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

Document Number 007-4264-001

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Record of Revision

Version	Description
001	September 2000 Initial Revision

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About This Guide

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

Product Features

Some of the graphics rack system features include:

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

The following topics are covered in this manual:

- Chapter 1, “Introducing the Onyx 3000 Series Rack Systems,” describes the graphics rack system and its capabilities and options. A brief overview of the workstation’s compute and interface capabilities is provided.
- Chapter 2, “Chassis and Hardware Overview,” describes all of the standard system components and reviews all of the standard controls, indicators, and connectors.
- Chapter 3, “Configurations and Cabling,” describes the single-rack and multirack graphics system configurations. It also covers the connection and use of graphics monitors. Basic information on SCSI applications and IRIX operating system requirements is provided.
- Chapter 4, “Basic Onyx 3000 Series Use,” gives basic information on using the Onyx 3000 series rack systems. Topics covered include monitor, keyboard, and mouse, connections, PCI audio card features, Ethernet connection, and procedures for powering the system on and off.

- Chapter 5, “Customer-Replaceable Units,” describes installation and replacement procedures for the G-brick (L1) System Controller, System Controller display panel, and cosmetic facade components.
- Chapter 6, “Using System Controllers with Graphics Systems,” describes the L2 System Controller and its interface panel. The L1 module level System Controller sections cover controller uses and status messages.
- Appendix A, “Regulatory Specifications” lists all regulatory information related to the use of SGI Onyx 3000 graphics systems in the United States and other countries.

Additional Information

SGI makes its manuals available in a variety of formats via the World Wide Web (WWW). Using your Web browser, open 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 proceed directly to the information you need using the table of contents as your guide. For more detailed hardware information on the SGI 3000 family of servers and visualization systems see the *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 *`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

- Warning or 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 Onyx 3000 Series Rack Systems

The Onyx 3000 series systems are single-pipe or multipipe rack-mounted graphics interface systems based on the SGI 3000 family of servers and visualization systems. The rackmount system is a graphics supercomputer that is designed to meet the demanding requirements of visual simulation, post-production, multimedia, and distributed computing environments. The Onyx 3000 series rack is a highly configurable and flexible system architecture that is available as a single rackmount or multirack system. The single-rack system uses from two to eight 64-bit microprocessors, with up to 16 GB of main memory, a wide variety of I/O interfaces, and one or two individual graphics workstation "pipes" (see Figure 1-1 on page 4). The multirack configuration normally uses from 4 to 32 processors and supports up to eight individual graphics pipes. Note that special order systems with up to 128 processors and up to 16 graphics pipes are available; contact your SGI sales or support representative for more information.

Graphics Rack System Overview and Options

In addition to the graphics module (G-brick), each graphics rack system has compute, I/O, and administration features or options as listed in the following sections.

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 800 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.

I-Brick

The I-brick is a Crosstalk-to-PCI based I/O subsystem. It has two 1200-MB/sec Xtown2 ports that connect to a C-brick and G-brick. The I-brick houses the standard system hard disk drive. 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 has the primary (standard) keyboard/mouse, audio, and serial port connections. Additional optional connections are available by adding PCI cards or additional bricks.

Optional P-Brick

The optional P-brick has two 1200-MB/sec Xtown2 ports that connect to a C-brick. Twelve PCI slots are configured on six buses. The PCI buses support both 32- and 64-bit modes.

Optional D-Brick

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

Optional X-Brick

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

Graphics Features

This section lists the graphics, I/O, and supercomputing features of the Onyx 3000 series rack system. The Onyx 3000 series provides features such as:

- 1 to 16 graphics-pipe configurations
- Optional support of up to eight monitors on each pipe

- SuperWide (1920 x 1200) high-resolution monitors
- PCI-based digital audio processing
- Beeping keyboard for support of “bell”

Additional System Features

Other features of the Onyx 3000 series systems include:

- Scalable growth of memory and I/O bandwidth as well as processor compute power
- Up to 16 GB of compute main memory in a single rack system
- High-availability within a single or multi rack system
- High-bandwidth I/O connectivity
- High total memory bandwidth
- Improved synchronization operations
- Wide variety of peripheral connectivity options

Hardware Overview

This section provides an overview of the Onyx 3000 series graphics systems. The block diagrams used generally divide the system into “brick level” functional parts, the I/O, compute, and storage portions, and the graphics subsystems.

The graphics hardware subsystem is always in the top half of single-rack Onyx 3000 products. All direct graphics connections to monitors and other video devices are made at the back of the graphics module. Multirack systems normally have a specific rack dedicated to holding the G-bricks.

The processor compute, mass storage, and I/O subsystems are usually contained in the lower half of the rack. The C-brick compute subsystems supply processing power for the G-brick graphics system as well as 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 Onyx 3000 series rack or multirack system, each brick (with the exception of the D-brick) has a dedicated module System Controller (L1), 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 enables multiple connections to occur simultaneously. Using the NUMAlink scheme, hardware resources (including main memory) can be shared and accessed by all the bricks in the graphics rack system.

Single-Rack Graphics System

The most basic single-rack system holds one two-RM single-pipe G-brick, one I-brick, and one C-brick. Each system varries based on the configuration ordered. Figure 1-1 shows a block diagram example of the graphics rack's processor, I/O, and graphics pipe configurations.

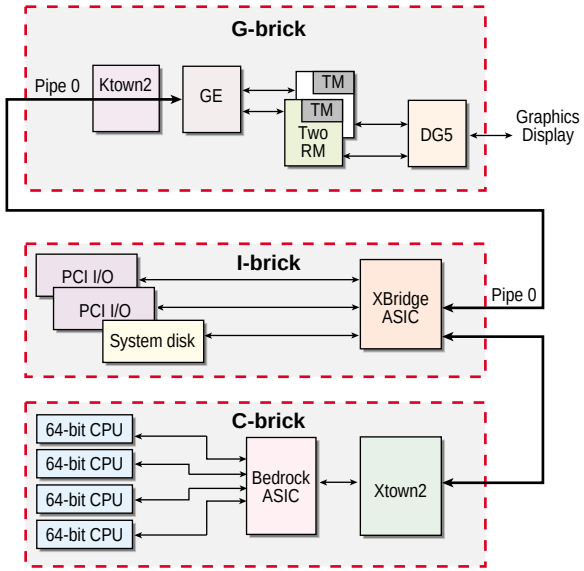

Figure 1-1 Single-Rack Graphics Block Diagram Example

Figure 1-2 shows a configuration with two graphics pipes and two C-bricks.

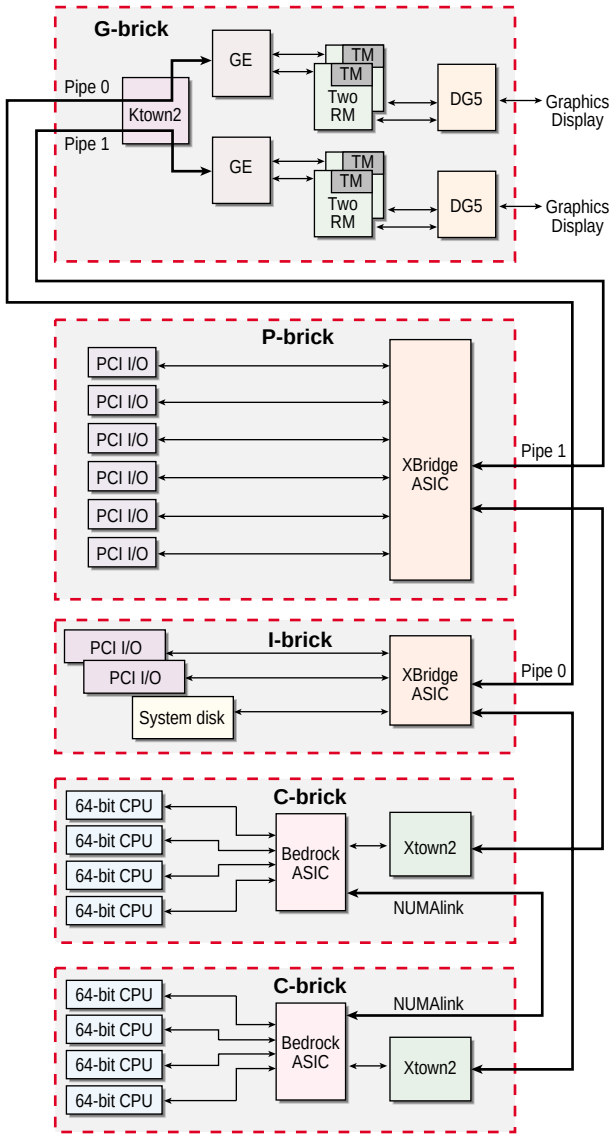

Figure 1-2 Rack System with Two Pipes and Two C-Bricks

Multirack Systems

The multirack systems come in many configurations. Note that some extremely large systems may require special ordering and configuration. Contact your SGI sales or service representative for information.

The multirack system illustrated in Figure 1-3 is a dual-rack system. This system provides up to four graphics pipes.

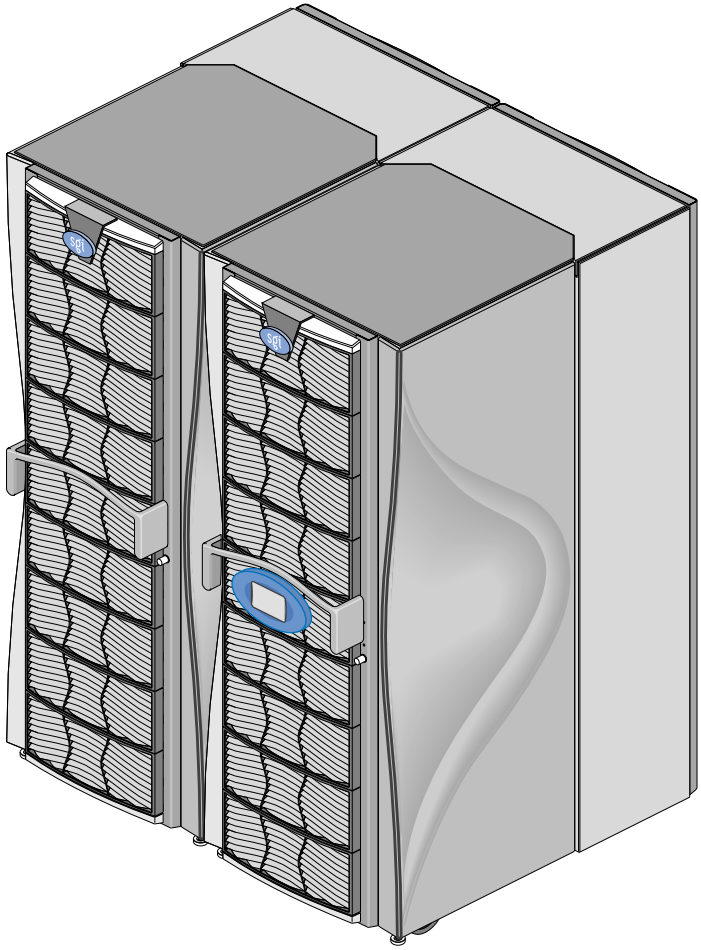

Figure 1-3 Multirack Graphics System Example

The four-rack graphics system shown in Figure 1-4 can hold multiple C-brick compute subsystems and up to four graphics modules, and is available in different configurations. Note that a system with this many racks requires USB hubs to connect all the L1 System Controllers.

Figure 1-4 Four-Rack Graphics System

Graphics Subsystem

The graphics subsystem contains one or two InfiniteReality board sets (pipes). One pipe holds two or four RM/TM assemblies and the second uses two RM/TM assemblies. The major components of the graphics subsystem are:

- GE board
- RM/TM assembly
- DG board (or DG with optional daughterboards)
- Ktown2 interface (the Ktown2 board supports two graphics pipes)
- G-brick L1 System Controller

Chapter 3, "Configurations and Cabling" describes the G-brick cabling and daughterboard options.

Compute and I/O Subsystem

The minimum hardware components required for a graphics system include:

- C-brick compute subsystem enclosure with two 64-bit microprocessor CPUs.
- I-brick I/O enclosure with one system disk (plus room for an optional mirror disk), PCI slots, and a CD-ROM drive.

A PCI expansion enclosure (P-brick) or a hard disk expansion (D-brick) are optional.

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 "Keyboard and Mouse Connections" in Chapter 4.

Audio connections are made through a PCI audio board physically located in the I-brick. The section "Connecting PCI Audio" in Chapter 4 provides detailed specifications on the audio board.

Graphics Rack Hardware Functional Overview

The following sections provide overview information on the Onyx 3000 series graphics rack hardware.

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 (I-brick, P-brick, and X-brick) and the G-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 used 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-, and X-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 rack or multirack system.

This makes the multirack system very scalable because it can range in size from 4 to 64 processors or more.

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 MBps bidirectionally, 1600 MBps 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 up to 8 MB of private secondary cache.

Each C-brick has local memory (up to 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.

G-brick Midplane

The rack system's graphics module (G-brick) uses a midplane. All graphics and interface boards go in the rear of the module and connect to the back of the midplane.

Figure 1-5 shows a view of the graphics midplane.

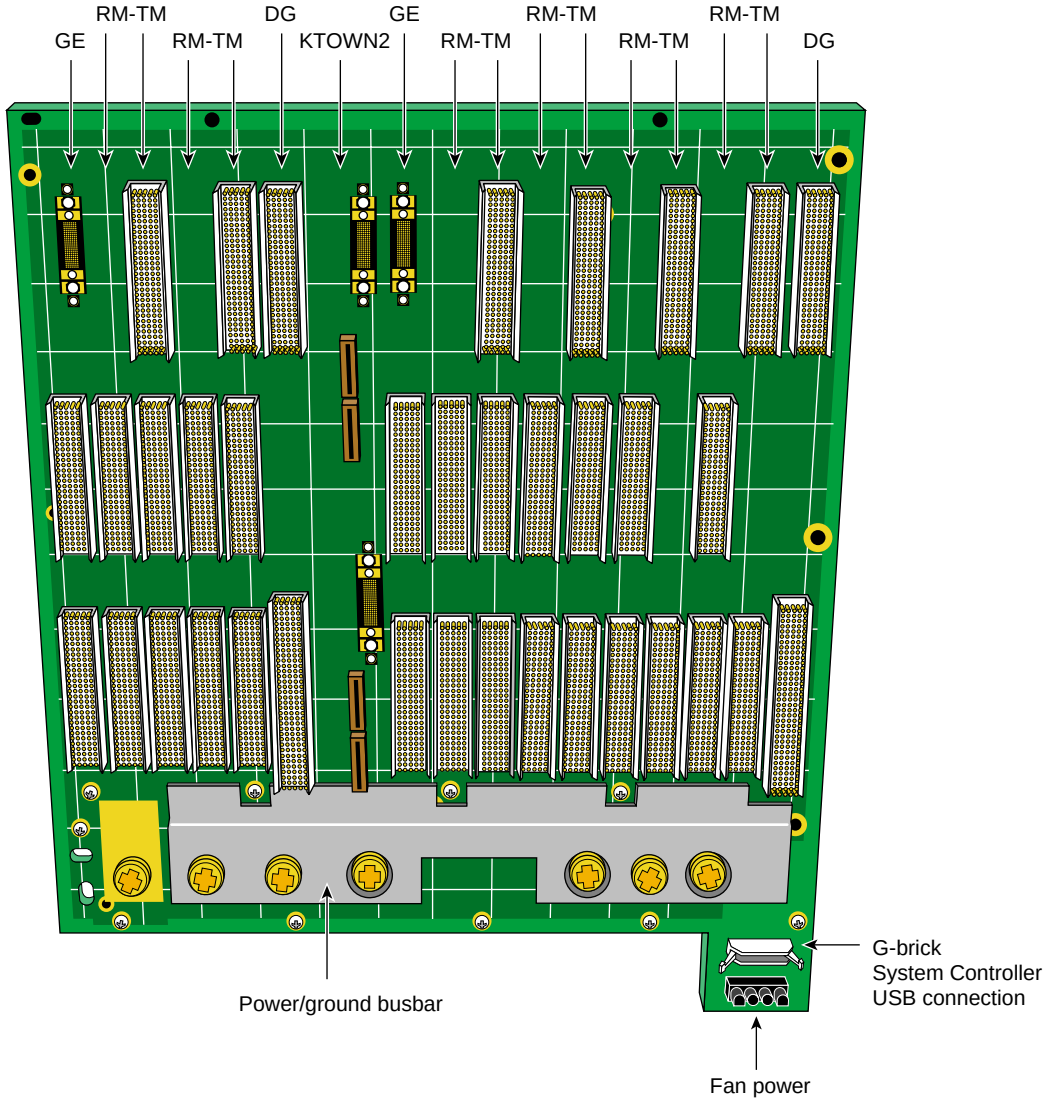

Figure 1-5 G-brick Midplane

System Location and Environment Overview

To ensure proper system operation, observe 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, see the *Site Preparation* manual for your system. If you are unable to find the information you need, contact your SGI system support engineer (SSE) or other authorized support organization representative.

