Silicon Graphics® Fuel™ Visual Workstation Hardware User's Guide

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About This Guide

Welcome to the user's guide for the Silicon Graphics Fuel visual workstation. Your new workstation offers VPro graphics, a high-performance MIPS processor, and a high-bandwidth architecture designed to maximize the performance of your desktop applications.

Note: This User's Guide has been translated and is available to download from the SGI Technical Publications Library at **`http://techpubs.sgi.com`**.
Enter the keywords **`Fuel`** + **`<language>`** to find the version you need.

This guide shows you how to set up, use, and troubleshoot your system. You'll learn to:

- Set up your workstation
- Access online information
- Install and remove internal parts
- Install and remove peripherals
- Diagnose hardware problems

This guide also provides:

- Technical specifications
- Safety and regulatory information

This guide is provided for all end-users and SGI technical support staff. Most of the hardware tasks are relatively simple and require no previous computer knowledge. A few tasks are lengthy; they are easier to perform if you have some computer hardware experience.

Conventions

Table i shows the conventions used in this document.

Table i Documentation Conventions

Convention	Meaning
Toolchest > Help > Online Books	The ">" is used to indicate direction in an on-screen menu hierarchy. In this example, "**Online Books**" is listed under the "**Help**" menu, which is listed under the "**Toolchest**" menu.
Silicon Graphics Fuel Hardware User's Guide	Document titles are shown in italics. This applies to both online and print documents.
`>>ls -al`	User input is shown in boldface, fixed-width type.

Software and System Administration Information

For complete information on installing software, see the online *Personal System Administration Guide*. It is located on your desktop in **Toolchest > Help > Online Books**. For more advanced information, see the online *IRIX Admin: Software Installation & Licensing Guide*. For system administration information, see the **SGI_Admin** section of the online bookshelf.

It is always a good idea to back up your system. For instructions on backing up your system, see the online *Personal System Administration Guide*.

Product Support

The Silicon Graphics Fuel visual workstation is designed for user maintenance and repair without the help of a trained technician. For product support information, contact your SGI subsidiary or authorized distributor.

SGI provides a comprehensive range of product support for its products. If you are in North America, contact the Technical Assistance Center at + 1 800 800 4SGI or your authorized service provider. If you are outside North America, contact the SGI subsidiary or authorized distributor in your country. For more information about product support, refer to the following website:
`http://www.sgi.com/support/index.html`

Reader Comments

If you have comments about the technical accuracy, content, or organization of this document, please contact SGI. Be sure to include the title and part number of the document with your comments. The part number for this document is printed on the front or back cover. You can contact SGI in any of the following ways:

- Send e-mail to the following address: `techpubs@sgi.com`
- Send a fax to the attention of "Technical Publications" at +1 650 932 0801
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- Send mail to: Technical Publications, SGI, 1600 Amphitheatre Pkwy., M/S 535, Mountain View, California, 94043-1351, USA.

SGI values your comments and will respond to them promptly.

Getting Started

This chapter shows you how to set up your Silicon Graphics Fuel visual workstation. The following topics are covered:

- "Checking Your Shipment" on page 2
- "Lifting the Workstation" on page 3
- "Getting Acquainted" on page 4
- "Setting Up the Workstation" on page 7

Checking Your Shipment

Figure 1-1 shows the basic components that ship with your workstation. If parts of your shipment are damaged or missing, contact your support provider.

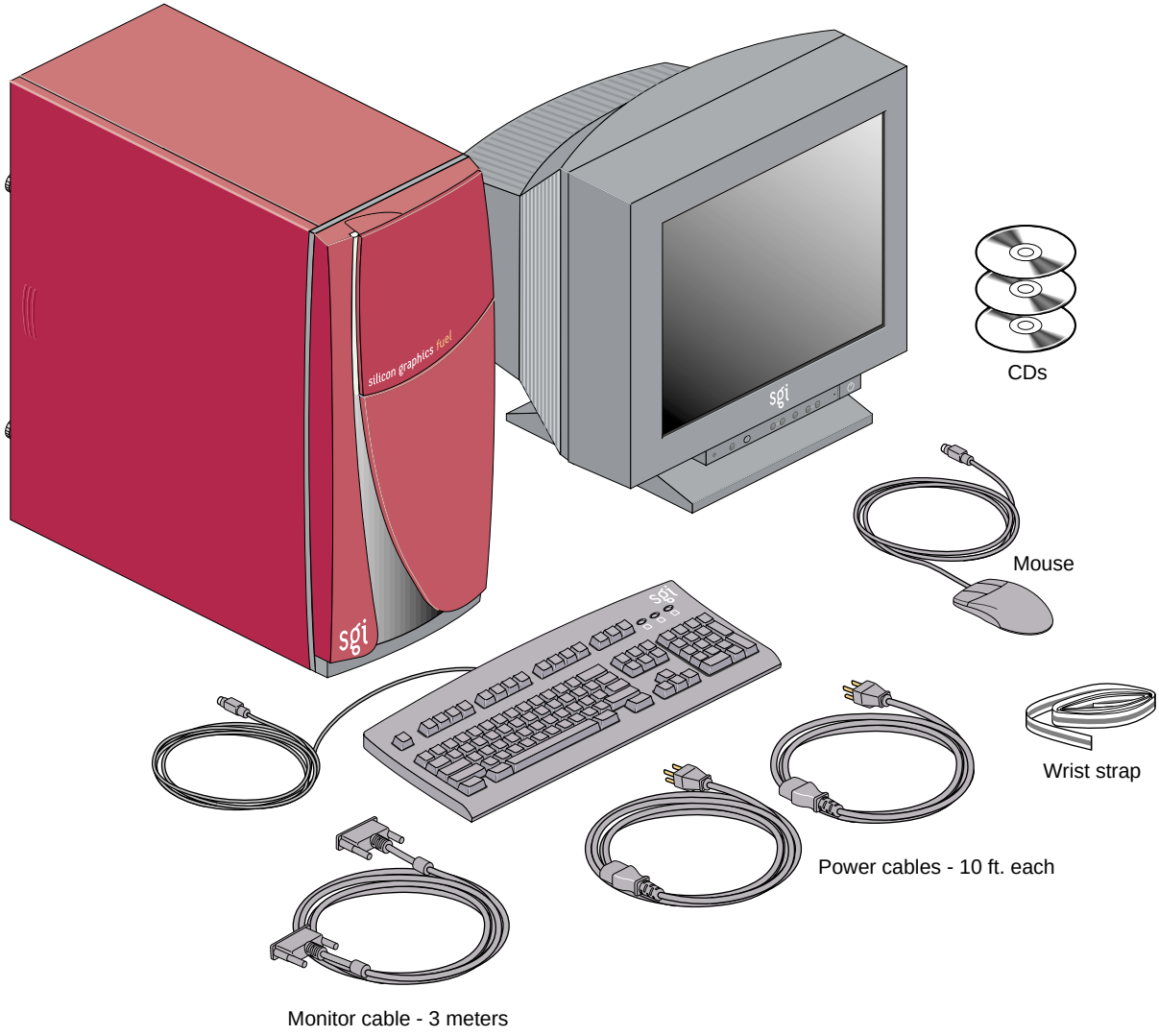

Figure 1-1 Workstation Components

Lifting the Workstation

The base workstation configuration weighs 42 lb. (19 kg). SGI highly recommends that two people lift the unit when it must be moved. Lift the unit by placing your hands under the bottom edges of the chassis, as shown in Figure 1-2.

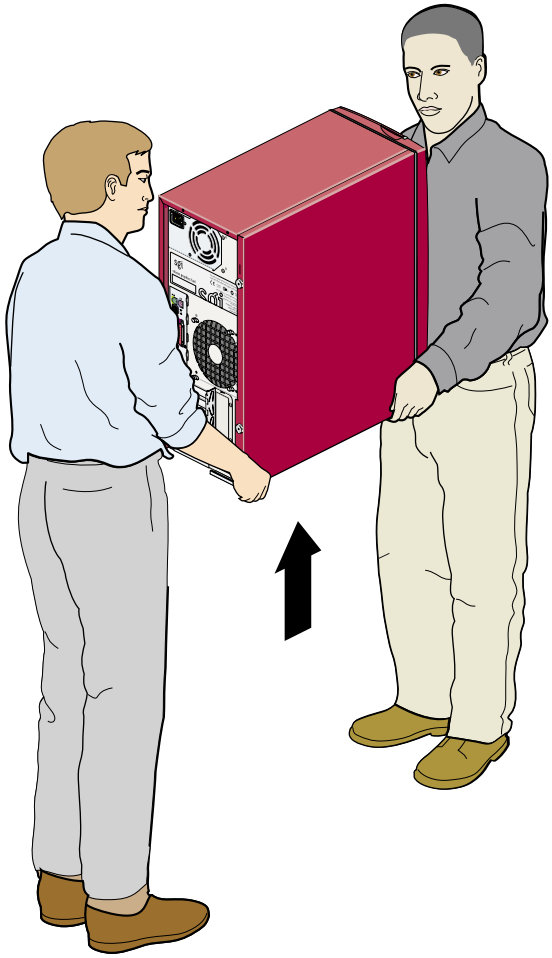

Figure 1-2 Lifting the Workstation

Getting Acquainted

To become familiar with your workstation, refer to the following figures:

- Figure 1-3, which shows the front view of the workstation.
- Figure 1-4, which shows the rear view of the workstation.

After you have set up your workstation and logged in, refer to the following resources for more information:

- From the **Toolchest**, select **System > System Manager** for information on the workstation's hardware and software.
- From the **Toolchest,** select **System > System Manager > About This System** to learn about your system's serial number, IP address, operating system, and more.

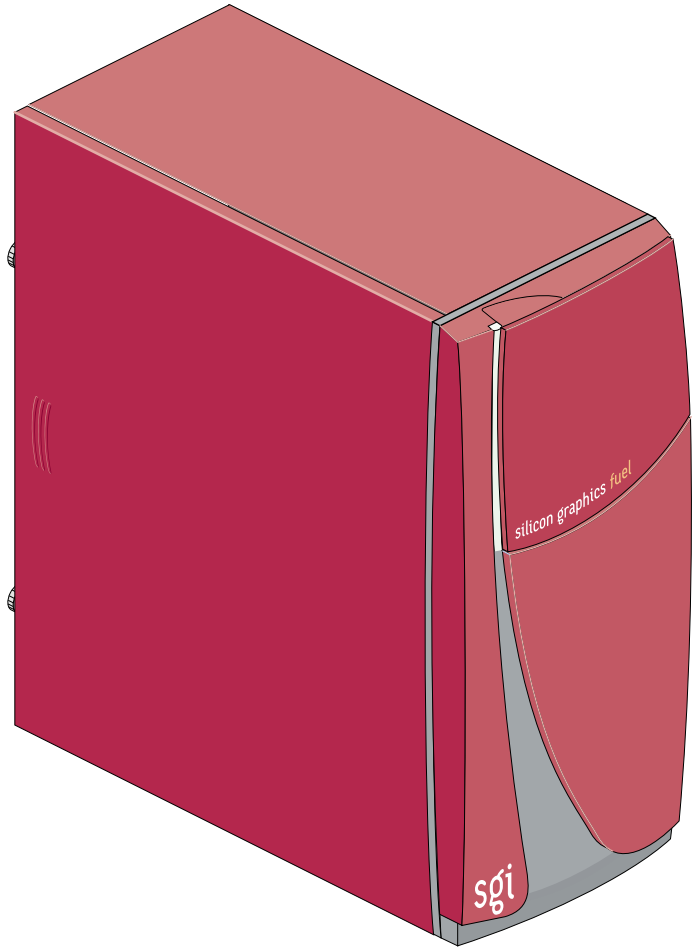

Figure 1-3 Front View of the Workstation

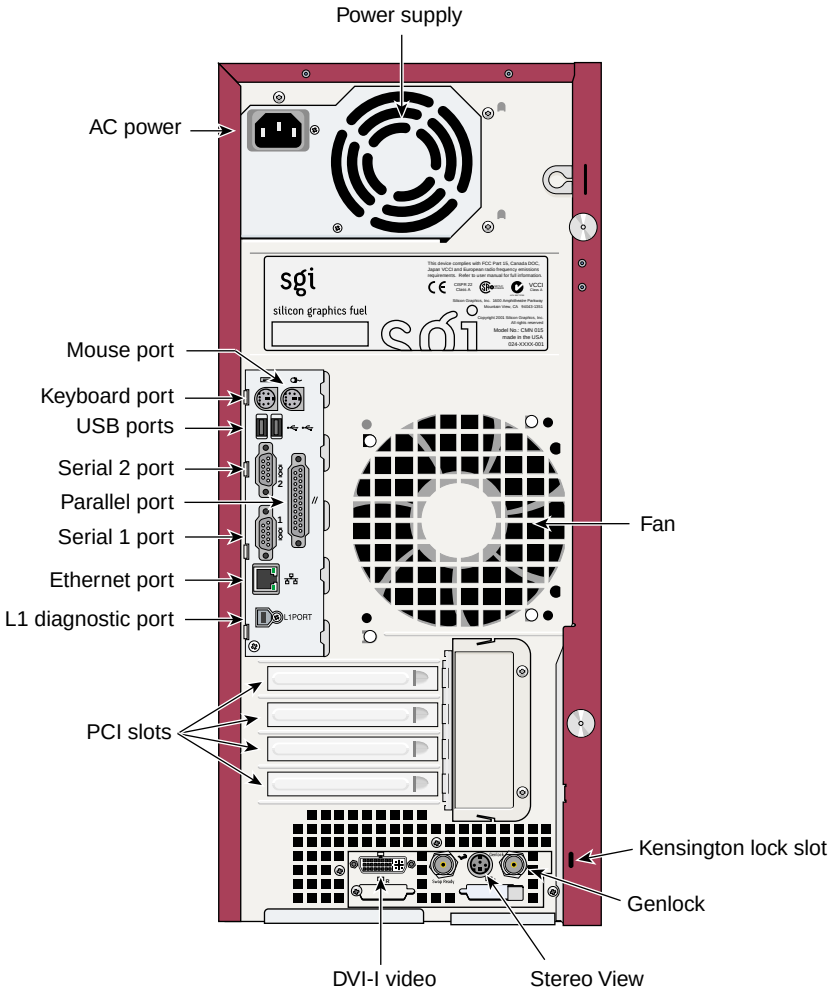

Figure 1-4 Rear View of the Workstation

Setting Up the Workstation

To set up the workstation, follow these steps:

1. Connect the keyboard and mouse cables, as shown in Figure 1-5.

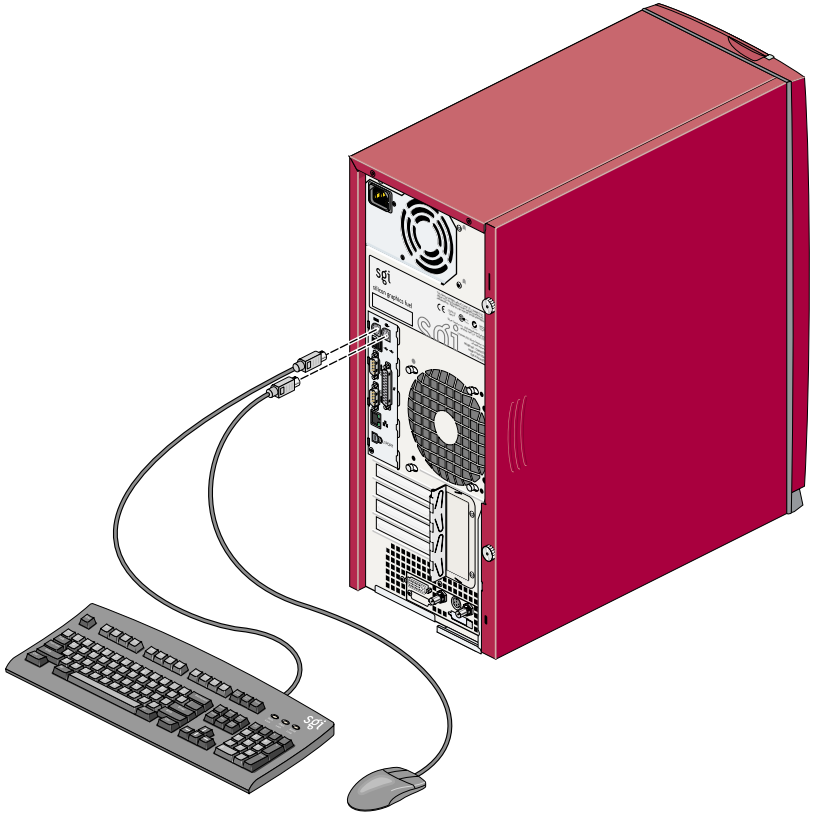

Figure 1-5 Connecting the Keyboard and Mouse Cables

2. Connect the Ethernet cable to the Ethernet port, as shown in Figure 1-6.

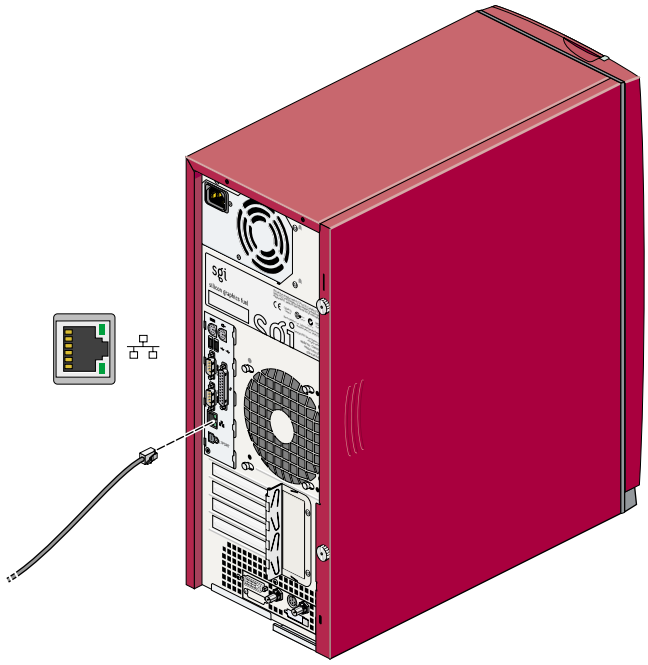

Figure 1-6 Connecting the Ethernet Cable

3. Connect the monitor cable, as follows (Figure 1-7):
   - Connect the monitor-to-graphics cable to the monitor.
   - Connect the monitor-to-graphics cable to the DVI-I video connector on the back of your workstation.

Note: The Silicon Graphics Fuel visual workstation can be connected to a variety of monitors. Your monitor and monitor cable may differ from those shown. If your monitor has multiple inputs, ensure that the source switch is set to the correct input port.

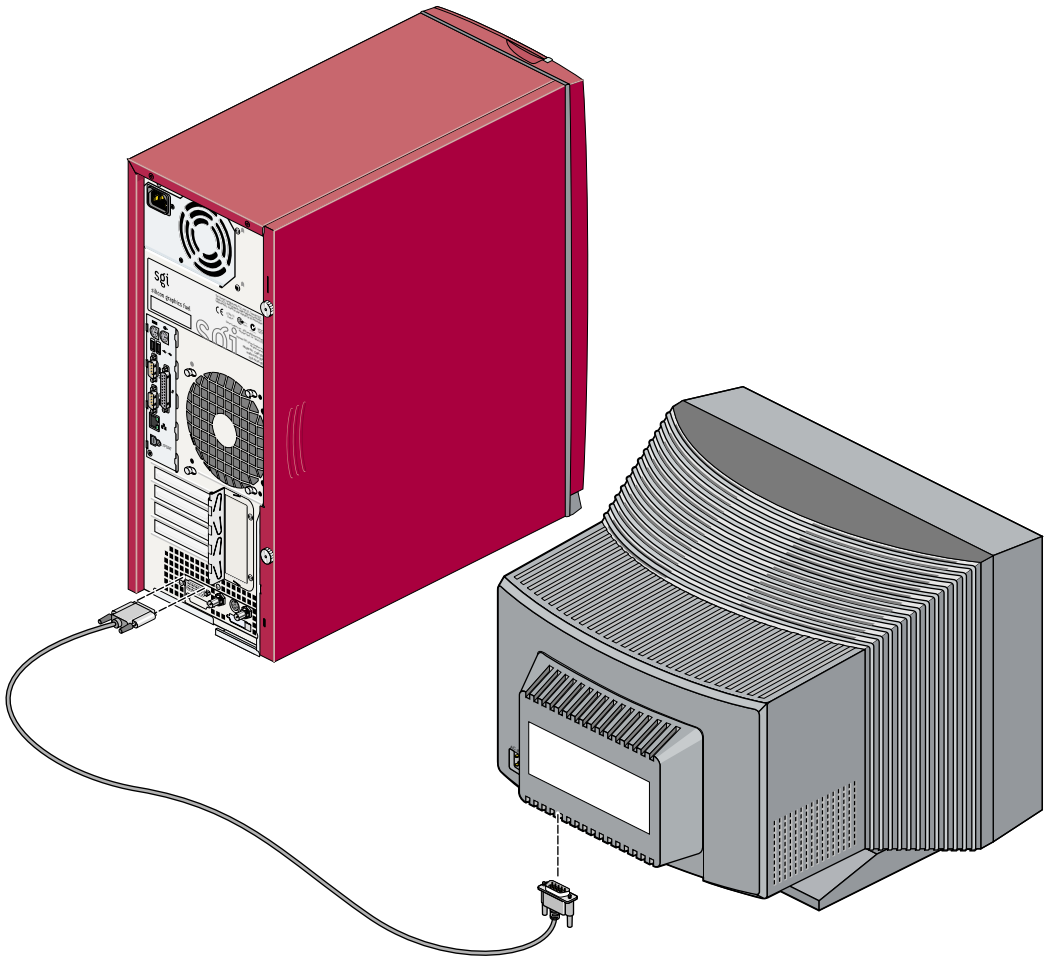

Figure 1-7 Connecting the Monitor Cable

4. Connect the power cables to your workstation and monitor. Then plug them into approved electrical outlets. Refer to Figure 1-8.

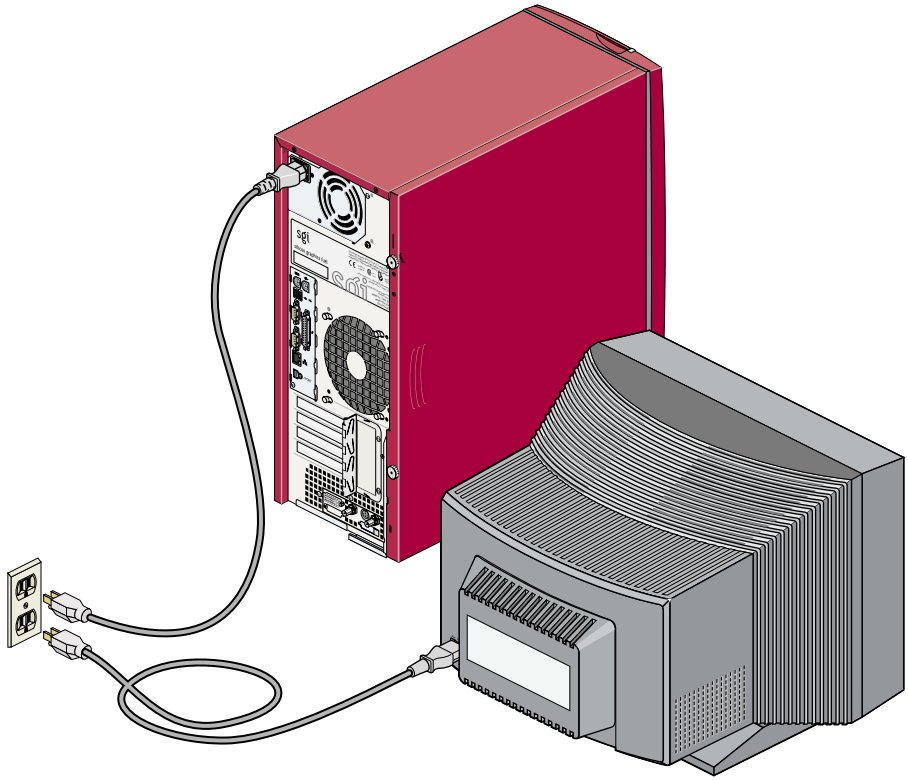

Figure 1-8 Connecting the Workstation and Monitor Power Cables

You have finished setting up your workstation. Now you are ready to log in. Proceed to Chapter 2, “Using the Workstation.”

Using the Workstation

This section provides information about using your Silicon Graphics Fuel visual workstation. The topics covered include:

- "Logging In to the Workstation" on page 14
- "Using the IRIX Interactive Desktop" on page 16
- "Powering Off the Workstation" on page 18

Logging In to the Workstation

Press the power buttons on your monitor and workstation as shown in Figure 2-1.

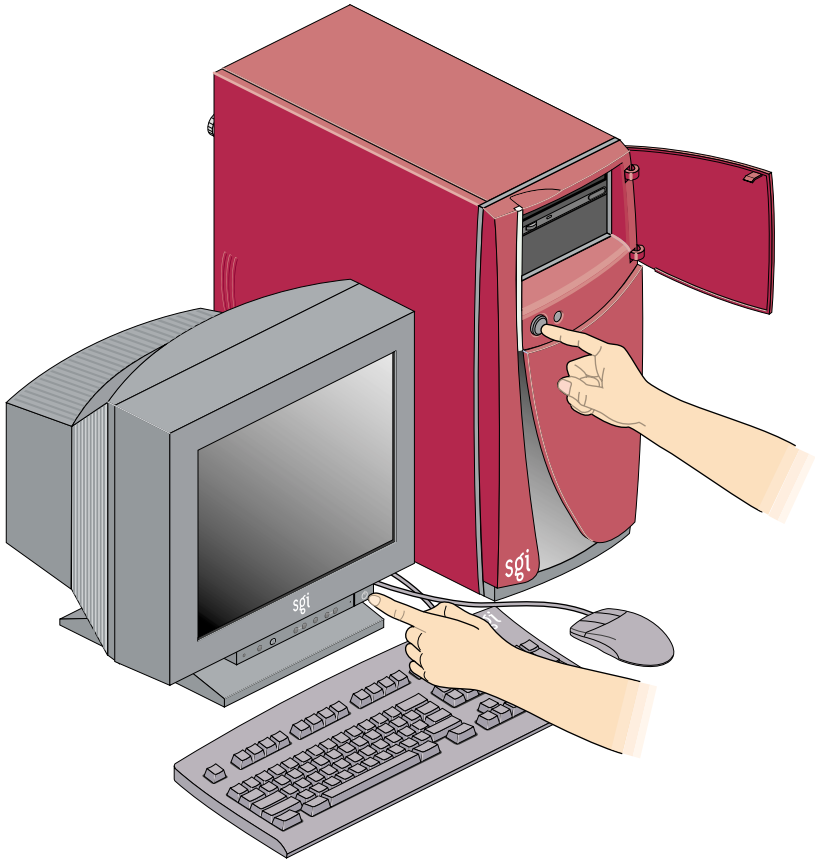

Figure 2-1 Powering On the Workstation and Monitor

A red LED flashing on the front of the workstation indicates that the system is booting. The monitor may remain blank for a few moments.

If your system is booting for the first time, you will see a login screen similar to the example shown in Figure 2-2.

Figure 2-2 Login Screen

If you have a login account, double-click the icon with your login name. If you do not have a login account, double-click **EZsetup** and then follow the instructions for creating a personal login account and setting up the networking software. Then, you can begin using the IRIX interactive desktop to create a personal work area and communicate with other users on your network.

Using the IRIX Interactive Desktop

After you have logged in, you are ready to use the IRIX Interactive Desktop. By default, several icons appear on your desktop: a folder icon representing your home directory, a dumpster icon, and icons for any peripherals you installed, examples of which are shown in Figure 2-3.

The peripheral icons show the current state of the respective devices. For example, if you insert a music CD into the CD-ROM drive, the icon changes. When you double-click the icon, it opens CD Player, a utility that allows you to play music from a compact disc.

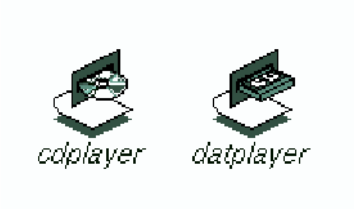

Figure 2-3 Peripheral Icons

The Toolchest, located at the top left corner of your screen, provides access to system functions, applications, hardware and software information, and documentation, as shown in Figure 2-4.

Note: For a complete description of the Toolchest, select **Help > InfoSearch** from the Toolchest, and type **`Desktop Users Guide`**.

Figure 2-4 Toolchest Menu

System Manager

From the Toolchest, select **System > System Manager** to display the System Manager, which shows your workstation's hardware and software information.

Online Documentation

From the Toolchest, select **Help** to display the library of online documentation. If your workstation is turned off and you cannot access online documentation, this printed guide contains all the information you need. You can also access this guide and most manuals, man pages, and release notes in the SGI Technical Publications Library at `http://techpubs.sgi.com/library`, and through InfoSearch, as described in the next section.

InfoSearch

From the Toolchest, select **Help > InfoSearch** and type the name of the desired book or topic to search online books, man pages, and release notes that cover end-user, developer, and system administrator information.

The Console Window

The small box next to the Toolchest is the **Console** window, as shown in Figure 2-5. It appears as a small box because it is minimized. You can open it to its full size by clicking it. Many system status and error messages appear in this window.

Figure 2-5 Console Window

If you click in the **Console** window, an IRIX shell appears, where you can type IRIX commands. For information on IRIX commands, select **Help > Online Books > SGI_End User > Desktop Users Guide > Using IRIX Commands** from the Toolchest.

Powering Off the Workstation

You can shut down and power off your workstation in either of two ways, which are explained in the following sections:

- Powering off with the power button.
- Powering off from the Toolchest.

