Silicon Graphics® Onyx4™ UltimateVision™ User's Guide

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TRADEMARKS AND ATTRIBUTIONS

Record of Revision

Version	Description
001	June 2003 Original publication
002	June 2004 Updated branding Added L1 rack- and slot-numbering section Updated XIO and NUMAlink cabling section Updated ImageSync section to include ImageSync2, Genlock, Framelock, and swap-ready cabling Added stereo-sync section Added XF86Config file section Added information about SG2.1 graphics board Changed pipe numbering terminology Changed “head” and “channel” terminology Updated L1 information Updated power and thermal figures Added graphics board removal and replacement information Updated list of video modes Added additional pinouts

Contents

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Examples

About This Guide

This publication provides information about the Silicon Graphics® Onyx4™ UltimateVision™ visualization system.

Related Publications

The following publication contain additional information that may be helpful:

- SGI Origin 350 Server User's Guide

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

Conventions

The following conventions are used throughout this publication:

Convention	Meaning
`command`	This fixed-space font denotes literal items such as commands, files, routines, path names, signals, messages, and programming language structures.
variable	Italic typeface denotes variable entries and words or concepts being defined.
`user input`	This bold, fixed-space font denotes literal items that the user enters in interactive sessions. (Output is shown in nonbold, fixed-space font.)
[]	Brackets enclose optional portions of a command or directive line.
...	Ellipses indicate that a preceding element can be repeated.
`manpage`(*x*)	Man page section identifiers appear in parentheses after man page names.
GUI element	This font denotes the names of graphical user interface (GUI) elements such as windows, screens, dialog boxes, menus, toolbars, icons, buttons, boxes, fields, and lists.

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Silicon Graphics Onyx4 Visualization System Overview

The Silicon Graphics Onyx4 UltimateVision system is a high-performance visualization system running the SGI IRIX operating system. The platform is available in a number of configurations to meet your visualization requirements.

This chapter introduces the two graphics bricks used in the Onyx4, and provides an overview of their connection to the rest of the platform.

G2-bricks and G2N-bricks

The SGI Onyx4 system uses two bricks for graphics output: a graphics-only brick (called a G2-brick) and a graphics/node brick (called a G2N-brick).

The G2-brick is a 2U rack mountable enclosure containing two high-performance graphics pipes. This brick connects as an I/O device.

The G2N-brick is a 2U rack mountable enclosure which, in addition to the two high-performance graphics pipes, adds to the host system a node board with two or four CPUs and up to eight memory DIMMs. This brick connects as an integral part of the host system's compute fabric. Though it contains CPUs and memory, the G2N-brick does not have boot I/O functionality, and therefore may not be used as a standalone system.

Though internally different, the G2-brick and the G2N-brick may not be distinguished by external features.

Connection Types: XIO Versus NUMAlink

The G2-brick is a graphics-only I/O brick, and therefore connects to a host system using XIO.

The G2N-brick is a compute brick, and therefore connects to the host system using NUMAlink, either directly or through a NUMAlink module (router). This way the brick becomes an integral part of the host computer, and contains both CPUs and memory, in addition to graphics output capabilities.

Chassis Tour

The sections below show front, rear, and internal views of the SGI Onyx4 G2-bricks and G2N-bricks.

Front Panel Items

This section describes the front panel controls and indicators of the G2-bricks and G2N-bricks, as shown in Figure 1-1.

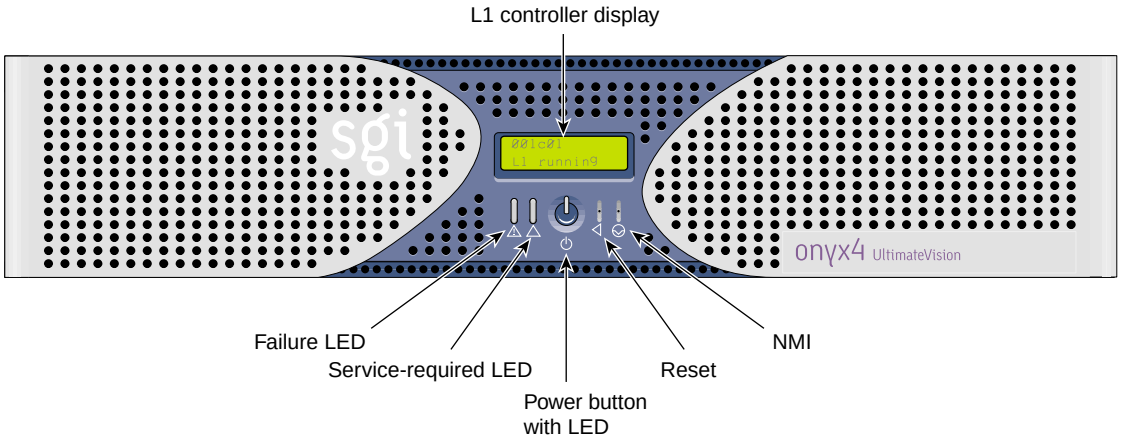

Figure 1-1 G2-brick and G2N-brick Front Panel Items

The front panels of the G2-brick and G2N-brick have the following items:

- **L1 controller display.** A liquid crystal display (LCD) that shows status and error messages generated by the L1 controller.

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

- **Status LEDs.** The front panel has the following LEDs:
  - Power button LED. This LED illuminates green when the internal components are on.

  - Service-required LED. This LED illuminates yellow to indicate that an item is not functioning properly (for example, a fan is off), but the system is still operating.
  - Failure LED. This LED illuminates red to indicate that a failure has occurred and the system is down.

- **Power button.** Press this button to power on the system. Alternatively, you can power on the system at a system console.
- **Reset button.** Press this button to reset the internal processors and ASICs. The reset will cause a memory loss.
- **NMI button**. Press this button to issue a non-maskable interrupt command to a brick. If the system hangs, you can send the affected brick an NMI interrupt. The interrupt goes to PROM and causes the CPU state to be captured for that brick. This information is saved in flash PROM and in the system log, and can assist SGI technicians in debugging system hangs and customer problems.

Rear Panel Items

Figure 1-2 shows a view of the rear panel of an SGI Onyx4 G2-brick and G2N-brick.

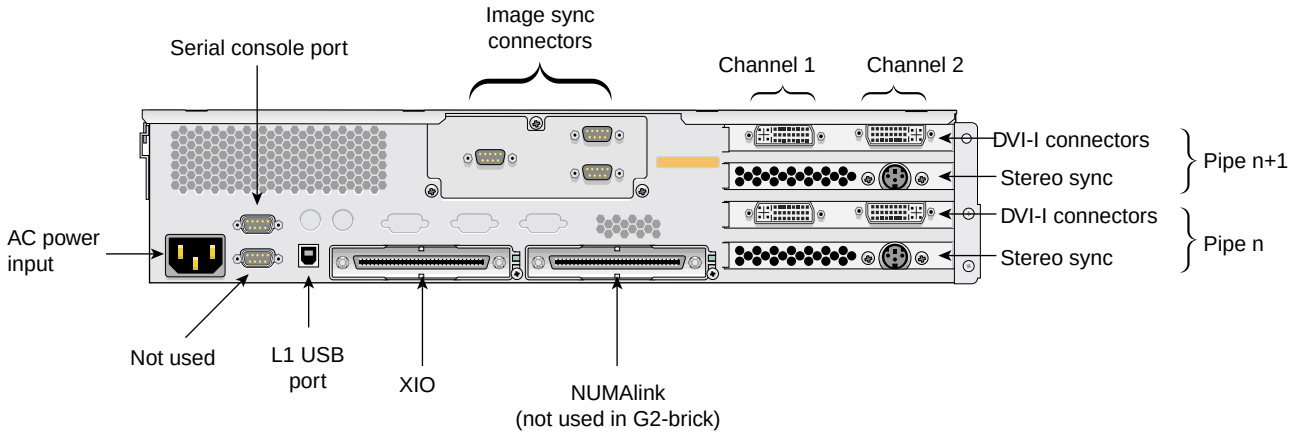

Figure 1-2 SGI Onyx4 G2-brick and G2N-brick Rear Panel

The rear panel of the SGI Onyx4 G2-brick and G2N-brick has the following items:

- **AC power input.** This connector connects the graphics brick to an AC power outlet.
- **Serial console port.** This DB-9 serial port (console and diagnostic port) enables you to connect a system console to the L1 controller on the graphics brick.
- **L1 USB port.** This universal serial bus (USB) type B port connects the graphics brick L1 controller to an L2 controller.
- **XIO connector**. This Crosstown2 connector connects the G2-brick to a host system compute brick. This connection is made with a NUMAlink cable at 800 MB/s in each direction.
  - **XIO connector LEDs.** The XIO connector has a yellow LED and a green LED (both located to the right of the NUMAlink connector). The yellow LED indicates that both the graphics brick and the host system brick to which it is connected are powered on. The green LED indicates that the host system has established a link to the graphics brick.
- **ImageSync connectors.** These connectors are used in conjunction with an SGI ImageSync card.

- **NUMAlink connector (only used in G2N-bricks).** This NUMAlink connector connects the G2N-brick to the host system. This connection is made with a NUMAlink cable at 1.6 GB/s in each direction.
  - **NUMAlink LEDs.** The NUMAlink connector has a yellow LED and a green LED (both located to the right of the NUMAlink connector). The yellow LED indicates that both the graphics brick and the host system brick to which it is connected are powered on. The green LED indicates that the host system has established a link to the graphics brick.
- **DVI-I display connectors.** These connectors are used to attach one or more external displays.
- **Stereo Sync connectors.** These connectors are used to attach stereo sync devices.

Internal Components

Figure 1-3 shows an internal view of the SGI Onyx4 G2N-brick.

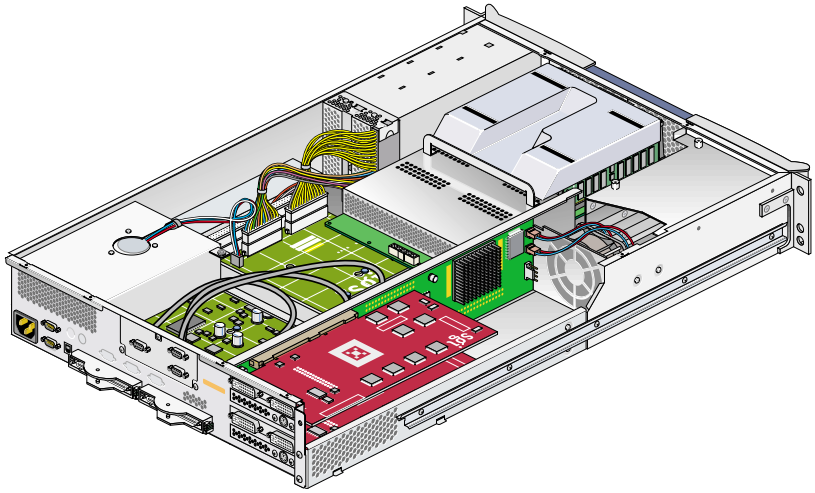

Figure 1-3 SGI Onyx4 G2N-brick Internal View

Assembling an Onyx4 System

This Chapter describes assembling the various bricks that make up your Onyx4 UltimateVision system to form one unified system. You should follow the steps in this Chapter if you ordered a complete Onyx4 system from SGI without a rack, or if you are expanding an existing Onyx4 system to include more graphics output pipes.

If your SGI Onyx4 system came from SGI already mounted in a rack, you should proceed directly to Chapter 3, “Setting Up Your Onyx4 System”.

The first section in this chapter discusses safety precautions that must be taken when working with the system:

- “Safety Precautions” on page 10

The second section in this chapter describes choosing where in the rack to mount the various bricks that form the system:

- “Selecting Rack Locations” on page 11

The third section describes making the NUMA and XIO connections:

- “NUMA and XIO Cabling” on page 20

The fourth section of this chapter details the installation of PCI cards in the host system:

- “PCI Card Locations” on page 21

The fifth section addresses connecting cables to the optional ImageSync card:

- “Connecting an SGI ImageSync Card to G2-bricks and G2N-bricks” on page 24

The sixth section addresses providing power to the system:

- “Providing Power to G2-bricks and G2N-bricks” on page 28

Safety Precautions

Before you install an SGI Onyx Next Generation Scalable Graphics system, you should familiarize yourself with the safety precautions discussed in the following subsections:

- "Hazard Statements" on page 10
- "ESD Precautions" on page 10
- "Safety Measures" on page 130

Hazard Statements

During the installation of the computer system, be alert for hazard advisory statements with icons, which signify the following:

- **Caution** Indicates a potentially hazardous situation that, if not avoided, can result in minor or moderate injury. A caution statement also alerts you to unsafe practices that can result in equipment damage and/or data corruption. A caution message is accompanied by an icon as shown in the following example:

Caution:

- **Warning** indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury. A warning message is accompanied by icon as shown in the following example:

Warning:

ESD Precautions

Observe electrostatic discharge (ESD) precautions during the entire installation process to eliminate possible ESD damage to the equipment. Wear an SGI-approved wrist strap when you handle an ESD-sensitive device. Connect the wrist strap cord directly to earth ground.

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

Selecting Rack Locations

The internal configuration of the system is partially determined by the locations of the various bricks within the rack. This includes such things as which brick the system boots from and the ordering of the graphics pipes.

Cable lengths and routings also play a part in determining rack configurations.

If your system was preconfigured from SGI but purchased without a rack, you should reassemble the system in the order in which it was originally configured. This is described in “Determining Rack Locations for Preconfigured Systems” on page 13.

If your system was not preconfigured, you will need to determine the best rack locations. This is described in “Selecting Rack Locations for Non-Preconfigured Systems” on page 14.

If you have changed the rack locations from those preconfigured in the factory, or if you have selected your own rack locations, you will need to program the L1 controllers with the new locations. This is described in “Programming L1 Rack and Slot Numbers” on page 19.

Once you determine the desired rack locations for all the bricks in your system, refer to Appendix C, “Installing G2-bricks and G2N-bricks in a Rack” for instructions to mount the bricks in a rack, then proceed to “NUMA and XIO Cabling” on page 20.

Non-Racked Systems

Rack mounting Onyx4 systems is recommended. However, if your Onyx4 system consists of only two or three bricks, they may be placed on a flat surface, as shown in Figure 2-1.

Caution: The Onyx4 bricks are heavy. Ensure that the bricks are positioned in such a way that they can not slide and fall, causing damage or injury.

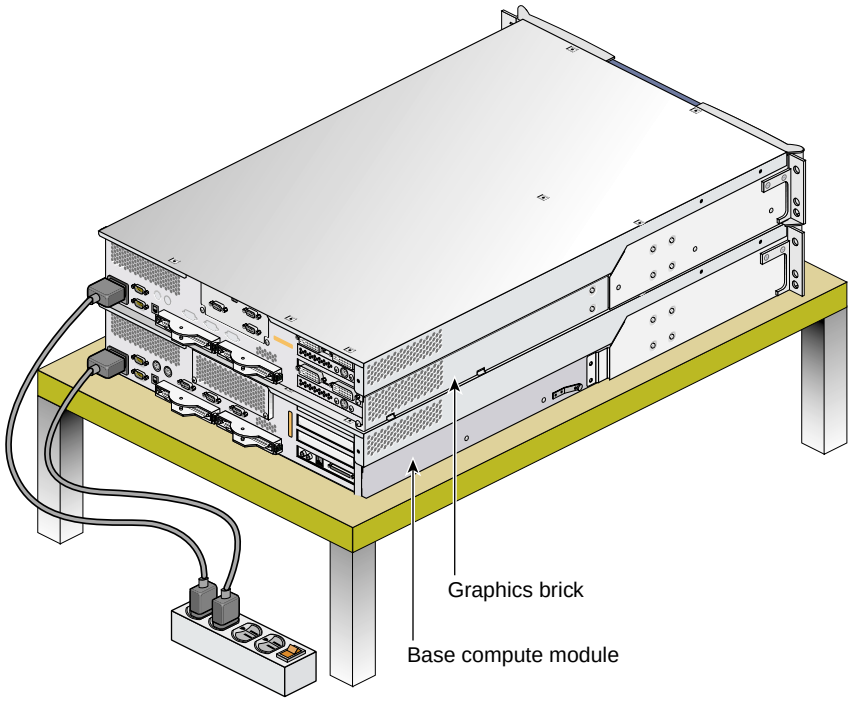

Figure 2-1 Positioning a Non-Racked Onyx4 System

Determining Rack Locations for Preconfigured Systems

If your system was preconfigured from SGI but purchased without a rack, you should reassemble the system in the order in which it was originally configured. This section describes how to determine that order.

1. Supply power to each brick in turn, as described in “Providing Power to G2-bricks and G2N-bricks” on page 28. There is no need to power up the bricks at this time.
2. While each brick is receiving power, make a note of the information on the L1 display on the front of that brick.

   Each L1 will display a location in the form “XXXyZZ” (for example, “001c07”) where:

   “XXX” is the rack number (001 in this example),

   “y” is the brick type (c in this example), and

   “ZZ” is the slot number (07 in this example).

Once you determine the desired rack locations for all the bricks in your system, refer to Appendix C, “Installing G2-bricks and G2N-bricks in a Rack” for instructions to mount the bricks in a rack.

Selecting Rack Locations for Non-Preconfigured Systems

If your system was not preconfigured by SGI, you will need to decide on suitable rack locations for each of the bricks in the system.

Because the SGI Onyx4 is a highly-configurable system, it is not practical to list every possible configuration. For configurations not shown here, consult your SGI sales or support representative.

The following figures show the most common configurations of the SGI Onyx4 system. To assist in system configuration, the typical location of pipe 0 is called out in these figures.

Once you determine the desired rack locations for the bricks in your system, Appendix C, “Installing G2-bricks and G2N-bricks in a Rack” describes how to mount them in a rack.

Figure 2-2 shows a configuration containing one host brick and one G2-brick.

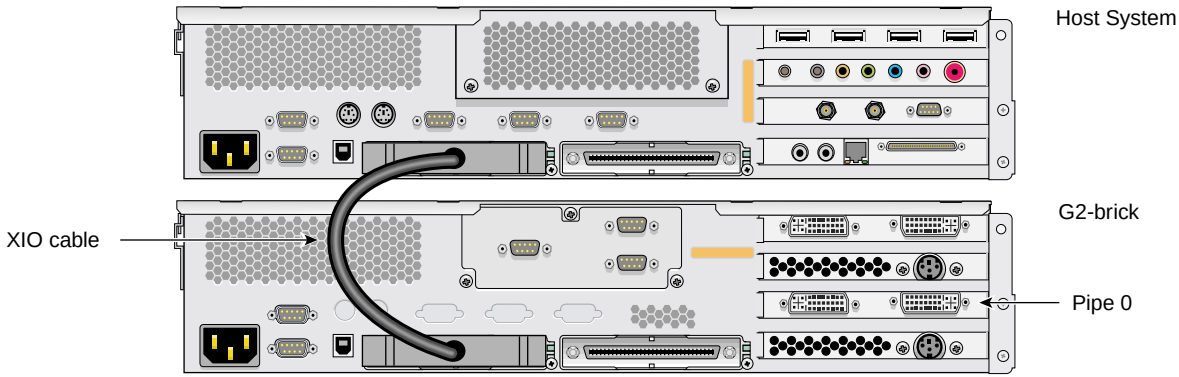

Figure 2-2 One Host Brick with One G2-brick

Figure 2-3 shows a configuration containing one host brick and one G2N-brick.

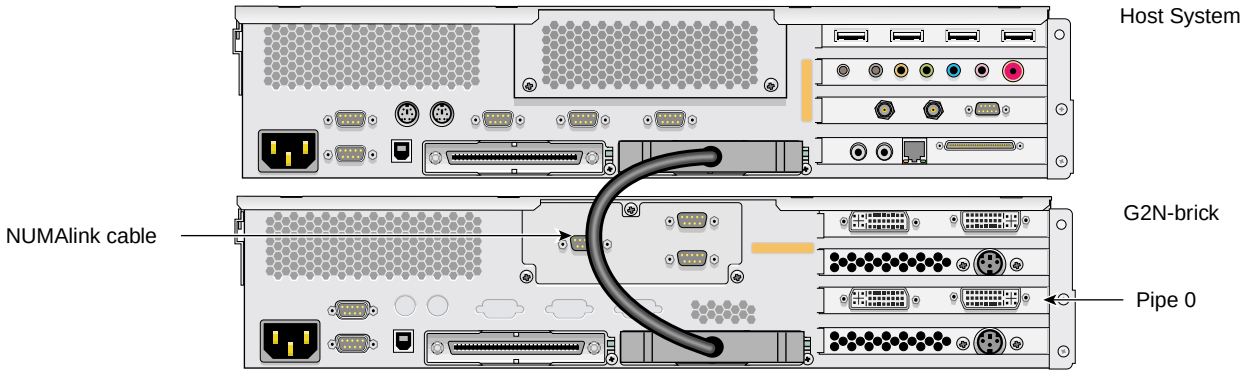

Figure 2-3 One Host Brick with One G2N-brick

Figure 2-4 shows a configuration containing one host brick, one G2-brick, and one G2N-brick.

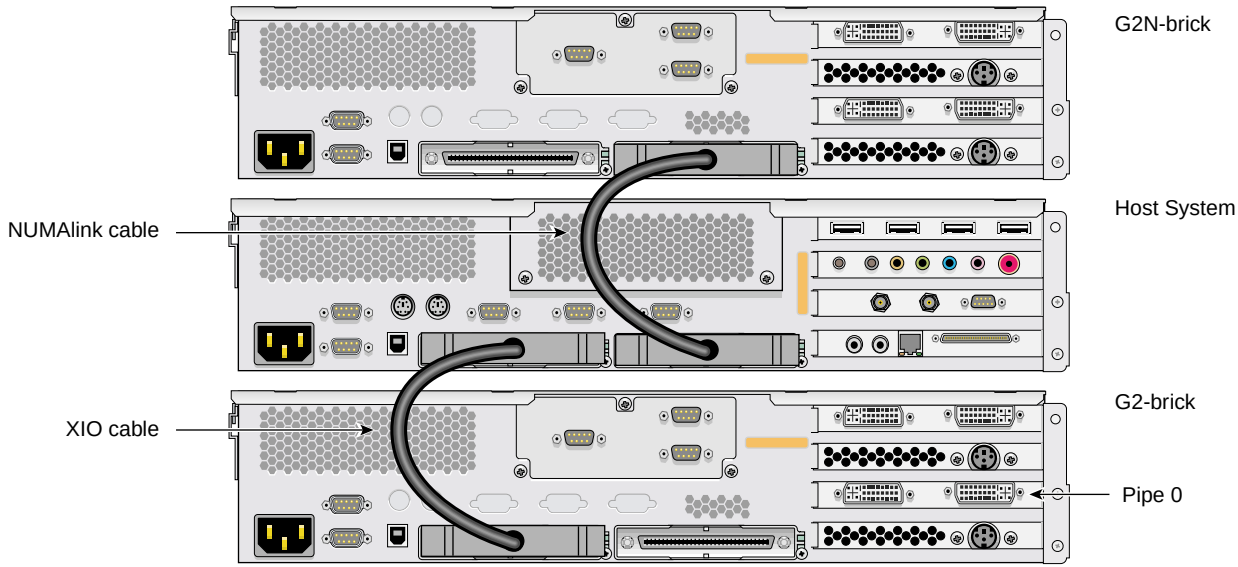

Figure 2-4 One Host Brick, One G2-brick, and One G2N-brick

Figure 2-5 shows a configuration containing two host bricks and one G2-brick.

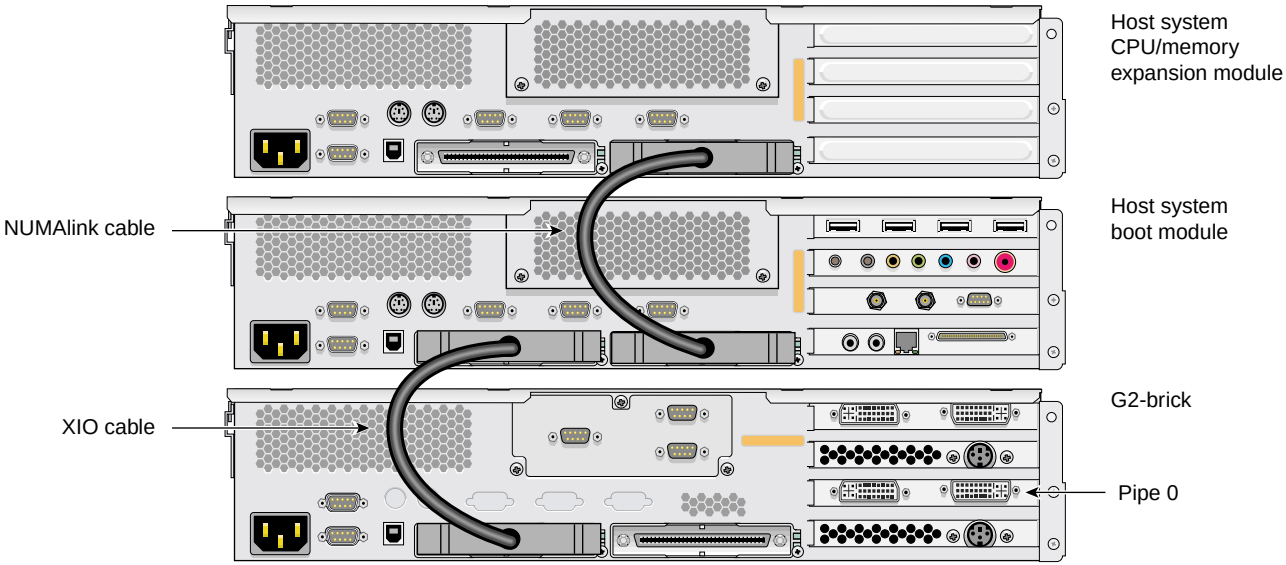

Figure 2-5 Two Host Bricks and One G2-brick

Figure 2-6 shows a configuration containing two host bricks and two G2-bricks.

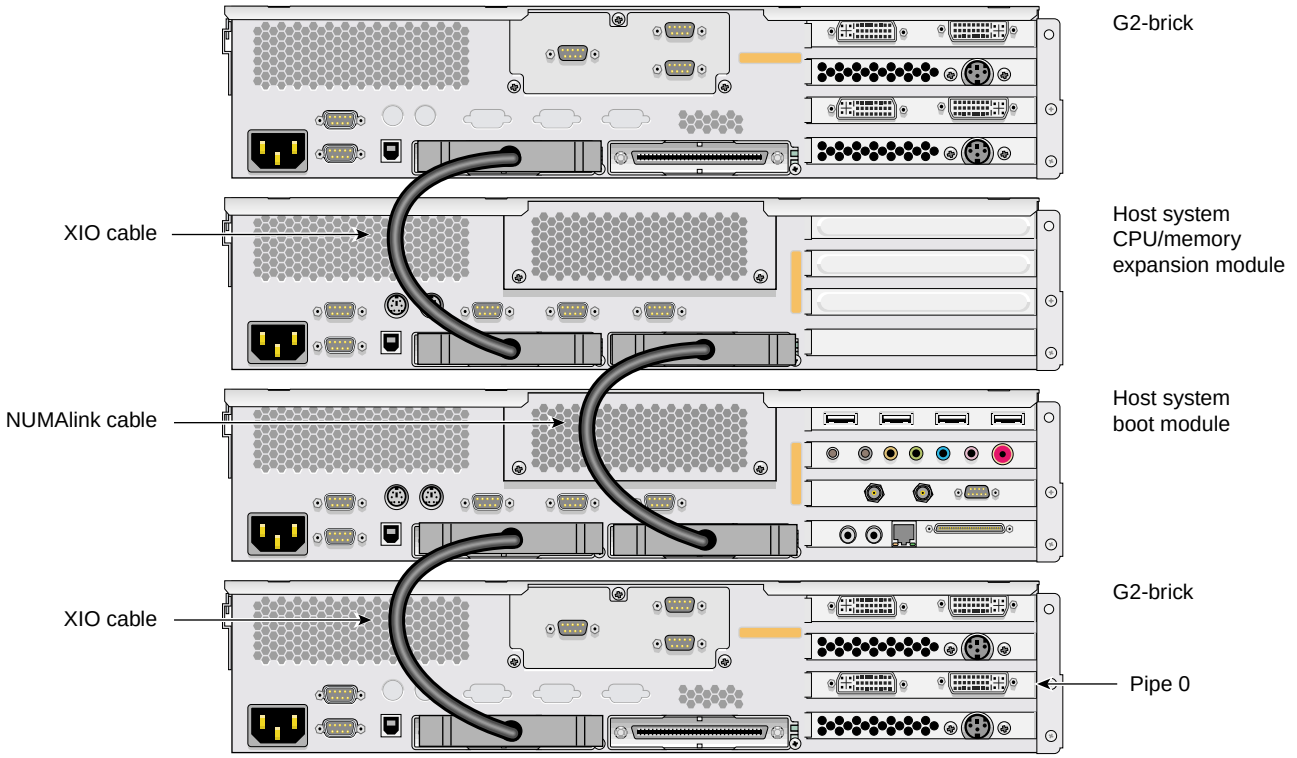

Figure 2-6 Two Host Bricks and Two G2-bricks

Programming L1 Rack and Slot Numbers

Each brick in an Onyx4 system contains a Level 1 controller (L1). This controller should be programmed with the location of the brick in which it is installed. Programming the L1 with the correct rack and slot numbers allows for easier system maintenance and diagnostics, and is necessary for predictable operation of the system.

