SGI™ Onyx® 3000 Series Graphics System Hardware Owner's Guide

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About This Guide

This guide provides information on using and administering your SGI Onyx 3000 rackmount graphics system. Although there several different models in the SGI Onyx 3000 system family, this guide refers to the products generically as SGI Onyx 3000 series graphics systems.

Warning: Before installing, operating, or servicing any part of this product, please read the "Safety Instructions" on page 152.

Product Features

Some of the graphics rack system features include:

- Enhanced modularity and scalability of all compute and I/O options.
- Increased system and memory bandwidth with reduced latency over Silicon Graphics Onyx2.
- More high-availability, reliability, and redundancy features than with Silicon Graphics Onyx2.
- Higher serviceability levels that result in faster diagnostic and repair time.

The following topics are covered in this manual:

- Chapter 1, "Introducing the SGI Onyx 3000 Series Graphics Systems," describes the graphics rack system and its components, capabilities, and options. A brief overview of the graphics system's compute and interface capabilities is provided. This chapter also describes the various SGI Onyx 3000 series graphic system models available.
- Chapter 2, "G-brick, V-brick, and N-brick," provides detailed descriptions of the functions of these bricks, including identification of their hardware components.

- Chapter 3, “Configurations and Cabling,” gives an overview on cabling the graphics system including cabling cautions and warnings. It provides examples of single-rack and multirack graphics system configurations. It also covers the cabling connections of monitors, keyboard and mouse, speakers, and the Ethernet.
- Chapter 4, “Using the SGI Onyx 3000 Series Graphics System,” gives basic information on using the Onyx 3000 series rack systems, including system maintenance and safety, using your monitor, connecting a keyboard and mouse to the I-brick, and instructions on powering on and off your system. It also references *SGI Origin 3000 Series Owner’s Guide* for instructions to add PCI cards or storage disks to enhance the use of your graphics system, and instructions to connect a system console to your system.
- Chapter 5, “Customer-replaceable Units,” describes installation and replacement procedures for the G-brick (L1) controller, L1 controller display panel, and cosmetic facade components.
- Chapter 6, “Graphics System Controllers,” describes the L1 brick-level controller, including descriptions of the status messages it displays. This chapter also describes the L2 rack-level controller, including the connectors on its interface panel and its L2 controller touch display.
- Appendix A, “Technical Specifications,” lists the specifications for the short 17U rack and the tall 39U rack enclosures and physical and power specifications for the bricks.
- Appendix B, “Regulatory Specifications,” lists all regulatory information related to the use of SGI Onyx 3000 graphics systems in the United States and other countries. This appendix also lists important safety instructions in operating, maintaining, and installing components for this product.

Additional Information

SGI manuals are available in various formats on the web at the following URL:

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

Enter a keyword search, or search by title to find the information or manual you need.

Start at the beginning of this guide to familiarize yourself with the features of your new system, or use the table of contents to proceed directly to the information you need. For more detailed hardware information on the SGI 3000 family of servers and visualization systems, see *SGI Origin 3000 Series Owner's Guide*.

Software-specific information is found in the following software guides:

- *IRIX Admin: System Configuration and Operation*
- *IRIX Admin: Software Installation and Licensing*

Conventions and Terminology

This guide uses the following conventions:

- References to document titles are in *italics*.
- Commands and names of files appear in text as `courier non-italics`.
- References to other chapters and sections within this guide are in quotation marks.
- Anything that you type on your keyboard is in **`Courier bold.`**
- Anything displayed on the screen is in `Courier`.
- Steps to perform tasks are in numbered sentences. When a numbered step needs more explanation, the explanation follows the step and is preceded by a square bullet.

- Warning text that describes conditions that could cause injury or death is highlighted with the icon in Figure i.

Figure i Injury or Death Warning Icon

- Caution text that describes conditions that could cause equipment damage or major data loss is highlighted with the icon in Figure ii.

Figure ii Equipment Damage or Data Loss Warning Icon

Introducing the SGI Onyx 3000 Series Graphics Systems

This chapter introduces the SGI Onyx 3000 series graphics systems in the following sections:

- "Product Description" on page 1
- "How the Hardware Components Work Together" on page 11
- "SGI Onyx 3000 Series Models" on page 21
- "System Location and Environment Overview" on page 34

Product Description

The SGI Onyx 3000 series graphics system, based on the SGI 3000 family of servers and visualization systems, is a rackmounted graphics supercomputer composed of separate, but interconnected, rackmounted functional units called "bricks." Figure 1-1 shows some of the bricks available with the graphics system in a front view of a sample SGI Onyx 3000 series graphics system that includes a G-brick, which contains InfiniteReality graphics pipes.

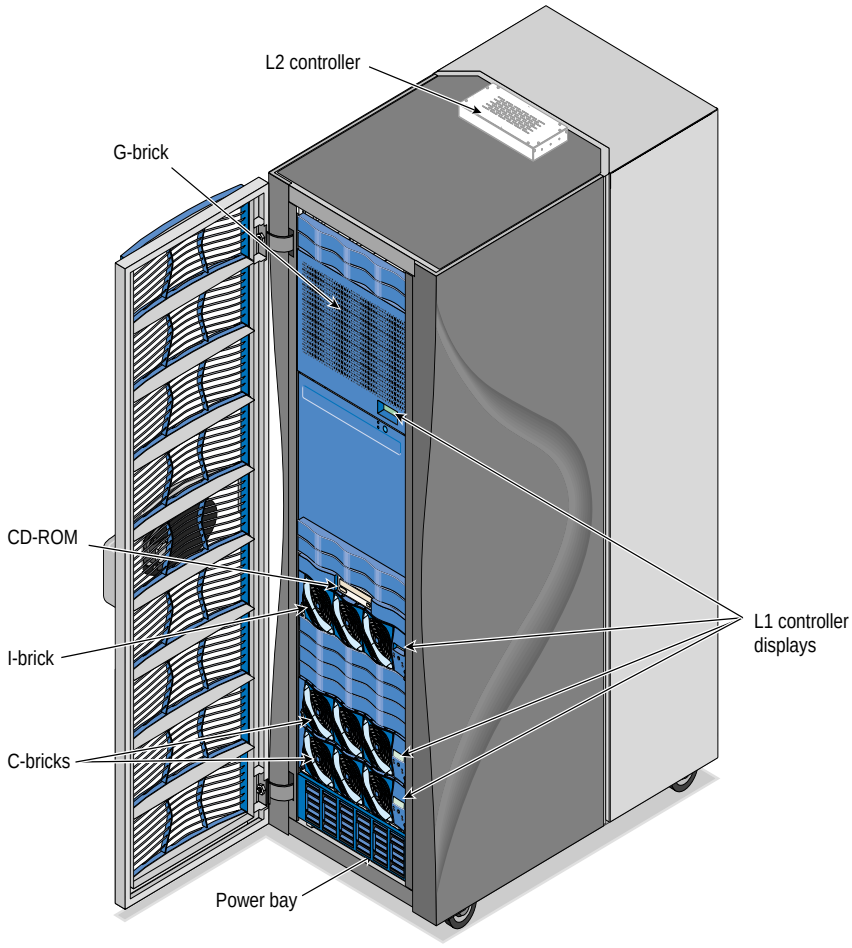

Figure 1-1 Example of SGI Onyx 3000 Graphics System (Front View)

Figure 1-2 shows the rear view of a sample SGI Onyx 3000 graphics system that includes a G-brick, which contains InfiniteReality graphics pipes.

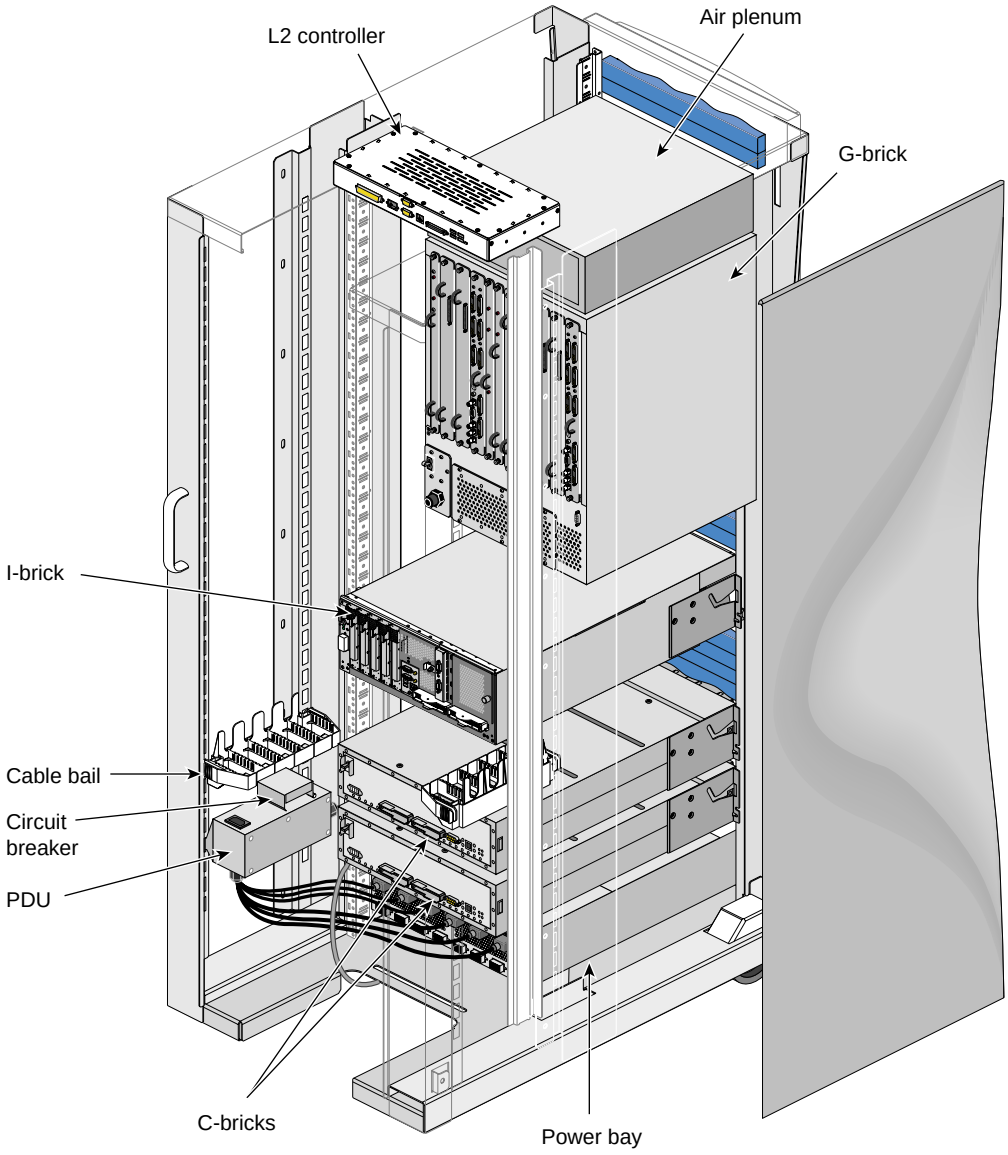

Figure 1-2 Example of SGI Onyx 3000 Graphics System (Rear View)

Table 1-1 provides functional descriptions of the bricks and rack components available with an SGI Onyx 3000 series graphics system. (For more detailed brick descriptions, see "Detailed Brick Descriptions" on page 8.)

Table 1-1 Major Components of the SGI Onyx 3000 Series Graphics System

Component	Description
G-brick	The G-brick, which contains the graphics subsystem, supports one or two InfiniteReality graphics pipes (sets of boards). (The SGI Onyx 3000 series graphics system can contain either G-brick(s) or V-brick(s), but not both.)
V-brick	Each V-brick, which contains the graphics subsystem, supports one or two InfinitePerformance pipes with each pipe consisting of one VPro V12 graphics board. (The SGI Onyx 3000 series graphics system can contain either V-brick(s) or G-brick(s), but not both.)
C-brick	The C-brick, also known as the compute brick, provides computer processing and memory function for the system.
I-brick	The I-brick provides basic boot functions, including the system hard disk, USB ports for keyboard and mouse connections, and an Ethernet connection. One CD-ROM drive is standard with each I-brick. This brick also has five PCI card slots. (See lithium battery warnings in Appendix B, "Regulatory Specifications".)
P-brick (optional)	The P-brick has 12 PCI card slots.
X-brick (optional)	The X-brick has four XIO card slots.
N-brick (optional)	The N-brick can replace an I-brick or X-brick to provide an efficient interconnection between the C-bricks and the InfiniteReality pipes in the G-brick.
R-brick	The R-brick provides router capabilities to the SGI Onyx 3400 and SGI Onyx 3800 graphics systems.
D-brick (optional)	The D-brick provides 3.5-inch drive slots for fibre channel drives to provide storage functionality.
L1 controller interface panel	The L1 controller is a part of each brick except the D-brick. The L1 controller microprocessor reports brick status information to the L2 controller.

Table 1-1 (continued) Major Components of the SGI Onyx 3000 Series Graphics System

Component	Description
L2 controller	The L2 controller and its touchscreen display panel provide an intelligent interface that can control and monitor all the rack activity, including all the brick L1 controllers in the rack. There is one L2 touch display panel in every rack with C-bricks.
NUMAlink interconnect cabling	These physical cables enable different C-bricks in a single or multirack graphics system to communicate and share resources with other system bricks. The interconnect cables are made with delicate copper strands. These cables should only be handled by an SGI system support engineer (SSE).
Cable bails	Cable bails hold any interconnect cables in place to prevent excessive cable bending, which can cause damage.
Power Distribution Unit (PDU) and circuit breaker	These are the primary power distribution input point for the tall rack. The number of PDUs in a rack is determined by 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 that the G-brick(s) uses independent power cables that plug to outlets outside the rack system.
Power Distribution Strip (PDS)	The PDS is a power distribution input point for the rack. The PDS has six outlet connectors, one inlet connector, and a circuit breaker switch. The PDS is used as a secondary distribution point for the tall racks and as a primary distribution point for a short rack. Because the D-brick(s) needs 220 VAC, it circumvents the power bay and plugs directly to a a PDS.
Power bay	The power bay distributes 48 VDC power to the L2 controller(s) and system bricks (except G-brick and D-brick).

Customize Your System

You can customize your graphics system by combining the bricks to provide the computing, I/O, storage, and graphics capabilities to meet your specific visual simulation, post-production, multimedia, and distributed computing requirements. You can choose, for example, between single or multiple G-bricks with one or two InfiniteReality pipes per G-brick, or single or multiple V-bricks with either one or two InfinitePerformance graphics pipes (VPro V12 graphics boards) per V-brick to meet your graphics needs.

The highly configurable and flexible SGI Onyx 3000 series graphics system is available in single-rack and multirack enclosure models, depending on the level of functionality you need. The Onyx 3000 series graphics systems come in three models to meet your graphics computing needs: SGI Onyx 3200, SGI Onyx 3400, and SGI Onyx 3800. Figure 1-3 shows an example of an SGI Onyx 3800 multirack graphics system.

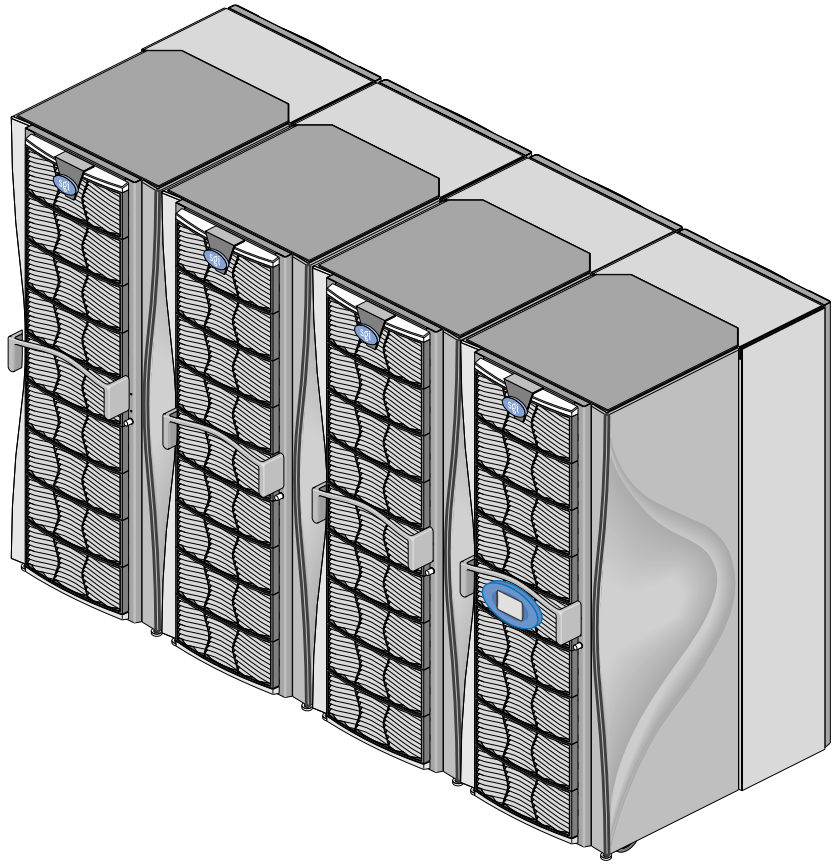

Figure 1-3 Example of SGI Onyx 3000 Multirack Graphics System

Detailed Brick Descriptions

This section describes the following SGI Onyx 3000 series graphics systems bricks: C-brick, I-brick, P-brick, X-brick, N-brick, R-brick, D-brick, G-brick, and V-brick.

Note: For more detailed descriptions of the C-, I-, P-, X-, R- and D-brick, see *SGI Origin 3000 Series Owner's Guide*. For more detailed descriptions of the G-, V-, and N-brick, see Chapter 2, "G-brick, V-brick, and N-brick" in this guide.

C-brick

The C-brick compute enclosure consists of two or four 64-bit processors with a secondary cache of either 4 or 8 MB. Each processor can execute two floating-point instructions per cycle, which supports a peak speed of 1000 Mflop/sec. The memory is a distributed shared memory (DSM) scheme, in which the memory is physically partitioned among the nodes but is accessible by all nodes. Cache coherence is maintained through a directory-based scheme. The C-brick, which provides computing functions for the V-brick and G- brick graphics bricks, connects directly to a V-brick, and connects through an I-, X-, or N-brick to the G-brick.

I-brick

The I-brick is a PCI-based I/O subsystem. It has two 800-MB/sec ports (in each direction) that connect to a C-brick, G-brick, or V-brick. The I-brick houses one or two standard system fibre channel (FC) hard disk drives. A standard CD-ROM drive is also located on the front of the I-brick. Five PCI slots are configured on two buses, and two drive bays support fibre channel drives (one standard system disk and one optional disk). The PCI buses support both 32- and 64-bit modes. The I-brick also provides the primary (standard) keyboard/mouse, audio, and serial port connections. Additional connections are available by adding optional PCI cards or additional I-bricks.

Warning: The motherboard on the I-brick has a lithium battery installed. Only qualified SGI service personnel should replace this lithium battery, and only with the same type or an equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions. There is a danger of explosion if the battery is incorrectly replaced. See Appendix B, "Regulatory Specifications".

P-brick (Optional)

The optional P-brick has two 1200-MB/sec ports (in each direction) that connect to a C-brick. Twelve PCI slots are configured on six buses. The PCI buses support both 32- and 64-bit modes.

N-brick (Optional)

The N-brick is an option to connect a C-brick to InfiniteReality pipes on the G-brick. The N-brick has four pairs of connectors (800 MBytes in each direction) that can be used in place of an X-brick or an extra I-brick to connect with as many as four C-bricks and as many as four InfiniteReality pipes. This is a cost and space-efficient solution when you do not require the additional I/O capability provided with an X-brick or extra I-brick.

For a more detailed description of the N-brick, see Chapter 2, “G-brick, V-brick, and N-brick” in this guide.

R-brick

The R-brick provides routing capabilities to the system. R-bricks are available with SGI Onyx 3400 and SGI Onyx 3800 graphics systems.

X-brick (Optional)

The X-brick is a dual-port brick that provides four expansion slots for SGI XIO interface cards, such as HIPPI, digital video, GSN, and so on.

D-brick (Optional)

The D-brick supports 3.5-inch fibre channel disk drives. The dual-ported disk drives can be connected to two fibre channels. The aggregate channel bandwidth of a disk fibre channel depends on the bandwidth capability of the FC controller and the number and type of FC disk drives on the channel.

Graphics Bricks (G-brick and V-brick)

The SGI Onyx 3000 series graphics system provides graphics capabilities with either one or more G-bricks or one or more V-bricks (but not both types of bricks in the same system).

The 18U-sized G-brick supports one or two InfiniteReality graphics pipes. Each InfiniteReality graphics pipe consists of a set of graphics boards to meet your graphics needs. The set of boards contain a Geometry Engine (GE), a Raster Manager (RM), and a Display Generator (DG).

The G-brick also includes a Ktown2 interface board with two connectors to connect the G-brick pipes to an I-, X-, or N-brick (which is in turn connected to a C-brick) on the graphics system.

Each InfiniteReality-based graphics system provides the following features:

- Between 1 to 16 graphics-pipe configurations. (The first pipe has one or two RMs, and the second pipe has one, two, or four RMs.)
- Various DG daughterboard options.
- Optional support of as many as eight monitors on each pipe.
- An L1 controller that monitors and controls the G-brick environment.

Note: For more details on the G-brick, see Chapter 2, “G-brick, V-brick, and N-brick”.

Each V-brick supports one or two independent InfinitePerformance graphics pipes.

Each V-brick provides the following features:

- Support for one or two InfinitePerformance graphics pipes. Each InfinitePerformance pipe has two DVI-I (Digital Video Interface-Integrated) output connectors for TMDS digital or RGB analog signals. Each InfinitePerformance pipe also provides swap ready, genlock, and stereo connectors.
- Two XIO connectors.
- An L1 controller that monitors and controls the V-brick environment.

Note: For more details on the V-brick, see Chapter 2, “G-brick, V-brick, and N-brick”.

How the Hardware Components Work Together

This section describes how the various bricks, peripherals, and other SGI Onyx 3000 series graphics system hardware components connect and work together. This section includes block diagrams, which divide the system into "brick-level" functional parts: the I/O, compute, storage portions, and the graphics subsystems. (These block diagrams are divided into systems that include the G-brick with InfiniteReality pipes and the V-brick with InfinitePerformance pipes.)

The G-brick or V-brick provide the graphics capabilities for the system. The C-brick compute subsystems supply processing power for the G-brick and V-brick graphics system as well as for the I/O and storage subsystems within a rack. Note that in multirack systems, the compute, I/O, and graphics bricks may be mixed in different configurations than those shown in this section.

In an SGI Onyx 3000 series rack or multirack system, each brick (with the exception of the D-brick) has a dedicated module system controller (L1 controller), which monitors operational status.

System bricks communicate using the high-speed NUMAlink interconnect. The NUMAlink interconnect cables (also known as the interconnection fabric) consists of a set of high-speed routing switches and cabling that enable multiple connections to occur simultaneously. With the NUMAlink scheme, hardware resources (including main memory) can be shared and accessed by all the bricks in the graphics rack system.

Keyboard and mouse functions are routed through the Universal Serial Bus (USB) connections on the back of the I-brick. For more information on the keyboard and mouse connections, see "System Maintenance and Safety Information" on page 92.

Audio connections are made through a PCI audio board physically located in the I-brick. "Speaker Pair Connections" on page 81 provides detailed specifications on the audio board.

Linked Microprocessors and Bricks

The CPU boards within the C-bricks use links that differ from bus technology. While a bus is a resource that can be used by only one processor at a time, the communications "fabric" in the rack makes connections from processor to processor as they are needed.

The C-brick uses two or four processors, each with 4 or 8 MB of private secondary cache, interconnected at an ASIC called the “Bedrock” ASIC.

The Bedrock ASIC acts as a crossbar between the internal processors, local memory, the I/O interface bricks (such as the I-brick, P-brick, and X-brick), and the G-brick(s) or V-brick(s). It also facilitates connection to external I/O peripherals, such as an Ethernet network connection or D-bricks.

This web of connections differs from a bus in the same way that multiple dimensions differ from a single dimension. You could describe a bus as a one-dimensional line while the Onyx 3000 series uses a multidimensional mesh.

The multiple data paths are constructed as they are needed by router ASICs, which act as switches. When you add a C-brick, you add to and scale the system bandwidth.

Multirack Interconnect Features

In the case of a multirack graphics system with multiple C-, I-, P-, X-, and N-bricks, the NUMAlink interconnects link them all to one another. The NUMAlink interconnect may appear to be a type of super data bus, but it differs from a bus in several important ways. Basically, a bus is a resource that can be used by only one processor at a time. The NUMAlink interconnect is a mesh of multiple, simultaneous, dynamically allocated connections that are made from brick to brick in the single-rack or multirack system.

This makes the multirack system very scalable because it can range in size from 4 to 64 processors or more (up to 128 CPUs with graphics).

As you add C-bricks, you add to and scale the system bandwidth.

The NUMAlink interconnect technology has the following key features:

- The interconnect is a mesh of multiple point-to-point links connected by routing switches. These links and switches allow multiple transactions to occur simultaneously.
- The links permit extremely fast switching (a peak rate of 3200 MB/s bidirectionally, 1600 MB/s in each direction).
- The NUMAlink interconnect mesh does not require arbitration, nor is it limited by contention.

- More routers and links are added as C-bricks are added, increasing the NUMAlink interconnect's bandwidth.
- The interconnect provides a minimum of two separate paths to any pair of bricks. This redundancy allows the system to bypass failing routers or broken fabric links. Each fabric link is additionally protected by a CRC code and a link-level protocol, which retry any corrupted transmissions and provide fault tolerance for transient errors.

Architecture and Memory

Each of the C-brick's 64-bit microprocessors has direct access to as many as 8 MB of private secondary cache.

Each C-brick has local memory (as many as 8 GB) that can be distributed and shared among all system microprocessors. This shared memory is accessible by way of the NUMAlink interconnection fabric cabling, which provides inter-brick accesses with low latency. The memory that is physically located on a compute node is referred to as the node's local memory.

Additional System Features

Other features of the SGI Onyx 3000 series graphics systems include:

- Scalable growth of memory and I/O bandwidth as well as processor compute power.
- As many as 16 InfiniteReality pipes or as many as four InfinitePerformance pipes in a single system.
- As many as 16 GB of compute main memory in a single-rack graphics system for systems with InfiniteReality graphics pipes. And as many as 48 GB of main memory in a single-rack graphics system for systems with InfinitePerformance graphics pipes.
- High availability within a single-rack or multirack system.
- High-bandwidth I/O connectivity.
- High total memory bandwidth.
- Improved synchronization operations.

- Wide variety of peripheral connectivity options, including support for super-wide (1920 x 1200) high-resolution monitors.
- PCI-based digital audio processing.
- Beeping keyboard for support of ”bell.”

G-brick Graphics System Block Diagrams

The most basic InfiniteReality single-rack graphics system contains one InfiniteReality pipe with one RM [Raster Manager] board assembly in one G-brick, one C-brick, and one I-brick, as shown in a block diagram in Figure 1-4. Each system varies based on the configuration ordered.

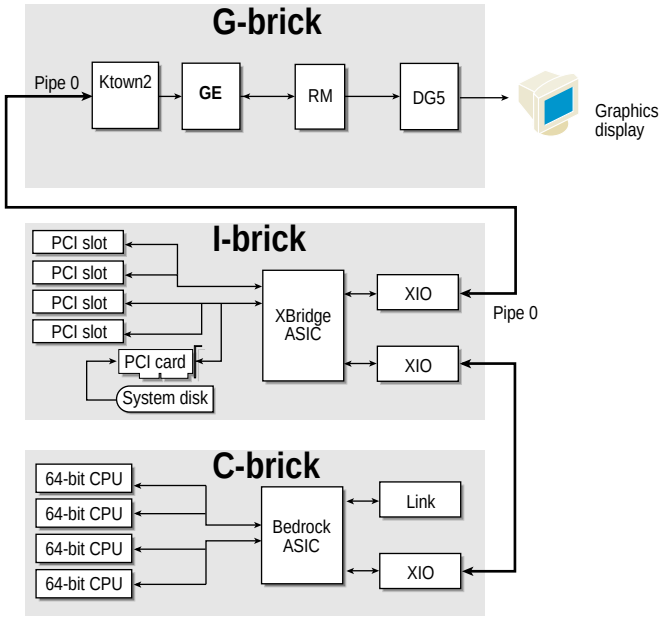

Figure 1-4 InfiniteReality Single-rack System with One Single-pipe G-brick and One C-brick

Figure 1-5 shows a configuration with a single G-brick (with two InfiniteReality pipes with two RMs each), two C-bricks, an X-brick, and an I-brick.

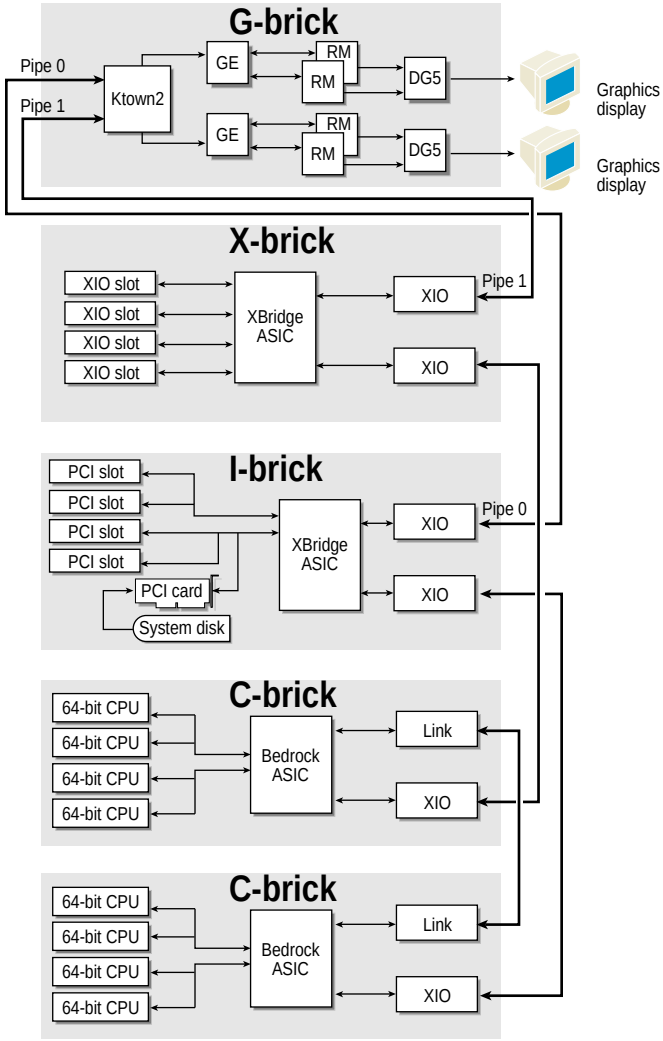

Figure 1-5 InfiniteReality Single-rack System with a Two-pipe G-brick and Two C-Bricks

Figure 1-6 shows a dual-rack InfiniteReality graphics system with two G-bricks (with each brick containing two pipes with two RMs), four C-bricks, two R-bricks, two I-bricks, and an N-brick.