Chassis and Hardware Overview

This chapter provides information about the Onyx 3000 series graphics system's hardware. Descriptions of the controls, connectors, and indicators are included.

Graphics Rack Chassis

Figure 2-1 and Figure 2-2 show the major components on the front and rear of a single-rack graphics system.

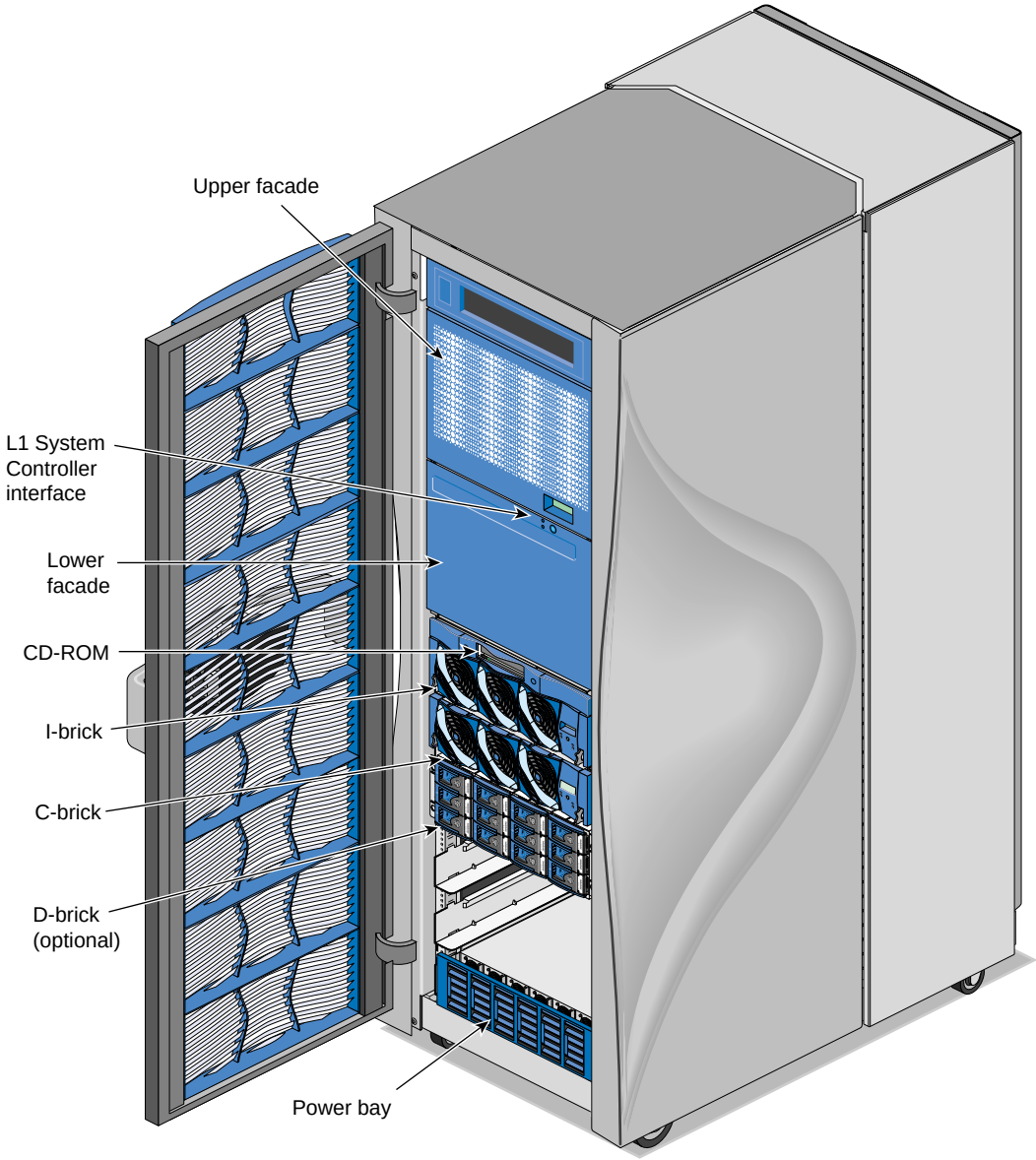

Figure 2-1 Single-Rack System Components (Front View)

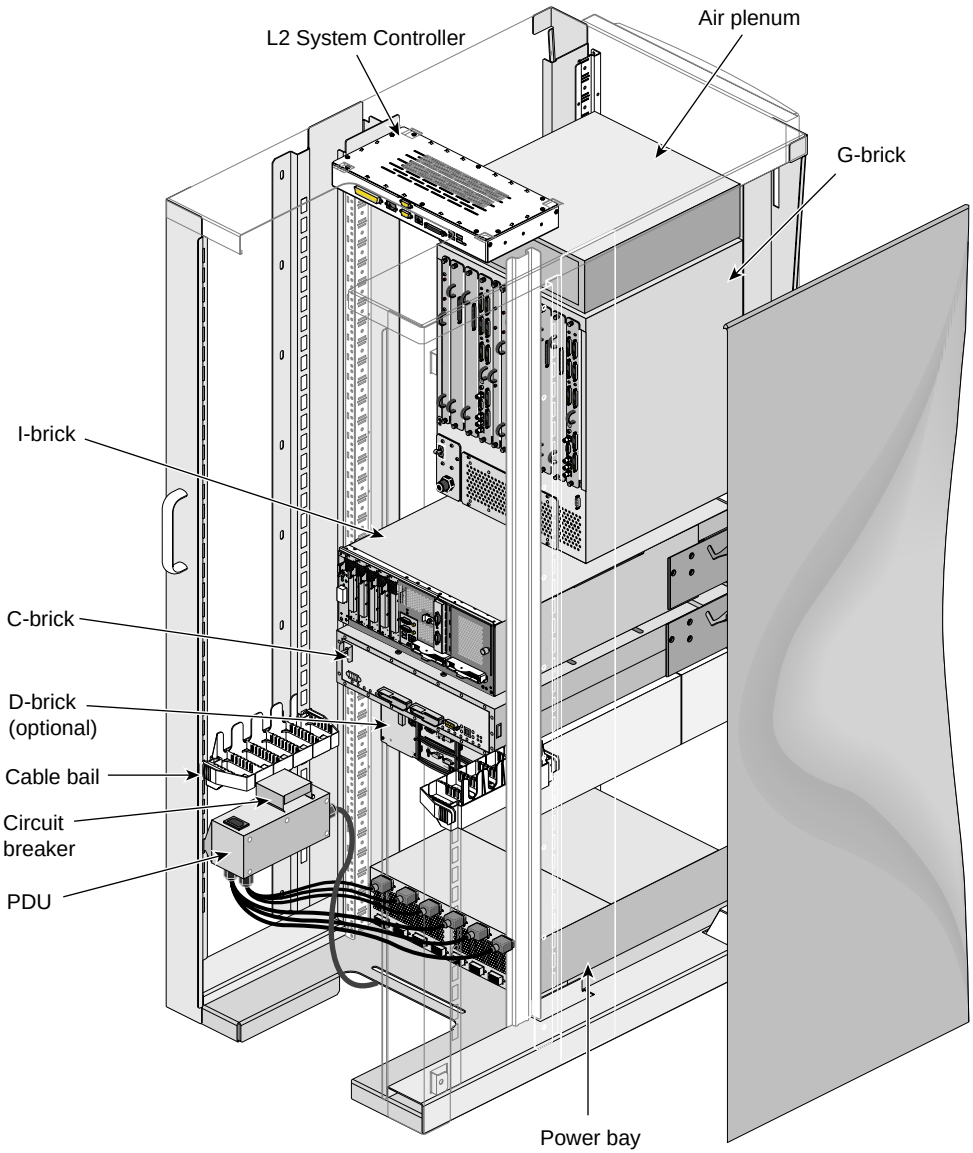

Figure 2-2 Major Components of the Single-Rack System (Rear View)

Table 2-1 provides functional descriptions of front components on the graphics rack.

Table 2-1 Major Components of the Onyx 3000 Series Graphics Rack

Component	Description
G-brick and System Controller (L1)	The G-brick contains video interface and graphics boards. Each module supports one or two graphics pipes and a maximum of 16 monitors. The L1 System Controller is a part of each graphics module. Its microprocessor reports module status information to the L2 System Controller.
L1 System Controller interface panel	Provides access to the G-brick's L1 System Controller.
Rack System Controller (L2) interface	The L2 and its touchscreen display panel provide an intelligent interface that can control all the bricks in a rack system. There is one L2 display panel per system.
Optional D-brick drive box	Provides 3.5-inch drive slots for fibre channel drives.
Air intake baffle	Promotes proper airflow through the rack. Airflow is pulled in from the front of the rack and exhausted through the back of the rack.
I-brick	The I-brick provides basic boot functions, including the system disk, USB ports, and an Ethernet connection. One CD drive is standard with each I-brick.
C-brick	The compute brick provides two or four 64-bit processors that are linked to the I/O, or other compute bricks.
Removable facades (upper and lower)	Cover the front of the G-brick in the rack.
NUMAlink interconnect cabling	Physical links that enable different C-bricks in a single or multirack graphics system to communicate and share resources. The interconnect cables are made with delicate copper strands. Be careful when handling these cables.
Cable bails	Bails hold any interconnect cables in place to prevent excessive cable bending, which can cause damage.
PDU and circuit breaker	Primary power input point to the rack. Note that the G-brick(s) use independent power cables that plug to outlets outside the rack system.
Power bay	Distributes power to the system bricks (except G-brick and D-brick).

Graphics Brick Components

The G-brick always sits in the top part of a single-rack system. Exceptions to this rule are found in certain multirack graphics systems configured for maximum graphics pipe support.

Each graphics brick holds up to two sets of graphics boards (two pipes). Each pipe supports up to eight monitors (using an optional DG5-8).

The pipe on the right of the G-brick (as seen from the back) supports two or four RM/TM assemblies (see Figure 2-3). It is supported by the top Ktown2 cable connection on the Ktown2 board. The pipe on the left supports one or two RM/TM assemblies and connects to the bottom Ktown2 board connector.

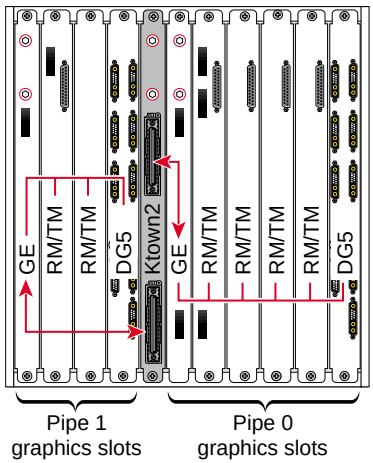

Figure 2-3 Graphics Pipe Board Locations

Figure 2-4 shows an example of a two-RM graphics board set that is supported by the rack's G-brick. Note that the 68-pin connectors on the RM/TM assemblies are reserved for caligraphics lights; they are *not* for SCSI drives.

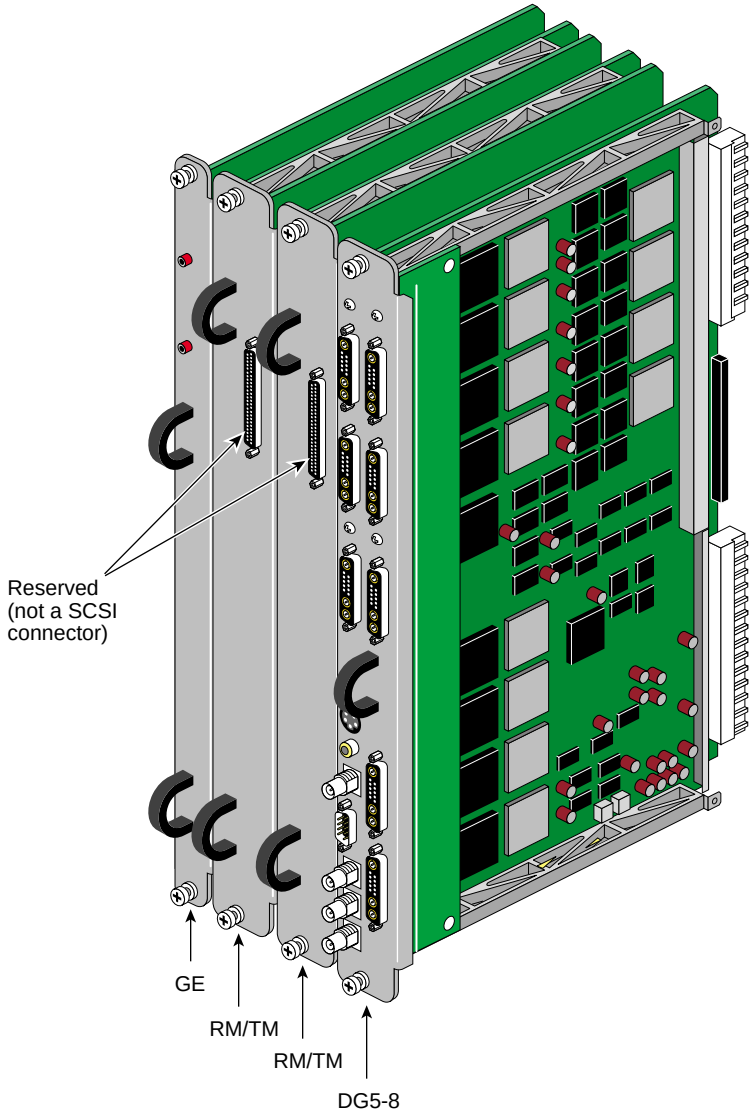

Figure 2-4 Graphics Pipe Example Board Set

Graphics Rack System Controllers

System controllers in the graphics rack are generally used to accomplish 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

Module (L1) System Controller and Display

The L1 System Controller is designed into the G-brick and uses a cable to connect to the display panel mounted on the front of the brick. The L1 controller performs many functions; some of the functions are common to all the system bricks and some are specific to a brick type. Basic functions of the L1 System Controller are listed in Table 2-2.

Table 2-2 Basic L1 Controller Functions

L1 Function	Used in G-brick?
Controls voltage regulator modules (VRMs)	No
Monitors voltage and reports increases, decreases or failures in voltage levels	Yes
Controls voltage margining within the brick	No
Controls and monitors fan speed	Yes
Monitors and reports operating temperature and status of 48 VDC input power	No
Monitors and controls LEDs	Yes
Reads system identification (ID) PROMs	No
Monitors the reset switch, and the nonmaskable interrupt (NMI) switch	No
Monitors the power On/Off switch	Yes

The L1 controller hardware used with the G-brick consists 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

Rack (L2) Controller and Display

In the graphics-equipped rack, the L2 allows remote maintenance, controls resource sharing, manages the L1 controllers in the system, and maintains controller configuration and topology. The L2 rack-level system controller also monitors D-bricks using an Intelligent Platform Management Interface (IPMI). Note that the optional disk enclosures (D-bricks) do not have built-in L1 system controllers.

As a general rule, you would use the L2 panel interface in the following functional areas:

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

Cables and Cautionary Guidelines

Xtown2 cables connect each graphics pipe's Ktown2 interface connector directly with an I-, P-, or X-brick. Each pipe in the graphics module must have its own Xtown2 cable connection coming from an Xtown2 connector on an X-, P-, or I-brick. The Ktown2 board in the G-brick sits directly between the two board sets in the graphics module.

Generally, you should not handle these sensitive linking cables. Observe the following guidelines if you need to move these 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 up and running. This can *hang* or *crash* the entire graphics rack system.

Caution: Additional NUMAlink and Xtown2 cable connections should be performed only by SGI certified personnel.

Configurations and Cabling

This chapter provides an overview of the configurations, connections, and cabling used in the Onyx 3000 series graphics rack systems.

Rackmount Graphics Configurations

The first part of this chapter 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 up to 8 GB of main memory.
- Power bay(s) for each graphics rack system. Note that racks which house only G-bricks do not use power bays.
- L2 System Controller that connects and controls individual L1 “brick” System Controllers within the rack system.
- G-brick (graphics module) with one or two graphics board sets (graphics pipes).
- I-brick containing a system disk, CD-ROM drive, USB ports, digital audio, serial, and PCI interfaces.

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

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

Figure 3-1 shows an example configuration of a single graphics rack system with one graphics pipe.