When a brick is connected to AC power, the L1 display will indicate its position as follows:

There will be a string of the form XXXyZZ (for example, “001c12”).

Decode this string as follows:

“XXX” is the rack number (in this example, rack 001)

“y” is the module type (in this case, c indicates a compute module)

“ZZ” is the “U” number within that rack, counting from the bottom (in this case, slot 12).

If the position indicated on an L1 display is not correct, you should correct it as follows:

1. Connect a serial terminal to the console port on the brick in question.
2. Display the current location setting in the L1:

   ```
   001c12-L1> brick
   rack: 001 slot: 12 partition: 0 type: C source: EEPROM
   ```

   Enter the new rack number:

   ```
   001c12-L1> brick rack 1
   brick rack set to 001
   ```

3. Enter the new slot number:

   ```
   001c12-L1> brick slot 7
   brick slot set to 07
   ```

4. Verify the newly entered information:

   ```
   001c12-L1> brick
   rack: 001 slot: 07 partition: 0 type: C source: EEPROM
   ```

   If other bricks need to be changed, repeat steps 1 through 4 for each additional brick.

NUMA and XIO Cabling

Once the bricks that make up your Onyx4 system are mounted in rack, you will need to connect the bricks together with NUMA and XIO cables.

Using the figure you selected for your system configuration in the previous section as a guide, connect the bricks in your system together with NUMA and XIO cables.

Caution: The connectors on the NUMAlink cables (used for both NUMAlink and XIO connections) are delicate, and must be handled carefully. Use care when removing and replacing these cables.

The SGI Onyx Next Generation Scalable Graphics Platform uses either of two different graphics bricks: a G2-brick (graphics-only) and a G2N-brick (graphics, CPUs, and memory).

Note that the two different styles of graphics bricks (G2 and G2N) attach to their host bricks in different manners.

The Onyx4 G2N-brick uses NUMAlink to attach to a host system.

The Onyx4 G2-brick uses XIO to attach to a host system.

Each host system brick has only one NUMA port and one XIO port.

Once the NUMA and XIO connection have been made, proceed to “PCI Card Locations” on page 21.

PCI Card Locations

Various configurations of the Onyx4 systems may ship with one or more PCI cards. These cards include:

- BaseI/O (IO9) PCI card
- ImageSync PCI card
- Four-port USB PCI card
- Basic or professional PCI sound card

In most cases, these cards will have been installed in the factory. There may be situations, however, where they may be installed or where their positions may be changed in the field.

This section describes the requirements for each of these cards, then shows the preferred location of these PCI cards in the host system.

Requirements for PCI Cards

Some of the PCI cards used with Onyx4 systems have specific requirements that may constrain their placement. Care must be taken that these requirements are met when installing these cards.

Note: The PCI cards described in this section are not installed in the G2-bricks or the G2N-bricks, but are instead installed in PCI slots in the host system.

Requirements for BaseI/O (IO9) PCI Card

The BaseI/O (IO9) PCI card is factory-installed in the certain host systems. It is not a customer-installable option. Though the IO9 card will run at either 33 MHz or 66 MHz, 66 MHz operation is strongly preferred. This means any cards that share a bus with an IO9 card should also be capable of running at 66 MHz.

Requirements for SGI ImageSync PCI Card

The SGI ImageSync PCI card will run at either 33 MHz or 66 MHz. However 66 MHz operation is strongly preferred. This means any cards that share a bus with an ImageSync card should also be capable of running at 66 MHz.

Requirements for Four-Port USB PCI Card

The four-port USB PCI card only runs at 33 MHz. This means any cards that share a bus with this card will also run at only 33 MHz.

Requirements for Basic or Professional Sound Card

The basic or professional PCI sound cards will run at either 33 MHz or 66 MHz. This means these sound cards can share a bus with at least one card that runs only at 33 MHz (in which case all cards in that bus will run at 33 MHz) or the sound cards can share a bus populated only with cards capable of running at 66 MHz (in which case all cards in that bus will run at 66 MHz).

Locations for PCI Cards in Host Systems

The preferred location for the SGI ImageSync PCI card in your host system is bus 1, slot 2 (i.e., the second PCI slot from the bottom).

The preferred location for the basic or professional sound card in your host system is bus 2, slot 1 (i.e., the third PCI slot from the bottom).

The preferred location for the USB card in your host system is bus 2, slot 2 (i.e., the fourth PCI slot from the bottom).

When present, the BaseI/O (IO9) card in your host system will be in bus 1, slot 1 (i.e., the bottom PCI slot).

Note: A BaseIO (IO9) card will always be present in the host system boot module, but may or may not be present in other host system compute modules, depending on configuration.

Figure 2-7 shows the rear panel of a host system with an ImageSync card, a sound card, a USB card, and a BaseI/O card installed in the preferred locations.

Detailed instructions for installing PCI cards may be found in the user's guide that came with your host system.

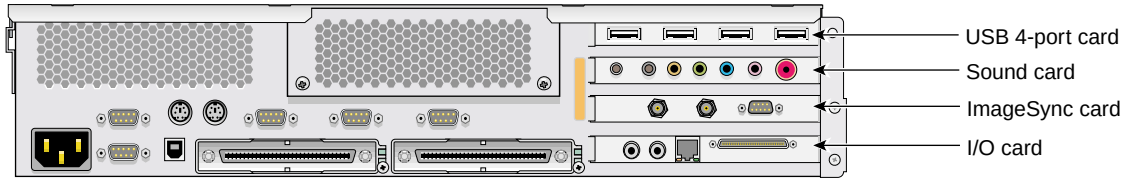

Figure 2-7 Preferred PCI Card Locations in Host System Base Compute Module

Connecting an SGI ImageSync Card to G2-bricks and G2N-bricks

If your Onyx4 system came with an ImageSync card, you will need to connect appropriate cables to each G2-brick or G2N-brick you wish to control.

Figure 2-8 shows the connector locations on an ImageSync card.

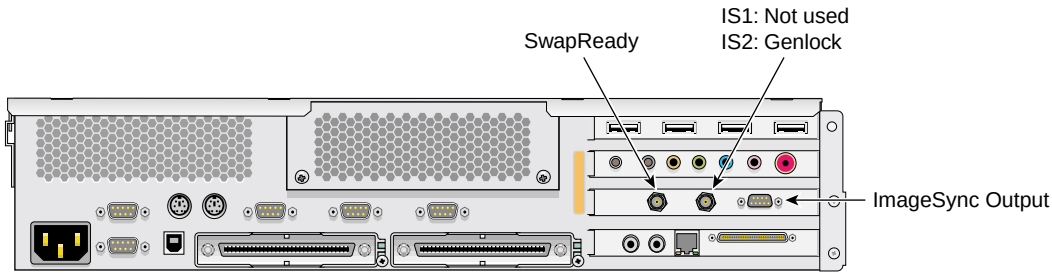

Figure 2-8 SGI ImageSync Card Connectors (Genlock on IS2 Card Only)

ImageSync cabling is described in the following section. Swap ready cabling is described in “Attaching SwapReady Cabling” on page 76. Genlock cabling is described in “Attaching Genlock or Framelock Cabling” on page 78.

Image Sync Cabling Overview

The image sync signal runs from the ImageSync card (installed in the host system) to one of the G2-bricks or G2N-bricks, then from that brick to another G2-brick or G2N-brick, and so on, to each additional graphics brick in the system.

Note: Before configuring the ImageSync card, ensure that you have the latest Onyx4 UltimateVision patch set installed on your system. If necessary, use the `flashsvf` command to upgrade the ImageSync card firmware.

Figure 2-9 shows the ImageSync connector locations on a G2-brick or G2N-brick.

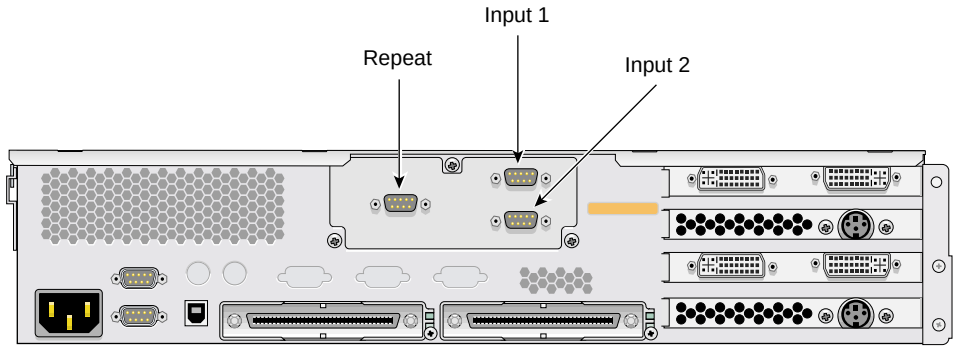

Figure 2-9 ImageSync Connectors on G2-brick and G2N-brick

Connecting ImageSync Cables

Follow these steps to connect your ImageSync cables:

1. Locate a DB9-to-DB9 image-sync cable (part number 018-1126-001).
2. Connect one end of the image-sync cable to the DB9 connector on the ImageSync card in your host system.
3. Connect the other end of the image-sync cable to the upper right (Input 1) image sync DB9 connector on one of the graphics bricks.
4. If you have only one graphics brick, you are done connecting image sync cables.
5. If you have additional graphics bricks, connect another image-sync cable between the left (Repeat) image sync DB9 connector on the last-connected system and the upper right (Input 1) image sync DB9 connector on the next graphics brick.

   Note: There is no required order for the image sync cabling.

6. Repeat step 5 until all graphics bricks are connected via image sync cables.

Figure 2-10 shows an ImageSync card installed in a host system with ImageSync cables connected to three G2-bricks.

Note: Figure 2-10 does not show a complete system, and should not be used as a guide for brick placement. It is intended only to show how the ImageSync cables connect.

Caution: Although the image sync subsystem uses DB9 connectors, these connectors, whether on the ImageSync card or on the G2 and G2N bricks, are not serial ports. Connecting a serial device to these connectors may cause damage to both the ImageSync devices and the serial devices.

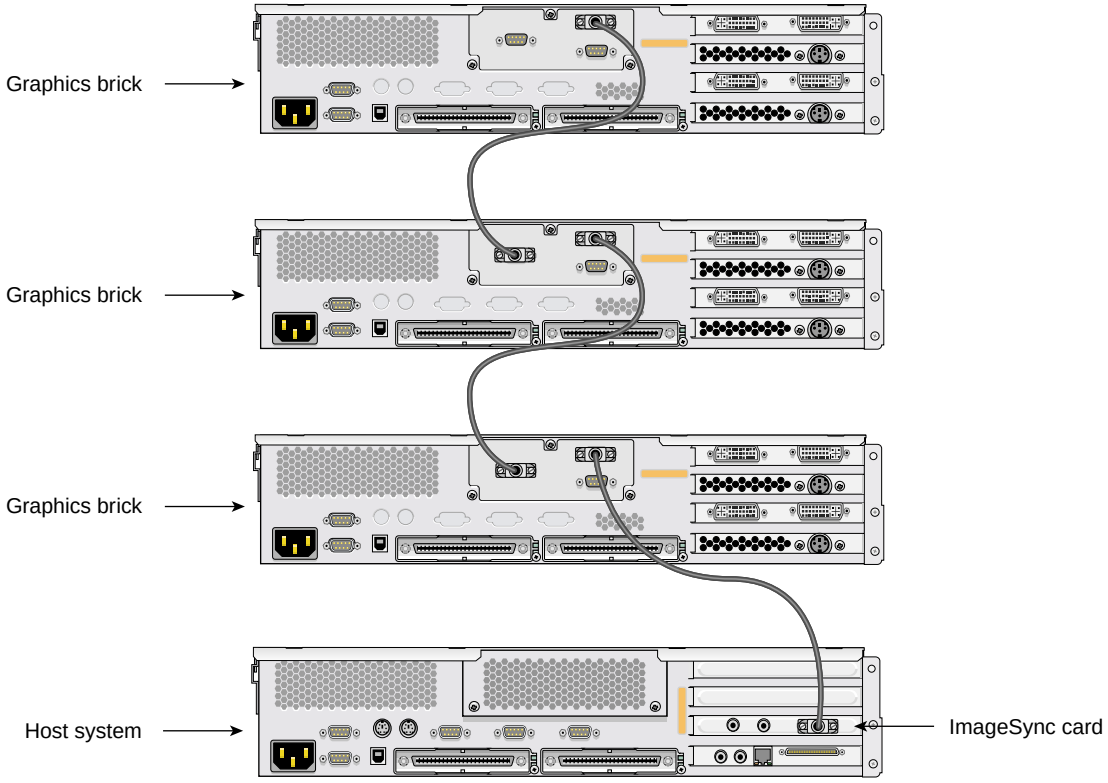

Figure 2-10 Cabling an ImageSync card to G2-bricks and G2N-bricks

Providing Power to G2-bricks and G2N-bricks

G2-bricks and G2N-bricks require AC power (see “Technical Specifications for G2-bricks and G2N-bricks” on page 120 for details). G2-bricks and G2N-bricks will therefore generally plug into a PDU (power distribution unit) at the rear of the rack.

Note: This is different from some other SGI bricks, such as C-bricks, Cx-bricks, IX-bricks, PX-bricks, and others, which receive 48V DC power from a power bay (a separate module that converts AC power to 48V DC).

Figure 2-11 shows the AC input location for the SGI Onyx4 G2-brick and the G2N-brick.

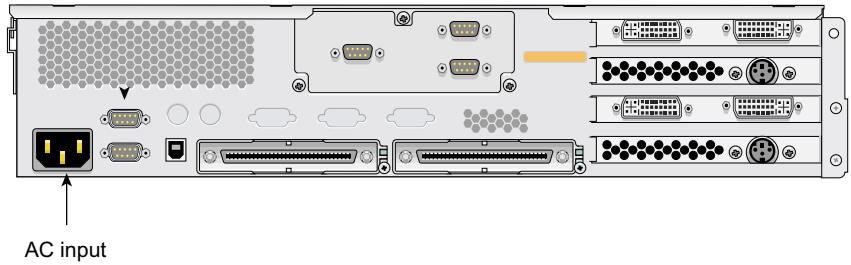

Figure 2-11 SGI Onyx4 G2-brick and G2N-brick AC Input

If your Onyx4 system is not installed in a rack, provide power as shown in Figure 2-1 on page 12.

If your Onyx4 system is installed in a rack, provide power as shown in Figure 2-12 on page 29.

Note: Figure 2-12 is intended only to present an example of power-cable routing, and should not be used as a guide to rack positioning of chassis. For information about rack positioning, see “Selecting Rack Locations” on page 11.

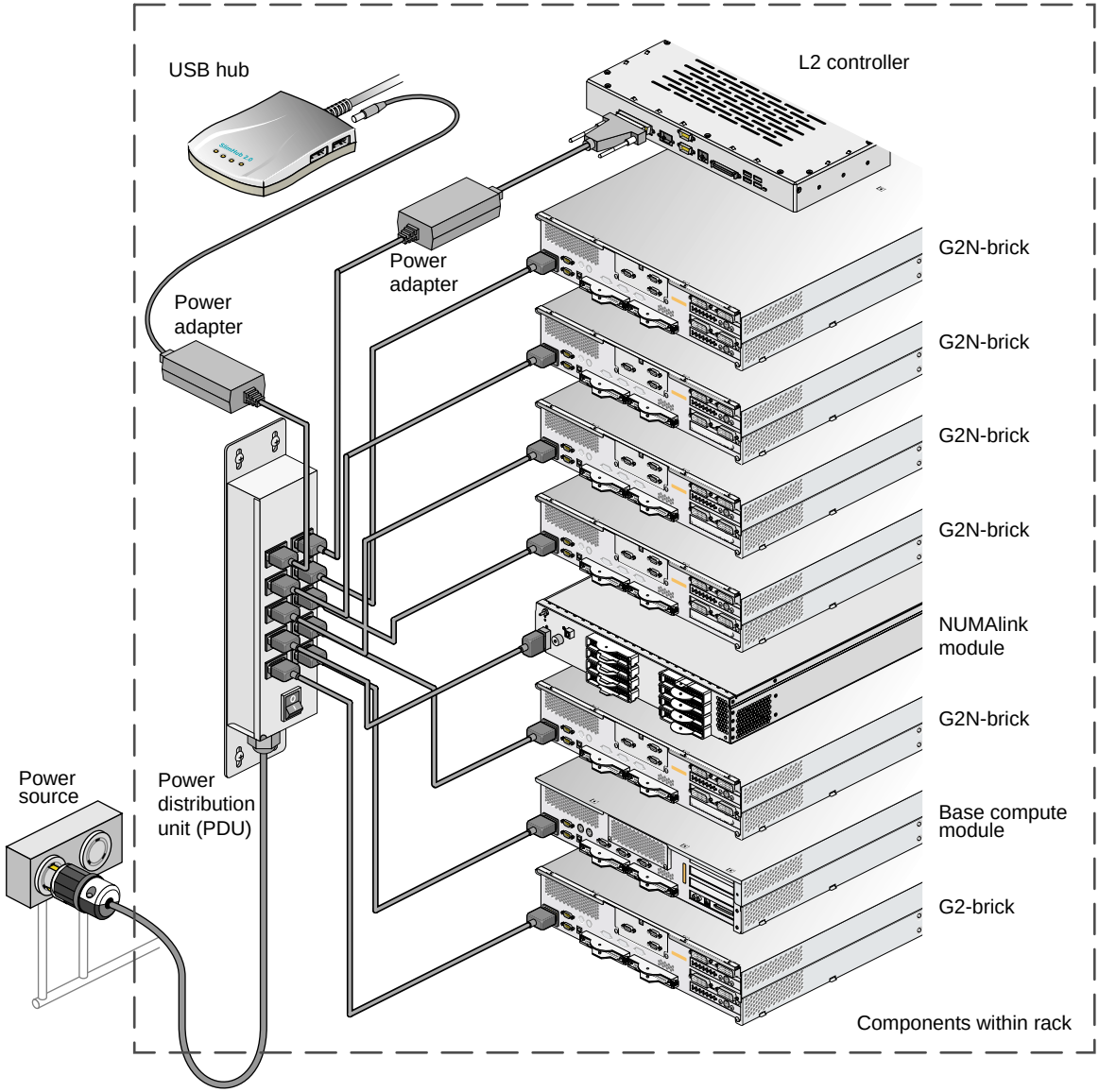

Figure 2-12 Connecting an Onyx4 Racked System to Power

Attaching a Serial Terminal to an Onyx4 System

If your Onyx4 system was shipped in a rack with a Level 2 controller, you should connect a serial terminal to that Level 2 controller, which is located in the top of the rack as shown in Figure 2-13 (this view shows the back of the rack).

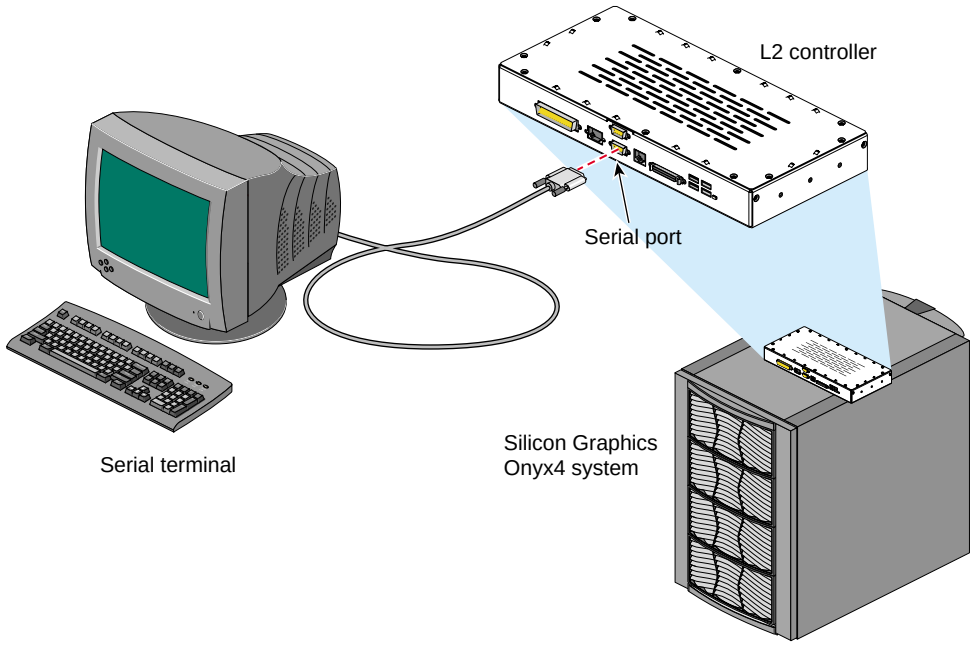

Figure 2-13 Connecting a Serial Terminal to an L2 Controller

If your Onyx4 system was shipped in a rack without a Level 2 controller, or was shipped as individual chassis, you should connect a serial terminal to the Level 1 controller contained in the host system master CPU brick as shown in Figure 2-14.

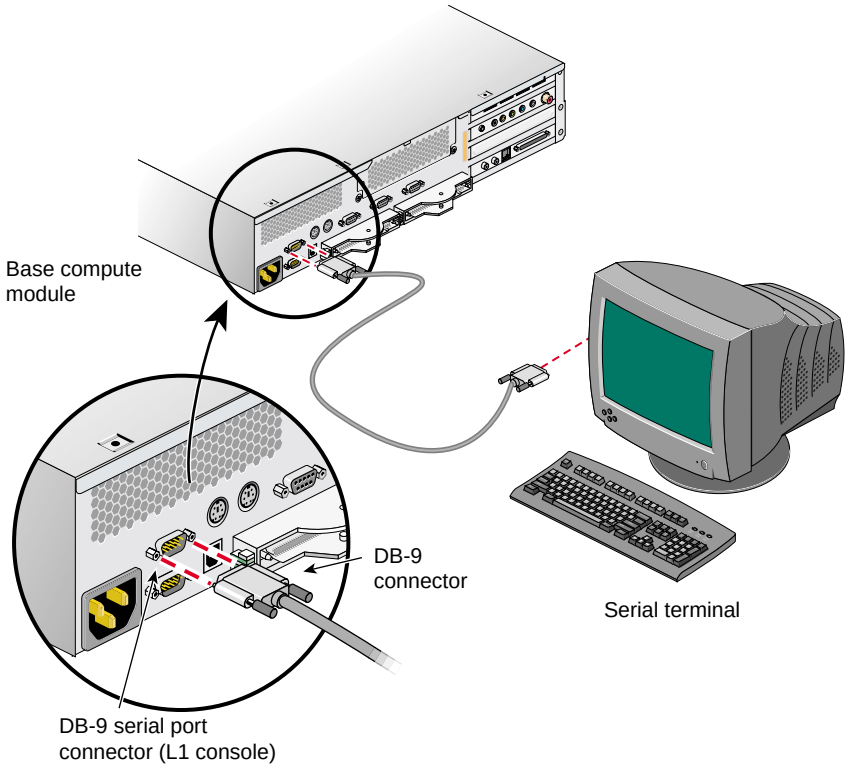

Figure 2-14 Connecting a Serial Terminal to an L1 Controller

Powering and Booting an Onyx4 System from a Serial Terminal

The power up procedure varies, depending on whether your serial terminal is connected to an L1 system controller or an L2 system controller. Refer to the appropriate section below.

Powering and Booting From an L1 System Controller

Power up your Onyx4 system from a serial terminal connected to the L1 system controller on the master CPU as follows:

1. At the system controller prompt, type:

   ```
   003c01-L1> * pwr u
   ```

2. To see the IRIX OS console output, type Control-D:

   ```
   003c01-L1> <ctrl>-D
   ```

3. If these commands result in an error message, reset the system:

   ```
   003c01-L1> reset
   ```

Once the system is powered up, it will automatically boot to the IRIX OS and a login screen will appear on the attached graphics monitor(s).

Powering and Booting From an L2 System Controller

Power up your Onyx4 system from the serial terminal connected to an L2 system controller as follows:

1. At the system controller prompt, type:

   ```
   001-10.17.168.102-L2> pwr u
   ```

2. To see the IRIX OS console output, type Control-D:

   ```
   001-10.17.168.102-L2> <ctrl>-D
   ```

Once the system is powered up, it will automatically boot to the IRIX OS and a login screen will appear on the attached graphics monitor(s).

Verifying System Connections

Once your system is installed in a rack (or otherwise situated), is cabled together via NUMAlink and/or XIO, and is powered on, you should verify that all G2-bricks and G2N-bricks are being seen by IRIX.

To do this, follow these steps:

1. From an IRIX prompt, run the `hinv` command:

   ```
   [1%] hinv
   ```

2. Count the number of lines in the hinv output similar to the following:

   ```
   Graphics board: SG2
   ```

3. For each G2-brick or G2N-brick there should be two such lines. If you do not see the correct number of lines, refer to the Appendix A, “Troubleshooting and Replacing Parts”.

Setting Up Your Onyx4 System

This chapter describes how to set up your SGI Onyx4 system. Before following the instructions in this chapter, your system should be assembled and bootable, all G2-bricks and G2N-bricks should be properly mounted (typically in a rack) and connected to the host system, and `hinv` should show all graphics pipes.

This will be the case if you purchased your system preconfigured from SGI. Otherwise you should assemble your system by following the instructions in Chapter 2, “Assembling an Onyx4 System”.

IRIX Operating System Version Requirements

This section guides you through the process of determining if the version of the IRIX operating system installed on your host system is suitable for use with the SGI Onyx4 system.

Note: Although some Onyx4 systems were shipped with earlier versions of IRIX, SGI strongly recommends that in order to get the best performance from your Onyx4 systems you upgrade them to at least IRIX version 6.5.22 with patch 5448, IRIX version 6.5.23 with patch 5448, or IRIX version 6.5.24.

To determine your IRIX version, type the following at an IRIX prompt:

```
[1%] uname -R
6.5 6.5.24m
```

Depending on the output of this command, go to the appropriate section below.

If Your System Is Running IRIX 6.5.21 or Earlier

If your system is running IRIX version 6.5.21 or earlier, you should upgrade your operating system to at least IRIX version 6.5.22 with patch 5448, IRIX version 6.5.23 with patch 5448, or IRIX version 6.5.24.

If Your System Is Running IRIX 6.5.22 or IRIX 6.5.23

If your system is running IRIX version 6.5.22 or IRIX version 6.5.23, you should also be running patch 5448.