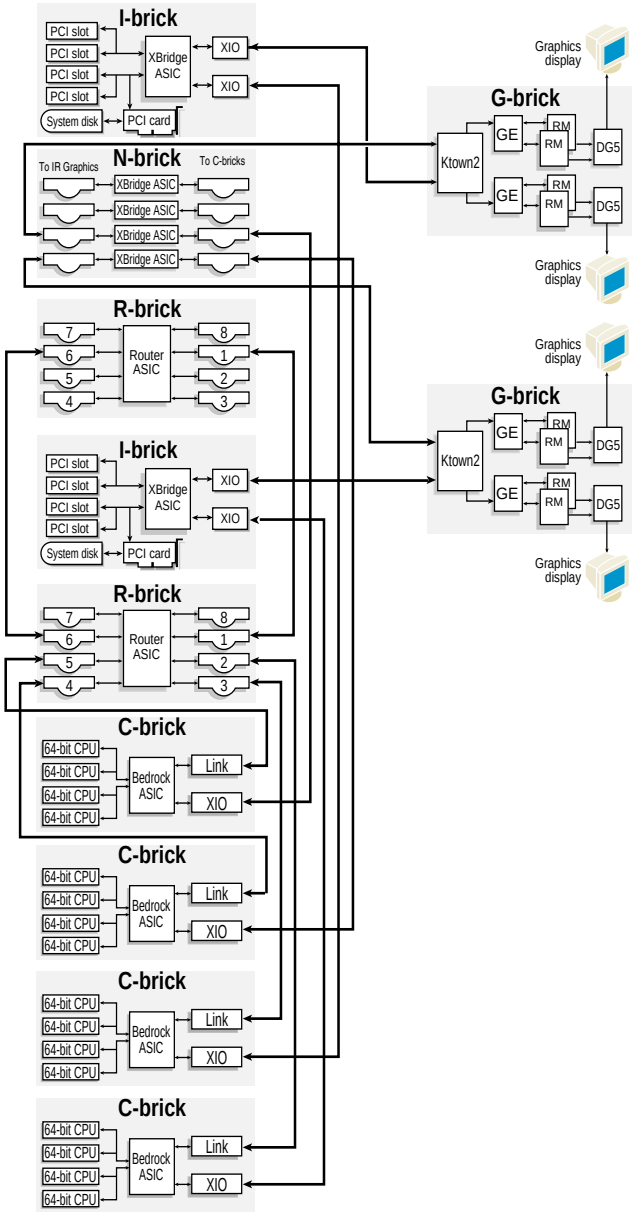

Figure 1-6 InfiniteReality Dual-rack System with Two G-bricks, Four C-bricks, and One N-brick

V-brick Graphics System Block Diagram

Figure 1-7 shows a single-rack SGI Onyx 3400 system that supports two V-bricks (each with two InfinitePerformance pipes), one I-brick, five C-bricks, and two R-bricks (routers). Each system varies based on the configuration ordered.

Note: Because each InfinitePerformance pipe requires a dedicated C-brick, and because one C-brick is dedicated for connection to the system I-brick, the minimum number of C-bricks required for a graphics system is the number of InfinitePerformance pipes in the system plus one.

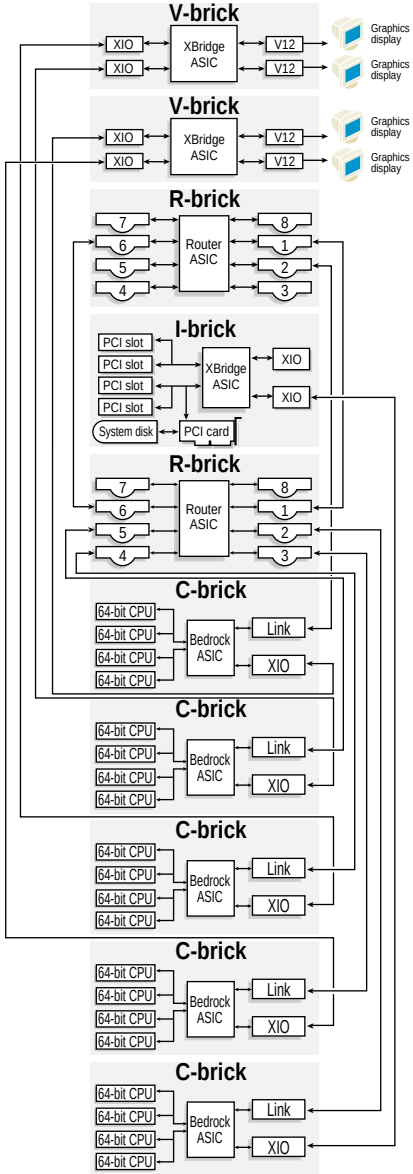

Figure 1-7 Example of Two V-brick, Single-rack Graphics Block Diagram

SGI Onyx 3000 Series Models

The following items help to identify an SGI Onyx 3000 series graphics system model:

- The system can include either an InfiniteReality (G-brick) or InfinitePerformance (V-brick) graphics brick, but cannot include both in the same system.
- Each G-brick (I8U-sized brick) can support one or two InfiniteReality graphics pipes, and each V-brick (4U-sized brick) can support one or two InfinitePerformance graphics pipes. (Each InfinitePerformance graphics pipe consists of one V12 graphics board.)

The different SGI Onyx 3000 series graphics system models are distinguished by the following:

- The type and number of graphics bricks, and the number of graphics pipes or boards these bricks support.
- The number of C-bricks and the number of processors in those C-bricks. (Each C-brick can contain either two or four processors.)
- The combination of functional bricks you have in your graphics system.

The SGI Onyx 3000 graphics system models are described in the following sections:

- "SGI Onyx 3200 Graphics Systems" on page 21
- "SGI Onyx 3400 Graphics Systems" on page 25
- "SGI Onyx 3800 Graphics Systems" on page 30

SGI Onyx 3200 Graphics Systems

This section describes the following two systems:

- SGI Onyx 3200 graphics system with G-brick and InfiniteReality graphics
- SGI Onyx 3200 graphics system with V-brick and InfinitePerformance graphics

SGI Onyx 3200 Graphics System with G-brick and InfiniteReality Graphics

An SGI Onyx 3200 graphics system model that includes one G-brick meets the following requirements:

- The system supports one G-brick with a minimum of one and a maximum of two InfiniteReality graphics pipes. The first pipe can hold one or two RMs and the second pipe can hold one, two, or four RMs.
- The system has a minimum of one and a maximum of two C-bricks, which together have a minimum of four to a maximum of eight processors.
- The system supports one I-brick and one power bay.

  Note: I-, X-, or P-bricks can be added to the system.

- The system has no R-bricks (no routers).
- The system is housed in a tall 39U rack enclosure with one power distribution unit (PDU).
- The system has an L2 controller with an L2 controller touch display.

The D-brick is optional with the SGI Onyx 3200 graphics system with a G-brick.

Figure 1-8 shows an example of an SGI Onyx 3200 graphics system with one G-brick with one InfiniteReality pipe.

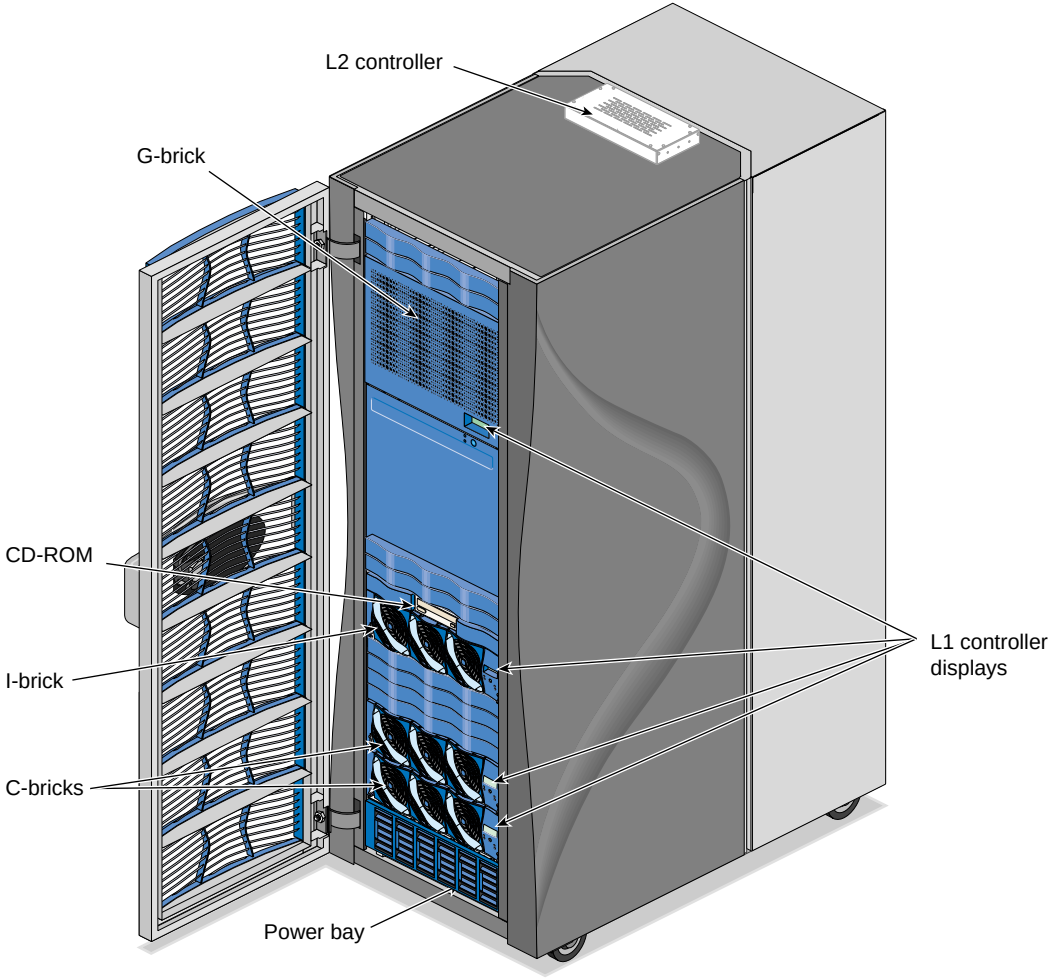

Figure 1-8 SGI Onyx 3200 Graphics System with One G-brick with One InfiniteReality Graphics Pipe

SGI Onyx 3200 Graphics System with V-brick and InfinitePerformance Graphics

An SGI Onyx 3200 graphics system that includes one V-brick with an InfinitePerformance graphics pipe meets the following requirements:

- The system has one V-brick with support for one InfinitePerformance graphics pipe.
- The system has two C-bricks (which together can have a minimum of four and a maximum of eight processors).
- The system has one I-brick and one power bay.
- The system has no R-bricks (no routers).
- The system is housed in a short 17U rack enclosure with one power distribution system (PDS).

Note: Although an L2 controller is optional with the SGI Onyx 3200 graphics system, the L2 controller touch display is not optional.

Figure 1-9 shows an example of the SGI Onyx 3200 graphics system with a V-brick with one InfinitePerformance graphics pipe.

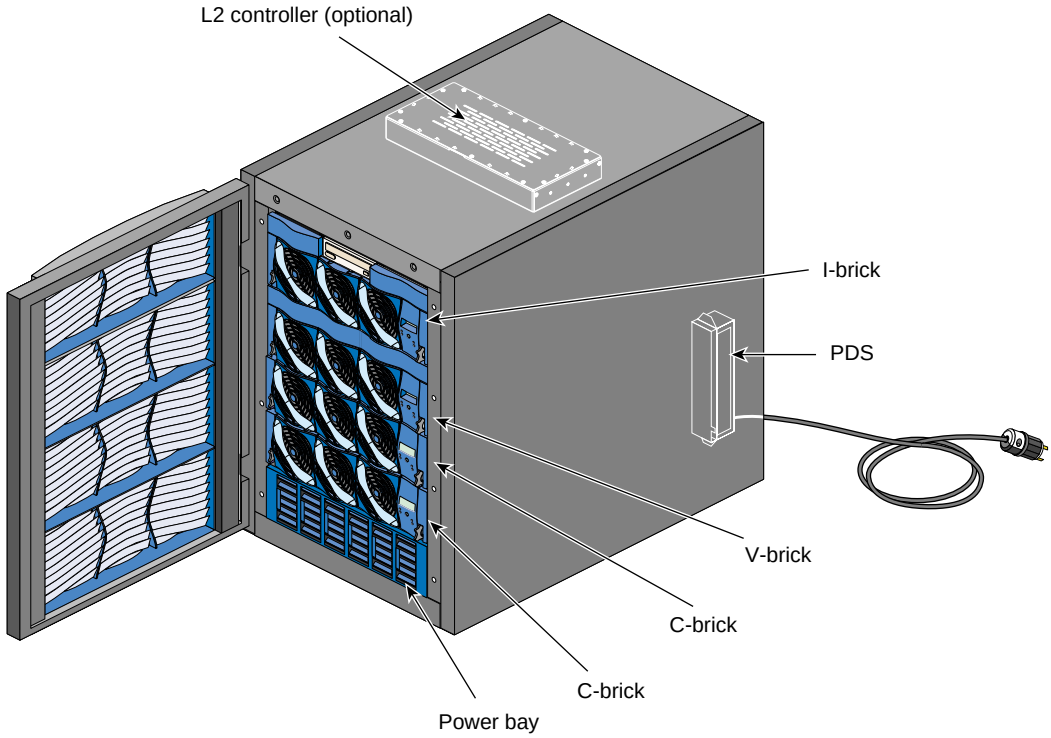

Figure 1-9 SGI Onyx 3200 Graphics System with One V-brick and Support for One InfinitePerformance Graphics Pipe

SGI Onyx 3400 Graphics Systems

This section describes the following two systems:

- SGI Onyx 3400 graphics system with G-brick and InfiniteReality graphics
- SGI Onyx 3400 graphics systems with V-brick and InfinitePerformance graphics

SGI Onyx 3400 Graphics System with G-brick and InfiniteReality Graphics

The SGI Onyx 3400 graphics system that contains one or more G-bricks with InfiniteReality graphics meets the following requirements:

- The system has a minimum of one and a maximum of eight G-bricks, and a minimum of one and a maximum of eight graphics pipes.
- The system has a minimum of one and a maximum of eight C-bricks. Together, the C-bricks can have minimum of four and a maximum of 32 processors.
- The system has a minimum of one system I-brick.

Note: The number of additional I-, X-, P-, or N- bricks in the system depends on the number of C-bricks in the system. (Each InfiniteReality graphics pipe requires a connection to a C-brick through an I/O brick [I-, X-, or N-brick].) The rack-space-saving N-brick (2U) is a good option in environments where the I/O functionality of the I- and X-brick is not required.

- The system has two R-bricks (two six-port routers).
- The system ships with at least two tall 39U rack enclosures. In the minimum configuration, the first rack holds the compute and I/O bricks, and the second rack holds one G-brick and space for a second G-brick.

  The first rack has at least one power bay with one power distribution unit (PDU). The second rack with the G-brick(s) does not require a PDU.
- Each tall rack enclosure containing C-bricks comes with an L2 controller and an L2 controller touch display.

Figure 1-10 shows an example of one possible SGI Onyx 3400 graphics system configuration that includes two racks. One rack has two G-bricks, and each G-brick has two InfiniteReality pipes.

The system model can be expanded to include additional racks to add I/O, storage (D-bricks), and graphics bricks.

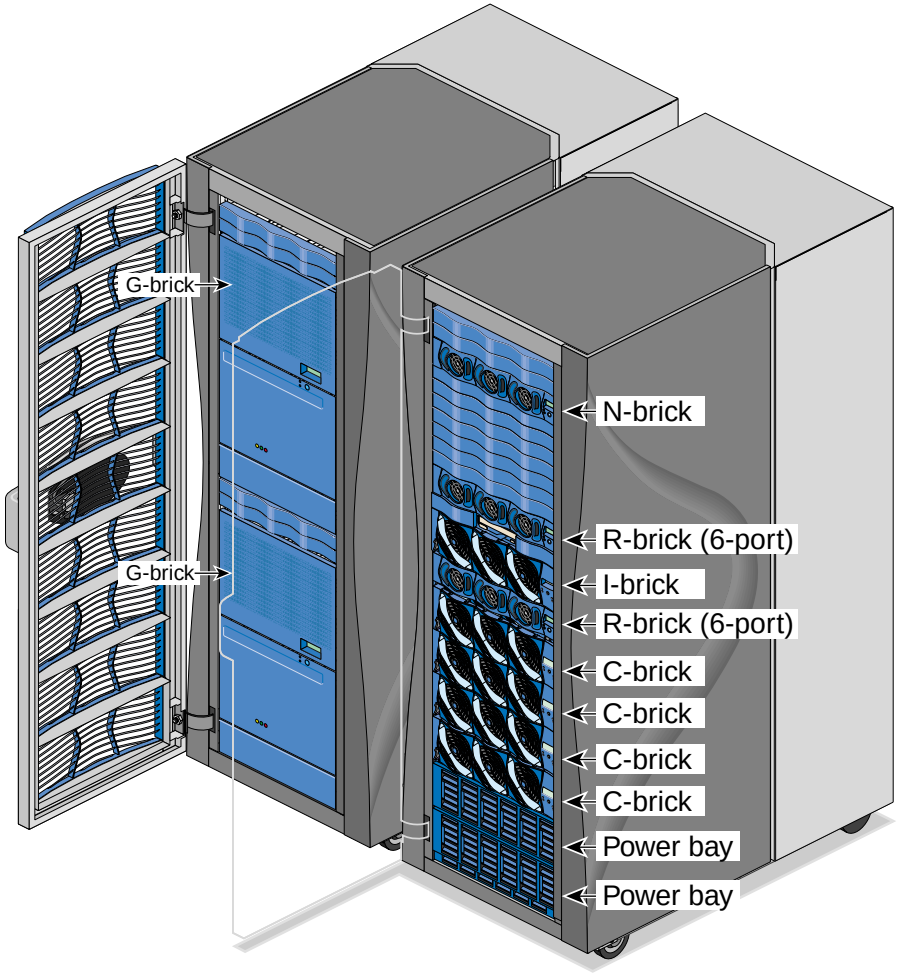

Figure 1-10 SGI Onyx 3400 Graphics System with Two G-bricks (Two InfiniteReality Pipes Each)

SGI Onyx 3400 Graphics System with V-brick and InfinitePerformance Graphics

The SGI Onyx 3400 graphics system that contains one or more V-bricks and InfinitePerformance graphics pipes meets the following requirements:

- The system has a minimum of one and a maximum of four InfinitePerformance graphics pipes.
- The system has a minimum of two and a maximum of eight C-bricks.
- The system has a minimum of six and a maximum of 32 CPUs.
- The system has a minimum of one system I-brick.
- The system has two R-bricks (two six-port routers).
- The system needs at least one tall 39U rack enclosure, which has at least one power bay with one power distribution unit (PDU).
- Each tall rack enclosure containing C-bricks comes with an L2 controller and an L2 controller touch display.

Figure 1-11 shows an example of one possible SGI Onyx 3400 graphics system configuration that includes a V-brick with two InfinitePerformance graphics pipes.

The system model can be expanded to include additional racks to add I/O, storage (D-bricks), and graphics bricks.

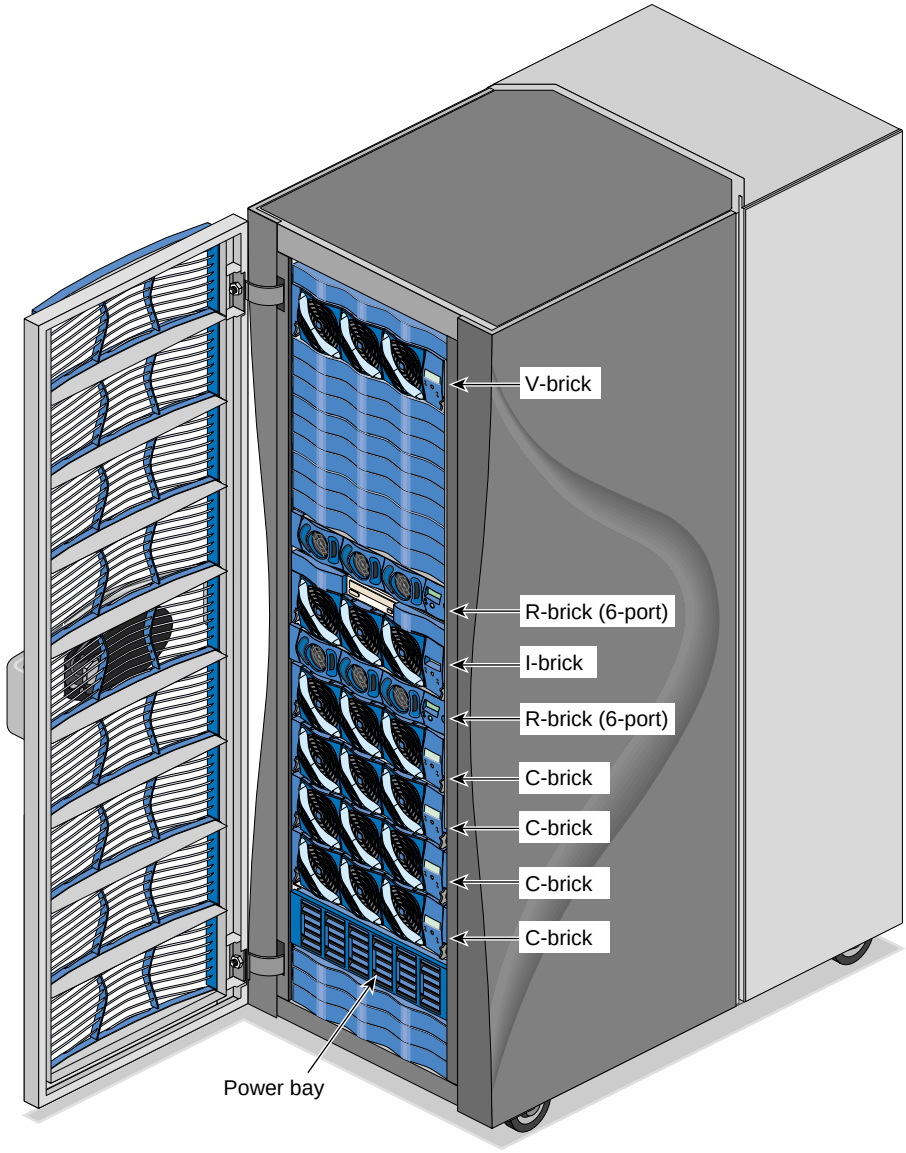

Figure 1-11 SGI Onyx 3400 Graphics System with One V-brick (with Two InfinitePerformance pipes)

SGI Onyx 3800 Graphics Systems

This section describes the following two systems:

- SGI Onyx 3800 graphics system with G-brick and InfiniteReality graphics
- SGI Onyx 3800 graphics system with V-brick and InfinitePerformance graphics

SGI Onyx 3800 Graphics System with G-brick and InfiniteReality Graphics

The SGI Onyx 3800 graphics system that contains one or more G-bricks with InfiniteReality graphics pipes meets the following requirements:

- The system has a minimum of one and a maximum of 16 G-bricks, and a minimum of one graphics pipe and a maximum of 16 graphics pipes.
- The system has a minimum of 4 and a maximum of 32 C-bricks, and a minimum of 16 and a maximum of 128 processors.
- The system has a minimum of one I-brick.

Note: The number of additional I-, X-, P-, or N- bricks in the system depends on the number of C-bricks in the system. (Each G-brick graphics pipe requires a connection to a C-brick through an I/O brick [I-, X-, or N-brick].) The rack-space-saving N-brick (2U) is a good option in environments where the I/O functionality of the I- and X-brick is not required.

- The system has two R-bricks (two 8-port routers).
- The system needs at least three tall 39U rack enclosures, in which each has at least one power bay with one power distribution unit (PDU).
- Each tall rack enclosure containing C-bricks comes with an L2 controller and an L2 controller touch display.

Figure 1-12 shows an example of one possible SGI Onyx 3800 graphics system configuration that includes four G-bricks (three G-bricks have two InfiniteReality pipes, and one G-brick has one InfiniteReality pipe).

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

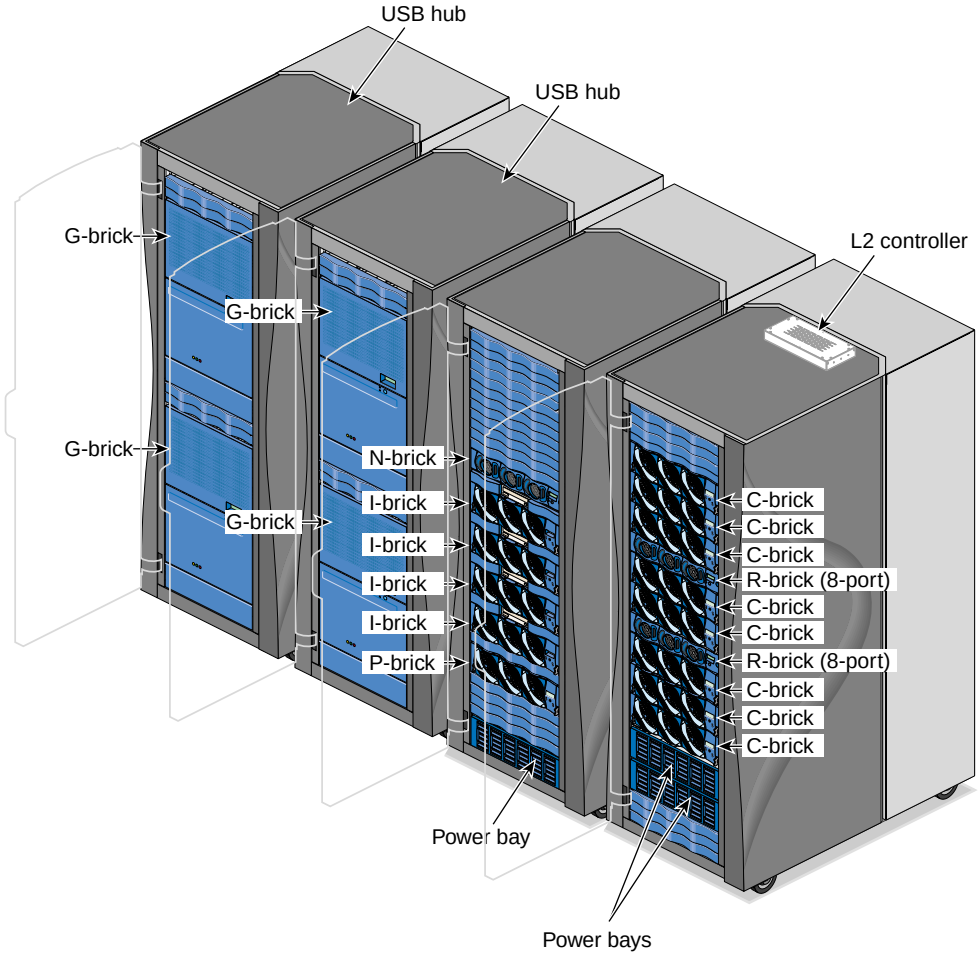

Figure 1-12 SGI Onyx 3800 Graphics System with Four G-bricks (with Seven InfiniteReality Pipes in Total)

SGI Onyx 3800 Graphics System with V-brick and InfinitePerformance Graphics

The SGI Onyx 3800 graphics system that contains one or more V-bricks with InfinitePerformance graphics pipes meets the following requirements:

- The system has a minimum of one to a maximum of four InfinitePerformance graphics pipes.
- The system has a minimum of four and a maximum of 32 C-bricks, and a minimum of 16 and a maximum of 128 processors.

  Note: Each InfinitePerformance graphics pipe requires a dedicated C-brick, and the system I-brick requires a dedicated C-brick.

- The system has a minimum of one I-brick.
- The system has one P-brick.
- The system has two R-bricks (two 8-port routers).
- The system needs at least two tall 39U rack enclosures, in which each has at least one power bay with one power distribution unit (PDU).
- Each tall rack enclosure containing C-bricks comes with an L2 controller and an L2 controller touch display.

Figure 1-13 shows an example of one possible SGI Onyx 3800 graphics system configuration that includes two V-bricks, each of which contains two InfinitePerformance graphics pipes.

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

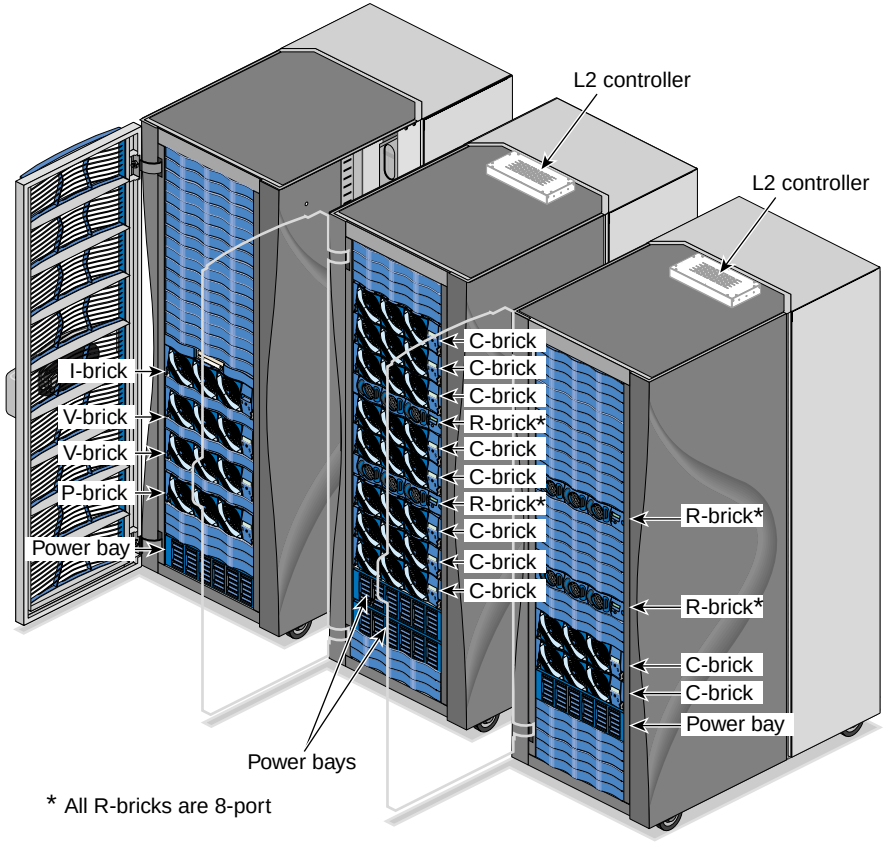

Figure 1-13 SGI Onyx 3800 Graphics System with Two V-bricks (with Two InfinitePerformance Pipe Each)

System Location and Environment Overview

To ensure proper system operation, your SGI system support engineer(s) (SSE) has installed your system in a location that observes the following basic requirements for physical location of the graphics rack:

- As a general rule, rack systems are intended for a lab or “machine room” environment.
- The graphics rack(s) should be protected from harsh environments that produce excessive vibration or heat.
- The rack system should be kept in a clean, dust-free location to reduce maintenance problems.

If you have questions concerning physical location or site preparation, contact your SGI system support engineer (SSE) or other authorized support organization representative.

G-brick, V-brick, and N-brick

This chapter provides detailed descriptions of the G-brick, V-brick, and N-brick in the following sections:

- "G-brick Components" on page 35
- "V-brick Components" on page 52
- "N-brick Components" on page 58

G-brick Components

The G-brick is a large 18U-sized brick that supports various combinations of InfiniteReality pipes (sets of boards) that with two pipes provides your SGI Onyx 3000 series graphics system with high-resolution graphics display capabilities for as many as 16 Silicon Graphics SuperWide monitors.

Internal Components and Front Panel Items

The following lists the G-brick internal components and front panel items. Figure 2-1 shows the G-brick's front panel items.

Internal components:

- **G-brick midplane.** All graphics and interface boards connect to this midplane. (See Figure 2-5 on page 42.)
- **Boards.** The various boards (and daughterboards) that are supported and installed in the board slots in the rear panel of the G-brick are described in detail in "G-brick Rear Panel Items" on page 37.

