SGI™ Origin 3000 Series Owner's Guide

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About This Guide

This guide introduces the SGI Origin 3000 series of server products, which are servers whose functionality is divided into distinct functional units called “bricks.” Bricks allow ease of customization to meet your computing needs. This guide also shows you how to operate and maintain your server. Specifically, it provides the following information:

- Introduction to the SGI Origin 3000 server series (the SGI Origin 3200 server, the SGI Origin 3400 server, and the SGI Origin 3800 server). The introduction includes descriptions of all the items that compose a server, including the bricks and the racks, and a list of the server features.
- Instructions for connecting a console and for adding and replacing PCI cards and disk drives to your server.

Warning: For your safety and for the protection of your server system, only add or replace those items designated in this guide as to be added or replaced by a customer. Contact your SGI system support engineer (SSE) to add or replace any items in this guide.

Warning: Before installing, operating, or servicing any part of this product, please read the “Safety Instructions” on page 300.

- Instructions for powering on and powering off your server.
- Instructions for using the L1 and L2 controllers to monitor and control your server system and lists of L1 and L2 controller commands.
- Descriptions of the components, functions, connectors, and LEDs of the C-brick, I-brick, P-brick, X-brick, D-brick, R-brick, and system power. These descriptions include instructions for installing and replacing PCI cards and disk drives.
- Instructions for maintaining and troubleshooting your server system.
- Specifications for rack enclosures and individual bricks.

Audience

This guide is written for owners, system administrators, and users of the SGI Origin 3000 series servers. It presumes general knowledge of computers and computer operation.

Notes, Cautions, and Warnings

Throughout this document you will find notes, cautions, and warnings:

- A note provides information to help you in setting up, using, or maintaining your server.
- A caution provides you with information to avoid damaging your server.
- A warning provides you with information to avoid harming yourself and possibly damaging the server.

As a general warning, you are asked to have your SGI system support engineer (SSE) perform all the set up, addition or replacement of parts, cabling, and service of your SGI Origin 3000 server, with the exception of the following items that you can perform yourself:

- Connecting a system console to your server.
- Using your system console and your L2 controller touch display to enter commands and perform system functions such as powering on and powering off as described in this guide.
- Adding and replacing PCI cards as described in this guide.
- Adding and replacing disk drives in the D-brick as described in this guide.
- Using the On/Off switch and other switches (the reset and non-maskable interrupt (NMI) switches on the C-bricks) on the front panel of your server bricks.
- Using the ESI/ops panel (operating panel) on the D-brick.

Chapter Descriptions

This guide consists of the following:

- Chapter 1, “Introducing the SGI Origin 3000 Series,” describes the primary features of the SGI Origin 3000 server models available and the bricks and rack enclosures that compose the SGI Origin 3000 series server.
- Chapter 2, “System Setup and Operation,” explains how to configure your system hardware to meet your computing needs, and how to operate your server system.
- Chapter 3, “System Control,” describes the functions and interactions of the L1 and L2 controllers used to monitor and control the SGI Origin 3000 servers.
- Chapter 4, “C-brick,” describes the compute brick, including its connectors.
- Chapter 5, “I-brick,” describes the I-brick’s function as the base I/O for the server, its removable components, its I/O panel, and its connectors.
- Chapter 6, “P-brick,” describes the brick that provides additional PCI slots and explains how to add and replace PCI boards in the brick.
- Chapter 7, “X-brick,” describes the brick that houses XIO boards.
- Chapter 8, “D-brick,” describes the D-brick chassis, panel, and disk drive modules, and explains how to install and replace disk drive modules.
- Chapter 9, “R-brick,” describes the R-brick (router). R-bricks are component parts of the SGI Origin 3400 server and the SGI Origin 3800 server.
- Chapter 10, “System Power,” describes the power system components of the SGI Origin 3000 series servers.
- Chapter 11, “Maintenance and Troubleshooting,” describes maintenance and troubleshooting that can be performed on the SGI Origin 3000 series servers.
- Chapter 12, “Cabling Examples,” illustrates and describes the brick connectors used to connect to other bricks in the SGI Origin 3000 series server system and provides cabling examples.
- Appendix A, “Technical Specifications,” contains specifications for the short 17U rack and the tall 39U rack enclosures and physical and power specifications for each brick.
- Appendix B, “System Controller Commands,” explains the L1 and L2 commands.
- Appendix C, “Controller Status and Error Messages,” describes the status and error messages received through your L1 and L2 controllers, and explains how to proceed, if some action is required.

- Appendix D, “Regulatory Specifications,” describes the regulatory specifications for the SGI Origin 3000 series servers. This appendix also lists important safety instructions in operating, maintaining, and installing components for this product.

Information Sources

The SGI Origin 3000 server series include the following sources of information, as shown in Figure i.

- *SGI Origin 3000 Series Owner's Guide* (this book, which you are reading) (hard copy)
- *IRIX Admin Software Installation and Licensing Guide* (hard copy)
- *SGI Onyx 3000 Series Graphics System Hardware Owner's Guide* (optional)
- *SGIconsole Hardware Connectivity Guide* (optional)
- *SGIconsole Start Here* (optional)
- SGI documentation available on the World Wide Web

To use the following information sources, you must have an SGI workstation running IRIX software. (If you do not have IRIX software, you can access PDF files of the following documentation at `http://techpubs.sgi.com/library`.)

- IRIS InSight online documentation and help
- Man pages (online)
- *IRIX Release Notes* (on CD-ROM)

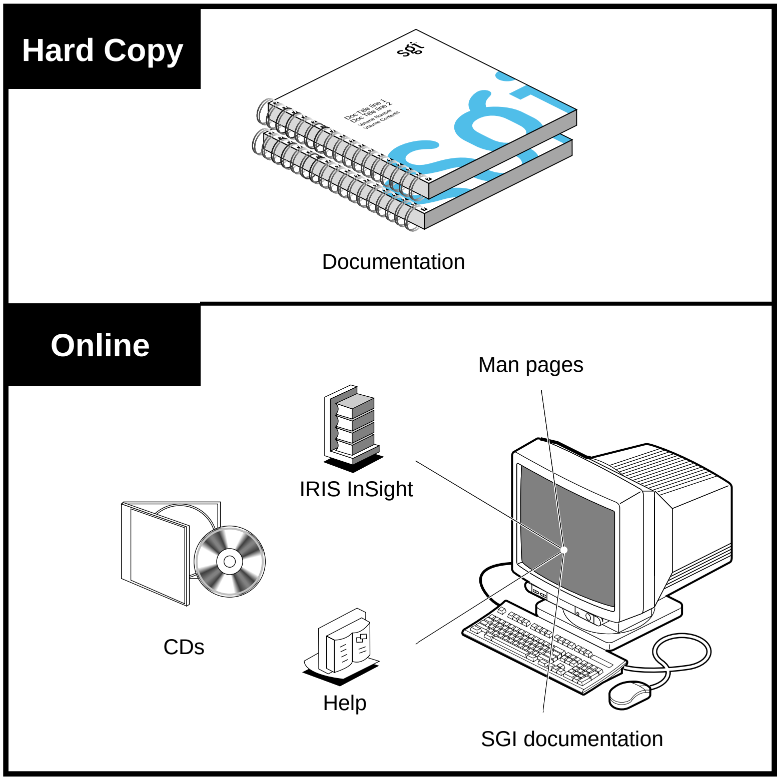

Figure i Information Sources for the SGI Origin 3000 Series System

The following sections describe information sources that can help you get started and become productive quickly.

SGI Origin 3000 Series Owner's Guide

See this guide (as shown in Figure ii) to get acquainted with your server system and to learn how to operate, monitor (by understanding various LEDs, alarms, and displays), maintain, and troubleshoot it. This guide also contains basic information on installing and replacing PCI cards and disk drives.

Figure ii SGI Origin 3000 Series Owner's Guide

Warning: For your safety and for the protection of your server system, only the items designated in this guide as to be added or replaced by a customer can be added or replaced by customers. Contact your SGI system support engineer (SSE) to install any hardware items not designated in this guide as items to be added or replaced by customers.

IRIX Admin: Software Installation and Licensing Guide

IRIX Admin: Software Installation and Licensing Guide is the complete reference guide on using the installation program, *inst*, to install software. For information on using the Software Manager to install software, see the online *Personal System Administration Guide*.

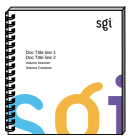

Figure iii IRIX Admin Guide

SGI Onyx 3000 Series Graphics System Hardware Owner's Guide (optional)

This guide describes how to install customer-installable components and operate the SGI Onyx 3000 series graphics system. It describes the G-brick and V-brick graphics subsystems, which can be added to your SGI Origin 3000 series server system (you can add a G-brick or a V-brick, but not both on the same system). This document also describes the N-brick, which can be used in systems with a G-brick to replace up to four I- or X-bricks to connect C-bricks with the InfiniteReality graphics pipes on the G-brick.

SGIconsole Hardware Connectivity Guide (optional)

This guide describes how to connect an SGIconsole to your SGI Origin 3000 series server and other servers supported by the SGIconsole. You use the SGIconsole to manage and monitor your server systems.

SGIconsole Start Here (optional)

This describes how to use the SGIconsole software tools to manage and monitor the server systems supported by the SGIconsole. It also lists other software guides to help you use the SGIconsole software tools.

IRIS InSight Online Documentation and Help

The online documentation package is called *IRIS InSight*. The InSight icon is shown in Figure iv. To view the manuals, select **Online Books** from the Help toolchest on your console. You will see bookshelves for end-user, developer, and administration manuals that are included online with the system. Double-click the name of a book to open it.

For descriptions of the manuals that are available to purchase in hard copy, double-click **Documentation Catalog**.

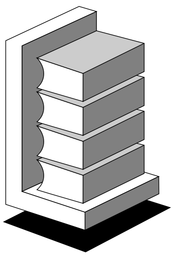

Figure iv IRIS InSight Icon

Online Man Pages

Your system includes a set of IRIX man pages, formatted in the standard UNIX "man page" style. These are found online on the internal system disk (or CD-ROM) and are displayed using the `man` command. For example, to display the man page for the `Add_disk` command, type the following command at a shell prompt:

```
man Add_disk
```

Important system configuration files and commands are documented on man pages. References in the documentation to these pages include the name of the command and the section number in which the command is found. For example, "Add_disk(1)" refers to the `Add_disk` command and indicates that it is found in section 1 of the IRIX reference.

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

```
apropos disk
```

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

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 at a shell prompt:

```
relnotes
```

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

SGI Documentation on World Wide Web

SGI manuals are available in various formats on the World Wide Web (WWW). Using your Web browser, open the following URL:

`http://techpubs.sgi.com/library`

Conventions

The following conventions are used throughout this document:

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

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, contact the SGI subsidiary or authorized distributor in your country.

Reader Comments

If you have comments about the technical accuracy, content, or organization of this document, please send comments to SGI. Be sure to include the title and document number of the manual. (The document number of an online document is located in the front matter of the manual. The document number of a printed manual can be found on the back cover.)

You can contact SGI in any of the following ways:

- Send e-mail to the following address:

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- Use the Feedback option on the Technical Publications Library World Wide Web page:

  http://techpubs.sgi.com

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

- Send mail to the following address:

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  1600 Amphitheatre Pkwy., M/S 535
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- Send a fax to the attention of "Technical Publications" at +1 650 932 0801.

SGI values your comments and will respond to them promptly.

Introducing the SGI Origin 3000 Series

This chapter introduces you to the SGI Origin 3000 series of server products in the following sections:

Product Description

The SGI Origin 3000 series is a family of modular computer server systems. The various internal components of the various SGI Origin 3000 servers and their functions are divided into separate units called "bricks" for easy system customization to meet your computing needs. These bricks are housed in short or tall rack enclosures (depending on the model you have chosen) like those shown in Figure 1-1.

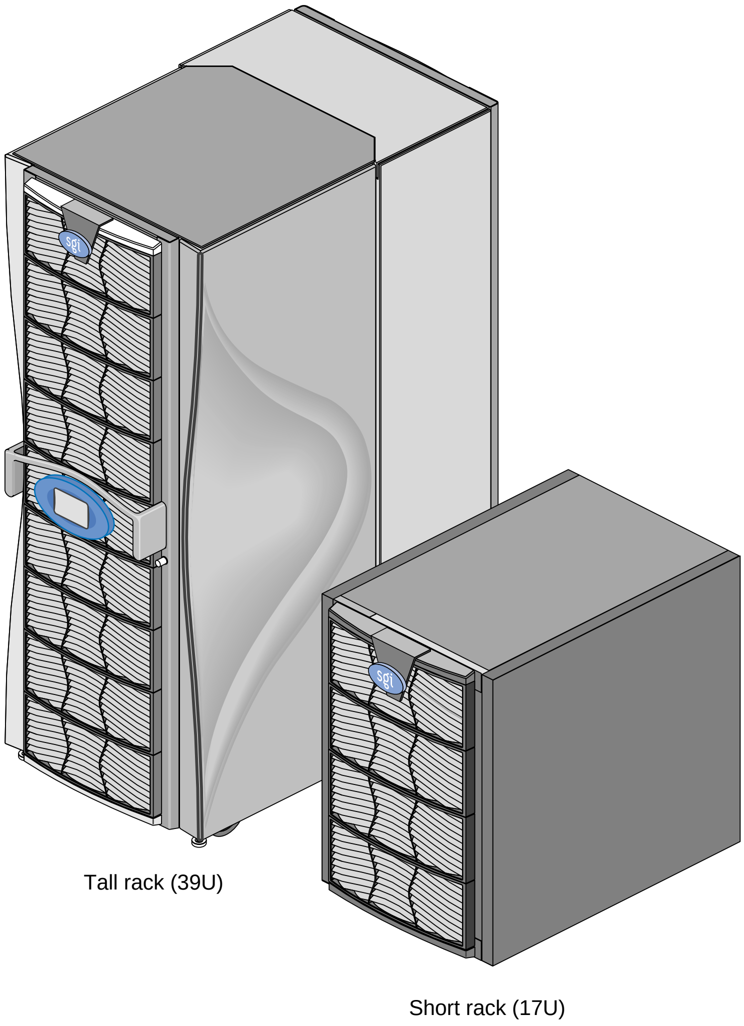

Figure 1-1 SGI Origin 3000 Series Servers

Bricks

SGI's third generation of ccNUMA architecture is known as NUMA 3 and is integral to the design of the SGI Origin 3000 series of servers. The NUMA 3 architecture is the basis for building a server that is highly flexible and resilient to failure.

Modular building blocks representing separate functional parts of the server are used to configure a server that matches your application environment. These individual ccNUMA building blocks are referred to as "bricks," and are covered individually in this section.

Table 1-1 lists the various bricks available with an SGI Origin 3000 series server. Each brick has a dedicated chapter in this guide that explains the brick's function in detail.

Table 1-1 Bricks

Brick	Provided Function	Described in
C-brick	Processing and memory	Chapter 4, "C-brick"
I-brick	Base system I/O	Chapter 5, "I-brick"
P-brick	PCI bus interfaces	Chapter 6, "P-brick"
X-brick	XIO interface	Chapter 7, "X-brick"
D-brick	Storage modules	Chapter 8, "D-brick"
R-brick	Interconnect fabric (routers)	Chapter 9, "R-brick"
G-brick and V-brick	Graphics subsystems[a]	*SGI Onyx 3000 Series Graphics System Hardware Owner's Guide*
N-brick	A cost and space saving alternative to other I/O bricks to connect the C-brick with a G-brick.	*SGI Onyx 3000 Series Graphics System Hardware Owner's Guide*
Power bay	Power supplies and control	Chapter 10, "System Power"

a. Can use either G-brick or V-brick, but not both in the same graphics system.

Interactions Among Bricks

The C-brick performs the computing function for the server system; it contains two or four processors (each with 4 or 8 MB of private secondary cache), memory, and a crossbar switch used as a memory controller.

This switch acts as a channel between the internal processors and local memory. The R-brick (router) is used to connect to other C-bricks. The I/O interface bricks (I-brick, P-brick, X-brick) connect to individual C-bricks.

A D-brick can be optionally added to your server. The D-brick is used to provide storage modules to your server.

The G-brick or a V-brick (but not both on the same server system) can also be optionally installed onto your server to provide your system with sophisticated graphics capabilities. The N-brick can be used in systems with a G-brick to replace up to four I- or X-bricks to connect C-bricks with the InfiniteReality graphics pipes on the G-brick. See *SGI Onyx 3000 Series Graphics System Hardware Owner's Guide* for details on these bricks.

See Figure 1-2 for an illustration of how the bricks are interconnected to create your server system. (For illustrations of how these various bricks are cabled together, see Chapter 12, "Cabling Examples.")

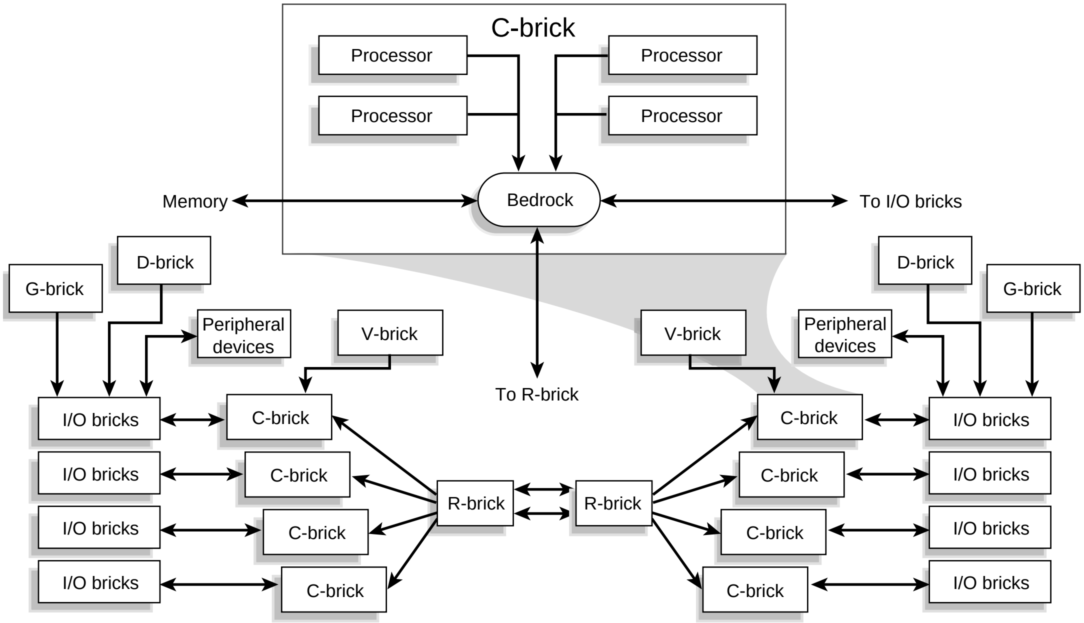

Figure 1-2 Interaction between SGI Origin 3000 Server Series Bricks

Brick Cooling and Fans

The bricks are air-cooled devices; airflow is from the front of the brick to the rear. All bricks have three fans at the front, except for the R-brick, which has two fans.

The fans run at variable speeds; the speed is controlled by the brick's L1 controller, which monitors and controls the brick's operating temperature. The R-brick fans are smaller than other brick fans and run at a single speed.

All fans are N+1 redundant and can be hot-swapped by a qualified SGI system support engineer (SSE). If a fan fails, the remaining functional fans run at higher speeds to compensate, and error messages are issued.

Bricks and Controllers

The C-brick, R-brick, I-brick, P-brick, and X-brick have L1 controllers that monitor the activities of their brick. The L1 controller generates status and error messages for the brick that are displayed on the L1 controller display located on the brick's front panel.

The L2 controller comes with all tall racks with C-bricks (L2 controller is optional for the short racks). The L2 controller in tall racks has a touch display unit located on the front door of the rack. The L2 controller displays system controller status and error messages. It displays the status and error messages generated by the L1 controllers.

The L1 controller messages can also be displayed in a server system console connected to your server system. You can also enter L1 and L2 commands at your console to control activity in your server system.

For details about the L1 and L2 controllers, see Chapter 3, "System Control." For a list of L1 and L2 commands, see Appendix B.

The D-brick has an ESI/ops panel module with a microcontroller for monitoring and controlling all elements of the D-brick.

See *SGI Onyx 3000 Series Graphics System Hardware Owner's Guide* for details on monitoring and controlling the activity of the G-brick, V-brick, and N-brick.

Racks

Two rack sizes are used in the SGI 3000 server series. The short rack (17U) shown in Figure 1-3 is used for SGI Origin 3200 server model, and the tall rack (39U) shown in Figure 1-4 is used for both the SGI Origin 3400 server and SGI Origin 3800 server models.

Short Rack (17U)

The short rack (shown in Figure 1-3) has the following features and components:

- **Front door and rear door.** Both doors have keylocks that prevent unauthorized access to the system.
- **Visible L1 controller display and visible brick LEDs** with the doors closed.
- **Cable entry/exit area** at the bottom of the rack. Cables are attached at the rear of the rack. The rack is mounted on four casters; the rear two casters swivel. The base of the rack has leveling pads, a ground strap, and seismic tie-downs.
- **Power distribution strip (PDS).** The PDS has six outlet connectors to connect to the power bay, one inlet connector, and a circuit breaker switch.
- **L2 controller (optional).** Used to display system controller status and error messages. The L2 controller displays the individual brick's status and error messages generated by each brick's L1 controller. Although short racks do not have an L2 controller touch display, the L2 controller can be monitored and managed on a local workstation connected to the L2 controller.
- **Single power bay with three power supplies.**

Note: The short rack is used to house the SGI Origin 3200 server model.

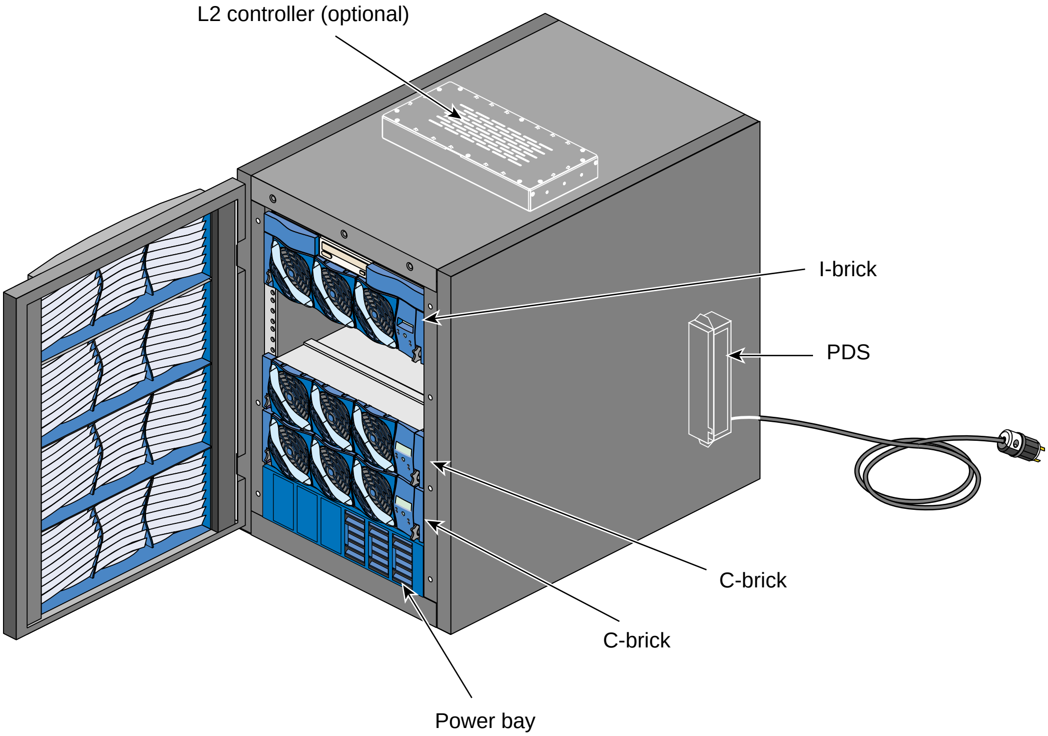

Figure 1-3 Front View of the Short Rack

Tall Rack (39U)

The tall rack shown in Figure 1-4 has the following features and components:

- **Front door and rear door.** Both doors have keylocks that prevent unauthorized access to the system.
- **L1 controller display and brick LEDs** with the doors closed.
- **Cable entry/exit area** at the bottom rear of the rack. Cables are attached at the rear of the rack. The rack is mounted on four casters; the two rear casters swivel. The base of the rack has four M12 weldnuts for seismic tie-downs.

The tall rack also has cable entry/exit areas at the top, bottom, and sides of the rack. I/O and power cables pass through the bottom of the rack. NUMAlink cables pass through the top and sides of the rack. Cable management occurs in the rear of the rack.

- **L2 controller.** Used to display system controller status and error messages. The L2 controller can display the individual brick's status and error messages generated by each brick's L1 controller. Each tall rack with C-bricks comes with an L2 controller and an L2 controller touch display located on the front door of the system.
- **One or two power bays**, depending on your computing needs. Each power bay on the tall racks has four power supplies.
- **One or two Power Distribution Units (PDUs) per rack**, depending on the number of power bays. (Each power bay requires four connections, one per each power supply.) The PDU can be single-phase or three-phase. The single-phase PDU, which supports one power bay, has one opening with six cables to connect to the power bay. This PDU has two input power-plug cables, a single outlet connector, and a circuit breaker switch.

  The three-phase PDU, which supports two power bays, has two openings, and each of these has six cables to connect to the two power bays. This PDU has one input power-plug cable, a single outlet connector, and a circuit breaker switch.

Note: The tall racks house a combination of bricks that compose SGI Origin 3400 servers and SGI Origin 3800 servers.

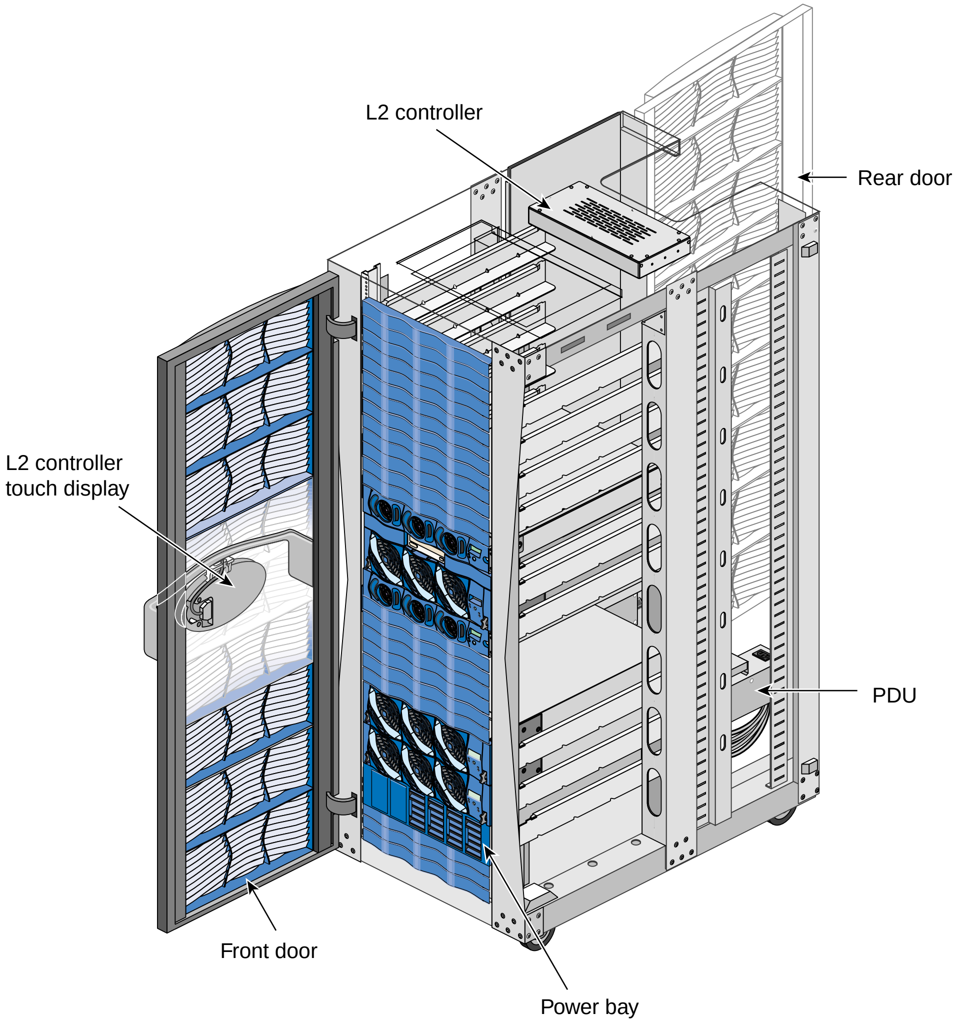

Figure 1-4 Front View of the Tall Rack (with Side Covers Removed)

Measuring Racks and Bricks

The racks are measured in EIA standard units; one SU or unit (U) is equal to 1.75 in. (4.49 cm).

Figure 1-5 illustrates the size in standard units of each brick type available with an SGI Origin 3000 series server, except for the G-brick, V-brick, and N-brick. The G-brick is 18 units high, the V-brick four units high, and the N-brick two units high. If you have a G-brick or a V-brick, or a G-brick with an N-brick, see *SGI Onyx 3000 Series Graphics System Hardware Owner's Guide* for details.

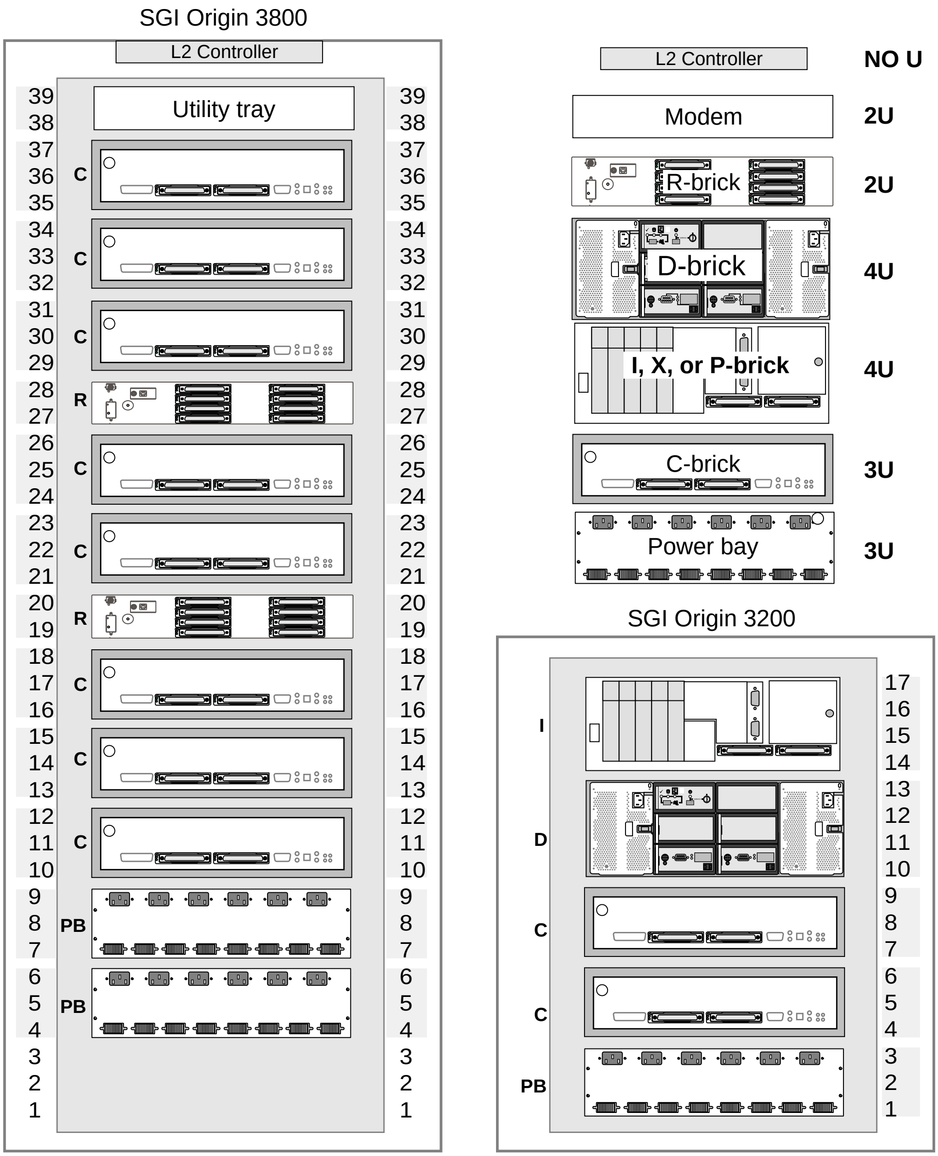

Figure 1-5 Rack and Brick Measurements

Bay (Unit) Numbering

Bays in the racks are numbered using standard units, as shown in Figure 1-5. The illustration also identifies the size (in units) of the different brick types.

Because bricks require multiple standard units to fit in a rack, brick locations within a rack are identified by the bottom unit (U) in which the brick resides. For example, in a tall 39U rack, the C-brick positioned in U10, U11, and U12 is identified as C10. In a short 17U rack, an I-brick positioned in U10, U11, U12, and U13 is identified as I10.

These identifiers or bay locations are represented as decimal numbers in the hardware graph path. The hardware graph path has the following form:

```
/hw/module/rrrTuu
```

where rrr = rack, T= brick type, and uu = location in rack.

Below is an example of **hinv** (IRIX hardware inventory command) output identifying the rack and bay numbers:

```
$ hinv
/hw/module/001c10
/hw/module/002r19
```

Rack Numbering

A rack is numbered with a three-digit number. A compute rack (designated for C-bricks) is numbered sequentially beginning with 001. An I/O rack (designated for I-bricks, P-bricks, X-bricks, and D-bricks) is numbered sequentially (also beginning with 001) and by the physical quadrant in which the I/O rack resides.

In a single-rack configuration (for all 3200 server configurations and some 3400 server configurations), the compute rack is numbered 001 even if it contains an I/O brick or D-brick.

Figure 1-6 shows the rack numbering scheme for multiple-rack server systems.

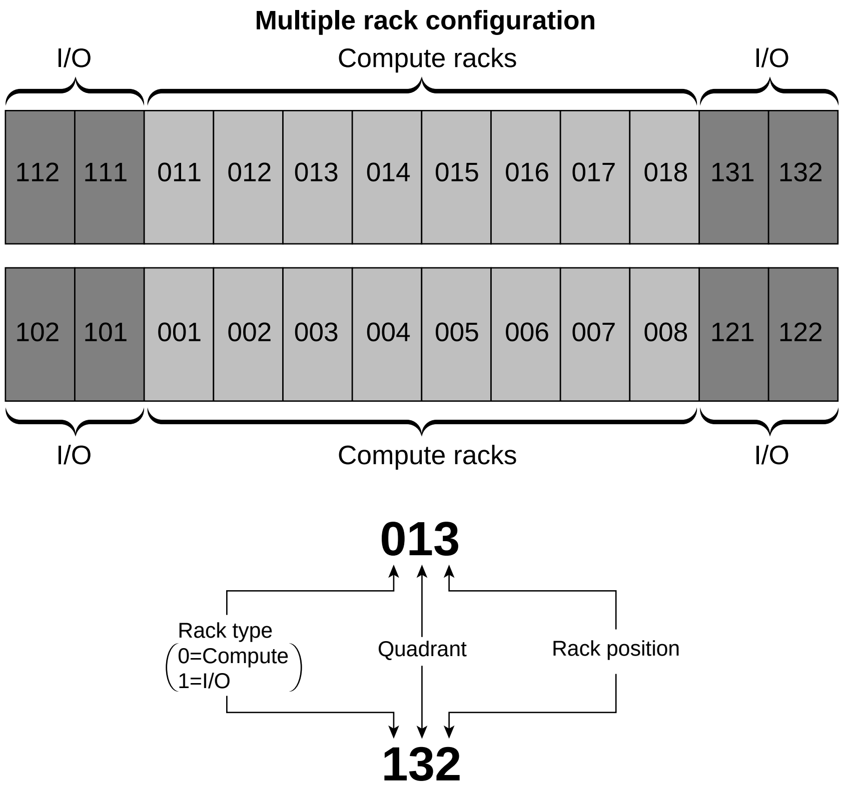

Figure 1-6 Rack Numbering

Rack numbers are represented as decimal numbers in the hardware graph path, for example:

```
$ hinv
/hw/module/001C10
```

SGI Origin 3000 Series Models

The C-brick contains the processors (two or four processors per C-brick) for the server system. The number of processors and the combination of functional bricks you have in your server system determines the SGI Origin 3000 server model. The following are the models available: the SGI Origin 3200 server, the SGI Origin 3400 server, and the SGI Origin 3800 server.

SGI Origin 3200 Server

SGI Origin 3200 server system has up to 8 processors, a minimum of one I/O brick (an I-brick), no routers, and a single power bay. The system is housed in a short 17U rack enclosure with a single power distribution strip (PDS). Although the L2 controller is optional with the SGI Origin 3200 server, the L2 controller touch display is not.

An I, P, or X-brick can be added to the SGI Origin 3200 server between the I-brick and the topmost C-brick.

Also, additional racks containing D-bricks can be added to your SGI Origin 3200 server system.

Figure 1-7 shows an example of one possible SGI Origin 3200 server system configuration.

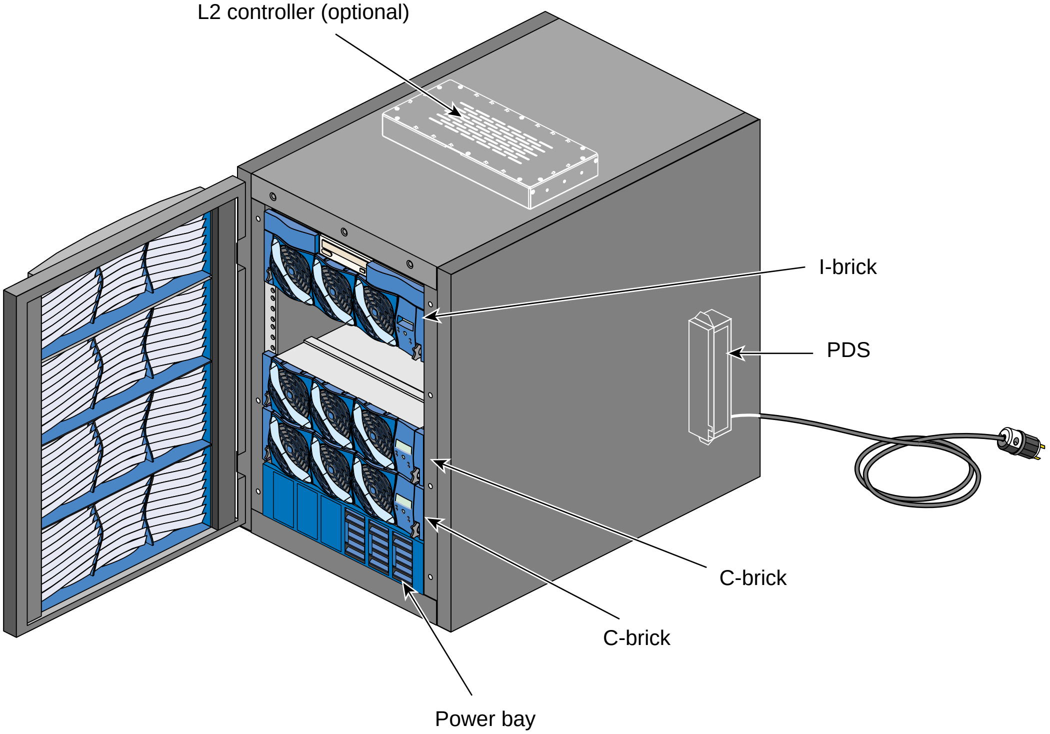

Figure 1-7 SGI Origin 3200 Server System

SGI Origin 3400 Server

The SGI Origin 3400 server system has up to 32 processors, a minimum of one I/O brick (an I-brick), two 6-port routers, and at least one power bay. The system needs at least one tall 39U rack enclosure, which has at least a single power bay with one single-phase power distribution unit (PDU). The SGI Origin 3400 is also offered with a three-phase PDU, which supports two power bays. (The single-phase PDU has one opening with six cables to connect to the power bay. The three-phase PDU has two openings with six cables from each opening to connect to the power bays.)

Each tall rack enclosure containing C-bricks comes with an L2 controller and an L2 controller touch display.

Figure 1-8 shows an example of one possible SGI Origin 3400 server system configuration.

The system can be expanded to include a second tall rack to add D-bricks, and I/O bricks (I-bricks, P-bricks, and X-bricks) to your server system.

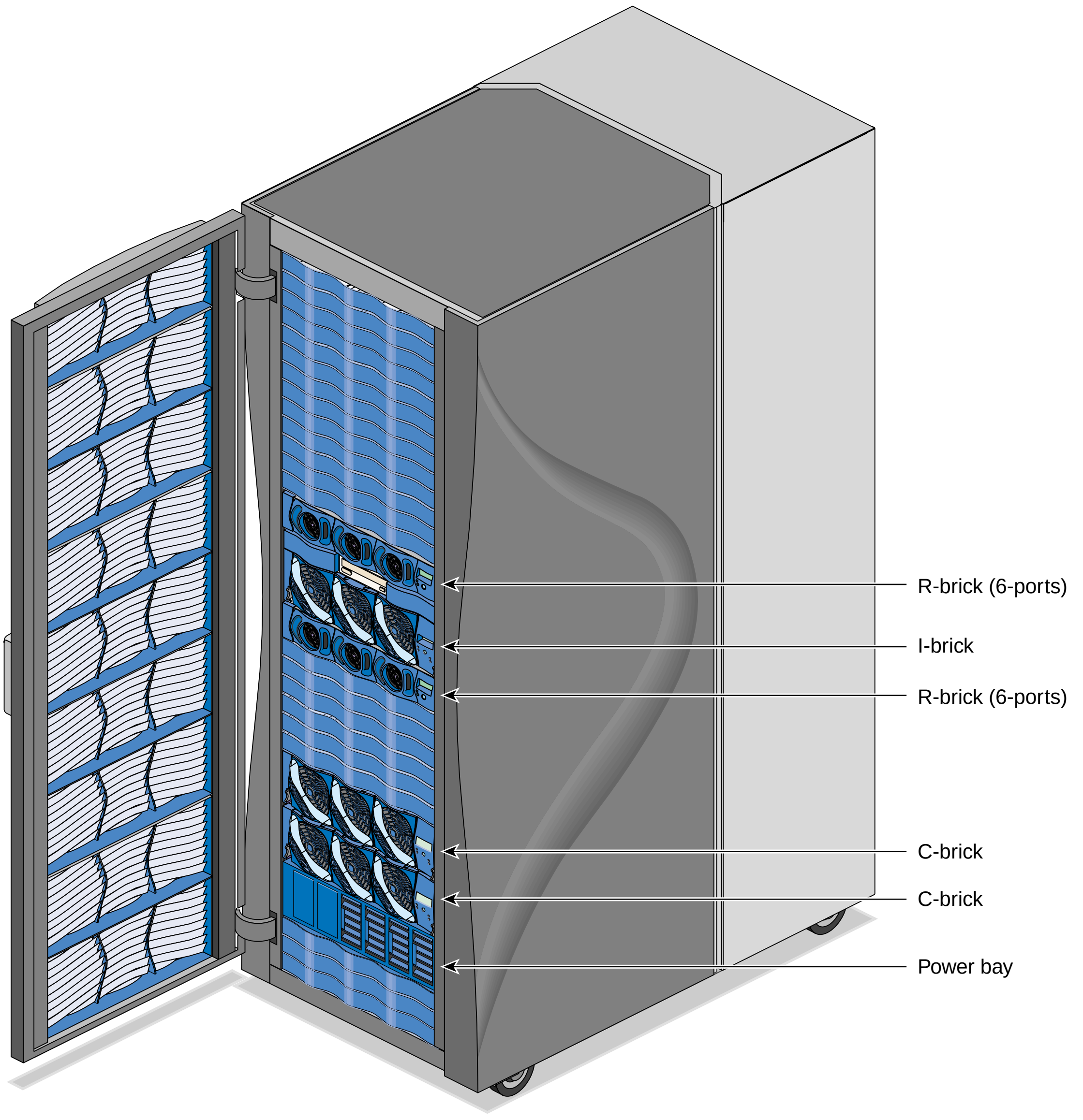

Figure 1-8 SGI Origin 3400 Server System

SGI Origin 3800 Server

The SGI Origin 3800 server system has a minimum four C-bricks, a minimum of 16 and a maximum of 512 processors, a minimum of one I-brick, one P-brick, and two 8-port routers. The system needs a minimum of two tall rack enclosures, with at least one power bay per rack (one for the compute rack and another for the I/O rack), and one single-phase PDU per rack. (The single-phase PDU has one opening, which has six cables to connect to the power bay. The SGI Origin 3800 is also offered with a three-phase PDU, which has two openings, each with six cables to connect to the power bays.)

Each tall rack enclosure containing C-bricks comes with an L2 controller and an L2 controller touch display.

Figure 1-9 shows an example of a possible SGI Origin 3800 server configuration.

Additional racks containing C-bricks, R-bricks, D-bricks, and I/O bricks (I-bricks, P-bricks, and X-bricks) can be added to your server system.

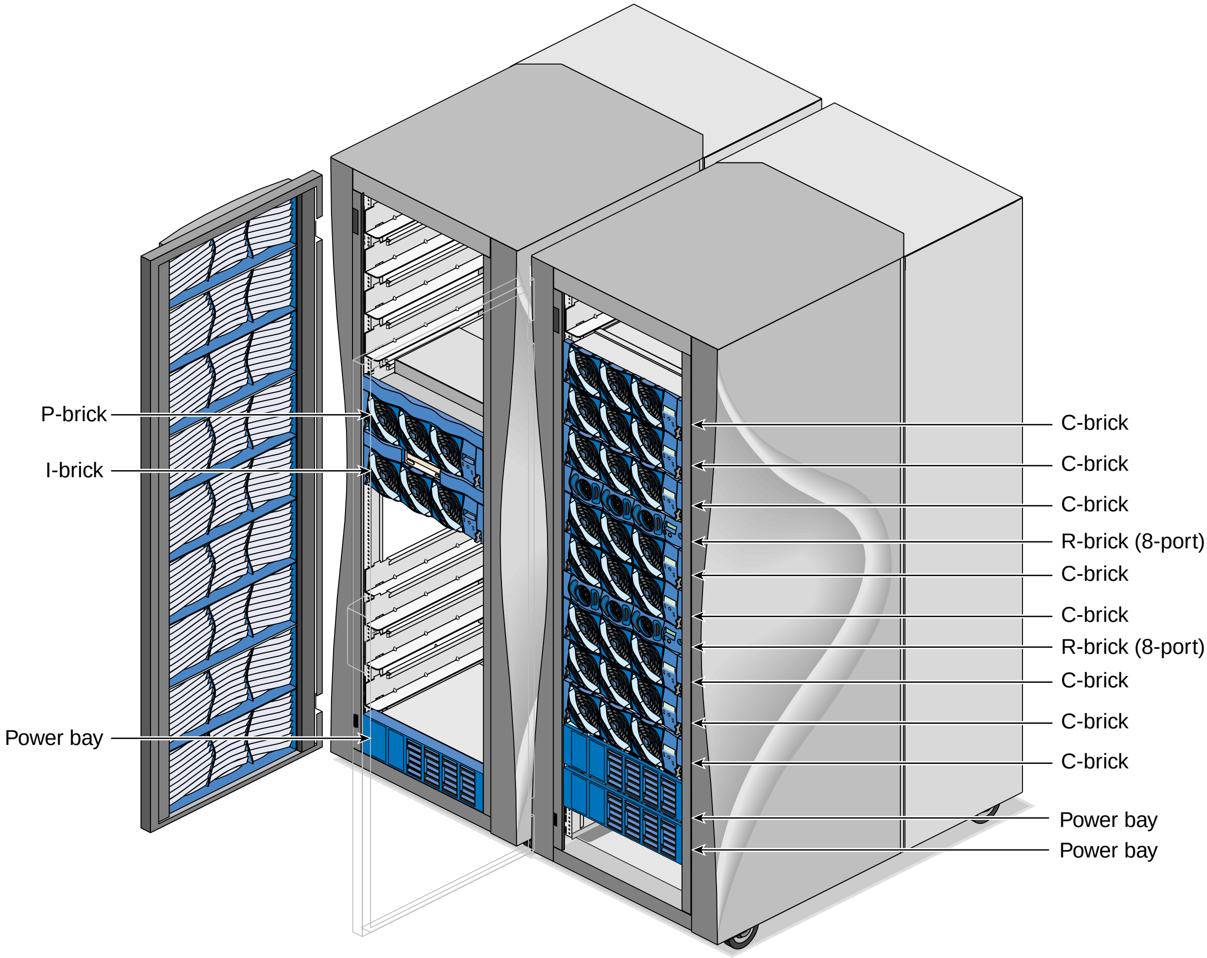

Figure 1-9 SGI Origin 3800 Server System

Server System Features

The following sections introduce the main features of the SGI Origin 3000 series server systems:

- "Modularity and Scalability" on page 21
- "Distributed Shared Memory (DSM)" on page 22
- "Distributed Shared I/O" on page 22
- "Cache-coherent Non-uniform Memory Access (ccNUMA) Architecture" on page 22
- "Reliability, Availability, and Serviceability (RAS)" on page 23

More than 3600 third-party software applications are available for the SGI Origin 3000 server series systems. For a current list of applications, see the following URL:

`http://www.sgi.com/Products/appsdirectory.html`

Modularity and Scalability

The SGI Origin 3000 server series systems are *scalable* systems with the ability to independently scale processors and memory, I/O bandwidth, and storage. Furthermore, the SGI Origin 3000 server series systems can be clustered to increase the number of processors from 512 to thousands of processors.

The SGI Origin 3000 server series system's functions (such as computing, I/O, and storage) are divided into separate components housed in building blocks called *bricks*. These bricks can be independently added to a system to achieve the desired system configuration. As bricks are added to a system, the bandwidth and performance scale in a manner that is almost linear, without significantly affecting system latencies.

Distributed Shared Memory (DSM)

In the SGI Origin 3000 server series, memory is physically distributed among the C-bricks (compute nodes); however, it is accessible to and shared by all C-bricks. When a processor accesses memory that is physically located on a C-brick, this is referred to as the C-brick's *local memory*. The total memory within the system is referred to as *global memory.*

When processors access memory located in other C-bricks, the memory is referred to as *remote memory*.

The memory latency, which is the amount of time it takes for a processor to retrieve data from memory, is lowest when a processor accesses memory that is local to its C-brick.

Distributed Shared I/O

Like DSM, I/O devices are distributed among the C-bricks (each C-brick has an I/O port that can connect to an I/O brick) and are accessible by all C-bricks through the NUMAlink interconnect fabric.

Cache-coherent Non-uniform Memory Access (ccNUMA) Architecture

As the name implies, the ccNUMA architecture has two parts: *cache coherency* and *nonuniform memory access*.

Cache Coherency

The SGI Origin 3000 server series use caches to reduce memory latency. Although data exists in local or remote memory, copies of the data can exist in various processor caches throughout the system. Cache coherency keeps the cached copies consistent.

To keep the copies consistent, the ccNUMA architecture uses directory-based coherence protocol. In directory-based coherence protocol, each block of memory (128 bytes) has an entry in a table that is referred to as a directory. Like the blocks of memory that they represent, the directories are distributed among the C-bricks. A block of memory is also referred to as a cache line.

Each directory entry indicates the state of the memory block that it represents. For example, when the block is not cached, it is in an unowned state. When only one processor has a copy of the memory block, it is in an exclusive state. And when more than one processor has a copy of the block, it is in a shared state; a bit vector indicates which caches contain a copy.

When a processor modifies a block of data, the processors that have the same block of data in their caches must be notified of the modification. The SGI Origin 3000 server series use an invalidation method to maintain cache coherence. The invalidation method purges all unmodified copies of the block of data and the processor that wants to modify the block receives exclusive ownership of the block.

Non-uniform Memory Access (NUMA)

In DSM systems, memory is physically located at various distances from the processors. As a result, memory access times (latencies) are different or "non-uniform." For example, it takes less time for a processor to reference its local memory than it does to reference remote memory.

In a NUMA system, program performance is based on proper placement of important data structures. In general, data should be located close to the processor that will access it. IRIX provides a service to enable applications to achieve this.

Reliability, Availability, and Serviceability (RAS)

The SGI Origin 3000 server series components have the following features to increase the reliability, availability, and serviceability (RAS) of the systems.

- **Power and cooling:**
  - Power supplies are redundant and can be hot-swapped by your SGI system support engineer (SSE).
  - Bricks have overcurrent protection.
  - Fans are redundant and can be hot-swapped by your SGI system support engineer (SSE).
  - Fans run at multiple speeds: in all bricks except the R-brick, speed increases automatically when temperature increases or when a single fan fails.

- **System monitoring:**
  - System controllers monitor the internal power and temperature of the bricks, and automatically shut down bricks to prevent overheating.
  - Memory and secondary cache are protected by single-bit error correction and double-bit error detection (SECDED).
  - The NUMAlink3 interconnect network is protected by cyclic redundancy check (CRC).
  - The primary cache is protected by parity.
  - Each brick has failure LEDs that indicate where in the PROM code the system stopped when booting. If IRIX is up and running, these LEDs are CPU usage indicators. These LEDs are readable via the system controllers.
  - Systems support Embedded Support Partner (ESP), a tool that monitors the system; when a condition occurs that may cause a failure, ESP notifies the appropriate SGI personnel.
  - Systems support remote console and maintenance activities.
- **Power-on and boot:**
  - Automatic testing occurs after you power on the system (power-on self-tests or POST; these tests are also referred to as power-on diagnostics or POD).
  - Processors and memory are automatically deallocated when a self-test failure occurs.
  - Boot times are minimized.
- **Further RAS features:**
  - Systems support partitioning.
  - PCI cards and disk drive modules can be added to the system without powering off the brick (hot-pluggable).
  - IRIX has enhanced reliability.
  - Systems have a local field-replaceable unit (FRU) analyzer.
  - All system faults are logged-in files.
  - Memory can be scrubbed when a single-bit error occurs.

System Setup and Operation

This chapter describes how to set up the hardware and operate your SGI Origin 3000 server. Specifically, it shows how to do the following:

- "Connecting a Console to Your Server System" on page 25
- "Adding or Replacing Server System Parts" on page 31
- "Powering On and Off" on page 33
- "Monitoring Your Server" on page 62

Warning: Before installing, operating, or servicing any part of this product, please read the "Safety Instructions" on page 300.

Connecting a Console to Your Server System

Connecting a console to your SGI Origin 3000 server enables you to do the following:

- Monitor your server system by reading the individual brick's status and error message information displayed by the L2 controller and generated by the brick's L1 controller. The L2 controller displays status and error message information for your server system's rack enclosure and for the racks monitored by other interconnected L2 controllers.
- Enter L1 and L2 controller commands to monitor or change particular server system functions. You can, for example, monitor the speed of fans for a particular brick. See Appendix B, "System Controller Commands," for descriptions of the L1 and L2 controller commands you can use.
- Power on or power off individual bricks or all the bricks in your server system.
- If you connect an SGIconsole to your server system, you can perform all the previous functions listed and have the use of various other server monitoring and management tools.

You have the following options in connecting your console to a server system. The option you choose may be determined by which server you have. Table 2-1 shows the various console connection options:

- If you have a server without an L2 controller (such as a smaller SGI Origin 3200 server), you can connect a dumb terminal (or a PC with a terminal emulator) to the C-brick console port connector as shown in Figure 2-1. (Figure 2-2 shows the console port connector pinouts.)

  If you have multiple C-bricks in a rack, connect your console to the bottom-most C-brick that is connected to an I-brick.

- If you have a server with an L2 controller, always connect your console to the L2 controller.

  If you have an SGIconsole, connect it to the Ethernet port connector on the L2 controller as shown in Figure 2-3 on page 29. (See your *SGIconsole Hardware Connectivity Guide* for instructions to connect your SGIconsole to the SGI Origin 3000 series servers with L2 controllers.) Optionally, you can connect a dumb terminal to the L2 controller console (RS-232) connector.

- If you have a server with multiple L2 controllers, you can connect the SGIconsole to the Ethernet hub, to which the multiple L2 controllers are connected, as shown in Figure 2-4 on page 30. See your *SGIconsole Hardware Connectivity Guide* for instructions to connect your SGIconsole to an SGI Origin 3000 series server.

  The Ethernet hub, in turn, can be cascaded to another Ethernet hub. This is a good solution for an SGI Origin 3800 server system model, as you would have multiple tall (39U) racks, and each rack with C-bricks would have its own L2 controller.

Table 2-1 Console Connection Options

System Console Type	Server with No L2 Controller (Connect to Console Port on C-brick)	Server with No L2 Controller (Connect to L1 Port [USB] on C-brick)	Server with Single L2 Controller (Connect to Console Port on L2 Controller)	Server with Single L2 Controller (Connect to Ethernet Port on L2 Controller)	Server with Multiple L2 Controllers (Connect to Ethernet Hub)
Dumb terminal or PC with terminal emulator	Connection	N/A	Connection	N/A	N/A
SGIconsole	N/A	N/A	N/A	Connection	Connection

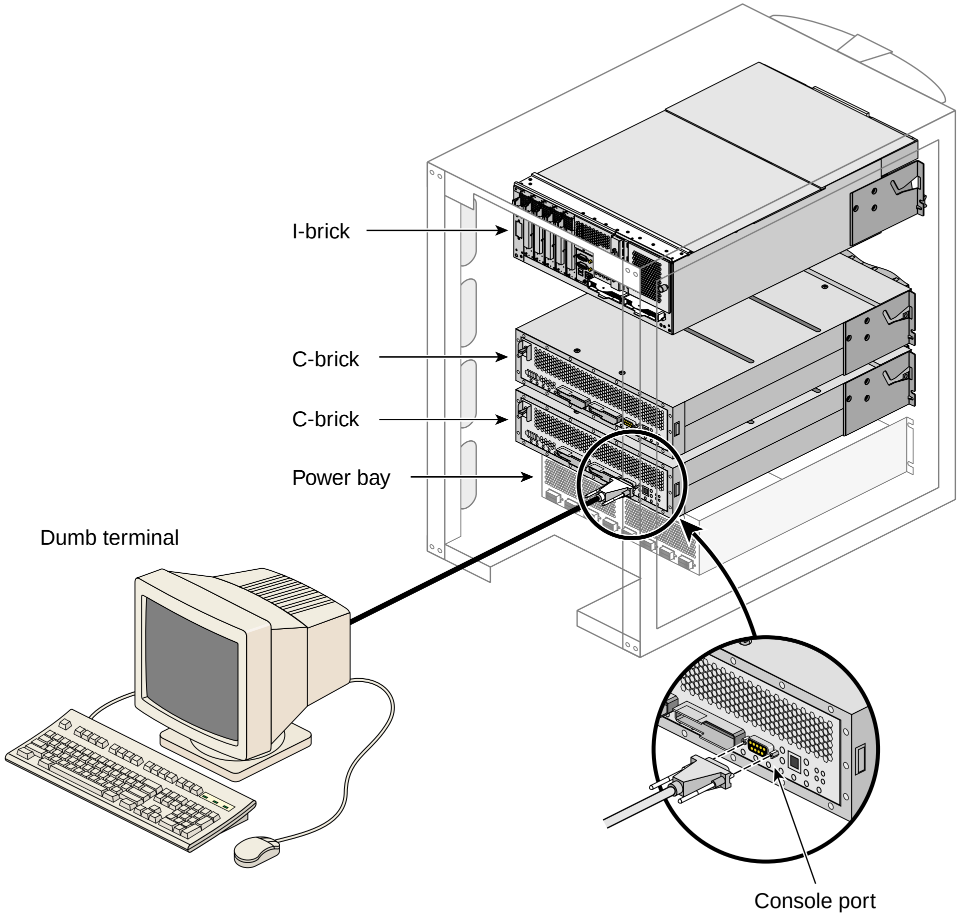

Figure 2-1 Connecting Dumb Terminal to C-brick Console Port

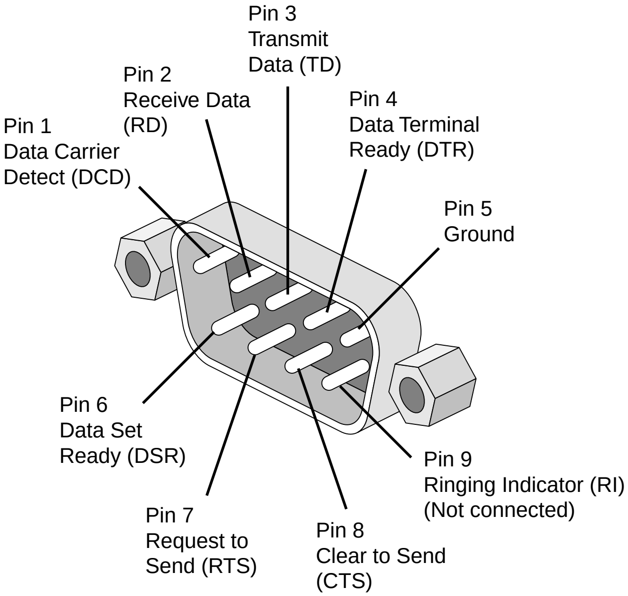

Figure 2-2 Console Port Pin Assignments

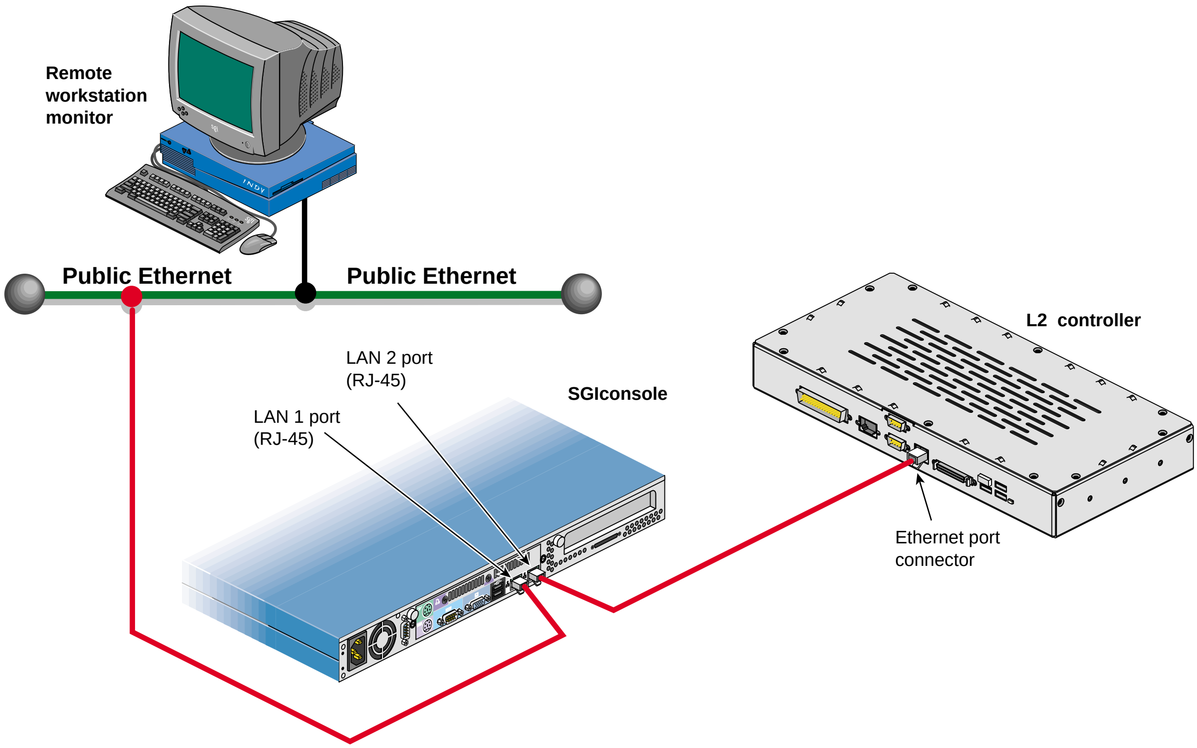

Figure 2-3 Connecting SGIconsole to L2 Controller Ethernet Port

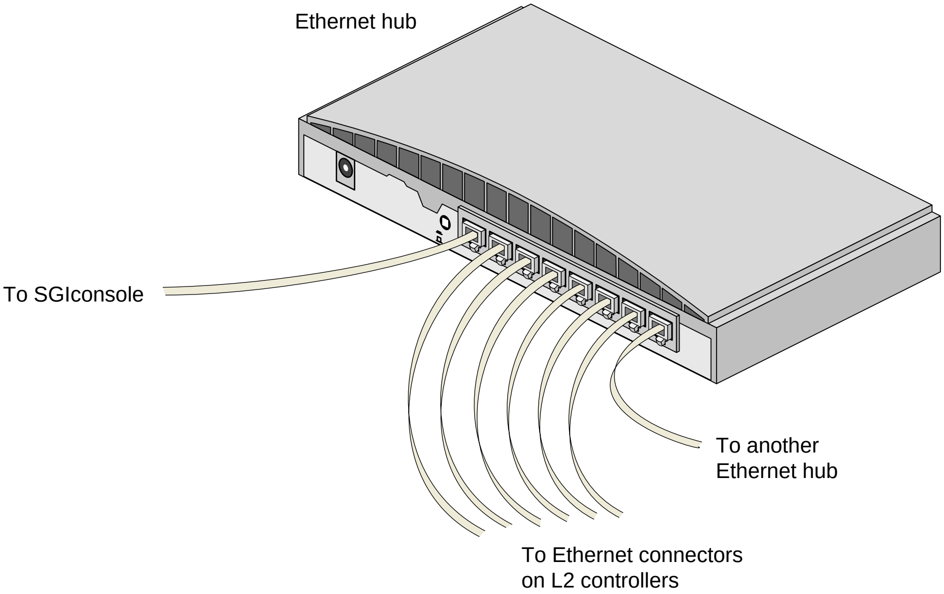

Figure 2-4 Connecting SGIconsole to an Ethernet Hub

Adding or Replacing Server System Parts

Besides the system console described in the previous section, you can add or replace the following hardware items on your SGI Origin 3000 series server system:

- Peripheral component interface (PCI) cards into your I-brick or P-brick.
- Disk drives to your D-brick.