Powering Off with the Power Button

To power off your workstation with the power button, follow these steps:

1. Open the door on the front of your workstation.
2. Press the power button, as shown in Figure 2-6.

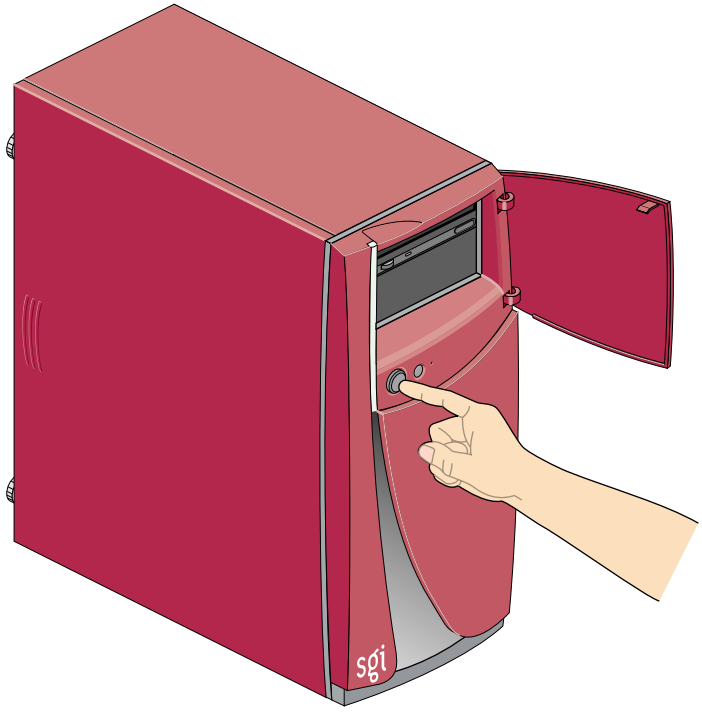

Figure 2-6 Powering Off the Workstation

Within a few seconds, a shutdown notifier appears, as shown in Figure 2-7. Within a minute, the system powers off automatically.

Figure 2-7 System Shutdown Notifier

3. Turn off your monitor by pressing the monitor power button.

   If your system does not power off and you do not see any activity for several minutes, press the power button again.

Note: If you press the power button a second time, the system should power off immediately, but this method does not perform a clean shutdown. Avoid using this method unless the system does not respond for several minutes after you first press the power button.

If pressing the power button a second time does not work, use a pencil or pen to press the reset button, shown in Figure 2-8. If the system still fails to power off, unplug the power cable from the back of your workstation and contact your service provider.

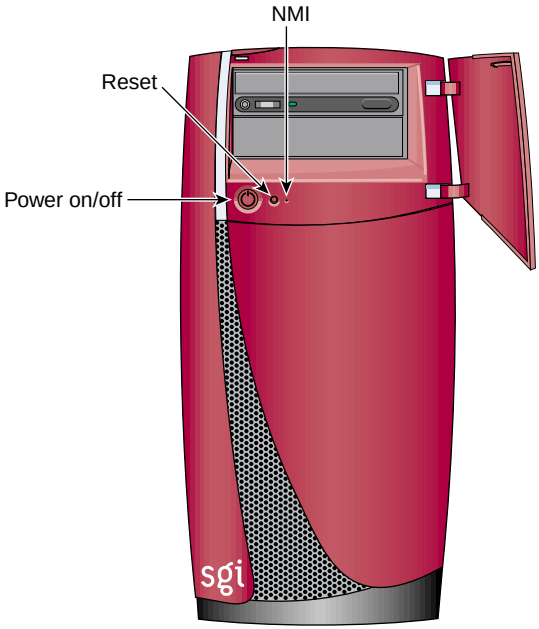

Figure 2-8 Power Button and Reset Button

Note: The NMI button shown in Figure 2-8 is used by SGI field engineers to diagnose problems. Do not press this button unless directed by SGI service personnel.

Powering Off from the Toolchest

If you have root level access to the workstation, you can shut down your system from the Toolchest. as follows:

1. From the Toolchest, select **System > System Shutdown**.

   After a few seconds, a shutdown caution message appears, as shown in Figure 2-9.

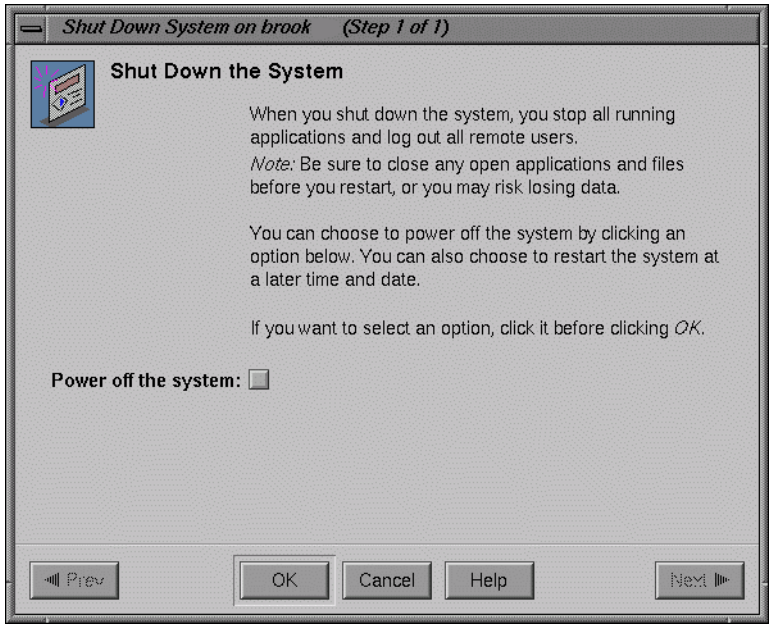

Figure 2-9 Shutdown Caution Message

2. Click the **Power Off the System** check box.

   The **Restart the system** window appears. At this point, you can shut down and power off the system or configure it to restart at a designated time, as shown in Figure 2-10.

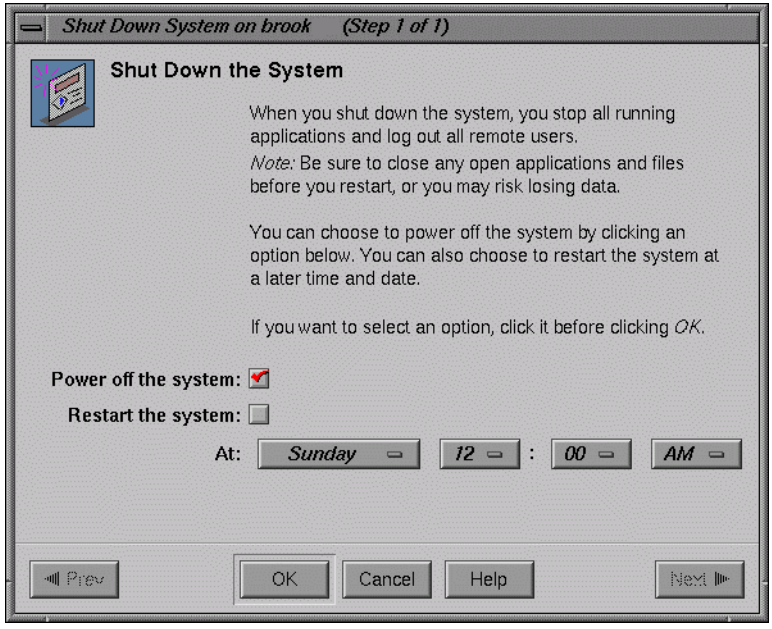

Figure 2-10 Restart System Option

3. Click **OK** to shut down and power off the system.

   The shutdown notifier appears, as shown in Figure 2-11. After a few seconds, the system powers off.

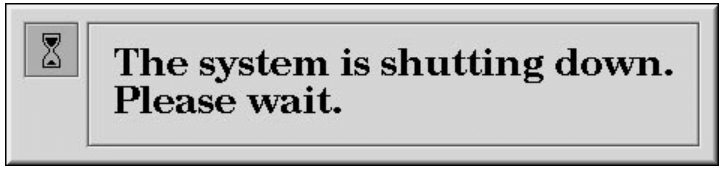

Figure 2-11 System Shutdown Notifier

Restarting from the Toolchest

If you have root level access to the workstation, you can restart the system from the Toolchest.

1. From the Toolchest, select **System > Restart**.

   After a few seconds the restart notifier appears, as shown in Figure 2-12.

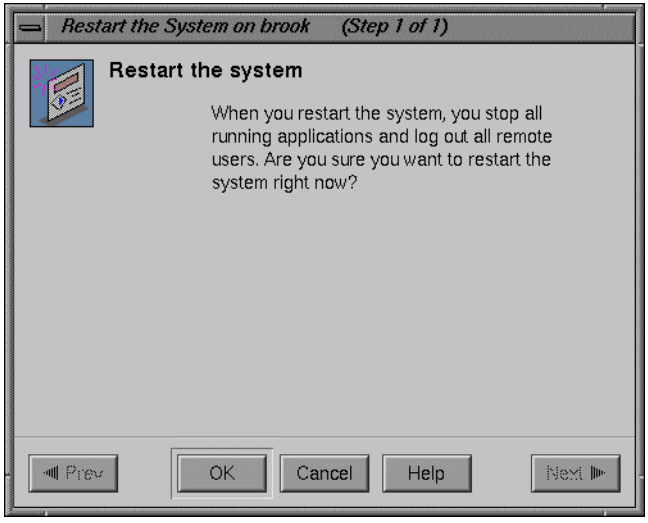

Figure 2-12 Restart Notifier

2. Click **OK** in the restart notifier.

   The shutdown notifier appears, as shown in Figure 2-13.

Figure 2-13 System Shutdown Notifier

After a brief delay, the power off/restart notifier appears, as shown in Figure 2-14.

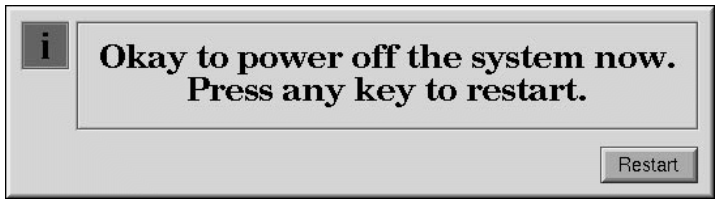

Figure 2-14 Power Off/Restart Notifier

3. Click **Restart**.

The restart notifier informs you that the system is coming up (restarting), as shown in Figure 2-15.

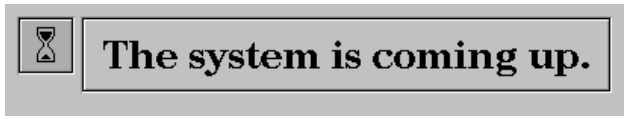

Figure 2-15 Restart Notifier

System Components

This chapter provides general information about the components of the Silicon Graphics Fuel visual workstation. The topics covered include:

- "System Enclosure" on page 26
- "System Board" on page 28
- "Processor" on page 30
- "Memory DIMMs" on page 31
- "Internal Hard Disk Drives" on page 32
- "Removable Media Drives" on page 34
- "Graphics Module" on page 35
- "PCI Boards" on page 38
- "Power Supply" on page 39
- "Cooling System" on page 40
- "Optional Components, Peripherals, and Upgrades" on page 42

System Enclosure

The Silicon Graphics Fuel visual workstation is installed in the system enclosure as shown in Figure 3-1. The enclosure provides a total of five card slot openings: One for the graphics module and four for PCI cards. The enclosure also provides space for three hard disk drives and two removable media drives. These drives are housed in three drive cages: two 3.5-in. cages and one 5.25-in. cage.

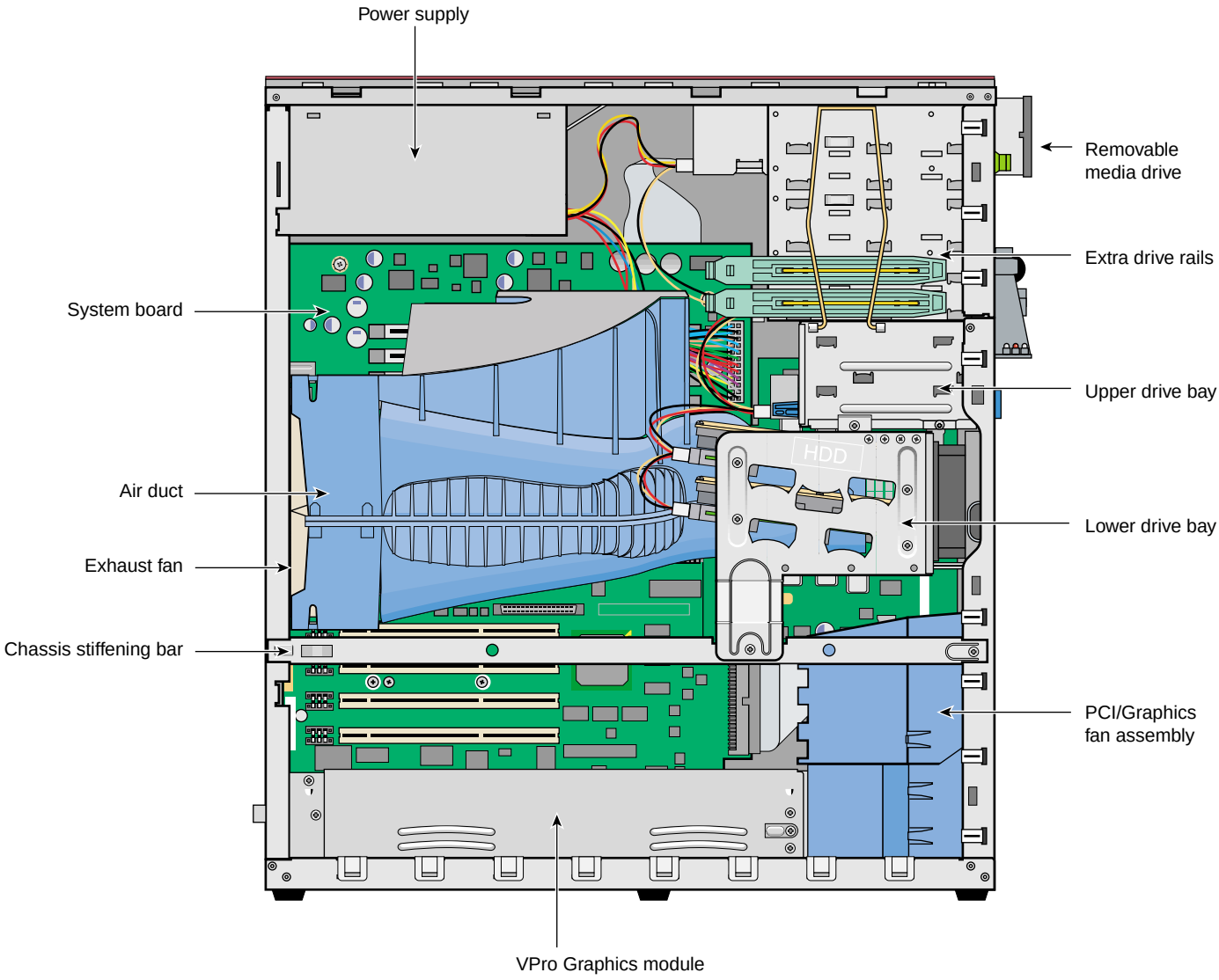

Figure 3-1 System Enclosure Layout

System Board

The Silicon Graphics Fuel visual workstation IP34 system board is attached to the side of the chassis as shown in Figure 3-2. The system board provides connectivity to all of the system components. The system board features include:

- Two 9-pin serial ports
- One 25 pin ECP parallel port
- PS2 keyboard and mouse interface
- 10/100 base-T ethernet port
- Dual channel Ultra-160 (Ultra3) SCSI host adapter
- Two USB-A ports
- Four PCI slots on 2 busses
- Connectivity point for the processor module

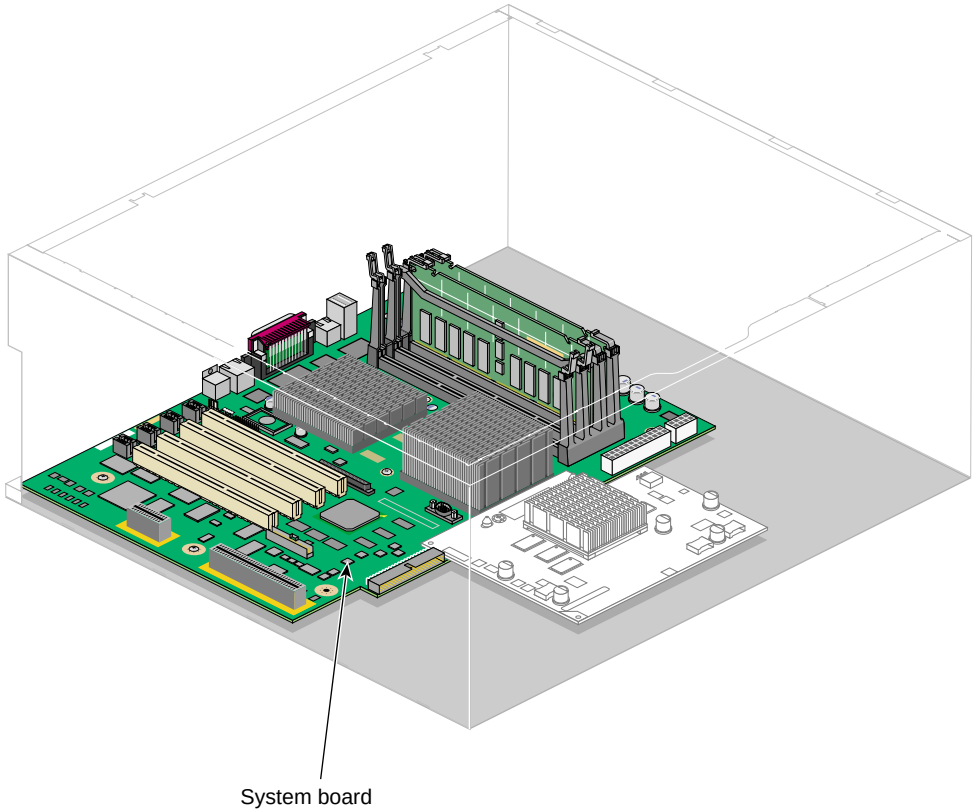

Figure 3-2 System Board

Processor

The Silicon Graphics Fuel visual workstation is available with either a 500-MHz R14000A processor with 2 MB of secondary cache or a 600-MHz R14000A processor with 4 MB of secondary cache. The unit supports a maximum of one processor. The processor and cache are mounted on a processor-integrated multi-module (PIMM) board, which is connected to the system board via a special connector, as shown in Figure 3-3.

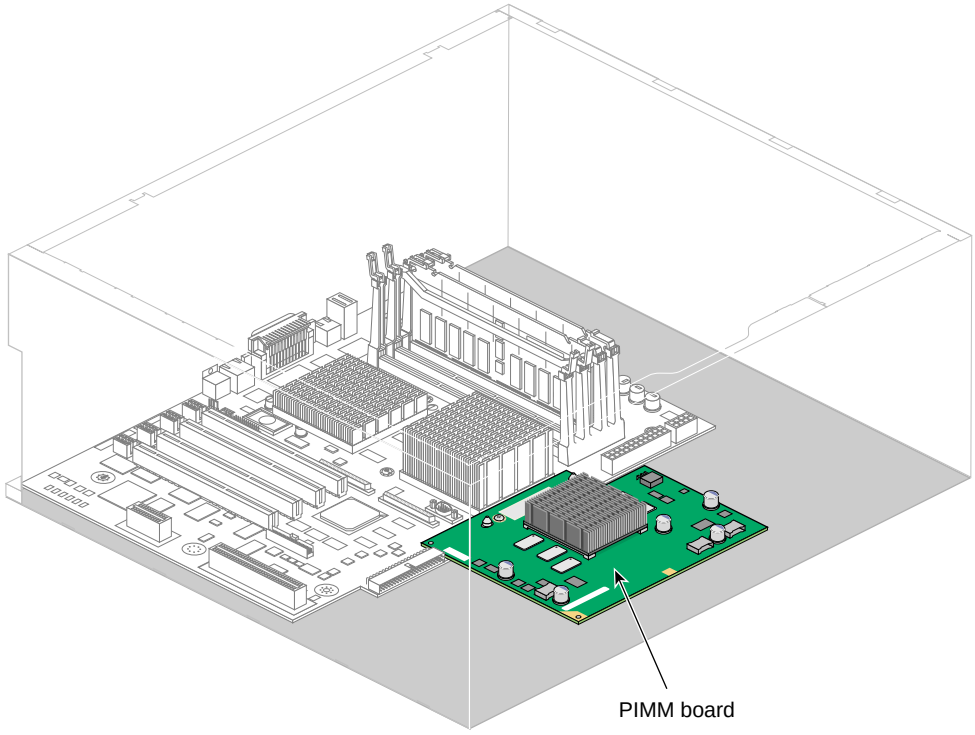

Figure 3-3 Processor Integrated Multi-module Board

Memory DIMMs

The workstation is configured with a minimum of 512 MB of memory and a maximum of 4 GB of memory. Your system uses double data rate synchronous dynamic random access memory (DDR SDRAM). The DIMMs used in your workstation are compatible with the DIMMs used in Origin 300, Origin 3000, and Onyx 3000 systems. The DIMMs used in your workstation are *not* compatible with the DIMMs used in Octane, Octane2, O2, O2+, Origin 200, Origin 2000, or Onyx2 systems.

The memory DIMMS are installed in four DIMM sockets on the motherboard. The DIMM sockets are numbered 0 through 3 (refer to Figure 3-4). The sockets are grouped into two banks of two DIMMs each: DIMM pair 1 and DIMM pair 2.

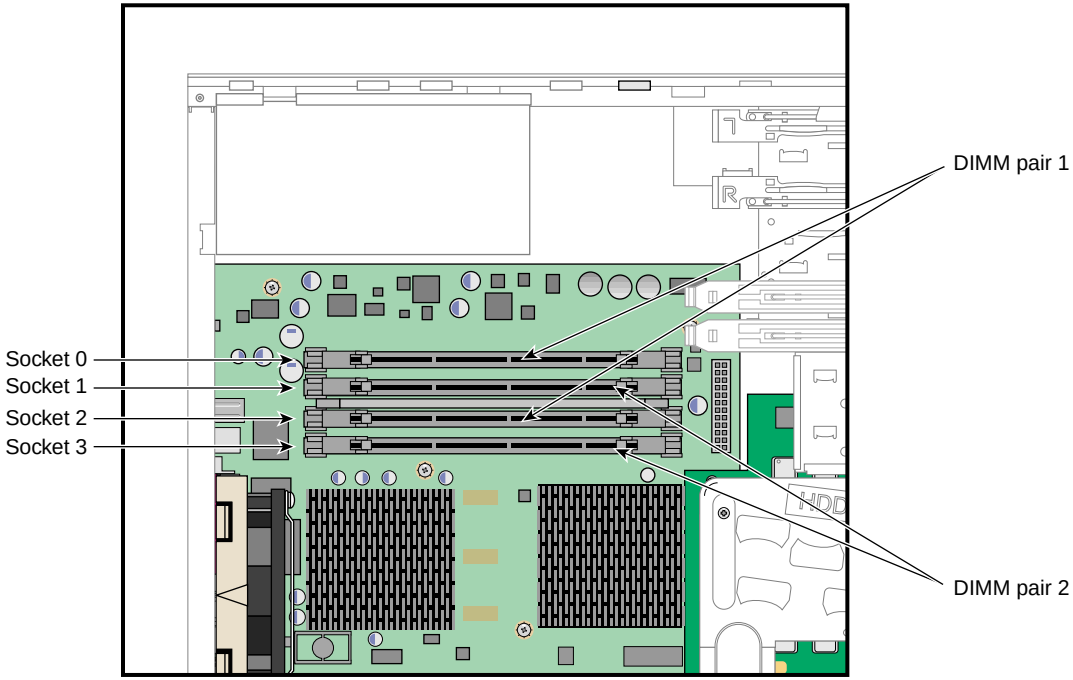

Figure 3-4 DIMM Sockets and Pairs

The following configuration rules apply to the memory banks and DIMMs in your system:

- At least one DIMM pair must be populated.
- DIMMs in the same DIMM pair must be the same density. For example, if DIMM 0 is 512 MB, then DIMM 2 must be 512 MB.
- DIMMs must be installed in pairs.

For information on removing or installing memory DIMMs, refer to "Installing or Removing a Memory DIMM" on page 58.

Internal Hard Disk Drives

The Silicon Graphics Fuel visual workstation supports up to 3 internal hard disk drives. The following drives are available:

- 18-GB 10000-RPM UltraSCSI hard disk drive
- 36-GB 10000-RPM UltraSCSI hard disk drive
- 73-GB 10000-RPM UltraSCSI hard disk drive

These drives provide the unit with a minimum of 18 GB of internal storage and a maximum of 219 GB of internal storage.

The hard disk drives in the workstation are installed in two 3.5-in. drive cages, as shown in Figure 3-5. The lower bay is mounted on a hinge and can be swung out of the chassis for service.

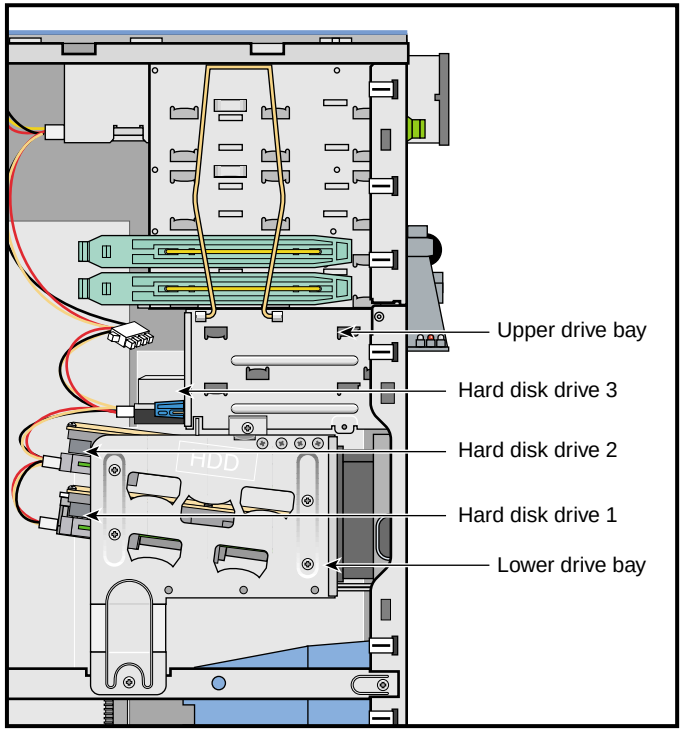

Figure 3-5 Internal Hard Disk Drive Cages

The disks are numbered 1 through 3, with 1 being the bottom disk in the lower bay and 3 being the bottom disk in the upper bay. The SCSI ID number of each disk must correspond with these drive numbers.

Note: The hard drives in your workstation are connected to the motherboard by a special SCSI cable, available only from SGI. Do not attempt to install a non-SGI SCSI cable in your workstation.

For information on removing or installing an internal hard disk drive, refer to “Installing or Removing Internal Hard Disk Drives” on page 63.

Removable Media Drives

Your workstation supports up to 2 internal removable media drives. The following drives are supported:

- 48X CD-ROM drive
- 20-GB 4-mm Internal SCSI Digital Audio Tape (DAT) drive

The removable media drives are installed in the 5.25-in. drive bay, as shown in Figure 3-5. These drives are optional components, and can be ordered from your SGI sales representative.

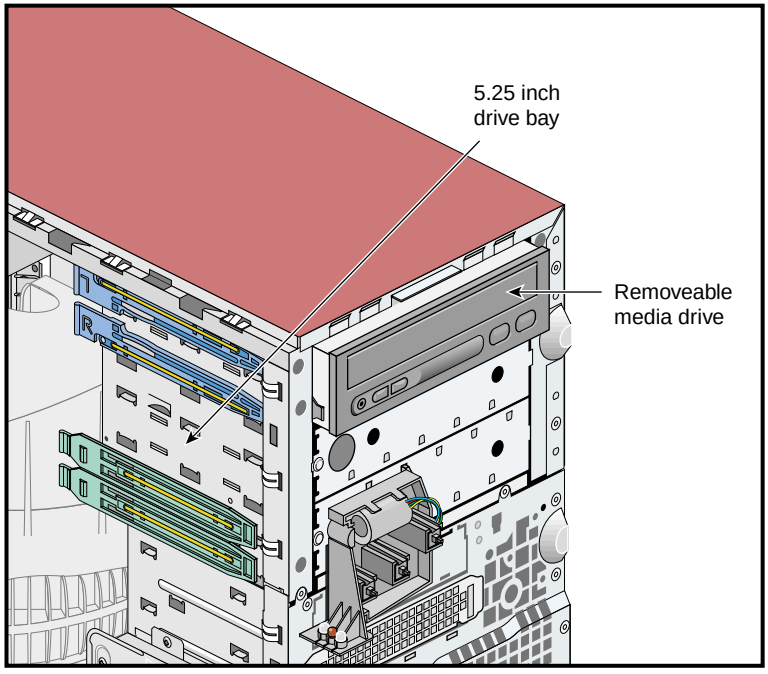

Figure 3-6 Removable Media Drive Bay

For information about installing and removing a removable media drive, refer to “Installing or Removing a Removable Media Drives” on page 72.

Graphics Module

The graphics module is located near the bottom of your workstation, as shown in Figure 3-7. It is made up of a metal cover, the VPro graphics board and the optional Dual Channel Display daughterboard. The metal shell protects the graphics board and optional daughterboard and shields them from electrical interference.

The VPro graphics board has the following features:

- 32 MB or 128 MB of onboard SDRAM (V10 has 32 MB, V12 has 128 MB).
- Analog RGB and TMDS video on a single DVI-I monitor port.
- Additional ports for Swap Ready, Stereo View, and Genlock signals.