Front panel items:

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

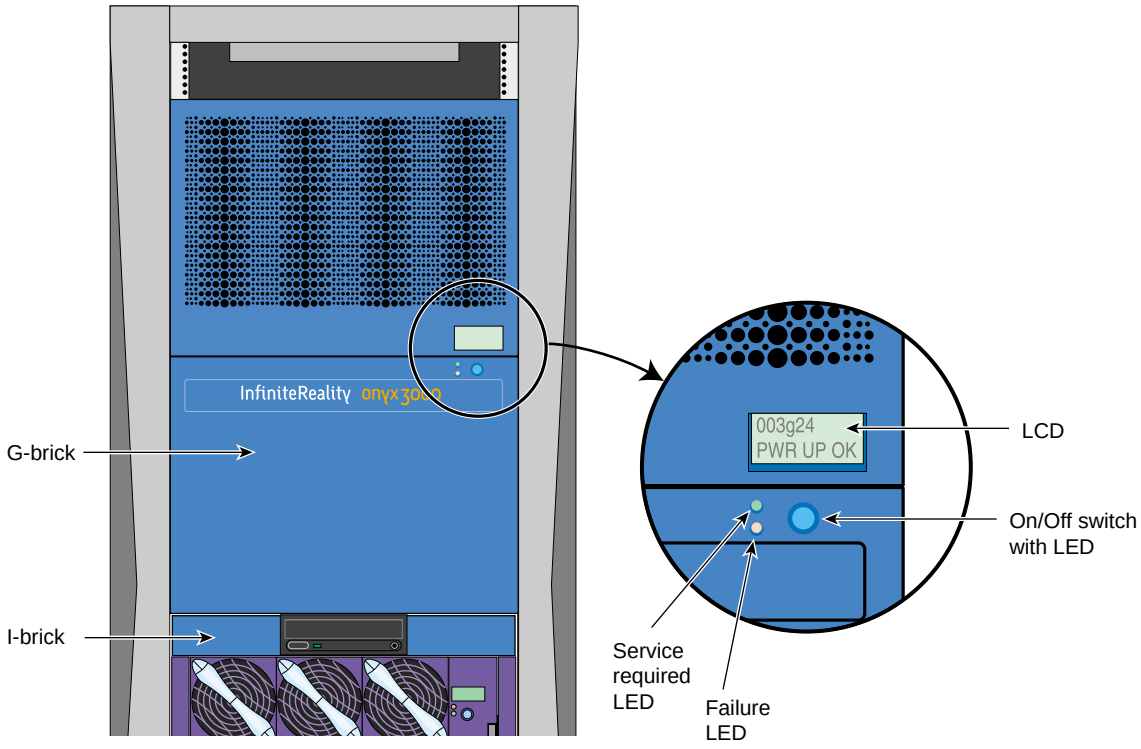

Figure 2-1 G-brick Front View

G-brick Rear Panel Items

Figure 2-2 shows the power switch, boards, connectors, and LEDs on the G-brick rear panel.

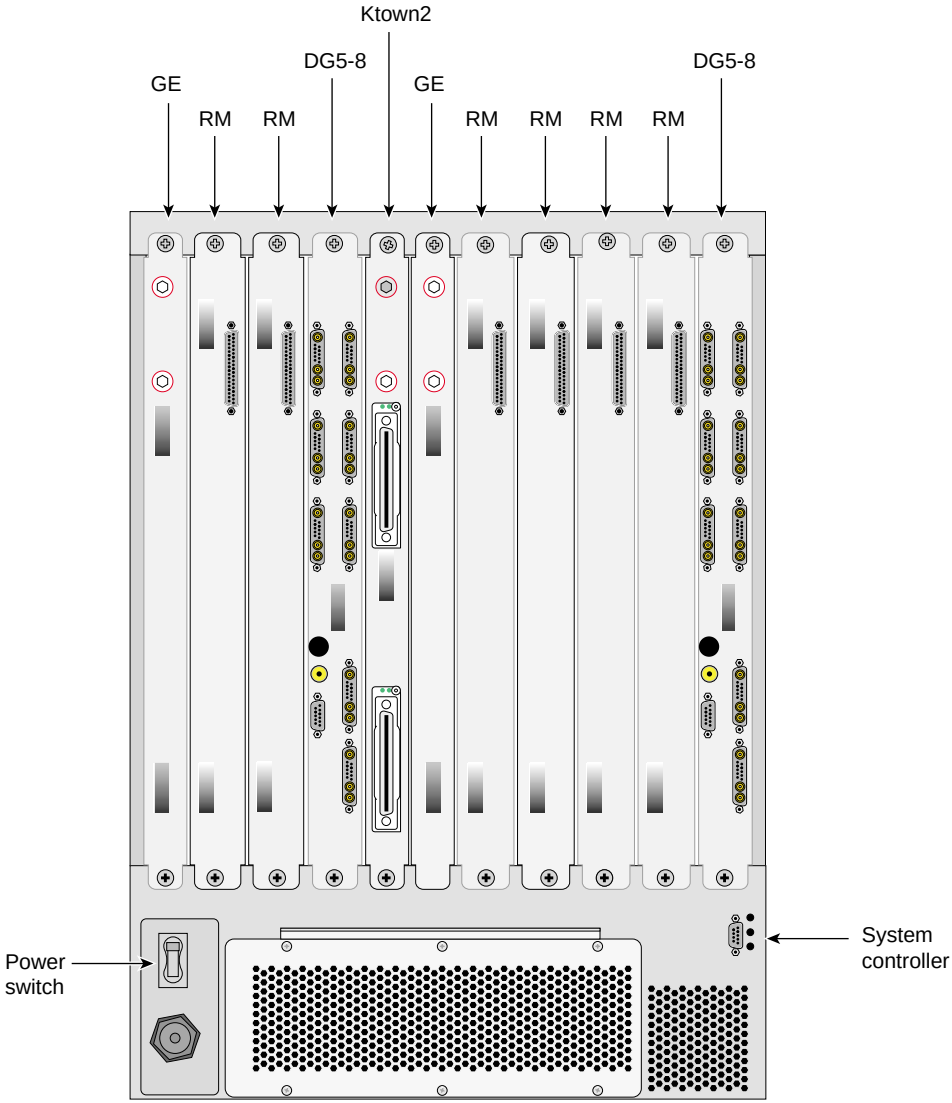

Figure 2-2 G-brick Rear Panel

The G-brick rear panel has the following items:

- **Power switch.** Move the power switch to the On (**1**) position to power on the G-brick L1 controller, and move it to the Off (**0**) position to power off the G-brick L1 controller. Powering on the L1 controller lights the 12 VDC (voltage direct current) LED green.
- **48 VDC and 12 VDC LEDs.** When you move the power switch to the On (**1**) position, these LEDs light up. 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 G-brick internal components are powered on and operating. Press the On/Off switch located on the L1 controller front panel to power on the internal components.
- **PWR (power) connector.** This connects directly to a 220V power source (circumvents the power bay) to supply power to the G-brick.
- **11 board slots.** These slots are used to install and replace a Ktown2 board and two InfiniteReality graphics pipes (sets of boards) in your graphics system. As you face the rear panel, the boards, as shown in Figure 2-3, are located as follows:
  - **Six rightmost slots (pipe 0).** These slots support a Geometry Engine (GE) board; one, two, or four Raster Manager (RM) board assemblies; and a Display Generator (DG) board.
  - **Four leftmost slots (pipe 1).** These slots support a GE board, one or two RM board assemblies, and a DG board.
  - **Ktown2 board with two connectors.** The top connector is used to connect pipe 0 (six rightmost slots) to an I/O brick connected to a C-brick. The bottom connector is used to connect pipe 1 (four leftmost slots) to an I/O brick connected to a C-brick.
- **LEDs.**
  - **PWR (power) and fault LEDs.** The power LED lights green when an InfiniteReality card is installed correctly and is receiving power. The fault LED lights yellow when a fault occurs with the board.
  - **Ktown2 board connector LEDs.** These LEDs light yellow when the connector is cabled securely to the I/O brick device. They light green when the connection is negotiated with the I/O brick device with which the connector is cabled.

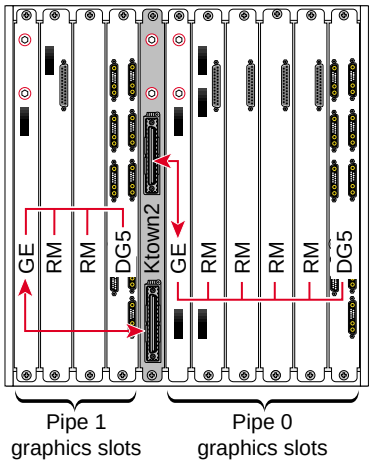

Figure 2-3 InfiniteReality Graphics Pipe Board Locations in G-brick

Figure 2-4 shows an example of a two-RM InfiniteReality graphics pipe board set that is supported by the rack's G-brick.

Note: The 68-pin connectors on the RM assemblies are reserved for calligraphic lights; they are *not* for SCSI drives.

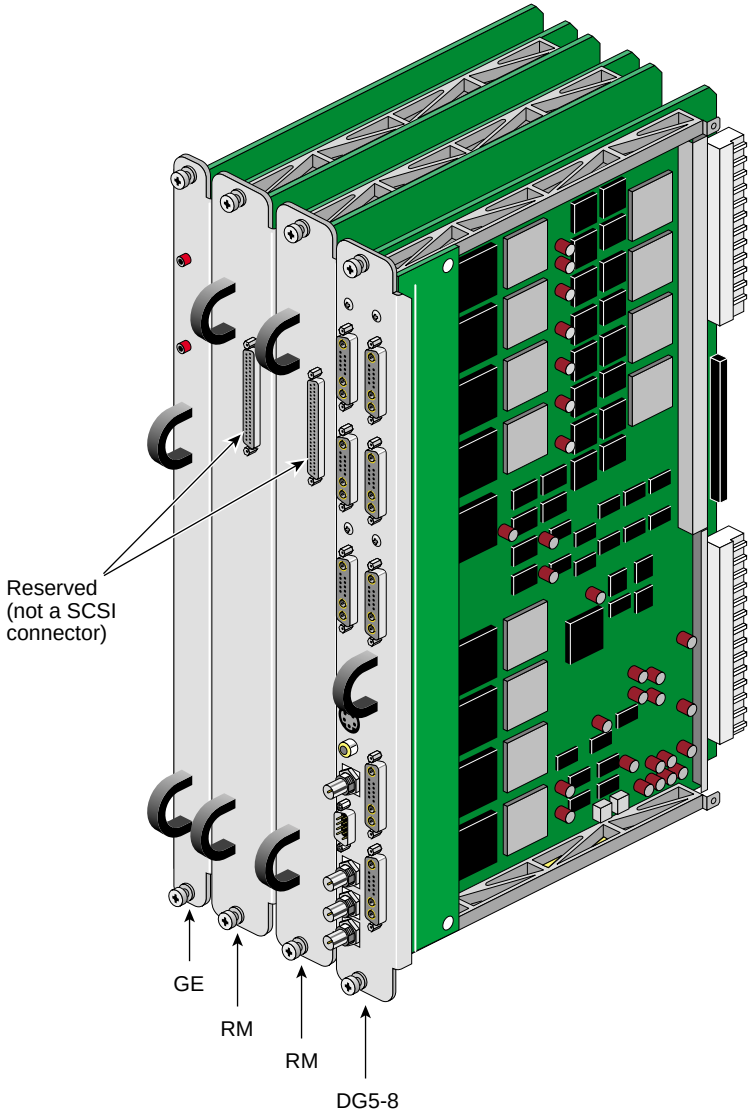

Figure 2-4 Example of InfiniteReality Graphics Pipe Board Set

G-brick Midplane

The G-brick graphics module uses a midplane. All graphics and interface boards are placed in the rear of the module and connect to the back of the midplane. Figure 2-5 shows a view of the graphics midplane.

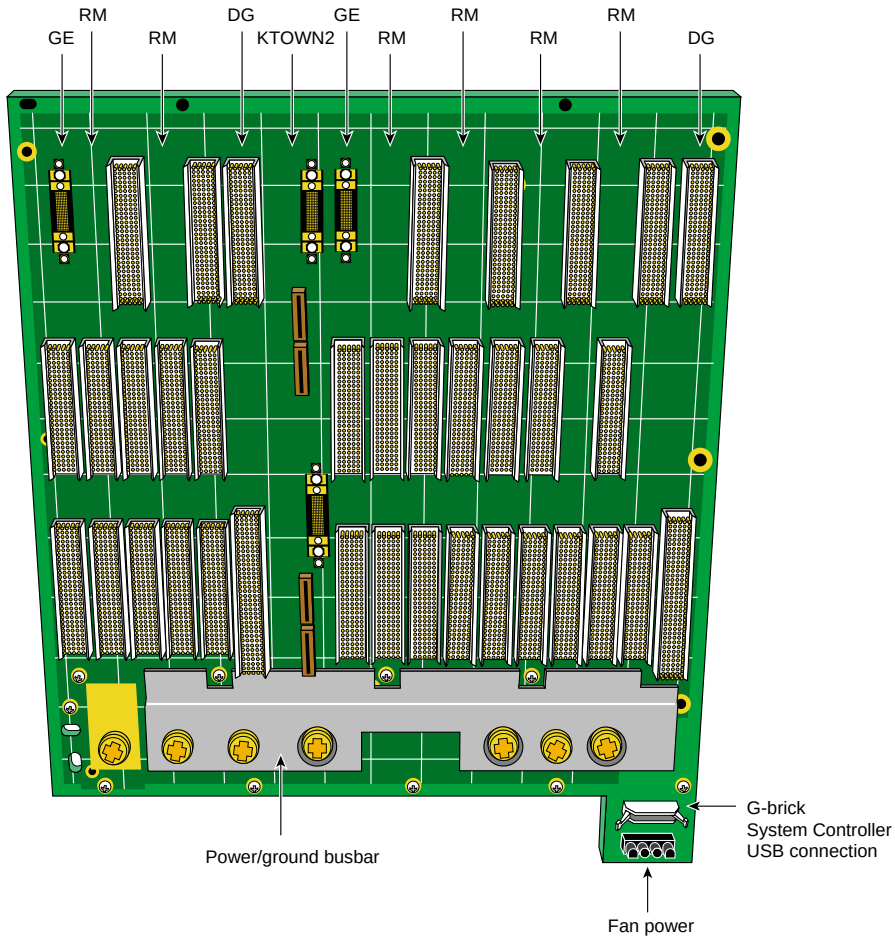

Figure 2-5 G-brick Midplane

DG5 Graphics Board

Various types of DG5 graphics boards are available to add graphics functions to your SGI Onyx 3000 series graphics system. You can have a basic configuration DG5 board, or a DG5 board with one of several daughterboards that can be mounted onto the board to add various graphics functions to your graphics system.

Table 2-1 lists the types of DG5 boards available with your SGI Onyx 3000 series graphics system.

Table 2-1 DG5 Graphics Board Configurations

DG5 Type	Option/daughterboard	Description
DG5-2	No daughterboard	Basic configuration: two high-resolution video outputs.
DG5-8	VIO5H daughterboard	Eight high-resolution video outputs.
DG5-2	GVO daughterboard	Provides serial digital output from the GVO daughterboard. It adds two high-resolution video outputs with two CCIR601 outputs on two BNCs.
DG5-2	TVO (HD-GVO) daughterboard	Provides two high-resolution video outputs and two high-definition graphics TMDS video outputs (TVO).
DG5-2	DPLEX daughterboard	The Digital Video Multiplexer (DPLEX) option provides specialized, high-resolution, digital and analog imagery capabilities by cascading the video outputs of two or more graphics pipes and outputting them to a single monitor or other video input device.

The DG5 board is always placed in the rightmost graphics board slot in each board set (pipe) in the G-brick. Figure 2-6 illustrates this placement with two DG5-8 boards installed in the G-brick.

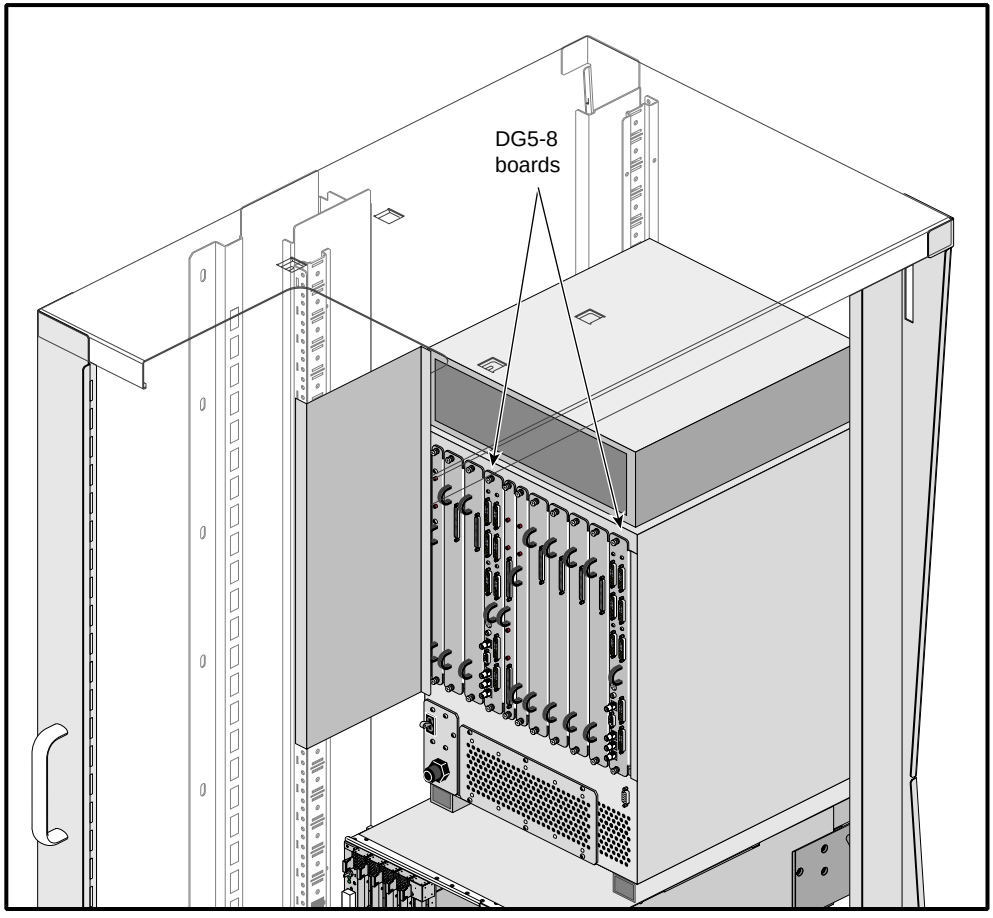

Figure 2-6 DG5-8 Board Locations in the G-brick

DG5 Board Operation

The DG5 board requests and receives digital frame buffer pixel data from the RM board set. The DG5 board processes the pixel data and streams it onto the video packet bus. The DG5 board also handles all pixel clocking, genlocking, and cursor display functions.

From the packet bus, processed video can be sent to one of the video output channels, or to the NTSC or PAL encoder (VTR channel). The encoder does not provide broadcast quality signals. The video output controller supplies data to a 3-DAC array that feeds out the analog RGB signals. NTSC or PAL circuitry signals are sent from the VOC through encoder and field buffer RAMs.

DG5 Board Standard Connector Descriptions

All the DG5 boards have standard connectors. Table 2-2 lists and describes these standard board connectors.

Table 2-2 DG5 Board Standard Connector Descriptions

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

DG5 Board Monitor Connector (13W3) Pinouts

Figure 2-7 shows the 13W3 pinouts for the monitor connectors on the I/O panel of the DG5 boards. The 13W3 connector on each DG5 board uses the same pinout pattern.

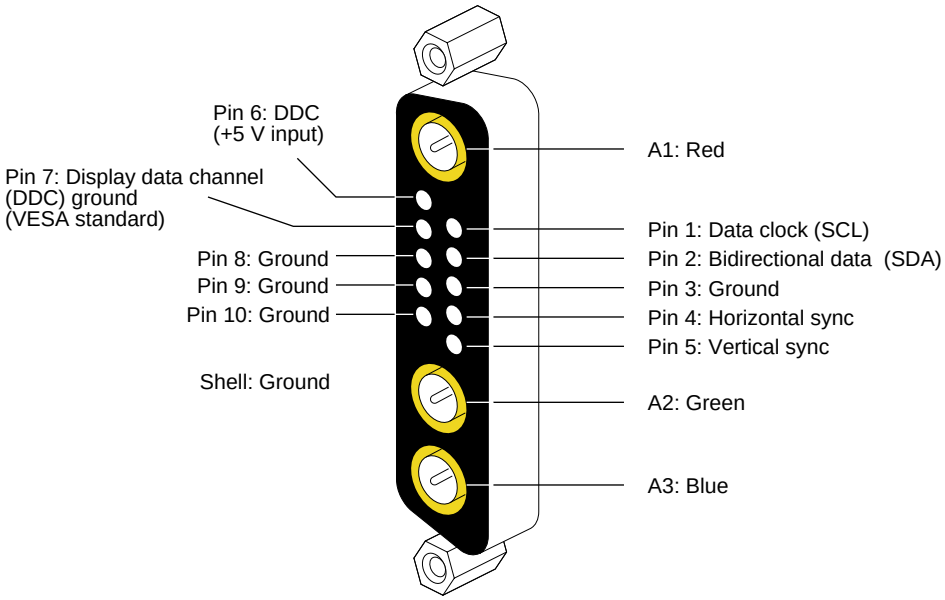

Figure 2-7 DG5 13W3 Connector Pinout

In the A1, A2, and A3 connectors, the center conductor carries the video signals. The outer conductors of the A1, A2, and A3 connectors are their video returns, which are tied to the monitor's grounded chassis.

DG5-2 Board Connectors

Figure 2-8 shows the connectors for the basic DG5-2 board, which has no daughterboard. For functional descriptions of these connectors, see "DG5 Board Standard Connector Descriptions" on page 45.

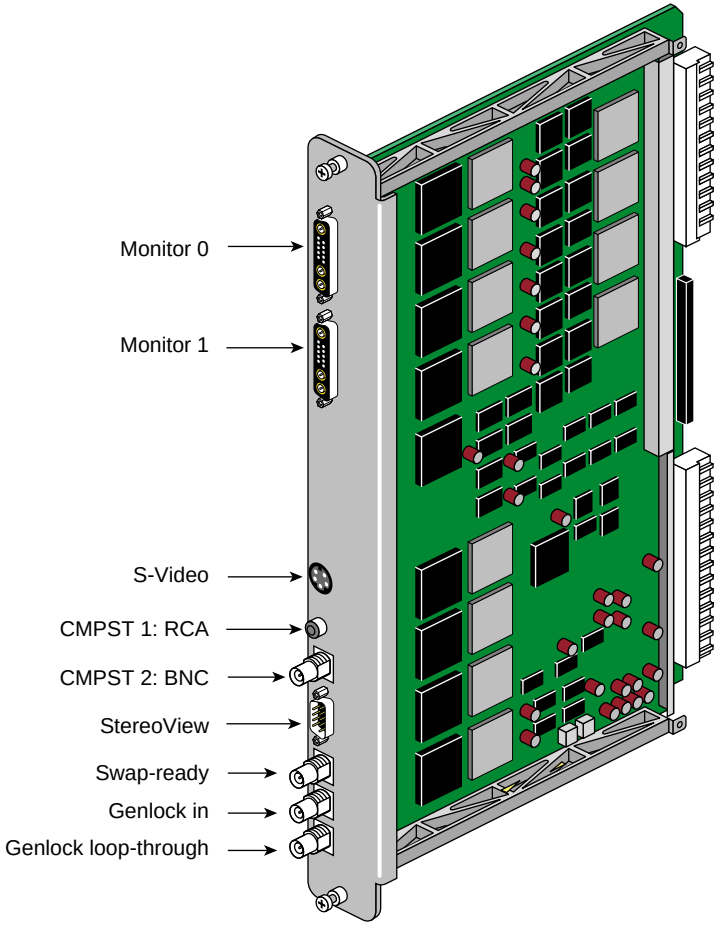

Figure 2-8 DG5-2 Graphics Board

Connectors on the DG5-8 Option Board

Figure 2-9 shows connectors on the panel for the DG5-8 option board with the VIO5H daughterboard, which adds several monitor connectors to a basic DG5-2 board that has no daughterboard. For functional descriptions of the DG5-8 connectors, see “DG5 Board Standard Connector Descriptions” on page 45.

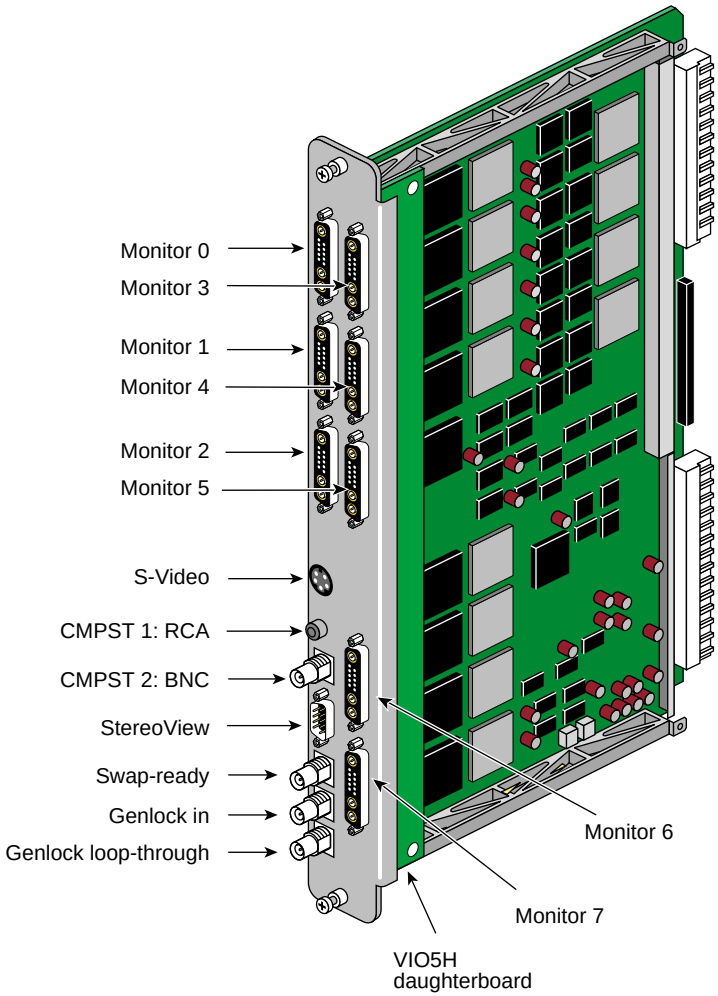

Figure 2-9 DG5-8 Board

Connectors on the Optional GVO Daughterboard

The graphics-to-video (GVO) option daughterboard comes assembled with the basic DG5-2 board and is designed to provide direct output from graphics to video in real-time through its two CCIR601 connectors implemented as BNCs (link A and link B connectors). For functional descriptions of the DG5-2 board connectors, see "DG5 Board Standard Connector Descriptions" on page 45.

Figure 2-10 shows connectors on the panel for the DG5-2 board with optional GVO daughterboard combination.

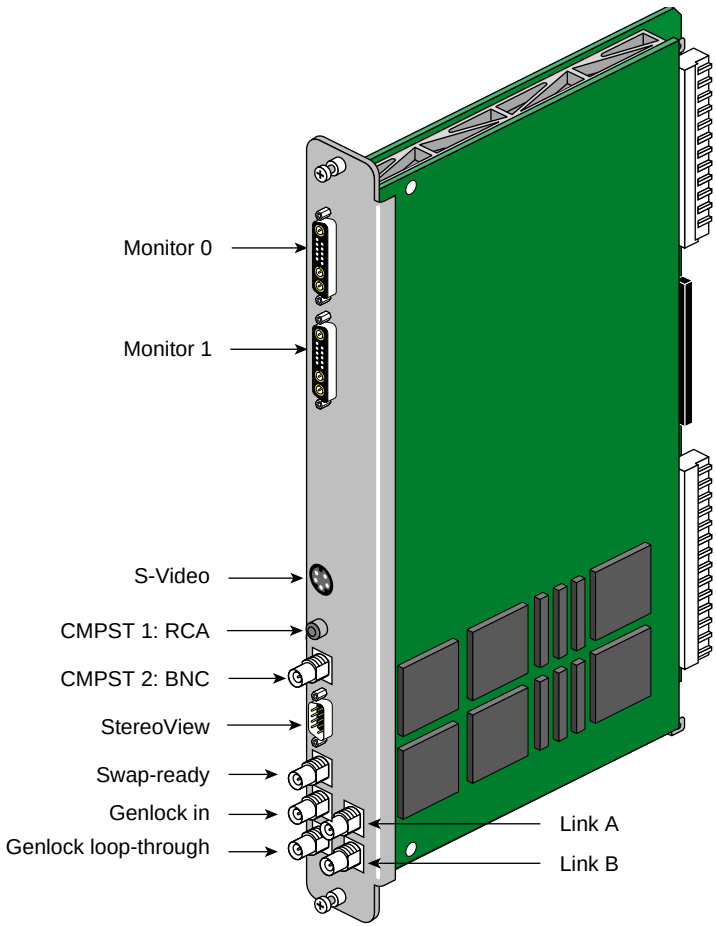

Figure 2-10 DG5-2 with Optional GVO Connectors

Connectors on Optional TVO (HD-GVO) Daughterboard

Figure 2-11 shows the connectors on the rear panel of the DG5-2 board with an optional TVO (HD-GVO) daughterboard.

The TVO daughterboard adds the Transition Minimized Differential Signaling (TMDS) video output connectors to the DG5-2 board, which are used to connect the graphics system to a High-Definition Graphics Video Output (HD-GVO) system.

For descriptions of the standard DG5-2 board connectors, see "DG5 Board Standard Connector Descriptions" on page 45.

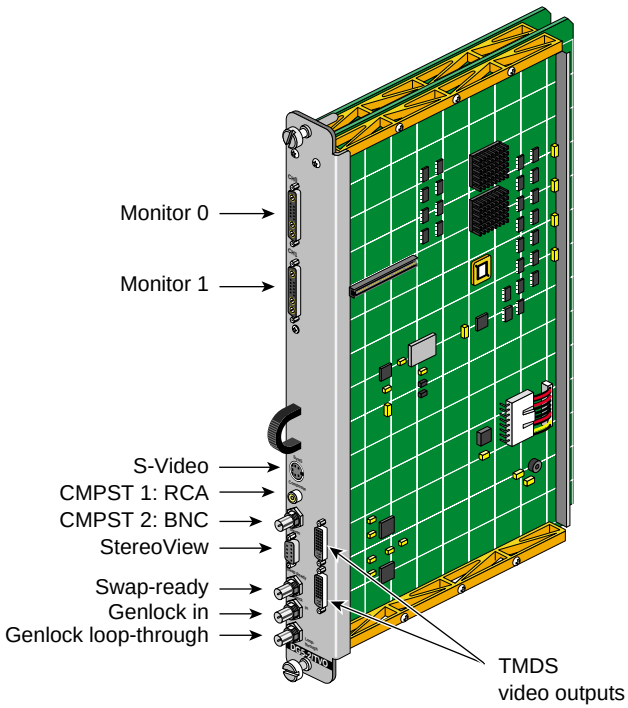

Figure 2-11 DG5-2 with Optional TVO (HD-GVO) Daughterboard

DPLEX Option Connectors on DG5

Each DPLEX option assembly, shown in Figure 2-12, is essentially composed of a DG5-2 board with an attached DPLEX daughterboard that adds a DPLEX analog output, a digital video low voltage differential signaling (LVDS) out and a digital video LVDS in connector. The DPLEX daughterboard and its connectors allow you to join or "cascade" the video outputs of two or more graphics pipes and output them to a single monitor or other video device (such as a video projector).

The pipes in the DPLEX cascade are always linked using LVDS, swap-ready, and genlocking (sync) cables. For a functional description of the DG5-2 board connectors, see "DG5 Board Standard Connector Descriptions" on page 45.

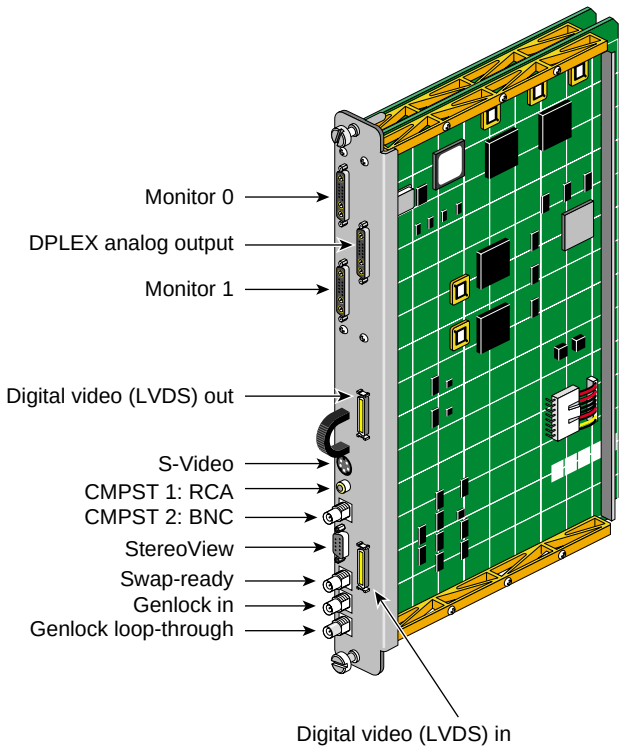

Figure 2-12 DG5-2 with Optional DPLEX Daughterboard

V-brick Components

The V-brick has slots for either one or two InfinitePerformance pipes to provide advanced graphics capabilities for your SGI Onyx 3000 series graphics system.