Warning: You can add or replace only the items listed in this section. For your safety and for the protection of your server system, contact your SGI system support engineer (SSE) to install any hardware items not listed in this section

---

Warning: Before installing, operating, or servicing any part of this product, please read the "Safety Instructions" on page 300.

Adding or Removing PCI Cards

The PCI-based I/O system, an industry standard for connecting peripherals to a processor, is the primary I/O system for the SGI Origin 3000 series servers.

The I-brick and P-brick subsystems provide PCI support for the SGI Origin 3000 server series systems. The I-brick provides five PCI slots. Normally, one of the five slots is reserved for a system PCI card.

If additional PCI slots are required beyond the I-brick's four remaining slots, a P-brick is configured into the system. The P-brick supports 12 PCI slots. Table 2-2 summarizes the maximum number of PCI slots available in the SGI Origin 3200, SGI Origin 3400, and SGI Origin 3800 server systems.

Table 2-2 PCI Slots Available

System	I/O Bricks	Maximum Available PCI Slots
SGI Origin 3200 server	1 I-brick, 1 P-brick	16
SGI Origin 3400 server	1 I-brick, 7 P-bricks	88
SGI Origin 3800 server	1 I-brick, 63 P-bricks	760

Table 2-3 shows the PCI cards supported and installable in your I-brick and P-brick.

Table 2-3 PCI Cards Supported

Marketing Code	Description
PCI-SER-10002	Serial card
PCI-SCSI-DF-2P	Ultra SCSI high-voltage differential 2-port
PCI-SCSI-U3-2P	Ultra3 SCSI low-voltage differential 2-port (3.3 V)
PCI-FC-1POPT-A	Fibre channel with fiber optic cable, 66 MHz
PCI-FC-1PCOP-A	Fibre channel with copper cable, 66 MHz
PCI-ATMOC3-1P	ATM OC3
PCI-ATMOC12-1P	ATM OC12
PCI-GIGENET-C	Gigabit Ethernet (copper)
PCI-GIGENET-OR	Gigabit Ethernet (optical)
PCI-AUD-D1000	Digital audio

See “PCI Card Description and Installation” on page 142 for detailed instructions for installing a PCI card.

Adding or Removing Disk Drives

The D-brick is a Fibre-Channel-based disk storage enclosure used to provide JBOD (just a bunch of disks) mass storage for all SGI Origin 3000 series server models.

See “Adding and Removing Disk Drive Modules” on page 173 for detailed instructions for installing disk drive modules in the D-brick.

Powering On and Off

The following subsections describe how to power on and power off individual bricks or your entire SGI Origin 3000 series server.

- "Powering On" on page 33
- "Powering Off" on page 49

For servers with an L2 controller, you can power on and power off individual bricks and the entire system at the L2 controller touch display located on the front door of the server rack.

For servers with a system console (an SGIconsole or a dumb terminal), you can power on and power off individual bricks and the entire system at the system console.

If you are using an SGIconsole, you can monitor and manage your server from a remote location, and you can control and monitor your server using various software tools. See your SGIconsole documentation for information on the particular tools available.

The Embedded Support Partner (ESP) program enables you and your SGI system support engineer (SSE) to monitor your server remotely so as to resolve issues before they become problems. For details on this program, see "Using Embedded Support Partner (ESP)" on page 61.

Powering On

This section describes how to prepare to power on your system, and describes how to power on your system by using either of the following:

- L2 controller touch display
- System console

Preparing to Power On

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

1. Check to ensure that the cabling between the PDU or PDS and the wall power-plug receptacle is secure.
2. Make sure that the power switch on each individual brick that you want to power on is set to the **1** (On) position, as shown in Figure 2-5 for the I-brick. This starts the L1 controller for the brick(s) when the brick(s) is powered on. The 12V LED on the individual brick lights green when the L1 controller has powered on successfully.

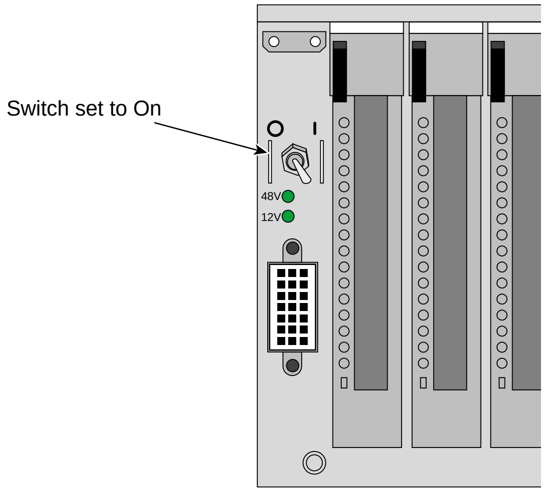

Figure 2-5 Ensuring the Power Switch Is Set to 1 (On) for Each Brick

3. If you plan to power on a D-brick or the entire server, which includes a D-brick, make sure that the D-brick's **RUN**/**SERVICE** key switch on the ESI/Ops panel is set to RUN, as shown in Figure 2-6.

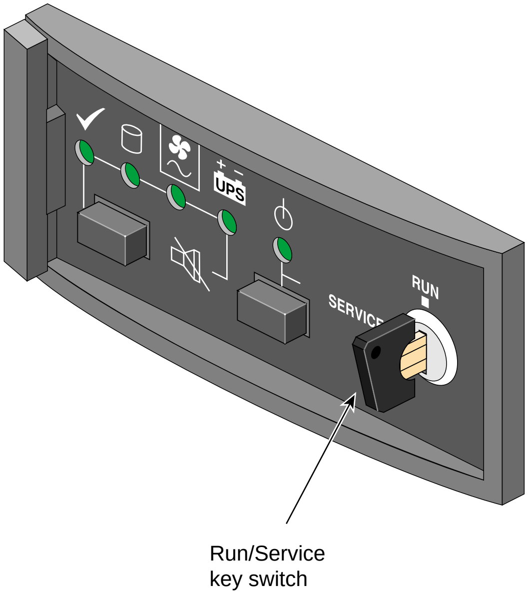

Figure 2-6 Setting D-brick's RUN/SERVICE Key Switch to RUN

4. Make sure that the PDU or PDS circuit breaker switch shown in Figure 2-7 is turned on to give power to the server system when the server is powered on.

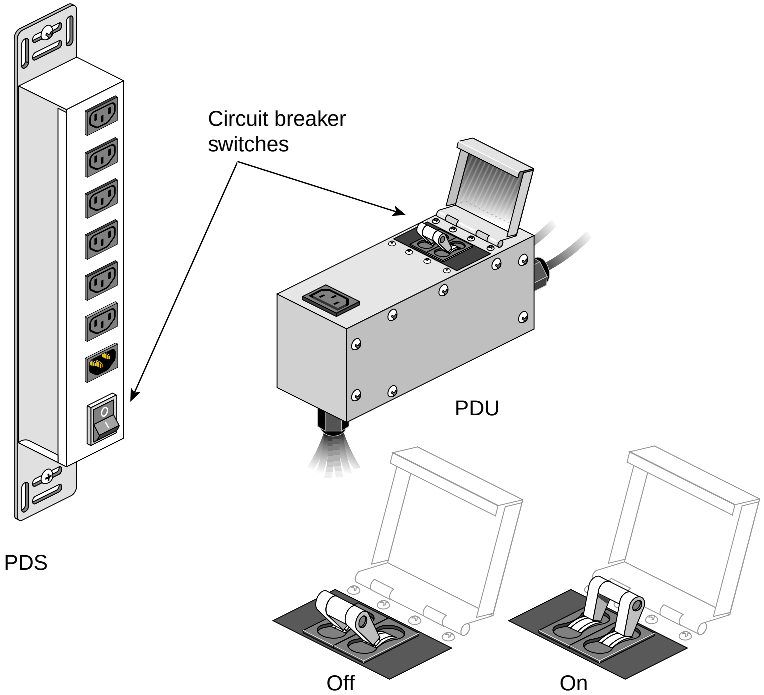

Figure 2-7 PDU and PDS Circuit Breaker Switch Locations

Note: Check that the brick LEDs turn on and light green and that your controllers display that the system is powered on for each segment of the procedure, which indicates that the powering on procedure is proceeding properly. If you have a problem during powering on and an error message appears on the L1 controller or the system console, see your online log files and Appendix C, "Controller Status and Error Messages," to learn what the error message indicates and what steps will resolve the problem.

Powering On with the L2 Controller Touch Display

This section describes how to power on individual bricks or the entire system from your L2 controller touch display (rack display) shown in Figure 2-8, which is located on the front door of every tall rack with an L2 controller. If you have multiple racks whose L2 controllers are interconnected at an Ethernet hub, you can power on any brick in those racks, a partition, or the entire system at any L2 controller touch display available on your server.

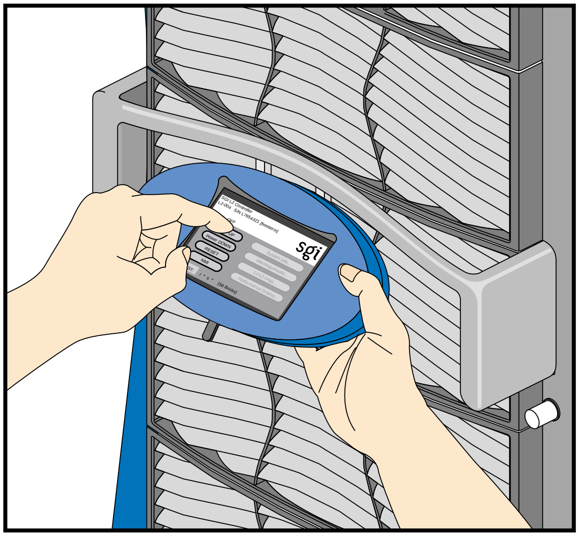

Figure 2-8 L2 Controller Touch Display

For instructions on navigating the L2 controller touch display, see "Using the L2 Controller Touch Display" on page 85.

The home window, shown in Figure 2-9, displays the following items:

- Rack number (*L2-004*) of the L2 controller to which the L2 controller touch display is connected.
- L2 controller system serial number (*L7654321*).
- Server system name in parentheses (*firestorm*).
- Power status (**Power:** *OFF*) for the bricks designated in the destination (**DEST**) field, which indicates all slots in all racks (*r * s **), which amounts to 56 bricks.

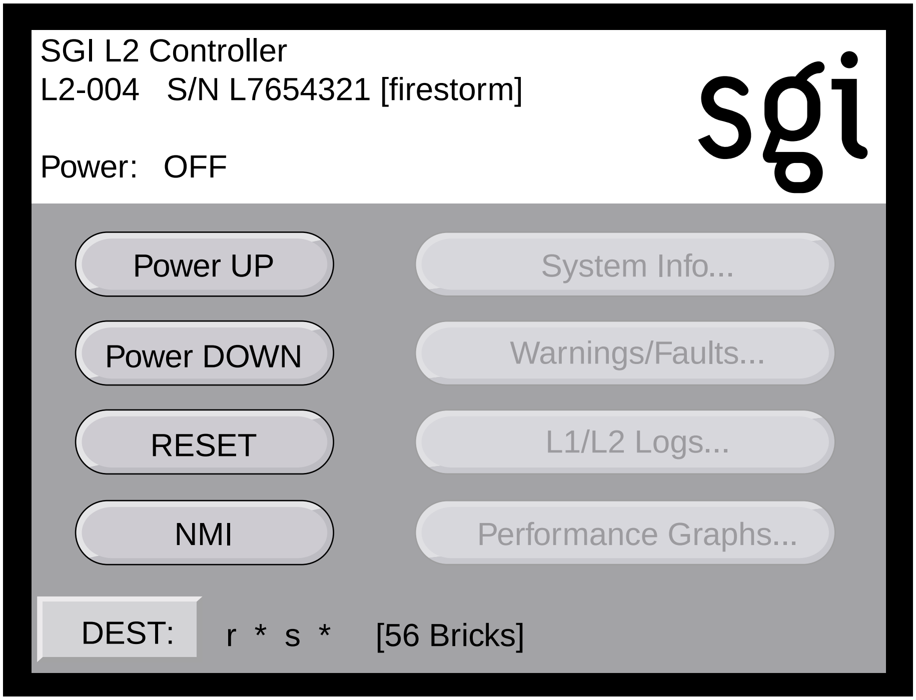

Figure 2-9 Home Window

To power on selected bricks, a partition, or the entire server, follow these steps:

1. Select the **DEST** button to select the bricks or partition you want to power on. The destination selection window, shown in Figure 2-10 appears.

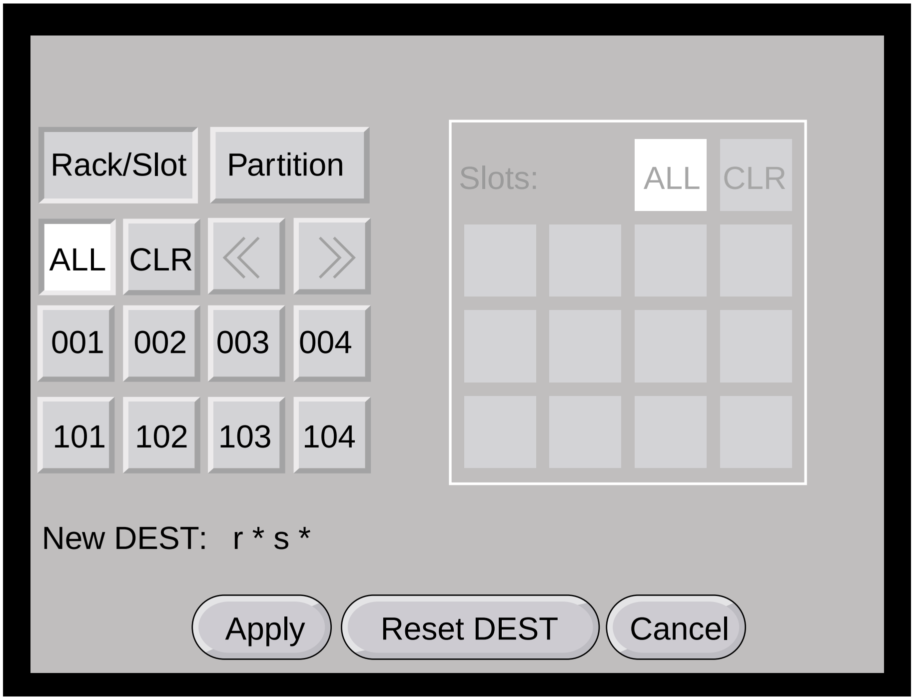

Figure 2-10 Destination Selection Window

2. The bricks are selected by their rack and slot/bay (unit position) number, or by partition. Select **ALL** in the display if you want to power on all the bricks in all the racks and slots in the server. You can also select the bricks in all the slots of multiple racks, but you cannot select slots for multiple racks.

   If you want to select individual bricks to power on, select the rack from which you want to select bricks from the **Rack/Slot** segment of the display. For example, if you select **001**, a **Slots** section on the window with all the slots for bricks in rack 001 appears, as shown in Figure 2-11.

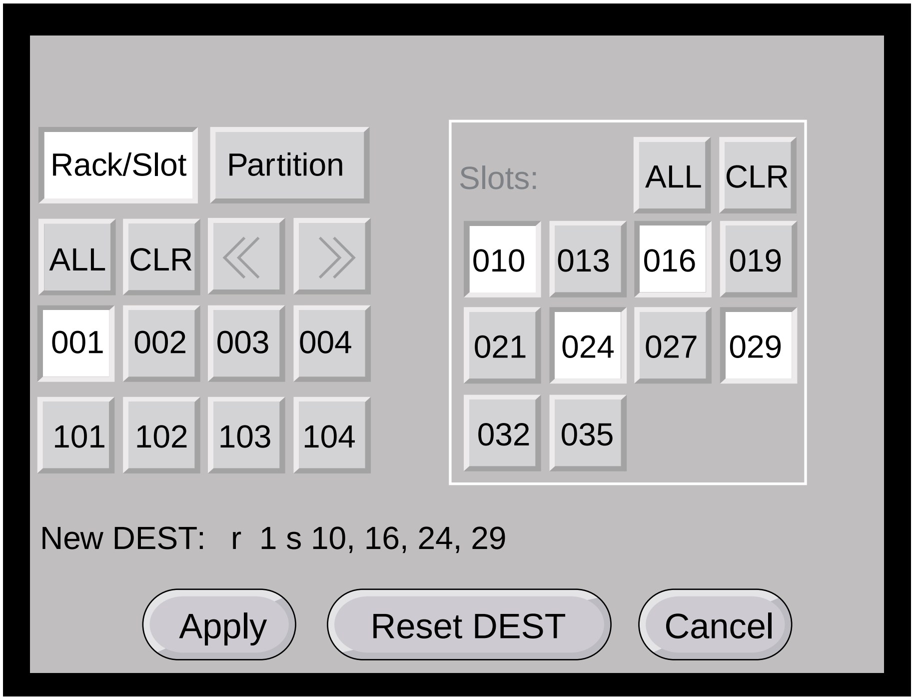

Figure 2-11 Slots Section

3. Select slots from the **Slots** section (Figure 2-11 shows slots 010, 016, 024, and 029 selected). The **New DEST** setting changes to reflect your selections. After you make your selections, select **Apply**. The home window appears, which displays *r 1 s 10, 16, 24, 29* in the **DEST** field, as shown in Figure 2-12. This indicates you have selected slots (bricks) 10, 16, 24, and 29 from rack 1 to power on.

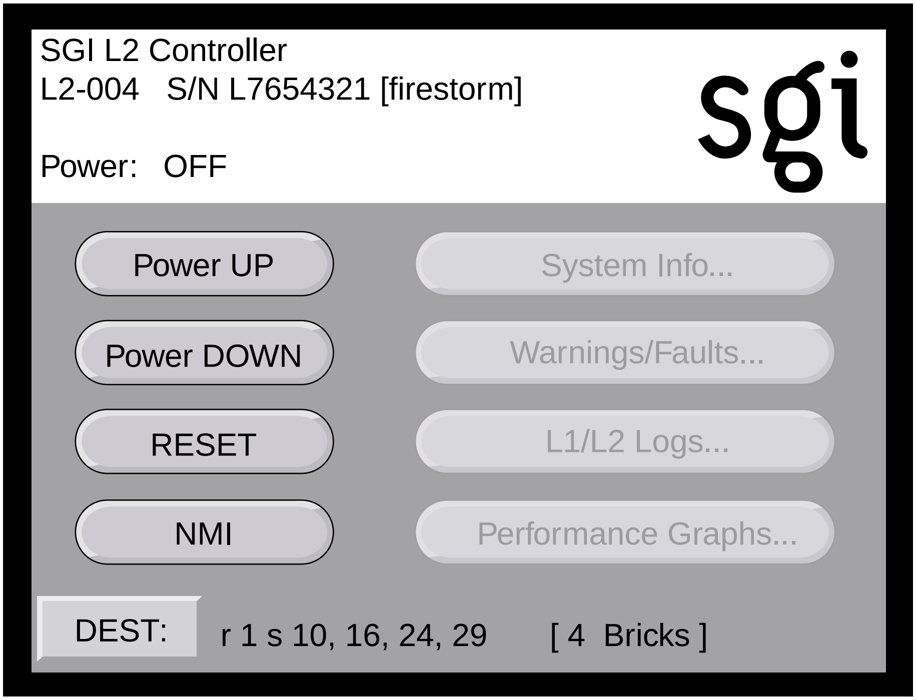

Figure 2-12 DEST Field on Home Window

4. If you want to power on a partition, select **Partition** from the destination selection window. The partition selection window, shown in Figure 2-13, appears.

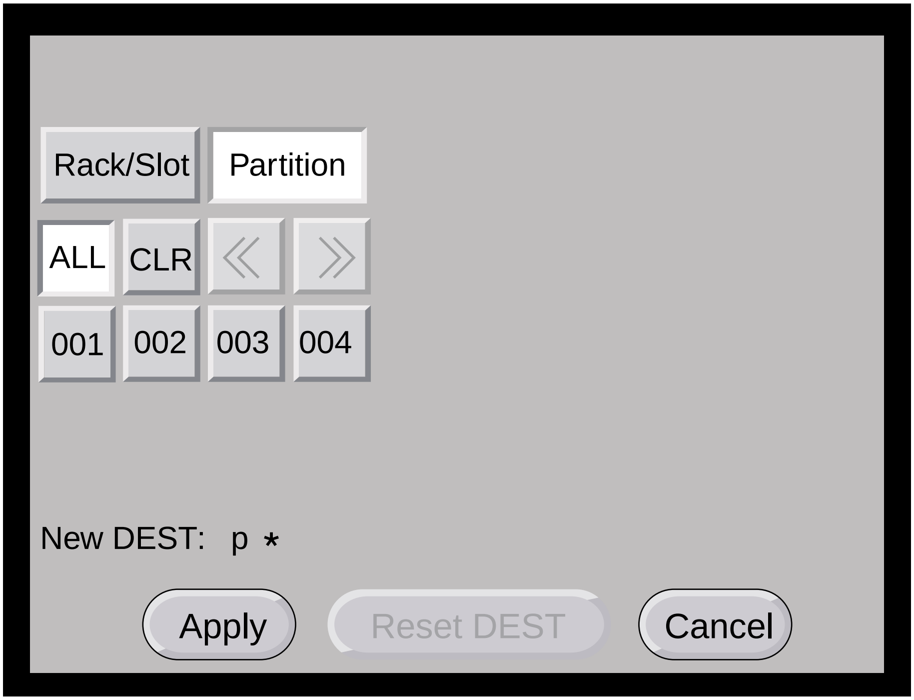

Figure 2-13 Partition Selection Window

5. You can select all partitions by selecting **ALL** on the partition selection window, or you can select a single or multiple partitions by selecting the individual partition numbers. Figure 2-14 shows partition 001 selected.

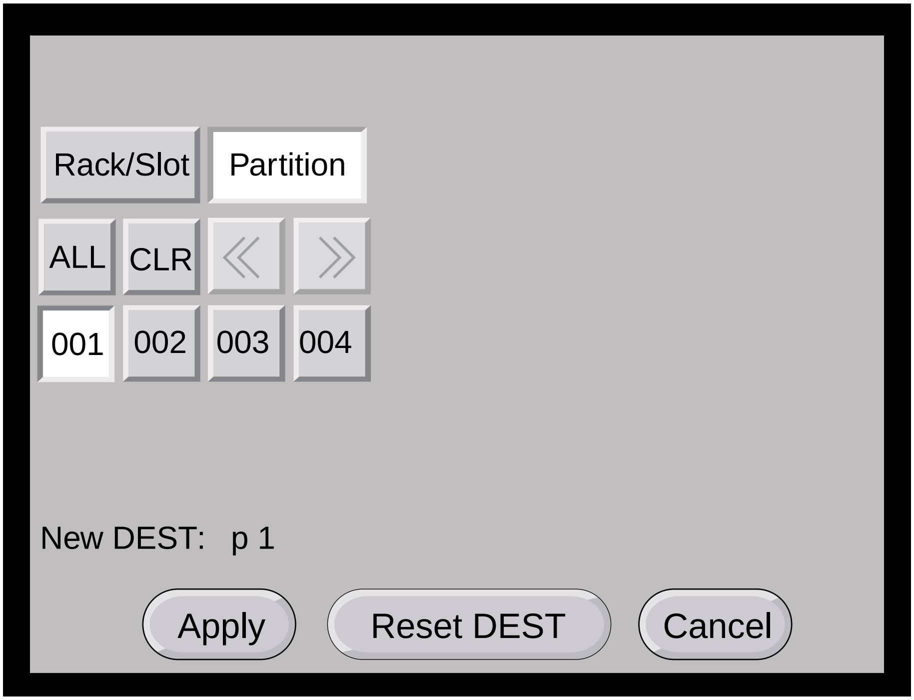

Figure 2-14 Selecting an Individual Partition

6. The **New DEST** field shows *p 1,* which indicates that partition 001 was selected as the new destination. If you select **Apply,** your selection is confirmed and the home window, shown in Figure 2-15, appears. The **DEST** field shows *p 1 [12 Bricks],* which indicates that all 12 Bricks belonging to partition 1 is the new destination.

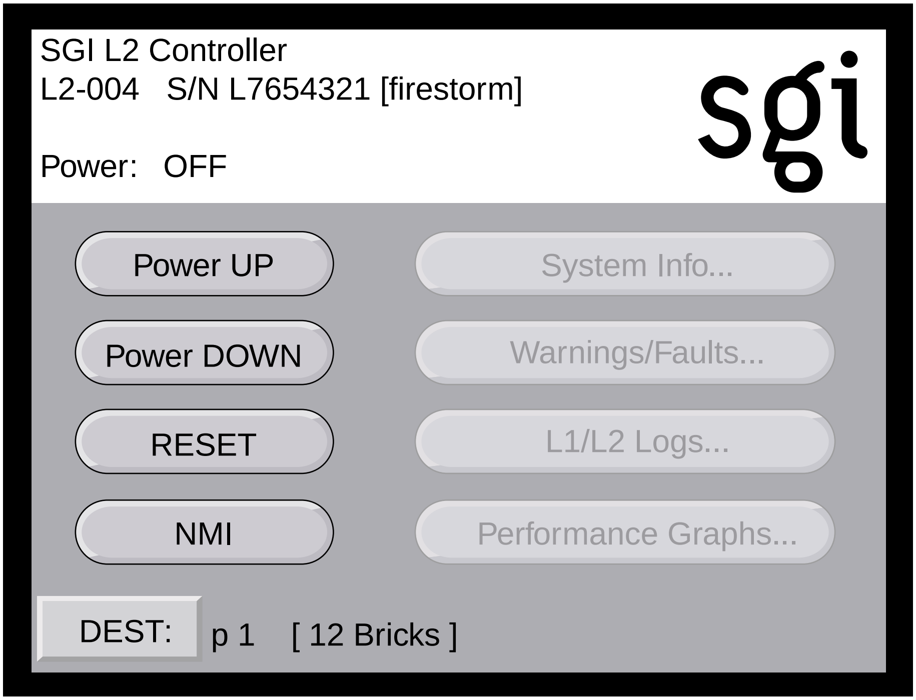

Figure 2-15 Home Window with Partition Destination

7. After you have selected the destination of the bricks you want to power on, select **Power UP** on the home window, and the **Power UP** confirmation window, shown in Figure 2-16, appears. This window indicates which bricks will receive the **Power UP** command. In this example, it indicates that it will power on all slots (bricks) in all racks (*r * s**). If you select **OK,** the power-up operation is confirmed, and the home window appears. Selecting **Cancel** stops the power-on operation, and the home window appears.

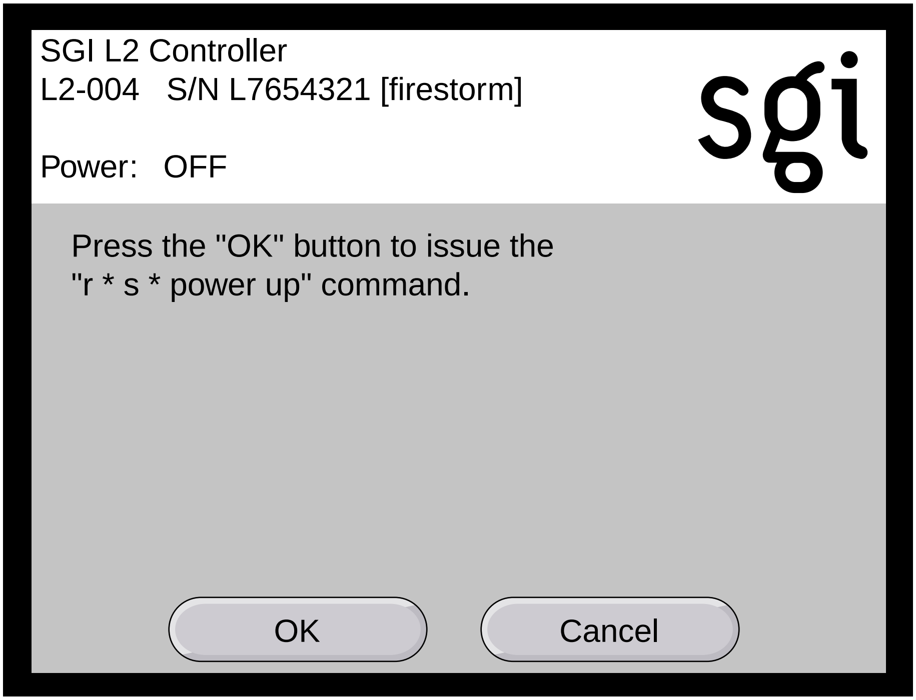

Figure 2-16 The Power UP Confirmation Window

Powering On at the System Console

The power-on procedure at a system console varies with your server setup:

- If you have a system console connected to a server with a hardware L2 controller, you can toggle between L2, L1, and console mode, power on your server with L1 or L2 controller commands, and monitor the power-on activity by changing to the console mode.

- If you have a system console without a hardware L2 controller, you can toggle between L1 and console mode. This enables you to power on your server with L1 commands and view the activity by changing to the console mode.

  For detailed instructions on using a system console running L2 software, see “About the L2 Controller Firmware” on page 95. For detailed instructions on using the L2 mode, see “Operating L2” on page 96. For detailed instructions on using a system console using the L1 mode, see “Operating L1” on page 105.

The following sections describe how to power on your system using the L2 mode and the L1 mode.

Powering On in the L2 Mode

To power on your system while in the L2 mode, follow these steps:

1. From the L2 prompt (L2>), power on an individual brick by typing the following command. (If you want to power on the entire server, proceed to the next step.)

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

   For example, to power on a C-brick in rack 1, slot 10, type the following:

   ```
   L2> r 1 s 10 pwr u
   ```

   The slot number is the unit position number located on the rack, slightly above where the bottom of the brick sits. Each rack unit position number is located toward the top of the two lines that mark off the unit position that the number represents. For example, the rack numbering for a brick located in slot 10 would appear on the left front side of the rack as shown in Figure 2-17:

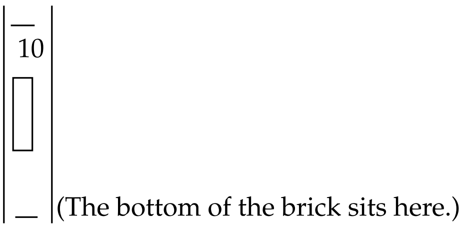

Figure 2-17 Rack Numbering

If you want to power on several selected bricks from a rack at the same time, you must type the rack number followed by the slot numbers of the bricks you want to power on. For example, to power on bricks in slots 7 and 10 for rack 4, type the following:

```
L2> r 4 s 7,10 pwr u
```

If you want to power on a brick for several racks, you must type the number of the racks followed by the slot number of the brick you want to power on for all the racks. For example, to power on the brick in slot 10 for racks 3 and 4, type the following:

```
L2> r 3, 4 s 10 pwr u
```

Caution: To avoid problems with your system, do not try to power on multiple slots for multiple racks at the same time.

2. If you want to power on the entire server, type the following command:

   ```
   L2> pwr u
   ```

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

3. From the L2 prompt, display the system configuration by typing the following command:

   ```
   L2> config
   ```

   This command lists the bricks in the system and each brick's system controller address.

The L1 controller display for each brick should display `L1 running` once the power on procedure starts.

Note: If you have a problem during powering on and an error message appears on your console display, see Appendix C, "Controller Status and Error Messages," to learn what the error message indicates and what steps will resolve the problem.

Powering On in the L1 Mode

The only time you would want to power on from the L1 mode is when you do not have the L2 mode available on your system.

To power on your system while in the L1 mode, follow these steps:

1. The prompt on your system will be the rack and slot number of the C-brick to which you have connected your console. If you want to power on the C-brick (003c01 in our example) indicated in the prompt, type the following command. (If you want to power on the bricks connected to the C-brick, proceed to the next step.)

   `003c01-L1>` **`power up`**

2. If you want to power on the bricks connected to the C-brick, type the following command:

   `oo3c01-L1>` **`* power up`**

   (* indicates all)

3. From the L1 prompt, display the brick configuration information by typing the following command:

   `003c01-L1>` **`config`**

   In L1 mode, you can obtain only limited information about the system configuration. A C-brick only has information about its attached I/O brick and, if another C-brick is attached to the I/O brick, information about that C-brick and its attached I/O brick. An I/O brick only has information about its attached C-brick and an R-brick only has information about itself.

The L1 controller display for the brick should display `L1 running` once the power-on procedure starts.

Powering Off

Individual bricks and your entire server system can be powered off from the L2 controller touch display located on the front door of the system or from the server system console.

Preparing to Power Off

Follow these steps to prepare to power off:

1. Check to assure that the cabling between the PDU or PDS and the wall power-plug receptacle is secure.

Note: Check that the LEDs turn off and that your controllers display that the system is powering off for each segment of the procedure, which indicates that the powering off procedure is proceeding properly. If you have a problem during powering off and an error message appears on your L2 controller touch display or your console, see your system's online log files and Appendix C, "Controller Status and Error Messages," to learn what the error message indicates and what steps will resolve the problem.

---

2. If you are going to power off the D-brick or the entire system, make sure that the D-brick's **RUN/SERVICE** key switch on the ESI/Ops panel is set to **SERVICE**, as shown in Figure 2-18.

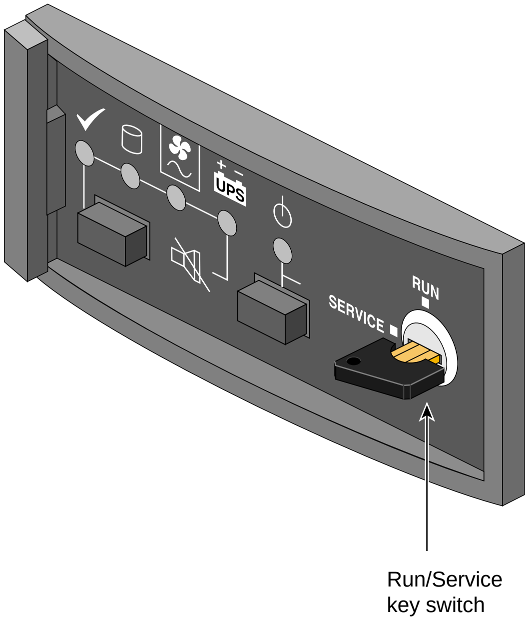

Figure 2-18 Setting the RUN/SERVICE Key Switch to Service

Powering Off at the L2 Controller Touch Display

This section describes how to power off individual bricks or the entire system from the L2 controller touch display located on the front door of any server tall rack with an L2 controller. If you have multiple racks whose L2 controllers are interconnected at an Ethernet hub, you can power on any brick in those racks or the entire system at any L2 controller touch display available on your server.

For instructions on navigating the L2 controller touch display, see "Using the L2 Controller Touch Display" on page 85, in Chapter 3, "System Control."

The home window shown in Figure 2-19 displays the following items:

- Rack number (*L2-004*) of the L2 controller to which the L2 controller touch display is connected.
- L2 controller system serial number (*L7654321*).
- Server system name in parentheses (*firestorm*).

- Power status (**Power:** *OFF*) for the bricks designated in the destination (**DEST**) field, which indicates all slots in all racks (*r * s **), which amounts to 56 bricks in this example.

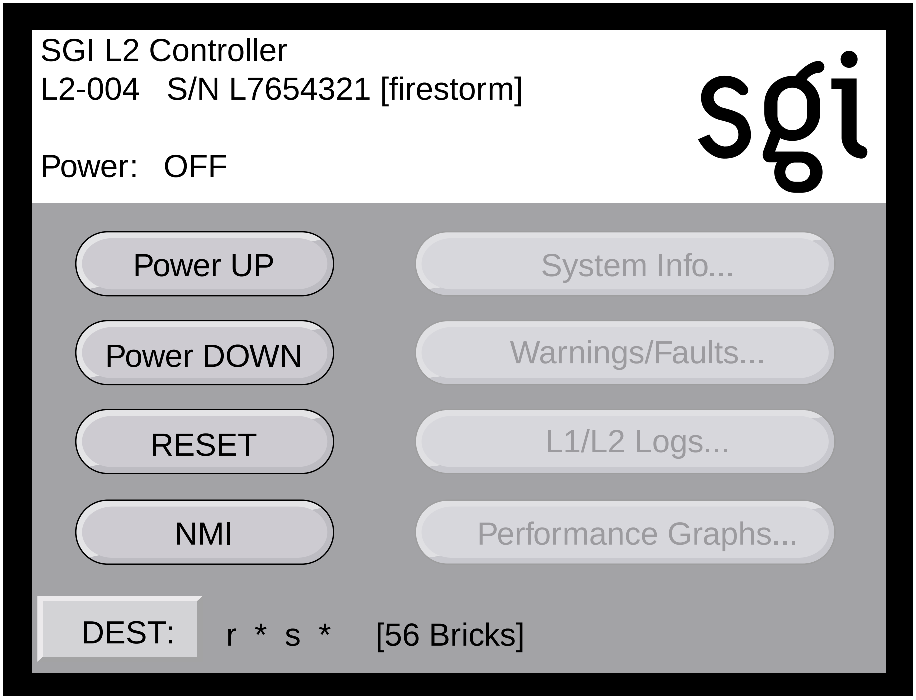

Figure 2-19 Home Window

To power off selected bricks, a partition, or the entire server, follow these steps:

1. Select the **DEST** button to select the bricks or partition you want to power on. The destination selection window, shown in Figure 2-20, appears.

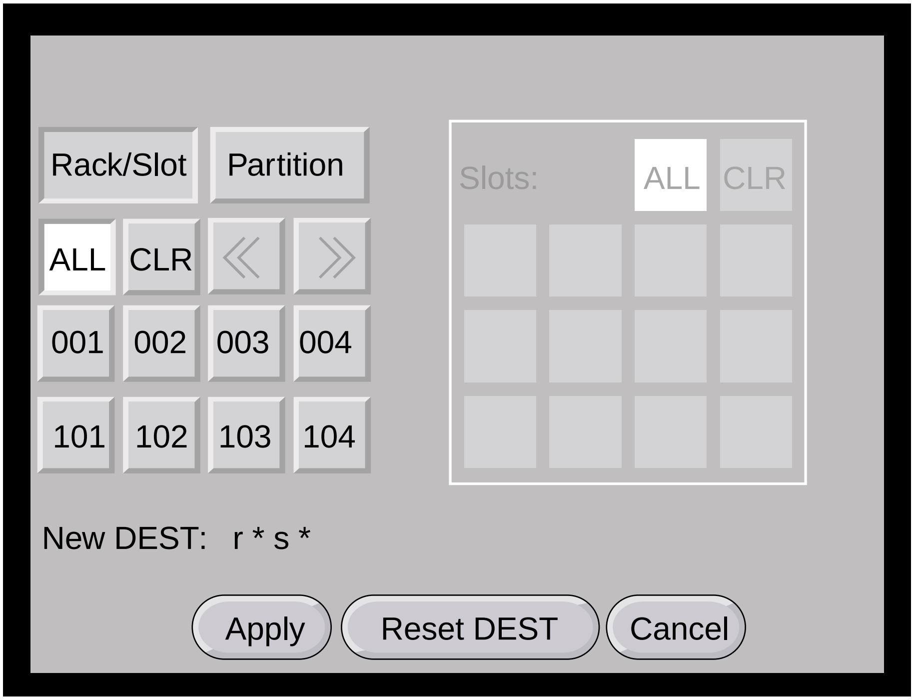

Figure 2-20 Destination Selection Window

2. The bricks are selected by their rack and slot/bay (unit position) number, or by partition. Select **All** in the display if you want to power down all the bricks in all the racks and slots in the server. You can also select the bricks in all the slots of multiple racks, but you cannot select slots for multiple racks.

   If you want to select individual bricks to power down, select the rack from which you want to select bricks from the **Rack/Slot** segment of the display. For example, if you select rack **001**, a **Slots** section on the window with all the slots for bricks in rack 001 appears, as shown in Figure 2-21.

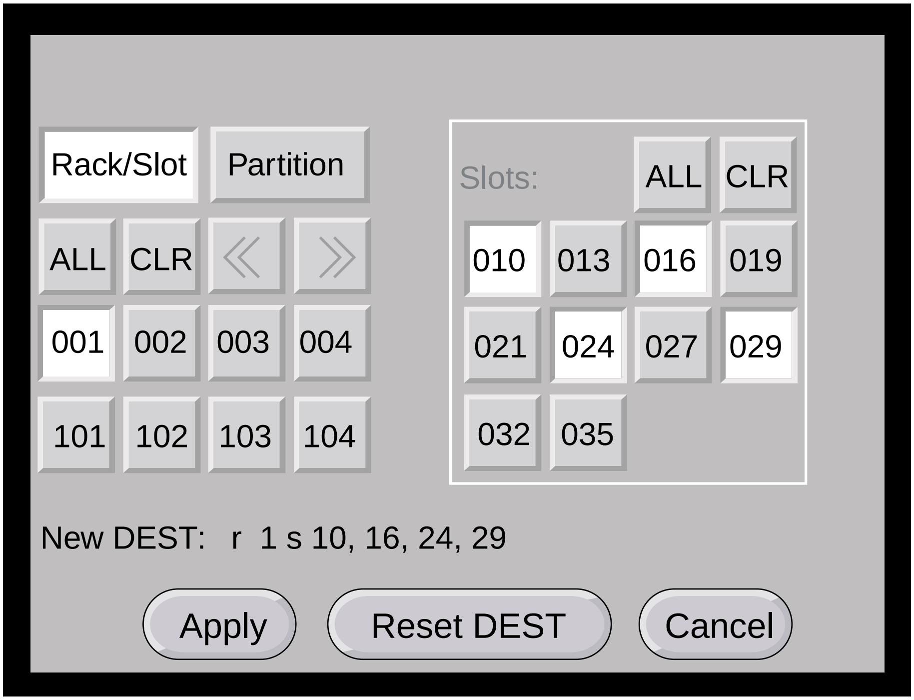

Figure 2-21 Slots Section

3. Select slots from the **Slots** section (Figure 2-21 shows slots 010, 016, 024, and 029 selected). The **New DEST** setting changes to reflect your selections. After you make your selections, select **Apply**. The home window appears, which displays *r 1 s 10, 16, 24, 29* in the **DEST** field, as shown in Figure 2-22. This indicates that you have selected slots (bricks) 10, 16, 24, and 29 from rack 1 to power off.

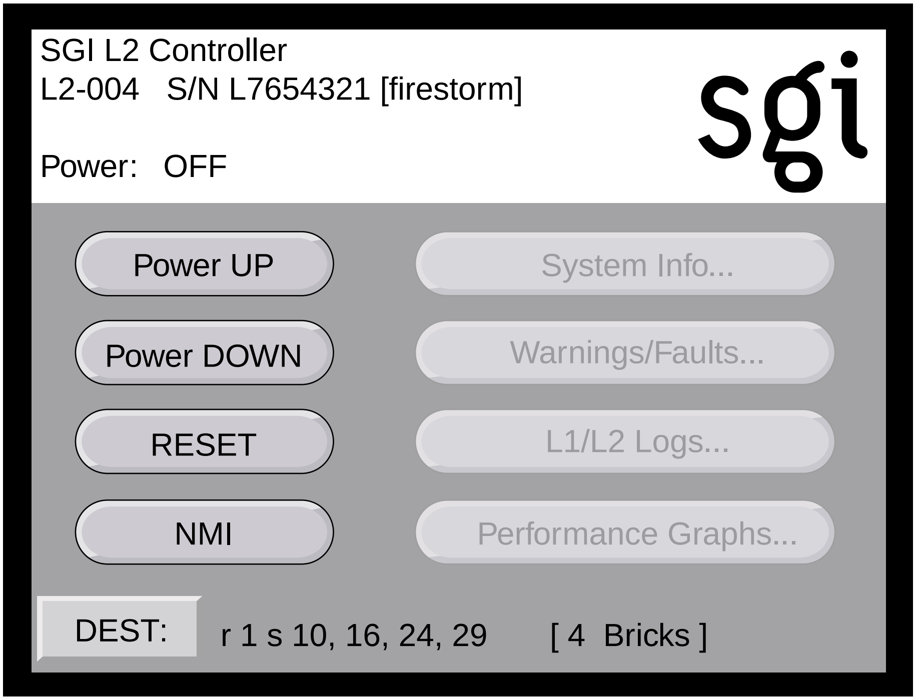

Figure 2-22 DEST Field on Home Window

4. If you want to power off a partition, select **Partition** from the destination selection window. The partition selection window, shown in Figure 2-23, appears.

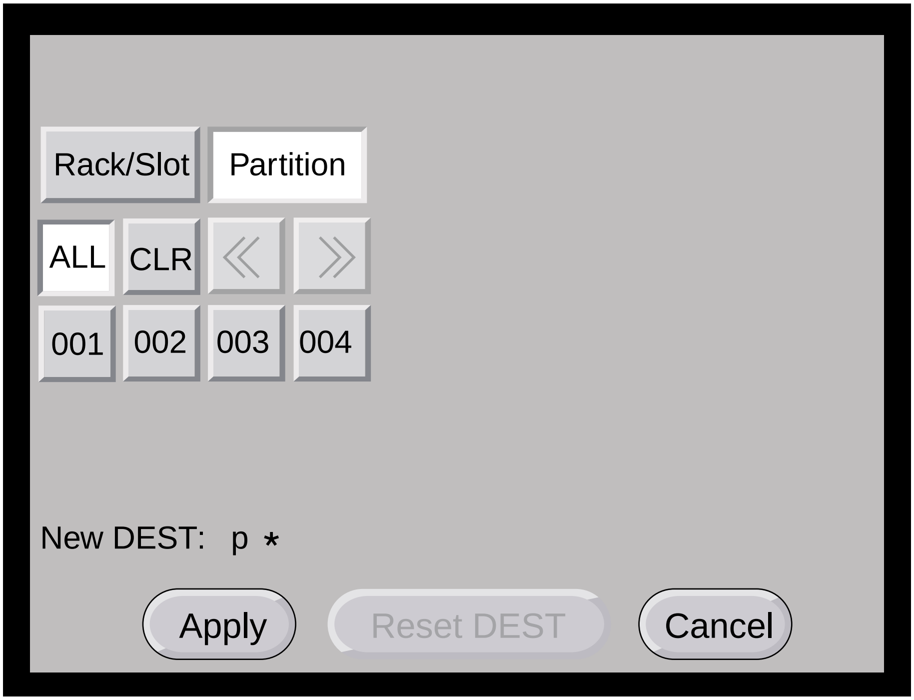

Figure 2-23 Partition Selection Window

5. You can select all partitions by selecting **ALL** on the partition selection window, or you can select a single or multiple partitions by selecting the individual partition numbers. Figure 2-24 shows partition **001** selected.

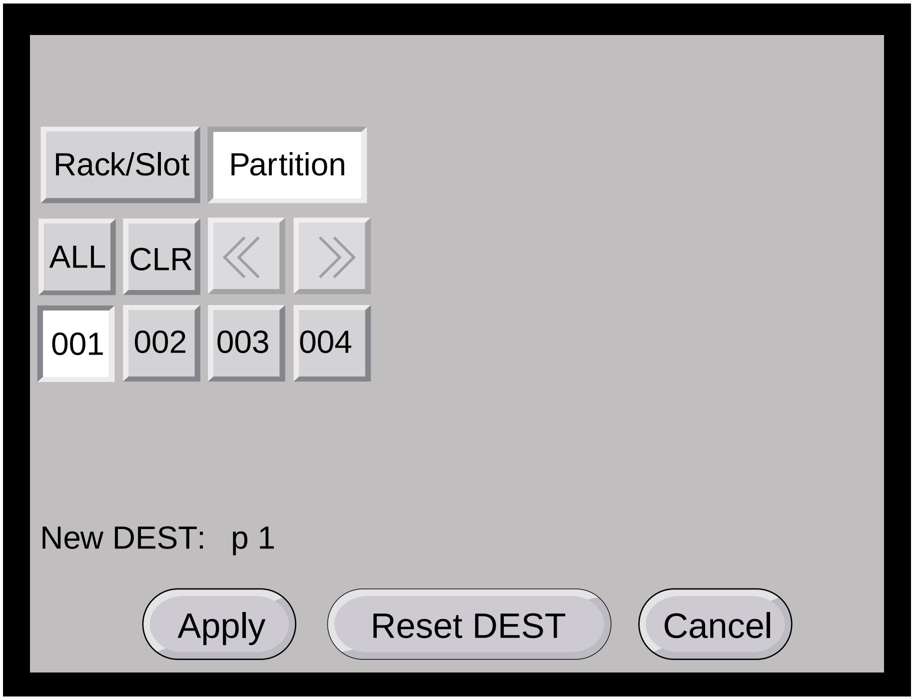

Figure 2-24 Selecting an Individual Partition

6. The **New DEST** field shows *p 1*, which indicates partition **001** was selected as the new destination. If you select **Apply**, your selection is confirmed and the home window, shown in Figure 2-25, appears. The **DEST** field shows *p 1 [12 Bricks]*, which indicates that all 12 Bricks belonging to partition 1 is the new destination.

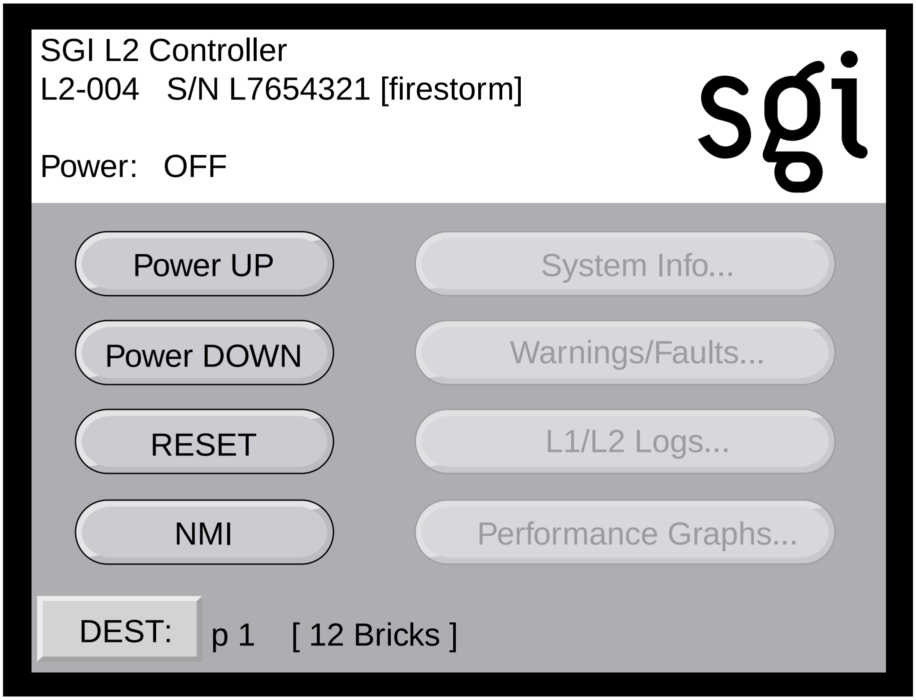

Figure 2-25 Home Window with Partition Destination

7. After you have selected the destination of the bricks you want to power off, select **Power DOWN** from the home window, and the Power DOWN confirmation window, shown in Figure 2-26, appears. This window indicates which bricks will receive the **Power DOWN** command. In this example, it indicates that it will power off all slots (bricks) in all racks (*r * s**). If you select **OK**, the power-off operation is confirmed and the home window appears. Selecting **Cancel** stops the power-off operation and the home window appears.

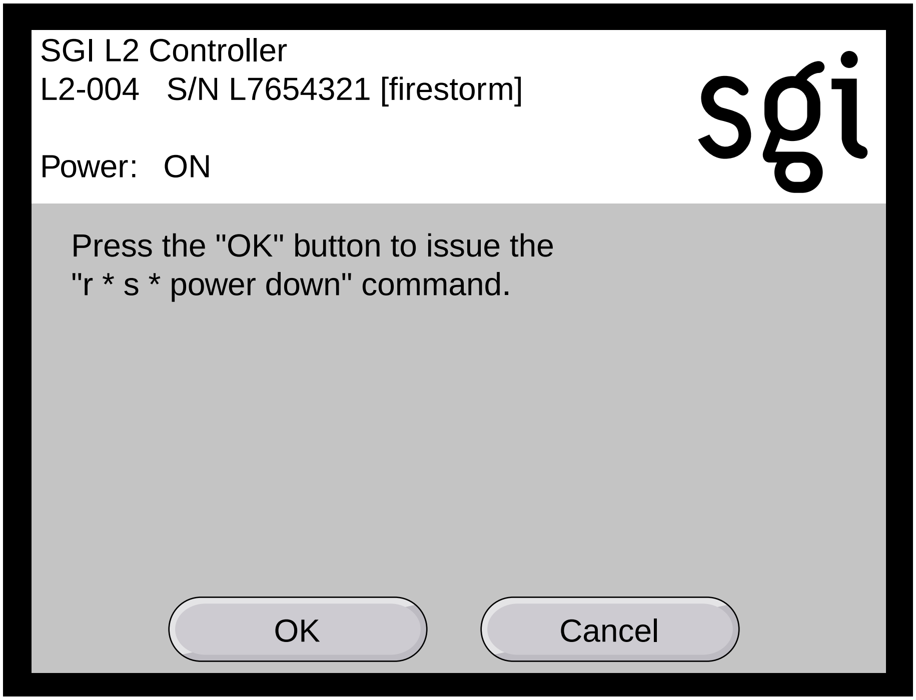

Figure 2-26 The Power DOWN Confirmation Window

Powering Off at the System Console

The power-off procedure at a system console varies with your server setup:

- If you have a system console connected to a server with a hardware L2 controller, you can toggle between L2, L1, and console mode, power off your server with L1 or L2 controller commands, and monitor the power-off activity by changing to the console mode.

- If your system console is running on a server that has no hardware L2 controller, you can toggle between L1 and console mode. This enables you to power off your server with L1 commands and view the activity by changing to the console mode.

  For detailed instructions on using a system console running L2 software, see "About the L2 Controller Firmware" on page 95. For detailed instructions on using the L2 mode, see "Operating L2" on page 96. For detailed instructions on using a system console in the L1 mode, see "Operating L1" on page 105.

The following sections describe how to power off your system in the L2 mode and the L1 mode.

Powering Off in the L2 Mode

To power off your system while in the L2 mode, follow these steps:

1. From the L2 prompt (L2>), power off an individual brick by typing the following command. (If you want to power off the entire server, proceed to the next step.)

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

   For example, to power off a C-brick in rack 1, slot 10, type the following:

   ```
   L2> r 1 s 10 pwr d
   ```

   The slot number is the unit position number located on the rack, slightly above where the bottom of the brick sits. Each rack unit position number is located toward the top of the two lines that mark off the unit position the number represents. For example, the rack numbering for a brick located in slot 10 would appear on the left front side of the rack as shown in Figure 2-27:

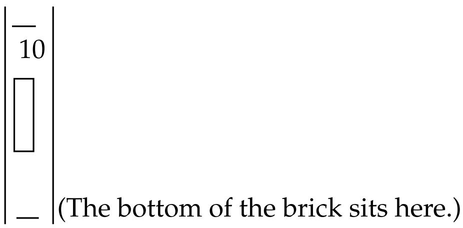

Figure 2-27 Rack Numbering

If you want to power off several selected bricks from a rack at the same time, you must type the rack number followed by the slot numbers of the bricks you want to power off. For example, to power off bricks in slots 7 and 10 for rack 4, type the following:

```
L2> r 4 s 7,10 pwr d
```

If you want to power off a brick for several racks, you must type the number of the racks followed by the slot number of the brick you want to power off for each rack. For example, to power off the brick in slot 10 for racks 3 and 4, type the following:

```
L2> r 3, 4 s 10 pwr d
```

Caution: To avoid problems with your system, do not try to power off several slots for several racks at the same time.

2. If you want to power off all the bricks in all the racks, type the following command:

   ```
   L2> pwr d
   ```

   (The default setting for power off is all racks and all slots.)

3. From the L2 prompt, display the brick configuration information by typing the following command:

   ```
   L2> config
   ```

   This command lists all the bricks in the system and each brick's system controller address.

The L1 controller display for each brick should display `L1 running` once the power down procedure starts.

Note: If you have a problem during powering on and an error message appears on your console display, see Appendix C, "Controller Status and Error Messages," to learn what the error message indicates and what steps will resolve the problem.

Powering Off in the L1 Mode

The only time you would want to power off from the L1 mode is when you do not have L2 software available on your system.

To power off your system while in the L1 mode, follow these steps:

1. The prompt on your system will be the rack and slot number of the C-brick to which you have connected your console. If you want to power off the C-brick (003c01 in our example) indicated in the prompt, type the following command. (If you want to power off the bricks connected to the C-brick, proceed to the next step.)

   `003c01-L1>` **`power down`**

2. If you want to power off the bricks connected to the C-brick, type the following command:

   `oo3c01-L1>` **`* pwer down`**

   (* indicates all)

3. From the L1 prompt, display the brick configuration information by typing the following command:

   `003c01-L1>` **`config`**

   In L1 mode, you can obtain only limited information about the system configuration. A C-brick only has information about its attached I/O brick and, if another C-brick is attached to the I/O brick, information about that C-brick and its attached I/O brick.

   An I/O brick only has information about its attached C-brick and an R-brick only has information about itself.

Using Embedded Support Partner (ESP)

Embedded Support Partner (ESP) automatically detects system conditions that indicate potential future 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.