Note: The Swap Ready feature is not functional at this time, but may be in the future.

The optional Dual Channel Display daughterboard supplies two additional DVI-I monitor ports. The daughterboard connects to the underside of the VPro graphics board and allows you to display data across two monitors at once. For more information about the optional Dual Channel Display daughterboard, contact your SGI sales representative.

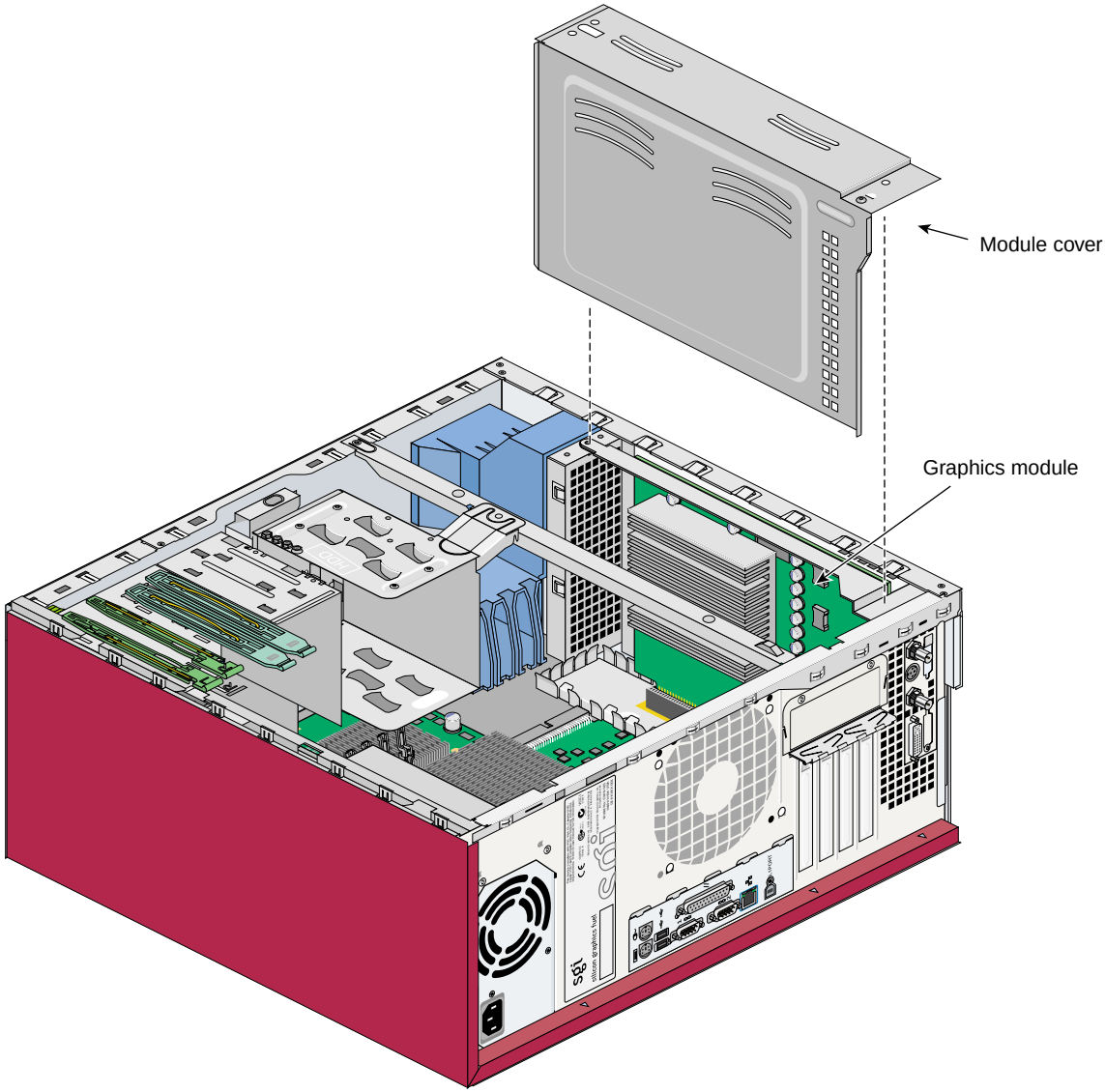

Figure 3-7 Locating the Graphics Module

Figure 3-8 shows the I/O ports of the VPro graphics board and optional Dual Channel Display daughterboard.

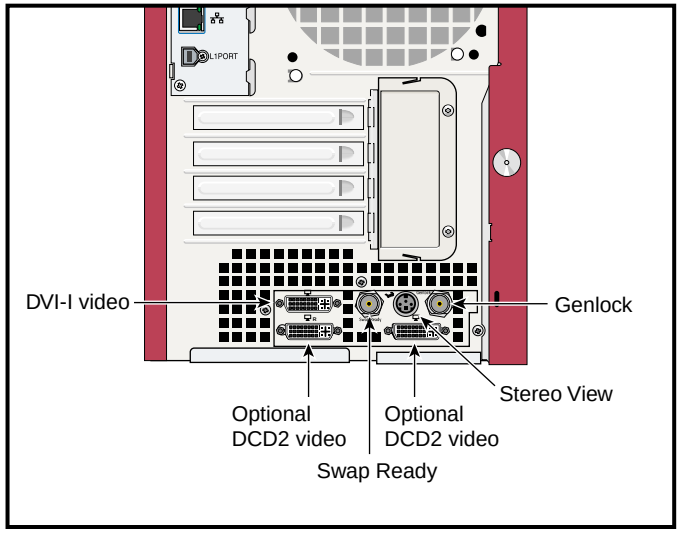

Figure 3-8 VPro Graphics and Dual Channel Display I/O Ports

For more information on the VPro graphics board and Dual Channel Display I/O ports, refer to “VPro Graphics Board I/O Port Specifications” in Appendix A.

PCI Boards

The Silicon Graphics Fuel visual workstation supports a maximum of four 3.3-volt PCI boards. The PCI boards are installed in PCI slots on the motherboard. The PCI slots are divided into two busses, PCI bus E and PCI bus F (refer to Figure 3-9).

- Bus E supports 66-MHz, 64-bit, 3.3-volt boards. However, if you install a 33-MHz PCI board in one of the bus E slots, both slots will default to 33 MHz. The slots in bus E are numbered 1 and 2.
- Bus F supports only 33-MHz, 32- or 64-bit, 3.3-volt boards.The slots in bus F are numbered 1 and 2.

Note: For internal clearance reasons, the PCI board installed in slot 1 of bus F must be a half-length PCI board.

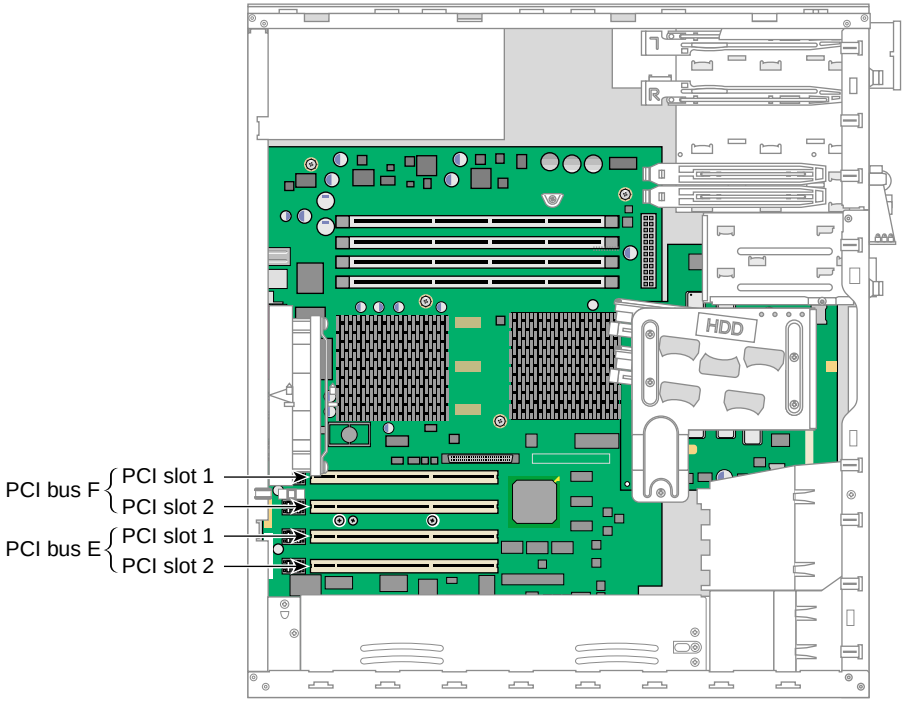

Figure 3-9 PCI Busses and Slots

The following PCI boards are currently supported:

- Digital Audio I/O board
- 1-Port copper gigabit Ethernet
- 1-port 1000Base-SX gigabit Ethernet adapter
- Dual port Ultra3 SCSI LVD or single-ended SCSI adapter

Power Supply

The power supply for the workstation is located in the top rear quadrant of the chassis, as shown in Figure 3-10.

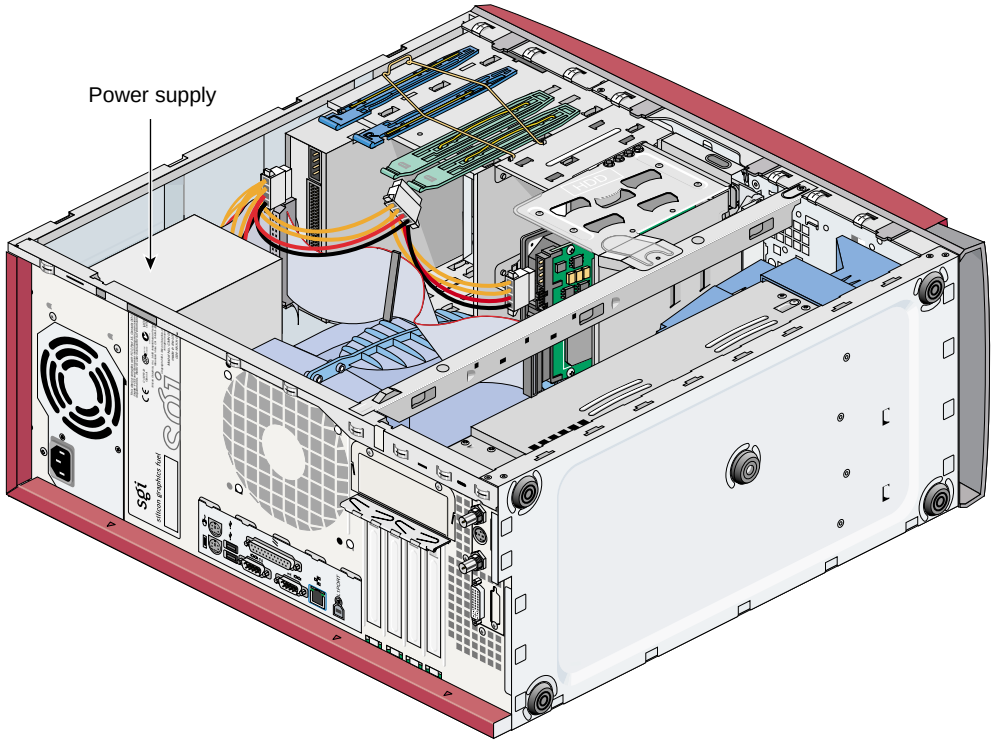

Figure 3-10 Power Supply Location

The power supply provides up to 430 watts of power to the motherboard, internal hard disk drives, removable media drives, and other optional components installed in the enclosure. For detailed information about the power supply specifications, refer to Appendix A, “Technical Specifications”.

Cooling System

The Silicon Graphics Fuel visual workstation uses a system of fans and ducts to cool the internal components. The cooling system is made up of the following components:

- 120-mm rear exhaust fan.
- 60-mm disk drive fan.
- Air duct, which cools the CPU, motherboard, and RAM.
- PCI/graphics fan assembly, which cools the PCI and graphics boards.

Figure 3-11 shows the location of each of these components.

Note: The power supply is cooled by its own internal fan.

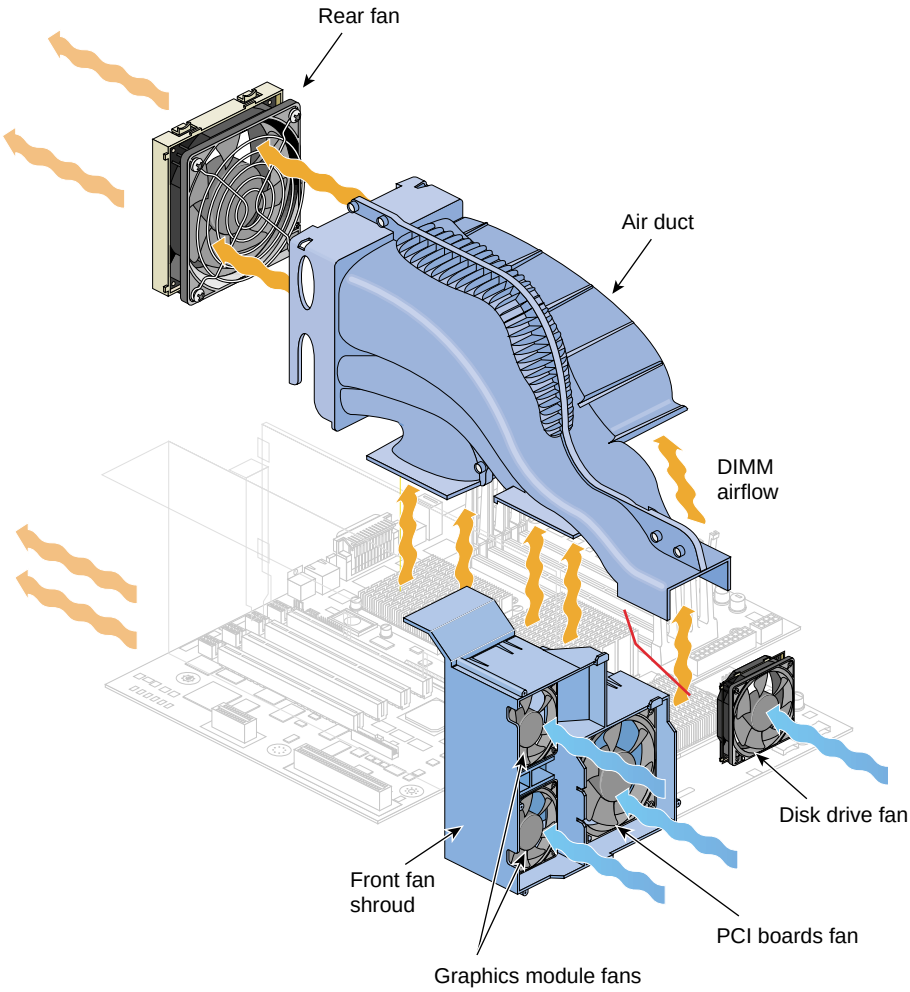

Figure 3-11 Cooling System Components

Optional Components, Peripherals, and Upgrades

Various optional components, peripherals, and upgrades are available for the Silicon Graphics Fuel visual workstation. If you have questions about any of these items, contact your SGI sales representative.

PCI Boards

The following PCI boards are available with the workstation:

- Digital Audio I/O board
- 1-port copper gigabit Ethernet adapter
- 1-port 1000base-SX gigabit Ethernet adapter
- Dual port Ultra3 SCSI LVD or single-ended SCSI adapter

Memory Upgrades

The following memory upgrades are available for the workstation:

- 256-MB memory DIMM
- 512-MB memory DIMM
- 1-GB memory DIMM

Note: The workstation supports a maximum of four memory DIMMs totalling four GB.

Graphics Boards

The following graphics boards are available with the workstation:

- VPro V10 graphics board, 32-MB
- VPro V12 graphics board, 128-MB
- Dual Channel Display option board

Processor Upgrades

The workstation is available with the following processors:

- R14000A 500-MHz processor with 2-MB cache
- R14000A 600-MHz processor with 4-MB cache

Storage Upgrades

The following storage upgrades are available for the workstation:

- 73-GB internal Ultra SCSI hard disk drive, 10000 RPM
- 36-GB internal Ultra SCSI hard disk drive, 10000 RPM
- 18-GB internal Ultra SCSI hard disk drive, 10000 RPM
- 20-GB internal 4-mm Digital Audio SCSI tape drive
- External SCSI Digital Audio Tape (DAT) drive
- 48X internal CD-ROM drive

In addition to the items listed above, there are a variety of other storage solutions available from SGI. For more, information, contact your SGI sales representative.

Displays

The following displays are available with the workstation:

- 21-in. SGI CRT monitor
- 24-in. SGI CRT monitor
- Silicon Graphics F180 (18.1-in. flat panel monitor)

Peripherals

The following peripherals are available with the workstation:

- 3-button mouse
- Speakers
- Spaceball programmable trackball

For a complete list of available components, contact your SGI sales representative or see the following website:
`http://www.sgi.com/peripherals/workstation/index.html`

Servicing the System

This chapter provides information about adding or removing components from your Silicon Graphics Fuel visual workstation. The topics covered include:

- "Ordering Parts" on page 45
- "Service Procedures and Precautions" on page 46
- "Installing or Removing a Memory DIMM" on page 58
- "Installing or Removing Internal Hard Disk Drives" on page 63
- "Installing or Removing a Removable Media Drives" on page 72
- "Installing or Removing a PCI Board" on page 77
- "Installing or Removing External devices" on page 84
- "Installing Locking Devices" on page 84
- "Replacing Cooling System Components" on page 87
- "Replacing Chassis Components" on page 104

Caution: For your own safety and to avoid damage to your equipment, do not attempt to install or remove components that are not listed in this chapter.

Ordering Parts

Replacement parts are available directly from your local service provider. Contact the SGI support office for more information.

Service Procedures and Precautions

This section shows you how to open the workstation for service, protect the components from static damage, and return the system to operation. The following topics are covered:

- "Preparing the Workstation for Service" on page 46
- "Removing the Side Panel" on page 49
- "Installing or Removing Internal Parts" on page 52
- "Returning the Workstation to Service" on page 55

Preparing the Workstation for Service

To prepare your workstation for service, follow these steps:

1. If you are logged in to the workstation, log out. Then, press the power buttons to power off your workstation and monitor (refer to Figure 4-1).

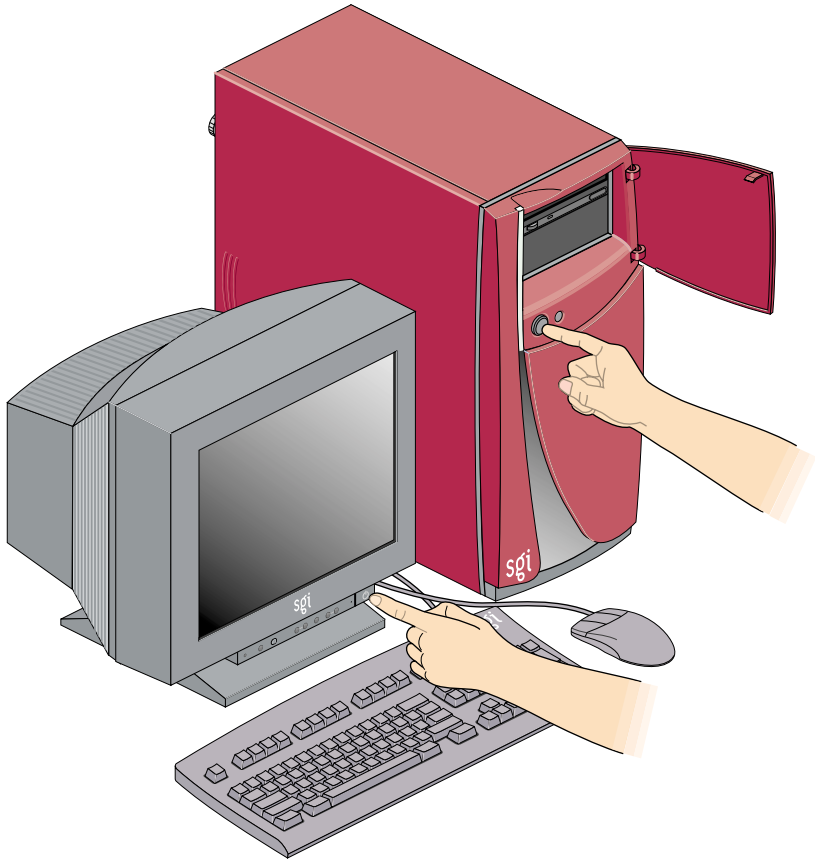

Figure 4-1 Powering Off the System

2. Disconnect all of the cables from the rear of the workstation. Be sure to note where each cable is connected, so that you can re-connect them correctly when you have finished servicing the system. Refer to Figure 4-2.

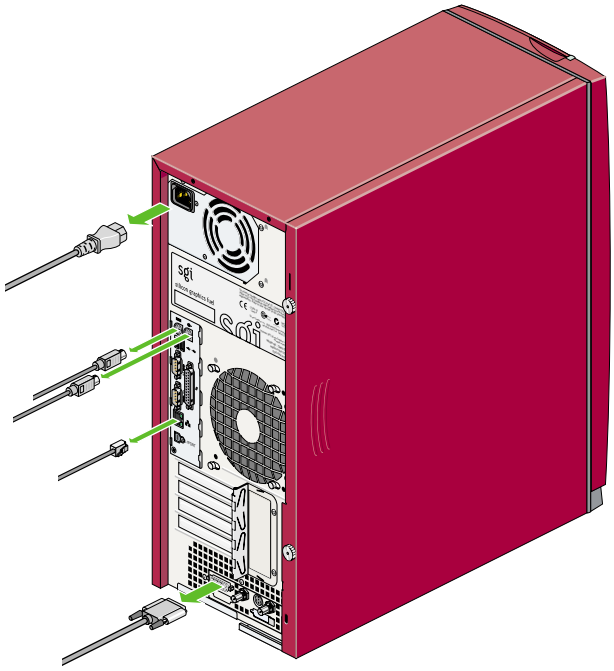

Figure 4-2 Disconnecting the Cables

3. If your system has a locking loop installed, remove the padlock (refer to Figure 4-3). If no lock is installed, proceed to the next section.

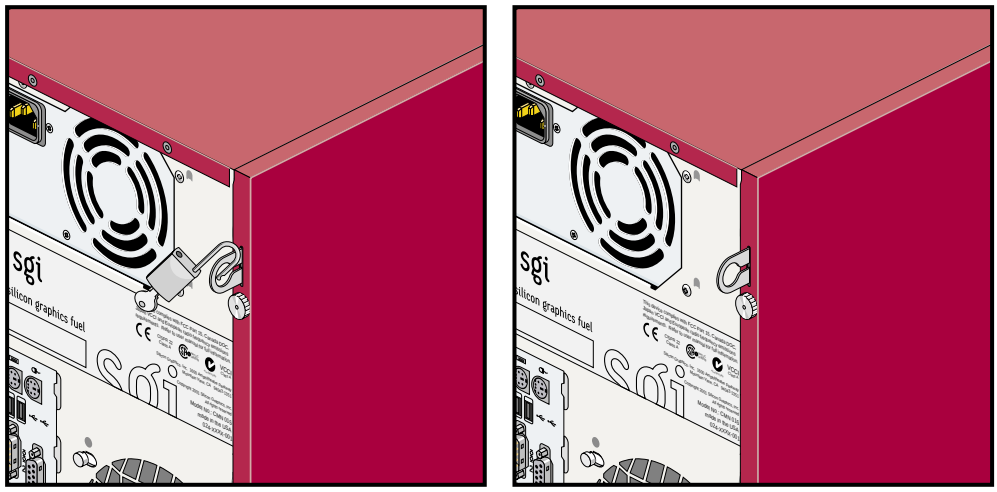

Figure 4-3 Removing the Padlock

Removing the Side Panel

Follow these steps to remove the side panel (refer to Figure 4-4):

1. Loosen the two captive thumbscrews that secure the side panel to the workstation.
2. Pull the side panel toward the rear of the workstation.
3. Swing the top edge of the panel away from the enclosure.
4. Lift the side panel up and off of the bottom edge of the enclosure.

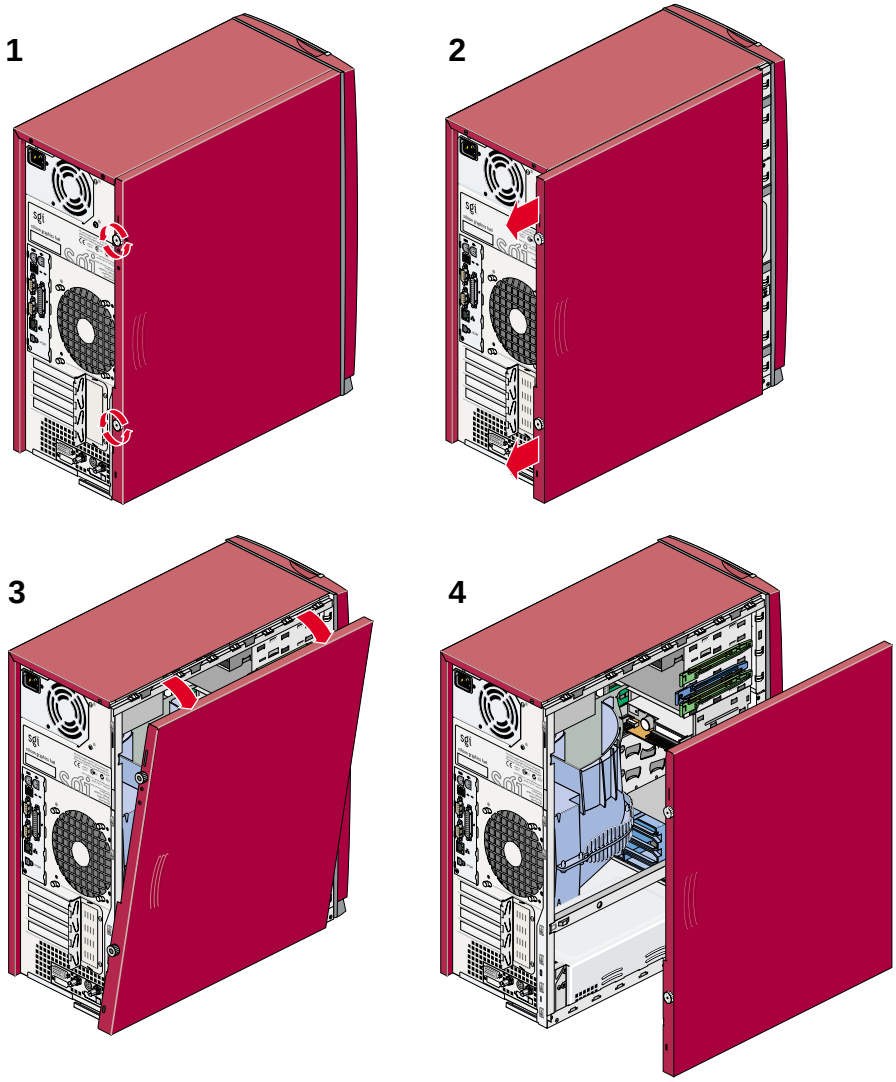

Figure 4-4 Removing the Side Panel

5. Carefully lay the system down on its right side, as shown in Figure 4-5. This makes it easier to access the internal components of the workstation.

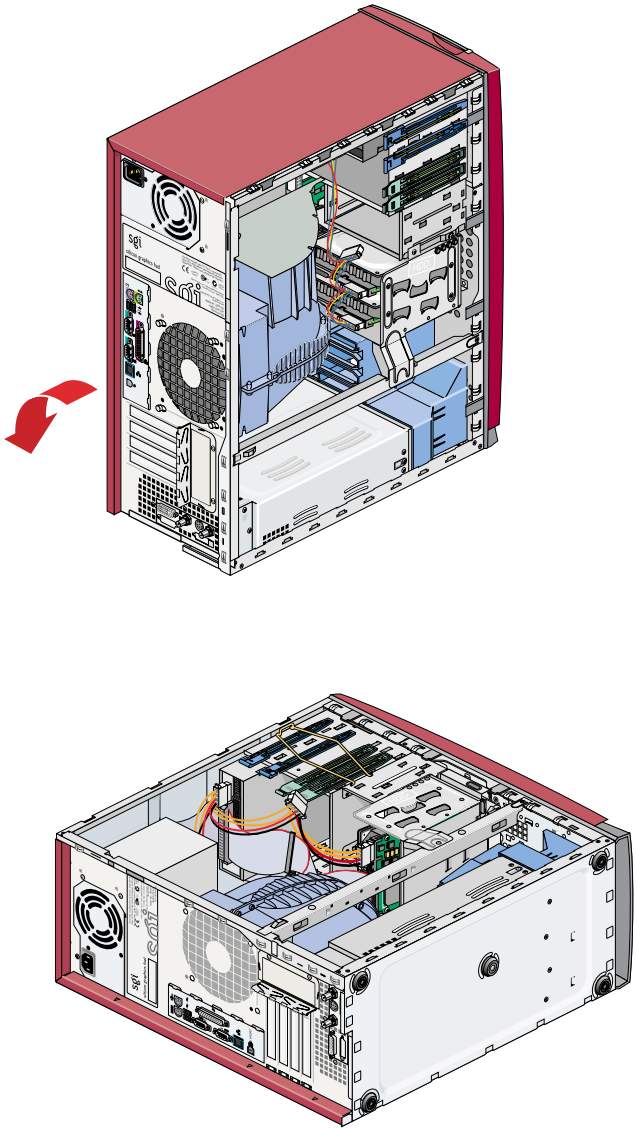

Figure 4-5 Laying Down the System Enclosure

Installing or Removing Internal Parts

Warning: The heat sinks on the motherboard get very hot. Wait five minutes after powering off your workstation before you touch any internal components. Touching the motherboard heat sinks could result in burns if a cooling-off period is not observed.