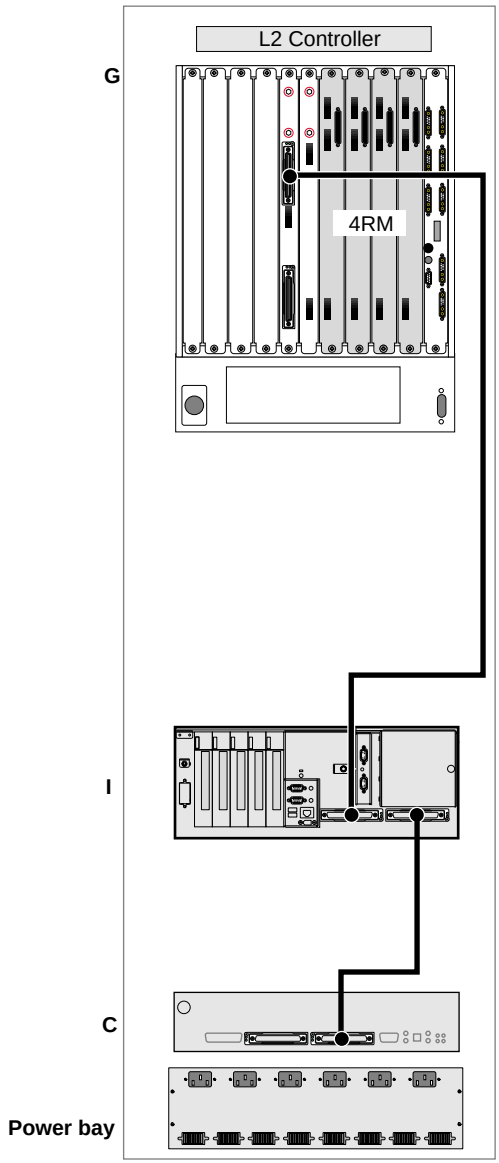

Figure 3-1 Single-Rack Single-Pipe Configuration Example

Figure 3-2 shows a two-rack three-pipe Onyx 3000 example configuration.

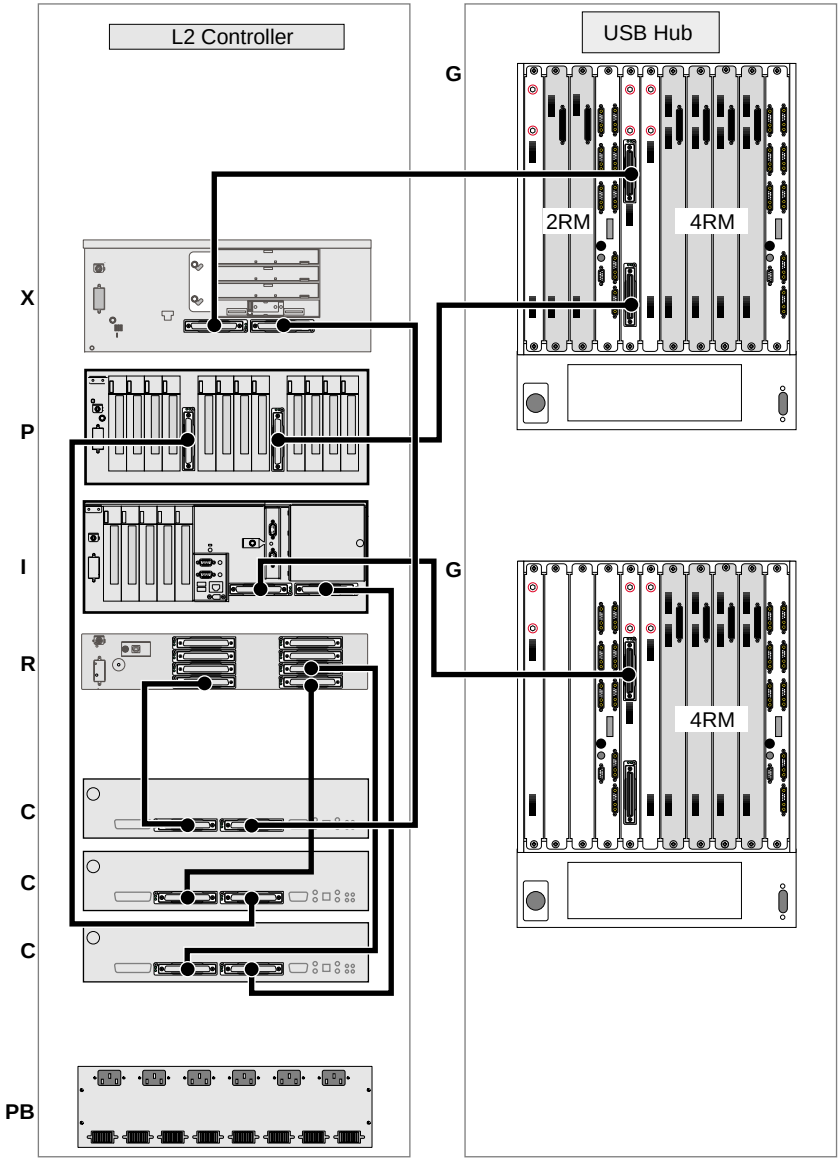

Figure 3-2 Two-Rack Three-Pipe Configuration Example

Figure 3-3 shows an example system with three racks and three (4RM) graphics pipes.

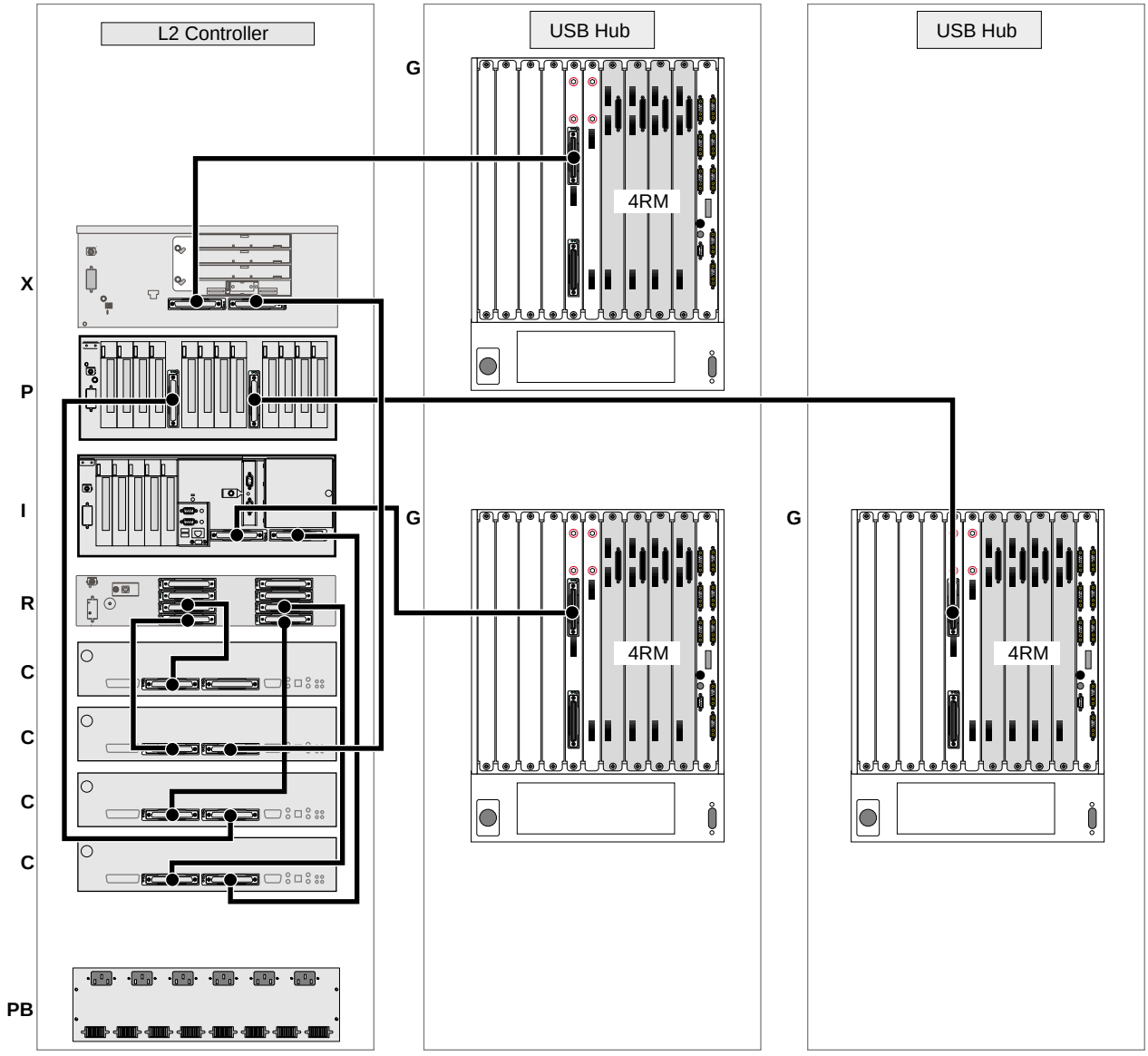

Figure 3-3 Three-Rack Three-Pipe Configuration Example

Graphics Interface Panels

This section describes the DG5 main display board. It also describes the VIO5H video option connector panel board, which mounts on the DG5-8 display board and outputs five high-resolution video channels.

Additionally, this section describes:

- The serial digital video output from graphics (GVO) option, which provides additional CCIR601 output on two BNCs.
- The TMDS video output (TVO) board option which has two high-definition graphics video outputs.
- The DPLEX option which provides specialized, high-resolution, digital and analog image processing by cascading the video outputs of two or more graphics pipes and outputing them to a single monitor or other video input device.

Table 3-1 summarizes DG5 configurations.

Table 3-1 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	Two high-resolution video outputs with two CCIR601 outputs
DG5-2	HD-TVO daughterboard	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 using LVDS.

Figure 3-4 shows the location of two optional DG5-8 boards installed in the G-brick.

Note that the DG5-8 option always requires the VIO5H daughterboard. The DG5 board is always placed in the rightmost graphics board slot in each board set (pipe) in the G-brick.

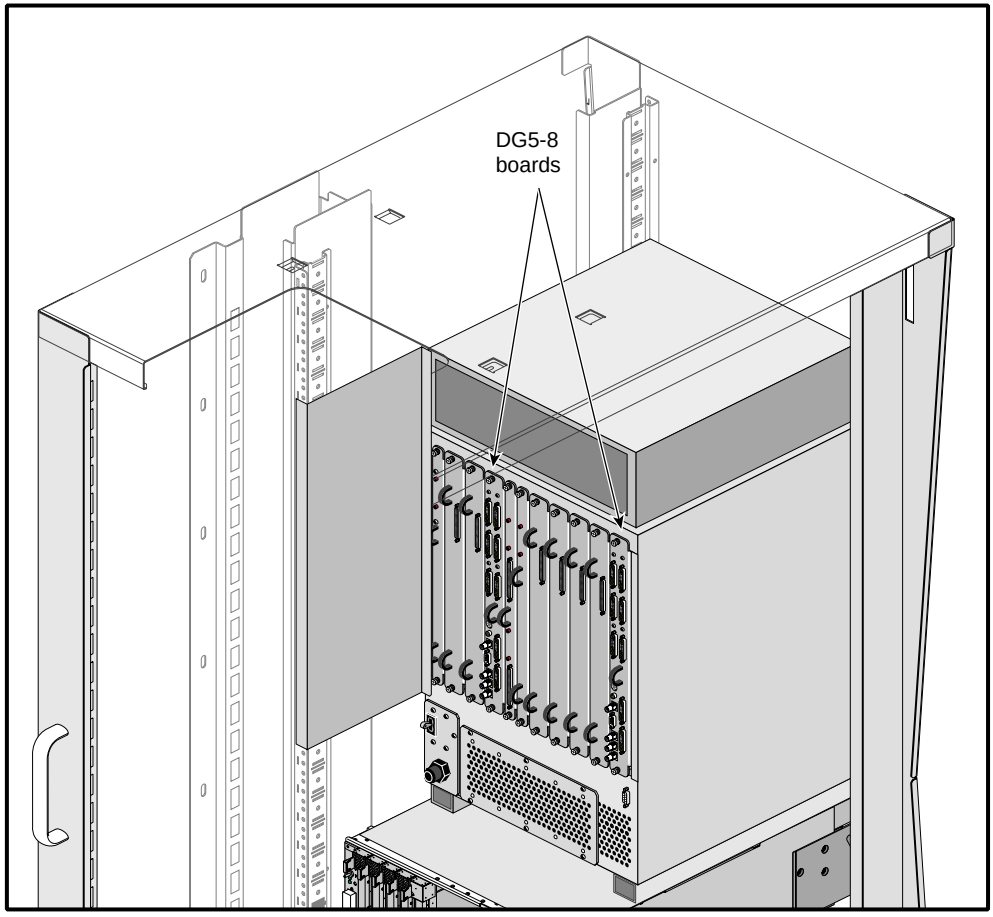

Figure 3-4 DG5 Board Locations in the G-brick

Figure 3-5 shows the DG5 board without options (DG5-2).

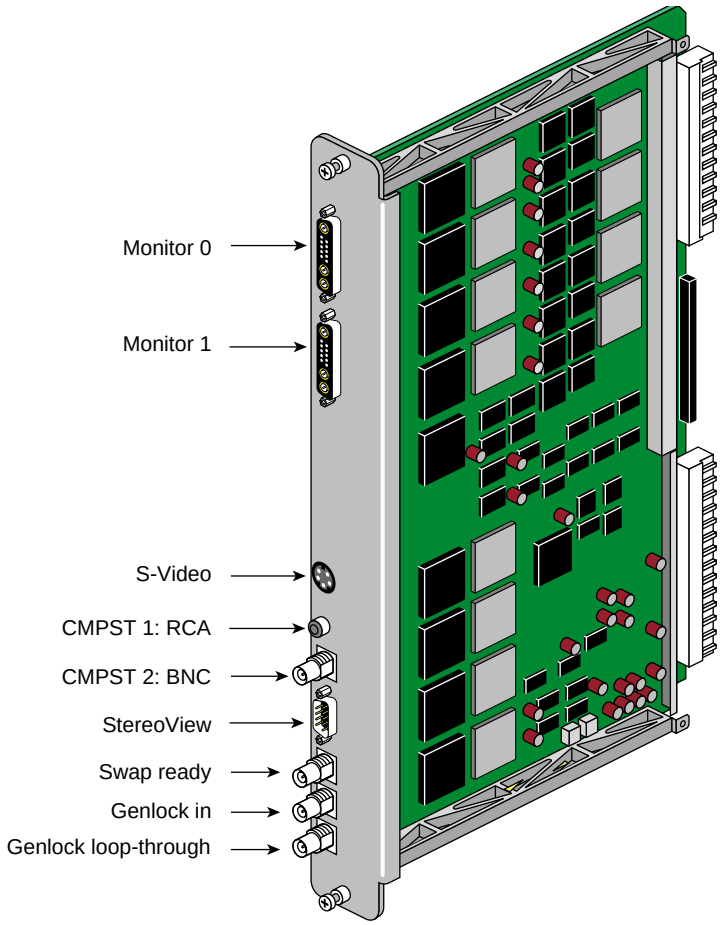

Figure 3-5 DG5-2 Graphics Board with No Options

DG5 Board Operation

The display generator subsystem requests and receives digital frame buffer pixel data from the RM/TM 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). Note that 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.

Table 3-2 summarizes DG5-8/VIO5H connectors.

Table 3-2 DG5-8/VIO5H Connectors

Label	Type	Function
Monitors 0 through 7	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

Connectors on the DG5-8 Option Board

Figure 3-6 shows connectors on the panel for the DG5-8 option board with the VIO5H daughterboard.

