SGI® Altix® UV 100 System User's Guide

Record of Revision

Version	Description
001	June, 2010
	First release
002	October, 2010
	Add information on drive installation/replacement in the IRU. Include information on PCIe board remove/replace procedures in blade riser.

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About This Guide

This guide provides an overview of the architecture, general operation and descriptions of the major components that compose the SGI® Altix® UV 100 family of servers. It also provides the standard procedures for powering on and powering off the system, basic troubleshooting, disk and PCIe card installation information, and important safety and regulatory specifications.

Audience

This guide may be helpful to operators, system administrators, and users of SGI Altix UV 100 computer systems. It is written with the assumption that the reader has a good working knowledge of computers and computer systems.

Important Information

Warning: **To avoid problems that could void your warranty, your SGI or other approved system support engineer (SSE) should perform all the set up, addition, or replacement of parts, cabling, and service of your SGI Altix UV 100 system, with the exception of the following items that you can perform yourself:**

- Adding and replacing PCIe cards, as described in this guide.

- Using the On/Off commands (also the reset and non-maskable interrupt [NMI] commands) on the system IRUs.

- Using the ESI/ops panel (operating panel) on optional mass storage bricks.

Chapter Descriptions

The following topics are covered in this guide:

- Chapter 1, "Operation Procedures," provides instructions for powering on and powering off your system.

- Chapter 2, "System Control," describes the function of the system controllers and provides instructions for operating the controllers.

- Chapter 3, "System Overview," provides environmental and technical information needed to properly set up and configure SGI Altix UV 100 systems.

- Chapter 4, "Rack Information," describes the rack sizes and features.

- Chapter 5, "PCIe and Disk Add or Replace Procedures," provides instructions for installing or removing the customer-replaceable components of your system.

- Chapter 6, "Troubleshooting and Diagnostics," provides recommended actions if problems occur on your system.

- Appendix A, "Technical Specifications and Pinouts," provides physical, environmental, and power specifications for your system. Also included are the pinouts for the non-proprietary connectors.

- Appendix B, "Safety Information and Regulatory Specifications," lists regulatory information related to use of the Altix UV 100 system in the United States and other countries. It also provides a list of safety instructions to follow when installing, operating, or servicing the product.

Related Publications

The following SGI documents are relevant to the Altix UV 100 series system:

- *SGI UV CMC Controller Software User's Guide*
  (P/N 007-5636-00*x*)

  This guide describes how to use the system console controller line commands to monitor and manage your SGI Altix UV 100 system. Coverage of control includes descriptions of the interface and usage of the commands. Note that it does not cover controller command information for the SGI Altix UV 10.

- *SGI Altix UV System Management Node Administrator's Guide*
  (P/N 007-5694-00*x*)

  This guide covers the system management node (SMN) for SGI Altix UV 1000 and SGI Altix UV 100 series systems. It describes the software and hardware components used with the SMN as well as providing an overview of the UV system control network. System network addressing is covered and a chapter on how to use KVM to enable remote console access from the system management node is included.

- *SGI Management Center Quick Start Guide*
  (P/N 007-5672-00*x*)

  This document may be helpful to users or administrators of SGI Altix UV systems using the SGI Management Center interface. The guide provides introductory information on configuration, operation and monitoring of your Altix UV system using the management center software.

- *SGI Management Center System Administrator's Guide*
  (P/N 007-5642-00*x*)

  This guide is intended for system administrators who work with the optional SGI Management Center software to manage and control Altix UV 100 systems. Depending on your system configuration and implementation, this guide may be optional. The manual is written with the assumption the user has a good working knowledge of Linux.

- *SGI UV Systems Linux Configuration and Operations Guide*
  (P/N 007-5629-00*x*)

  This guide discusses the operational management of SGI ProPack for Linux when used on the SGI Altix UV 100 or UV 1000 family of servers and superclusters. It explains how to perform general system configuration and operation under Linux.

- *SGI UV Systems Software Install Guide*
  (P/N 007-5675-00*x*)

This guide covers software installation on UV 100 or UV 1000 systems and their SMNs.

- *Linux Application Tuning Guide for SGI X86-64 Based Systems*
  (P/N 007-5646-00*x*)

  This guide includes a chapter that covers advanced tuning strategies for applications running on Altix UV 100 or UV 1000 systems as well as other SGI X86 based systems.

- Man pages (online)

  Man pages locate and print the titled entries from the online reference manuals.

You can obtain SGI documentation, release notes, or man pages in the following ways:

- See the SGI Technical Publications Library at http://docs.sgi.com

  Various formats are available. This library contains the most recent and most comprehensive set of online books, release notes, man pages, and other information.

- The release notes, which contain the latest information about software and documentation in this release, are in a file named README.SGI in the root directory of the SGI ProPack for Linux Documentation CD.

- You can also view man pages by typing **man** *<title>* on a command line.

SGI systems shipped with Linux include a set of Linux man pages, formatted in the standard UNIX "man page" style. Important system configuration files and commands are documented on man pages. These are found online on the internal system disk (or DVD) and are displayed using the man command.

References in the documentation to these pages include the name of the command and the section number in which the command is found. For example, to display a man page, type the request on a command line:

```
man commandx
```

For additional information about displaying man pages using the man command, see man(1). In addition, the apropos command locates man pages based on keywords. For example, to display a list of man pages that describe disks, type the following on a command line:

```
apropos disk
```

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

Conventions

The following conventions are used throughout this document:

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

Product Support

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- If you are in North America, contact the Technical Assistance Center at +1 800 800 4SGI or contact your authorized service provider.

- If you are outside North America, contact the SGI subsidiary or authorized distributor in your country. International customers can visit http://www.sgi.com/support/ Click on the "Support Centers" link under the "Online Support" heading for information on how to contact your nearest SGI customer support center.

Reader Comments

If you have comments about the technical accuracy, content, or organization of this document, contact SGI. Be sure to include the title and document number of the manual with your comments. (Online, the document number is located in the front matter of the manual. In printed manuals, the document number is located at the bottom of each page.)

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

- Send mail to the following address:

Technical Publications
SGI
46600 Landing Parkway
Fremont, California 94538

SGI values your comments and will respond to them promptly.

Operation Procedures

This chapter explains how to operate your new system in the following sections:

Precautions

Before operating your system, familiarize yourself with the safety information in the following sections:

ESD Precaution

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

Wear an SGI-approved wrist strap when you handle an ESD-sensitive device to eliminate possible ESD damage to equipment. Connect the wrist strap cord directly to earth ground.

Safety Precautions

Warning: **Before operating or servicing any part of this product, read the "Safety Information" on page 93.**

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

Caution: Power off the system only after the system software has been shut down in an orderly manner. If you power off the system before you halt the operating system, data may be corrupted.

Warning: **If a lithium battery is installed in your system as a soldered part, only qualified SGI service personnel should replace this lithium battery. For a battery of another type, replace it only with the same type or an equivalent type recommended by the battery manufacturer, or an explosion could occur. Discard used batteries according to the manufacturer's instructions.**

System Controller Network

All Altix UV 100 enclosures - known as individual rack units (IRUs) use an embedded chassis management controller (CMC) board which communicates with the blade level BMCs and other CMCs in other IRUs within the software system image (SSI). The system can also use an optional system management node (SMN) which runs top-level SGI Management Center software that can administer the entire system. In concert with the SGI management center software, they are generically known as the system control network.

The *SGI Management Center System Administrator's Guide* (P/N 007-5642-00*x*) provides information on using the optional GUI to administer your Altix UV 100 system.

The Altix UV 100 system control network provides control and monitoring functionality for each compute blade, power supply, and fan assembly in each IRU enclosure in the system.

The CMC network provides the following functionality:

- Powering the entire system on and off.

- Powering individual IRUs on and off.

- Power on/off individual blades in an IRU.

- Monitoring the environmental state of the system, including voltage levels.

- Monitors and controls status LEDs on the enclosure.

- Partitioning the system.

- Enter controller commands to monitor or change particular system functions within a particular IRU. See the *SGI UV CMC Controller Software User's Guide* (P/N 007-5636-00*x*) for a complete list of command line interface (CLI) commands.

- Provides access to the system OS console allowing you to run diagnostics and boot the system.

- Provides the ability to flash system BIOS.

System Controller Access

Access to the UV system controller network is accomplished by the following methods:

- A LAN connection to the optional system management node (running the SGI Management Center software application). This can also be done using an optional VGA-connected console, see Figure 1-1.

- A direct ethernet connection to a CMC, see Figure 1-2 (you must connect to ACC).

- A serial connection to the "Console" port (see Figure 1-2) on the CMC.
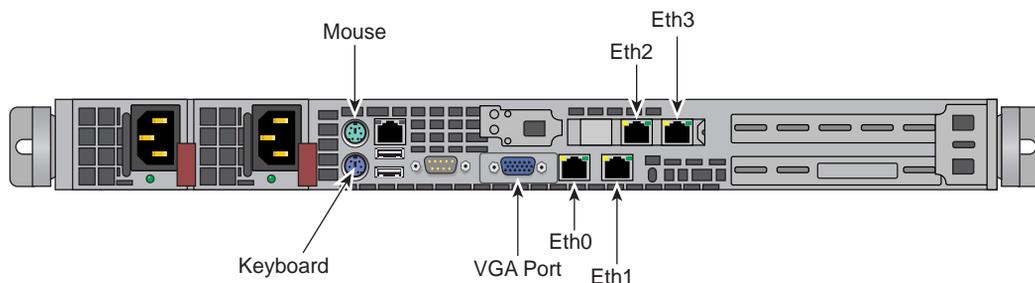
Figure 1-1   Optional System Management Node VGA Connection Points
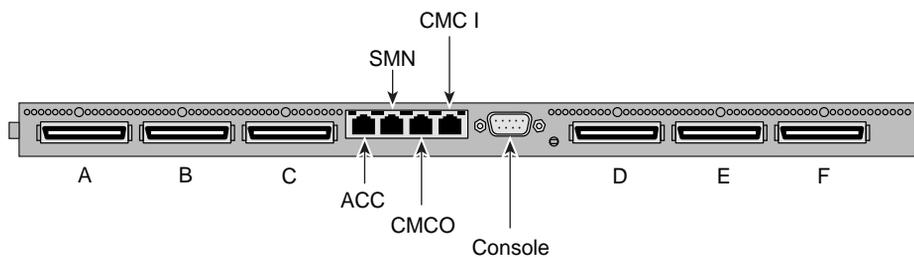
Figure 1-2   UV 100 CMC Connections

Connecting to the UV System Control Network

The ethernet connection is the preferred method of accessing the system console.

Administrators can perform one of the following options for connectivity:

- If an optional SMN is plugged into the customer LAN, connect to the SMN (SSH w/ X11 Forwarding) and start the SGI Management Center remotely.

- An in-rack system console can be directly connected to the optional system management node via VGA and PS2.You can then log into the SMN and perform system administration either through CLI commands or via the SGI Management Center interface. Note that the CMC erthernet connect port, (labeled **ACC** - see Figure 1-2 on page 4) requires connecting to a network with a DHCP server if the SMN node is not used. The CMC is factory set to DHCP mode and thus has no fixed IP address and cannot be accessed until an IP address is established. If unknown, the IP address must be generated by accessing the CMC directly using a serial connection.

- When no optional SMN is available, a serial connection is used to communicate directly with the CMC. This connection is typically used with small systems, or for set-up or service purposes, or for system controller and system console access where an ethernet connection or in-rack system console is not used or available.

Communicating with the System

The two primary ways to communicate with and administer the UV 100 system are through the optional SGI Management Center interface or the UV command line interface (CLI).

The Command Line Interface

The UV command line interface is accessible by logging into either the optional SMN or directly into a chassis management controller (CMC).

Log in as `root`, (default password **root**) when logging into the CMC.

Login as `sysco`, when logging into the SMN.

Once a connection to the SMN or CMC is established, system control commands can be entered.

See "Powering On and Off from the Command Line Interface" on page 13 for specific examples of using the CLI commands.

SMN Specific CLI Commands

The following CLI command options are available specifically for the SMN:

-h|--help   This help message.

hh|--help   This help message + CLI help message.

-q|--quiet   No disgnostic message.

-s|--system Select UV system. If only one system is present, this one is selected. Otherwise, this option is mandatory.

-S|--show depth Show nodes at depth >= 1 using optional supplied pattern. Default pattern=*

-t|--target One target in one of the two following formats:

a. rack[/slot[/blade]]

b. r{1..}[{s|i}{1..2}[{b|n}{0..15}]]

Note: This format is NOT for uvcli only.

Examples: r1i02 = rack 1, slot 2

r2i1b4 = rack 2, slot 1, blade 4

Select the target from the CLI command itself or, if not available, using the -t option.

Example SMN uvcli Commands

The following are examples of uvcli commands:

uvcli --help   This help.

```
uvcli -- leds --help    Help on leds command.

uvcli    leds r1i1b4    Show leds on BMC located at rack 1, slot1, blade 4.

uvcli -t 1/1  leds      Show leds on all BMC in rack 1, slot 1.

uvcli -- leds -v r1i1   Same as previous command but more verbose.

uvcli -S 1              Show all system serial numbers.

uvcli -S 1 '*/part*'    Show all system partitions.
```

Additional CLI Commands Used With the SMN

The following list of available CLI commands are specifically for the SMN:

`auth`   authenticate SSN/APPWT change

`bios`   perform bios actions

`bmc`   access BMC shell

`cmc`   access CMC shell

`config`   show system configuration

`console` access system consoles

`help`   list available commands

`hel`   access hardware error logs

`hwcfg`   access hardware configuration variable

`leds`   display system LED values

`log`   display system controller logs

`power`   access power control/status

Type '`<cmd>` --help' for help on individual commands.

Optional SGI Management Center Interface

The SGI Management Center interface is a server monitoring and management system. The SGI Management Center provides status metrics on operational aspects for each node in a system. The interface can also be customized to meet the specific needs of individual systems.