Caution: The components inside your workstation are extremely sensitive to static electricity. Always wear the wrist strap when you work with parts inside your workstation. Follow these steps to use the wrist strap (refer to Figure 4-6):

1. Unroll the first two folds of the band.
2. Wrap the exposed adhesive side firmly around your wrist, unroll the rest of the band, and then peel the liner from the copper foil at the opposite end.
3. Attach the copper foil to an exposed electrical ground, such as a metal part of the chassis.

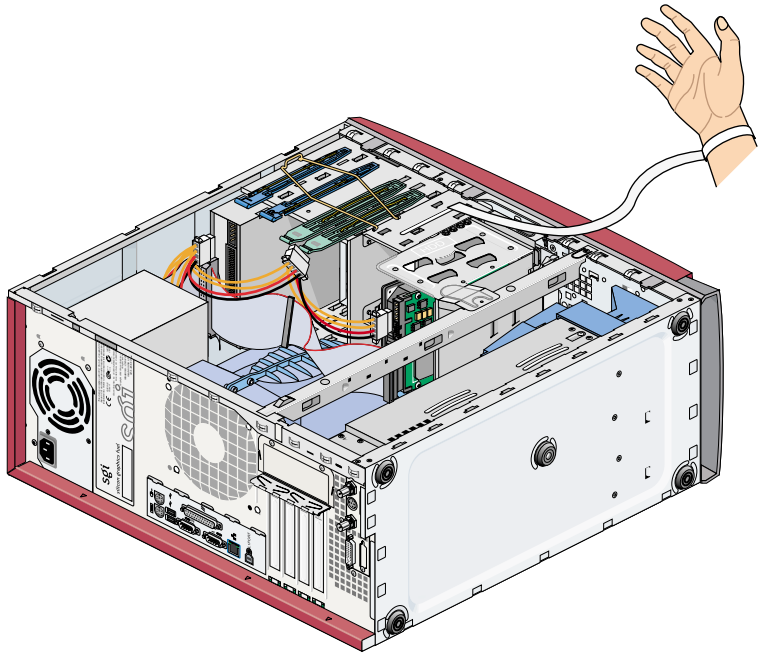

Figure 4-6 Attaching the Wrist Strap to the Chassis

After you remove the side panel and attach the wrist strap, you can install or remove internal parts of the workstation. Table 4-1 contains a list of all of the internal components that you can install or remove and the procedure associated with each one.

Caution: Do not attempt to install or remove components that are not listed in Table 4-1. Components not listed in Table 4-1 must be installed or removed by a qualified SGI field engineers.

Table 4-1 Customer-replaceable Components and Service Procedures

Component	Procedure
Memory DIMMs: DIMM 256 MB DIMM 512 MB DIMM 1 GB	"Installing or Removing a Memory DIMM" on page 58
Internal hard disk drives: 18 GB, 10000 RPM 36 GB, 10000 RPM 73 GB, 10000 RPM	"Installing or Removing Internal Hard Disk Drives" on page 63
Removable media drives: CD-ROM drive Internal DAT drive	"Installing or Removing a Removable Media Drives" on page 72
Cooling system: Exhaust fan Air duct PCI and graphics fan housing Hard drive fan	"Replacing Cooling System Components" on page 87
Enclosure Components: Chassis feet Bezel assembly Switch/LED assembly	"Replacing Chassis Components" on page 104

When you finish installing or removing internal components, proceed to the next section.

Returning the Workstation to Service

When you finish installing or removing components, follow these steps to return the workstation to service:

1. If the workstation is lying on its side, carefully stand it up.
2. Disconnect the anti-static wrist strap from the workstation.
3. Install the side panel (refer to Figure 4-7) as follows:
   - Position the side panel so that the groove in the bottom edge of the side panel is resting on the rail in the bottom of the enclosure.
   - Swing the top edge of the side panel up into place against the top edge of the enclosure.
   - Slide the side panel toward the front of the workstation until it is firmly seated.
   - Tighten the two captive thumbscrews that secure the side panel to the workstation.

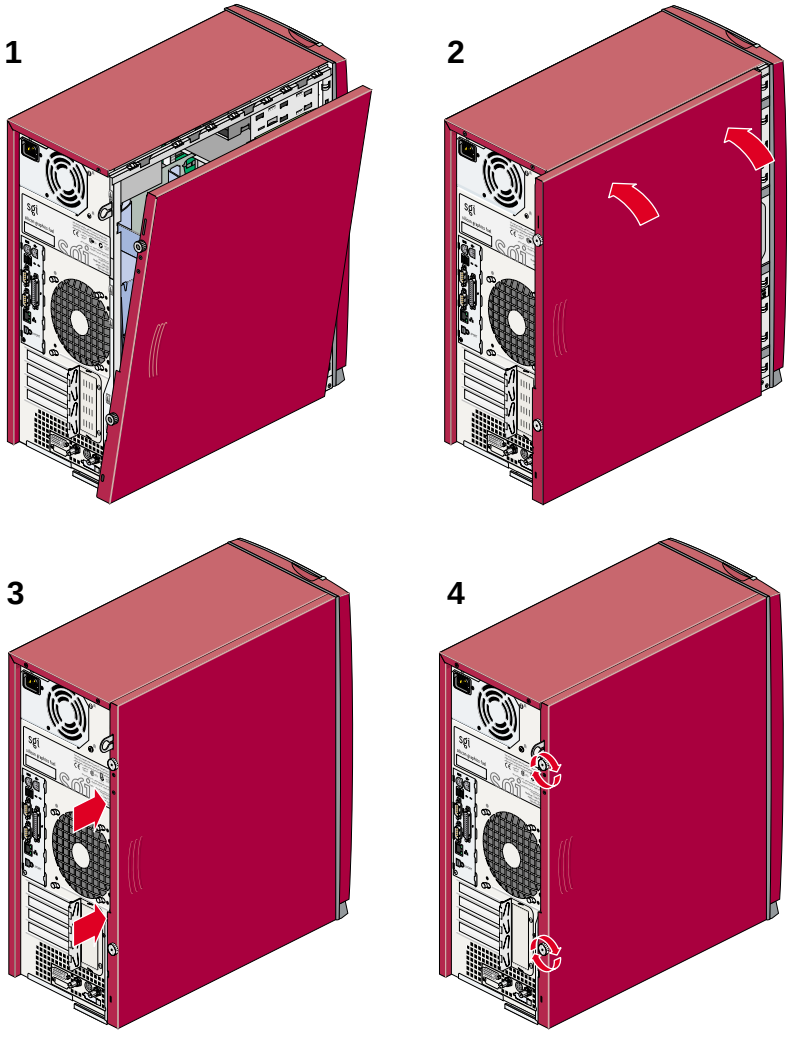

Figure 4-7 Replacing the Side Panel

4. Connect all of the system cables to the rear of the enclosure (refer to Figure 4-8).

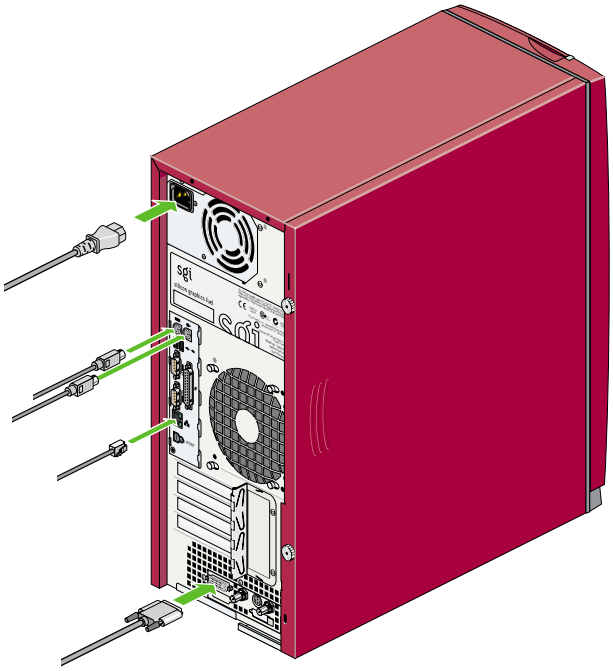

Figure 4-8 Connecting the System Cables

5. If your workstation is equipped with a padlock or Kensington lock, lock the workstation. Refer to “Installing Locking Devices” on page 84 for more information.
6. Press the power buttons on your workstation and monitor.

If your workstation does not boot correctly, refer to Chapter 5, “Troubleshooting and Diagnostics.”

Installing or Removing a Memory DIMM

The Silicon Graphics Fuel visual workstation is configured with a minimum of 512 MB of memory and a maximum of 4 GB of memory. The memory DIMMs are installed in four DIMM sockets on the system board, which are divided into two DIMM pairs. The instructions in the following sections assume that you know which slots to install the memory DIMMs in. For information about DIMM configurations and placement rules, refer to "Memory DIMMs" in Chapter 3.

Note: If you have not already done so, prepare your system for service before installing or removing a DIMM. Refer to "Preparing the Workstation for Service" on page 46.

This section provides instructions for the following procedures:

- Removing a DIMM
- Installing a DIMM
- Verifying Memory Installation

Removing a DIMM

To remove a DIMM, follow these steps:

1. Remove the motherboard air duct. Refer to “Replacing the Motherboard Air Duct” on page 88.
2. Locate the DIMM that you want to remove.
3. Pull up on the latches at the end of the DIMM socket (refer to Figure 4-9). The DIMM will partially eject from the socket.
4. Lift the DIMM up and out of the enclosure.
5. Place the DIMM in an anti-static bag and store it in a secure location.

Note: Both sockets in a DIMM bank must be either empty or populated. If you remove one DIMM and do not plan to replace it immediately, also remove the other DIMM in the bank and replace it when you install a new DIMM.

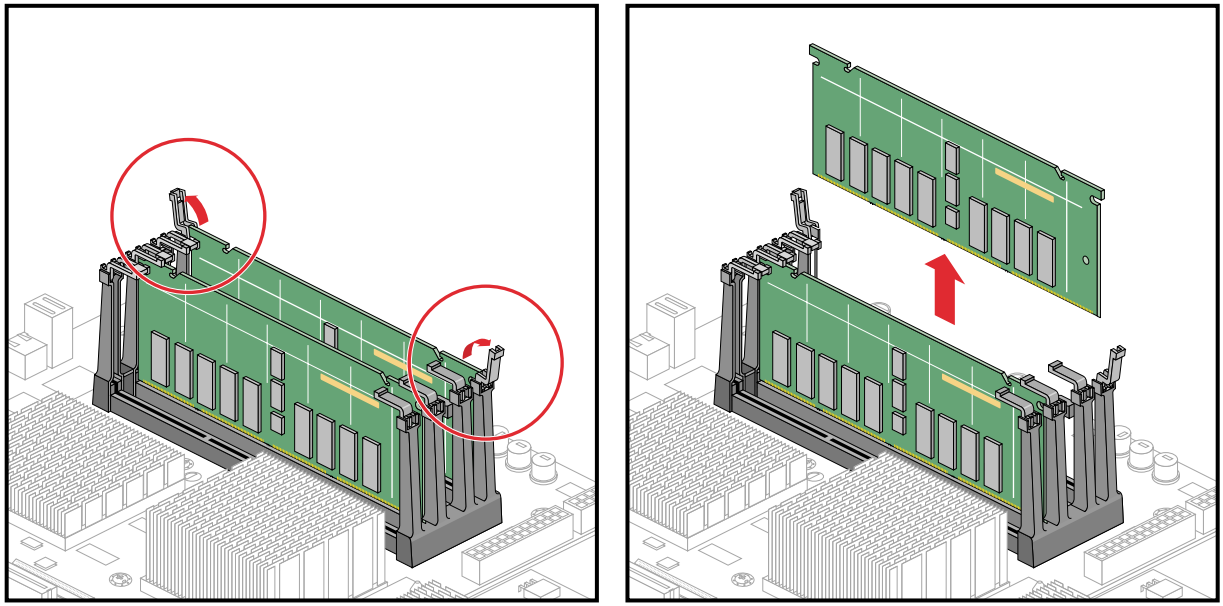

Figure 4-9 Removing a DIMM

6. Install a new DIMM or return the system to service, as follows:
   - To replace the DIMM immediately, proceed to the next section, “Installing a DIMM” on page 61.
   - To return the system to service, proceed to the next step.

Note: The workstation will not function if there are no memory DIMMs installed. Two memory DIMMS of equal size must be installed in DIMM pair number 1.

---

7. Install the motherboard air duct. Refer to “Replacing the Motherboard Air Duct” on page 88.
8. Refer to “Returning the Workstation to Service” on page 55 to complete this procedure.

Installing a DIMM

To install a DIMM, follow these steps:

Caution: DIMMs are sensitive to static electricity. Be sure to wear the anti-static wrist strap while you complete these steps.

1. If you have not already done so, remove the motherboard air duct. Refer to "Replacing the Motherboard Air Duct" on page 88.
2. Rotate the ejector latches on each end of the socket so that they stand straight up, as shown in Figure 4-10.

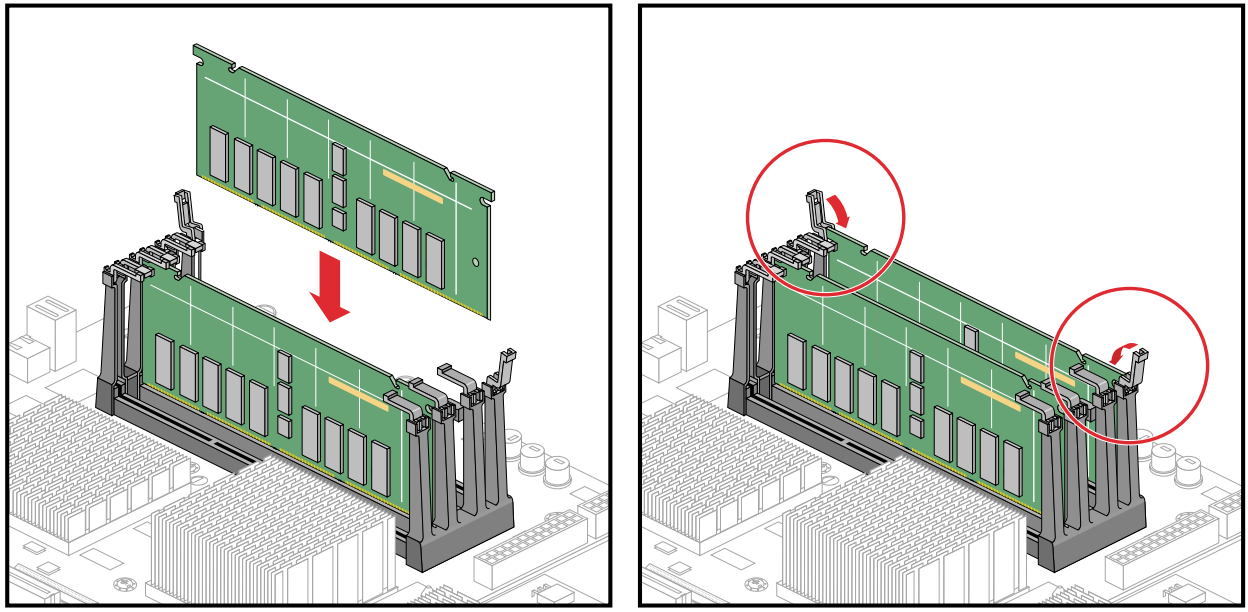

Figure 4-10 Installing a DIMM

3. If there is a plastic blank in the DIMM socket, remove it. These blanks are installed in the factory to prevent damage to the socket during shipping.
4. Align the DIMM with the socket. Make sure that the notches on the bottom of the DIMM align with the protrusions in the bottom of the socket. Refer to Figure 4-11.

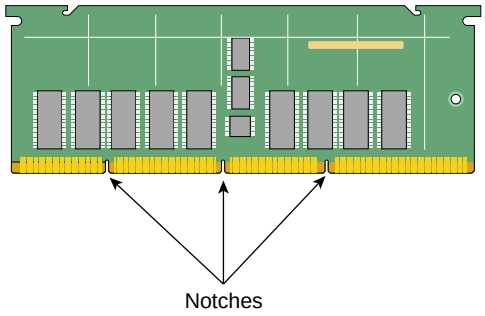

Figure 4-11 Locating the Notches on a DIMM

5. Seat the DIMM in the socket and press down. If you have seated the DIMM correctly, the ejector latches will swing up and click into place in the notches on the ends of the DIMM.
6. If necessary, repeat steps 2 through 5 to install a second DIMM.
7. Ensure that both sockets in the DIMM bank are full. DIMMs must be installed in pairs.
8. Install the motherboard air duct in the enclosure. Refer to "Replacing the Motherboard Air Duct" on page 88.
9. This completes the memory DIMM installation. To return the workstation to service, refer to "Returning the Workstation to Service" on page 55.

Verifying Memory Installation

To verify the memory installation, follow these steps:

1. After you power on the system, select **System Manager > Hardware and Devices > About This System** from the Toolchest and check the amount of memory displayed for **Main Memory**. The displayed memory should equal the original amount of memory minus any memory you removed, plus the amount of memory you installed.
2. If the amount of memory is incorrect, power off the system and check the following:
   - Check the angle of the DIMMs. They should be upright and completely seated.
   - Ensure that each bank is populated with two DIMMs, and that they are the same type. You must have an even number of DIMMs installed.

Installing or Removing Internal Hard Disk Drives

The Silicon Graphics Fuel visual workstation can have as many as three internal hard disk drives. The instructions in the following sections assume that you know where to install the hard disk drive.

- For information about drive placement rules, refer to "Internal Hard Disk Drives" on page 32.
- To install or remove a disk drive in the lower drive cage, refer to "Installing or Removing a Drive in the Lower Hard Disk Drive Cage" on page 63.
- To install or remove a disk drive in the upper drive cage, refer to "Installing or Removing a Drive in the Upper Hard Disk Drive Cage" on page 68.

Note: If you have not already done so, prepare your system for service before installing or removing an internal hard disk drive. Refer to "Preparing the Workstation for Service" on page 46.

Installing or Removing a Drive in the Lower Hard Disk Drive Cage

This section provides instructions for the following procedures:

- Opening the Lower Drive Cage
- Installing a Disk Drive in the Lower Drive Cage
- Removing a Disk Drive from the Lower Drive Cage
- Closing the Lower Drive Cage

Opening the Lower Drive Cage

Follow these steps to open the lower drive cage:

1. Disconnect the SCSI and power cables from any disk drives that are installed in the lower drive cage.
2. Remove the two screws that secure the drive cage to the chassis. Then swing the drive cage up and out of the chassis until it locks into place. Refer to Figure 4-12.

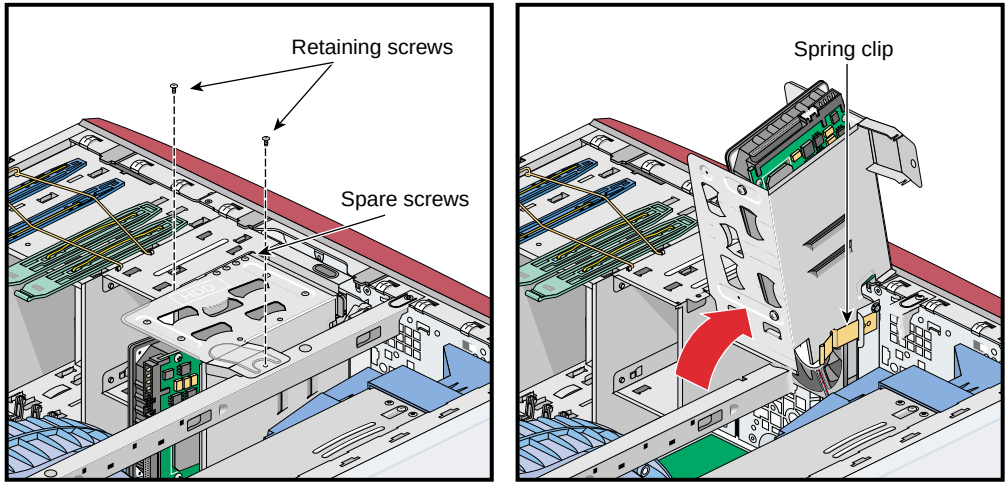

Figure 4-12 Opening the Lower Drive Cage

Installing a Disk Drive in the Lower Drive Cage

Follow these steps to install a disk drive in the lower drive cage:

1. If a disk drive is already installed in the position where you will install the new disk, you must remove it. Refer to “Removing a Disk Drive from the Lower Drive Cage” on page 66.
2. Remove the four hard drive screws that stored on the side of the lower drive cage. You will use these screws to install the disk drive. If you a
3. Orient the disk drive so that the SCSI cable connector is on the left as you look at the rear of the drive. Then slide the drive into the drive cage so that it rests on the drive rails. Refer to Figure 4-13.

4. Align the holes in the side of the drive cage with the holes in the sides of the disk drive. Then install the four Phillips screws that secure the drive to the drive cage. Refer to Figure 4-13.

Caution: The hard drive screws must be 6-32 and no longer than 3/16-in. Using screws that do not meet this specification will damage your drive.

5. When you have finished installing the disk drive, close the lower drive cage. Refer to "Closing the Lower Drive Cage" on page 67.

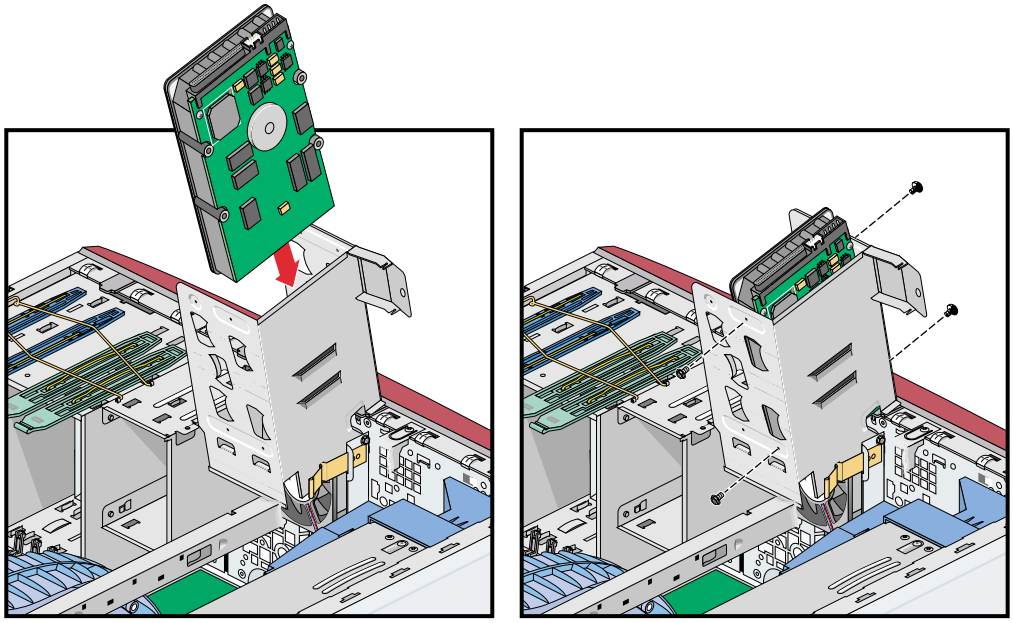

Figure 4-13 Installing the Disk Drive

Removing a Disk Drive from the Lower Drive Cage

Follow these steps to remove a disk drive from the lower drive cage:

1. Remove the four Phillips screws that secure the drive you are removing to the drive cage. Then grasp the disk drive and slide it up and out of the drive cage. Refer to Figure 4-14.

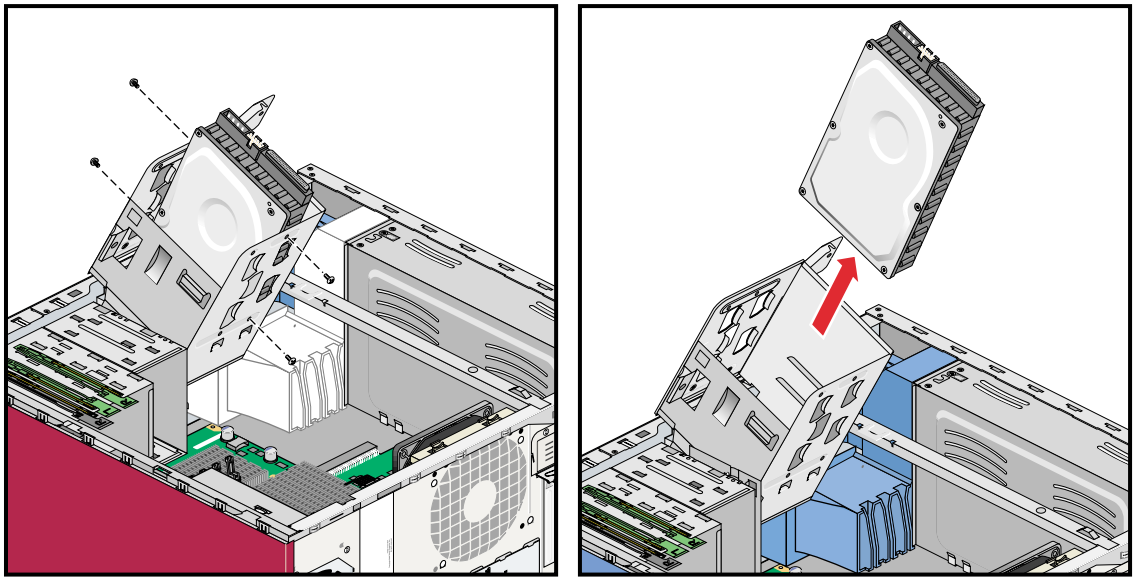

Figure 4-14 Removing the Disk Drive

2. If you are replacing the disk drive with a new drive, refer to “Installing a Disk Drive in the Lower Drive Cage” on page 64.
3. Proceed to the next section, “Closing the Lower Drive Cage” on page 67.

Closing the Lower Drive Cage

Follow these steps to close the lower drive cage:

1. Release the drive cage latch and swing the drive cage into the enclosure. Then install the two Phillips screws that secure the drive cage to the chassis. Refer to Figure 4-15.

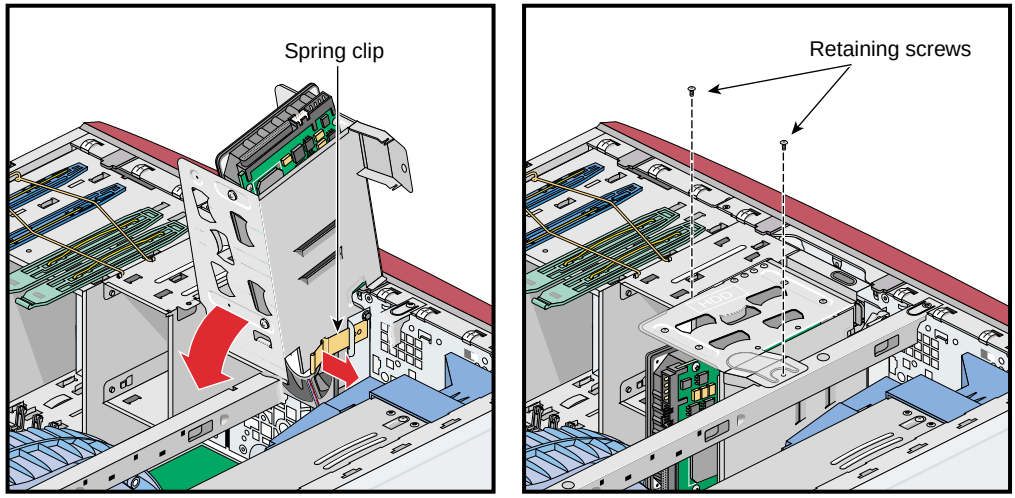

Figure 4-15 Closing the Lower Drive Cage

2. Connect the SCSI and power cables to the rear of the disk drive(s) in the lower drive cage. Refer to Appendix C, “Internal Cabling Diagrams”.
3. This completes the hard disk installation or removal. To return the workstation to service, refer to “Returning the Workstation to Service” on page 55.

Installing or Removing a Drive in the Upper Hard Disk Drive Cage

This section provides instructions for the following procedures:

- Installing a Disk Drive in the Upper Drive Cage
- Removing a Disk Drive from the Upper Drive Cage

Installing a Disk Drive in the Upper Drive Cage

Follow these steps to install a disk drive in the upper drive cage:

1. If you have not already done so, prepare your system for service.
   Refer to “Preparing the Workstation for Service” on page 46. Then remove the bezel of the workstation. Refer to “Replacing the Bezel Assembly” on page 104.
2. If a disk drive is already installed in the upper drive cage, you must remove it before you can install the new disk drive. Refer to “Removing a Disk Drive from the Upper Drive Cage” on page 70. If you remove a drive from the upper drive bay, save the blue drive rails. You will need them to install the new drive.
3. Locate the blue drive rails. They are stored on the side of the upper drive cages. Refer to Figure 4-16.
4. Attach the blue drive rails to the sides of the disk drive by inserting the pins into the openings in the sides of the drive. The drive rails are marked “**L**” and “**R**” to show the side of the drive to which they should be attached. Refer to Figure 4-16

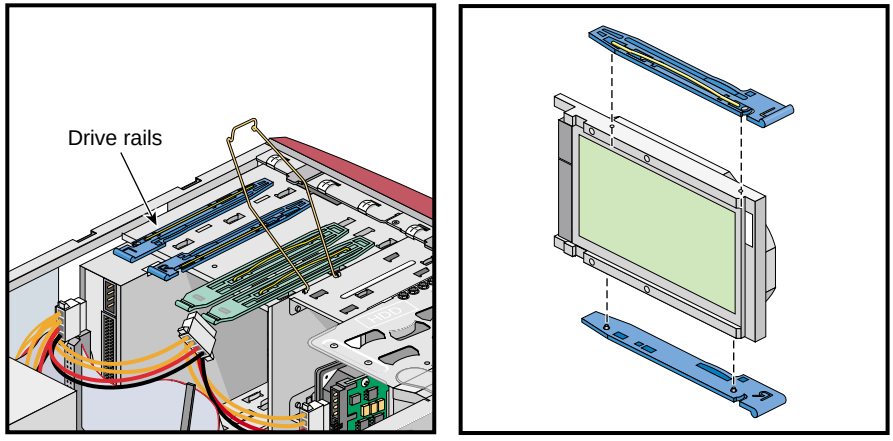

Figure 4-16 Installing the Drive Rails

5. Remove the screw that secures the drive cage cover to the front of the enclosure. Refer to Figure 4-17.
6. Align the drive rails with the slots in the side of the drive cage and slide the drive into the drive cage. Then install the drive cage cover. Refer to Figure 4-17.