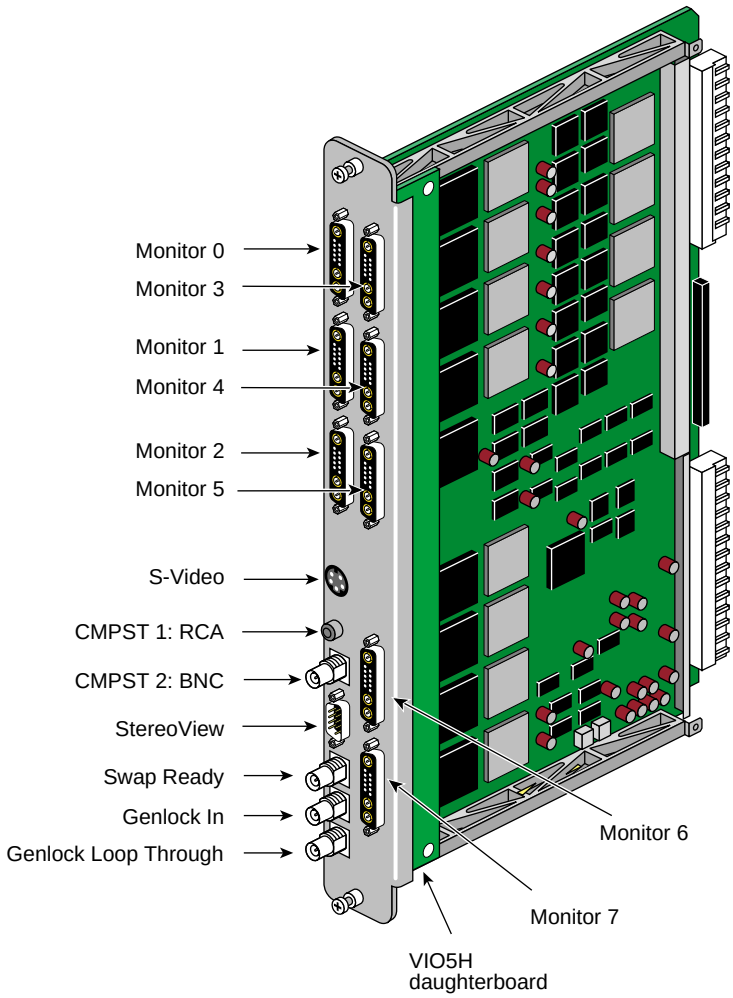

Figure 3-6 DG5-8 Board

Figure 3-7 shows the 13W3 pinouts for the monitor connectors on the DG5 I/O panel; each 13W3 uses the same pinout pattern.

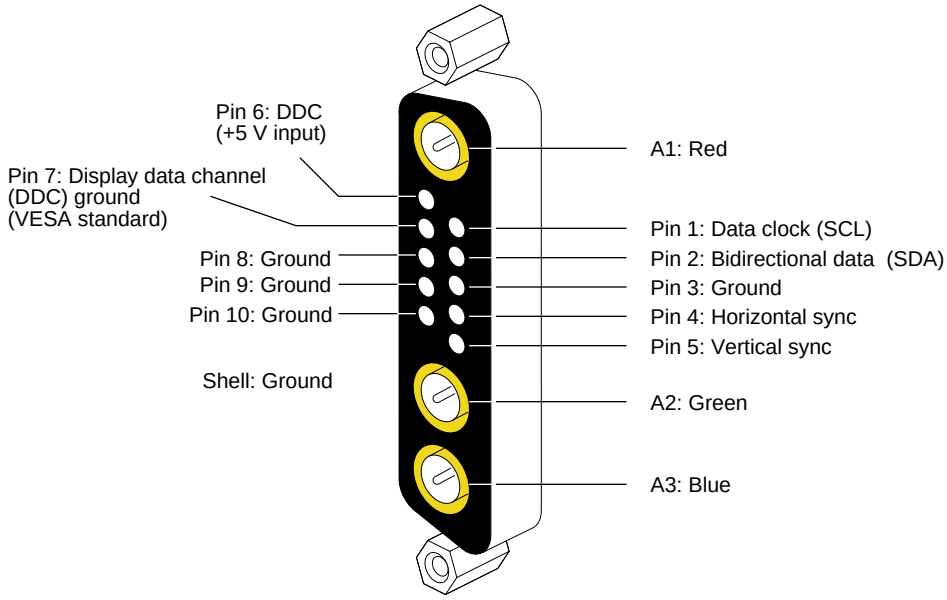

Figure 3-7 DG5 13W3 Connector Pinout

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.

Connectors on the Optional GVO Daughterboard

The graphics-to-video option (GVO) daughterboard comes assembled with the DG5 and is designed to provide direct output from graphics to video in real time.

The GVO daughterboard has two CCIR601 connectors implemented as BNCs. Figure 3-8 shows connectors on the panel for the DG5 board with optional GVO daughterboard combination.

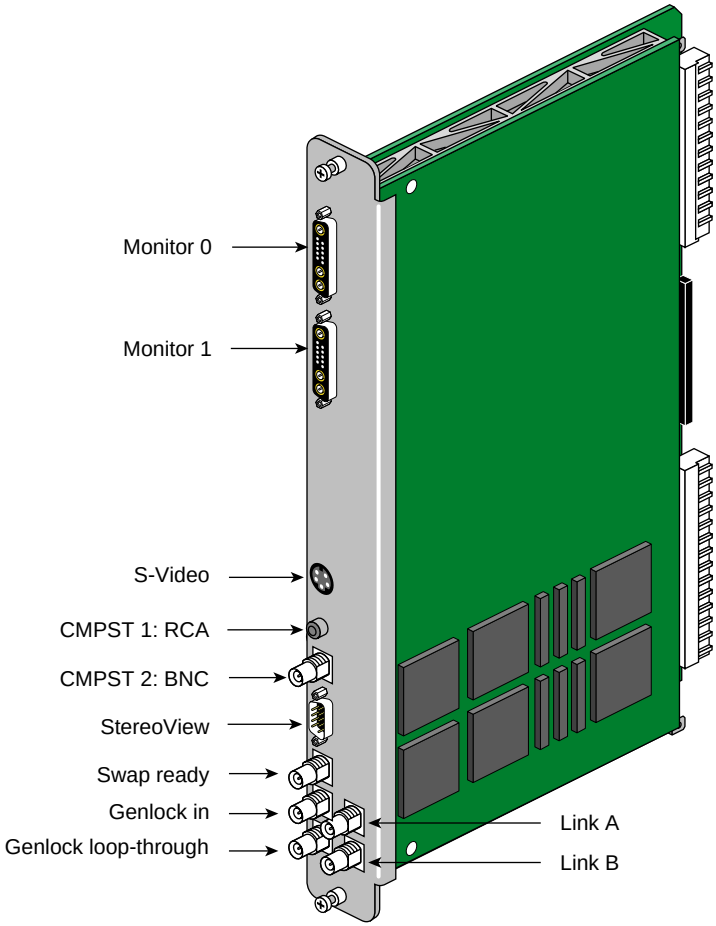

Figure 3-8 DG5-2 with Optional GVO Connectors

Connectors on the Optional TVO Daughterboard

Figure 3-9 shows the connectors on the rear panel of the DG5 board with optional TVO daughterboard.

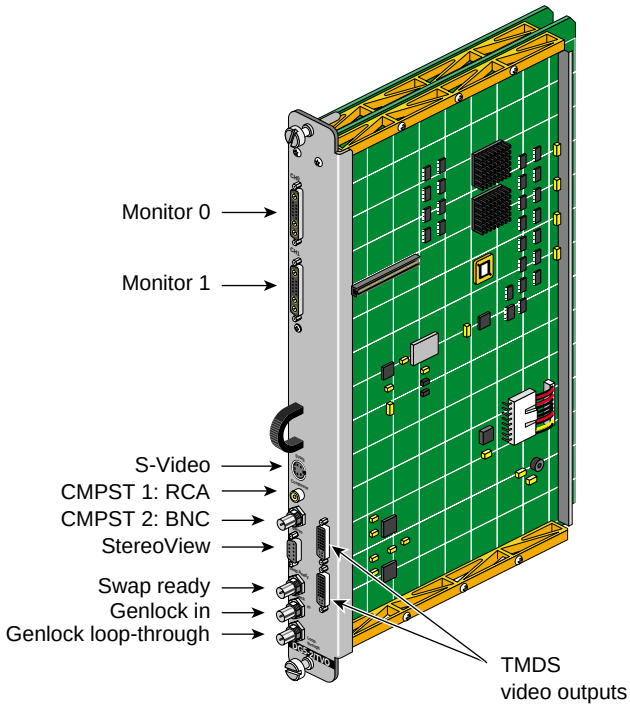

Figure 3-9 DG5-2 with Optional TVO Daughterboard

DPLEX Option Connectors on DG5

Each DPLEX option assembly is essentially composed of a DG5-2 board with an attached DPLEX daughter card. DPLEX allows 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.

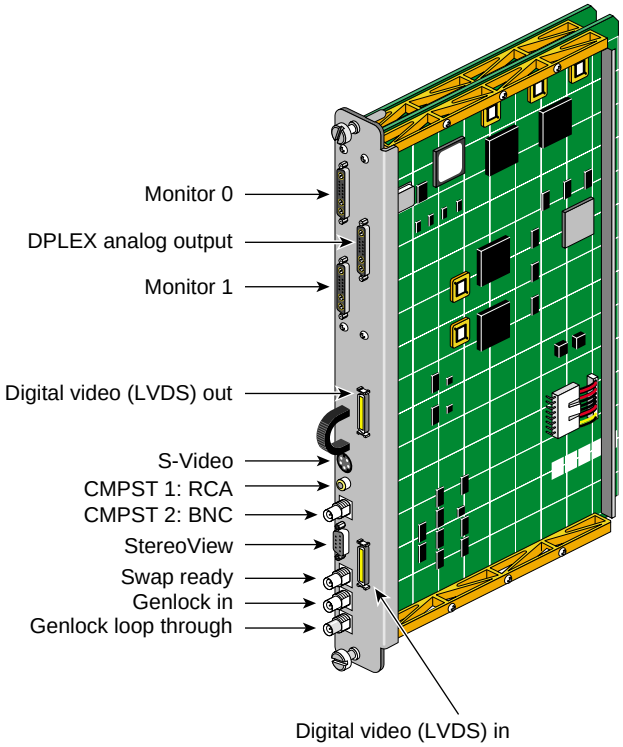

Figure 3-10 DG5-2 with Optional DPLEX daughterboard

Monitor Cabling Options

Three cable options are offered for using different types of monitors with the DG5 (see Figure 3-11):

- 13W3-13W3: For use with the Silicon Graphics 24-inch 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”).

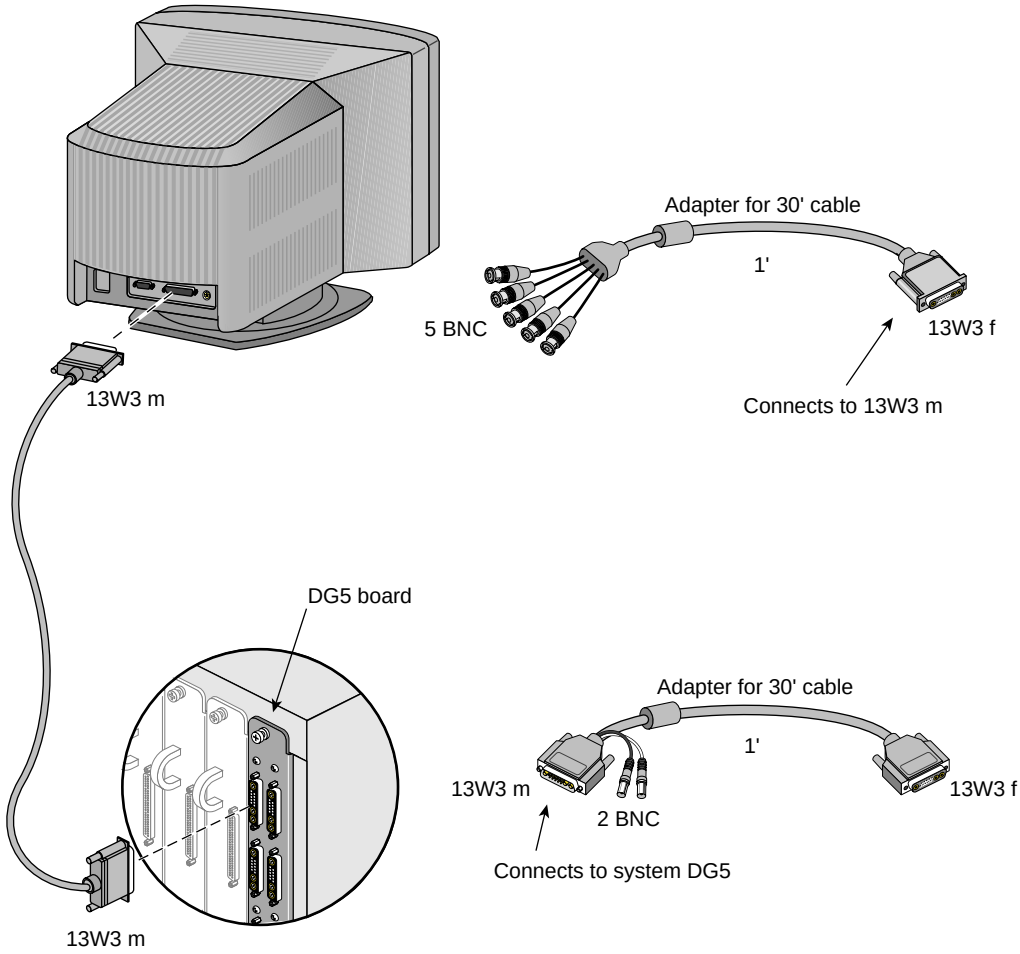

Figure 3-11 13W3 Monitor Cable and Adapters

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

Figure 3-12 shows a connection example with two monitors attached to separate graphics pipes on the G-brick.

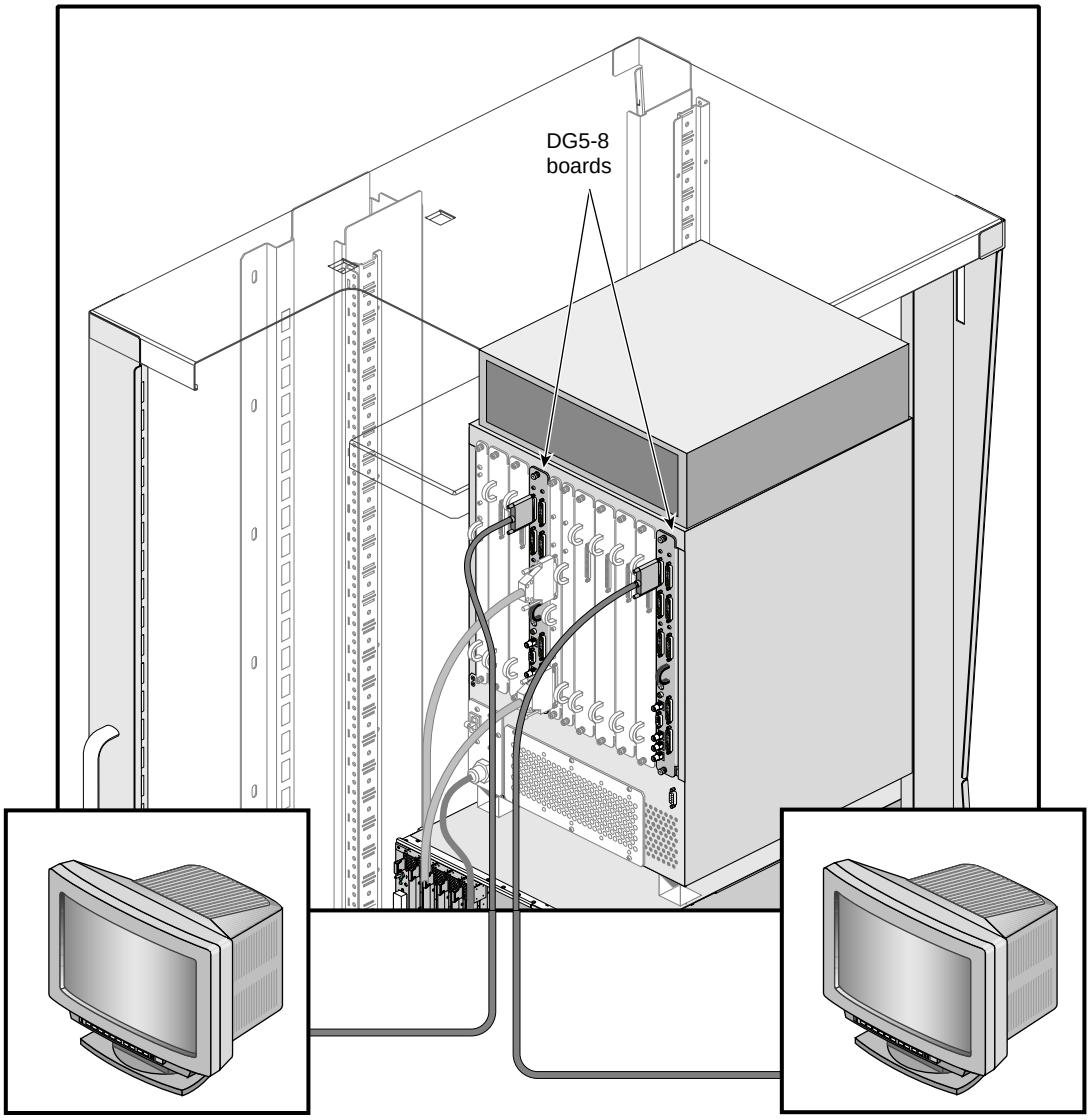

Figure 3-12 Cable-to-Monitor Connection Example

Keyboard and Mouse Port Configuration

The primary Onyx 3000 series keyboard and mouse USB interfaces are located on the back of the I-brick enclosure. Figure 3-13 shows the location of the connectors.