Internal Components and Front Panel Items

The following are the V-brick's internal components and front panel items. Figure 2-13 shows the items located on the V-brick front panel.

Internal components:

- **Power board.** This board provides power to the V-brick.
- **Midplane PCA.** The V-brick midplane contains an Xbridge ASIC that is the interface between the V-brick's two ports and the V12 boards (see Figure 2-14). The midplane also has receptacles for the compression connectors of the V12 boards.

Front panel items:

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

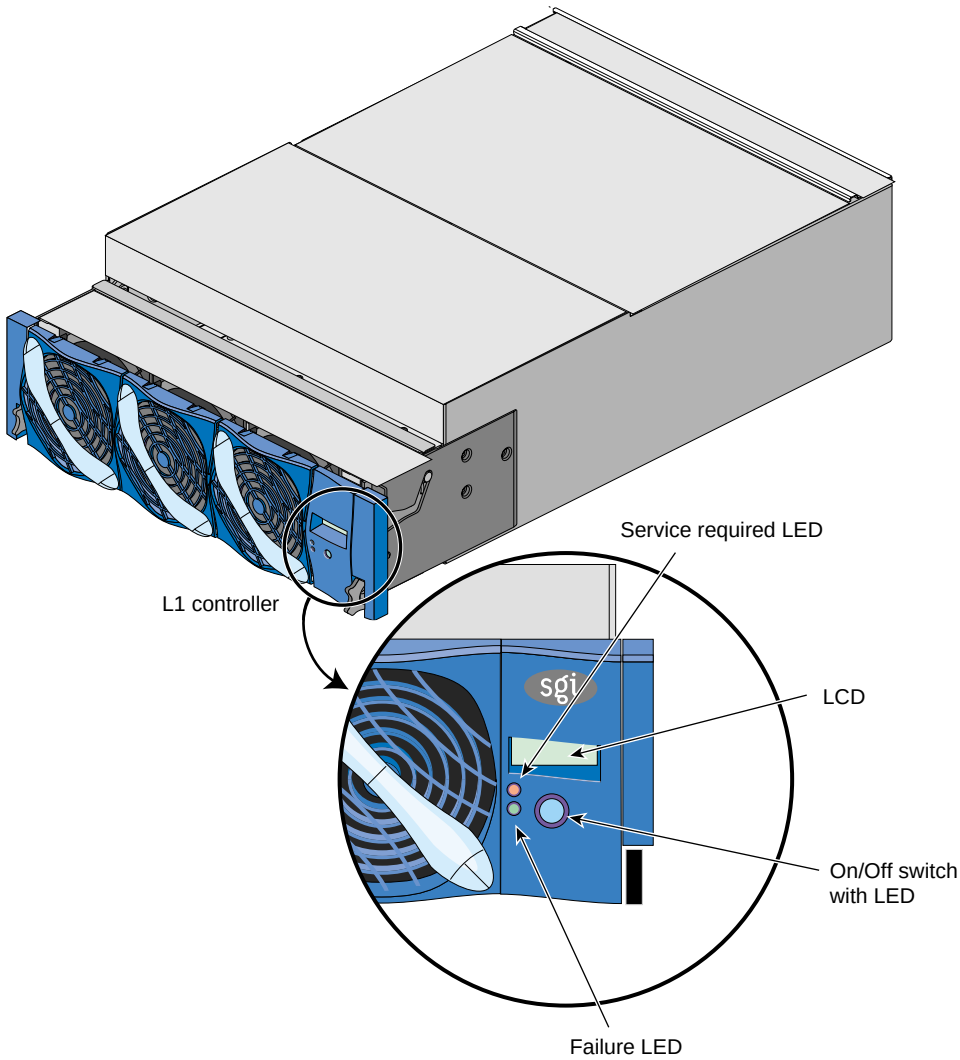

Figure 2-13 V-brick Front View

V-brick Midplane

The V-brick midplane contains an Xbridge ASIC that is the interface between the V-brick's two ports and the V12 boards in the board slots, as shown in Figure 2-14, a block diagram of the V-brick. The midplane also has receptacles for the compression connectors of the V12 boards.

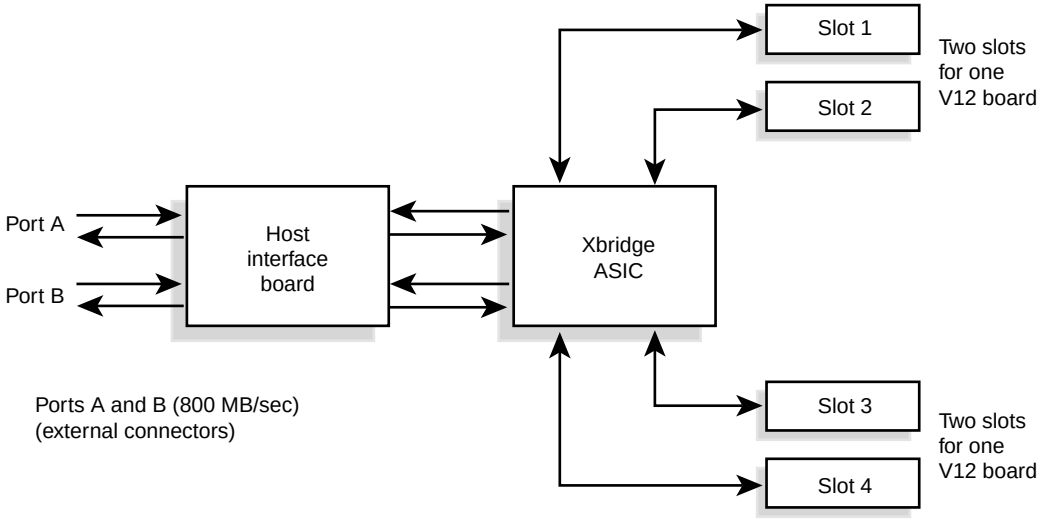

Figure 2-14 V-brick Block Diagram

V-brick L1 Controller

The L1 controller monitors and controls the environment of the V-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.

V-brick Rear Panel Items

The V-brick has four board slots to support either one or two V12 boards. Each V12 board requires two board slots.

Figure 2-15 shows the location of the power switch, two V12 boards, connectors, and LEDs on the V-brick rear panel.

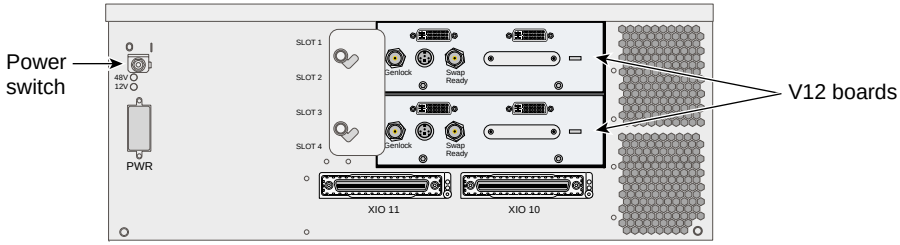

Figure 2-15 V-brick with Two V12 Boards

The V-brick has the following rear-panel items:

- **Power switch.** Move the power switch to the On (**1**) position to power on the V-brick's L1 controller, and move it to the Off (**0**) position to power off the V-brick's L1 controller. Powering on the L1 controller lights the 12 VDC LED green.
- **48 VDC and 12 VDC LEDs.** When you move the power switch to the On (**1**) position, these LEDs light up. 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 V-brick internal components are powered on and operating. Press the On/Off switch located on the L1 controller front panel to power on the internal components.
- **PWR (power) connector.** This connects to the power bay to supply power to the V-brick.
- **Slot 1, slot 2, slot 3, and slot 4.** These slots are used to install and replace V12 boards in your graphics system. Each V12 board requires two slots.

Warning: To avoid personal injury or damage to your system, only qualified SGI system support engineers (SSEs) can install and replace V12 boards.

- **XIO 11 and XIO 10 connectors.** These connectors connect the V-brick to a C-brick. Only one connector is required to connect to a single C-brick. As an option, in V-bricks that contain one InfinitePerformance pipe, the second connector can be connected to another C-brick to create a dual-ported V-brick, which would provide greater bandwidth. The connection to a another C-brick would occur only in situations where another C-brick was not already used to support a second V12 board.

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

InfinitePerformance Graphics Pipe

Figure 2-16 shows the connectors and LEDs on a InfinitePerformance graphics pipe (V12 graphics board). The following is a functional description of these connectors and LEDs:

- Two Digital Video Interface-Integrated (DVI-I) analog or digital connectors to connect monitors to the SGI Onyx 3000 series graphics system.
- 13W3 analog connector that is not operable (this connector is blocked).
- One genlock connector to synchronize multiple V12 boards with each other.
- One swap-ready connector to synchronize the swap buffers in order to synchronize two or more V12 boards to as many as four V-bricks and four V12 boards.
- Stereo connector to connect to an emitter to provide stereo effect for LCD shutter glasses.

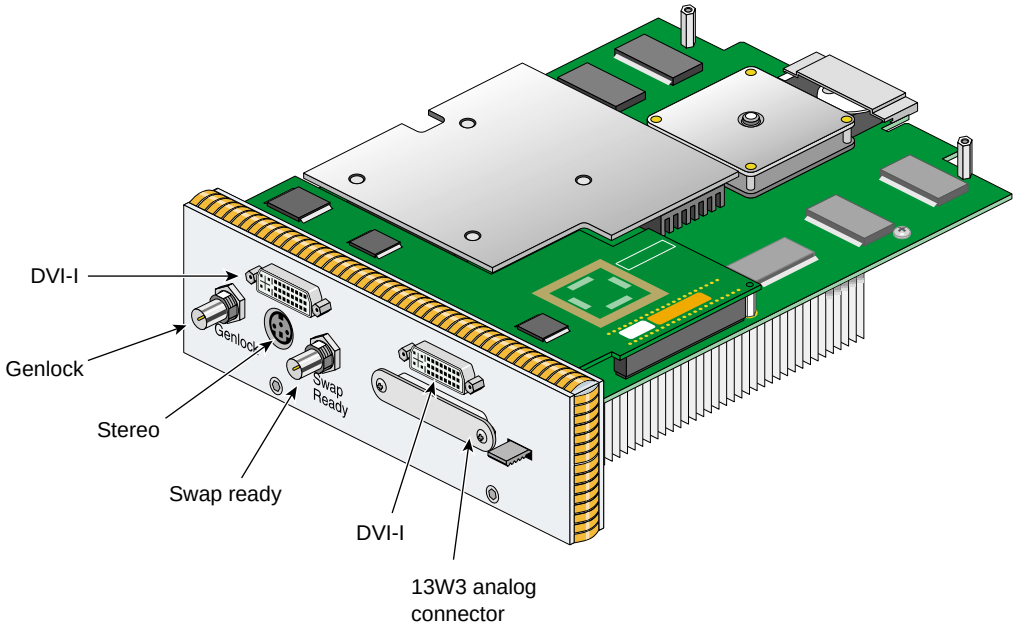

Figure 2-16 V12 Graphics Board Connectors and LEDs

N-brick Components

The N-brick, which has four pairs of connectors (800 MBytes in each direction), is used in the place of as many as four X-brick or I-bricks to connect up to four C-bricks to four InfiniteReality pipes (two in each of two G-bricks). This is a cost and space efficient solution when you do not require the additional I/O capability provided with an X-brick or extra I-brick and when you want to save rack space (the N-brick is a 2U-sized brick). For N-brick sample cabling configurations, see Chapter 3, "Configurations and Cabling."

Note: The N-brick is an option only for the InfiniteReality graphics system, which includes a G-brick.

Internal Components and Front Panel Items

The following list describes the N-brick's internal components and front panel items. Figure 2-17 shows the N-brick's front panel items.

Internal components:

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

Front panel items:

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

Warning: **To avoid personal injury and to avoid damage to your system, these N-brick fans, which are N+1 redundant, can be hot-swapped only by your SGI system support engineer (SSE).**

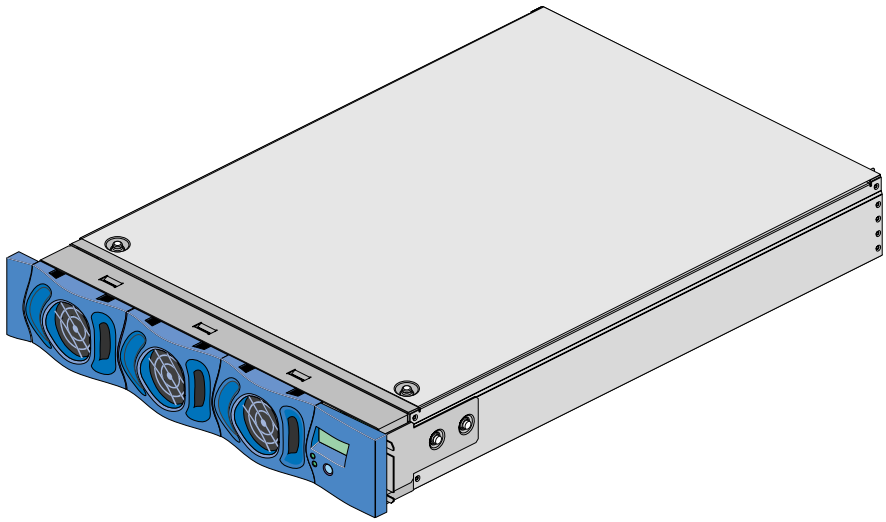

Figure 2-17 N-brick Front View

N-brick Rear Panel Items

Figure 2-18 shows the location of the power switch, connectors, and LEDs on the N-brick rear panel.

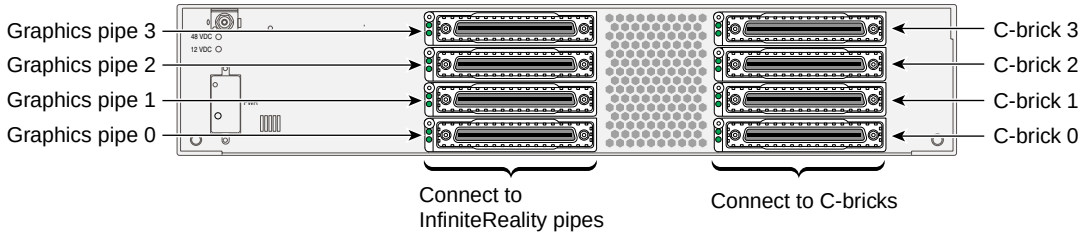

Figure 2-18 N-brick Rear View

The N-brick has the following rear panel items.

- **PWR (power) connector.** This connects to the power bay to provide power to the N-brick.
- **Power switch.** Move the power switch to the On (**1**) position to powers on the N-brick, and move it to the Off (**0**) position to powers off the N-brick. Move the power switch to the On (**1**) position to power on the L1 controller. Press the On/Off switch (brick reset button) to power on the rest of the N-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 N-brick internal components are powered on.
- **C-brick 0 through C-brick 3 connectors.** Connectors C-brick 0, C-brick 1, C-brick 2, and C-brick 3 connect to the XIO (II) I/O interface connectors on the C-bricks.
- **Graphics pipe 0 through Graphics pipe 3 connectors.** Connectors Graphics pipe 0, Graphics pipe 1, Graphics pipe 2, and Graphics pipe 3 connect to the connectors on the G-brick Ktown2 board. As you face the rear panel of the G-brick, the top Ktown2 connector is connected to the rightmost InfiniteReality pipe (set of graphics boards), and the bottom Ktown2 connector is connected to the leftmost InfiniteReality pipe.
- **Graphics pipe and C-brick connector LEDs.** All of these connectors have two LEDs as follows:
  - The green LED (the hardware LED) lights to indicate that a cable is connected properly between the N-brick and another brick.
  - The yellow LED (the software LED) lights to indicate that packets are being transferred successfully across the link.

Configurations and Cabling

This chapter provides overview information on how SGI Onyx 3000 series graphics system bricks and other components are cabled together, provides important cabling cautions and warnings, and shows graphics system configuration and cabling examples. This chapter also describes how to cable monitors, keyboard and mouse, and speakers to your graphics system. This information is covered in the following sections:

- "Cabling Information Overview" on page 61
- "Cabling Cautions and Warning" on page 63
- "Examples of Configurations and Cabling" on page 63
- "Monitor Cabling Options" on page 71
- "Keyboard and Mouse Port Configuration" on page 76
- "Connecting Your System to an Ethernet" on page 81
- "Speaker Pair Connections" on page 81

Warning: Before installing, operating, or servicing any part of this product, please read the "Safety Instructions" on page 152.

Cabling Information Overview

All the bricks (except the D-brick) in the SGI Onyx 3000 graphics system are connected to each other with a NUMAlink cable connected to the appropriate connectors on each brick.

Warning: All NUMAlink cabling between the SGI Onyx 3000 series graphics system bricks must be performed by an SGI support service engineer (SSE).

Note: The D-brick connects to an I-brick or a P-brick through the cabling of the Gigabit Interface Connector (GBIC) port on the D-brick to a PCI card (host bus adapter [HBA] card) connector on an I-brick or a P-brick.

The G-brick must connect to a C-brick through an I/O brick (I-, X-, or N-brick). The two connectors on the Ktown2 board, which sits between the two InfiniteReality graphics pipes (board sets) on the G-brick as shown in Figure 3-1, connect each pipe on the G-brick with the I/O brick.

As you face the G-brick rear panel, the top connector connects the pipe 0 (rightmost graphics board set), and the bottom connector connects the pipe 1 (leftmost graphics board set) to the I/O brick.

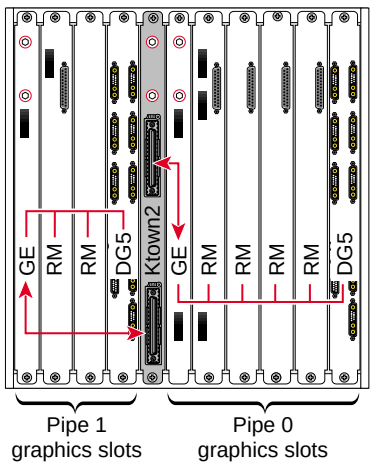

Figure 3-1 G-brick Graphics Boards and Connector Locations

The V-brick connects directly to a C-brick through one of its two connectors. Each V-brick can house as many as two InfinitePerformance graphics pipes. Each InfinitePerformance graphics pipe requires a dedicated C-brick.

Cabling Cautions and Warning

Observe the following cautionary guidelines if you need to move the NUMAlink cables:

- Avoid bending the cables tighter than a 3-inch (7.62-cm) inside radius.
- Avoid stepping on the cables.
- Avoid "hot-plugging" in or removing cables while the system is running. This can *hang* or *crash* the entire graphics rack system.

Warning: All NUMAlink cabling between the SGI Onyx 3000 series graphics system bricks must be performed only by an SGI support service engineer (SSE).

Examples of Configurations and Cabling

This section describes examples of single-rack and multirack graphics system configurations. All configurations contain the following major hardware components:

- One or more C-brick compute enclosures with either two or four 64-bit processors and as much as 8 GB of main memory.
- Power bay(s) for each graphics rack system. Note that racks that house only G-bricks do not use power bays.
- L2 controller that connects and controls individual L1 "brick" controllers within the rack system.
- G-brick with one or two InfiniteReality graphics pipes (board sets) or a V-brick with one or two InfinitePerformance graphics pipes (V12 graphics boards). (Each graphics system can have either a G-brick or V-brick, but not both.)
- I-brick containing a system disk, CD-ROM drive, USB ports, digital audio, serial, and PCI interfaces.

Multirack systems can hold additional C-bricks, I/O, or graphics bricks, and individual hardware components can be added to suit growing graphics, computational, and I/O requirements.

Note: The N-brick is only an option with an InfiniteReality graphics system that includes a G-brick. The N-brick can be used in place of an X-brick or an extra I-brick to connect as many as four C-bricks with as many as four G-bricks. This is a space saving and cost effective solution when you do not require the additional I/O capability provided with an X-brick or extra I-brick.

The SGI Onyx 3000 series graphics system racks provide cable management hardware for all interconnect cables.

Examples of G-bricks and InfiniteReality Graphics Pipes

This section shows three examples of SGI Onyx 3000 series graphics system cabling configurations with G-bricks with InfiniteReality graphics pipes.

Figure 3-2 shows a configuration example of one graphics rack system with one InfiniteReality graphics pipe (with 4 RMs) in one G-brick.

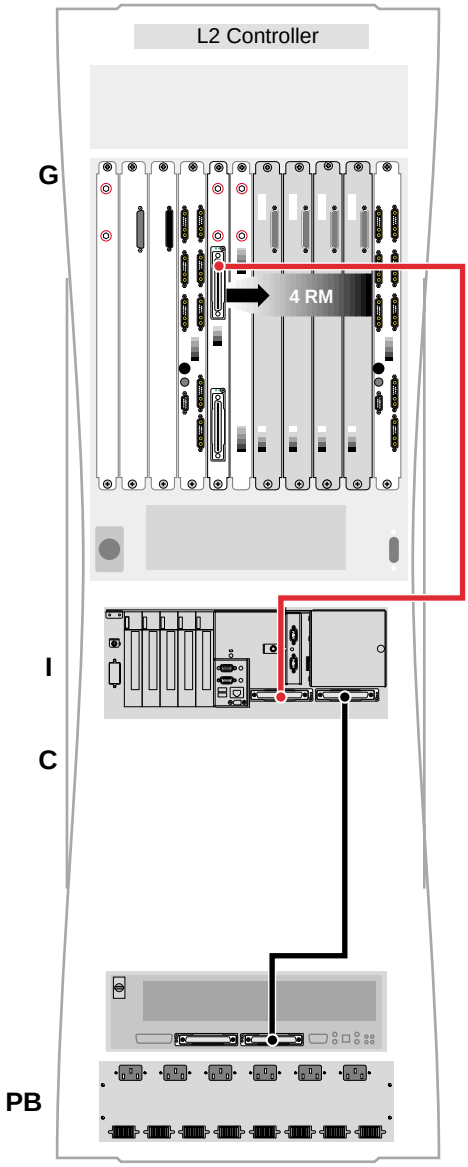

Figure 3-2 Configuration Example: One Rack, One G-brick with One InfiniteReality Pipe

Figure 3-3 shows a configuration example of a graphics system in two racks with three InfiniteReality pipes (one 4-RM pipe in one G-brick, and a 2-RM pipe and a 4-RM pipe in a second G-brick).

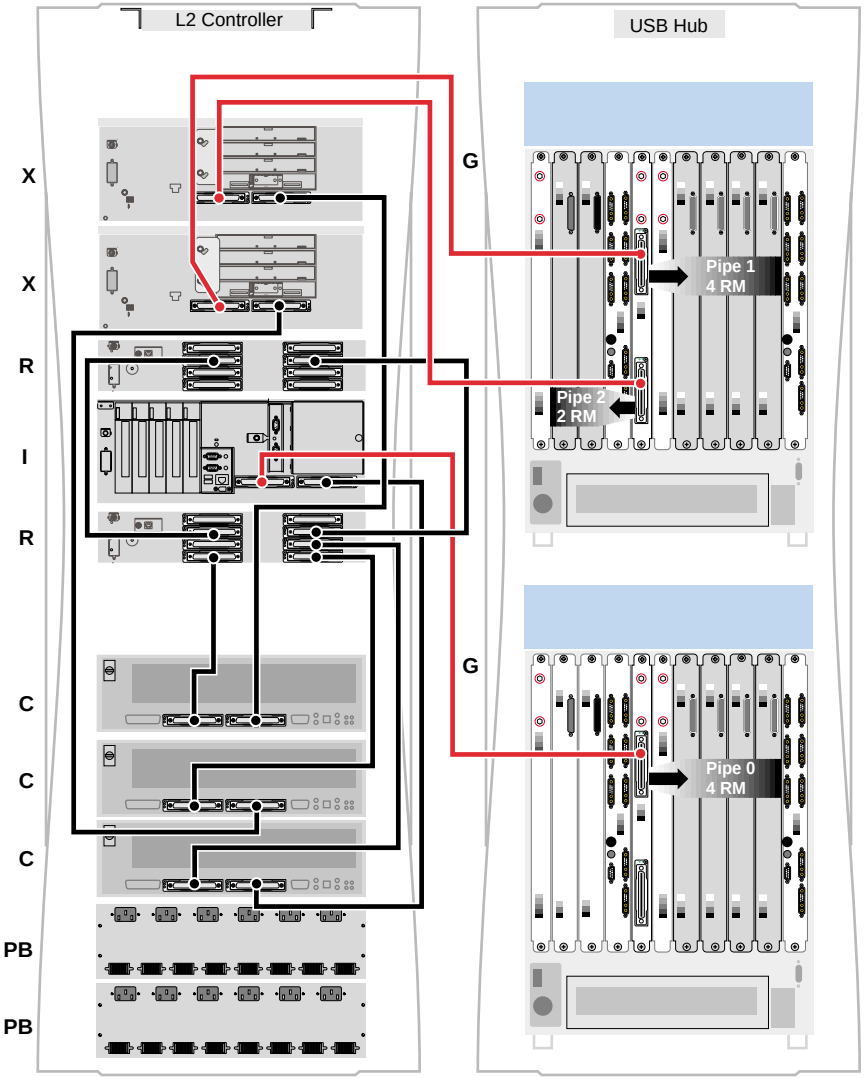

Figure 3-3 Configuration Example: Two-Racks, Two G-bricks with Three InfiniteReality Pipes

Figure 3-4 shows a configuration example of a graphics system in three racks with three InfiniteReality graphics pipes (with 4 RMs each) in three G-bricks.

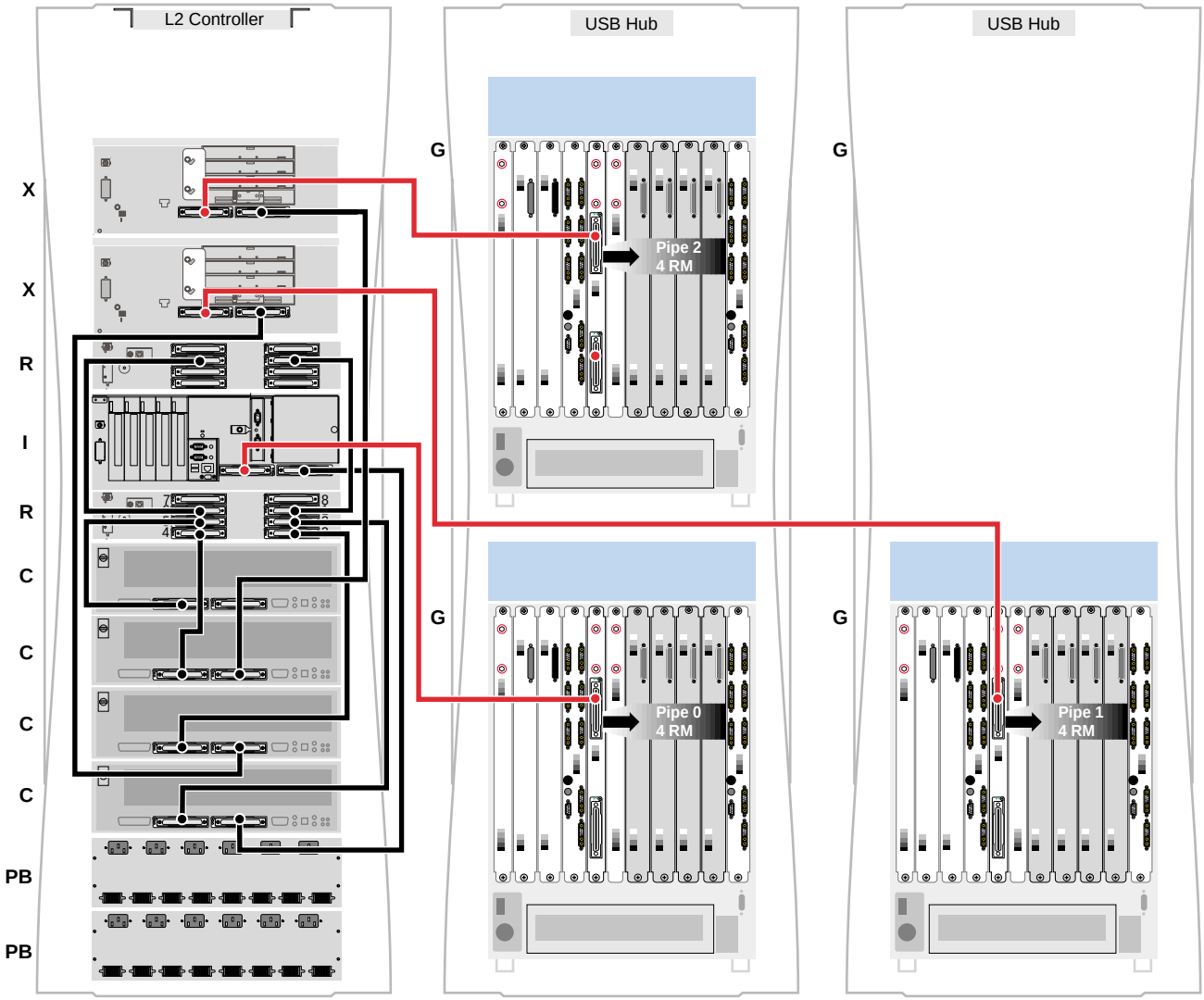

Figure 3-4 Configuration Example: Three-Racks, Three G-bricks (with One InfiniteReality Pipe Each)

Example with G-brick and N-brick

Figure 3-5 shows an example of a graphics system configuration in three racks, with three G-bricks, with a 4-RM InfiniteReality pipe in each G-brick, and one N-brick.

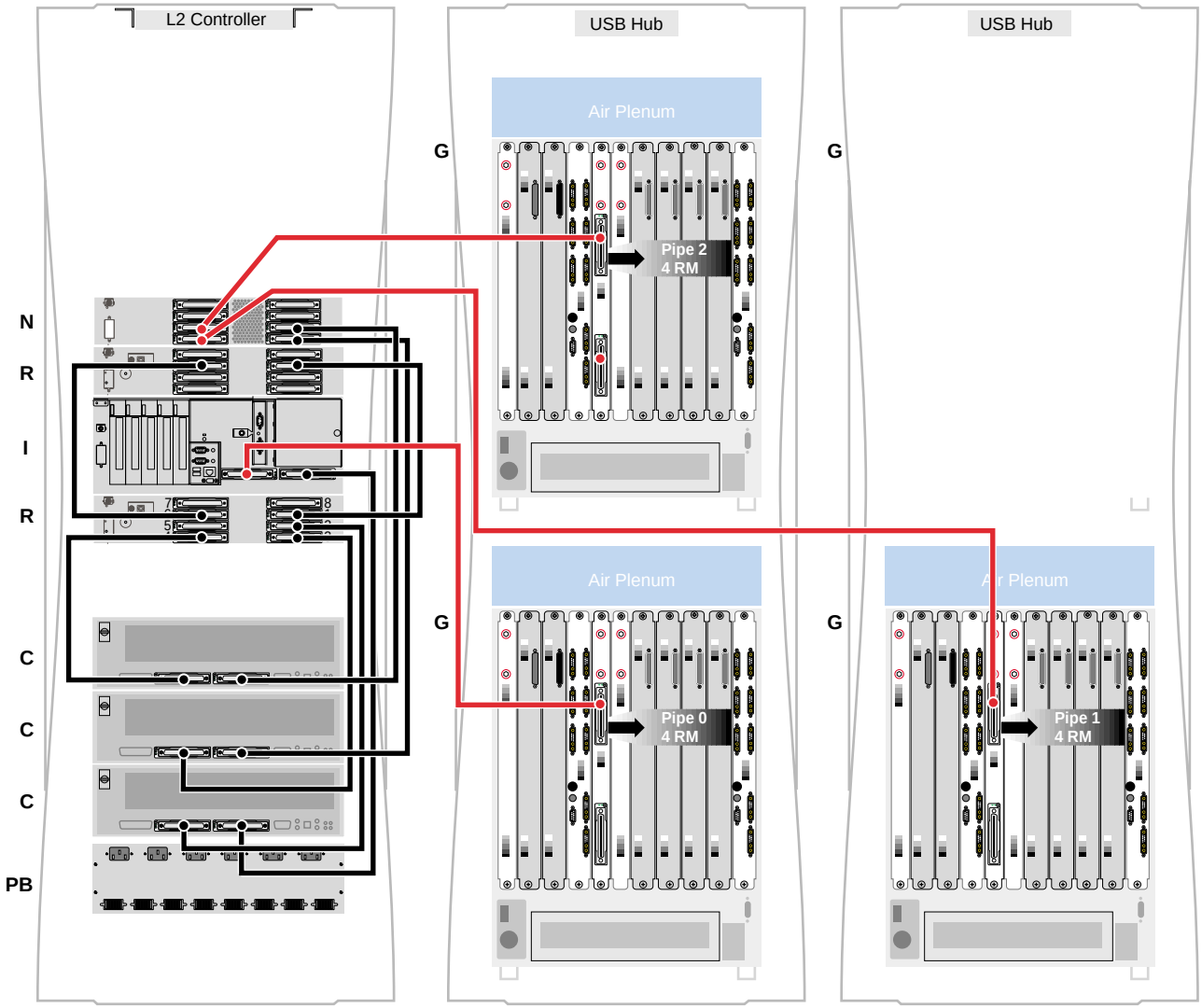

Figure 3-5 Configuration Example: Three Racks with Three G-bricks (with One Pipe Each) and One N-brick

Example with V-brick and V12 Graphics Pipes

This section shows an example of an SGI Onyx 3000 series graphics system cabling configuration with V-bricks with InfinitePerformance graphics pipes.