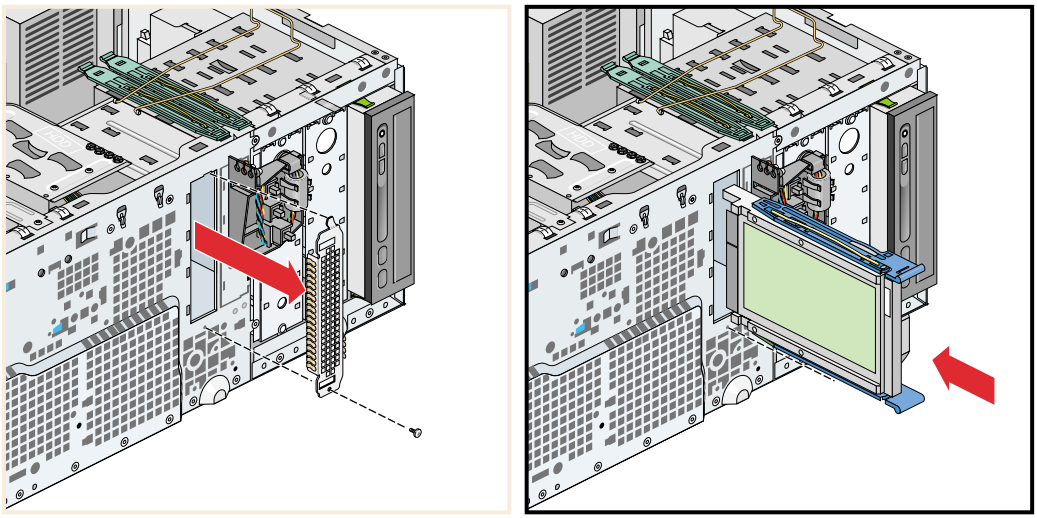

Figure 4-17 Installing the Disk Drive

7. Connect the SCSI and power cables to the rear of the disk drive. Refer to Appendix C, “Internal Cabling Diagrams”.
8. Install the bezel on the front of the workstation.
Refer to “Replacing the Bezel Assembly” on page 104.
9. This completes the hard disk drive installation. To return the workstation to service, refer to “Returning the Workstation to Service” on page 55.

Removing a Disk Drive from the Upper Drive Cage

Follow these steps to remove a disk drive from the upper drive cage:

1. If you have not already done so, prepare your system for service. Refer to “Preparing the Workstation for Service” on page 46.
2. Remove the bezel of the workstation. Refer to “Replacing the Bezel Assembly” on page 104.
3. Disconnect the SCSI and power cables from the rear of the disk drive.
4. Remove the screw that secures the drive cage cover to the front of the enclosure.
5. Squeeze the tabs on the drive rails against the sides of the drive. Then slide the drive out of the drive cage. Refer to Figure 4-18.

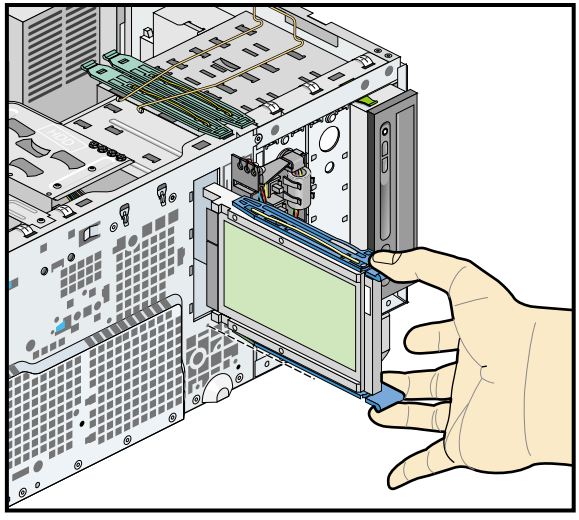

Figure 4-18 Removing the Disk Drive

6. If you are replacing the disk drive with a new drive, refer to “Installing a Disk Drive in the Lower Drive Cage” on page 64.
7. If you are leaving the drive cage empty, install the drive cage cover on the front of the enclosure. Refer to Figure 4-19.

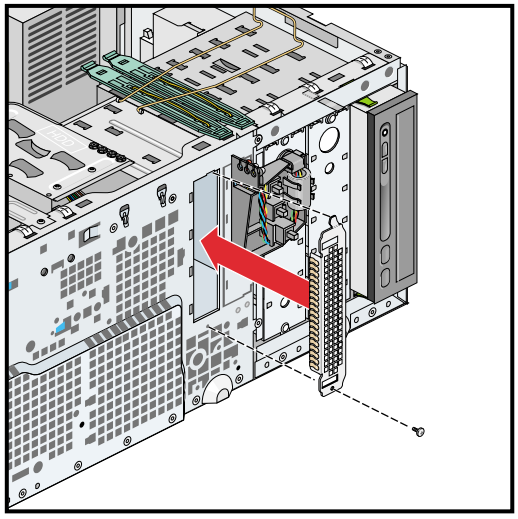

Figure 4-19 Installing the Drive Cage Cover

8. Install the bezel on the front of the workstation. Refer to “Replacing the Bezel Assembly” on page 104.
9. This completes the hard disk drive removal. To return the workstation to service, refer to “Returning the Workstation to Service” on page 55.

Installing or Removing a Removable Media Drives

The Silicon Graphics Fuel visual workstation supports two removable media drives: a 40X CD-ROM drive, and a 20-GB 4-mm Digital Audio SCSI tape drive. The following procedures apply to both of these drives. The CD-ROM drive should be installed in the upper opening in the drive bay, and the DAT drive should be installed in the lower opening.

Note: If you have not already done so, prepare your system for service. Refer to "Preparing the Workstation for Service" on page 46.

Installing a Removable Media Drive

Follow these steps to install a removable media drive:

1. Remove the bezel from the front of the enclosure. Refer to "Replacing the Bezel Assembly" on page 104.
2. If a removable media drive is already installed in the position where you will install the new drive, you must remove it before you can install the new drive. Refer to "Removing a Removable Media Drive" on page 75. If you remove a drive from the drive bay, save the drive rails. You will need them to install the new drive.
3. If an EMI shield is installed in the position where you will install the drive, remove it. To remove the EMI shield, place your finger in the hole and pull straight out.

4. Locate the green drive rails. They are stored on the side of the drive cages. Refer to Figure 4-20.
5. Attach the 5.25-in. green drive rails to the sides of the disk drive by inserting the pins into the openings in the sides of the drive. Refer to Figure 4-20.

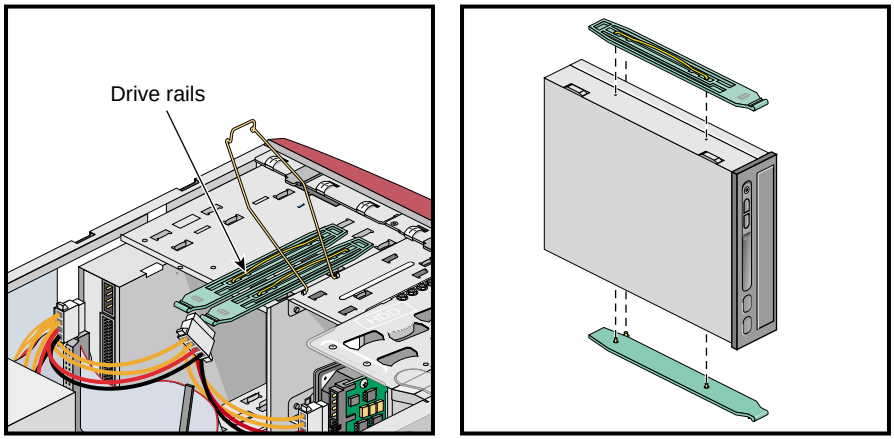

Figure 4-20 Installing the Drive Rails

6. Align the drive rails with the slots in the side of the drive cage and slide the drive into the drive cage. Refer to Figure 4-21.
7. Connect the SCSI cable to the rear of the drive as follows (refer to Appendix C, “Internal Cabling Diagrams”):
   - Connect the CD-ROM drive to the 50-pin SCSI cable. Connect the drive to the connector at the end of the cable.
   - Connect the DAT drive to the 68-pin SCSI cable to which the hard disk drives are connected.
8. Connect a power cable to the rear of the drive. Refer to Figure 4-21 and Appendix C.

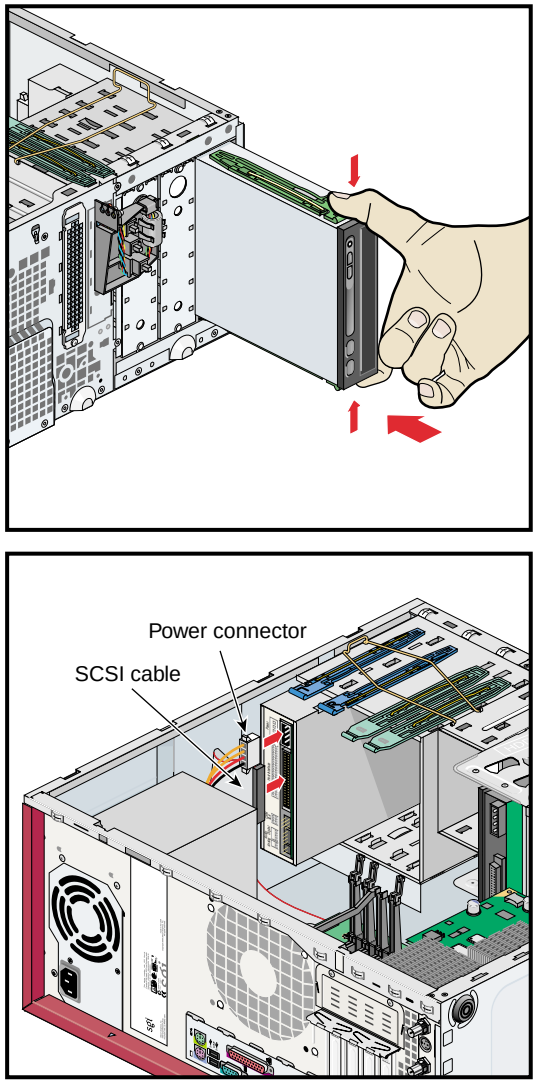

Figure 4-21 Installing the Removable Media Drive

Note: The CD ROM drive is shown in Figure 4-21. The DAT drive should be installed in the bay below the CD ROM drive using the same procedure, but a different SCSI cable. For complete SCSI and power cabling diagrams, refer to Appendix C, "Internal Cabling Diagrams".

9. Remove the drive bay cover that corresponds to the bay you installed the new drive in from the bezel. Place the drive bay cover in a secure location.
10. Install the bezel on the front of the enclosure. Refer to "Replacing the Bezel Assembly" on page 104.
11. This completes the removable media drive installation. To return the workstation to service, refer to "Returning the Workstation to Service" on page 55.

Removing a Removable Media Drive

Follow these steps to remove a removable media drive:

1. Remove the bezel from the front of the enclosure. Refer to "Replacing the Bezel Assembly" on page 104.
2. Disconnect the SCSI and power cables from the rear of the drive. Refer to Figure 4-22.

   Note: Figure 4-22 shows the CD ROM drive. The procedure is the same for the DAT drive, but the drive is located in the lower opening in the removable media drive bay.

3. Squeeze the tabs on the drive rails against the sides of the drive. Then slide the drive out of the drive cage. Refer to Figure 4-22.

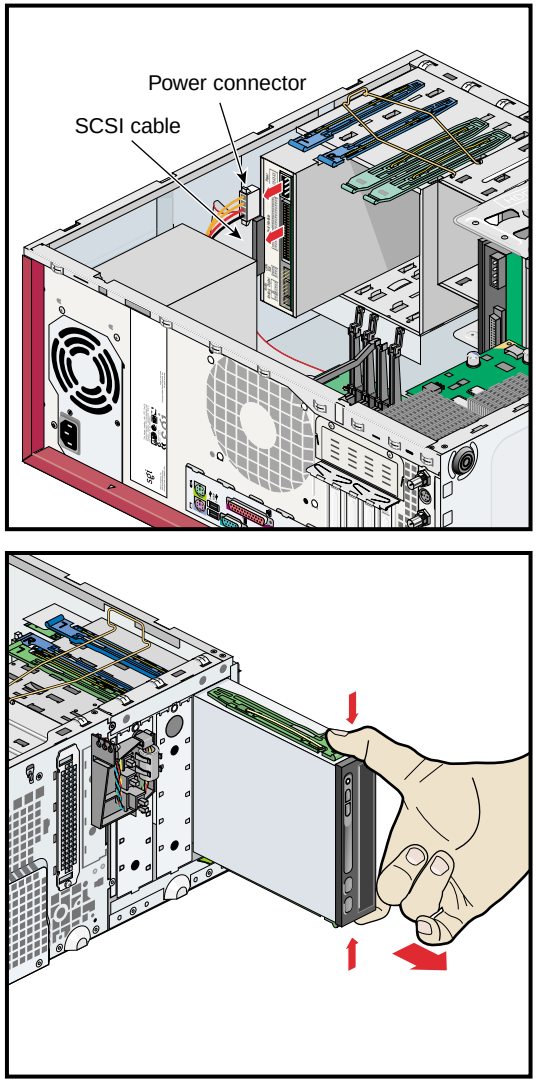

Figure 4-22 Removing a Removable Media Drive

4. If you are replacing the drive with a new drive, refer to “Installing a Removable Media Drive” on page 72.
5. If you are leaving the drive bay empty, install the EMI shield in the opening left by the drive.

6. Install the drive bay cover in the bezel to cover the empty drive bay. Then install the bezel on the front of the enclosure. Refer to "Replacing the Bezel Assembly" on page 104.
7. This completes the removal of the removable media drive. To return the workstation to service, refer to "Returning the Workstation to Service" on page 55.

Installing or Removing a PCI Board

The Silicon Graphics Fuel visual workstation can house as many as 4 PCI boards. These instructions assume that you know what slot you need to install the PCI board in. For more information of PCI board placement rules and configurations, refer to "PCI Boards" on page 38.

Note: If you have not already done so, prepare your system for service. Refer to "Preparing the Workstation for Service" on page 46.

This section provides instructions for the following procedures:

- Accessing the PCI Boards
- Installing a PCI Board
- Removing a PCI Board
- Completing the PCI Board Installation or Removal

Accessing the PCI Boards

Follow these steps to access a PCI board:

1. Disconnect the SCSI and power cables from any disk drives that are installed in the lower drive cage.
2. Remove the two screws that secure the drive cage to the chassis. Then swing the drive cage up and out of the chassis until it locks into place. Refer to Figure 4-23.

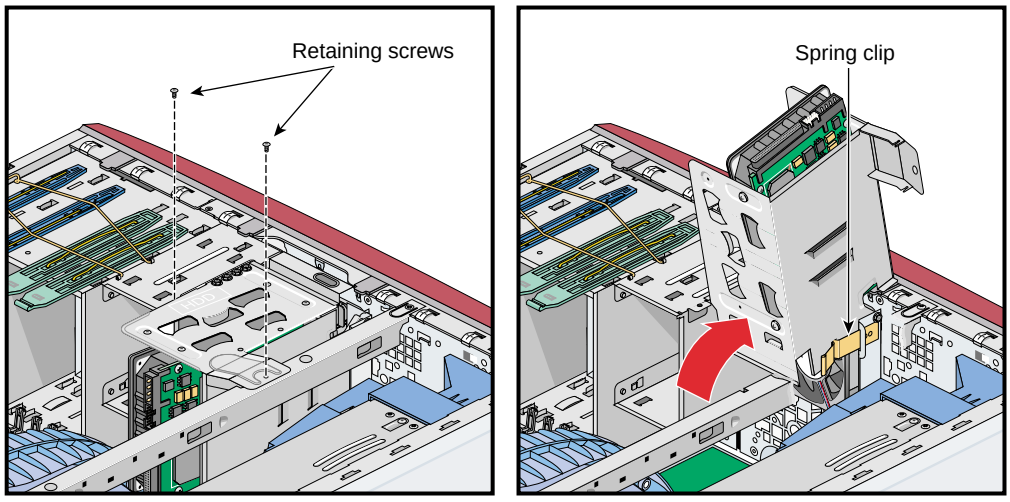

Figure 4-23 Opening the Lower Drive Cage

3. Remove the screw that secures the chassis stiffening bar to the chassis. Then swing the chassis stiffening bar toward the rear of the chassis and remove it. Refer to Figure 4-24.

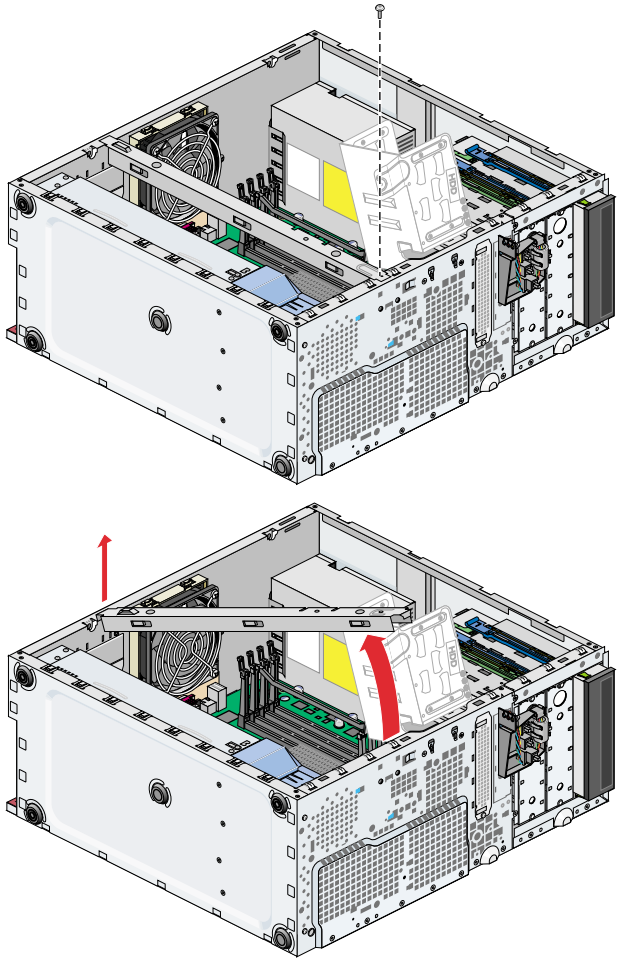

Figure 4-24 Removing the Chassis Stiffening Bar

4. Remove the two screws that secure the PCI gate. Then open the PCI gate. Refer to Figure 4-25.

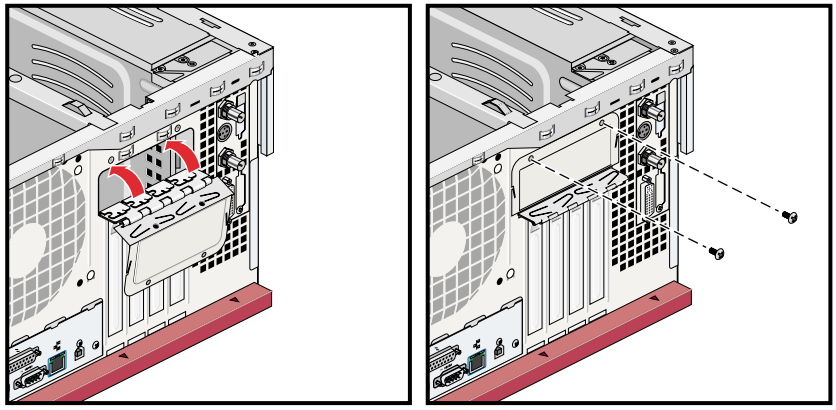

Figure 4-25 Opening the PCI Gate

5. To install a PCI board, proceed to the next section. To remove a PCI board, refer to "Removing a PCI Board" on page 82.

Installing a PCI Board

Follow these steps to install a PCI board:

1. If a PCI blank module or another PCI board is installed in the slot where you will install the new PCI board, you must remove it before you can install the new PCI board.

Note: Store the PCI blank module in a safe place. If you remove a PCI board and do not replace it, you will need to install the PCI blank module to maintain proper airflow in the chassis.

---

2. Align the PCI board with the PCI slot. Then lower the PCI board into the chassis with the connector end angled slightly downward. Refer to Figure 4-26.
3. Align the connector in the PCI gate. Then press down firmly on the PCI board until it is fully seated in the PCI slot. Refer to Figure 4-26.

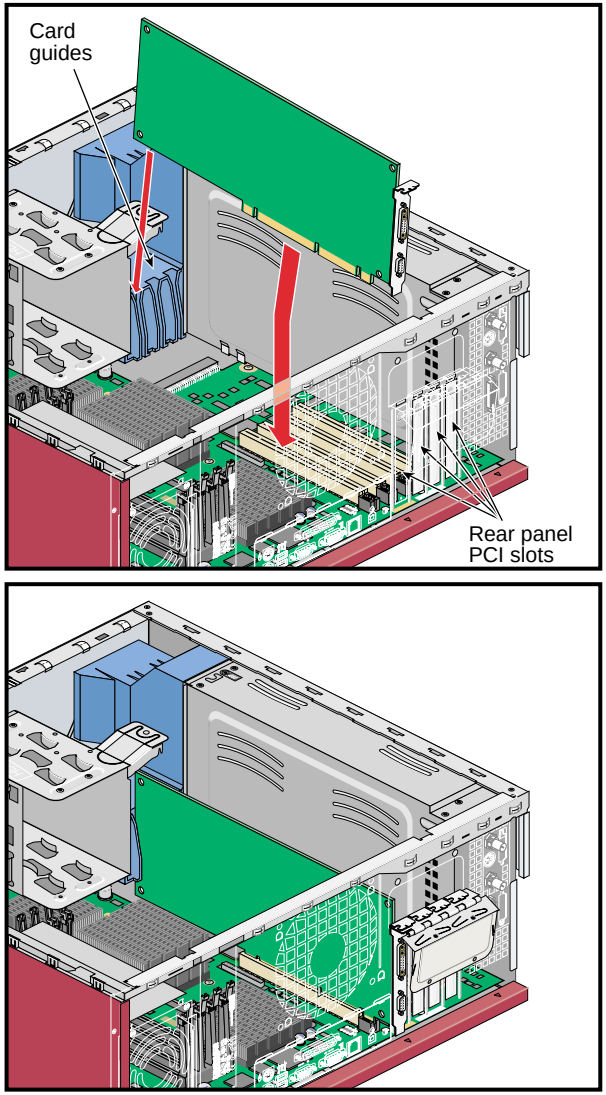

Figure 4-26 Installing the PCI Board

4. To complete the installation of the PCI board, proceed to “Completing the PCI Board Installation or Removal” on page 82.

Removing a PCI Board

Follow these steps to remove a PCI board:

1. Grasp the top edge of the PCI board firmly. Then lift the PCI board straight up until it clears the PCI slot. Remove the PCI from the enclosure and place it in a safe location.
2. If you will not replace the PCI board with another PCI board immediately, you must install a PCI blank module in the slot to maintain airflow in the enclosure.
3. To complete the removal of the PCI board, proceed to "Completing the PCI Board Installation or Removal" on page 82.

Completing the PCI Board Installation or Removal

Follow these steps to complete the PCI board installation or removal:

1. Close the PCI gate. Then install the 2 screws that secure the PCI gate. Refer to Figure 4-27.

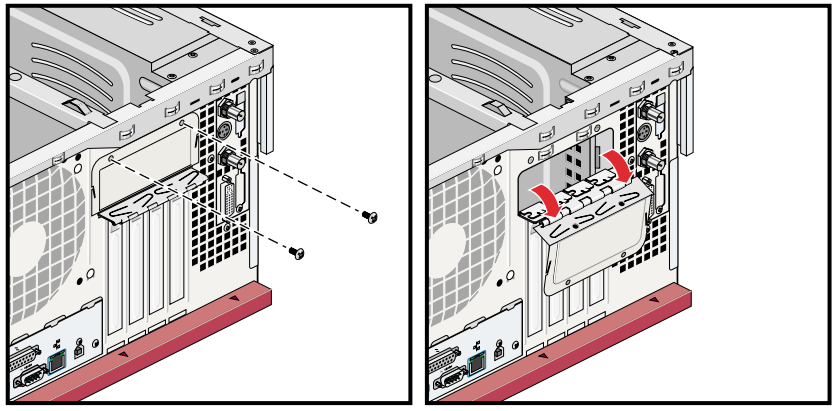

Figure 4-27 Closing the PCI Gate

2. Insert the tab on the chassis stiffening bar into the hole in the chassis and swing the chassis stiffening arm down into place. Then install the screw that secures the chassis stiffening arm to the chassis. Refer to Figure 4-28.

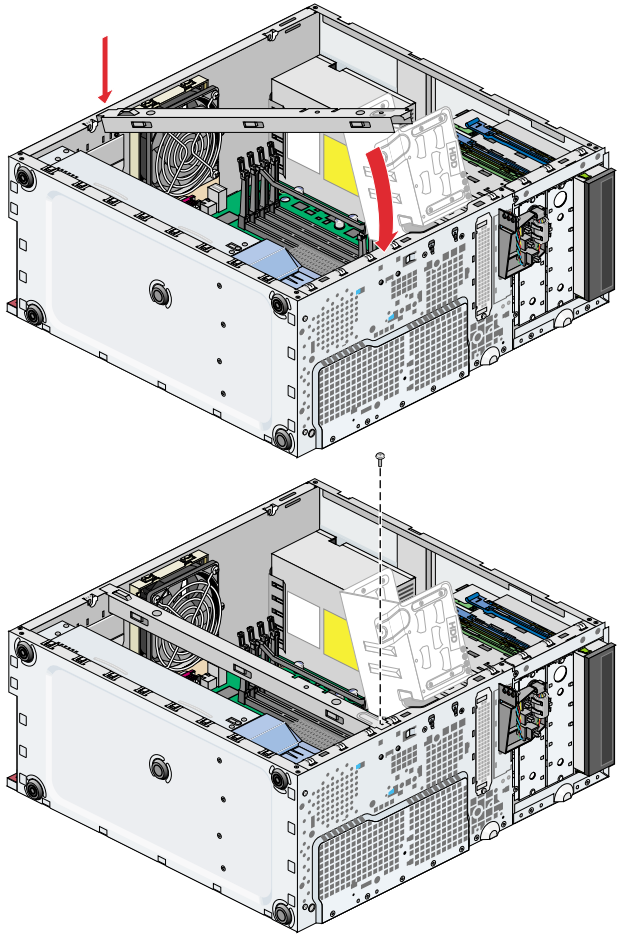

Figure 4-28 Installing the Chassis Stiffening Arm

3. Close the lower drive cage. Refer to “Closing the Lower Drive Cage” on page 67. Then install the two screws that secure the drive cage to the chassis.
4. Connect the SCSI and power cables to the drive(s) in the lower drive cage. Refer to Appendix C, “Internal Cabling Diagrams”.
5. This completes the PCI board installation or removal. To return the workstation to service, refer to “Returning the Workstation to Service” on page 55.

Installing or Removing External devices

Refer to the documentation that came with the device for more information on connecting it to your workstation.

Installing Locking Devices

You can lock the Silicon Graphics Fuel visual workstation can be locked in two ways, which are explained in the following sections:

- Installing a Locking Loop and a Padlock
- Installing a Kensington Lock

This section provides information about the function and installation of both types of locks.

Note: Locks are not supplied with the workstation.

Installing a Locking Loop and a Padlock

The locking loop allows you to lock the workstation case to prevent the internal components from being removed or tampered with. The locking loop is located at the rear of the workstation side panel (refer to Figure 4-29). The loop is stored in a slot in the chassis and must be installed in the locking slot to be used.

Follow these steps to install the locking loop:

1. Remove the side panel from your workstation. Refer to “Preparing the Workstation for Service” on page 46.

   Note: If you are only installing the locking loop, you do not need to disconnect all of the cables from the rear of the chassis or lay the chassis down.

2. Locate the locking loop storage slot; then remove the loop from its storage position by squeezing the two hooks together and pulling the loop out of the chassis. Refer to Figure 4-29.

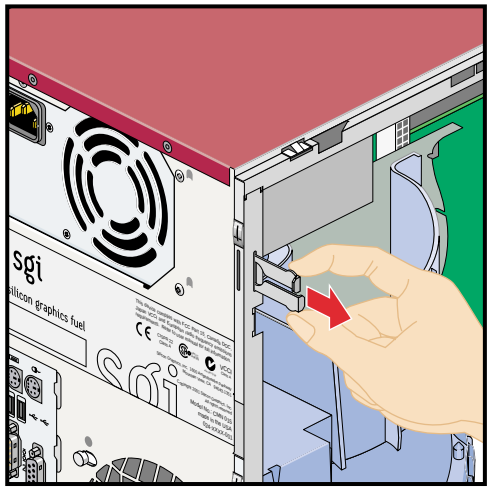

Figure 4-29 Removing the Locking Loop from Storage

3. Locate the locking slot at the rear of the chassis; then insert the narrow end of the locking loop into the slot from inside the chassis and push it outward until it snaps into place. Refer to Figure 4-30.