The *SGI Management Center System Administrator's Guide* (P/N 007-5642-00*x*) provides information on using the interface to monitor and maintain your Altix UV 100 system. Also, see Chapter 2 in this guide for additional reference information on the SGI Management Center interface.

Powering the System On and Off

This section explains how to power on and power off individual rack units, or your entire Altix UV 100 system, as follows:

- "Preparing to Power On" on page 9
- "Powering On and Off from the Command Line Interface" on page 13
- "Booting Directly From a CMC" on page 13

Using a system controller connection, you can power on and power off individual blades, IRUs or the entire system.

If you are using an SGI Management Center interface, you can monitor and manage your server from a remote location or local terminal. For details, see the documentation for the power management tool you are using in concert with the SGI Management Center.

The Embedded Support Partner (ESP) program enables you and your SGI system support engineer (SSE) to monitor your server remotely and resolve issues before they become problems. For details on this program, see "Using Embedded Support Partner (ESP)" on page 20.

Preparing to Power On

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

1. Check to ensure that the power connector on the cable between the rack's power distribution units (PDUs) and the wall power-plug receptacles are securely plugged in.

2. For each individual IRU that you want to power on, make sure that the power cables are plugged into both the IRU power supplies correctly, see the example in Figure 1-3. Setting the circuit breakers on the PDUs to the "On" position will apply power to the IRUs and will start the CMCs in the IRUs. Note that the CMC in each IRU stays powered on as long as there is power coming into the unit. Turn off the PDU breaker switch on the PDU(s) that supply voltage to the IRU's power supplies if you want to remove all power from the unit.
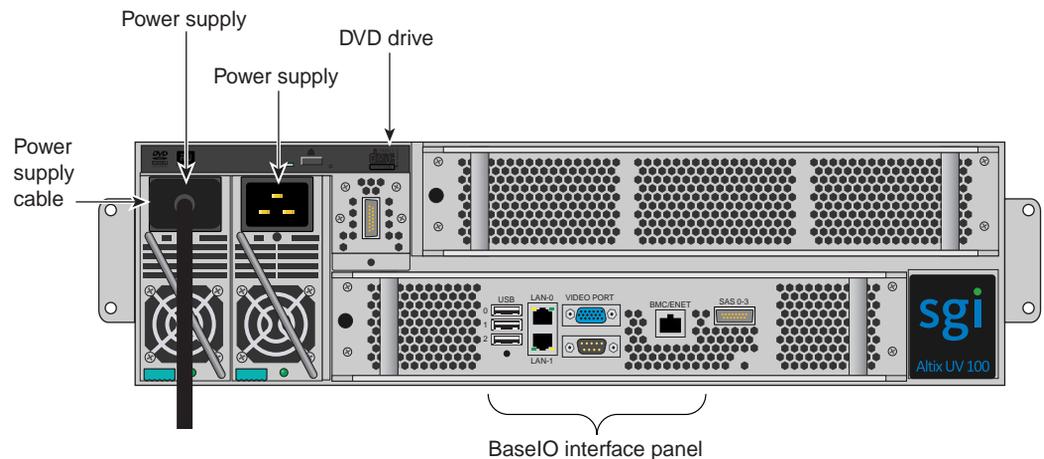
Figure 1-3   IRU Power Supply Cable Location Example

3. If you plan to power on a server that includes optional mass storage enclosures, make sure that the power switch on the rear of each PSU/cooling module (one or two per enclosure) is in the **1** (on) position.

4. Make sure that all PDU circuit breaker switches (see the examples in the following three figures) are turned on to provide power to the server when the system is powered on.

Figure 1-4 shows an example of a single-phase 2-plug PDU that can be used with the Altix UV 100 system. This is the PDU that is used to distribute power to the IRUs when the system is configured with single-phase power.
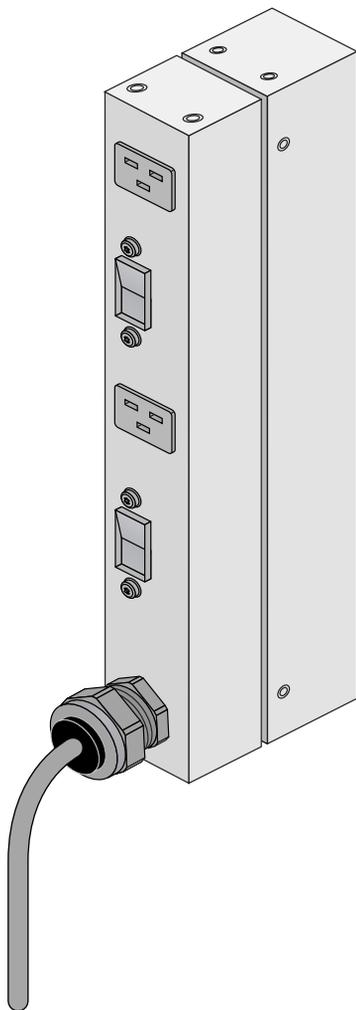
Figure 1-4   Single-Phase 2-Outlet PDU Example

Figure 1-5 shows an example of an eight-plug single-phase PDU that can be used in the Altix UV 100 rack system. This unit is used to support auxiliary equipment in the rack.
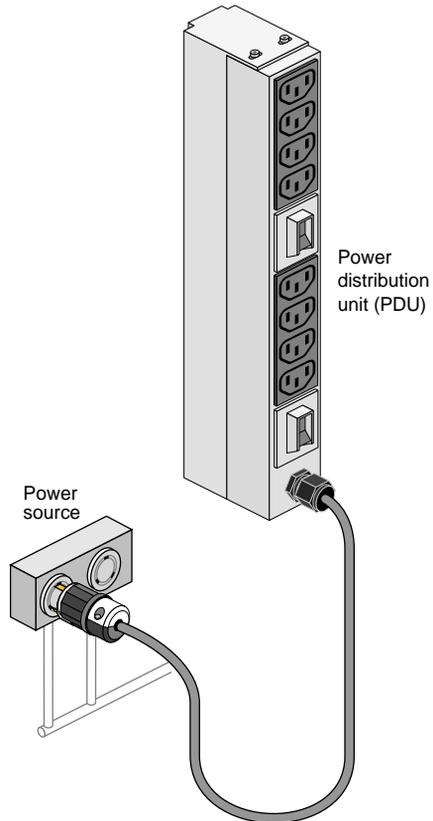
Figure 1-5   Single-Phase 8-Outlet PDU

Figure 1-6 shows examples of the three-phase PDUs that can be used in the SGI Altix UV 100 system. These PDUs are used to distribute power to the IRUs when the system is configured with three-phase power
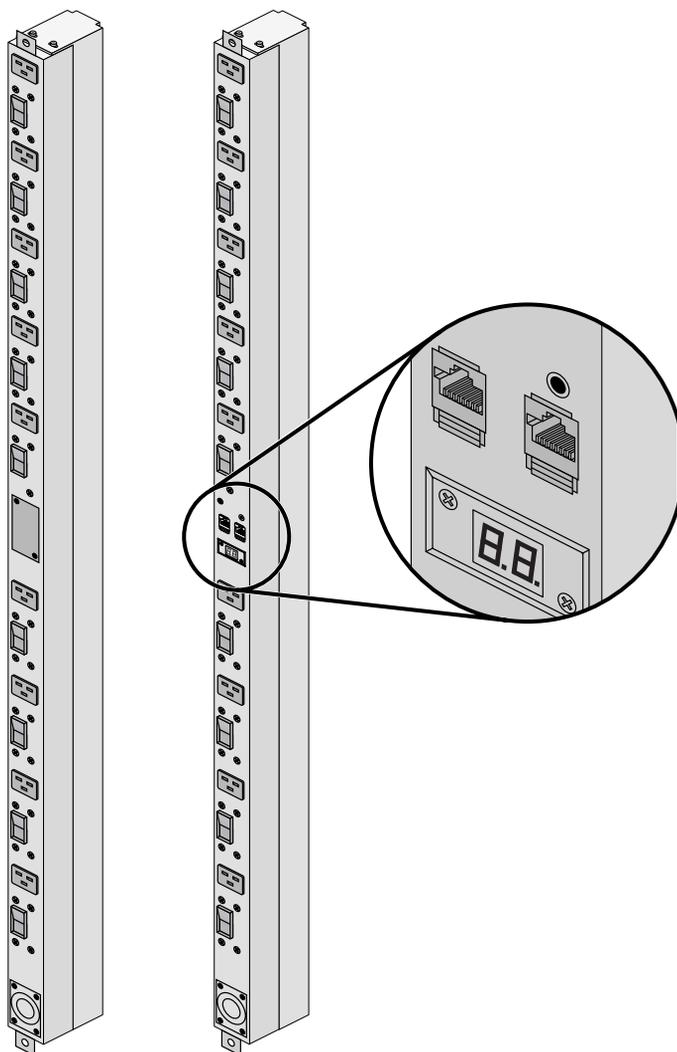
Figure 1-6   Three-Phase PDU Examples

Powering On and Off from the Command Line Interface

The Altix UV 100 command line interface is accessible by logging into either the optional system management node (SMN) as **sysco** or the CMC as **root**.

Instructions issued at the command line interface of a local console prompt typically only affect the local partition or a part of the system. Depending on the directory level you are logged in at, you may power up an entire partition (SSI), a single rack, or a single IRU enclosure. In CLI command console mode, you can obtain only limited information about the overall system configuration. An SMN has information about the IRUs in its SSI. Each IRU has information about its internal blades, and also (if other IRUs are attached via NUMAlink to the IRU) information about those IRUs.

Booting Directly From a CMC

If a system management node (SMN) is not available, it is possible to power on and administer your system directly from the CMC. When available, the optional SMN should always be the primary interface to the system.

The console type and how these console types are connected to the Altix UV 100 systems is determined by what console option is chosen. Establish either a serial connection and/or network/Ethernet connection to the CMC.

Serial Console Hardware Requirements

The console type and how these console types are connected to the Altix UV 100 servers is determined by what console option is chosen. If you have an Altix UV 100 server and wish to use a serially-connected "dumb terminal", you can connect the terminal via a serial cable to the (DB-9) RS-232-style console port connector on the CMC. The terminal should be set to the following functional modes:

- Baud rate of 115,200

- 8 data bits

- One stop bit, no parity

- No hardware flow control (RTS/CTS)

Note that a serial console is generally connected to the first (bottom) IRU in any single rack configuration.

Establishing a Serial Connection to the CMC on UV 100

If you have an Altix UV 100 system and wish to use a serially-connected "dumb terminal", you can connect the terminal via a serial cable to the (DB-9) RS-232-style console port connector on the CMC board of the IRU.

1. The terminal should be set to the operational modes described in the previous subsection.

    Note that a serial console is generally connected to the CMC on the first (bottom) IRU in any single rack configuration.

2. On the system management node (SMN) port, the CMC is configured to request an IP address via dynamic host configuration protocol (DHCP).

3. If your system does not have an SMN, the CMC address cannot be directly obtained by DHCP and will have to be assigned, see the following subsections for more information.

Establishing CMC IP Hardware Connections

For IP address configuration, there are two options: DHCP or static IP. The following subsections provide information on the setup and use of both.

Note: Both options require the use of the CMC's serial port, refer to Figure 1-2 on page 4.

Network (LAN RJ-45) connections to the Altix UV 100 CMC are always made via the **ACC** port.

For DHCP, you must determine the IP address that the CMC has been assigned; for a static IP, you must also configure the CMC to use the desired static IP address.

To use the serial port connection, you must attach and properly configure an RS-232 cable to the CMC's "CONSOLE" port. Configure the serial port as described in "Serial Console Hardware Requirements" on page 13.

When the serial port session is established, the console will show a CMC login, and the user can login to the CMC as user "root" with password "**root**".

Using DHCP to Establish an IP Address

To obtain and use a DHCP generated IP address, plug the CMC's external network port (**ACC**) into a network that provides IP addresses via DHCP, the CMC can then acquire an IP address.

To determine the IP address assigned to the CMC, you must first establish a connection to the CMC serial port (as indicated in the section "Serial Console Hardware Requirements" on page 13), and run the command "`ifconfig eth0`". This will report the IP address that the CMC is configured to use.

Running the CMC with DHCP is not recommended as the preferred option for UV 100 systems. The nature of DHCP makes it difficult to determine the IP address of the CMC, and it is possible for that IP address to change over time, depending on the DHCP configuration usage. The exception would be a configuration where the system administrator is using DHCP to assign a "permanent" IP address to the CMC.

To switch from a static IP back to DHCP, the configuration file `/etc/sysconfig/ifcfg-eth0` on the CMC must be modified (see additional instructions in the "Using a Static IP Address" section). The file must contain the following line to enable use of DHCP:

```
BOOTPROTO=dhcp
```

Using a Static IP Address

To configure the CMC to use a static IP address, the user/administrator must edit the configuration file `/etc/sysconfig/ifcfg-eth0` on the CMC. The user can use the "vi" command (i.e. "**vi** `/etc/sysconfig/ifcfg-eth0`") to modify the file.

The configuration file should be modified to contain these lines:

```
BOOTPROTO=static
IPADDR=<IP address to use>
NETMASK=<netmask>
GATEWAY=<network gateway IP address>
HOSTNAME=<hostname to use>
```

Note that the "GATEWAY" and "HOSTNAME" lines are optional.

After modifying the file, save and write it using the vi command ":**w!**", and then exit vi using ":**q**". Then reboot the CMC (using the "`reboot`" command); after it reboots, it will be configured with the specified IP address.

Power On the System Using the CMC Network Connection

You can use a network connection to power on your UV system as described in the following steps:

1. Establish a Network/Ethernet connection (as detailed in the previous subsections). CMCs have their rack and "U" position set at the factory. The CMC will have an IP address, similar to the following:

   ACC 172.17.<rack>.<slot>

2. You can use the IP address of the CMC to login, as follows:

   ssh **root@<IP-ADDRESS>**

   Typically, the default password for the CMC set out of the SGI factory is **root**. The default password for logging in as sysco on the SMN is **sgisgi**.

