each I/O module contains two VHDCI connectors and a switch to set the SCSI ID range. When only one I/O module is present in the system, the other I/O module location contains a loopback module that has no external connectors.
- **1 or 2 cooling modules** (The second cooling module is optional.)
The cooling module consists of fans that cool the components of the storage module. In addition, the cooling module has two LEDs that are located on the front panel of the cooling module. The green LED indicates that the cooling module is functioning properly. The amber LED indicates a fan failure.
- **Blank modules**
Blank modules are placed in all vacant power supply and cooling module bays to maintain proper airflow through the system.

SGI TP9100 Storage System

The SGI Total Performance 9100 (TP9100), shown in Figure 1-35, is an affordable, entry-level RAID storage array that is easily expandable and comes in either a desktide 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. By purchasing a desktide model, you can start small and scale to a multi-terabyte environment. The drives within the desktide tower can easily slide into a rack to increase storage capacity. The compact design of the TP9100 enables as many as 108 drives to fit in a single cabinet.

This storage system has the following features:

- Converts easily from JBOD to RAID.
- Supports RAID levels 0, 1, 1+0, 3, and 5.
- The base unit comes with one RAID controller and can be upgraded to two controllers, allowing no single point of failure.
- Supports the latest in high-performance 18-GB, 36-GB, or 73-GB 10,000 RPM FC-AL (fibre channel-arbitrated loop) drives.
- Can be configured with as many as 60 drives per controller.
- Support for multi-platform OS-based servers: IRIX, Linux, Microsoft Windows NT, and Microsoft Windows 2000.
- Fully tested in SAN and switch environments.
- Nine TP9100 arrays can be rackmounted into a single cabinet, for a maximum of 108 drives per cabinet.
- Uninterrupted data access with automatic failover capability and hot-swappable, redundant components.

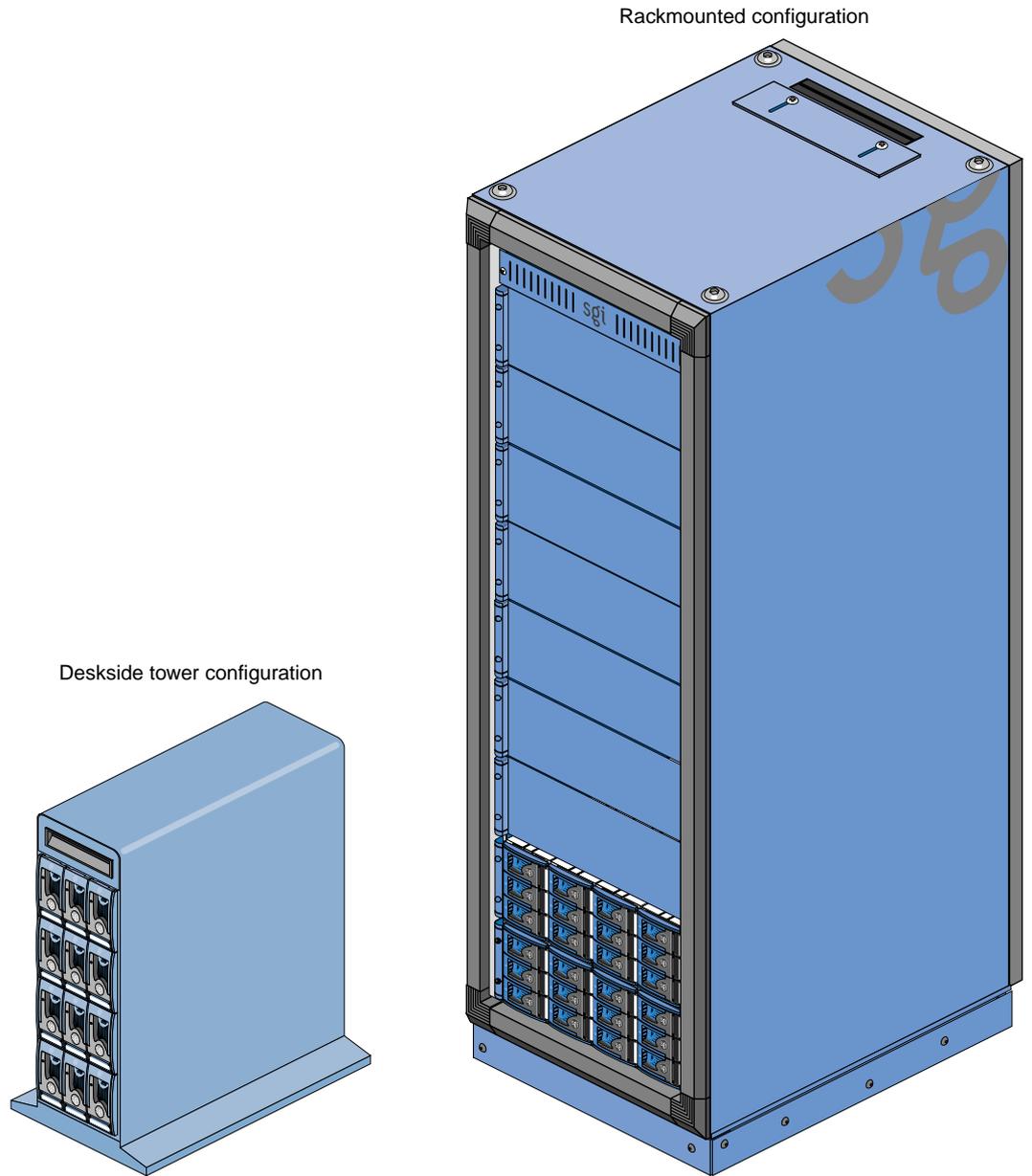


Figure 1-35 SGI TP9100 Storage System

SGI TP9400 Storage System

The SGI Total Performance 9400 (TP9400), shown in Figure 1-36, is a highly scalable RAID storage subsystem. It supports more than 8 TB of fast storage in a 19-inch rack enclosure and can grow from as few as 73 GB of storage to whatever size you require without disruption to normal processing activities. The TP9400 has continuous availability; all active components may be configured redundantly and installed “hot” as customer replaceable or expansion units.

This storage system has the following features:

- Full RAID support, implemented in hardware with custom ASICs for performance.
- Total fibre channel design, including all-fibre dual-ported disk drives.
- As many as eight internal optical fibre hubs for online expansion and connectivity.
- Four fibre channel loops support I/O reads as fast as 357 MB/s and writes as fast as 239 MB/s.
- Direct attachment of up to eight host systems using optical fibre cables.
- Full support for all SAN topologies.
- Dual active controllers with as much as 1 GB redundant cache and dual battery backup.
- User-friendly GUI or command line interface software for installation and management.
- In-band and out-of-band management, including e-mail event notification.
- As many as 100 drives in each rack (36- or 73-GB 10,000-RPM drives).
- Support for system and file clustering.
- Host failover software supports logical volume management and load balancing.

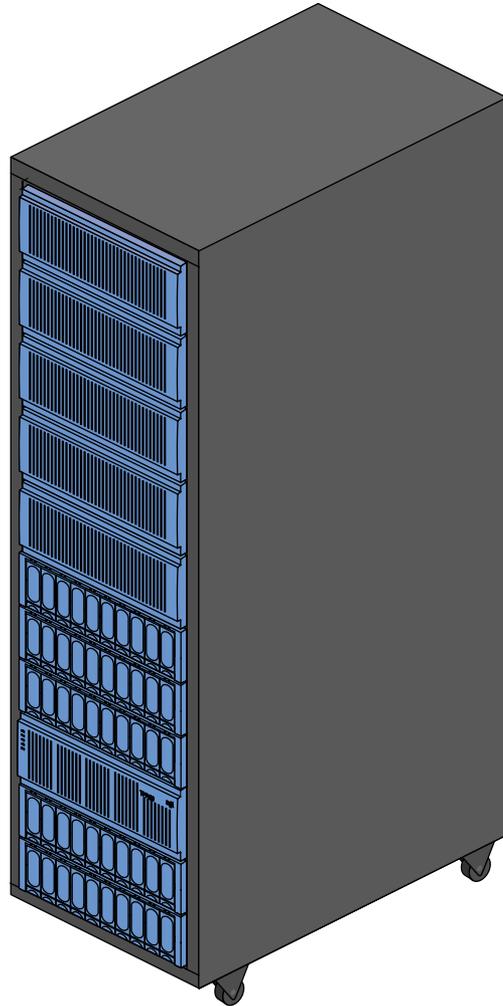


Figure 1-36 SGI TP9400 Storage System

Tape Devices

The Onyx 300 graphics system supports the following DAT (digital audio tape) option:

- **4mm DAT.** Offers a storage capacity of 20 GB (native) and a data transfer rate of 2.36 MB/s. This drive is the least expensive media and is a viable solution for small file sizes and instances when backup time is not an issue.

All of the following tape devices have faster transfer rates, can store larger amounts of data, and, in general terms, are more reliable and more scalable than the DAT option. The main differences between these devices is the mode of operation; they are either start/stop devices or streaming devices. Start/stop devices are better suited for HSM (hierarchical storage management) applications where access to the first byte of data is critical and heavy start- and stop-activity takes place. Streaming devices are better suited for backup and restore applications where massive amounts of data are being written and read in one operation.

The start/stop devices are:

- **9840.** Offers SCSI and native fibre channel connectivity, storage capacity of 20 GB (native), and a data transfer rate of 10 MB/s.
- **9840B.** Offers SCSI and native fibre channel connectivity, storage capacity of 20 GB (native), and a data transfer rate of 20 MB/s.
- **9940.** Offers SCSI and native fibre channel connectivity, storage capacity of 60 GB (native), and a data transfer rate of 10 MB/s.

The streaming devices are:

- **DLT (digital linear tape) 8000 (7000 emulation).** Offers SCSI connectivity, storage capacity of 35 GB, and a data transfer rate of 5.0 MB/s.
- **DLT 8000 (native mode).** Offers SCSI connectivity, storage capacity of 40 GB, and a data transfer rate of 6.0 MB/s.
- **ULTRIUM LTO.** Offers SCSI connectivity, storage capacity of 100 GB (native), and a data transfer rate of 15 MB/s.
- **SDLT.** Offers SCSI connectivity, storage capacity of 110 GB, and a data transfer rate of 11 MB/s. The SDLT is backward read compatible (BRC) with DLT 4000, DLT 7000, and DLT 8000 drives; however, SDLT performance is affected when reading legacy media.

The 4mm DAT can be mounted in the Onyx 300 rack or placed on a table. All other supported tape devices are housed within one of the following libraries: L20, L40, L80, L180, or L700 (refer to Table 1-5).

Note: In Table 1-5, device transfer rates are dictated by the profile of the data being transferred and are likely to be less than the rated speed, depending on the size of files and the block size.

Table 1-5 Tape Drive Libraries

Library	Specifications
L20	<p>Number of cartridge slots: 10 or 20</p> <p>Number of drives: 1 or 2</p> <p>Supported drives: DLT 8000 (native mode), LTO ULTRIUM, and SDLT</p> <p>Cartridge capacity:</p> <p>DLT 8000: 800 GB (20 slots, UNC) - 1.6 TB (20 slots, COM)</p> <p>LTO ULTRIUM: 2.0 TB (20 slots, UNC) - 4.0 TB (20 slots, COM)</p> <p>SDLT: 2.2 TB (20 slots, UNC) - 4.4 TB (20 slots, COM)</p> <p>Drive data rate:</p> <p>DLT 8000: 43.2 GB/hr (2 drives, UNC) - 86.4 GB/hr (2 drives, COM)</p> <p>LTO ULTRIUM: 108 GB/hr (2 drives, UNC) - 216 GB/hr (2 drives, COM)</p> <p>SDLT: 79.2 GB/hr (2 drives, UNC) - 158.4 GB/hr (2 drives, COM)</p>
L40	<p>Number of cartridge slots: 20 or 40</p> <p>Number of drives: 1 to 4</p> <p>Supported drives: DLT 8000 (native mode), LTO ULTRIUM, and SDLT</p> <p>Cartridge capacity:</p> <p>DLT 8000: 1.6 TB (40 slots, UNC) - 3.2 TB (40 slots, COM)</p> <p>LTO ULTRIUM: 4.0 TB (40 slots, UNC) - 8.0 TB (40 slots, COM)</p> <p>SDLT: 4.4 TB (40 slots, UNC) - 8.8 TB (40 slots, COM)</p> <p>Drive data rate:</p> <p>DLT 8000: 86.4 GB/hr (4 drives, UNC) - 172.8 GB/hr (4 drives, COM)</p> <p>LTO ULTRIUM: 216 GB/hr (4 drives, UNC) - 432 GB/hr (4 drives, COM)</p> <p>SDLT: 158.4 GB/hr (4 drives, UNC) - 316.8 GB/hr (4 drives, COM)</p>

Key: UNC = uncompressed, COM = compressed

Table 1-5 (continued) Tape Drive Libraries

Library	Specifications
L80	<p>Number of cartridge slots: 40, 60, or 80</p> <p>Number of drives: 1 to 8</p> <p>Supported drives: DLT 8000 (native mode), LTO ULTRIUM, and SDLT</p> <p>Cartridge capacity:</p> <ul style="list-style-type: none">DLT 8000: 3.2 TB (80 slots, UNC) - 6.4 TB (80 slots, COM)LTO ULTRIUM: 8.0 TB (80 slots, UNC) - 16.0 TB (80 slots, COM)SDLT: 8.8 TB (80 slots, UNC) - 17.6 TB (80 slots, COM) <p>Drive data rate:</p> <ul style="list-style-type: none">DLT 8000: 172.8 GB/hr (8 drives, UNC) - 345.6 GB/hr (8 drives, COM)LTO ULTRIUM: 432 GB/hr (8 drives, UNC) - 864 GB/hr (8 drives, COM)SDLT: 316.8 GB/hr (8 drives, UNC) - 633.6 GB/hr (8 drives, COM)
L180	<p>Number of cartridge slots: 84, 140, or 174</p> <p>Number of drives: 1 to 10</p> <p>Supported drives: DLT 8000 (native mode), DLT 8000 (7000 emulation), LTO ULTRIUM, and SDLT</p> <p><i>or</i></p> <p>Number of drives: 1 to 6</p> <p>Supported drives: 9840 and 9840B</p> <p>Cartridge capacity:</p> <ul style="list-style-type: none">DLT 8000 (native): 6.96 TB (174 slots, UNC) - 13.92 TB (174 slots, COM)DLT 8000 (7000 em): 6.09 TB (174 slots, UNC) - 12.18 TB (174 slots, COM)LTO ULTRIUM: 17.4 TB (174 slots, UNC) - 34.8 TB (174 slots, COM)SDLT:- 19.14 TB (174 slots, UNC) - 38.28 TB (174 slots, COM)9840: 3.48 TB (174 slots, UNC) - 6.96 TB (174 slots, COM) <p>Drive data rate:</p> <ul style="list-style-type: none">DLT 8000 (native): 216 GB/hr (10 drives, UNC) - 432 GB/hr (10 drives, COM)DLT 8000 (7000 em): 180 GB/hr (10 drives, UNC) - 360 GB/hr (10 drives, COM)LTO ULTRIUM: 540 GB/hr (10 drives, UNC) - 1.08 TB/hr (10 drives, COM)SDLT: 396 GB/hr (10 drives, UNC) - 792 GB/hr (10 drives, COM)9840: 216 GB/hr (6 drives, UNC) - 432 GB/hr (6 drives, COM)9840b: 432 GB/hr (6 drives, UNC) - 864 GB/hr (6 drives, COM)

Table 1-5 (continued) Tape Drive Libraries

Library	Specifications
L700	<p>Number of cartridge slots: 216, 384, or 678</p> <p>Number of drives: 1 to 20</p> <p>Supported drives: DLT 8000 (native mode), DLT 8000 (7000 emulation), LTO ULTRIUM, and SDLT</p> <p><i>or</i></p> <p>Number of drives: 1 to 12</p> <p>Supported drives: 9840, 9840B, and 9940</p> <p>Cartridge capacity:</p> <p>DLT 8000: 27.1 TB (678 slots, UNC) - 54.2 TB (678 slots, COM)</p> <p>DLT 8000 (7000 em): 23.7 TB (678 slots, UNC) - 47.4 TB (678 slots, COM)</p> <p>LTO ULTRIUM: 67.8 TB (678 slots, UNC) - 135.6 TB (678 slots, COM)</p> <p>SDLT: 74.5 TB (678 slots, UNC) - 149 TB (678 slots, COM)</p> <p>9840: 13.6 TB (678 slots, UNC) - 40.8 TB (678 slots, COM)</p> <p>9940: 40.68 TB (678 slots, UNC) - 89.5 TB (678 slots, COM)</p> <p>Drive data rate:</p> <p>DLT 8000:- 432 GB/hr (20 drives, UNC) - 864 GB/hr (20 drives, COM)</p> <p>DLT 8000 (7000 em): 360 GB/hr (20 drives, UNC) - 720 GB/hr (20 drives, COM)</p> <p>LTO ULTRIUM: 1.08 TB/hr (20 drives, UNC) - 2.16 TB/hr (20 drives, COM)</p> <p>SDLT: 792 GB/hr (20 drives, UNC) - 1.58 TB/hr (20 drives, COM)</p> <p>9840: 432 GB/hr (12 drives, UNC) - 864 GB/hr (12 drives, COM)</p> <p>9840b: 864 GB/hr (12 drives, UNC) - 1.73 TB/hr (12 drives, COM)</p> <p>9940: 432 GB/hr (12 drives, UNC) - 864 GB/hr (12 drives, COM)</p> <p>Key: UNC = uncompressed, COM = compressed, em = emulation</p>

Table 1-6 lists the supported tape options and their specifications.

Table 1-6 Tape Drive Comparison Chart

Tape Device	Interface	Media Capacity	Transfer Rate	Mount Location
4mm DAT	SCSI	20 GB	2.36 MB/s	Onyx 300 rack or table
9840	SCSI and fibre channel	20 GB	10 MB/s	L180 or L700
9840B (when available)	SCSI and fibre channel	20 GB	20 MB/s	L180 or L700
DLT 8000 (7000 emulation)	SCSI	35 GB	5 MB/s	L180 or L700
DLT 8000 (native mode)	SCSI	40 GB	6 MB/s	All libraries
9940	SCSI and fibre channel	60 GB	10 MB/s	L700
LTO ULTRIUM	SCSI	100 GB	15 MB/s	All libraries
SDLT (when available)	SCSI	110 GB	11 MB/s	All libraries

USB Hub

The USB hub, shown in Figure 1-37, routes information between the L2 controller and the four Onyx 300 compute modules that connect to NUMAlink module ports 1, 6, 7, and 8 (the ports that do not carry USB signals). In multiple-rack systems, USB hubs also route information between the L2 controller and the InfiniteReality graphics modules.