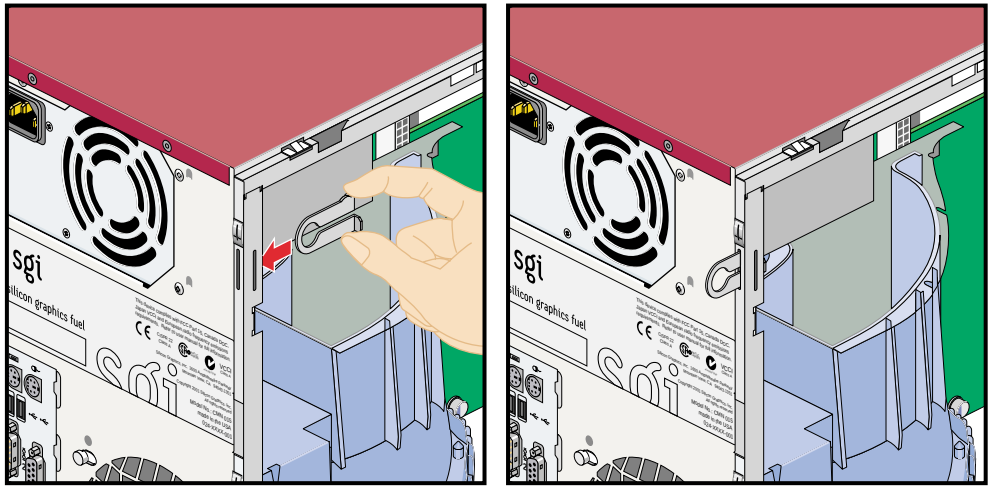

Figure 4-30 Installing the Locking Loop

4. Install the side panel on your workstation. Refer to “Returning the Workstation to Service” on page 55.
5. Install a padlock in the locking loop to prevent the side panel from being removed. This completes the locking loop installation.

Installing a Kensington Lock

The workstation is equipped with a Kensington lock slot. The lock slot is located on the rear edge of the removable side panel, near the bottom. This slot allows you to install a Kensington lock to secure the workstation to the work area. For more information on installing a Kensington lock, refer to the documentation supplied with the lock.

Note: A Kensington lock is not included with the workstation.

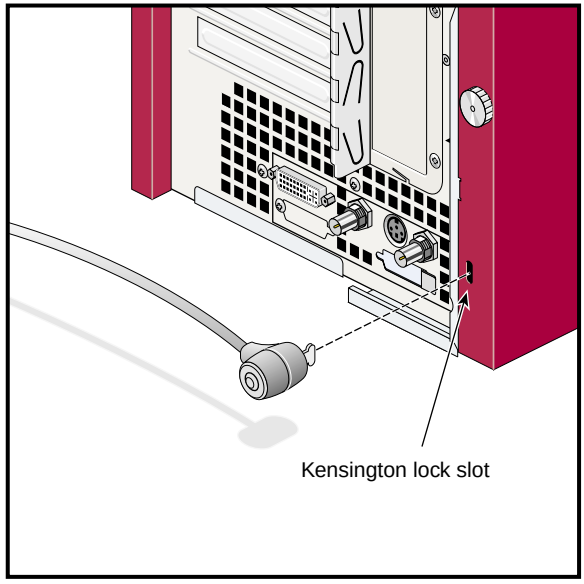

Figure 4-31 Kensington Lock Slot

Replacing Cooling System Components

This section provides instructions for the following procedures:

- Replacing the Motherboard Air Duct
- Replacing the Exhaust Fan
- Replacing the Hard Disk Drive Fan
- Replacing the PCI and Graphics Fan Housing

Caution: Never operate the unit without all of the cooling system components in place. Operating the workstation without the proper cooling equipment may damage the internal components.

Replacing the Motherboard Air Duct

Follow these steps to replace the motherboard air duct:

Note: If you have not already done so, prepare your system for service. Refer to"Preparing the Workstation for Service" on page 46.

1. Disconnect the SCSI and power cables from the disk drive(s) installed in the lower drive cage.
2. Remove the two screws that secure the drive cage to the chassis. Then swing the drive cage up and out of the enclosure until it locks into place. Refer to Figure 4-32.

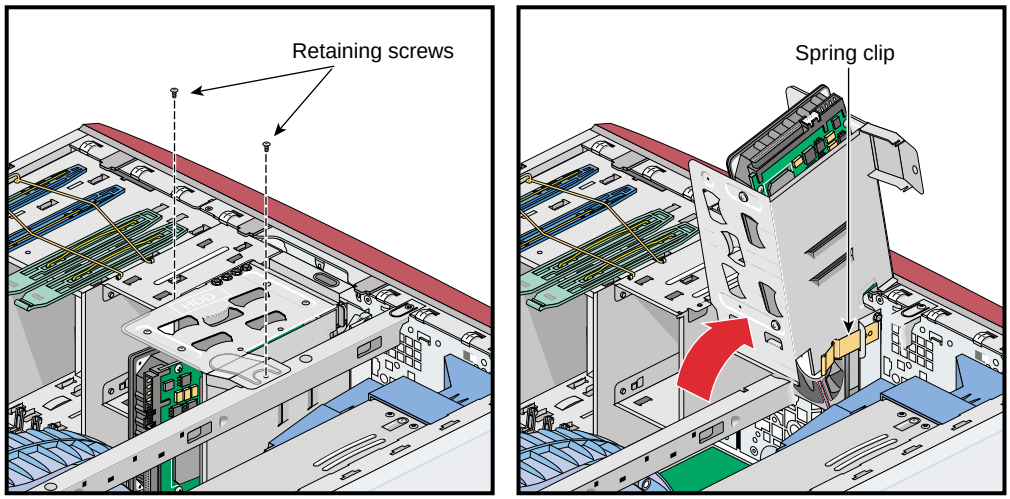

Figure 4-32 Opening the Lower Drive Cage

3. Grasp the handle of the air duct and tilt the rear edge of the duct upward. Then slide the duct out of the enclosure. Refer to Figure 4-33.

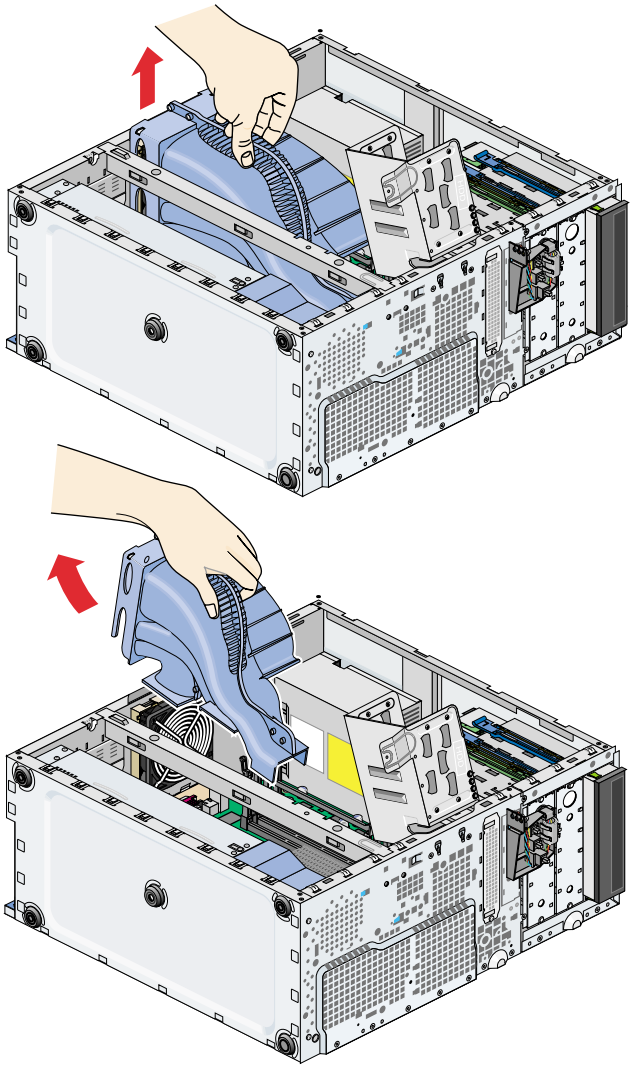

Figure 4-33 Removing the Air Duct

4. Align the narrow end of the replacement duct over the PIMM heat sink. Then, swing the duct down until it snaps into place.

5. Ensure that the duct is properly seated on the heatsinks and that the rear edge is properly seated on the top edge of the exhaust fan. Refer to Figure 4-34.

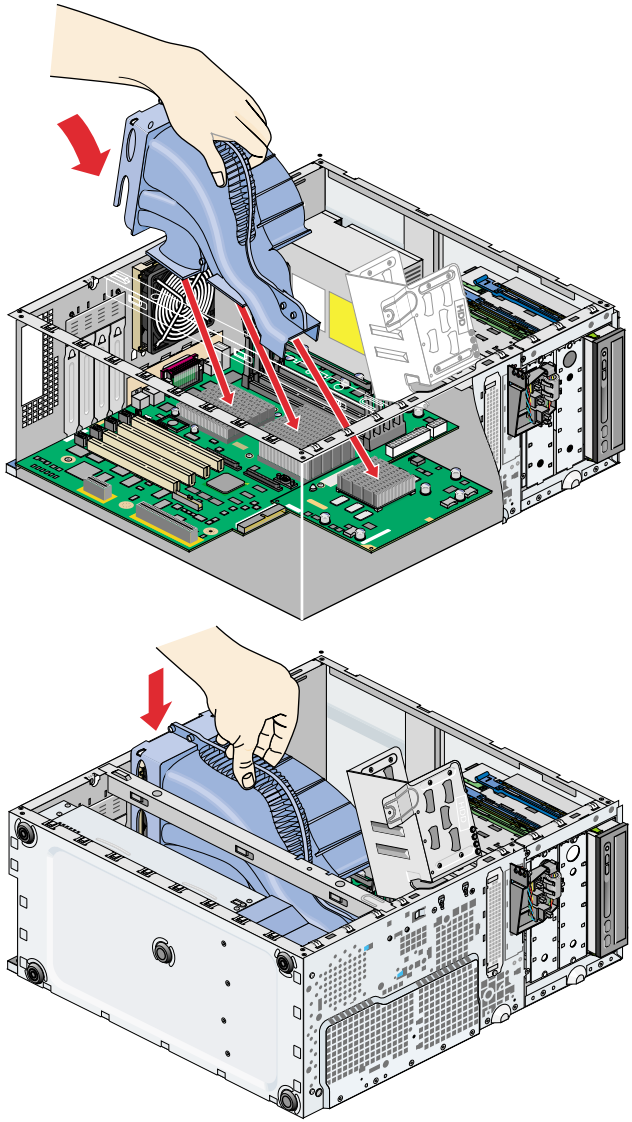

Figure 4-34 Installing the Replacement Air Duct

6. Release the drive cage latch and swing the drive cage down into the enclosure. Then install the two Phillips screws that secure the drive cage to the chassis. Refer to Figure 4-35

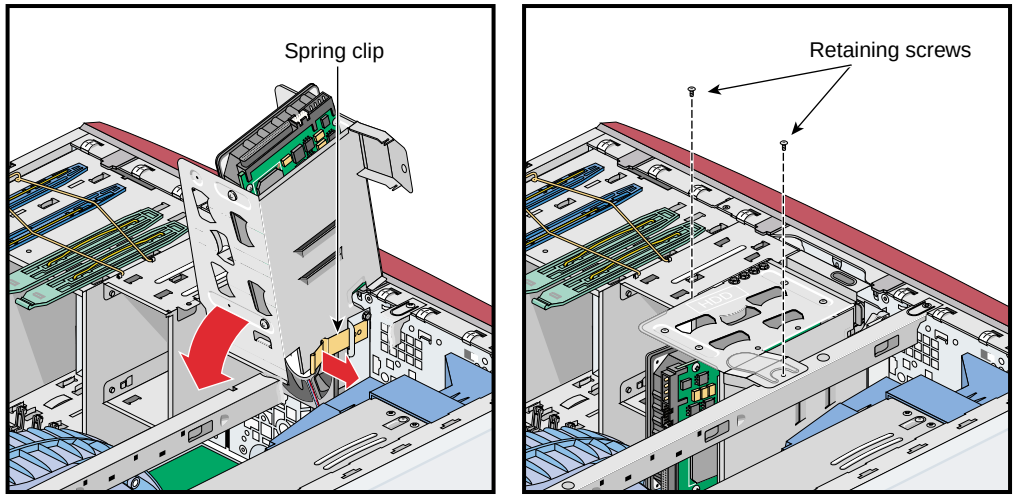

Figure 4-35 Closing the Lower Drive Cage

7. Connect the SCSI and power cables to the rear of the disk drive(s) in the lower drive cage. Refer to Appendix C, “Internal Cabling Diagrams”.
8. This completes the replacement of the motherboard air duct. To return the workstation to service, refer to “Returning the Workstation to Service” on page 55

Replacing the Exhaust Fan

Follow these steps to replace the exhaust fan:

Note: If you have not already done so, prepare your system for service. Refer to"Preparing the Workstation for Service" on page 46.

1. Remove the motherboard air duct from the system enclosure. Refer to "Replacing the Motherboard Air Duct" on page 88
2. Disconnect the exhaust fan wire harness from the mother board. Refer to Figure 4-36.

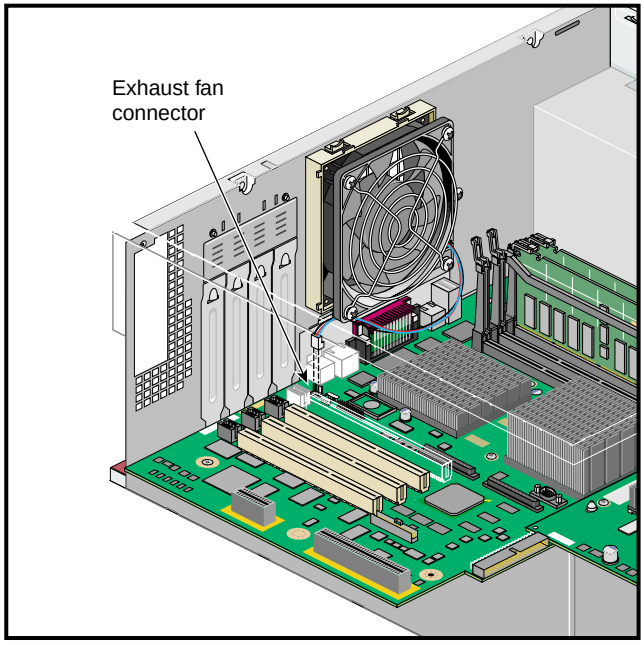

Figure 4-36 Disconnecting the Exhaust Fan Wire Harness

3. Press the two tabs on top of the fan toward the center of the enclosure. Then, slide the fan up and out of the frame and lift it clear of the enclosure. Refer to Figure 4-37.

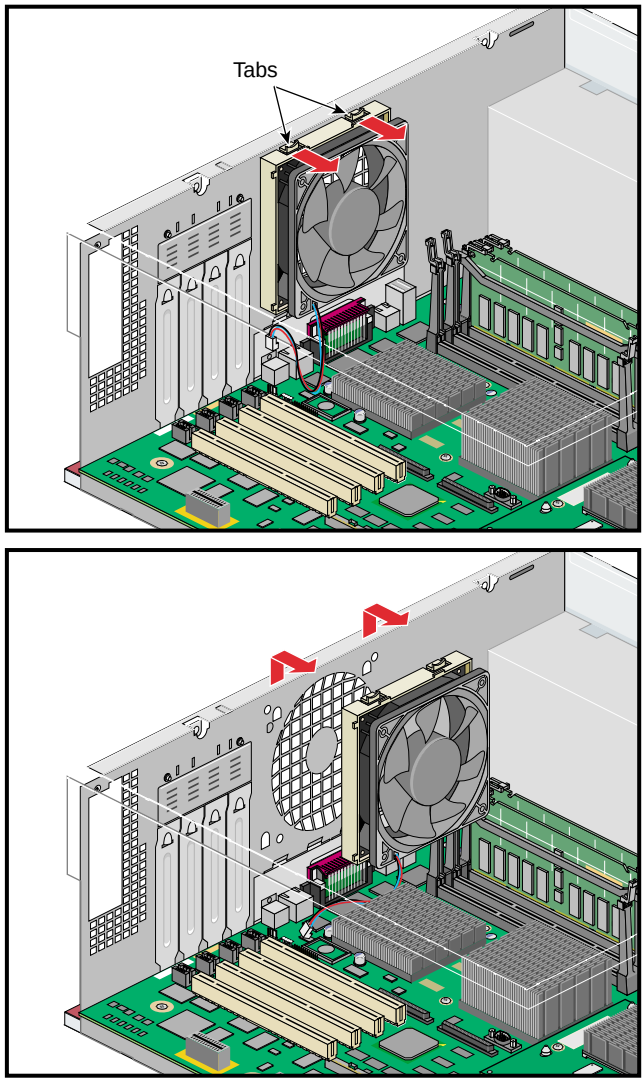

Figure 4-37 Removing the Exhaust Fan

4. Orient the replacement fan so that the tabs are on the top edge of the fan. Then align the four pegs on the rear of the fan with the holes in the fan frame.

5. Insert the pegs into the holes. Then, slide the fan down into the frame until it snaps into place. Refer to Figure 4-38.
6. Connect the exhaust fan wire harness to the fan power connector on the system board.

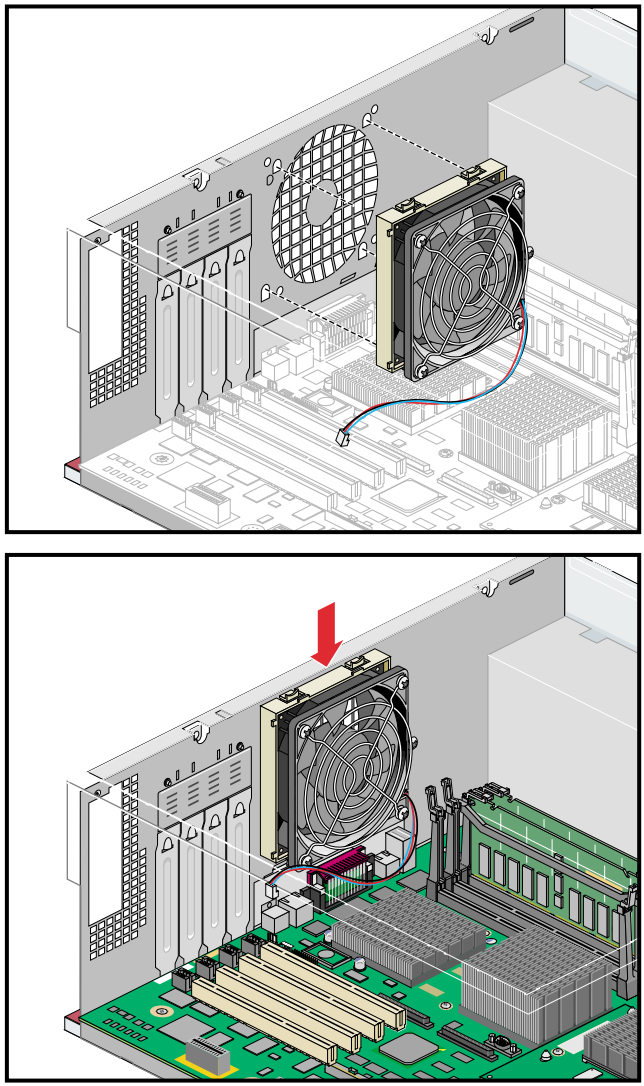

Figure 4-38 Installing the Replacement Exhaust Fan

7. Install the motherboard air duct in the enclosure. Refer to "Replacing the Motherboard Air Duct" on page 88.
8. Connect the SCSI and power cables to the rear of the drive(s) installed in the lower drive cage. Refer to Appendix C, "Internal Cabling Diagrams".
9. Close the lower drive cage. Refer to "Closing the Lower Drive Cage" on page 67.
10. This completes the replacement of the exhaust fan. To return the workstation to service, refer to "Returning the Workstation to Service" on page 55.

Replacing the Hard Disk Drive Fan

Follow these steps to replace the hard disk drive fan:

Note: If you have not already done so, prepare your system for service. Refer to "Preparing the Workstation for Service" on page 46.

---

1. Remove the motherboard air duct from the system enclosure. Refer to "Replacing the Motherboard Air Duct" on page 88
2. Disconnect the disk drive fan wire harness from the system board. Refer to Figure 4-39.

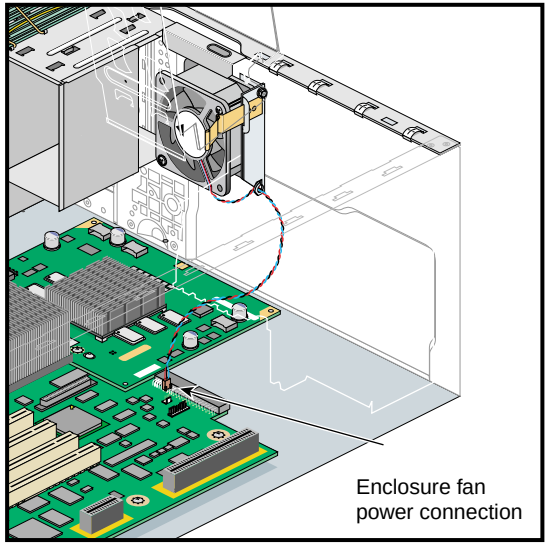

Figure 4-39 Disconnecting the Disk Drive Fan Wire Harness

3. Using a short Phillips screw driver, remove the two screws that secure the disk drive fan to the fan frame. Then remove the fan from the enclosure. Refer to Figure 4-40.

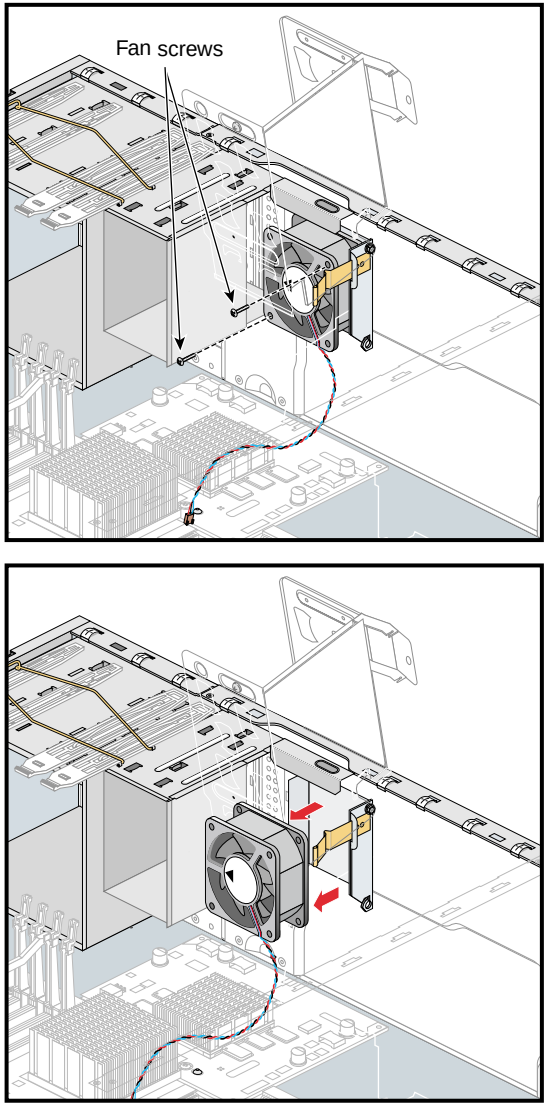

Figure 4-40 Removing the Disk Drive Fan

4. Orient the replacement fan so that the airflow is toward the rear of the chassis and the wire harness is on the side closest to the power connector. Then insert the fan into the enclosure and route the wire harness through the notch in the fan frame.Refer to Figure 4-41.

5. Install the two Phillips screws that secure the fan to the fan frame. Then connect the disk drive fan wire harness to the power connector on the system board. Refer to Figure 4-41.
6. Install the motherboard air duct in the enclosure. Refer to “Replacing the Motherboard Air Duct” on page 88.
7. Connect the SCSI and power cables to the rear of the drive(s) installed in the lower drive cage. Refer to Appendix C, “Internal Cabling Diagrams”.
8. Close the lower drive cage. Refer to “Closing the Lower Drive Cage” on page 67.
9. This completes the replacement of the hard disk drive fan. To return the workstation to service, refer to “Returning the Workstation to Service” on page 55.

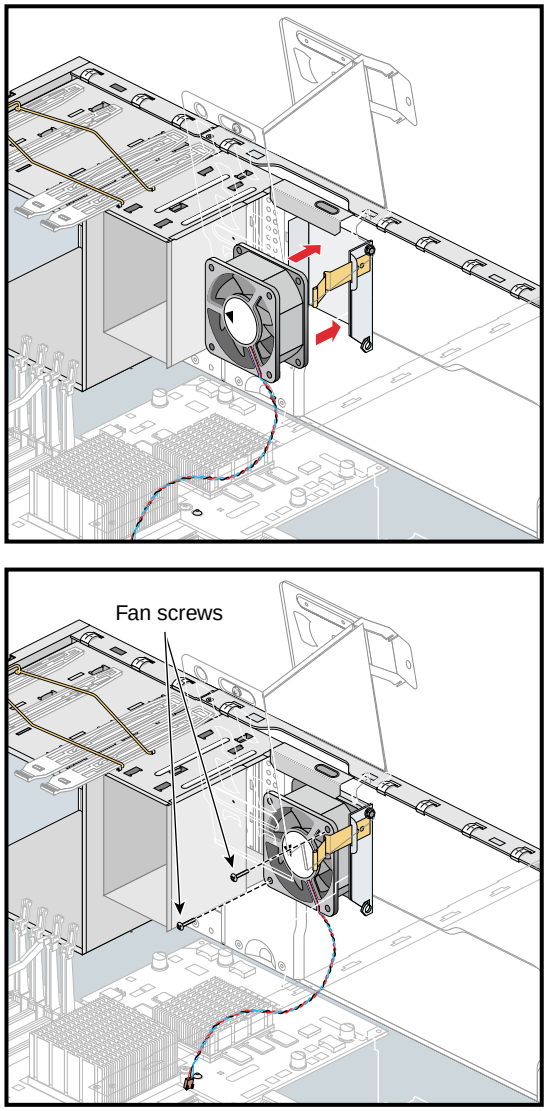

Figure 4-41 Installing the Replacement Disk Drive Fan

Replacing the PCI and Graphics Fan Housing

Follow these steps to replace the PCI and graphics fan housing:

Note: If you have not already done so, prepare your system for service. Refer to "Preparing the Workstation for Service" on page 46.

---

1. Disconnect the SCSI and power cables from any disk drives that are installed in the lower drive cage.
2. Remove the bezel on the front of the workstation. Refer to "Replacing the Bezel Assembly" on page 104.
3. Remove the two screws that secure the lower disk drive cage to the chassis. Then, swing the drive cage up and out of the chassis until it locks into place. Refer to Figure 4-42.

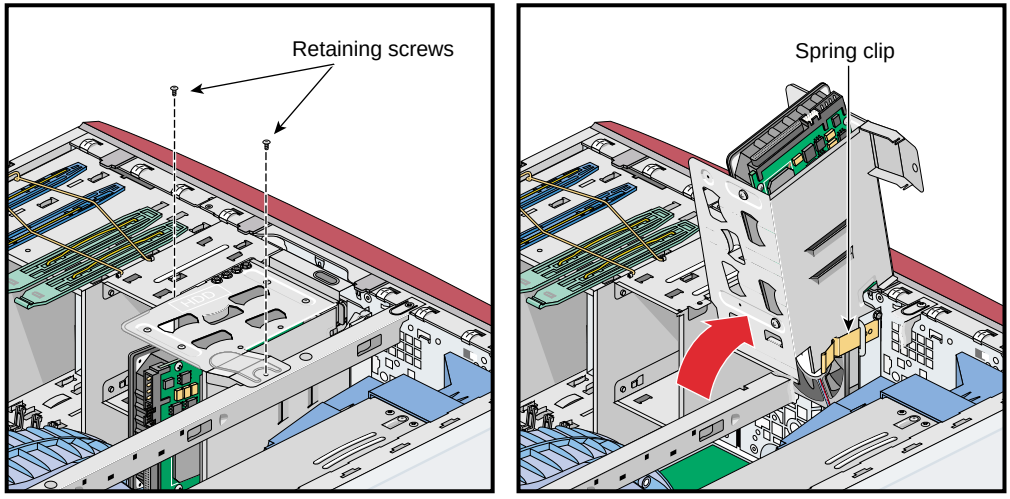

Figure 4-42 Opening the Lower Drive Cage

4. Remove the screw that secures the chassis stiffening bar to the chassis. Then, swing the chassis stiffening bar toward the rear of the chassis and remove it. Refer to Figure 4-43.