To determine if you have patch 5448 installed, type the following at an IRIX command prompt:

```
[3%] versions patchSG0005448
```

If the output of this command is simply the headings “Name,” “Date,” and “Description,” you do not have patch 5448 installed. This patch should be installed (or you should upgrade your system to IRIX version 6.5.24 or later) in order to get the best performance from your Onyx4 system.

If the output of this command includes items below the Name-Date-Description heading, you do have patch 5448 installed, and your system is suitable for use with Onyx4 graphics.

You may use this method to determine if you have other patches installed. Simply substitute the other patch number for 5448.

If Your System Is Running IRIX 6.5.24

If your system is running IRIX version 6.5.24 or later, your operating system is suitable for use with the SGI Onyx4 system.

Regenerating the XF86Config-4 File After Hardware Changes

Many details of the graphics system in an Onyx4 are controlled by the `/etc/X11/XF86Config-4` file.

After adding or removing a G2-brick or G2N-brick, it may be necessary to regenerate your `XF86Config-4` file. Depending on the settings of two variables, this might be done automatically or may need to be done manually. Both methods are described in this section.

Automatic Regeneration of the XF86Config-4 File

Two `chkconfig` variables control the automatic regeneration of the `XF86Config-4`. These are *`xf86config-autoconfig`* and *`xf86config-autoreplace`*. The settings of these variables on a particular system may be displayed by running the `chkconfig` command as follows:

```
[1%] /etc/chkconfig
```

The default value for *`xf86config-autoconfig`* is *on*. The default value for *`xf86config-autoreplace`* is *off*.

When the system boots (or the init level is changed in any other manner) the setting of the *`xf86config-autoconfig`* variable is consulted. If this variable is set to *on*, the `/etc/X11/gen-XF86Config` script is run.

If the `gen-XF86Config` script detects no hardware changes, it does nothing.

If any graphics hardware not listed in the existing `XF86Config-4` file is detected, a new file named `XF86Config-4.N` is created, containing the new hardware. The existing `XF86Config-4` file is left unchanged. The graphics system will still start this way (though some graphics pipes will not be active). The user can then choose to manually replace the old `XF86Config-4` file with the new `XF86Config-4.N` file and reboot.

If some graphics hardware listed in the existing `XF86Config-4` file is no longer detected, the existing `XF86Config-4` is renamed `XF86Config-4.O`, and a new `XF86Config-4` file is written in its place. This allows the graphics system to start, which it would not do if the `XF86Config-4` file listed graphics hardware no longer present in the system.

After the **`gen-XF86Config`** script is completed, the setting of the *`xf86config-autoreplace`* variable is consulted. If this variable is set to *on*, the system looks for a `XF86Config-4.N` file. If this file is found, the `XF86Config-4` is renamed `XF86Config-4.O`, and the `XF86Config-4.N` file is renamed to `XF86Config-4`.

Manually Regenerating the XF86Config-4 File

To manually regenerate the `XF86Config-4` file, follow these steps:

1. Stop graphics:

   # /usr/gfx/stopgfx

2. Make a backup copy of the XF86Config-4 file:

   # mv /etc/X11/XF86Config-4 /etc/X11/XF86Config-4.bak

3. Regenerate your XF86Config-4 file:

   # /etc/X11/gen-XF86Config

4. Restart graphics:

   # /usr/gfx/startgfx

If there are no graphics hardware changes, this procedure will do nothing.

If any graphics hardware not listed in the existing `XF86Config-4` file is detected, a new file named `XF86Config-4.N` is created, containing the new hardware. The existing `XF86Config-4` file is left unchanged. The graphics system will still start this way (though some graphics pipes will not be active). The user can then choose to manually replace the old `XF86Config-4` file with the new `XF86Config-4.N` file and reboot.

If some graphics hardware listed in the existing `XF86Config-4` file is no longer detected, the existing `XF86Config-4` is renamed `XF86Config-4.O`, and a new `XF86Config-4` file is written in its place. This allows the graphics system to start, which it would not do if the `XF86Config-4` file listed graphics hardware no longer present in the system.

Note: The `XF86Config-4` file generated by this procedure provides a good starting point. To take advantage of additional features, the file may be customized, as described in “Modifying Configuration Files” on page 41.

Note: Systems with more than 10 graphics pipes require multiple X servers. For more information, see “Configuring an Onyx4 System for Multiple X servers” on page 42.

Modifying Configuration Files

Much of the functionality of the Onyx4 system is controlled by contents of configuration files, such as the `/etc/X11/XF86Config-4` file.

This section describes the following topics:

Configuring an Onyx4 System for Multiple X servers

Onyx4 systems may be configured for use with multiple X servers, where each X server has a keyboard, a mouse, and one or more displays. This configuration is done by creating a distinct `XF86Config-4` file for each desired X server, as described in this section.

Each X server can support a maximum of 10 graphics pipes. Systems with more than 10 pipes must therefore be configured with multiple X server, though smaller configurations may be configured.

1. Make a backup copy of the `/etc/ioconfig.conf` file:

   ```
   # cp /etc/ioconfig.conf /etc/ioconfig.conf.bak
   ```

2. Remove all keyboard and mouse entries from the `/etc/ioconfig.conf` file.
3. Attach all keyboards and mice to be used (see "Attaching Keyboards and Mice to an Onyx4 System" on page 70).
4. Use `ioconfig` to create links for all keyboards and mice:

   ```
   # /sbin/ioconfig -f /hw
   ```

5. Look in the `/dev/input*` directories to verify that links were created for each keyboard and mouse.
6. Make a copy of the `/etc/X11/XF86Config-4` file for each X server to be run, appending "`.server`*N*" to each file. For example, for a four-server system:

   ```
   # cp /etc/X11/XF86Config-4 /etc/X11/XF86Config-4.server0
   # cp /etc/X11/XF86Config-4 /etc/X11/XF86Config-4.server1
   # cp /etc/X11/XF86Config-4 /etc/X11/XF86Config-4.server2
   # cp /etc/X11/XF86Config-4 /etc/X11/XF86Config-4.server3
   ```

7. Edit the `XF86Config-4.server0` file to point to the correct mouse:

   In the core pointer "InputDevice" section (not the core keyboard "InputDevice" section), replace the line:

   ```
   Option "Device" "/dev/mouse"
   ```

   with:

   ```
   Option "Device" "/dev/input/mouse"
   ```

8. Repeat step 7 for each of the `XF86Config-4.server`*N* files, but this time replace the line with:

   ```
   Option "Device" "/dev/input<N>/mouse"
   ```

   where *N* is the server number.

9. For each of the `XF86Config-4.server`*N* files, edit the Device Section, Screen Section, and Server Layout Section to reflect the pipes that are to be managed by that particular X server.
10. Create a file named `/var/X11/xdm/Xservers.`*N*`key` (where *N* is the number of X servers to be run) and add a line associating each keyboard with an X server, as demonstrated in Example 3-1 on page 43 for a system running six X servers.
11. Edit the `/var/X11/xdm/xdm-config` file to point to the new `Xservers.`*N*`key` file.

    Replace the line:

    ```
    DisplayManager.servers:      /var/X11/xdm/Xservers
    ```

    with:

    ```
    DisplayManager.servers:      /var/X11/xdm/Xservers.Nkey
    ```

    where *N* is the number of X servers to be run.
12. Stop and restart graphics:

    ```
    # /usr/gfx/stopgfx
    # /usr/gfx/startgfx
    ```

Example 3-1 Example `/var/X11/xdm/Xservers.6key` File

```
:0 secure /usr/bin/X11/X :0 -xf86config /etc/X11/XF86Config-4.server0 -devdir /dev/input
:1 secure /usr/bin/X11/X :1 -xf86config /etc/X11/XF86Config-4.server1 -devdir /dev/input1
:2 secure /usr/bin/X11/X :2 -xf86config /etc/X11/XF86Config-4.server2 -devdir /dev/input2
:3 secure /usr/bin/X11/X :3 -xf86config /etc/X11/XF86Config-4.server3 -devdir /dev/input3
:4 secure /usr/bin/X11/X :4 -xf86config /etc/X11/XF86Config-4.server4 -devdir /dev/input4
:5 secure /usr/bin/X11/X :5 -xf86config /etc/X11/XF86Config-4.server5 -devdir /dev/input5
```

Configuring an Onyx4 System for Stereo

This section describes how to configure an Onyx4 system to display stereo images.

Note: Stereo sync is supported only on systems running IRIX version 6.5.21 with patch 5208, or running IRIX version 6.5.22 or later. However SGI recommends that in order to get the best performance from your Onyx4 system you upgrade to at least IRIX version 6.5.22 with patch 5448. To determine the IRIX version running on your system, see "IRIX Operating System Version Requirements" on page 36.

Note: Simultaneously running stereo and full scene anti-aliasing can require more graphics-card memory than is available, and thus may not work correctly.

---

1. Create a copy of the `XF86Config-4` file to be customized for stereo:

   ```
   # cp /etc/X11/XF86Config-4 /etc/X11/XF86Config-4.Stereo
   ```

2. Edit the `XF86Config-4.Stereo` file to include the following line at the end of each "Device" section:

   ```
   Option "Stereo"           "1"
   Option "StereoSyncEnable" "1"
   ```

   (see the example "Device" section in Example 3-2 on page 46).

3. Edit the `XF86Config-4.Stereo` file to include the appropriate stereo modes in the "Monitor" section:

   a. Create an appropriate mode (for samples modes, see Example 3-3 on page 46).

   b. Add that mode to the "Monitor" section of your `XF86Config-4.Stereo` file (see the example "Monitor" section in Example 3-4 on page 46).

   Note: "Mode" and "Modeline" are two alternative formats used to present the same information.

   ---

4. Ensure that the monitor supports the high horizontal sync rate setting. Refer to the documentation for the monitor to determine the horizontal sync rate. Modify the HorizSync setting in the "Monitor" section of the `XF86Config-4.Stereo` file. For example:

   ```
   HorizSync   22-105
   ```

5. Modify the “Screen” section so that you use the appropriate mode setting. For example:

   ```
   Modes   "1280x1024@96"
   ```

   (see the example “Screen” section in Example 3-5 on page 46).

6. Create a new `/var/X11/xdm/Xservers.Stereo` file containing the following line:

   ```
   :0 secure /usr/bin/X11/X :0 -xf86config /etc/X11/XF86Config-4.Stereo
   ```

7. Edit the `/var/X11/xdm/xdm-config` file to point to the new Xservers file:

   Replace the line:

   ```
   DisplayManager.servers: /var/X11/xdm/Xservers
   ```

   with:

   ```
   DisplayManager.servers: /var/X11/xdm/Xservers.Stereo
   ```

8. Stop and restart graphics:

   ```
   # /usr/gfx/stopgfx
   # /usr/gfx/startgfx
   ```

Note: A stereo sync signal will not be present until you run a stereo application. One such application is `ivview`. To use `ivview` to test the stereo configuration, run:
`ivview /usr/share/data/models/X29.iv`
and right click to activate the stereo setting on the preferences pane.

Example 3-2 Example “Device” Section for Stereo

```
Section "Device"
    Identifier  "SGI SG-0"
    Driver      "fglrx"
    BusId       "PCI:2:0:0"
# === QBS Management ===
    Option "Stereo"           "1"
    Option "StereoSyncEnable" "1"
EndSection
```

Example 3-3 Sample Stereo Mode Entries

```
Modeline "1024x768@96" 103.5  1024 1050 1154 1336  768 771 774 807
Modeline "1280x1024@96" 163.28  1280 1300 1460 1600  1024 1027 1033 1063
Modeline "1024x768@100" 113.309 1024 1096 1208 1392 768 769 772 814
Modeline "1024x768@120" 139.054 1024 1104 1216 1408 768 769 772 823 +hsync +vsync
Modeline "1280x1024@100" 190.960 1280 1376 1520 1760 1024 1025 1028 1085 +hsync +vsync
Mode "1280x1024_96s_mirage"
    DotClock       152.928
    HTimings       1280 1330 1390 1500
    VTimings       1024 1026 1030 1062
EndMode
```

Example 3-4 Example “Monitor” Section for Stereo

```
Section "Monitor"
    Identifier  "Stereo Monitor"
    HorizSync   30-96      # multisync
    VertRefresh 50-160     # multisync
    Modeline "1024x768@96" 103.5  1024 1050 1154 1336  768 771 774 807
EndSection
```

Example 3-5 Example “Screen” Section for Stereo

```
Section "Screen"
    Identifier          "Screen SG-0"
    Device              "SGI SG-0"
    Monitor             "Stereo Monitor"
    DefaultDepth         24
    SubSection          "Display"
        Depth   24
        Modes   "1280x1024@96"
    EndSubSection
EndSection
```

Configuring an Onyx4 System for Full Scene Anti-Aliasing

This section describes how to configure an Onyx4 system for global or per-window full scene anti-aliasing.

Note: Simultaneously running stereo and full scene anti-aliasing can require more graphics-card memory than is available, and thus may not work correctly.

---

1. Create a copy of the `XF86Config-4` file to be customized for full scene anti-aliasing:

   ```
   # cp /etc/X11/XF86Config-4 /etc/X11/XF86Config-4.AntiAlias
   ```

   Note: Automatically generated `XF86Config-4` files should contain the customized multi-sample positions shown in Example 3-6 on page 48. If these values are not already present, adding them will significantly improve the quality of your output.

   ---

2. Edit the `XF86Config-4.AntiAlias` file to include the following line at the end of each "Device" section:

   ```
   Option "FSAAScale" "X"
   ```

   where *X* is 1, 2, 4, or 6 (see the example "Device" section in Example 3-6 on page 48).

   Note: Per-window full scene anti-aliasing is accomplished by setting "FSAAScale" to 1. The anti-aliasing level may then be set by the appropriate selection of visuals.
   Global anti-aliasing is accomplished by setting "FSAAScale" to 2, 4, or 6. In this case, the setting will apply to all OpenGL windows, regardless of the visual being displayed.

   ---

3. Create a new `/var/X11/xdm/Xservers.AntiAlias` file containing the following (all on one line):

   ```
   :0 secure /usr/bin/X11/X :0 -xf86config
   /etc/X11/XF86Config-4.AntiAlias
   ```

4. Edit the `/var/X11/xdm/xdm-config` file to point to the new Xservers file:

   Replace the line:

   ```
   DisplayManager.servers: /var/X11/xdm/Xservers
   ```

   with:

   ```
   DisplayManager.servers: /var/X11/xdm/Xservers.AntiAlias
   ```

5. Stop and restart graphics:

```
# /usr/gfx/stopgfx
# /usr/gfx/startgfx
```

Example 3-6 Example “Device” Section for Full Scene Anti-Aliasing

```
Section "Device"
    Identifier  "SGI SG-0"
    Driver      "fglrx"
    BusId       "PCI:2:0:0"
# === FSAA Management ===
    Option "FSAAScale"                  "1"
    Option "FSAADisableGamma"           "no"
    Option "FSAACustomizeMSPos"         "yes"
    Option "FSAAMSPosX0"                "0.250000"
    Option "FSAAMSPosY0"                "0.416666"
    Option "FSAAMSPosX1"                "0.083333"
    Option "FSAAMSPosY1"                "0.083333"
    Option "FSAAMSPosX2"                "0.416666"
    Option "FSAAMSPosY2"                "0.750000"
    Option "FSAAMSPosX3"                "0.750000"
    Option "FSAAMSPosY3"                "0.916666"
    Option "FSAAMSPosX4"                "0.583333"
    Option "FSAAMSPosY4"                "0.250000"
    Option "FSAAMSPosX5"                "0.916666"
    Option "FSAAMSPosY5"                "0.583333"
EndSection
```

Configuring an Onyx4 System for Dual-Channel

To configure an Onyx4 system for dual-channel operation, follow the steps in this section.

Note: If any pipes managed by an X server have their second channel enabled, then every pipe managed by that X server must have its second channel enabled.

Note: Both channels on a pipe must have the same display resolution.

1. Create a copy of the XF86Config-4 file to be customized for dual-channel operation:

   ```
   # cp /etc/X11/XF86Config-4 /etc/X11/XF86Config-4.DualChannel
   ```

2. Edit the `XF86Config-4.DualChannel` file to include the following line at the end of each “Device” section:

   ```
   Option "DesktopSetup" mode
   ```

   where *mode* is one of the following:

   ```
   "0x00000100" [this mode clones the managed area]
   "0x00000200" [this mode scales the managed area by 2 horizontally]
   "0x00000300" [this mode scales the managed area by 2 vertically]
   ```

   (see the example “Device” section in Example 3-7 on page 50).

   Note: All pipes managed by the same X server must be set to the same mode.

   Note: See “Using Both DVI Channels on a Card” on page 63 for important limitations on the use of digital monitors.

3. When using monitors or monitor cables which do not conform to the VESA Display Data Channel (DDC) standard, append the following entry in the “Device” section to enable proper display configuration:

   ```
   Option "NoDDC" "on"
   ```

4. Create a new `/var/X11/xdm/Xservers.DualChannel` file containing the following line:

   ```
   :0 secure /usr/bin/X11/X :0 -xf86config
   /etc/X11/XF86Config-4.DualChannel
   ```

5. Edit the `/var/X11/xdm/xdm-config` file to point to the new Xservers file:

   Replace the line:

   ```
   DisplayManager.servers: /var/X11/xdm/Xservers
   ```

   with:

   ```
   DisplayManager.servers: /var/X11/xdm/Xservers.DualChannel
   ```

6. Stop and restart graphics:

   ```
   # /usr/gfx/stopgfx
   # /usr/gfx/startgfx
   ```

Example 3-7 Example “Device” Section for Dual Channel

```
Section "Device"
    Identifier  "SGI SG-0"
    Driver      "fglrx"
    BusId       "PCI:2:0:0"
    Option      "DesktopSetup" "0x00000200"
EndSection
```

Configuring an Onyx4 System for SwapReady

To configure an Onyx4 system for SwapReady, it must first be enabled in all pipe connected to a particular ImageSync board, as described in these steps:

1. On the screen 0 desktop, open a winterm.
2. Within that winterm, run `xsetmon`, setting the target to the pipe you are configuring and setting the display to screen 0. For example:

   ```
   # xsetmon -target :0.1 -display :0.0
   ```

   would start the GUI on screen 0 to configure pipe 1.
3. Click the two radio buttons on the GUI main menu:

   ```
   Swap Buffers on Vertical Blank: On
   GLX Swap Barrier Extension: On
   ```
4. Save the configuration by clicking the **Load** button.
5. Repeat steps 1 through 4 for each additional pipe connected to the same ImageSync board.
6. Log out from the desktop, then log back on.

Configuring an Onyx4 System for External Genlock or Framelock

External genlock and framelock may be used with ImageSync2 cards, but not with ImageSync1 cards. To determine the version of an ImageSync card, see “Determining ImageSync Card Version” on page 77.

To configure an Onyx4 system to receive an external genlock or framelock signal you must run the `setmon` command with the appropriate options.

Before running setmon, use `printenv DISPLAY` to ensure that the DISPLAY environment variable is set to the local system (for example, :0.0). If it is not, use `setenv DISPLAY :0.0` to change it (substituting other numbers for :0.0 if appropriate).

To set the system for genlock, execute the following command:

`# setmon -p`*pipenumber* `-g` *graphicsformat*

where *pipenumber* is the pipe to which this setting should be applied, and *graphicsformat* is one of the timings (modes) listed in the “Monitor” section of the `/etc/X11/XF86Config-4` file.

To set the system for framelock, execute the following command:

`# setmon -p`*pipenumber* `-L`*videoformat* *graphicsformat*

where *pipenumber* is the pipe to which this setting should be applied, *videoformat* is the input video format to be used as a framelock source, and *graphicsformat* is one of the framelock-certified timings (modes) listed in the “Monitor” section of the `/etc/X11/XF86Config-4` file that is compatible with the chosen input video format (Table 3-1 provides a list of compatible formats).

Note: The default behavior of `setmon` is to load the new format for the current session only and to prompt for input to determine if the format should be saved as the default. To save the new format as the default you must be logged in as root.

For more information about the `setmon` command, see the `setmon` manual page (`man setmon`).

Note: Framelock-certified timings will include an “f” appended to their name (i.e., “1280x1024_5994f” is certified for NTSC (525 line) video timing).

Note: Some of the ImageSync2 features documented in this guide require at least IRIX version 6.5.24 and patch 5585. To determine the IRIX version and patch level running on your system, see “IRIX Operating System Version Requirements” on page 36.

Table 3-1 Framelock Source Format to Graphics Format Compatibility

Input Video Format (Framelock Source)	Format Name	Compatible Graphics Formats
525 line at 59.94Hz (NTSC)	525 (or use the alias NTSC)	1280x1024_5994f 1920x1154_5994f
625 line at 50Hz (PAL)	625 (or use the alias PAL)	1280x1024_50f 1920x1154_50f
720-line progressive-scan at 59.94Hz	720p_5994	1920x1154_5994f
720-line progressive-scan at 60Hz	720p_60	1280x1024_60f 1920x1154_60f 1920x1200_60f
1080-line progressive-scan at 25Hz	1080p_25	1280x1024_50f 1920x1154_50f
1080-line interlaced at 25Hz	1080i_25	1280x1024_50f 1920x1154_50f
1080-line progressive-scan at 29.97Hz	1080p_2997	1920x1154_5994f
1080-line interlaced at 29.97Hz	1080i_2997	1920x1154_5994f
1080-line progressive-scan at 30Hz	1080p_30	1280x1024_60f 1920x1154_60f 1920x1200_60f
1080-line interlaced at 30Hz	1080i_30	1280x1024_60f 1920x1154_60f 1920x1200_60f

Configuring Monitor Positions

When an X-Server is managing multiple monitors, it needs to know their relative positions in order to properly handle cursor cross-over locations.

The monitor positions are specified in the “ServerLayout” section of the `/etc/X11/XF86Config-4` file as follows:

Each screen is listed, followed by a list of the four screens above, below, to the left, and to the right of it (in that order). Figure 3-1 and Example 3-8 show an example of four monitors arranged in a line. Figure 3-2 and Example 3-9 show an example of four monitors arranged in a square.

Figure 3-1 Four Monitors in a Line

Example 3-8 Example “ServerLayout” Section for Four Monitors in a Line

```
Section "ServerLayout"
    Identifier  "Four-in-a-Line"
    Screen "Screen SG-0"        ""      ""      ""      "Screen SG-1"
    Screen "Screen SG-1"        ""      ""      "Screen SG-0"   "Screen SG-2"
    Screen "Screen SG-2"        ""      ""      "Screen SG-1"   "Screen SG-3"
    Screen "Screen SG-3"        ""      ""      "Screen SG-2"   ""
    InputDevice "Mouse1" "CorePointer"
    InputDevice "Keyboard1" "CoreKeyboard"
EndSection
```

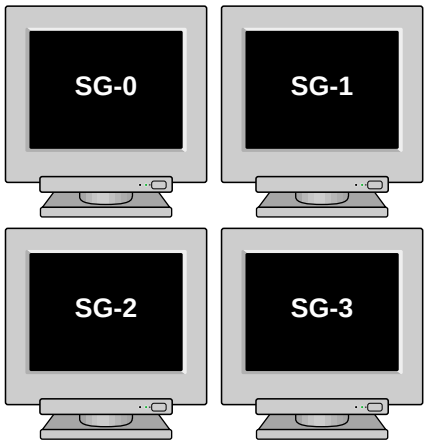

Figure 3-2 Four Monitors in a Square

Example 3-9 Example “ServerLayout” Section for Four Monitors in a Square

```
Section "ServerLayout"
    Identifier  "Four-in-a-Square"
    Screen "Screen SG-0"        ""      "Screen SG-2"      ""      "Screen SG-1"
    Screen "Screen SG-1"        ""      "Screen SG-3"      "Screen SG-0"   ""
    Screen "Screen SG-2"        "Screen SG-0"      ""      ""   "Screen SG-3"
    Screen "Screen SG-3"        "Screen SG-1"      ""      "Screen SG-2"   ""
    InputDevice "Mouse1" "CorePointer"
    InputDevice "Keyboard1" "CoreKeyboard"
EndSection
```

Configuring Monitor Types

Onyx4 systems support both analog and digital monitors. The type of monitor connected to each graphics card is specified in the "Device" sections of the `/etc/X11/XF86Config-4` file.

Note: See "Using Both DVI Channels on a Card" on page 63 for important limitations on the use of digital monitors.

Table 3-2 lists the allowable options for the MonitorLayout line. If the line is not present, both channels default to AUTO.

Table 3-2 Options for MonitorLayout Line

Monitor Type	Meaning
AUTO	Automatically select monitor type (default)
TMDS	Digital monitor
CRT	Analog monitor
NONE	No monitor

The format is:

```
Option      "MonitorLayout" "channel1type, channel2type"
```

where *channel1type* is the type (AUTO, TMDS, CRT or NONE) of monitor attached to channel 1 (the left DVI-I connector) for this pipe, and
channel2type is the type (AUTO, TMDS, CRT or NONE) of monitor attached to channel 2 (the right DVI-I connector) for this pipe.

Example 3-10 Example "Device" Section for Use With Two Analog Monitors

```
Section "Device"
    Identifier  "SGI SG-0"
    Driver      "fglrx"
    BusId       "PCI:2:0:0"
    Option      "MonitorLayout" "CRT, CRT"
EndSection
```

Selecting the Screen on Which a Program Runs

During an interactive session with the Window Manager, you can use the `DISPLAY` environment variable to control where a newly-started graphics programs will run. When the `DISPLAY` variable is set to *:0.0*, programs you start will run on the first Xserver (server 0) and the first pipe (pipe 0) on that server; when it is set to *:0.1*, programs you start will run on the first Xserver (server 0) and the second pipe (pipe 1) on that server.

For convenience, the default startup files (`.login`, `.profile`) for `root` and `guest` shells set the `DISPLAY` variable to a reasonable initial value if it is not already set. Each screen has a toolchest that can be used to invoke graphics programs. Each toolchest has the `DISPLAY` variable in its environment set to the correct value for the screen on which it appears, so any application you invoke from a toolchest inherits this `DISPLAY` value, and thus appears on the same screen as the toolchest from which it was invoked.

Similarly, programs started by clicking on an icon appear on the screen from which you invoked them.

Once a program has been launched, it is not possible to move it from one screen to another.

Configuring Multiple Keyboards and Mice

The `ioconfig(1m)` command establishes logical device numbers for each keyboard and mouse in an Onyx4 system. When the system first initializes the USB hardware, it scans each USB bus looking for devices. Initially, these devices are assigned a device ID of -1. Later in the boot process, the `ioconfig(1m)` command assigns device IDs based on the contents of the file `/etc/ioconfig.conf`.

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

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

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

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

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

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

The controller prefix encodes the hardware components leading to the USB controller. In the previous example, the controller path indicates that there is a USB controller at PCI slot 5 of the compute module that is located at 001c13.

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

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

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

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

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

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

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

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

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

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

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

Follow these steps to reconfigure the keyboard and mouse setup:

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

Steps 4 and 5 are the keys to binding the devices in your new configuration to the correct IDs. Because a keyboard and mouse with the same ID are put in the same `/dev/input`*X* directory, you must ensure that both the keyboard and mouse used by a given X server have the same ID. Because `ioconfig` does not know what device IDs to assign automatically for new devices, the

correct IDs might not be assigned in step 3. You can change the device IDs manually by editing `/etc/ioconfig.conf` and then re–running `ioconfig`. The `/dev/input/keyboard` and `/dev/input/mouse` entries are always created, even if a keyboard and/or mouse with device ID 0 are not present. This allows the default X server to run without a keyboard or mouse physically attached for manufacturing checkout purposes.

Note: If you boot the system in this mode (that is, without a keyboard, without a mouse, or without both) and connect a keyboard or a mouse after the system is running, you must restart the graphics system to use the newly-connected devices.

Attaching Monitors to an Onyx4 System

Your Onyx4 system can drive as many as four monitors per G2-brick or G2N-brick (however see “Using Both DVI Channels on a Card” on page 63 for limitations).