   The following example shows the CMC prompt:

   SGI Chassis Manager Controller, Firmware Rev. 0.x.xx

   CMC:r1i1c>

   This refers to rack 1, IRU 1, CMC.

3. Power up your Altix UV system using the power on command, as follows:

   CMC:r1i1c> **power on**

The system will take time to fully power up (depending on size and options). Larger systems take longer to fully power on. Information on booting Linux from the shell prompt is included at the end of the next subsection ("Monitoring Power On" on page 17).

Note: The commands are the same from the CMC or SMN command line interface.

The following command options can be used with either the CMC or SMN CLI:

usage: **power [-vcow] on|up** [TARGET]...turns power on

```
-v, --verbose          verbose output
-c, --clear            clear EFI variables (system and partition targets only)
-o, --override         override partition check
-w, --watch            watch boot progress
```

To monitor the power-on sequence during boot, see the next section "Monitoring Power On", the -uvpower option must be included.

Monitoring Power On

Establish another connection to the SMN or CMC and use the uvcon command to open a system console and monitor the system boot process. Use the following steps:

```
CMC:r1i1c> uvcon
   uvcon: attempting connection to localhost...
   uvcon: connection to SMN/CMC (localhost) established.
   uvcon: requesting baseio console access at r001i01b00...
   uvcon: tty mode enabled, use 'CTRL-]' 'q' to exit
   uvcon: console access established
   uvcon: CMC <--> BASEIO connection active
   *************************************************
   ******* START OF CACHED CONSOLE OUTPUT *******
   *************************************************
   ******** [20100512.143541] BMC r001i01b10: Cold Reset via NL
   broadcast reset
   ******** [20100512.143541] BMC r001i01b07: Cold Reset via NL
   broadcast reset
   ******** [20100512.143540] BMC r001i01b08: Cold Reset via NL
   broadcast reset
   ******** [20100512.143540] BMC r001i01b12: Cold Reset via NL
   broadcast reset
   ******** [20100512.143541] BMC r001i01b14: Cold Reset via NL
   broadcast reset
   ******** [20100512.143541] BMC r001i01b04: Cold Reset via NL....
```

Note: Use CTRL-] q to exit the console.

Depending upon the size of your system, in can take 5 to 10 minutes for the Altix UV system to boot to the EFI shell. When the shell> prompt appears, enter fs0, as follows:

```
shell> fs0
```

At the fs0 prompt, enter the Linux boot loader information, as follows:

```
fs0> /efi/suse/elilo
```

The ELILO Linux Boot loader is called and various SGI configuration scripts are run and the SUSE Linux Enterprise Server 11 Service Pack *x* installation program appears.

Power off an Altix UV System

To power down the Altix UV system, use the `power off` command, as follows:
```
CMC:r1i1c> power off
==== r001i01c (PRI) ====
```

You can also use the `power status` command, to check the power status of your system
```
CMC:r1i1c> power status
==== r001i01c (PRI) ====

on: 0, off: 32, unknown: 0, disabled: 0
```

Powering-On and Off From the SGI Management Center Interface

Commands issued from the SGI Management Center interface are typically sent to all enclosures and blades in the system (up to a maximum 768 compute cores) depending on set parameters. SGI Management Center services are started and stopped from scripts that exist in */etc/init.d*

SGI Management Center, is commonly installed in */opt/sgi/sgimc*, and is controlled by one of these services—this allows you to manage SGI Management Center services using standard Linux tools such as `chkconfig` and `service`.

If your SGI Management Center interface is not already running, or you are bringing it up for the first time, use the following steps:

1. Open an ssh or other terminal session command line console to the SMN using a remote workstation or local VGA terminal.

2. Use the information in the section "Preparing to Power On" on page 9 to ensure that all system components are supplied with power and ready for bring up.

3. Log in to the SMN command line as `root` (the default password is **sgisgi**).

4. On the command line, enter **mgrclient** and press **Enter**. The SGI Management Center Login dialog box is displayed.

5. Enter a user name (**root** by default) and password (**root** by default) and click **OK**. The SGI Management Center interface is displayed.

6. The power on (green button) and power off (red button) are located in the middle of the SGI Management Center GUI's Tool Bar - icons which provide quick access to common tasks and features.

See the *SGI Management Center System Administrator's Guide* for more information.

Using Embedded Support Partner (ESP)

Embedded Support Partner (ESP) automatically detects system conditions that indicate potential future problems and then notifies the appropriate personnel. This enables you and SGI system support engineers (SSEs) to proactively support systems and resolve issues before they develop into actual failures.

ESP enables users to monitor one or more systems at a site from a local or remote connection. ESP can perform the following functions:

- Monitor the system configuration, events, performance, and availability.
- Notify SSEs when specific events occur.
- Generate reports.

ESP also supports the following:

- Remote support and on-site troubleshooting.
- System group management, which enables you to manage an entire group of systems from a single system.

For additional information on this and other available monitoring services, see the section "SGI Electronic Support" in Chapter 6.

System Control Interface Options

You can monitor and interact with your Altix UV 100 server from the following sources:

- Using the SGI 1U rackmount console option you can connect directly to the optional system management node (SMN) for basic monitoring and administration of the Altix system. See "1U Console Option" on page 27 for more information; SLES 11 or later is required.

- A PC or workstation on the local area network can connect to the optional SMN's external ethernet port and set up remote console sessions or display GUI objects from the SGI Management Center interface.

- A serial console display can be plugged into the CMC at the rear of IRU 001. You can also monitor IRU information and system operational status from other IRUs that are connected to IRU 001.

These console connections enable you to view the status and error messages generated by the chassis management controllers in your Altix UV 100 rack. For example, you can monitor error messages that warn of power or temperature values that are out of tolerance. See the section "Console Hardware Requirements" in Chapter 2, for additional information.

Optional Components

Besides adding a network-connected system console or basic VGA monitor, you can add or replace the following hardware items on your Altix UV 100 series server:

- Peripheral component interface (PCIe) cards into the optional PCIe expansion chassis.

- PCIe cards installed or replaced in a two-slot internal PCIe riser card.

- Disk or DVD drives in your UV 100 IRU drive tray.

PCIe Cards

The PCIe based I/O sub-systems, are industry standard for connecting peripherals, storage, and graphics to a processor blade. The following are the primary configurable I/O system interfaces for the Altix UV 100 series systems:

- The optional two-slot internal PCIe riser card is a compute blade-installed riser card that supports one x8 and one x16 PCIe Gen2 cards.

- The optional external PCIe riser card is a compute blade-installed riser card that supports two x16 PCI express Gen2 ports. These ports can be used to connect to an optional I/O expansion chassis that supports multiple PCIe cards. Each x16 connector on the riser card can support one I/O expansion chassis.

Important: PCIe cards installed in a two-slot internal PCIe riser card are *not* hot swappable or hot pluggable. The compute blade using the PCIe riser must be powered down and removed from the system before installation or removal of a PCIe card. See also, "Installing Cards in the 1U PCIe Expansion Chassis" on page 55 for more information on PCIe options.

Not all blades or PCIe cards may be available with your system configuration. Check with your SGI sales or service representative for availability. See Chapter 5, "PCIe and Disk Add or Replace Procedures" for detailed instructions on installing or removing PCIe cards or UV 100 system disk drives.

System Control

This chapter describes the general interaction and functions of the overall Altix UV 100 system control. System control parameters depend somewhat on the overall size and complexity of the SGI Altix UV 100 but will generally include the following three areas:

• The optional system management node (SMN) which runs the SGI Management Center software

• The chassis management controllers (CMC) boards - one in each IRU

• The individual blade-based board management controllers (BMCs) - report to the CMCs

Note: It is possible to operate and administer a very basic (single-rack) SGI Altix UV 100 system without using an optional SMN and the SGI Management Center. Use of an SMN will enhance the overall system control process and is highly recommended for multi-rack systems.

Levels of System Control

The system control network configuration of your server will depend on the size of the system and control options selected. Typically, an Ethernet LAN connection to the system controller network is used. This Ethernet connection is made from a local or remote PC, VGA terminal or workstation connected to the optional system management node (SMN).

The SMN is a separate stand-alone server installed in the SGI Altix UV 100 rack. The SMN acts as a gateway and buffer between the UV system control network and any other public or private local area networks as well as the system CMCs.

Important: The SGI Altix UV system control network is a private, closed network. It should not be reconfigured in any way to change it from the standard SGI Altix UV factory installation. It should not be directly connected to any other network. The Altix UV system control network is not designed for and does not accommodate additional network traffic, routing, address naming (other than its own schema), or DCHP controls (other than its own configuration). The Altix UV system control network also is not security hardened, nor is it tolerant of heavy network traffic, and is vulnerable to Denial of Service attacks.

Optional System Management Node (SMN) Overview

An Ethernet connection directly from the SMN (Figure 2-1 on page 23) to a local private or public LAN allows the system to be administered directly from a local or remote console via the SGI Management Center interface (most often installed on the SMN). Note that there is no direct inter-connected system controller function in the optional expansion PCIe modules.

The system controller network is designed into all IRUs. Controllers within the system report and share status information via the CMC Ethernet interconnect cables. This maintains controller configuration and topology information between all controllers in an SSI. Figure 2-2 on page 24 shows an example system control network using an optional and separate (remote) workstation to monitor a single-rack SGI Altix UV 100 system. It is also possible to connect an optional PC or console directly to the SMN, see Figure 2-1 on page 23.

Note: Mass storage option enclosures are not specifically monitored by the system controller network. Most optional mass storage enclosures have their own internal microcontrollers for monitoring and controlling all elements of the disk array. See the owner's guide for your mass storage option for more information on this topic.

For information on administering network connected SGI systems using the SGI Management Center, see the *SGI Management Center System Administrator's Guide* (P/N 007-5642-00*x*).
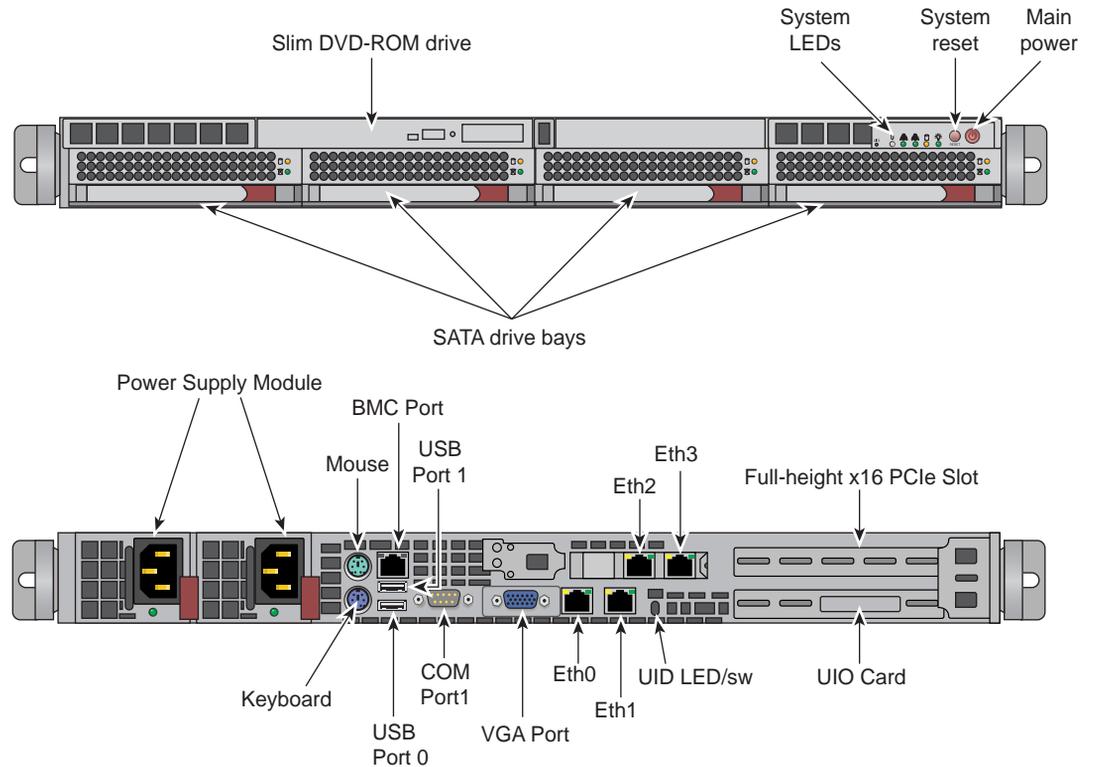
Figure 2-1   Optional SMN Server Front and Rear Panels

CMC Overview

The CMC system for the SGI Altix UV 100 servers manages power control and sequencing, provides environmental control and monitoring, initiates system resets, stores identification and configuration information, and provides console/diagnostic and scan interface.

Viewing the system from the rear, the CMC blade is near the center of the IRU. The CMC accepts direction from the SMN and supports powering-up and powering-down individual or groups of compute blades and environmental monitoring of all units within the IRU. The CMC sends operational requests to the Baseboard Management Controller (BMC) on each compute/memory blade installed. The CMC provides data collected from the compute nodes within the IRU to the

SMN upon request. Each CMC in a system communicates with other CMCs and the optional SMN via a private system control ethernet network.