Note: The appearance of the USB hub might differ from the one shown in Figure 1-37.

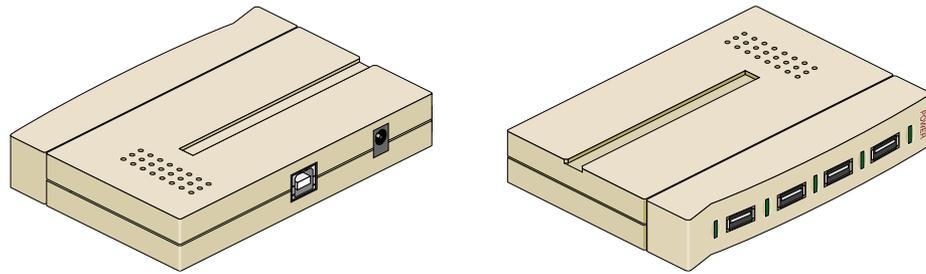


Figure 1-37 USB Hub

CD-ROM Drive

The 40X CD-ROM drive is a half-height, high-capacity (approximately 600 MB, formatted), high-performance device that is packaged in a custom external enclosure designed to match other SGI external peripherals. It is capable of transferring data at up to 6.0 MB/s. It can connect to the Onyx 300 compute module via the SCSI port connector or a SCSI PCI card.

Speakers

An SGI Onyx 300 graphics system can connect to Genelec digital audio speakers that have the following features:

- 96-KHz / 24-bit digital audio interface
- AES/EBU digital audio and analog inputs
- Single-knob, stereo-pair volume and balance control
- Signal indicator LED (green = analog signal, yellow = digital signal, red = error)

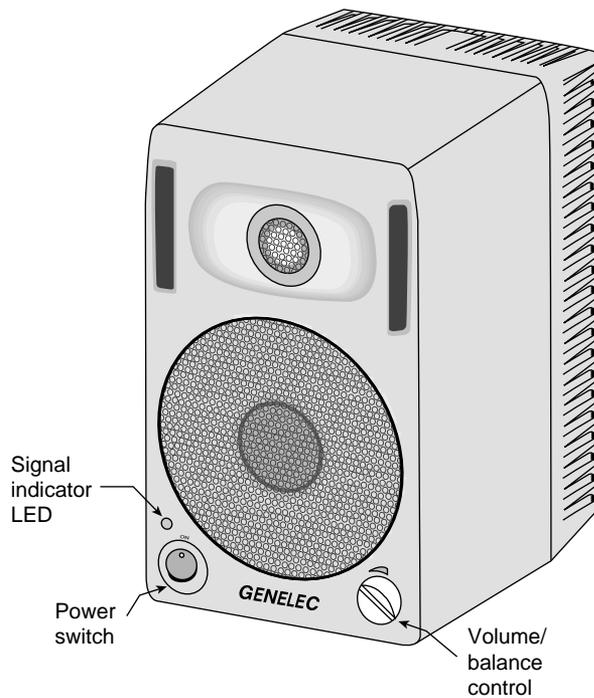


Figure 1-38 Front View of Speaker

Radical Audio PCI Card

Radical audio PCI card provides Audio Engineering Society (AES) digital audio input and output. It has eight input/output channels and a BNC AES connector.

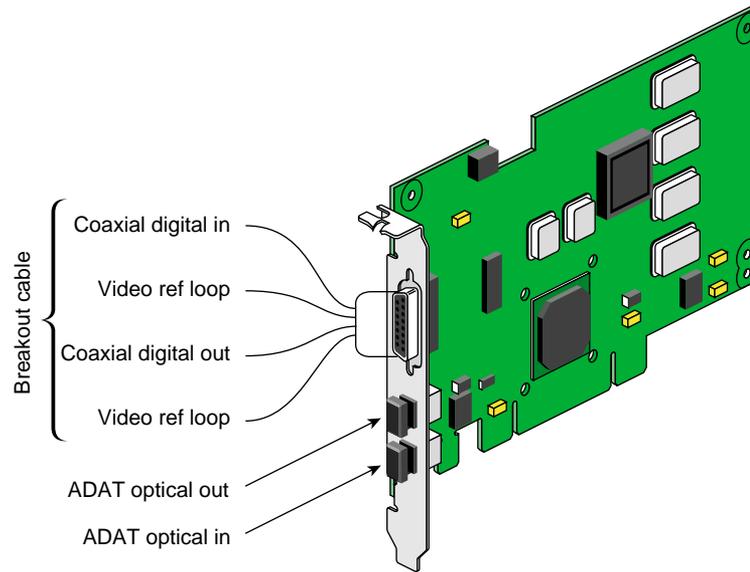


Figure 1-39 Radical Audio PCI Card

Table 1-7 describes the connectors.

Table 1-7 Audio PCI Card Connectors

Connector	Description
Coaxial digital audio input	AES-3id 75-ohm BNC connector, breakout cable AES11 synchronization input (for audio clock rates) AES3 professional 2-channel 24-bit digital Compatible with IEC958, S/PDIF consumer 2-channel digital
Video reference loop	75-ohm BNC connector, breakout cable
Coaxial digital audio output	AES-3id 75-ohm BNC connector, breakout cable AES11 synchronization output AES3 professional 2-channel 24-bit digital Compatible with IEC958, S/PDIF consumer 2-channel digital
ADAT optical in	12.8-Mb/s SHARP multimode plastic fiber-optic connector, PCI I/O panel 8-channel, 24-bit ADAT optical interface Compatible with IEC958, S/PDIF consumer 2-channel digital
ADAT optical out	12.8-Mb/s SHARP multimode plastic fiber-optic connector, PCI I/O panel 8-channel, 24-bit ADAT optical interface Compatible with IEC958, S/PDIF consumer 2-channel digital

Operation Procedures

This chapter describes how to operate your SGI Onyx 300 graphics system. Specifically, it explains how to perform the following procedures:

- “Connecting Monitor” on page 64
- “Connecting Keyboard and Mouse” on page 66
- “Connecting Speakers” on page 71
- “Connecting System Console to System” on page 75
- “Powering System On and Off” on page 77
- “Monitoring System” on page 94
- “Installing or Removing Disk Drives” on page 95



Warning: Before you install, operate, or service any part of this product, please read the safety information.

Safety Information



Warning: Power off the equipment before you install or remove power cords. The SGI Onyx 300 graphics system operates on 200-240 Vac. Use extreme caution when working around this voltage.



Caution: Always use two people to move the 24-inch SuperWide color monitors. Be sure to practice proper lifting techniques.

Note: This product requires the use of external shielded cables in order to maintain compliance with Part 15 of the FCC rules.

Connecting Monitor

A high-resolution SuperWide (1920 x 1200-pixel) 24-inch monitor is shipped as a standard monitor for the SGI Onyx 300 graphics systems. The graphics monitor connects to the DG5 board located in the InfiniteReality graphics module via a 30-ft. (9.1-m) monitor cable. Refer to Figure 2-1.



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 SGI Onyx 300 graphics system and it has adjustable RGB connectors, ensure that they are in the 75-ohm position; otherwise, the monitor displays incorrect colors.

The default monitor resolution supported by the SGI Onyx 300 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.

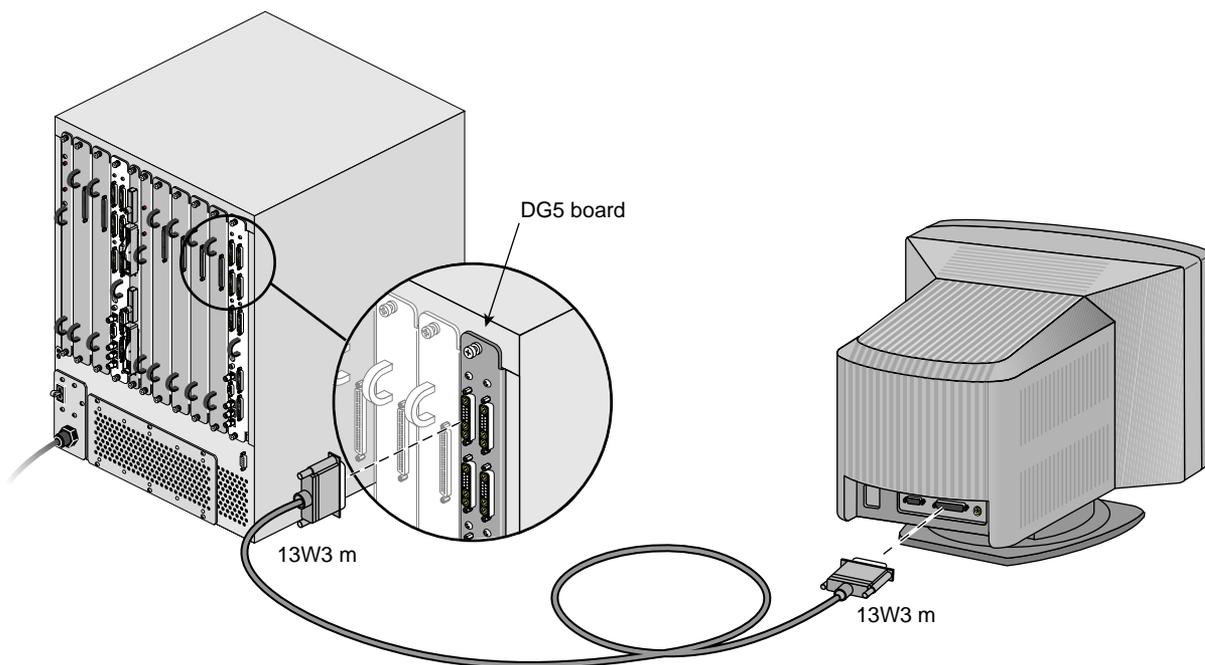


Figure 2-1 Monitor-to-DG5 Connection

Connecting Keyboard and Mouse

To use your SuperWide monitor, your graphics system is shipped with a standard 101-key USB keyboard and a USB mouse that you can plug directly into the USB connectors of an Onyx 300 compute module (refer to Figure 2-2); however, unless you want your keyboard and mouse located close to the compute module, SGI recommends that you use a USB extender. The USB extender allows you to place the keyboard and mouse up to 328.68 ft (100 m) from the Onyx 300 compute module. Refer to Figure 2-3.

Note: You can have one keyboard and one mouse per graphics pipe.

Note: The 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.

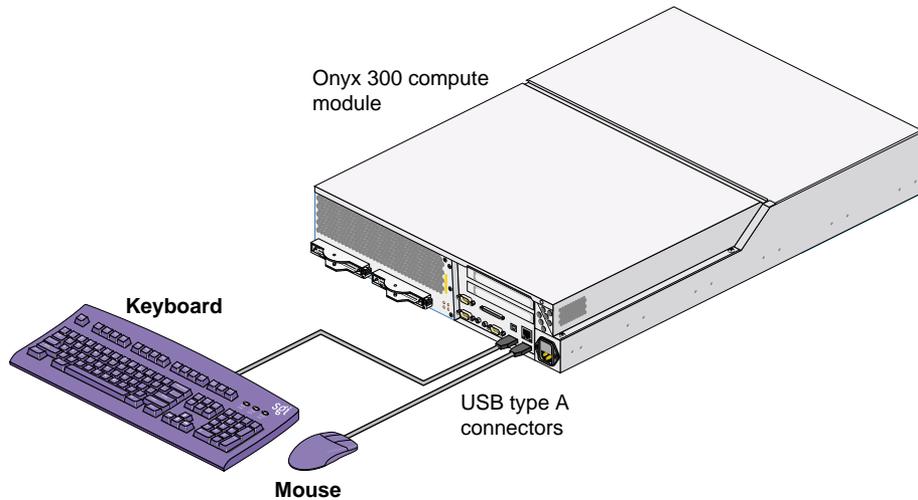


Figure 2-2 Keyboard and Mouse Connections Directly to Compute Module

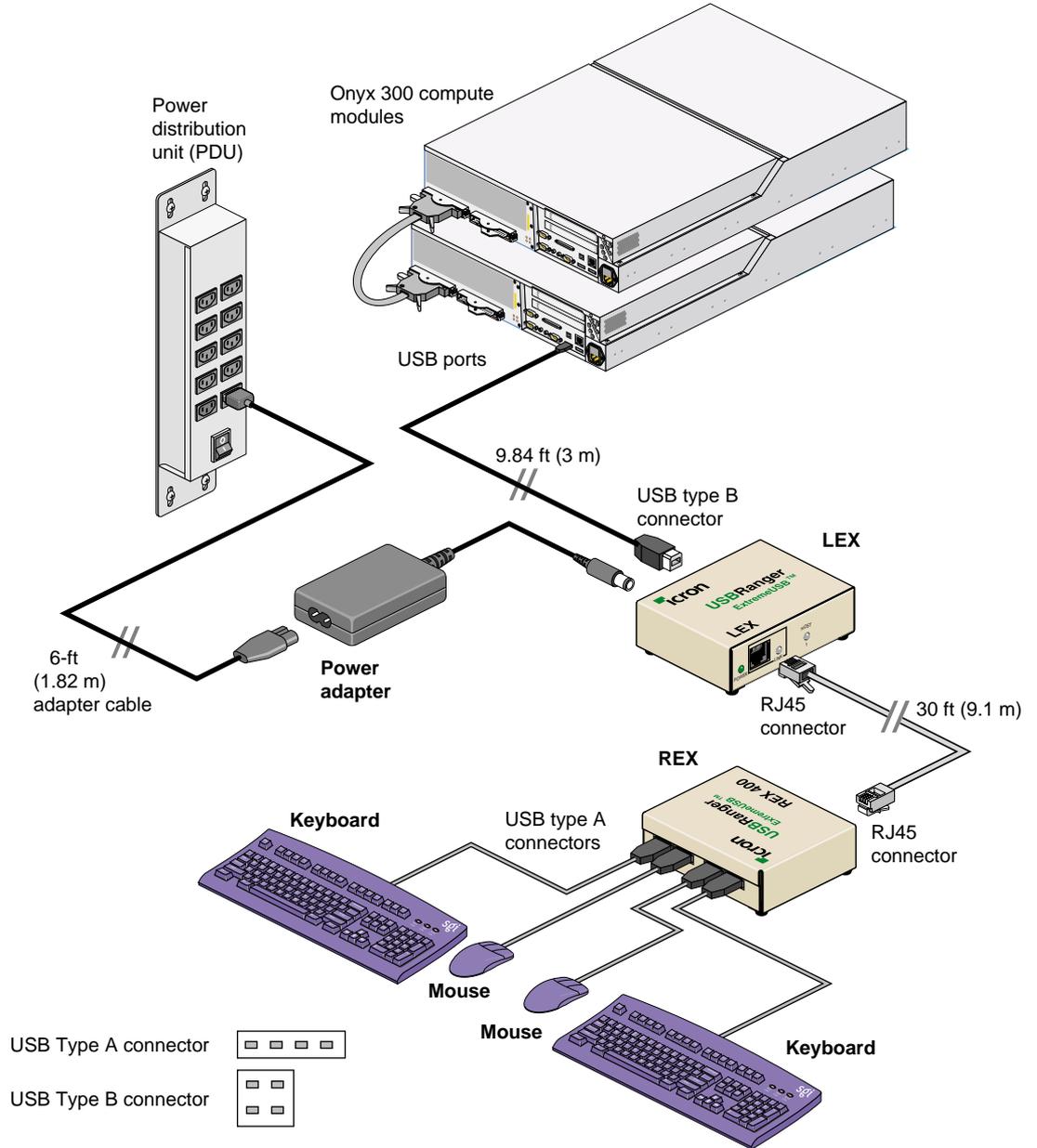


Figure 2-3 Keyboard and Mouse Connections via USB Extender

The `ioconfig(1m)` command establishes logical device numbers for each keyboard and mouse in an SGI Onyx 300 graphics 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. For example:

```
0 /hw/module/001c13/Ibrick/xtalk/15/pci/5/usb/1/1/keyboard
0 /hw/module/001c13/Ibrick/xtalk/15/pci/5/usb/1/2/mouse
```