See “Display Requirements” on page 119 for detailed monitor requirements and “DVI-I Connector Pinout” on page 123 for detailed information about the DVI-I connectors.

Note: Although the markings on the graphics boards (and the illustrations in this manual) refer to the channels as “1” and “2,” the IRIX command `gfxinfo` reports the channels as “0” and “1.”

Note: The first graphics brick in a system will contain pipe 0 and pipe 1. However, since other graphics bricks will have successively higher-numbered pipes, graphics bricks are shown in this manual with pipes numbered “n” and “n+1.” In all cases, the lower pipe within a brick will have an even pipe number and the upper pipe within a brick will have an odd pipe number.

Using Both DVI Channels on a Card

Onyx4 systems can contain two different versions of graphics card, with different capabilities. The two versions are distinguishable by the presence or absence of a sticker on the rear panel of the graphics card.

If a graphics card has a sticker on the back indicating part number 030-2003-xxx, as shown in Figure 3-3, it is an SG2.1 card, and both DVI ports on the card may be connected to either a digital monitor or an analog monitor.

If a graphics card does not have a sticker on the back, it is an SG2 card, and only the first DVI-I port (channel 1, on the left) may be connected to either a digital monitor or an analog monitor. The second DVI-I port (channel 2, on the right) may only be connected to an analog monitor.

Note: Some versions of IRIX report both cards as SG2 in `hinv`. Therefore the only reliable method to determine the revision of a graphics card is to look for the sticker on the rear panel.

Note: It is possible for an Onyx4 system to simultaneously contain both SG2 and SG2.1 graphics cards.

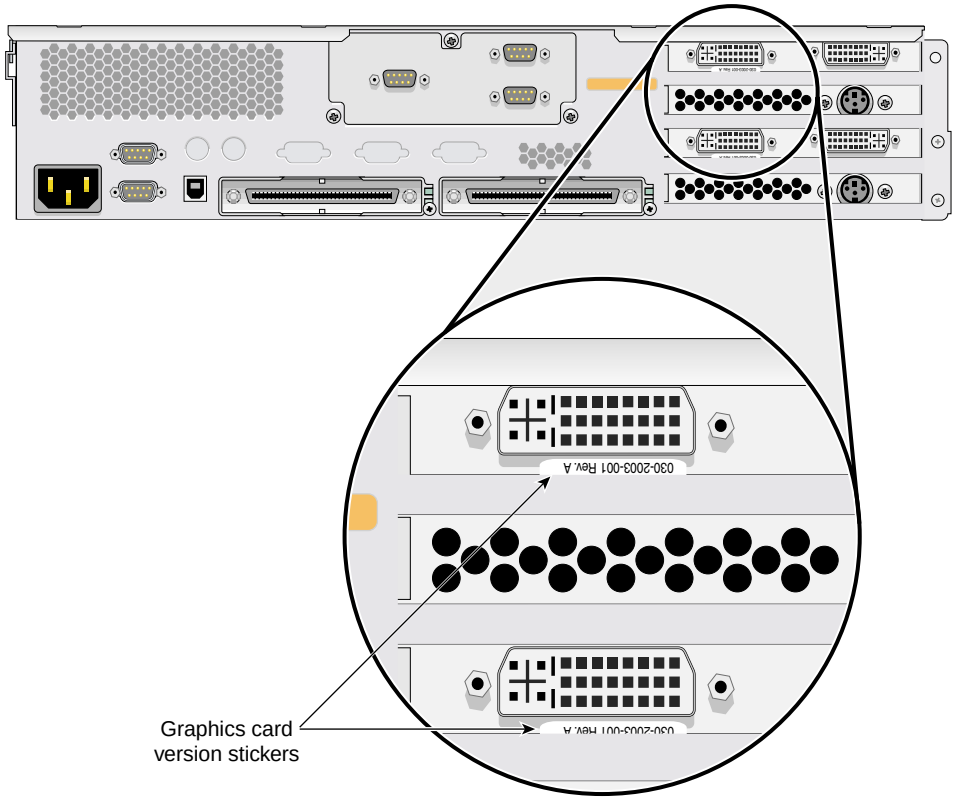

Figure 3-3 Location of Graphics Card Sticker

Monitor Connection Overview

Figure 3-4 shows the four monitor connectors on G2-bricks and G2N-bricks.

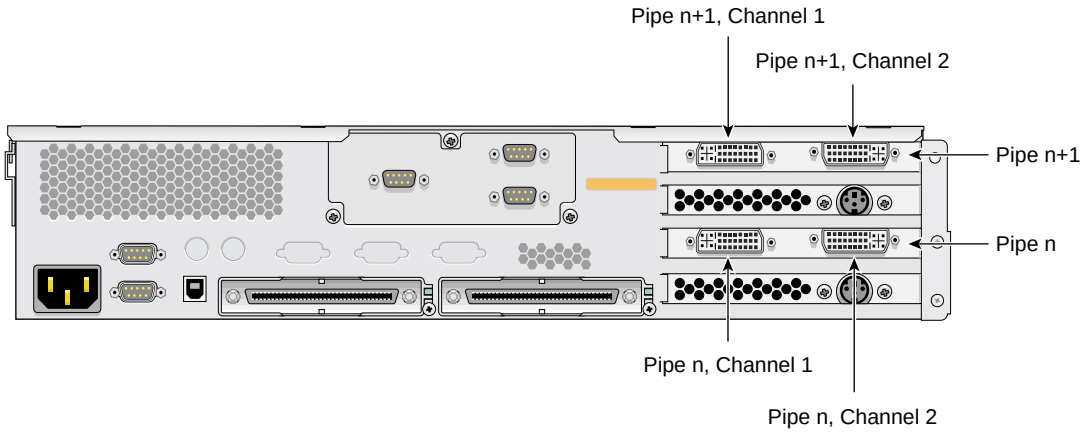

Figure 3-4 Monitor Connections on G2-bricks and G2N-bricks

Note: The IRIX® OS console will appear on the monitor connected to the pipe 0, channel 1 connector on your Onyx4 system.

Figure 3-5 shows the connection of four monitors to an SGI Onyx4 system G2-brick or G2N-brick with SG2 graphics cards.

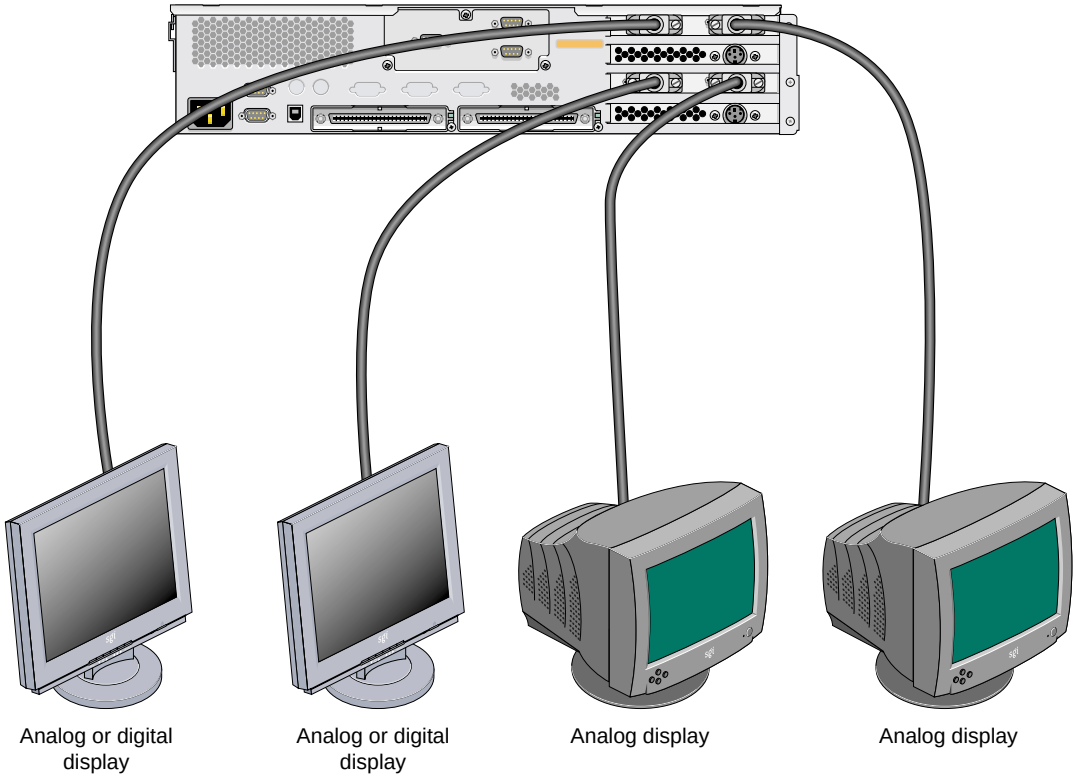

Figure 3-5 Connecting Monitors to a G2-brick or G2N-brick (SG2 Graphics Cards)

Figure 3-6 shows the connection of four monitors to an SGI Onyx4 system G2-brick or G2N-brick with SG2.1 graphics cards.

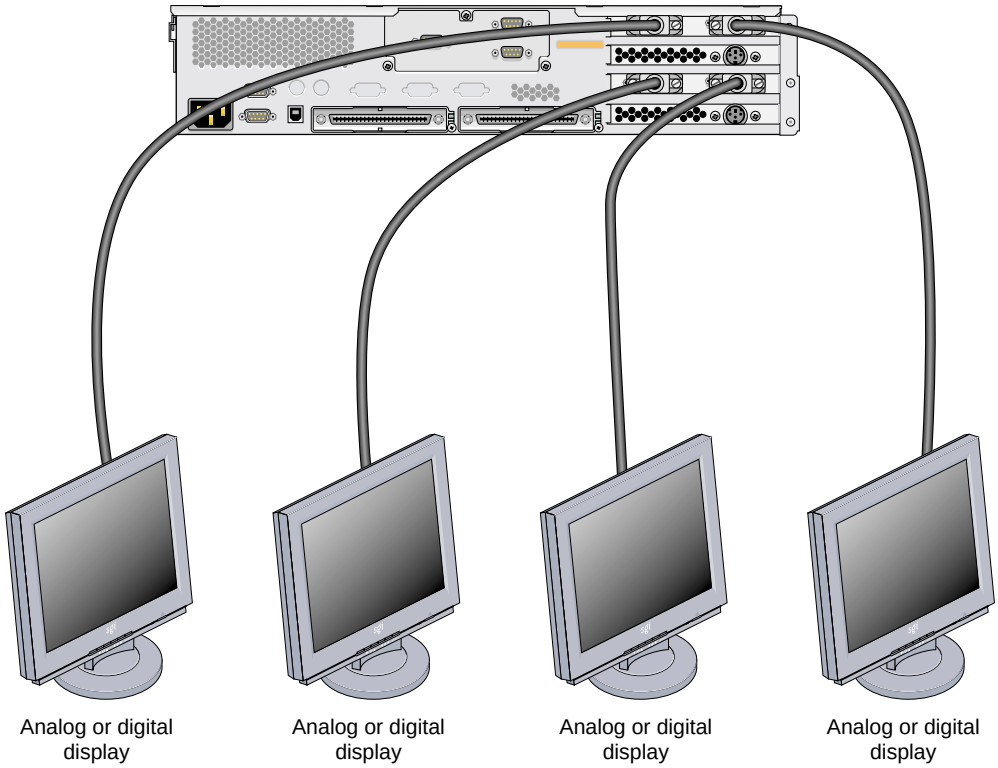

Figure 3-6 Connecting Monitors to a G2-brick or G2N-brick (SG2.1 Graphics Cards)

Locating Pipe 0

In an Onyx4 system containing only one G2-brick or G2N-brick, that brick will contain pipe 0.

In an Onyx4 system containing more than one G2-brick or G2N-brick, pipe 0 will typically be in the graphics brick located closest to the bottom of the rack. For more information on rack locations and cabling, see “Selecting Rack Locations” on page 11.

Once you have located the correct brick, pipe 0, channel 1 will be the lower left DVI-I port on that brick, as shown in Figure 3-4.

The best way to determine the location of pipe 0, however, is to use the IRIX `gfxtopology` command, as follows:

1. From an IRIX command prompt, run `/usr/gfx/gfxtopology`. The output will look similar to:

```
# /usr/gfx/gfxtopology
pipe 0  g @ 001c12/CG:15/0      SG2
pipe 1  g @ 001c12/CG:15/1      SG2
pipe 2  g @ 001c14/CG:15/0      SG2
pipe 3  g @ 001c14/CG:15/1      SG2
pipe 4  g @ 001c16/CG:15/0      SG2
pipe 5  g @ 001c16/CG:15/1      SG2
pipe 6  g @ 001c18/CG:15/0      SG2
pipe 7  g @ 001c18/CG:15/1      SG2

input   k @ 001c10/I:5/1        m @ 001c10/I:5/2
#
```

2. Locate the line in the `gfxtopology` output that begins “`pipe 0`.”
3. On this line, locate the string following the “@” symbol. This string will be of the form AAAxBB (in the example provided above, the string would be “`001c12`”).
4. Decode this string as follows:

   “AAA” is the rack number (in this example, rack `001`)

   “x” is module type (in this case, `c` indicates a compute module)

   “BB” is the “U” number within that rack, counting from the bottom (in this case, slot `12`).
5. Locate the brick at the rack location indicated. The L1 controller display on the front of that brick should be displaying the same string you just decoded.

6. Go to the back of the rack, and determine if this brick is a G2N-brick or a host system compute module.

   If the brick has four DVI-I connectors (as shown in Figure 1-2), it is a G2N-brick, and it contains pipe 0.

   If the brick does not have DVI-I connectors, it is a host-system compute brick. In this case, a G2-brick will be connected to its XIO port. This XIO-connected G2-brick will contain pipe 0.

Attaching Keyboards and Mice to an Onyx4 System

Your Onyx4 system uses USB keyboards and mice. This section describes how to connect them to a host system.

If you need to connect more keyboards and mice than you have available USB ports on your host system, refer to “Using a USB Hub for Keyboards and Mice” on page 71.

If the keyboards and mice will be further than 10 feet (3 meters) from the host system, refer to “Using a USB Extender to Connect Keyboards and Mice” on page 72.

Attaching Keyboards and Mice Directly to a Host System

Each keyboard and mouse pair must be connected to either the odd-numbered USB ports (ports 1 and 3, as shown in Figure 3-7) or the even-numbered ports (ports 2 and 4). The USB port closest to the side of the chassis is port 1.

Figure 3-7 shows the USB PCI card in bus 2, slot 2 (the top PCI slot) of a host system chassis, which is the preferred location for this card. Some configurations, however, may have the USB card in a different PCI slot in the host system.

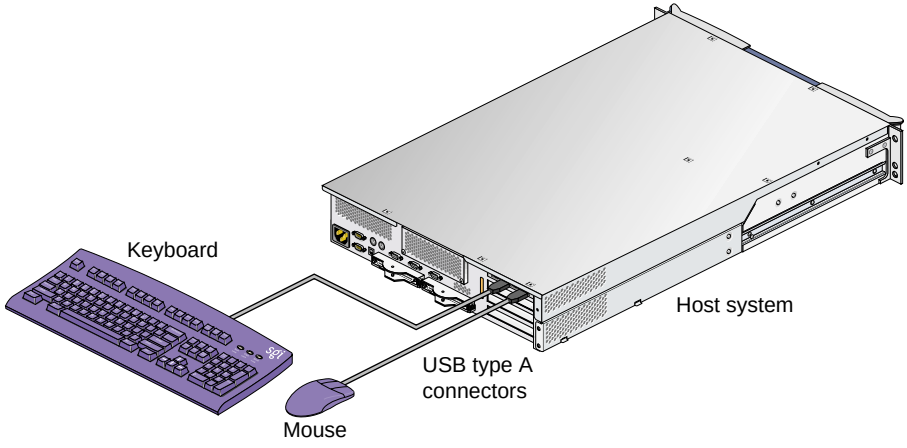

Figure 3-7 Connecting a USB Keyboard and Mouse to a Host System

Using a USB Hub for Keyboards and Mice

If the number of USB devices connected to your host system will be greater than the number of USB ports on that system, you will need one or more USB hubs. Figure 3-8 shows how a USB hub is used for this purpose.

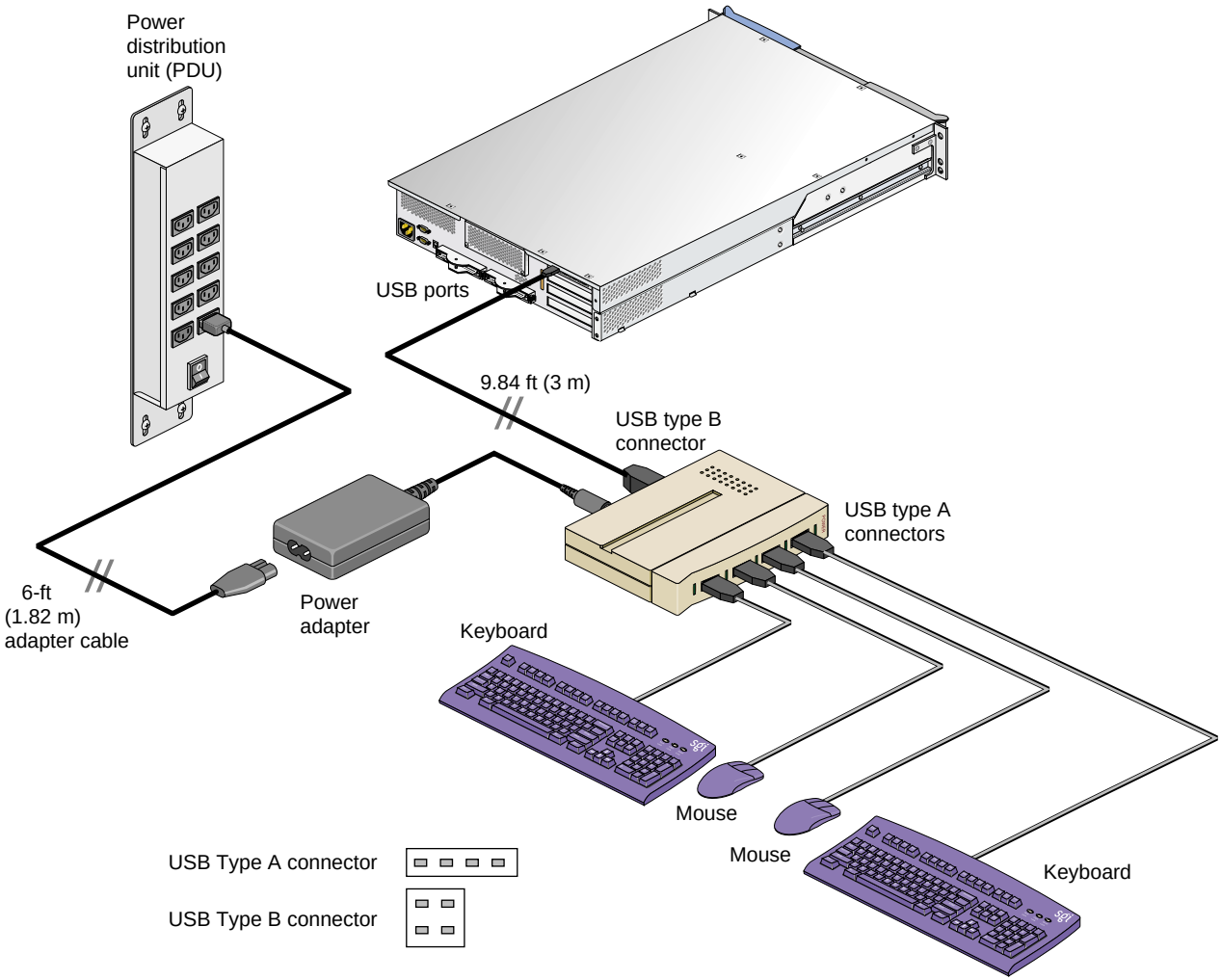

Figure 3-8 Using a USB Hub to Connect Multiple Keyboards and Mice to Host System (USB Hub May Differ From Illustration)

Using a USB Extender to Connect Keyboards and Mice

If one or more of your keyboard/mouse pairs will be further than 10 feet (3 meters) away from the USB ports on the host system, you will need to use one or more USB extenders. The use of an extender will allow keyboards and mice to be placed up to 328 feet (100 meters) from the host system (a 30-foot (9.1 meter) cable is supplied with the USB extender).

Figure 3-9 shows how a USB extender is connected.

Only keyboards and mice may be connected through USB extenders. Hubs, in particular, will not work through a USB extender. A USB extender, however, may be plugged into a hub.

Note: The local extender (LEX) receives AC power from a standard AC outlet (typically the power distribution unit (PDU) in the rack). A 6-ft. (1.82-m) adapter cable connects the extender's power adapter to the PDU. The remote extender (REX) does not use an external power source.

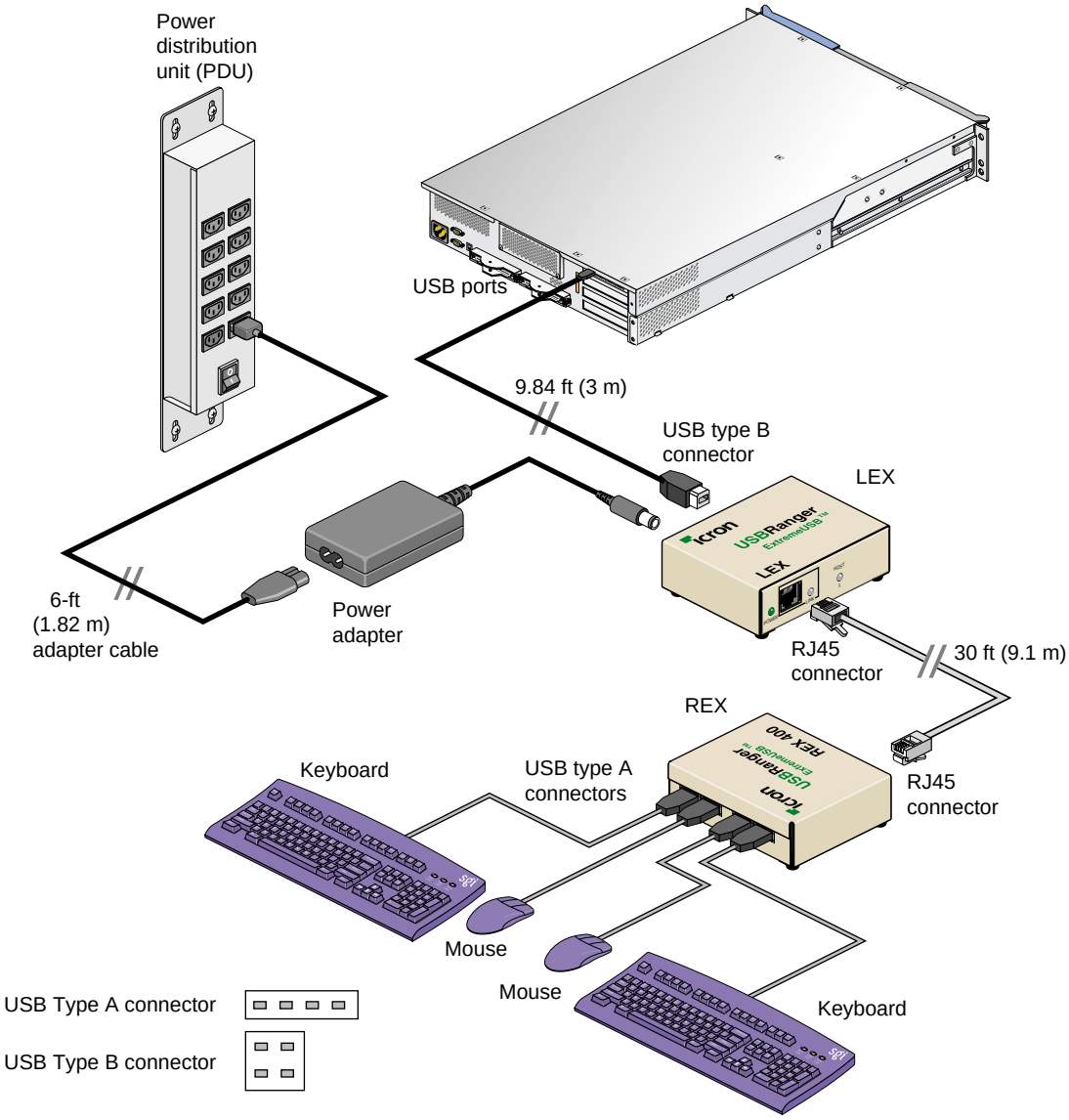

Figure 3-9 Using a USB Extender to Connect Keyboards and Mice

Making Other External Connections

This section describes the following additional external connections:

Attaching Stereo Sync Devices

The SGI Onyx4 system has a stereo sync connector for each pipe (thus two on each G2 or G2N brick).

Note: Stereo sync is supported only on systems running IRIX version 6.5.21 with patch 5208, or running IRIX version 6.5.22 or later. However SGI recommends that in order to get the best performance from your Onyx4 system you upgrade to at least IRIX version 6.5.22 with patch 5448. To determine the IRIX version running on your system, see “IRIX Operating System Version Requirements” on page 36.

Stereo sync must have been configured as described in “Configuring an Onyx4 System for Stereo” on page 44.

Figure 3-10 shows the location of the two stereo sync ports on G2-bricks and G2N-bricks.

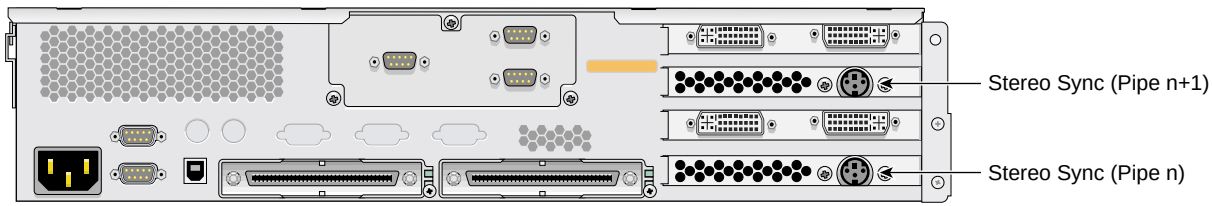

Figure 3-10 Stereo Sync Ports on G2-bricks and G2N-bricks

For details of the stereo sync connector, see “Stereo-Sync Connector Pinout” on page 125.

Note: A stereo sync signal will not be present until you run a stereo application. One such application is `ivview`. To use `ivview` to test the stereo configuration, run:
`ivview /usr/share/data/models/X29.iv`
and right click to activate the stereo setting on the preferences pane.

Attaching SwapReady Cabling

The SwapReady signal synchronizes the front and rear framebuffer swapping between multiple pipes.

Use a standard 75-ohm BNC cable between the SwapReady connector on the ImageSync card and the SwapReady input on the display device or compositor.

SwapReady must have been configured as described in “Configuring an Onyx4 System for External Genlock or Framelock” on page 52.

Figure 3-11 shows the connector locations on an ImageSync card.

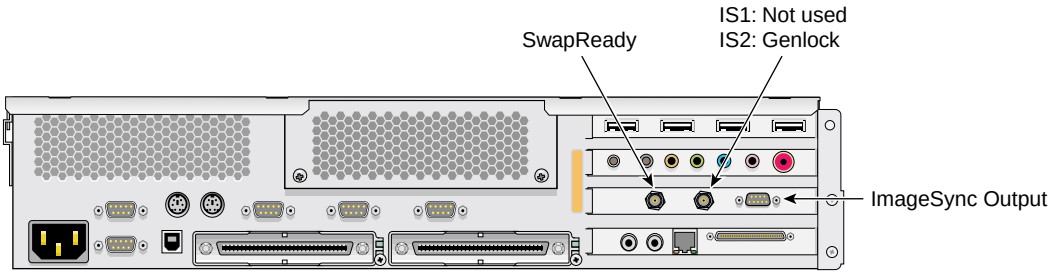

Figure 3-11 ImageSync Card Connectors

For details of the SwapReady connector, see “SwapReady Connector Pinout” on page 126.