CMCs can communicate with the blade BMCs and other IRU CMCs when they are linked together under a single system image (SSI); also called a partition. Each CMC shares its information with an optional SMN and other CMCs within the SSI. Note that the optional SMN (server), optional mass storage units and PCIe expansion enclosures do *not* have a CMC installed.
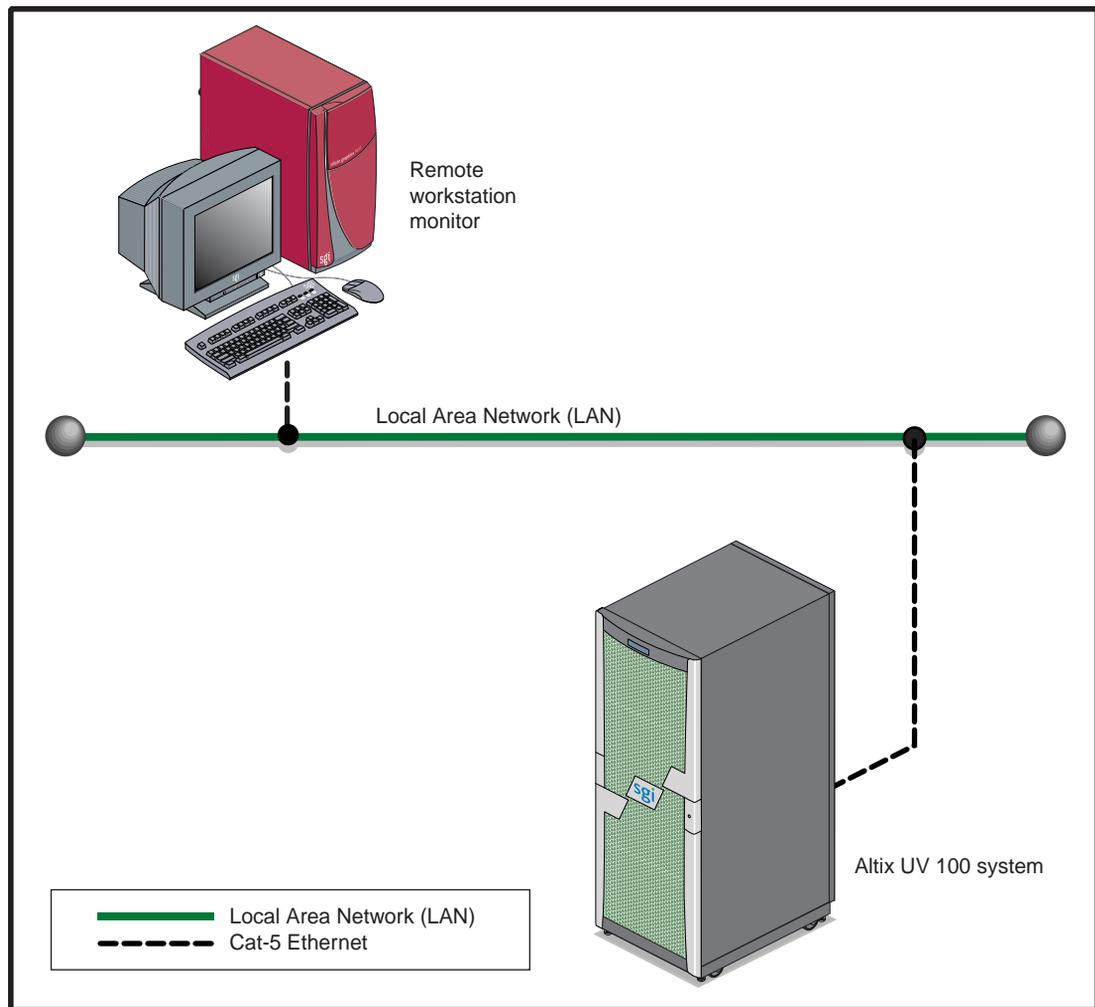
Figure 2-2   SGI Altix UV 100 LAN-attached System Control Network

BMC Overview

Each compute blade in an IRU has a baseboard management controller (BMC). The BMC is a built-in specialized microcontroller hardware component that monitors and reports on the functional "health" status of the blade. The BMC provides a key functional element in the overall Intelligent Platform Management Interface (IPMI) architecture.

The BMC acts as an interface to the higher levels of system control such as the IRU's CMC boards and the higher level control system used in the optional system management node. The BMC can report any on-board sensor information that it has regarding temperatures, power status, operating system condition and other functional parameters that may be reported by the blade.When any of the preset limits fall out of bounds, the information will be reported by the BMC and an administrator can take some corrective action. This could entail a node shutdown, reset (NMI) or power cycling of the individual blade.

The individual blade BMCs do not have information on the status of other blades within the IRU. This function is handled by the CMCs and/or the optional SMN. Note that blades equipped with an optional BaseIO riser board have a dedicated BMC Ethernet port.

System Controller Interaction

In all Altix UV 100 servers all the system controller types (SMNs, CMCs and BMCs) communicate with each other in the following ways:

- System control commands and communications are passed between the SMN and CMCs via a private dedicated gigabit ethernet. The CMCs communicate directly with the BMC in each installed blade by way of the IRU's internal backplane.

- All the primary CMCs can communicate with each other via an ethernet "ring" configuration network.

Controllers

All IRUs have one CMC board installed. The following subsections describe the basic features of the controllers:

Note: For additional information on controller commands, see the *SGI UV CMC Controller Software User's Guide* (P/N 007-5636-00*x*).

Chassis Management Controller Functions

The following list summarizes the control and monitoring functions that the CMC performs. Many of the controller functions are common across all IRUs, however, some functions are specific to the type of enclosure.

- Controls voltage margining within the IRU

- Monitors individual blade status via blade BMCs

- Controls and monitors IRU fan speeds

- Reads system identification (ID) PROMs

- Monitors voltage levels and reports failures

- Monitors and controls warning LEDs

- Monitors the On/Off power cycles

- Monitors the power status of the IRU

Console Hardware Requirements

The console type and how these console types are connected to the Altix UV 100 servers is determined by what console option is chosen.

If you have an Altix UV 100 server and wish to use a serially-connected "dumb terminal", you can connect the terminal via a serial cable to the (DB-9) RS-232-style console port connector on the CMC.

The terminal should be set to the following functional modes:

- Baud rate of 115,200

- 8 data bits

- One stop bit, no parity

- No hardware flow control (RTS/CTS)

Note that a serial console is generally connected to the first (bottom) IRU in any single rack configuration.

1U Console Option

The SGI optional 1U console is a rackmountable unit that includes a built-in keyboard/touchpad, and uses a 17-inch (43-cm) LCD flat panel display of up to 1280 x 1024 pixels.
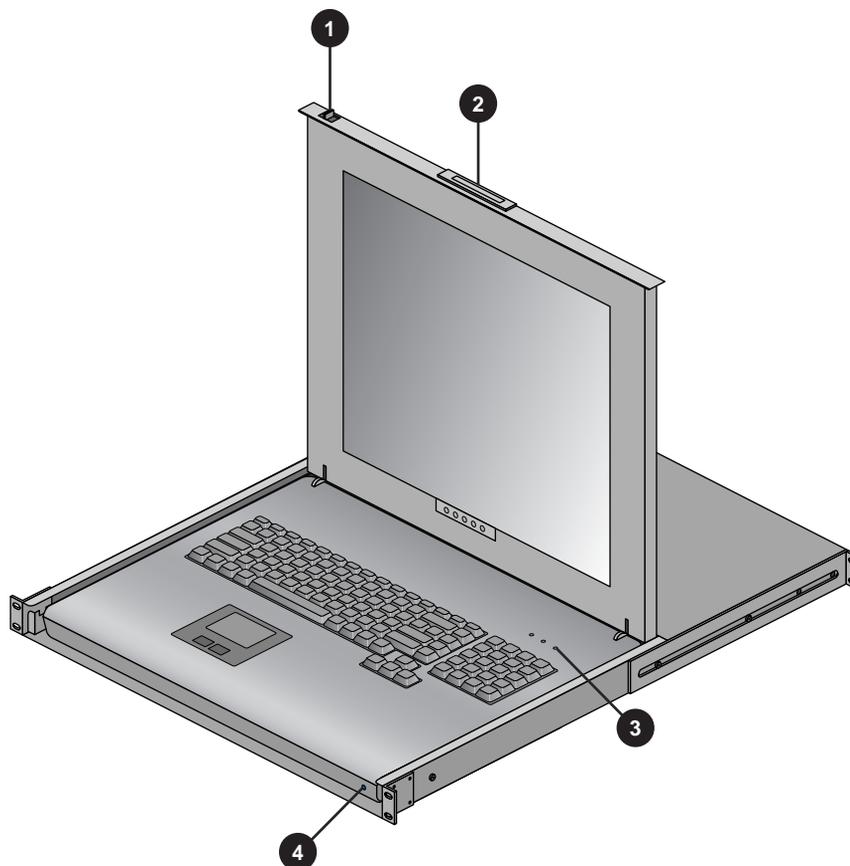
Figure 2-3   Optional 1U Rackmount Console

Flat Panel Rackmount Console Option Features

The 1U flat panel console option has the following listed features:

1. **Slide Release** - Move this tab sideways to slide the console out. It locks the drawer closed when the console is not in use and prevents it from accidentally sliding open.

2. **Handle** - Used to push and pull the module in and out of the rack.

3. **LCD Display Controls** - The LCD controls include On/Off buttons and buttons to control the position and picture settings of the LCD display.

4.   **Power LED** - Illuminates blue when the unit is receiving power.

The 1U console attaches to the optional system management node server using PS/2 and HD15M connectors or to an optional KVM switch (not provided by SGI). See Figure 2-4 for the SMN video connection points. The 1U console is basically a "dumb" VGA terminal, it cannot be used as a workstation or loaded with any system administration program.

The 27-pound (12.27-kg) console automatically goes into sleep mode when the cover is closed.
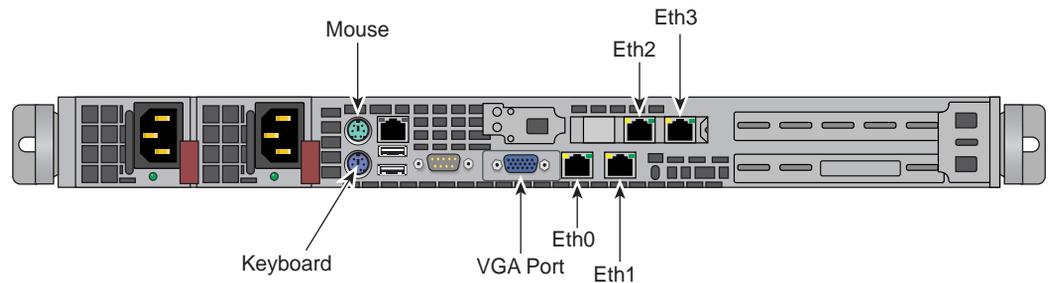
Figure 2-4   Optional System Management Node (SMN) Direct Video Connection Ports

System Overview

This chapter provides an overview of the physical and architectural aspects of your SGI Altix UV 100 series system. The major components of the Altix UV 100 series systems are described and illustrated.

The Altix UV 100 series is a family of multiprocessor distributed shared memory (DSM) computer systems that initially scale from 16 to 768 Intel processor cores as a cache-coherent single system image (SSI). Future releases may scale to larger processor counts for single system image (SSI) applications. Contact your SGI sales or service representative for the most current information on this topic.

In a DSM system, each processor board contains memory that it shares with the other processors in the system. Because the DSM system is modular, it combines the advantages of lower entry-level cost with global scalability in processors, memory, and I/O. You can install and operate the Altix UV 100 series system in your lab or server room. Each 42U SGI rack holds up to twelve 3U high enclosures that each support one or two compute/memory and I/O sub modules known as "blades." These blades are single printed circuit boards (PCBs) with ASICS, processors, memory components and I/O chip sets mounted on a mechanical carrier. The blades slide directly in and out of the Altix UV 100 IRU enclosures.

This chapter consists of the following sections:

- "System Models" on page 33
- "System Architecture" on page 35
- "System Features" on page 37
- "System Components" on page 41

Figure 3-1 shows the front view of a single-rack Altix UV 100 system.
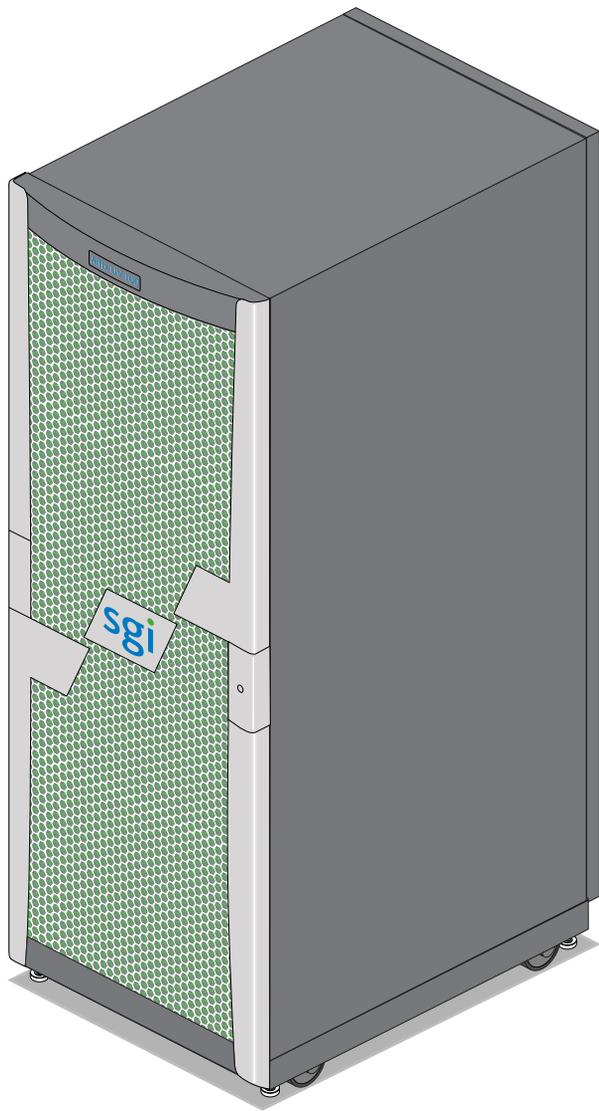
Figure 3-1   SGI Altix UV 100 System Example

System Models

The basic enclosure within the Altix UV 100 system is the 3U high "individual rack unit" (IRU). The IRU enclosure contains one or two blades connected to each other via NUMAlink with a maximum bi-directional bandwidth communication rate of up to 15 GB/sec.