Note: 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.” For example:

```
/hw/module/001c13/Ibrick/xtalk/15/pci/5/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 5 of the compute module that is 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.

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.

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

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

Follow these steps to reconfigure the keyboard and mouse setup:

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 are the keys to binding 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.

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 to use the devices.

Connecting Speakers

The graphics system can connect to digital audio speakers. The speakers, like the one shown in Figure 2-4, have the following features:

- 96-kHz/24-bit digital audio interface.
- AES/EBU digital audio and analog audio inputs.
- Single-knob stereo pair volume and balance control.

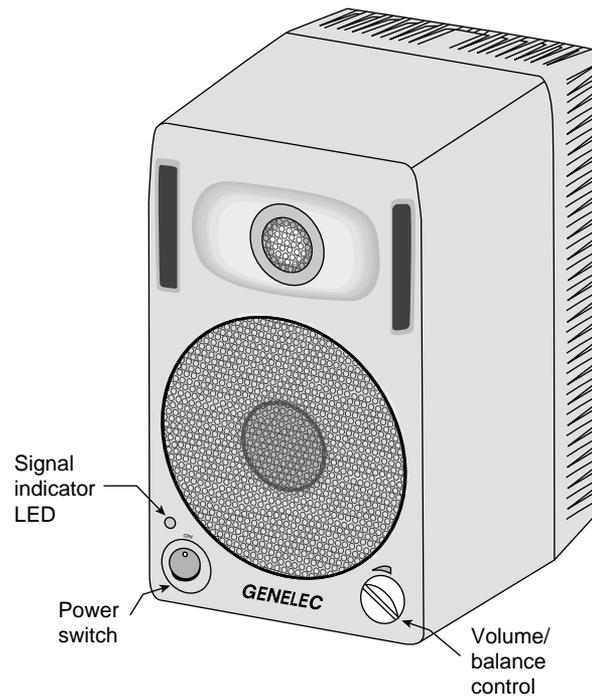


Figure 2-4 Front View of Speaker

Warning: Each of the speakers weighs 12.5 pounds (5.7 kg). Secure or enclose speakers that are placed off the ground to prevent them from falling and causing injury to personnel or damage to equipment.

The speakers connect to a radical audio PCI card that resides in an Onyx 300 compute module or PCI expansion module. Refer to Figure 2-5 for connections between the audio PCI card and the speakers.

To connect the speakers, follow these steps:

1. Locate the audio PCI card and connect the audio breakout cable to the DB15 connector.
2. Connect one end of a BNC audio cable (a 30-ft. extension cable) to the AES-3id digital audio connection on the breakout cable (the blue BNC connector).

Note: The breakout cable has four BNC connections. Only the blue connection is used.)

3. Connect the other end of the BNC audio cable to the back of the right speaker.
4. Connect the left and right speakers to each other with the cable provided.

Note the following operating information before you use your speakers:

- The “commercial” version of the speakers is labeled Model 2029B. The SGI version is the Model 2029B-Y, which differs in the following ways:
 - The digital input on the right (master) speaker is equipped with a BNC input connector (the commercial version has an XLR connector).
 - Each speaker in a pair is labeled as either 2029BL-Y (left) or 2029BR-Y (right).
- Each speaker is equipped with its own power cord.
- The speakers are dual-voltage (switchable between 110 V and 220 V operation).
- Each speaker has its voltage switch set to 220 V operation as a default. If you are in North America or other locations using 110 V sources, you need to manually switch to 110 V.



Caution: Do not plug the speaker into 220 V if the voltage select switch is set to 110 V, or the speaker fuse will blow. If the switch is set to 220 V and you plug the speaker into 110 V, the speaker will not function properly, and the speaker fuse may blow.

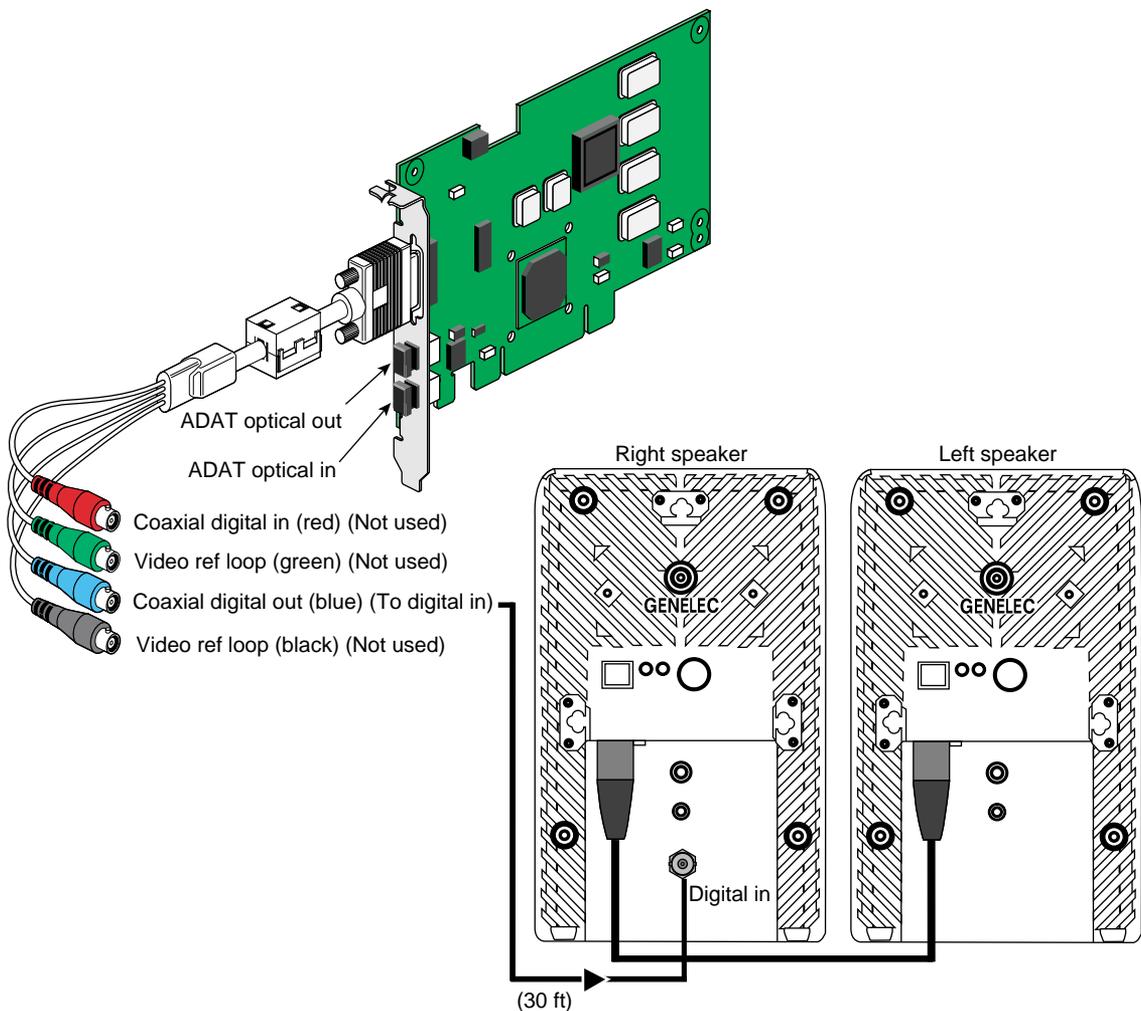


Figure 2-5 Connecting the Audio PCI Card to Speakers

Figure 2-6 shows the location of the controls and connectors on the back of the right speaker.

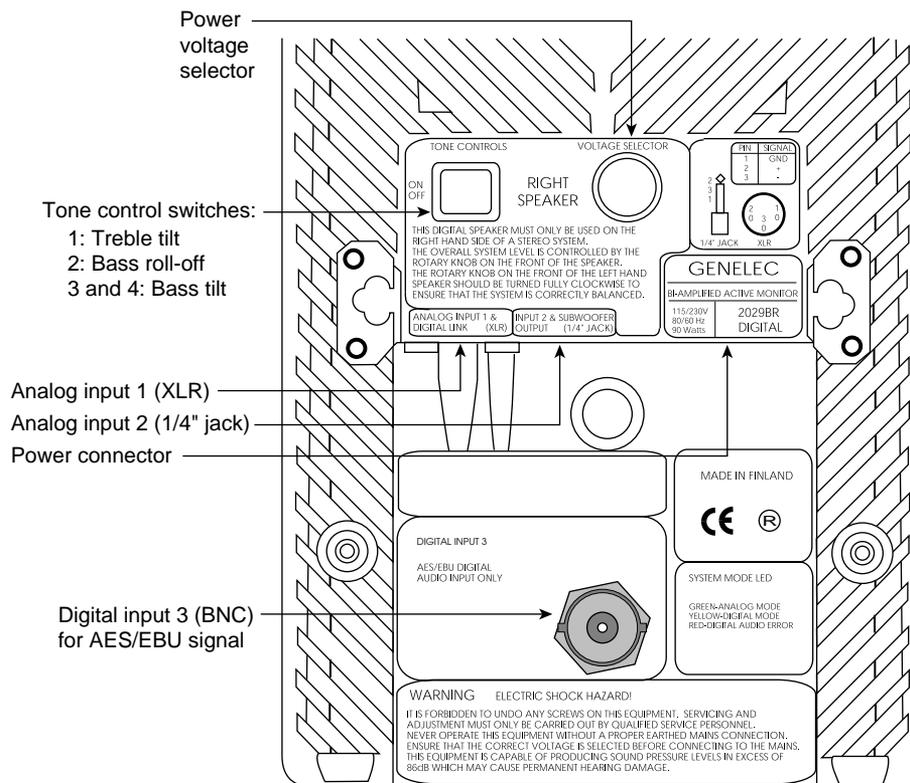


Figure 2-6 Right Speaker Rear Controls and Connectors

Figure 2-7 shows the connector that is used on the speaker-to-speaker interconnect cable.

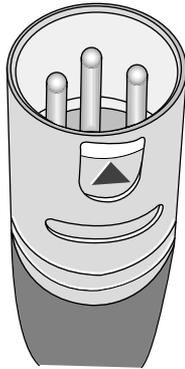


Figure 2-7 Speaker-to-speaker Cable Connector

Connecting System Console to System

The system console, which is an optional component, enables you to perform the following activities:

- Monitor your system by reading the status and error message information that the L1 and L2 controllers generate.
- Enter L1 and L2 controller commands to monitor or change particular system functions. You can, for example, monitor the speed of fans for a particular module.
- Power on or power off individual modules or all modules (except for the storage modules) in your system.
- If you connect a console that contains SGIconsole software, you can perform the functions listed above and have boundary scan capabilities. Boundary scan capabilities enable an SGI system support engineer (SSE) to test the functionality of your system.

To attach a system console that runs the SGIconsole software to your system, connect the system console to the L2 controller Ethernet port connector as shown in Figure 2-8.

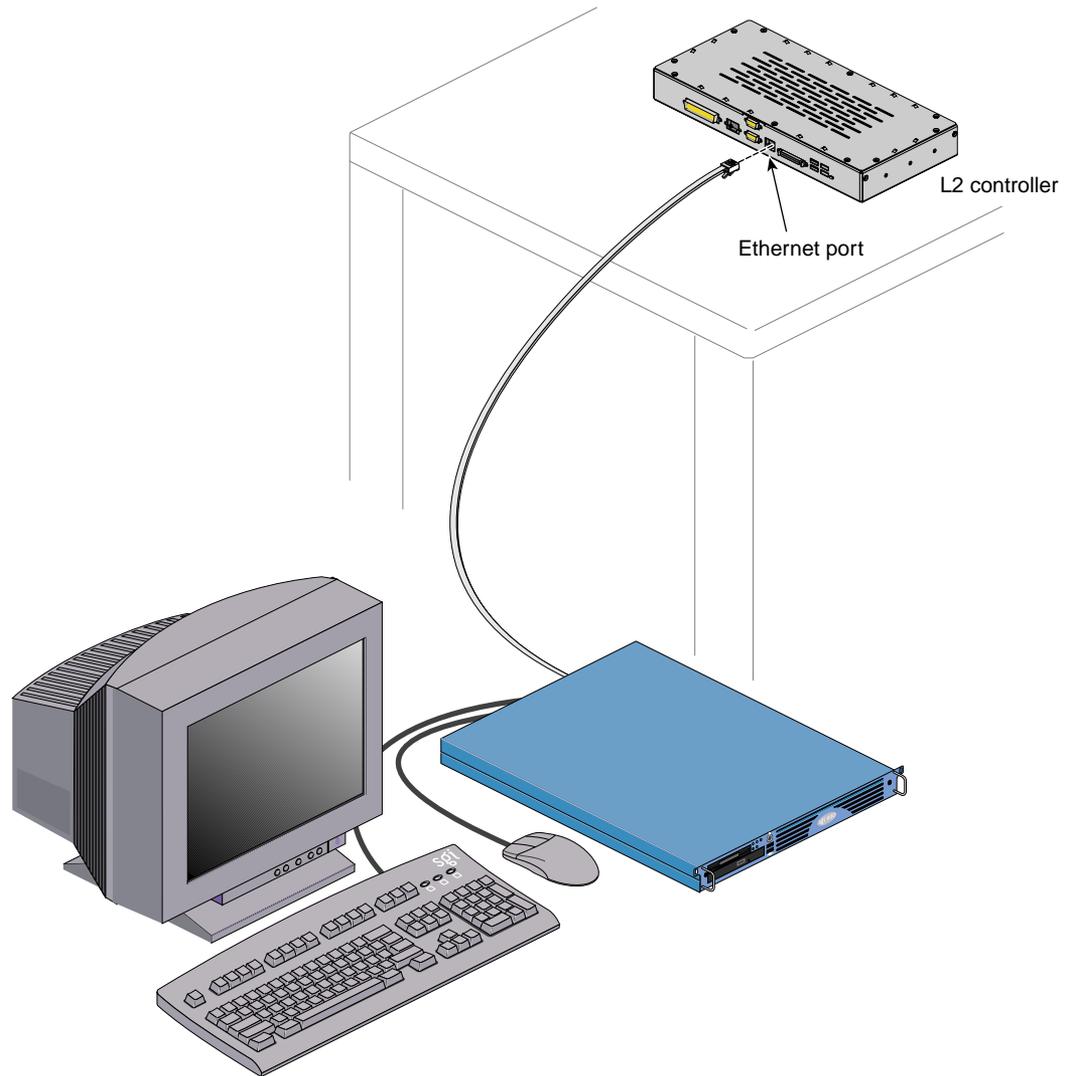