Monitoring Your Server

You can monitor your SGI Origin 3000 series server from the following sources:

- On the L1 controller's display located at the right-hand corner of each brick (except the D-brick), as shown in Figure 2-28, you can monitor brick items. For example, you can see if the fans on a particular brick are operating properly.

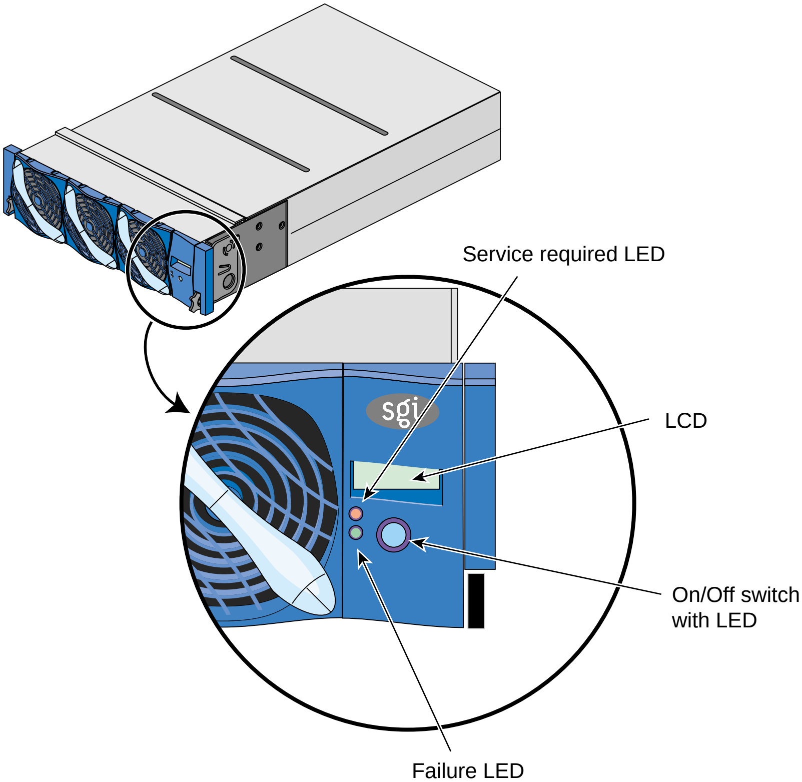

Figure 2-28 L1 Controller Display

- On the L2 controller touch display on the front door of the tall rack shown in Figure 2-29, you can see the L1 status and error messages for each brick in the rack.

  The L2 controller can connect to other L2 controllers in other racks via its Ethernet port. For details on how to interconnect multiple L2 controllers, see Chapter 3, "System Control."

- If your server has an L2 controller, you can connect the SGIconsole to the Ethernet port on the L2 controller. If you have multiple L2 controllers, connect the SGIconsole to an Ethernet hub that is connected to the Ethernet port of the multiple L2 controllers. You will need to connect either a local or remote workstation to monitor the servers, as shown in Figure 2-30.

  Optionally, you can connect a dumb terminal (or PC with terminal emulator) to the L2 controller console port as shown in Figure 2-30.

  These console connections to the L2 controller enable you to view the status and error messages generated by the L1 controllers on your server rack. You can also use these consoles to input L1 and L2 commands to manage and monitor your system.

  Note: The SGIconsole enables you to use various software tools to manage and monitor your system. See the *SGIconsole Start Here* guide for descriptions of these tools and for references to other documents for information on using these tools.

- If your system does not have an L2 controller, you can connect a dumb terminal to the C-brick console port. If you have multiple C-bricks in a rack, connect the dumb terminal to the bottom-most C-brick that is connected to an I-brick as shown in Figure 2-31. This connection enables you to view the status and error messages generated by the L1 controller and to enter L1 commands to manage and monitor your system.

For explanations of the L1 and L2 commands, see Appendix B, “System Controller Commands.”

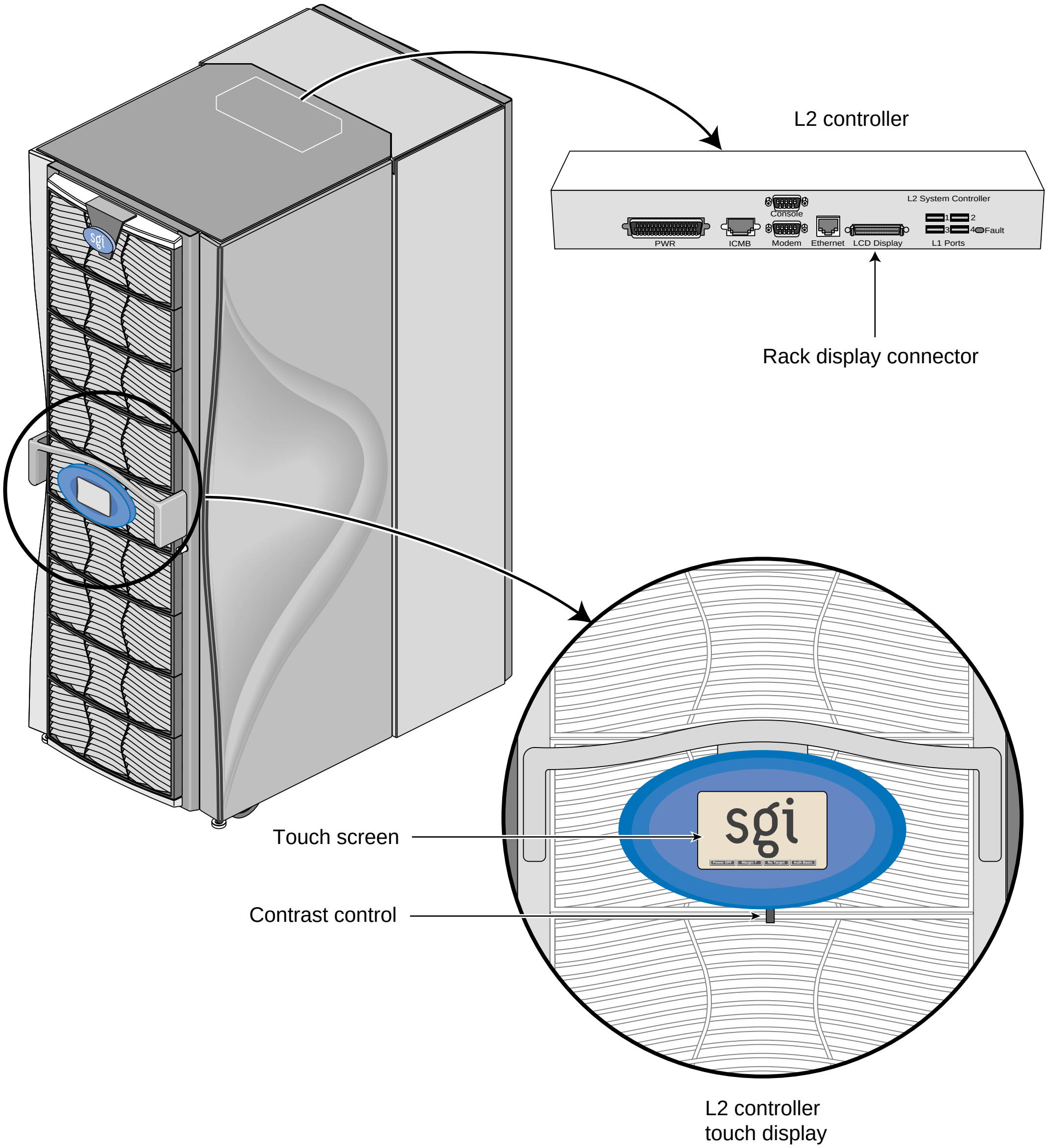

Figure 2-29 L2 Controller Touch Display

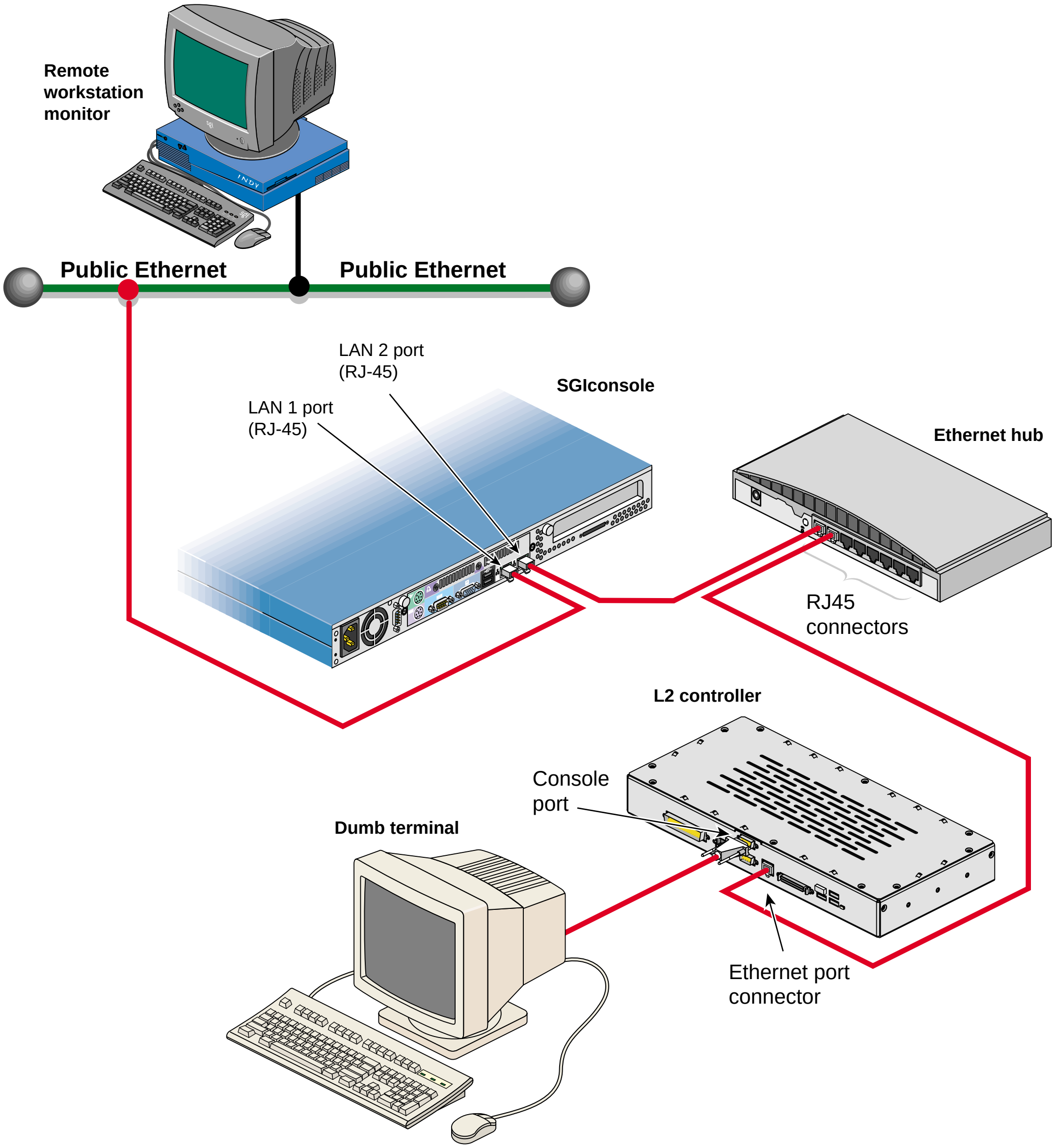

Figure 2-30 Console Connection Options for Servers with L2 Controllers

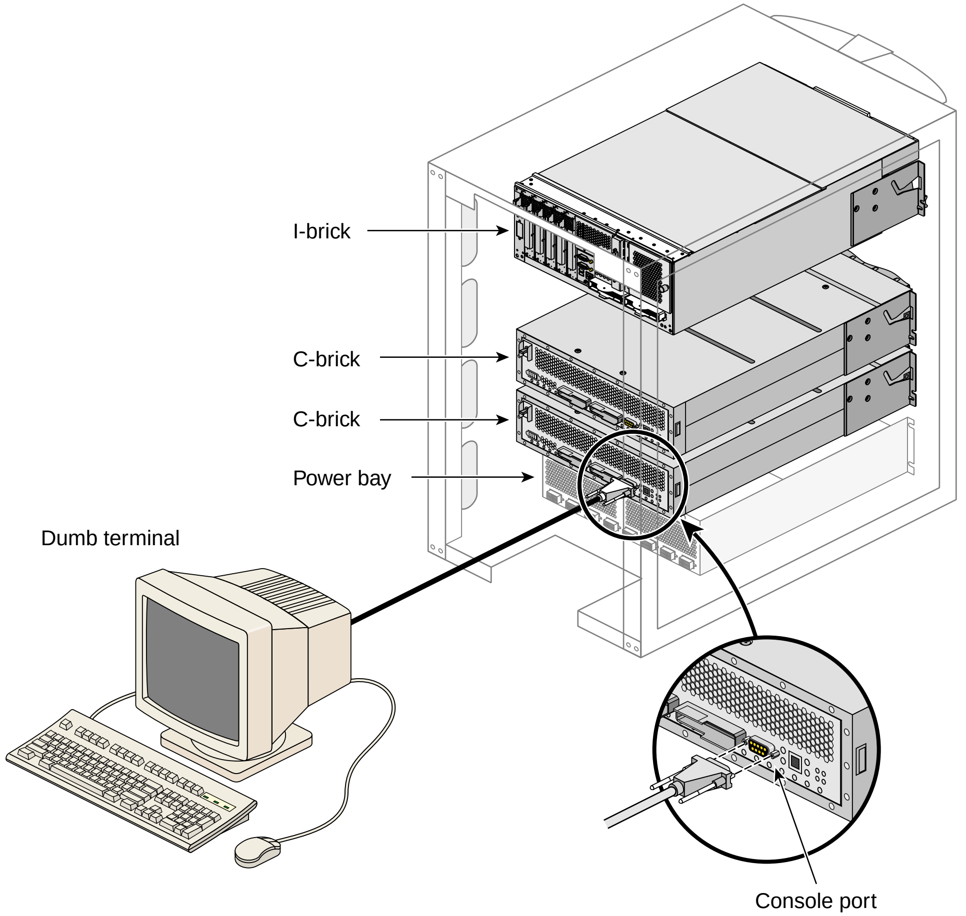

Figure 2-31 Console Connection Options for Servers without an L2 Controller

System Control

This chapter describes the functions of system controllers, in these sections:

Two Levels of System Control

The control systems for the SGI Origin 3000 series servers manage power control and sequencing, provide environmental control and monitoring, initiate system resets, store identification and configuration information, and provide console/diagnostic and scan interface. The SGI Origin 3000 series server has two levels of control:

- **L1: brick-level system controller.** The L1 system controller is designed into all bricks except the D-brick; controller function varies slightly by brick.

- **L2: rack-level system controller** (optional in the SGI Origin 3200 server system). This controller is standard in each tall rack containing C-bricks. The L2 allows remote maintenance, controls resource sharing, controls the L1 controllers in the system, and maintains controller configuration and topology information between itself and other L2 controllers.

System Controller Interaction

In an SGI Origin 3200 server with no L2 controller, the L1 controllers on the C-bricks work as peers in the server system. In all SGI Origin series servers with L2 controllers, the L1 controllers are slave devices to the L2 controller. The controllers communicate with each other in the following ways.

- In the SGI Origin 3200 server with two C-bricks, the L1 controller of a C-brick communicates with the L1 controller of the other C-brick (not shown in Figure 3-1).
- In any SGI Origin 3000 series server, an L1 controller of an I/O brick communicates with an L1 controller of a C-brick.
- In the SGI Origin 3000 series server with L2 controllers, an L1 controller of a C-brick that is connected to an R-brick communicates with the L2 controller via the R-brick. If the server does not have an R-brick, such as the SGI Origin 3200 with an optional L2 controller, the C-brick connects to the L2 controller via the C-brick L1 port (USB port).
- In the SGI Origin 3000 series server with multiple L2 controllers, they and a system console (like the SGIconsole) can connect with each other via an Ethernet hub, as shown in Figure 3-1, and via an Ethernet network.

Note: The D-brick, which is not monitored by the L2 controller, has its own ESI/ops panel module with a microcontroller for monitoring and controlling all elements of the D-brick. See “Enclosure System Interface/Operator (ESI/Ops) Panel Module” on page 163 for details.

Figure 3-1 diagrams some of the interactions between the L1 and L2 controllers.

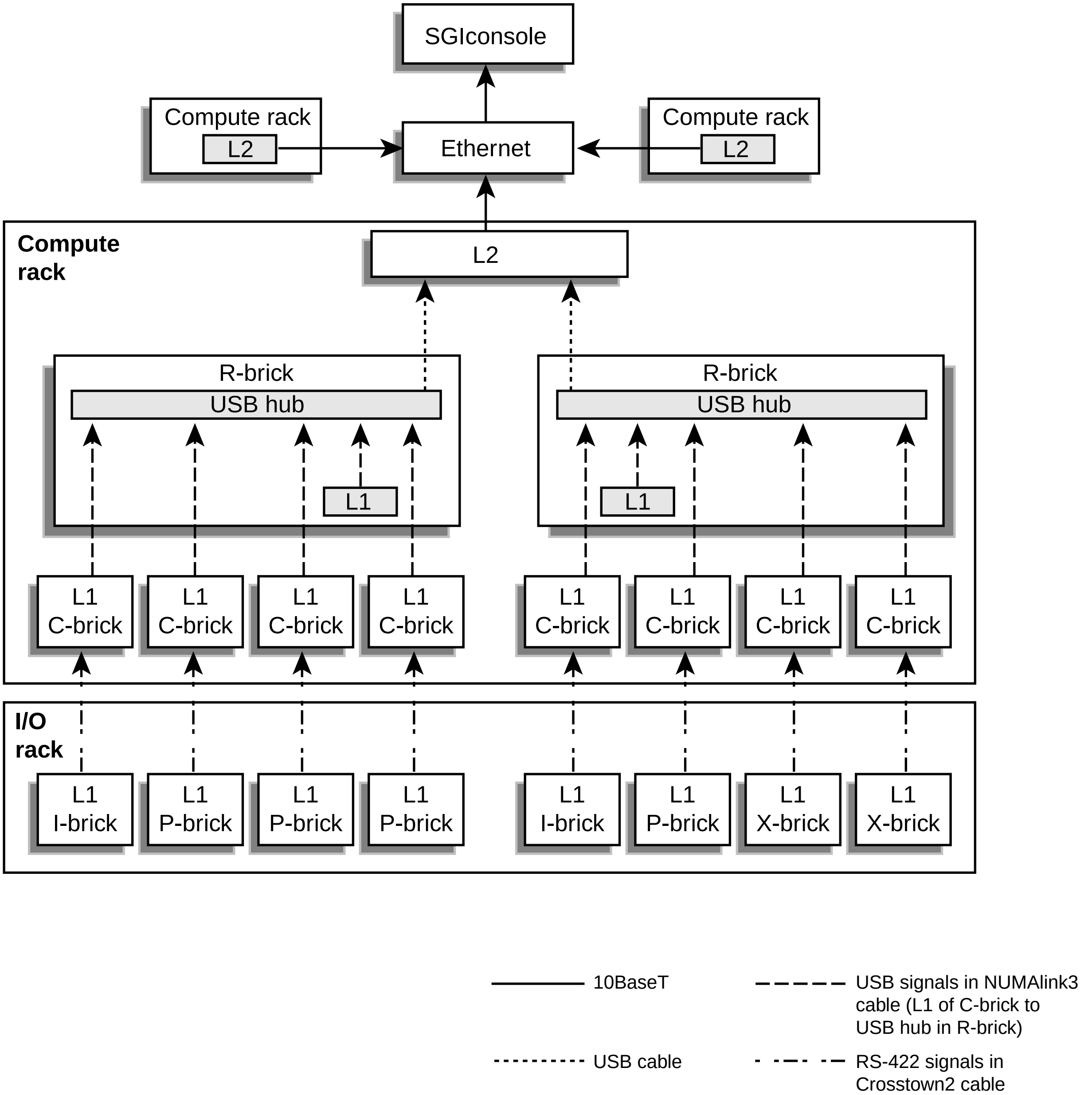

Figure 3-1 Controller Network

L1 Controller

All bricks except D-bricks have L1 controllers. This section describes basic features of all L1 controllers:

- "L1 Controller Functions" on page 72
- "L1 Front Panel Display" on page 74

Note: For L1 controller commands, see Appendix B,"System Controller Commands."

L1 Controller Functions

The L1 controller performs many functions; many of the functions are common for the C-brick, R-brick, I-brick, P-brick, and X-bricks and some are specific to a brick type. Table 3-1 summarizes some of the functions that the L1 controller performs.

Table 3-1 L1 Controller Functions

Function	C-brick	R-brick	I-brick	P-brick	X-brick
Controls voltage regulator modules (VRMs).	X	X	X	X	X
Monitors voltage and reports failures.	X	X	X	X	X
Controls voltage margining within the brick.	X	X	X	X	X
Controls and monitors fan speed.	X		X	X	X
Monitors and reports operating temperature and status of 48 VDC input power.	X	X	X	X	X
Monitors and controls LEDs.	X	X	X	X	X
Reads system identification (ID) PROMs.	X	X	X	X	X
Monitors the power On/Off switch.	X	X	X	X	X

Table 3-1 (continued) L1 Controller Functions

Function	C-brick	R-brick	I-brick	P-brick	X-brick
Monitors the reset switch, and the nonmaskable interrupt (NMI) switch.	X				
Provides a USB hub chip that has six master ports: one port connects internally to the R-brick's L1 controller, four ports connect to the L1 controllers of four C-bricks (via the NUMAlink3 cable), and a master port connects to the L2 controller.		X			
Reports the population of the PCI cards and the power levels of the PCI slots.			X	X	
Powers on the PCI slots and their associated LEDs.			X	X	
Reports the power levels of the XIO slots.					X
Controls the termination voltage margins of the XIO cards.					X

L1 Front Panel Display

Figure 3-2 shows the L1 controller front panel.

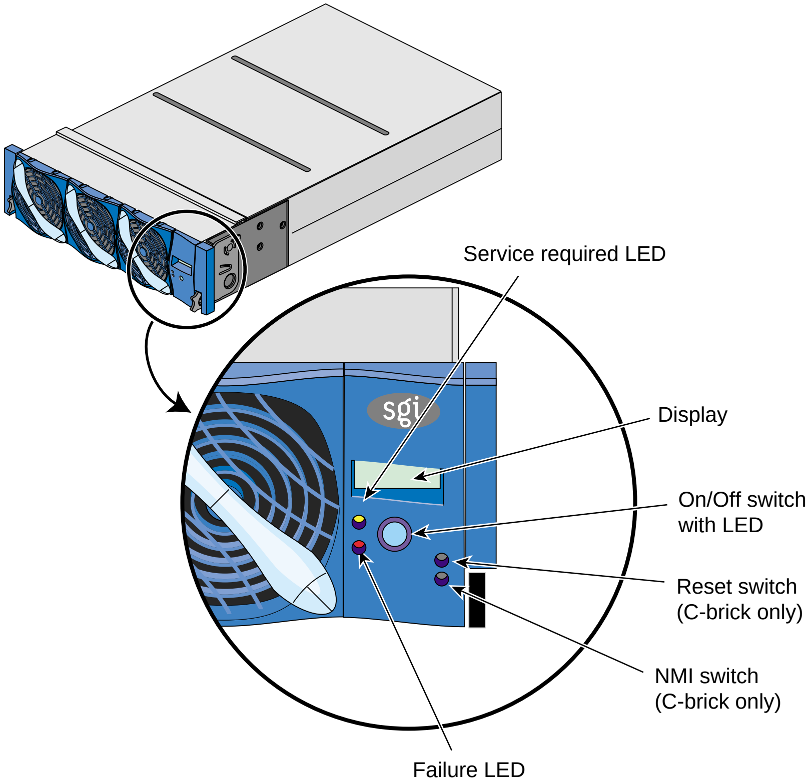

Figure 3-2 L1 Front Panel

The front panel display contains the following items:

- 2 x 12 character liquid crystal display (LCD). The display uniquely identifies the brick, shows system status, warns of required service, and identifies a failed component.
- On/Off switch with LED (button with light-emitting diode [LED]).
- Service required LED.
- Failure LED.

- Reset switch and non-maskable interrupt (NMI) button switch (only on C-bricks).

  Note: The reset and NMI switches are not available in the front panel of an I-brick, P-brick, X-brick, or R-brick.

L2 Controller

The L2 controller is a rack-level controller located at the top of the rack; it is a single-board computer that runs an embedded operating system out of flash memory.

The L2 system controller is optional in SGI Origin 3200 server systems, but is standard on all SGI Origin 3400 and SGI Origin 3800 server systems. The L2 system controller is required in a system in the following circumstances:

- If the system contains an R-brick (Each SGI Origin 3400 and SGI Origin 3800 server system has an R-brick).
- If remote maintenance of the system is required (any SGI Origin 3000 series server system).

The L2 controller is present in all the server tall racks that contain C-bricks, and all tall racks that have an L2 controller have an L2 controller touch display.

The L2 controller performs the following functions:

- Controls resource sharing.
- Controls all L1 controllers.
- Maintains controller configuration and topology information between the L1 and L2 controllers.
- Routes data between upstream devices and downstream devices.

  Upstream devices (for example, rack display, console, and modem) 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, the USB hub of the R-brick, and L1 controllers of the bricks) perform the actions that are 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.

- Allows remote maintenance via a modem.

In a system with more than one L2 controller, all L2 controllers are peers and each propagates configuration information to the other L2 controllers. Each L2 controller monitors its associated L1 controllers and propagates this information to the other L2 controllers.

Figure 3-3 diagrams the L2 controller and its interactions.

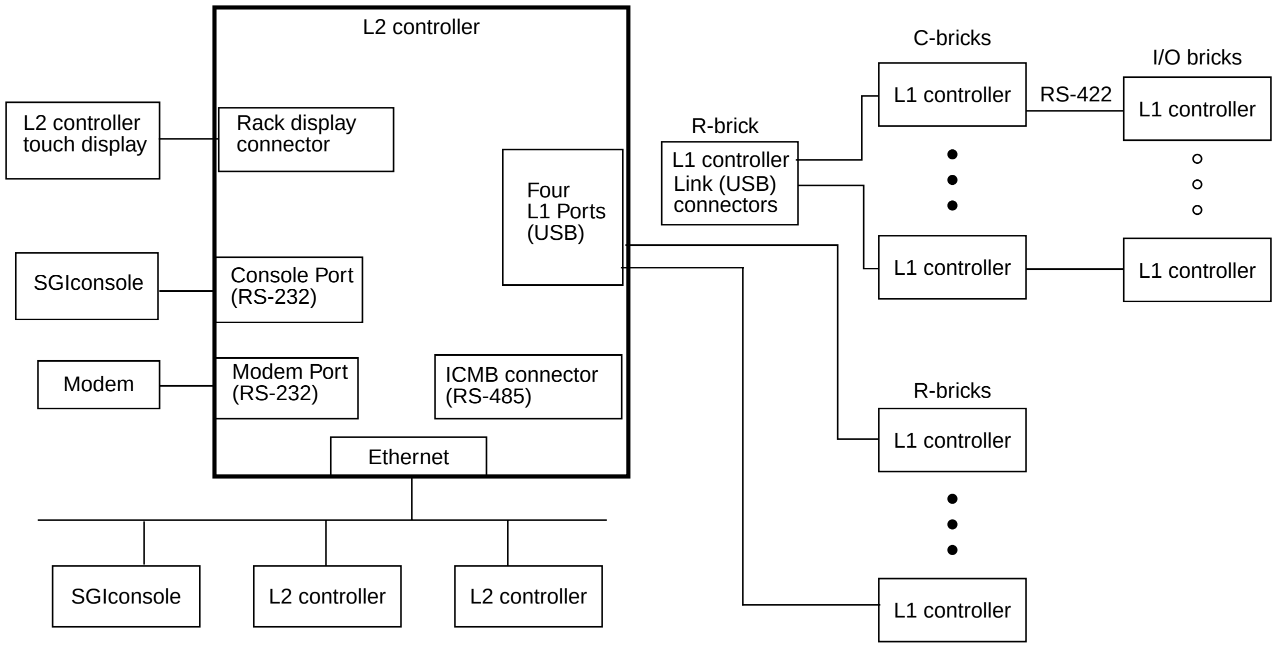

Figure 3-3 L2 Controller Interactions

The L2 controller is mounted in the top of the tall or short rack (optional for short rack); it does not use configurable rack space. Figure 3-4 shows its location in a tall rack.

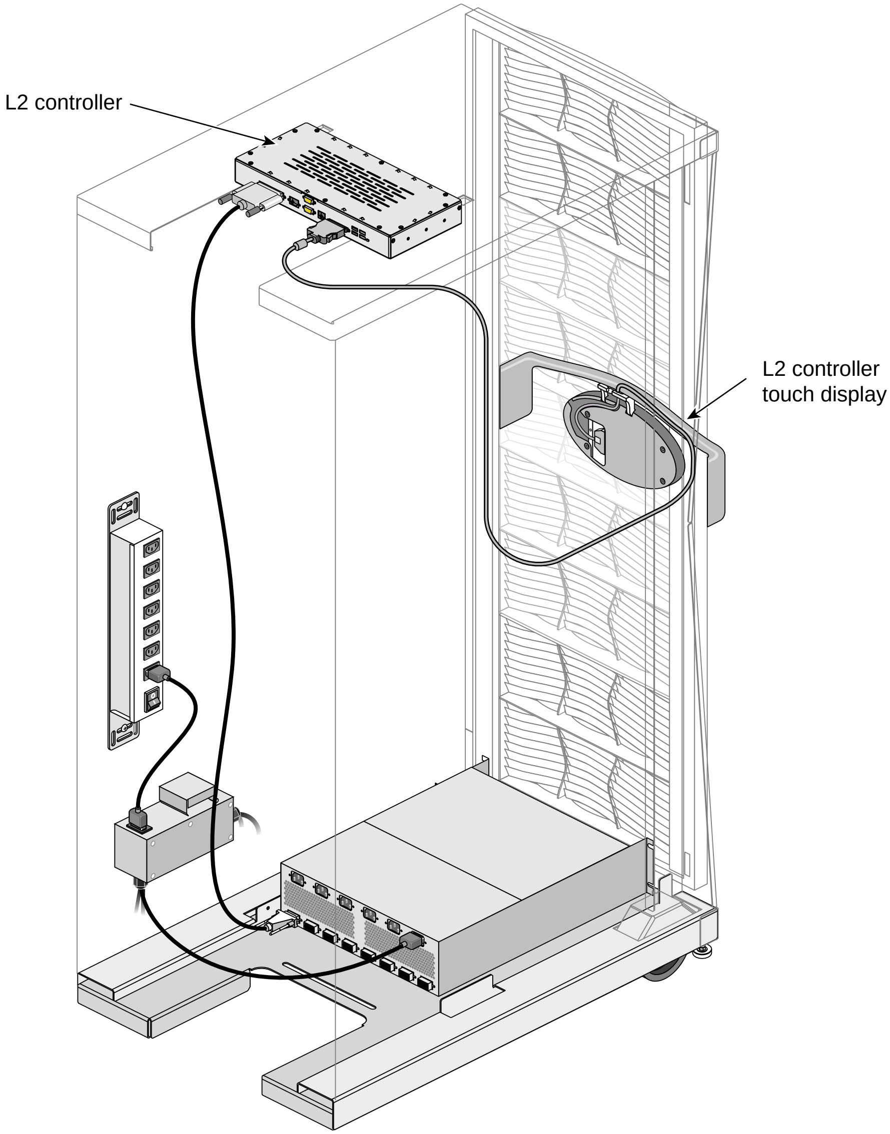

Figure 3-4 Location of L2 Controller in a Tall Rack (Rear View)

The L2 controller consists of touch display controllers, ports, and a software component, which are described in these subsections:

- “L2 Controller Touch Display” on page 78
- “L2 Controller Ports” on page 80

Note: For L2 controller commands, see Appendix B,”System Controller Commands.”

L2 Controller Touch Display

The L2 controller touch display is a 320 x 240 touch-pad LCD (liquid crystal display) screen display. The L2 controller’s touch-screen translates what the user touches into commands and displays the results of the commands.

The L2 controller touch display is located on the front door of the cabinet, as shown in Figure 3-5.

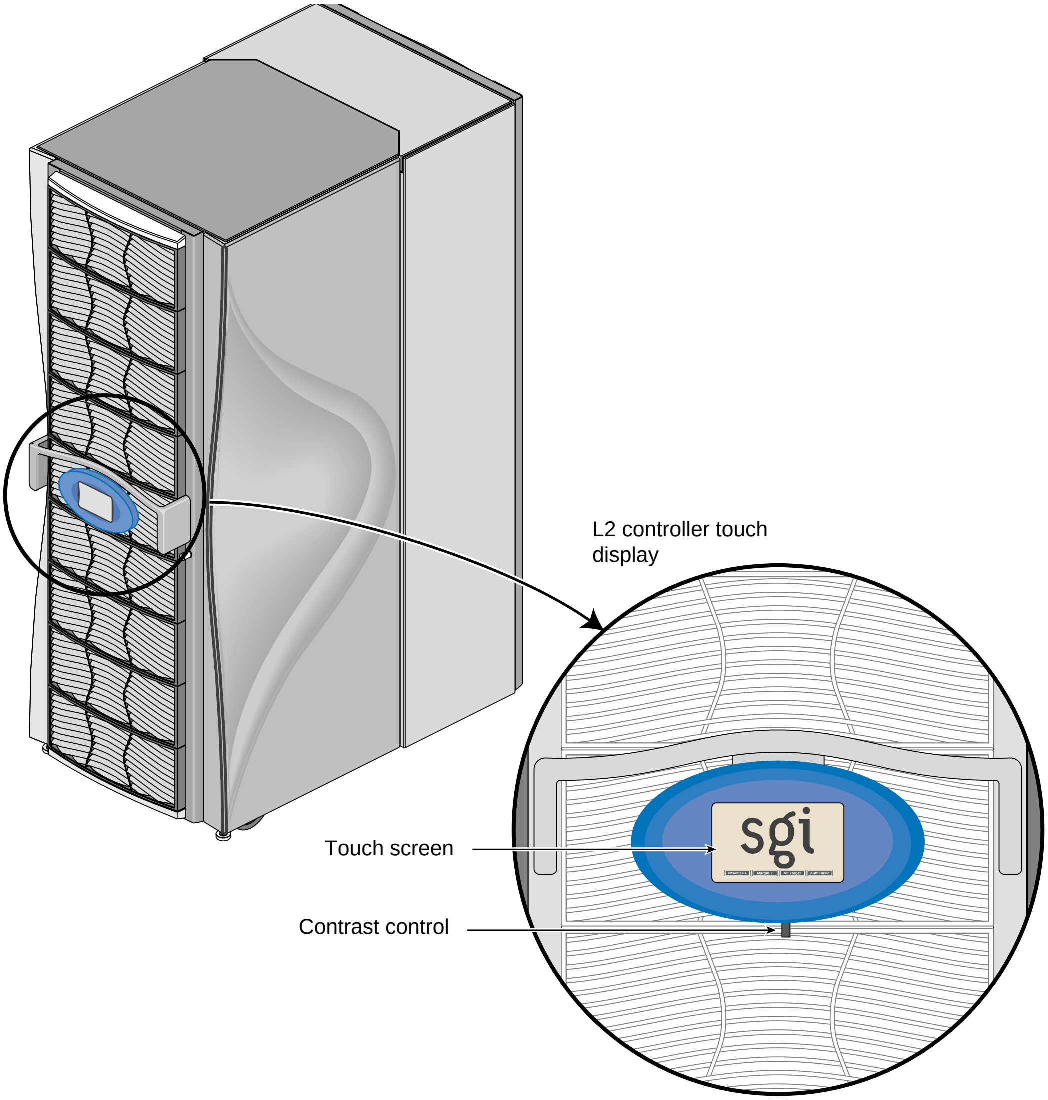

Figure 3-5 L2 Controller Touch Display

L2 Controller Ports

Figure 3-6 shows the ports on the L2 controller.

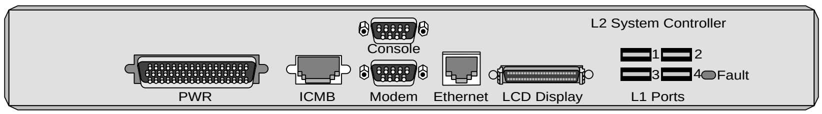

Figure 3-6 L2 Controller Connectors

Table 3-2 summarizes the ports of the L2 controller.

Table 3-2 L2 Controller Ports

Quantity	Port	Connector Label	Connects To	Purpose or Notes
4	Standard downstream USB	L1 port 1 through L1 port 4	USB hubs of R-bricks	In a system with no R-brick, this port connects to an L1 controller of a C-brick. The USB hub transfers status and control information between the L2 controller, which is the master of the USB ports, and the L1 controllers in the attached R-brick or C-bricks.
1	10/100-Base-T Ethernet, RJ45, autonegotiating	Enet	Ethernet hub	This port provides a means to connect multiple L2 controllers and to connect multiple L2 controllers to a console like the SGIconsole. The Ethernet hub provides eight Ethernet connectors. Any of these eight connectors can be used to cascade to another hub. See Figure 3-7.

Table 3-2 (continued) L2 Controller Ports

Quantity	Port	Connector Label	Connects To	Purpose or Notes
1	RS-232 ports (DB-9; 38.4 Kbaud)	Console	Dumb terminal	Console and modem ports allow the user to input text-based commands and to receive text-based results. The console and modem ports operate in one of the following modes:
1		Modem	Modem	L2 mode: L2 controller forwards all commands to the specified L2 controller. L1 mode: L2 controller forwards all commands to the specified L1 controller, except commands that are prefixed with CTRL T; the L2 controller interprets these commands. Console mode: L2 controller forwards all commands to the system console, except commands prefixed with CTRL T; the L2 controller interprets these commands.
1	L2 controller touch display	LCD display	L2 controller touch display	This port is used to display status and error messages generated by the L1 or L2 controller on the display panel located in the front door of your system.
1	Power	PWR	Power bay	This port provides a power source to the L2 controller.

The L2 controller connects to a modem through the modem connector on the back of the L2 controller. This connection provides a means of connecting remote support hardware to the system; however, the use of an Ethernet hub is the preferred method of connecting remote support hardware to the system.

The Ethernet hub provides eight Ethernet connectors. Figure 3-7 shows sample connections between the Ethernet hub, L2 controllers, and an SGIconsole.

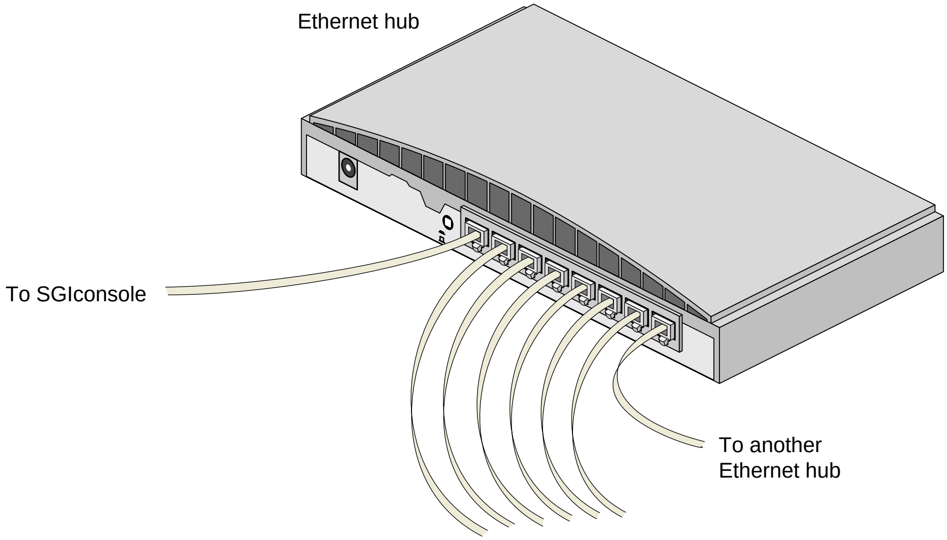

Figure 3-7 Ethernet Hub System Controller Connections (Example)

If a system has more L2 controllers than the Ethernet hub can accommodate, the Ethernet hub can be cascaded to a second Ethernet hub. The primary and secondary Ethernet hubs are connected by connecting the leftmost connector of the second Ethernet hub to any open connector on the primary hub. The Uplink button located next to the leftmost connector of the secondary Ethernet hub must be set to Uplink (the button is pushed in).

Large systems may require three Ethernet hubs in order to connect an SGIconsole to all of the L2 controllers in the system.

Console Hardware Requirements

The choice of console type and the method of connecting the console to the SGI Origin 3000 series server depend on whether or not the server has an L2 controller.

If you have an SGI Origin 3200 server without an L2 controller, you connect a dumb terminal to the C-brick (console port) as shown in Figure 3-8. This connection enables you to view the status and error messages generated by the L1 controller and to enter L1 commands to manage and monitor your system.

If you have an SGI Origin 3000 series server that has an L2 controller such as the SGI Origin 3400 server shown in Figure 3-9, you can either connect an SGIconsole to the L2 controller (the Ethernet port) or connect a dumb terminal to the L2 controller console port. If you have multiple L2 controllers, you can interconnect the SGIconsole and the various L2 controllers with an Ethernet hub.

These console connections to the L2 controller enable you to view the status and error messages generated by the L1 controllers on your server rack. You can also use these consoles to input L1 and L2 commands to manage and monitor your system.

For more details on connecting a console to your SGI Origin 3000 series server, see "Connecting a Console to Your Server System" on page 25. For more information on monitoring your server, see "Monitoring Your Server" on page 62.

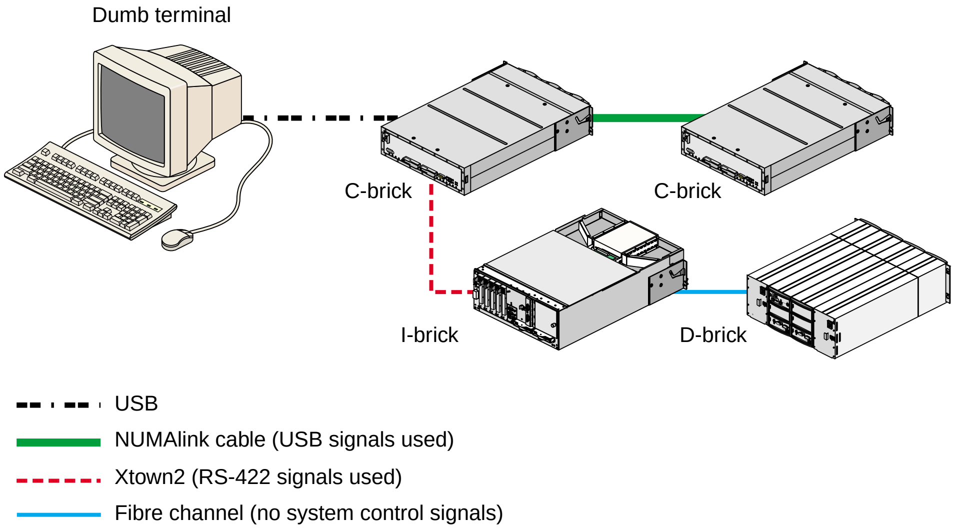

Figure 3-8 SGI Origin 3200 Server System Control Network (Example)

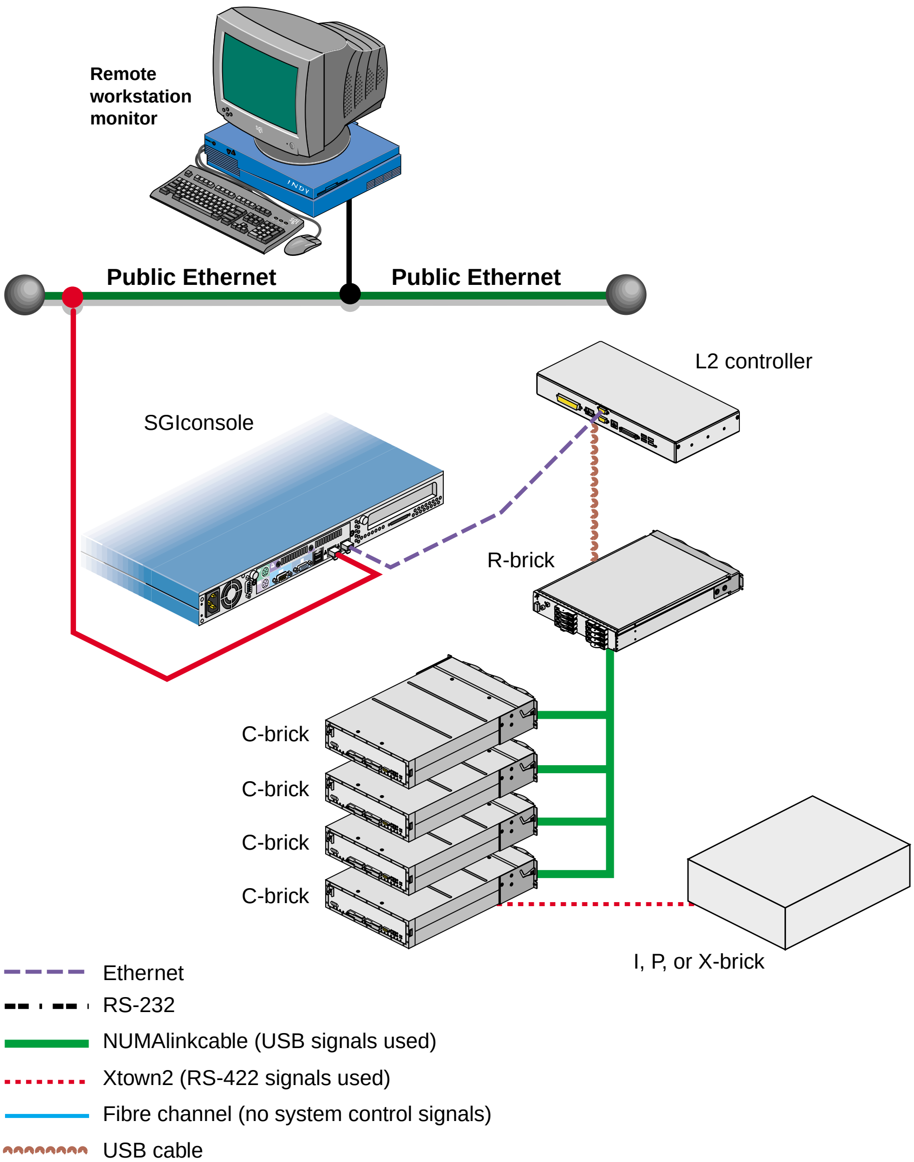

Figure 3-9 SGI Origin 3400 Server System Control Network (Example)

Using the L2 Controller Touch Display

The L2 controller touch display provides a simple graphical interface that allows you to perform basic functions.

Figure 3-10 illustrates the L2 controller touch display.

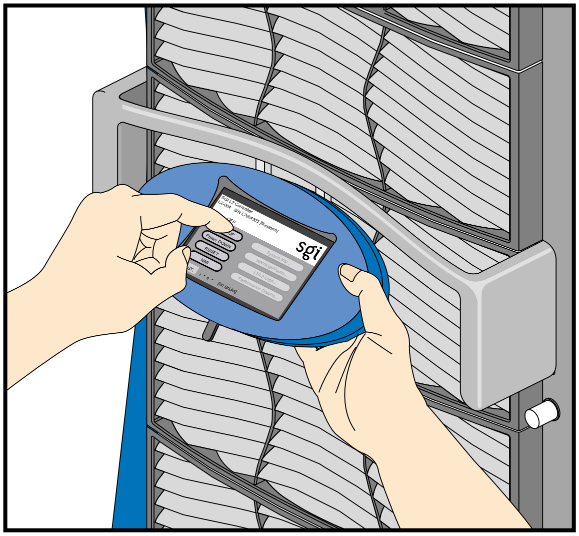

Figure 3-10 L2 Controller Touch Display Interface

Home Window

The home window of the L2 controller touch display, shown in Figure 3-11, includes five buttons:

Power UP	Power on selected bricks.
Power DOWN	Power off selected bricks.
RESET	Reset the system.
NMI	Send non-maskable interrupts (NMIs) to the system.
DEST	Select the bricks that will receive the function, such as power on or off.

The top of the home window also includes the following information (with sample output):

- Rack number (*L2-004* in our example) of the L2 controller to which the L2 controller touch display is connected.
- L2 controller system serial number (*L7654321* in our example).
- Server system name in parenthesis (*firestorm* in our example).
- Power status (**Power:** *OFF*) for the bricks designated in the destination (**DEST**) field, which indicates all slots in all racks (*r * s * [56 bricks]* in our example).

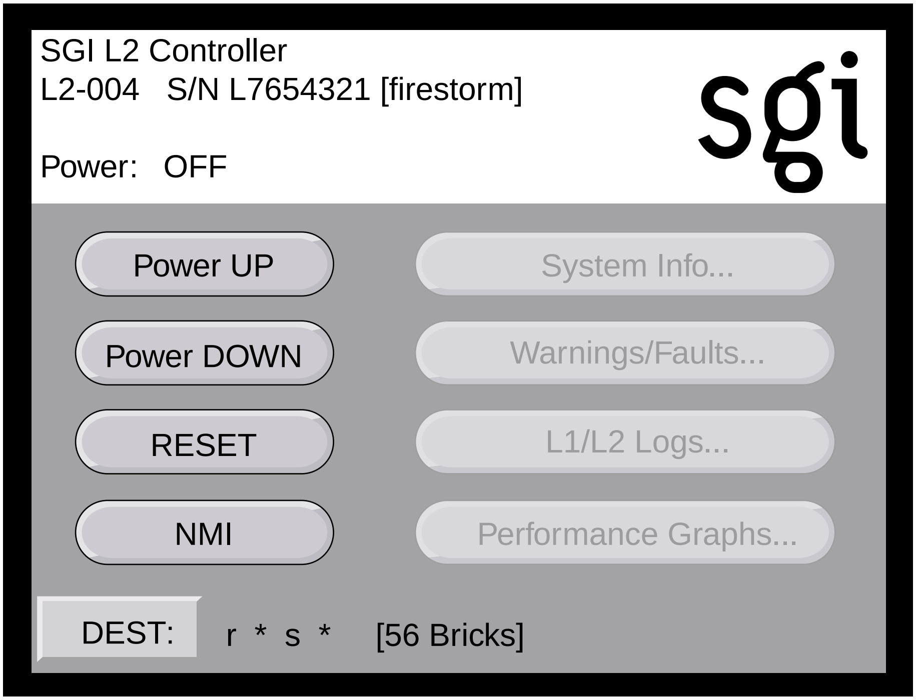

Figure 3-11 Home Window

Destination Selection Window

If you select the **DEST** button in the home window, the destination selection window, shown in Figure 3-12, appears. This window provides the following options:

Rack/Slot Select this option to select all slots (bricks) in all racks, all slots in multiple racks, or individual slots in a single rack. (You cannot select individual slots for multiple racks.)

Partition Select this option to select all the bricks in all partitions, or all bricks in individual or multiple partitions.

ALL If you select **Rack/Slot,** you can select all slots for all racks by selecting **ALL** on the left side of the window. If **Partition** is selected, you can select all bricks in all partitions by selecting **ALL** on the left side of the window. If you select **ALL** on the right side of the window, you select all slots for a particular rack.

CLR If you select **CLR** on the left side of the window, you clear the system of all rack or partition destination selections. If you select **CLR** on the right side of the window, you clear the system of all slot destination selections.

Numbered selections Select numbers on the left side of the window to select racks or partitions by number. Select numbers on the right side of the window to select slots by the number for a single rack.

New DEST This field displays the new destinations as you select them.

Apply If you select **Apply,** your destination selections are confirmed and the home window appears. The home window shows your destination selections in the **DEST** field.

Reset DEST Select this option to reset the destination to its previous setting.

Cancel Select this option to cancel the selected destinations and return to the home window.

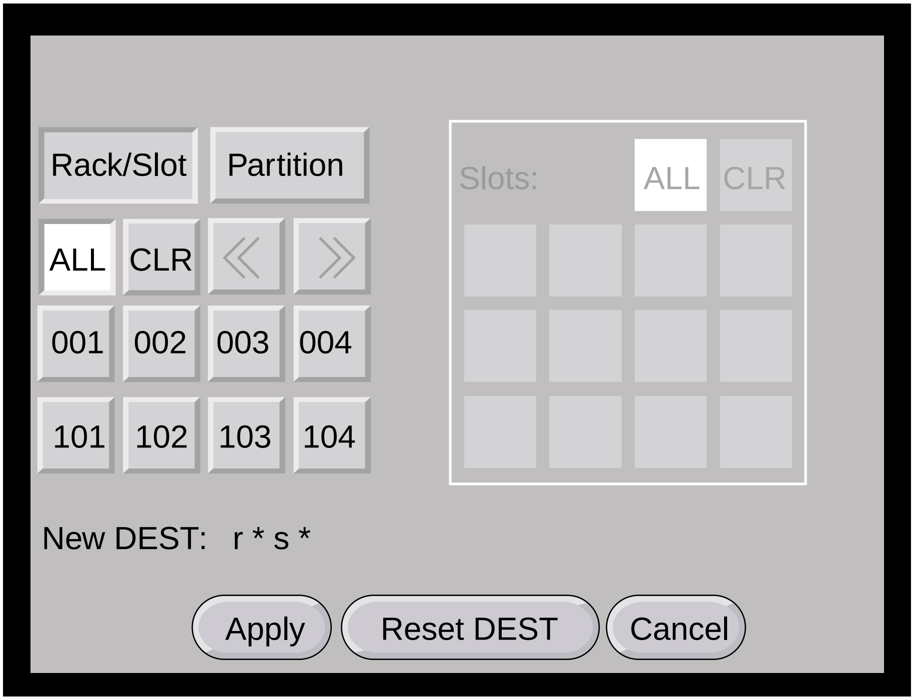

Figure 3-12 Destination Selection Window

Slots Selection Section

If you select **Rack/Slot** and a rack number (**001** in our example) from the destination selection window, the **Slots** selection section appears as shown in Figure 3-13. This section provides the following options:

ALL	Select **ALL** to select all the slots for the rack selected.
CLR	Select **CLR** to deselect all the slots you have selected for the rack.
Numbered selections	Select these numbers to pick the slots that you want as destination for the command you want to execute.

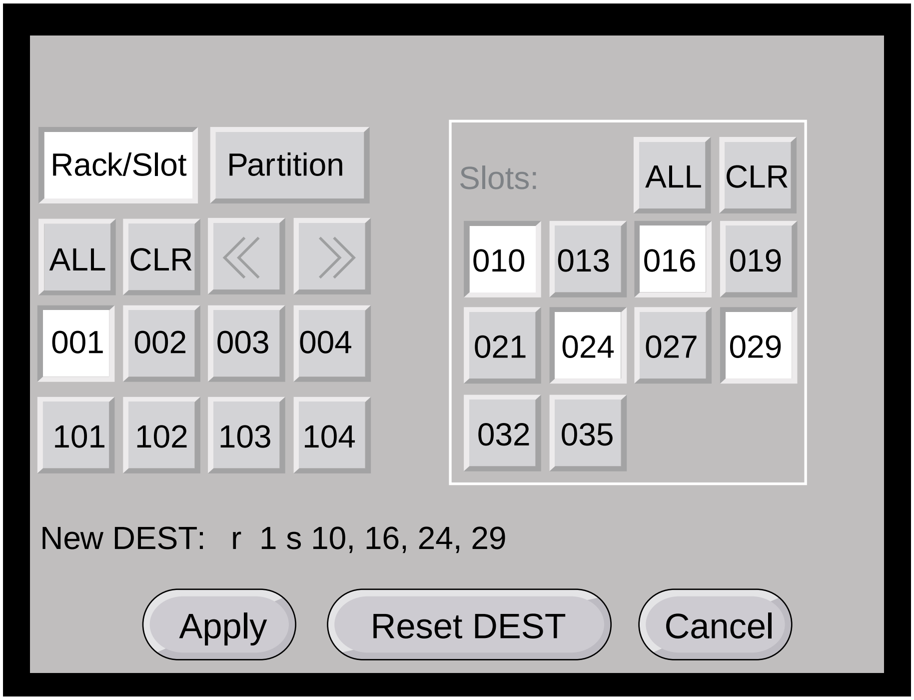

Figure 3-13 Slot Selection Section

Partition Selection

If you select **Partition** and **ALL** (to select all partitions in a server system) from the destination selection window, the partition selection window appears as shown in Figure 3-14.

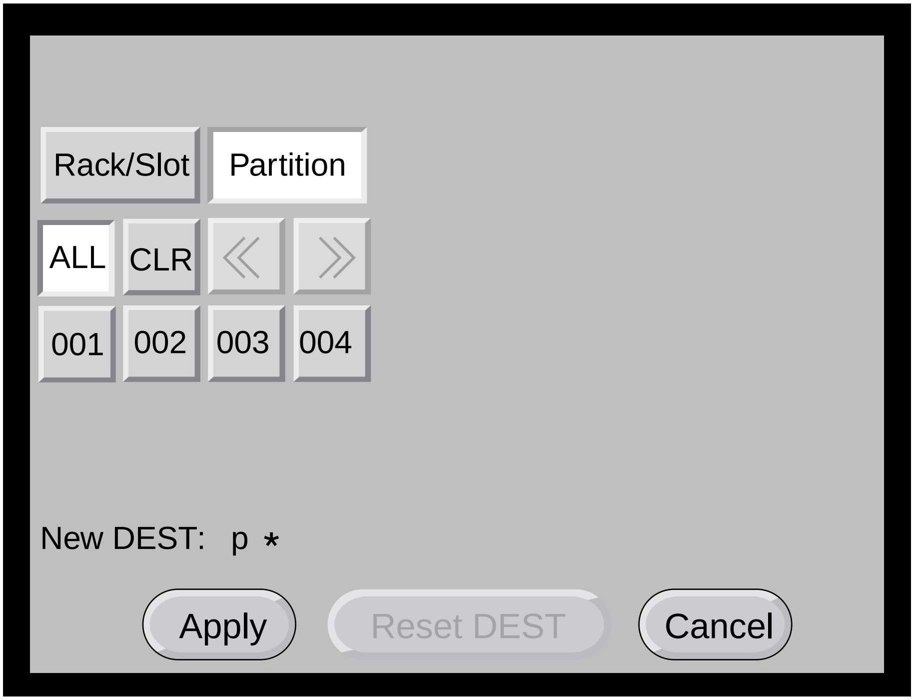

Figure 3-14 All Partitions Selected Window

If you select **Partition** and a particular partition (**001** in our example), the partition selection window appears as shown in Figure 3-15.

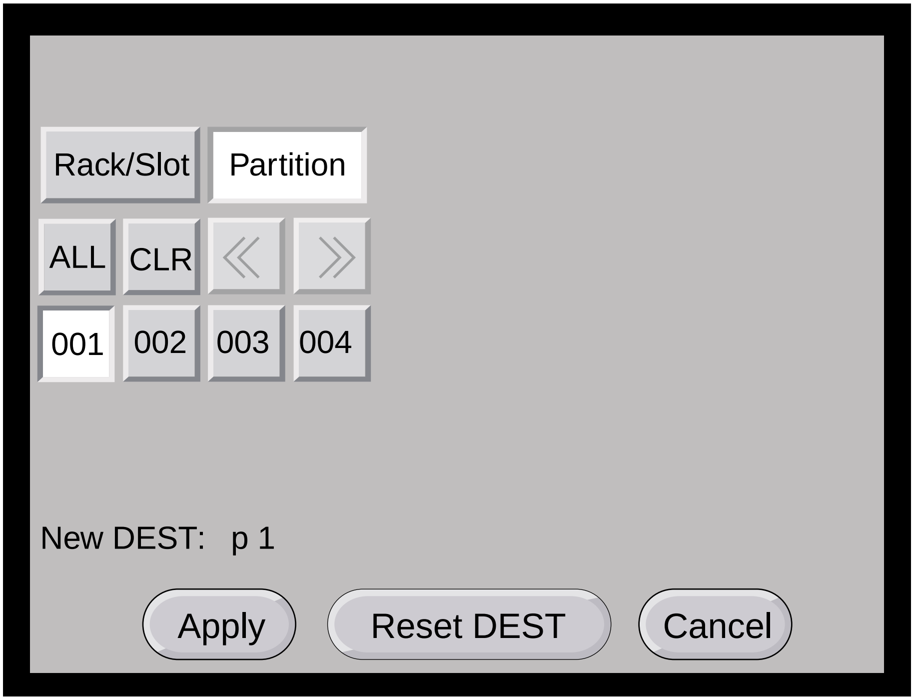

Figure 3-15 Individual Partition Selected Window

Command Confirmation Windows

After you have determined the destination of the bricks that will receive the command that you select and you have selected the command from the home window, a command confirmation window appears. (For example, if you select **Power UP** from the home window, the Power UP command confirmation window, shown in Figure 3-16, appears.)

The command confirmation window displays a message that prompts you to select the **OK** button to issue the command to the destination (r * s * means all slots in all racks, in the example).

To initiate the command, select the **OK** button. To terminate the command, select the **Cancel** button. The window stays visible until the command successfully completes. (An unsuccessful command results from an L1/L2 error in processing the command or a time-out in waiting for a response.)

A similar confirmation window with a similar prompt and button selections appears for the **Power UP**, **Power DOWN (**Figure 3-17**)**, **Reset (**Figure 3-18**)**, and **NMI (**Figure 3-19) commands.