Figure 3-6 shows a single-rack cabling example with two V-bricks with two InfinitePerformance pipes each.

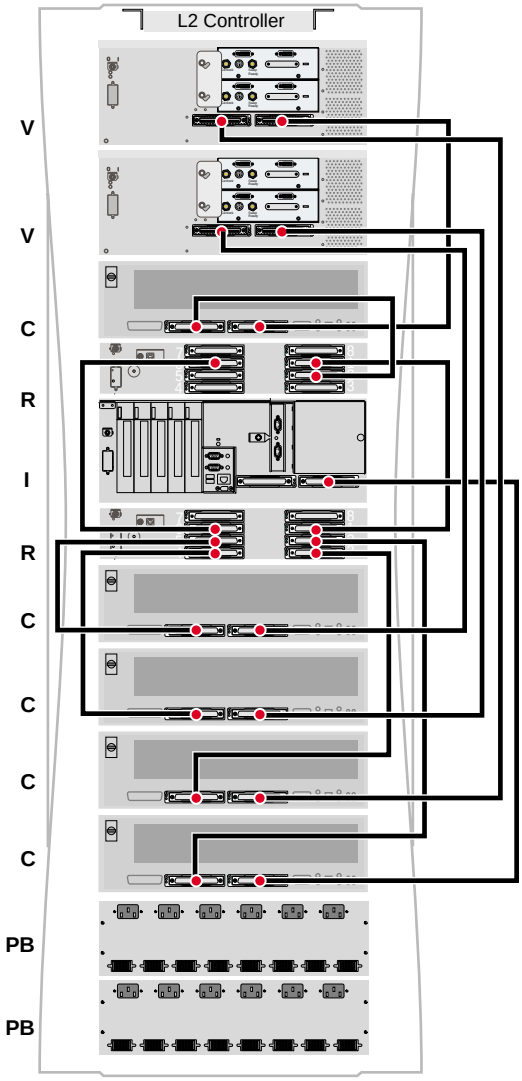

Figure 3-6 Configuration Example: One Rack with Two V-bricks (with Two Pipes Each)

Monitor Cabling Options

This section describes how to cable various monitors to a DG5 board on a G-brick and how to cable a monitor on a V-brick.

DG5 Board Monitor Cabling Options

Three cable options are offered for using different types of monitors with the DG5 (see Figure 3-7):

- 13W3-13W3: For use with the 24-inch Silicon Graphics SuperWide™ monitor and other compatible monitors.
- 13W3-five BNCs: Separate connectors for R, G, B, horizontal sync, and vertical sync for monitors that require these separate connectors.
- 13W3-13W3HV: Two separate BNC connectors for horizontal and vertical sync (for example, for synchronizing video out “genlocking”).

Caution: To avoid possible damage to your graphics system, use only the cables specified to connect the monitor to the SGI Onyx 3000 series graphics system rackmount chassis.

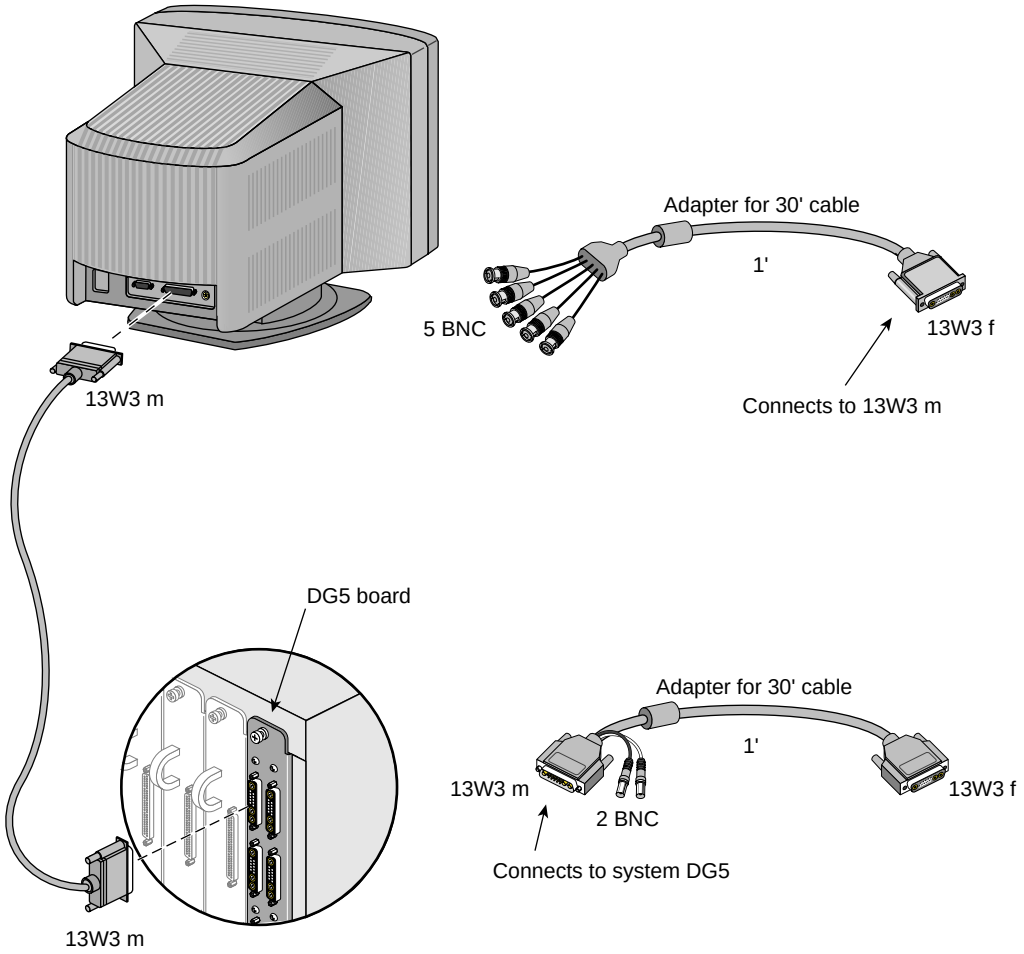

Figure 3-7 13W3 Monitor Cable and Adapters

Each cable ordered connects to a 13W3 port on one of the DG5 boards in the G-brick.

Figure 3-8 shows a connection example with two monitors attached to separate DG5 boards in the G-brick.

Note: The default monitor resolution supported by the 24-inch Silicon Graphics SuperWide monitor is 1920 x 1200 at 66 Hz. The maximum output bandwidth is about 300 Mpix/sec. With two monitors, each at 1920 x 1200 at 66 Hz resolution, the speed is about 188 Mpix/sec. If you connect more than two monitors to a DG5 board, you must use a combination of lower- and higher-resolution monitors that are within the limit of 300 Mpix/sec.

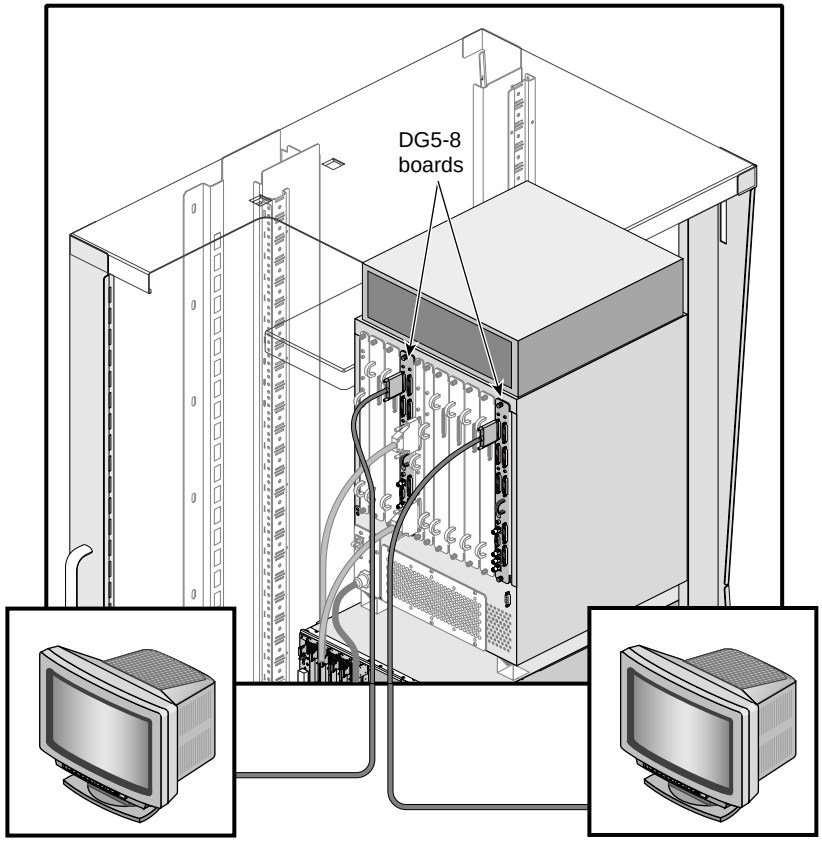

Figure 3-8 Connecting Two Monitors to Separate DG5 Boards in G-brick

V12 Board Monitor Cabling

Use the Digital Video Interface-Integrated (DVI-I) to VGA cable to connect one of the two DVI-I (analog and digital) V12 board connectors to a VGA connector on a 24- or 21-inch VGA monitor. (See Figure 3-9.)

Note: The V12 board 13W3 connector, which is blocked, is not operable.

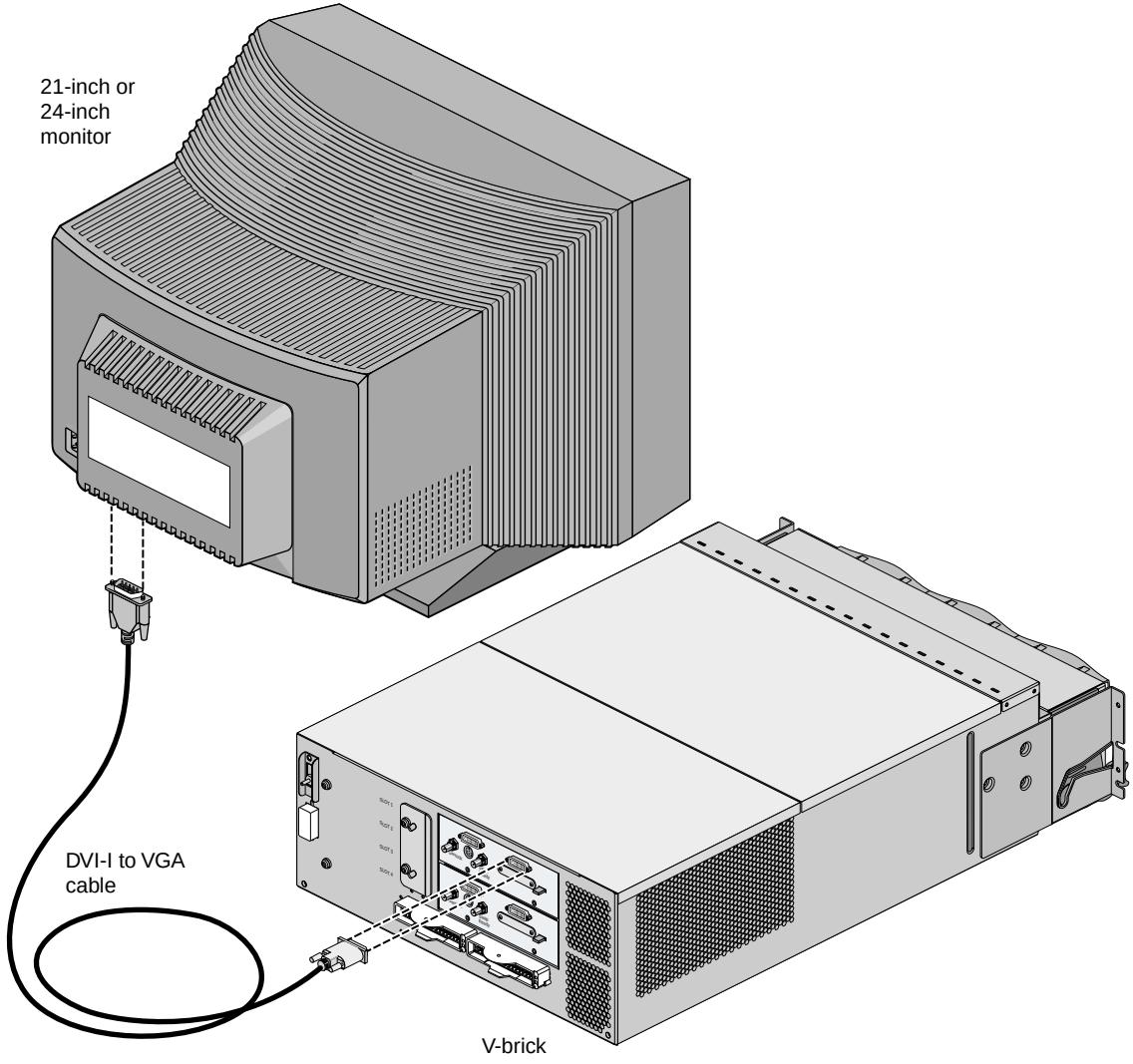

Figure 3-9 Connecting Monitor to V12 Board with DVI-I to VGA Monitor Cable

Keyboard and Mouse Port Configuration

Your graphics system is shipped with a standard 101-key USB keyboard and a USB mouse.

For keyboard and mouse applications directly adjacent to the system, you may plug cables not longer than 10 feet (3m) directly to the primary keyboard and mouse USB ports located on the rear panel of the I-brick. Figure 3-10 shows the location of these USB connectors.

You connect the four-port USB local extender (LEX) and remote extender (REX) using 30 feet (9m) of Category 5 (Cat 5) cable.

You can make additional keyboard and mouse connections using the primary system I-brick USB ports and an additional local/remote extender assembly (LEX and REX). You can also use additional USB ports on the rear panel of an optional I-brick.

The SGI Onyx 3000 series USB hub supports maximum keyboard and mouse cable lengths of as long as 328 feet (100 m) with the help of USB local extender.

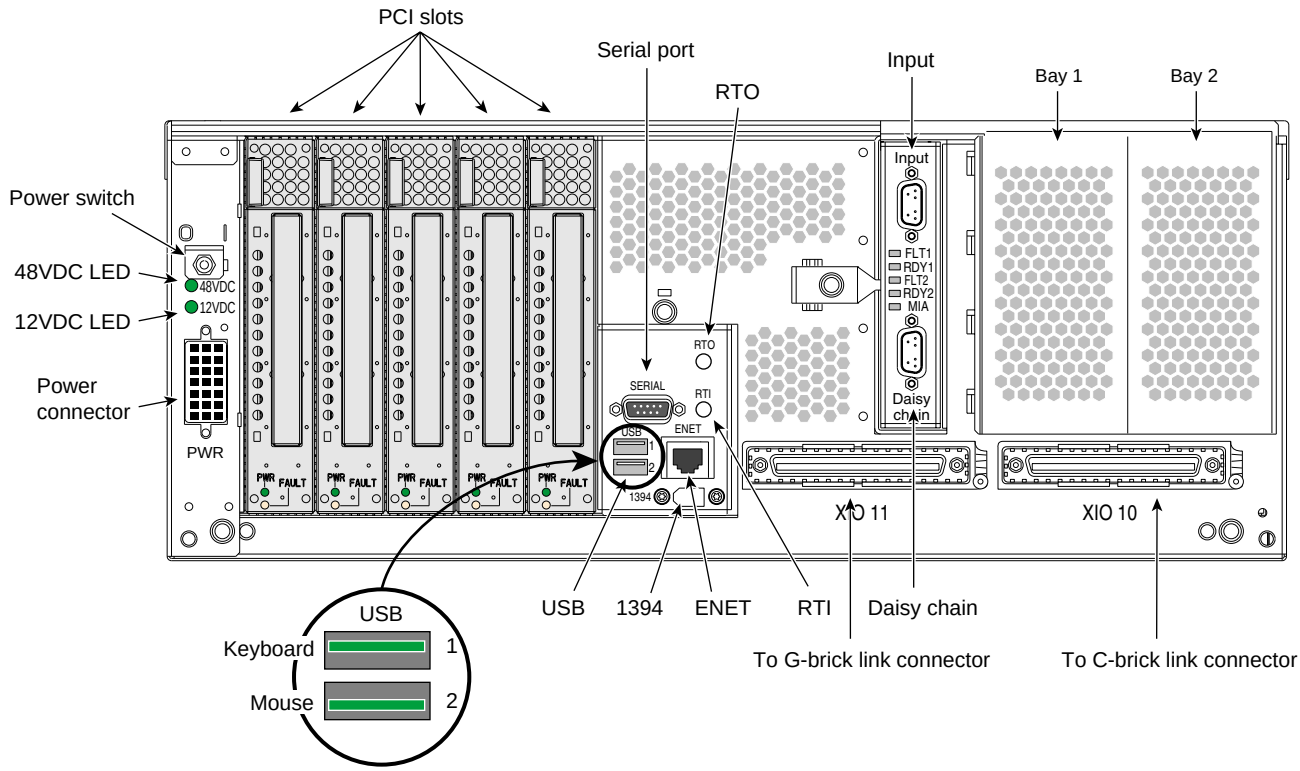

Figure 3-10 Primary I-brick Keyboard/Mouse Connectors

The SGI Onyx 3000 series graphics systems use USB to provide keyboard and mouse input.

The flexibility of USB, and the lack of persistent hardware identification, means that the mappings between a keyboard and mouse pair and an X display must be managed with a configuration file. This means that manual configuration is necessary. See the following section, “Keyboard and Mouse Device IDs,” for instructions.

Keyboard and Mouse Device IDs

The command `ioconfig(1m)` is used to establish persistent logical device numbers for each keyboard and mouse in an SGI Onyx 3000 series graphics system. When the system first initializes the USB hardware, it scans each USB bus looking for devices. Initially, these devices are assigned a device ID of -1. Later in the boot process, `ioconfig(1m)` is run. This assigns device IDs based on the contents of the file `/etc/ioconfig.conf`.

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

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

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

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

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

```
/hw/module/001c13/Ibrick/xtalk/15/pci/5/usb
```

The `controller prefix` encodes the hardware components leading to the USB controller. In the previous example, the controller path indicates that there is a USB controller at PCI slot 5 on the I-brick connected to C-brick 001c13.

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

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

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

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

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

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

You can use the `hinv` command to display a device's ID. See the `hinv(1)` man page for additional information.

Device IDs and X Windows

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

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

Configurations

The keyboard and mouse may be connected directly to USB ports 1 and 2 on the back of the I-brick. The use of an extender and a hub is described in the following paragraphs.

The Onyx 3000 USB extender configuration consists of an I-brick, a 4-port USB hub and extender, a keyboard, and a mouse. Before booting, the system should be configured as follows:

- I-brick USB port 1
- 4-port hub
- Keyboard on hub port 1
- Mouse on hub port 2

During the first boot, the USB driver discovers the keyboard and mouse, and `ioconfig` assigns them each an ID of `0`. They appear to the system as `/dev/input/keyboard` and `/dev/input/mouse`, and the X server will use them as its default input devices.

Reconfiguration

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

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

Follow these steps to reconfigure the keyboard and mouse setup:

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

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

Because `ioconfig` does not know what device IDs to assign automatically for new devices, step 3 may not assign the correct IDs. You can change the device IDs manually by editing `/etc/ioconfig.conf` and then re-running `ioconfig`.

Special Cases

The `/dev/input/keyboard` and `/dev/input/mouse` entries are always created, even if a keyboard and/or mouse with device ID `0` are not present. This allows the default X server to run without a keyboard or mouse physically attached for manufacturing checkout purposes.

Note: If you boot the system in this mode and plug in a keyboard or mouse after the system is running, you must restart the graphics subsystem to use the devices. To perform the process of adding a keyboard and mouse, see "Reconfiguration" on page 80.

Connecting Your System to an Ethernet

The graphics rack system is shipped with a standard Ethernet connector located on the rear of the I-brick. You can order optional PCI or XIO boards for additional Ethernet connections.

Speaker Pair Connections

This section describes how to connect audio speakers to your SGI Onyx 3000 series graphics system. The speakers connect to a PCI board installed in the I-brick. This section describes the PCI board to which the audio speakers connect and then describes how to connect the audio speakers to this board.

PCI Audio Board

The SGI Onyx 3000 series products use a PCI board (installed in the I-brick) for system audio output. This section lists the audio features available as well as the connector pinouts. See Figure 3-11.

Warning: Do *not* use first- or second-generation audio boards (P/N 030-0950-00*x*) with SGI Onyx 3000 or SGI Origin 3000 series systems. System damage or fire will result.

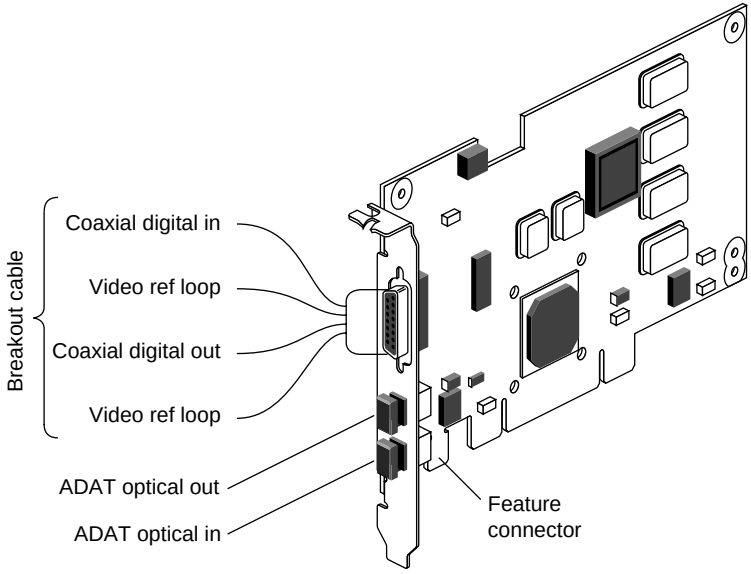

Figure 3-11 PCI Audio Board

Table 3-1 lists the features and specifications of the PCI audio board.

Table 3-1 PCI Audio Board Specifications

Feature	Specification
Synchronization	Locks to professional video (via video sync) and audio equipment with professional jitter attenuation. Accepts video reference input, and generates AES11 grade 2 (10 ppm) clocks.
Input sample rates	Continuous between 32 kHz and 48 kHz.
Output sample rates	32 kHz, 44.1 kHz, and 48 kHz.
Jitter attenuation	For 44.1 k-Hz or 48-kHz sample rates.
Video reference loop-through	75-ohm BNC connectors, breakout cable.
Coaxial digital audio input	AES-3id 75-ohm BNC connector, breakout cable. AES11 synchronization input (for audio clock rates). AES3 professional 2-channel 24-bit digital. Compatible with IEC958, S/PDIF consumer 2-channel digital.

Table 3-1 (continued) PCI Audio Board Specifications

Feature	Specification
Coaxial digital audio outputs	AES-3id 75-ohm BNC connector, breakout cable. AES11 synchronization output. AES3 professional 2-channel 24-bit digital. Compatible with IEC958, S/PDIF consumer 2-channel digital.
Optical digital input	12.8-Mbps SHARP multimode plastic fiber optic connector, PCI I/O panel. 8-channel, 24-bit ADAT optical interface. Compatible with IEC958, S/PDIF consumer 2-channel digital.
Optical digital output	12.8 Mbps SHARP multimode plastic fiber optic connector, PCI I/O panel. 8-channel, 24-bit ADAT optical. Compatible with IEC958, S/PDIF consumer 2-channel digital.

Note: IEC958 standards are now covered by IEC60958.

Table 3-2 shows the pinouts for the DB15 connector for video synchronization and AES-3id digital audio through the breakout cable.

Table 3-2 DB15 Connector Pinout Assignments

Pin	Assignment
1	COAXIAL DIGITAL_IN GND
2	COAXIAL DIGITAL_IN
3	VID_REF
4	VID_REF GND
5	VID_REF
6	VID_REF GND
7	NOT CONNECTED
8	CHASSIS GND

Table 3-2 (continued) DB15 Connector Pinout Assignments

Pin	Assignment
9	COAXIAL DIGITAL_OUT
10	NOT CONNECTED
11	COAXIAL DIGITAL_OUT GND
12	NOT CONNECTED
13	CHASSIS GND
14	CHASSIS GND
15	NOT CONNECTED

Connecting the Audio Speakers

Each graphics system uses a pair of digital audio speakers. These speakers connect to the system PCI-based digital audio output port. The speakers, like the one shown in Figure 3-12, have the following features:

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

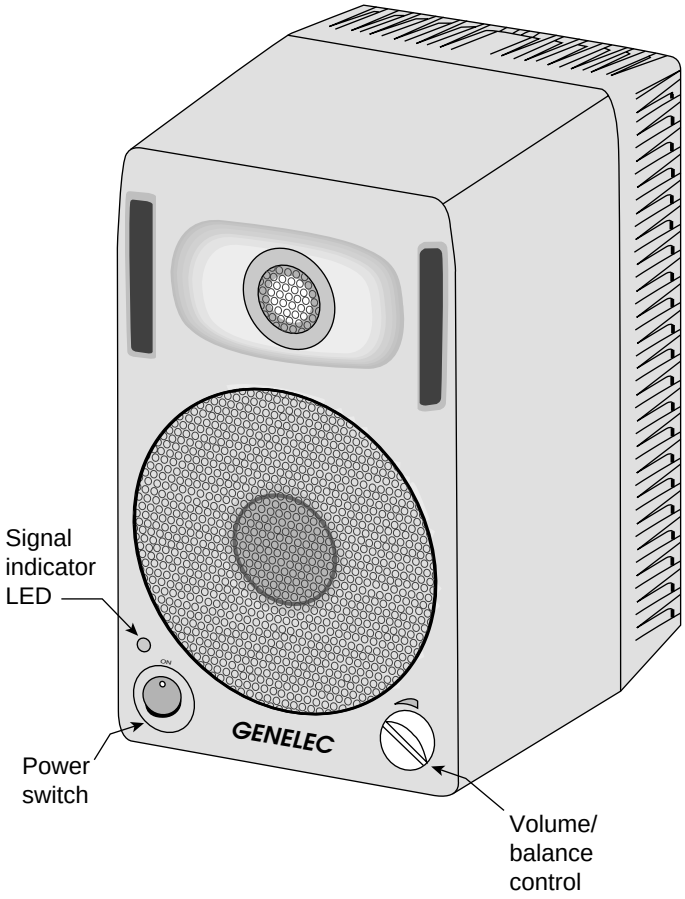

Figure 3-12 Front View of Speaker

Warning: Each of the speakers weighs 12.5 pounds (5.7 kg). Speakers placed off the ground should be secured or enclosed to prevent them from falling and causing injury to personnel or damage to equipment.

The speakers connect to the PCI system audio card using an audio breakout cable (see Figure 3-13) and a BNC cable combination connection. To connect the speakers, follow these steps:

1. Locate the PCI audio card in the I-brick at the back of your system rack, and connect the audio breakout cable to the DB15 connector. Note that the breakout cable has four BNC connections (you will use only the blue one).
2. Connect one end of the BNC audio cable to the AES-3id digital audio connection on the breakout cable (the blue BNC connector).

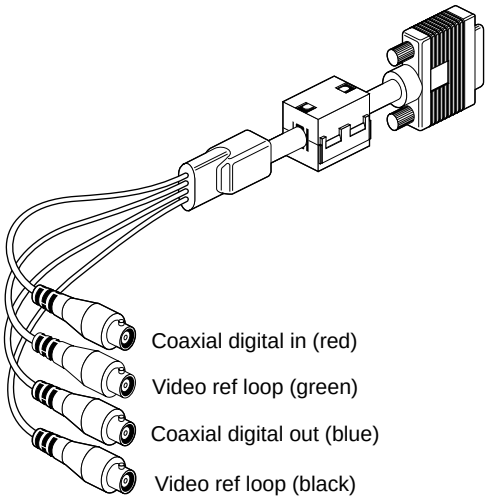

Figure 3-13 PCI Audio Breakout Cable

3. Connect the other end of the BNC audio cable to the back of the right speaker. (See Figure 3-14.)
4. Connect the left and right speakers together with the cable provided.

Note the following operating information prior to using your speakers:

- The “commercial” version of the speakers are labeled Model 2029B. The SGI version is the Model 2029B-Y, which differs in the following ways:
  - The digital input on the right (master) speaker is equipped with a BNC input connector (the commercial version has an XLR connector).
  - Each speaker in a pair is labeled as either 2029BL-Y (left) or 2029BR-Y (right).

- Each speaker is equipped with its own power cord.
- The speakers are dual-voltage (switchable between 110 V and 220 V operation).
- Each speaker has its voltage switch set to 220 V operation as a default. If you are in North America or other locations using 110 V sources, you need to manually switch to 110 V.

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

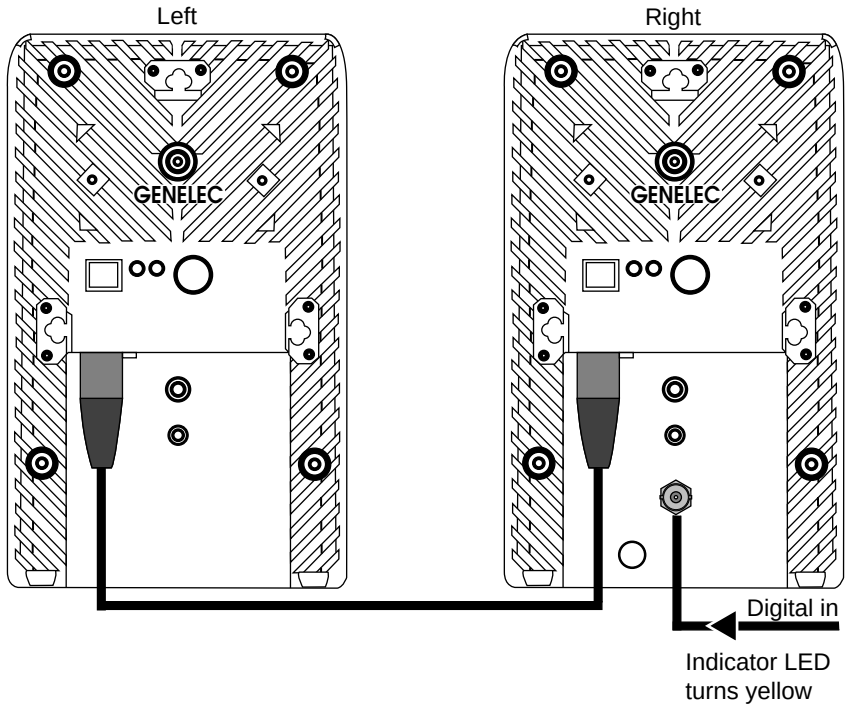

Figure 3-14 Speaker Pair Connection

The speaker's status LED indicates the following:

- Green indicates the presence of an analog input signal (not used in SGI Onyx 3000 series graphics system configurations).
- Yellow indicates the presence of a valid digital input signal.
- Red indicates a problem is detected with the digital input signal.