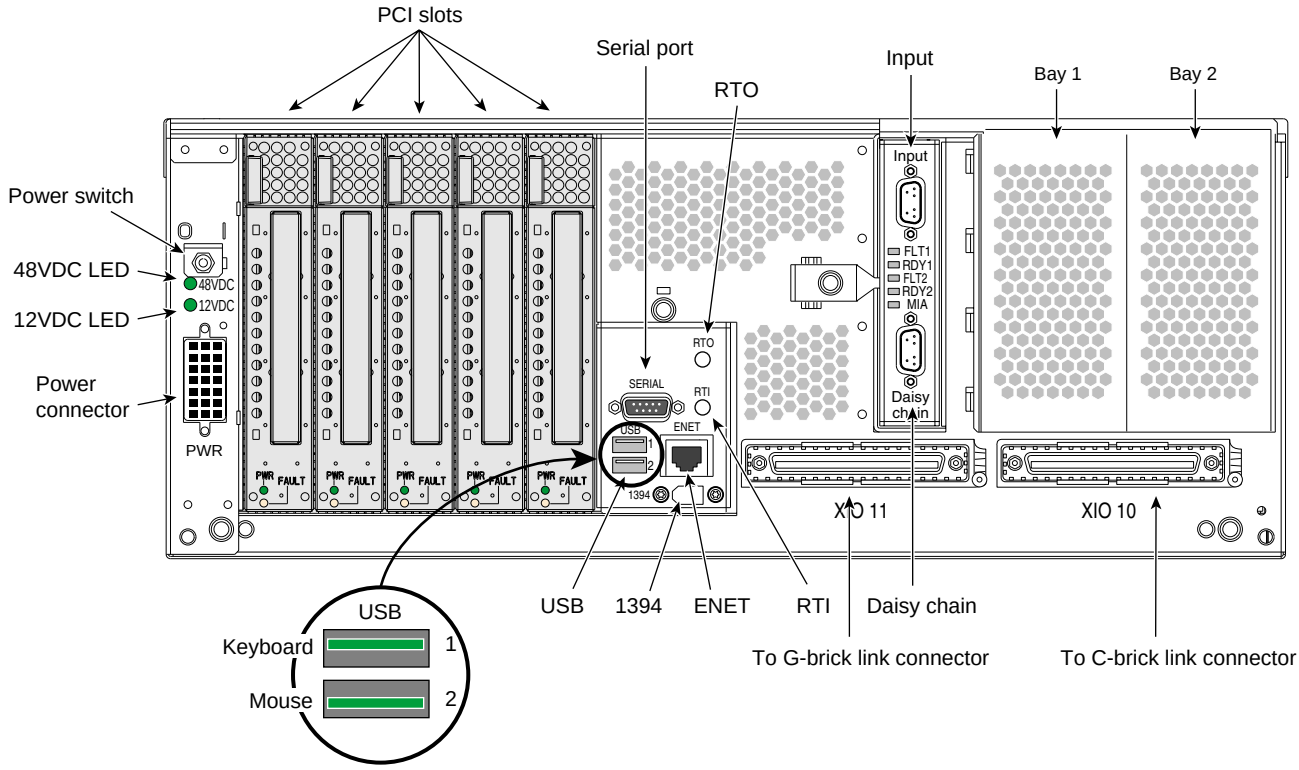

Figure 3-13 Primary I-brick Keyboard/Mouse Connector

The Onyx 3000 series of systems use USB to provide keyboard and mouse input. Note that this is different from Onyx2 systems that use PS2-based keyboards and mice.

The flexibility of USB, and the lack of persistent hardware identification, means that the mappings between a keyboard/mouse pair and an X display must be managed with a configuration file. This means that manual configuration is necessary.

Keyboard and Mouse Device IDs

The command `ioconfig(1m)` is used to establish persistent logical device numbers for each keyboard and mouse in an Onyx 3000 series 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, 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 that 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 USB component. This 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 Cbrick 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. Note these examples:

`.../usb/1/1/keyboard`
indicates a keyboard device attached to port 1 of a hub, which is attached to port 1 of the root hub.

`.../usb/1/2/mouse`
shows a mouse attached to port 2 of the same hub. The command `hinv` can be used to display a device’s ID. See the hinv(1) manpage 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 to look 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. Use of an extender and 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/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. Rerun `/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/mouse pair that is used by a given X server has the same ID.

Since `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 rerunning `ioconfig`. At the time this guide was published, there was no automated tool to do this.

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.

The process is discussed in “Reconfiguration” on page 41. See that section for additional information.

Speaker Pair Connections

Each graphics system uses a pair of digital audio speakers. These speakers connect to the system's PCI-based digital audio output port. The speakers 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

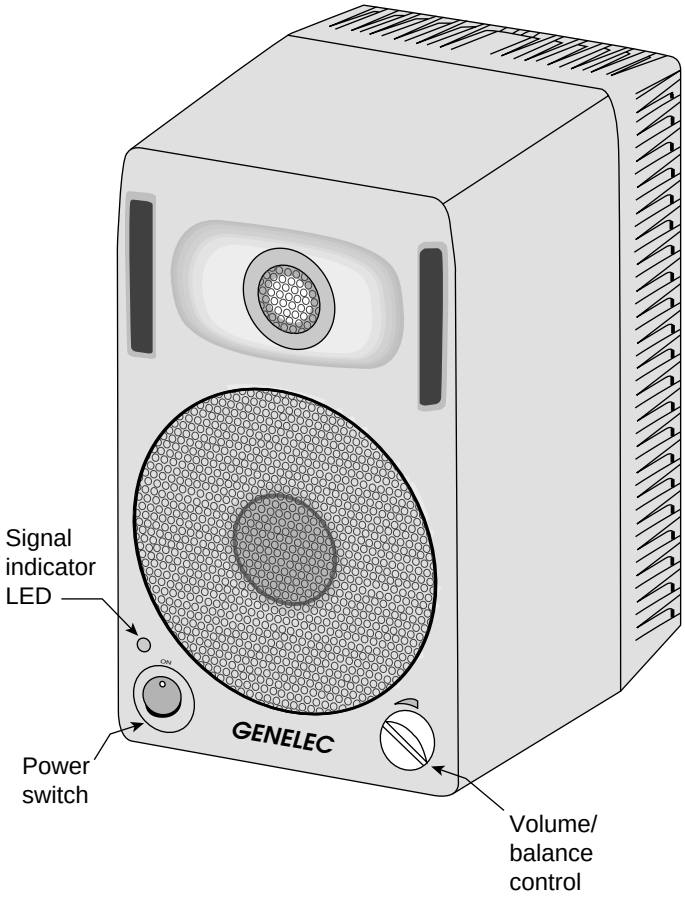

Figure 3-14 Front View of Speaker

Warning: Each of the speakers weighs 12.5 pounds (5.7 kg). Speakers placed off the ground should be secured or enclosed to keep them from potentially 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 3-15) and BNC cable combination connection. 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).

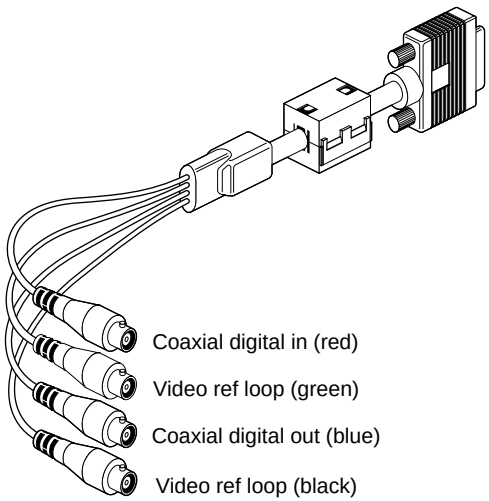

Figure 3-15 PCI Audio Breakout Cable

3. Connect the other end of the BNC audio cable to the back of the right speaker, see Figure 3-16.
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 and 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, and 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. North American and other locations using 110 V sources need to manually switch to 110 V.

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

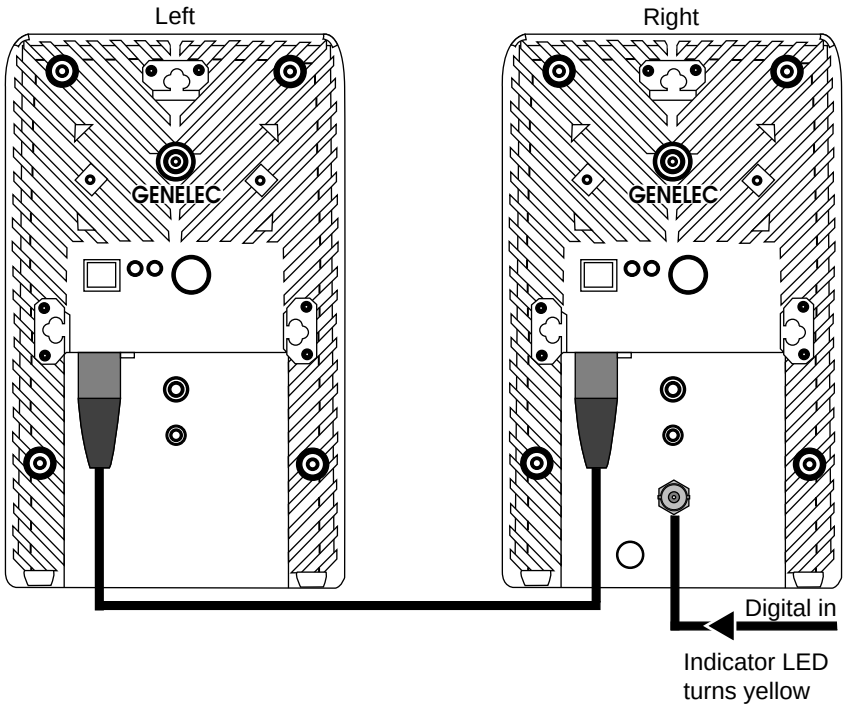

Figure 3-16 Speaker Pair Connection

The speaker's status LED indicates the following:

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

Figure 3-17 shows the location of the controls and connectors on the back of the right speaker.

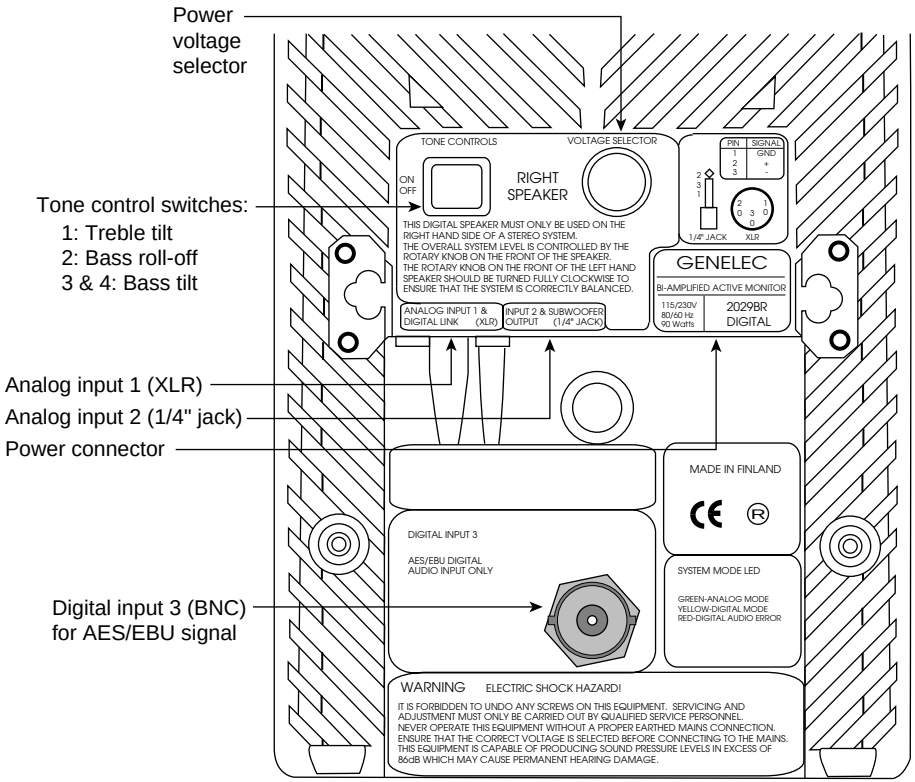

Figure 3-17 Right Speaker Rear Controls and Connectors

Figure 3-18 shows the connector used on the speaker-to-speaker interconnect cable.

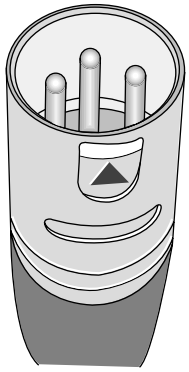

Figure 3-18 Speaker-to-speaker Cable Connector

Basic Onyx 3000 Series Use

This chapter provides information on how to operate your Onyx 3000 series system correctly. Always observe the following safety information when working with the system.

Warning: The 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.

Customer maintenance 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.

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 is shipped as the standard monitor for the rackmount systems. This section describes the 24-inch monitor. Connect the monitor by following the steps in the applicable section.

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 before plugging in the monitor power cable.

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

Use only the cables specified to connect the monitor to the Onyx 3000 series rackmount chassis.

The section "Connectors on the DG5-8 Option Board" on page 30 has specific information on cabling options for the graphics rack system.

The 24-inch high-resolution monitor uses a 13W3-to-13W3 cable. Connect one of the fittings to a 13W3 connector on the DG5 graphics board panel and the other to the back of the monitor. The monitor is shown in Figure 4-1 on page 51.

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

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

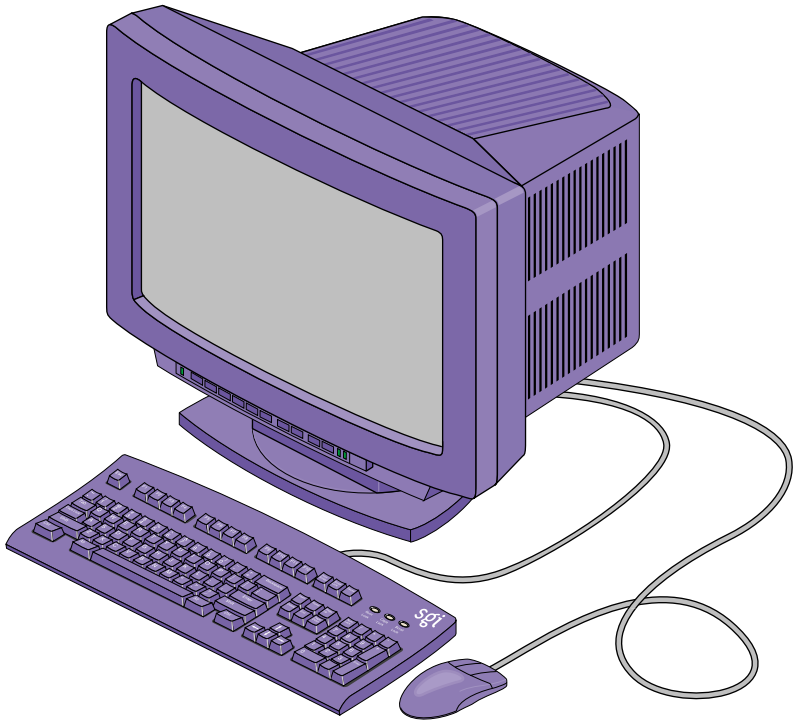

Figure 4-1 24-inch SuperWide Monitor

Keyboard and Mouse Connections

Your 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 (3m) 10 feet) directly to the USB ports on the I-brick. The four-port USB local extender (LEX) and remote extender (REX) are connected using (9m) 30 feet of Catagory 5 (Cat 5) cable.

Additional keyboard and mouse connections can be made 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 of an optional I-brick. The Onyx 3000 series USB hub supports maximum keyboard and mouse cable lengths of up to 100m (328 ft.).

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.

Connecting PCI Audio

The 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 4-2.