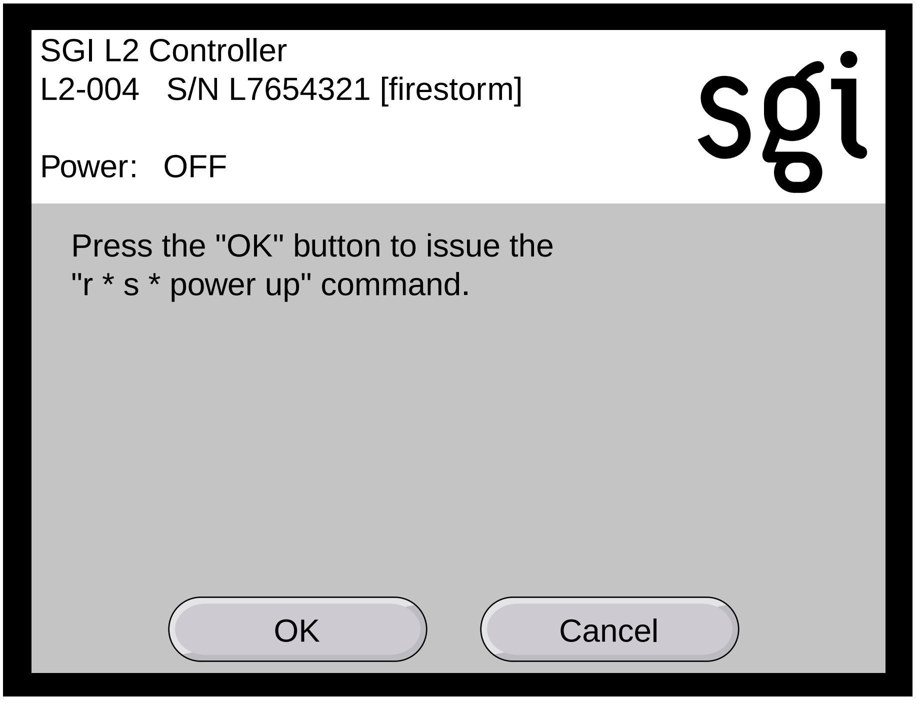

Figure 3-16 Power UP Command Confirmation Window

Figure 3-17 shows the Power DOWN command confirmation window.

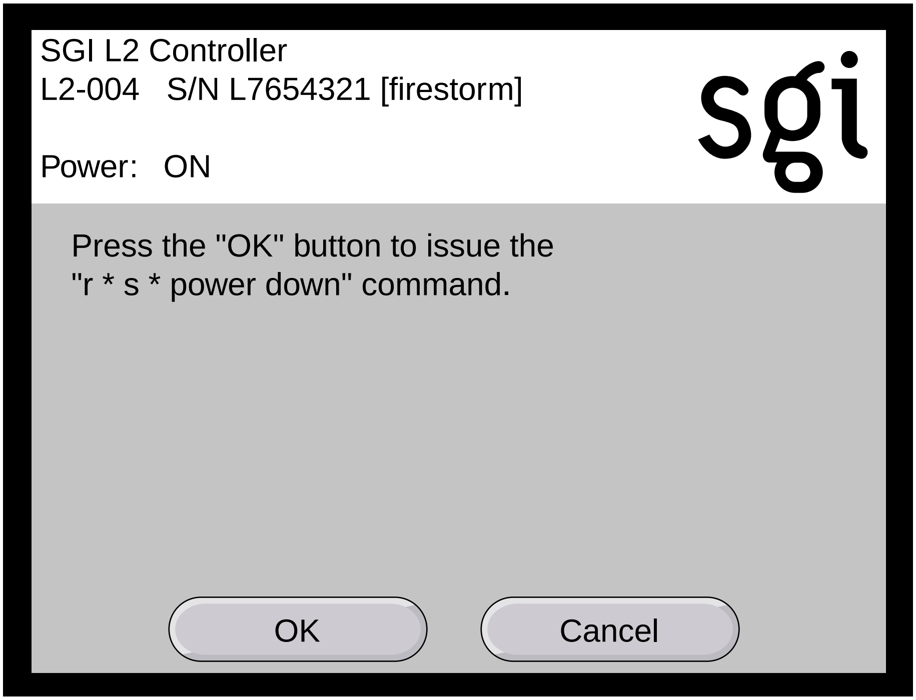

Figure 3-17 Power DOWN Command Confirmation Window

Figure 3-18 shows the Reset command confirmation window.

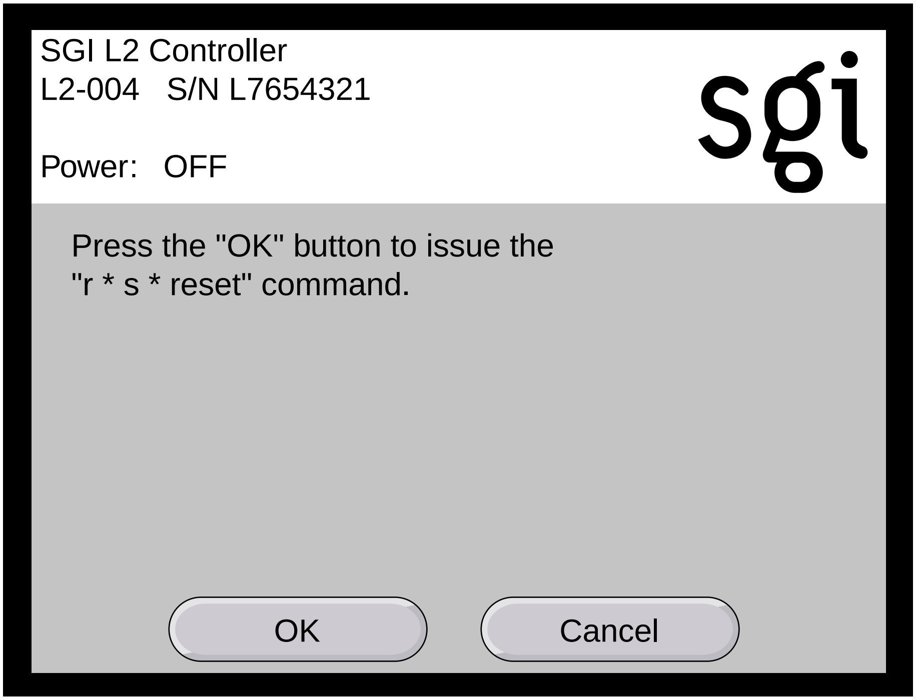

Figure 3-18 Reset Command Confirmation Window

Figure 3-19 shows the NMI command confirmation window.

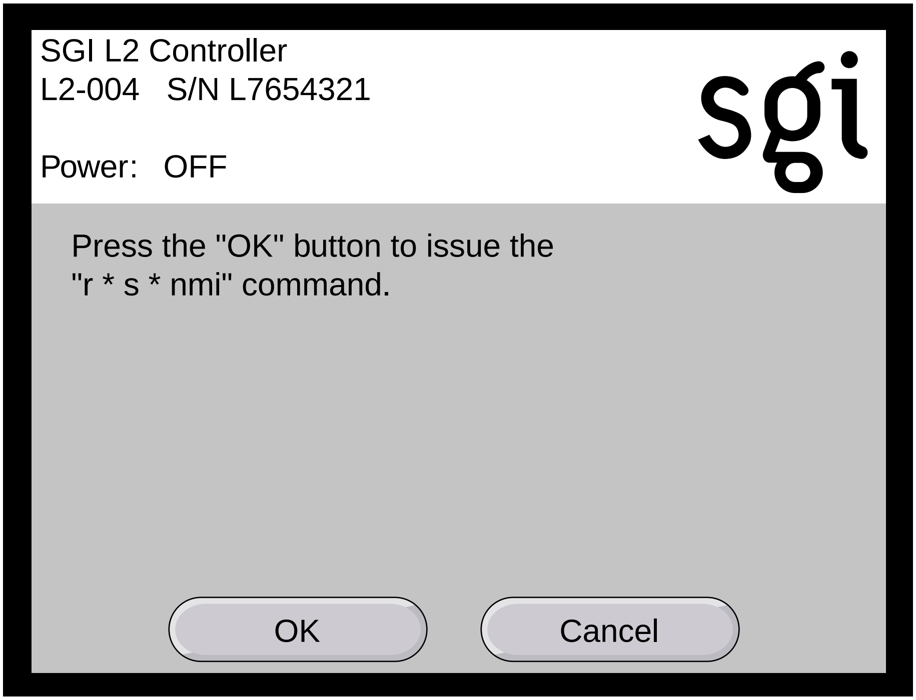

Figure 3-19 NMI Command Confirmation Window

About the L2 Controller Firmware

The L2 controller hardware includes L2 controller firmware. In order to access the L2 controller firmware, you must connect a console such as the SGIconsole or a dumb terminal to the L2 controller. For instructions to connect a console to the L2 controller, see “Connecting a Console to Your Server System” on page 25.

The L2 firmware is always running as long as power is supplied to the L2 controller. If you connect a system console to the L2 controller’s console port, the L2 prompt appears.

Operating L2

The L2 firmware operates in one of three modes:

- **L2 mode**. The L2 prompt is visible and all input is directed to the L2 command processor.
- **Console mode from L2**. Output from the system is visible and all input is directed to the system.
- **L1 mode from L2**. The prompt from a single L1 is visible, and all input is directed to that L1 command processor.

L2 Mode

After connecting to the L2 controller, the following prompt appears indicating that the L2 is ready to accept commands:

```
L2>
```

Common operations are discussed in the following sections:

- “Viewing System Configuration” on page 96
- “Setting Command Targeting” on page 97
- “Viewing Information, Warnings, and Error Messages” on page 100
- “Powering On, Powering Off, and Resetting the System” on page 100

Viewing System Configuration

You can use the L2 `config` command to view the current system configuration from a brick level, as follows:

```
L2> config
127.0.0.1:
127.0.0.1:0:0 - 003c01
127.0.0.1:0:1 - 004c01
127.0.0.1:0:2 - 002c01
127.0.0.1:0:3 - 001x01
L2>
```

As shown above, `config` produces a list of bricks in the system and the system controller address of each brick. This is similar to the output from using the `config` command on the L1 with the addition of the L2 IP address and USB port number. The structure of the brick's address is as follows:

```
a.b.c.d:x:y - rrrtss.p
```

where:

`a.b.c.d`	is the IP address of the L2. (In the example above, the IP address is 127.0.0.1.)
`x`	is the USB port number. (In the example above, the port number is zero.)
`y`	is the L1 index, as follows:
	0 - local brick (the brick to which the USB cable is attached)
	1 - I/O brick attached to the local brick
	3 - C-brick attached to the local brick
	4 - I/O brick (attached to the C-brick) that is attached to the local brick
`rrr`	rack number
`t`	type of brick (C-brick, I-brick, and so on)
`ss`	slot number
`p`	is the partition (not present if the system is not partitioned).

A brick is identified by its rack and slot. In the example shown above, 003c01 is a C-brick in rack 3 and unit position 1.

Setting Command Targeting

If a command is not understood by the L2 system controller, in general it is passed on to the L1 system controllers. The destination determines which L1s receive the command. A destination, specified by the following, is a range of racks and slots:

`rack` *<rack list>* `slot` *<slot list>*

The *<rack list>* specifies a list of racks. This can be a list delimited by commas, such that 2,4,7 specifies racks 2, 4, and 7. You can use a dash to specify a range of racks, such that 2-4 specifies racks 2, 3, and 4. Both nomenclatures can be combined, such that 2-4,7 specifies racks 2, 3, 4, and 7.

You can specify the <*slot list*> using the same nomenclature. The slot number, sometimes referred to as a bay number, is the unit position number located on the rack, slightly above where the bottom of the brick sits. Each rack unit position number is located toward the top of the two lines that mark the unit position that the number represents. For example, the rack numbering for a brick located in slot 10 would appear on the left front side of the rack, as shown in Figure 3-20:

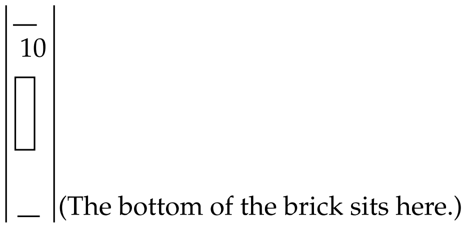

Figure 3-20 Rack Numbering

The slot <*slot list*> is optional; if not given, then all slots in the specified rack(s) are implied. You should avoid specifying a rack list and a slot list that includes multiple racks and slots, such as `rack 2-4,7 slot 1-8,11,13`. Generally, a rack and slot together are used to specify an individual brick.

You can use the aliases `r` and `s` to specify `rack` and `slot`, respectively. You can use the alias `all` or `*` in both the <*rack list*> and the <*slot list*>, or by themselves, to specify all racks and all slots.

To send a command to all bricks in a partition, type the following:

`partition` <*partition*> <*cmd*>

Default Destination

When the L2 starts, the default destination is set to all racks and all slots. You can determine the default destination by using the `destination` command, as follows:

```
L2> destination
all racks, all slots
L2>
```

The following command sets the destinations to rack 2 and 3, all slots:

```
L2> r 2,3 destination
2 default destination(s) set
L2>
```

The following example shows what bricks are found in the default destination. If you type a command not understood by the L2, the command would be sent to these bricks.

Note: In the current implementation, adding a brick to either rack 2 or 3 would not automatically include it in the default destination. You would need to reset the default destination.

```
L2> destination
002c01 (127.0.0.1:0:2)
003c01 (127.0.0.1:0:0)
L2>
```

The following command resets the default destination to all racks and all slots:

```
L2> destination reset
default destination reset to all racks and slots
L2>
```

Current Destination

The current destination is a range of racks and slots for a given command. For example, the following command sends the command `<L1 command>` to all bricks in racks 2, 3, 4, and 7:

```
L2> r 2-4,7 <L1 command>
```

This is a one-time destination.

Command Interpretation

Some L2 commands are the same as the L1 commands. In many cases, this is intentional because the L2 provides sequencing that is necessary for a command to function correctly.

When L1 and L2 commands are similar, you can assure that an L1 command is entered for the bricks in the current destination by preceding the <*L1 command*> with the `L1` command (this is a one-time destination):

L2> **r 2-4,7 l1** <*L1 command*>

See Appendix B, "System Controller Commands," for details on the L2 commands.

Viewing Information, Warnings, and Error Messages

All information, warnings, and error messages generated by any of the system controllers are in the following form:

```
002c01 ERROR: invalid arguments for 'ver' command, try "help ver"
```

The general format includes a brick identification and the type of message, followed by the message. A message may be the result of an invalid command, as shown in the example, or the result of tasks running on the L1, such as the environmental monitor.

Each L1 has a log of local events. Use the L1 command `log` to view events on any of the L1s.

Powering On, Powering Off, and Resetting the System

The system can be powered on and off with the `power` command. This command is interpreted by the L2, because the bricks must be powered on in a specific order.

```
L2> power up
L2>
```

The `power` command may require several seconds to several minutes to complete. In the example above, all racks and slots in the default destination are affected. Any errors or warnings are reported as described in "Viewing Information, Warnings, and Error Messages."

To power on or power off a specific brick, specify a current destination:

```
L2> r 2 s 5 power up
L2>
```

You can enter the `power down` and `reset` commands in a similar way. See Appendix B, "System Controller Commands," for details on the L2 commands.

L2> **partition** <*partition number*> <*power up* or *power down*>

Console Mode from L2

In console mode, all output from the system is visible and all input is directed to the system.

To enter console mode from L2, press `Ctrl+D` at the L2 prompt and observe the response:

```
L2> Ctrl+D
entering console mode 002c01 console, <CTRL_T> to escape to L2
.
<system output appears here>
.
```

To return to L2 mode from console mode, press `Ctrl+T`:

```
Ctrl+T
escaping to L2 system controller
L2>
```

At this point, you can enter any L2 or L1 command. When the command completes, the L2 returns to console mode:

```
Re-entering console mode 002c01 console, <CTRL_T> to escape to L2
```

To permanently engage the L2 mode, press `Ctrl+T` and then type the `l2` command:

```
Ctrl+T
escaping to L2 system controller
L2> l2
L2 command processor engaged, <CTRL_D> for console mode.
L2>
```

Console Selection

When in console mode, the L2 can communicate with a brick set with the `select` command to be the system console or global master that receives the console input. This system console can be set and viewed with the `select` command.

The L2 chooses the C-brick as the default console in the following order of priority:

- C-brick in the lowest numbered rack and slot, which has produced console output, and has an attached I-brick.
- C-brick in the lowest numbered rack and slot, which has an attached I-brick.
- C-brick in the lowest numbered rack and slot.

The `select` command by itself shows the current console mode settings:

```
L2> select
console input: 002c01 console
console output: not filtered
console detection: L2 detected
```

There are five common subchannels associated with console communications:

1. Subchannel a or 0 specifies CPU A.
2. Subchannel b or 1 specifies CPU B.
3. Subchannel c or 2 specifies CPU C.
4. Subchannel d or 3 specifies CPU D.
5. The console subchannel.

The output `console input: 002c01 console` shows that the L2 will send console input to brick 002c01 and the console subchannel will be used.

To change the brick that will be the system console, use the `select` <*rack*>.<*slot*> command, where <*rack*> is the rack and <*slot*> is the slot where the brick is located, as follows:

```
L2> select 3.1
console input: 003c01 console
console output: no filtered
console detection: L2 detected
```

To change the subchannel used by the brick to be the system console, use `select subchannel <`*a*`|`*b*`|`*c*`|`*d*`>` command. (Use `select subchannel console` to select the console as the subchannel of the brick to be the system console.) For example, to select subchannel b, type the following:

```
L2> select subchannel b
console input: 003c01 console CPU
console output: no filtered
console detection: L2 detected
```

During the boot process on a multibrick system, there is a window of time during which the C-bricks are all producing output. This can result in a somewhat jumbled output at the L2. Console output can be filtered, though, which means that the L2 will show output only from the brick chosen to receive console input. You can turn on filtering with `select filter on` and turn it off with `select filter off`.

If you try to communicate with a brick chosen to receive console input, but the brick is not responding, a time-out condition results, as follows:

```
L2> Ctrl+D
entering console mode 003c01 CPU2, <CTRL_T> to escape to L2

no response from 003c01 bedrock CPU2 system not responding
no response from 003c01 bedrock CPU2 system not responding
```

When this time-out condition occurs, either the brick is hung or the subchannel is not correct.

L1 Mode from L2

In L1 mode, the prompt from a single L1 is visible, and all input is directed to that L1 command processor.

To enter L1 mode, type the `l1` command and specify a rack and a slot:

```
L2> r 2 s 1 l1
enterling L1 mode 002c01, <CTRL-T> to escape to L2

002c01-L1>
```

To return to L2 mode, press `Ctrl+T`:

```
002c01-L1> Ctrl+T
escaping to L2 system controller, <CTRL-T> to send escape to L1
L2>
```

At this point, any L2 command can be entered. When the command completes execution, the L2 returns to L1 mode:

```
002c01-L1>
```

To permanently engage the L2 mode, press `Ctrl+T` and type the `l2` command:

```
002c01-L1> Ctrl+T
escaping to L2 system controller, <CTRL-T> to send escape to L1
L2> l2
L2 command processor engaged, <CTRL-T> for console mode.
L2>
```

Note: If you press `Ctrl+D` while in L1 mode, the L1 goes into console mode. Output from the system console will not be visible because the L2 never shows system console output unless the L2 is in console mode. To return to the L1 prompt at this point, press `Ctrl+T` twice, followed by the `L1` command, to lock the L1 back into L1 mode.

```
003c01> Ctrl+D

entering console mode 002c01 console, <CTRL-T> to escape to L1
Ctrl+T
escaping to L2 system controller, <CTRL-T> to send escape to L1
L2> Ctrl+T
escaping to L1 system controller
003c01-L1> l1
L1 command processor engaged, <CTRL-T> to exit.
003c01-L1>
```

Operating L1

The L1 operates in one of two modes:

L1 Mode

The L1 prompt is visible and all input is directed to the L1 command processor.

Console Mode from L1

Output from the system is visible and all input is directed to the system.

Note: Console mode from the L1 mode is not supported if the system contains an L2 controller.

L1 Mode

When you see a prompt of the following form, the L1 is ready to accept commands.

```
001c19-L1>
```

Common operations include the following and are discussed in the sections that follow:

- “Viewing System Configuration (from a Brick’s Perspective)” on page 105
- “Command Targeting” on page 106
- “Viewing Information, Warnings, and Error Messages” on page 107
- “Powering On, Powering Off, and Resetting the Brick” on page 107

Viewing System Configuration (from a Brick’s Perspective)

An L1 has limited knowledge of the system configuration. A C-brick only has information about its attached I/O brick and, if another C-brick is attached to it, information about that C-brick and its attached I/O brick. An I/O brick only has information about its attached C-brick. An R-brick only has information about itself.

You can view a brick's configuration information with the `config` command:

```
003c01-L1> config
:0 - 003c01
:1 - 004i01
:2 - 002c01
:3 - 001x01
003c01-L1>
```

This example is a two C-brick, two I/O-brick system. The :<*number*> that follows the colon (0, 1, 2, and 3 from top to bottom in our example) refers to the L1 connection relative to the local brick. (The local brick is the brick that is processing the command.)

From a C-brick's perspective:

:0 is the local brick
:1 is the attached I/O brick
:2 is the attached C-brick
:3 is the attached C-brick's attached I/O brick

From an I/O brick's perspective:

:0 is the local brick
:1 is the attached C-brick on port A
:2 is the attached C-brick on port B

From an R-brick's perspective:

0: is the local brick

Command Targeting

All commands entered affect only the local brick. You can target a command to all bricks (including the local brick) by prefixing the command with an asterisk (`*`).

```
003c01-L1> * version
003c01:
L1 0.7.37 (Image A), Built 05/24/2001 14:59:42 [P1 support]
004i01:
L1 0.7.37 (Image A), Built 05/24/2001 14:59:42 [P1 support]
002c01:
L1 0.7.37 (Image A), Built 05/24/2001 14:59:42 [P1 support]
001x01:
```

```
L1 0.7.37 (Image A), Built 05/24/2001 14:59:42 [P1 support]
003c01-L1>
```

You can also target commands to a single attached brick with either the `cti`, `ctc`, or `ctci` command:

```
003c01-L1> cti version
004i01:
L1 0.7.37 (Image A), Built 05/24/2001 14:59:42 [P1 support]
003c01-L1> ctc version
002c01:
L1 0.7.37 (Image A), Built 05/24/2001 14:59:42 [P1 support]
003c01-L1> ctci version
001x01:
L1 0.7.37 (Image A), Built 05/24/2001 14:59:42 [P1 support]
003c01-L1>
```

See Appendix B, “System Controller Commands,” for details on the L1 commands.

Viewing Information, Warnings, and Error Messages

All information, warnings, and error messages generated by any of the system controllers are in the following form:

```
002c01 ERROR: invalid arguments for ‘ver’ command, try “help ver”
```

The general format of the message includes a brick identification (this is not present if the command was to the local brick only), type of message, and the message. These messages can be the result of an invalid command (as shown in the example) or from tasks running on the L1, such as the environmental monitor.

Each L1 has a log of local events. Use the L1 command `log` to view the event on any of the L1s.

Powering On, Powering Off, and Resetting the Brick

You can power on and power off the brick with the `power` command, as follows:

```
003c01-L1> power up
003c01-L1>
```

If an L2 is not present, you need to power on, power off, and reset the system from one of the C-bricks. You do so by targeting all bricks, as follows:

```
003c01-L1> * power up
003c01-L1>
```

This command can require from several seconds to several minutes to complete.

You can enter the `power off` and `reset` commands in a similar fashion. See Appendix B, "System Controller Commands," for details on the L1 commands.

Console Mode from L1

In console mode, output from the system is visible and all input is directed to the system.

To enter console mode, press `Ctrl+D` at the L1 prompt:

```
003c01-L1> Ctrl+D
entering console mode 003c01 console, <CTRL-T> to escape to L1
.
<system output appears here>
.
```

To return to L1 mode, press `Ctrl+T`:

```
Ctrl+T
escaping to L1 system controller
003c01-L1>
```

At this point, you can enter any L1 command. When the command completes execution, the L1 returns to console mode:

```
re-entering console mode 003c01 console, <CTRL-T> to escape to L1
```

To permanently engage the L1 mode, press `Ctrl+T` and then type the `l1` command:

```
Ctrl+T
escaping to L1 system controller
003c01-L1> l1
L1 command processor engaged, <CTRL-D> for console mode.
003c01-L1>
```

Console Selection

The brick with which the L1 communicates in console mode is the system console or global master, and it can be viewed and set with the `select` command. By default, the

C-brick attempts to communicate with its local CPUs when console mode is entered. If the system has been powered on and either one of the bricks has a request to be the system console, then the C-brick attempts to communicate with that brick. The `select` command by itself shows the current console mode settings:

```
003c01-L1> select
console input: 003c01 console
console output: not filtered.
```

There are five common subchannels associated with console communications.

1. Subchannel 0 specifies CPU A.
2. Subchannel 1 specifies CPU B.
3. Subchannel 2 specifies CPU C.
4. Subchannel 3 specifies CPU D.
5. Subchannel 4 is the console subchannel.

The output `console input: 003c01 console` shows that the L1 will send console input to brick 003c01 and the console subchannel will be used.

To change system console status from one brick to the attached C-brick, use the `select` command, followed by `ctc` or the rack and slot number of the attached C-brick:

```
003c01-L1> select ctc
console input: 002c01 console
console output: not filtered.
003c01-L1> select r 2 s 1
console input: 002c01 console
console output: not filtered.
003c01-L1>
```

To change the subchannel used on the selected brick, use the `select` command, followed by the subchannel number or the word `console`:

```
003c01-L1> select 2
console input: 002c01 CPU C
console output: not filtered.
003c01-L1>
```

During the boot process on a multi-rack system, there is a window of time during which both C-bricks are producing output. This resulting output may be a somewhat jumbled at the L1. Console output can be filtered, though, meaning that the L1 shows output only from the brick chosen to receive console input. You can turn filtering on and off with the `select filter` command.

If you try to communicate with a brick that is not responding, a time-out condition results, as follows:

```
003c01-L1>

entering console mode 002c01 console, <CTRL-T> to escape to L1
no response from 002c01 bedrock console UART:UART_TIMEOUT
```

When this time-out condition occurs, either the brick is hung or the subchannel is incorrect.

Upgrading L1/L2 Firmware

The L1/L2 firmware is currently distributed as part of your IRIX software package. This collection of software packages contains L1/L2 firmware.

The L1 and L2 firmware binary, and the utilities used to update it, are stored in `/usr/cpu/firmware/sysco`.

Upgrading L1 Firmware

The L1 firmware consists of three parts:

- Boot image
- Image A
- Image B

At boot time, the boot image validates images A and B and, if it’s not instructed otherwise, it executes the newer of the two images. Because the L1 is running one of the two images, the image not in use is the image that will be overwritten when the firmware is upgraded. You need to reboot any L1 update either by power cycling the brick or by using the L1 command `reboot_l1`. See the `flash` and `reboot_l1` commands in Appendix B, “System Controller Commands,” for details.

Typically, you will upgrade the firmware through the network connection from the SGIconsole to the L2, as follows:

```
$> /usr/cpu/firmware/sysco/flashsc --12 10.1.1.1
/usr/cpu/firmware/sysco/l1.bin all
```

This updates all the bricks in the system. Individual bricks can be updated by replacing *all* with a rack and slot number, as follows:

```
$> /usr/cpu/firmware/sysco/flashsc --12 10.1.1.1
/usr/cpu/firmware/sysco/l1.bin 1.19
```

This updates only the brick in rack 1, slot 19.

Upgrading L2 Firmware

The L2 firmware consists of two parts:

- Boot image
- Kernel image

Typically, you will upgrade the firmware through the network connection from the SGIconsole to the L2, as follows:

```
$> /usr/cpu/firmware/sysco/flashsc --12 10.1.1.1
/usr/cpu/firmware/sysco/l2.bin local
```

Once this command has executed, the L2 must be power cycled to run the new image. To do this, you can use the L2 command `reboot_l2`.

If the L2 update fails, there is no second image as a back up as there is with the L1. The L2, however, will not run the kernel image if it is not valid. The L2 is intelligent enough at this point to be upgraded through its console port, as follows:

```
$> /usr/cpu/firmware/sysco/flashsc --l2recover /usr/cpu/firmware/sysco
/l2.bin <device>
```

where <*device*> equals --dev or --serial with the appropriate argument for the option entered.

Output will indicate that the firmware image is being erased and then rewritten. The flash image is quite large (almost 2 MB), so updating the flash takes several minutes. The

L2 must be power cycled to run the new image. To do this, you can use the L2 command `reboot_l2`.

Identifying Bricks

Bricks are referenced by their racks and slot or bay locations. These values are stored in non-volatile memory on the L1. Virtually all system controller communication requires that each brick have a valid and unique rack and slot.

If a brick does not have its rack and slot number set, it shows up in the output of an L2 `config` command as shown in the following example:

```
L2> config
137.38.88.82.1.0 ---c-- (no rack/slot set)
L2>
```

To set the rack and slot for a brick, address it by its IP address, USB port, and L1 controller index. The following is an example:

```
L2> 137.38.88.82:1:0 brick rack 3
L2> 137.38.88.82:1:0 brick slot 10
L2> 137.38.88.82:1:0 reboot_l1
L2>config
137.38.88.82:1:0 003c10
L2>
```

The following example shows how to set rack 3, slot 1, for the C-brick with the IP address 127.0.0.1:

```
L2> config
127.0.0.1:
127.0.0.1:0:0 - ---c--
127.0.0.1:0:0 - 004i01
127.0.0.1:0:0 - 002c01
127.0.0.1:0:0 - 001x01
L2> :0:0 brick rack 3
brick rack set to 003.
L2> :0:0 brick slot 1
brick slot set to 01.
L2> :0:0 reboot_l1
WARNING: can’t read packet on L1 connection (/dev/sgil1_0), status:
IRouter:read failed - read error
INFO: closed USB /dev/sgil1_0
```

```
INFO: opened USB /dev/sgil1_0
WARNING: last error on L1 connection (/dev/sgil1_0) repeated 64 times

L2>
L2> config
127.0.0.1:
127.0.0.1:0:0 - 003c01
127.0.0.1:0:0 - 004i01
127.0.0.1:0:0 - 002c01
127.0.0.1:0:0 - 001x01
L2>
```

If the brick is connected to an L2 other than the local L2, the format of the command would be the following:

```
L2><ipaddress>:<USB port>:<L1 index> <command>
```

To set the rack and slot from the L1 prompt, simply use the `brick rack` and `brick slot` commands. To set the rack and slot on one of the attached bricks (an attached I/O brick, C-brick, or a C-brick's I/O brick), use the L1 targeting commands `cti`, `ctc`, or `ctci`.

```
003c01-L1> config
:0 - 003c01
:1 - ---i--
:2 - 002c01
:3 - 001x01
003c01-L1> cti brick rack 4
---i--:
brick rack set to 004.
003c01-l1> cti reboot_l1
003c01 ERROR: no response from ---i--
003c01-L1> config
:0 - 003c01
:1 - 004i01
:2 - 002c01
:3 - 001x01
003c01-L1>
```

C-brick

This chapter describes the function and physical components of the C-brick in the following sections:

- "Functional Description" on page 115
- "Internal Components and Front Panel Items" on page 115
- "Switch, Connectors, and LEDs on C-brick Rear Panel" on page 123

Functional Description

The C-brick provides the computing functionality for the SGI Origin 3000 server series since it contains the processors and memory; this brick is also referred to as a compute node.

Internal Components and Front Panel Items

The following lists and describes the C-brick's internal components and front panel items (Figure 4-1 shows the C-brick's front panel items):

Internal components:

- **IP35 Motherboard.** Contains internal components such as the L1 controller logic, bedrock application-specific integrated circuit (ASIC), the processor integrated memory modules (PIMMs), and the dual-inline memory modules (DIMMs).
- **PIMMs.** Location in which the CPUs (processors) are physically located. Each PIMM contains two processors; each C-brick can contain one or two PIMMs (two or four processors).
- **DIMMs.** Are the dual-inline memory modules for the server.

- **Bedrock ASIC.** Is a crossbar switch that allows communication between the processors, memory, network routers, and I/O devices.

Front panel items:

- **Fans.**
- **L1 controller display.** A liquid crystal display (LCD) for the L1 controller.
- **On/Off switch with LED.** Press this button to turn on the C-brick internal components. Alternatively, you can turn on the C-brick internal components at a system console. If your system has an L2 controller, you can turn on the C-brick internal components at the L2 controller touch display.
- **L1 controller switches and LEDs:**
  - **On/Off switch LED.** Lights green when the C-brick internal components are on and turns off when they are off.
  - **Service required LED.** Lights orange to indicate that an item is broken or not operating properly (for example, a fan is off), but the C-brick is still operating.
  - **Failure LED.** Lights red to indicate that a system failure has occurred and the C-brick system is down.
  - **Reset switch.** Press this switch to reset the C-brick internal processors and ASICs. The reset will cause a memory loss. (See the non-maskable interrupt [NMI] to perform a reset without losing memory.)
  - **Non-maskable interrupt [NMI] switch.** Press this switch to reset the C-brick internal processors and ASICs without losing memory.

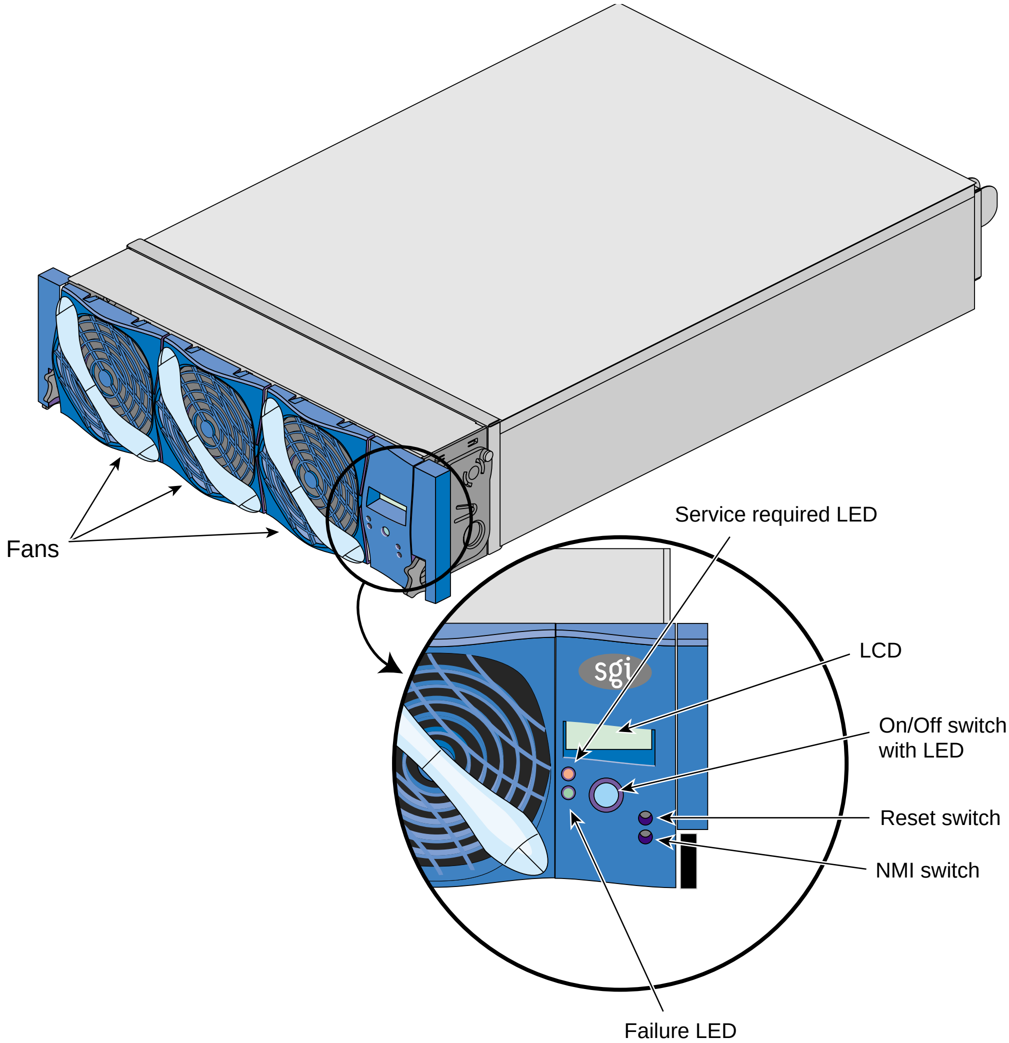

Figure 4-1 C-brick Front View

IP35 Motherboard

The half-panel IP35 motherboard houses these components:

- **L1 controller logic.**
- **One or two processor integrated memory modules (PIMMs),** each with two processors (8-MB L2 cache per processor).
- **Eight dual-inline memory module (DIMM) slots** that are organized in banks, with each bank divided between two DIMMs with up to four banks and eight DIMMs total (configurable from 512 MB to 8 GB of main memory). Memory is increased or decreased in two DIMM increments.
- **Bedrock memory controller.** The bedrock also controls all activity within the C-brick (for example, error correction and cache coherency).
- **Serial ID EEPROM** that contains component information.
- **Three 2.5 VDC, 30 A VRMs (VRMs 4, 3, and 8)** that convert the incoming 48 VDC to the voltage levels required by the components.
- **Four 240-pin PIMM connectors.**
- **10 light-emitting diodes (LEDs)** on the C-brick rear panel.
  - One 12 VDC LED, which lights when L1 controller is powered on, and one 48 VDC LED, which lights when internal components are powered on
  - Two NUMAlink3 LEDs, controlled by the L1 controller
  - Two Crosstown2 LEDs, controlled by the L1 controller
  - Four heartbeat LEDs, controlled by the hub ASIC
- **The following switch and connectors** on the C-brick rear panel.
  - Power switch
  - PWR (power) connector
  - LINK (NI - Network Interface) connector
  - XIO (II - I/O Interface) connector
  - Console port (serial)
  - L1 Port (USB)

Note: Ports and LEDs on the C-brick rear panel are discussed in detail in "Switch, Connectors, and LEDs on C-brick Rear Panel" on page 123.

Processor Integrated Memory Modules (PIMMs)

The processors are physically located on processor integrated memory modules (PIMMs). Each C-brick can contain one or two PIMMs (two or four processors).

Each PIMM contains:

- Two processors.
- 8 MB of secondary cache per processor: synchronous static random access memory (SSRAM).

  To reduce memory latency, a processor has access to two 32-KB primary caches (one for data and one for instructions) and an off-chip secondary cache. The primary caches are located within the processor for fast, low-latency access of instructions and data.

Local Memory: Dual-Inline Memory Modules (DIMMs)

Each C-brick has from 512 MB to 8 GB of local memory, which includes *main memory* and *directory memory* for cache coherence.

Local memory can consist of 1 to 4 banks. Each bank consists of two dual-inline memory modules (DIMMs) that contain double data rate synchronous dynamic random access memory (DDR SDRAM chips). Memory is increased or decreased in two-DIMM increments only.

Note: SGI Origin 3000 server series DIMMs are not compatible with the DIMMs used in Origin 200, Origin 2000, Onyx2, or Octane systems.

Two types of DIMMs that make up a bank must be the same memory size; however, each pair of DIMMs in a C-brick can be a different memory size.

The SGI Origin 3000 series servers support four types of memory kits:

- **512-MB kit with integrated directory memory.** Main memory for all server systems with less than 128 processors.
- **1-GB kit with integrated directory memory.** Main memory for all server systems with less than 128 processors.
- **1-GB kit with premium integrated directory memory.** Memory required for server systems over 128 processors; however, this memory can also be used in server systems with fewer than 128 processors. These DIMMs contain one additional memory chip to provide additional directory memory for building configurations with more than 128 processors.
- **2-GB kit with premium integrated directory memory.** Memory required for server systems with more than 128 processors, but can also be used for server systems with fewer than 128 processors.

Note: For cost reasons, if you plan to upgrade your site to more than 128 processors, use only DIMMs with premium integrated directory memory.

Table 4-1 outlines main memory sizes. This table does not cover systems that have multiple-size memory banks.

Table 4-1 Main Memory DIMM Sizes

Memory Kit	Single DIMM Size	DRAM Technology
512 MB with integrated directory memory	256 MB	128 Mbits
1 GB with integrated directory memory	512 MB	128 Mbits
1 GB with premium integrated directory memory	512 MB	128 Mbits
2 GB with premium integrated directory memory	1 GB	256 Mbits

L1 Controller

Every C-brick has an L1 system controller. The L1 controller monitors and controls the environment of the C-brick (for example, fan speed, operating temperature, voltage margins, and system LEDs). The L1 controller also reads component information from serial ID EEPROMs, provides a system console connection, and interfaces with its own 2-line x 12-character liquid crystal display (LCD) at the front of the brick.

The L1 controller in the IP35 C-brick transfers status and control information to three types of external devices: system console computer, L1 controller in another brick, and L2 controller.

The L1 controller consists of the display, logic components, and internal display cable. The logic components are located on the IP35 motherboard; the internal cable connects the display to the logic components.

For general information about the L1 controller, see Chapter 3, “System Control,” of this guide.

Communication between L1 Controllers

The C-brick L1 controller communicates with the L1 controller in an I/O-brick (X-, I-, or P-brick) through the XIO (II - I/O interface) connector on the back of the C-brick (see Figure 4-2).

In the SGI Origin 3200, which has no R-brick, the L1 controller in a C-brick can communicate with the L1 controller in another C-brick through the link (NI - Network Interface) connector.

In SGI Origin 3400 or SGI Origin 3800 servers, which have R-bricks, the C-brick L1 communicates to the R-brick through the LINK (NI) connector on the back of the C-brick. This connector, which provides USB protocol signals, connects to one of the R-brick connectors labeled R TO R or C TO R (2, 3, 4, and 5) to communicate with the USB hub residing inside the R-brick and its L1.

Communication Between L1 and L2 Controllers

How the L1 and L2 controller connect and communicate with each other is determined by which SGI Origin 3000 series server you have. The C-brick connectors located on its rear panel (see Figure 4-2) are central to making these connections.

If the SGI Origin 3200, which has no R-brick, has an L2 controller (optional with the SGI Origin 3200), the L1 controller in a C-brick can communicate with an L2 controller through the C-brick L1 port connector. This connector provides universal serial bus (USB) protocol signals to communicate with the L2 controller.

In the SGI Origin 3400 and 3800, the L1 controller in a C-brick communicates with an L2 controller that is connected to an R-brick, to which the C-brick is connected. The C-brick's L1 communicates to the R-brick through the LINK (NI) connector on the back of the C-brick. This connector, which provides USB protocol signals, connects to one of the R-brick connectors labeled R TO R or C TO R (2, 3, 4, and 5) to communicate with the USB hub residing inside the R-brick.

Connecting a System Console

For SGI Origin 3200 servers, which do not have R-bricks, and do not have an L2 controller, connect a dumb terminal, as system console, to the C-brick Console connector.

In larger system configurations such as the SGI Origin 3400 and SGI Origin 3800 servers, which have an R-brick and an L2 controller, connect the system console to the L2 controller. The individual brick L1 controllers connect to the USB hub in the R-brick, which is in turn connected to the USB connector on the L2 controller. The L2 controller enables you to monitor and manage the activities of all the L1 controllers in the rack and other rack items.

You can connect an SGIconsole to the L2 controller Ethernet port through an Ethernet hub. As an alternative, you can connect a dumb terminal to the L2 controller console port. For details about connecting a system console to an SGI Origin 3000 series server, see "Connecting a Console to Your Server System" on page 25.

Switch, Connectors, and LEDs on C-brick Rear Panel

Figure 4-2 shows the location of the power-on switch, connectors, and LEDs on the C-brick rear panel.

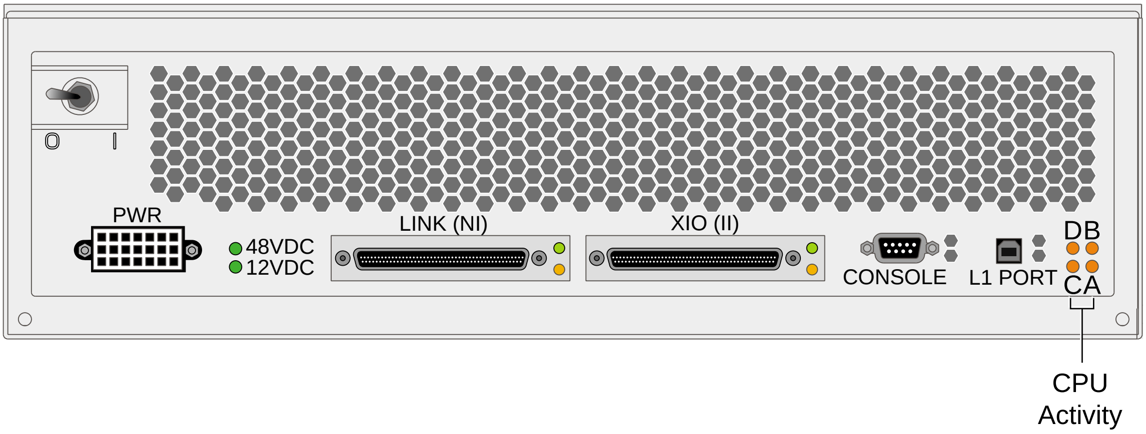

Figure 4-2 C-brick Rear View

The C-brick has the following items on the rear panel:

- **Power switch.** Move the power switch to the **1** position to power on the C-brick's L1 controller, and to the **0** position to power off the C-brick's L1 controller. Powering on the L1 controller lights the 12VDC LED green.
- **PWR (power) connector.** Connects the connector to the power bay, which gives power to the C-brick.
- **48 VDC and 12 VDC LEDs.** The power switch must be in the ON (**1**) position for these LEDs to be on. The 12 VDC lights green when the L1 controller is powered on and operating, and the 48 VDC lights green when the rest of the C-brick internal components are powered on and operating. The internal components are powered on by pressing the On/Off switch (brick reset button) located on the L1 controller panel.
- **LINK (NI - Network Interface) connector.** This connector connects the C-brick to an R-brick or to another C-brick if the system does not have an R-brick, such the SGI Origin 3200 server. This connection is made with a NUMAlink™3 cable at 1.6 GB/sec in each direction.
- **XIO (II - I/O Interface) connector.** This connector connects a C-brick to an I/O-brick (I-brick, P-brick, or X-brick); this connection occurs via a NUMAlink™3 cable at 1.2 GB/sec in each direction.
- **Console connector.** This is a DB-9 RS-232 port (console and diagnostic port) connector that connects the C-brick's L1 controller to a system console. The C-brick L1 controller communicates with a system console through the console connector, which provides a serial bus that uses standard RS-232 protocol.
- **L1 port connector.** This universal serial bus (USB) connector connects the C-brick's L1 controller to the L2 controller on the rack enclosure for systems with no router.

Table 4-2 summarizes the function of the C-brick connectors.

Table 4-2 C-brick Port Connectors and LEDs

Label on Panel	Connector	Purpose	LED
PWR		Inputs power from the power bay.	
48 VDC **12 VDC**	N/A	The 12 VDC LED lights green, indicating the L1 controller is on, when the power switch on the brick has been turned to the On (**1**) position. The 48 VDC LED lights green, indicating all other C-brick internals are on, after the switch has been turned on and the On/Off switch (brick reset button) on the L1 controller has been turned on. Alternatively, the L1 controller and the rest of the C-brick internals can be turned on and off from the system console.	2 (1 for 48 VDC and 1 for 12 VDC)
LINK (NI)	NUMAlink3	Connects the C-brick to an R-brick or to another C-brick (if the system does not have an R-brick); 1.6 GB/sec each direction.	2
XIO (II)	Crosstown2	Connects the C-brick to an I-brick, P-brick, or X-brick; 1.2 GB/sec each direction.	2
Console	DB-9	Connects the C-brick to a system console.	None
L1 Port	Series A universal serial bus (USB)	For systems with no router, this port connects directly to a USB connector on the L2 controller.	None
DB **CA**	N/A	Status of the processors in the C-brick. A C-brick can have up to four processors (two processors per PIMM).	4 (1 per processor [A, B, C, D])

The following LEDs are located on the C-brick rear panel:

- One 12 VDC LED and one 48 VDC LED.
- Two LINK (NI) NUMAlink3 connector LEDs, controlled by the L1 controller.
- Two XIO (II) Crosstown2 connector LEDs, controlled by the L1 controller.
- Four heartbeat LEDs (one for each processor; two processors per PIMM) controlled by the hub ASIC.

Table 4-3 summarizes what the rear panel LEDs indicate.

Table 4-3 C-brick Rear Panel LEDs

Label on Panel	Quantity	Purpose
12 VDC	1	LED lights green when L1 controller is on. LED not lit indicates L1 controller is off. L1 controller is turned on by turning on the power switch.
48 VDC	1	LED lights green when all C-brick internal items besides L1 controller are on. LED not lit indicates C-brick internal items, besides L1 controller, are off. Internal devices are turned on by turning on the power switch and pressing the On/Off switch (brick reset button).
LINK (NI)	2	LEDs light yellow when the connector is cabled securely to an R-brick or another C-brick. LEDs light green when connection is negotiated with the R-brick or C-brick with which the connector is cabled.
XIO (II)	2	LEDs light yellow when connector is cabled securely to an I/O device. LEDs light green when connection is negotiated with the I/O device with which the connector is cabled.
DB CA	4	Heartbeat LEDs for processors on PIMMs (one LED per processor [A, B, C, and D]; each PIMM has two processors).

I-brick

The following sections in this chapter describe the function and physical components of the I-brick, and explain how to add and replace PCI cards in the I-brick:

- "Functional Description" on page 127
- "Internal Components and Front Panel Items" on page 127
- "Switch, Connectors, Card Slots, and LEDs on I-brick Rear Panel" on page 131
- "PCI Card Installation" on page 135

Functional Description

The I-brick provides standard base I/O for all SGI Origin 3000 series servers. This brick supports five hot-pluggable PCI cards configured on two PCI buses, two sled-mounted 3.5-in. Fibre Channel disk drives, and a CD-ROM. The I-brick also provides access to a network via a 10/100-Base-T Ethernet port, and access to peripherals via various other ports.

Internal Components and Front Panel Items

The following are descriptions of the I-brick's front panel items and internal components (Figure 5-1 shows the I-brick's front panel items):

- **CD-ROM.** Loads software onto your server system.
- **L1 controller and display.** L1 controller generates I-brick status and error messages that appear on the liquid crystal display (LCD).
- **On/Off switch with LED.** Press this switch to turn on the I-brick internal components. Alternatively, you can turn on the I-brick internal components at an L2 controller touch display or a system console.

L1 controller switches and LEDs:

- **On/Off switch LED.** Lights green when the I-brick internal components are on and turns off when they are off.
- **Service required LED.** Lights orange to indicate that an item is broken or not operating properly (for example, a fan is off), but the I-brick is still operating.
- **Failure LED.** Lights red to indicate that a system failure has occurred and the I-brick system is down.

Internal Components:

- **Fibre Channel Disk Drives.** This is where the server operating system software resides.
- **I-brick Power Board.** The power board contains the logic components of the L1 controller, Dc to Dc convertors, and voltage regulator modules (VRMs).

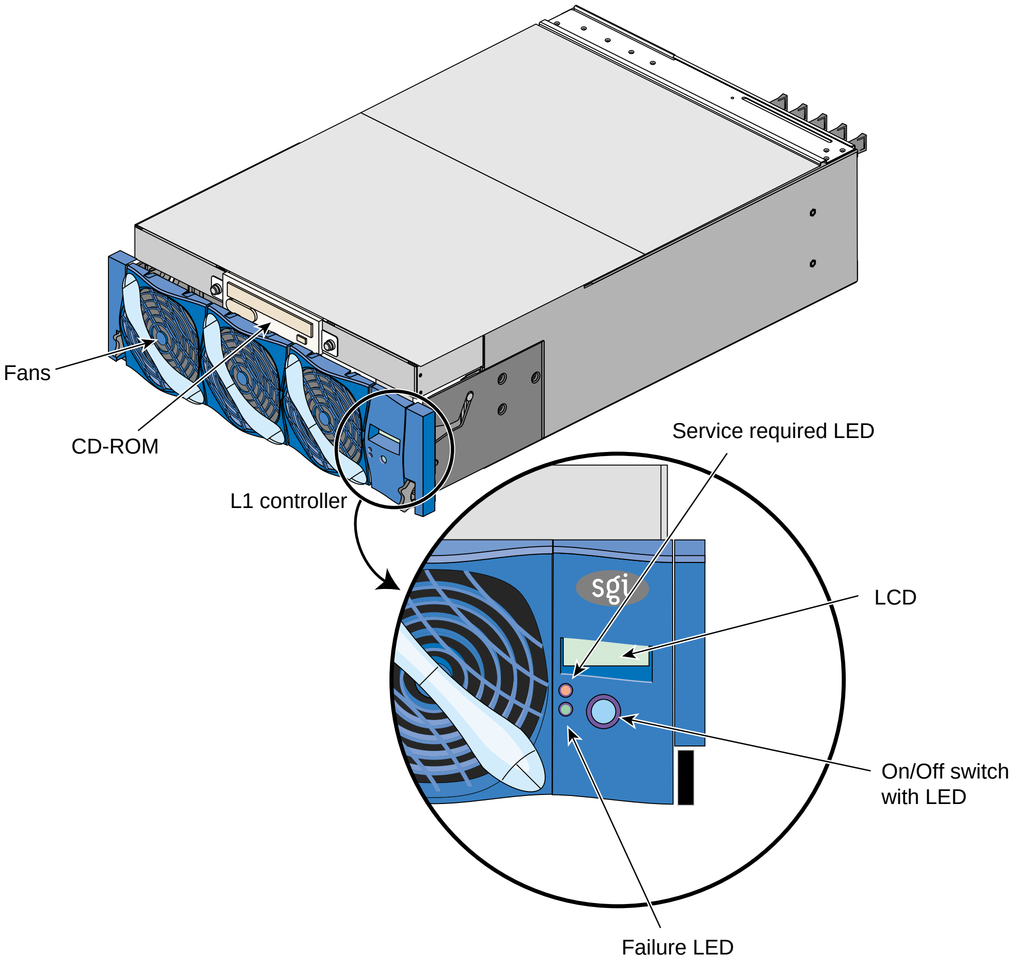

Figure 5-1 I-brick Front Panel

Fibre Channel Disk Drives

The I-brick contains one or two 3.5-in. Fibre Channel disk drives. One is standard; the second is optional. The disks connect to the Fibre Channel controller via the Input connector on the Fibre Channel bulkhead card.

The Fibre Channel disk drives are boot drives and are configured as separate drives or as mirrored images. The Fibre Channel disk drives is where your server operating system resides.

Warning: Only an SGI system support engineer (SSE) can add or replace a Fibre Channel disk drive module for you.

CD-ROM

The CD-ROM is a single removable media drive in the front of the brick (see Figure 5-1). It connects to the IEEE internal 1394 connector of the PCI motherboard.

IEEE 1394 is a high-performance serial bus protocol that provides a low-cost, high-bandwidth universal interconnect technology for digital media, storage, networking, and other applications.

I-brick Power Board

The power board contains the logic components of the L1 controller, DC to DC convertors, and voltage regulator modules (VRMs). The DC-to-DC converters and VRMs convert the 48 VDC coming from the power bay to the voltage levels required by the components of the brick.

The power board supplies an average of 17.5 W (5.3 A, 3.3 V or 3.5, 5.0 V) of power to each PCI slot; however, a PCI card may consume up to 25 W of power. The L1 controller controls how the power board applies power to the PCI cards. The power board applies power to the PCI cards starting with the lowest numbered slot. It continues to apply power to the PCI slots until all of the power has been consumed.

The I-brick L1 controller uses two presense pins in each PCI slot to total the power consumption of the PCI cards. The L1 controller prints a message to the console if there is not enough power for all of the PCI cards.

I-brick L1 Controller

The L1 controller monitors and controls the environment of the I-brick. It consists of a display, logic components, and an internal cable. The logic components are located on the I-brick power board. The cable connects the display to the logic components.

For general information about the L1 controller, see Chapter 3, "System Control."

Switch, Connectors, Card Slots, and LEDs on I-brick Rear Panel

Figure 5-2 shows the location of the 5 PCI card slots and the Fibre channel disk drives on the I-brick real panel. Figure 5-3 shows all the I-brick rear panel items in close-up detail.

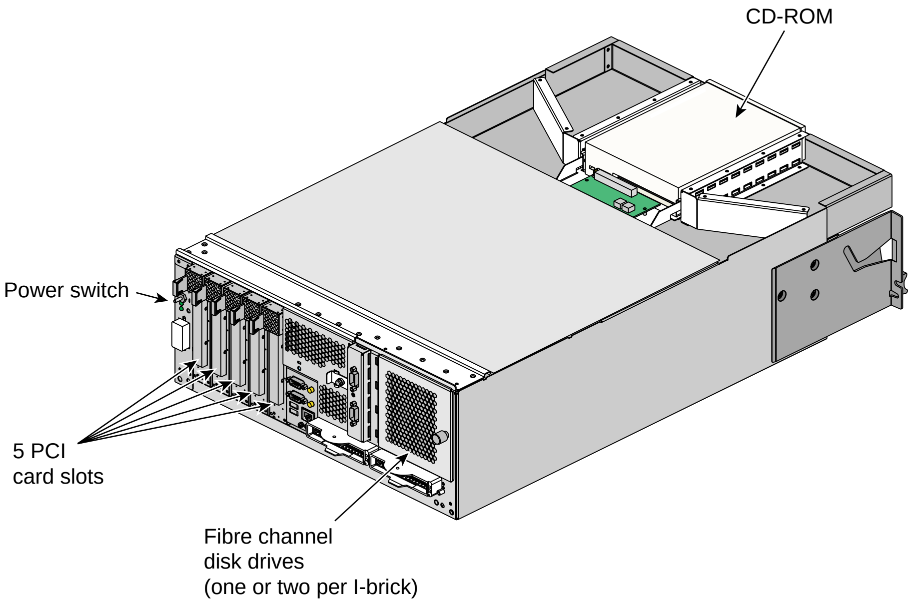

Figure 5-2 Rear View of I-brick

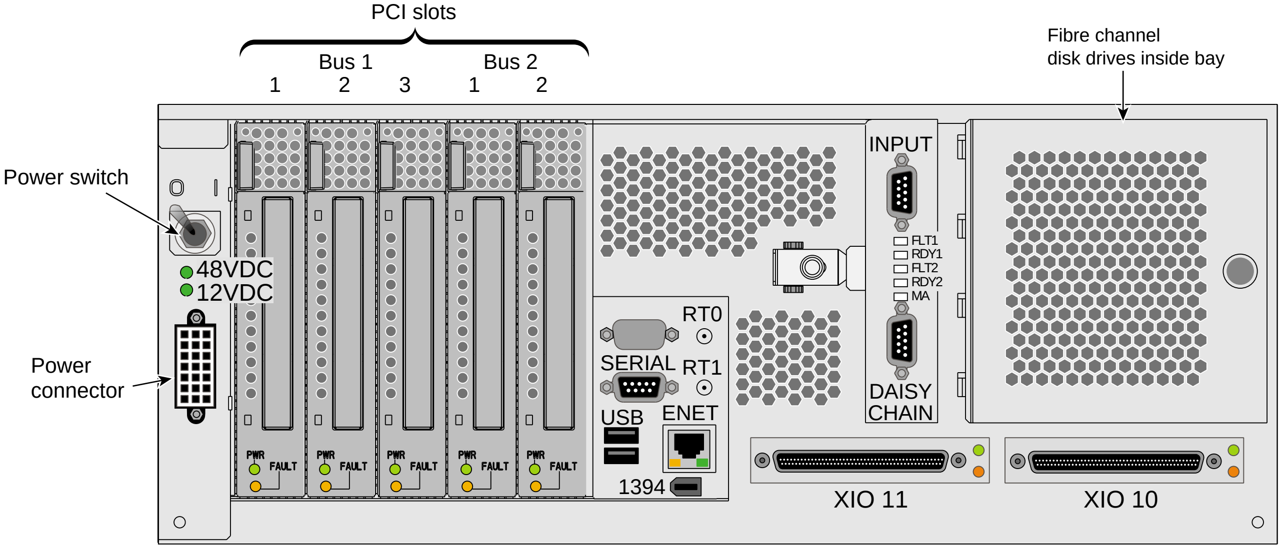

Figure 5-3 I-brick Rear Panel

The I-brick rear panel has the following items:

- **Power switch.** Moving the power switch to the **1** position powers on the I-brick L1 controller, and moving it to the **0** position powers off the I-brick L1 controller. Powering on the L1 controller lights the 12 VDC LED green.
- **48 VDC and 12 VDC LEDs.** The power switch must be in the ON (**1**) position for these LEDs to be on. The 12 VDC lights green when the L1 controller is powered on and operating, and the 48 VDC lights green when the rest of the I-brick internal components are powered on and operating. The internal components are powered on by pressing the On/Off switch located on the L1 controller front panel.
- **PWR (power) connector.** Connects to the power bay to give power to the I-brick.
- **Five PCI slots.** Used to install and replace PCI cards onto your server system (normally, one of the five slots is reserved for a system PCI card to support the system disk drives). See “PCI Card Installation” on page 135:
  - **Bus 1 slot (slots 1, 2, and 3).** To install 33-MHz PCI cards.
  - **Bus 2 Slot (slots 1 and 2).** To install 33-MHz or 66-MHz PCI cards.

Note: A 66-MHz card will operate at 33 MHz if installed in one of the bus 1 slots, or if installed in a bus 2 slot that includes a 33-MHz card installed in one of the other bus 2 slots.