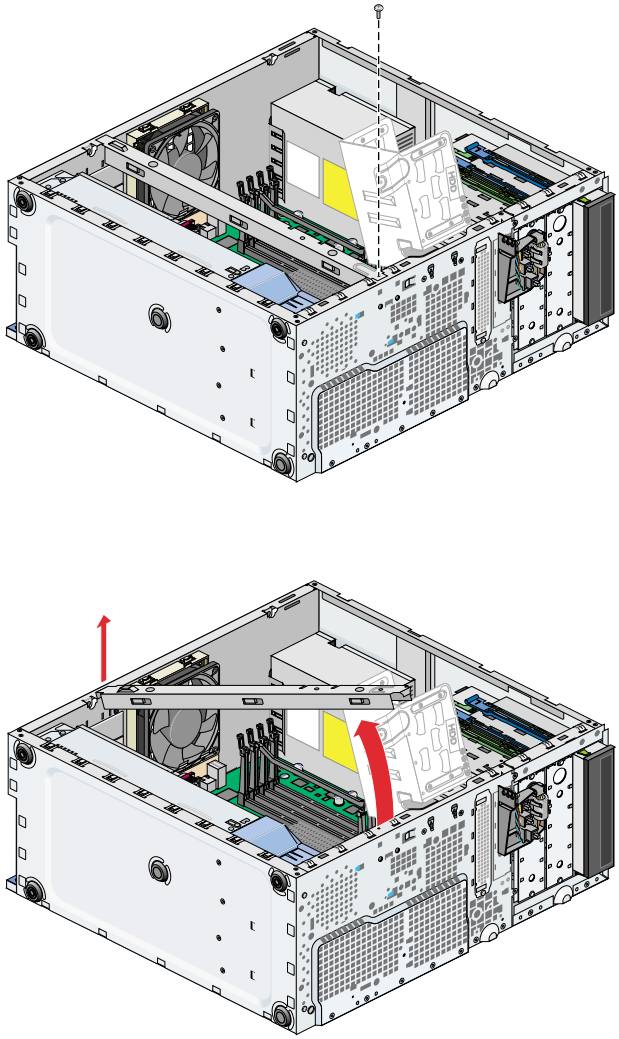

Figure 4-43 Removing the Chassis Stiffening Bar

5. If any full length PCI boards are installed in the system, you must remove them before you replace the PCI and graphics fan housing. For instructions on removing the full-length PCI boards, refer to “Installing or Removing a PCI Board” on page 77.
6. Disconnect the PCI and graphics fan wire harness from the motherboard. Refer to Figure 4-44.
7. Remove the three screws that secure the housing to the front of the enclosure. Then slide the housing toward the top of the enclosure until the retention clips are aligned with the holes in the enclosure. Refer to Figure 4-44.
8. Pull the housing toward the center of the chassis until all of the retention clips are clear of the enclosure. Then, lift the housing up and out of the enclosure.
9. Lower the replacement housing into the enclosure. Then, orient the housing so that the retention clips are aligned with the holes in the front of the enclosure.
10. Push the housing against the front of the enclosure to seat the retention clips.
11. Slide the housing toward the bottom of the enclosure until the screw holes in the housing align with those in the chassis.
12. Install the three screws that secure the housing to the enclosure.
13. Connect the PCI and graphics fan wire harness to the motherboard.
14. If you removed any full-length PCI cards to install the housing, install them now. Refer to “Installing or Removing a PCI Board” on page 77.
15. Install the chassis stiffening bar. Then, install the screw that secures it to the chassis.
16. Connect the SCSI and power cables to the rear of the drive(s) installed in the lower drive cage. Refer to Appendix C, “Internal Cabling Diagrams”.
17. Close the lower drive cage. Refer to Figure 4-35.
18. Install the bezel on the front of the workstation. Refer to “Replacing the Bezel Assembly” on page 104.
19. This completes the replacement of the PCI and graphics fan housing. To return the workstation to service, refer to “Returning the Workstation to Service” on page 55.

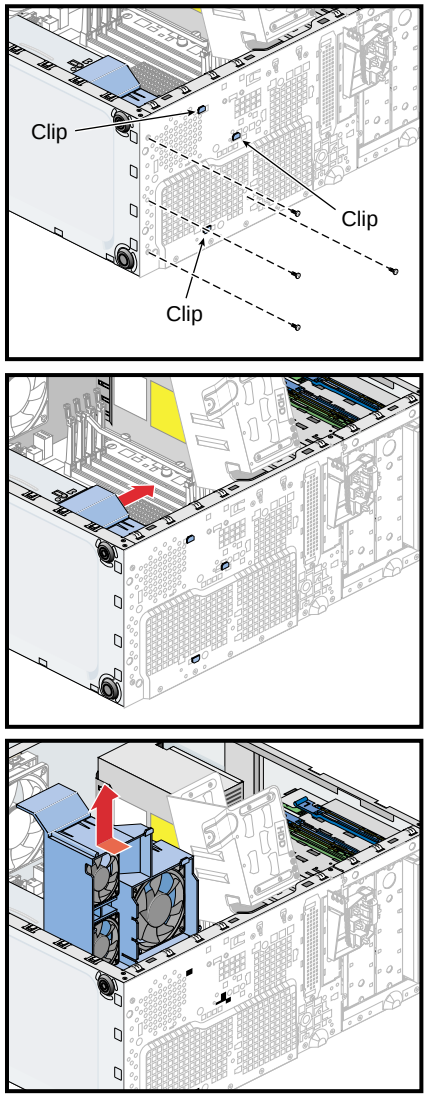

Figure 4-44 Removing the PCI and Graphics Fan Housing

Replacing Chassis Components

This section provides instructions for the following procedures:

- Replacing Chassis Feet
- Replacing the Bezel Assembly
- Replacing the Switch/LED Assembly

Replacing Chassis Feet

The four corner-mounted chassis feet on the Silicon Graphics Fuel visual workstation are self-adhesive rubber. To replace a foot, peel one off of the backing and press the adhesive side against the underside of the chassis in the desired location. Apply gentle pressure to the foot to ensure adhesion.

Replacing the Bezel Assembly

This section provides instructions for the following procedures:

- Removing the Bezel
- Installing the Bezel

Removing the Bezel

Follow these steps to remove the bezel:

1. Remove the side panel from the enclosure. Refer to "Preparing the Workstation for Service" on page 46.

   Note: If you are only replacing the bezel, you do not need to disconnect all of the cables from the rear of the chassis or lay the chassis down.

2. Gently pull out on the tabs that hold the left edge of the bezel to the side of the chassis. Then, swing the left edge of the bezel out and to the right, as if it were a door. Refer to Figure 4-45.

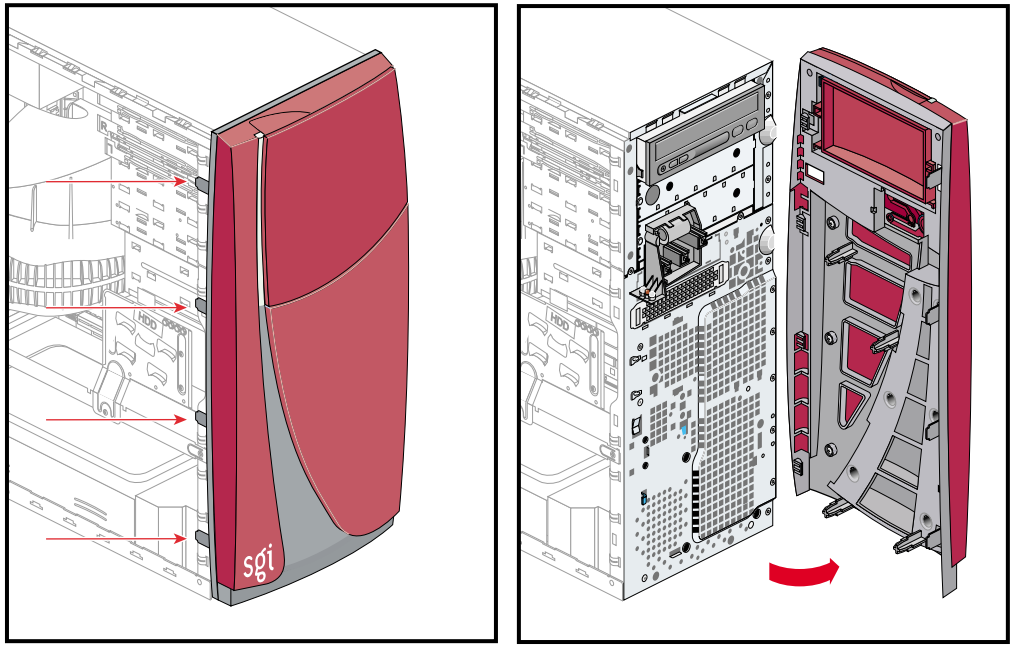

Figure 4-45 Removing the Bezel

3. Swing the bezel to the right until it is perpendicular to the front of the chassis. The right edge of the bezel will be freed from the chassis. Lift the bezel off the chassis.
4. Set the bezel in a secure location.

Installing the Bezel

Follow these steps to install the bezel:

1. Align the four tabs on the right side of the bezel with the four slots on the right side of the chassis. Refer to Figure 4-46.
2. Swing the left edge of the bezel toward the chassis until the tabs engage on the left side of the enclosure. Refer to Figure 4-46.

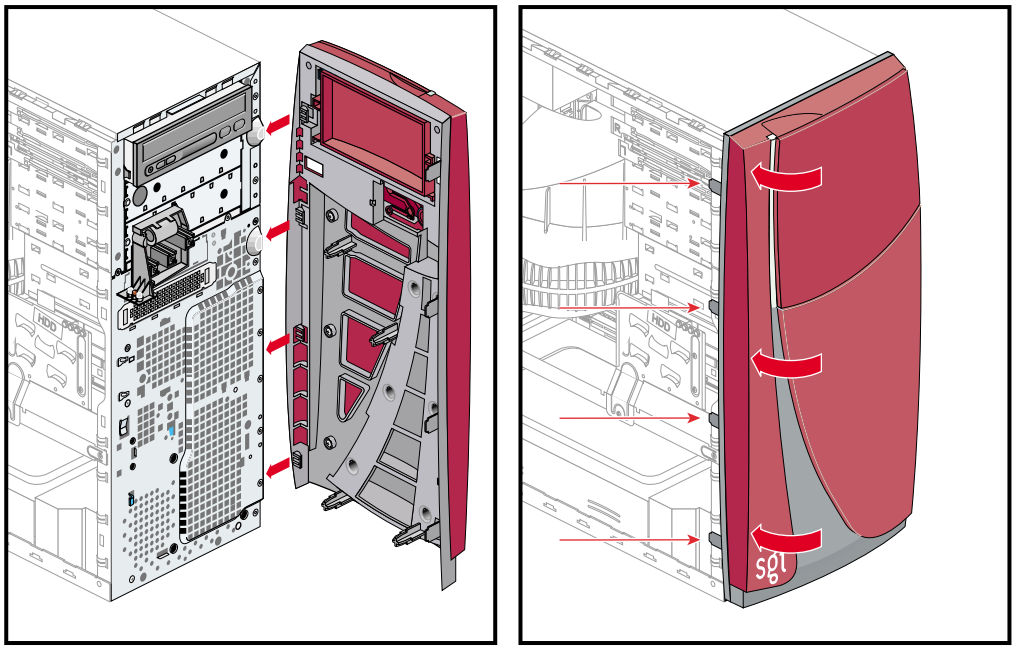

Figure 4-46 Install the Bezel

3. Ensure that the bezel is properly seated.
4. Install the side panel on the enclosure. Refer to “Returning the Workstation to Service” on page 55.

Replacing the Switch/LED Assembly

Follow these steps and refer Figure 4-47 to replace the switch/LED assembly:

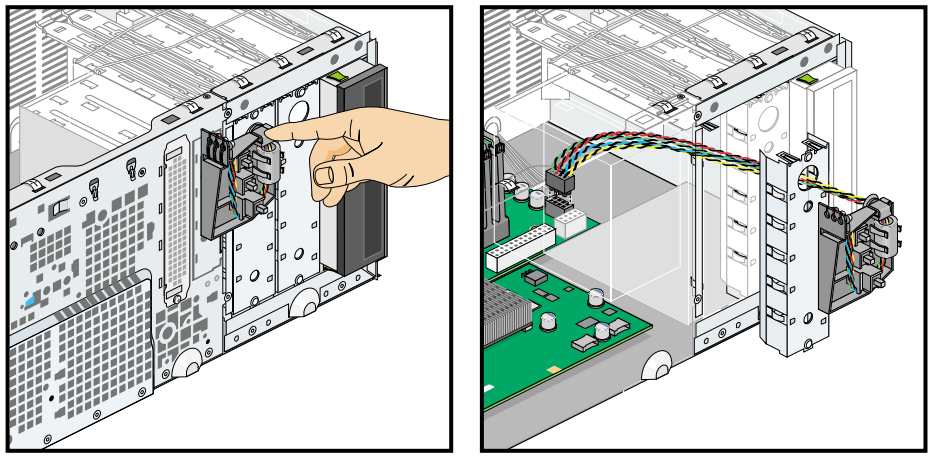

Figure 4-47 Replacing the Switch/LED Wire Harness Assembly

1. Remove the bezel from the front of the enclosure. Refer to “Replacing the Bezel Assembly” on page 104.
2. Disconnect the switch/LED wire harness assembly from the system board.
3. Grasp the switch/LED assembly with one hand. Then reach into the removable media drive bay from the side of the enclosure and push out on the metal EMI shield on which the switch/LED assembly is mounted. The EMI shield and switch/LED assembly will separate from the enclosure as one piece.
4. Press the round retention plug out of the hole in the EMI shield. Then swing the switch/LED assembly away from the EMI shield to free the two retention clips.
5. Pass the switch/LED assembly wire harness through the hole in the EMI shield.
6. Pass the new switch/LED assembly wire harness through the EMI shield from the front side.

Note: Do not scrape the insulation on the wire harness while passing it through the hole in the EMI shield.

---

7. Insert the two retention clips into their holes. Then rotate the switch/LED assembly toward the EMI shield and press the round retention plug in the hole in the EMI shield.
8. Install the EMI shield in the enclosure. Then connect the switch/LED assembly wire harness to the system board.
9. Install the bezel on the front of the enclosure. Refer to "Replacing the Bezel Assembly" on page 104.
10. This completes the replacement of the switch/LED assembly. To return the workstation to service, refer to "Returning the Workstation to Service" on page 55.

Troubleshooting and Diagnostics

If you are experiencing problems with your Silicon Graphics Fuel workstation, contact your service provider:

- If you are located in North America, contact the Technical Assistant Center at 1-800-800-4SGI. SGI personnel will guide you through the troubleshooting process.
- If you are located outside of North America, contact your local SGI subsidiary or authorized distributor.

This chapter includes the following sections:

- "Troubleshooting" on page 110
- "Diagnostics" on page 111

Troubleshooting

This section covers the following topics:

- Environmental Fault Monitoring
- LED Lightbar

Environmental Fault Monitoring

The workstation monitors its environment to ensure proper operation. It will automatically power off if any of the following faults are found:

- Any fan spins at less than 80% of nominal speed.
- Any temperature sensor registers 158 °F (70 °C) or above.
- Any voltage reaches +/- 20% of nominal.

If your workstation is powering off unexpectedly, check for these conditions.

LED Lightbar

The LED lightbar on the workstation bezel can provide important troubleshooting information. Table 5-1 shows a list of LED signals and what they mean.

Table 5-1 LED Lightbar Signals

LED Lightbar Signal	Explanation
Blinking white	Power button pressed (On or Off)
Solid white	Successful PROM boot/ OS running
Solid red	System board failure (failed to read prom at power on)
Blinking red	During boot sequence: memory error While OS is running: kernel panic
Blinking red and white	Graphics configuration error

Diagnostics

The Silicon Graphics Fuel visual workstation is equipped with diagnostics to test the system hardware and diagnose part failures. These diagnostics are grouped into three categories:

- **Power-on diagnostics (POD)**
  Power-on diagnostics are PROM-resident tests that run automatically when you power on the system. As the boot process discovers hardware components, it runs power-on diagnostics to verify that each component that is needed to boot the system is working correctly. Refer to "Power-on Diagnostics" on page 111 for more information about POD.
- **Offline diagnostics**
  Offline diagnostics use a standalone diagnostic environment to test the system hardware; the operating system cannot be running while you use offline diagnostics. Refer to "Offline Diagnostics" on page 112 for more information.
- **Online diagnostics**
  Online diagnostics are tests that verify system hardware while the operating system is running. To prevent data loss, you should use the online diagnostics only when the system is idle. Refer to "Online Diagnostics" on page 115 for more information.

Note: The diagnostics described in this document run only on Silicon Graphics Fuel visual workstations. They will not work on any other SGI systems.

Power-on Diagnostics

The power-on diagnostics run automatically when you power on or reset the system. As the boot process discovers hardware, it verifies that each component is functional enough to load the operating system.

The power-on diagnostics test the hardware in the following order:

- CPU
- Bedrock ASIC
- PROM
- Memory DIMMs

- Secondary cache
- Xbridge ASIC
- PCI slots
- Serial ports
- SCSI controller
- Keyboard and mouse
- VPro graphics
- Ethernet port

If the power-on diagnostics complete successfully, the **System Maintenance** menu appears or the system automatically boots, depending on how the system is configured.

If the power-on diagnostics detect errors, the diagnostics disable the failing hardware and continue testing. When testing completes, the system may or may not be able to boot, depending on the hardware that has been disabled. If the system does not boot, contact your service representative. For more information about product support, refer to "Product Support" on page xix.

Offline Diagnostics

Offline diagnostics run a sequence of tests on the system hardware under a standalone diagnostic environment; the operating system cannot be running while the offline diagnostics test the system

The offline diagnostics include a "launcher" that automatically runs a sequence of tests. In most cases, you should run the offline diagnostics automatically with the launcher. Use the following procedure to run launcher:

1. Power on the system.
2. Wait until the **System Maintenance** menu appears.

   Note: If the *Autoload* PROM variable is set to **`Yes`**, you must click on the **Stop for Maintenance** button to access the **System Maintenance** menu.

3. Select the **Run Diagnostics** option.

Note: You can also start the launcher by entering the following command at the command monitor (PROM) prompt (>>):

```
boot -f dksc (0,1,0) /stand/smdk/smdk --a
```

The launcher automatically runs the offline diagnostics on system components in the following order:

- CPU
- Secondary cache
- Memory DIMMs
- Motherboard (including the USB ports, serial ports, Ethernet port, parallel port, mouse port, keyboard port, Xbridge ASIC, and PCI slots)

Note: The offline diagnostics test the simpler components first and then proceed to the more complex components.

Table 5-2 shows the approximate time required (in minutes and seconds format) to automatically run the offline diagnostics on a workstation with a 500-MHz processor and 512 MB of memory. (Your testing time will vary, depending on your hardware configuration.)

Table 5-2 Time Required to Run Offline Diagnostics

Testing Progress	Total Elapsed Time
The launcher boot-up sequence starts	0:00
The launcher boot-up sequence completes	0:10
PIMM testing completes	0:40
Secondary cache testing completes	1:17
Memory DIMM testing completes	5:05
Motherboard testing completes	7:30

The offline diagnostics display test status information as they run. If the diagnostics complete testing without detecting errors, the output is similar to the following example:

```
SMDK SGI Version 6.93 TEST built 10:20:12 AM Sep 21, 2001
smdk loading io discovery code...
smdk loading launcher code...
smdk>term none
Setting up diagnostics.....
Starting diagnostics.....
Testing  PIMM........   PASSED
Testing  CACHE..............   PASSED
Testing
DIMM.....................................................................
.........................................................................
.........................................................................
.........................................................................
.............   PASSED
Testing  Mother Board...

FINISHED
All diagnostics passed.
resetting the system...
```

If the launcher detects an error, it displays a `FAILED` status message for the hardware it is testing and stops testing. If any of the components do not pass the offline diagnostics, contact your service representative.

Online Diagnostics

Caution: The `runalldiags` script should be run while the system is idle. If you run the online diagnostics while the system is in use, data may be lost.

Online diagnostics are tests that verify system hardware while the operating system is running. When you run the online diagnostics from the IRIX operating system prompt, each diagnostic runs a set of tests for a certain number of loops. The online diagnostics test the following areas of the system:

- CPU
- Memory
- I/O
- Graphics
- Storage devices
- Network devices

The online diagnostics also run a system stress test, which tests all areas of the system under heavy load.

The *Customer Diagnostics 1.0* CD, SGI part number 812-1122-001, includes the online diagnostics that are available for customer use. This CD ships with all Silicon Graphics Fuel visual workstations. You need to install files from the CD on a system before you can run the online diagnostics. The CD booklet includes installation procedures.

The `runalldiags` script automatically runs a sequence of online diagnostics. It runs in three modes:

- Basic mode verifies memory and performs 30 minutes of stress testing. (If you want to perform regularly scheduled testing, use basic mode.)
- Normal mode performs the same tests as basic mode and also performs I/O testing. (The I/O testing may disrupt the serial port and USB devices.)
- Extensive mode performs more disruptive I/O testing. (Ethernet is unavailable, and USB operations are disrupted.) It also performs more intensive CPU, memory, and stress testing. Use this mode only if you suspect there is a problem with the system.

Follow these steps to run the `runalldiags` script:

Note: You must have root level access to the system to run online diagnostics.

1. Enter the following command at the command prompt to change to the directory that contains the diagnostics:
   `cd /usr/diags/bin`
2. Enter the following command to start the script:
   `./runalldiags` [*options*]

Note: When you run `runalldiags` in `-normal` or `-extensive` modes, you should run it from the console. The Ethernet testing that `runalldiags` performs in `-normal` and `-extensive` modes disrupts any `telnet` sessions on the system.

Refer to Table 5-3 for descriptions of the command-line options.

Table 5-3 runalldiags Command-line Options

Option	Description
`-h | -help`	Displays help information
`-basic`	Runs the script in basic mode
`-normal`	Runs the script in normal mode (default)
`-extensive`	Runs the script in extensive mode
`-host <`*host*`>`	Specifies a system to target for network tests
`-d <`*directory*`>`	Specifies the directory that contains the online diagnostics

If a diagnostic fails, the script saves the output from the diagnostic in a file in the `/tmp` directory (for example, `/tmp/diagTestOutput.1.olenet`). Output from the script indicates the actual name of the file. When a diagnostic fails, the script continues to run the remaining diagnostics.

Note: If you have USB devices connected to your workstation, you must disconnect the USB cables from the rear of the enclosure after the online diagnostics have finished running. Then reconnect the cables to restore the USB devices.

Example Output

Online diagnostics display `PASS` [*testname*] when a test is passed, and `FAIL` [*testname*] when a test is failed.

The following example shows output from running `runalldiags` in basic mode with no errors:

```
shad# ./runalldiags -basic

Running online diagnostics at Basic level

Time: Mon Oct  1 10:55:53 CDT 2001
System Information: IRIX64 shad 6.5-wolfi-root-SN1O 6.5.10m 07171440
IP35
Plan on running: olmem pandora

olmem - Online Memory Diagnostic    (Check /var/adm/SYSLOG for error
message)
/usr/diags/bin/olmem
PASS(olmem)
pandora - System Stress Test
/usr/diags/bin/pandora -runtime 30
PASS(pandora)

Finished running at Mon Oct  1 11:35:38 CDT 2001
Ran: 2 Failed: 0
```

The following example shows output from running `runalldiags` in basic mode with one error:

```
shad# ./runalldiags -basic

Running online diagnostics at Basic level

Time: Mon Oct  1 10:55:53 CDT 2001
System Information: IRIX64 shad 6.5-wolfi-root-SN1O 6.5.10m 07171440
IP35
Plan on running: olmem pandora

olmem - Online Memory Diagnostic    (Check /var/adm/SYSLOG for error
message)
/usr/diags/bin/olmem
PASS(olmem)
pandora - System Stress Test
/usr/diags/bin/pandora -runtime 30
FAIL(pandora): see /tmp/diagFailure.0.pandora
Finished running at Mon Oct 1 11:35:38 CDT 2001
Ran: 1 Failed: 1
```

If any of the components do not pass the online diagnostics, contact your service representative.

Technical Specifications

This chapter contains technical information about the Silicon Graphics Fuel visual workstation. The following topics are covered:

- "Physical Environment Specifications" on page 120
- "Power Supply Specifications" on page 122
- "I/O Port Specifications" on page 123
- "Serial Cables and Adapter Specifications" on page 131
- "VPro Graphics Board I/O Port Specifications" on page 136

Physical Environment Specifications

Table A-1 shows the physical environment specifications for the Silicon Graphics Fuel visual workstation.

Table A-1 Physical Environment Specifications

Feature	Specification
Workstation dimensions	Height: 19.0 in. Width: 8.9 in. at the bezel 8.3 in. on the rest of the chassis Depth: 19.4 in. from front of bezel to rear of chassis
Workstation weight Base system	 42 lb. (19 kg)
Power requirements	Voltage and frequency: 100-240 VAC, 50-60 Hz, 7.0-3.0 A, 430 W
Voltage and frequency	50-60Hz and 100-120/200-240 VAC
Temperature Tolerance (operating)	+5 °C (13.6 °F) to +35 °C (95 °F) 5000 ft. ASL or less +5 °C (13.6 °F) to +30° C (81.6 °F) 5000 ft. ASL to 10,000 ft. ASL
Temperature tolerance (non-operating)	-40 C (-40 °F) to +60 °C (140° F)
Relative humidity	10% to 80% operating (no condensation) 10% to 95% non-operating (no condensation)
Heat dissipation	1075 Btu/hr
Maximum altitude	10,000 ft. (3,049 m) operating 40,000 ft. (12,195 m) non-operating
Vibration, sine sweep (operating)	0.01”, 5-19 Hz; 0.25 G, 19-500 Hz
Vibration, sine sweep (non-operating)	0.10”, 3-10 Hz; 0.5 G, 10-200 Hz
Vibration, random (operating)	0.10 Grms for 15 minutes

Table A-1 (continued) Physical Environment Specifications

Feature	Specification
Vibration, random (non- operating)	1.15 Grms for 15 minutes
Shock, half-sine wave (operating)	30 G, 3 msec (vertical); 15 G, 3 msec. (horizontal)
Shock, trapezoidal wave (non-operating)	30 G, 200 in./sec.
Sound power	4.29 bels
Sound pressure	38.8dBA at operator position per ISO 7779

Power Supply Specifications

Table A-2 shows the power supply specifications for the Silicon Graphics Fuel visual workstation.

Table A-2 Power Supply Specifications

Feature	Specification
AC line voltage rating	90-264 VAC RMS nominal, 47-63 Hz
Output ratings	45 amps @ 3.3 V 27 amps @ 5 V 16 amps @ +12 V 18 amps @ +12 V (digital) 0.6 amps @ -12 V 3 amps @ +5 stand by
Combined output Limit	Combined 3.3-V, 5-V, and 12-V output is limited to 300 watts. An additional 18 amps @ 12 V powers the onboard switching regulators.

I/O Port Specifications

This section contains specifications and port pinout information for the I/O ports of the Silicon Graphics Fuel visual workstation. The ports are discussed in the following sections:

- "Ethernet 10-Base-T/100-Base-T Port" on page 124
- "IEEE 1284-A Parallel Port" on page 125
- "Keyboard and Mouse Ports" on page 127
- "Serial Ports" on page 128
- "Serial Cables and Adapter Specifications" on page 131
- "USB Ports" on page 130

Ethernet 10-Base-T/100-Base-T Port

The workstation auto-selects the Ethernet port speed and type (duplex vs. half-duplex) when the workstation is booted, based on what it is connected to. Figure A-1 shows the Ethernet port.

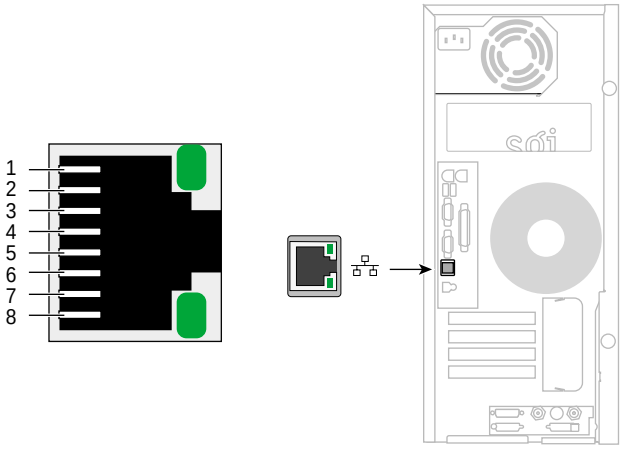

Figure A-1 Ethernet 10-Base-T/100-Base-T Port

Table A-3 shows the cable pinout assignments for the Ethernet port.

Table A-3 Ethernet 10-Base-T/100-Base-T Port Pinout

Pin	Assignment
1	Transmit+
2	Transmit–
3	Receive+
4	(Reserved)
5	(Reserved)
6	Receive–
7	(Reserved)
8	(Reserved)

IEEE 1284-A Parallel Port

The parallel port on the workstation is bi-directional and supports both EPP and ECP modes. Figure A-2 shows the IEEE 1284-A parallel port.

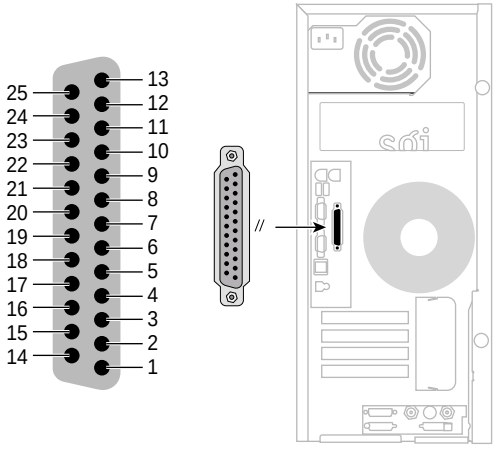

Figure A-2 IEEE 1284-A Parallel Port

Table A-4 shows the cable pinout assignments for the IEEE 1284-A parallel port.

Table A-4 IEEE 1284-A Parallel Port Pinout

Pin	Assignment	Pin	Assignment
1	Strobe	14	AutoFd
2	Data 1 (least significant bit)	15	Fault
3	Data 2	16	Init
4	Data 3	17	SelectIn
5	Data 4	18	Signal Ground
6	Data 5	19	Signal Ground
7	Data 6	20	Signal Ground
8	Data 7	21	Signal Ground
9	Data 8 (most significant bit)	22	Signal Ground
10	Ack	23	Signal Ground
11	Busy	24	Signal Ground
12	Error	25	Signal Ground
13	Select		

Keyboard and Mouse Ports

The workstation uses keyboards and mouse devices that are PS/2-compatible. The combined current draw of the keyboard and mouse is limited to 0.5 amps at +5V. Figure A-3 shows the keyboard and mouse ports.