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

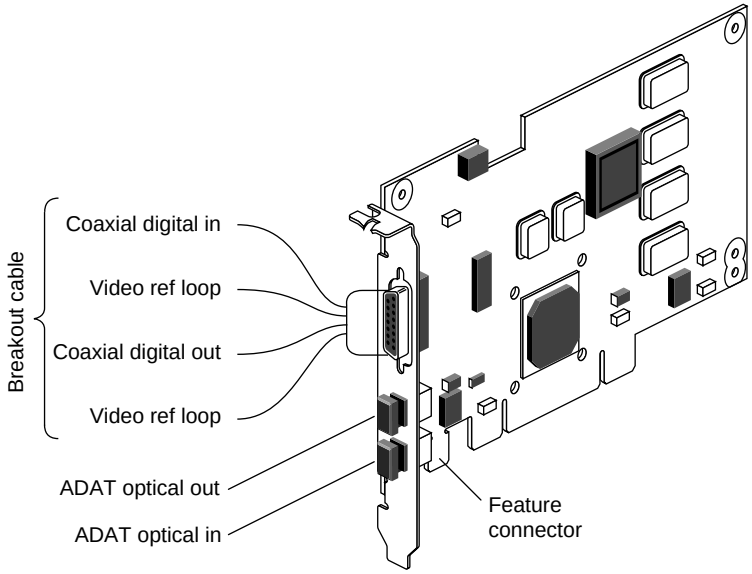

Figure 4-2 PCI Audio Board

Table 4-1 lists the PCI audio board's features and specifications.

Table 4-1 PCI Audio Board's Specifications

Feature	Specification
Synchronization	Locks to professional video (via video sync) and audio equipment with professional jitter attenuation. Accepts video reference input, 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.
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 4-2 shows the pinouts for the DB15 connector for video synchronization and AES-3id digital audio through the breakout cable.

Table 4-2 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
9	COAXIAL DIGITAL_OUT
10	NOT CONNECTED
11	COAXIAL DIGITAL_OUT GND
12	NOT CONNECTED
13	CHASSIS GND
14	CHASSIS GND
15	NOT CONNECTED

Powering On the System

There are several ways to power on your graphics rack system. This section documents only the procedure using the L2 System Controller front panel interface. For information regarding optional power-on procedures, see the *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 4-3).
  - 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 4-4.)
- All these cables should have been properly connected by your SGI system support engineer. If the system includes a D-brick(s), 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 1 (On) 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 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 position when the system is powered on.

- All Onyx 3000 series graphics rack systems have an L2 controller. You can power on and power off individual bricks, or the entire system at the L2 controller touch display located on the front door.
- 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, see your system's *Site Preparation* manual.

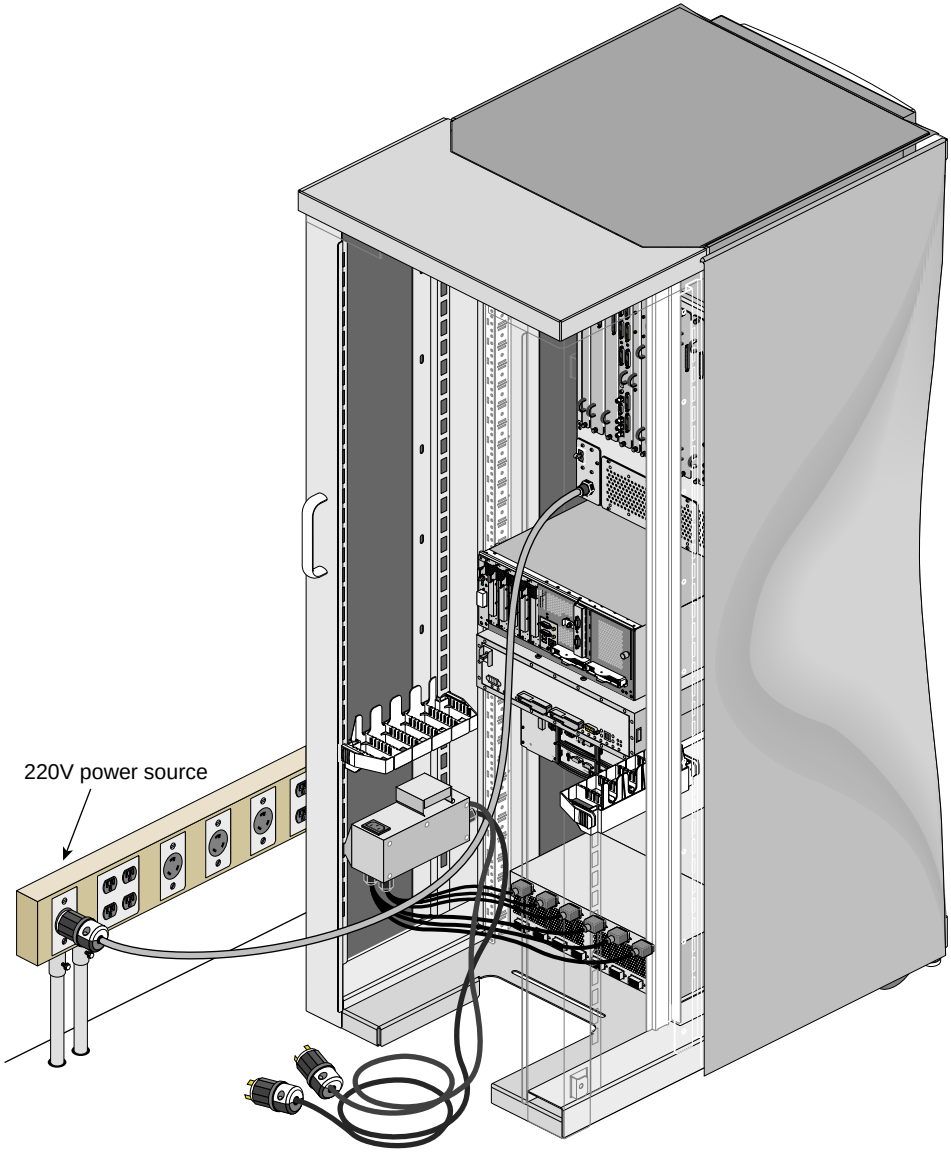

Figure 4-3 Connecting a G-brick Power Cable

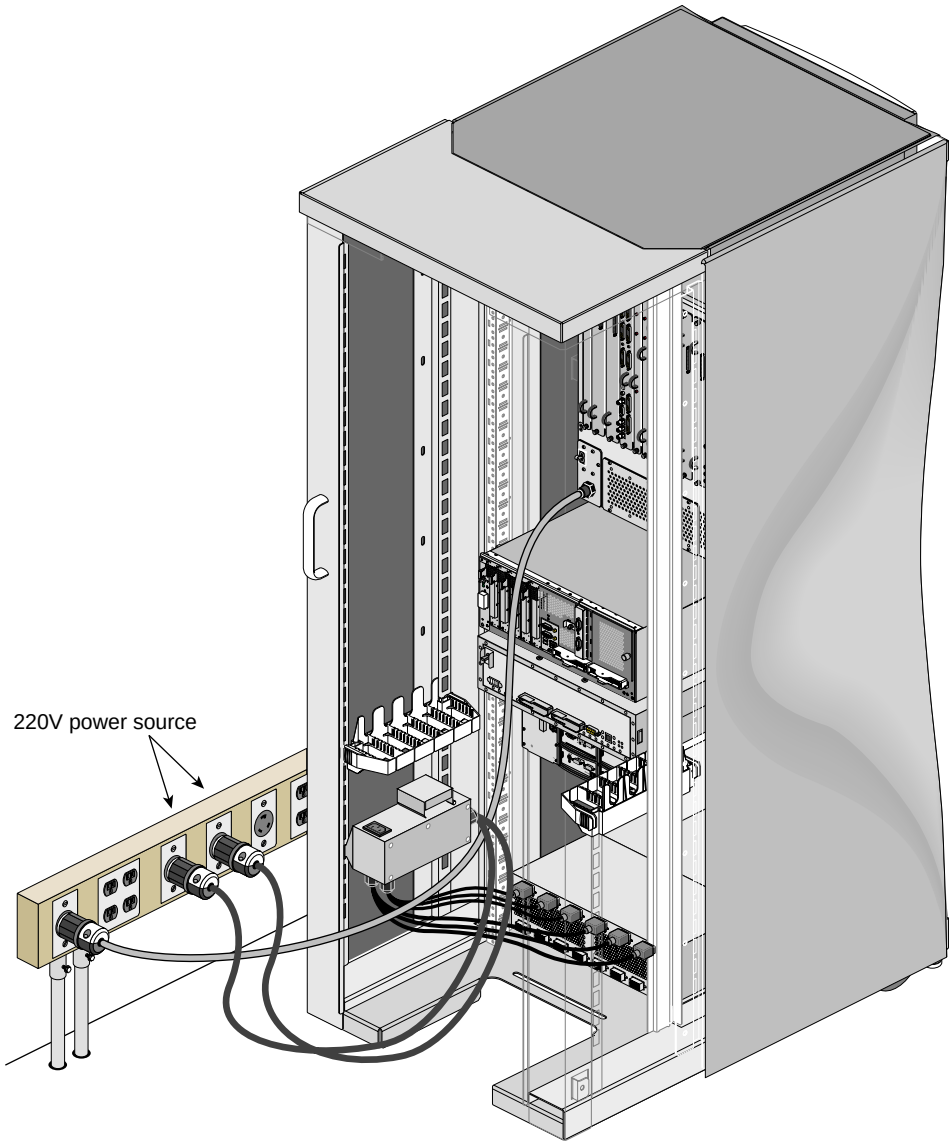

Figure 4-4 Connecting the PDU Power Cable

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

Power-on the rackmount graphics system as follows:

1. Turn on the PDU and/or PDS circuit breaker switches (shown in Figure 4-5).

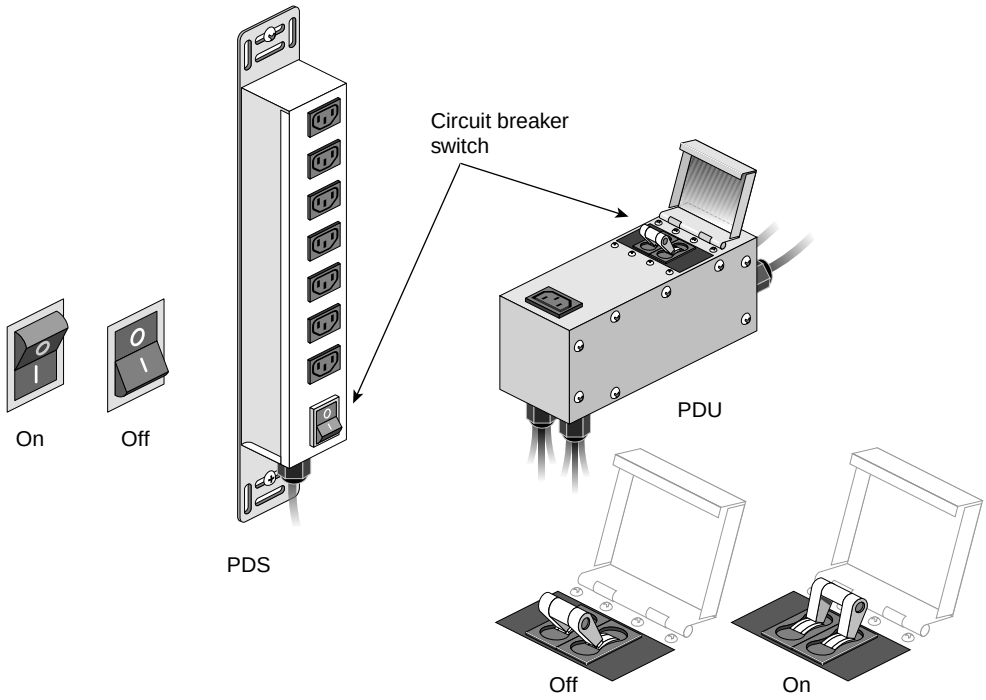

Figure 4-5 Assuring PDU or PDS Circuit Breaker Switches Are Turned On

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 4-6). It should be ready for input.

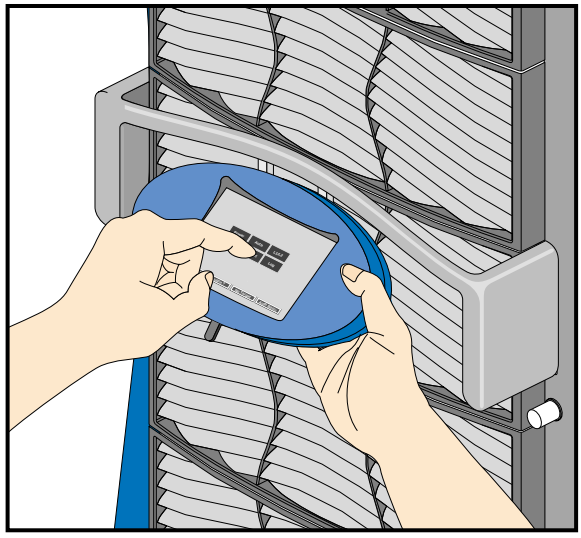

Figure 4-6 L2 Controller Touch Display

4. Select **Power** from the Home window as shown in Figure 4-7.

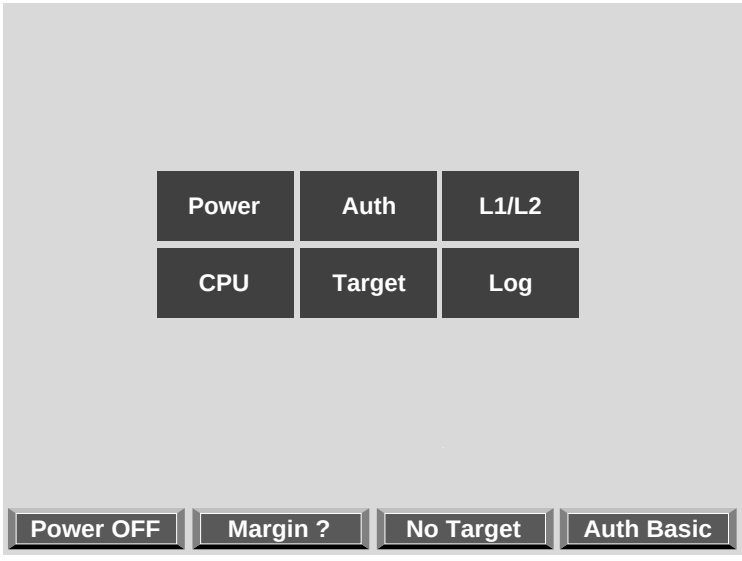

Figure 4-7 L2 Interface Home Window

5. Select **Set Tgt** from the Power window when it appears (see Figure 4-8); then select the bricks you want to power on.

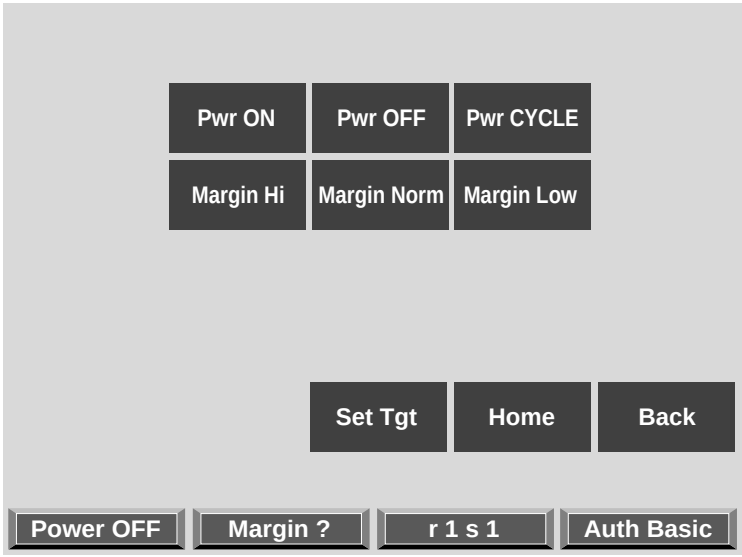

Figure 4-8 Power Window

6. Select **All** in the upper left-hand corner of the display to power on all the bricks in the graphics system, (see Figure 4-9).