Figure 2-8 Connecting the System Console to the L2 Controller Ethernet Port

Powering System On and Off

The following sections describe how to power on and power off individual modules or your entire SGI Onyx 300 system.

- “Powering On” on page 77
- “Powering Off” on page 91

Note: The following information applies to the InfiniteReality graphics modules, Onyx 300 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 1 position. Refer to Figure 2-9.

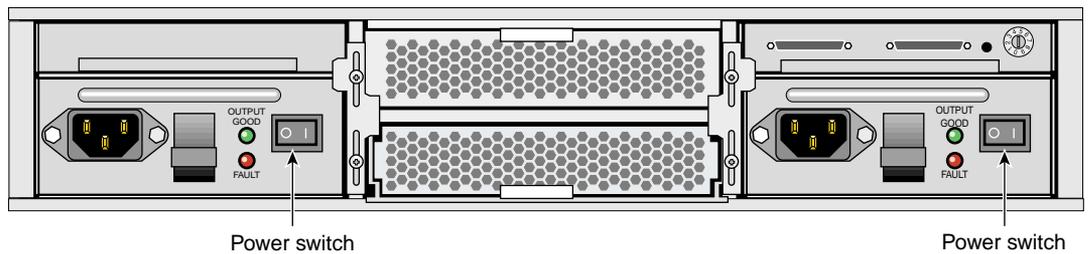


Figure 2-9 TP900 Power Switch (1 Position)

Powering On

This section describes how to perform the following procedures:

- Preparing to power on
- Powering on at the system console
- Powering on with switches

Preparing to Power On

To prepare to power on the system, perform the following tasks:

- Confirm that the power cables between the following components are secure:
 - The InfiniteReality graphics module(s) and the external power receptacle(s) (refer to Figure 2-10).
 - The power bay and the following modules: NUMALink module, PCI expansion module(s), and L2 controller module (refer to Figure 2-10).
 - The power distribution unit (PDU) and the following components: Onyx 300 compute module(s), USB hub, TP900 storage module(s), and power bay.
 - The PDU and the external power receptacle.

Figure 2-10 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 the system.

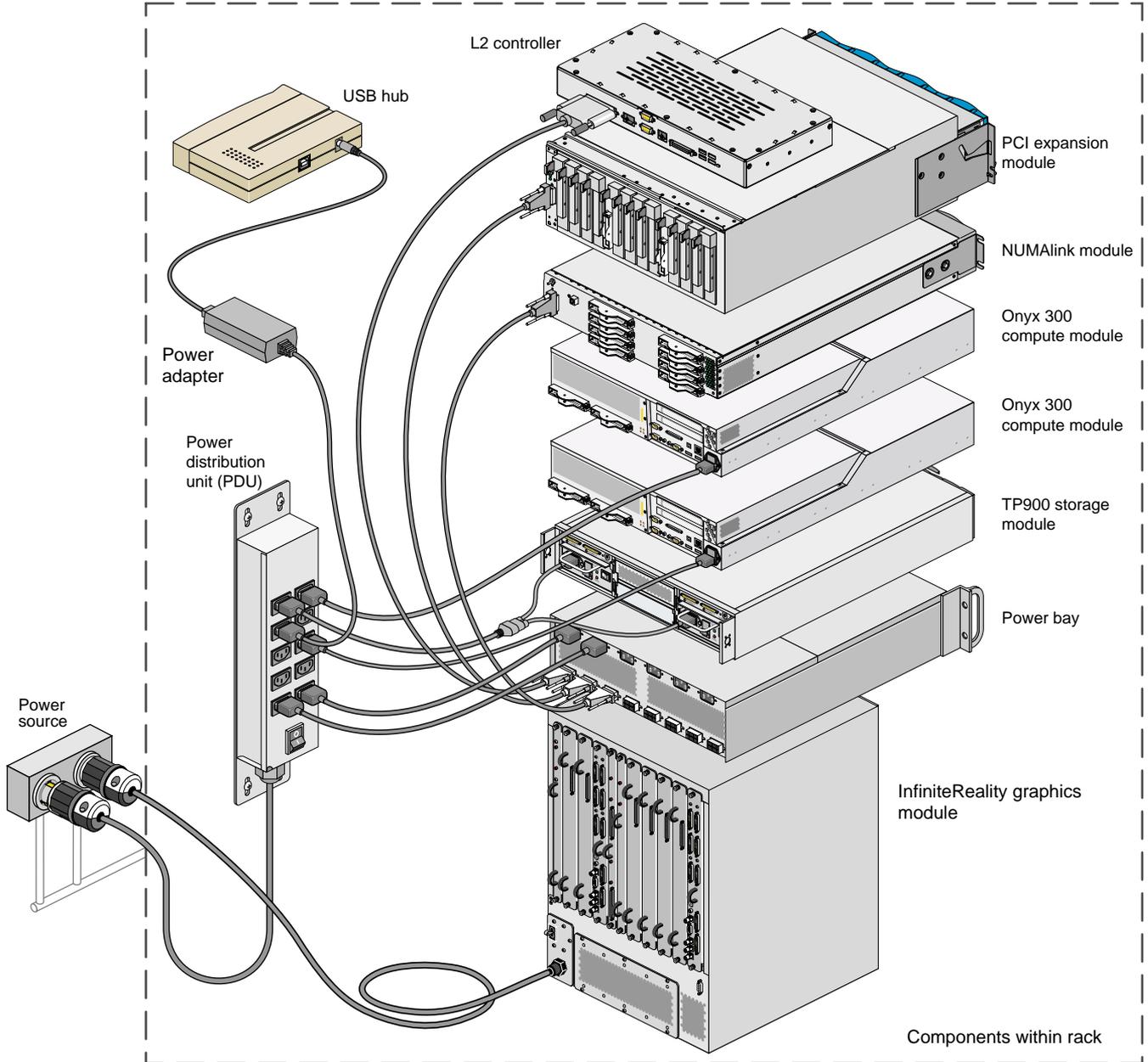


Figure 2-10 PDU and Power Connections

- Confirm that the cabling between the L2 controller and the following components is secure:

- InfiniteReality graphics module (refer to Figure 2-11)

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.

- NUMALink module (refer to Figure 2-12)

Note: If your system does not have a NUMALink module, the Onyx 300 compute modules connect directly to the L2 controller (refer to Figure 2-13).

- USB hub

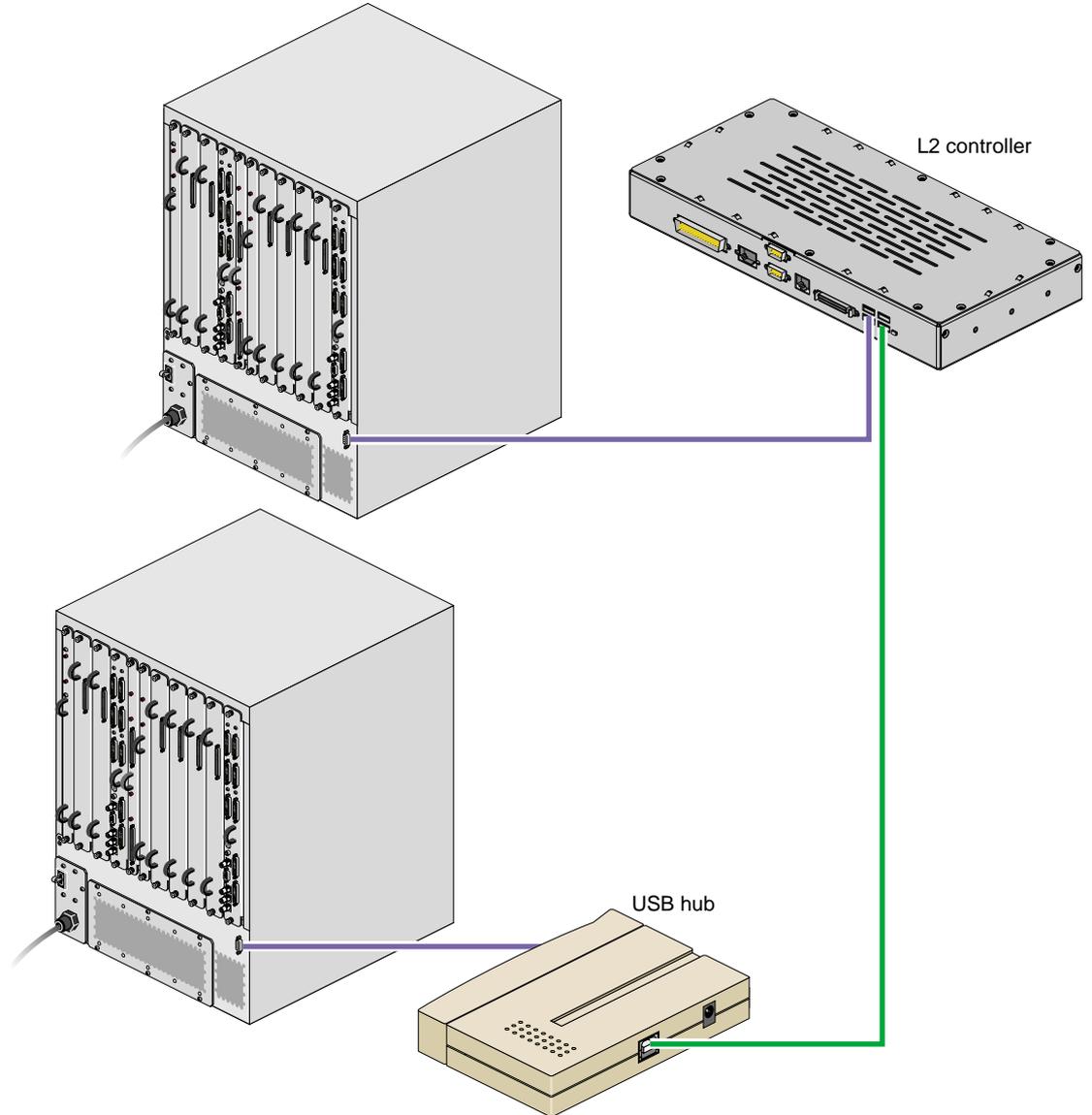


Figure 2-11 InfiniteReality Connections to L2 Controller

Figure 2-12 shows how the components of a graphics system that contains a NUMalink module connect to the L2 controller.

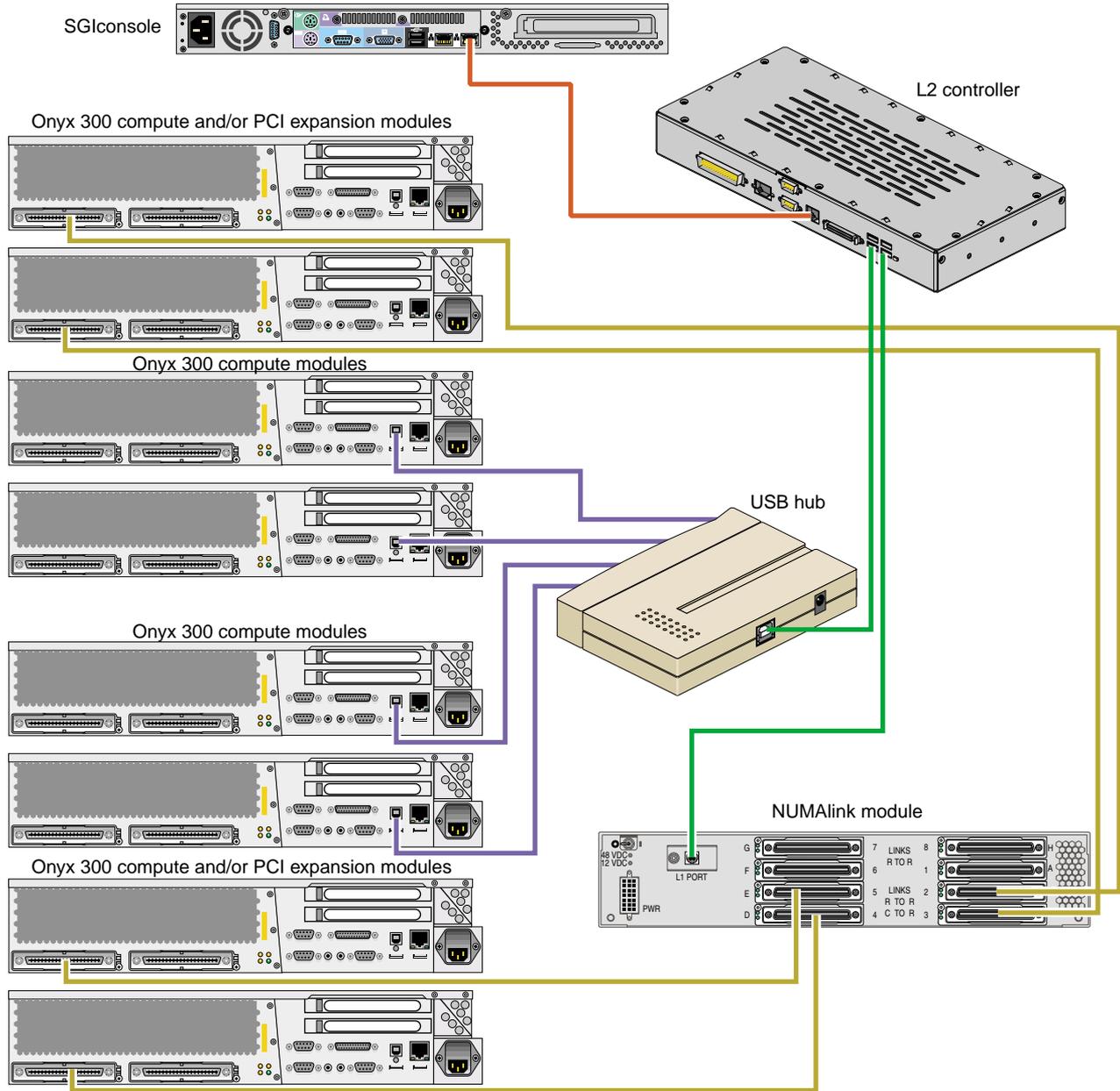


Figure 2-12 NUMalink Module and USB Hub Connections to the L2 Controller

Figure 2-13 shows how the Onyx 300 compute modules in a graphics system that does **not** contain a NUMalink module connect to the L2 controller. The top Onyx 300 compute module communicates with the L2 controller via its NUMalink connection to the bottom Onyx 300 compute module. Likewise, if a system contains one Onyx 300 compute module and one PCI expansion module, the PCI expansion module connects to the L2 controller via its NUMalink connection to the Onyx 300 compute module (refer to Figure 2-14).

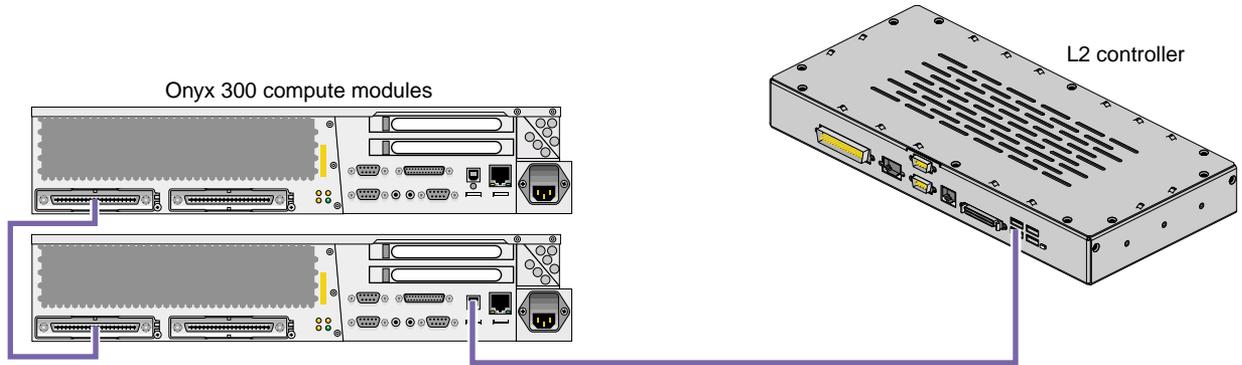


Figure 2-13 Onyx 300 Compute Module Connections to the L2 Controller

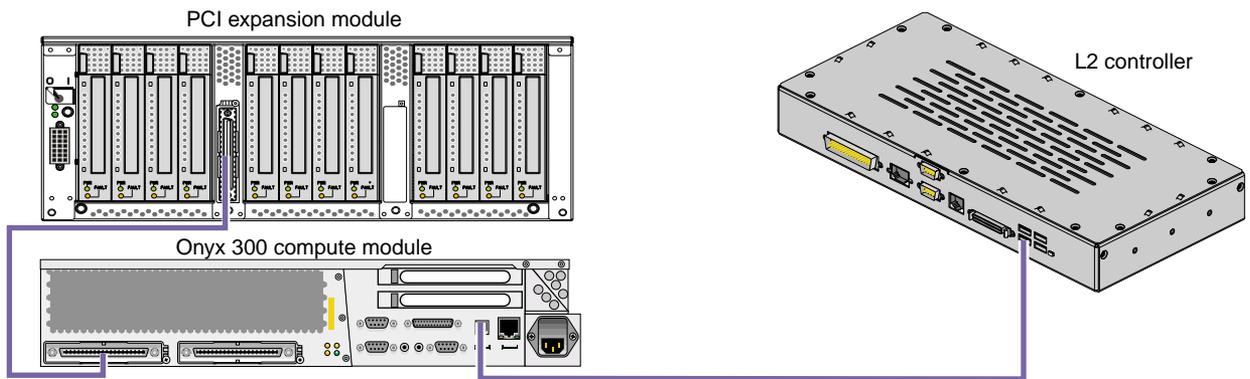


Figure 2-14 PCI Expansion Module Connection to L2 Controller

- Ensure that the **PWR** (power) switch on each NUMAlink and PCI expansion module that you want to power on is set to the On (**1**) position. The PWR switch is located in the upper-left corner of the module (refer to Figure 2-15). This switch enables the L1 controllers of the NUMAlink module and PCI expansion modules to power on after you turn on the circuit breaker of the PDU.

Note: The Onyx 300 compute module does not have a power switch; when the PDU circuit breaker is on, the Onyx 300 L1 controller is on.

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

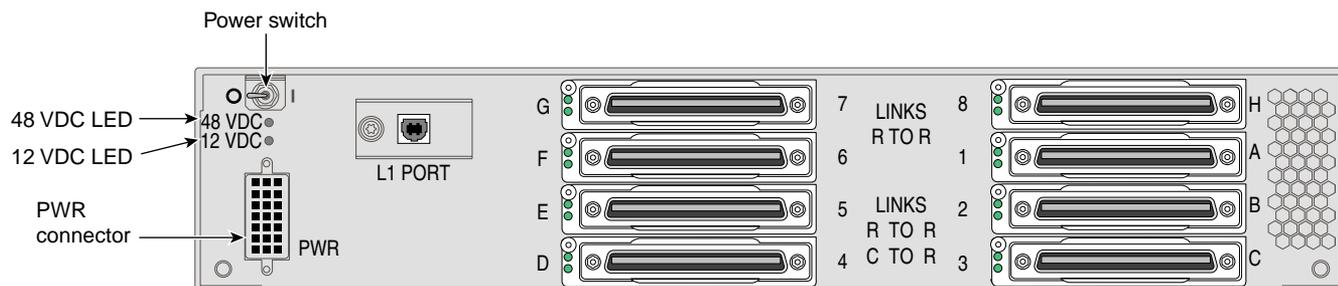


Figure 2-15 NUMAlink Module Power Switch

- Ensure that the power receptacles for the graphics module and the PDU are sourced and grounded from the same breaker box. For additional information on this topic, call your SGI SSE.

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.

Power on the graphics system as follows:

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 2-16.

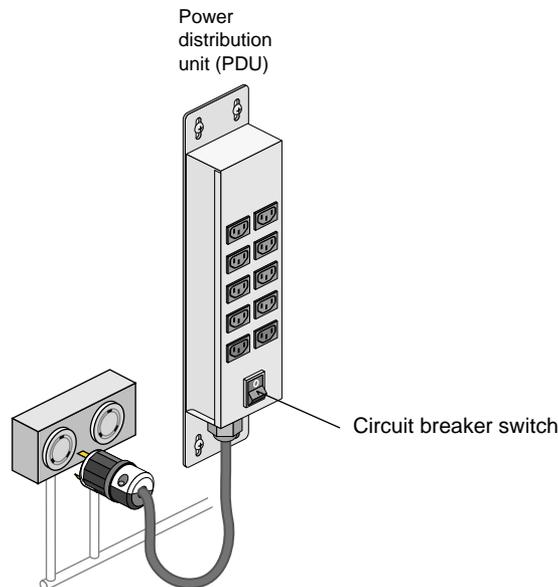


Figure 2-16 PDU Circuit Breaker Switch

3. Set the power switch of the InfiniteReality graphics module to the On position. Figure 2-17 shows the location of the power switch.

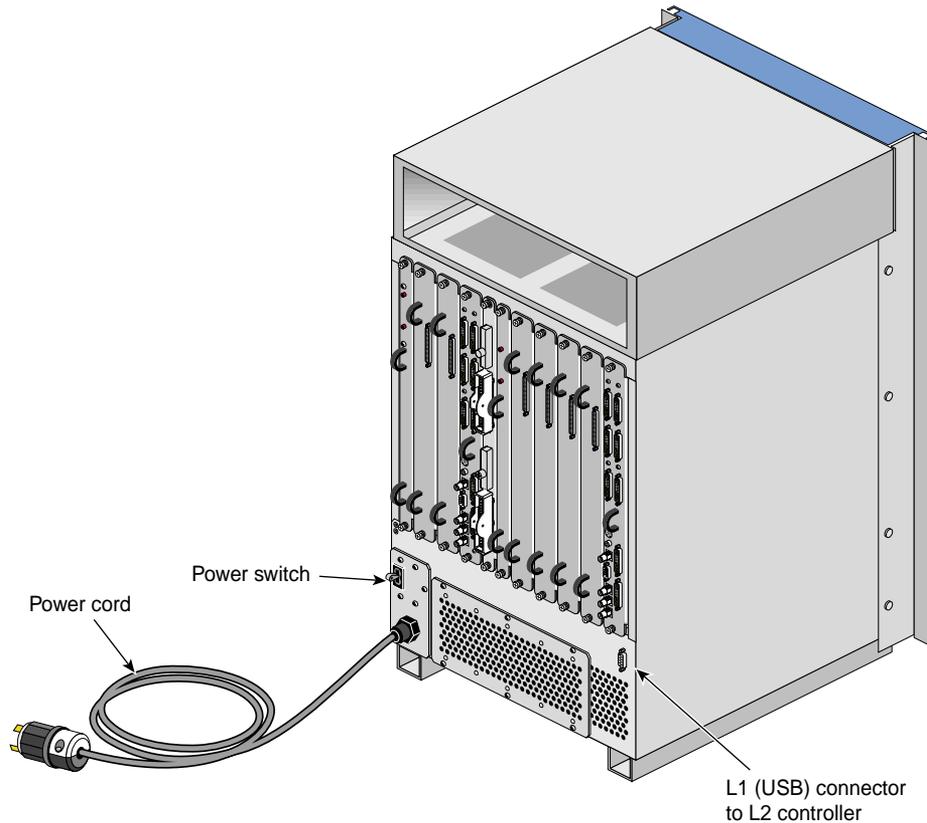


Figure 2-17 InfiniteReality Graphics Module Power Switch

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/12term
```
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 300 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 unit numbers, refer to Chapter 1 of this document.