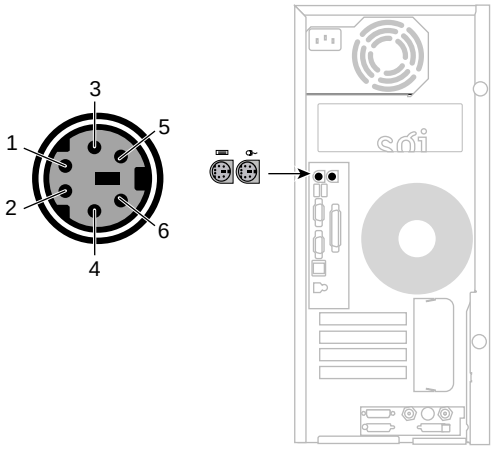

Figure A-3 Keyboard and Mouse Ports

Table A-5 shows the pinout assignments for the keyboard and mouse ports.

Table A-5 Keyboard and Mouse Port Pinout

Pin	Assignment
1	Keyboard/mouse data
2	(Reserved)
3	Ground
4	Keyboard/mouse power (+5V)
5	Keyboard/mouse clock
6	(Reserved)

Serial Ports

The workstation features two 9-pin serial ports. These ports are capable of transferring data at rates as high as 230 kbps. Other features of the ports include:

- Programmable data, parity, and stop bits
- Programmable baud rate and modem control

Figure A-4 shows a serial port.

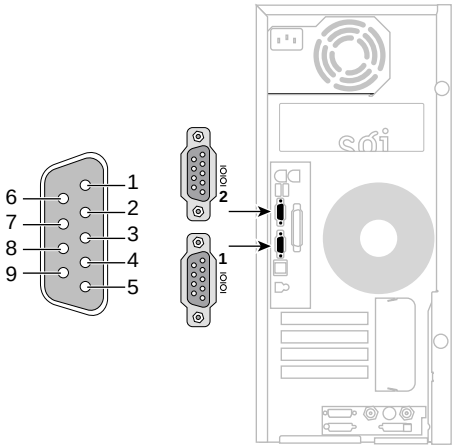

Figure A-4 Serial Port

Table A-6 shows pinout assignments for the 9-pin male DB-9 connector.

Table A-6 Serial Port Pinout

Pin	Assignment	Description
1	DCD	Data carrier detect
2	RXD	Receive data
3	TXD	Transmit data
4	DTR	Data terminal ready
5	GND	Signal ground
6	DSR	Data set ready
7	RTS	Request to send
8	CTS	Clear to send
9	RI	Ring indicator

USB Ports

The workstation is equipped with two USB-A ports. These ports support both low-speed (1.5 Mbps) and high-speed (12 Mbps) USB devices. They are connected to a USS-312 USB controller, which uses a 32-bit, 33-MHz PCI interface. Figure A-5 shows the USB-A ports.

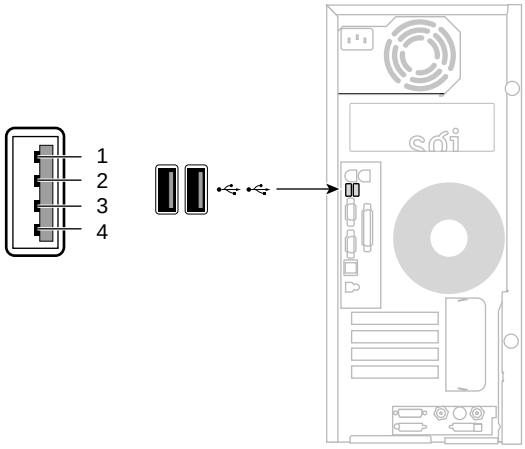

Figure A-5 USB-A Port

Table A-7 shows the pinout information for the USB-A ports.

Table A-7 USB-A Port Pinout

Pin	Assignment
1	+5 V
2	- DATA
3	+ DATA
4	GND

Note: The Silicon Graphics Fuel visual workstation also has a USB-B port, but this port is used only for system maintenance. Do not attempt to connect any devices to the USB-B port.

Serial Cables and Adapter Specifications

This section contains cable pinout information for serial cables that you can connect to your Silicon Graphics Fuel visual workstation. It also describes SGI serial port converters. The following topics are covered:

- "Printer/Dumb Terminal Serial Cable" on page 132
- "PC Modem Serial Cable" on page 133
- "Serial Port Adapter Cables" on page 134

Printer/Dumb Terminal Serial Cable

For serial printers and dumb terminals, use a 3-wire standard PC cable. Table A-8 shows the cable connector pinout assignments for this cable.

Note: For a 3-wire cable and no hardware flow control modem, you must use the **`/dev/ttyd`*** command devices in the configuration files. For more detailed information, see the **`serial`** man page. To access the man page, select **Help > InfoSearch > Man pages** from the Toolchest or place the cursor in the console window and type **`man serial.`**

Table A-8 Printer/Dumb Terminal Cable Pinout

Signal Description	Pin Number DB-9 Connector (Female)	Pin Number DB-25 Connector (Male)
	1	NOT CONNECTED
RXD	2	2
TXD	3	3
	4	NOT CONNECTED
GND	5	7
	6	NOT CONNECTED
	7	NOT CONNECTED
	8	NOT CONNECTED
	9	NOT CONNECTED

PC Modem Serial Cable

Use a full-handshake (includes RTS and CTS) PC modem serial cable for a modem with RTS/CTS flow control. Table A-9 shows the cable connector pin assignments for this cable.

You can use this cable for all serial devices except those that do not need RTS flow control. If you add a null modem adapter to one end of the cable, you can still use it with devices like serial printers and dumb terminals that do not need RTS flow control. You can purchase the full-handshake PC modem serial cable from SGI or your local service provider.

Note: If you are attaching a modem with modem signals and RTS/CTS flow control, you must use the **`/dev/ttyf*`** command devices in the configuration files. For more detailed information, see the **`serial`** man page. To access this man page, select **Help > InfoSearch > Man pages** from the Toolchest or place the cursor in the console window and type **`man serial.`**

Table A-9 PC Modem Cable Pinout

Signal Description	Pin Number DB-9 Connector (Female)	Pin Number DB-25 Connector (Male)
DCD	1	8
RXD	2	3
TXD	3	2
DTR	4	20
GND	5	7
DSR	6	6
RTS	7	4
CTS	8	5
RI	9	22

Serial Port Adapter Cables

The workstation's serial ports conform to the PC standard pinout for EIA standard RS-232 signals.

The purpose of the adapter cable is to allow the workstation to use standard PC serial devices. Table A-10 shows the adapter cable pinout for a standard PC or Macintosh serial port.

Table A-10 Female DB-9 to Female MiniDIN8 Adapter Cable Pinout

From: Female DB	To: MiniDIN8	PC Signal	Macintosh Signal
1	7	DCD	GPi
2	5	RD	RxD-
3	3	TD	TxD-
4	1	DTR	TxD+
5	4	SG	SG
6	8	DSR	RxD+
7	6	RTS	HSKo
8	2	CTS	HSKi
9	Unused	RI	Unused

The purpose of the following adapter cable is to support ANSI/SMPTE Standard 107M-1992.

Table A-11 shows the pinout for a female DB-9 to female DB-9 adapter cable.

Table A-11 Female DB-9 to Female DB-9 Adapter Cable Pinout

Female DB-9 Connected to Workstation	Female DB-9 Connected to Peripheral
1	Unused
2	To DB9 -2 (RxD-)
3	To DB9-8 (TxD-)
4	Unused
5	To DB9-6 and DB9-4 (GND)
6	To DB9-7 (RxD+)
7	To DB9-3 (TxD+)
8	Unused
9	Unused

Note: For more detailed information, see the **`serial`** man page. To access it, open an IRIX shell and enter **`man serial`**

You can also access man pages by selecting **`Help`** > **`InfoSearch`** and entering **`man serial.`**

VPro Graphics Board I/O Port Specifications

This section provides specifications for the following ports:

- "DVI-I Video Port" on page 136
- "Stereo View Port" on page 139
- "Genlock Port" on page 140
- "Swap Ready Port" on page 141

DVI-I Video Port

Figure A-6 shows the DVI-I video port.

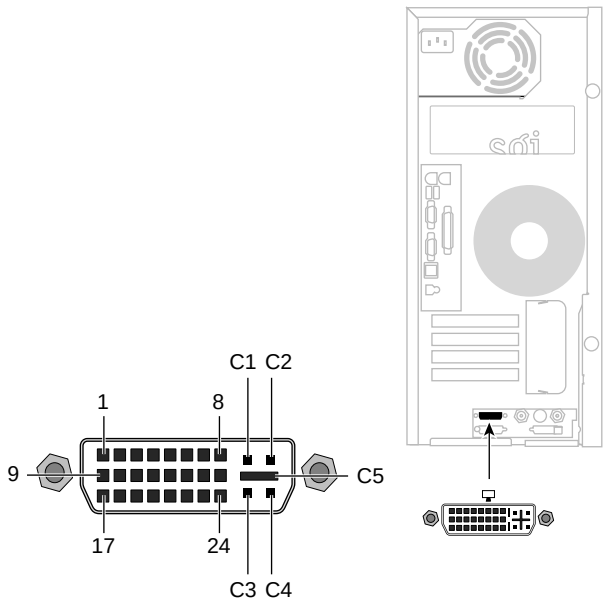

Figure A-6 DVI-I Port

Table A-12 shows the port pinout assignments for DVI-I port(s).

Table A-12 DVI-I Video Port Pinout

Pin	Assignment	Pin	Assignment
1	DATA 2-	16	HOT_POWER
2	DATA2+	17	DATA 0-
3	SHIELD 2/4	18	DATA 0+
4	DATA 4-	19	SHIELD 0/5
5	DATA 4+	20	DATA 5-
6	DDC_CLOCK	21	DATA 5+
7	DDC_DATA	22	SHIELD CLOCK
8	VSYNC	23	CLOCK -
9	DATA 1-	24	CLOCK +
10	DATA1+	C1	A_RED
11	SHIELD 1/3	C2	A_GREEN
12	DATA 3-	C3	A_BLUE
13	DATA 3+	C4	HYNSC
14	DDC_POWER	C5	A_GROUND2
15	A_GROUND1	C6	A_GROUND3

Table A-13 lists the scan rates supported by the VPro graphics board.

Table A-13 Supported VPro Graphics Board Scan Rates

Format	Supported by V10 8bpp	Supported by V10 16bpp	Supported by V12
1024x768 at 60Hz,75Hz, and 96Hz-Stereo	yes	yes	yes
1280x1024 at 59, 60, 72, 75, 85Hz, and 96Hz-Stereo	yes	yes	yes
1280x1024 at 100Hz Stereo (also through DCD2 on V12)	yes		yes
1280x720 at 60 and 72 Hz	yes	yes	yes
1280x1024 at 30 Hz interlaced	yes		yes
1280x960 at 30 Hz interlaced	yes		yes
1600x1024 at 83 Hz	yes		yes
1600x1200 at 60, 72, and 75 Hz	yes	no	yes
1920x1035 at 30 Hz interlaced	yes		yes
1920x1080 at 30 Hz interlaced	yes		yes
1920x1200 at 60 Hz	yes		yes
1920x1200 at 25 and 30 Hz	yes		yes

Stereo View Port

The following diagram shows the Stereo View port.

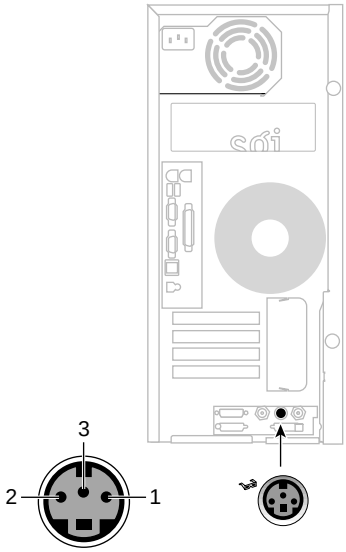

Figure A-7 StereoView Port

Table A-14 shows the cable pinout assignments for the Stereo View port on the VPro graphics board.

Table A-14 Stereo View Pinout Assignments

Pin	Assignment
1	+12 V DC output to Stereo View device
2	Ground
3	Stereo left/right Eye signal (1=left, 0=right) (STEREO_LEFT)

Genlock Port

The following diagram shows the Genlock port.

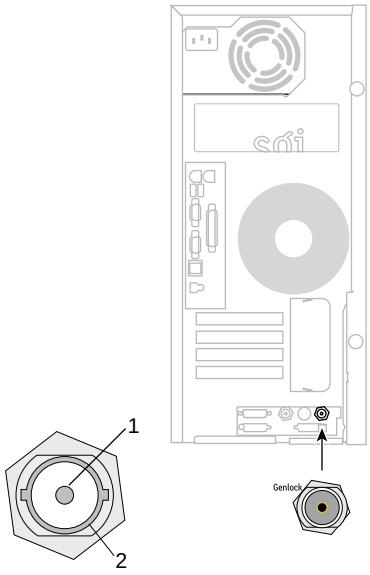

Figure A-8 Genlock Port

Table A-15 shows the cable pinout assignments for the Genlock port on the VPro graphics board.

Table A-15 Genlock Pinout Assignments

Pin	Assignment
1	Genlock Input/output video or 3.3V TTL signal levels
2	Sigma - return ground

Swap Ready Port

The following diagram shows the Swap Ready port.

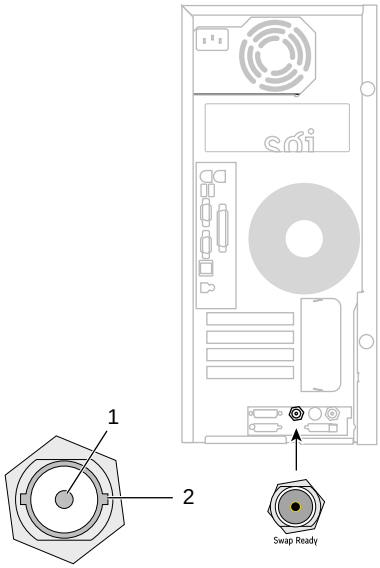

Figure A-9 Swap Ready Port

Note: The swap ready port is not functional with this release, but may be at a future date.

Table A-16 shows the cable pinout assignments for the Swap Ready port on the VPro graphics board.

Table A-16 Swap Ready Pinout Assignments

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

Safety and Regulatory Information

This appendix provides regulatory statements, safety instructions, and guidelines for adjusting your work surface to increase your comfort and safety, as follows:

- "Regulatory Declarations" on page 143
- "Safety Instructions" on page 147
- "Human Factors Guidelines for Setting Up Your Workstation" on page 149

Regulatory Declarations

The following topics are covered in this section:

- "CMN Number" on page 144
- "CE Notice and Manufacturer's Declaration of Conformity" on page 144
- "Electromagnetic Emissions" on page 144
- "Shielded Cables" on page 146
- "Electrostatic Discharge" on page 147
- "Laser Compliance Statements" on page 147
- "Lithium Battery Statement" on page 147

The Silicon Graphics Fuel visual workstation conforms to several national and international specifications and European Directives listed on the "Manufacturer's Declaration of Conformity." The CE mark insignia displayed on each device is an indication of conformity to the European requirements.

Caution: This product 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.

CMN Number

The model number, or CMN number, for the Silicon Graphics Fuel visual workstation is on the system label, which is mounted on the rear panel of the system enclosure.

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 from 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。

Figure B-1 VCCI Notice (Japan Only)

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．

Figure B-2 Chinese Class A Regulatory Notice

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.

Figure B-3 Korean Class A Regulatory Notice

Shielded Cables

The Silicon Graphics Fuel visual workstation is FCC-compliant under test conditions that include the use of shielded cables between the workstation and its peripherals. Your workstation and any peripherals you purchase from SGI have shielded cables. Shielded cables reduce the possibility of interference with radio, television, and other devices. If you use any cables that are not from SGI, ensure that they are shielded. Telephone cables do not need to be shielded.

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

Electrostatic Discharge

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

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

An ESD wrist strap may be included with some products, such as memory or PCI upgrades. The wrist strap is used during the installation of these upgrades to prevent the flow of static electricity, and it should protect your system from ESD damage.

Laser Compliance Statements

The CD-ROM drive in this computer is a Class 1 laser product. The CD-ROM drive's classification label is located on the drive.

Lithium Battery Statement

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

Safety Instructions

Read these instructions carefully.

1. Follow all warnings and instructions marked on the product and noted in this and other documentation included with this product.
2. Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
3. Do not use this product near water.
4. Do not place this product or components of this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.

5. Slots and openings of the workstation are provided for ventilation. To ensure reliable operation of the product and to protect it from overheating, these openings must not be blocked or covered. This product should never be placed near or over a radiator or heat register, or in a built-in installation, unless proper ventilation is provided.
6. This product should be operated from the type of power indicated on the marking label. If you are not sure of the type of power available, consult your dealer or local power company.
7. Do not allow anything to rest on the power cord. Do not locate this product where persons will walk on the cord.
8. Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a fire or electric shock. Never spill liquid of any kind on the product.
9. Do not attempt to service this product yourself except as noted in this guide. Opening or removing covers of node and switch internal components may expose you to dangerous voltage points or other risks. Refer all servicing to qualified service personnel.
10. Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
    1. When the power cord or plug is damaged or frayed.
    2. If liquid has been spilled into the product.
    3. If the product has been exposed to rain or water.
    4. If the product does not operate normally when the operating instructions are followed. Adjust only those controls that are covered by the operating instructions since 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.
    5. If the product has been dropped or the cabinet has been damaged.
    6. If the product exhibits a distinct change in performance, indicating a need for service.
11. Replace the lithium battery on the motherboard only with the same type or an equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions. There is a danger of explosion if the battery is incorrectly replaced.

12. Use only the proper type of power supply cord set (provided with the system) for this unit.

Human Factors Guidelines for Setting Up Your Workstation

You can increase the comfort and safety of your work environment and decrease your chances of repetitive strain injuries by following the guidelines in these sections:

- "ANSI Standard for VDT Workstations" on page 149
- "CAD Operator Preferences" on page 151

ANSI Standard for VDT Workstations

Table B-1 shows recommended guidelines for furniture and system adjustment, as developed by the American National Standards Institute (ANSI).[1]

Local Visual Display Terminal (VDT) guidelines issued by country, state, or municipality may apply and supersede the guidelines in Table B-1.

Table B-1 ANSI/HFS 100-1988 Guidelines for VDT Workplace Adjustment

Adjustment	Small Female	Midpoint	Large Male
Seat pan height	40.6 cm (16.0 in.)	46.3 cm (18.2 in.)	52.0 cm (20.5 in.)
Work surface height (keyboard and mouse)	58.5 cm (23.0 in.)	64.75 cm (25.5 in.)	71.0 cm (28.0 in.)
Screen viewing height	103.1 cm (40.6 in.)	118.1 (46.5 in.	133.1 cm (52.4 in.)
Screen viewing distance	>30.5 cm (>12 in.)	>30.5 cm (>12 in.)	>30.5 cm (>12 in.)
Screen viewing angle	0-60 degrees	0-60 degrees	0-60 degrees

[1] *American National Standard for Human Factors Engineering of Visual Display Terminal Workstations.* ANSI/HFS 100-1988. Available from the Human Factors Society, Inc., P.O. Box 1369, Santa Monica, CA, 90406, USA.

Adjustment parameters are defined in Figure B-4. Guidelines are shown for small females (standing height of 150 cm, or 59 in) and large males (standing height of 185 cm, or 73 in.). Midpoints are also interpolated for persons of more average height.

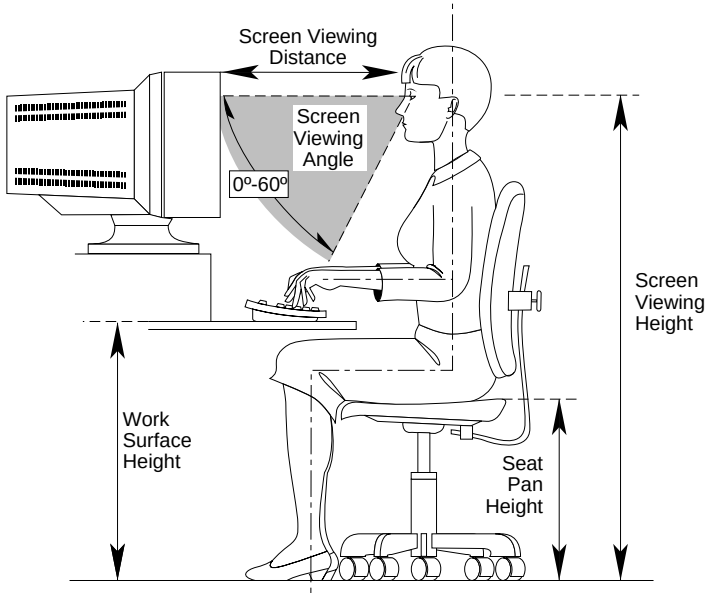

Figure B-4 Basic Parameters of Visual Display Terminal Workstation Adjustment (Adapted From ANSI/HFS 100-1988)

CAD Operator Preferences

If you work on a CAD system, you may feel more comfortable using the ranges of adjustment shown in Table B-2.

Table B-2 Workstation Adjustments Preferred by CAD Users[a]

Adjustment	Mean cm (in)	Range cm (in)
Seat pan height	54 cm (21.3 in.)	50-57 cm (19.7-22.4 in.)
Work surface height	73 cm (28.7 in.)	70-80 cm (27.6 -31.5 in.)
Monitor center above floor	113 cm (44.5 in.)	107-115 cm (42.1-45.3 in.)
Screen viewing distance	70 cm (27.6 in.)	59-78 cm (23.2-30.7 in.)
Work surface tilt	8.6 degrees	2-13 degrees
Monitor tilt[b]	-7.7 degrees	-15 to +1 degrees

a. Derived from Grandjean, Etienne. *Ergonomics in Computerized Office*s. London: Taylor & Francis Ltd., 1987, p. 148.

b. In Table B-2, a negative monitor tilt indicates that the top of the monitor is tilted toward the user.

Internal Cabling Diagrams

This appendix contains diagrams of the internal cabling in the workstation. The following topics are covered:

- "Internal Power Cabling" on page 154
- "Internal SCSI Cabling" on page 155

Internal Power Cabling

The internal power cables in the workstation are connected as shown in Figure C-1.

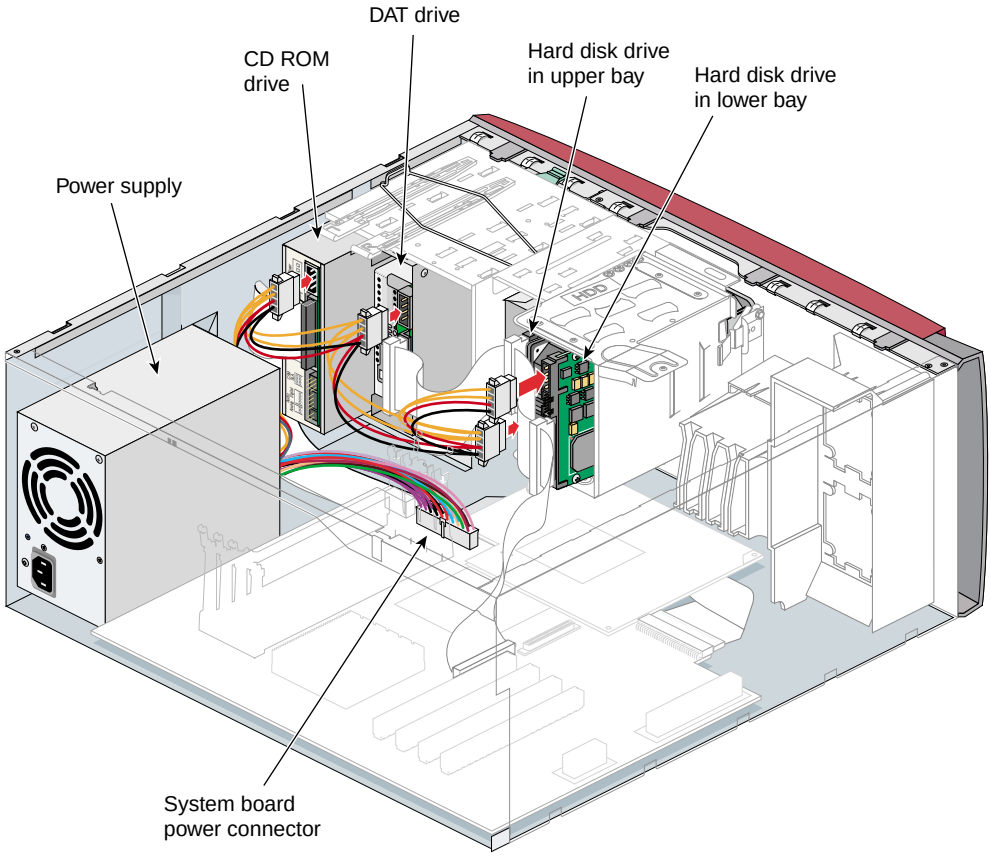

Figure C-1 Internal Power Cabling

Internal SCSI Cabling

The internal SCSI cables in the workstation are connected as shown in Figure C-2.

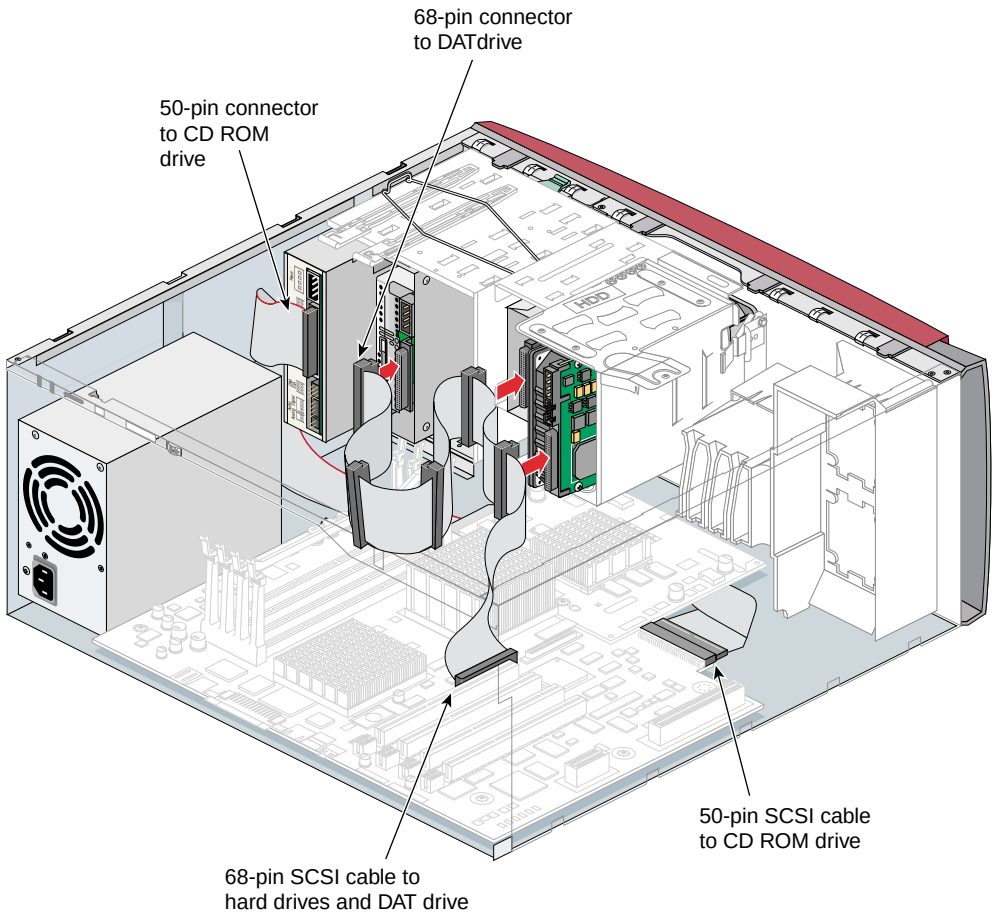

Figure C-2 Internal SCSI Cabling

The pinouts for the internal SCSI cables are shown in Figure C-3.

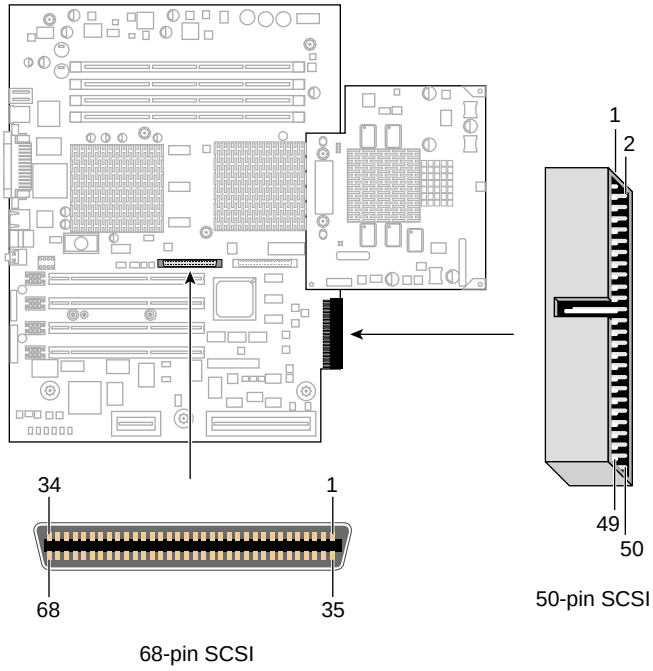

Figure C-3 Internal SCSI Cable Pinouts

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