Each IRU has ports that are brought out to external NUMAlink 5 connectors located on the back of each IRU. The 20U, 40U or 42U rack for this server houses all IRU enclosures, option modules, and other components; up to (384 processor cores) in a single rack. The Altix UV 100 server system can expand up to 768 Intel processor cores per SSI; a minimum of one BaseIO riser equipped blade is required for every 768 processor cores. Higher core counts in an SSI may be available in future releases, check with your SGI sales or service representative for current information.

Figure 3-2 shows an example of how IRU placement is done in a single-rack Altix UV 100 server.

The system requires a minimum of one rack with enough power distribution units (PDUs) to support the IRUs and any optional equipment installed in the rack. Each single-phase PDU has two or eight outlets (one PDU is required to support each IRU and two power connections are needed for the optional SMN).

The three-phase PDU has 9 outlets used to support the IRUs and any optional equipment that may be installed in a rack.

You can also add additional PCIe expansion cards or RAID and non-RAID disk storage to your server system.
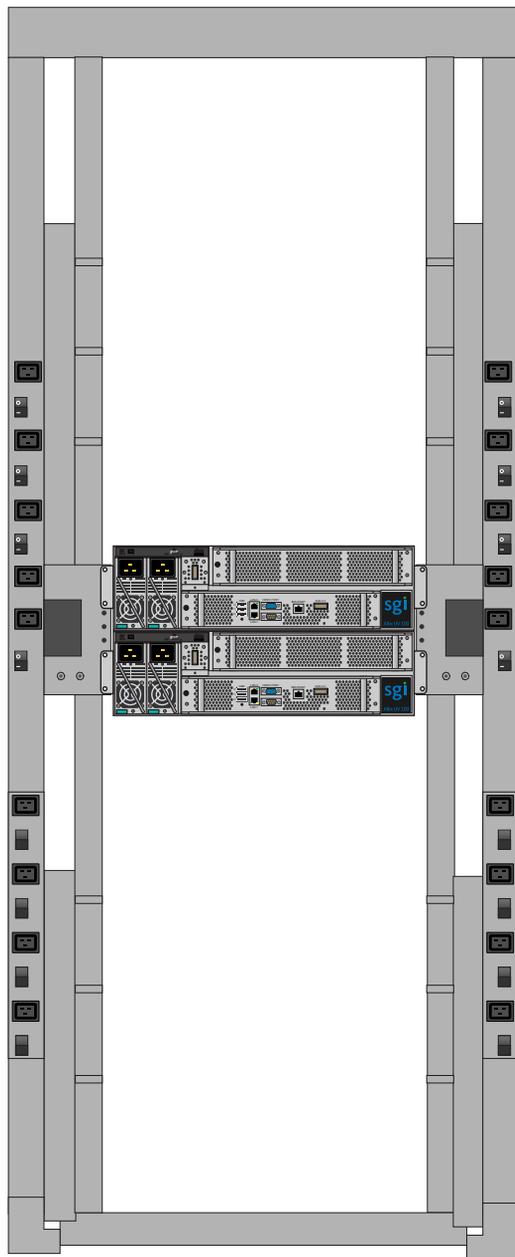
Figure 3-2   SGI Altix UV 100 IRU and Rack Example

System Architecture

The Altix UV 100 computer system is based on a distributed shared memory (DSM) architecture. The system uses a global-address-space, cache-coherent multiprocessor that scales up to 384 processor cores in a single rack. Because it is modular, the DSM combines the advantages of lower entry cost with the ability to scale processors, memory, and I/O independently to a maximum of 768 cores on a single-system image (SSI). Larger SSI configurations may be offered in the future, contact your SGI sales or service representative for information.

The system architecture for the Altix UV 100 system is a fifth-generation NUMAflex DSM architecture known as NUMAlink 5. In the NUMAlink 5 architecture, all processors and memory can be tied together into a single logical system. This combination of processors, memory, and internal switches constitute the interconnect fabric called NUMAlink within each IRU enclosure.

The basic expansion building block for the NUMAlink interconnect is the processor node; each processor node consists of a Hub ASIC and two four-core, six-core, or eight-core processors with on-chip secondary caches. The Intel processors are connected to the Hub ASIC via quick path interconnects.

The Hub ASIC is the heart of the processor and memory node blade technology. This specialized ASIC acts as a crossbar between the processors, local SDRAM memory, and the network interface. The Hub ASIC enables any processor in the SSI to access the memory of all processors in the SSI.

Figure 3-3 on page 36 shows a functional block diagram of the Altix UV 100 series system IRU processor blades.

Logical Drawing of the UV Mid-range IRU

3U-High IRU Enclosure

Three external NL5 ports

Internally connected
NL5 port

Three external NL5 ports

Compute Blade

Compute Blade
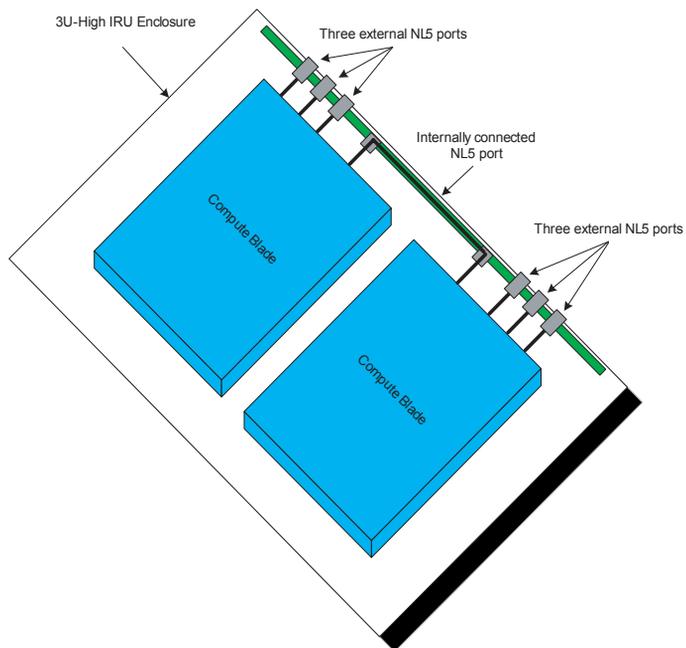
Figure 3-3   Functional Block Diagram of the Individual Rack Unit

System Features

The main features of the Altix UV 100 series server systems are discussed in the following sections:

- "Modularity and Scalability" on page 37
- "Distributed Shared Memory (DSM)" on page 37
- "Chassis Management Controller (CMC)" on page 39
- "Distributed Shared I/O" on page 39
- "Reliability, Availability, and Serviceability (RAS)" on page 40

Modularity and Scalability

The Altix UV 100 series systems are modular systems. The components are primarily housed in building blocks referred to as individual rack units (IRUs). Additional optional mass storage may be added to the rack along with additional IRUs. You can add different types of blade options to a system IRU to achieve the desired system configuration. You can easily configure systems around processing capability, I/O capability, memory size, or storage capacity. The air-cooled IRU enclosure system has redundant, hot-swap fans and redundant, hot-swap power supplies.

Distributed Shared Memory (DSM)

In the Altix UV 100 series server, memory is physically distributed both within and among the IRU enclosures (compute/memory/I/O blades); however, it is accessible to and shared by all NUMAlinked devices within the single-system image (SSI). This means all NUMAlinked components sharing a single Linux operating system, operate and share the memory "fabric" of the system. Memory latency is the amount of time required for a processor to retrieve data from memory. Memory latency is lowest when a processor accesses local memory. Note the following sub-types of memory within a system:

- If a processor accesses memory that it is connected to on a compute node blade, the memory is referred to as the node's *local memory*. Figure 3-4 on page 38 shows a conceptual block diagram of the blade's memory, compute and I/O pathways.
- If processors access memory located in other blade nodes within the IRU, (or other NUMAlinked IRUs) the memory is referred to as *remote memory*.
- The total memory within the NUMAlinked system is referred to as *global memory*.

The following riser cards plug into the mezzanine connector:
1. Base I/O card
2. Boot drive
3. Integrated PCIE GEN2 (supports two PCIe cards)
4. I/O expansion (supports two PCIe card expansion channels).

DDR3 1066 MT/s/lane
8.5 GB/s agregate for both DDR3 channels

DDR3 1066 MT/s/lane
8.5 GB/s agregate for both DDR3 channels

Nexlev Mezzanine Connector (Z-axis)

BMC

GPIO
I2C
JTAG
Enet to backplane
SIO

6.4GT/s   6.4GT/s

Memory DIMM
Memory DIMM
Mill Brook 0

SMI 6.4 GT/s
8.53 GB/s read
7.20 GB/s write

SMI 6.4 GT/s
8.53 GB/s read
7.20 GB/s write

Mill Brook 4
Memory DIMM
Memory DIMM

Memory DIMM
Memory DIMM
Mill Brook 1

QPI-0   QPI-3

Branch 0   Branch 1

A   C
B   D

Nehalem Processor P0

QPI-1   QPI-2

Nehalem Processor P1

Mill Brook 5
Memory DIMM
Memory DIMM

Memory DIMM
Memory DIMM
Mill Brook 2

6.4GT/s

D   B
C   A

QPI-2   QPI-1

Branch 1   Branch 0

Mill Brook 6
Memory DIMM
Memory DIMM

Memory DIMM
Memory DIMM
Mill Brook 3

SMI 6.4 GT/s
8.53 GB/s read
7.20 GB/s write

QPI-3   QPI-0

SMI 6.4 GT/s
8.53 GB/s read
7.20 GB/s write

Mill Brook 7
Memory DIMM
Memory DIMM

Note: Both DIMMs connected to a MillBrook must be the same Frequency.

5.86GT/s   5.86GT/s

The following DIMM sizes are supported: 1, 2, 4, 8, and 16GB

733 MT/s
(9 bit transfers)

CSI-1   CSI-0

FBD 0 channel
4.4 GT/s, 7.7 GB/s Read

Memory DIMM
5.87 GB/s Read BW

RLD
(Reduced Latency DRAM)

UV Hub

Memory DIMM
Memory DIMM
Directory Memory riser board

Note: The directory memory size is 1/16 the size of the main memory size.

Channel Specs:
QPI = 25.6 GB/s (32 lanes x 6.4 GT/s / 8)
SMI = 8.53 GB/s (((12 lanes x 6.4 GT/s x 128)/144)/8)

Intel¤ Scalable Memory Interconnect (SMI)

Intel¤ Quick Path Interconnect (QPI)

Note: QPI and CSI are the same channel.

Backplane

(4) NL5 Ports
15.0 GB/s aggregate
6.25 GT/s per port

Figure 3-4   Blade Node Block Diagram

Distributed Shared I/O

Like DSM, I/O devices are distributed among the blade nodes within the IRUs. Each BaseIO riser card equipped blade node is accessible by all compute nodes within the SSI (partition) through the NUMAlink interconnect fabric.

Chassis Management Controller (CMC)

Each IRU has a chassis management controller (CMC) located directly below the upper set of cooling fans in the rear of the IRU. The chassis manager supports powering up and down of the compute blades and environmental monitoring of all units within the IRU.

One GigE port from each compute blade connects to the CMC blade via the internal IRU backplane. A second GigE port from each blade slot is also connected to the CMC. This second port is used to support an optional BaseIO riser card.

ccNUMA Architecture

As the name implies, the cache-coherent non-uniform memory access (ccNUMA) architecture has two parts, *cache coherency* and *nonuniform memory access*, which are discussed in the sections that follow.

Cache Coherency

The Altix UV 100 server series use caches to reduce memory latency. Although data exists in local or remote memory, copies of the data can exist in various processor caches throughout the system. Cache coherency keeps the cached copies consistent.

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

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

When a processor modifies a block of data, the processors that have the same block of data in their caches must be notified of the modification. The Altix UV 100 server series uses an invalidation method to maintain cache coherence. The invalidation method purges all unmodified copies of the block of data, and the processor that wants to modify the block receives exclusive ownership of the block.

Non-uniform Memory Access (NUMA)

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

Reliability, Availability, and Serviceability (RAS)

The Altix UV 100 server series components have the following features to increase the reliability, availability, and serviceability (RAS) of the systems.

- **Power and cooling:**
  - IRU power supplies are redundant and can be hot-swapped under most circumstances.
  - IRUs have overcurrent protection at the blade and power supply level.
  - Fans are redundant and can be hot-swapped.
  - Fans run at multiple speeds in the IRUs. Speed increases automatically when temperature increases or when a single fan fails.

- **System monitoring:**
  - System controllers monitor the internal power and temperature of the IRUs, and can automatically shut down an enclosure to prevent overheating.
  - All main memory has Intel Single Device Data Correction, to detect and correct 8 contiguous bits failing in a memory device. Additionally, the main memory can detect and correct any two-bit errors coming from two memory devices (8 bits or more apart).
  - All high speed links including Intel Quick Path Interconnect (QPI), Intel Scalable Memory Interconnect (SMI), and PCIe have CRC check and retry.
  - The NUMAlink interconnect network is protected by cyclic redundancy check (CRC).
  - Each blade/node installed has status LEDs that indicate the blade's operational condition; LEDs are readable at the front of the IRU.

–   Systems support the optional Embedded Support Partner (ESP), a tool that monitors the system; when a condition occurs that may cause a failure, ESP notifies the appropriate SGI personnel.

–   Systems support optional remote console and maintenance activities.

•   **Power-on and boot:**

–   Automatic testing occurs after you power on the system. (These power-on self-tests or POSTs are also referred to as power-on diagnostics or PODs).

–   Processors and memory are automatically de-allocated when a self-test failure occurs.

–   Boot times are minimized.

•   **Further RAS features:**

–   Systems have a local field-replaceable unit (FRU) analyzer.

–   All system faults are logged in files.

–   Memory can be scrubbed using error checking code (ECC) when a single-bit error occurs.

System Components

The Altix UV 100 series system features the following major components:

•   **20U, 40U or 42U rack.** These racks are used for both the compute and I/O rack in the Altix UV 100 system. Up to 12 IRUs can be installed in each rack (six in the 20U rack). There is also space reserved for an optional system management node and other optional 1U components such as a PCIe expansion enclosure.