Determining ImageSync Card Version

ImageSync1 and ImageSync2 cards look similar from the rear of the chassis. The easiest way to distinguish them is by using the `hinv` command as follows:

1. At an IRIX command prompt, type `hinv`:

   ```
   [1%] hinv
   ```

2. Look in the output of the `hinv` command for one or more lines like the following:

   ```
   ImageSync2 board: unit 0, version 1.4
   ```

   Each line represents one ImageSync card.

Note: Some of the ImageSync2 features documented in this guide require at least IRIX version 6.5.24 and patch 5585. To determine the IRIX version and patch level running on your system, see “IRIX Operating System Version Requirements” on page 36.

Attaching Genlock or Framelock Cabling

Genlock and framelock are only available on ImageSync2 (IS2) cards. To determine the version of your ImageSync card(s), see “Determining ImageSync Card Version” on page 77.

The Genlock connector allows the ImageSync2 card to receive a genlock or framelock signal from an external source. The ImageSync card then uses the external signal as the source for the sync signal it sends to each pipe it controls.

Use standard 75-ohm BNC cables between the genlock source and each device that receives the signal. Use a BNC L-connector at each device, and a 75-ohm BNC terminator at the last device in the chain.

Genlock or framelock must have been configured as described in “Configuring an Onyx4 System for External Genlock or Framelock” on page 52.

Figure 3-12 shows the connector locations on an ImageSync card.

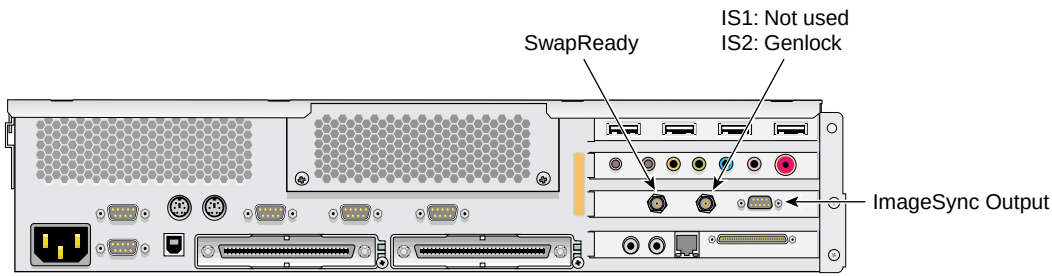

Figure 3-12 ImageSync Card Connectors

For details of the genlock connector, see “Stereo-Sync Connector Pinout” on page 125.

Attaching Audio Devices

Follow the instructions in your host system user's guide for the connection of audio devices.

Troubleshooting and Replacing Parts

This Appendix describes the steps to be taken to locate problems with an SGI Onyx4 system, and provides the procedures for the removal and replacement of user-replaceable parts.

Troubleshooting G2-bricks and G2N-bricks

If you are experiencing problems with your SGI Onyx4 system, you can follow the steps detailed in this section to help isolate and correct the problem.

If you are having problems with your host system you should refer to the user's manual for that host system.

For problems not addressed in this section, please contact your SGI authorized support representative.

General Procedures

Before proceeding to the sections addressing specific issues, follow the steps in this section.

1. Ensure that each graphics brick in your system is connected to AC power.

   See "Providing Power to G2-bricks and G2N-bricks" on page 28.

2. Ensure that each graphics brick in your system is powered on.

   See "Front Panel Items" on page 3.

3. Ensure that the host system can "see" each graphics brick in your system.

   See "Verifying System Connections" on page 33.

Troubleshooting Chart

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

Table A-1 Troubleshooting Chart

Problem Description	Recommended Action
The system will not power on.	Ensure that the power cord of the PDU is seated properly in the power receptacle. Ensure that the PDU circuit breaker is on. If the power cord is plugged in and the circuit breaker is on, contact your SSE.
An individual brick will not power on.	Ensure that the power cord between the PDU and the brick is securely plugged in at both ends. View the L1 display, refer to Table A-2 if an error message is present. If the L1 controller is not running, contact your SSE.
The system will not boot the operating system.	Contact your SSE.
The Service Required LED illuminates on a brick.	View the L1 display of the failing brick; refer to Table A-2 for a description of the error message.
The Failure LED illuminates on a brick.	View the L1 display of the failing brick; refer to Table A-2 for a description of the error message.
The green or yellow LED of a NUMAlink port (rear of NUMAlink brick) is not illuminated.	Ensure that each end of the NUMAlink cable is seated properly.

L1 Controller Error Messages

Table A-2 lists error messages that the L1 controller generates and displays on the L1 display. This display is located on the front of the brick.

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

Note: For more details about these environmental limits, use the L1 `env` command.

Table A-2 L1 Controller Messages

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

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

L1 System Controller Message	Message Meaning and Action Needed
Temperature messages:	
ATTN: TEMP # advisory temperature reached @ xxC xxF	The ambient temperature at the brick's air inlet has exceeded the advisory limit.
ATTN: TEMP # critical temperature reached @ xxC xxF	The ambient temperature at the brick's air inlet has exceeded the advisory limit.
ATTN: TEMP # fault temperature reached @ xxC xxF	The ambient temperature at the brick's air inlet has exceeded the advisory limit.
Temperature stable message:	
ATTN: TEMP # stabilized @ xxC/xxF	The ambient temperature at the brick's air inlet has returned to an acceptable level.
Power off messages:	
Auto power down in xx seconds	The L1 controller has registered a fault and is shutting down. The message displays every 5 seconds until shutdown.
Base module appears to have been powered down	The L1 controller has registered a fault and has shut down.

SGI Electronic Support

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

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

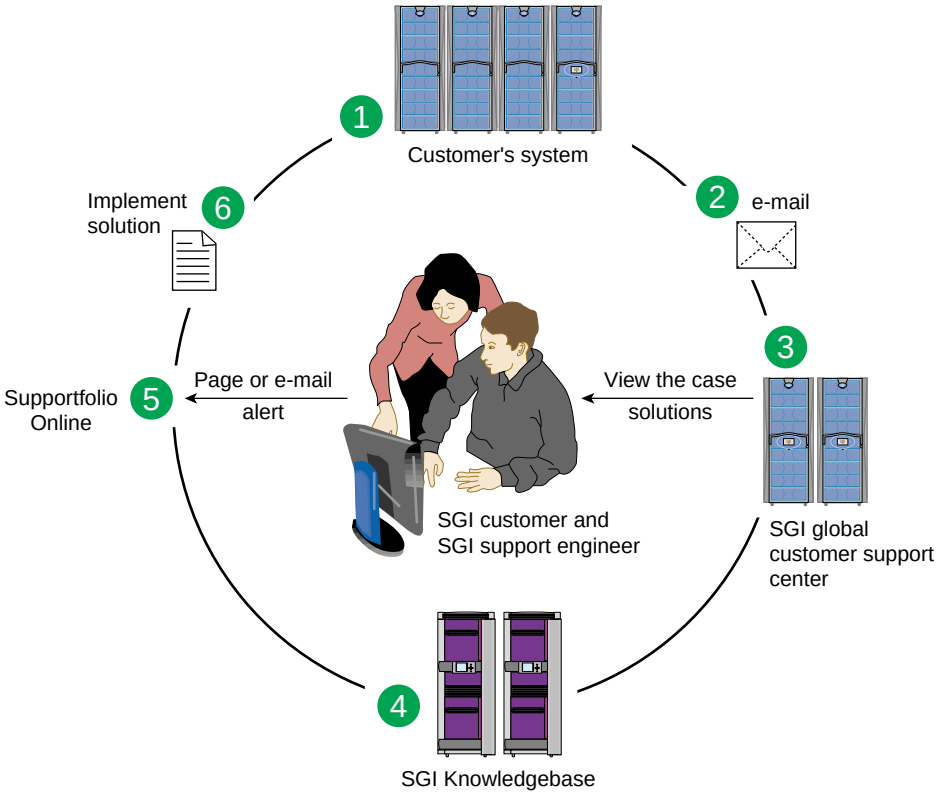

Figure A-1 Full Support Sequence

The sequence of events can be described as follows:

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

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

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

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

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

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

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

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

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

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

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

Installing and Removing Customer-Replaceable Units

This section describes the parts in an SGI Onyx4 system that may be replaced by a user.

For information about parts in your host system you should refer to the user's manual for that host system.

For parts not addressed in this Appendix, please contact your SGI authorized support representative.

Safety Instructions

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

- Follow all warnings and instructions marked on the product and noted in this and other documentation included with the product.
- Unplug this product from the wall outlet before you clean it. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
- Do not use this product near water.
- Do not place this product or components of this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.
- Slots and openings on the cabinet and components are provided for ventilation, reliable operation, and protection from overheating of the product. These slots and openings must not be blocked or covered. This product should never be placed near or over a radiator or heat register, or in a built-in installation unless proper ventilation is provided.
- This product should be operated with the type of power indicated on the marking label. If you are not sure of the type of power available, consult your dealer or local power company.
- Do not allow anything to rest on the power cord. Do not locate this product where people will walk on the cord.
- Do not use extension cords with your SGI system.
- Never push objects of any kind into this product through cabinet slots because they may touch dangerous voltage points or short out parts that could result in a fire or electric shock.
- Never spill liquid of any kind on the product.

- Do not attempt to service this product yourself except as noted in this guide. Opening or removing covers of internal components may expose you to dangerous voltage points or other risks. Refer all servicing to qualified service personnel.
- Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
  - If the power cord or plug is damaged or frayed.
  - If the product has been exposed to rain, water, or other type of liquid.
  - If the product does not operate normally when the operating instructions are followed.

    Note: Adjust only those controls that are covered by the operating instructions, because improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to normal condition.

  - If the product has been dropped or if the cabinet has been damaged.
  - If the product exhibits a distinct change in performance, which indicates a need for service.
- Only qualified service personnel should replace the soldered lithium battery (or batteries) in the system. Please see the “Lithium Battery Statement” on page 154 for more information.
- Use only the proper type of power supply cord set (provided with the system) for this unit.

Power Supply

Each G2-brick or G2N-brick contains a sled-mounted power supply (refer to Figure A-2).

This section provides the following information:

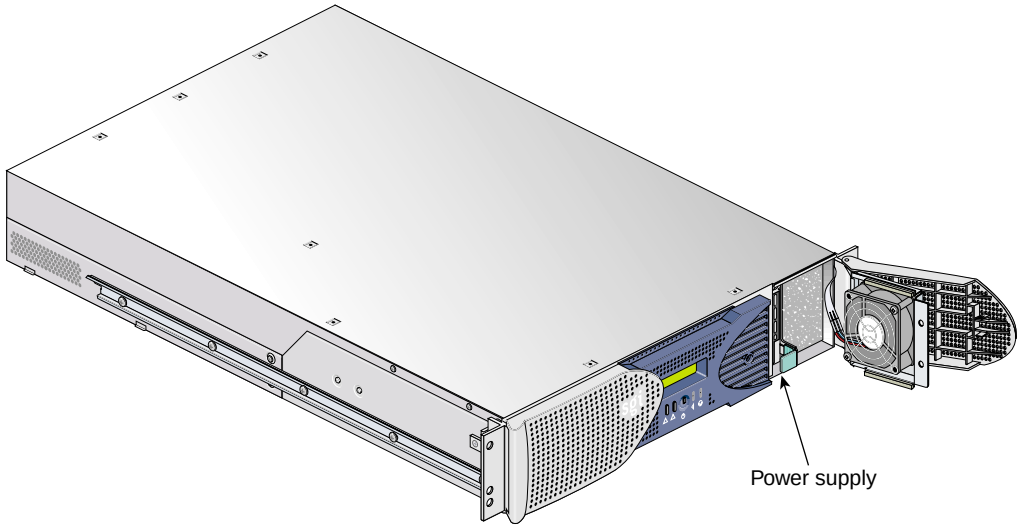

Figure A-2 Power Supply Location

Reading the Power Supply LEDs

Use the LED located on the front (towards the top) of the power supply to read the condition of the power supply. Table A-3 shows the LED status and the power supply condition the LED status indicates.

Table A-3 LED Status and Power Supply Condition

LED Status	Power Supply Condition Indicated
Off	Indicates that the power supply is not receiving AC power. Power supplies will not be receiving AC power because either the brick is not plugged into power, or an electrical fuse has blown.
Amber	Indicates a fault condition for one of the following reasons: - The voltage limit has been exceeded. - The temperature limit has been exceeded. - The current limit has been exceeded.
Blinking Green	The power supply is receiving AC power, but the main primary DC power has not yet activated.
Green	The power supply is operating properly.

Replacing the Power Supply

To replace the power supply, follow these steps:

1. Power off the host system as described in the user's guide that came with your host system.

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

2. Remove the power supply, as follows:
   a. Swing open the bezel door located on the right side of the brick front panel. With a Phillips screw driver, unscrew the two screws on the screen cover as shown in Figure A-3A.
   b. Swing open the screen cover as shown in Figure A-3B.
   c. Disengage the power supply from the power supply bay by pushing the interior release button to the right and pulling up and out on the green handle lock as shown in Figure A-3C.
   d. Gently pull out the power supply from the chassis until it clears the power supply bay as shown in Figure A-3D. Place the power supply on an ESD-safe surface.

Caution: When pulling the power supply out from the chassis, make sure not to disturb the power supply fan's ribbon cable.

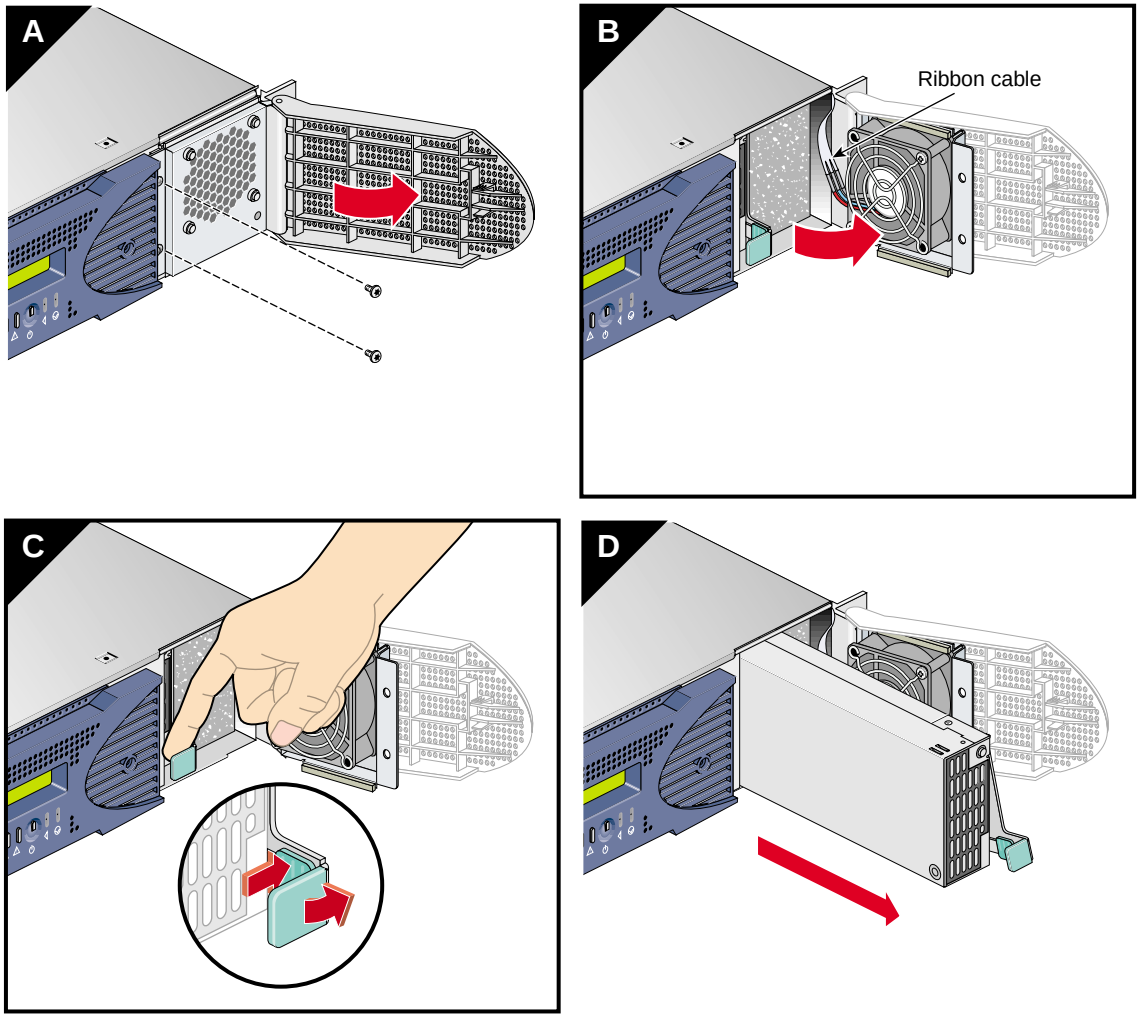

Figure A-3 Removing the Power Supply

3. Install the replacement power supply, as follows:

   a. Position the power supply in the slot and with the power supply handle pulled up (fully opened), gently push the power supply into the bay as shown in Figure A-4A.

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

   b. Push in and down on the green handle and snap the power supply into place as shown in Figure A-4B.

   c. After you have installed the power supply, swing the screen cover until it closes as shown in Figure A-4C.

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

   d. Screw in the two Phillips screws that you had removed as shown in Figure A-4D, and close the bezel door.

4. Power on the host system as described in the user's guide that came with your host system.

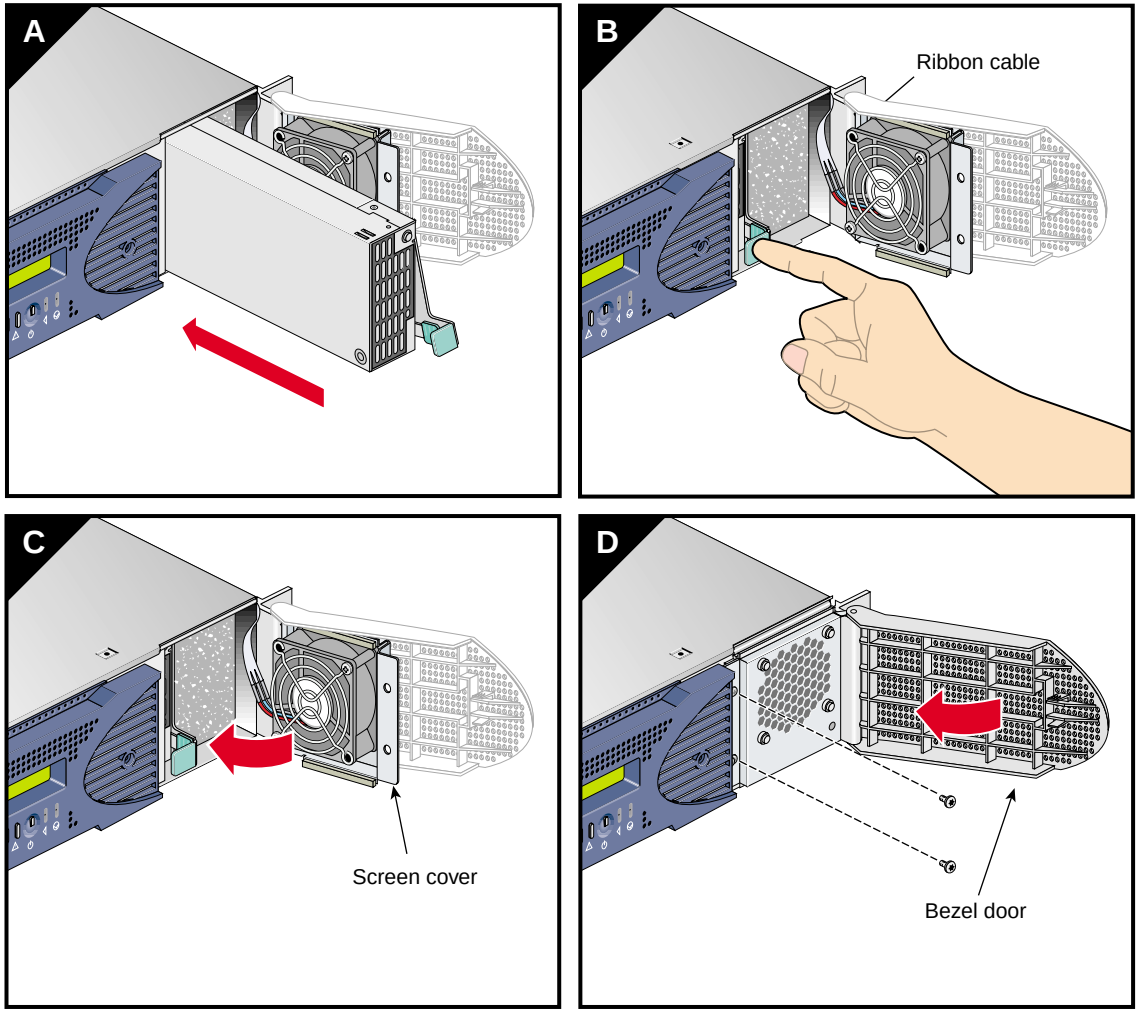

Figure A-4 Installing the Power Supply

Opening the Chassis

To open the chassis, follow the steps in this section.

1. Remove the ten Phillips screws shown in Figure A-5
2. Lift and open the hinged cover.

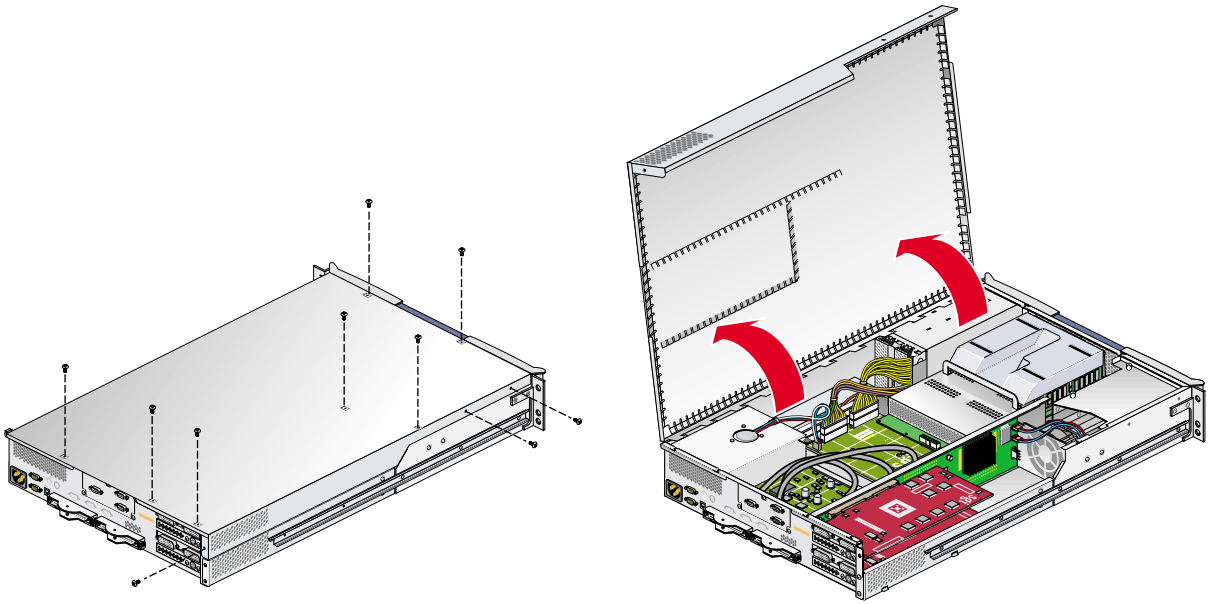

Figure A-5 Opening Module Cover

Memory

Memory is contained on cards that are referred to as DIMMs (dual inline memory modules). Each G2N-brick can contain two, four, six, or eight DIMMs installed in eight DIMM slots located in the brick.

Note: G2N-bricks contain memory. G2-bricks, however, do not have DIMM slots, and therefore can not contain memory.

These eight DIMM slots are physically grouped into even-numbered slots (0, 2, 4, and 6) and odd-numbered slots (1, 3, 5, and 7) as shown in Figure A-6 on page 99.

DIMMs must be installed in pairs, one per DIMM slot, so that the two DIMMs installed provide local memory for the same pair of banks. For example, if you install a DIMM in slot 0, you must also install a DIMM in slot 1. (This adds memory to bank pairs 0 and 1). Table A-4 lists the DIMM slots and the corresponding bank pairs to which local memory is provided when DIMMs are installed.

Table A-4 DIMMs and Bank Pairs

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

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

You must note these guidelines when installing DIMMs:

- Memory is increased or decreased in two-DIMM increments only.
- The two DIMMs that make up a bank pair must be the same memory size; however, each pair of DIMMs can differ in memory size.
- The first two DIMMs must be installed in DIMM slot 0 and DIMM slot 1. Subsequent DIMMs can be installed into any bank pairs as long as the two DIMMs are installed so that they provide local memory for the same bank pair. For example, you can install DIMMs in slots 2 and 3 to provide local memory for banks 2 and 3. Or you can install DIMMs in slots 4 and 5 to provide memory to banks 4 and 5, or you can install DIMMs in slots 6 and 7 to provide memory for banks 6 and 7.
- The DIMMs used in the G2N-brick are compatible with the DIMMs used in Origin 300 and Origin 350 server system base compute modules, the system expansion compute module, and the MPX module. They are not compatible with the DIMMs used in the Origin 200, SGI 2000 series, Onyx2, or Octane systems.
- The G2N-brick supports the following memory kits:
  - 1-GB kit with integrated directory memory.
  - 2-GB kit with integrated directory memory.

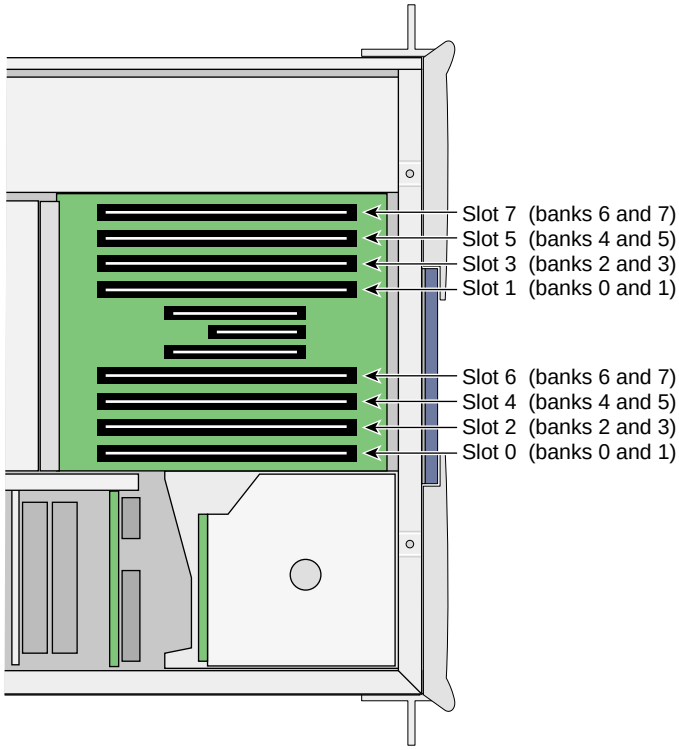

Figure A-6 Layout of DIMM Slots and Local Memory Banks

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

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

- If you handle a component before installation, do not place it on surfaces that produce ESD (carpeting, for example) or near devices that create static electricity.

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

Installing a DIMM

To install a DIMM, follow these steps:

1. Power off the host system as described in the user's guide that came with your host system.
2. Disconnect all of the cables at the rear of the brick.
3. Open the chassis as described in "Opening the Chassis" on page 96.