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 typing control d.

```
L2> ctrl d
```

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

Powering On with Switches

If your system does not have a system console, you can power on your system manually by using On/Off switches. Each module that has an L1 controller has an On/Off switch with an LED; this switch is located on the front of the module (refer to Figure 2-18). The TP900 storage module power switch(es) are located at the rear of the module. (refer again to Figure 2-9 on page 77).

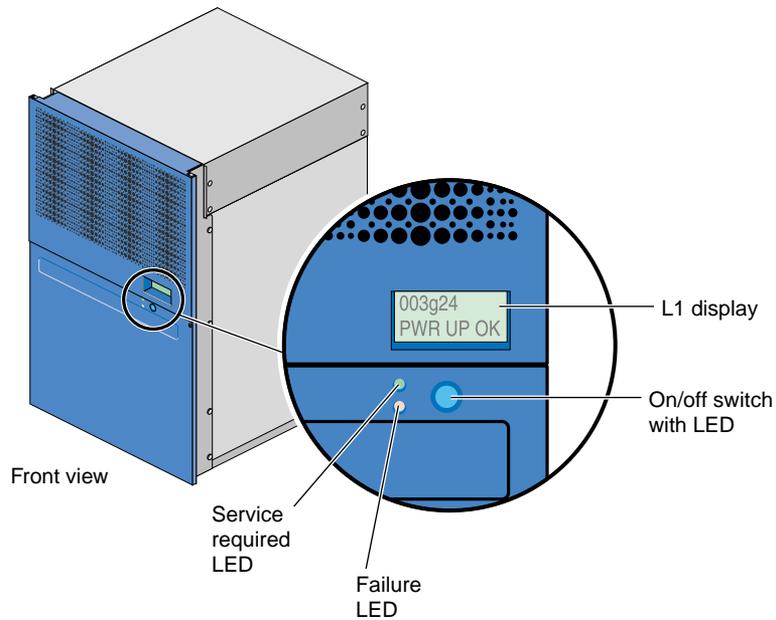


Figure 2-18 Front View of InfiniteReality Graphics Module

Power on the graphics system as follows:

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 2-19.

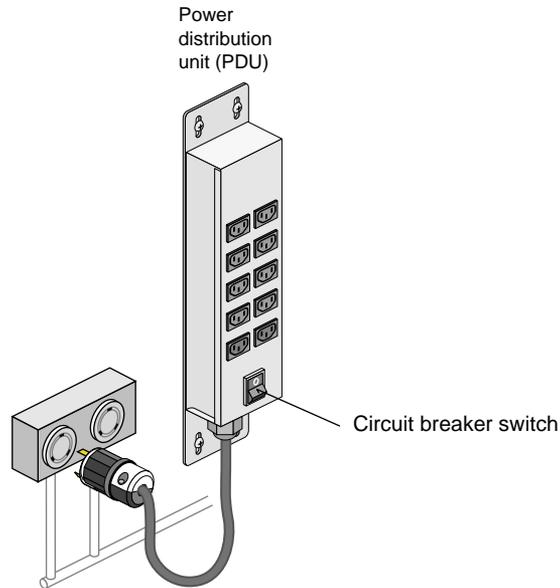


Figure 2-19 PDU Circuit Breaker Switch

3. Set the power switch(es) of the InfiniteReality graphics module(s) to the On position. Figure 2-20 shows the location of the power switch.
4. Set the power switch(es) of the TP900 storage module(s) to the On position.

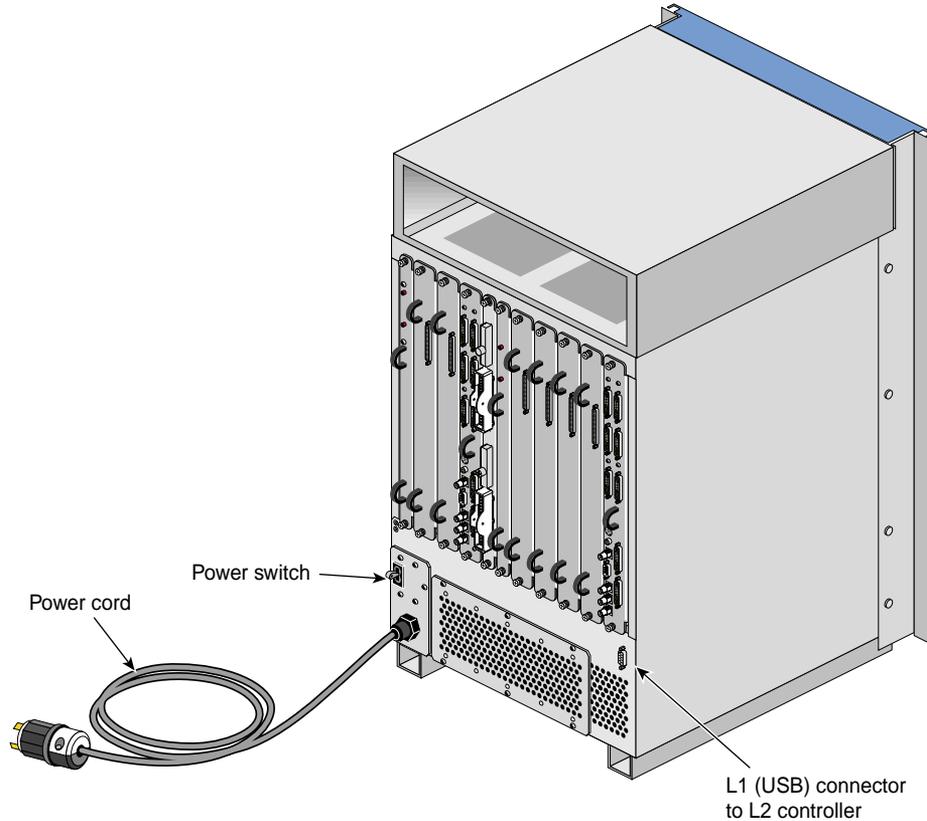


Figure 2-20 InfiniteReality Graphics Module Power Switch

5. Verify that all of the L1 controllers display “L1 running.” If any L1 controllers are not running, contact your SGI system support engineer (SSE).
6. Press the On/Off switches that are located on the front of the modules that you want to power on. Always power on the PCI expansion and InfiniteReality graphics modules first. Next, power on the NUMAlink module. Last, power on the Onyx 300 compute modules starting with the global master (the lowest compute module in the rack).

The On/Off 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 option 1 “Start System” to boot the IRIX operating system.

Powering Off

This section explains how to power off individual modules or your entire system from the system console or via the On/Off switches.

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

Powering Off at the System Console

Note: The following information applies only to InfiniteReality graphics modules, Onyx 300 compute modules, the NUMAlink module, and PCI expansion modules. You must manually power off the TP900 storage module by placing the power switch(es) in the 0 position. Refer to Figure 2-21.

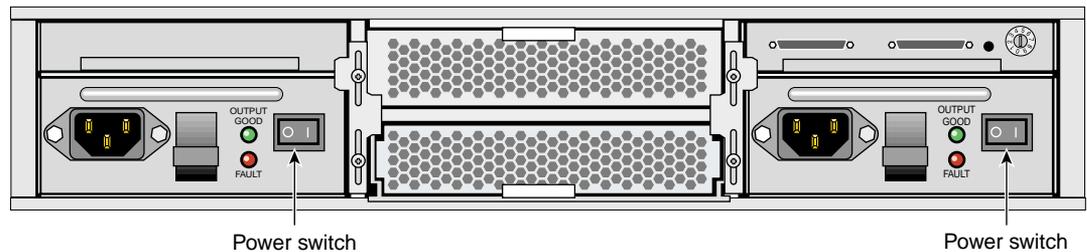


Figure 2-21 TP900 Power Switch (0 Position)

To power off your system using 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 control t.


```
$> 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 300 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 unit numbers, refer to Chapter 1 of this document.

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 down an L1 controller of a NUMALink, PCI expansion, or InfiniteReality graphics module, set the power switch to the Off position. The power switch of the NUMALink and PCI expansion modules is located in the upper-left corner of the rear of the modules. The power switch of the InfiniteReality graphics module is located in the lower-left corner of the rear of the module.

Note: The Onyx 300 compute module does not have a power switch. To power down the L1 controller of an Onyx 300 compute module, unplug the module from the PDU.

Powering Off with Switches

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

To manually power off your system using switches, follow these steps:

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