•   **Individual Rack Unit (IRU).** This 3U high enclosure contains two power supplies, one or two compute/memory blades, BaseIO and other optional riser enabled blades for the Altix UV 100. Figure 3-5 shows the Altix UV 100 IRU front components.

•   **Compute blade.** Holds two processor sockets and 8 or 16 memory DIMMs. Each compute blade can be ordered with a riser card that enables the blade to support various I/O options.

•   **BaseIO enabled compute blade.** I/O riser enabled blade that supports all base system I/O functions including two ethernet connectors, one SAS port, one BMC ethernet port and three USB ports.
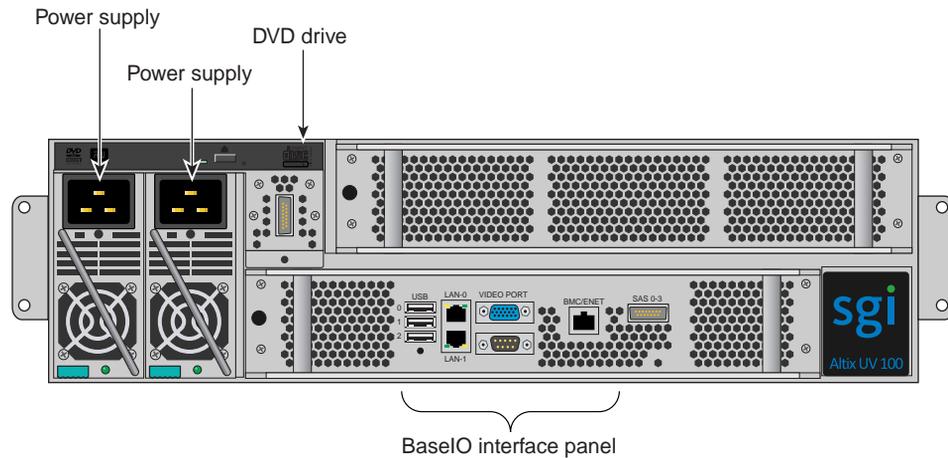
Figure 3-5   UV 100 IRU Front Components

- **Drives.** Each IRU has a drive tray that supports one optional DVD drive and three or four hard disk drives. Installing the DVD drive limits the tray to supporting three hard disks.

- **Two-Slot Internal PCIe enabled compute blade.** The internal PCIe riser based compute blade supports two internally installed PCI Express option cards.

- **External PCIe enabled compute blade.** This riser enabled board must be used in conjunction with a PCIe expansion enclosure. A x16 adapter card connects from the blade to the expansion enclosure, supporting up to four PCIe option cards.

   Note: PCIe card options may be limited, check with your SGI sales or support representative.

- **CMC and external NUMAlink Connectors.** The CMC and external NUMAlink connectors are located on the rear of each IRU below the unit's fans (see Figure 3-6 on page 43).
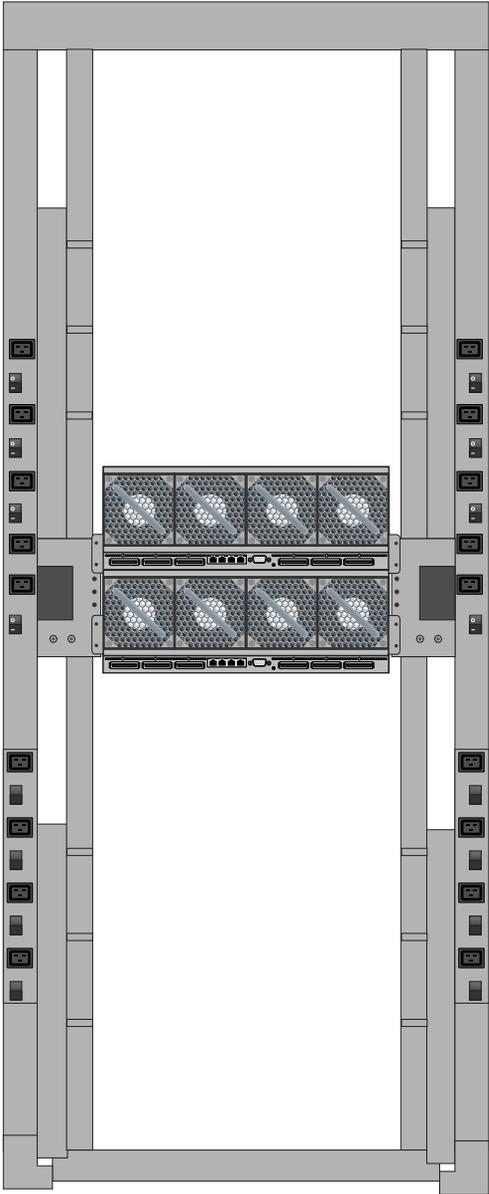
Figure 3-6   Altix UV 100 IRU Rear Components Example
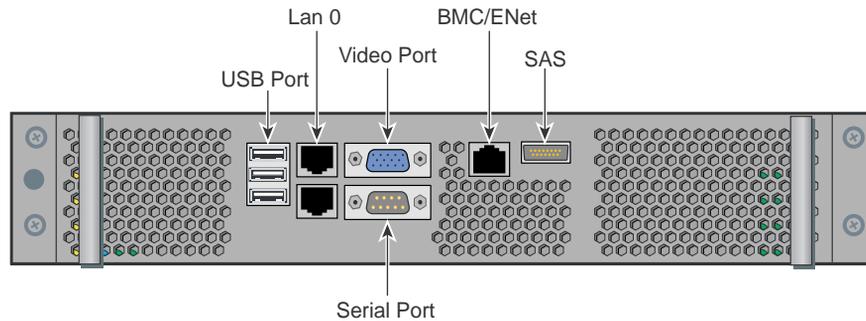
Figure 3-7   BaseIO Riser Enabled Blade Front Panel Example

Bay (Unit) Numbering

Bays in the racks are numbered using standard units. A standard unit (SU) or unit (U) is equal to 1.75 inches (4.445 cm). Because IRUs occupy multiple standard units, IRU locations within a rack are identified by the bottom unit (U) in which the IRU resides. For example, in a 42U rack, an IRU positioned in U01 through U03 is identified as U01.

Rack Numbering

Each rack is numbered with a three-digit number sequentially beginning with 001. A rack contains IRU enclosures, optional mass storage enclosures, and potentially other options. In a single compute rack system, the rack number is always 001.

Optional System Components

Availability of optional components for the SGI UV 100 systems may vary based on new product introductions or end-of-life components. Some options are listed in this manual, others may be introduced after this document goes to production status. Check with your SGI sales or support representative for current information on available product options not discussed in this manual.

Rack Information

This chapter describes the physical characteristics of the UV 100 racks in the following sections:

- "Overview" on page 45
- "Altix UV 100 Series Racks" on page 46

Overview

At the time this document was published the 20U, 40U and 42U Altix racks (shown in Figure 4-1 on page 47 through Figure 4-6 on page 52), were available from the SGI factory for use with the Altix UV 100 systems. Other racks may be available to house the system IRUs, check with your SGI sales or service representative for more information.

Altix UV 100 Series Racks

The SGI Altix UV 100 system racks (described in this chapter) have the following features and components:

- **Front and rear door**. The front door is opened by grasping the outer end of the rectangular-shaped door piece and pulling outward. It uses a key lock for security purposes that should open all the front doors in a multi-rack system (see Figure 4-5 on page 51).

   Note: The front door and rear door locks are keyed differently on all racks. The optional water-chilled rear door panels on the 42U rack (see Figure 4-6 on page 52) do not use a lock.

   The standard rear door has a push-button key lock to prevent unauthorized access to the system. The rear doors have a master key that locks and unlocks all rear doors in any system made up of multiple racks. You cannot use the rear door key to secure the front door lock.

- **Cable entry/exit area.** Cable access openings are located primarily in the bottom of the racks. The tall (40U and 42U) racks use top cable routing access when more than one rack is used in a system. Multiple cables are attached to the front of the IRUs; therefore, a significant part of the internal cable management occurs in the front part of the rack. The optional stand-alone system management node has cables that attach at the rear of the rack. Rear cable connections will also be required for optional storage modules installed in the same rack with the IRU(s). I/O and power cables normally pass through the bottom of each rack.

- **Rack structural features.** The rack is mounted on four casters; the two rear casters swivel. There are four leveling pads available at the base of the rack. The base of the rack also has attachment points to support an optional ground strap, and/or seismic tie-downs.

- **Power distribution units in the rack.** Two outlets minimum are required for a single IRU system as follows:

   - Allow two outlets for the first IRU

   - Two outlets are required for an optional system management node (server)

   - Optional PCIe expansion units require two outlets each

   - Allow two more outlets for each additional IRU in the system

The number and type of power distribution units (PDUs) your system rack uses is dependent on how many IRUs and other types of equipment are installed in the rack. Single phase PDUs are available in 2 and 8-outlet versions. Three phase PDUs have 9 outlets each.

The 20U (Short) Rack

The 20U Altix UV 100 rack holds up to six IRUs.

Table 4-1 lists the technical specifications of the Altix UV 100 short rack.

Table 4-1   Short (20U) Altix Rack Technical Specifications

Characteristic	Specification
Height	42.8 in. (108.7 cm)
Width	25.8 in. (65.5 cm)
Depth	40.9 in. (103.9 cm)
Weight (full)	~750 lb (340 kg)

Figure 4-1 and Figure 4-2 on page 48 show front and rear examples of the 20U rack used with Altix UV100 systems.
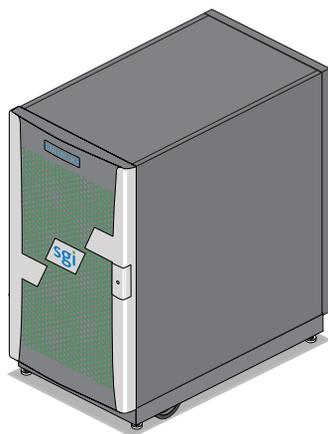
Figure 4-1   Altix UV 100 Short Rack Front View
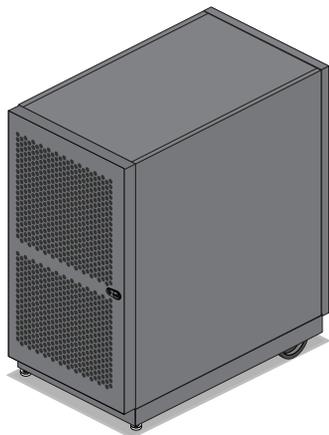
Figure 4-2   Altix UV 100 Short Rack Rear View

The 40U-tall Altix UV 100 Rack

The 40U-tall Altix UV 100 rack holds up to twelve UV 100 IRUs plus an optional system management node (SMN), PCIe expansion chassis or mass storage enclosure.

Table 4-2 provides the basic physical specifications of the 40U Altix rack. Figure 4-3 on page 49 shows an example of the 40U-tall Altix UV 100 rack.

Table 4-2   40U Altix Rack Technical Specifications

Characteristic	Specification
Height	79.48 in. (201.9 cm)
Width	27.34 in. (69.4 cm)
Depth	45.7 in. (116.1 cm)
Weight (full)	~1200 lbs (545 kg)
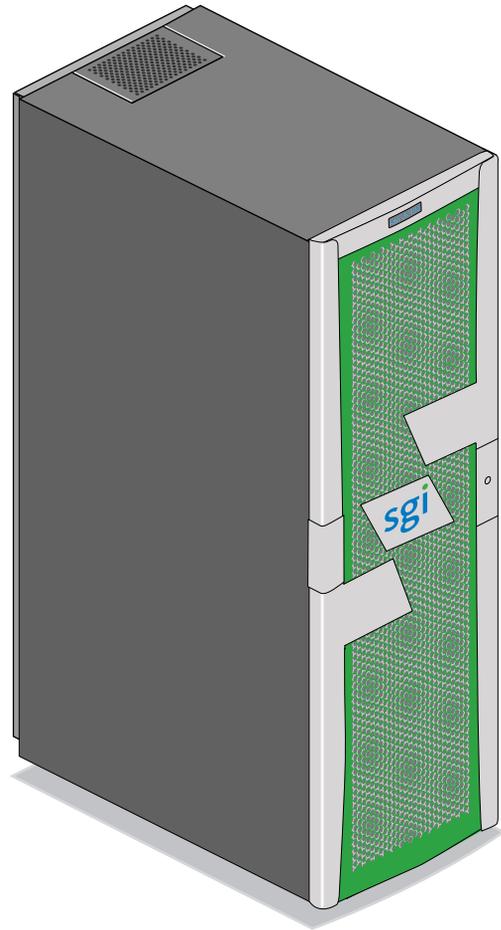
Figure 4-3   Altix UV 100 40U Rack Example