You can select bricks by their rack and slot/bay (unit position) number. If you want to select individual bricks to power on, or you need additional information on working with the L2 controller interface, see the *SGI Origin 3000 Series Owner's Guide.*

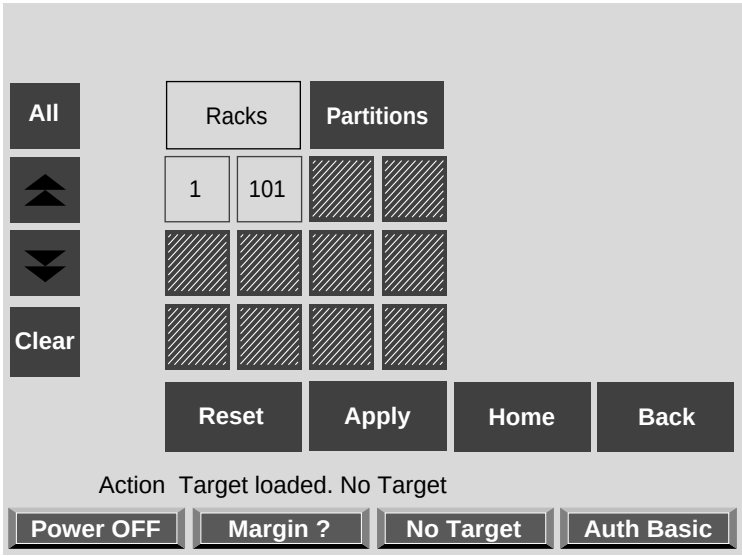

Figure 4-9 Target Select Window

7. After the system powers on, confirm that the L1 controllers on each brick are active, (see Figure 4-10 for an example).

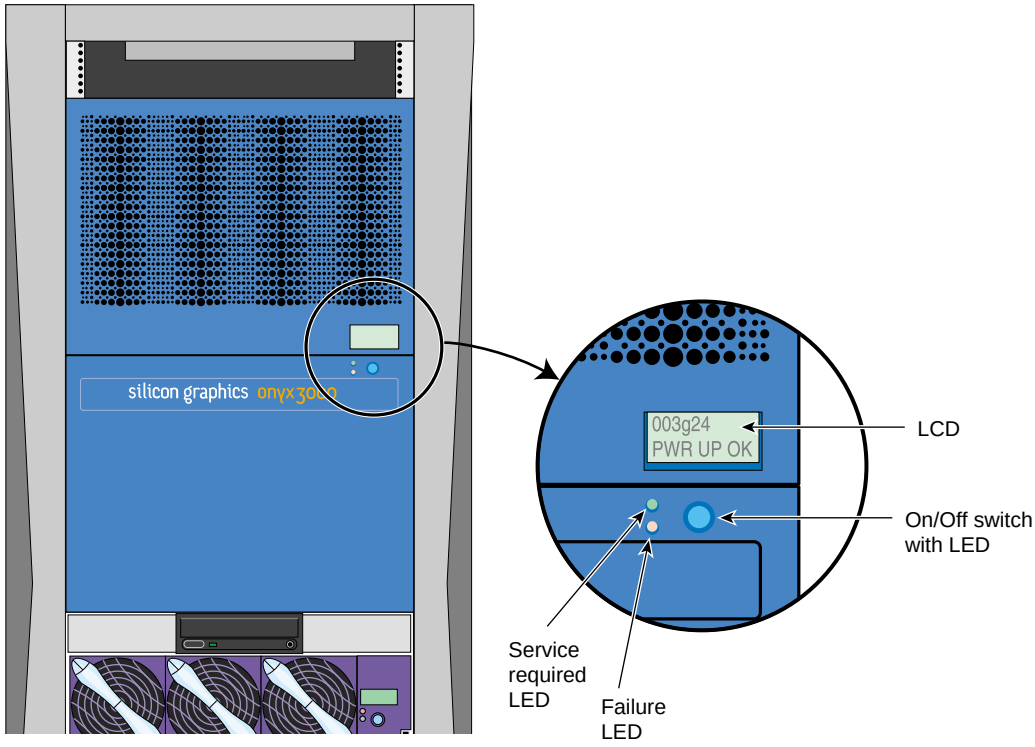

Figure 4-10 G-brick L1 and Power Button

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 Appendix C in the *SGI Origin 3000 Series Owner's Guide.*

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 your system, follow these steps:

1. Locate the L2 touch-screen on the front of the system (see Figure 4-11).

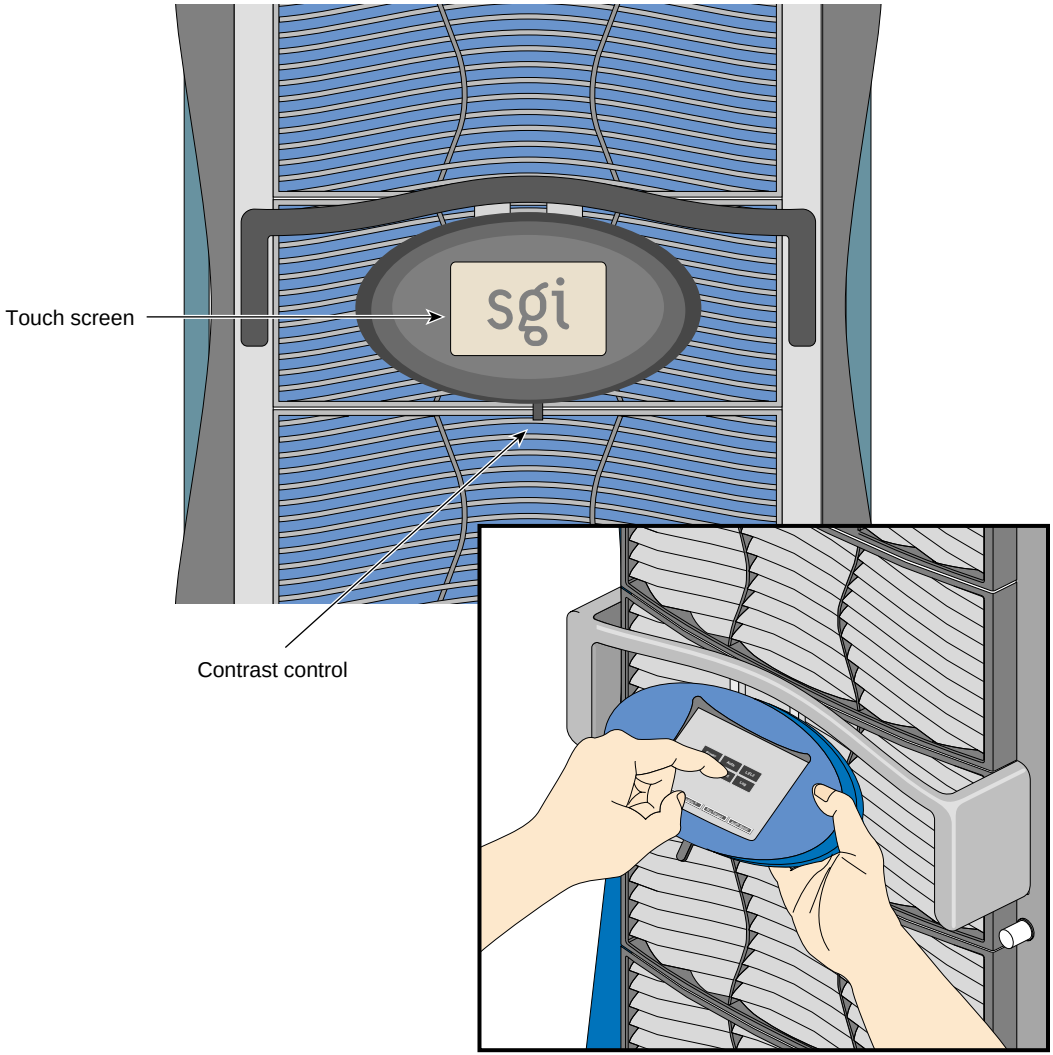

Figure 4-11 L2 System Controller Interface Screen

2. Select **Power** from the home window as shown in Figure 4-12, and the Power window appears, as shown in Figure 4-13.

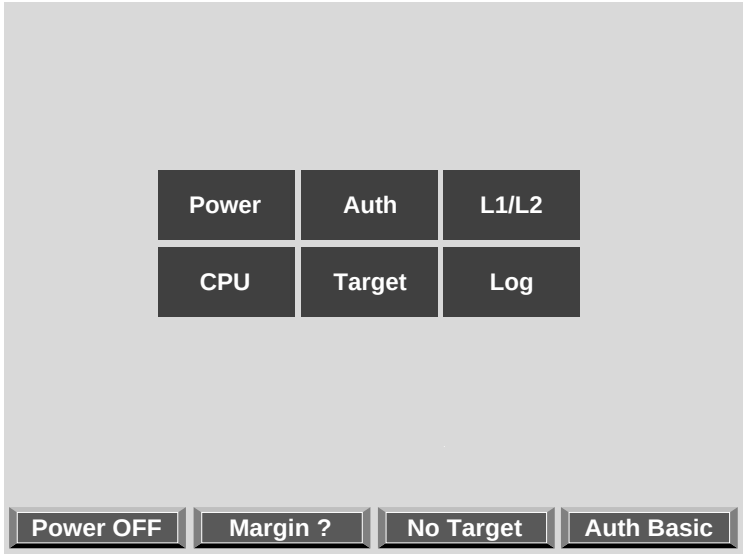

Figure 4-12 Home Window

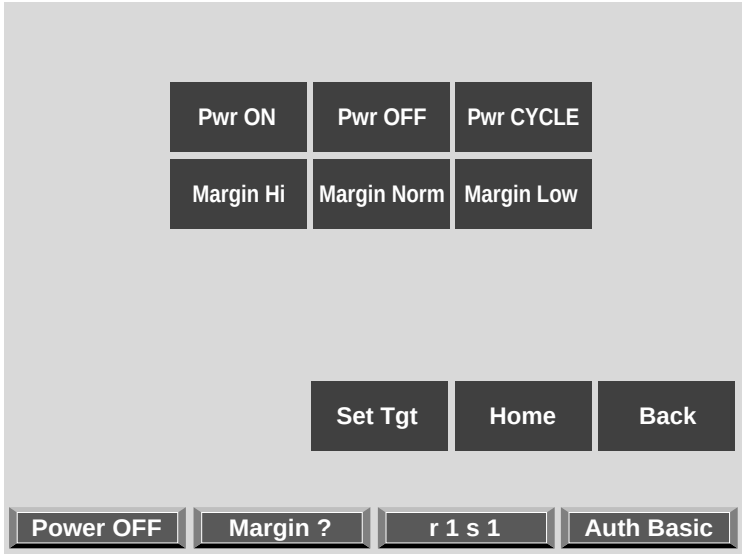

Figure 4-13 Power Window

3. Select **Set Tgt** from the window.
4. The Target Select window appears, as shown in Figure 4-14.
5. Select **All** in the upper left-hand corner of the display if you want to power off all the bricks in all the racks and slots.
6. Select **Back** to return to the Power window.
7. Select **Pwr Off** from the Power window to power off the bricks selected.
8. Turn off the power switches for any external peripherals in the following order:
   - Printer (if installed)
   - Monitors
   - Other external peripherals

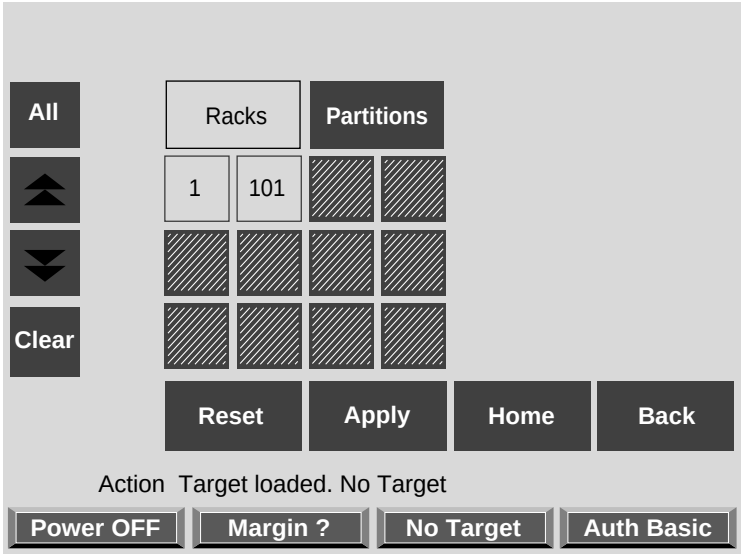

Figure 4-14 Target Select Window

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 4-5 on page 58) to the Off position.
2. Turn the switch(es) on the back of the G-brick(s) to the Off position.
3. Disconnect the PDU power cable(s) from the wall receptacles.
4. Unplug the power cord(s) of the G-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 Onyx 3000 series rack system. The CRUs are hardware components that can be safely removed by an end user without undue exposure to high electrical power potentials. CRUs are limited to the following major components:

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

Figure 5-1 shows a rack with CRUs. Note that the facade on the G-brick is also removable.

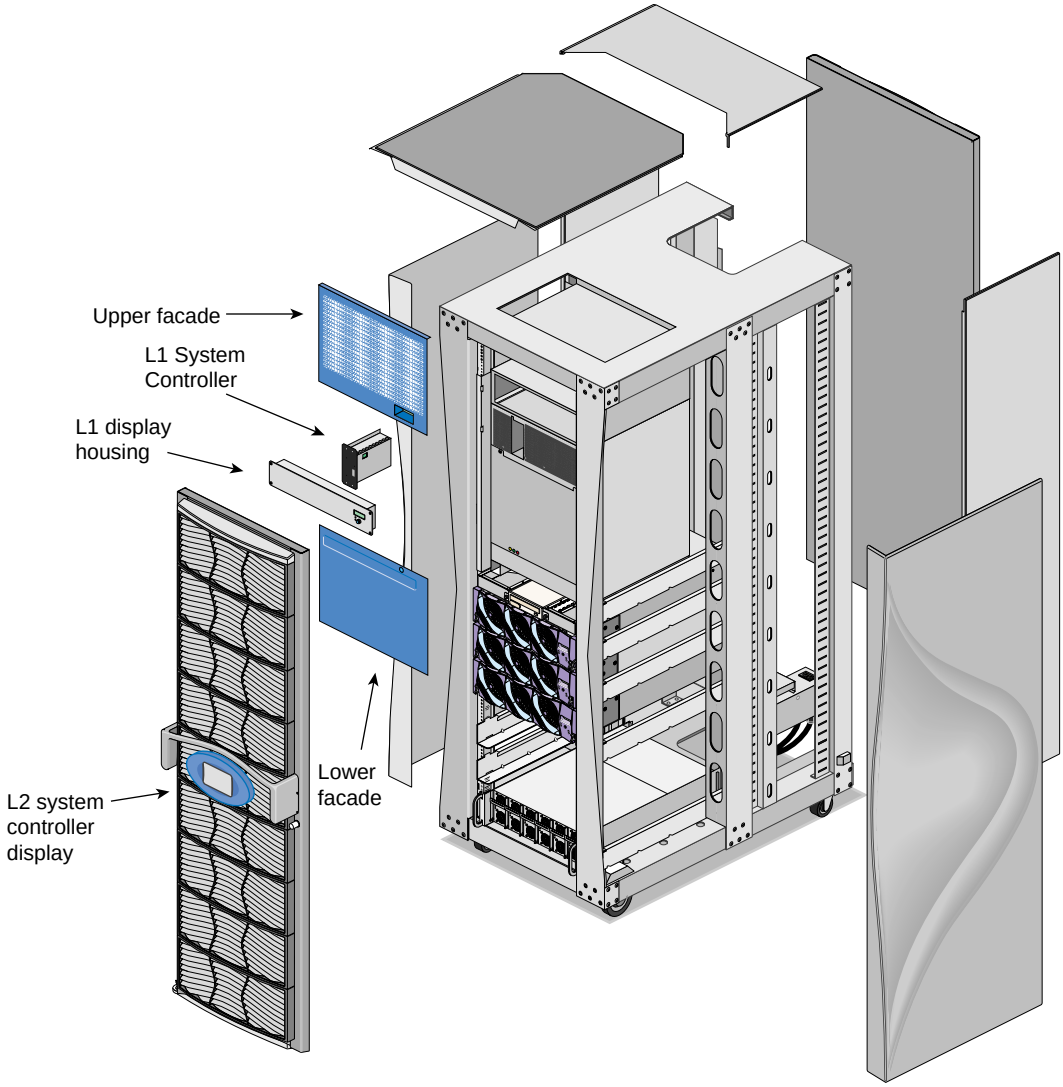

Figure 5-1 Onyx 3000 Series Rack System Customer-Replaceable Units

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.

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 62 explains how to properly turn off and disconnect all system power.

"Powering On the System" on page 54 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.