Figure 3-15 shows the location of the controls and connectors on the back of the right speaker.

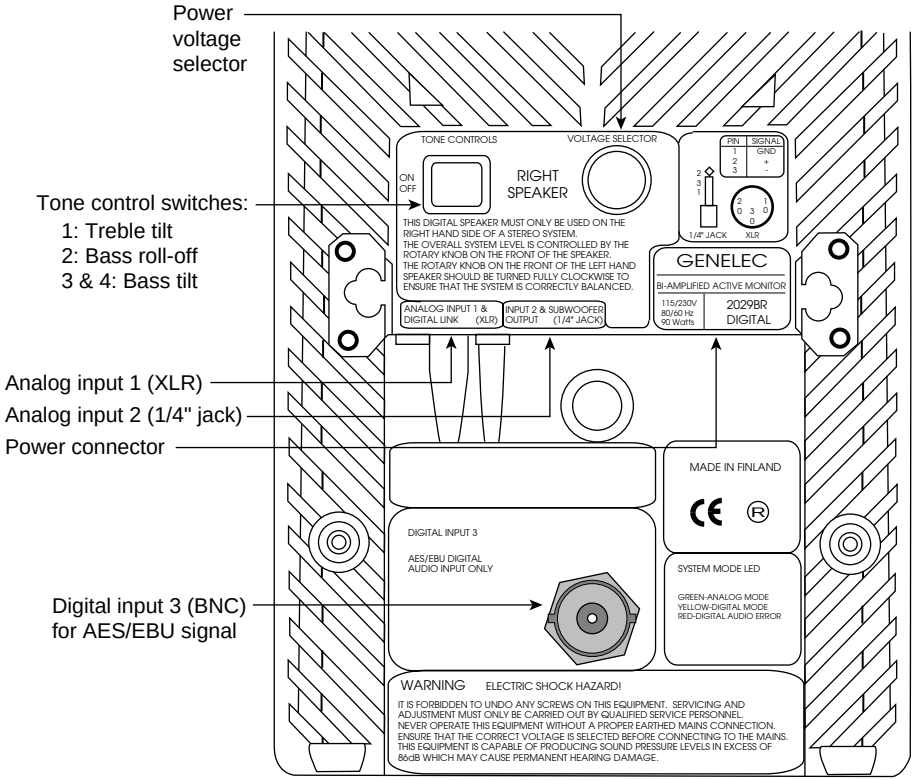

Figure 3-15 Right Speaker Rear Controls and Connectors

Figure 3-16 shows the connector used on the speaker-to-speaker interconnect cable.

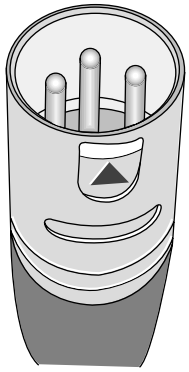

Figure 3-16 Speaker-to-speaker Cable Connector

Using the SGI Onyx 3000 Series Graphics System

This chapter provides information on using your SGI Onyx 3000 series graphics system in the following sections:

- "Overview" on page 91
- "System Maintenance and Safety Information" on page 92
- "Using Your Monitor" on page 93
- "Keyboard and Mouse Connections" on page 94
- "Powering On the System" on page 95
- "Powering Off the System" on page 109

Overview

This chapter describes system maintenance and safety information, and the use of your monitor. It also describes how to power on and power off the system from the L2 controller touch display located on the front door of the system rack that has the C-bricks.

You can also power on and power off your graphics system from a system console. Instructions to connect a system console to your graphics system and to power on and power off your graphics system is described in detail in *SGI Origin 3000 Series Owner's Guide*.

Warning: Before installing, operating, or servicing any part of this product, please read the "Safety Instructions" on page 152.

SGI Origin 3000 Series Owner's Guide also has the following information to help you use your graphics system:

- How to insert PCI cards into the graphics system I-brick and P-brick to provide more functionality to your system.
- How to install storage disk drive modules into the optional D-brick to increase storage capacity for your system.
- How the L1 and L2 controllers work together to manage and control your system. The guide also lists the L1 and L2 controller commands that you can enter at the system console to manage and control your system.

Note: Chapter 6, "Graphics System Controllers," describes the functions of the L1 and L2 controllers and the L1 controller messages that appear on the L1 controller display.

System Maintenance and Safety Information

Customer maintenance of your graphics system is limited to the outside of the chassis, where the peripherals and cables attach to the I/O panels. No user-serviceable parts are found within the chassis or individual system bricks.

Warning: The SGI Onyx 3000 series rackmount graphics system operates on 200-240 VAC. Use extreme caution when working around this voltage. Never install or remove power cords without first turning off the equipment.

There is voltage in the system brick midplanes even if the system has been reset or halted.

Caution: The graphics rack comes with one or more 24-inch SuperWide color monitors. Always use two people to move the monitors. Be sure to practice proper lifting techniques.

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

Using Your Monitor

A high-resolution SuperWide (1920 x 1200-pixel) 24-inch monitor, as shown in Figure 4-1, is shipped as a standard monitor for the SGI Onyx 3000 series graphics rackmount systems. To connect your monitor to your graphics system, see "Monitor Cabling Options" on page 71.

Caution: Before plugging any monitor into either a 100-120 VAC or a 220–240 VAC outlet, be sure that the electrical rating on the label is in either the 100-120 or the 220–240V range, whichever applies. When using a monitor in locations that do not have either of these outlets, contact your SGI system support engineer (SSE) before plugging in the monitor power cable.

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

Note: If you are using a monitor that was not shipped with your SGI Onyx 3000 series graphics system that has adjustable RGB connectors, make sure they are in the 75-ohm position; otherwise, the monitor displays the wrong colors.

The default monitor resolution supported by the SGI Onyx 3000 series graphics system SuperWide monitor is 1920 x 1200 at 66 Hz. The maximum output bandwidth is about 300 Mpix/sec. With two monitors, the speed of each monitor at a resolution of 1920 x 1200 at 66 Hz is approximately 188 Mpix/sec. If you connect more than two monitors, you must use a combination of lower- and higher-resolution monitors that are within the limit of 300 Mpix/sec.

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

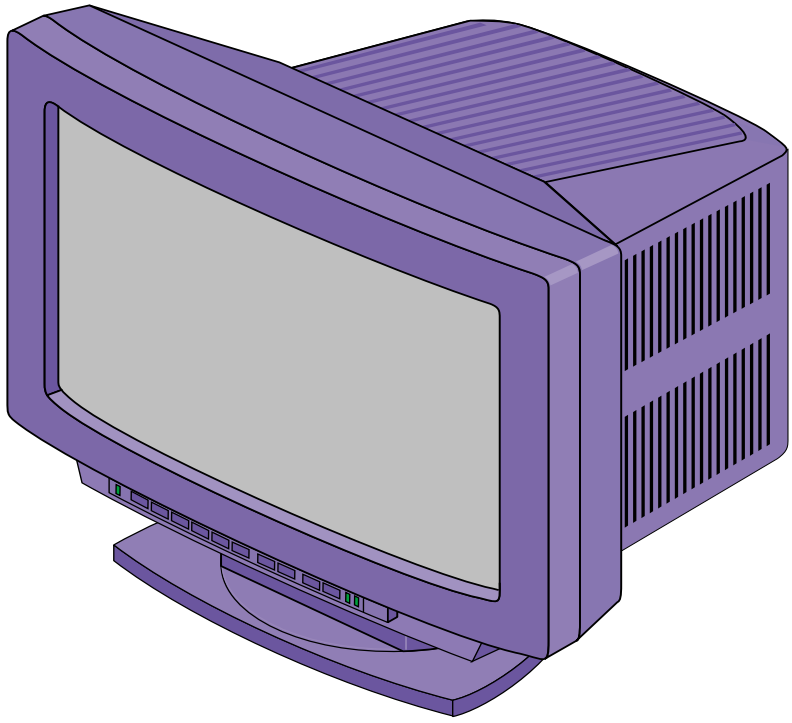

Figure 4-1 24-inch SuperWide Monitor

Keyboard and Mouse Connections

To use with your SuperWide monitor, your graphics system is shipped with a standard 101-key USB keyboard and a USB mouse that you can directly plug into the USB connectors in your graphics system I-brick.

For instructions to connect and configure your keyboard and mouse to the I-brick, see "Keyboard and Mouse Port Configuration" on page 76.

Powering On the System

There are several ways to power on your graphics system. This section documents only the procedure using the L2 controller touch display. For information regarding optional power-on procedures, see *SGI Origin 3000 Series Owner's Guide*.

Warning: The rackmount system operates on 200-240 VAC. Use extreme caution when working around this voltage. Never install or remove power cords without first turning off the equipment.

To prepare to power on the system, note or perform the following:

- Confirm that the power cabling between the following items is secure:
  - Between the G-brick(s) and the external power receptacle(s) (see Figure 4-2).
  - Between the bricks and the power bay.
  - Between the power bay and the power distribution unit (PDU).
  - Between the power distribution unit (PDU) and the power distribution strip (PDS).
  - For a D-brick, between its power connector and the PDS; the D-brick bypasses the power bay.
  - Between the PDU or PDS and the power receptacle (see Figure 4-3).
- All these cables should have been properly connected by your SGI system support engineer. If the system includes one or more D-bricks, make sure that each D-brick's Run/Service key switch on the ESI/Ops panel is set to **RUN**.
- Make sure that the **PWR** (power) switch on each individual brick that you want to power on is set to the On (**1**) position. This will start the L1 controller for the brick when the brick is powered on. Your SGI system support engineer normally leaves system brick rear power switches in the On (**1**) position.

Note: The system may malfunction or fail to boot if the rear power switch on one of the bricks is left in the Off (**0**) position when the system is powered on.

- Although the L2 controller is optional with the SGI Onyx 3200 graphics system that comes in a short rack enclosure, the L2 controller touch display is not. The L2 controller and L2 controller touch display is included with all the other SGI Onyx 3000 series graphics system models. With an L2 controller, you can power on and power off individual bricks, or power on and off the entire system at the L2 controller touch display located on the front door.

  Note: If the graphics system does not have an L2 controller touch display, you power on and off individual bricks or the entire system at a dumb terminal connected to the C-brick console port.

- The power receptacles used for the graphics brick and the system PDU should be sourced and grounded from the same breaker box. For additional information on this topic, call your SGI system support engineer.

Figure 4-2 shows the connection between a G-brick power cable cord and an external power receptacle.

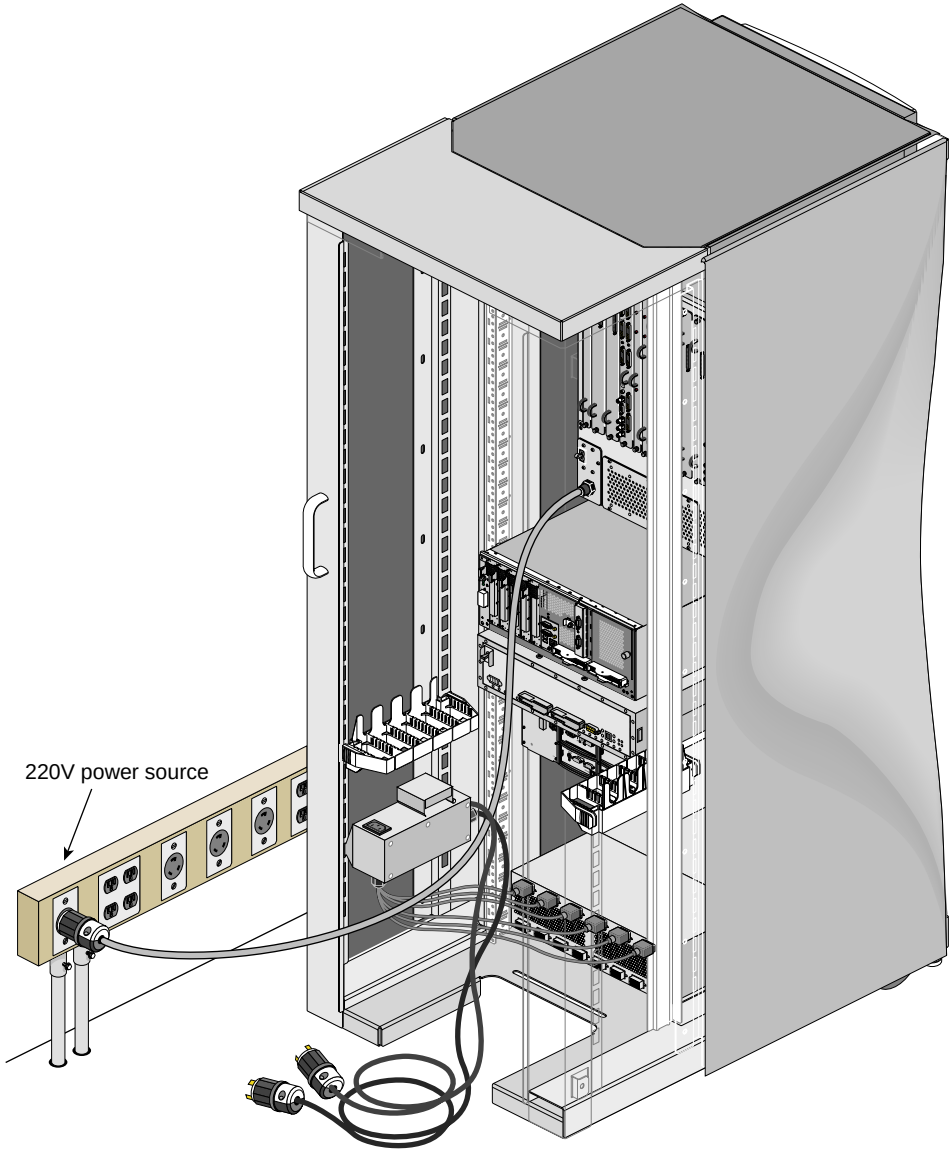

Figure 4-2 Connecting a G-brick Power Cable

Figure 4-3 shows the connection between a PDU power cable and an external power receptacle.

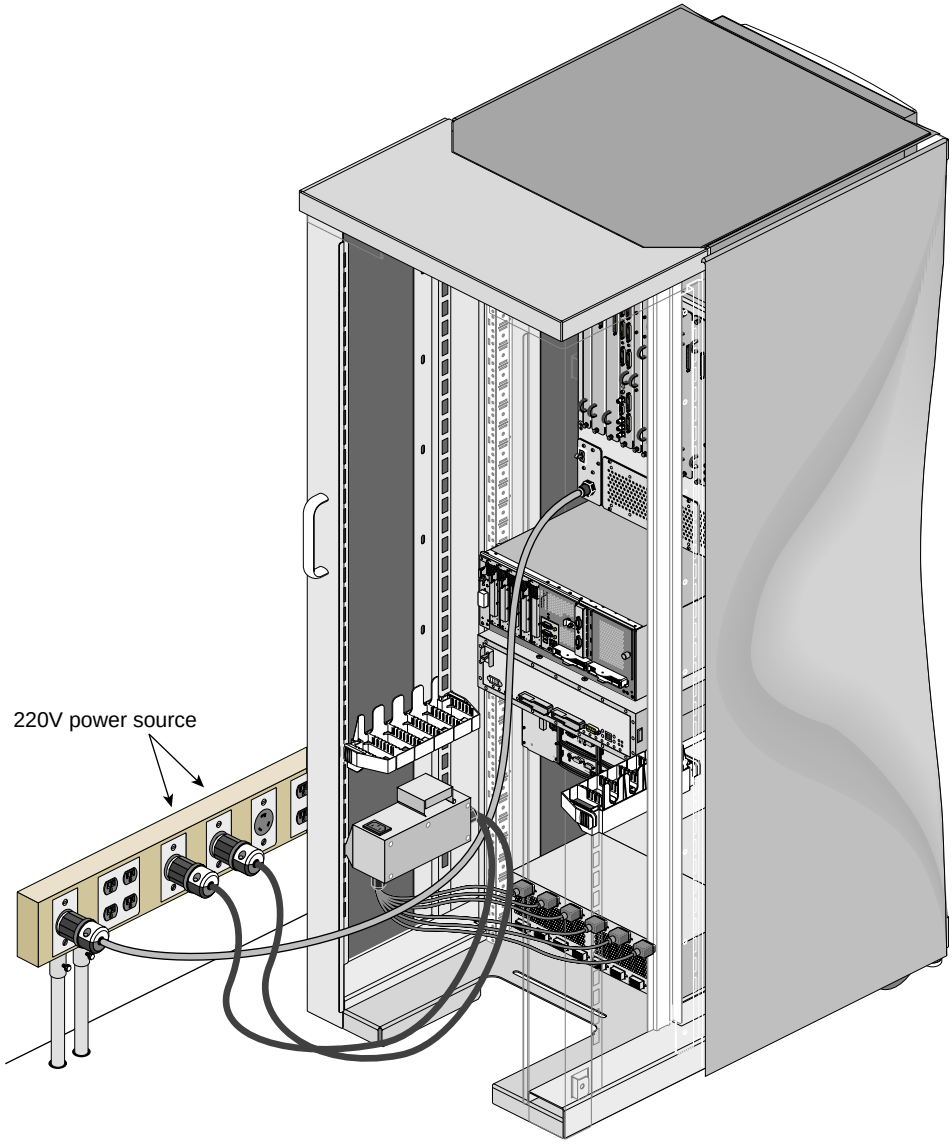

Figure 4-3 Connecting the PDU Power Cable

Caution: If the difference in ground potential between two chassis connected together with the NUMAlink or Xtown2 cables is greater than 500 millivolts (0.5 V), severe equipment damage can result.

Power on the rackmount graphics system as follows:

1. Turn on the PDU and/or PDS circuit breaker switches (shown in Figure 4-4).

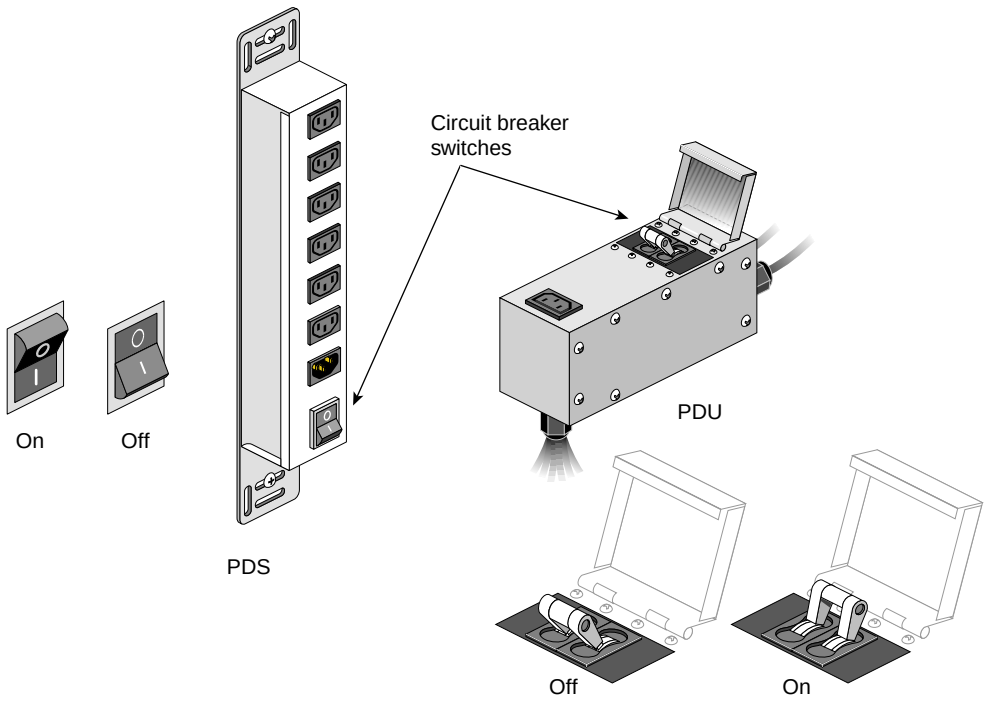

Figure 4-4 PDU or PDS Circuit Breaker Switches

2. If the monitors and other peripherals are equipped with voltage select switches, verify that they are set for the appropriate AC voltage and plug them in. Note that they are normally plugged in to sources outside the rack system.
3. Locate the L2 controller touch display on the front of the rack system (see Figure 4-5). It should be ready for input.

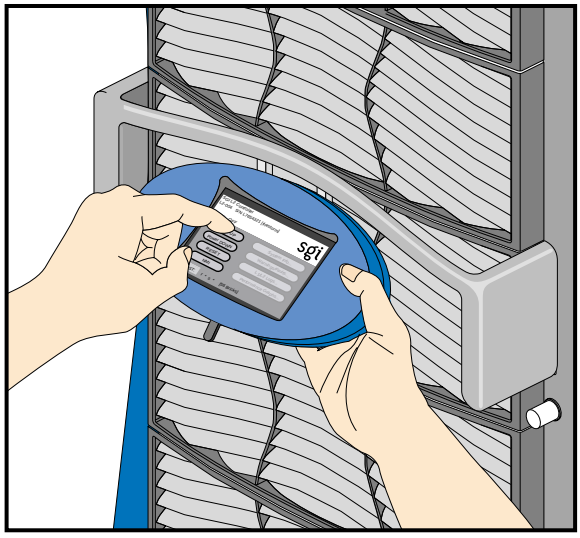

Figure 4-5 L2 Controller Touch Display

The home window, shown in Figure 4-6, 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.

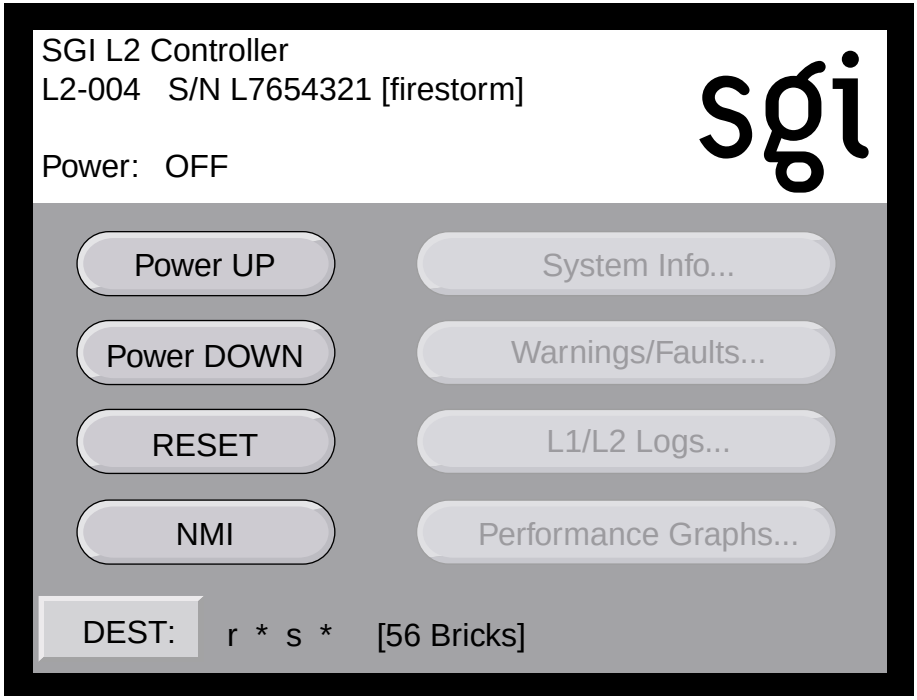

Figure 4-6 Home Window

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 4-7, appears.

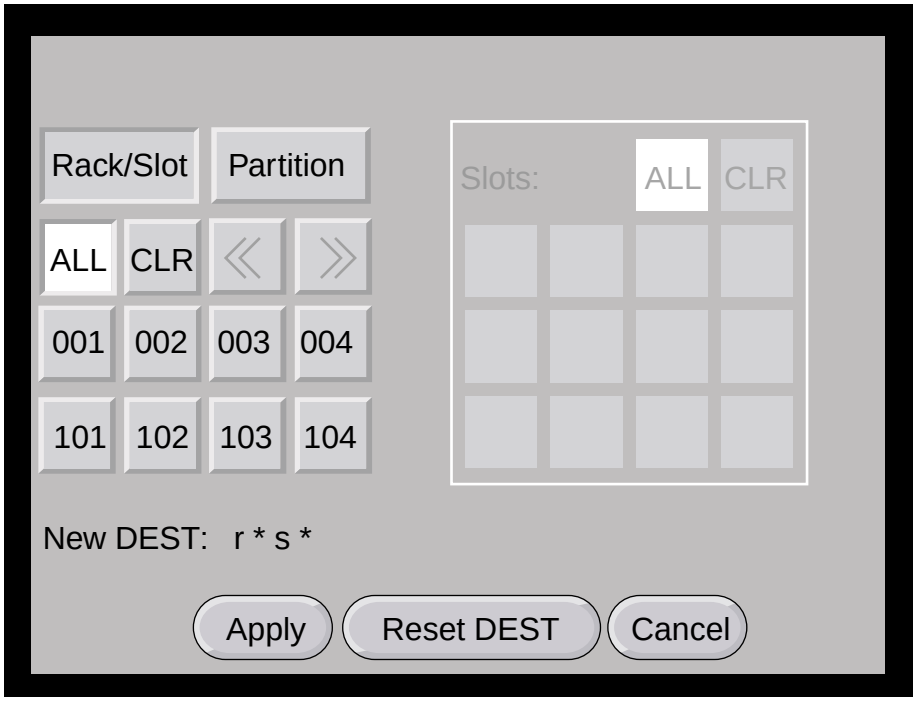

Figure 4-7 Destination Selection Window

2. You select the bricks by their rack and slot/bay (unit position) number, or by partition. Select **ALL** 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 4-8.

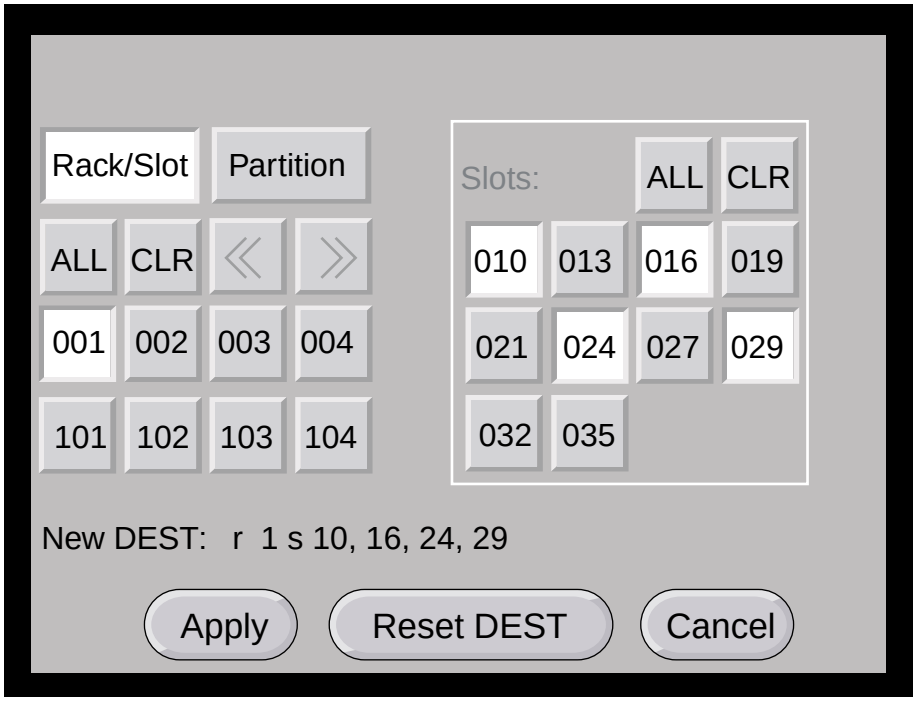

Figure 4-8 Slots Section

3. Select slots from the **Slots** section. (Figure 4-8 shows the selection of slots 010, 016, 024, and 029.) 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 4-9. This indicates that you have selected slots (bricks) 10, 16, 24, and 29 from rack 1 to power on.

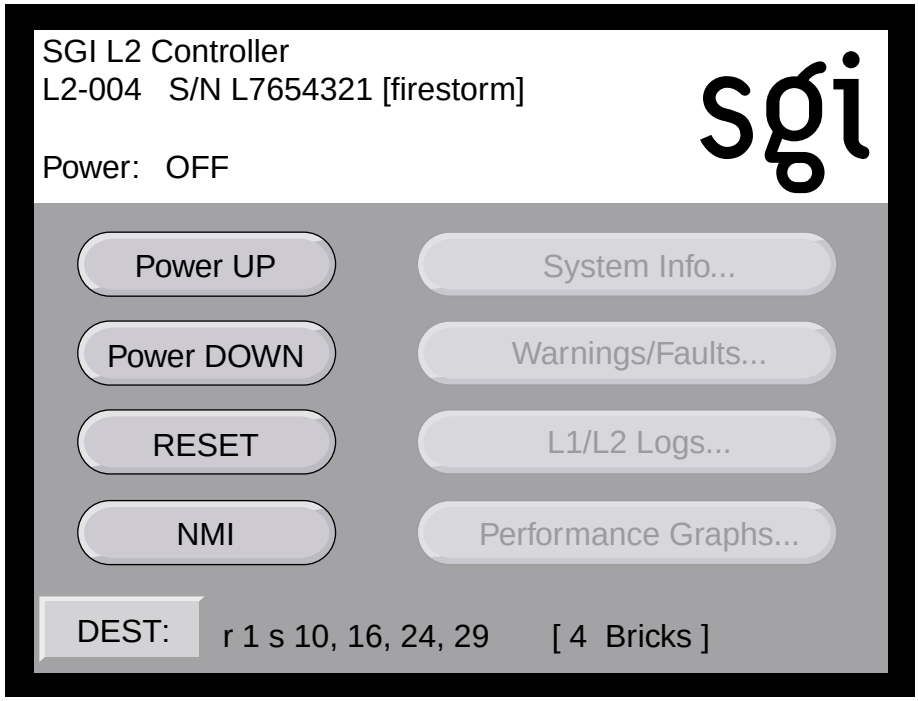

Figure 4-9 DEST Field on Home Window

4. If you want to power on a partition, select **Partition** from the destination selection window. The partition selection window, shown in Figure 4-10, appears.

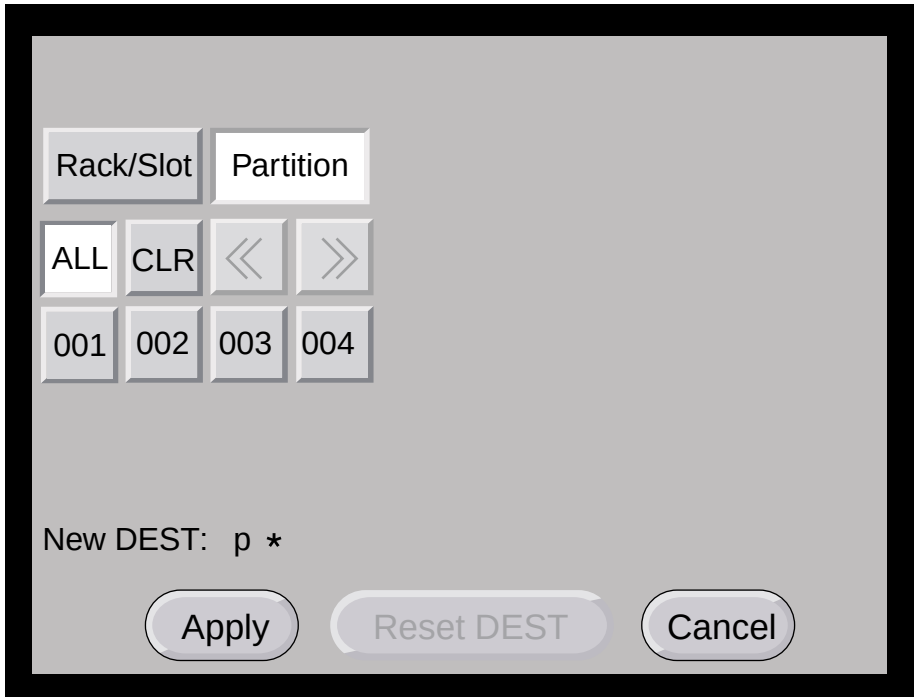

Figure 4-10 Partition Selection Window

5. You can select all partitions by selecting **ALL** from the partition selection window, or you can select a single or multiple partitions by selecting the individual partition numbers. Figure 4-11 shows the selection of partition **001**.