Figure 4-4 shows an example of the 42U Altix rack used with the UV 100 systems. Figure 4-5 on page 51 shows the front lock location for the 42U rack. Figure 4-6 on page 52 shows an example of the optional water-chilled cooling units on the 42U rack.
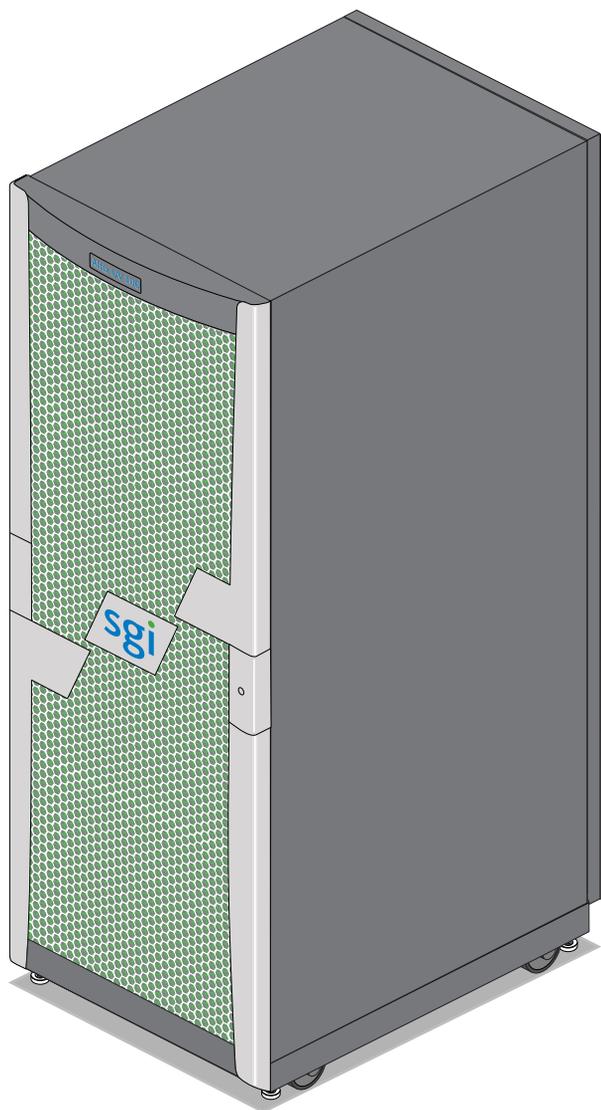
Figure 4-4   Altix UV 100 Series 42U Rack Example
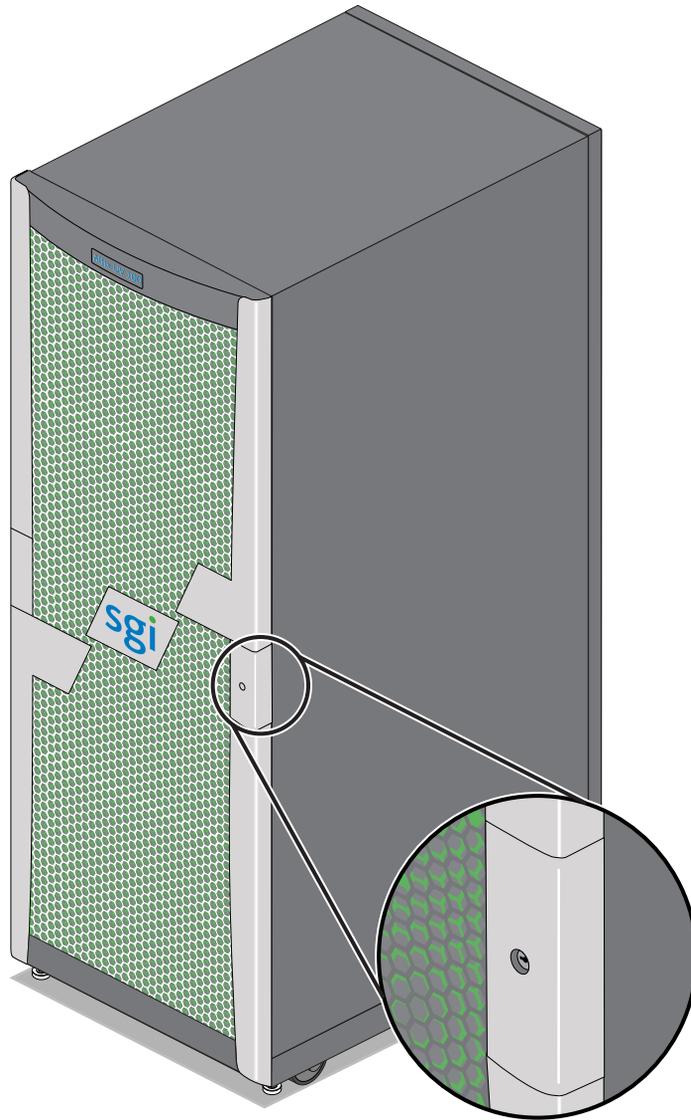
Figure 4-5   Front Lock on Tall (42U) Altix Rack
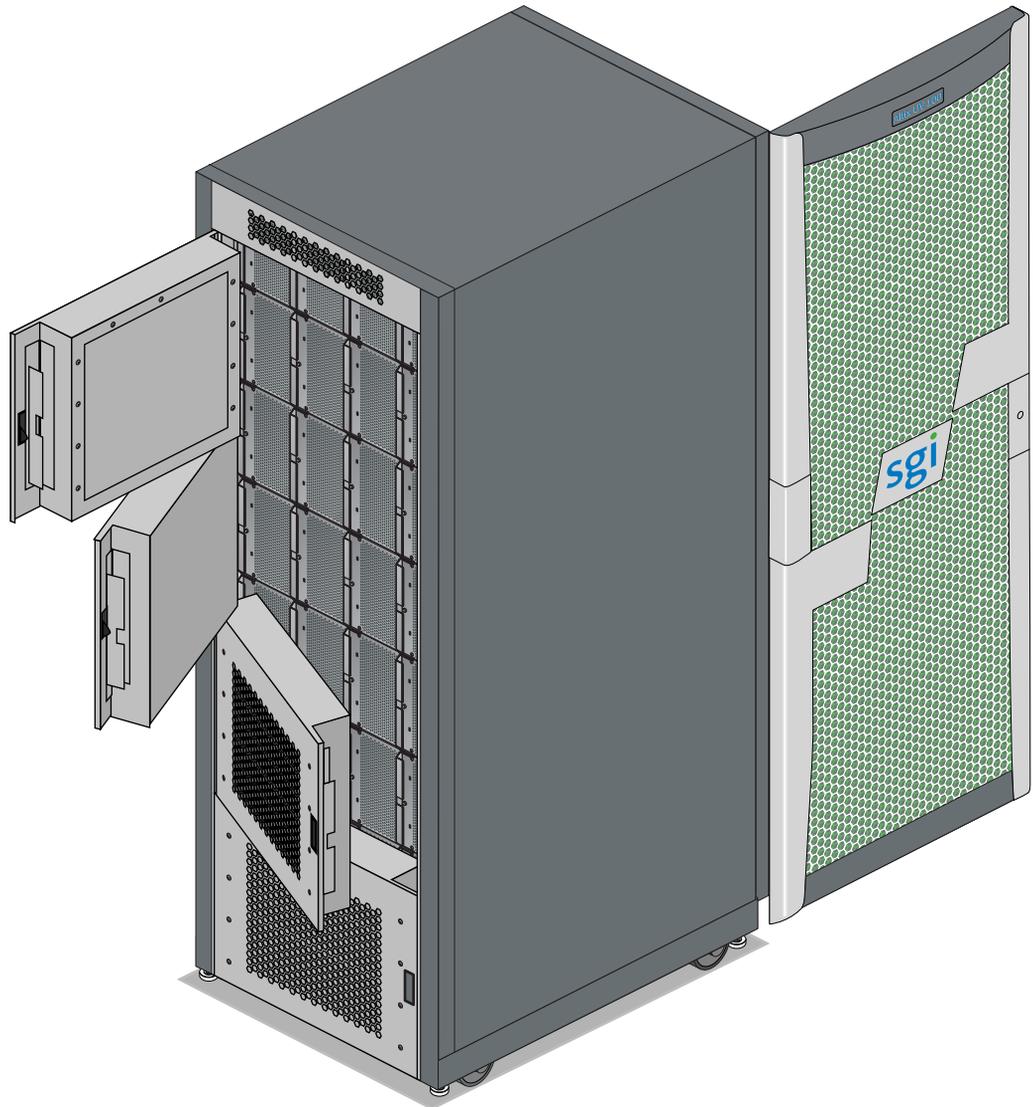
Figure 4-6   Optional Water-Chilled Doors on Rear of 42U Altix Rack

Altix 42U System Rack Technical Specifications

Table 4-3 lists the technical specifications of the Altix UV 100 series (42U) tall rack.

Table 4-3   Tall (42U) Altix Rack Technical Specifications

Characteristic	Specification
Height	79.5 in. (201.9 cm)
Width	31.3 in. (79.5 cm)
Depth	45.8 in. (116.3 cm)
Single-rack shipping weight (approximate)	1,370 lbs. (623 kg) air cooled
Single-rack system weight (approximate)	1,200 lbs. (545 kg) air cooled
Voltage range Nominal Tolerance range	North America/International 200-240 VAC /230 VAC 180-264 VAC
Frequency Nominal Tolerance range	North America/International 60 Hz /50 Hz 47-63 Hz
Phase required	Single-phase or 3-phase
Power requirements (max)	18 kW approximate
Hold time	16 ms
Power cable	8 ft. (2.4 m) pluggable cords

PCIe and Disk Add or Replace Procedures

This chapter provides information about installing and removing PCIe cards and system disk drives from your SGI system, as follows:

•   "Maintenance Precautions and Procedures" on page 55

•   "Adding or Replacing PCIe Cards" on page 58

•   "Remove or Replace a Blade Riser PCIe Board" on page 62

•   "Installing or Replacing a Drive" on page 66

Maintenance Precautions and Procedures

This section describes how to open the system for maintenance and upgrade, protect the components from static damage, and return the system to operation. The following topics are covered:

•   "Preparing the System for Maintenance or Upgrade" on page 56

•   "Returning the System to Operation" on page 56

Warning: To avoid problems that could void your warranty, your SGI or other approved system support engineer (SSE) should perform all the setup, addition, or replacement of parts, cabling, and service of your SGI Altix UV 100 system, with the exception of the following items that you can perform yourself:

•   Using your system console or network access workstation to enter commands and perform system functions such as powering on and powering off, as described in this guide.

•   Installing, removing or replacing PCIe cards in the optional 1U PCIe expansion chassis or two-card PCIe riser blade.

•   Installing or replacing hard disk or DVD drives in the IRU.

•   Using the ESI/ops panel (operating panel) on optional mass storage.

Preparing the System for Maintenance or Upgrade

To prepare the system for maintenance, follow these steps:

1. If you are logged on to the system, log out. Follow standard procedures for gracefully halting the operating system.

2. Go to the section "Powering the System On and Off" on page 8 if you are not familiar with power down procedures.

3. After the system is powered off, locate the power distribution unit(s) (PDUs) in the front of the rack and turn off the circuit breaker switches on each PDU.

Returning the System to Operation

When you finish installing or removing components, return the system to operation as follows:

1. Turn each of the PDU circuit breaker switches to the "on" position.

2. Power up the system. If you are not familiar with the proper power-on procedure, review the section "Powering the System On and Off" on page 8.

3. Verify that the LEDs on the system power supplies and system blades turn on and illuminate green which indicates that the power-on procedure is proceeding properly.

If your system does not boot correctly, see "Troubleshooting Chart" in Chapter 6, for troubleshooting procedures.

Overview of PCI Express (PCIe) Operation

This section provides a brief overview of the PCI Express (PCIe) technology available as an option with your system. PCI Express has both compatibility and differences with older PCI/PCI-X technology. Check with your SGI sales or service representative for more detail on specific PCI Express board options available with the SGI Altix UV 100.

PCI Express is compatible with PCI/PCI-X in the following ways:

- Compatible software layers

- Compatible device driver models

- Same basic board form factors

- PCIe controlled devices appear the same as PCI/PCI-X devices to most software

PCI Express technology is different from PCI/PCI-X in the following ways:

- PCI Express uses a point-to-point serial interface vs. a shared parallel bus interface used in older PCI/PCI-X technology

- PCIe hardware connectors are not compatible with PCI/PCI-X, (see Figure 5-1)

- Potential sustained throughput of x16 PCI Express is approximately four times that of the fastest PCI-X throughputs

PCI 2.0 32-bit

PCI Express x1
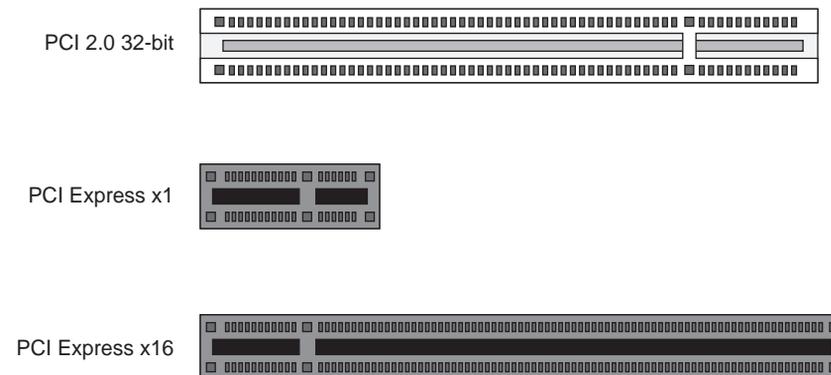
PCI Express x16

Figure 5-1   Comparison of PCI/PCI-X Connector with PCI Express Connectors

PCI Express technology uses two pairs of wires for each transmit and receive connection (4 wires total). These four wires are generally referred to as a lane or x1 connection - also called "by 1".

SGI Altix UV 100 PCIe technology is available up to a x16 connector (64 wires) or "by 16" in PCI Express card slots. This technology will support PCIe boards that use connectors up to x16 in size. Table 5-1 shows this concept.

For information on which slots in the PCIe expansion chassis support what lane levels, see Table 5-2 on page 59.

Table 5-1   SGI Altix UV 100 PCIe Support Levels

SGI x16 PCIe Connectors	Support levels in optional four card chassis
x1 PCIe cards	Supported in all four slots
x2 PCIe cards	Supported in all four slots
x4 PCIe cards	Supported in all four slots
x8 PCIe cards	Supported in two slots
x16 PCIe cards	1 slot supported
x32 PCIe cards	Not supported

Adding or Replacing PCIe Cards

Warning: Before installing, operating, or servicing any part of this product, read the "Safety Information" on page 79.

This section provides instructions for adding or replacing a PCIe card in a PCIe expansion enclosure installed in your system. To maximize the operating efficiency of your cards, be sure to read all the introductory matter before beginning the installation.

Caution: To protect the PCIe cards from ESD damage, SGI recommends that you use a grounding wrist strap while installing a PCIe card.