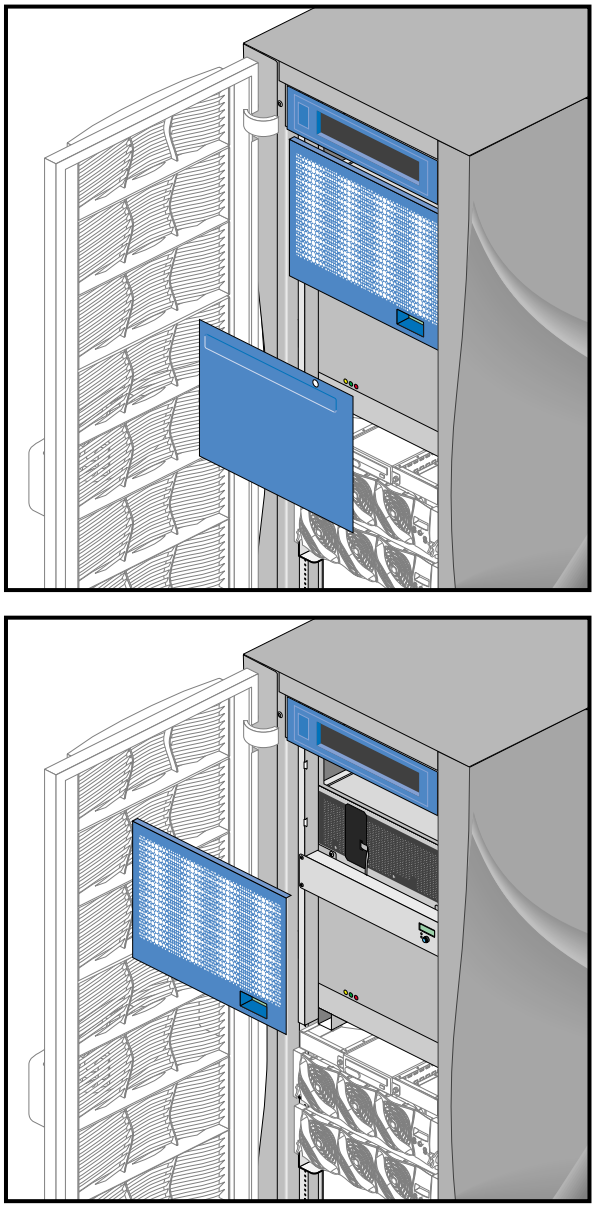

Figure 5-2 Removing the G-brick Facade

Using System Controllers with Graphics Systems

This chapter provides overview information about using the G-brick's (L1) System Controller in your Onyx 3000 series graphics rack. Information on the L2 rack System Controller follows the section on the L1.

L1 G-brick System Controller

The front panel display of the L1 System Controller (as shown in Figure 6-1) 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

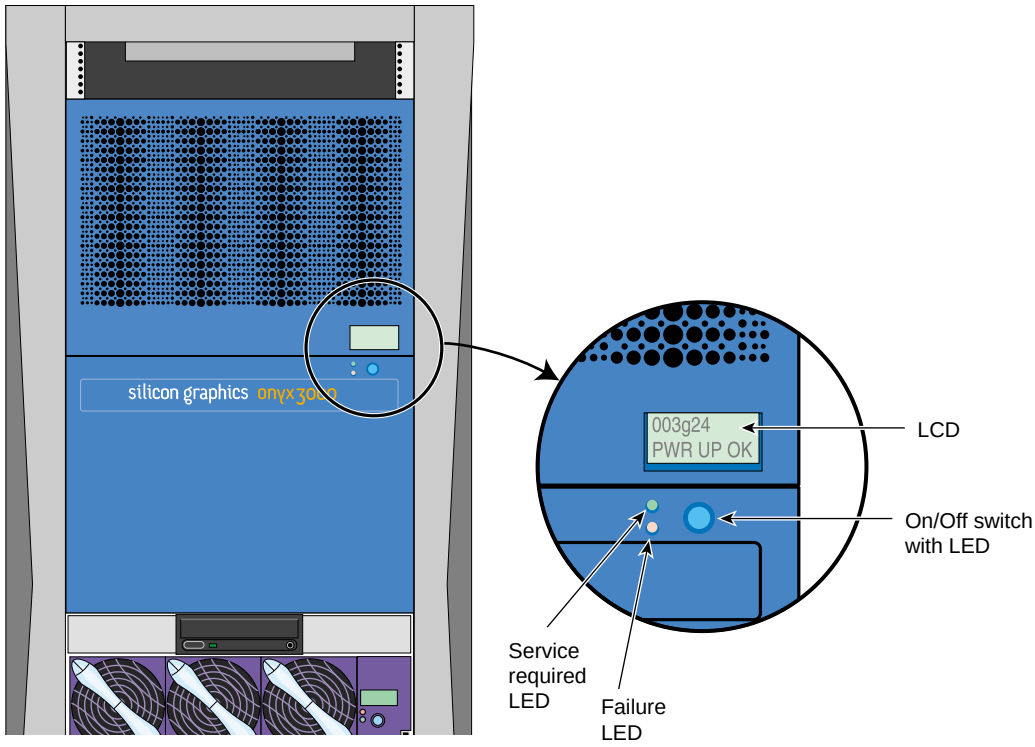

Figure 6-1 G-brick L1 System Controller Display and Controls

In a single-rack configuration, the G-brick's L1 USB connection goes directly to an L2 System Controller USB port.

In multirack graphics systems with two or more G-bricks installed, the G-brick's L1 USB connection goes to a USB HUB before connecting to the L2 System Controller.

The L1 display provides warnings, fault information, advisory status, and critical status messages. Note that as listed in Table 6-1, 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 6-1 L1 System 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: FAN # x fault limit reached @ xx RPM	A fan has reached its maximum RPM level. The ambient temperature may be too high. Check to see if a fan has failed.
ATTN: FAN # x warning limit reached @ xx RPM	A fan has increased its RPM level. Check the ambient temperature. Check to see if the fan stablizes.
ATTN: FAN # x stabilized @ xx RPM	Increased fan RPM level has returned to normal.
Temperature messages: low alt.	
ATTN: TEMP # advisory temperature reached @ xxC xxF	The ambient temerature at the brick's air inlet has exceeded 30 degrees centigrade.
ATTN: TEMP # critical temperature reached @ xxC xxF	The ambient temerature at the brick's air inlet has exceeded 35 degrees centigrade.
ATTN: TEMP # fault temperature reached @ xxC xxF	The ambient temerature at the brick's air inlet has exceeded 40 degrees centigrade.
Temperature messages: high alt.	
ATTN: TEMP # advisory temperature reached @ xxC xxF	The ambient temerature at the brick's air inlet has exceeded 27 degrees centigrade.

Table 6-1 (continued) L1 System Controller Messages

Message	Meaning and action needed
ATTN: TEMP # critical temperature reached @ xxC xxF	The ambient temerature at the brick's air inlet has exceeded 31 degrees centigrade.
ATTN: TEMP # fault temperature reached @ xxC xxF	The ambient temerature at the brick's air inlet has exceeded 35 degrees centigrade.
Temperature stable message:	
ATTN: TEMP # stabilized @ xxC/xxF	The ambient temerature 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 Rack System Controller

The L2 System 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 front panel display touch screen on the front of the rack. Figure 6-2 shows the L2 front panel display.

The following sections provide an overview of the L2 controller's features and functions. For more details about the L2, see Chapter 3 in the *Origin 3000 Series Owner's Guide*.

L2 Display Screen

The rack display is a 320 x 240 LCD touch display located on the front of the system. The L2's touch-screen translates what the user touches into commands. The controller displays the results of the commands.

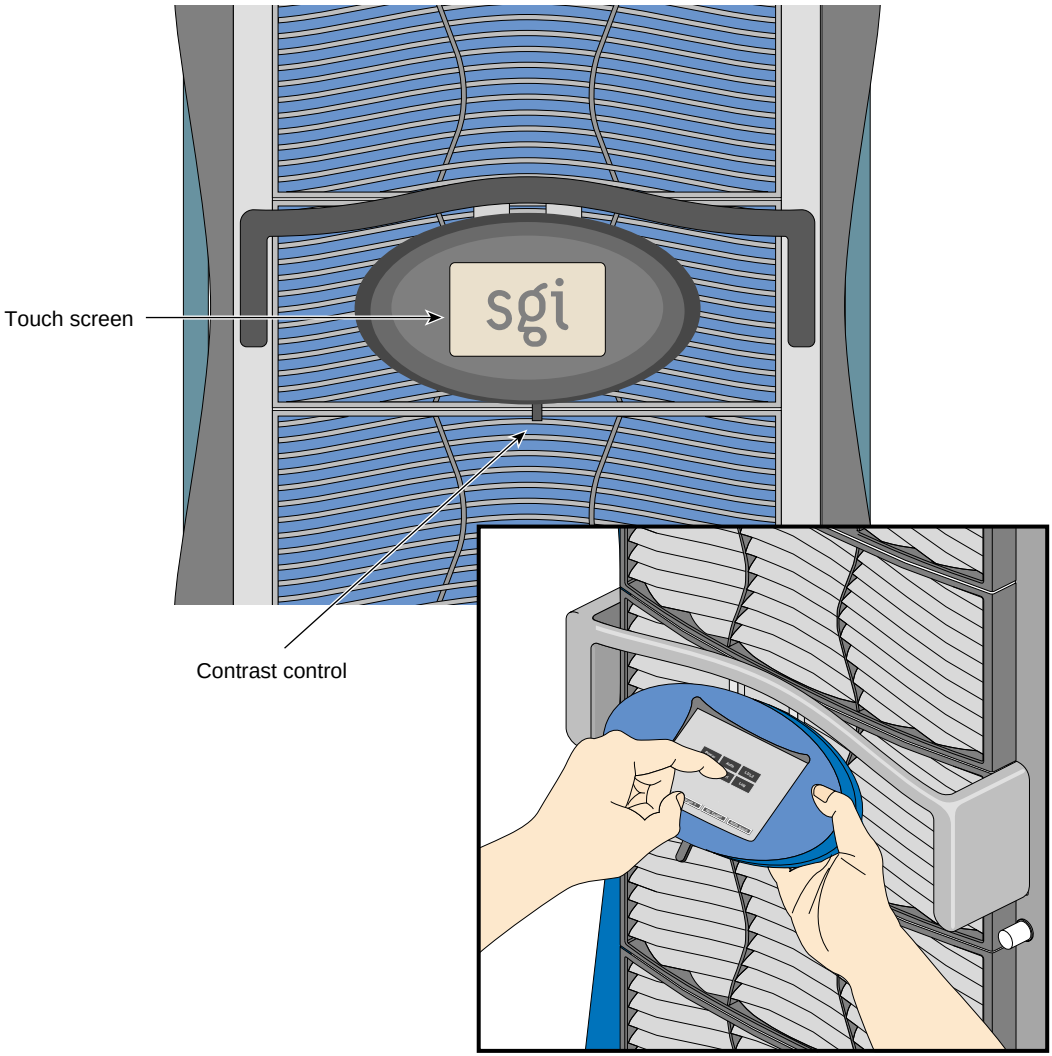

Figure 6-2 L2 System Controller Display and Controls

The L2 System 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.

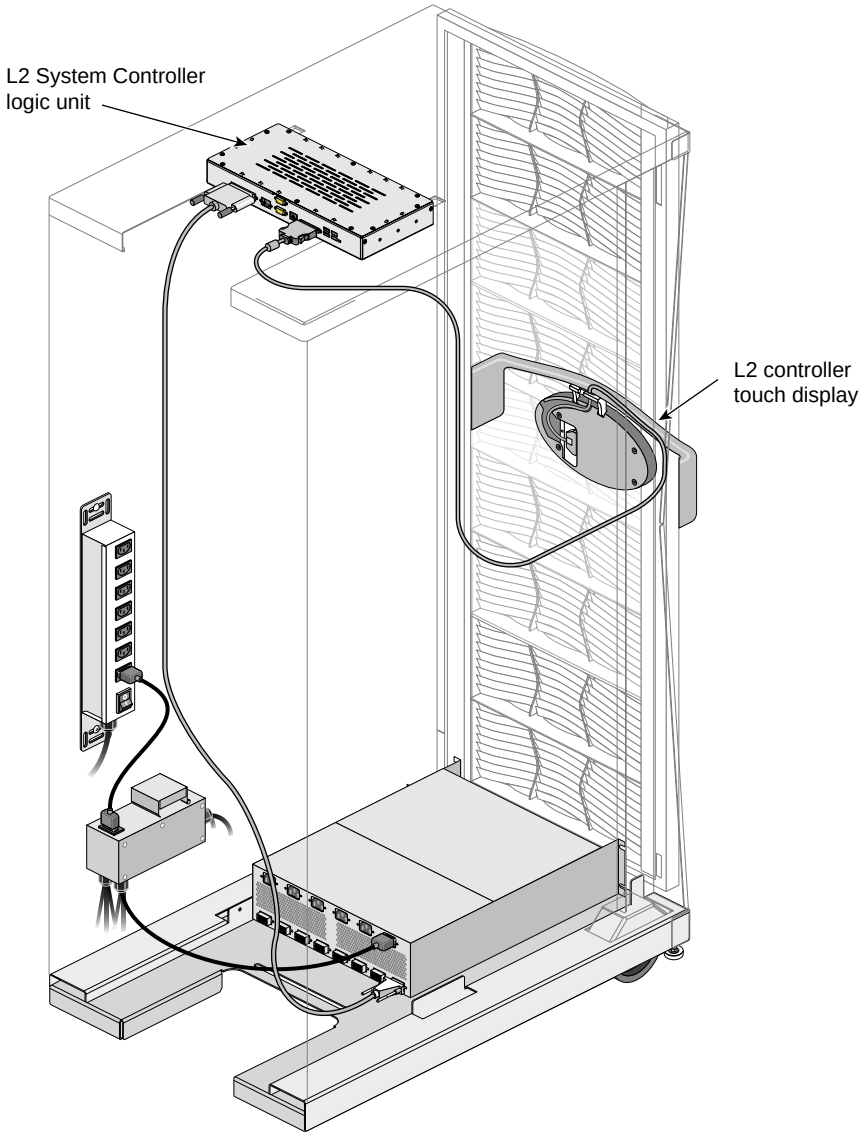

Figure 6-3 Location of L2 Controller in a Rack

Input power is 48 VDC (about 30 Watts), 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 ports on the L2 controller.

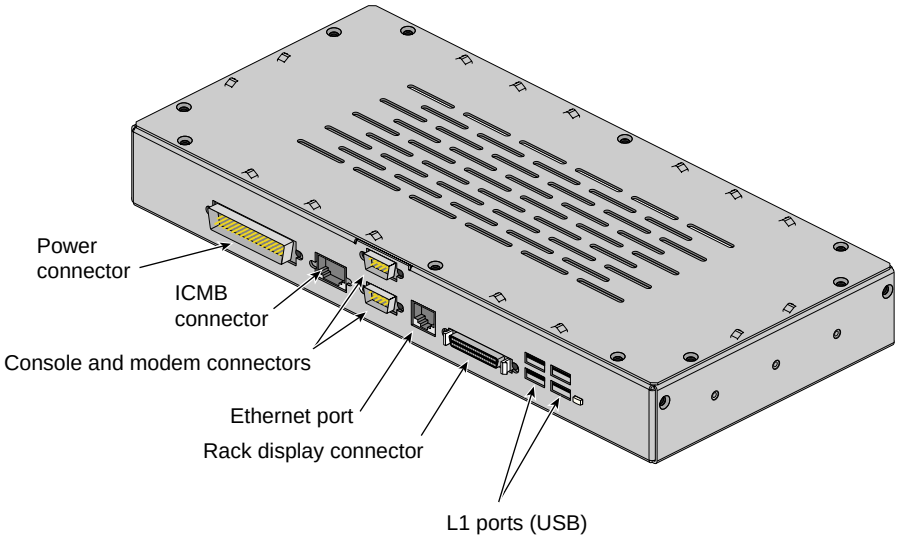

Figure 6-4 L2 Controller Connectors

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 (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 rack 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).

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 Model Number

The CMN (model) number for each system is shown on the system label on the unit.

Series Number

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 to identify your 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.

Upgrade Regulatory Label

If you received a regulatory label with an upgrade, place it on the system near the Manufacturer's Declaration of Conformity label.

Class A Compliance

This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at 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.

Electromagnetic Emissions

This device complies with the Class A limits of 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.

Also, this device 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.

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NOM 024 Information (Mexico Only)

La información siguiente se proporciona en el dispositivo o en dispositivos descritos en este documento, en cumplimiento con los requisitos de la Norma Ofical Mexicana (NOM 024):

Exportador: Silicon Graphics, Inc.

Importador: Silicon Graphics, Inc.

Embarcar a: Av. Vasco de Quiroga
No. 3000
Col. Santa Fe
C.P. 01210
México, D.F. México

Tensión alimentación:
100/240 ~ VAC

Frecuencia: 50/60 Hz: Consumo de corriente: 7.6 A

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．

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.

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 Silicon Graphics upon request.

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, a replacement cable should be obtained 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.

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