  - **PWR (power) and fault LEDs.** The power LED lights green when the PCI card is installed correctly and is getting power; the fault LED lights yellow when a fault occurs with the PCI card.
- **Serial connectors.** Can be used as a COM port to connect modems or other serial devices.
- **Universal serial bus (USB) connectors (2).** Can be used to connect auxiliary equipment such as a printer, a scanner, a keyboard, or a mouse.
- **RT0 and RT1.** Real-time interrupts used by the graphics cards to keep the graphics synchronized and in time with each other.
- **Enet connector (Ethernet).** Connects the server system to an Ethernet network.
- **IEEE 1394 connector.** Provides a serial bus protocol connection for digital media, storage, networking, and other applications.
- **XIO 11 and XIO 10 connectors.** Each of these connectors can connect the I-brick to a C-brick. As an option, the second connector can be connected to another C-brick to create a dual-ported I-brick, which would provide greater bandwidth.
  - **XIO 11 and XIO 10 connector LEDs.** Light yellow when the connector is cabled securely to the C-brick device, and light green when the connection is negotiated with the C-brick device with which the connector is cabled.
- **Fibre channel bulkhead card.**
  - **Input connector.** Connects to the connector on a Fibre Channel card installed in one of the 33-MHz PCI card slots available in the I-brick. This connection interconnects the Fibre Channel disk drive(s) (where the server system's operating system resides) in the I-brick with the PCI card slot bus. This connection enables powering on of the operating system by the C-brick via its connection to one of the I-brick's XIO connectors.
  - **Flt1 LED.** Lights yellow if the Fibre Channel disk drive in bay 1 discovers a fault. The disk drive goes off-line if it detects a fault.
  - **RDY1 LED.** Lights red when the Fibre Channel disk drive in bay 1 is active and spun up.

- **FLT2 LED.** Lights yellow if the Fibre Channel disk drive in bay 2 discovers a fault. The disk drive goes off-line if it detects a fault.
- **RDY2 LED.** Lights red when the Fibre Channel disk drive in bay 2 is active and spun up.
- **MIA LED.** The media interface adapter (MIA) is a copper to optical converter that allows the Fibre Channel loop to be extended up to 2 km. The MIA LED lights if the MIA discovers a fault condition.
- **Daisy chain connector.** Used to add more Fibre Channel disks to the same Fibre Channel loop as the two internal disk drives connected to the Fibre Channel bulkhead card input connector.

Table 5-1 summarizes the ports on the I-brick rear panel.

Table 5-1 I-brick Connector Ports

Quantity	Port	Connector Label	Purpose
1	Power connector	PWR	Connects to the power bay to give power to the I-brick.
1	Serial: RS-232 or RS-422	Serial	Can be used as a COM port to connect modems or other serial devices.
2	Universal serial bus	USB	Can be used to connect auxiliary equipment such as a printer, a scanner, a keyboard, or a mouse.
1 each	RT0 and RT1	RT0 and RT1	Real-time interrupts used by the graphics cards to keep the graphics synchronized and in time with each other.
1	10/100-Base-T Ethernet, RJ45	Enet	Autonegotiating Ethernet port enables the connection of the server to an Ethernet network.
1 each	IEEE 1394 internal and external	1394	Provides a serial bus protocol connection for digital media, storage, networking, and other applications.

Table 5-1 (continued) I-brick Connector Ports

Quantity	Port	Connector Label	Purpose
2	Crosstown2	XIO 10 and XIO 11	Connects the I-brick to a C-brick. 1.2 GB/sec each direction. Crosstown2 ports support two speeds, 800 MB/sec and 1200 MB/sec, which can be selected with software.
2	Fibre Channel Bulkhead Card	Input and Daisy chain	Input connector connects to the connector on a Fibre Channel card installed in one of the 33-MHz PCI card slots available in the I-brick. This connection interconnects the Fibre Channel disk drive(s) (where the server system operating system resides) in the I-brick with the PCI card slot bus. This connection enables the operating system to be loaded by the C-brick via its connection to one of the I-brick XIO connectors. Daisy chain connector is used to add more Fibre Channel disks to the same Fibre Channel loop as the two internal disk drives connected to the system disk Input connector.

PCI Card Installation

The five hot-pluggable PCI slots support full-length 3.3-V PCI cards with 64-bit data and addressing. The five PCI slots are configured on two buses: bus 1 supports three PCI slots at 33 MHz and bus 2 supports two PCI slots at 66 MHz. Separate buses enable the system to run 66-MHz devices in the same brick as 33-MHz devices. If a PCI bus contains a 33-MHz card and a 66-MHz card, both slots of that bus run at 33 MHz. The PCI bus supports 32-bit and 64-bit PCI cards on the same bus.

You can use various types of PCI cards in the I-brick; for a list of SGI PCI cards, see Table 6-1 on page 143 in Chapter 6.

When the I-brick is shipped, any SGI PCI cards that were ordered are installed. The system Fibre Channel controller bulkhead card is standard. Unoccupied PCI slots are populated with empty PCI carriers; these must be present to maintain an even airflow through the PCI slots and to protect against electromagnetic interference (EMI).

Figure 5-4 shows PCI slot numbering in the I-brick.

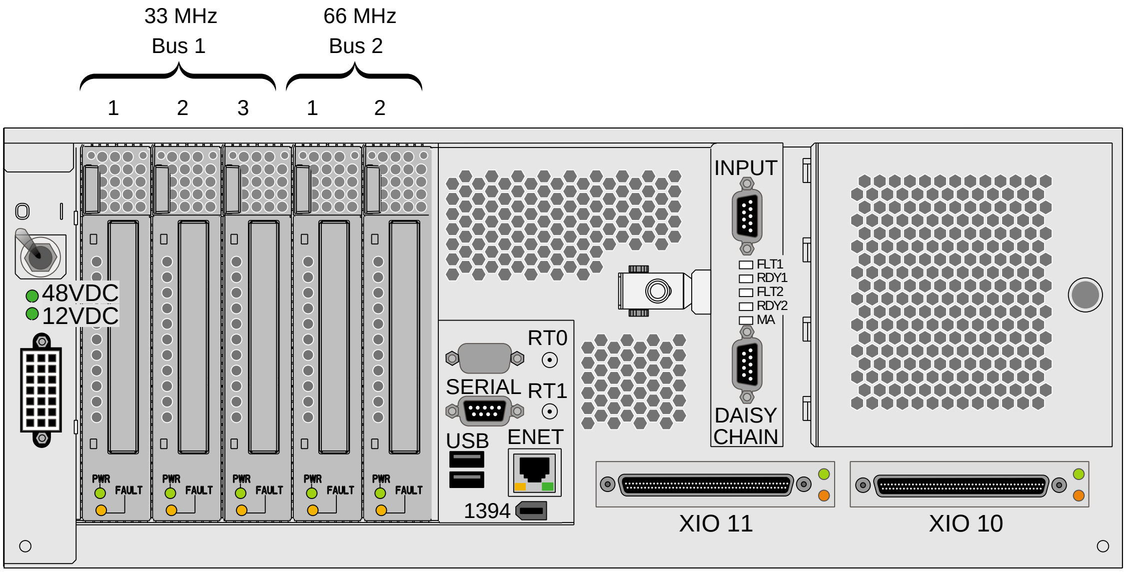

Figure 5-4 I-brick PCI Card Slot Numbering

PCI cards are hot-pluggable. This means that although you do not need to power off the I-brick to install the card, you must power off the PCI card (the slot) in which you are to replace or add a PCI card. For installation instructions, see "PCI Card Description and Installation" on page 142 in Chapter 6. An SGI SSE can also replace these items for you.

P-brick

The following sections in this chapter describe the function and physical components of the P-brick, and explain how to add and replace PCI cards in the P-brick:

- "Functional Description" on page 137
- "Internal Components and Front Panel Items" on page 137
- "Switch, Connectors, Card Slots, and LEDs on Rear Panel" on page 140
- "PCI Card Description and Installation" on page 142

Functional Description

The P-brick is a 4U I/O expansion subsystem that supports a maximum of 12 3.3-volt or universal hot-pluggable PCI cards.

Internal Components and Front Panel Items

The following are the P-brick's internal components and front panel items (Figure 6-1 shows the items located on the P-brick front panel):

Internal components:

- **Power board.** Provides the power to the P-brick.
- **PCI motherboard.** Houses the components and slots (and carriers) in which you can install PCI cards.

Front panel items:

- **L1 controller and display.** L1 controller generates P-brick status and error messages that appear on the liquid crystal display (LCD).
- **On/Off switch with LED.** Press this button to turn on the P-brick internal components. Alternatively, you can turn on the P-brick internal components at an L2 controller display or at a system console.
- **L1 controller switches and LEDs:**
  - **On/Off switch LED.** Lights green when the P-brick internal components are on and turns off when they are off.
  - **Service required LED.** Lights orange to indicate that an item is broken or not operating properly (for example, a fan is off), but the P-brick is still operating.
  - **Failure LED.** Lights red to indicate that a system failure has occurred and the P-brick system is down.
- **Fans.**

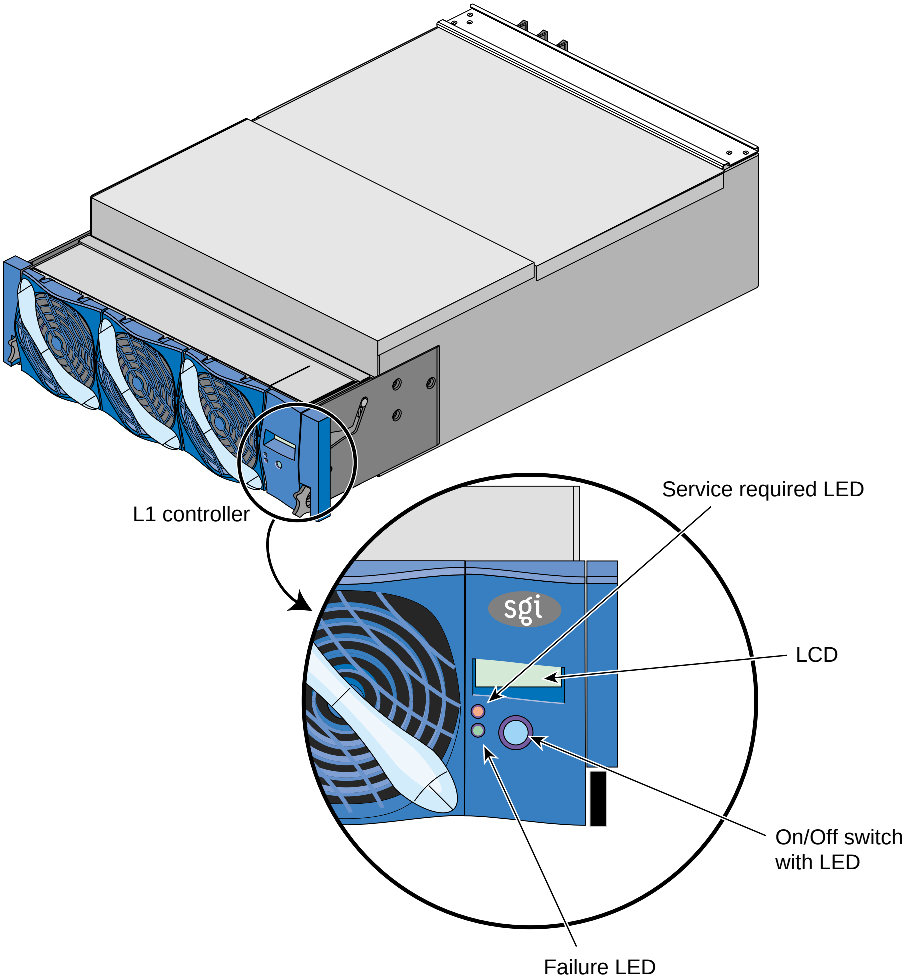

Figure 6-1 P-brick Front View

P-brick Power Board

The power board contains the logic components of the L1 controller, voltage regulator modules (VRMs), and a DC-to-DC converter. The VRMs and the DC-to-DC converter, convert the incoming 48 VDC to voltage levels required by the components within the brick. See Appendix A, “Technical Specifications” for more details.

PCI Motherboard

The P-brick’s 12 PCI slots are on the PCI motherboard. Three Xbridge ASICs interface between two Crosstown2 ports and the PCI cards. Each Crosstown2 port transmits 1.2 GB/sec each direction and can connect to a Crosstown2 port on a C-brick. The PCI motherboard also contains a serial ID EEPROM that contains component information.

P-brick L1 Controller

The L1 controller monitors and controls the environment of the P-brick. It consists of a display, logic components, and an internal cable. The display is located on the front of the P-brick. The P-brick’s L1 controller logic components are on the power board. The internal cable connects the display to the logic components.

For general information about the L1 controller, see Chapter 3, “System Control” of this guide.

Switch, Connectors, Card Slots, and LEDs on Rear Panel

Figure 6-2 shows the location of the power-on switch, PCI card slots, connectors, and LEDs on the P-brick rear panel.

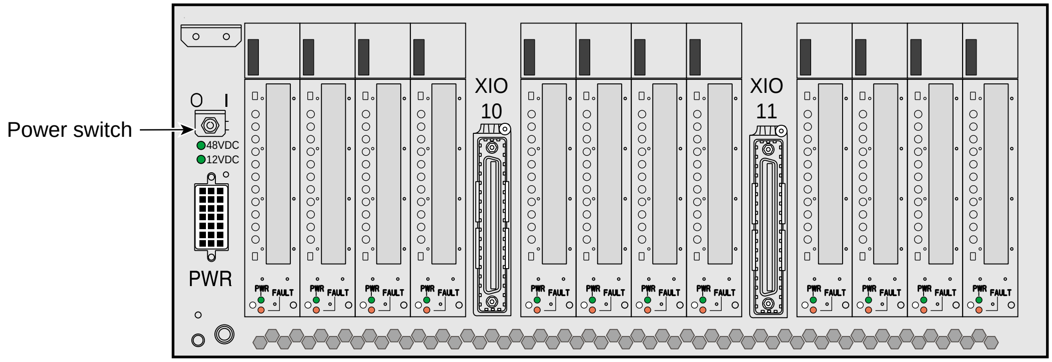

Figure 6-2 P-brick Rear Panel

The P-brick rear panel has the following items:

- **Power switch.** Moving the power switch to the **1** position powers on the P-brick's L1 controller, and moving it to the **0** position powers off the P-brick's L1 controller. Powering on the L1 controller lights the 12 VDC LED green.
- **48 VDC and 12 VDC LEDs.** The power switch must be in the ON (**1**) position for these LEDs to be on. The 12 VDC lights green when the L1 controller is powered on and operating, and the 48 VDC lights green when the rest of the I-brick internal components are powered on and operating. To power on the internal components, press the On/Off switch located on the L1 controller's front panel.
- **PWR (power) connector.** Connects to the power bay to give power to the P-brick.
- **PCI slots.** Use these slots to install and replace PCI cards onto your server system. See "PCI Card Description and Installation" on page 142. The PCI card slots are numbered bus 1 through bus 6. Each bus has two slots, labeled 1 and 2, as shown in Figure 6-3. All slots can accommodate 66 MHz or 33 MHz PCI cards. If a PCI bus contains both a 33-MHz card and a 66-MHz card, however, both slots of that bus run at 33 MHz.
  - **PWR (power) LED.** Lights green when the PCI card carrier is installed securely and is getting power.
  - **Fault LED.** Lights orange when a fault occurs with the PCI card.

- **XIO 10 and XIO 11 connectors.** These connectors connect the P-brick to a C-brick. As an option, the second connector can be connected to another C-brick to create a dual-ported P-brick, which would provide greater bandwidth.
  - **XIO 10 and XIO 11 connector LEDs.** Light yellow when the connector is cabled securely to the C-brick device. Light green when the connection is negotiated with the device with which the connector is cabled.

PCI Card Description and Installation

The PCI card slots on the motherboard are numbered bus 1 through bus 6. Each bus has two slots, labeled 1 and 2, as shown in Figure 6-3.

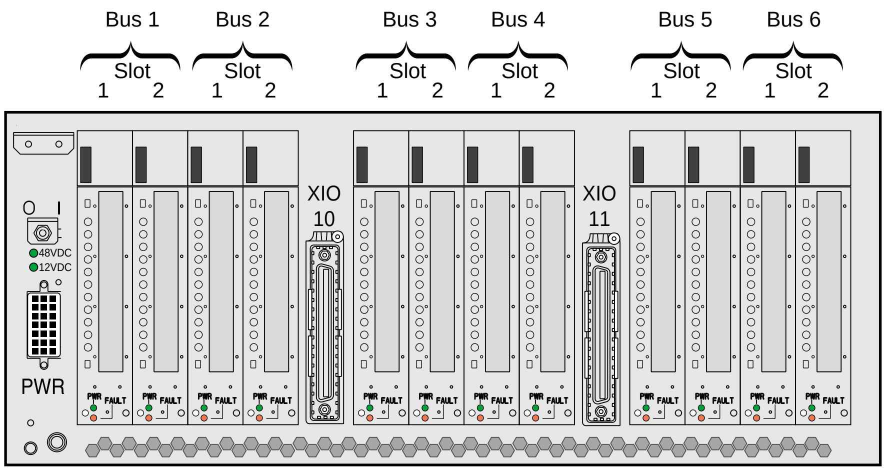

Figure 6-3 P-brick PCI Card Slot Numbering

Each bus has two slots that operate with 66-MHz or 33-MHz cards. If a PCI bus contains both a 33-MHz card and a 66-MHz card, both slots of that bus run at 33 MHz. The PCI bus supports 32-bit and 64-bit PCI cards at the same time. Separate buses enable the P-brick to run 66-MHz devices in the same brick as 33-MHz devices.

For maximum bandwidth, PCI cards are distributed across all six PCI buses when they are integrated at the factory.

Supported PCI Cards

The SGI Origin 3000 server systems support various PCI cards that can be purchased from SGI or from other manufacturer. Each PCI card is mounted in a carrier so that you can slide the PCI cards into and out of the brick. The PCI cards connect to the PCI motherboard when the PCI carrier is fully inserted into the brick.

Table 6-1 lists currently supported PCI cards from SGI.

Table 6-1 PCI Cards

Marketing Code	Description
PCI-SER-10002	Serial card
PCI-SCSI-DF-2P	Ultra SCSI high-voltage differential 2-port
PCI-SCSI-U3-2P	Ultra3 SCSI low-voltage differential 2-port (3.3 V)
PCI-FC-1POPT-A	Fibre channel with fiber optic cable, 66 MHz
PCI-FC-1PCOP-A	Fibre channel with copper cable, 66 MHz
PCI-ATMOC3-1P	ATM OC3
PCI-ATMOC12-1P	ATM OC12
PCI-GIGENET-C	Gigabit Ethernet (copper)
PCI-GIGENET-OR	Gigabit Ethernet (optical)
PCI-AUD-D1000	Digital audio

PCI Carrier

The PCI carrier is designed to support most PCI cards. The carrier can be adjusted to accommodate different size PCI cards. (A description on how to make these adjustments is described within the installation procedure.)

When the P-brick is shipped, any PCI cards that were ordered are installed with carriers, and any unoccupied PCI slots are populated with empty PCI carriers. PCI carriers must be present in nonpopulated PCI slots to maintain an even airflow through the PCI slots and to protect against electromagnetic interference (EMI).

PCI Card Installation

The PCI card is hot-pluggable, which means that although you need not power off the rack or the P-brick to add or replace a PCI card, you do need to power off the individual PCI card (the slot) in which you will replace a PCI card. The PCI card is powered off and powered on with the `pci` L1 controller command. For details, see "pci" on page 255.

Warning: Before installing, operating, or servicing any part of this product, please read the "Safety Instructions" on page 300.

Caution: It is recommended that you use a grounding wrist strap while installing a PCI card.

To add or replace a PCI card for the system, follow these steps:

1. Using the `pci` L1 controller command, power off the PCI card (the slot) in which you will replace the PCI card.
2. Pull the handle on the empty PCI carrier straight out to extract it from a PCI slot, as shown in Figure 6-4.

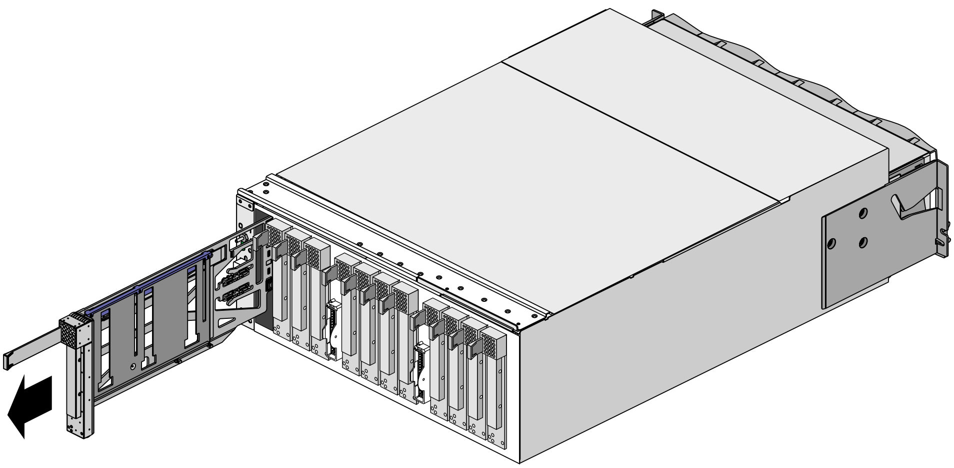

Figure 6-4 Removing a PCI Card Carrier

3. If you are replacing a card, gently pull the existing PCI card from the carrier. If adding a PCI card, extract the PCI carrier's metal filler, by pushing down on it as shown in Figure 6-5. This filler covers the area where your PCI card's connectors will protrude out to the rear panel of the P-brick.

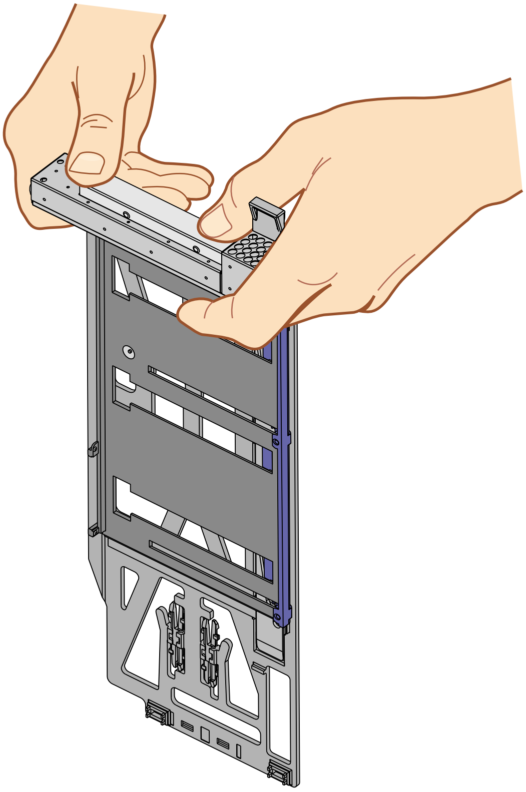

Figure 6-5 Extracting PCI Carrier's Metal Filler

4. If the PCI card you want to install does not fit the carrier, using a Phillips screwdriver, loosen the three screws and adjust the carrier guide bar up or down as needed (see Figure 6-6).

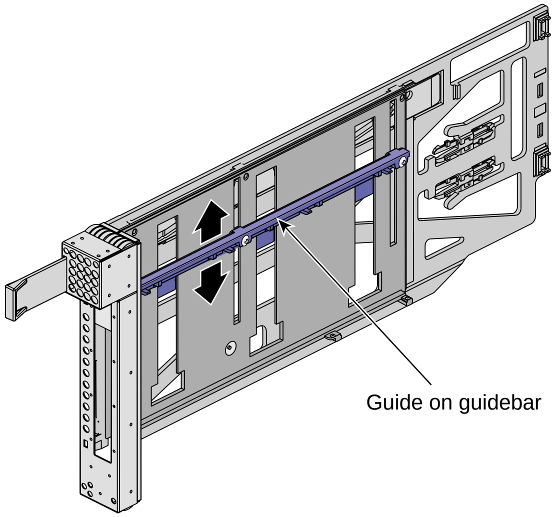

Figure 6-6 Adjusting the Carrier Guides

5. Mount your new or replacement PCI card into the carrier using the guides on the guide bar, as shown in Figure 6-7.

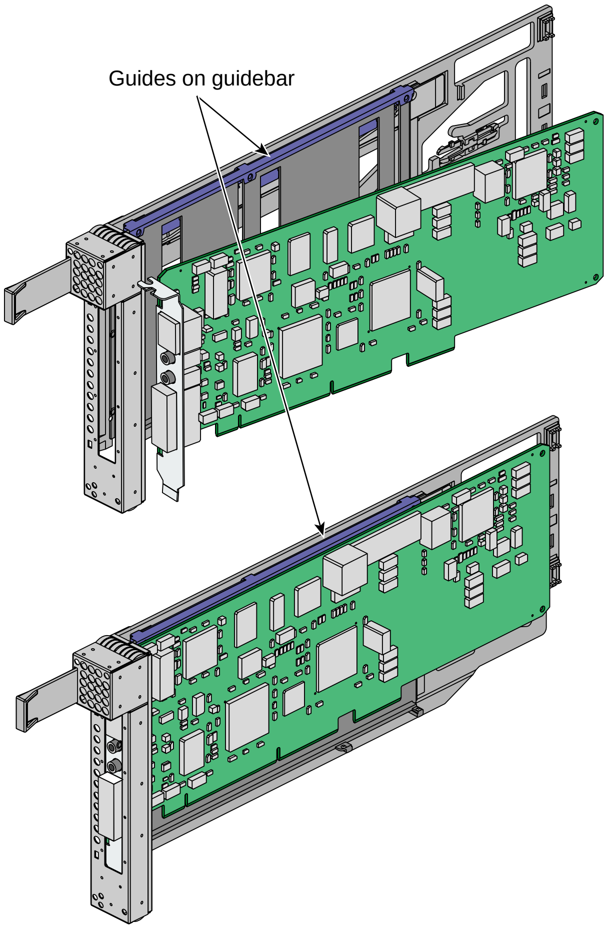

Figure 6-7 Mounting PCI Card Into Carrier

6. Insert the PCI carrier carrying the PCI card horizontally into the vacant slot, using the slot guides, as shown in Figure 6-8.

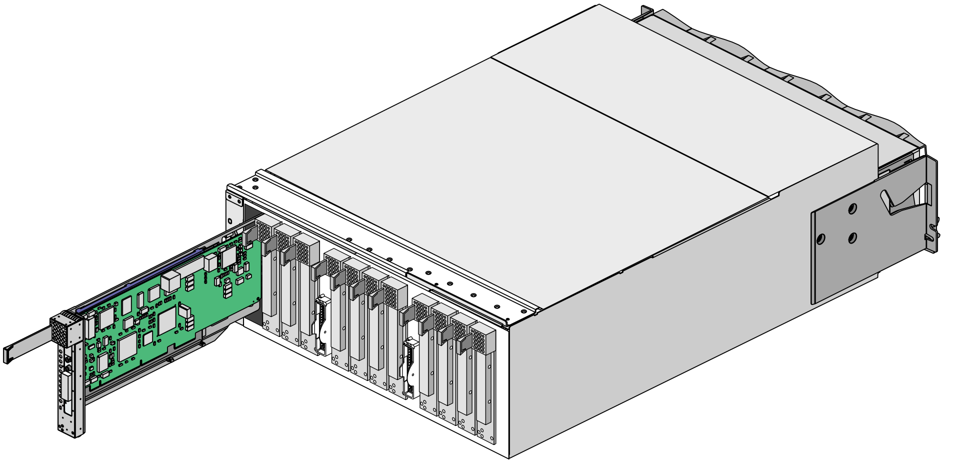

Figure 6-8 Installing a PCI Card in a PCI Slot

7. Pushing horizontally on the PCI carrier's seating bar, as shown in Figure 6-9, seats the PCI card securely in the slot. After the card is installed, you will need to power on the PCI card (slot) using the `pci` L1 controller command.

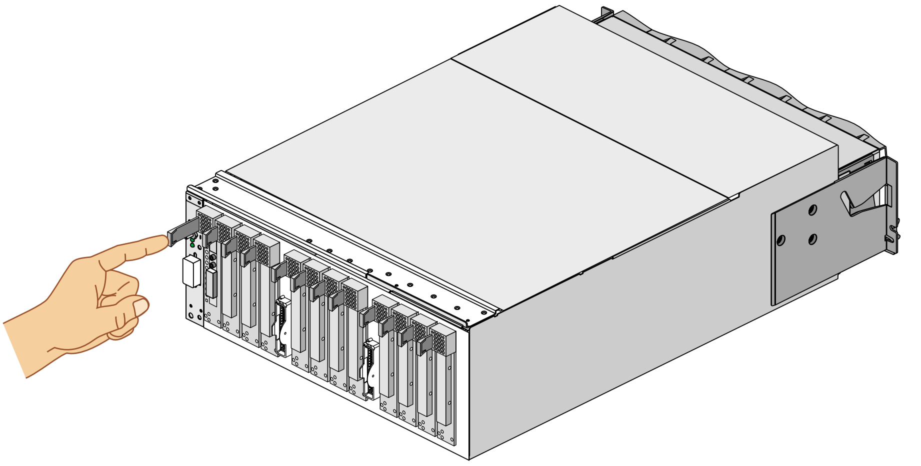

Figure 6-9 Seating the PCI Card in the Slot

X-brick

The following sections in this chapter describe the function and physical components of the X-brick:

- "Functional Description" on page 149
- "Internal Components and Front Panel Items" on page 149
- "Switch, Connectors, Card Slots, and LEDs on Rear Panel" on page 152
- "XIO Cards" on page 154

Functional Description

The X-brick is an I/O expansion brick that provides an XIO interface for the SGI Origin 3000 series servers. Four XIO slots are available and will support a variety of XIO adapter cards. Please see Table 7-1 on page 154 for a complete list of the XIO cards that are supported in the X-brick.

This XIO expansion brick is 4U high and can be installed in the I/O rack of the SGI Origin 3800 server, or combined within the first rack on the SGI Origin 3400 server if space is available. The X-brick can also be installed in an SGI Origin 3200 server.

Internal Components and Front Panel Items

The following are the X-brick's internal components and front panel items (Figure 7-1 shows the items located on the X-brick front panel):

Internal components:

- **Power board.** Provides power to the X-brick.
- **Midplane PCA.** The X-brick midplane contains an Xbridge ASIC that is the interface between the X-brick's two Crosstown2 ports and the XIO cards (see Figure 7-2). The midplane also has receptacles for the compression connectors of the XIO cards.

Front panel items:

- **L1 controller and display.** L1 controller generates X-brick status and error messages that appear on the liquid crystal display (LCD).
- **On/Off switch with LED.** Press this button to turn on the X-brick internal components. Alternatively, you can turn on the X-brick internal components at a system console.
- **L1 controller switches and LEDs:**
  - **On/Off switch LED.** Lights green when the X-brick internal components are on and turns off when they are off.
  - **Service required LED.** Lights orange to indicate that an item is broken or not operating properly (for example, a fan is off), but the X-brick is still operating.
  - **Failure LED.** Lights red to indicate that a system failure has occurred and the X-brick system is down.
- **Fans.**

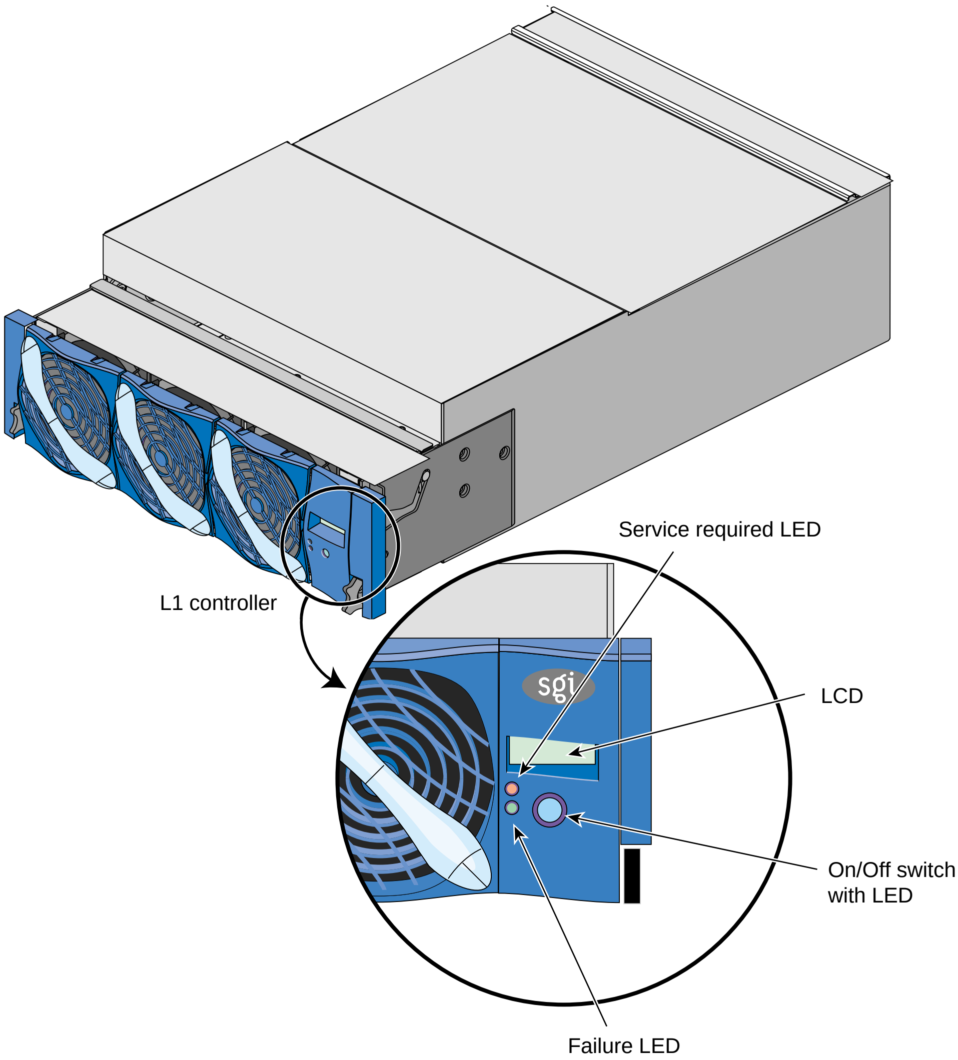

Figure 7-1 X-brick Front View

X-brick Midplane

The X-brick midplane contains an Xbridge ASIC that is the interface between the X-brick's two Crosstown2 ports and the slots for the XIO cards, as shown in Figure 7-2. The midplane also has receptacles for the compression connectors of the XIO cards.

Figure 7-2 is a block diagram of the X-brick.

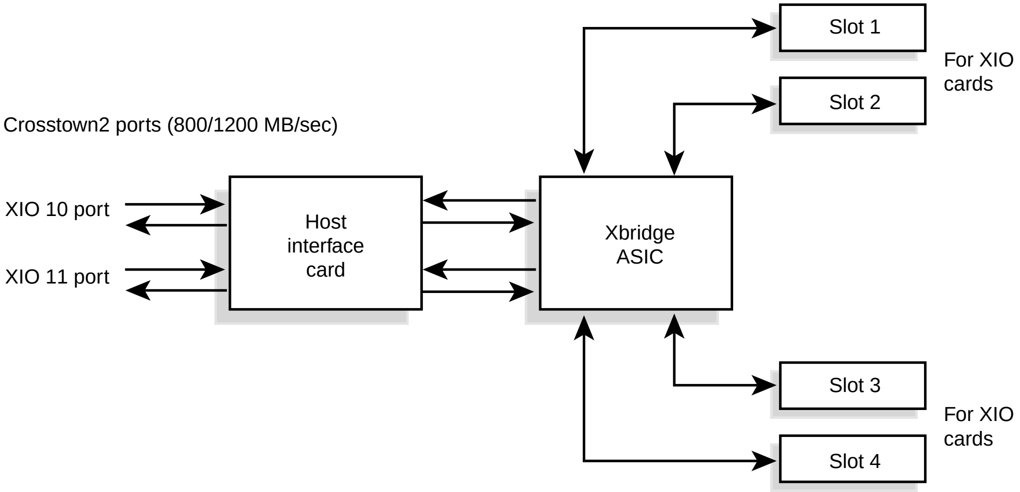

Figure 7-2 X-brick Block Diagram

X-brick L1 Controller

The L1 controller monitors and controls the environment of the X-brick. It consists of a display, logic components, and a cable. The display is located at the front of the brick. The logic components are located on the power board; an internal cable connects the display to the logic components.

For general information about the L1 controller, see Chapter 3, "System Control."

Switch, Connectors, Card Slots, and LEDs on Rear Panel

Figure 7-3 shows the location of the power-on switch, XIO card slots, connectors, and LEDs on the X-brick rear panel.

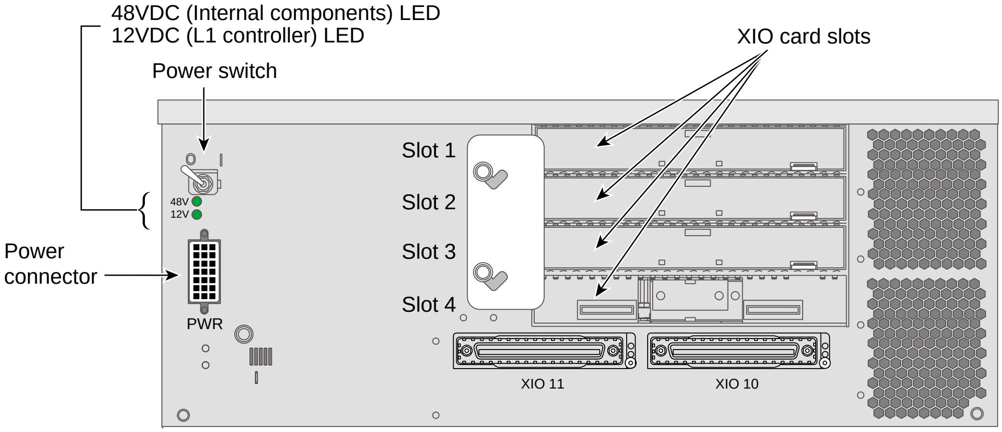

Figure 7-3 X-brick Rear Panel

The X-brick rear panel has the following items:

- **Power switch (O 1).** Moving the power switch to the **1** position powers on the X-brick's L1 controller, and moving it to the **0** position powers off the X-brick's L1 controller. Powering on the L1 controller lights the 12 VDC LED green.
- **48 VDC and 12 VDC LEDs.** The power switch must be in the ON (**1**) position for these LEDs to be on. The 12 VDC lights green when the L1 controller is powered on and operating, and the 48 VDC lights green when the rest of the X-brick internal components are powered on and operating. The internal components are powered on by pressing the On/Off switch located on the L1 controller front panel.
- **PWR (power) connector.** Connects to the power bay to give power to the X-brick.
- **Slot 1, Slot 2, Slot 3, and Slot 4 XIO card slots.** Used to install and replace XIO cards onto your server system.

Warning: To avoid personal injury or damage to your system, only qualified SGI system support engineers (SSEs) can install and replace XIO cards.

- **XIO 11 and XIO 10 connectors.** These connectors connect the X-brick to a C-brick. Only one connector is required to connect to a single C-brick. As an option, the second connector can be connected to another C-brick to create a dual-ported X-brick, which would provide greater bandwidth.

- **XIO 11 and XIO 10 connector LEDs.** LEDs light yellow when the connector is cabled securely to the C-brick device, and light green when the connection is negotiated with the device with which the connector is cabled.

XIO Cards

The XIO cards insert horizontally into slots of the X-brick and connect to the X-brick's midplane. The XIO card slots are labeled Slots 1, 2, 3, and 4. Each slot can support one card with maximum power levels of 50 W.

Warning: Only qualified SGI system support engineers (SSEs) can install and replace XIO cards.

Table 7-1 shows the SGI XIO cards supported in the X-brick. (Although other XIO cards are available from SGI and are supported in other systems, they are not supported in the X-brick.)

Table 7-1 XIO Cards

Marketing Code	Description
XT-HIPPI-800-SER	Single-port serial HIPPI
XT-FDDI-D	Dual-attach FDDI
XT-GSN-C-1XIO	Single-port GSN, copper interface
XT-GSN-C-2XIO	Dual-port GSN, copper interface
XT-DIVO	Digital video
XT-DIVO-DVC	Digital video with DVCPRO support
XT-HD	High-definition video
XT-VME-6U	Adapter for 6U VME card
XT-VME-9U	Adapter for 9U VME card

D-brick

The following sections in this chapter describe the function and physical components of the D-brick. These sections also explain how to operate, how to add and replace disk drive modules, and how to troubleshoot the D-brick:

D-brick Functional Description

The D-brick is a module used to add JBOD (just a bunch of disks) storage to SGI Origin 3000 series of servers. It supports a maximum of 12 disk drives. (A minimum of 2 disk drives in specified slot locations described later in this chapter are required for D-brick management.) The D-brick provides the “hot-plugging” feature that enables you to add, replace, or take out disk drive modules from the D-brick without powering off the brick.

Note: The D-brick is added only as JBOD, but if you require RAID storage, ask your SGI sales representative about SGI’s RAID storage products, such as the TP 9100 and TP9400, to meet your needs.

Besides the disk drives, the D-brick includes the following modules and functionality:

- **Two power supply/cooling modules.** To provide power and cooling for the D-brick. Using a Y cable, these two power supplies bypass the power bay, which provides only 12 VDC and 48 VDC, and connect directly to a single PDS outlet connector to get the 220 VAC it needs.
- **Enclosure system interface/operator panel (ESI/ops).** To operate, monitor, and troubleshoot the D-brick.
- **Two FC-AL loop resiliency circuit (LRC) I/O modules.** Each module provides input and output connectors to all 12 disk drives. The modules provide connection to your system console or to another D-brick to daisy chain two or more D-bricks together.

Disk Drive Modules, and the Front Panel and Chassis

Figure 8-1 shows a front view of the D-brick, with the full complement of 12 disk drive modules. You can have a minimum of 2 to a maximum of 12 disk drives. The left lowermost and right lowermost drive bays must have a disk drive module to enable management of the D-brick. See “Required Drives” on page 159 and “Operating Panel, Modules, Connectors, and LEDs on D-brick Rear Panel” on page 160 for detailed information about the required disk drive modules and their locations.

The D-brick uses disk technology that allows you to replace a disk while the system continues to run. This “hot-plugging” must be done under controlled circumstances; see “Adding and Removing Disk Drive Modules” on page 173 for more information.

The disk drives are also dual-ported and can be configured on two separate loops to increase availability, in case one loop becomes disabled.

Disk-drive fillers are provided for all unused disk drive bays and are required to maintain a balanced airflow in the D-brick.

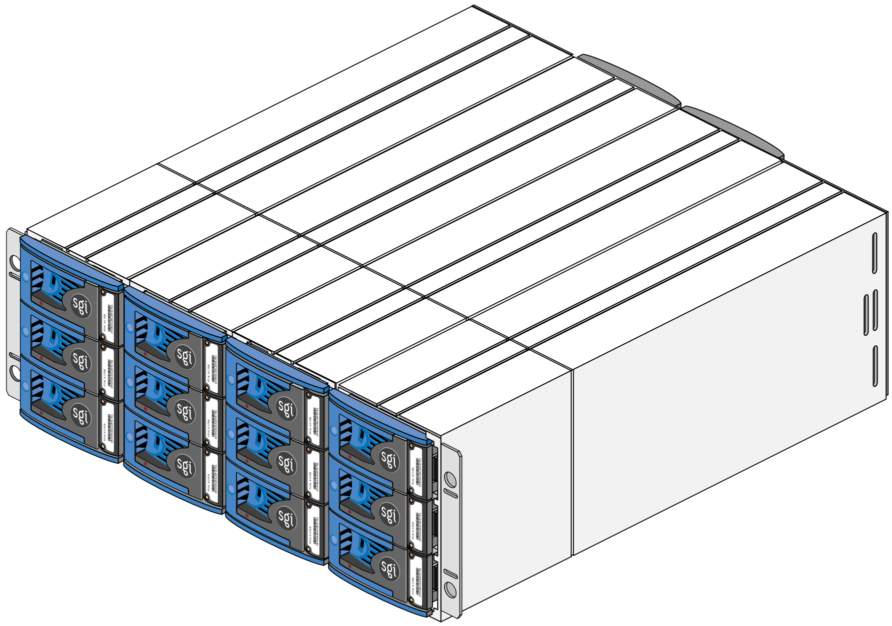

Figure 8-1 D-brick Front View

Figure 8-2 shows a close-up picture of the disk drive module, which consists of a hard disk mounted in an aluminum carrier. Each drive bay in the front of the D-brick houses a single 1.6-in. high (4.064 cm), 3.5-in. (8.89 cm) disk drive in its wrapper, or a 1-in. (2.54 cm) high drive, which has a foam filler.

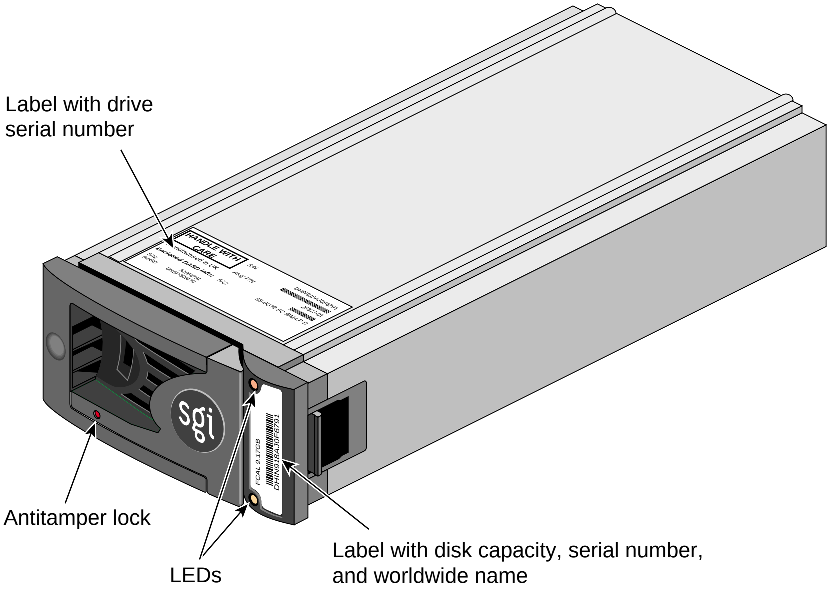

Figure 8-2 Disk Drive Module

The following items are found on the disk drive module:

- **Labels.** The label on the front of the drive has the drive capacity (for example, **FCAL 9.17GB**), the serial number, and worldwide name. The serial number of the drive is also on a label on the top of the carrier.
- **LEDs.** Each drive carrier has two LEDs, an upper (green) and lower (amber). In normal operation, the green LED is on and flickers as the drive operates. The amber LED illuminates when the drive is faulty.
- **Antitamper lock.** The drive carrier has an antitamper lock that disables the normal latch action of the handle for security purposes. A key to lock the disk drive is provided with each D-brick. A red indicator is visible in the center rectangular aperture in the handle if the antitamper lock is locked, and a black indicator is visible when the lock in unlocked.

Disk Drive Carrier

The extruded aluminum carrier (canister) provides thermal conduction, radio frequency and electromagnetic induction protection, and maximum physical protection of the drive.

The drive module cap has an ergonomic handle that provides the following functions:

- Camming of the carrier into and out of the drive bays
- Positive spring loading of the drive/backplane connector

Disk Drive Antitamper Lock

The drive carrier has an antitamper lock that disables the normal latch action of the handle; it is fitted in the drive carrier handle, as shown in Figure 8-2. The lock is set through the hole in the lower part of the handle trim. An indicator shows the setting:

- When the drive is locked, a red indicator is visible in the center rectangular aperture in the handle.
- When the drive is unlocked, a black indicator is visible.

The antitamper lock setting is changed with a key through the small round cutout in the lower part of the handle trim piece. (A key is included with each D-brick.) Changing the setting is explained in “Adding a Disk Drive Module” on page 173 and in “Adding and Removing Disk Drive Modules” on page 173.

Required Drives

Figure 8-3 shows the location of the drives required by the ESI/ops panel, namely drive bays 1/3 and 4/3. “Operating Panel, Modules, Connectors, and LEDs on D-brick Rear Panel” on page 160 has full details about bay numbering.

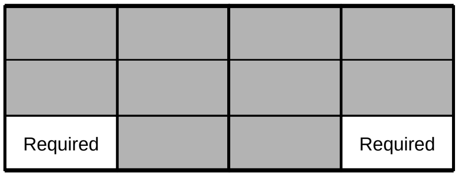

Figure 8-3 Required Disk Drive Module Locations

Operating Panel, Modules, Connectors, and LEDs on D-brick Rear Panel

Figure 8-4 shows the location of the power-on switch, connectors, and LEDs on the D-brick rear panel.

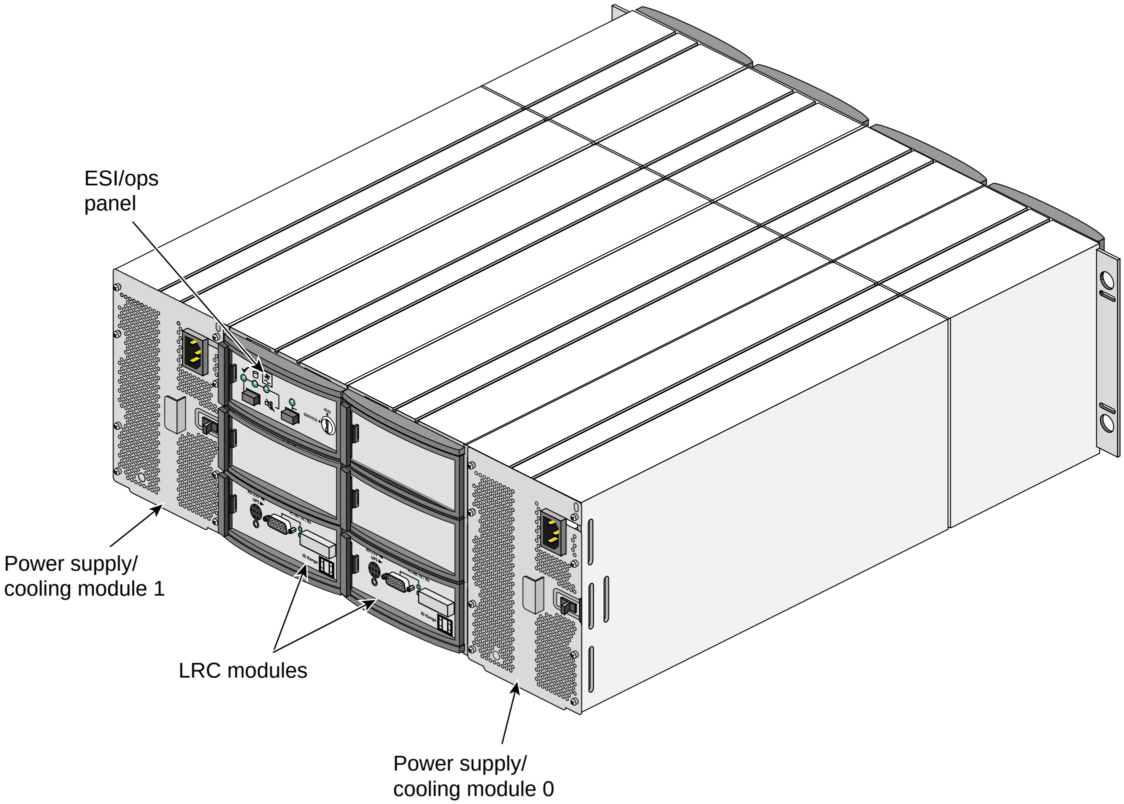

Figure 8-4 D-brick Rear View

The D-brick is shipped with the following component modules, shown in Figure 8-4, as standard equipment:

- Two power supply/cooling modules (modules 0 and 1)
- One enclosure system interface/operator panel (ESI/ops)
- Two loop resiliency circuit (LRC) I/O modules

These subsections provide details about the chassis and the component modules:

- "D-brick Chassis" on page 162
- "Power Supply/Cooling Module" on page 162

- “Enclosure System Interface/Operator (ESI/Ops) Panel Module” on page 163
- “FC-AL Loop Resiliency Circuit (LRC) I/O Modules” on page 167

D-brick Chassis

The D-brick chassis consists of two extended aluminum assemblies with a midplane PCB between them. Each chassis assembly contains 12 bays; a bay is defined as the space required to house a single 3.5-in. disk drive (1.6 in. high, or 1 in. high with a foam filler) in its carrier module. The two standard power supplies accommodate multiple bay spaces (three). The midplane PCB provides logic level signal and low-voltage power distribution paths.

Power Supply/Cooling Module

Two 550-W power supply/cooling modules are mounted in the rear of the D-brick. Figure 8-5 shows a module. The module contains two fans as well as the power supply and its associated electronics. The fans derive power from the chassis midplane, not from the power supply itself.

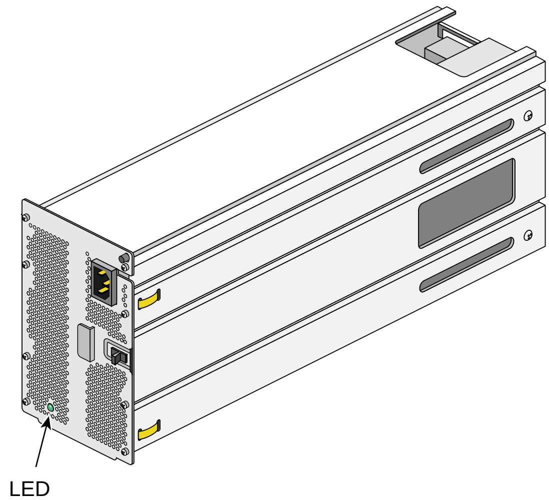

Figure 8-5 Power Supply/Cooling Module

Power supply voltage operating ranges are nominally 115 V or 230 V, selected automatically.

An LED on the front panel of the power supply/cooling module indicates the status of the power supply and the fan. Green indicates normal operation and amber indicates a fault condition.

With a Y-cable, the D-brick power supplies are connected directly to an output connector on the power distribution strip (PDS) to get the required 220 VAC.

Enclosure System Interface/Operator (ESI/Ops) Panel Module

The ESI/ops panel module provides the D-brick with a microcontroller for monitoring and controlling all elements of the D-brick. Each element (power, cooling, temperature, device status) is interfaced to the processor using an I^2C (I square C) bus.

Figure 8-6 shows the location of the ESI/ops panel in the D-brick.

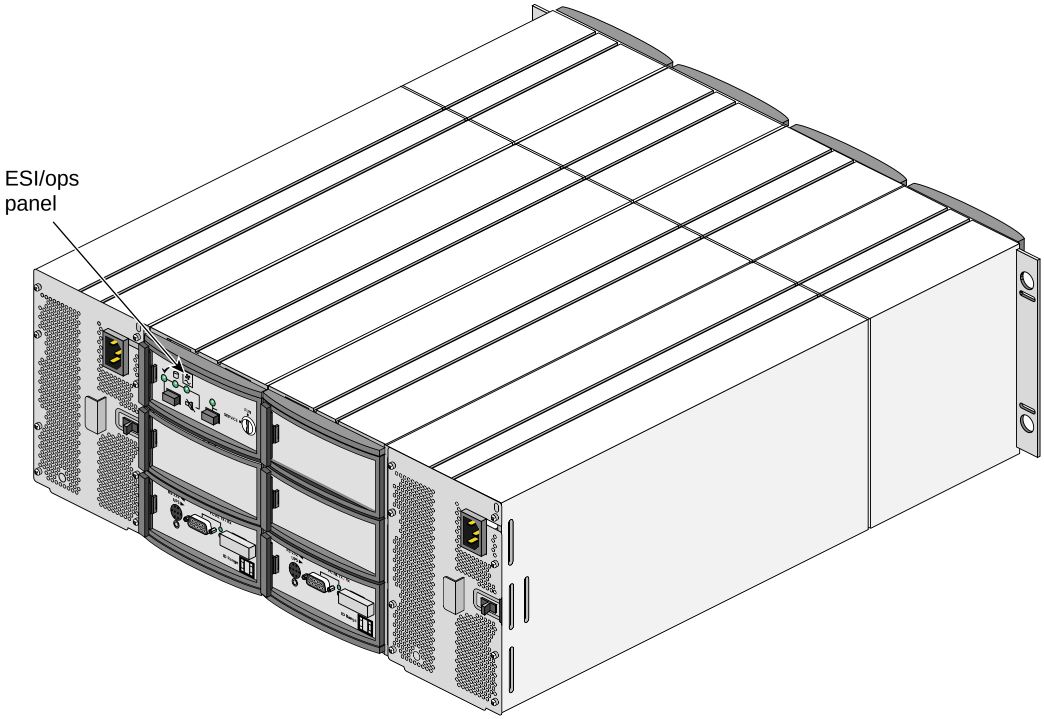

Figure 8-6 ESI/Ops Panel Module

Figure 8-7 shows details of the ESI/Ops panel.

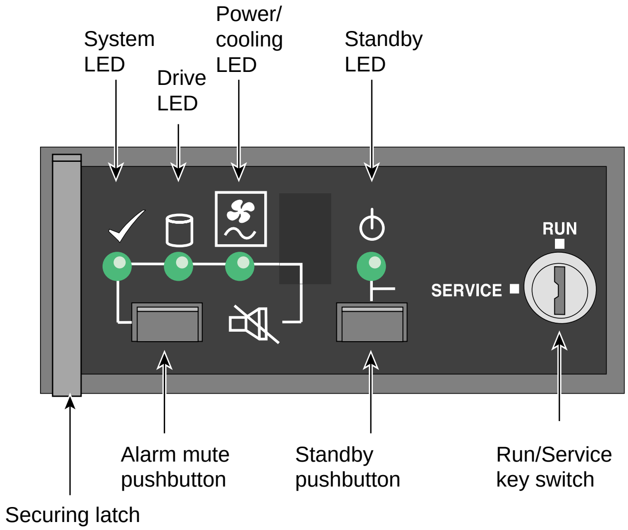

Figure 8-7 ESI/Ops Panel Indicators and Switches

The ESI/ops panel shows a consolidated status for all modules. Table 8-1 summarizes the functions of the LEDs on the ESI/ops panel, as well as those on other modules in the D-brick.

Table 8-1 D-brick LED Indicators

LED	Meaning
Green, steady	Positive condition
Green, flashing	Disk drives: data activity
Alternating green and amber, flashing	Noncritical condition
Amber, steady	Fault

In addition to the indicators on the ESI/ops panel, each module type has its own status LED(s). Using the LEDs for troubleshooting is explained in “Using D-brick LEDs for Troubleshooting” on page 181.

Other features of the ESI/ops panel are as follows:

- **Key switch.** Activates run or service mode, as explained in "Key Switch for Starting the D-brick."
- **Standby button.** Activates standby mode when the key switch is in the Service position; see "Powering the D-brick On or Off" on page 169.
- **Alarm mute button.** Mutes the alarm; see "Audible Alarm" on page 166.

The ESI/ops panel module firmware includes SCSI enclosure services (SES), which monitor the modules in the D-brick and control the ESI/ops panel LEDs. The ESI/ops panel requires two disk drives in specific drive bays to serve as conduits for information from the D-brick to the ESI/ops panel module.

Key Switch for Starting the D-brick

For general use, the D-brick is started by turning the key switch on the far right of the ESI/ops panel to the **RUN** position; the key is in this position when the D-brick is shipped. For specific instructions on starting and stopping the D-brick, see "Powering the D-brick On or Off" on page 169.

Audible Alarm

The audible alarm on the ESI/ops panel sounds when a fault state is present. Pressing the alarm mute button reduces the volume of the alarm, but beeps at approximately 10-second intervals to indicate that a fault state is still present. The mute button is beneath the indicators on the ESI/ops panel (see Figure 8-7).

See "Using the Alarm for Troubleshooting" on page 187 for a list of the conditions that activate the alarm.

FC-AL Loop Resiliency Circuit (LRC) I/O Modules

The D-brick is shipped with two FC-AL loop resiliency circuit (LRC) I/O modules, which make dual (redundant) data paths possible.

Figure 8-8 shows the locations of the I/O modules.

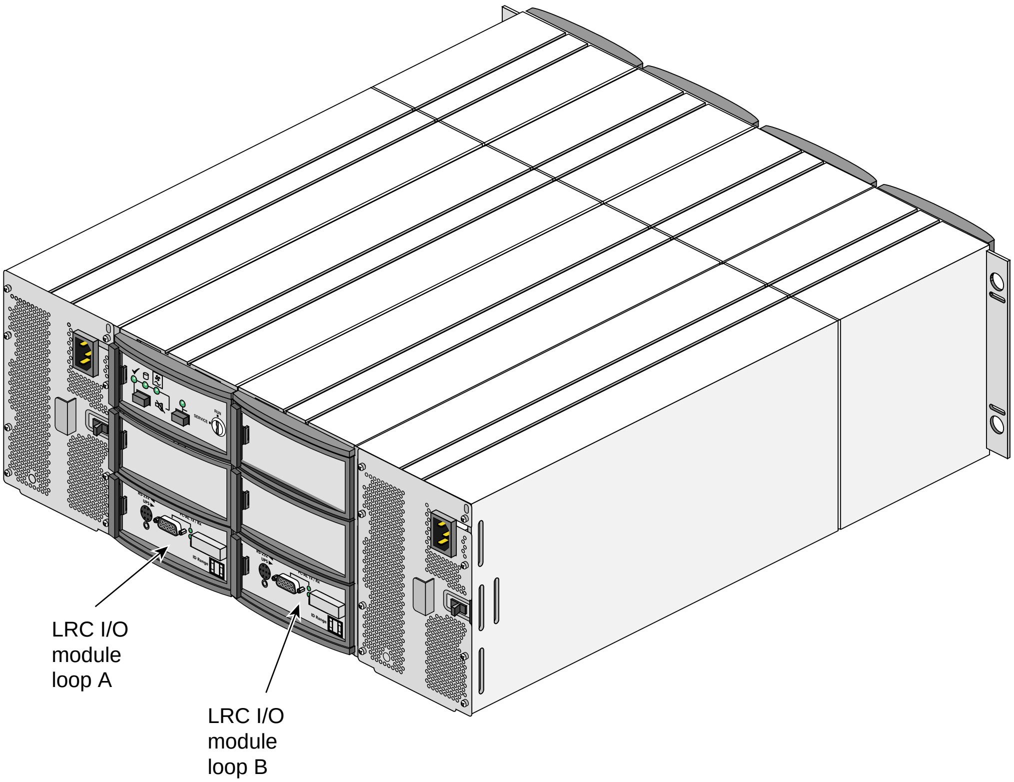

Figure 8-8 I/O Module Locations

Figure 8-9 shows features of the I/O module panel.