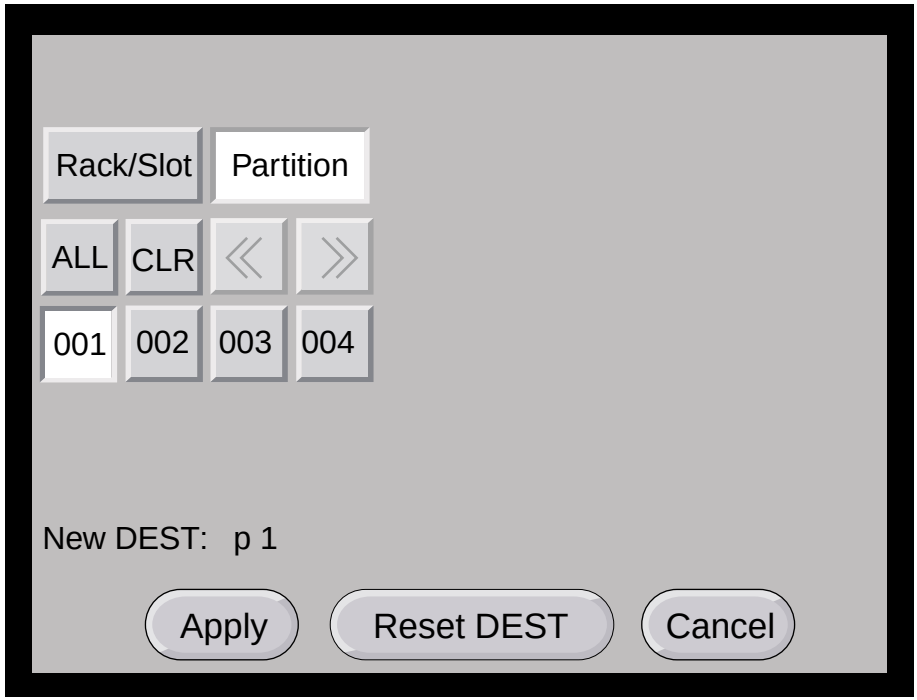

Figure 4-11 Selecting an Individual Partition

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 4-12, appears. The **DEST** field shows *p 1 [12 Bricks],* which indicates that all 12 Bricks belonging to partition 1 is the new destination.

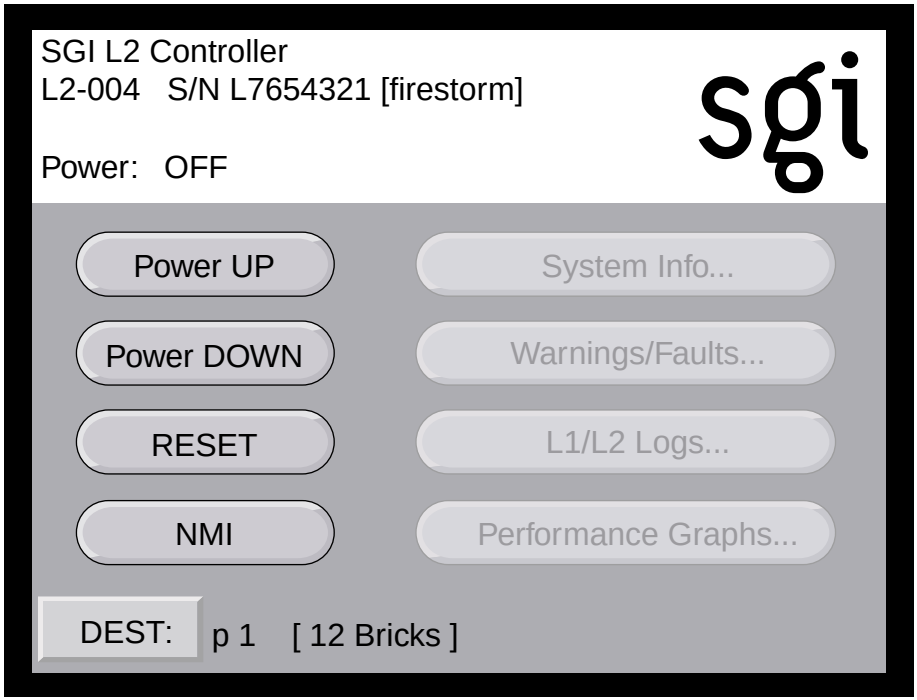

Figure 4-12 Home Window with Partition Destination

7. After you have selected the destination of the bricks you want to power on, select **Power UP** on the home window. The **Power UP** confirmation window, shown in Figure 4-13, appears. This window indicates which bricks will receive the **Power UP** command. In this example, it will power on all slots (bricks) in all racks (*r* * *s**). If you select **OK,** the power-on operation is confirmed, and the home window appears. Selecting **Cancel** stops the power-on operation, and the home window appears.

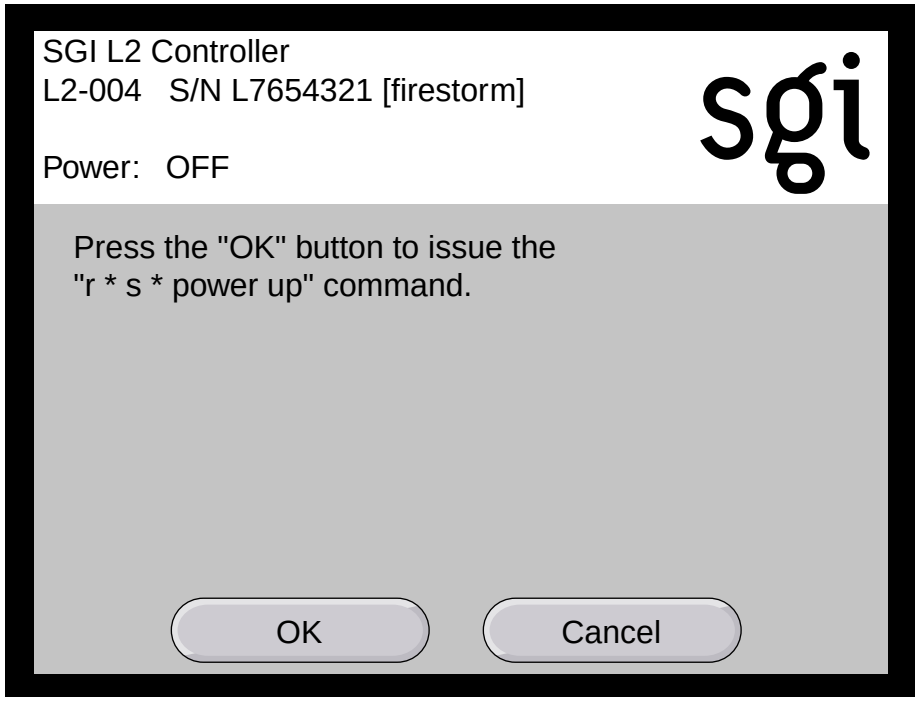

Figure 4-13 Power UP Confirmation Window

After the system powers on, confirm that the L1 controllers on each are brick are active (see Figure 4-14 for an example).

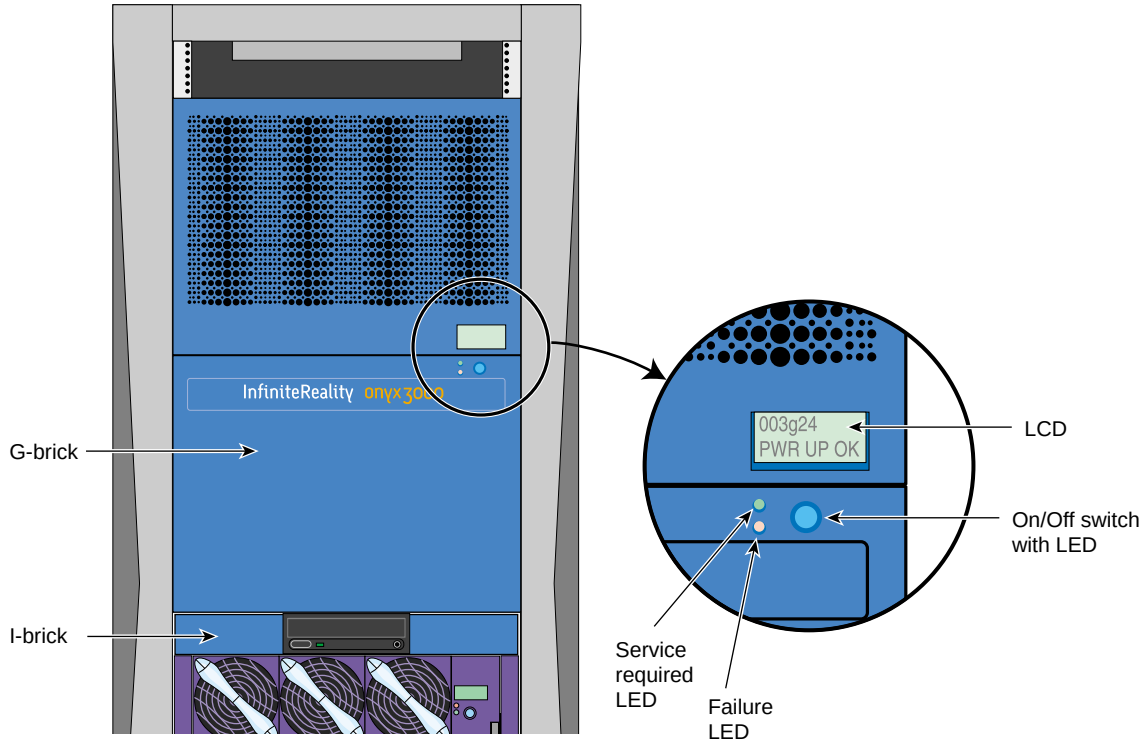

Figure 4-14 G-brick L1 and Power Button

Powering Off the System

The system should be powered off only for routine maintenance or repair. If you have a problem during powering off and an error message appears on your L2 controller touch display, see Table 6-2 on page 132 for a listing of L1 controller messages.

To prepare to power off your graphics system, note the following:

- If your system includes optional D-bricks, make sure that the D-brick's Run/Service key switch on the ESI/Ops panel is set to **Service**.
- During the power-off process, the L1 indicators on the individual bricks should display that the system is powering off for each segment of the procedure.

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

1. Locate the L2 controller touch display on the front of the system (see Figure 4-15).

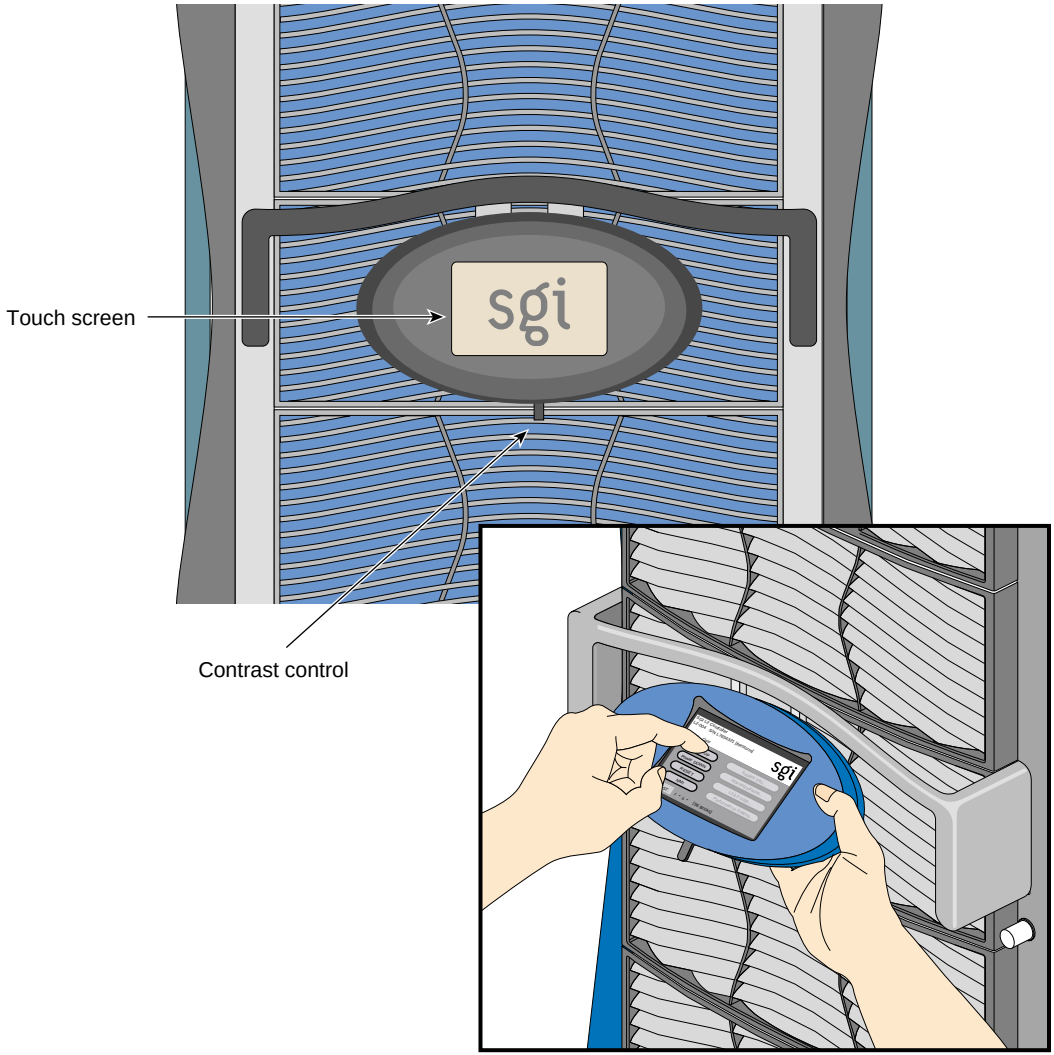

Figure 4-15 L2 Controller Interface Screen

The home window, shown in Figure 4-16, 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.

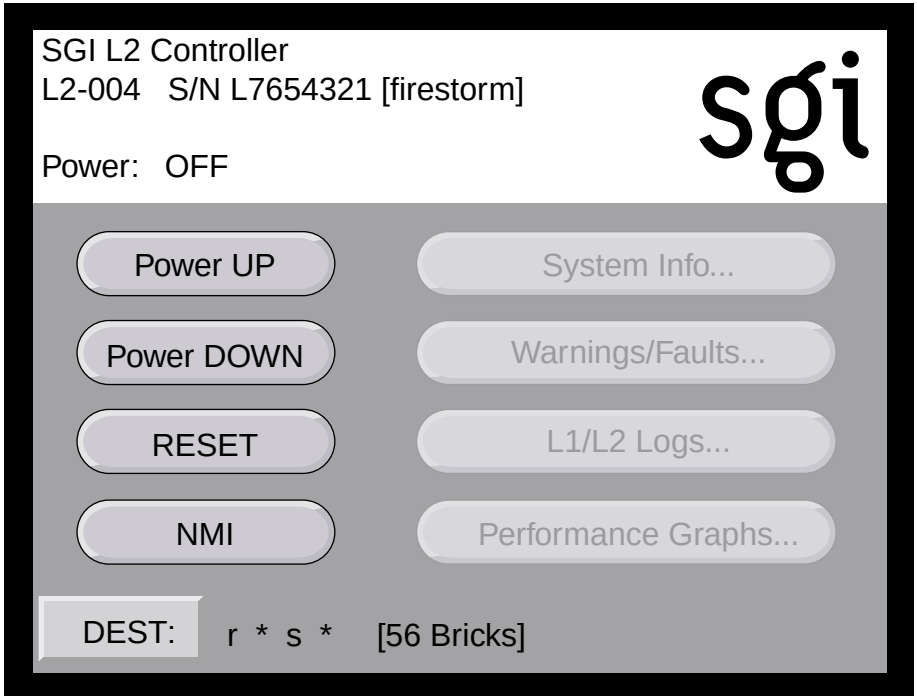

Figure 4-16 Home Window

2. Select the **DEST** button to select the bricks or partition you want to power on. The destination selection window, shown in Figure 4-17, appears.

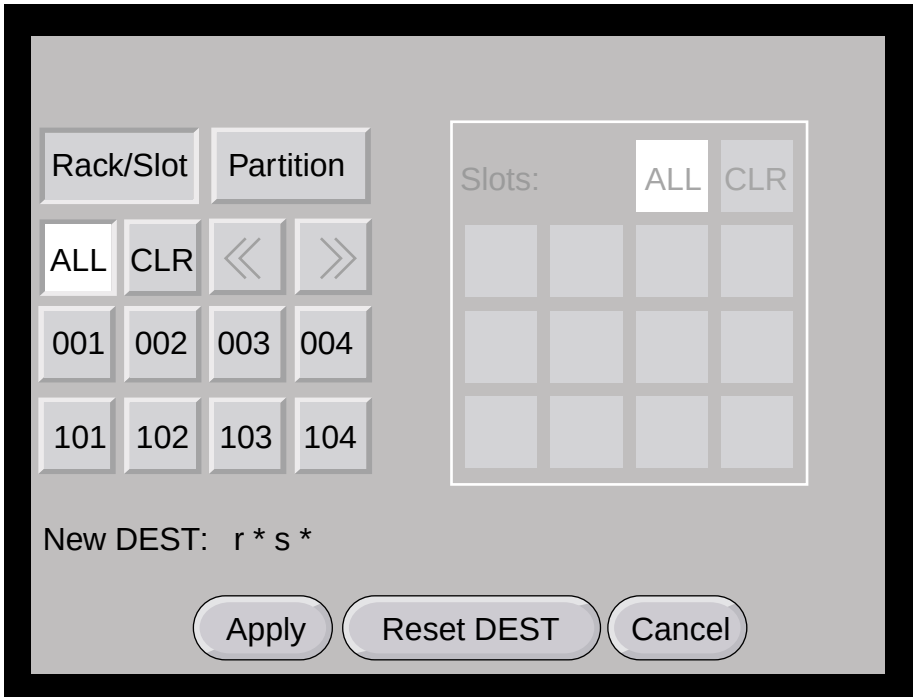

Figure 4-17 Destination Selection Window

3. You select the bricks by their rack and slot/bay (unit position) number, or by partition. Select **All** if you want to power off 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 off, 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 4-18.

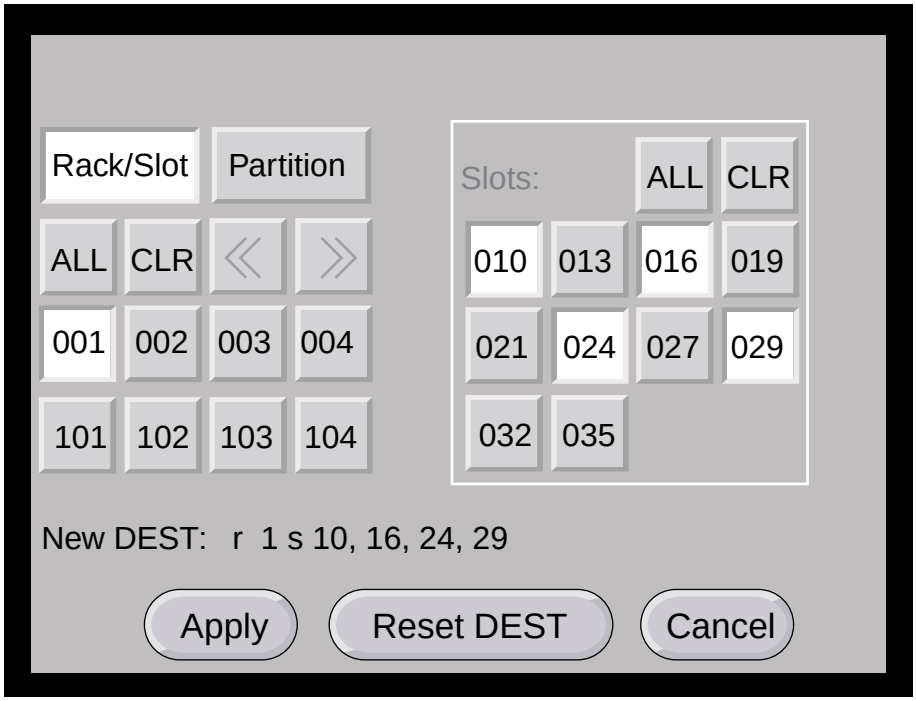

Figure 4-18 Slots Section

4. Select slots from the **Slots** section. (Figure 4-18 shows the selection of slots 010, 016, 024, and 029.) 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 4-19. This indicates that you have selected slots (bricks) 10, 16, 24, and 29 from rack 1 to power off.

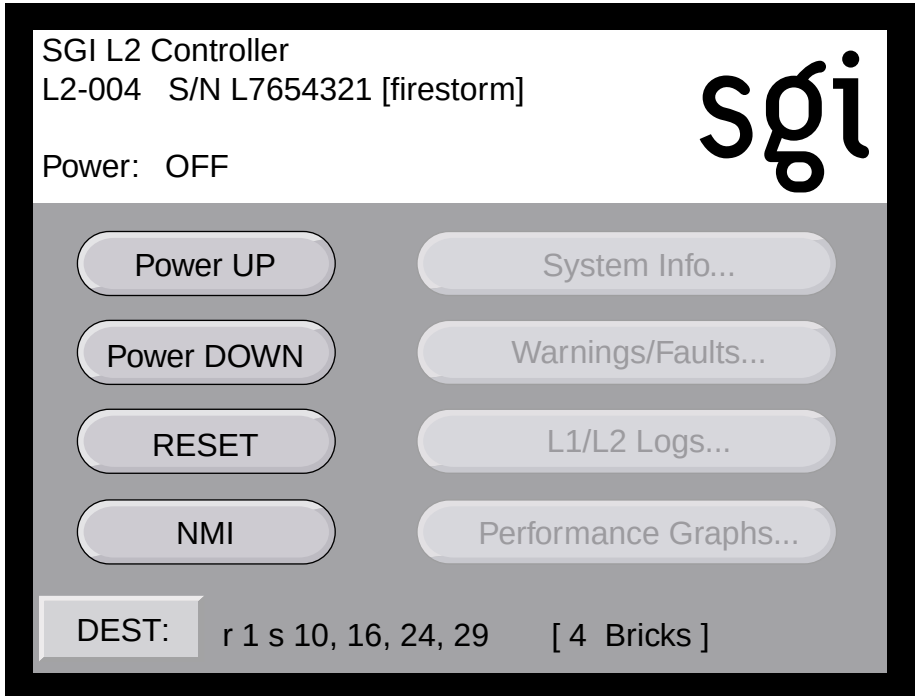

Figure 4-19 DEST Field on Home Window

5. If you want to power off a partition, select **Partition** from the destination selection window. The partition selection window, shown in Figure 4-20, appears.

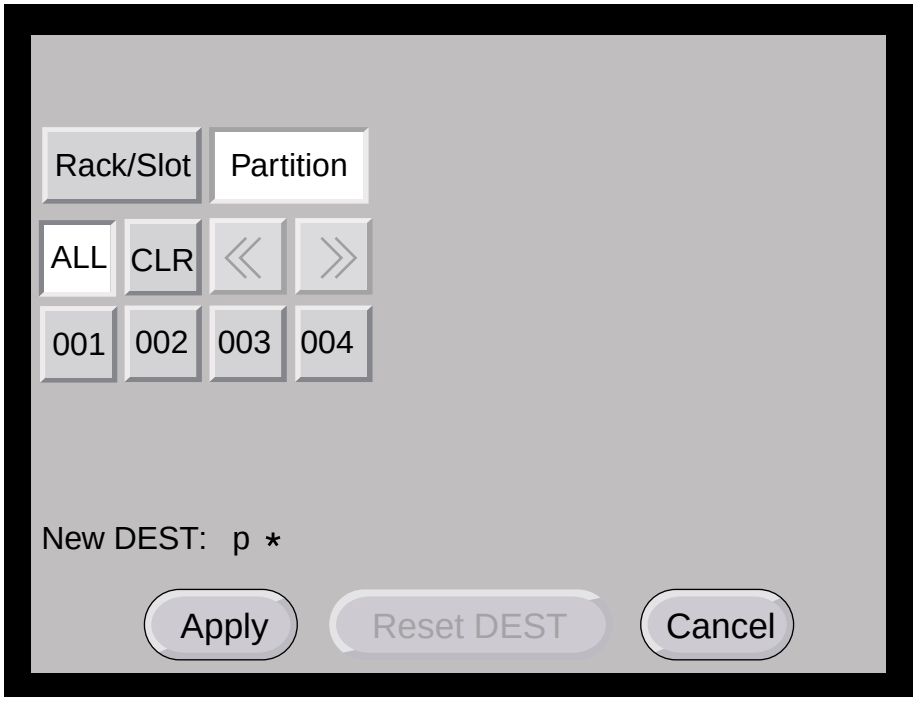

Figure 4-20 Partition Selection Window

6. You can select all partitions by selecting **ALL** from the partition selection window, or you can select a single or multiple partitions by selecting the individual partition numbers. Figure 4-21 shows the selection of partition **001**.

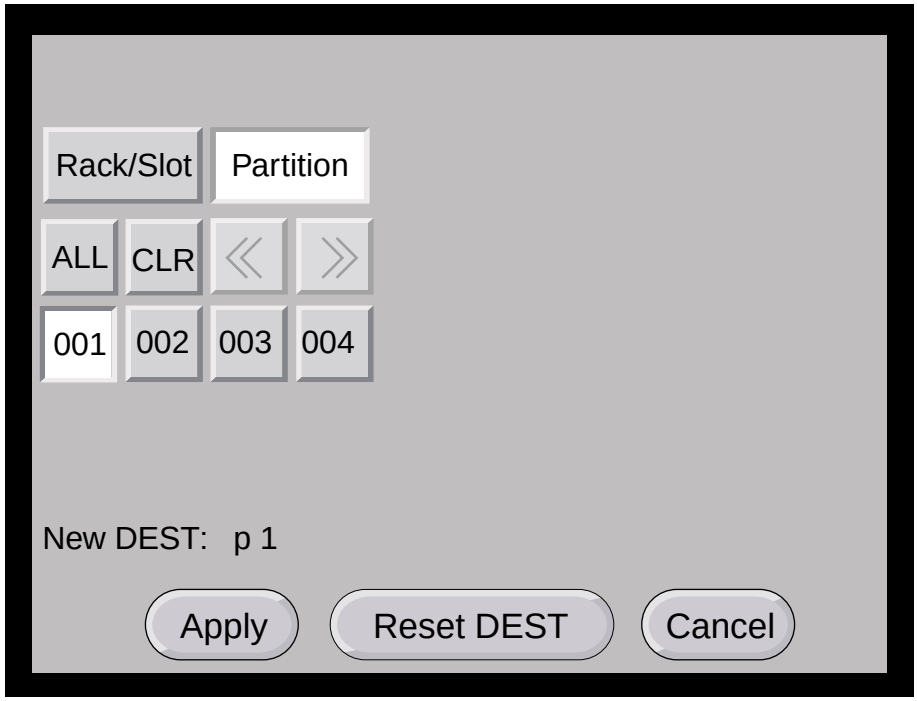

Figure 4-21 Selecting an Individual Partition

7. 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 4-22, appears. The **DEST** field shows *p 1 [12 Bricks]*, which indicates that all 12 bricks belonging to partition 1 is the new destination.

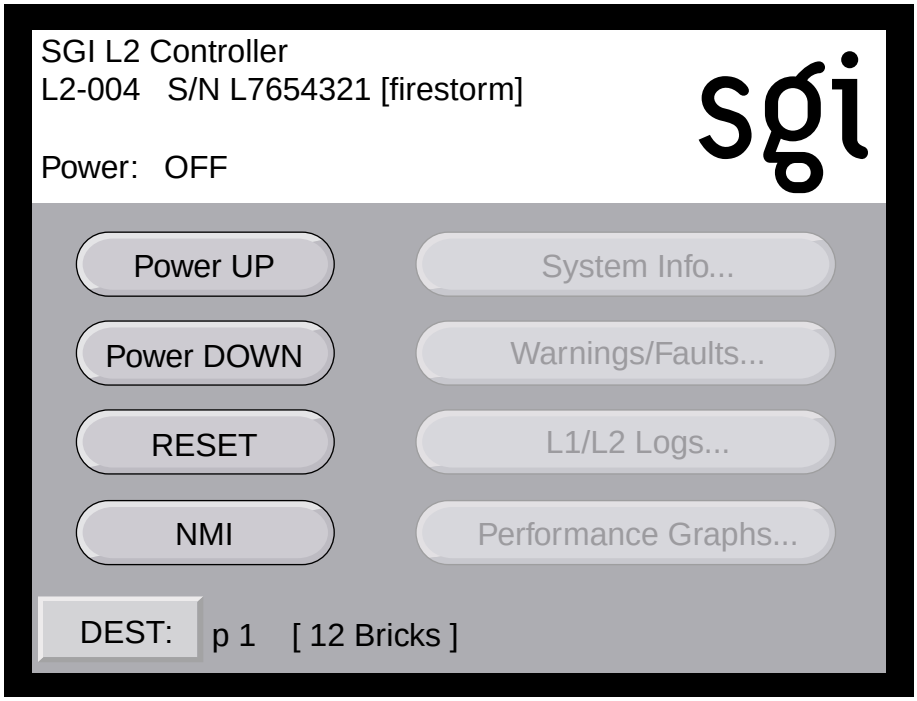

Figure 4-22 Home Window with Partition Destination

8. After you have selected the destination of the bricks you want to power off, select **Power DOWN** from the home window. The Power DOWN confirmation window, shown in Figure 4-23, appears. This window indicates which bricks will receive the **Power DOWN** command. In this example, 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.

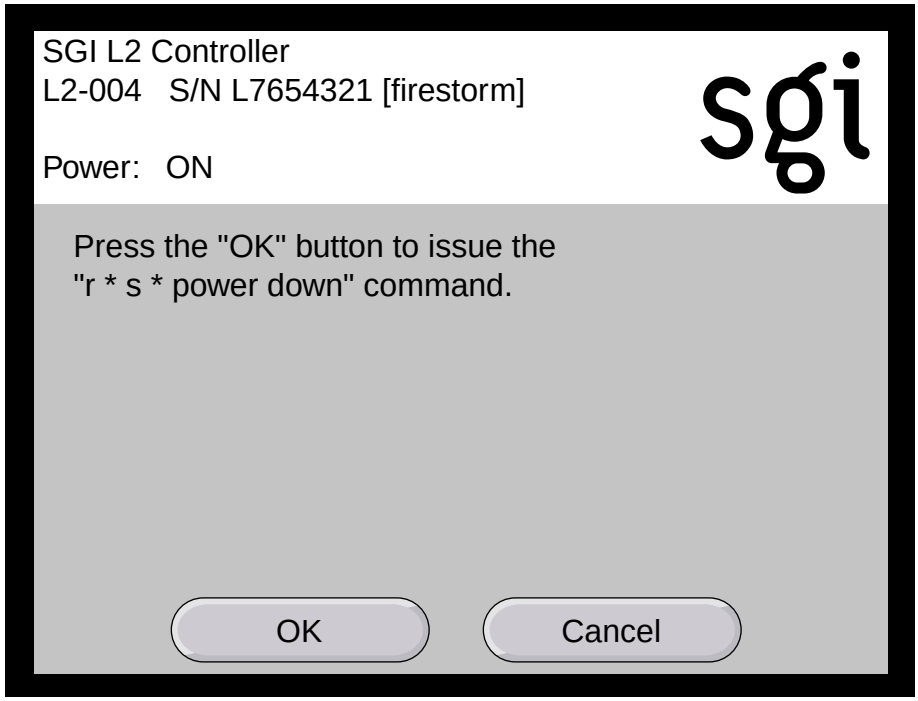

Figure 4-23 Power DOWN Confirmation Window

If you want to turn off the power switches for any external peripherals, do so in the following order:

1. Printer (if installed)
2. Monitors
3. Other external peripherals

If you want to turn off all power to the system, follow these steps:

1. Turn the PDU and/or PDS circuit breaker switches (shown in Figure 4-4 on page 99) to the Off (**0**) position.
2. Turn the switch(es) on the back of the G-brick(s) or V-brick(s) to the Off (**0**) position.

3. Disconnect the PDU power cable(s) from the wall receptacles.
4. Unplug the power cord(s) of the G-brick(s) or V-brick(s) from the wall socket(s).

After you complete all these steps, all power to the system is turned off.