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

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

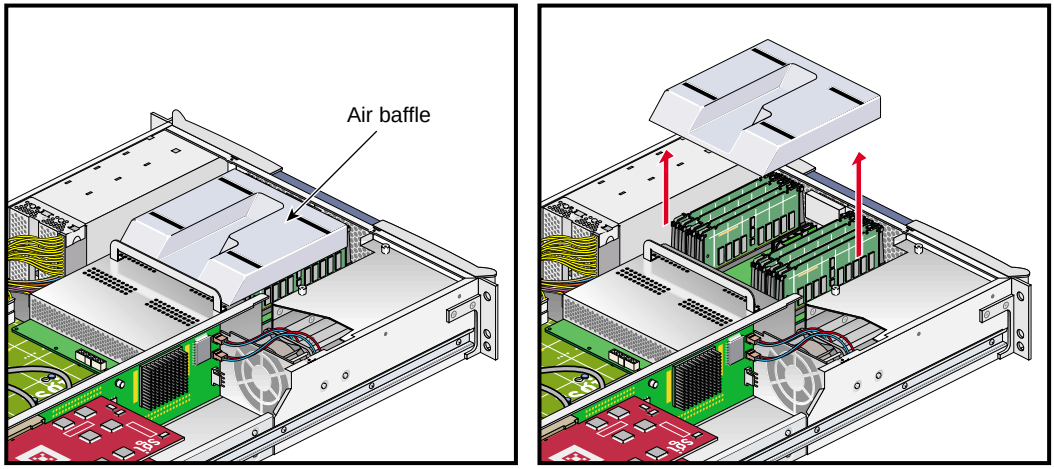

Figure A-7 Removing the Plastic Air Baffle

5. Install the DIMM, as follows (see Figure A-8):

   Note: If you need to find the correct location in which to install the DIMMs, make sure to read the introductory material in "Memory" on page 97.

   a. Open the ejector latches.

   b. Hold the DIMM only by its edges and remove it from its antistatic package.

   c. Align the three notches in the bottom edge of the DIMM with the keyed socket.

   d. Insert the bottom edge of the DIMM into the socket, and then press down on the DIMM until it seats correctly. Use extreme care when you install a DIMM. If you apply too much pressure, you can damage the socket.

   e. Gently push the plastic ejector latches down to secure the DIMM, as shown in Figure A-8. When the DIMM is fully seated in the connector, the ejector latches snap into place.

6. Repeat Step 5 for the second DIMM of the pair.
7. Replace the plastic air baffle.
8. Close the chassis by reversing the operation described in "Opening the Chassis" on page 96.
9. Press the safety latches on both sides of the brick and slide the brick into the rack.
10. Install the two screws that secure the brick to the front rails of the rack.
11. Install all of the cables at the rear of the brick.
12. Power on the host system as described in the user's guide that came with your host system.

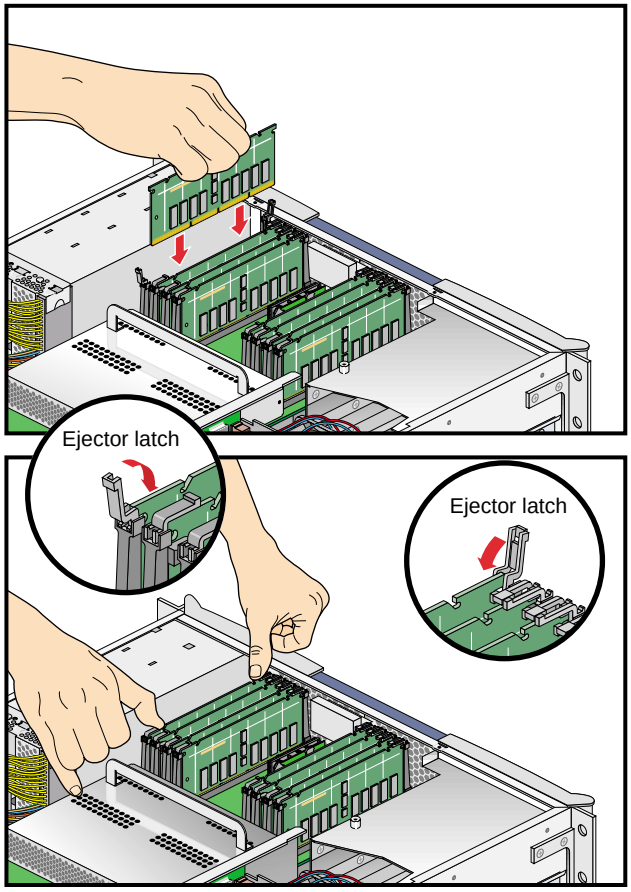

Figure A-8 Inserting a DIMM

Removing a DIMM

To remove a DIMM, follow these steps:

1. Power off the host system as described in the user's guide that came with your host system.
2. Disconnect all of the cables at the rear of the brick.

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

3. Remove the two screws that secure the brick to the front rails of the rack.
4. Pull the brick from the rack until it is stopped by the safety latches.
5. Open the chassis as described in "Opening the Chassis" on page 96.
6. Remove the plastic air baffle covering the DIMMs, as shown in Figure A-9.

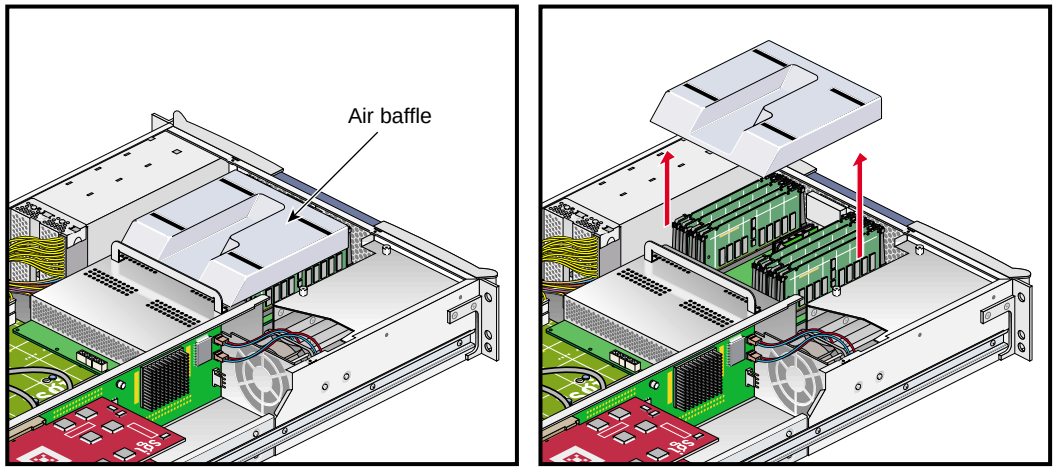

Figure A-9 Removing the Plastic Air Baffle

7. Remove the DIMM, as follows (see Figure A-10):

   Note: If you need to find the correct location from which to remove the DIMMs, make sure to read the introductory material in "Memory" on page 97.

   a. Lift the two ejector latches simultaneously to disengage the DIMM from its connector.

   b. Carefully grasp the DIMM and pull it up and out of the guide rails.

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

   c. Place the DIMM on an ESD-safe surface.

8. If you are installing a new DIMM, proceed to "Installing a DIMM" on page 100. If you are not installing a new DIMM, proceed to the next step.
9. Repeat Step 7 for the second DIMM of the pair.
10. Replace the plastic air baffle covering the DIMMs.
11. Close the chassis by reversing the operation described in "Opening the Chassis" on page 96.
12. Press the safety latches on both sides of the brick and slide the brick into the rack.
13. Install the two screws that secure the brick to the front rails of the rack.
14. Install all of the cables at the rear of the brick.
15. Power on the host system as described in the user's guide that came with your host system.

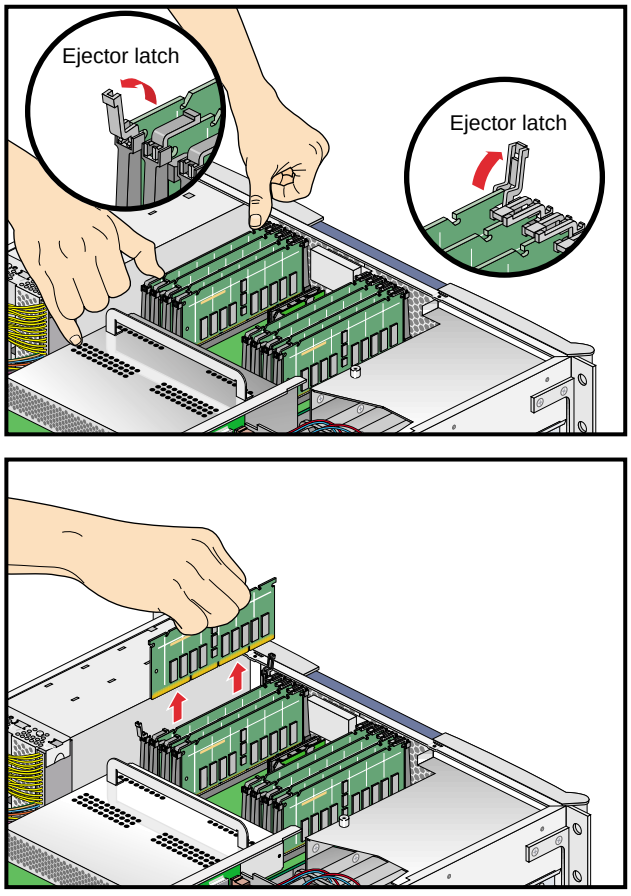

Figure A-10 Removing a DIMM

L1 Controller Display

The L1 controller, which is used to monitor and manage the G2-brick or G2N-brick, has a display located on the front panel of the brick, as shown in Figure A-11. Every G2-brick and G2N-brick is factory-shipped with an L1 controller display. This section describes how to replace an L1 controller display panel.

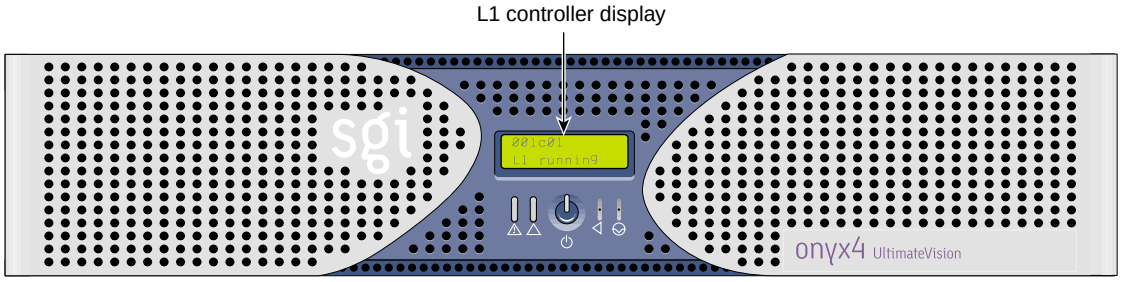

Figure A-11 L1 Controller Display on G2-bricks and G2N-bricks

To replace an L1 controller display, follow these steps:

1. Power off the host system as described in the user's guide that came with your host system.
2. Disconnect all of the cables at the rear of the brick.

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

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

5. Open the chassis as described in “Opening the Chassis” on page 96.
6. Remove the plastic air baffle covering the DIMMs, as shown in Figure A-7 in “Memory” on page 97.
7. On the front panel of your system, remove the front bezel by unscrewing the two Phillips screws holding the bezel to the chassis, as shown in Figure A-12A.
8. Holding the L1 display cover with one hand, unscrew the single Phillips screw holding the L1 display cover to the chassis, as shown in Figure A-12B. Gently unhook and pull away the L1 display cover from the chassis.
9. Unscrew the two Phillips screws holding the L1 controller display panel to the L1 display protective cover, as shown in Figure A-12C.
10. Gently disconnect the L1 controller cable from the connector on the L1 controller display, as shown in Figure A-12D.

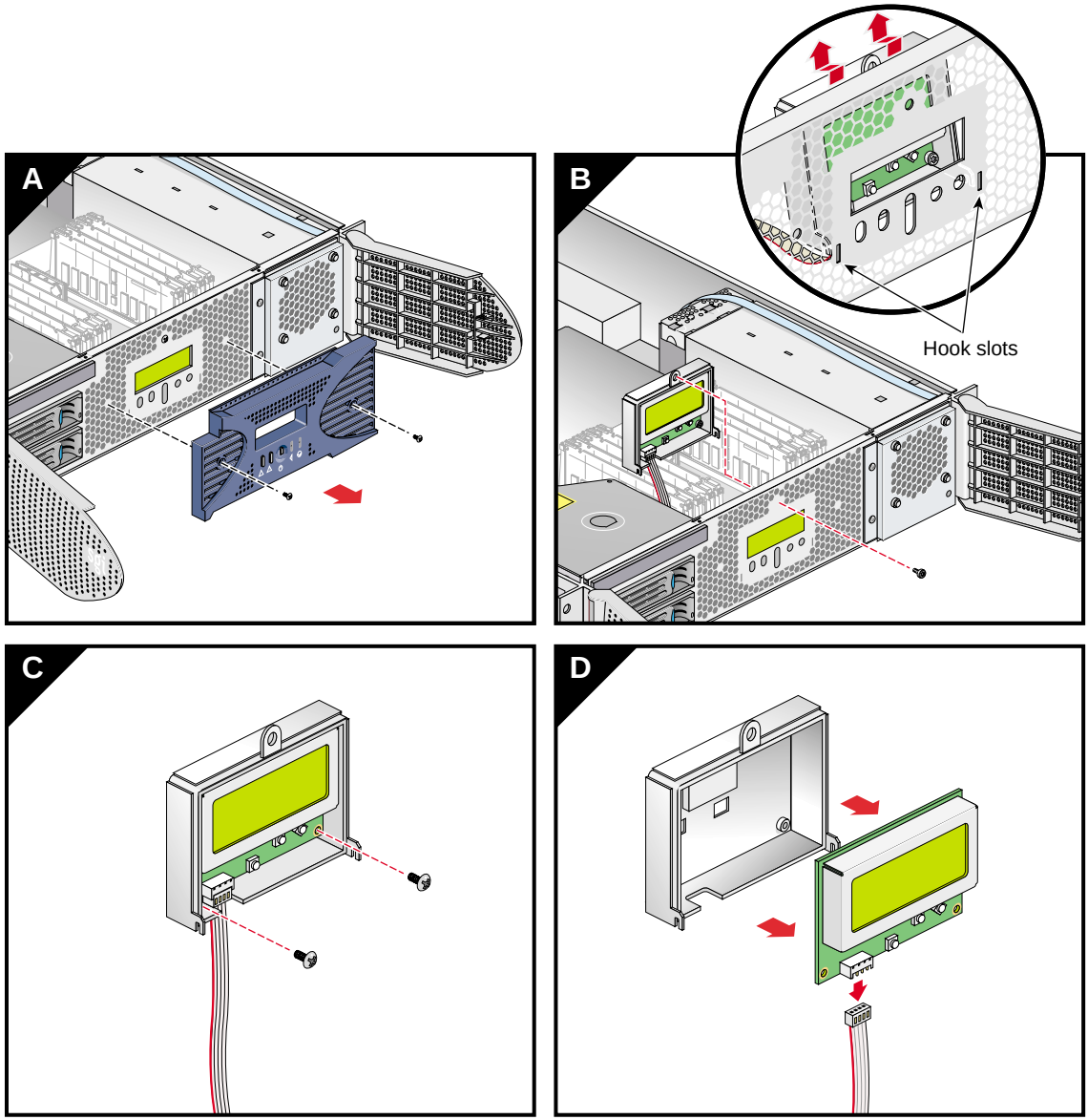

Figure A-12 Removing an L1 Controller Display Panel

11. Connect the L1 controller cable to the connector on the new L1 controller display, making sure that the red stripe is to your left, as shown in Figure A-13A.
12. Align the two screw holes on the L1 controller display with the holes on the L1 display protective cover, and screw in the two Phillips screws, as shown in Figure A-13B.
13. Hook in the L1 display protective cover onto the slots on the front chassis and, holding the L1 display cover up against the front chassis, screw in the Phillips screw, as shown in Figure A-13C.
14. Replace the front bezel onto the front chassis of the system by screwing in the two Phillips screws holding the bezel to the chassis, as shown in Figure A-13D.

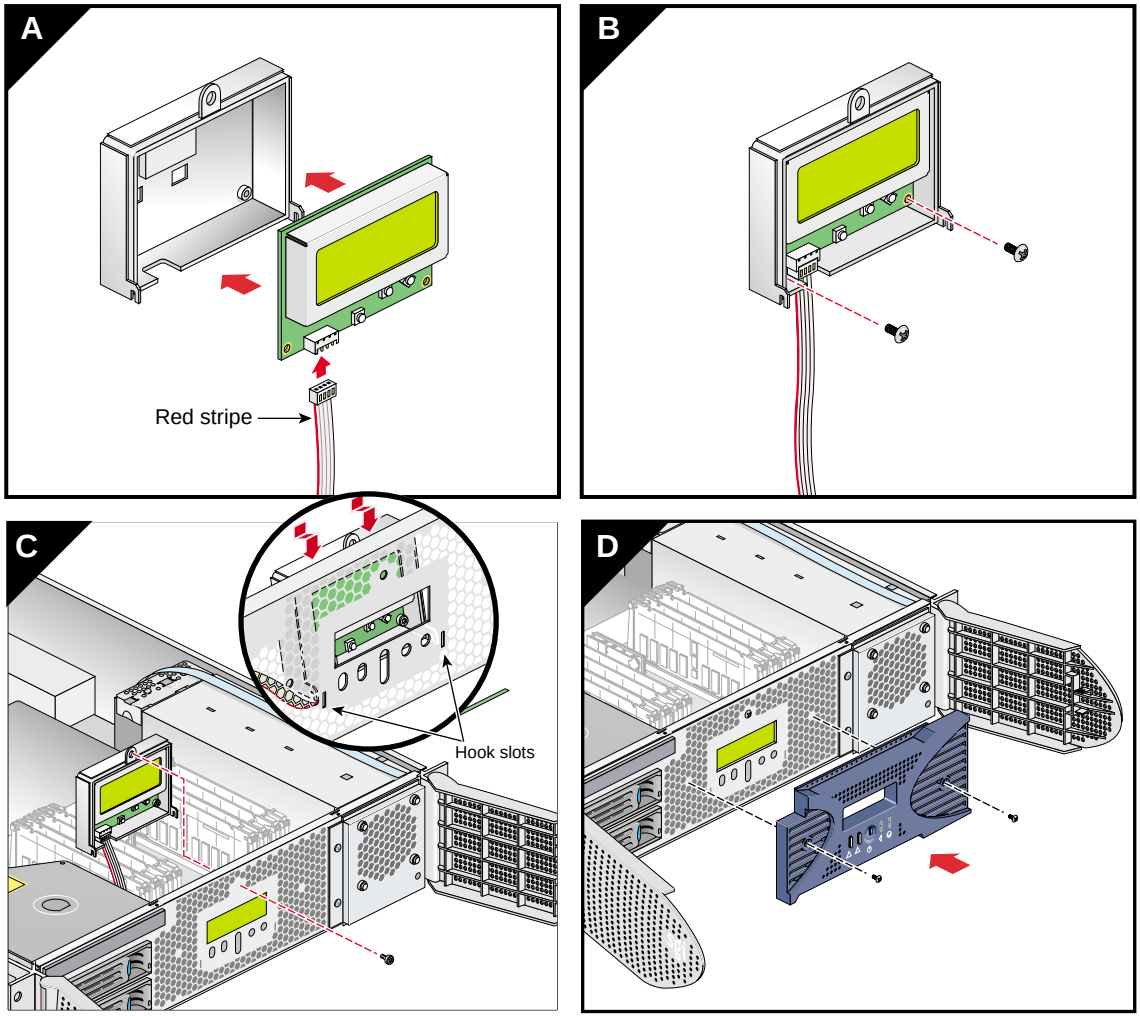

Figure A-13 Installing an L1 Controller Display Panel

15. Replace the plastic air baffle covering the DIMMs.
16. Close the chassis by reversing the operation described in “Opening the Chassis” on page 96.
17. Press the safety latches on both sides of the brick, and slide the brick into the rack.
18. Install the two screws that secure the brick to the front rails of the rack.

19. Install all of the cables at the rear of the brick.
20. Power on the host system as described in the user's guide that came with your host system.

Replacing a Graphics Card

To replace a graphics card, follow these steps:

1. Power off the host system as described in the user's guide that came with your host system.
2. Disconnect all of the cables at the rear of the brick.

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

3. If the brick is rackmounted, remove the two screws that secure the brick to the front rails of the rack. If the brick is mounted with shelf rails, remove the screws at the rear also. If the brick is not rackmounted, proceed to step 6.
4. If the brick is mounted with the optional slide rail kit, pull the brick from the rack until it is stopped by the safety latches. Otherwise, two people should lift the unit from the rack and place it on a stable work surface.
5. Using two people, remove the brick from the optional slide rails by depressing the safety latches and sliding the brick outward. Place it on a stable work surface.

6. Remove the optional chassis rail by unscrewing the five Phillips screws (see Figure A-14).

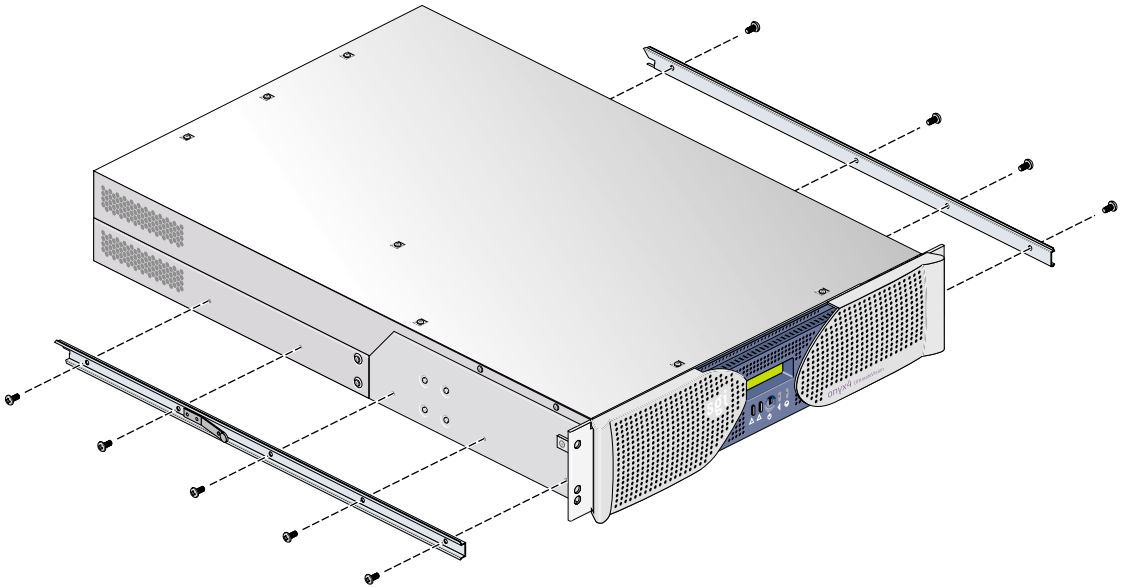

Figure A-14 Removing Chassis Rails from the Brick

7. Open the chassis as described in “Opening the Chassis” on page 96.
8. Make sure that you read “Safety Instructions” on page 88, before beginning removal of a graphics card.

9. Remove the lower PCI/PCI-X support bracket by unscrewing the four Phillips screws, as shown in Figure A-15.

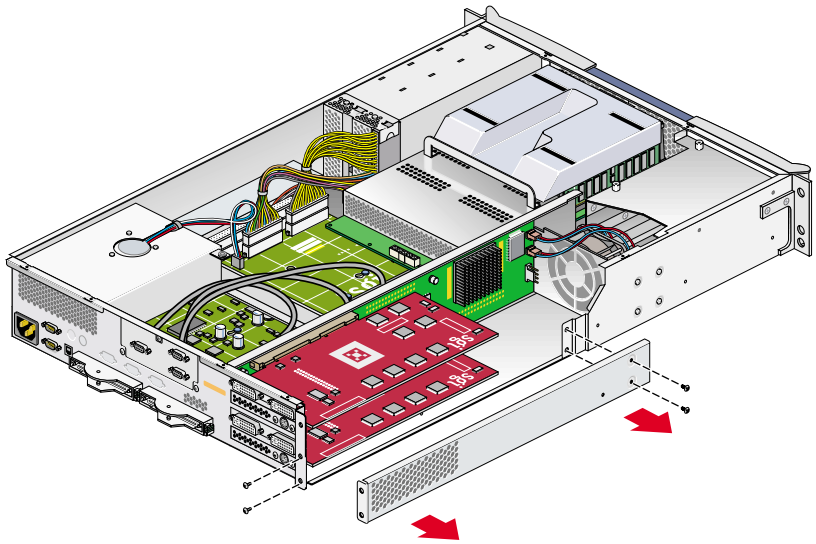

Figure A-15 Removing the PCI/PCI-X Support Bracket

10. Undo and remove the two screws that hold the card to the back panel, as shown in Figure A-16.

Caution: Each graphics card is connected to the riser board by a 7-pin synchronization cable connected from the PCI riser board to the underside of the graphics card. Be careful not to pull the graphics card away from the board too far as you remove it.

11. Pull the card gently out of the main connector on the riser board until it is clear of the back panel and main connector.
12. Carefully turn the graphics card over and disconnect the 7-pin keyed synchronization cable from the bottom (it attaches the graphics card assembly to the PCI riser board). See Figure A-17 on page 116.
13. Place the graphics card on an ESD-safe surface or in a protective bag.