```
# init 0
```
2. Press the On/Off switches that are located on the front of the modules that you want to power off. You can power off the modules in any order.
3. To power down an L1 controller of a NUMAlink, PCI expansion, or InfiniteReality graphics module, set the power switch to the Off position. The power switch of the NUMAlink and PCI expansion modules is located in the upper-left corner of the rear of the modules. The power switch of the InfiniteReality graphics module is located in the lower-left corner of the rear of the module.

Note: The Onyx 300 compute module does not have a power switch. To power down the L1 controller of an Onyx 300 compute module, unplug the module from the PDU.

Monitoring System

You can monitor your SGI Onyx 300 graphics system from the following sources:

- You can view individual module (graphics, compute, NUMALink, and PCI expansion) status and error messages via the module's L1 controller display. For example, you can determine whether the fans of a particular module are operating properly.
- The system console enables you to view the status and error messages that are generated by both the L1 and L2 controllers. Refer to the *SGI Origin 300 System with NUMALink Module User's Guide* for L1 and L2 commands.
- You can monitor the status of the TP900 storage modules by viewing the LEDs on the front and the rear of the storage modules.
- You can use the Embedded Support Partner (ESP) system, which is discussed in the next section.

Using Embedded Support Partner (ESP)

Embedded Support Partner (ESP) automatically detects system conditions that indicate potential problems and then notifies the appropriate personnel. This enables you and SGI system support engineers (SSEs) to proactively support systems and resolve issues before they develop into actual failures.

ESP enables users to monitor one or more systems at a site from a local or remote connection. ESP can perform the following functions:

- Monitor the system configuration, events, performance, and availability.
- Notify SSEs when specific events occur.
- Generate reports.

ESP also supports:

- Remote support and on-site troubleshooting.
- System group management, which enables you to manage an entire group of systems from a single system.

For more information about ESP, refer to Chapter 4, "Troubleshooting." For information about configuring ESP, refer to the *Embedded Support Partner User Guide*.

Installing or Removing Disk Drives

Note: The following disk drive procedures apply to the Onyx 300 compute module only. For disk drive installation and removal procedures for the TP900 storage module, refer to the *SGI Total Performance 900 Storage System User's Guide*.

Each Onyx 300 compute module can contain one or two sled-mounted Ultra3 SCSI disk drives (refer to Figure 2-22).

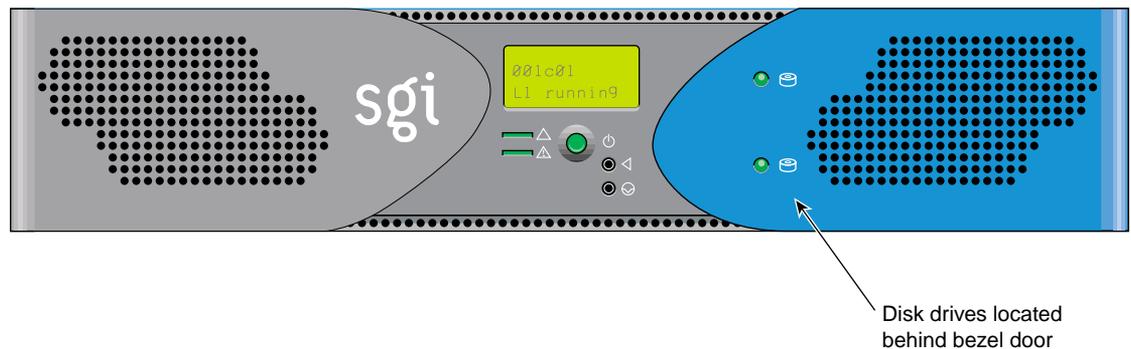


Figure 2-22 Disk Drive Location

Tools/Parts Required:

One or more of the following disk drives/blanks:

- 18-GB disk drive P/N 013-3485-00x
- 73-GB disk drive P/N 013-3486-00x
- Disk drive blank P/N 9470464

Installing a Disk Drive

To install a disk drive, follow these steps:

1. Open the bezel door as shown in Figure 2-23a.
2. Position the drive assembly so that it engages the bay guide rails and gently push the drive into the bay (refer to Figure 2-23b).
3. Swing the locking handle towards the chassis until the locking handle engages the latch (refer to Figure 2-23c).
4. Close the bezel door as shown in Figure 2-23d.

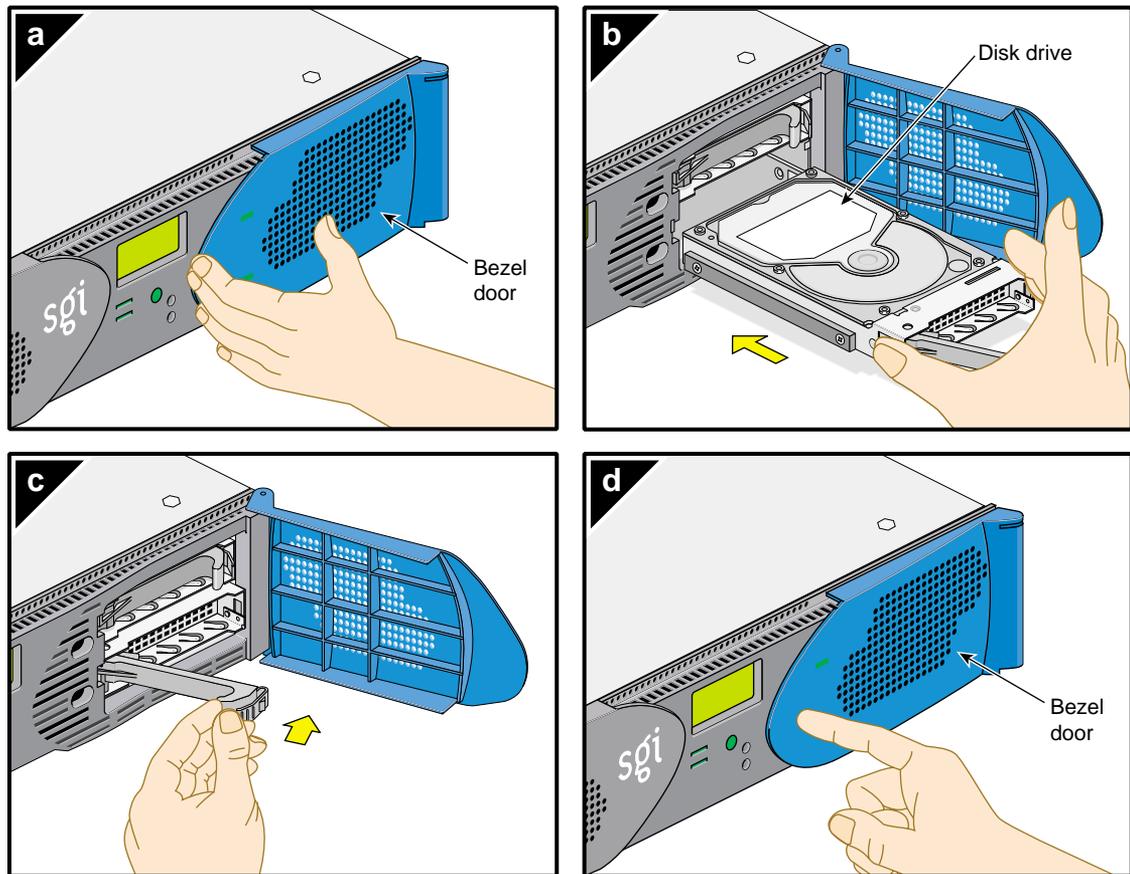


Figure 2-23 Installing a Disk Drive

Removing a Disk Drive

To remove a disk drive, follow these steps:

1. To replace a data drive, ensure that the drive has spun down before you remove it.
2. Open the bezel door as shown in Figure 2-24a.
3. Remove a drive by depressing its handle lock with your thumb and pulling the handle away from the chassis until the handle disengages the drive connector from the backplane connector (refer to Figure 2-24b).
4. Carefully slide the drive out of the bay (refer to Figure 2-24c) and place it on an ESD-safe surface. Do not use the handle to pull the drive out of the bay.
5. Close the bezel door as shown in Figure 2-24d.

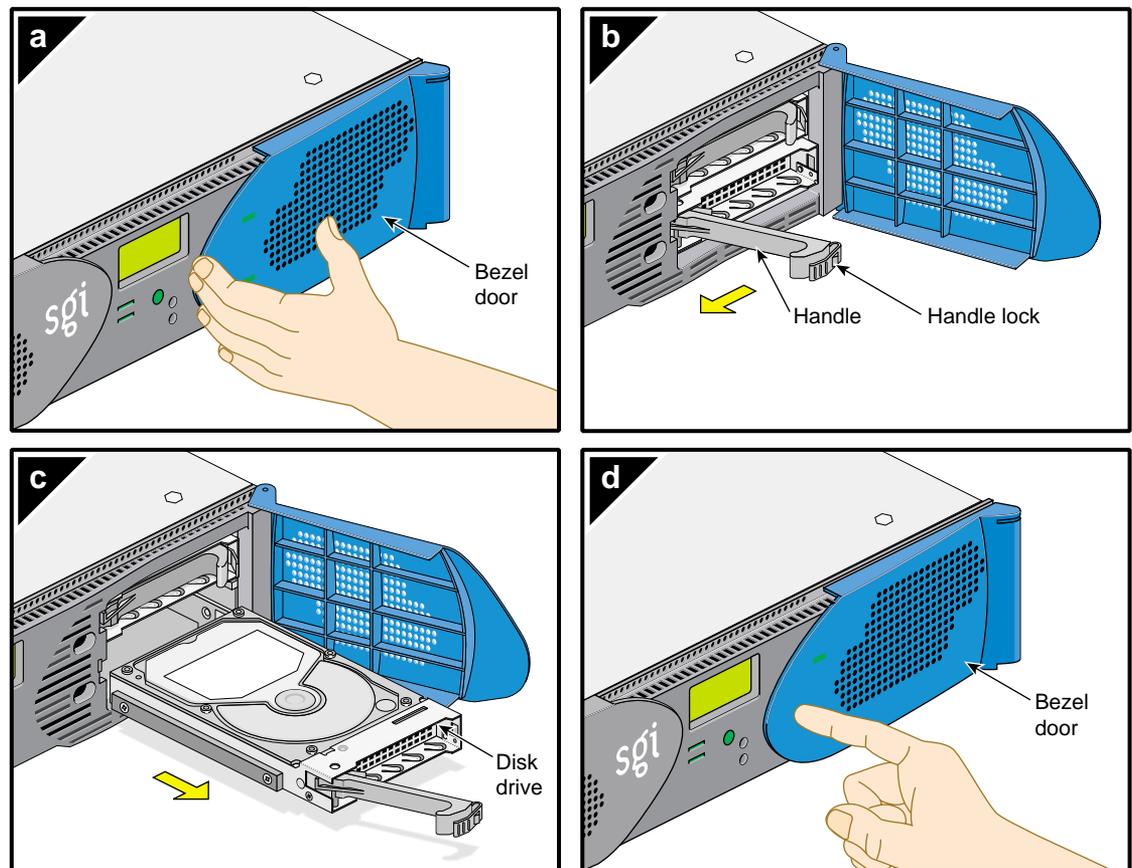


Figure 2-24 Removing a Disk Drive

Configurations

This chapter provides examples of the following graphics system configurations:

- Onyx 300 graphics systems without a NUMALink module
- Onyx 300 graphics systems with a NUMALink module

Onyx 300 Graphics System without NUMALink Module

The Onyx 300 graphics system that does not contain a NUMALink module is a single-rack system. It contains one InfiniteReality graphics module that has one or two graphics pipes. When the system contains only one graphics pipe, the lowest physical Onyx 300 compute module in the rack connects to pipe 0 as shown in Figure 3-1.

When the system contains two graphics pipes, the lowest physical Onyx 300 compute module connects to pipe 0, which is the pipe that can contain one, two, or four RM boards. Pipe 1, which can contain one or two RM boards, connects to the other Onyx 300 compute module. Refer to Figure 3-2.

Figure 3-1 illustrates a one-pipe Onyx 300 graphics system without NUMAlink module.

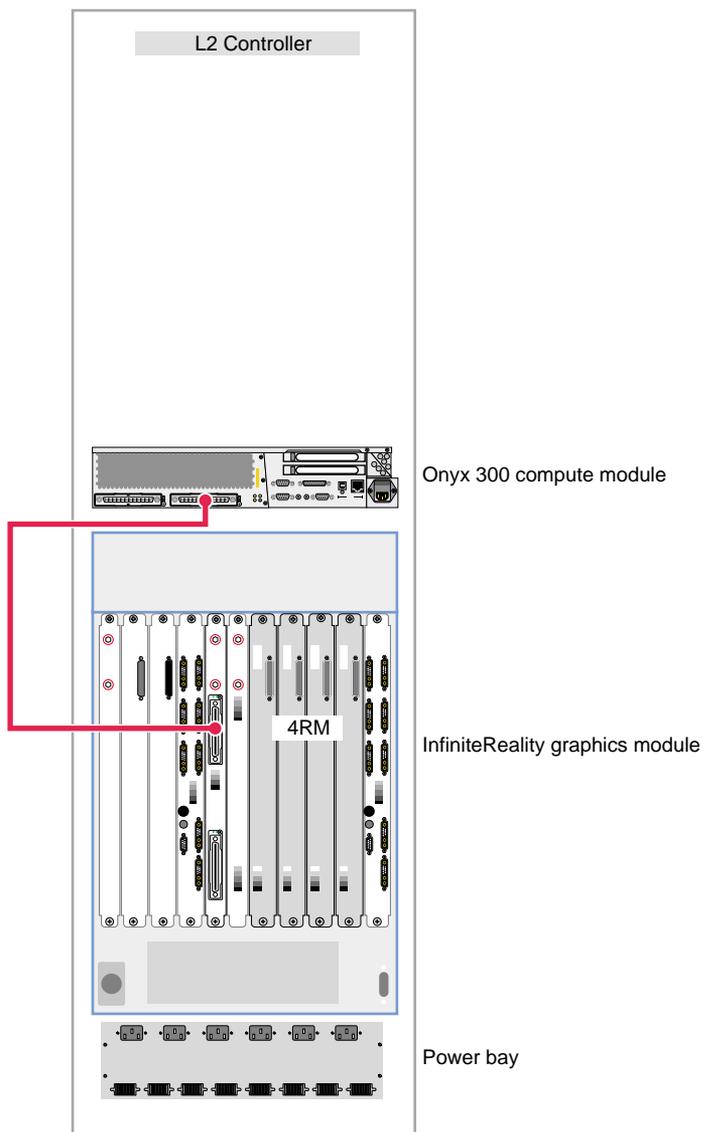


Figure 3-1 One 4-RM Pipe Graphics System

Figure 3-2 illustrates a two-pipe Onyx 300 graphics system without NUMAlink module.

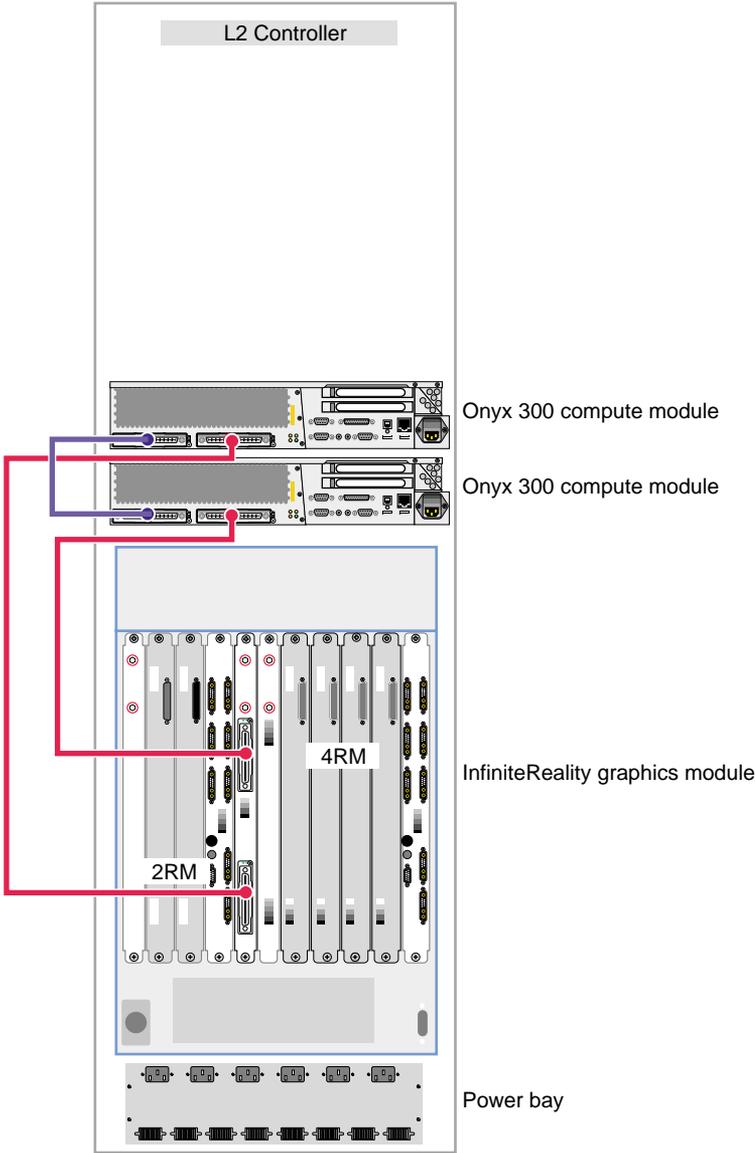


Figure 3-2 Two-pipe Graphics System (One 2-RM and One 4-RM Pipe)

Onyx 300 Graphics System with NUMAlink Module

The Onyx 300 graphics system that contains a NUMAlink module is a single- or multiple-rack system. The single-rack system contains one or two graphics pipes. The multiple-rack system contains from one to eight graphics pipes. The number of racks depends on the number of graphics pipes and the number of RM boards in the graphics pipes. The maximum number of racks (eight 4-RM pipes) is five. This number does not include disk-storage racks.

In a single-rack system, the pipes are numbered 0 and 1: the 4-RM pipe is pipe 0 and the 2-RM pipe is pipe 1. In multiple-rack systems, the pipes are numbered in the order shown in Figure 3-3 through Figure 3-5.

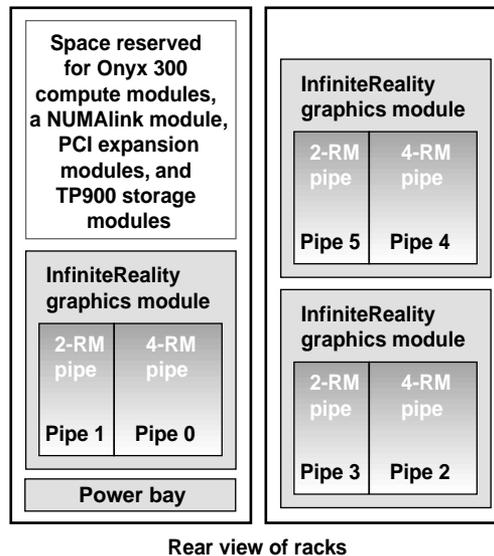
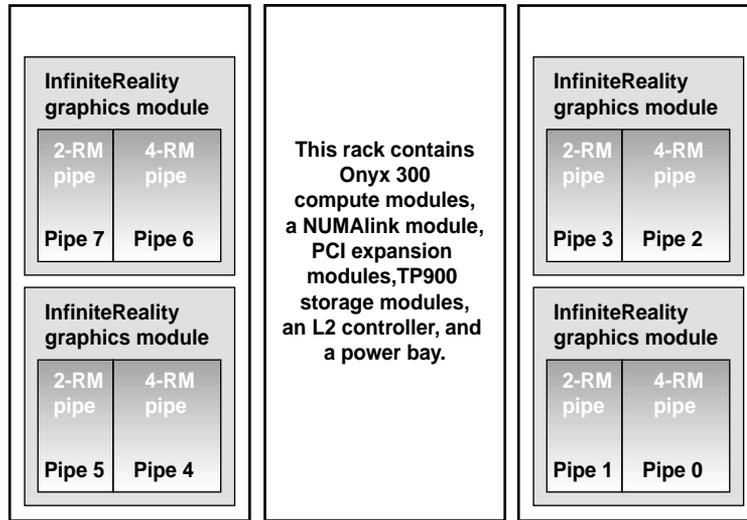
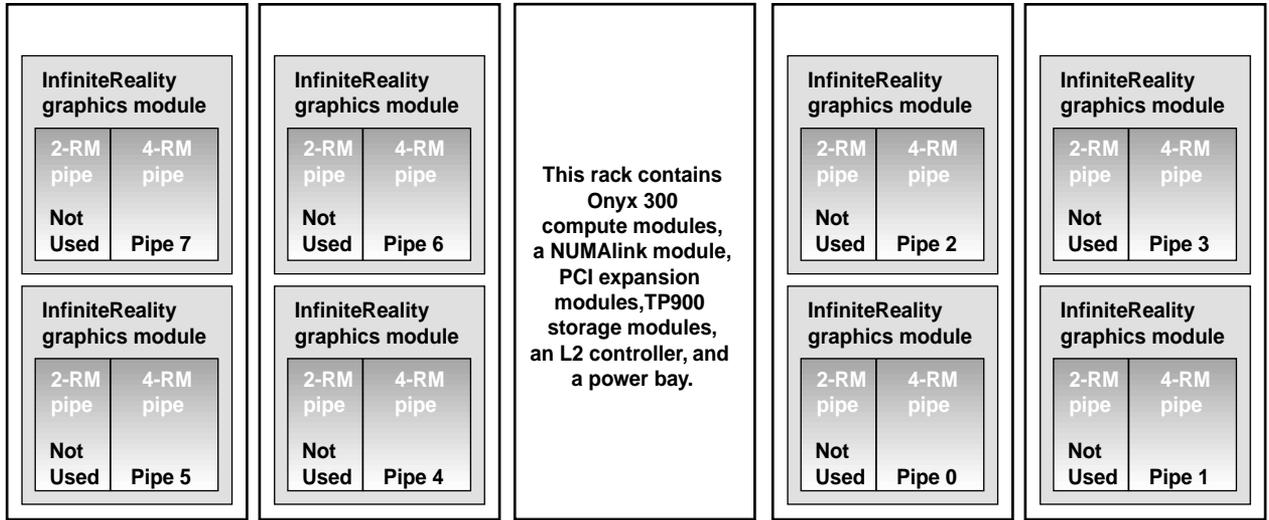


Figure 3-3 Pipe Numbering in a Six-pipe System



Rear view of racks

Figure 3-4 Pipe Numbering in an Eight-pipe System (Four 2-RM and Four 4-RM Pipes)



Rear view of racks

Figure 3-5 Pipe Numbering in an Eight-pipe System (Eight 4-RM Pipes)

Each graphics pipe connects to an Onyx 300 compute module. The lowest physical Onyx 300 compute module (the global master) connects to pipe 0. The remaining pipes are connected to the Onyx 300 compute modules in ascending order (refer to Figure 3-6).

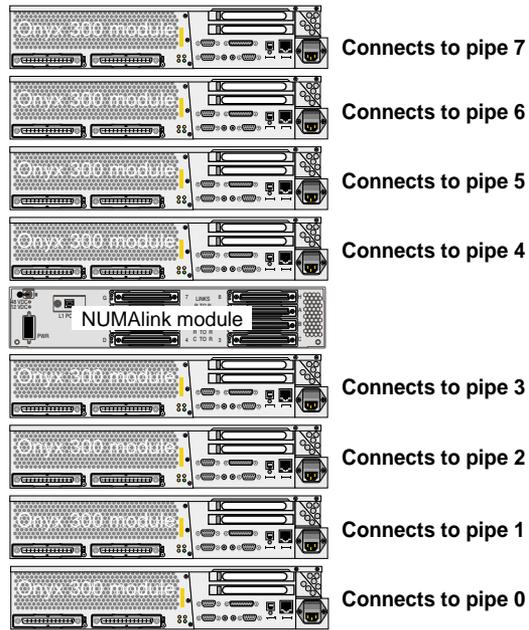


Figure 3-6 Pipe Connections

Figure 3-7 illustrates a one-pipe Onyx 300 graphics system with NUMAlink module.

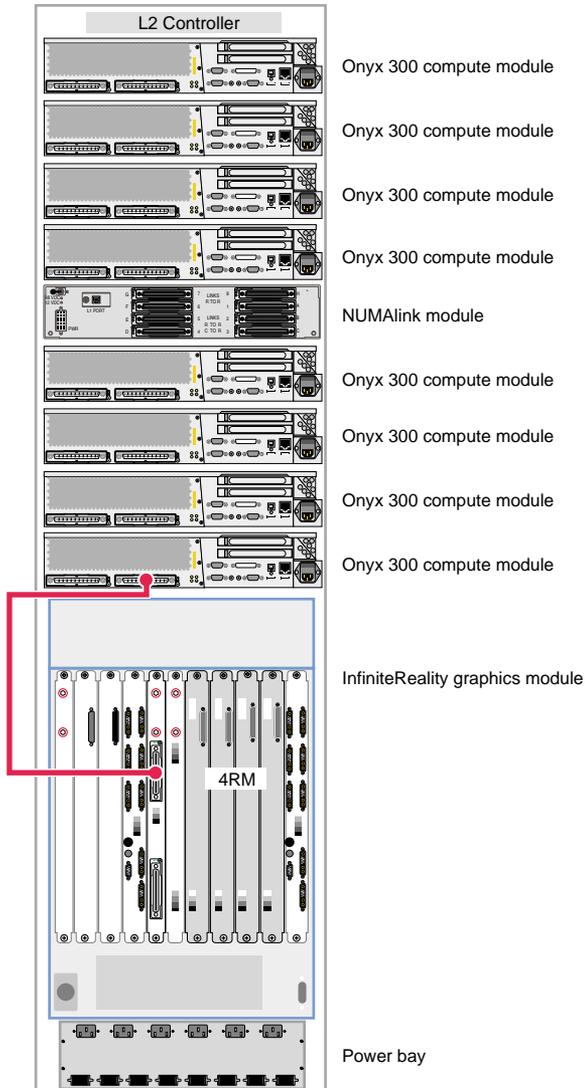


Figure 3-7 One 4-RM Pipe Graphics System