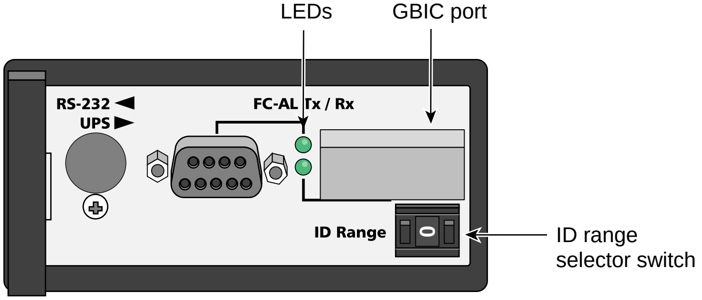

Figure 8-9 I/O Module Panel Features

Each I/O module has the following connectors and LEDs:

- **DB-9 connector.** This output connector can be cabled into a second D-brick's GBIC port connector to daisy-chain the two D-bricks.

  The DB-9 port connector on the I/O module panel has an LED indicating its status. The LED glows a steady green to indicate a good FC-AL signal on the attached cable. The LED lights amber when a problem with the connection is detected.

- **GBIC Port.** This Gigabit Interface Connector (GBIC) port is an input connector used to cable in an I/O brick on the server to the D-brick. This port connects to a host bus adapter (HBA) PCI card in an I-brick or P-brick on the server. You can also connect a cable coming from a second D-brick's DB-9 connector into the GBIC port to daisy-chain the two D-bricks.

  You insert an HSSDC GBIC module into the GBIC port to make the cabling connection.

  The GBIC port connector has an LED indicating its status. The LED glows a steady green to indicate a good FC-AL signal on the attached cable. The LED lights amber when a problem with the connection is detected.

- **ID range selector switch.** Each I/O module has an ID range selector switch for the system ID. Disk drive IDs are based on this ID. The legal address ID settings are 1 through 7.

At initial startup, each I/O module controls a separate loop of six drives

Powering the D-brick On or Off

1. Make sure that the ambient temperature is within the specified operating range of 10 ˚C to 40 ˚C (50 ˚F to 104 ˚F). If drives have been recently installed, make sure that they have had time to acclimatize before operating them.
2. Make sure that the D-brick's power supply/cooling modules' power connectors are cabled directly, with a Y cable, to an outlet connector of the power distribution strip (PDS).
3. For an unattended installation in which the D-brick is required to power on whenever AC power is present, the **RUN**/**SERVICE** key switch on each ESI/ops panel of each enclosure you are operating should be in the **RUN** position. The key switches are in this position when the D-bricks are shipped (see Figure 8-10).

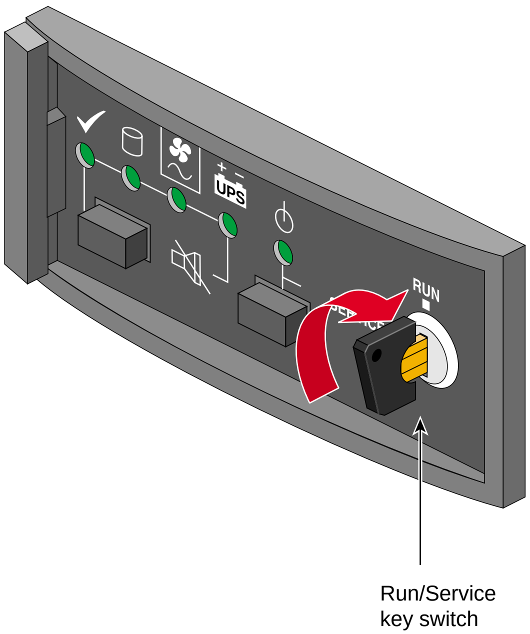

Figure 8-10 ESI/Ops Panel, Rackmount: Powering On

If the **RUN**/**SERVICE** key switch is in the **RUN** position, the enclosure powers on when power reaches the enclosure.

If the **RUN**/**SERVICE** key switch is in the **RUN** position and power is interrupted, the enclosure returns to the power-on condition when power is restored.

In run mode, the standby button is disabled.

Note: Setting the **RUN**/**SERVICE** key switch on the ESI/ops panel to the **SERVICE** position puts the D-brick in service mode; only SGI system support engineers (SSEs) use this mode. In service mode, if power is lost for any reason, the D-brick defaults to standby mode when power is restored. Press the standby button to power on the D-brick.

Checking AC Power and System Status

When you power on the system, the standby LED on each ESI/ops panel (see Figure 8-11) in each enclosure you are operating should turn green. If it does not, check that the power supply/cooling modules in the enclosure are correctly cabled to the rack PDS.

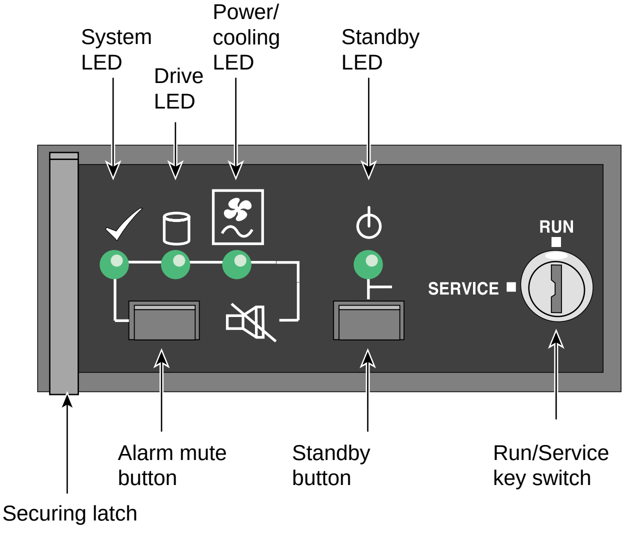

Figure 8-11 ESI/Ops Panel Indicators and Switches: Rackmount Enclosure

When you power on the system, check ESI/ops panel LEDs for system status. Under normal conditions, these LEDs should all be illuminated constant green. If a problem is detected, the ESI processor in the operator panel changes the relevant LED from green to amber. See “Solving Initial Startup Problems” on page 181 and “Solving Power Supply/Cooling Problems” on page 184.

Other modules in the D-brick also have LEDs, which are described in “Using D-brick LEDs for Troubleshooting” on page 181.

Powering Off the D-brick

The D-brick toggles between standby mode (all drives are powered off) and run (operation) mode whenever the standby button is pressed.

After making sure users are off the affected systems, power off the D-brick as follows:

1. Turn the key switch to the **SERVICE** position and then press the standby button for two seconds.

   Note: To power on the D-brick again from this setting, press the standby button for two seconds again.

   ---

2. Remove power at the power source: unplug the D-brick from the PDS.

Note: If the key switch on the ESI/ops panel is in the **RUN** position when power is restored to the D-brick, the system powers on. If the key switch is in the **SERVICE** position when power is restored to the D-brick, the system does not power on.

D-brick Bay Numbering

Figure 8-12 shows the correct positions of the disk drive modules and the enclosure bay numbering convention. A bay is defined as the space required to house a single 3.5-in. disk drive in its carrier module.

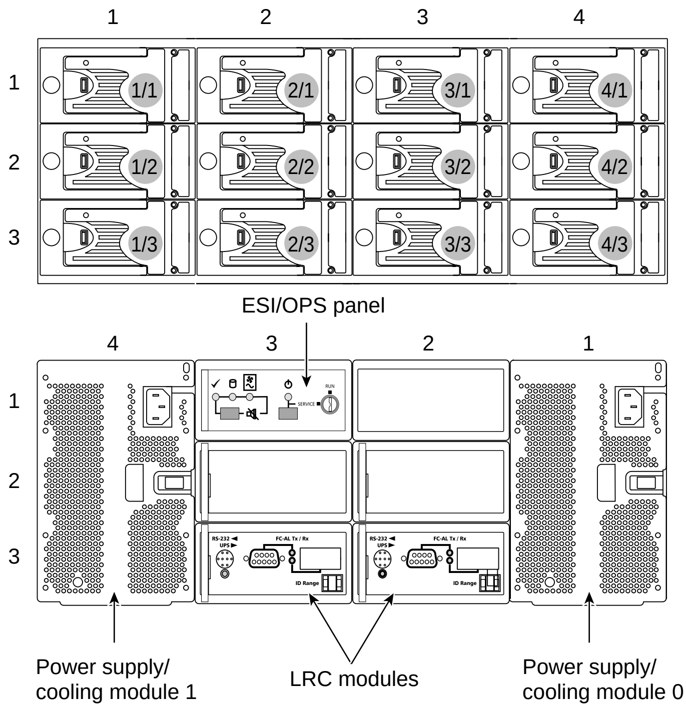

Figure 8-12 Module Locations and Bay Numbering

The D-brick is 4 bays wide by 3 bays high.

- The disk drive bays, located in front, are numbered 1 to 4 from left to right and 1 to 3 from top to bottom. Drives in bays 1/3 and 4/3 are required for D-brick management; these bays must always be occupied.
- The rear bays are numbered 1 to 4 from right to left and 1 to 3 from top to bottom.

Module locations are identified by combining the column and row numbers (top and side numbers in Figure 8-12). For example, the ESI/ops panel is in rear bay 3/1 (third column from right, top row).

Adding and Removing Disk Drive Modules

This section explains how to add or remove a disk drive module in the following sections:

- “Adding a Disk Drive Module” on page 173
- “Removing a Disk Drive Module” on page 179

Adding a Disk Drive Module

Note the following:

- All disk drive bays must be filled with either a disk drive module or a drive filler; no bay should be left completely empty.
- The drives in bays 1/3 and 4/3 are required for enclosure management; these bays must always have a disk drive.
- Install drives in the order shown in Figure 8-13. Generally, after the two required bays are occupied, drive bays are filled starting at the bottom of the D-brick.

9	11	12	10
5	7	8	6
1 (required)	3	4	2 (required)

Figure 8-13 Drive Installation Order

Follow these steps to add a new disk drive module to the D-brick:

1. Make sure that enough disk drives and disk-drive fillers have been ordered to occupy all bays.
2. For each new drive, carefully open the bag containing the drive.

Warning: The disk drive handle might have come unlatched in shipment and might spring open when you open the bag. As you open the bag, keep it a safe distance from your face.

3. Place the disk drive modules on an antistatic work surface, and make sure that their antitamper locks are disengaged (unlocked). A disk drive module cannot be installed if its antitamper lock is activated outside the enclosure.

   Drives are shipped with the locks set in the unlocked position. However, if a drive is locked, insert the key (included with the disk drive) into the socket in the lower part of the handle trim and turn it 90 degrees clockwise until the indicator visible in the center aperture of the handle shows black. See Figure 8-14.

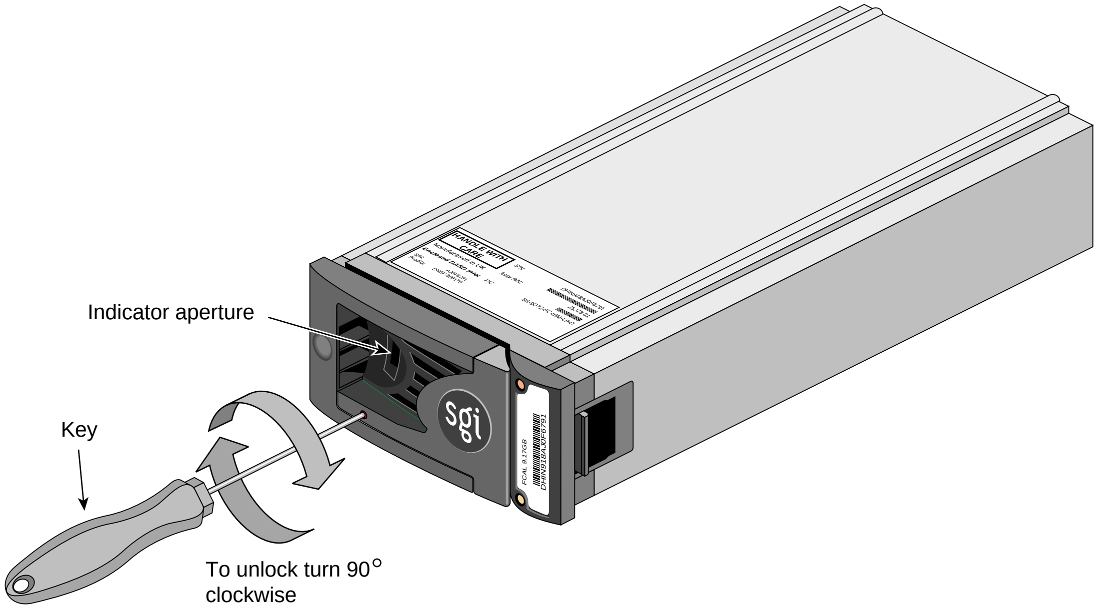

Figure 8-14 Unlocking the Disk Drive Module (Disengaging the Antitamper Lock)

4. Release the disk drive module handle by pressing on the small indentation on the left of the module front (see Figure 8-15).

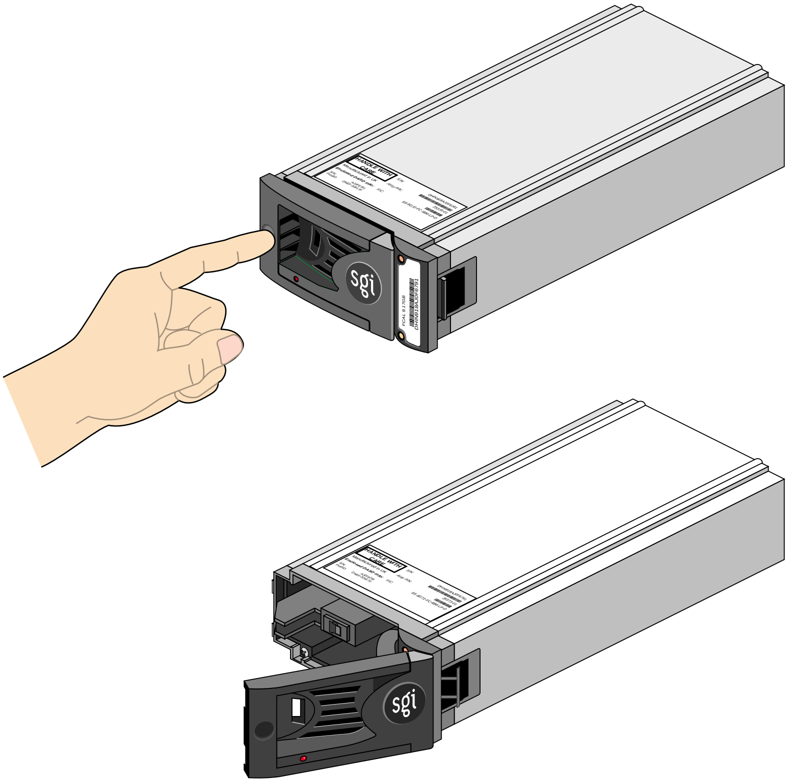

Figure 8-15 Releasing the Module Handle

5. Insert the disk drive module into the chassis, as shown in Figure 8-16.

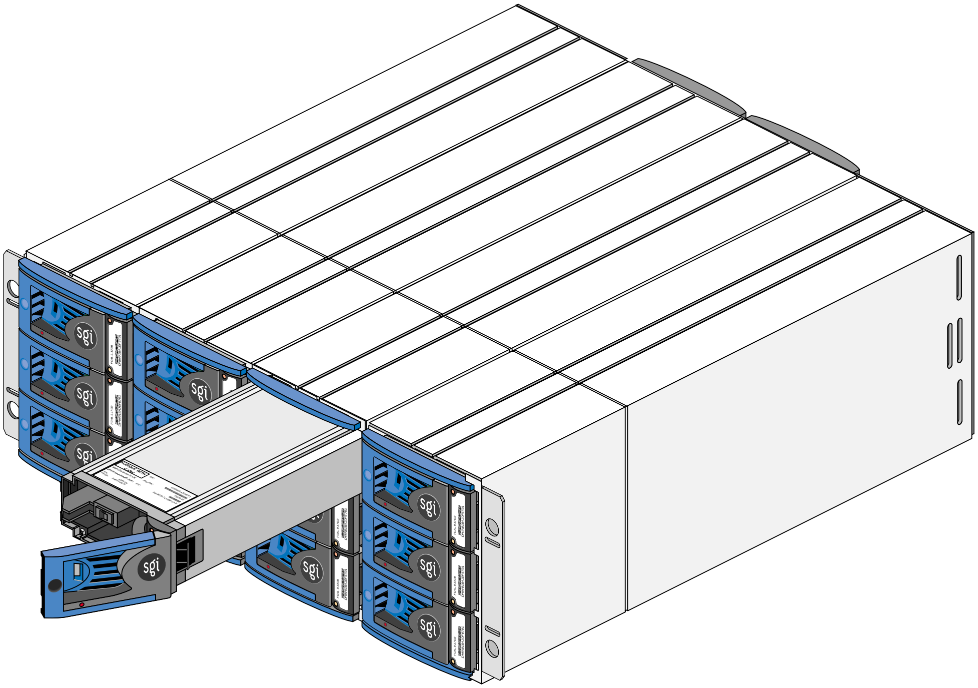

Figure 8-16 Inserting the Disk Drive Module

Note: The drive modules are not keyed. Make sure you are inserting the drive module in the correct orientation.

---

6. Push the disk drive module gently into the chassis until it is stopped by the camming lever on the right of the module, as shown in Figure 8-17.

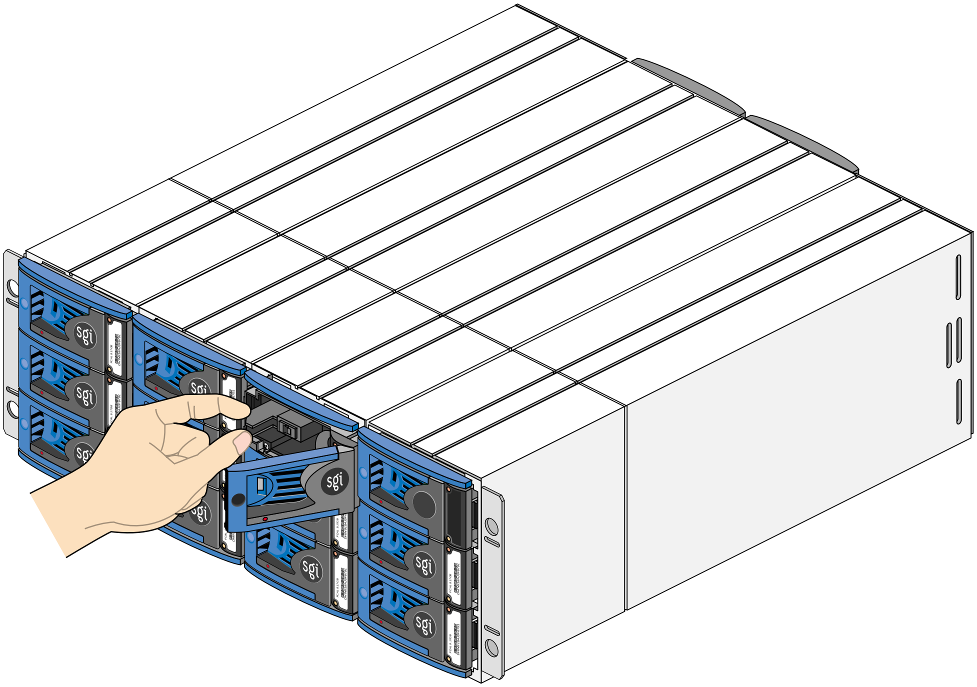

Figure 8-17 Drive Seated: Rackmount Enclosure

7. Press on the drive handle to seat the drive. The camming lever on the right of the module engages with a slot in the chassis, as shown in Figure 8-18.

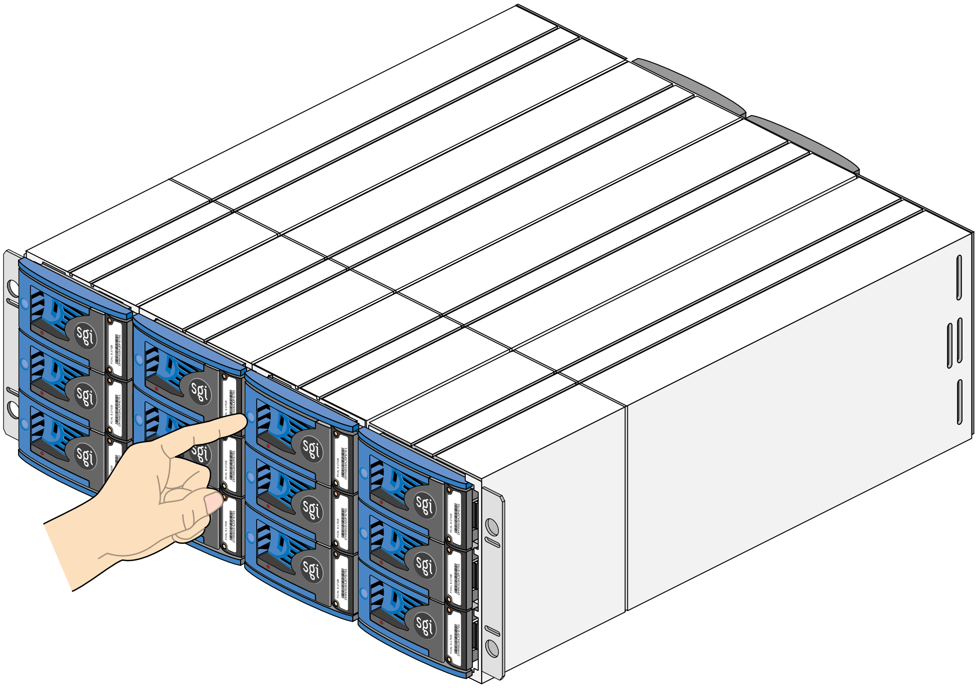

Figure 8-18 Engaging the Camming Lever: Rackmount Enclosure

Continue to push firmly until the handle fully engages with the module cap. You should hear a click as the latch engages and holds the handle closed.

8. Repeat steps 2 through 7 for all drive modules to be installed.
9. When you have finished installing all drives, activate the drive antitamper lock on each one:
    a. Carefully insert the lock key provided into the cutout in the handle trim. See Figure 8-19.

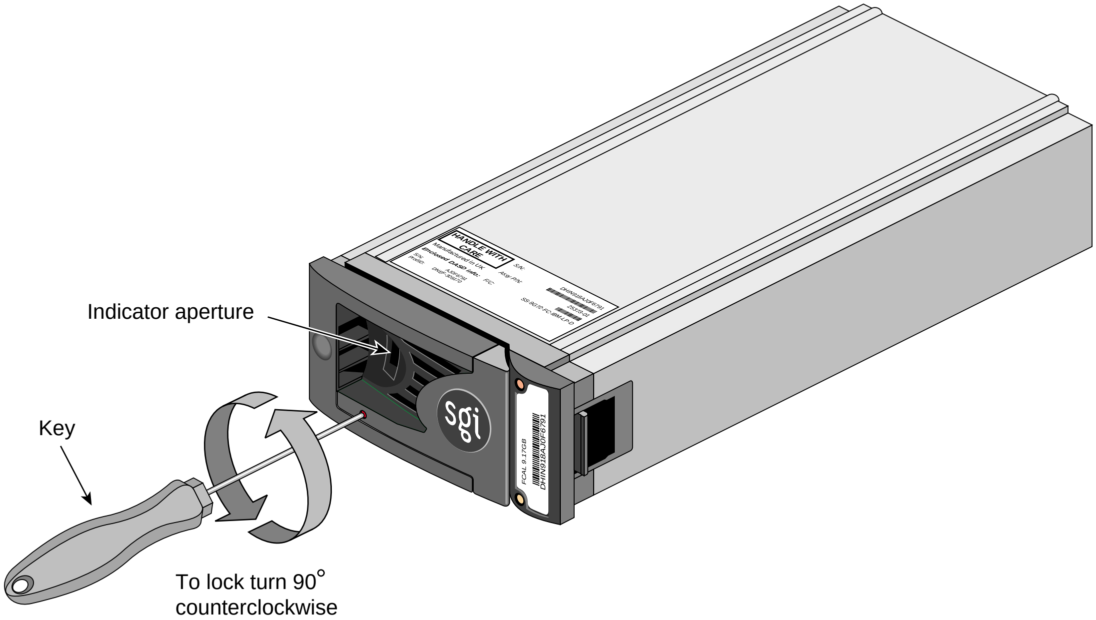

Figure 8-19 Locking the Disk Drive Module (Setting the Antitamper Lock)

b. Rotate the key 90 degrees counterclockwise until the indicator in the handle shows red.

c. Remove the key and store it.

10. Fit all empty drive bays with disk-drive fillers. The drive handle and camming mechanism operate the same way as for disk drives.

Removing a Disk Drive Module

If an LED indicates that a disk drive is defective, follow these steps to remove the faulty drive:

1. Make sure enough disk drives and disk-drive fillers are available to occupy all bays.
2. Make sure users are off the affected systems; back up data if necessary.

Note: Replace disk drive modules one at a time,

3. Make sure the faulty drive has spun down.

Caution: Damage can occur to a drive if it is removed while still spinning.

4. Using the key, turn the antitamper lock to the off position:
   a. Carefully insert the lock key provided into the cutout in the handle trim, as shown in Figure 8-14.
   b. Rotate the key 90 degrees clockwise until the indicator in the handle shows black.
   c. Remove the key and store it.
5. Release the handle by pressing on the small indentation area on the left of the module front.
6. Gently withdraw the module approximately 25 mm (1 in.) and wait 30 seconds.
7. Withdraw the module from the drive bay. Replace the drive immediately; follow instructions in "Adding a Disk Drive Module" on page 173.
8. If you are replacing a module in a LUN that uses a hot spare, note the location of the replacement module; it is the new hot spare.

Troubleshooting

The D-brick includes a processor and associated monitoring and control logic that allow it to diagnose problems within the D-brick's power, cooling, and drive systems.

The SES (SCSI enclosure services) processor is housed in the ESI/ops panel module. The sensors for power, cooling, and thermal conditions are housed within the power supply/cooling modules. Each module in the D-brick is monitored independently.

This section consists of the following subsections:

- "Solving Initial Startup Problems" on page 181
- "Using D-brick LEDs for Troubleshooting" on page 181

- "Using the Alarm for Troubleshooting" on page 187
- "Solving Storage System Temperature Problems" on page 188
- "Using Test Mode" on page 190

Note: If a fault is indicated on the ESI/ops panel, see Table 8-2 in "Using D-brick LEDs for Troubleshooting" on page 181 and then see the section referenced within that table.

Solving Initial Startup Problems

If cords are missing or damaged, plugs are incorrect, or cables are too short, contact your supplier for replacements.

If the D-brick alarm sounds when you power on the SGI Origin 3000 server (or the D-brick, if it has been powered off separately), one of the following conditions exists:

- A fan is slowing down. See "Solving Power Supply/Cooling Problems" on page 184 for further checks to perform.
- There is an over temperature or thermal overrun condition. See "Solving Power Supply/Cooling Problems" on page 184.
- There is a D-brick fault. See "Solving Problems Indicated by ESI/Ops Panel LEDs" on page 182.

If an amber disk drive module LED drive fault is on, there is a drive fault. See Table 8-3 on page 187.

Using D-brick LEDs for Troubleshooting

This section summarizes LED functions and gives instructions for solving D-brick problems in these subsections:

- "Solving Problems Indicated by ESI/Ops Panel LEDs" on page 182
- "Solving Power Supply/Cooling Problems" on page 184
- "Solving Problems Indicated by FC LRC I/O Module LEDs" on page 185
- "Solving Disk Drive Problems" on page 186

Solving Problems Indicated by ESI/Ops Panel LEDs

Figure 8-20 shows details of the ESI/ops panel.

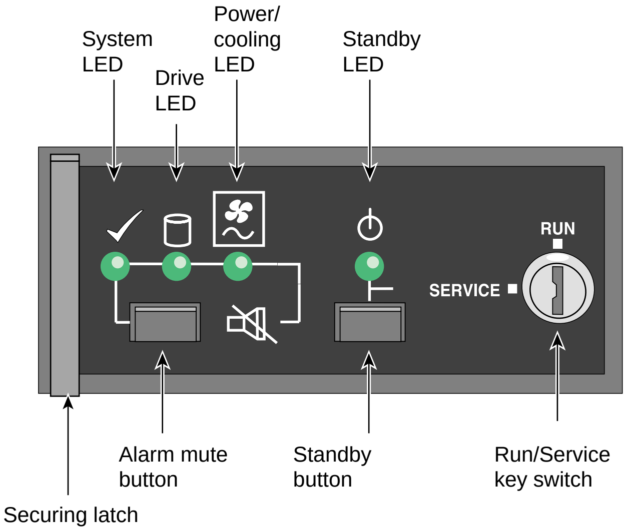

Figure 8-20 ESI/Ops Panel Indicators and Switches

Table 8-2 summarizes functions of the LEDs on the ESI/ops panel.

Table 8-2 ESI/Ops Panel LEDs and Troubleshooting

LED	Off	Green Steady	Green or Amber Flashing	Amber Steady	Remedy
✓ System status	Power is off, or standby mode is selected.	All ESI functions OK.	System configuration error.	ESI / I^2C function failure.	See “Solving Problems Indicated by ESI/Ops Panel LEDs” on page 182.
Drive status	Power is off, or standby mode is selected.	All drives OK.	Drive fault (alternating green and amber). Note: ESI polling causes flash at regular interval.	N/A	Replace the drive as explained in “Adding and Removing Disk Drive Modules” on page 173.
Power/ Cooling	Power is off, or standby mode is selected.	All power and fans OK.	Not used.	Power supply/cooling module or fan fault.	See “Solving Power Supply/Cooling Problems” on page 184. Contact service provider for replacement.
Standby	No AC power is supplied.	Power is good, or standby status is selected.	Not used.	Storage system is in standby mode due to ESI thermal shutdown.	See “Thermal Alarm” on page 189, “Thermal Shutdown” on page 189.

Note the following:

- If all LEDs on the ESI/ops panel flash simultaneously, see “Using Test Mode” on page 190.
- If test mode has been enabled (see “Using Test Mode” on page 190), the amber and green drive bay LEDs flash for any non-muted fault condition.
- The LED for the uninterruptible power supply (UPS) is covered with a sticker. This LED lights whether or not a UPS is present. Use of a UPS is not supported in this release. Leave the sticker in place.

If the system status LED on the ESI/ops panel is amber and the alarm is sounding, the ESI processor has detected an internal fault, such as failure of an internal communications path. Follow these steps:

1. Check if the LEDs on the power supply/cooling modules are amber. If a PSU error is present, there might be a communications problem with that power supply/cooling module. Contact your service representative for a replacement.
2. Check if the disk drive module LEDs are amber. If none are, there might be either an ESI processor problem or a chassis midplane problem. Contact your service provider.

See also "Thermal Shutdown" on page 189.

Solving Power Supply/Cooling Problems

If the alarm is sounding, the power supply/cooling LED on the ESI/ops panel is amber, and the LED on one or both power supply/cooling modules is amber, the cause is one of the following:

- Power fault
- Fan failure
- Thermal condition that is causing the power supply/cooling module to overheat.

To troubleshoot the problem, follow these steps:

1. Check the power connection to the power supply/cooling module.
2. If possible, reduce the ambient temperature. If the problem persists, contact your service provider.

If one of the power supply/cooling modules is missing or defective, all of the following occur:

- Alarm sounds.
- System LED on the ESI/ops panel flashes.
- Power supply/cooling module LED remains illuminated.

If these warnings occur, check the LED on the power supply/cooling module. If it is amber, contact your service representative.

Figure 8-21 shows the location of the LED on the power supply/cooling module.

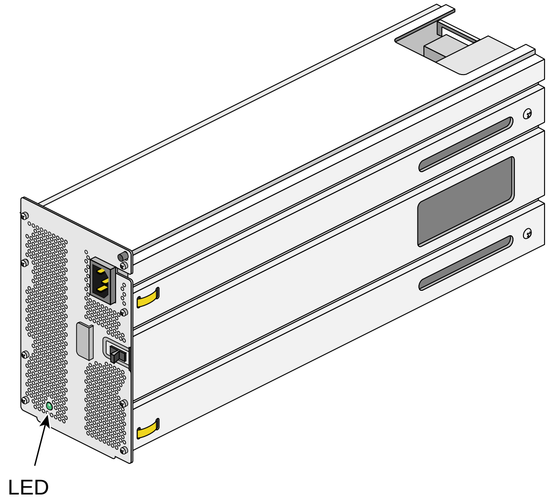

Figure 8-21 Power Supply/Cooling Module LED

If this LED is amber, or if the power/cooling LED on the ESI/ops panel is amber and the alarm is sounding, contact your service provider.

Solving Problems Indicated by FC LRC I/O Module LEDs

Two LEDs between the DB-9 connectors on the I/O panel light steady green to indicate a good FC-AL signal on the cables attached to the adjacent connectors. Figure 8-22 shows the LEDs on the I/O module panel.

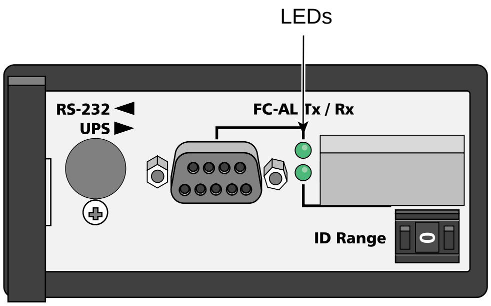

Figure 8-22 FC LRC I/O Module LEDs

If the LED for a connector is amber, check the connection. If the problem persists, contact your service provider for a replacement.

Solving Disk Drive Problems

Each disk drive module has two LEDs, an upper (green) and a lower (amber), as shown in Figure 8-23.

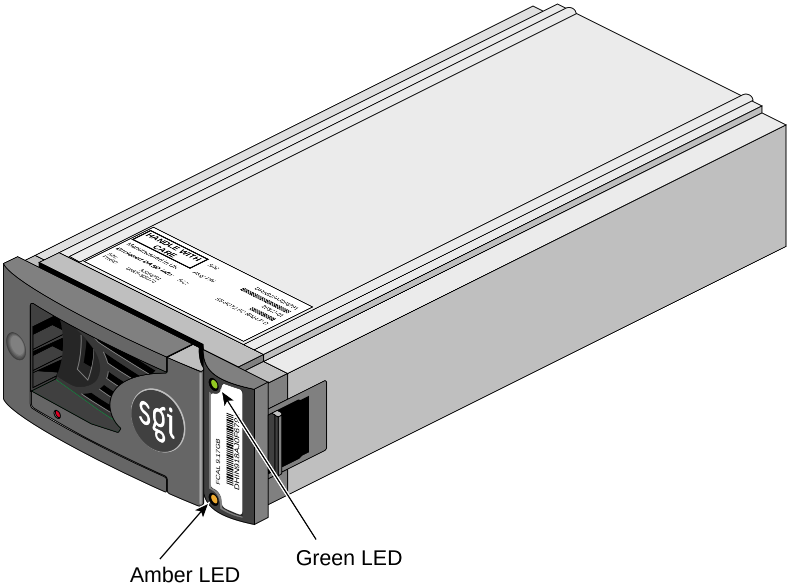

Figure 8-23 Disk Drive Module LEDs

The LEDs on the disk drive modules provide the information summarized in Table 8-3.

Table 8-3 Disk Drive LED Function

Green LED (Upper)	Amber LED (Lower)	State	Solution
Off	Off	No disk drive fitted; that is, the drive is not fully seated.	Check that the drive is fully seated.
On	Off	Disk drive power is on, but the drive is not active.	N/A
Blinking	Off	Disk drive is active (LED might be off during power-on).	N/A
Flashing at 2-second intervals	On	Disk drive fault (SES function).	Contact your service provider for a replacement drive and follow instructions in "Adding and Removing Disk Drive Modules" on page 173.
N/A	Flashing at half-second intervals	Disk drive identify (SES function).	N/A

In addition, the amber drive LED on the ESI/ops panel alternates between on and off every 10 seconds when a drive fault is present.

Using the Alarm for Troubleshooting

The ESI/ops panel includes an audible alarm that indicates when a fault state is present. The following conditions activate the audible alarm:

- Drive fault
- Fan slows down
- Voltage out of range
- Over temperature
- Thermal overrun
- Storage system fault

You can mute the audible alarm by pressing the alarm mute button for about a second, until you hear a double beep. The mute button is beneath the indicators on the ESI/ops panel (see Figure 8-20).

When the alarm is muted, it continues to sound with short intermittent beeps to indicate that a problem still exists. It is silenced when all problems are cleared.

Note: If a new fault condition is detected, the alarm mute is disabled.

Solving Storage System Temperature Problems

This section explains D-brick temperature conditions and problems in these subsections:

- "Thermal Control" on page 188
- "Thermal Alarm" on page 189
- "Thermal Shutdown" on page 189

Thermal Control

The D-brick uses extensive thermal monitoring and ensures that component temperatures are kept low and acoustic noise is minimized. Airflow is from front to rear of the D-brick.

If the ambient air is cool (below 25 ˚C or 77 ˚F) and you can hear that the fans have sped up by their noise level and tone, then some restriction on airflow might be raising the D-brick's internal temperature. The first stage in the thermal control process is for the fans to automatically increase in speed when a thermal threshold is reached. This might be a normal reaction to higher ambient temperatures in the local environment. The thermal threshold changes according to the number of drives and power supplies fitted.

If fans are speeding up, follow these steps:

1. Check that there is clear, uninterrupted airflow at the front and rear of the D-brick.
2. Check for restrictions due to dust buildup; clean as appropriate.
3. Check for excessive recirculation of heated air from the rear of the D-brick to the front.

4. Check that all blank plates and disk-drive fillers are in place.
5. Reduce the ambient temperature.

Thermal Alarm

The thermal alarm is a combination of all these:

- Alarm sounds.
- Power supply/cooling LED on the ESI/ops panel is amber.
- LED on one or both power supply/cooling modules is amber.
- Air temperature of the air exiting the PSU is above 55 ˚C (131 ˚F).

This alarm sounds when the internal temperature (measured in the airflow through the D-brick) exceeds a threshold. Follow these steps:

1. Check that local ambient environment temperature is below the upper temperature specification of 40 ˚C (104 ˚F).
2. Check that there is clear, uninterrupted airflow at the front and rear of the D-brick.
3. Check for restrictions due to dust buildup; clean as appropriate.
4. Check for excessive recirculation of heated air from the rear to the front.

Thermal Shutdown

The D-brick automatically shuts down to protect itself and the disk drives from damage. Thermal shutdown occurs under these conditions:

- After the thermal alarm condition is present. Shutdown occurs at a higher threshold than the thermal alarm.
- When all fans fail.
- When only one fan is operating and the D-brick internal temperature reaches 40 ˚C (104 ˚F).

The D-brick shuts down ten seconds after any of these conditions is present.

When a thermal shutdown is imminent, all amber LEDs on the ESI/ops panel and on all disk drives flash and the alarm sounds continuously and cannot be muted.

When thermal shutdown conditions are present, follow these steps (if possible):

1. Check for airflow restrictions.
2. Check for power supply/cooling module faults as detailed in "Solving Power Supply/Cooling Problems" on page 184.
3. Check for excessive ambient temperatures (over 40 ˚C [104 ˚F])

If the overheating problem is not solved, thermal shutdown occurs. The standby LED on the ESI/ops panel and the power supply status LED are amber and the D-brick powers itself off.

Follow these steps:

1. Correct the source of the overheating.
2. Allow the D-brick to cool down.
3. Unplug the power cord from the D-brick and leave it unplugged for at least 30 seconds to reset the shutdown condition.
4. Reconnect the power cord and restart the D-brick, following the normal procedure (see "Powering the D-brick On or Off" on page 169).
5. Check for cooling faults that persist, particularly fan failure. If a fan has failed, contact your service provider for a replacement.

Using Test Mode

When no faults are present in the D-brick, you can run test mode to check the LEDs and the audible alarm on the ESI/ops panel. In this mode, the amber and green LEDs on each of the drive carrier modules and the ESI/ops panel flash on and off in sequence; the alarm beeps twice when test mode is entered and exited.

To activate test mode, press the alarm mute button until you hear a double beep. The LEDs then flash until the D-brick is reset, either when you press the alarm mute button again or if an actual fault occurs.

R-brick

This chapter describes the function and physical components of the R-brick in the following sections:

Functional Description

The R-brick (router brick) includes one SGI router ASIC, which is an 8-port router in the SGI Origin 3000 series. The R-brick acts as a centralized hub for the NUMAlink interconnect fabric, where all C-bricks in the system are connected to R-bricks with NUMAlink cables.

R-bricks are included in all standard configurations of the SGI Origin 3400 server and the SGI Origin 3800 server. The SGI Origin 3200 server does not support an R-brick since the maximum 8-processor configuration can be achieved by connecting the two C-bricks directly with a NUMAlink cable.

Because each R-brick has four port connectors to connect to C-bricks, the ratio of C-bricks to R-bricks in a fully-populated configuration is 4 to 1.

Note: Each R-brick, which comes bundled with the SGI Origin 3400 and 3800 servers, requires 2U of rack space.

The following three types of routers are available as R-bricks in the SGI Origin 3000 series servers:

- The 6-port router comes only on the SGI Origin 3400 server and two 6-port routers support up to a maximum of 8 C-bricks.

- The 8-port router comes standard on the SGI Origin 3800 server and supports up to 32 C-bricks.
- The metarouter is used in the SGI Origin 3800 sever only to expand beyond 128 and up to 512 processors. This router connects only to other 8-port routers; it does not connect to C-bricks.
- Repeater routers used on 512 processors.

This chapter discusses the R-brick as a router used in the NUMA 3 interconnect fabric.

Internal Components and Front Panel Items

The following are the R-brick's internal components and front panel items (Figure 9-1 shows the R-brick's front panel items):

Internal components:

- **Router printed circuit board (PCB) with port connectors.**
- **Power board.**

Front panel items:

- **L1 controller and display.** L1 controller generates R-brick status and error messages that appear on the liquid crystal display (LCD).
- **On/Off switch with LED.** Turns on the R-brick internal components.
- **L1 controller LEDs and switches:**
  - **On/Off switch LED.** Lights green when the R-brick internal components are on and turns off when they are off.
  - **Service required LED.** Lights orange to indicate that an item is broken or not operating properly (for example, a fan is off), but the R-brick is still operating.
  - **Failure LED.** Lights red to indicate that a system failure has occurred and the R-brick system is down.
- **Fans.**

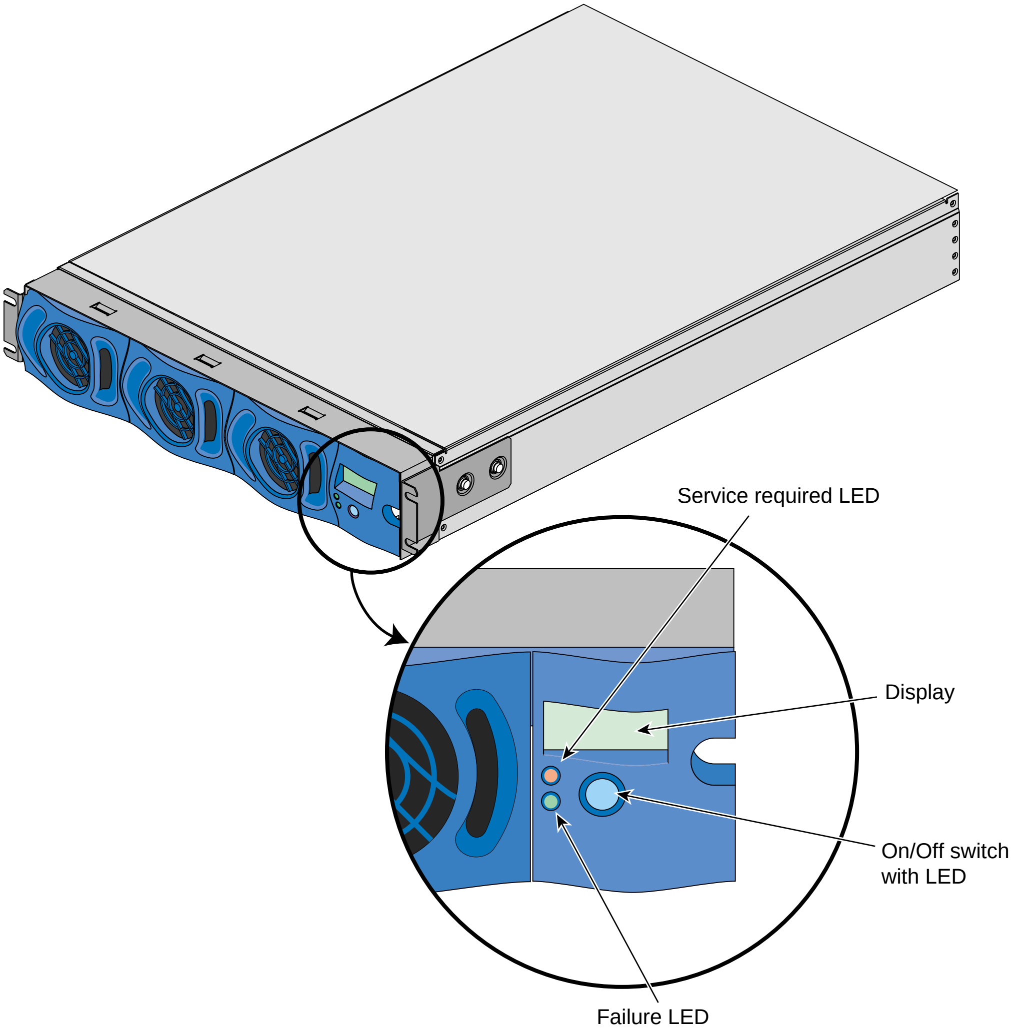

Figure 9-1 R-brick Front View

L1 Controller

The L1 controller monitors and controls the environment of the R-brick, specifically, its operating temperature, voltage margins, and system LEDs. The L1 controller also reads component information from serial ID EEPROMs, and interfaces with its own 2-line x 12-character liquid crystal display (LCD).

The R-brick's L1 controller also connects to the L2 controller. For general information about the L1 controller, see Chapter 3, "System Control."

Fans

The front of the R-brick houses two cooling fans. However, only the middle and rightmost panel sections contain fans to cool components.

The R-brick fans are smaller than other brick fans and run at a single speed.

Warning: To avoid personal injury and to avoid damage to your system, these R-brick fans, which are N+1 redundant, can be hot-swapped only by your SGI system support engineer (SSE).

Switch, Connectors, and LEDs on R-brick Rear Panel

Figure 9-2 shows the location of the power-on switch, connectors, and LEDs on the R-brick rear panel.

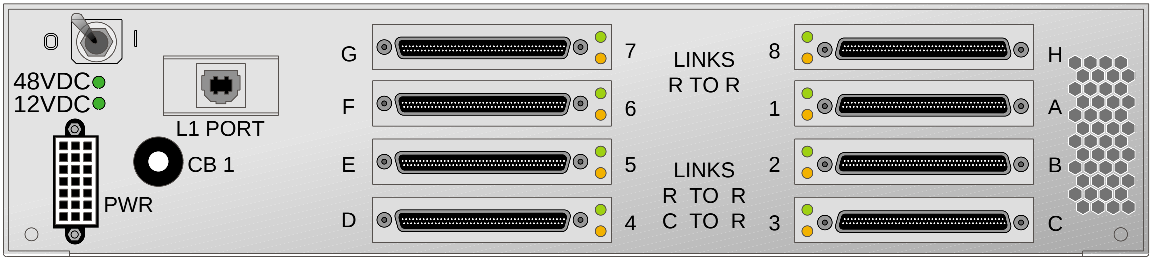

Figure 9-2 R-brick Rear Panel.

The R-brick has the following rear panel items:

- **PWR (power) connector.** Connects to the power bay to provide power to the R-brick.
- **Power switch.** Moving the power switch to the **1** position powers on the R-brick, and moving it to the **0** position powers off the R-brick. Moving the power switch to the **1** position turns on the L1 controller. Pressing the On/Off switch (brick reset button) turns on the rest of the R-brick internal components.
- **48 VDC and 12 VDC LEDs.** The power switch must be in the ON (**1**) position for these LEDs to be on. The 12 VDC lights when the L1 controller is operating, and the 48 VDC lights when the rest of the R-brick internal components are on.
- **CB1 circuit breaker** (PUSH, 2.5, RE-CIRK-IT). Pressing this button resets your system.
- **L1 port connector.** The L1 port connector connects to the L2 controller on the rack enclosure. Therefore, it is not necessary for an R-brick to distribute USB signals to other R-bricks. R-brick-to-R-brick network connections are normally made through the four port connectors that do not carry USB signals (1, 6, 7, and 8); however, they are not restricted to these four ports.

  The USB hub receives the USB signals from the L2 controller via the USB port, labeled **L1 Port** on the R-brick panel, and distributes these USB signals to the L1 controllers of the attached C-bricks.
- **Links R TO R** (1, 6, 7, and 8 or A, F, G, and H). These link connectors connect the R-brick to other R-bricks in the server system.

- **Link connector LEDs.** All the link connectors (1 through 8) have two LEDs (one that lights green and another that lights yellow):
  - The green LED (the hardware LED) lights to indicate that a cable is connected properly between the R-brick and another brick.
  - The yellow LED (the software LED) lights to indicate that packets are being transferred successfully across the link.
- **Links R TO R and C TO R** (2, 3, 4, and 5 or B, C, D, and E). These link connectors connect the R-brick to C-bricks.

Note: Links 2, 3, 4, and 5 are also used in the metarouter to connect other routers in server configurations greater than 128 processors.

Besides link signals, links 2, 3, 4, and 5 carry system controller USB signals, which are distributed over the network cables. Since the C-bricks require USB signals, the C-bricks are cabled only to ports 2, 3, 4, and 5.

If the SGI Origin 3400 server system has more than four C-bricks, C-bricks are cabled to a second R-brick as shown in Figure 9-3. These C-bricks communicate with the first four C-bricks through a connection between the R-bricks. R-brick to R-brick links use ports 1, 6, 7, and 8 located on the top half of the R-brick panel and labeled LINKS R TO R.

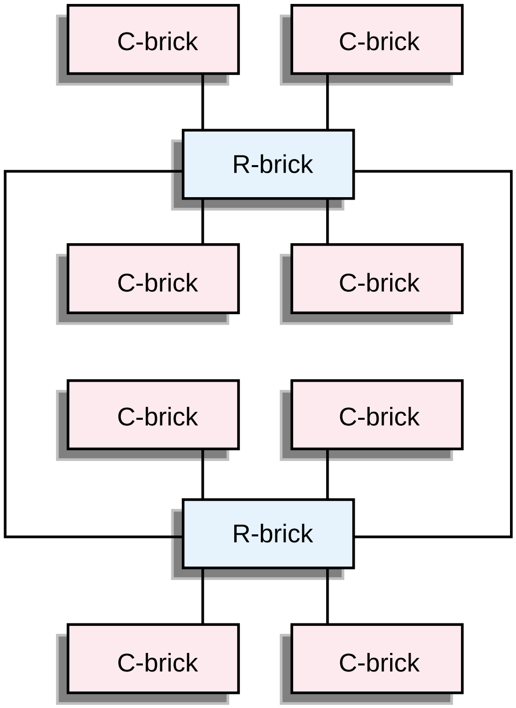

Figure 9-3 R-brick Connections

In the case of a server configuration greater than 128 processors, the metarouters would use links 1, 6, 7, and 8 in addition to Links 2, 3, 4, and 5, which are normally used to connect directly to C-bricks.

System Power

The following sections in this chapter describe the function and physical components that make up the power system for the SGI Origin 3000 series of server products:

Overview of the Power System

This section describes the power devices in a tall rack and a short rack for an SGI Origin 3000 series servers.

Tall Rack Power Devices

The power devices in a tall rack for the SGI Origin 3000 series servers shown in Figure 10-1 illustrate the following items:

- **Power bay(s).** Each power bay contains four 950 W hot-swappable power supplies, which are connected to a power bus. The power bay has the following connectors on its rear panel:
  - Six input power connectors (one per power supply bay) that connect each power supply that corresponds to the individual power connector to a power receptacle through the power distribution units (PDUs).

- Eight output connectors to connect to an individual brick's PWR (power) connector and provide power to the brick. These output connectors also connect to the L2 controller's power connector to provide power to the L2 controller. Each power supply provides power to all eight output connectors.
- Fault Reset Switch that is used to reset the power bay.

Note: The D-brick has two power supplies of its own. Because these power supplies require 220 VAC, they bypass the power bays, which only provide 12 VDC and 48 VDC, and connect directly to a 220 VAC power receptacle through a PDS.

Warning: To avoid personal injury and damage to the server system, only a qualified SGI system support engineer (SSE) can add, remove, replace, or service the power bays and power supplies. Contact your service provider for assistance.

- **One or two PDUs** depending on the number of power bays. (Each power bay requires four connections, one per each power supply.) The PDU can be single-phase or three-phase. The single-phase PDU, which supports one power bay, has one opening with six cables to connect to the power bay. This PDU has two input power-plug cables, a single outlet connector, and a circuit breaker switch.

  The three-phase PDU, which supports two power bays, has two openings, and each of these has six cables to connect to the two power bays. This PDU has one input power-plug cable, a single outlet connector, and a circuit breaker switch.

  If you have two PDUs, they are located one above the other. The PDUs are located on the left side of the rack as you face the rear of the rack. The PDUs connect directly to a wall power source.

- **Cabling** to interconnect the PDUs to the input power connectors on the power bay, and cabling to connect the individual bricks to the output connectors on the power bay.

Note: Although you may have only four power supplies in the power bay that require power, make sure that all the PDU cables are connected to the power bay input power connectors.

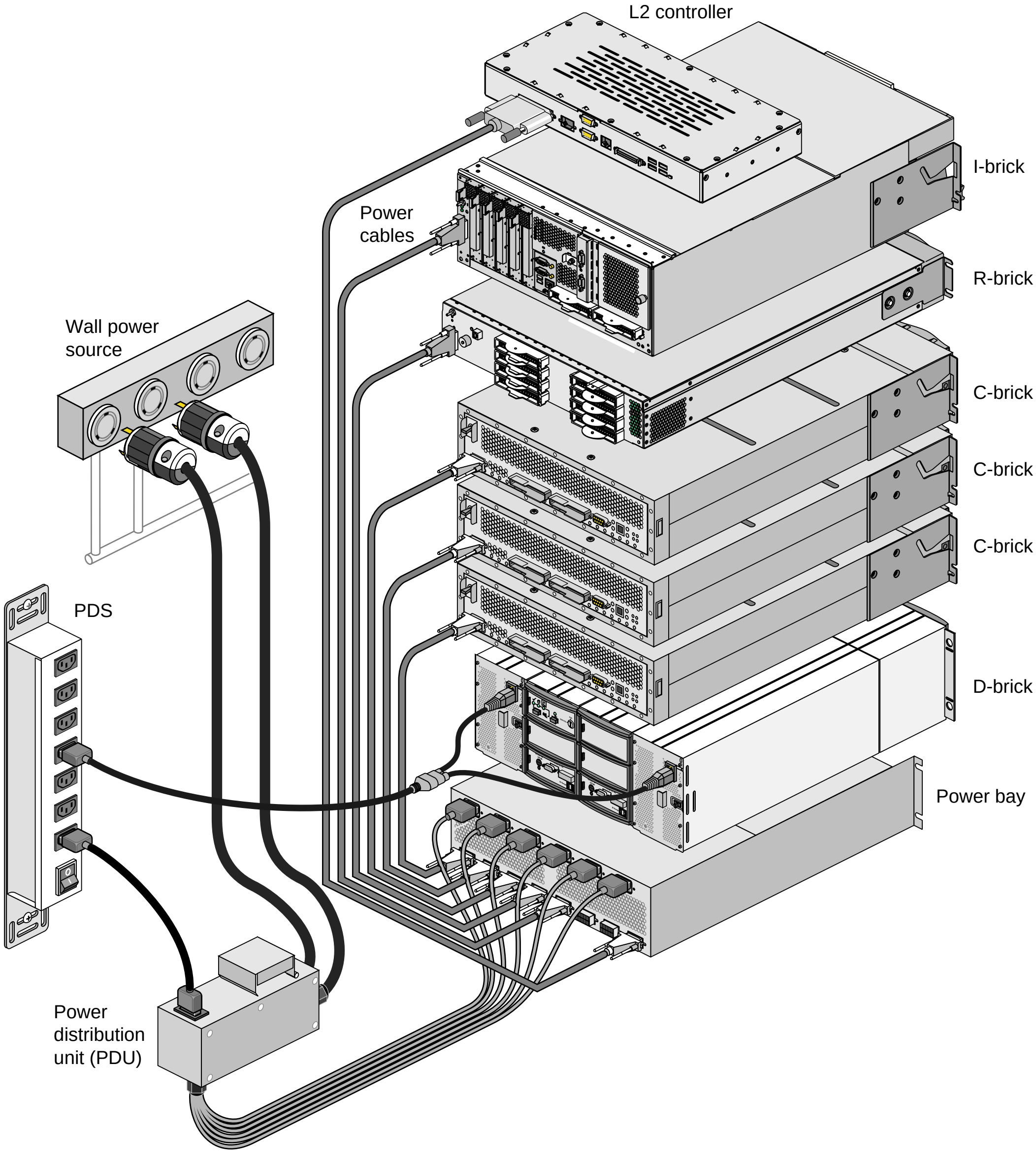

Figure 10-1 SGI Origin 3000 Series Power System (for Tall Racks)

Short Rack Power Devices

The power devices on a short rack used to house the SGI Origin 3200 server (shown in Figure 10-2) include the following items:

- **Power bay.** The SGI Origin 3200 that is housed in a short rack, can have only one power bay. Although each power bay can contain up to six 950 W hot-swappable power supplies, only three are required for the SGI Origin 3200 server. These power supplies connect to a common output power bus of the power bay. The power bay has the following connectors on its rear panel:
  - Although the power bay has six input power connectors, only three input power connectors (slots 4, 5, and 6 - one per power supply) connect each power supply that corresponds to the individual power connector to a wall power source through the power distribution strip (PDS).
  - Eight output connectors to connect to an individual brick's PWR (power) connector and provide power to the brick. (Each power supply provides power to all eight output connectors). These output connectors also connect to the L2 controller's power connector to provide power to the L2 controller. The L2 controller is optional on a short rack.
  - Fault Reset Switch that is used to reset the power bay.

Warning: To avoid personal injury and damage to the server system, only a qualified SGI system support engineer (SSE) can add, remove, replace, or service the power bays and power supplies. Contact your service provider for assistance.

- **One power distribution strip (PDS).** Any three of the six outlet connectors (the six topmost connectors on the PDS) can be used to connect to the leftmost input power connectors (slots 4, 5, and 6 [see Figure 10-3] to which power supplies are connected) on the power bay. The bottom-most connector on the PDS connects to the wall power source.
- **Cabling** to interconnect the PDS to the input power connectors on the power bay, and cabling to connect the individual bricks to the output connectors on the power bay.

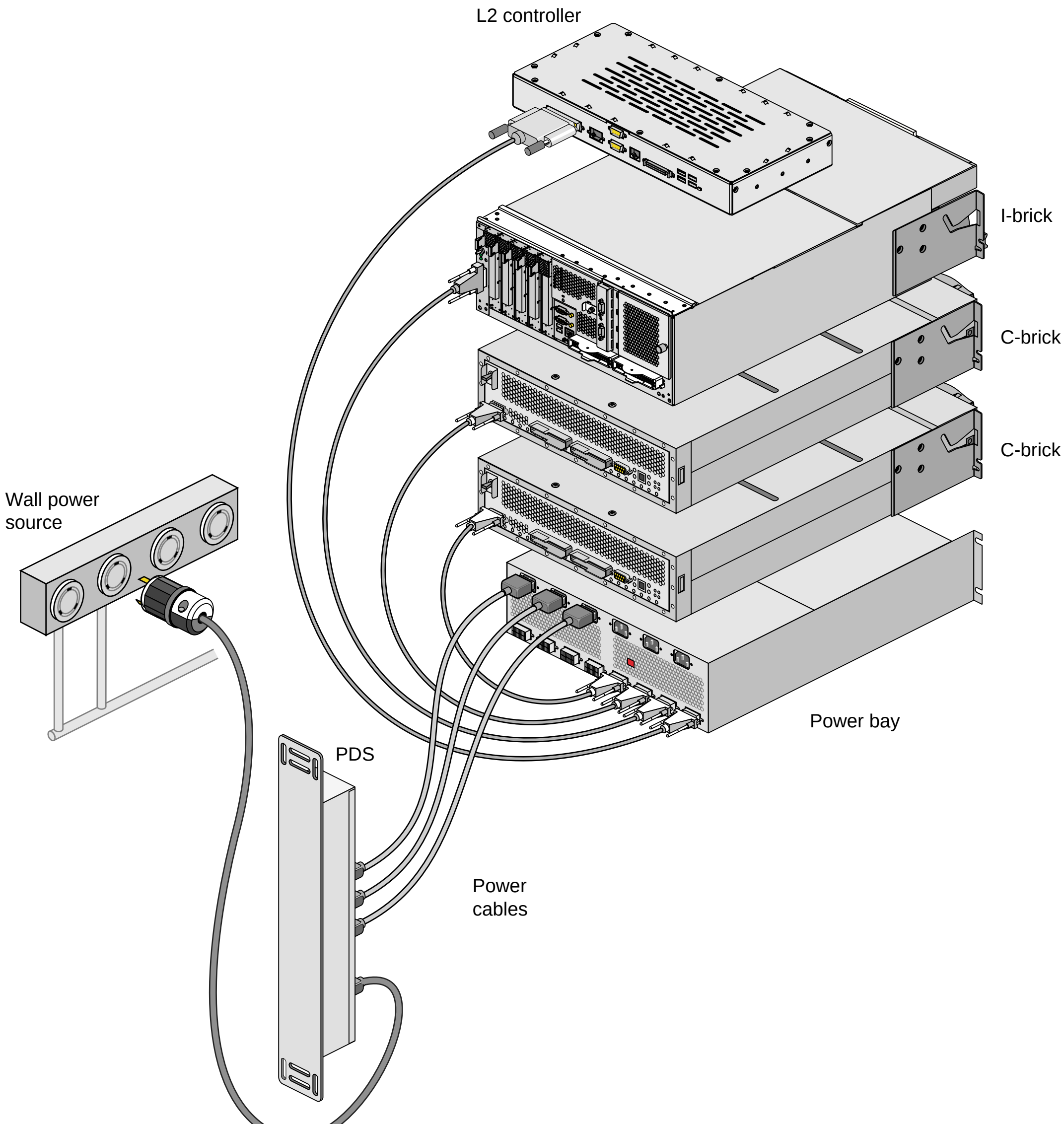

Figure 10-2 SGI Origin 3000 Series Power System (for Short Racks)

Power Bay Front Panel, Internal Components, and Functional Description

The short rack is shipped with one power bay; the tall rack is shipped with either one or two power bays, depending on the configuration.