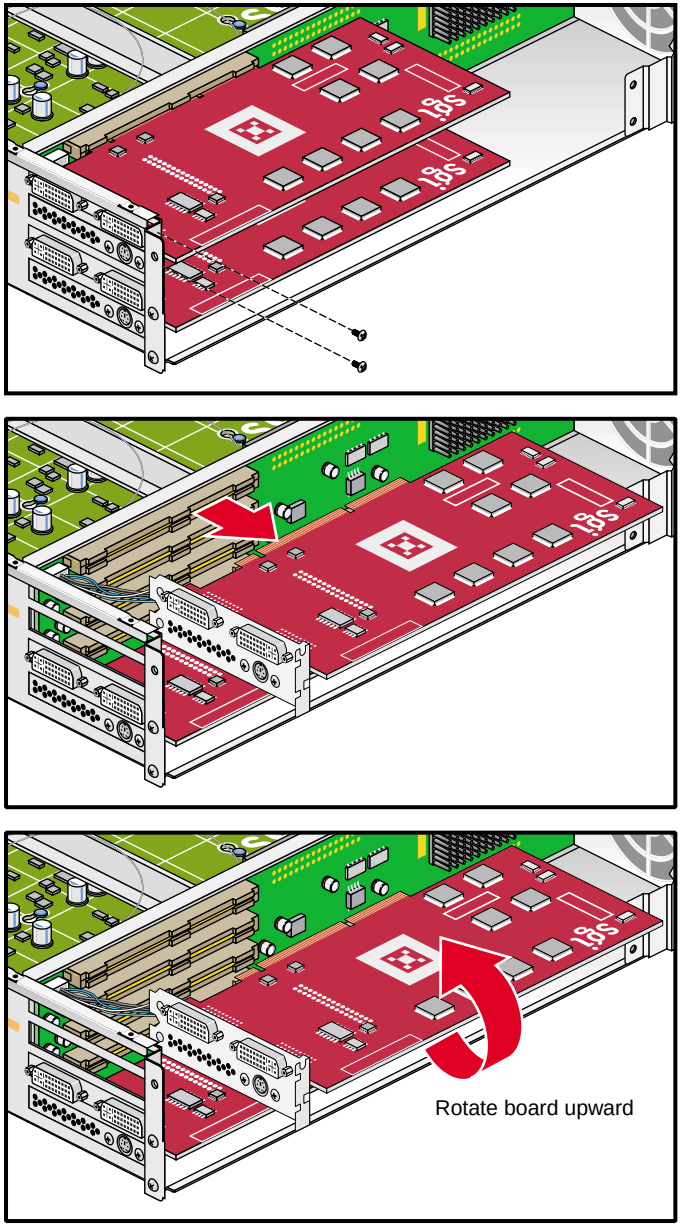

Figure A-16 Removing the Graphics Card Assembly

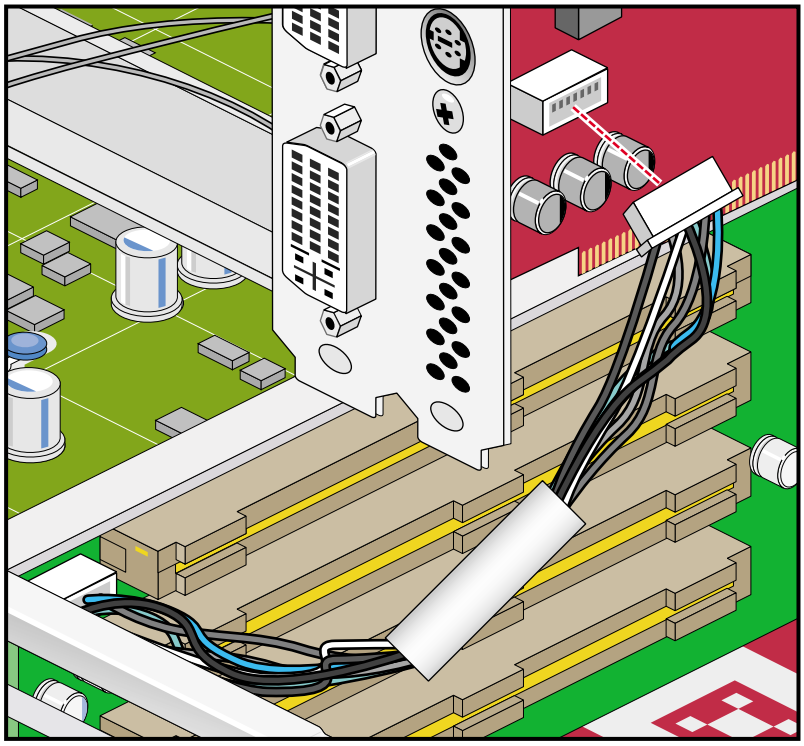

Figure A-17 Synchronization Cable Connection on Underside of Graphics Card

To install a new graphics card, use the following steps:

1. Place the card close to the graphics connector on the riser board and tilt it up until you can see the connector location for the 7-pin synchronization cable.
2. Gently insert the 7-pin synchronization cable into the connector on the bottom of the replacement graphics card, see Figure A-17. The connector is keyed and will only insert in the proper orientation. You should hear or feel a slight snap as the connector is seated.
3. Insert the card into the slot from which the old graphics card was removed by pushing the card into the connector until it is properly seated and installing the back panel retaining screws, as shown in Figure A-18.

Be careful not to snag the 7-pin synchronization cable between the graphics card and the riser board connector when you install the new card.

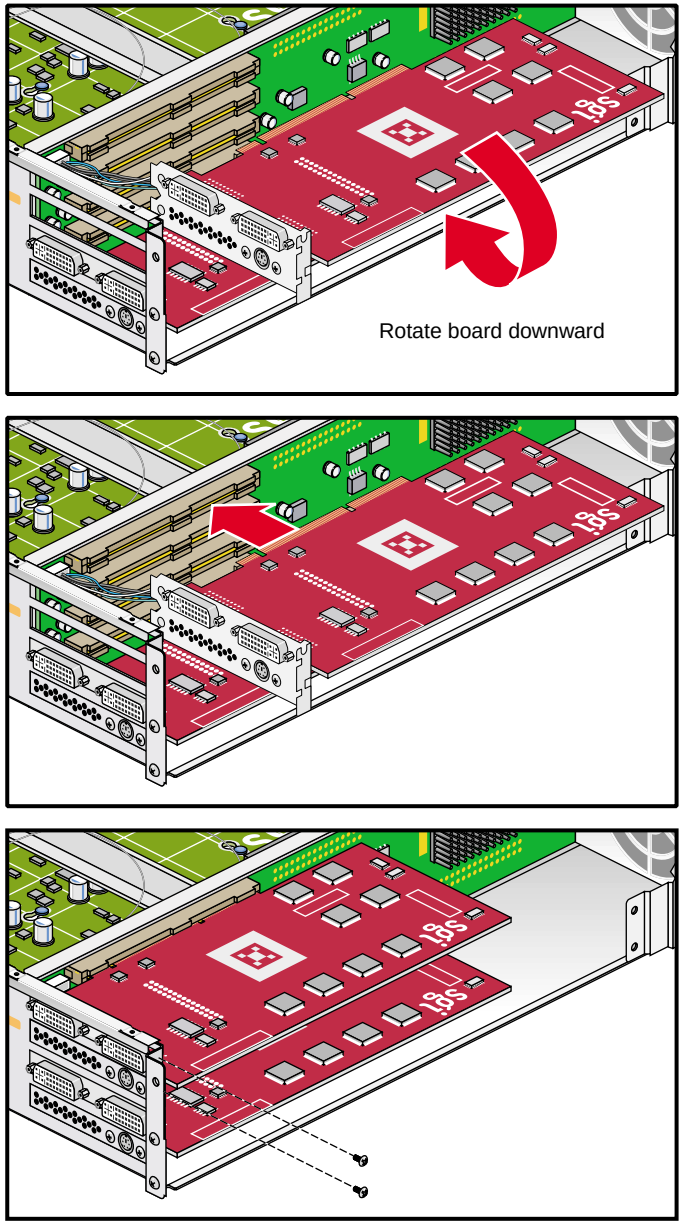

Figure A-18 Installing the Graphics Card and Retaining Screws

4. Replace the lower PCI/PCI-X support bracket and screw in the four Phillips screws, as shown in Figure A-19.

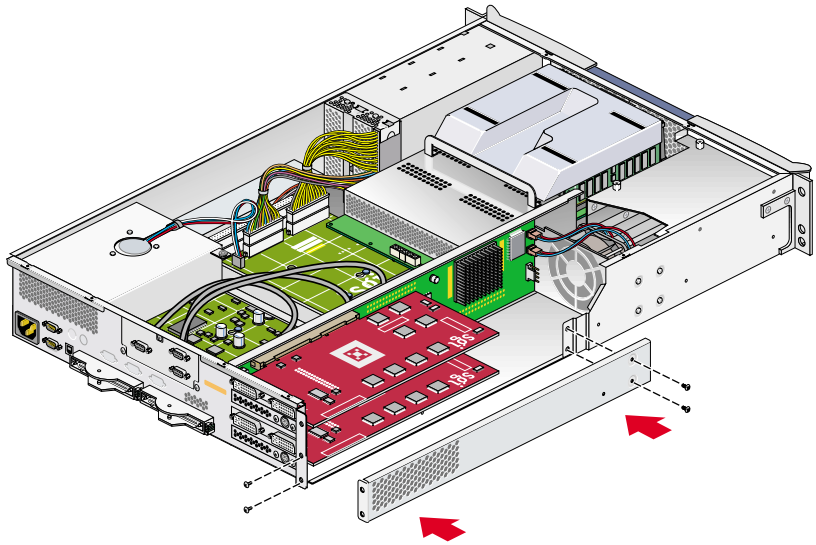

Figure A-19 Replacing the PCI/PCI-X Support Bracket

5. Replace the optional chassis rail (if applicable) by screwing in the five Phillips screws (see Figure A-14).
6. Close the chassis by reversing the operation described in “Opening the Chassis” on page 96.
7. If your system uses optional slide rails, follow substeps a-d; otherwise go to step 8.
   a. Fully extend the left and right slide rails from the rack until they lock into place.
   b. This step requires two people. With one person holding each side of the brick, align the chassis rails of the brick with the slide rails of the rack.
   c. Slide the chassis rails into the slide rails until the chassis rails are stopped by the safety latches.
   d. Press the safety latches on both sides of the brick, and slide the brick into the rack.
8. For bricks mounted on shelf rails, use two people to slide the unit into the rack.
9. Install the two screws that secure the brick to the front rails of the rack. For shelf mounted units, secure the two screws at the back.
10. Install all of the cables at the rear of the brick.
11. Power on the Onyx4 system.

Technical Information

This Appendix presents technical information about the SGI Onyx4 G2-bricks and G2N-bricks.

Display Requirements

The SGI Onyx4 system can support analog or digital monitors with a broad range of resolutions and refresh rates. The video modes supported by default include those listed in Table B-1. Numerous additional formats may be entered into the “Monitor” sections of the `/etc/X11/XF86Config-4` file.

Table B-1 Video Modes Supported by Default on SGI Onyx4 Pipes

Resolution	Refresh Rates
1024x768	60 Hz
1280x1024	60 Hz
1280x1024	96 Hz (stereo)
1600x1200	60 Hz
1920x1080	72 Hz
1920x1200	60 Hz

Note: Each graphics card has two DVI-I ports. However, on some cards the second DVI-I port (channel 2, on the right) may only be connected to an analog display. For more information, see “Using Both DVI Channels on a Card” on page 63.

Technical Specifications for G2-bricks and G2N-bricks

This section lists the technical specifications for the G2-bricks and G2N-bricks.

Table B-2 G2-brick and G2N-brick Technical Specifications

	G2-brick	G2N-brick
Dimensions		
Length	26.8 inches (68 cm)	26.8 inches (68 cm)
Width	17.1 inches (43.4 cm)	17.1 inches (43.4 cm)
Height	3.5 inches (8.8 cm)	3.5 inches (8.8 cm)
Form-factor	19-inch rack mount	19-inch rack mount
Weight	30 lb. (13.6 kg)	35 lb. (15.9 kg)
Voltage Ranges	90VAC-132VAC or 180VAC-264VAC	90VAC-132VAC or 180VAC-264VAC
Frequency	50Hz-60Hz	50Hz-60Hz
Power	150 watts maximum	350 watts maximum
Inrush current	20 amps (per power supply)	20 amps (per power supply)
Thermal load	512 Btu/hour maximum	1194 Btu/hour maximum
Temperature (operating)	+41 to +95 °F (+5 to +35 °C) <5,000 ft +41 to +86 °F (+5 to +30 °C) 5,000-10,000 ft	+41 to +95 °F (+5 to +35 °C) <5,000 ft +41 to +86 °F (+5 to +30 °C) 5,000-10,000 ft
Temperature (nonoperating)	-40 to +140 °F (-40 to +60 °C)	-40 to +140 °F (-40 to +60 °C)
Acoustic output	6 bel (idle), 41-86 °F (5-30 °C) <5,000 ft	6 bel (idle), 41-86 °F (5-30 °C) <5,000 ft
Altitude	Operating: 0-10,000 ft (0-3,048 m) Non-operating: 0-40,000 ft (0-12,192 m)	Operating: 0-10,000 ft (0-3,048 m) Non-operating: 0-40,000 ft (0-12,192 m)
Humidity	10% to 95% RH, noncondensing	10% to 95% RH, noncondensing

Connector Pinouts

This section describes the various connectors found on an SGI Onyx4 G2 or G2N brick. For details of connectors found on the host system, or on other bricks, see the documentation that came with the host system or with those other bricks.

DB9 Serial Connector

Figure B-1 shows the DB9 serial port connector pin assignments. This connector is used for the console and diagnostic port of the G2-brick and G2N-brick, and enables you to connect a system console to the L1 controller on the graphics brick.

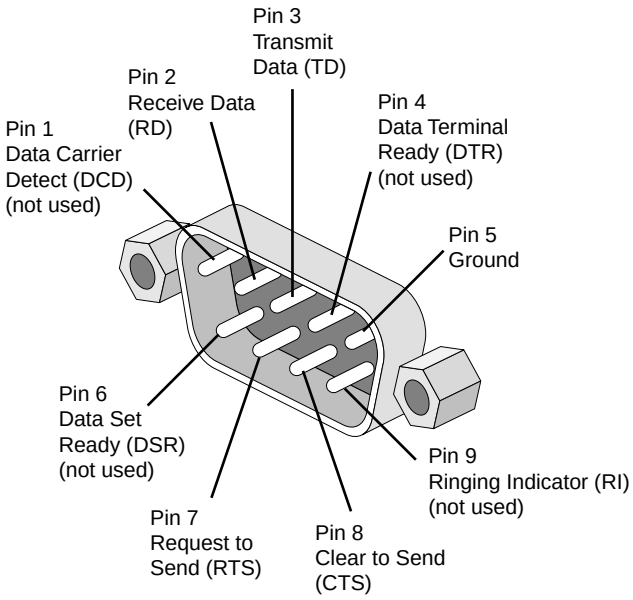

Figure B-1 DB9 Connector Pin Assignments

Caution: Although the image sync subsystem also uses DB9 connectors, these connectors, whether on the ImageSync card or on the G2 and G2N bricks, are not serial ports. Connecting a serial device to these connectors may cause damage to both the ImageSync devices and the serial devices.

USB Type B Connector

Figure B-2 shows the USB type B connector that is used for the L1 USB port of the G2-bricks and G2N-bricks. Table B-3 lists the pin assignments.

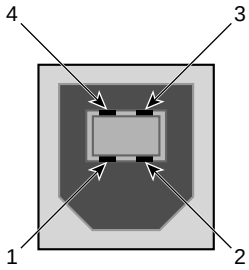

Figure B-2 USB Type B Connector Pin Number Locations

Table B-3 USB Type B Connector Pin Assignments

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

DVI-I Connector Pinout

The DVI-I connectors on each graphics card incorporate both digital and analog signals. Figure B-3 shows the pin numbers and Table B-4 shows the signals.

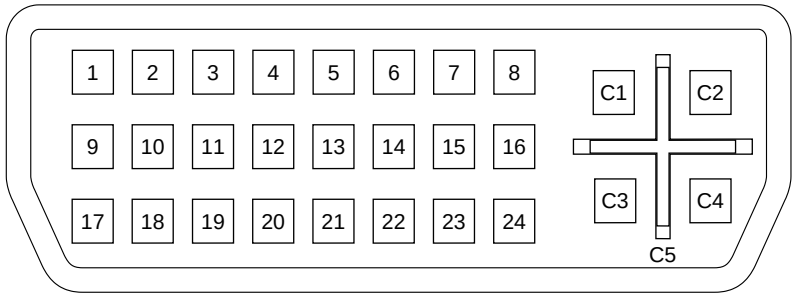

Figure B-3 DVI-I Connector Pinout

Table B-4 DVI-I Connector Signals

Pin	Function	Pin	Function
1	T.M.D.S.[a] Data 2-	16	Hot Plug Detect
2	T.M.D.S. Data 2+	17	T.M.D.S. Data 0-
3	T.M.D.S. Data 2/4 Shield	18	T.M.D.S. Data 0+
4	T.M.D.S. Data 4-	19	T.M.D.S. Data 0/5 Shield
5	T.M.D.S. Data 4+	20	T.M.D.S. Data 5-
6	DDC Clock	21	T.M.D.S. Data 5+
7	DDC Data	22	T.M.D.S. Clock Shield
8	Analog Vertical Sync	23	T.M.D.S. Clock+
9	T.M.D.S. Data 1-	24	T.M.D.S. Clock-
10	T.M.D.S. Data 1+		
11	T.M.D.S Data 1/3 Shield	C1	Analog Red Video Out
12	T.M.D.S. Data 3-	C2	Analog Green Video Out
13	T.M.D.S. Data 3+	C3	Analog Blue Video Out
14	+5V Power	C4	Analog Horizontal Sync
15	Ground (for +5V)	C5	Analog Common Ground

a. Transition Minimized Differential Signaling

Stereo-Sync Connector Pinout

Figure B-4 shows the stereo-sync connector on the Onyx4 graphics board. Table B-5 lists the pin assignments.

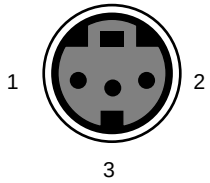

Figure B-4 Stereo-Sync Connector Pin Number Locations

Table B-5 Stereo-Sync Connector Pin Assignments

Pin	Signal
1	+12V DC output to stereo device
2	Ground
3	Stereo left/right eye signal (1=left, 0=right) (STEREO_LEFT)

SwapReady Connector Pinout

Figure B-5 shows the SwapReady connector on the ImageSync card. Table B-6 lists the pin assignments.

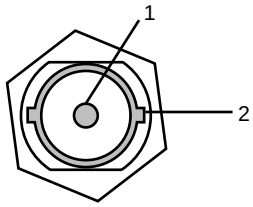

Figure B-5 SwapReady Connector Pin Number Locations

Table B-6 SwapReady Connector Pin Assignments

Pin	Signal
1	Swapbuffer gang sync open collector I/O
2	Signal return ground

Genlock Connector Pinout

Figure B-6 shows the Genlock connector on the ImageSync card. Table B-7 lists the pin assignments.

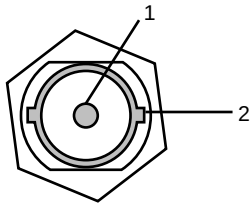

Figure B-6 Genlock Connector Pin Number Locations

Table B-7 Genlock Connector Pin Assignments

Pin	Signal
1	Genlock in
2	Genlock return (signal ground)

Installing G2-bricks and G2N-bricks in a Rack

Depending on how you purchased your SGI Onyx4 system, you may need to install one or more G2-bricks or G2N-bricks in a rack. This Appendix describes the process of installing bricks in a rack and removing bricks from a rack.

Safety Measures

Observe the following safety measures when you install the system:

- Use caution when you remove the system from the shipping crate. Failure to handle the system carefully can result in personal injury or property damage.

Warning: Ensure that the shipping crate is positioned close to its destination before you unpack the crate.

Warning: Employ a minimum of two people to lift the brick or bricks off the shipping pallet, to move the brick(s) from one location to another, and to install the brick(s) in a rack. Otherwise, someone could be seriously injured.

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

Warning: Keep fingers and conductive tools away from high-voltage areas. Failure to follow these precautions will result in serious injury or death. The high-voltage areas of the system are indicated with high-voltage warning labels.

- Ensure that a qualified electrician has properly installed the power receptacles.
- Set all circuit breakers to the OFF (**O**) position before you plug in the system power cord.

Warning: Use the following guidelines to prevent the rack from toppling over. Otherwise, people could be seriously injured and/or equipment could be damaged.

Follow these guidelines to prevent the rack from toppling over:

- Make sure that only one brick is extended out of the rack at one time.
- Install all equipment in the lowest available position in the rack.
- If provided, ensure that the tip tray is bolted to the front of the rack.

Rackmounting a G2-brick or G2N-brick

This section describes how to rackmount bricks with slide rail assemblies. This section includes the following topics:

Determining Space Requirements

Table C-1 specifies the space requirements when rackmounting a G2-brick or a G2N-brick in a 19-inch rack.

Table C-1 G2-brick and G2N-brick Space Requirements

Height	3.44 inches (8.74 cm)
Width	17.06 inches (43.33 cm)
Depth	27 inches (68.58 cm) (with bezel)
Weight	37.80 lb. (17.18 kg) minimum configuration; 44.50 lb. (20.23 kg) maximum configuration[a]
Required front clearance for brick	8.25 inches (20.96 cm)
Required rear clearance for brick	10 inches (25.40 cm)
Required side clearance for brick	6 inches (15.24 cm) (right side) No clearance requirement for left side.
Required front clearance for rack	36 inches (91 cm)
Required rear clearance for rack	36 inches (91 cm)

a. Weight will vary depending on configuration.

Checking the Slide Rail Hardware

Table C-2 lists the hardware that you will use to mount each G2-brick or G2N-brick in a 19-inch rack.

Table C-2 Rackmounting Hardware

Hardware Type	Qty	Usage
Slide rail assembly (includes chassis rail)	2	Allows the brick to slide in and out of rack. (The left and right slides are identical.)
2-inch rear mounting bracket	2	Mounts the slide rails to the rear rack rails. (The left and right brackets are identical.)
10-24 x 1/4-inch Phillips screw	10	Secures the chassis rails to the brick.

Table C-2 Rackmounting Hardware **(continued)**

Hardware Type	Qty	Usage
10-32 x 1/2-inch Phillips screw Shoulder washer Bar nut	8 8 4	Secures the slide rails to the rack rails.
10-32 x 1/2-inch Phillips screw Bar nut	4 2	Secures the slide rails to their mounting brackets.
10-32 clip nut	2	Provides a threaded hole for fastening the brick front panel to the rack rails.
10-32 x 1/2-inch Phillips screw	2	Fastens the brick front panel to the clip nut.

Preparing the Slide Rail Assemblies

The slide rail assembly consists of a chassis rail and a slide rail. You need to remove the chassis rail from the slide rail so that you can install a mounting bracket to the slide rail and attach the chassis rail to the brick (see “Preparing the Brick” on page 136). To remove the chassis rail from the slide rail, follow these steps:

1. Remove the two slide rail assemblies and the rear mounting brackets from the shipping container.
2. Extend each slide rail assembly until the safety latch snaps into place.
3. Press the safety latch and remove the chassis rail from the slide rail, as shown in Figure C-1.

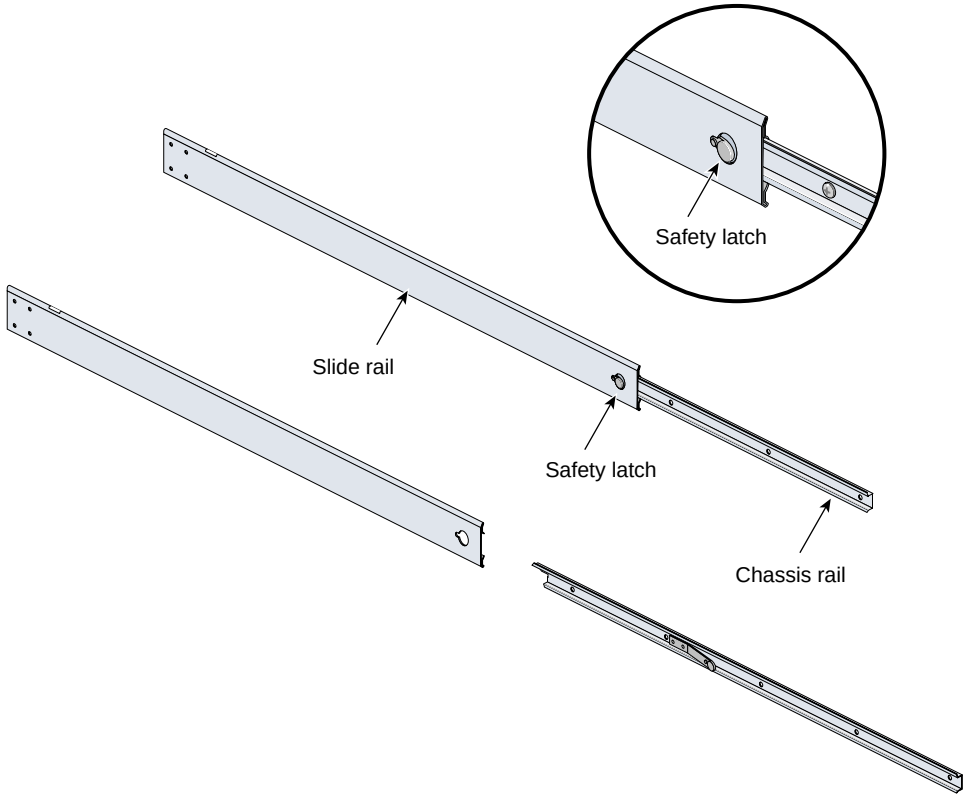

Figure C-1 Removing the Chassis Rail from the Slide Rail

4. Place one of the mounting brackets on the back of the slide rail as shown in Figure C-2. Adjust the position of the mounting bracket on the slide rail according to the depth of the rack.
5. Place a bar nut next to the mounting bracket. Secure the mounting bracket to the slide rail by inserting two 10-32 x 1/2-inch screws through the assembly and into the bar nut as shown in Figure C-2.
6. Repeat steps 4 and 5 to attach a mounting bracket to the other slide rail.

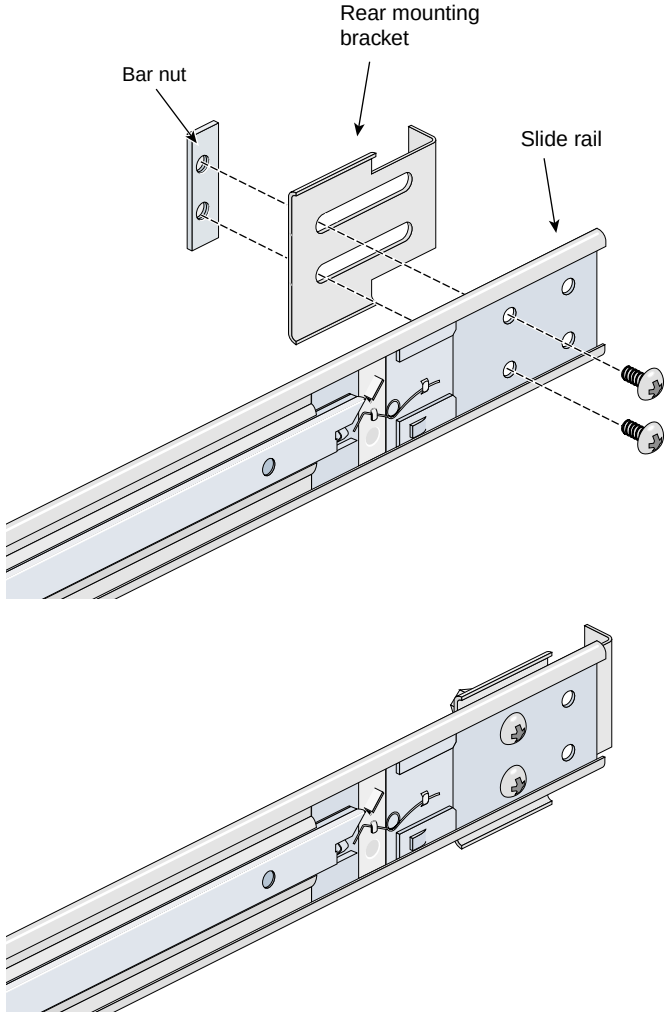

Figure C-2 Attaching the Rear Mounting Bracket to the Slide Rail

Preparing the Brick

To attach the chassis rails to the brick, follow these steps:

1. Place the brick on a flat, stable surface.
2. Using four 10-24 x 1/4-inch screws, attach one of the chassis rails to the right side of the brick. Ensure that the rail is installed in the correct direction (see Figure C-3).

Caution: Use only the 1/4-inch (0.64 cm) length screws. Longer screws damage internal components in the brick.

3. Using five 10-24 x 1/4-inch screws, attach the second rail to the left side of the brick. Again, ensure that the rail is installed in the correct direction.