Figure 3-8 illustrates a two-pipe Onyx 300 graphics system with NUMAlink module.

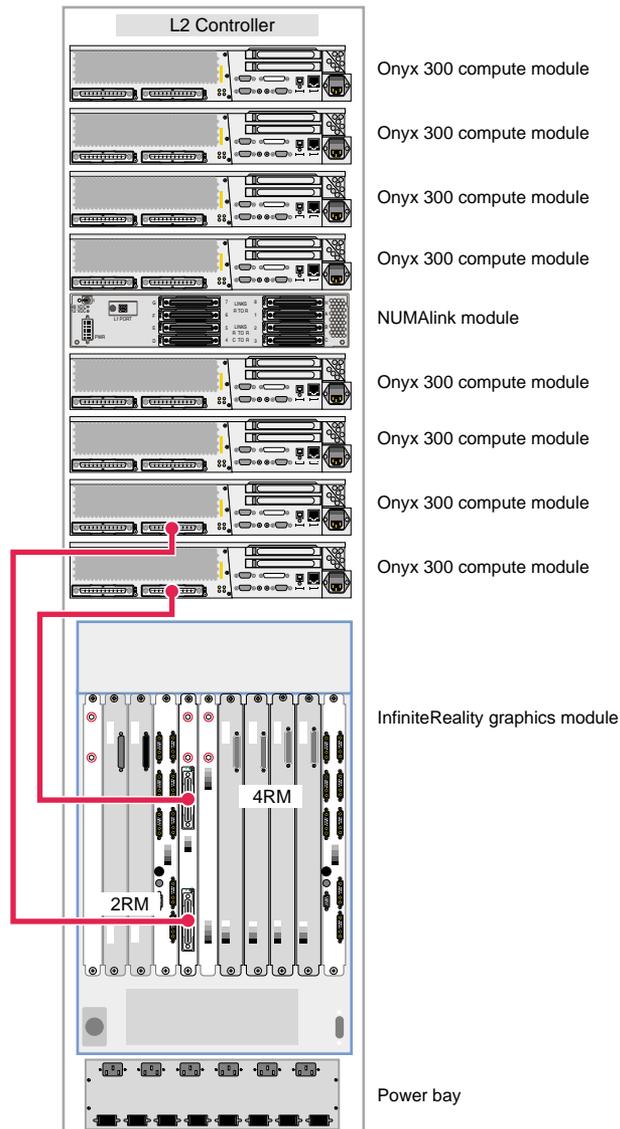


Figure 3-8 Two-pipe Graphics System (One 2-RM and One 4-RM Pipe)

Figure 3-9 illustrates a three-pipe Onyx 300 graphics system with NUMAlink module.

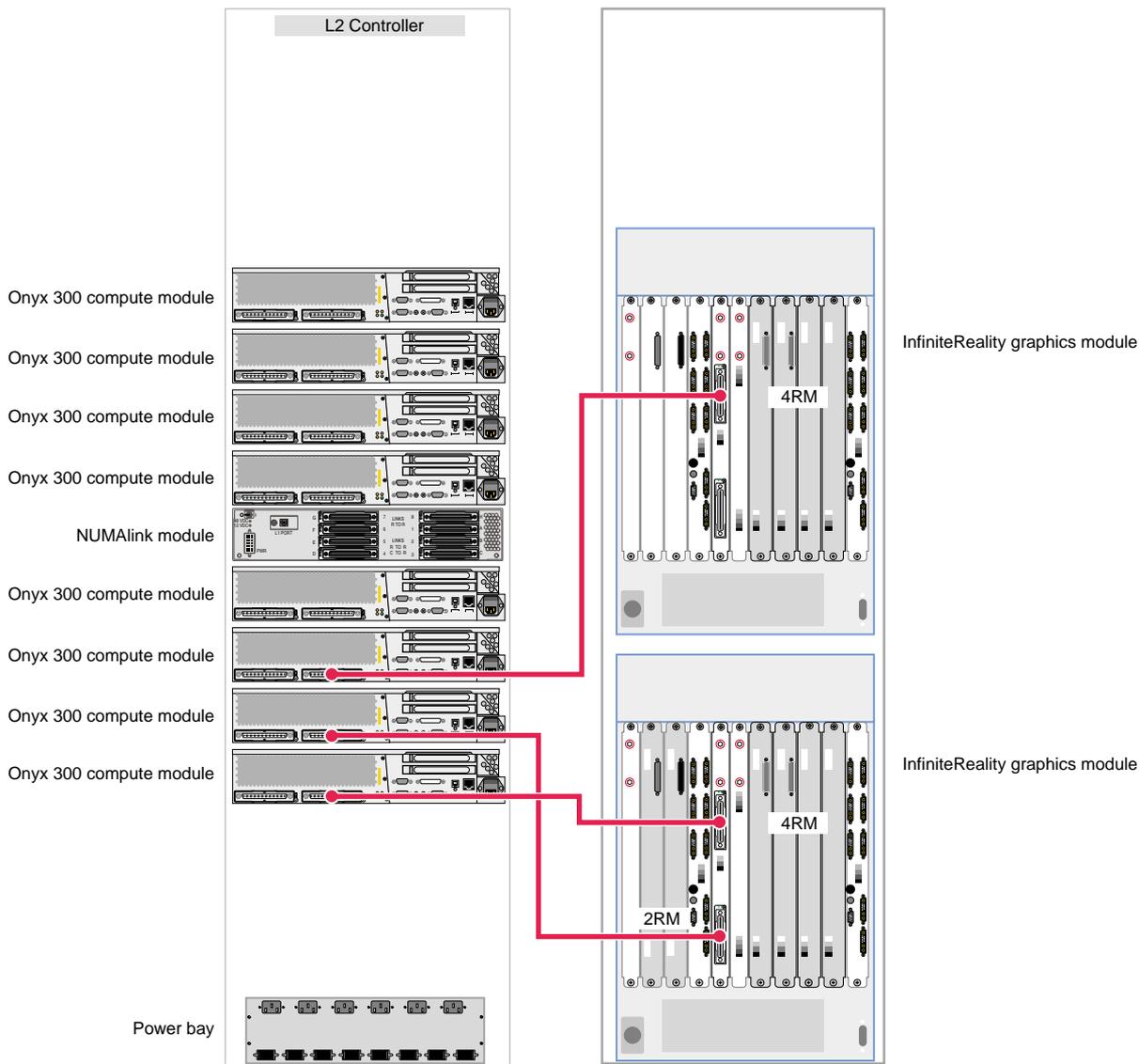


Figure 3-9 Three-pipe Graphics System (One 2-RM and Two 4-RM Pipes)

Figure 3-10 illustrates a four-pipe Onyx 300 graphics system with NUMAlink module.

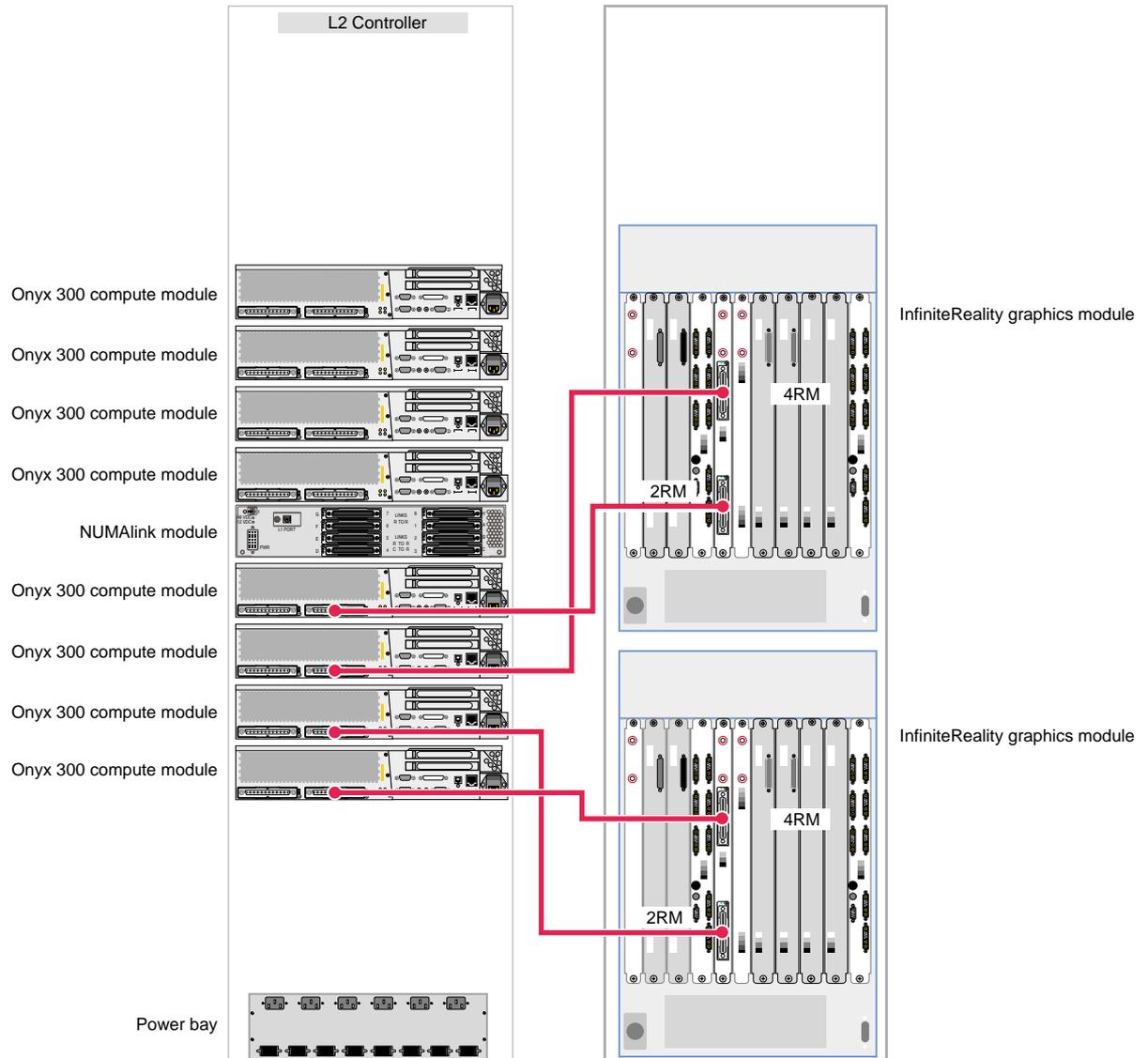


Figure 3-10 Four-pipe Graphics System (Two 2-RM and Two 4-RM Pipes)

Figure 3-11 illustrates a six-pipe Onyx 300 graphics system with NUMAlink module.

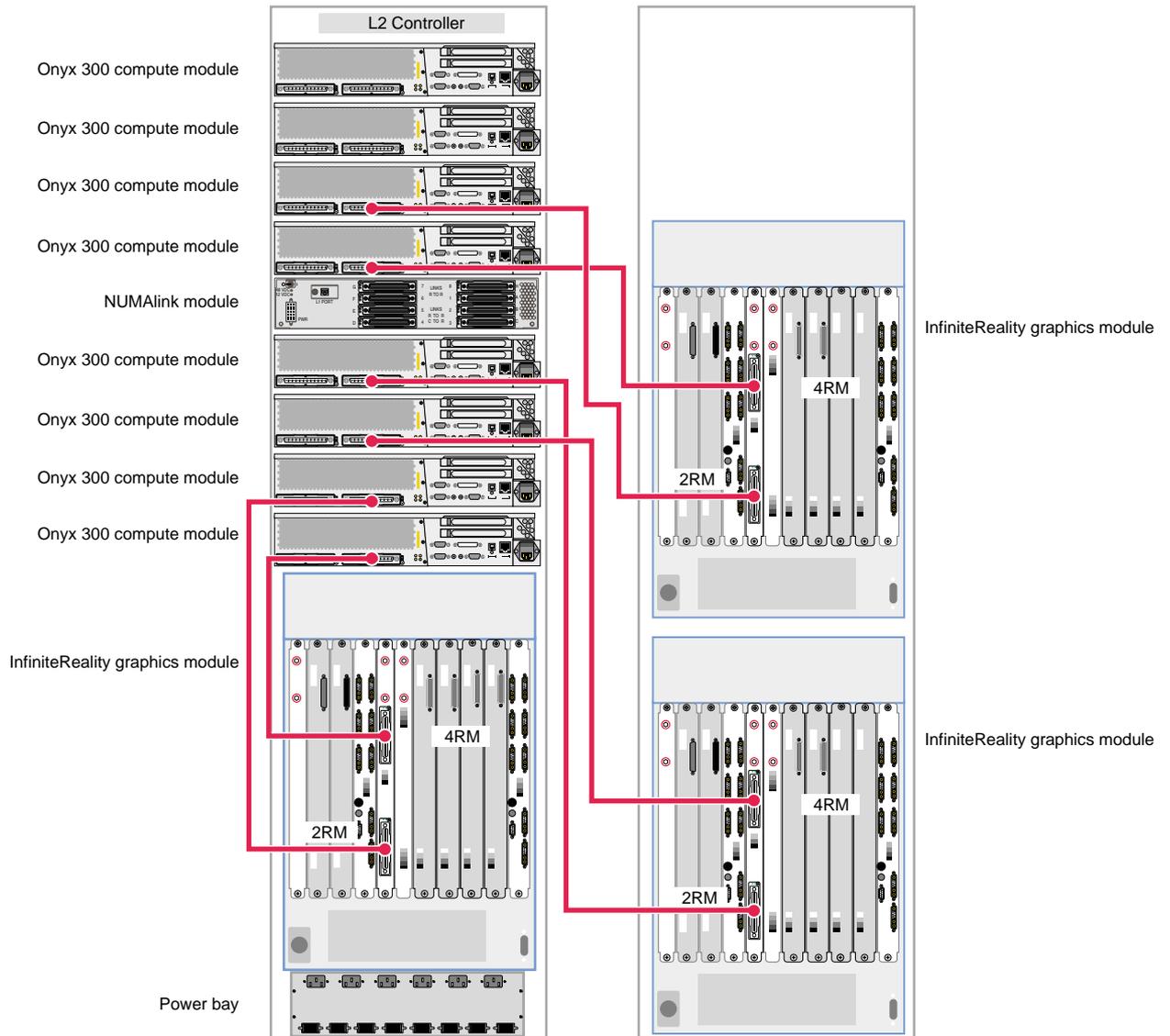


Figure 3-11 Six-pipe Graphics System (Three 2-RM Pipes and Three 4-RM Pipes)

Figure 3-12 through Figure 3-14 provide examples of eight-pipe Onyx 300 graphics systems.

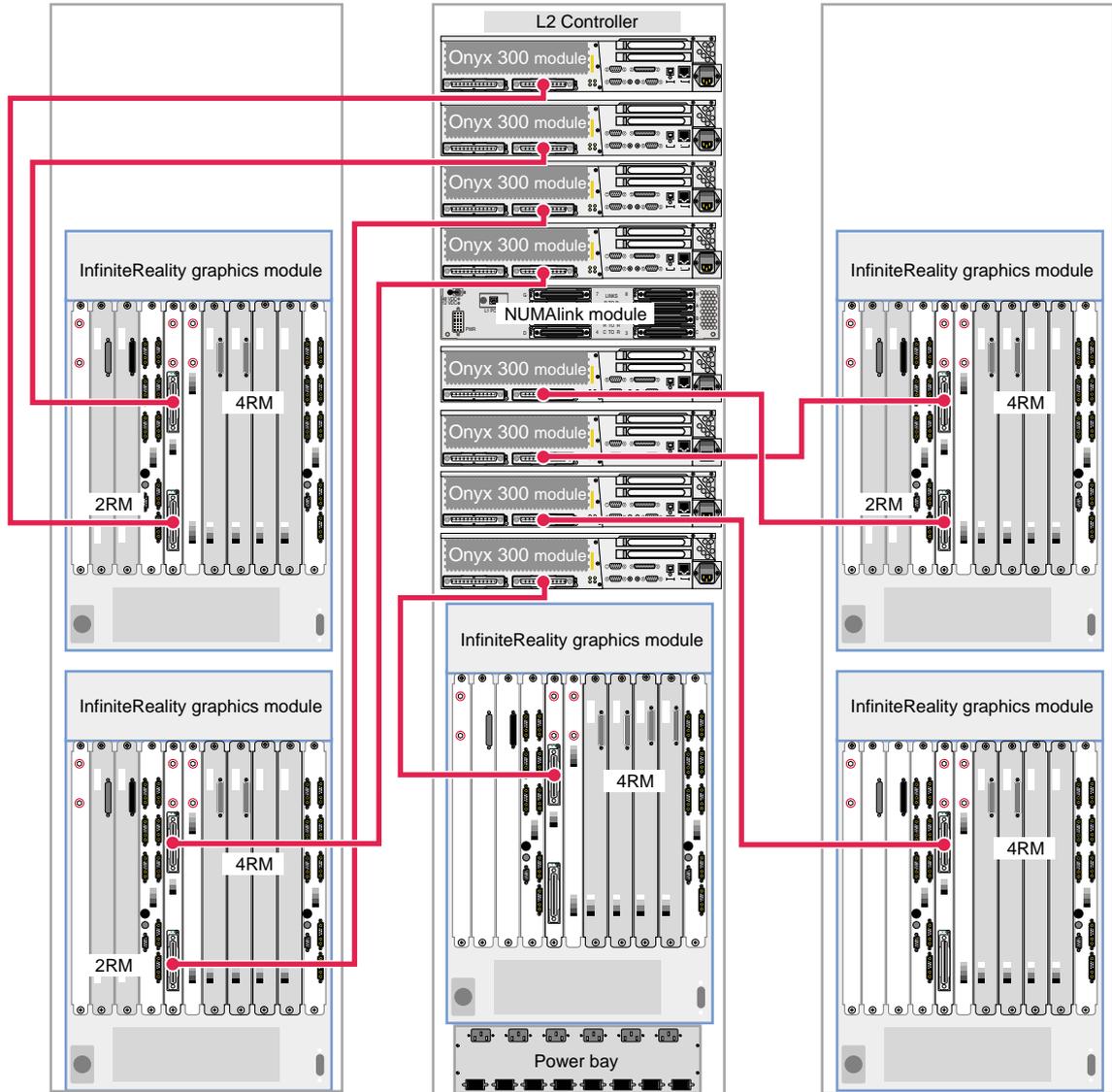


Figure 3-12 Eight-pipe Graphics System (Five 4-RM and Three 2-RM Pipes)

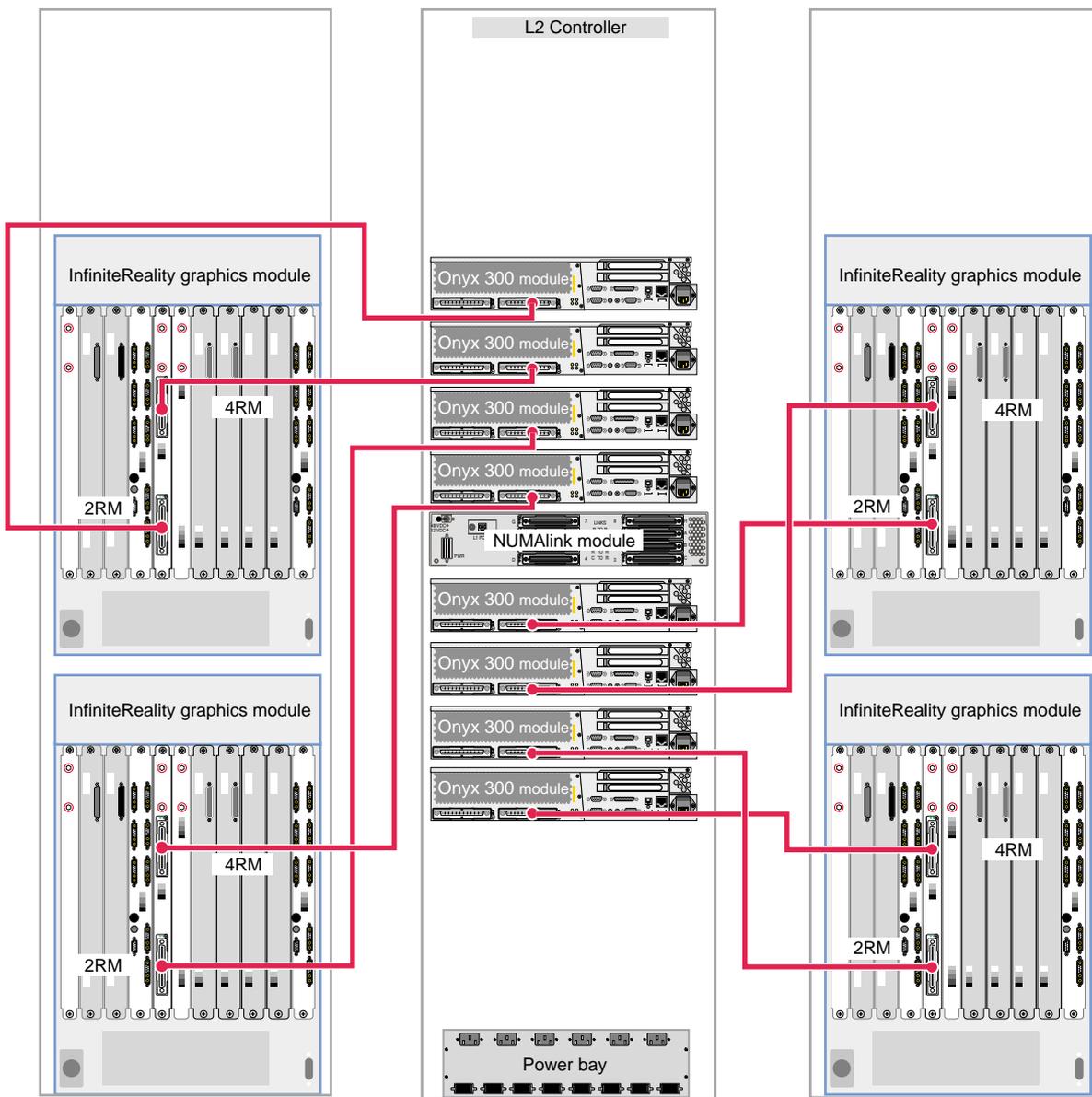


Figure 3-13 Eight-pipe Graphics System (Four 4-RM and Four 2-RM Pipes)

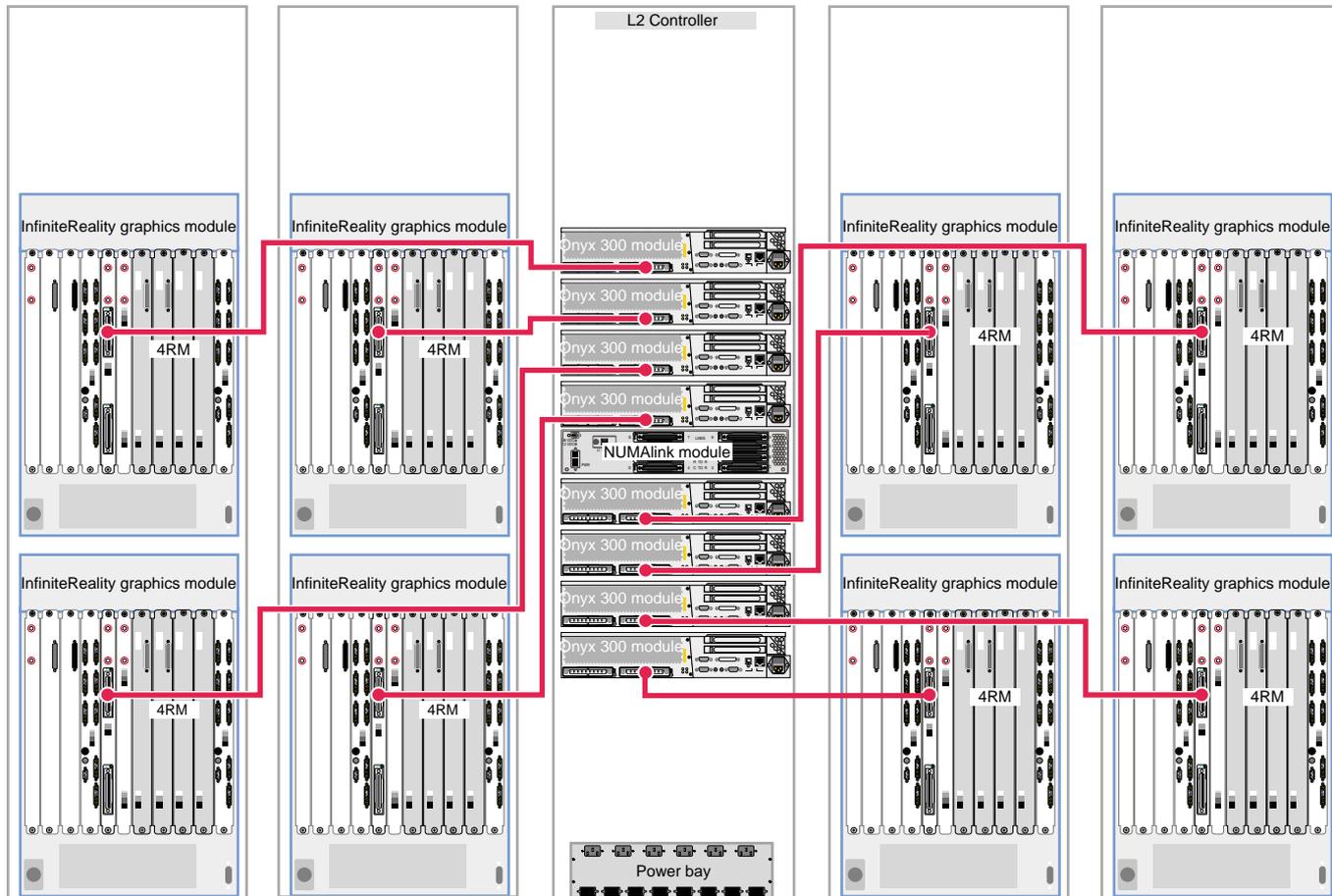


Figure 3-14 Eight-pipe Graphics System (Eight 4-RM Pipes)

Troubleshooting

This chapter contains the following information to help you troubleshoot your SGI Onyx 300 graphics system:

- “Troubleshooting Chart” on page 114
- “L1 Controller Error Messages” on page 116
- “SGI Electronic Support” on page 118

Troubleshooting Chart

Table 4-1 lists recommended actions for problems that can occur with 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 in this chapter.

Table 4-1 Troubleshooting Chart

Problem Description	Recommended Action
The system will not power on.	<p>Ensure that the power cord of the PDU is seated properly in the power receptacle.</p> <p>Ensure that the PDU circuit breaker is on.</p> <p>If the power cord is plugged in and the circuit breaker is on, contact your SSE.</p>
An individual NUMAlink, PCI expansion, or InfiniteReality graphics module will not power on.	<p>Ensure that the power switch at the rear of the module is on (1 position).</p> <p>View the L1 display; refer to Table 4-2 if an error message is present.</p> <p>If the L1 controller is not running, contact your SSE.</p> <p>Check the connection between the module and its power source.</p>
The system will not boot the operating system.	Contact your SSE.
The Service Required LED illuminates on an InfiniteReality graphics, Onyx 300 compute, NUMAlink, or PCI expansion module.	View the L1 display of the failing module; refer to Table 4-2 for a description of the error message.
The Failure LED illuminates on an InfiniteReality graphics, Onyx 300 compute, NUMAlink, or PCI expansion module.	View the L1 display of the failing module; refer to Table 4-2 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 green LED of a power supply is not illuminated.	Ensure that the AC power cord is seated properly in the rear of the power bay.

Table 4-1 (continued) Troubleshooting Chart

Problem Description	Recommended Action
The PWR LED of a populated PCI slot is not illuminated.	Contact your SSE to reseal the PCI card.
The Fault LED of a populated PCI slot is illuminated (on).	Contact your SSE to reseal the PCI card. If the fault LED remains on, replace the PCI card.
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 4-2 lists the error messages that the L1 controller generates and displays on the L1 display. This display is located on the front of the InfiniteReality graphics module, the Onyx 300 compute module, the NUMAlink module, and the PCI expansion module.

Note: As noted in Table 4-2, 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 4-2 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 4-2 (continued) L1 Controller Messages

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 5 seconds until shutdown.
Server 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 4-1 shows the sequence of events that occurs if you use all of the SGI Electronic Support capabilities.

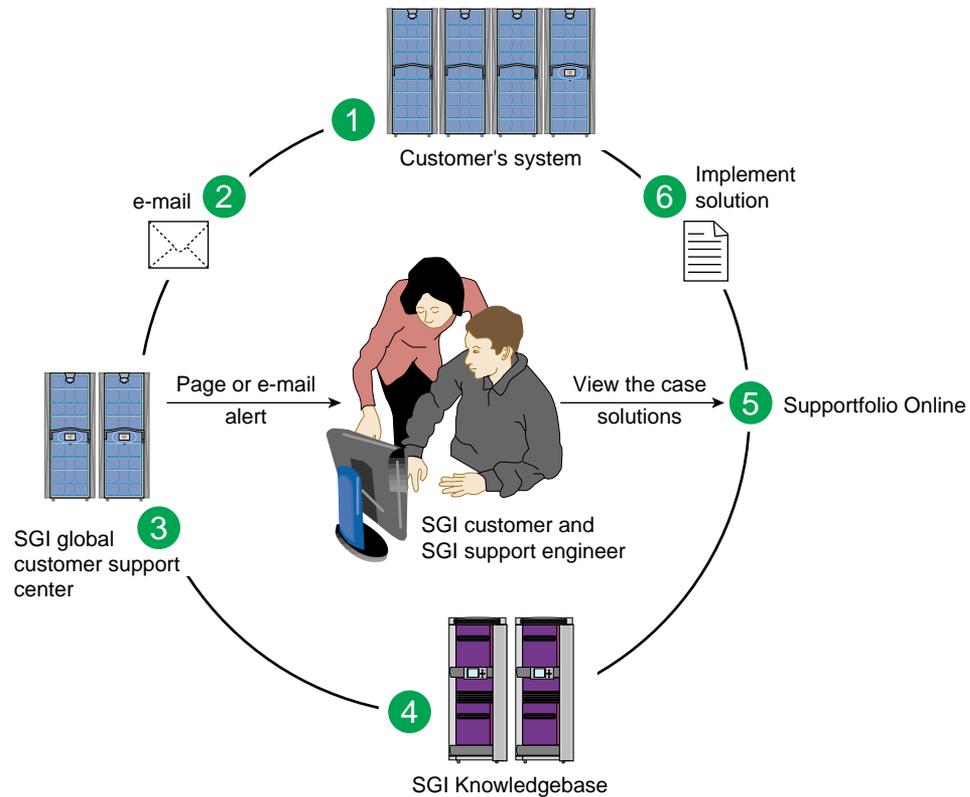


Figure 4-1 Full Support Sequence

This sequence of events is 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 found 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, refer to the following Web page:

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

For more information about SGI Electronic Support, refer to the following Web page:

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

Technical Specifications

This appendix provides the technical specifications for the following system components:

- “System Environmental Specifications” on page 122
- “Rack Specifications” on page 123
- “InfiniteReality Graphics Module Specifications” on page 124
- “SGI Onyx 300 Compute Module Specifications” on page 125
- “NUMALink Module Specifications” on page 127
- “USB Hub Specifications” on page 128
- “L2 Controller Specifications” on page 129
- “Power Bay Module Specifications” on page 130
- “PCI Expansion Module Specifications” on page 131
- “SGI TP900 Storage Module Specifications” on page 132

System Environmental Specifications

Table A-1 lists the environmental specifications of the Onyx 300 graphics system.

Table A-1 Onyx 300 Graphics System Environmental Specifications

Characteristic	Specification
Temperature, operating	+5 °C (+41 °F) to +35 °C (+95 °F) (up to 1500 m / 5,000 ft) +5 °C (+41 °F) to +30 °C (+86 °F) (1500 m to 3000 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 (3000 m) (operating)

Rack Specifications

The SGI Onyx 300 graphics system can be housed in one or more tall (39U) racks. The number of graphics modules determines how many racks are used.

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

Table A-2 lists the specifications of the tall rack.

Table A-2 Tall-rack Specifications

Characteristic	Specification
Height	75.82 in. (1925.83 mm)
Width	23.62 in. (599.95 mm)
Depth	41.28 in. (1048.51 mm)
Weight (maximum)	1,130 lb (512.56 kg)
Shipping weight (maximum)	1,320 lb (598.74 kg)

InfiniteReality Graphics Module Specifications

The InfiniteReality graphics module is a two-pipe, rackmounted graphics interface that requires 18U of space within a rack and has the specifications that are listed in Table A-3.

Table A-3 InfiniteReality Graphics Module Specifications

Characteristic	Specification
Height	31.50 in. (800.10 mm)
Width	19.00 in. (482.60 mm)
Depth	20.00 in. (508.00 mm)
Weight	215 lb (98 kg)
Input power (maximum)	+180-254 Vac (~2000 W)

SGI Onyx 300 Compute Module Specifications

The Onyx 300 compute module provides the compute and base I/O functionality for the system. Table A-4 summarizes the general features of this module.

Table A-4 General Features of the SGI Onyx 300 Compute Module

Feature	Specification
MIPS RISC processors	2 or 4
Memory	512 MB to 4 GB
Expansion slots	Two 32- or 64-bit (33- or 66-MHz) PCI slots
Serial ports	Two DB-9 RS-232 or RS-422
Ethernet	One 10BaseT or 100BaseT
SCSI channels (internal)	One Ultra3 SCSI, 160 MB/s