Each power bay monitors, controls, and supplies AC power to as many as six hot-swappable power supplies that can be inserted into the power bays. When inserted into the power bay, these power supplies make up the power bay's front panel. Figure 10-3 shows six power supplies installed in the power bay and their numbering.

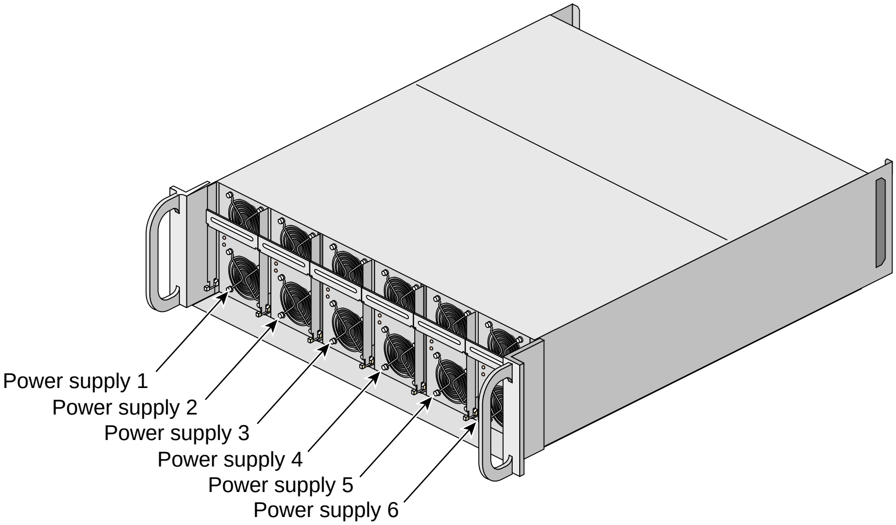

Figure 10-3 Power Bay Front Panel

Figure 10-4 shows front and rear views of one of the power supplies that are installed in the power bay:

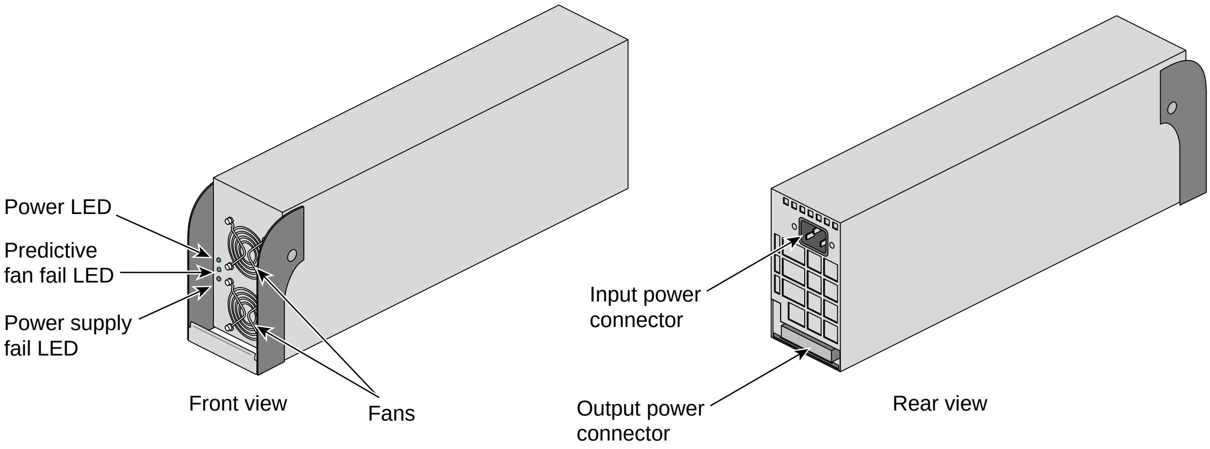

Figure 10-4 Front and Rear Views of Power Supply

The input and output power connectors shown in the rear view of the power supply interconnect with the power bus located inside the power bay.

The LEDs and fans shown on the front view of the power supply become the LEDs and fans of the power bay's front panel.

Power Management Card

The power bay's power management card, which connects to the power bay motherboard, is the control system for the power bay. The power management card, which provides a communication link between the power supplies and the power bay, contains the logic that powers on and powers off the power supplies and power bay ports, and monitors faults.

The power management card also contains a serial ID EEPROM that indicates the model and serial number of the unit and other information about the unit's capabilities and configuration. The L1 controller of a connecting brick reads this information via a serial bus (RS-422), which is part of the DC power cable.

Power Supply LEDs

Each power supply has three LEDs:

- Power
- Predictive fail (PFAIL)
- Power supply fail (FAIL)

Table 10-1 lists conditions of the power supplies and the corresponding states of the LEDs.

Table 10-1 Power Supply LED States

Condition	Power (Green)	PFAIL (Amber)	FAIL (Amber)
AC voltage not applied to all power supplies	Off	Off	Off
AC voltage not applied to this power supply	Off	Off	On
AC voltage present; standby voltage on	Blinking	Off	Off
Power supply DC outputs on	On	Off	Off
Power supply failure	Off	Off	On
Current limit reached on 48 VDC output	On	Off	Blinking
Predictive failure	On	Blinking	Off

Power Supply Fans and Airflow

Each power supply has two fans that move air from the front of the rack to the rear of the rack (see Figure 10-4). Blanking panels cover unoccupied spaces in the bay and must be present to prevent foreign objects from entering the power bay.

Power Supply Configuration

Each power bay contains either three or four distributed power supplies. The power bay supplies AC voltage to these power supplies and also monitors and controls the power supplies.

Each distributed power supply inputs the single-phase AC power can output 950 W at 48 VDC. The outputs are bussed together to provide a maximum of 3,800 W of available power in an N+1 redundant configuration, which means you have one additional 950 W power supply for reserve. This additional 950 W reserve power supply means that if you lose any one power supply, you still have enough power to power your system.

The number of power supplies in a power bay depends on the electrical requirements of the bricks in the rack. A minimum of two power supplies must be present per system at all times to provide standby 48 V power. A minimum of two supplies must be present to provide the N+1 redundant configuration. For example, a system with four C-bricks (which require a total of approximately 1232 W) and one R-brick (which requires approximately 60 W) would require three power supplies (two power supplies plus one redundant power supply, which together produce 2850 W).

VRM and DC-to-DC Converter Interactions with Power Bay

The voltage regulator modules (VRMs) and DC-to-DC converters in each brick receive 48 VDC from the power bay and convert it to the voltage levels required by the brick components.

When the power bay receives power from the PDU or PDS and the 12 V enable for the brick is on, the power bay powers on the L1 controller by supplying a 12 V standby voltage to the brick. The L1 controller signals the power bay to supply the 48 VDC to its brick if the brick is enabled.

You can enable a brick by pressing the On/Off switch (brick reset button), located below the L1 display, or by entering a console command. The power bay does not supply the 48 VDC to the brick until the L1 controller signals it to do so. (Unlike the L1 controller, the L2 controller receives the 48 VDC from the power bay immediately.)

When the brick receives the 48 VDC, the L1 controller controls the application of the 48 VDC to the VRMs and DC-to-DC converters within the brick. The VRMs and DC-to-DC converters convert the 48 VDC to the voltage levels required by the brick components.

Power Bay Rear Panel Connectors and Fault Reset Switch

Besides the power supplies and the power management card, the power bay contains the following input and output connectors as shown in Figure 10-5:

- **Six input power connectors.** These six input power connectors (one per corresponding power supply) connect the individual power supply to a power receptacle through the power distribution units (PDUs) or power distribution strips (PDSs). (Each power supply in the power bay gives power to each of the power bay's eight output connectors.)
- **Eight output connectors.** A power cord connects an output connector to a brick. This connection provides 48 VDC and 12 V standby voltage and monitoring signals to the brick. The L2 controller also connects to these output connectors.

  Note: If you have two power bays in an SGI Origin 3400 server rack enclosure, the L2 controller is connected to the uppermost power bay. If you have two power bays in an SGI Origin 3800 server rack enclosure, the L2 controller is connected to the lowermost power bay.

- **Fault Reset Switch.** Use this switch to reset the power bay.

Note: The D-brick has two power supplies of its own. Because these power supplies need 220 VAC, they bypass the power bay, which provides 12 VDC and 48 VDC, and connect directly to a PDS outlet connector.

Note: The L1 controller of a connecting brick can monitor the status of the power bay; however, it cannot control the power bay.

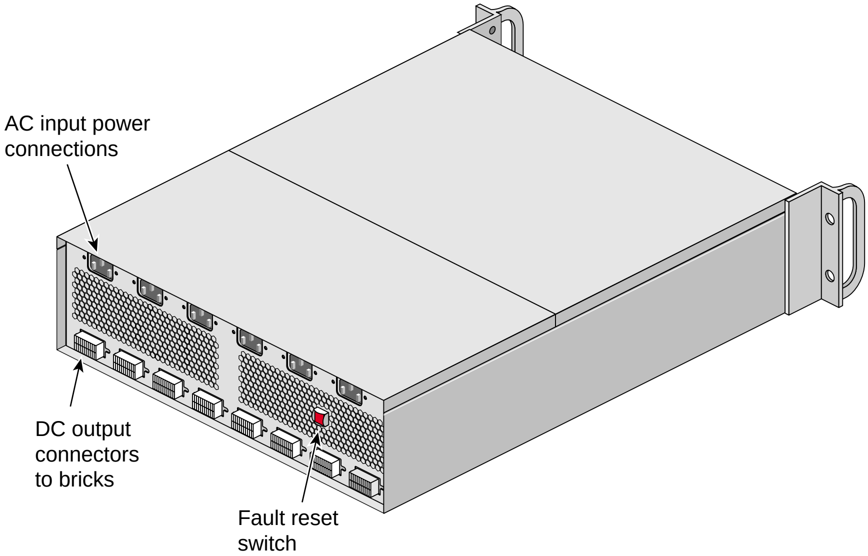

Figure 10-5 Rear View of Power Bay

Power Distribution Units (PDUs)

Each tall rack enclosure is shipped with either one or two single-phase PDUs or one three-phase PDU. Table 10-2 describes these PDUs.

Table 10-2 Power Distribution Units

Phase Type	Voltage	Country Standard	Number of Wall Outlet Connectors	Number of Output Power Cables to Power Bay
Single-phase	200-240 VAC	North America/Japan	2 per PDU	6 connectors
Three-phase	200-240 VAC	North America/Japan	1 per PDU	12 connectors
Single-phase	200-240 VAC	International	2 per PDU	6 connectors
Three-phase	400 VAC	International	1 per PDU	12 connectors

Power Distribution Strips (PDSs)

All I/O rack enclosures and compute rack number 001 enclosures come with a PDS. Table 10-3 describes these PDSs.:

Table 10-3 Power Distribution Strips

Voltage	Country Standard	Number of Wall Outlet Connectors	Number of Connectors to Power Supplies in Power Bay
200-240 VAC	North America/International	1 per PDS	3 connectors

Cabling

You need the following cables to enable the SGI Origin 3000 servers' power system:

Warning: To avoid personal injury or damage to your system, all cabling is done by an SGI system support engineer (SSE).

- Cables that connect the PDU to the input connectors on the power bay. One cable is needed for each of the six input connectors that has a power supply inserted in the location that corresponds to the position of the connector.
- Cables to connect the eight output connectors on the power bay to the PWR (power) connectors on the individual bricks.
- A cable to connect the L2 controller power connector to one of the eight output connectors on the power bay.
- A Y cable to connect the two power bays that reside in the D-brick to a PDS outlet connector (220 VAC).

Note: If you have two power bays in an SGI Origin 3400 server rack enclosure, the L2 controller is connected to the uppermost power bay. If you have two power bays in an SGI Origin 3800 server rack enclosure, the L2 controller is connected to the lowermost power bay.

Maintenance and Troubleshooting

This chapter contains hardware-specific information that helps you maintain and troubleshoot your SGI Origin 3000 series server.

This chapter consists of these sections:

Warning: Before installing, operating, or servicing any part of this product, please read the "Safety Instructions" on page 300.

Performing Maintenance

Although you can perform the following maintenance activities, a qualified SGI system support engineer (SSE) can also perform the following maintenance tasks on an SGI Origin 3000 series server for you:

- Adding, replacing, or removing PCI cards into or out of the I-brick and P-brick.
- Adding, replacing, or removing disk drives into or out of the D-brick.

The PCI cards and disk drives are hot-pluggable, meaning that although you do not have to power down the individual brick involved, you do have to power down the slot where you are to add, replace, or remove the PCI card or disk drive.

Warning: To avoid personal injury or damage to your system, only an SGI system support engineer (SSE) can add or replace a fibre channel disk drive, fans, and a CD-ROM in the I-brick. Also, only an SGI SSE can add or replace an XIO board in the X-brick and a power supply in the power bay.

A trained SGI SSE must power down individual bricks for most maintenance activities; however, the server can remain powered on. The following are some examples of the maintenance an SSE can perform without powering down the server:

- The IRIX operating system allows an SSE to remove (partition) a C-brick from the system, power it off, perform the maintenance activity, power it on, and configure it back into the system. All of these activities can occur while the operating system is running.
- An SGI SSE can replace a power supply in the power bay without powering down the system.

The following are some examples where the maintenance can be performed without powering down the individual brick involved:

- An SGI SSE can replace fans and the CD-ROM on the I-brick without powering down the I-brick.
- An SGI SSE can add, replace, or remove an XIO card in the X-brick without powering down the X-brick.
- You or an SGI SSE can add, replace, or remove a PCI card without powering down the I-brick or P-brick (the individual slot will have to be powered down, however).
- You or an SGI SSE can add, replace, or remove a disk drive module without powering down the D-brick (the individual slot will have to be powered down, however).

Adding or Removing Disk Drive Modules

See “Adding and Removing Disk Drive Modules” on page 173 for instructions on adding, replacing, or removing disk drive modules in the D-brick.

See the troubleshooting section in Chapter 8, “D-brick” for instructions on troubleshooting the D-brick

Adding or Replacing a PCI Card

See “PCI Card Description and Installation” on page 142 for instructions on adding, replacing, or removing a PCI card.

Cabling Examples

This chapter describes the brick connectors that are used to cable the bricks together and provides cabling examples in the following sections:

Warning: The cabling examples in this chapter are shown to you only for your understanding of how the bricks in your system are cabled together. For your safety and for the protection of your server system, only your SGI system support engineer (SSE) can cable together the bricks in your SGI Origin 3000 series server system.

Connectors Used to Cable the Bricks Together

With the exception of the D-brick, all the SGI Origin 3000 series server systems bricks are cabled together with NUMAlink cables.

Note: The D-brick is cabled to the server through the cabling of its Gigabit Interface Connector (GBIC) port to a host bus adapter (HBA) PCI card in an I-brick or P-brick on your server. For more details about this connection, see the GBIC port description under "FC-AL Loop Resiliency Circuit (LRC) I/O Modules" on page 167.

This section describes and illustrates the brick connectors that are used to cable the bricks together in an SGI Origin 3000 series server system. This sections describes the connectors for the C-brick, I-brick, P-brick, X-brick, and R-brick.

C-brick Connectors

The following C-brick connectors shown in Figure 12-1 are used to connect the C-brick to other bricks in the SGI Origin 3000 series server system:

LINK (NI - Network Interface) connector. This connector connects the C-brick to an R-brick or to another C-brick if the system does not have an R-brick, such the SGI Origin 3200 server. This connection is made with a NUMAlink 3 cable at 1.6 GB/sec in each direction.

The LINK connector LEDs light yellow when connector is cabled securely to an R-brick. LEDs light green when connection is negotiated with device with which connector is cabled.

XIO (II - I/O Interface) connector. This connector connects a C-brick to an I/O-brick (I-brick, P-brick, or X-brick); this connection occurs via a NUMAlink 3 cable at 1.2 GB/sec in each direction.

The XIO connector LEDs light yellow when connector is cabled securely to an I/O device. LEDs light green when connection is negotiated with device with which connector is cabled.

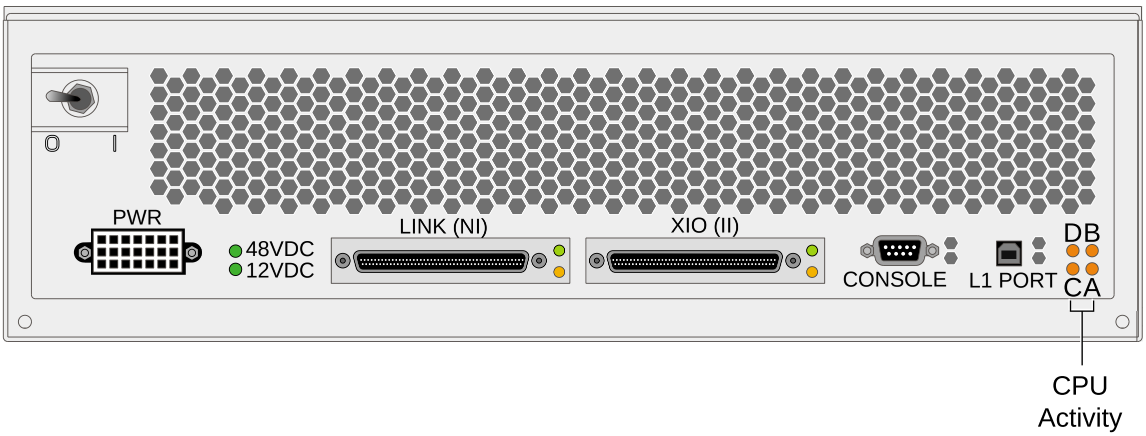

Figure 12-1 C-brick Rear Panel

I-brick Connectors

Figure 12-2 shows the following I-brick connectors (and LEDs) used to connect the I-brick to C-bricks in the SGI Origin 3000 series server system:

- **XIO 11 and XIO 10 connectors.** Each of these connectors can connect the I-brick to a C-brick. As an option, the second connector can be connected to another C-brick to create a dual-ported I-brick, which would provide greater bandwidth.
- **XIO 11 and XIO 10 connector LEDs.** Light yellow when the connector is cabled securely to the C-brick device, and light green when the connection is negotiated with the C-brick device with which the connector is cabled.

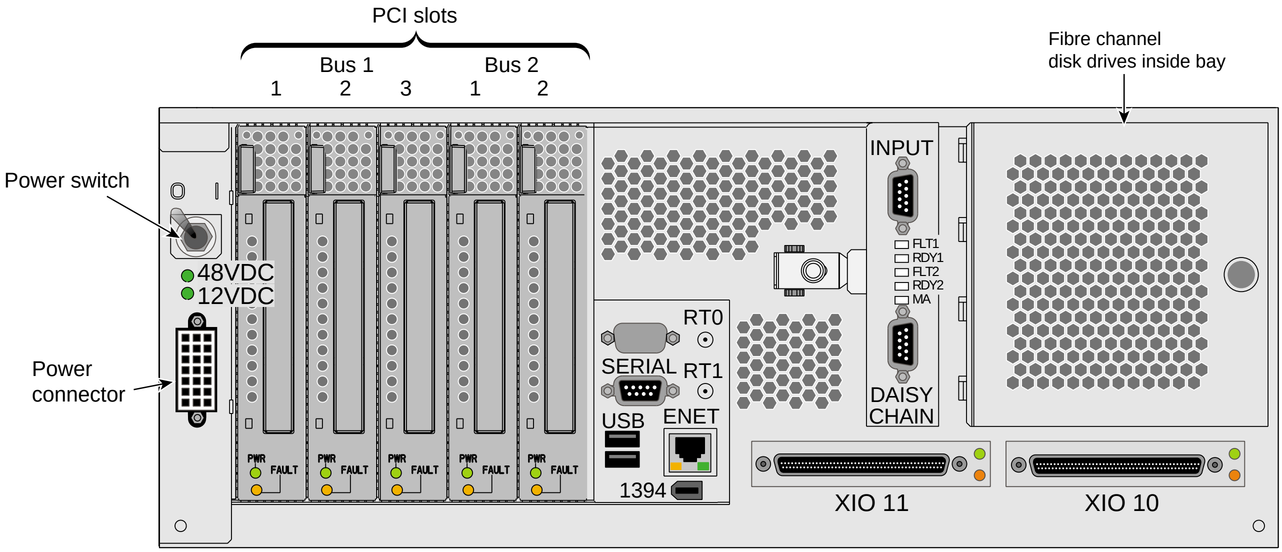

Figure 12-2 I-brick Rear Panel

P-brick Connectors

Figure 12-3 shows the following P-brick connectors (and LEDs) used to connect the P-brick to C-bricks in the SGI Origin 3000 series server system:

- **XIO 10 and XIO 11 connectors.** These connectors connect the P-brick to a C-brick. As an option, the second connector can be connected to another C-brick to create a dual-ported P-brick, which would provide greater bandwidth.
- **XIO 10 and XIO 11 connector LEDs.** Light yellow when the connector is cabled securely to the C-brick device. Light green when the connection is negotiated with the device with which the connector is cabled.

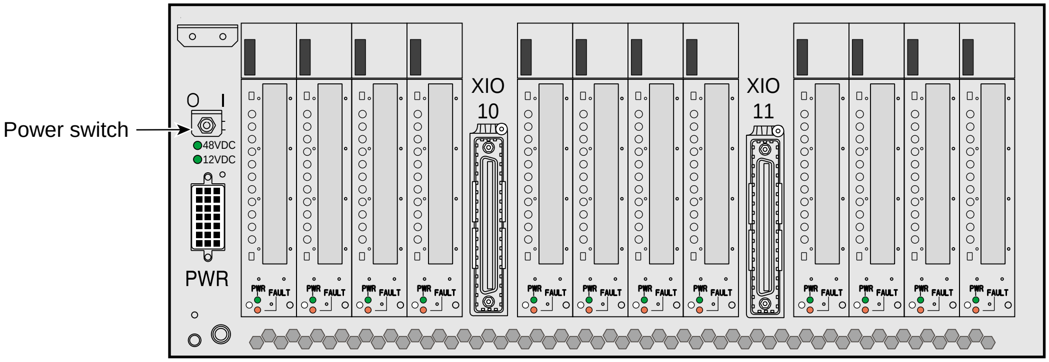

Figure 12-3 P-brick Rear Panel

X-brick Connectors

Figure 12-4 shows the following X-brick connectors (and LEDs) used to connect the X-brick to C-bricks in the SGI Origin 3000 series server system:

- **XIO 11 and XIO 10 connectors.** These connectors connect the X-brick to a C-brick. Only one connector is required to connect to a single C-brick. As an option, the second connector can be connected to another C-brick to create a dual-ported X-brick, which would provide greater bandwidth.
- **XIO 11 and XIO 10 connector LEDs.** LEDs light yellow when the connector is cabled securely to the C-brick device, and light green when the connection is negotiated with the device with which the connector is cabled.

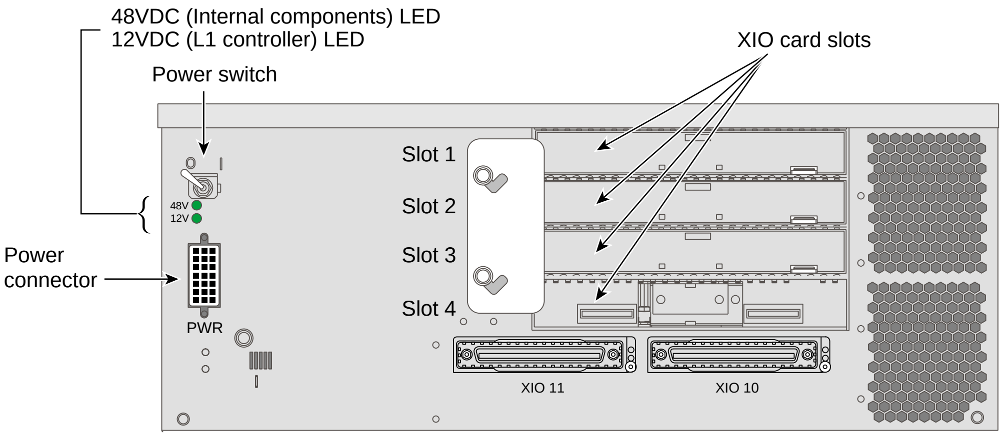

Figure 12-4 X-brick Rear Panel

R-brick Connectors

Figure 12-5 shows the following R-brick connectors (and LEDs) used to connect the R-brick to other bricks in the SGI Origin 3000 series server system:

- **Links R TO R** (1, 6, 7, and 8 or A, F, G, and H). These link connectors connect the R-brick to other R-bricks in the server system.
- **Link connector LEDs.** All the link connectors (1 through 8) have two LEDs (one that lights green and another that lights yellow):
  - The green LED (the hardware LED) lights to indicate that a cable is connected properly between the R-brick and another brick.
  - The yellow LED (the software LED) lights to indicate that packets are being transferred successfully across the link.
- **Links R TO R and C TO R** (2, 3, 4, and 5 or B, C, D, and E). These link connectors connect the R-brick to C-bricks.

Note: Links 2, 3, 4, and 5 are also used in the metarouter to connect other routers in server configurations greater than 128 processors.

Besides link signals, links 2, 3, 4, and 5 carry system controller USB signals, which are distributed over the network cables. Since the C-bricks require USB signals, the C-bricks are cabled only to ports 2, 3, 4, and 5.

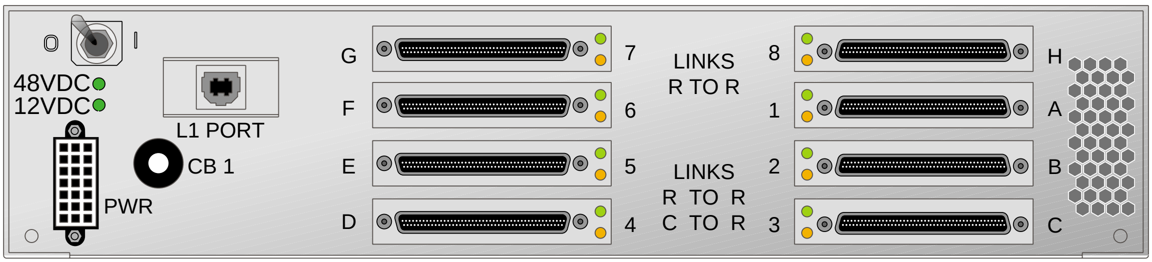

Figure 12-5 R-brick Rear Panel

If the SGI Origin 3400 server system has more than four C-bricks, C-bricks are cabled to a second R-brick as shown in Figure 12-6. These C-bricks communicate with the first four C-bricks through a connection between the R-bricks. R-brick to R-brick links use ports 1, 6, 7, and 8 located on the top half of the R-brick panel and labeled LINKS R TO R.

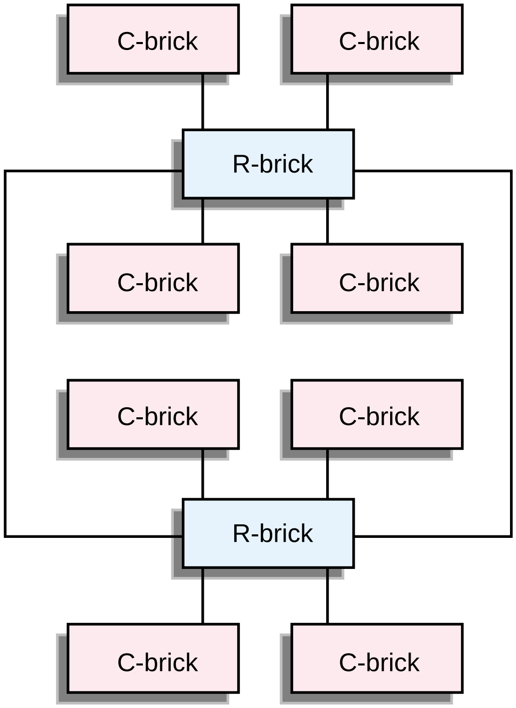

Figure 12-6 R-brick Connections

In the case of a server configuration greater than 128 processors, the metarouters would use links 1, 6, 7, and 8 in addition to Links 2, 3, 4, and 5, which are normally used to connect directly to C-bricks.

Cabling Examples

This section shows cabling examples for the SGI Origin 3200, SGI Origin 3400, and SGI 3800 server systems.

SGI Origin 3200 Server Cabling Example

Figure 12-7 shows an example of the cabling together with NUMAlink cables of the bricks in an SGI Origin 3200 server:

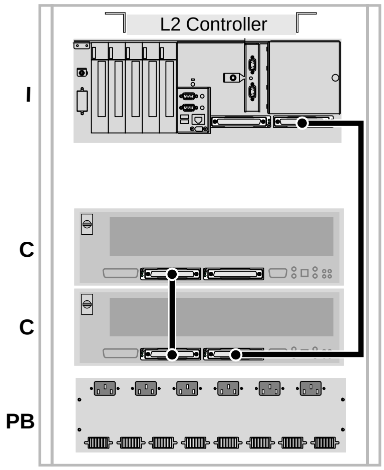

Figure 12-7 SGI Origin 3200 Server Cabling Example

SGI Origin 3400 Server Cabling Example

Figure 12-8 shows an example of the cabling together of the bricks in an SGI Origin 3400 server:

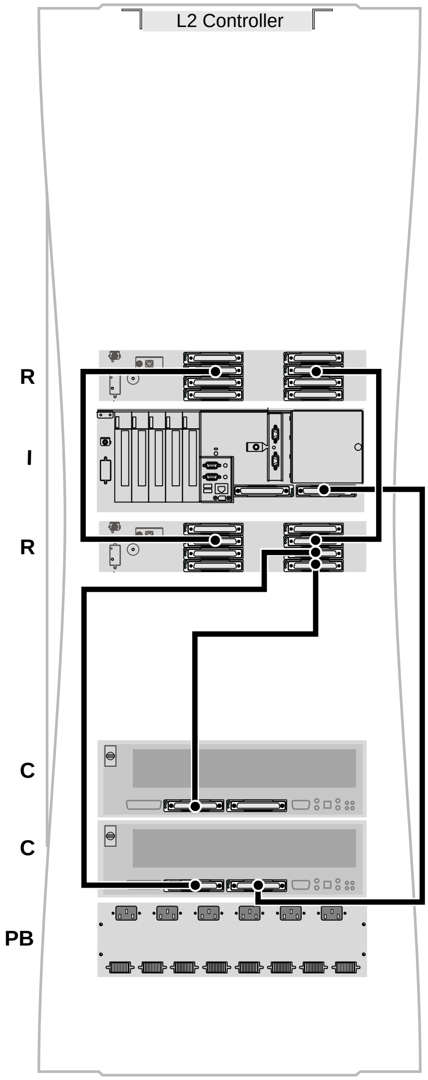

Figure 12-8 SGI Origin 3400 Server Cabling Example

SGI Origin 3800 Server Cabling Example

Figure 12-9 shows an example of the cabling together of the bricks in an SGI Origin 3800 server:

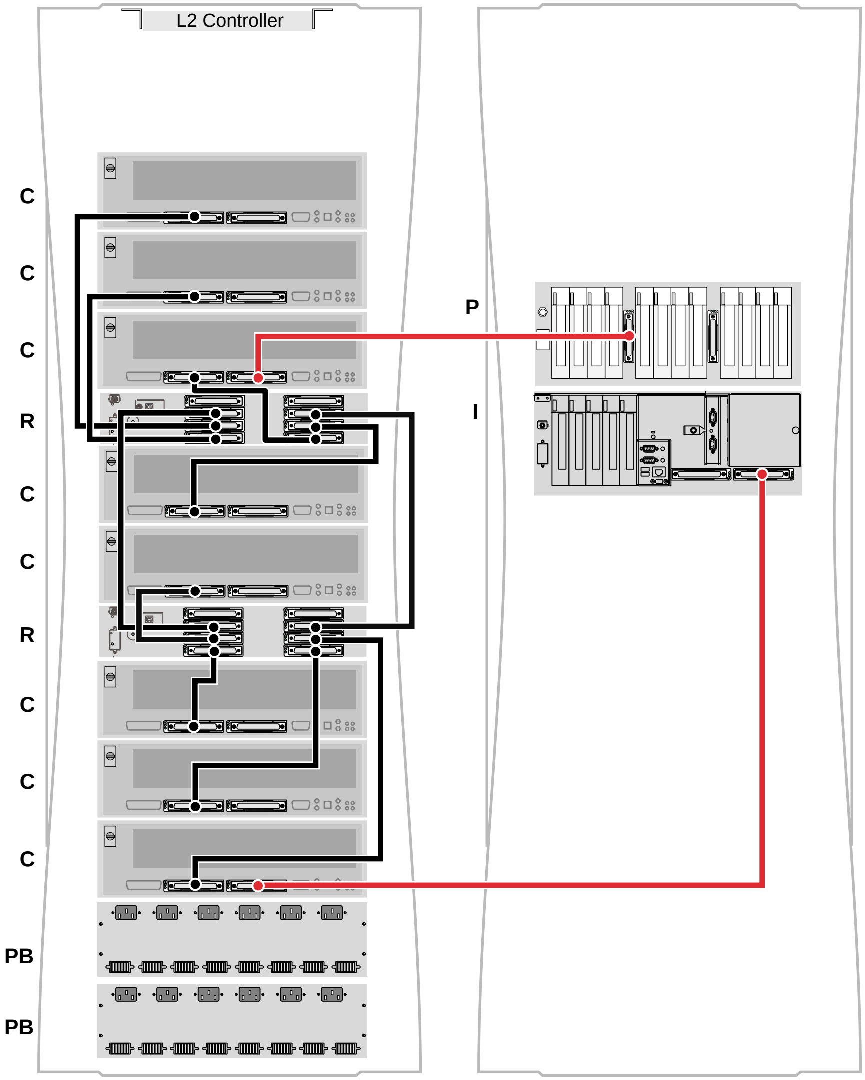

Figure 12-9 SGI Origin 3800 Server Cabling Example

Technical Specifications

This appendix lists technical specifications of the SGI Origin 3000 series server in these sections:

- "System-Level Specifications" on page 223
- "Brick-Level Specifications" on page 225
- "Power Specifications" on page 226

System-Level Specifications

Table A-1 summarizes system configuration ranges.

Table A-1 System Configuration Ranges

Category	Minimum	Maximum
Processors	2	512
Peak performance	~2000 Mflops (one 2P node brick)	~512 Gflops (128 4P node bricks)
C-brick memory capacity	512 MB	8 GB
System main memory capacity	512 MB (one node brick)	1 Tbyte (128 node bricks)
I/O channels	1	128
Aggregated peak I/O bandwidth	0.768 GB/sec (one I-brick)	~ 152 GB/sec (one I-brick and 63 P-bricks)

Table A-2 lists the physical specifications for the short rack.

Table A-2 Short Rack Physical Specifications

Characteristic	Specification
Height	36.06 in. (916 mm)
Width	25.38 in. (645 mm)
Depth	40.63 in. (1032 mm)
Weight (maximum)	475 lbs (215 kg)
Shipping weight (maximum)	550 lbs (249 kg)

Table A-3 lists the physical specifications of the tall rack.

Table A-3 Tall Rack Physical Specifications

Characteristic	Specification
Height	74.25 in. (1886 mm)
Width	30.00 in. (762 mm)
Depth	51.50 in. (1308 mm)
Weight (maximum)	Compute rack = 1145 lb (519 kg); I/O rack = 1225 lb (557 kg)
Shipping weight (maximum)	Compute rack = 1508 lb (684 kg); I/O rack = 1588 lb (722 kg)

Brick-Level Specifications

Table A-4 lists the physical specifications for all bricks.

Table A-4 Brick Physical Specifications

Brick or Bay	Height	Height	Maximum Weight
C-brick	3U	5.25 in. (133 mm)	65 lb (29 kg)
I-brick	4U	7.00 in. (178 mm)	69 lb (31 kg)
P-brick	4U	7.00 in. (178 mm)	70 lb (32 kg)
X-brick	4U	7.00 in. (178 mm)	69 lb (31 kg)
D-brick	4U	7.00 in. (178 mm)	94 lb (43 kg)
R-brick	2U	3.50 in. (89 mm)	18 lb (8 kg)
L2 controller	1U	1.75 in. (44 mm)	3.9 lb (2 kg)
Power bay	3U	Height 5.10 in. x Width 17.50 in. x Depth 24.50 in. (130 mm x 445 mm x 622 mm)	72 lb (33 kg) fully loaded with 6 power supplies
Power supply	3U	Height 5.00 in. x Width 2.80 in x Depth 13.00 in. (127 mm x 71 mm x 330 mm)	8 lb (4 kg)

Power Specifications

Table A-5 shows the power requirements of individual bricks.

Table A-5 Brick Power Consumption

Brick	Maximum Power Consumption	Input Power
C-brick with 2 processors	250 W	48 VDC
C-brick with 4 processors	308 W	48 VDC
I-brick	190 W	48 VDC
P-brick	225 W	48 VDC
X-brick	225 W	48 VDC
D-brick	350 W	180-254 VAC (50/60 Hz
R-brick	60 W	48 VDC
L2 controller	37 W	48 VDC
Power supply[a]	950 W (maximum)	

a. Power supply efficiency needs to be considered if calculating total AC power input.

The following sections provide more details about the I-brick, P-brick, R-brick, and X-brick.

I-brick:

- Supports a CD-ROM
- Supports five 64-bit PCI slots to support 3.3/Universal VDC PCI cards (three slots support 33-MHz and two slots support either 33-MHz or 66-MHz PCI cards)
- Supports two 3.5-in. sled-mounted Fibre Channel disk drives
- FC disk controller uses one of the PCI slots

P-brick:

- Supports twelve 3.3/Universal volt PCI cards (all slots support either 33-MHz or 66-MHz PCI cards).

The P-brick power board supplies an average of 17.5 W (5.3 A, 3.3 V) of power to each PCI slot; however, a PCI card may consume as much as 25 W of power. The L1 controller controls how the power board applies power to the PCI cards. Starting with lowest numbered slot, the power board continues to apply power to the PCI cards starting with the lowest numbered slot. It continues to apply power to the PCI slots until all of the power has been consumed. The L1 controller uses two presense pins in each PCI slot to calculate the total power consumption of the PCI cards. The L1 controller prints a message to the console if there is not enough power for all of the PCI cards.

X-brick:

- Four XIO slots

The power board contains the logic components of the X-brick's L1 controller, five VRMs, one DC-to-DC converter, and three voltage regulators. The VRMs, DC-to-DC converter, and voltage regulators convert the incoming 48 VDC to voltage levels required by the components in the brick.

R-brick:

- One USB port (connects to L2 controller)
- Eight NUMAlink I/O connectors (located in rear)
- Input power is +48 VDC (~60 W)

Table A-6 shows power supply electrical data

Table A-6 Power Bay and Power Supply Specifications

Feature	Value
Power bay supplies	4.4 kW continuous power (if all six supplies are being used)
Maximum output rating per power supply	950 W
Output connection	Eight 48 VDC
Cable (power input)	AC input (200-240 VAC 1P 20 A each cord)

System Controller Commands

This appendix lists L1 and L2 commands for the SGI Origin 3000 servers in these sections:

- "L1 Controller Command Set" on page 229
- "L2 Controller Command Set" on page 267

L1 Controller Command Set

The following subsections describe the L1 controller command set. The commands are listed alphabetically and include examples of output where applicable.

* (asterisk character)

Use the asterisk character (*) to broadcast a command. A command that is broadcast is sent to all of the bricks that are attached to the C-brick that issued the command. The broadcast option is valid only from the C-brick. Example B-1 shows sample output from the `* version` command.

Example B-1 `* version` Command Output

```
001c07-L1>* version
001c07:
L1 0.7.27 (Image A), Built 04/28/2000 13:06:43    [P1 support]
001i21:
L1 0.8.xx (Image B), Built 06/13/2000 09:54:32    [P1 support]
```

bedrock

The bedrock set of commands provides the status of and sets the L1 controller-to-hub-ASIC protocol setting. There are two commands in this set, which is valid only for the C-brick:

- `bedrock`
- `bedrock ppp`

Note: For the bedrock command set, you can use the mnemonic `bdrck` instead of the word `bedrock`.

Use the `bedrock` command to determine the current settings for the L1-controller-to-hub-ASIC protocol. Example B-2 shows sample output from this command, and Table B-1 lists the valid protocols. (Use the `l1dbg` set of commands to turn debugging on or off.)

Example B-2 `bedrock` Command Output

```
001c003-L1>bedrock
bedrock protocol is PPP
```

Table B-1 Valid Protocols

Name	Description
PPP	Point-to-point protocol

Use `bedrock ppp` to set the L1 controller-to-hub protocol to PPP. Example B-3 shows sample output from this command.

Example B-3 `bedrock ppp` Command Output

```
001c003-L1>bedrock ppp
bedrock protocol is PPP
```

brick

The brick set of commands provides the status of and sets the brick location and type. The following are the commands in this set:

- `brick`
- `brick rack` <*racknumber*>
- `brick slot` <*slotnumber*>
- `brick partition none`
- `brick partition` <*partition*>

Note: For this command set, you can use the mnemonics `upos` and `part` instead of the words `slot` and `partition`.

Use the `brick` command to determine the brick location and type. Example B-4 shows sample output from the `brick` command.

Example B-4 `brick` Command Output

```
001c07-L1>brick
rack: 001 slot: 07 partition:0type: C source: EEPROM
```

Use `brick rack` <*racknumber*> to set the rack number where the brick is located. Example B-5 shows sample output from the `brick rack` <*racknumber*> command.

Example B-5 `brick rack` <*racknumber*> Command Output

```
001c07-L1>brick rack 1
brick rack set to 001.
```

Use `brick slot` <*slotnumber*> to set the brick unit position (slot number) in the rack. The variable <*slotnumber*> is a unit number from 01 to 39. Example B-6 shows sample output from the `brick slot 07` command.

Note: For the `brick slot` <*slotnumber*> command, the mnemonic `upos` may replace the word `slot`.

Example B-6 `brick slot 07` Command Output

```
001c07-L1>brick slot 07
brick slot set to 07.
```

Use `brick partition none` to clear the brick partition number. Example B-7 shows sample output from this command.

Example B-7 `brick partition none` Command Output

```
001c07-L1>brick partition none
brick partition cleared.
```

Use `brick partition` <*partition*> to set the brick partition number. Example B-8 shows sample output from this command.

Example B-8 `brick partition` <*partition*> Command Output

```
001c07-L1>brick partition 1
brick partition set to 1.
```

ctc <cmd>

Use the `ctc` <*cmd*> command to send a command to an attached C-brick. This command is valid only for a C-brick. Example B-9 shows sample output from the `ctc version` command.

Example B-9 `ctc version` Command Output

```
003c01-L1>ctc version
002c01:
L1 0.7.37 (Image A), Built 05/24/2000 14:59:42    [P1 support]
```

ctci <cmd>

Use the `ctci` <*cmd*> command to send a command to an I/O brick (X-brick, P-brick, or I-brick) that connects to an attached C-brick. This command is valid only for a C-brick. Example B-10 shows sample output from the `ctci version` command.

Example B-10 `ctci version` Command Output

```
003c01-L1>ctci version
001x01:
L1 0.7.37 (Image A), Built 05/24/2000 14:59:42    [P1 support]
```

cti <cmd>

Use the `cti` <*cmd*> command to send a command to an attached I/O brick. This command is valid only for the C-brick. Example B-11 shows sample output from the `cti version` command.

Example B-11 `cti version` Command Output

```
003c01-L1>cti version
004i01:
L1 0.7.37 (Image A), Built 05/24/2000 14:59:42    [P1 support]
```

config

Use the `config` command to view the L1 controller configuration information. Example B-12 shows sample output from the `config` command.

Example B-12 `config` Command Output

```
003c01-L1>config
:0 - 003c01
:1 - 004i01
:2 - 002c01
:3 - 001x01
003c01-L1>
```

In the output, the first number after the colon is the L1 index number. Table B-2 lists the values of the L1 index for a C-brick and an R-brick. Only L1 index number 0 is valid for an R-brick.

Table B-2 L1 Index Values for C-brick and R-brick

L1 Index	Name	Description
0	Local brick	The C-brick or R-brick that contains the L1 issuing the command.
1 (Applies to C-brick only)	Attached I/O brick	An I/O brick that connects to the local brick.
2 or 3 (Applies to C-brick only)	Attached C-brick	A C-brick that connects to the local brick.
3 or 4 (Applies to C-brick only)	I/O brick attached to the attached C-brick	An I/O brick that connects to a C-brick that connects to the local brick.

Table B-3 lists the values of the L1 index for an I/O brick.

Table B-3 L1 Index Values for I/O brick

L1 Index	Name	Description
0	Local brick	The I/O brick that contains the L1 issuing the command.
1	Attached C-brick on port A	A C-brick that connects to the local brick through port A.
2	Attached C-brick on port B	A C-brick that connects to the local brick through port B.
3	Attached C-brick on port C	A C-brick that connects to the local brick through port C.
4	Attached C-brick on port D	A C-brick that connects to the local brick through port D.

The number that follows the L1 index, after the dash, is the brick identification (for example, 003c01). The first three digits of the brick identification indicate the rack in which the brick resides. The fourth digit of the brick identification indicates the type of brick (see Table B-4). The last two digits of the brick identification indicate the slot position in which the brick resides.

Table B-4 Valid Brick Types

Type	Description
c	C-brick
i	I-brick
p	P-brick
r	R-brick
x	X-brick
n	N-brick
g	G-brick
?	Unknown brick type

date

Use the date set of commands to view and set the current date and time used by the L1 controller. There are three commands in this set:

- `date`
- `date set` <*value*>
- `date set tz` <*value*>

Use the `date` command to view the current date and time value used by the L1 controller. Example B-13 shows sample output from the `date` command.

Example B-13 `date` Command Output

```
001r19-L1>date
09/14/4655  22:47:07
```

Use `date set` <*value*> command to set the date and time value used by the L1 controller. The variable <*value*> is a time value in the form *yyyymmddHHMMSS* (where *yyyy* is the four-digit year, *mm* is a two-digit month, *dd* is a two-digit day, *HH* is a two-digit hour, *MM* is a two-digit minute, and *SS* is a two-digit second).

Use `date set tz` <*value*> to set the time zone offset used by the L1 controller. The variable <*value*> is a maximum of +12 (for 12 hours ahead of GMT) and a minimum of -12 (for 12 hours behind GMT).

debug

The debug set of commands provides the status of and sets the virtual debug switches. There are two commands in this set, which is valid only for C-bricks:

- `debug`
- `debug` <*switches*>

Use the `debug` command to determine the current settings for the virtual debug switches. Example B-14 shows sample output from the `debug` command.

Example B-14 `debug` Command Output

```
001c07-L1>debug
debug switches set to 0x0000.
```

Use `debug` <*switches*> command to set the virtual debug switches. The variable <*switches*> is a hexadecimal value for the switches. Example B-15 shows sample output from this command.

Example B-15 `debug` <*switches*> Command Output

```
001c07-L1>debug 0x0001
debug switches set to 0x0001
```

display

The display set of commands displays text on the front panel display and controls the LEDs on the front panel display. There is one command in this set:

- `display`

Use the `display` command to view the front panel display status. Example B-16 shows sample output from the `display` command.

Example B-16 `display` Command Output

```
001c07-L1>display
line 1: 001c10
line 2: powered up
```

eeprom

Use the `eeprom` command to view the eeprom data for a brick.

Example B-17 shows sample output from the `eeprom` command.

Example B-17 `eeprom` Command Output

```
001c07-L1>eeprom
PWR/LOG (UNKNOWN)
43 20 01 06 00 00 00 d9 00 02 17 c2 4e 41 c2 4e
41 c1 00 00 00 00 00 84 ff ff ff ff ff ff ff ff
ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff
00 09 00 3a 52 21 c9 43 45 4c 45 53 54 49 43 41
c4 49 50 33 35 c6 4b 48 4b 35 36 35 cc 30 33 30
5f 31 36 30 34 5f 30 30 31 00 c2 5f 46 01 02 c2
30 30 04 ff ff ff ff 04 ff ff ff ff 04 ff ff ff
ff c1 00 00 00 00 00 25 ff ff ff ff ff ff ff ff
PIMM 0 - no hardware detected
PIMM 1 - no hardware detected
DIMM 0    (SPD)
80 08 07 0c 0a 02 48 00 04 a0 80 02 80 08 08 01
0e 04 04 01 02 26 00 00 00 00 00 50 3c 50 30 40
b0 b0 60 60 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 51
ce 00 00 00 00 00 00 00 01 4b 4d 4d 33 20 34 36
4c 33 33 31 33 42 20 54 2d 47 30 20 42 05 00 14
16 02 09 ff ff ff ff ff ff ff ff ff ff ff ff ff
ff ff ff ff ff ff ff ff ff ff ff ff ff ff 64 ff
DIMM 2    - no hardware detected
DIMM 4    - no hardware detected
DIMM 6    - no hardware detected
DIMM 1    (SPD)
80 08 07 0c 0a 02 48 00 04 a0 80 02 80 08 08 01
0e 04 04 01 02 26 00 00 00 00 00 50 3c 50 30 40
b0 b0 60 60 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 51
ce 00 00 00 00 00 00 00 01 4b 4d 4d 33 20 34 36
4c 33 33 31 33 42 20 54 2d 47 30 20 42 05 00 14
19 02 09 ff ff ff ff ff ff ff ff ff ff ff ff ff
ff ff ff ff ff ff ff ff ff ff ff ff ff ff 64 ff
DIMM 3    - no hardware detected
DIMM 5    - no hardware detected
DIMM 7    - no hardware detected
```

env

The env set of commands provides the status of environmental conditions in a brick and turns environmental monitoring on and off. The following are the commands in this set:

- `env`
- `env altitude` <*high*|*low*>
- `env reset`

Use the `env` command to view the status of the voltage, fan speed, and internal temperature of a brick. The output of the `env` command is divided into four areas: environmental monitoring and auto start status, voltage status, fan status, and temperature status (see Example B-18).

Example B-18 `env` Command Output

```
001c07-L1>env

Environmental monitoring is disabled.  Auto start at L1 boot is disabled.

Description    State      Warning Limits       Fault Limits        Current
-------------- ---------- -------------------  -------------------  -------
          DIMM    Enabled  10%   2.250/  2.750  20%   2.000/  3.000    2.509
          2.5V    Enabled  10%   2.250/  2.750  20%   2.000/  3.000    2.522
          1.5V    Enabled  10%   1.350/  1.650  20%   1.200/  1.800    1.509
      3.3V aux    Enabled  10%   2.970/  3.630  20%   2.640/  3.960    3.337
       3.3V L1    Enabled  10%   2.970/  3.630  20%   2.640/  3.960    3.302
        5V aux    Enabled  10%   4.500/  5.500  20%   4.000/  6.000    4.992
      12V bias    Enabled  10%  10.800/ 13.200  20%   9.600/ 14.400   12.188
    PIMM0 SRAM    Enabled  10%   2.970/  3.630  20%   2.640/  3.960    3.276
     PIMM0 CPU    Enabled  10%   1.710/  2.090  20%   1.520/  2.280    1.875
    PIMM0 1.5V    Enabled  10%   1.350/  1.650  20%   1.200/  1.800    1.495
PIMM0 3.3V aux    Enabled  10%   2.970/  3.630  20%   2.640/  3.960    3.320
  PIMM0 5V aux    Enabled  10%   4.500/  5.500  20%   4.000/  6.000    4.914
PIMM0 12V bias    Enabled  10%  10.800/ 13.200  20%   9.600/ 14.400   12.125
    PIMM1 SRAM   Disabled  10%   2.970/  3.630  20%   2.640/  3.960   12.125
     PIMM1 CPU   Disabled  10%   1.710/  2.090  20%   1.520/  2.280   12.125
    PIMM1 1.5V   Disabled  10%   1.350/  1.650  20%   1.200/  1.800   12.125
PIMM1 3.3V aux   Disabled  10%   2.970/  3.630  20%   2.640/  3.960   12.125
  PIMM1 5V aux   Disabled  10%   4.500/  5.500  20%   4.000/  6.000   12.125
PIMM1 12V bias   Disabled  10%  10.800/ 13.200  20%   9.600/ 14.400   12.125
```

```
Description    State       Warning RPM  Current RPM
-------------- ----------  -----------  -----------
         FAN 0    Enabled         2160         2421
         FAN 1    Enabled         2160         2421
         FAN 2    Enabled         2160         2404

                           Advisory  Critical  Fault     Current
Description    State       Temp      Temp      Temp      Temp
-------------- ----------  --------  --------  --------  ---------
        TEMP 3    Enabled  30C/ 86F  35C/ 95F  40C/104F  26c/ 78F
        TEMP 5   Disabled  30C/ 86F  35C/ 95F  40C/104F   0c/ 32F
```

The environmental monitoring and auto start status area has two statements. The first statement describes the current state of environmental monitoring. The environmental monitoring state is one of the following:

- “disabled - initialization error”
- “disabled - configuration error”
- “disabled - start error”
- “disabled”
- “disabled - unknown error (0x00)”
- “running”

The second statement describes the current state of the auto start. The auto start state is “enabled” or “disabled.”

The voltage status contains five columns as follows:

- The Description column provides the name of the supply voltage (2.5 V, 3.3 V, 5 V, etc.).
- The State column provides the current state of the supply voltage (Enabled, Fault, Warning, Waiting, or Disabled).
- The Warning Limits column provides the range of voltages that, when exceeded, causes a supply voltage to be in a Warning state.
- The Fault Limits column provides the range of voltages that, when exceeded, causes a supply voltage to be in a Fault state.
- The Current column provides the current value of the supply voltage.

The fan status contains four columns, as follows:

- The Description column provides the name of each fan.
- The State column provides the current state of the fan (Warning, Enabled, Waiting, or Disabled).
- The Warning RPM column provides the lowest revolutions-per-minute allowed before a fan enters a Warning state.
- The Current RPM column provides the current value of the revolutions-per-minute for the fan.

The temperature status contains six columns as follows:

- The Description column provides the name of a temperature sensor.
- The State column provides the current state of the temperature sensor (Fault, Warning, Enabled, or Disabled).
- The Advisory Temp column provides the temperature that, when exceeded, causes a temperature advisory state.
- The Critical Temp column provides the temperature that, when exceeded, causes a critical temperature state.
- The Fault Temp column provides the temperature that, when exceeded, causes the temperature sensor to be in a Fault state.
- The Current Temp column provides the current temperature reading from the temperature sensor.

Use `env altitude` <*high*|*low*> to enable a high- or low-altitude setting for the environmental monitoring. The variable <*high*|*low*> is high or low. Example B-19 shows sample output from the `env altitude high` command.

Example B-19 `env altitude high` Command Output

```
001c07-L1>env altitude high
001c07-L1>
```

Use the `env reset` command to reset all current warnings and faults that are set. Example B-20 shows sample output from this command.

Note: For this command, the mnemonic `rst` may replace the word `reset`.

Example B-20 `env reset` Command Output

```
001c07-L1>env reset
001c07-L1>
```

fan

The fan set of commands provides the status of and sets the fan speed for a brick. There is one command in this set:

- `fan`

Use the `fan` command to determine whether the fans are on or off and to read the fan speeds. In the `fan` command output, the number in parentheses is the counter reading for the fan. The counter reading is a value provided by the fan tachometer. The system controller converts the counter reading into a revolutions-per-minute value.
Example B-21 shows sample output from the `fan` command.

Example B-21 `fan` Command Output

```
001c07-L1>fan
fan(s) are on.
fan 0 rpm 2465 (339)
fan 1 rpm 2423 (352)
fan 2 rpm 2430 (349)
```

When the temperature of the brick is below 30 ˚C, the fans run at 2400 rpm. If a fan fails and the speed of the fan drops below 2100 rpm, the system controller increases the fan speed for the fans to 4400 rpm. If any two fans drop below 2100 rpm, the system controller shuts down the brick.

When the temperature of the brick is between 30 ˚C and 40 ˚C, the fans run at 3400 rpm. If a fan fails and the speed of the fan drops below 3100 rpm, the system controller shuts down the brick.

flash

The flash set of commands provides the status of and updates of the firmware images stored in flash memory. The following are the commands in this set:

- `flash status`
- `flash default` <*a*|*b*>
- `flash default current`
- `flash default new`
- `flash default old`
- `flash default reset`

Use the `flash status` command to view the status of the two firmware images stored in flash memory. Example B-22 shows sample output from this command. Each image has a checksum value that indicates whether an image is valid.

Example B-22 `flash status` Command Output

```
001c07-L1>flash status
Flash image A currently booted

Image   Status     Revision     Built
-----   --------   ----------   -----
  A     default    0.7.27       04/28/2000 13:06:43
  B     valid      0.8.0        05/24/2000 10:50:23
```

Use `flash default` <*a*|*b*> to set firmware image A or firmware image B as the default image that the system controller uses when booting. The variable <*a*|*b*> is A or B. Use `flash default current` to set the current image as the default flash image. Use `flash default new` to set the new image as the default flash image. Use `flash default old` to set the old image as the default flash image.

Use `flash default reset` to set the firmware image with the latest time-stamp as the default image that the system controller uses when booting. If the selected firmware image is not valid, the flash default commands will return the following message: "cannot set default--image A (or B) is invalid!"

help

The help set of commands provides helpful information on the system controller commands. There are two commands in this set:

- `help`
- `help` <*command*>

Use the `help` command to generate a list of all of the system controller commands. Use the `help` <*command*> command to display more information on a single command. The variable <*command*> is the name of a command.

history

Use the `history` command to create a list of commands that have been issued. In the `history` command output, the first number in the history length is the number of commands stored in the history array. The second number in the history length is the maximum number of commands that can be stored in the history array. Example B-23 shows sample output from the `history` command.

Example B-23 `history` Command Output

```
001c07-L1>history
History length: 3/20
2: fan speed 4
1: fan
0: env
```

l1

Use the `l1` command to engage the L1 controller command processor. Press **`Ctrl+D`** to disengage the command processor. Example B-24 shows sample output from the `l1` command.

Example B-24 `L1` Command Output

```
001c003-L1>l1
L1 command processor engaged, <CTRL-D> to exit.
```

l1dbg

The l1dbg set of commands displays and sets the state of communication debugging features. There are eight commands in this set:

- `l1dbg`
- `l1dbg bedrock` <*on* | *off*>
- `l1dbg irtr` <*on* | *off*>
- `l1dbg env` <*on* | *off*>
- `l1dbg port` <*on* | *off*>
- `l1dbg i2c` <*on* | *off*>
- `l1dbg uart` <*on* | *off*>
- `l1dbg margin` <*on* | *off*>

Use the `l1dbg` command to display the state of the communication debugging features. Example B-25 shows sample output from the `l1dbg` command.

Example B-25 `l1dbg` Command Output

```
001c07-L1>l1dbg
L1 irouter debugging is off
L1 bedrock communication debugging is off
L1 environmental debugging is off
L1 port interrupt debugging is off
L1 i2c interrupt debugging is off
L1 voltage margin debugging is off
```

Use `l1dbg bedrock` <*on* | *off*> to turn on communication debugging for the L1 controller-to-bedrock-ASIC communication. The variable <*on* | *off*> is on or off. Example B-26 shows sample output from the `l1dbg bedrock on` command.

Example B-26 `l1dbg bedrock on` Command Output

```
001c07-L1>l1dbg bedrock on
L1 irouter debugging is off
L1 bedrock communication debugging is on
L1 environmental debugging is off
L1 port interrupt debugging is off
L1 i2c interrupt debugging is off
L1 voltage margin debugging is off
```

The remaining l1dbg commands function in the same manner as the `l1dbg bedrock` <*on* | *off*> command. Table B-5 lists the l1dbg commands and describes the debugging features that each command controls.

Table B-5 l1dbg Commands

Command	Description
`l1dbg bedrock` <*on* | *off*>	Controls bedrock ASIC debugging
`l1dbg irtr` <*on* | *off*>	Controls irouter debugging
`l1dbg env` <*on* | *off*>	Controls environmental debugging
`l1dbg port` <*on* | *off*>	Controls L1-port interrupt debugging
`l1dgb i2c` <*on* | *off*>	Controls I²C interrupt debugging
`l1dbg uart` <*on* | *off*>	Controls bedrock UART debugging
`l1dbg margin` <*on* | *off*>	Controls voltage margin debugging

log

The log set of commands displays the contents of the log, resets the log, and writes an entry into the log. There are three commands in this set:

- `log`
- `log reset`
- `log <entry>`

Use the `log` command to view the contents of the log. Example B-27 shows sample output from the `log` command. If the log is empty, the output from the `log` command is "log is empty."