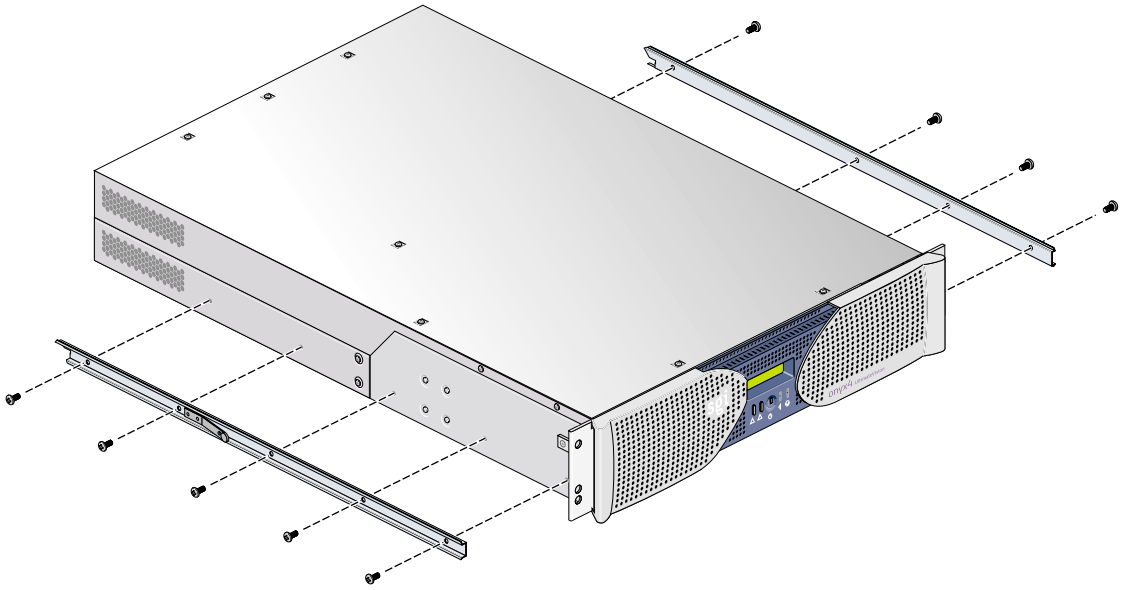

Figure C-3 Attaching Chassis Rails to the Brick

Determining Where to Attach the Slide Rail in the Rack

The brick requires two units (2U) of space within the rack (one unit is equivalent to 1.75 inches [44.5 cm]). To determine where you should install the slide rails in the rack, you must count mounting holes. Each U contains three mounting holes; therefore, in the 2U of space that the brick occupies, there are six mounting holes. The bottom hole of the 2U space is hole 1. The top mounting hole in the 2U space is hole 6. See Figure C-4.

Note: A brick in the rack is identified by the lowest U number that it occupies. For example, in Figure C-4 the brick resides in U5 (the fifth unit within the rack).

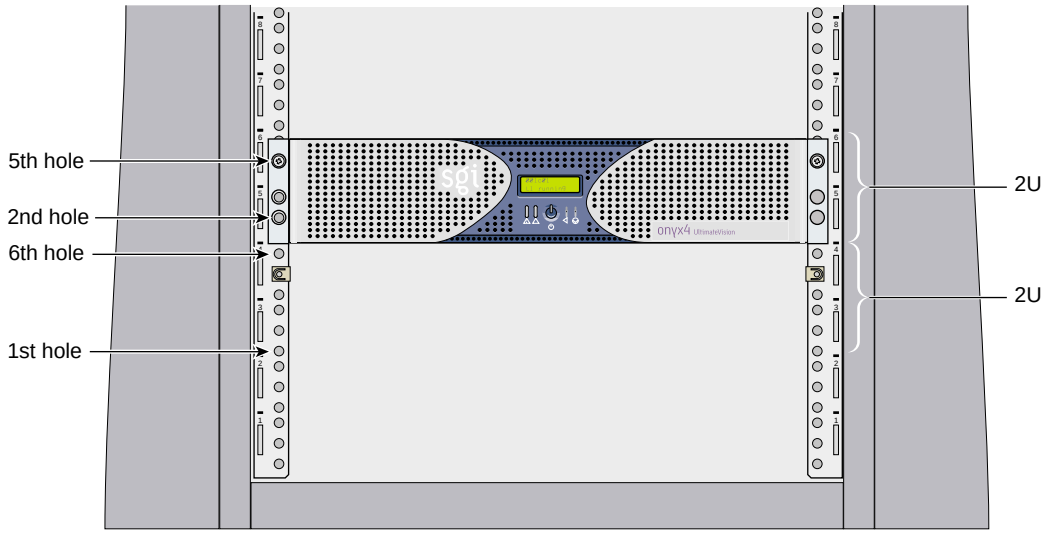

Figure C-4 Mounting-hole Pattern of Rack Vertical Rails

To determine how many mounting holes you must count, use the following formula: **3 x (the lowest U number that the brick will occupy) - 2**. For example, when you want to install the brick in locations U9 and U10, count 25 mounting holes (3 x 9 - 2) starting from the bottom of the rack. The 25th hole is the first mounting hole of U9.

Attaching the Slide Rail to the Rack

To attach the slide rail to the rack, follow these steps:

Tip: The slide rails must be level in the rack. To ensure that you install the slide rails correctly, carefully count the mounting holes on all of the rack rails (both front rails and both rear rails).

1. Locate eight 10-32 x 1/2-inch Phillips screws, eight shoulder washers, and four bar nuts.
2. Place one of the bar nuts inside the rack and align it with the second and third holes of the selected 2U of space (see Figure C-5).

   Note: The holes in the bar nuts are not centered. The bar nuts need to be placed in such a way that the holes are closest to the inside edge of the rack rails. See Figure C-5.

3. Insert two screws with shoulder washers through the rack rail to hold the bar nut in place. The screws should not be tightened at this point.
4. Repeat steps 2 and 3 to install the remaining three bar nuts on the other three rack rails (front and rear of rack).

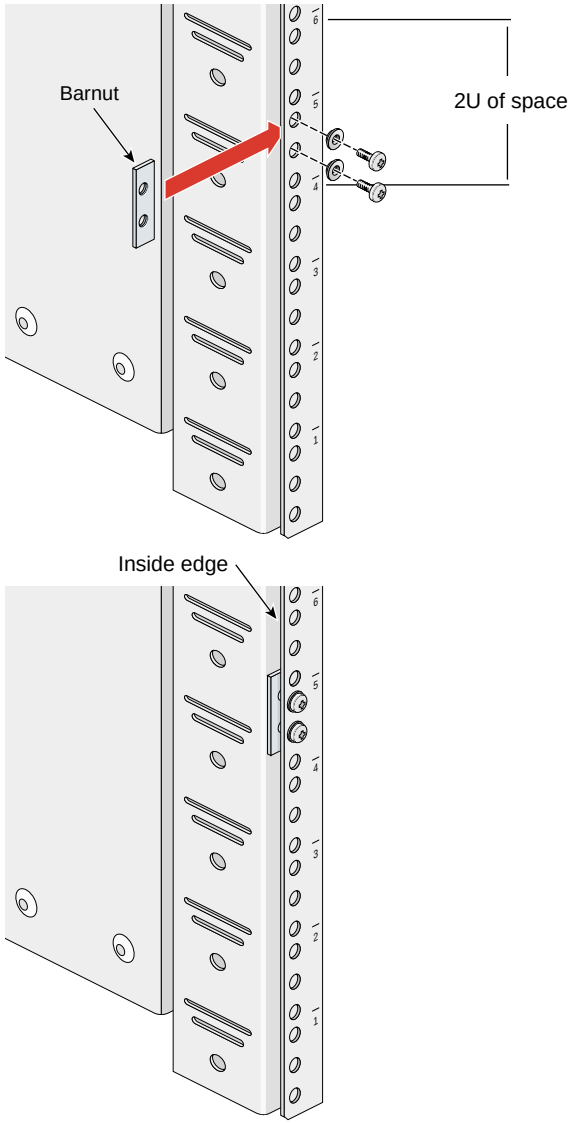

Figure C-5 Placing the Bar Nuts on the Rack Rails

5. Insert the front and rear brackets of one of the slide rails between the rack rails and the bar nuts, as shown in Figure C-6.
6. Tighten the screws on the front- and rear-end of the rails. Do not tighten firmly at this point, because all screws will be firmly tightened once the brick is installed in the rack.
7. Repeat steps 5 and 6 to attach the second slide rail to the other side of the rack.

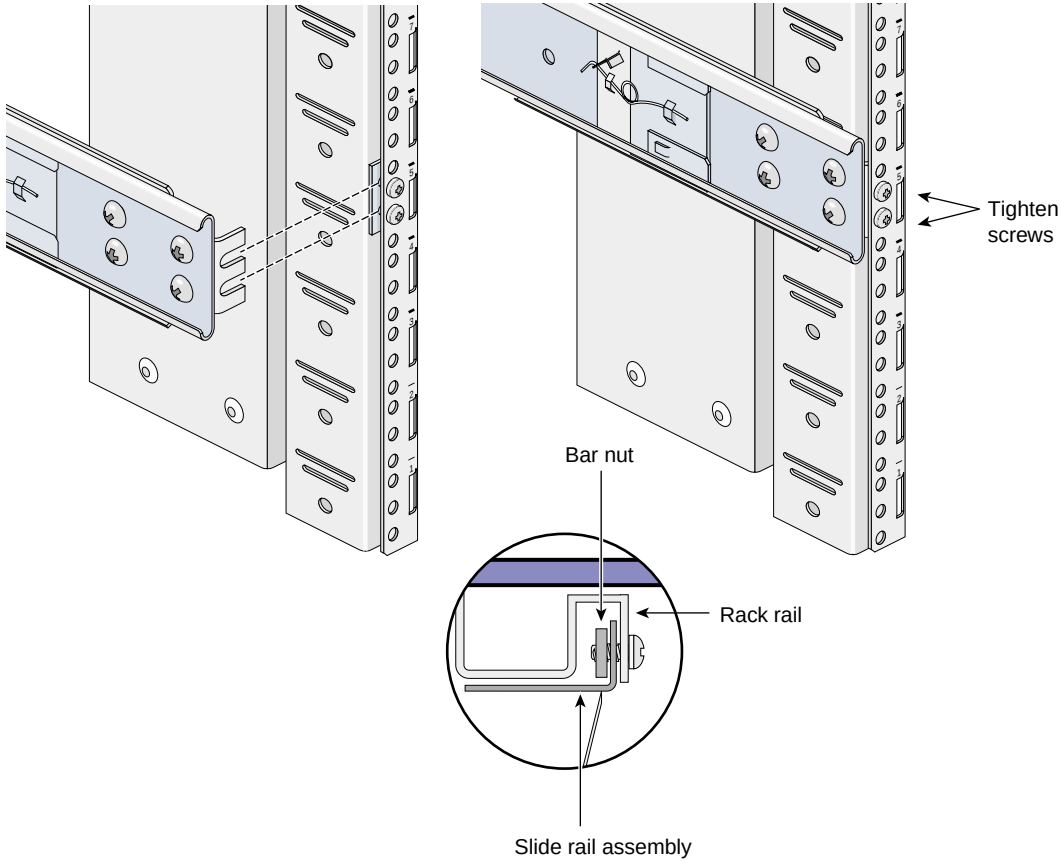

Figure C-6 Attaching the Slide Rail to the Rack

Installing Clip Nuts in Rack Rails

Clip nuts secure the bricks to the rack. To install the clip nuts, slide the clip nuts over the fifth hole of the selected 2U of space on each of the front rails. See Figure C-7 for details.

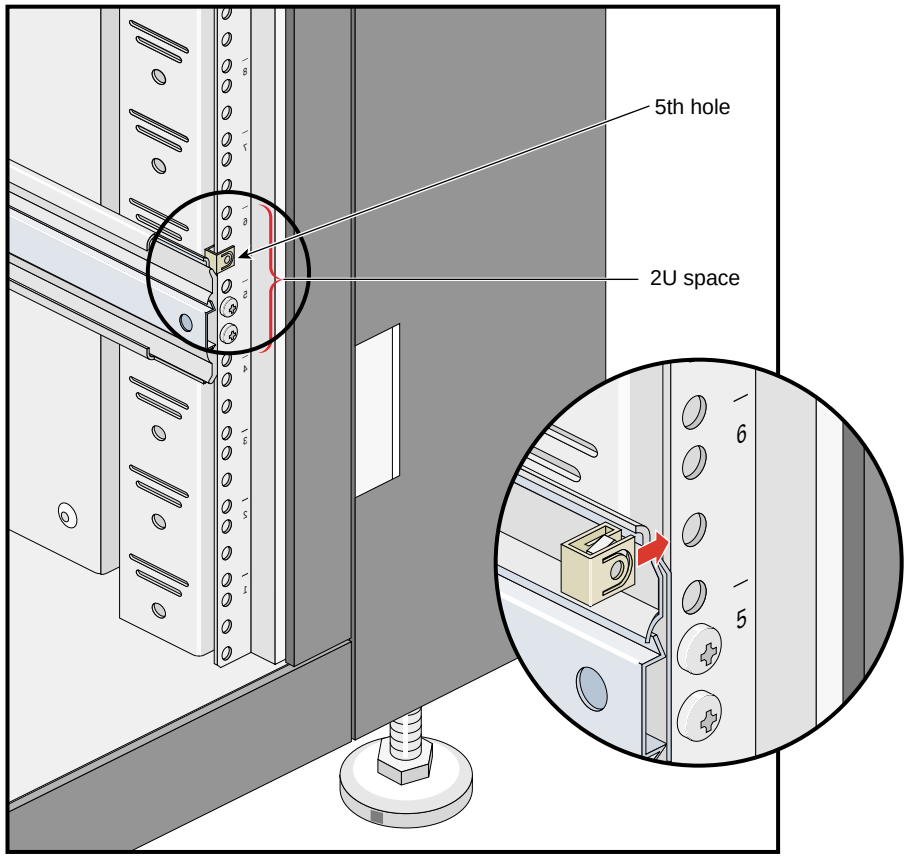

Figure C-7 Installing Clip Nuts in Rack Rails

Installing the Brick in the Rack

To install the brick in the rack, follow these steps:

Note: Step 2 requires two people.

1. Fully extend the left and right slide rails from the rack until they lock into place.
2. With one person holding each side of the brick, align the chassis rails of the brick with the slide rails of the rack.
3. Slide the chassis rails into the slide rails until the chassis rails are stopped by the safety latches.
4. Press the safety latches on both sides of the brick to fully seat the chassis rails into the slide rails (see Figure C-8).
5. Firmly tighten all screws (the eight screws that secure the slide rails to the rack rails).

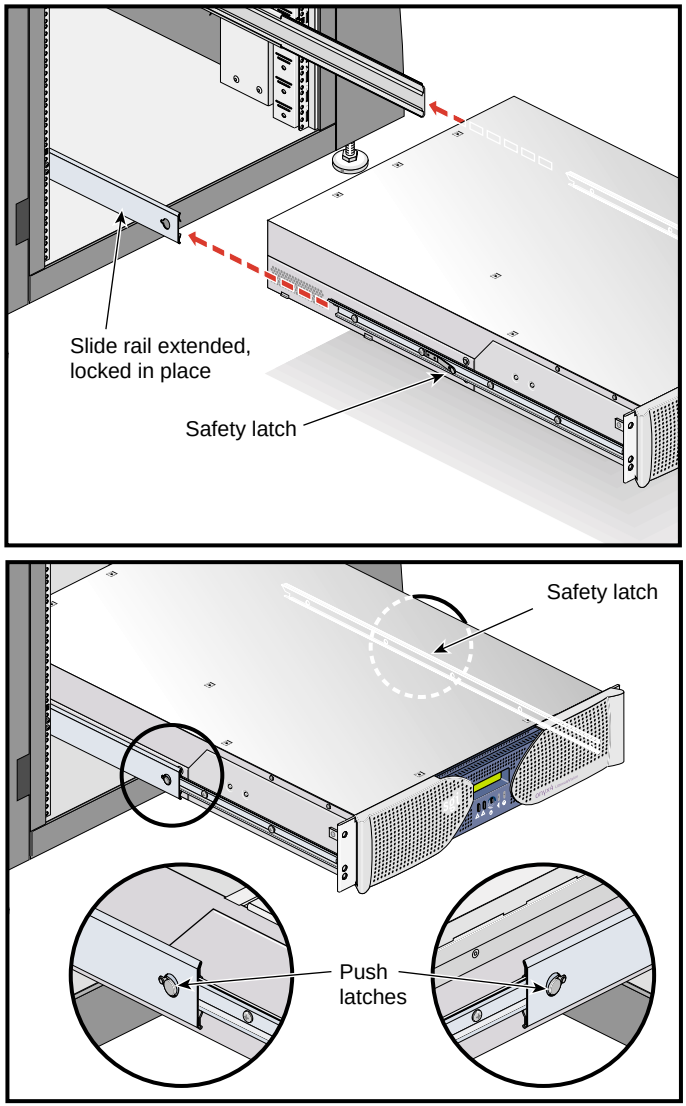

Figure C-8 Pressing the Safety Latches

6. Secure the brick to the rack by inserting a 10-32 x 1/2-inch Phillips screw in the top hole of each chassis ear (see Figure C-9).

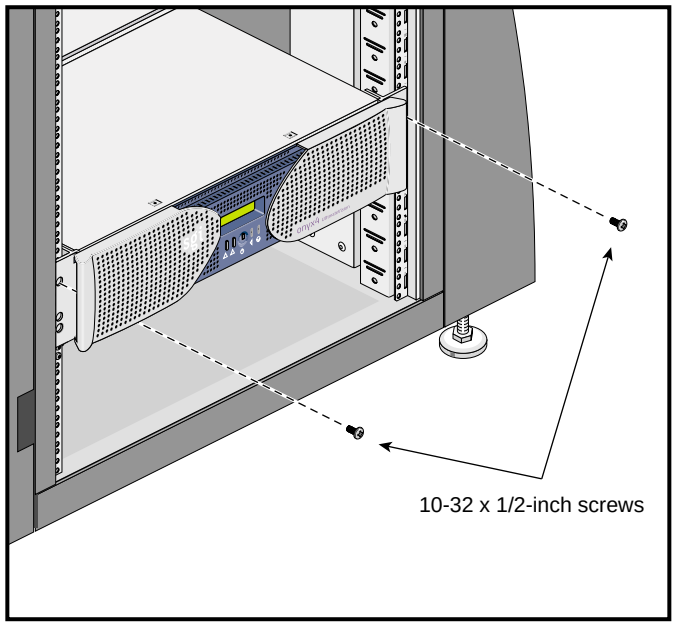

Figure C-9 Securing the Brick to the Rack

Adjusting the Position of the Rackmounted Brick

Once the brick is installed in the rack, you can adjust the position of the brick in the rack (up and down, side-to-side). To adjust the position of the brick, loosen the front mounting screws, adjust the brick to the desired position, then tighten the mounting screws.

Caution: Do not lift the brick by its bezel; it is not designed to handle the weight of the brick. Instead, use the chassis ears to move the brick (see Figure C-9).

Removing a G2-brick or G2N-brick from a Rack

To remove a G2-brick or G2N-brick from a rack, follow these steps:

1. Power off the brick.
2. Disconnect all of the cables at the rear of the brick.

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

3. Remove the two screws that secure the brick to the front rails of the rack.
4. Carefully pull the brick from the rack until it is stopped by the safety latches.
5. With one person holding each side, release the safety latches on both sides of the brick and pull the brick out of the slide rail (see Figure C-10).
6. Place the brick on a flat, stable surface.

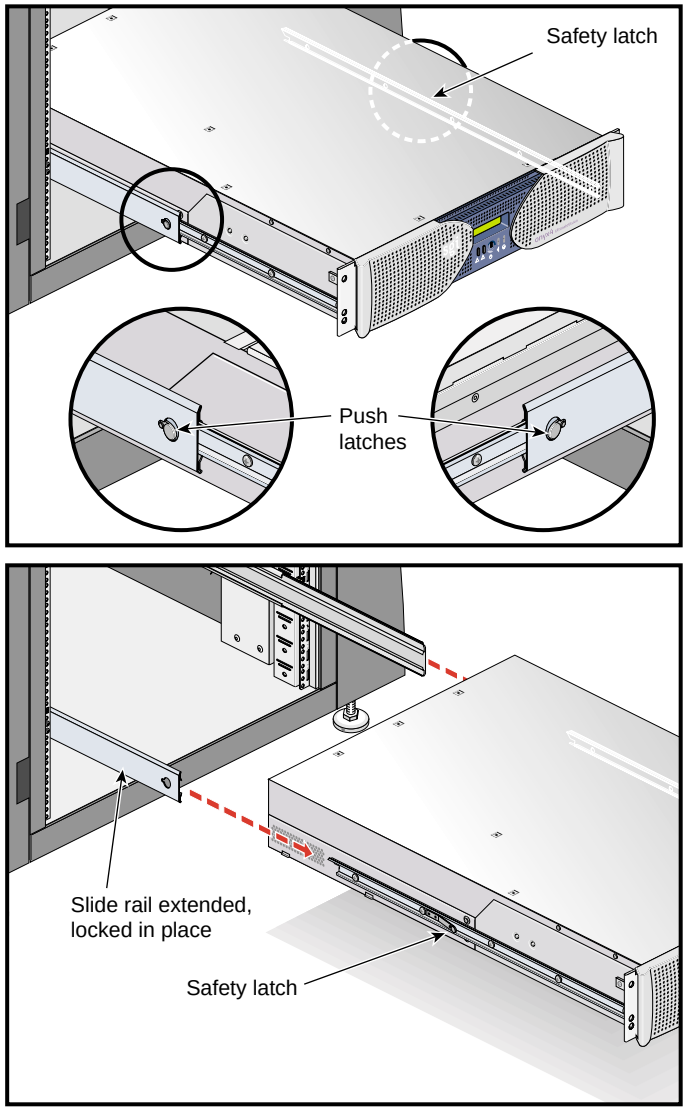

Figure C-10 Releasing the Safety Latches

7. To slide the slide rails back into the rack, push down on the slide latches as shown in Figure C-11.

Note: Before you reinstall a brick into the rack, fully extend the slide rails from the rack until they lock into place.

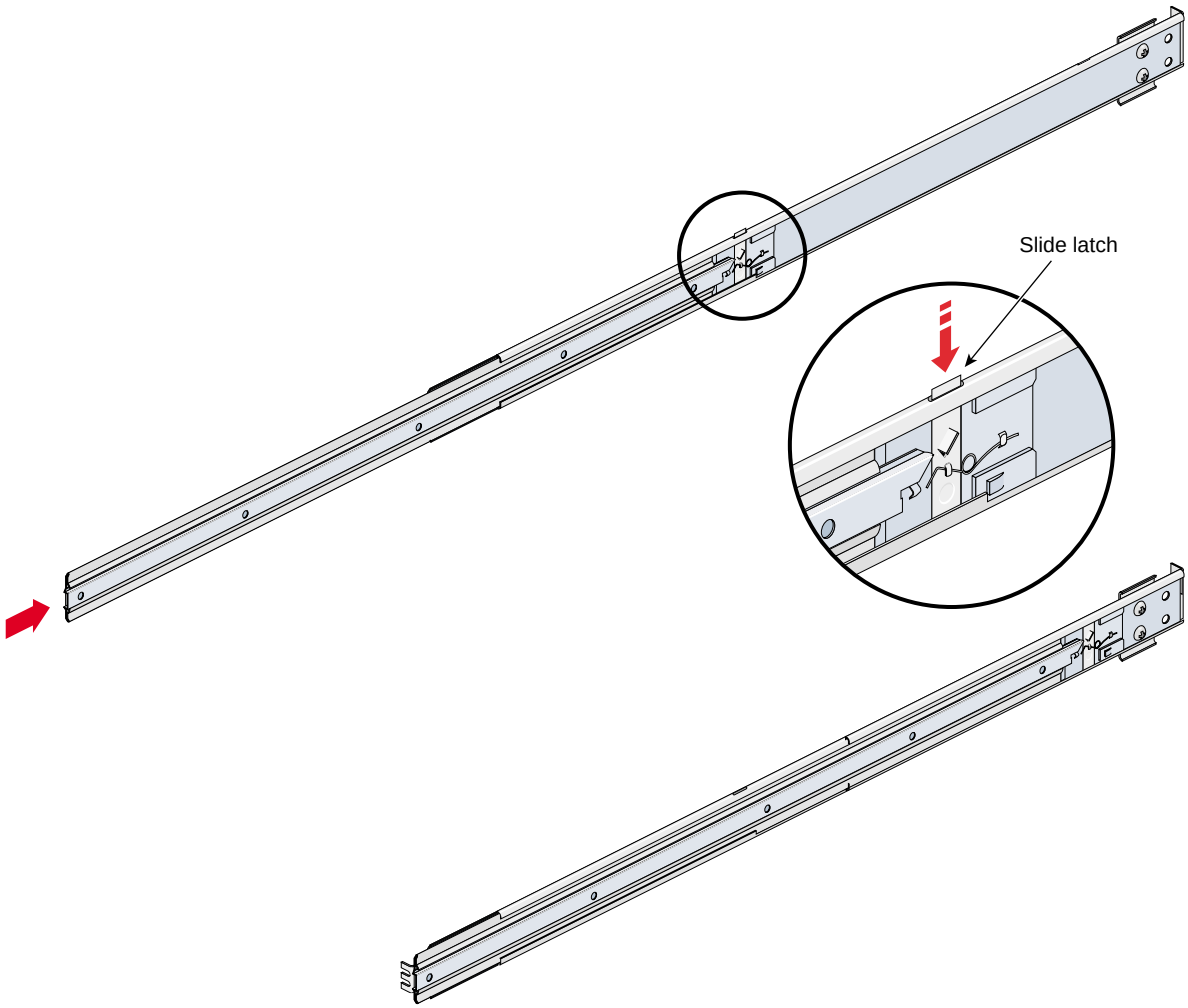

Figure C-11 Releasing the Slide Latches

Compliance and Regulatory Statements

This appendix presents regulatory information that may be important to the operation of your SGI system.

Manufacturer's Regulatory Declarations

SGI 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 printed on the system label on the unit.

CE Notice and Manufacturer's Declaration of Conformity

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 section provides the contents of electromagnetic emissions notices for various countries.

FCC Notice (USA Only)

This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

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

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment 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 your authority to operate the equipment.

Industry Canada Notice (Canada Only)

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

Cet appareil numérique német pas de perturbations radioélectriques dépassant les normes applicables aux appareils numériques de Classe A préscrites dans le Règlement sur les interferences radioélectriques établi par le Ministère des Communications du Canada.

VCCI Notice (Japan Only)

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

Chinese Class A Regulatory Notice

警告使用者：

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

Korean Class A Regulatory Notice

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며 만약 잘못 판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

Shielded Cables

This SGI system product is FCC compliant under test conditions that include the use of shielded cables between the system and its peripherals. Your system and any peripherals that you purchase from SGI have shielded cables. Shielded cables reduce the possibility of interference with radio, television, and other devices. If you use any cables that are not from SGI, ensure that they are shielded. Telephone cables do not require shielding.

Optional monitor cables supplied with your system use additional filtering molded into the cable jacket to reduce radio frequency interference. Always use the cable that is supplied with your system. If your monitor cable becomes damaged, obtain a replacement cable from SGI.

Electrostatic Discharge

SGI designs and tests its products to be resistant to the effects of electrostatic discharge (ESD). ESD is a source of electromagnetic interference and can cause problems ranging from data errors and lockups to permanent component damage.

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

An ESD wrist strap may be included with some products, such as memory or PCI upgrades. Use the wrist strap when you install these upgrades to prevent the flow of static electricity; it is designed to protect your system from ESD damage.

Laser Compliance Statements

Some SGI system contain one or more DVD-ROM drives. These drives are Class 1 laser products. The DVD-ROM drive-classification label is located on the drive.

Warning: **Invisible laser radiation when open. Avoid exposure to beam.**

Warning: **Attention: Radiation du faisceau laser invisible en cas d'ouverture. Evitter toute exposition aux rayons.**

Warning: **Vorsicht: Unsichtbare Laserstrahlung, Wenn Abdeckung geöffnet, nicht dem Strahl aussetzen.**

Warning: **Advertencia: Radiación láser invisible al ser abierto. Evite exponerse a los rayos.**

Warning: **Advarsel: Laserstråling vedåbning se ikke ind i strålen**

Warning: **Varo! Lavattaessa Olet Alttina Lasersåteilylle**

Warning: **Varning: Laserstrålning når denna del år öppnad ålå tuijota såteeseenstirra ej in i strålen.**

Warning: **Varning: Laserstrålning nar denna del år öppnadstirra ej in i strålen.**

Warning: **Advarsel: Laserstråling nar deksel åpnesstirr ikke inn i strålen.**

Lithium Battery Statement

Warning: **Only qualified service personnel should replace the soldered lithium battery (or batteries) in SGI systems.**

Warning: **Risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the battery manufacturer's instructions.**

Warning: **Avertissement: Il y a risque d'explosion si la pile est remplacée par une autre de type incorrect. Débarrassez-vous des piles utilisées selon les instructions du fabricant de pile.**

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.**

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