SCSI channels (external)	One Ultra3 SCSI (VHDCI)
3.5-in. drive bays	Two
USB ports	Two
RT interrupt input	One
RT interrupt output	One
L1 console port	One
NUMAlink 3 port	One (1.6 GB/s each direction)
XIO port	One (1.2 GB/s each direction)

Table A-5 shows the specifications for the SGI Onyx 300 compute module.

Table A-5 Onyx 300 Compute Module Specifications

Characteristic	Specification
Height	3.46 in. (8.80 cm)
Width	19.00 in. (48.30 cm) (front panel width) 17.07 in. (43.36 cm) (chassis width)
Depth	26.00 in. (66.00 cm) (without bezel) 26.80 in. (68.00 cm) (with bezel)
Weight	36.0 lb (16.4 kg)
Noise	50 dB(A) maximum
Heat dissipation	938 Btu/hr maximum
Input power	110/220 Vac autosensing (~275 W)

NUMAlink Module Specifications

The NUMAlink module routes information between the Onyx 300 compute modules via the NUMAlink 3 interconnect. The NUMAlink module consists of eight ports. Four ports can connect to four Onyx 300 compute modules. The other four ports, which carry USB signals, can connect to Onyx 300 compute modules or PCI expansion modules.

Note: For more information about the NUMAlink module, refer to the *SGI Origin 300 System with NUMAlink Module User's Guide*.

The NUMAlink module requires 2U of space within the rack and has the specifications that Table A-6 lists.

Table A-6 NUMAlink Module Specifications

Characteristic	Specification
Height	3.30 in. (83.82 mm)
Width	17.38 in. (441.45 mm)
Depth	27.50 in. (609.60 mm)
Weight	20 lb (9 kg)
Input power	+48 Vdc (~60 W)

USB Hub Specifications

The four-port USB hub connects the L2 controller to the Onyx 300 compute modules that connect to ports 1, 6, 7, and 8 of the NUMALink module. In a multiple-rack system, USB hubs connect the L2 controller to the InfiniteReality graphics modules.

Table A-7 lists the specifications of the USB hub.

Table A-7 USB Hub Specifications

Characteristic	Specification
Height	0.875 in. (22.230 mm)
Width	4.25 in. (107.95 mm)
Depth	2.75 in. (69.85 mm)

L2 Controller Specifications

The L2 controller is housed in a sheet-metal box that is 1U high and is located at the top rear of the rack. Table A-8 lists the specifications of the L2 controller.

Table A-8 L2 Controller Specifications

Characteristic	Specification
Height	1.75 in. (44.45 mm)
Width	14.00 in. (355.60 mm)
Depth	6.50 in. (165.10 mm)
Input power	+48 Vdc (~30 W)

Power Bay Module Specifications

The power bay requires 3U of space within the rack and has the specifications that are listed in Table A-9.

Table A-9 Power Bay Module Specifications

Characteristic	Specification
Height	5.118 in. (130.000 mm)
Width	17.5 in. (443.0 mm)
Depth	23.898 in. (607.000 mm)
Weight (with two power supplies)	42.00 lb (19.05 kg)

Table A-10 lists the specifications of the power supplies.

Table A-10 Power Supply Specifications

Characteristic	Specification
Height	4.86 in. (123.50 mm)
Width	2.74 in. (69.50 mm)
Depth	13.67 in. (347.30 mm)
Weight	7.50 lb (3.38 kg)

PCI Expansion Module Specifications

The PCI expansion module is an optional device that provides an additional twelve PCI slots for the Onyx 300 system. For more information about the PCI expansion module, refer to the *PCI Expansion Module User's Guide*.

Table A-11 lists the specifications of the PCI expansion module.

Table A-11 PCI Expansion Specifications

Characteristic	Specification
Height	7.00 in. (177.80 mm)
Width	17.50 in. (444.50 mm)
Depth	27.50 in. (698.50 mm)
Weight	70.00 lb (31.50 kg)
Input power	+48 Vdc (~250 W)

SGI TP900 Storage Module Specifications

The SGI TP900 storage module is a rackmountable, 2U-high, 8-drive storage system that provides JBOD (just a bunch of disks) storage for the Onyx 300 graphics system. For more information about the TP900 storage module, refer to the *SGI Total Performance 900 Storage System User's Guide*.

Table A-12 lists the specifications of the TP900 storage module.

Table A-12 TP900 Storage Module Specifications

Characteristic	Specification
Height	3.37 in. (85.70 mm)
Width	17.6 in. (447.0 mm)
Depth	21.46 in. (545.00 mm)
Input power	100 - 254 Vac (~175 W)
Weight:	
Maximum configuration	48.5 lb (22.0 kg)
Empty enclosure	14.3 lb (6.5 kg)

Regulatory Specifications

The following sections and illustrations present information that may be important to the operation of your SGI Onyx 300 graphics system.

Manufacturer's Regulatory Declarations

The SGI Onyx 300 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

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 by 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 n'émet pas de perturbations radioélectriques dépassant les normes applicables aux appareils numériques de Classe A prescrites dans le Règlement sur les interférences radioélectriques établi par le Ministère des Communications du Canada.

VCCI Notice (Japan Only)

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

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

The SGI Onyx 300 graphics system is FCC-compliant under test conditions that include the use of shielded cables between the system and its peripherals. Your system and any peripherals 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



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. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.



Warning: Varoitus: Pärisko voi räjähtää, jos se on virheellisesti asennettu. Vaihda parisko ainoastaan laitevalmistajan suositteluun tyypin. Hävitä käytetty parisko 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.

Safety Instructions

Read these instructions carefully:

1. Follow all warnings and instructions marked on the product and noted in this and other documentation included with the product.
2. Unplug this product from the wall outlet before you clean it. 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. This product may fall, causing serious damage to the product.
5. Slots and openings on the cabinets and components of the product 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.
6. This product should be operated from the type of power indicated on the 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 individuals will walk on the cord.
8. Do not use extension cords with your SGI system.

9. 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.
10. 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.
11. Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
 - When the power cord or plug is damaged or frayed.
 - If liquid has been spilled into the product.
 - If the product has been exposed to rain or water.
 - If the product does not operate normally when the operating instructions are followed. Adjust only those controls that are covered by the operating instructions, because improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to normal condition.
 - If the product has been dropped or the cabinet has been damaged.
 - If the product exhibits a distinct change in performance, indicating a need for service.
12. Use only the proper type of power supply cord set (provided with the system) for this unit.

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