Example B-27 `log` Command Output

```
001c07-L1>log
USB: registered as remote
USB-R: USB:device was reset
USB: unregistered
USB-R: IRouter:read failed - read error
USB: registered as remote
```

```
USB-R: USB:device was reset
USB: unregistered
USB-R: IRouter:read failed - read error
USB: registered as remote
SMP-R: UART:UART_NO_CONNECTION
L1 booting...
[L1-0] ALERT: eeprom.c line 367 ; eeprom 0 checksum error.
USB: registered as remote
L1 booting...
[L1-0] ALERT: eeprom.c line 367 ; eeprom 0 checksum error.
USB: registered as remote
CTI-R: UART:UART_BREAK_RECEIVED
CTI-R: IRouter:read failed - read error
USB-R: USB:device was reset
```

Use `log reset` to empty the log. Example B-28 shows sample output from this command.

Example B-28 `log reset` Command Output

```
001c003-L1>log reset
log reset.
```

Use `log` <*entry*> to write a line in the log. The variable <*entry*> is text to enter into the log. Example B-29 shows sample output from the `log Start the Test` command.

Example B-29 `log Start the Test` Command Output

```
001c003-L1>log Start the Test
log entry made.
```

ioport

The ioport set of commands displays and sets the speeds and clock source of the I/O ports. There are three commands in this set, which is valid only for C-, I-, P-, and X-bricks:

- `ioport`
- `ioport` <*speed*>
- `ioport clksrc` <*a|b*>

Note: For the ioport command set, the mnemonic `ioprt` may replace the word `ioport`.

Use the `ioport` command to view the speed of the I/O ports in the C-, I-, P-, or X-brick and the clock source for the universal system time (UST). The I/O port speed is 400 MHz or 600 MHz. In the command output, the word Bedrock refers to the hub ASIC in the C-brick. The word XBridge refers to the crosstown ASIC in the I-, P-, or X-brick. Example B-30 and Example B-31 show sample output from the `ioport` command.

Example B-30 `ioport` Command Output for a C-Brick

```
001c07-L1>ioport
Bedrock I/O port speed: 600 MHz - current, attached I/O is detected
                        400 MHz - default, when no attached I/O
detected
```

Example B-31 `ioport` Command Output for an X-Brick

```
001i21-L1>ioport
XBridge port A speed: 400 MHz - current, no attached C detected
XBridge port B speed: 600 MHz - current, from attached C
                      400 MHz - default, when no attached C detected
XBridge UST clock source: port A
```

Use `ioport` <*speed*> to set the speed of all of the I/O ports in the C-, I-, P-, or X-brick. The variable <*speed*> is 400 or 600 (400 MHz or 600 MHz). Example B-32 shows sample output from the `ioport 600` command.

Example B-32 `ioport 600` Command Output

```
001x004-L1>ioport 600
nvram parameter changed, reset required to affect change.
```

Use `ioport clksrc` <*a*|*b*> to set the universal system time clock source in the I-, P-, or X-brick to port A or port B. The variable <*a*|*b*> is A or B. Example B-33 shows sample output from the `ioport clksrc a` command. These commands are valid only for the I-, P-, and X-bricks.

Example B-33 `ioport clksrc a` Command Output

```
001x004-L1>ioport clksrc a
nvram parameter changed, reset required to affect change.
```

istat

Use the istat set of commands to view the status of the memory, queues, tasks, and memory allocation. There are four commands in this set:

- `istat memory`
- `istat queues`
- `istat tasks`
- `istat pmalloc`

Use `istat memory` to view the status of the memory. Example B-34 shows sample output from this command.

Example B-34 `istat memory` Command Output

```
001c07-L1>istat memory
SYSMEM   [0x30005cf8]    Size:  41656         Avail:  26792
SMLPOOL  [0x30005cbc]    Size:   8704/ 272 Avail:     28
BIGPOOL  [0x30005c80]    Size:  16640/1040 Avail:     15
```

Use `istat queues` to view the status of the queues. Example B-35 shows sample output from this command.

Example B-35 `istat queues` Command Output

```
001c07-L1>istat queues
CMD_REQQ [0x30008a54]    Size: 10   Avail: 10   Msgs:  0
CMD_RSPQ [0x30008a9c]    Size: 10   Avail: 10   Msgs:  0
SMP_RQUE [0x3000c8a0]    Size: 10   Avail: 10   Msgs:  0
SMP_WQUE [0x3000c8e8]    Size: 10   Avail: 10   Msgs:  0
SMP_IQUE [0x3000c930]    Size: 10   Avail: 10   Msgs:  0
CTI_WQUE [0x3000f38c]    Size: 10   Avail: 10   Msgs:  0
USB_WQUE [0x3000ee7c]    Size: 10   Avail: 10   Msgs:  0
SCAN_QUE [0x30002440]    Size: 20   Avail: 20   Msgs:  0
FLASH_Q  [0x30009c64]    Size:  5   Avail:  5   Msgs:  0
BDR_WQUE [0x3000a0c8]    Size: 10   Avail: 10   Msgs:  0
```

Use `istat tasks` to view the status of the tasks. Example B-36 shows sample output from this command.

Example B-36 `istat tasks` Command Output

```
001c07-L1>istat tasks
MAIN_TSK [0x300019f8] (SLEEP     )  STACK: 2048 @ 0x300011f8 ( 904 used, 1144 free)
USB_CNTL [0x30007f38] (DRV_SUSP  )  STACK: 1536 @ 0x30007fe0 ( 288 used, 1248 free)
CMD_ITSK [0x300096e4] (READY     )  STACK: 3072 @ 0x30008ae4 (1936 used, 1136 free)
SMP_RTSK [0x3000e1c8] (EVT_SUSP  )  STACK: 2048 @ 0x3000c9c8 ( 800 used, 1248 free)
SMP_ITSK [0x3000e318] (QUEUE_SUSP)  STACK: 2048 @ 0x3000d9c8 ( 768 used, 1280 free)
SMP_WTSK [0x3000e270] (QUEUE_SUSP)  STACK: 2048 @ 0x3000d1c8 ( 416 used, 1632 free)
ENV_PITK [0x3000a9ec] (SEM_SUSP  )  STACK: 1024 @ 0x3000addc ( 276 used,  748 free)
ENV_FITK [0x3000aa94] (SEM_SUSP  )  STACK: 1024 @ 0x3000b1dc ( 260 used,  764 free)
ENV_TITK [0x3000ab3c] (SEM_SUSP  )  STACK: 1024 @ 0x3000b5dc ( 264 used,  760 free)
ENV_PMTK [0x3000abe4] (SEM_SUSP  )  STACK: 1024 @ 0x3000b9dc ( 260 used,  764 free)
ENV_FMTK [0x3000ac8c] (SEM_SUSP  )  STACK: 1024 @ 0x3000bddc ( 268 used,  756 free)
ENV_TMTK [0x3000ad34] (SEM_SUSP  )  STACK: 1024 @ 0x3000c1dc ( 324 used,  700 free)
BDR_RTSK [0x30009f30] (DRV_SUSP  )  STACK: 2048 @ 0x30016524 (1204 used,  844 free)
BDR_WTSK [0x3000a020] (QUEUE_SUSP)  STACK: 1024 @ 0x30016d34 ( 532 used,  492 free)
CTI_RTSK [0x3000f23c] (DRV_SUSP  )  STACK: 2048 @ 0x3001717c ( 892 used, 1156 free)
CTI_WTSK [0x3000f2e4] (QUEUE_SUSP)  STACK: 2048 @ 0x3001798c ( 572 used, 1476 free)
USB_RTSK [0x3000edd4] (READY     )  STACK: 1800 @ 0x300181d4 ( 732 used, 1068 free)
USB_WTSK [0x3000eeec] (QUEUE_SUSP)  STACK: 1500 @ 0x300188ec ( 480 used, 1020 free)
SCAN_TSK [0x30002398] (QUEUE_SUSP)  STACK: 2048 @ 0x30001b98 ( 600 used, 1448 free)
I2C_HIGH [0x30007154] (SEM_SUSP  )  STACK: 1500 @ 0x300071fc ( 248 used, 1252 free)
I2C_LOW  [0x30006a2c] (SEM_SUSP  )  STACK: 1500 @ 0x30006ad4 ( 396 used, 1104 free)
FLASH_T  [0x30009bbc] (QUEUE_SUSP)  STACK: 1024 @ 0x300097bc ( 316 used,  708 free)
```

Use `istat pmalloc` to view the status of the memory allocation. Example B-37 shows sample output from this command.

Example B-37 `istat pmalloc` Command Output

```
001c07-L1>istat pmalloc

small pool size:   272
small pool avail:   28
small pool used:     3
small pool max:     25

big pool size:    1040
big pool avail:     15
big pool used:       0
big pool max:        3
```

```
pmalloc calls:       0
prealloc calls:      3

history:
```

leds

Use the `leds` command to read the value of the group 0 and group 1 status LEDs in the C-brick. The `leds` command is valid only for the C-brick. These LEDs connect to I/O expanders that monitor group 0 status LEDs 0 through 15 and group 1 status LEDs 0 through 15. In the output of the `leds` command, the CPUs correspond to the status LEDs as follows:

- CPU A corresponds to I/O expander A_0100001x - group 0 status LEDs 0 through 7.
- CPU B corresponds to I/O expander A_0100010x - group 0 status LEDs 8 through 15.
- CPU C corresponds to I/O expander A_0100011x - group 1 status LEDs 0 through 7.
- CPU D corresponds to I/O expander A_0100100x - group 1 status LEDs 8 through 15.

The number next to the CPU letter is a hexadecimal value that represents the value of the status LEDs that connect to the I/O expander (a bit set to 1 indicates the LED is on, a bit set to 0 indicates the LED is off). Example B-38 shows sample output from the `leds` command.

Example B-38 `leds` Command Output

```
001c07-L1>leds
CPU A: 0x02
CPU B: 0x02
CPU C: 0x0f
CPU D: 0x0f
```

Table B-6 LED Message Explanations

Message on LED	Meaning	Message on LED	Meaning
0x00	PLED_RESET. Slave loop (0x00/0x45=okay, solid 0x00=possibly hung.		
0x01	PLED_INITCPU. Init the processor, FP, and C0P0 registers		
0x02	PLED_TESTCP1. Test processor C0P1 registers.		
0x03	PLED_RUNTLB. Switch to mapped mode.		
0x04	PLED_TESTICACHE. Test processor instruction cache.		
0x05	PLED_TESTDCACHE. Test processor primary data cache.		
0x06	PLED_TESTSCACHE. Test secondary cache.		
0x07	PLED_FLUSHCACHES. Flush all caches.		
0x08	PLED_CHUBLOCAL. }		
0x09	PLED_CKHUBCONFIG. }		
0x0A	PLED_INVICACHE. Invalidate processor primary I-cache.		

margin

The margin set of commands displays and sets the state of the supply margins. There are three commands in this set:

- `margin`
- `margin default`
- `margin` <*low* | *norm* | *high*>

Note: For the margin command set, the mnemonic `mgn` may replace the word `margin`.

Use the `margin` command to view the current state of the margin values for the supplies in a brick. Example B-39 shows sample output from the `margin` command.

Example B-39 `margin` Command Output

```
001c07-L1>margin
Supply          State Voltage    Margin  Value
--------------  ----- ---------  ------- -----
          DIMM     on    2.509V  default   132
          2.5V     on    2.522V  default   120
          1.5V     on    1.509V  default   110
    PIMM0 SRAM     on    3.276V  default   125
     PIMM0 CPU     on    1.875V  default   142
    PIMM0 1.5V     NC    1.495V  default     3
    PIMM1 SRAM     <not present>
     PIMM1 CPU     <not present>
    PIMM1 1.5V     <not present>
```

Use `margin default` to set the margin values for the supplies to their default values. Use the `margin` <*low* | *norm* | *high*> command to set the margin values for the supplies to the low-margin, normal-margin, or high-margin values. Example B-40 shows sample output from the `margin default` command.

Example B-40 `margin default` Command Output

```
001c07-L1>margin default
```

Use `margin` <*voltage*> `default` to set the margin value for a specific supply to its default value.

network

The network set of commands displays and sets the mode of the network communication interface. There are five commands in this set, which is valid only for C-bricks:

- `network`
- `network usb`
- `network 422`
- `network autodetect|auto on`
- `network autodetect|auto off`

Use the `network` command to view the current mode of the network communication interface. Example B-41 shows sample output from the `network` command.

Example B-41 `network` Command Output

```
001c07-L1>network
network interface communication is USB
```

Use `network usb` to set the network communication interface mode to Universal Serial Bus (USB). Use the `network 422` command to set the network communication interface mode to RS-422 protocol. Example B-42 shows sample output from the `network usb` command.

Example B-42 `network usb` Command Output

```
001c003-L1>network usb
nvram parameter changed, reset required to affect change.
```

Use `network autodetect|auto on` to turn on the autodetection. Use `network autodetect|auto off` to turn off the autodetection.

nmi

Use the `nmi` command to issue a non-maskable interrupt (NMI) in a C-brick. The `nmi` command is valid only for the C-brick.

After the system controller receives an `nmi` command, it displays “NMI...” on the front panel display and asserts the NMI signal in I/O expander B_0100001x. If no errors occur while the system controller issues the NMI, it displays “NMI done” on the front panel display (see Example B-43 and Figure B-1). If an error occurs, the system controller displays “NMI Fail” on the front panel display.

Example B-43 `nmi` Command Output

```
001c07-L1>nmi
001c07-L1>
```

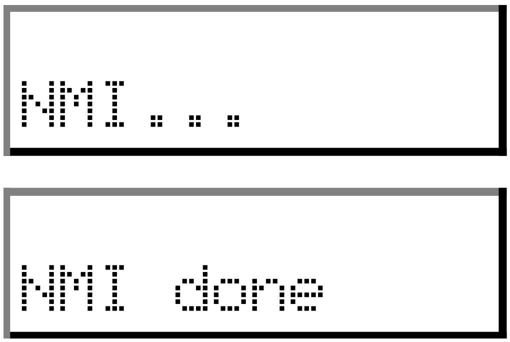

Figure B-1 Example of `nmi` Front Panel Display Output

pci

The pci set of commands displays the status of the PCI cards in an I/O brick, and powers up, powers down, and resets a PCI card. There are six commands in this set, which is valid only for I- and P-bricks:

- `pci`, `pci` <*u*|*d*>
- `pci reset`
- `pci` <*bus*> <*u*|*d*>
- `pci` <*bus*> `reset`

- `pci` <*bus*> <*slot*> <*u*|*d*>
- `pci` <*bus*> <*slot*> `reset`

Note: For this command set, the mnemonic `rst` may replace the word `reset.`

Use the `pci` command to view the value of the status register for each PCI card in an I- or P-brick. The output of the `pci` command contains eight columns, as follows:

- The Bus column lists the number of the bus for each PCI card.
- The Slot column lists the slot value for each PCI card.
- The Stat column lists the hexadecimal value of the status register for each PCI card.
- The Card Type column lists the card type (7.5 W, 15 W, 25 W, or none) for each slot.
- The Power column lists the value (error & off, error & on, okay & off, or okay & on) of the power OK and power on bits.
- The Attn LED column lists the value (off or on) of the attention LED for the PCI card.
- The Enable column lists the value (off or on) of the bus enable bit for the PCI card.
- The Reset column lists the value (off or on) of the reset bit for the PCI card.

Example B-44 shows sample output from the `pci` command.

Example B-44 `pci` Command Output

```
001i21-L1>pci
Bus Slot Stat Card Type Power       Attn LED Enable Reset
--- ---- ---- --------- ----------- -------- ------ -----
  1    1 0x91       15W  okay &  on      off     on   off
  1    2 0x57      none  okay & off      off    off    on
  1    3 0x91       15W  okay &  on      off     on   off
  1    4 0xff  on board   N/A & N/A      N/A    N/A   off
  2    1 0x57      none  okay & off      off    off    on
  2    2 0x57      none  okay & off      off    off    on
```

Use `pci` <*u*|*d*> to power up (u) or power down (d) all of the PCI cards in an I- or P-brick. Example B-45 shows sample output from the `pci d` command.

Example B-45 `pci d` Command Output

```
001i21-L1>pci d
001i21-L1>
```

Use `pci reset` to reset all of the PCI cards in an I- or P-brick. Example B-46 shows sample output from the `pci reset` command.

Example B-46 `pci reset` Command Output

```
001i21-L1>pci reset
001i21-L1>
```

Use `pci` <*bus*> <*u*|*d*> to power up (u) or power down (d) all of the PCI cards on a bus in an I- or P-brick. The variable <*bus*> is the bus number. Example B-47 shows sample output from the `pci 1 u` command.

Example B-47 `pci 1 u` Command Output

```
001i21-L1>pci 1 u
001i21-L1>
```

Use `pci` <*bus*> `reset` to reset all of the PCI cards on a bus in an I- or P-brick. The variable <*bus*> is the bus number. Example B-48 shows sample output from the `pci 1 reset` command.

Example B-48 `pci 1 reset` Command Output

```
001i21-L1>pci 1 reset
001i21-L1>
```

Use `pci` <*bus*> <*slot*> <*u*|*d*> to power up (u) or power down (d) an individual PCI card in an I- or P-brick. The variable <*bus*> is the bus number and the variable <*slot*> is the slot number. Example B-49 shows sample output from the `pci 1 2 u` command.

Example B-49 `pci 1 2 u` Command Output

```
001i21-L1>pci 1 2 u
001i21-L1>
```

Use `pci` <*bus*> <*slot*> `reset` to reset an individual PCI card in an I- or P-brick. The variable <*bus*> is the bus number and the variable <*slot*> is the slot number. Example B-50 shows sample output from the `pci 1 2 reset` command.

Example B-50 `pci 1 2 reset` Command Output

```
001i21-L1>pci 1 2 reset
001i21-L1>
```

pimm

The pimm set of commands displays the state of and sets the processor inline memory module (PIMM) clock source and clock mode. There are three commands in this set, which is valid only for C-bricks:

- `pimm`
- `pimm clksrc` <*external*|*internal*>
- `pimm clkmode` <*async*|*sync*>

Note: For the pimm command set, you can use the mnemonics `int` and `ext` instead of the words `internal` and `external`.

Use the `pimm` command to determine the PIMM clock source (internal or external) and the clock mode (synchronous or asynchronous). Example B-51 shows sample output from the `pimm` command.

Example B-51 `pimm` Command Output

```
001c07-L1>pimm
PIMM clock source is external
PIMM mode is asynchronous
```

Use the `pimm clksrc` <*external*|*internal*> command to set the PIMM clock source to external or internal. Example B-52 shows sample output from the `pimm clksrc internal` command.

Example B-52 `pimm clksrc internal` Command Output

```
001c07-L1>pimm clksrc internal
nvram parameter changed, reset required to affect change.
```

Use `pimm clkmode` <*async*|*sync*> to set the PIMM clock mode to asynchronous (async) or synchronous (sync). Example B-53 shows sample output from the `pimm clkmode sync` command.

Example B-53 `pimm clkmode sync` Command Output

```
001c07-L1>pimm clkmode sync
nvram parameter changed, reset required to affect change.
```

port

Use the `port` command to view the value of the status register for each port in the brick. As shown in Example B-54 and Example B-55, the output of the `port` command contains six columns, as follows:

- The Port column lists the name of each port.
- The Stat column lists the hexadecimal value of the status register for each port.
- The Remote Pwr column lists the value, “okay” or “none,” of the remote power OK bit (bit 0) for each port.
- The Local Pwr column lists the value, “okay” or “none,” of the local power OK bit (bit 1) for each port.
- The Link LED column lists the value, “on” or “off,” of the link LED bit (bit 2) for each port.
- The SW LED column lists the value, “on” or “off,” of the software LED bit (bit 3) for each port.

Note: For this command, the mnemonic `prt` may replace the word `port`.

Example B-54 `port` Command Output for an R-brick

```
001r19-L1>port
Port Stat Remote Pwr Local Pwr  Link LED SW LED
---- ---- ---------- ---------- -------- --------
   A 0x02       none       okay      off      off
   B 0x0f       okay       okay       on       on
   C 0x0f       okay       okay       on       on
   D 0x02       none       okay      off      off
   E 0x02       none       okay      off      off
   F 0x0b       okay       okay      off       on
   G 0x0b       okay       okay      off       on
   H 0x02       none       okay      off      off
```

Example B-55 `port` Command Output for a C-brick

```
001c07-L1>port
Port Stat Remote Pwr Local Pwr  Link LED SW LED
---- ---- ---------- ---------- -------- --------
   A 0x0f       okay       okay       on       on
   B 0x0f       okay       okay       on       on
```

power

The power set of commands displays the status of the supplies, and powers up and powers down the supplies. There are three commands in this set:

- `power`
- `power check`
- `power` <*up*|*down*>

Note: For the power command set, the mnemonics `pwr`, `u`, and `d` may replace the words `power`, `up`, and `down`.

Use the `power` command to view the detailed current state of the power and margin values for the supplies in a brick. Example B-56 shows sample output from the `power` command.

Example B-56 `power` Command Output

```
001c07-L1>power
Supply          State Voltage    Margin  Value
--------------  ----- ---------  ------- -----
           48V     on       N/A      N/A
          DIMM     on    2.509V  default   132
          2.5V     on    2.522V  default   120
          1.5V     on    1.509V  default   110
      3.3V aux     NC    3.337V      N/A
       3.3V L1     NC    3.302V      N/A
        5V aux     NC    4.992V      N/A
      12V bias     NC   12.188V      N/A
    PIMM0 SRAM     on    3.276V  default   125
     PIMM0 CPU     on    1.875V  default   142
    PIMM0 1.5V     NC    1.495V  default     3
PIMM0 3.3V aux     NC    3.320V      N/A
  PIMM0 5V aux     NC    4.914V      N/A
PIMM0 12V bias     NC   12.125V      N/A
    PIMM1 SRAM     <not present>
     PIMM1 CPU     <not present>
    PIMM1 1.5V     <not present>
PIMM1 3.3V aux     <not present>
  PIMM1 5V aux     <not present>
PIMM1 12V bias     <not present>
```

Use `power check` to view the summary of the current state of the power and margin values for the supplies in a brick. Example B-57 shows sample output from the `power check` command.

Example B-57 `power check` Command Output

```
001c07-L1>power check
power appears on
```

Use `power` <*up*|*down*> to power up or power down all of the supplies in a brick. Example B-58 shows sample output from the `power up` command.

Example B-58 `power up` Command Output

```
001c07-L1>power up
001c07-L1>
```

reboot_l1

The reboot_l1 command set reboots the L1 controller. There are two commands in this set:

- `reboot_l1`
- `reboot_l1 <`*a*`|`*b*`>`

Use the `reboot_l1` command to reboot the L1 controller using the newest firmware image (firmware image A or firmware image B). Use `reboot_l1 <`*a*`|`*b*`>` to reboot the L1 controller using the specified firmware image (A or B).

reset

Use the `reset` command to perform a reset of the system. After the system controller receives a `reset` command, it sets various control and status signals back to their default values, and reboots the operating system. Example B-59 shows sample output from the `reset` command.

Example B-59 `reset` Command Output

```
001c07-L1>reset
001c07-L1>
```

router

Use the router set of commands to view and set the router type. There are two commands in this set, which is valid only for R-bricks:

- `router`
- `router <`*type*`>`

Use the `router` command to view the current router type. Example B-60 shows sample output from the `router` command.

Example B-60 `router` Command Output

```
001r19-L1>router
router type is ordinary
```

Use `router` <*type*> to set the current router type. The variable <*type*> is meta (for a meta-router), repeater (for a repeater router), or ordinary (for a regular router).

Note: For this command, the mnemonics `rep` and `ord` may replace the words `repeater` and `ordinary`.

---

select

The select set of commands displays and sets the mode of console I/O. There are four commands in this set, which is valid only for C-bricks:

- `select`
- `select` <*exp*> <*exp*>
- `select` <*subchannel*> <*a|b|c|d|console*>
- `select filter` <*on|off*>

Note: For this command, the mnemonics `sel, sub,` and `con` may replace the words `select, subchannel,` and `console`.

Use the `select` command to view the current mode of console I/O. Example B-61 shows sample output from the `select` command.

Example B-61 `select` Command Output

```
001c07-L1>select
console input:  001c07 console
console output: not filtered.
```

Use the other select commands as follows:

- Use `select` <*exp*> <*exp*> to set the rack and slot for console I/O.
- Use `select` <*subchannel*> <*a|b|c|d|console*> to set the mode of console I/O to a specified subchannel a, b, c, d, or console (you can also enter 0 for a, 1 for b, 2 for c, and 3 for d).
- Use `select filter` <*on|off*> to enable (on) or disable (off) the console output filter.

serial

Use the serial set of commands to view and set the system serial number (SSN) that is stored in each brick. The following are the commands in this set:

- `serial`
- `serial all`
- `serial dimm`
- `serial verify`
- `serial set` <*str*> <*str*> <*str*> <*str*>
- `serial security on`

Use the `serial` command to view the system serial number (SSN) settings stored in the NVRAM. Use `serial all` to show the brick serial number (BSN) and the SSN settings in NVRAM. Use `serial dimm` to show the dual-inline memory module (DIMM) serial number.

Use `serial verify` to test the brick's readiness for secure serial numbering. Use `serial` <*str*> <*str*> <*str*> <*str*> to reassign the SSN for a brick. The variable <*str*> <*str*> <*str*> <*str*> is the value of a security key that is provided only to SGI employees.

Use `serial security on` to enable the SSN security.

softreset

Use the `softreset` command to issue a software reset in a C-brick. The `softreset` command is valid only for the C-brick.

After receiving a `softreset` command, the system controller displays "Sft rst..." on the front panel display and asserts the soft reset signal in I/O expander B_0100001x. If no errors occur while the system controller issues the soft reset, it displays "Sft rst done" on the front panel display (see Example B-62 and Figure B-2). If an error occurs while the system controller issues the soft reset, it displays "Sft rst fail" on the front panel display.

Note: For this command, you can use the mnemonic `softrst` instead of the word `softreset`.

Example B-62 `softreset` Command Output

```
001c07-L1>softreset
001c07-L1>
```

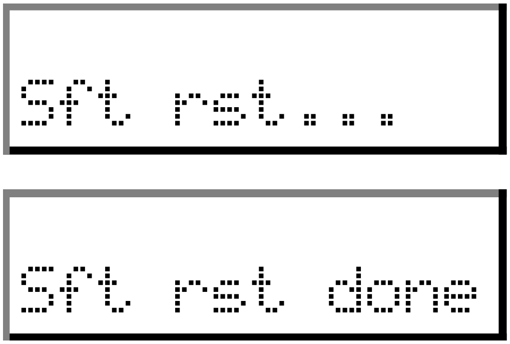

Figure B-2 Example of `softreset` Command Output

test

Use the test set of commands to test various components in the L1 controller. There are seven commands in this set:

- `test i2c` <*passes*>
- `test ioexp set` <*index*> <*value*>
- `test ioexp get` <*index*>
- `test ioexp get all`
- `test intr`
- `test display`
- `test exception` <*value*>

For this command, you can use the mnemonic `tst` and `exc` in place of the words `test` and `exception`.

Use `test i2c` <*passes*> to test the I^2C bus. The variable <*passes*> is optional; it represents the number of times to run the test.

Use `test ioexp set` <*index*> <*value*> to set a value for an I/O expander. The variable <*index*> is an I^{2}C bus address and the variable <*value*> is the value for the I/O expander.

Use `test ioexp get` <*index*> to read a value from an I/O expander. The variable <*index*> in an I^{2}C bus address. Use `test ioexp get all` to read the values from all of the I/O expanders.

Use `test intr` to view the I^{2}C bus interrupt counts. Example B-63 shows sample output from the `test intr` command.

Example B-63 `test intr` Command Output

```
001r19-L1>test intr
I2C interrupts, High: 25  Low: 406
DS1780  0, 1:    0 (0x00) 2:    0 (0x00)
IOExp  0:  197
IOExp  1:    0
IOExp  2:    0
IOExp  3:    0
IOExp  4:  137
IOExp  5:    0
IOExp  6:   11
IOExp  7:    0
```

Use `test exception` <*value*> to test the memory fault handling, stack corruption error handling, software watchdog reset, and fatal_error() call. The variable <*value*> is mem (for memory fault handling), stack (for stack corruption error handling), wdog (for software watchdog reset), and fatal (for fatal_error() call).

version

Use the `version` command to view the version of the firmware that is running in the system controller. Example B-64 shows sample output from the `version` command.

Example B-64 `version` Command Output

```
001r19-L1>version
L1 0.7.27 (Image A), Built 04/28/2000 13:06:43    [P1 support]
```

L2 Controller Command Set

The following subsections describe the L2 controller command set. The commands are listed alphabetically and include examples of output where applicable.

autopower

The autopower set of commands enables, disables, aborts, and shows the current auto power status. There are four commands in this set:

- `autopower`
- `autopower on`
- `autopower off`
- `autopower abort`

Note: For these commands, the mnemonic `apwr` may replace the word `autopower`.

Use the `autopower` command to view the current auto power up setting. Example B-65 shows the sample output for the `autopower` command:

Example B-65 `autopower` Command Output

```
essc1-001-L2>autopower
auto power up appears disabled
essc1-001-L2>
```

Use `autopower on` to enable the auto power on. Use `autopower off` to disable the auto power on. Use `autopower abort` to abort the auto power on.

config

The config set of commands displays the L2 controller configuration information. The following are the commands in this set:

- `config`
- `config summary`
- `config verbose`
- `config l2`
- `config l2 verbose`
- `config rescan`

Note: For these commands, the mnemonic `cfg` may replace the word `config`.

Note: For the `summary`, `verbose`, and `rescan` commands, the mnemonics `s`, `v`, and `re` may replace the words `summary`, `verbose`, and `rescan`.

Use the `config` command to view the L2 controller configuration information (see Example B-66). In the `config` command output, the first number is the IP address of the L2 controller (127.0.0.1 in the output below). The number that follows the IP address, after the first colon, is the USB port number (1 in the output below).

Example B-66 `config` Command output

```
L2> config
127.0.0.1:
127.0.0.1:0:0 - 001r19
127.0.0.1:1:0 - 001c07
127.0.0.1:1:1 - 001i21
127.0.0.1:2:0 - 001c10
```

The number that follows the USB port number, after the second colon, is the L1 index. Table B-7 lists the values of the L1 index.

Table B-7 L1 Index Values

L1 Index	Name	Description
0	Local brick	The C-brick that connects to the L2 through the USB cable.
1	Attached I/O brick	An I/O brick that connects to the local brick.
2 or 3	Attached C-brick	A C-brick that connects to the local brick.
3 or 4	I/O brick attached to the attached C-brick	An I/O brick that connects to a C-brick that connects to the local brick.

The number that follows the L1 index, after the dash, is the brick identification number (for example, 001c07). The first three digits of the brick identification number indicate the rack in which the brick resides. The fourth digit indicates the type of brick (see Table B-8). The last two digits indicate the slot position in which the brick resides.

Table B-8 Valid Brick Types

Type	Description
c	C-brick
i	I-brick
p	P-brick
r	R-brick
x	X-brick
?	Unknown brick type

Use the other config commands as follows:

- Use `config summary` to see summary configuration information.
- Use `config verbose` to see verbose configuration information.
- Use `config l2` to see normal L2 controller configuration information.
- Use `config l2 verbose` to see verbose L2 controller configuration information.
- Use `config rescan` to force an L1 controller configuration update.

destination

The destination set of commands displays the brick identification numbers of bricks that are the destinations of L2 commands, and sets the bricks that are the destinations for L2 commands. The following are the commands in this set:

- `destination`
- `rack` <*rng*> `destination`
- `rack` <*rng*> `slot` <*rng*> `destination`
- `destination reset`
- `partition` <*exp*> <*destination*>

Note: For these commands, the mnemonic `dest` may replace the word `destination`. Also, the mnemonics `r` and `s` may replace the words `rack` and `slot`.

Note: For the <*rng*> variable, you can enter a single number, numbered items separated by a hyphen to indicate a range, or you can enter numbers separated by a comma to indicate two separate numbered items. For <*rng*>, you can also enter an asterisk or the word "all" to select all the items available.

Use the `destination` command to view the brick identification numbers of the bricks that are the destinations of L2 commands. Example B-67 shows sample output from the `destination` command.

Example B-67 `destination` Command Output

```
L2> destination
all racks, all slots
```

Use `rack` <*rng*> `destination` to set the racks that are the destinations for L2 commands (this command selects all of the bricks in a rack as the destination bricks). The variable <*rng*> is a rack number, a comma-separated list of rack numbers, or a range of rack numbers indicated by a dash character. Example B-68 shows sample output from this command.

Example B-68 `rack <rng> destination` Command Output

```
L2> r 1 destination
4 default destination(s) set
L2> destination
001i21 (127.0.0.1:1:1)
001r19 (127.0.0.1:0:0)
001c07 (127.0.0.1:1:0)
001c10 (127.0.0.1:2:0)
```

Use `rack` <*rng*> `slot` <*rng*> `destination` to set individual bricks that are the destinations for L2 commands. The variable <*rng*> is a rack number. The variable <*rng*> is a slot number, a comma-separated list of slot numbers, or a range of slot numbers indicated by a dash character. Example B-69 shows sample output from this command.

Example B-69 `rack <rng> slot <rng> destination` Command Output

```
L2> r 1 s 7 destination
1 default destination(s) set
L2> destination
001c07 (127.0.0.1:1:0)
```

Use `destination reset` to reset the destination bricks to all racks and all slots. Example B-70 shows sample output from this command.

Note: For this command, the mnemonic `rst` may replace the word `reset`.

Example B-70 `destination reset` Command Output

```
L2> destination reset
default destination reset to all bricks and slots
```

Use `partition` <*exp*> `destination` to set the partition or partitions that are the destination of the L2 commands. The variable <*exp*> is a partition number or numbers that are the destination for the L2 commands (if you have more than one partition, separate the partition numbers with a comma). Example B-71 shows a sample output for this command:

Example B-71 partition <*exp*> destination Command Output

```
L2> partition 2 destination
1 default destination(s) set
L2> destination
partition 2
```

env

The env set of commands provide an environmental status summary. The following are the commands in this set:

- env summary
- rack <*rng*> slot <*rng*> env summary

Note: For this command, `r` may replace the word `reset,` and `s` may replace the word `slot` and may also replace the word `summary`.

Note: For the <*rng*> variable, you can enter a single number, numbered items separated by a hyphen to indicate a range, or you can enter numbers separated by a comma to indicate two separate numbered items. For <*rng*>, you can also enter an asterisk or the word “all” to select all the items available.

Use the `env summary` command to generate an environmental summary of an entire server system. shows a sample output for the env summary command:

Example B-72 env summary Command Output

```
essc1-001-L2>env summary
all environmental conditions appear normal
essc1-001-L2>
```

Use the `rack <rng> slot <rng> env summary` command to display an environmental summary for a particular rack number (or rack numbers) and slot, or slots, in a server system.

help

The help set of commands provides helpful information on the system controller commands. There are two commands in this set:

- `help`
- `help` <*command*>

Use the `help` command to generate a list of all of the system controller commands. Use the `help` <*command*> command to display more information on a single command. In this command, the variable <*command*> is the name of a command.

ip

Use the ip set of commands to set, clear, and show the L2 controller static IP address configuration settings. The following are the commands in this set:

- `ip`
- `ip` <*str*> <*str*>
- `ip` <*str*> <*str*> <*str*>
- `ip clear|reset`

Use the `ip` command to display the L2 controller static IP address settings. Example B-73 shows a sample output for the `ip` command:

Example B-73 ip Command Output

```
essc1-001-L2>ip
addr: 137.38.88.197 netmask: 255.255.255.0 broadcast addr: 137.38.88.255
essc1-001-L2>
```

Use the `ip` <*str*> <*str*> command to set the following L2 static IP configuration parameters: <addr> and <netmask>.

Use the `ip` <*str*> <*str*> <*str*> command to set the L2 static IP configuration parameters: <addr>, <netmask>, and <broadcast>.

Use the `ip clear|reset` command to clear the L2 static IP address settings.

l1

The l1 set of commands enters L1 mode or sends an L1 controller command to a specified L1 controller. The following are the commands in this set:

- `rack` <*rng*> `slot` <*rng*> `l1`
- <*rack*>`.`<*slot*> `l1`
- `rack` <*rng*> `slot` <*rng*> `l1` <*command*>
- <*rack*>`.`<*slot*> `l1` <*command*>
- `:`<*port*>`:`<*l1*> `l1` <*command*>
- <*ip*>`:`<*port*>`:`<*l1*> `l1` <*command*>

Note: For these commands, the mnemonics `r` and `s` may replace the words `rack` and `slot`.

Note: For the <*rng*> variable, you can enter a single number, numbered items separated by a hyphen to indicate a range, or you can enter numbers separated by a comma to indicate two separate numbered items. For <*rng*>, you can also enter an asterisk or the word "all" to select all the items available.

Use the `rack` <*rng*> `slot` <*rng*> `l1` command to engage the L1 command processor for the specified rack and slot. In this command, the <*rng*> variable following `rack` is a rack number or rack numbers, and the <*rng*> variable following `slot` is a slot number or slot numbers. Example B-74 shows sample output from the `rack` <*rng*> `slot` <*rng*> `l1` command.

Example B-74 `rack` <*rng*> `slot` <*rng*> `l1` Command Output

```
L2> r 1 s 19 l1
entering L1 mode 001r19, <CTRL-T> to escape to L2

001r19-L1>
```

Alternatively, you can use the <*rack*>`.`<*slot*> `l1` command to engage the L1 command processor for a specified rack and slot.

Use the `rack` <*rng*> `slot` <*rng*> `l1` <*command*> command to send a command to a destination brick without changing the default destination value. In this command, the <*rng*> variable following `rack` is a rack number or rack numbers, the variable <*rng*> following `slot`, is a slot number or slot numbers, and the variable <*command*> is an L1 controller command such as `config`. Example B-75 shows sample output from the `rack` <*rng*> `slot` <*rng*> `l1 config` command.

Example B-75 `rack` <*rng*> `slot` <*rng*> `l1 config` Command Output

```
L2> r 1 s 7 l1 config
:0 - 001c07
:1 - 001i21
L2>
```

Alternatively, you can use <*rack*>`.`<*slot*> `l1` <*command*> to send a command to a destination brick without changing the default destination value.

Use the `:`<*port*>`:`<*l1*> `l1` <*command*> command to send a command to a destination brick that does not yet have a brick identification number assigned to it. In this command, the variable <*port*> is the port number, the variable <*l1*> is an L1 controller index number, and the variable <*command*> is an L1 controller command.

Use the <*ip*>`:`<*port*>`:`<*l1*> `l1` <*command*> command to send a command to a destination brick that does not yet have a brick identification number assigned to it. In this command, the variable <*ip*> is an IP address, the variable <*port*> is the port number, the variable <*l1*> is the L1 controller index number, and the variable <*command*> is an L1 controller command.

l2

Use the l2 command set to engage and lock a specified L2 command processor or to send a command to specified L2 command processor(s). The following are the commands in this set:

- `l2`
- `rack` <*rng*> `slot` <*rng*> `l2`
- `rack` <*rng*> `slot` <*rng*> `l2` <*command*>
- <*ip*> `l2` <*command*>

Note: For these commands, the mnemonics `r` and `s` may replace the word `rack` and `slot`.

Note: For the <*rng*> variable, you can enter a single number, numbered items separated by a hyphen to indicate a range, or you can enter numbers separated by a comma to indicate two separate numbered items. For <*rng*>, you can also enter an asterisk or the word "all" to select all the items available.

Use the `l2` command to engage and lock the L2 command processor. Example B-76 shows sample output from the `l2` command.

Example B-76 `l2` Command Output

```
L2> l2
L2 command processor engaged, <CTRL-D> for console mode.
```

Use the `rack` <*rng*> `slot` <*rng*> `l2` command to engage a specified L2 controller.

Use the `rack` <*rng*> `slot` <*rng*> `l2` <*command*> command to send a command to a specified L2 controller(s). Use the <*ip*> `l2` <*command*> command to send a command to an L2 controller specified with its IP address.

multisys

Use the multisys set of commands enable, disable, and show the settings for multiple network sharing. The following commands are in this set:

- `multisys`
- `multisys on`
- `multisys off`

Note: For these commands, `msys` can replace the word `multisys`.

Use the `multisys` command to view the current setting for the L2 controller multiple system network sharing. Example B-77 shows the a sample output for the `multisys` command:

Example B-77 multisys Command Output

```
L2>multisys
L2 multiple system enabled.
L2's will only connect to L2s with same system SN.
L2>
```

Use the `multisys on` command to enable multiple L2 controller system network sharing. Network sharing enables L2s to talk only to other L2s that have the same serial number. Use the `multisys off` command to disable multiple L2 controller system network sharing. When L2 controller system network sharing is disabled, L2s talk to all all L2s.

power

The power set of commands displays the power status of the bricks and powers up and powers down the bricks. The following are the commands in this set:

- `power`
- `power up`
- `power down`
- `rack` <*rng*> `slot` <*rng*> `power`
- `rack` <*rng*> `slot` <*rng*> `power up`
- `rack` <*rng*> `slot` <*rng*> `power down`
- `power summary`
- `rack` <*rng*> `slot` <*rng*> `power summary`
- `partition` <*exp*> `power up|down|summary`

Note: For the power command set, the mnemonics `pwr`, `u`, `d`, and `s` may replace the words `power`, `up`, `down`, and `summary`. The mnemonics `r` and `s` may replace the words `rack` and `slot`.

Note: For <*rng*>, you can enter as a value numbered items separated by a hyphen to indicate a range, or you can enter numbers separated by a comma to indicate two separate numbered items. For <*rng*>, you can also enter an asterisk or the word "all" to select all the items available.

Use the `power` command to view the power status of each brick identified by the destination set of commands. Use the `power up` and `power down` commands to power up or power down each brick identified by the destination set of commands. Example B-78 shows sample output from the `power` command.

Example B-78 `power` Command Output

```
L2> power
001i21:
power appears on
001r19:
power appears on
001c07:
power appears on
001c10:
power appears on
```

Use the `r` <*rng*> `s` <*rng*> `power` command to view the power status of a specified brick. Use the `r` <*rng*> `s` <*rng*> `power up` or `r` <*rng*> `s` <*rng*> `power down` command to power up or power down specified bricks. In these commands, the variable <*rng*> is a rack number and the variable <*rng*> is a slot number. Example B-79 shows sample output from the `r` <*rng*> `s` <*rng*> `power` command.

Example B-79 `r` <*rng*> `s` <*rng*> `power` Command Output

```
L2> r 1 s 19 power
power appears on
```

Use the `power summary` command to display a power status summary. Use the `rack` <*rng*> `slot` <*rng*> `power summary` command to display the power status summary for specified bricks. Example B-80 shows sample output for the `power summary` command:

Example B-80 power summary Command Output

```
essc1-001-L2> power summary
all 2 bricks appear powered off
margin: 1 default, 0 low, 0 normal, 0 high, 0 custom, 0 other
essc1-001-L2>
```

Use the `partition` <*exp*> `power up|down|summary` command to power up or power down a partition(s), or to display a power summary for the partition(s). Use the `<exp>` variable to indicate the partition(s) that you want to power up, power down, or for which you want to provide a power summary. Example B-81 shows sample output for the `partition` <*exp*> `power up|down|summary` command:

Example B-81 partition <*exp*> power up|down|summary Command Output

```
essc1-001-L2> partition 2 power up
partition 2 powered up
```

quit

Use the `quit` command to exit the L2 command processor.

rackid

The rackid set of commands are used to display or set the L2 controller rack ID. The following are the rackid commands:

- `rackid`
- `rackid` <*decimal exp*>

Use the `rackid` command to display the rack ID of an L2 controller. Example B-82 shows a sample output for the `rackid` command:

Example B-82 rackid Command Output

```
essc1-001-L2>rackid
rack ID is 001
essc1-001-L2>
```

Use the `rackid` <*decimal exp*> command to set the rack ID for an L2 controller, where <*decimal exp*> is the rack ID number to be entered for the L2 controller.

select

The select set of commands displays and sets the brick ID number and subchannel that receives console input. The following are the commands in this set:

- `select`
- `select terse`
- `select subchannel console`
- `select subchannel` <*a*|*b*|*c*|*d*>
- `select subchannel` <*exp*>
- `select` <*exp*> <*exp*>
- `select` <*rack*>.<*slot*>
- `select reset`
- `select partition` <*exp*>
- `select filter on`
- `select filter off`

Note: For this command set, the mnemonic `sel, t, sub` (or `s`), `con, part` (or `p`), `res` may replace the words `select, terse, subchannel, console, partition,` and `reset`.

Use the `select` command to view the brick ID number and subchannel that receives console input. Example B-83 shows sample output from the `select` command. In this example, the brick ID is a C-brick in rack 2, slot 1 (002c01) and the subchannel is the console channel.

Example B-83 `select` Command Output

```
L2> select
console input: 002c01 console
console output: not filtered
console detection: L2 detected
```

Alternatively, you can use the `select terse` command to provide a terse display of information identifying the brick ID number and the subchannel that receives the console input.

Use the `select subchannel console` command to select the current console as the as the subchannel of the brick that receives the console input. Use the `select subchannel` <*a*|*b*|*c*|*d*> command to select CPU a, b, c, or d of the brick that receives the console input. Alternatively, use the `select subchannel` <*exp*> command to select the subchannel CPU of the brick that receives that console input.

Example B-84 shows sample output from the `select subchannel` <*a*|*b*|*c*|*d*> command. In this command, the variable <*a*|*b*|*c*|*d*> is the subchannel letter (a, b, c, or d CPU) of the brick to receive the console input.

Example B-84 `select subchannel` <*a*|*b*|*c*|*d*> Command Output

```
L2> select subchannel c
console input: 003c01 CPUc
console output: not filtered

console detection: L2 detected
```

Use the `select` <*rack*>.<*slot*> command to select the brick (brick ID) that receives console input. Example B-85 shows sample output from the `select` <*rack*>.<*slot*> command. In this command, the variable <*rack*> is a rack number and the variable <*slot*> is a slot number. In the example, the brick ID is a C-brick in rack 3, slot 1 (003c01).

Example B-85 `select` <*rack*>.<*slot*> Command Output

```
L2> select 3.1
console input: 003c01 console
console output: not filtered
console detection: L2 detected
```

Alternatively, use the `select` <*exp*> <*exp*> command to enter the rack and slot of the brick that receives the console input.

Use the `select reset command` to reset the selection of the brick to receive the console input to the default setting. Use the `select partition` <*exp*> command to select the partition and system console to receive the console input.

Use the `select filter on` command to turn the console output filter on, and the `select filter off` command to turn the console output filter off. Example B-86 shows sample output from the `select filter on` command.

Example B-86 `select filter on` Command Output

```
L2> select filter on
console input: 003c01 console
console output: filtered

console detection: L2 detected
```

serial

Use the serial set of commands to view and set the L2 controller system serial number. There are two commands in this set:

- `serial`
- `serial set` <*str*>

Use the `serial` command to view the L2 controller system serial number. Example B-87 shows sample output from the `serial` command.

Example B-87 `serial` Command Output

```
L2> serial
L2 system serial number: not set.
```

Use the `serial set` <*str*> command to set the L2 controller system serial number. In this command, the variable <*str*> is the L2 system serial number. Example B-88 shows sample output from the `serial set` <*str*> command.

Example B-88 `serial set` <*str*> Command Output

```
L2> serial set L0000010
L2 system serial number set to L0000010.
L2> serial
L2 system serial number: L0000010.
```

shell

Use the `shell` command to escape to the L2 operating system. Example B-89 shows sample output from the `shell` command.

Example B-89 `shell` Command Output

```
L2> shell
bash$ rm core
bash$ exit
exit
L2>
```

Note: For this command, you may use the character `!` instead of the word `shell`.

smp

The smp set of commands displays the status of the system maintenance port (SMP) network connection. These commands are also used to join a specified SMP group or leave a current SMP group. The following are the commands in this set:

- `smp`
- `smp verbose`
- `smp join` <*exp*>
- `smp leave`

Note: For this command set, the mnemonic `v` may replace the word `verbose`.

Use the `smp` command to view the status of the SMP network connection. Example B-90 shows a sample output for the `smp` command:

Example B-90 smp Command Output

```
essc1-001-L2>smp
Session    Who           Group  Mode   Console
-------   -------------  -----  ----   -----------------------
>>>  6    network port      6    L2    038c01 console (default)
     1    modem port        1    L2    038c01 console (default)
     1    modem port        1    L2    038c01 console (default)

essc1-001-L2>
```

Use the `smp verbose` command to display a verbose status of the SMP network connection.

Use the `smp join` <*exp*> command to join a specified SMP group identified by the <*exp*> variable. Use the `smp leave` command to leave the current SMP group.

sysname

Use the sysname set of commands to display or set the system name. The following are the commands in this set:

- `sysname`
- `sysname` <*str*>

Use the `sysname` command to display the name of the system. Example B-91 shows a sample output for the `sysname` command:

Example B-91 sysname Command Output

```
essc1-001-L2>sysname
L2 system name : essc1.
essc1-001-L2>
```

Use the `sysname` <*str*> command to set a system name where the variable <*str*> is the system name. Example B-92 shows a sample output for the `sysname` <*str*> command:

Example B-92 sysname <*str*> Command Output

```
essc1-001-L2>sysname essc2
L2 system name : essc2.

essc2-001-L2>
```

version

Use the `version` command to view the version of the firmware running in the system controller. Example B-93 shows sample output from the `version` command.

Example B-93 `version` Command Output

```
L2> version
L2 version 0.4.0
```

Note: For this command, the mnemonic `ver` may replace the word `version`.

Controller Status and Error Messages

This appendix lists and describes the status and error messages generated by the L1 and L2 controllers. It also explains how to resolve the errors, if action is necessary.

L1 Controller Messages

The L1 controller front panel display shown in Figure C-1 consists of a 2-line, 12-character liquid crystal display (LCD) that provides the following:

- Brick identification
- System status
- Warning of required service or failure
- Identification of failed components

Note: Besides the L1 control display, if you have an L2 controller, you can see the L1 controller messages on the L2 controller touch display located on the front door of the rack where the L2 controller resides. If you have a system console, you can also see the L1 controller messages on your system console.

Besides the display, the L1 controller front panel also includes the following items:

- **On/Off switch with LED** (brick reset button with LED). Pressing this button turns on the brick's internal components. The LED on the button lights green when the brick's internal components are on and turns off when the internal components are off.
- **Service required LED.** Lights orange to indicate that some item is broken or not operating properly (for example, a fan is off), but the brick is still operating.
- **Failure LED.** Lights red to indicate that a system failure has occurred and the brick system is down.

The following items are available on the C-brick only:

- **Reset switch.** Use this switch to reset the C-brick internal processors and ASICs. The reset will cause a memory loss. (See the non-maskable interrupt information that follows to perform a reset without losing memory.)
- **Non-maskable interrupt (NMI) switch.** Use this switch to reset the C-brick internal processors and ASICs without losing memory.

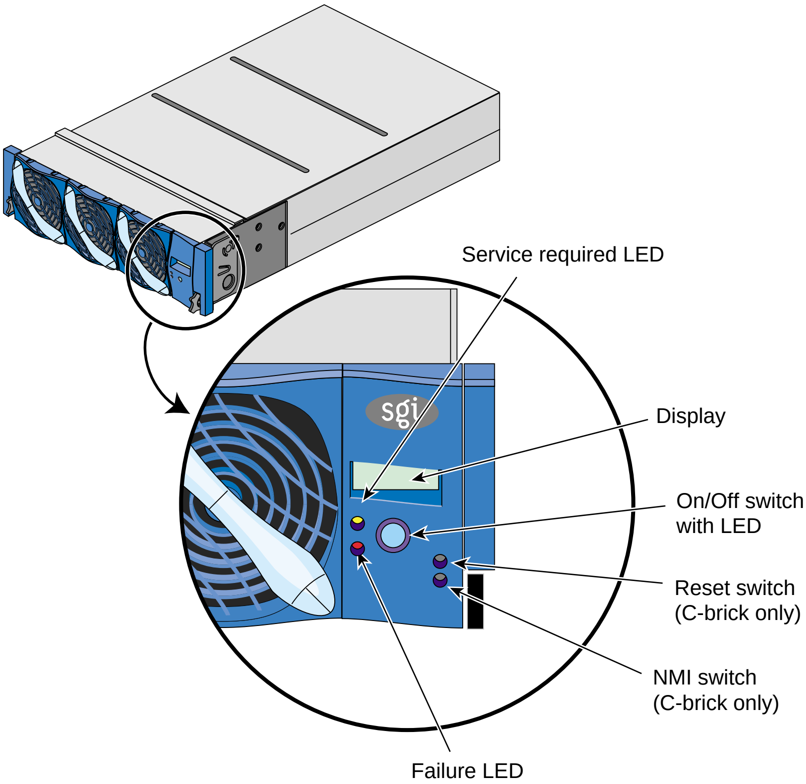

Figure C-1 L1 Controller

Table C-1 lists the L1 controller messages.

Note: Note that in Table C-1, 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 by 20 percent.

Table C-1 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 brick (or system, if no backup is available).
ATTN: x.xV low fault limit reached @ x.xxV	30-second power off sequence for the brick (or system, if no backup is available).
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.
Temperature messages: low alt.	
ATTN: TEMP # advisory temperature reached @ xxC xxF	The ambient temperature at the brick's air inlet has exceeded 30 degrees centigrade.

Table C-1 (continued) L1 Controller Messages

L1 System Controller Message	Message Meaning and Action Needed
ATTN: TEMP # critical temperature reached @ xxC xxF	The ambient temperature at the brick's air inlet has exceeded 35 degrees centigrade.
ATTN: TEMP # fault temperature reached @ xxC xxF	The ambient temperature at the brick's air inlet has exceeded 40 degrees centigrade.
Temperature messages: high alt.	
ATTN: TEMP # advisory temperature reached @ xxC xxF	The ambient temperature at the brick's air inlet has exceeded 27 degrees centigrade.
ATTN: TEMP # critical temperature reached @ xxC xxF	The ambient temperature at the brick's air inlet has exceeded 31 degrees centigrade.
ATTN: TEMP # fault temperature reached @ xxC xxF	The ambient temperature at the brick's air inlet has exceeded 35 degrees centigrade.
Temperature stable message:	
ATTN: TEMP # stabilized @ xxC/xxF	The ambient temperature at the brick'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.
Brick appears to have been powered down	The L1 controller has registered a fault and has shut down.

L2 Controller Messages

The L2 controller performs the following functions:

- Controls resource sharing.
- Controls L1 controllers.
- Resets the system.
- Issues non-maskable interrupts (NMI).

- Displays voltage margin information.
- Routes data between upstream devices and downstream devices.

  Upstream devices (for example, rack display, console, and modem) 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, C-bricks, the USB hub of the R-brick, and L1 controllers of the bricks) perform the actions that are 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.
- Allows remote maintenance.

The L2 controller touch display is used to do the following:

- Powering the system on and off
- Monitoring voltage margins
- Resetting the system
- Entering a non-maskable interrupt (NMI)

The L2 controller also monitors and generates status and error messages related to the rack chassis items, such as the power bay and other rack items. The L2 controller also displays status and error messages generated by each individual brick's L1 controller.

(See "L1 Controller Messages" on page 287 for L1 controller message descriptions.)

The L2 controller information is displayed on the L2 controller touch display located in the front door of your server system, as shown in Figure C-2. (The actual L2 controller is located on the top of your rack enclosure.)

Note: Besides on the L2 controller touch display, if you have a system console, you can see the L2 controller messages on the system console.

The L2 controller contains a software component that transfers data from a send client to the appropriate receive client. The clients with which the L2 controller communicates are local to the L2 controller.

The software allows the router clients to:

- Register with the router (identifies the client with a unique ID).
- Register to receive messages from other clients (local or remote).
- Receive commands and send corresponding responses.
- Send commands and receive corresponding responses.
- Receive messages that they are registered to receive.

The L2 controller logs the following information in separate files:

- Messages and command responses from the L1 controllers (includes the I/O bricks).
- Messages and output from the system console.
- Debugging messages that the L2 controller produces.
- Commands and responses from the L2 controller touch display.
- Messages and output that are sent to the console (attached to the L2 controller).
- Messages and output that are sent to the modem port (attached to the L2 controller).

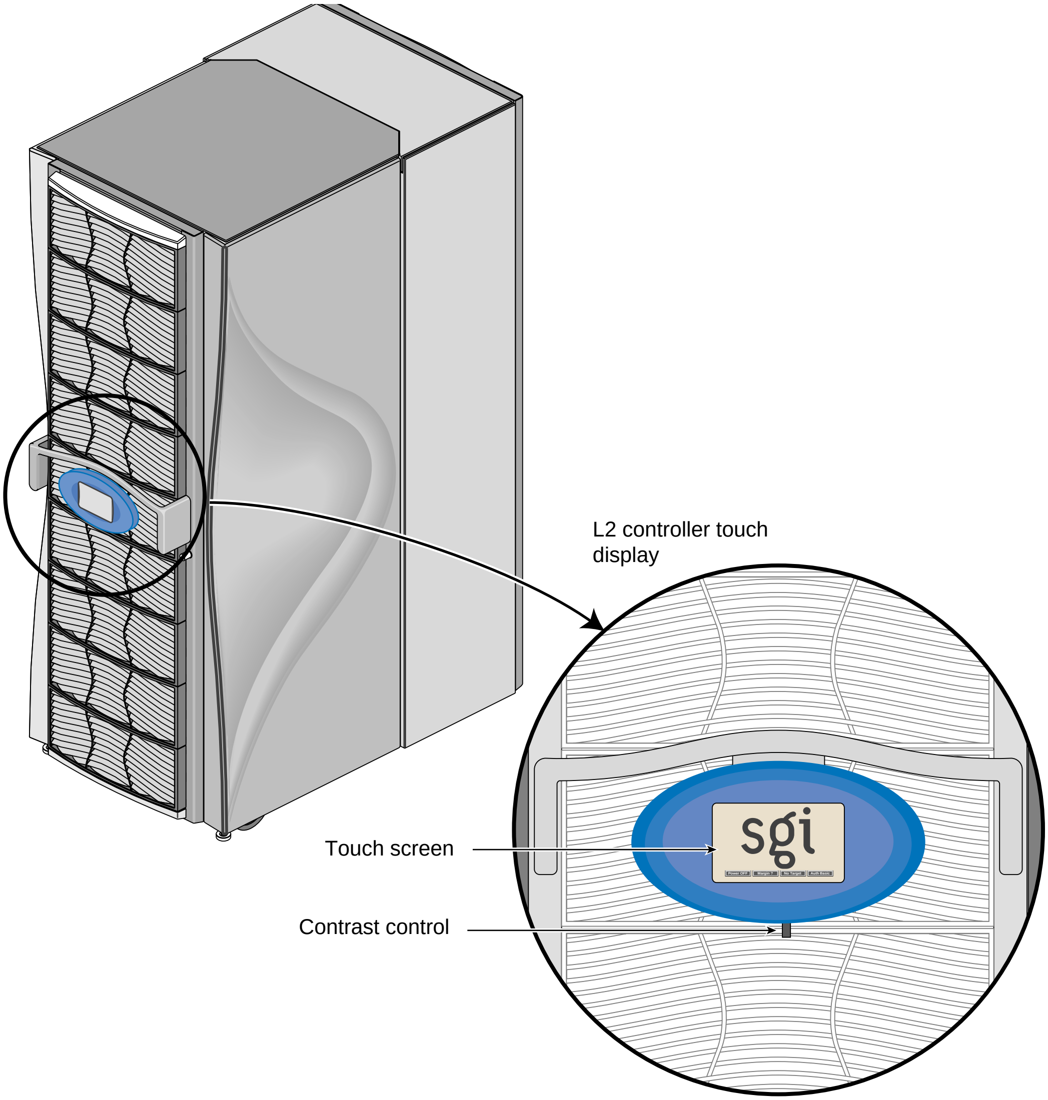

Figure C-2 L2 Controller Display

Regulatory Specifications

The following sections and illustrations present information that may be important to the operation of your SGI Origin 3000 series server.

Manufacturer's Regulatory Declarations

The SGI 3000 series of sever products conform to several national and international specifications and European Directives listed on the "Manufacturer's Declaration of Conformity." The CE insignia displayed on each device is an indication of conformity to the European requirements.

Caution: Each SGI server 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.

Server Model Number

The CMN (model) number for each server is shown on the system label on the unit.

CE Notice and Manufacturer's Declaration of Conformity

Marking by 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

FCC Notice (USA Only)

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

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

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

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

Industry Canada Notice (Canada Only)

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

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

VCCI Notice (Japan Only)

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 Origin 3000 series of server products is FCC-compliant under test conditions that include the use of shielded cables between the server and its peripherals. Your server and any peripherals you purchase from SGI have shielded cables. Shielded cables reduce the possibility of interference with radio, television, and other devices. If you use any cables that are not from SGI, ensure that they are shielded. Telephone cables do not need to be shielded.

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

Electrostatic Discharge

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

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

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

Lithium Battery Statement

Warning: Only qualified SGI service personnel should replace the lithium battery.

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

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

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

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

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

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

Safety Instructions

Read these instructions carefully:

1. Follow all warnings and instructions marked on the product and noted in this and other documentation included with the product.
2. Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
3. Do not use this product near water.
4. Do not place this product or components of this product on an unstable cart, stand, or table. 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 marking label. If you are not sure of the type of power available, consult your dealer or local power company.
7. Do not allow anything to rest on the power cord. Do not locate this product where persons will walk on the cord.
8. Do not use extension cords with your SGI system.
9. Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a fire or electric shock. Never spill liquid of any kind on the product.
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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