Customer-replaceable Units

This chapter describes the installation and removal procedures for the customer-replaceable units (CRUs) in the SGI Onyx 3000 series graphics system. CRUs are hardware components that can be safely removed by an end-user without undue exposure to high electrical power potentials. Instructions for identifying, installing, and replacing CRUs are found in the following sections:

- "Identification of CRUs" on page 121
- "General Safety Information" on page 123
- "Before Replacement of Components" on page 123
- "Removal or Replacement of Components" on page 124

Identification of CRUs

CRUs are limited to the following major hardware components:

- Front panels and L1 display (facade)
- G-brick (L1) System Controller module
- System disk drives

S*GI Origin 3000 Series Owner's Guide* contains instructions for installing and replacing the following items:

- Storage disk drive modules
- PCI cards

Warning: To avoid injury to yourself or your system, only SGI support service engineers (SSEs) can install and replace XIO cards and V12 boards on your SGI Onyx 3000 series graphics system.

Figure 5-1 shows a rack with CRUs for an SGI Onyx 3000 series graphics system that contains a G-brick. Note that the facade on the G-brick is also removable.

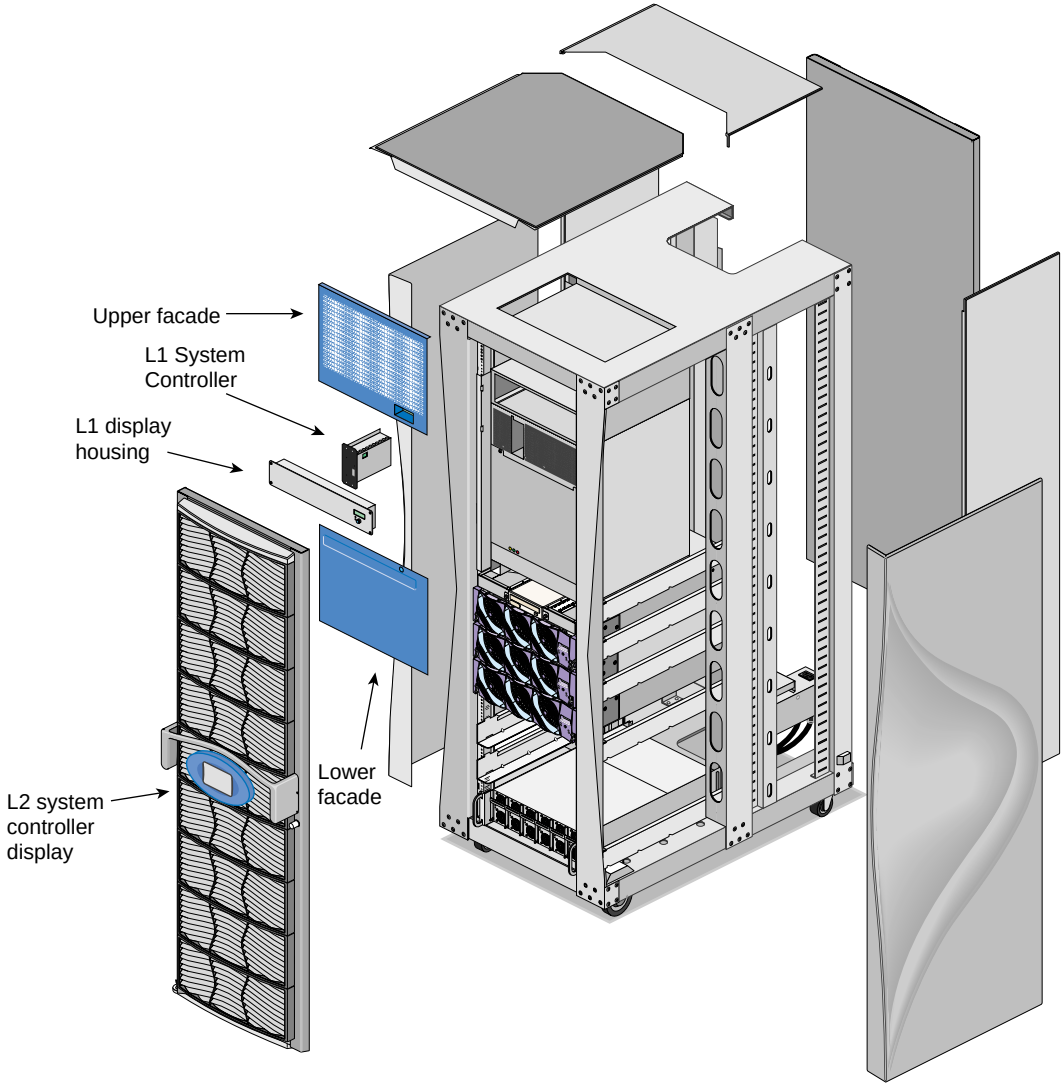

Figure 5-1 SGI Onyx 3000 Series Rack System Customer-replaceable Units

General Safety Information

Read the following subsections for general safety information. Before beginning any replacement procedures, observe the precautions in this section.

Warning: This equipment uses electrical power internally that is hazardous if the equipment is improperly disassembled.

This equipment is extremely sensitive and susceptible to damage by electrostatic discharge (ESD). The buildup of electrical static potential on clothing and other materials may cause ESD. Use proper ESD preventive measures and observe these precautions:

- Wear a properly grounded wrist strap when connecting and disconnecting peripherals.
- Be sure that you and all the electrical equipment you handle are at ground potential to avoid damage from ESD.

Warning: Before installing, operating, or servicing any part of this product, please read the "Safety Instructions" on page 152.

Warning: The motherboard on the I-brick has a lithium battery installed. Only qualified SGI service personnel should replace this lithium battery, and only with the same type or an equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions. There is a danger of explosion if the battery is incorrectly replaced. See Appendix B, "Regulatory Specifications".

Before Replacement of Components

Ensure that the system files are backed up, and that all users are logged off the system. Always completely power off the system when removing or replacing internal components.

"Powering Off the System" on page 109 explains how to properly turn off and disconnect all system power.

"Keyboard and Mouse Connections" on page 94 details the procedures for bringing the rack back online after adding, removing, or replacing internal components.

Removal or Replacement of Components

The G-brick uses three front panel components (sometimes called a facade). When you remove G-brick facade components, see Figure 5-2 and note the following information:

- The top portion of the G-brick facade slots into place at the top and is held by two screws near the bottom and a guide pin (located next to the L1 controller interface). Note that it slides over the L1's On/Off button. Be careful not to break the button when removing or replacing this portion of the facade.
- Slots at the bottom of the lower facade hold it in place, and it secures at the top with two screws.
- After you remove the upper and lower facade plates, you can undo the L1 display housing bar by removing four screws (two at each end). Note that the display housing also holds the cable connection to the L1 module, which should be carefully detached. Note that the cable should always be detached at the controller end (not at the display end).
- Remove the L1 module from the G-brick by undoing the four screws (two at the top and two at the bottom) and sliding the unit out of the G-brick chassis.

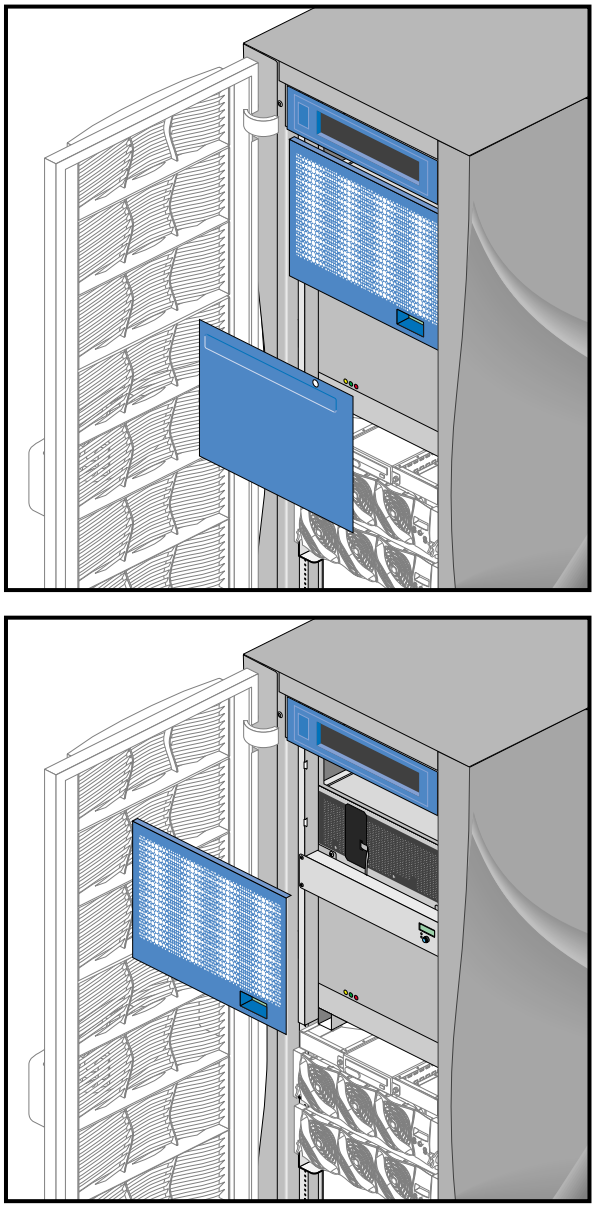

Figure 5-2 Removing the G-brick Facade

Graphics System Controllers

This chapter describes the L1 controller and L2 controller used to monitor, manage, and control your SGI Onyx 3000 series graphics system in the following sections:

- "Overview" on page 127
- "L1 Controller" on page 128
- "L2 Controller" on page 134

Overview

System Controllers in the SGI Onyx 3000 series graphics system are generally used for the following overall tasks:

- Manage power control and sequencing
- Provide environmental control and monitoring
- Initiate system resets
- Store identification and configuration information
- Provide console/diagnostic and scan interface

The graphics system has two controllers to monitor and manage the graphics system:

- **L1 controller.** This is a brick-level controller used to monitor and control brick functions such as fan speed (for temperature control) and voltage levels.
- **L2 controller.** This is a rack-level controller that enables 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. The L2 controller (optional in the SGI Onyx 3200 graphics system that is housed in a short rack) is standard in all the system tall racks containing C-bricks.

You can enter L1 and L2 controller commands to reconfigure your L1 and L2 controllers to modify the management and control of your SGI Onyx 3000 series graphics system to suit your needs. The L1 and L2 controller commands are entered at a system console connected to the L2 controller console port.

Note: For instructions to connect a system console to your SGI Onyx 3000 series graphics system, for a listing and description of the L1 and L2 controller commands, and for a detailed description of the L1 and L2 controllers, see the *SGI Origin 3000 Series Owner's Guide*.

L1 Controller

The G-brick, V-brick, and N-brick, like all bricks in the SGI Onyx 3000 series graphics system (except the D-brick), have built-in L1 controllers to monitor many functions of the brick. (For more details about the L1 controller and the L1 controller for other bricks in your graphics system, see *SGI Origin 3000 Series Owner's Guide*.)

Note: The D-brick, which does not have built-in L1 system controller, has instead its own ESI/Ops panel module with a microcontroller for monitoring and controlling all elements of the D-brick. See the D-brick chapter in S*GI Origin 3000 Series Owner's Guide* for details.

Some of the functions monitored by the L1 controller are common to all the system bricks and some are specific to a brick type. Basic functions of the L1 controller are listed in Table 6-1.

Table 6-1 Basic L1 Controller Functions

L1 Function	Used in G-brick?	Used in V-brick?	Used in N-brick?
Controls voltage regulator modules (VRMs).	No	Yes	Yes
Monitors voltage and reports increases, decreases, or failures in voltage levels.	Yes	Yes	Yes

Table 6-1 (continued) Basic L1 Controller Functions

L1 Function	Used in G-brick?	Used in V-brick?	Used in N-brick?
Controls voltage margining within the brick.	No	Yes	Yes
Controls and monitors fan speed.	Yes	Yes	Yes
Monitors and reports operating temperature and status of 48 VDC input power.	No	Yes	Yes
Monitors and controls LEDs.	Yes	Yes	Yes
Reads system identification (ID) PROMs.	No	Yes	Yes
Monitors the reset switch and the nonmaskable interrupt (NMI) switch.	No	Yes	Yes
Monitors the On/Off power switch.	Yes	Yes	Yes

The L1 controller hardware used with the G-brick, V-brick, and N-brick consist of the following:

- Logic components:
  - SRAM, NVRAM, and flash memory
  - Microcontroller unit (MCU)
  - Inter-integrated circuit bus (I^2C bus)
  - ID EEPROM
- Front panel connection cable
- Front panel display
- Voltage regulator module (VRM)
- USB port

The front panel display of the G-brick L1 controller (as shown in Figure 6-1), like the L1 controller for the V-brick and N-brick, consists of a 2-line, 12-character liquid crystal display (LCD) that provides:

- Brick identification
- System status
- Warning of required service or failure
- Identification of failed components
- On/Off switch

Note: For an illustration of a V-brick and an N-brick L1 controller display, see Chapter 2, “G-brick, V-brick, and N-brick”.

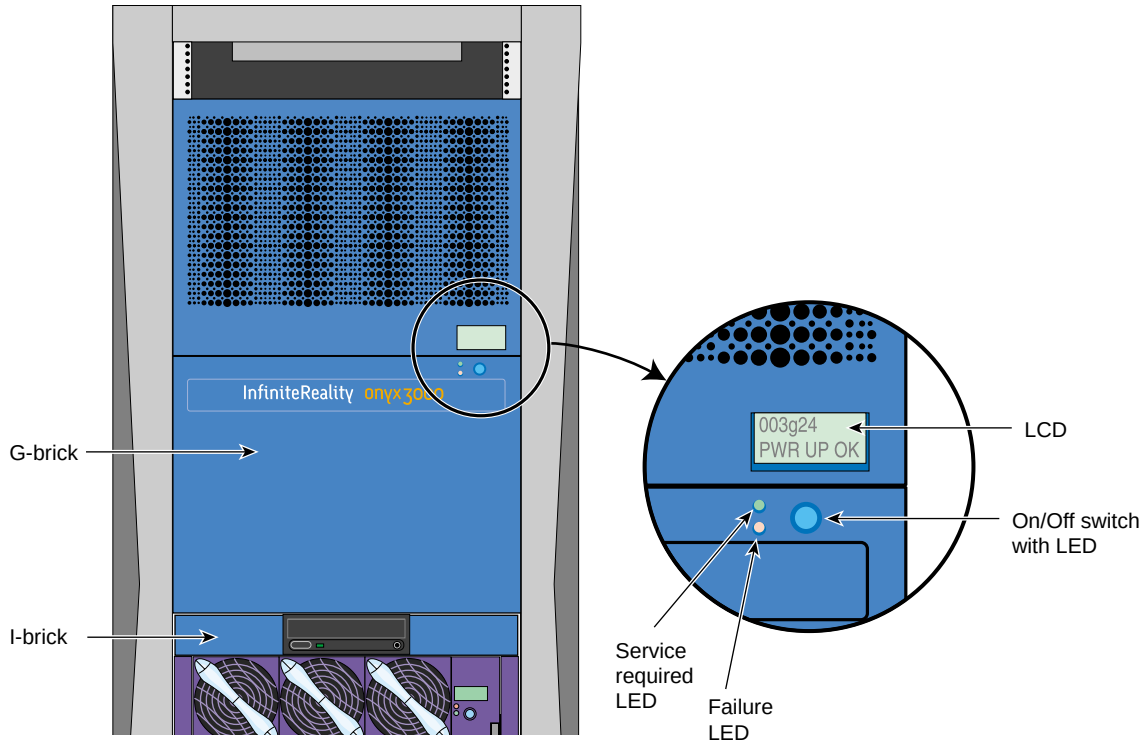

Figure 6-1 G-brick L1 System Controller Display and Controls

In a single-rack configuration, the G-brick's L1 controller USB connection connects directly to an L2 controller L1 port (USB).

In a multirack graphics system with two or more G-bricks installed, the G-brick's L1 controller USB connection connects to a USB hub before connecting to the L2 controller.

The L1 controller on the V-brick and N-brick connect to the L2 controller via their connections to the C-brick, which is connected to the R-brick, which in turn is connected to one of the L2 controller L1 ports (USB).

L1 Controller Display Messages

The L1 controller display provides warnings, fault information, advisory status, and critical status messages. Note that as listed in Table 6-2, a voltage warning occurs when a supplied level of voltage is below or above the nominal (normal) voltage by 10%. A voltage fault occurs when a supplied level is below or above the nominal by 20%.

Table 6-2 L1 Controller Messages

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	Higher than nominal voltage condition is detected.
ATTN: x.xV low warning limit reached @ x.xxV	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: locaFAN # x fault limit reached @ xx RPM	The L1 controller issues this fault message if a fan can not spin at its minimum RPM, and the environment is warm (greater than 30 ºC) or if there is another fan already spinning at its minimum RPM. A 30-second shutdown sequence starts. Check to see if a fan has failed.
ATTN: FAN # x warning limit reached @ xx RPM	The L1 controller issues this fan warning when a fan is not spinning at its minimum RPM in a cool environment (less than 30 ºC). The system increases the fan RPM to provide additional air flow to compensate. Check to see if the fan stabilizes.
ATTN: FAN # x stabilized @ xx RPM	Fan appears to be spinning at appropriate RPM. The L1 controller usually displays this message after a fan has been replaced.

Table 6-2 (continued) L1 Controller Messages

Message	Meaning and Action Needed
Temperature messages: low alt.	
ATTN: TEMP # advisory temperature reached @ xxC xxF	The ambient temperature at the brick's air inlet has exceeded 30 ºC.
ATTN: TEMP # critical temperature reached @ xxC xxF	The ambient temperature at the brick's air inlet has exceeded 35 ºC.
ATTN: TEMP # fault temperature reached @ xxC xxF	The ambient temperature at the brick's air inlet has exceeded 40 ºC.
Temperature messages: high alt.	
ATTN: TEMP # advisory temperature reached @ xxC xxF	The ambient temperature at the brick's air inlet has exceeded 27 ºC.
ATTN: TEMP # critical temperature reached @ xxC xxF	The ambient temperature at the brick's air inlet has exceeded 31 ºC.
ATTN: TEMP # fault temperature reached @ xxC xxF	The ambient temperature at the brick's air inlet has exceeded 35 ºC.
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 five seconds until shut down.
Brick appears to have been powered down	The L1 controller has registered a fault and has shut down.

L2 Controller

In the graphics-equipped rack, the L2 controller allows remote maintenance, controls resource sharing, manages the L1 controllers in the system, and maintains controller configuration and topology.

Note: The D-brick, which does not have a built-in L1 system controller, is not monitored by the L2 controller. It has instead its own ESI/Ops panel module with a microcontroller for monitoring and controlling all elements of the D-brick. See the D-brick chapter in *SGI Origin 3000 Series Owner's Guide* for details.

As a general rule, you would use the L2 controller touch display shown in Figure 6-2 in the following functional areas:

- Powering the system on and off
- Monitoring voltage margins
- Resetting the system
- Entering a non-maskable interrupt (NMI)

The L2 controller monitors and reports status information from the individual compute, I/O, and graphics bricks in the rack system. Information is displayed and commands can be selected using the L2 controller touch display on the front of the rack.

The following sections provide an overview of the L2 controller's features and functions. For more details about the L2 controller, see *SGI Origin 3000 Series Owner's Guide*.

L2 Controller Touch Display

The rack display is a 320 x 240 LCD touch display located on the front of the system, as shown in Figure 6-2. The L2 controller touch display translates what the user touches into commands. The controller displays the results of the commands.

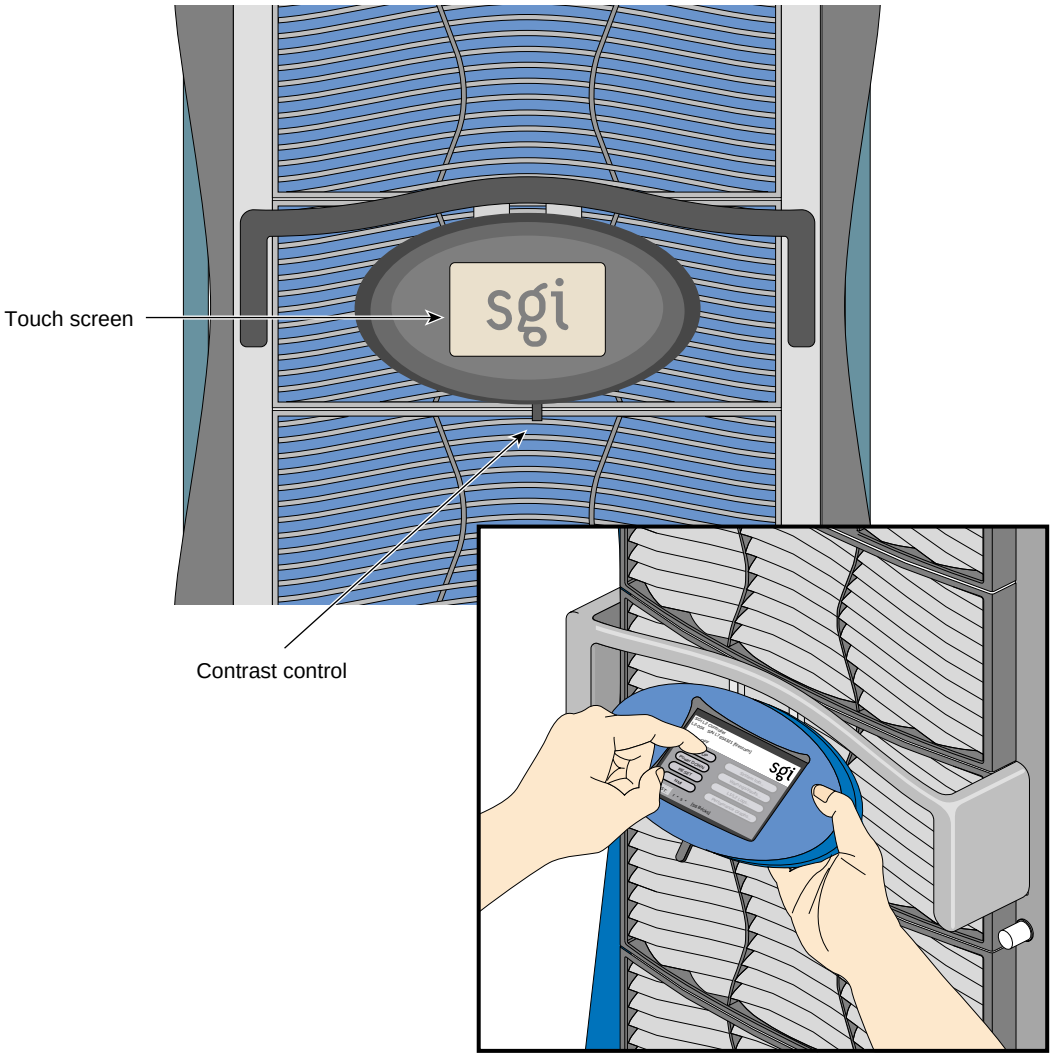

Figure 6-2 L2 Controller Touch Display and Controls

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 is mounted in the top of the rack. Figure 6-3 shows its location.

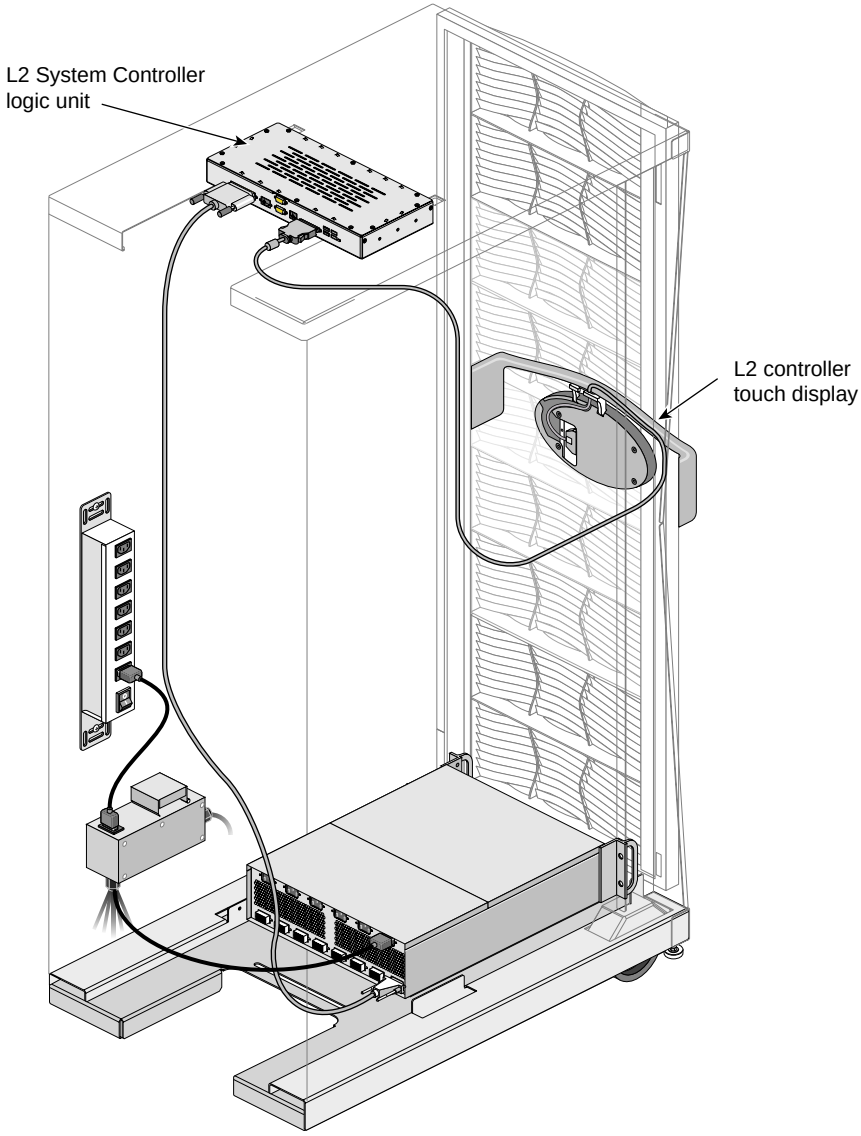

Figure 6-3 Location of L2 Controller in Rack

Input power is 48 VDC (about 30 W), which is provided by the power bay.

The L2 controller consists of rack display controllers, ports, and a software component, which are described in the following subsections.

L2 Controller Ports

Figure 6-4 shows the connectors on the L2 controller.

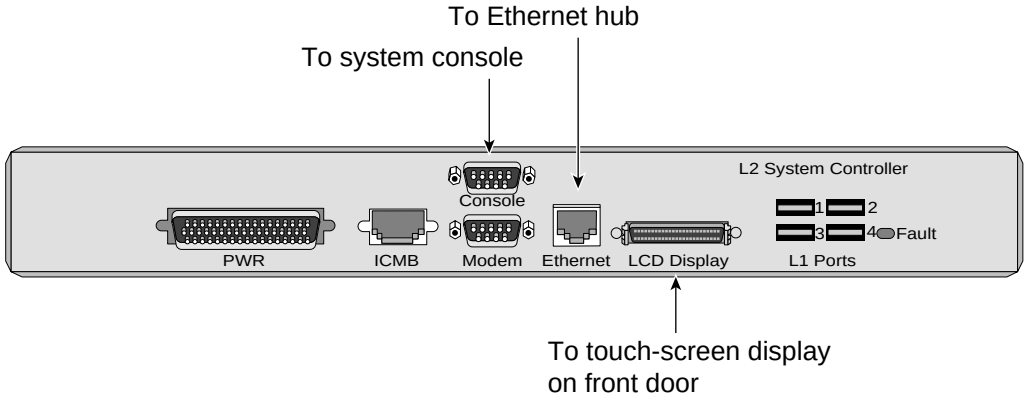

Figure 6-4 L2 Controller Connectors

L2 Controller Software Component

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. (The software 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).

Technical Specifications

This appendix lists the technical specifications of the SGI Onyx 3000 series graphics system in these sections:

- "System-Level Specifications" on page 141
- "Brick-Level Specifications" on page 143
- "Power Specifications" on page 144

System-Level Specifications

Table A-1 summarizes system configuration ranges.

Table A-1 System Configuration Ranges

Category	Minimum	Maximum
Processors	4	128
Peak performance	~4 Gigaflops (one 4P node brick)	~128 Gflops (32 4P node bricks)
C-brick memory capacity	512 MB	8 GB
System main memory capacity	512 MB (one node brick)	256 GB (32 node bricks)
I/O channels	1	32
Aggregated peak I/O bandwidth	0.768 GB/sec (one I-brick)	~ 76 GB/sec (one I-brick and 31 P-bricks)

Table A-2 lists the physical specifications of the short rack.

Table A-2 Short Rack Physical Specifications

Characteristic	Specification
Height	36.06 in. (915 mm)
Width	25.38 in. (644 mm)
Depth	40.63 in. (1031 mm)
Weight (maximum)	475 lb (216 kg)
Shipping weight (maximum)	550 lb (250 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. (1885 mm)
Width	30.00 in. (761 mm)
Depth	51.50 in. (1307 mm)
Weight (maximum)	Compute rack = 1075 lb (489 kg); I/O rack = 1225 lb (557 kg); Graphics rack with two G-bricks = 850 lb (386 kg)
Shipping weight (maximum)	Compute rack = 1438 lb (654 kg); I/O rack = 1588 lb (722 kg); Graphics rack with two G-bricks = 1213 lb (550 kg)

Brick-Level Specifications

Table A-4 lists the physical specifications of all bricks.

Table A-4 Brick and Power Supply Physical Specifications

Brick or Bay	Height (in Units)	Height (in Inches)	Maximum Weight
C-brick	3U	5.25 in. (133 mm)	65 lb (30 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)
G-brick	18U	31.5 in. (800 mm)	215 lb (98 kg)
N-brick	2U	3.50 in. (89 mm)	18 lb (8 kg)
V-brick	4U	7.00 in. (178 mm)	69 lb (31 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 449 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 lists the power requirements of individual bricks.

Table A-5 Brick and Power Supply 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	550 W (for each of two power supplies)	180-254 VAC (50/60 Hz)
R-brick	60 W	48 VDC
G-brick	2000 W	180-254 VAC (50/60 Hz)
V-brick	225 W	48 VDC
N-brick	115 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.
- Has five 64-bit PCI slots to support 3.3/Universal VDC PCI cards (three slots support 33-MHz cards 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 the lowest numbered slot, the power board 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 lists the 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)

Regulatory Specifications

The following sections and illustrations present information that may be important to the operation of your SGI Onyx 3000 series graphics system.

Manufacturer's Regulatory Declarations

The SGI Onyx 3000 series of computer 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 system has several governmental and third-party approvals, licenses, and permits. Do not modify this product in any way that is not expressly approved by SGI. If you do, you may lose these approvals and your governmental agency authority to operate this device.

System Numbers

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

Manufacturer's Declaration of Conformity

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

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

CE Notice

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

Electromagnetic Emissions

This equipment has been tested and found to comply with the limits of a Class A device, pursuant to Part 15 of the FCC Rules. Operation is subject to the following two conditions:

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

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

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

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

Industry Canada Notice (Canada Only)

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

Cet appareil numérique 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 3000 series of computer systems is FCC-compliant under test conditions that include the use of shielded cables between the system and its peripherals. Your system and any peripherals you purchase from SGI have shielded cables. Shielded cables reduce the possibility of interference with radio, television, and other devices. If you use any cables that are not from SGI, make sure they are shielded. Telephone cables do not need to be shielded.

Optional monitor cables supplied with your system use additional filtering molded into the cable jacket to reduce radio frequency interference. Always use the cable supplied with your system. If your monitor cable becomes damaged, 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.

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

An ESD wrist strap may be included with some products, such as memory or PCI upgrades. 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: The motherboard on the I-brick has a lithium battery installed. Only qualified SGI service personnel should replace this lithium battery, and only with the same type or an equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions. There is a danger of explosion if the battery is incorrectly replaced.

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

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. The motherboard on the I-brick has a lithium battery installed. Only qualified SGI service personnel should replace this lithium battery, and only with the same type or an equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions. There is a danger of explosion if the battery is incorrectly replaced. "Lithium Battery Statement" on page 151 provides a warning about replacing lithium batteries in English and in other languages.
13. Use only the proper type of power supply cord set (provided with the system) for this unit.

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