Installing Cards in the 1U PCIe Expansion Chassis

The PCIe expansion chassis functions in a similar manner to a computer chassis that supports PCIe slots. Always follow the manufacturer's instructions or restrictions for installing their card.

Important: Replacement (swapping) of a PCIe card in the 1U chassis may be done while the system is powered on. Addition of a new card while the system is running requires a reboot to initiate recognition and functionality. Removal (without replacement) of an existing PCIe card may cause system error messages. When installing PCIe cards, ensure that the input current rating specified on the AC input label is not exceeded.

The EB4-1U-SGI optional PCIe chassis provides space for up to four PCIe cards (see Table 5-2) in the following "lane" bandwidth configurations:

Table 5-2   PCIe Expansion Slot Bandwidth Support Levels

PCIe expansion enclosure slot #	PCIe connector level supported by slot	PCIe slot number location in board "carriage"
Slot 1	Up to x16	Bottom-left side
Slot 2	Up to x4	Top-left side
Slot 3	Up to x8	Top-right side
Slot 4	Up to x4	Bottom-right side

Note: Before installing the PCIe expansion cards, be sure to remove each respective slot cover and use its screw to secure your expansion card in place.

1. Working from the front of the expansion chassis, locate the two "thumb screws" that hold the PCIe board "carriage" in the expansion chassis, see Figure 5-2 on page 60.

2. Turn the two thumb screws counter-clockwise until they disengage from the 1U chassis.

3. Pull the T-shaped board "carriage" out of the chassis until the slots are clear of the unit, see Figure 5-3 on page 61 for an example.

4. Select an available slot based on the lane support your PCIe card requires, see Table 5-2.

5. Remove the metal slot cover from the selected slot and retain its screw.

6. Fit the PCIe card into the slot connector with the connector(s) extending out the front of the bracket, then secure the board with the screw that previously held the metal slot cover.

7. Push the PCIe board "carriage" back into the enclosure until it is seated and twist the retaining thumb screws clockwise (right) until fully secure.

Important: After installation of a new card, be sure to power on the PCIe expansion enclosure before re-booting your system.
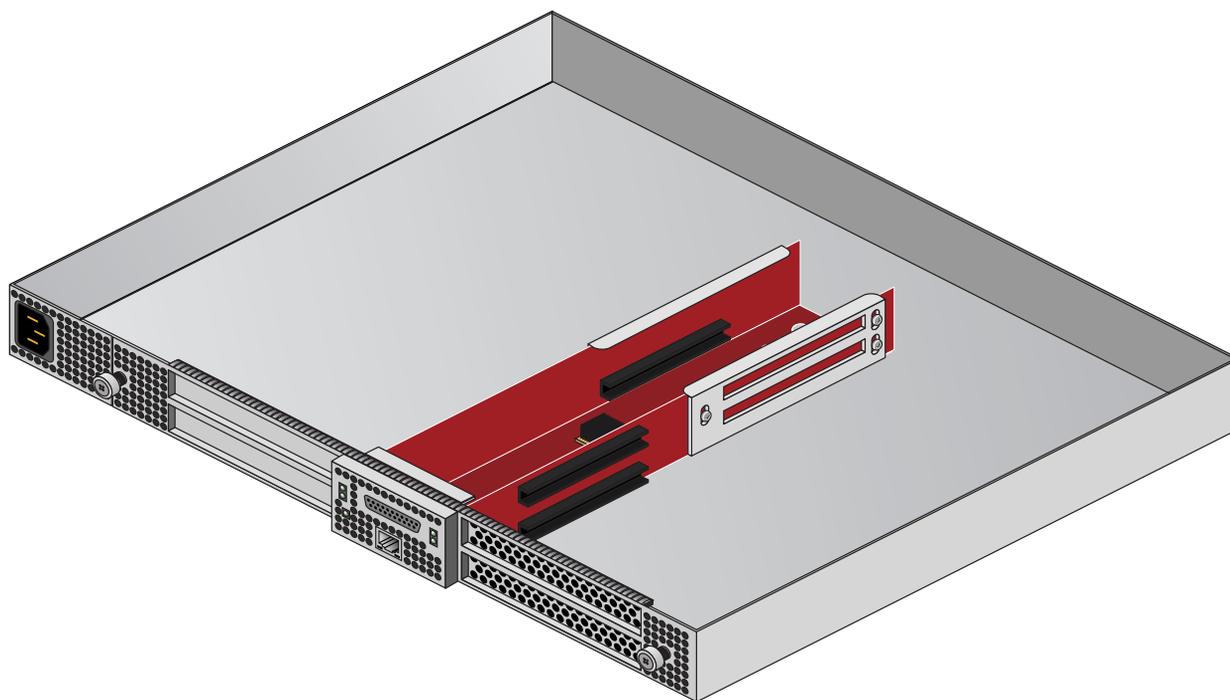
Figure 5-2   The PCIe Expansion Enclosure
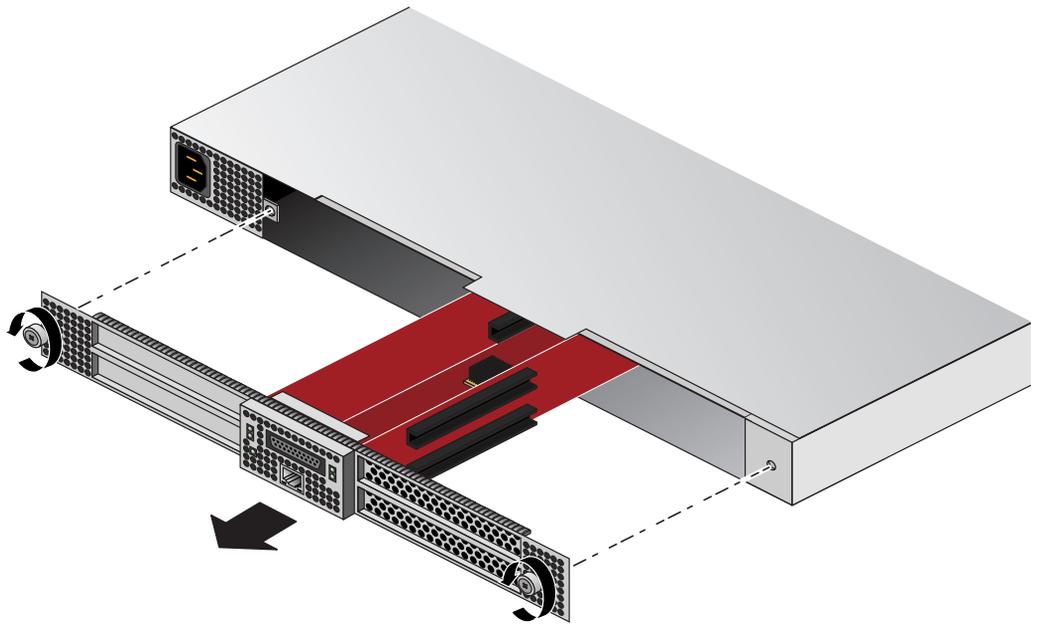
Figure 5-3   Card Slot Locations in "PCIe Carriage"

Remove or Replace a Blade Riser PCIe Board

If your system is equipped with an optional PCIe riser blade, you can install or replace PCIe cards (up to x16) using the following steps and illustrations:

1. Obtain a T10 torx driver to perform the necessary disassembly of the blade. It is recommended that you use an anti-static wrist strap during this procedure.

2. Shut down the system or the individual blade you will be upgrading and open the front door of the rack.

3. Grasp the front pull bars and depress the black release button on the blade and pull it out of the IRU. Place it on a flat static-safe working surface.
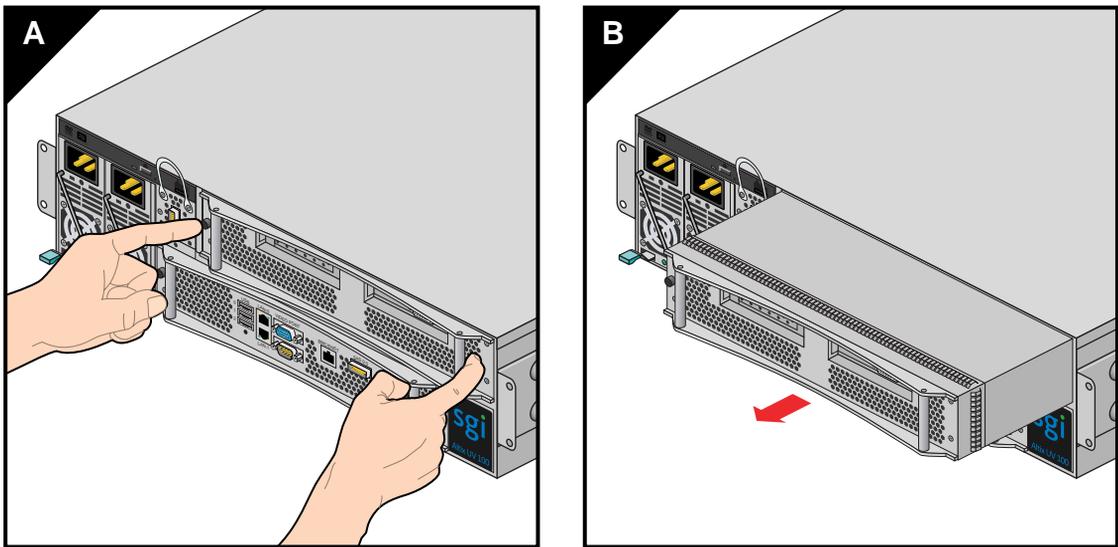
Figure 5-4   Extracting the PCIe Riser Blade From the Enclosure

4. Unscrew and remove the two T10 torx-head screws located on either side of the rear part of the blade's sheetmetal housing, (see Figure 5-5 on page 63). Set the screws aside for the re-installation process.

5. Slide the blade's sheetmetal cover back slightly and then lift it away from the unit.

6. Near the front of the blade you will remove a single T10 torx-head screw from the C-shaped bracket that holds both of the optional PCIe cards in place on the blade's riser board. Set the screw aside for the reinstallation process.
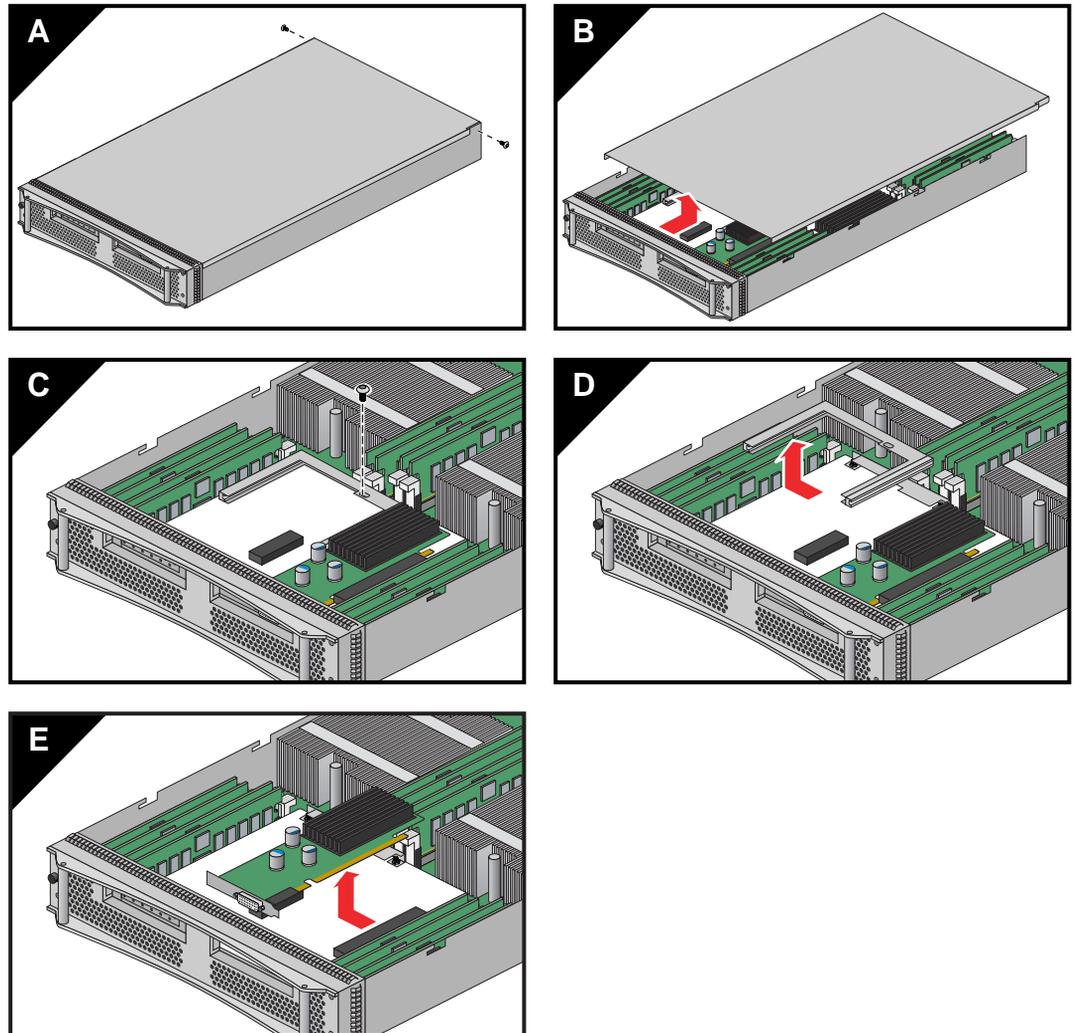
Figure 5-5   Remove PCIe Card from the Riser Blade

7. If you are replacing a PCIe card, gently remove the existing board from the PCIe connector on the riser and place in static safe bag or container.

8. Install a new PCIe card by aligning the board's interface connector with the riser's and inserting until the card is flush to the connector, see Figure 5-6. The PCIe functional connector(s) such as graphics, Fibre Channel, etc. should protrude from the front of the blade.
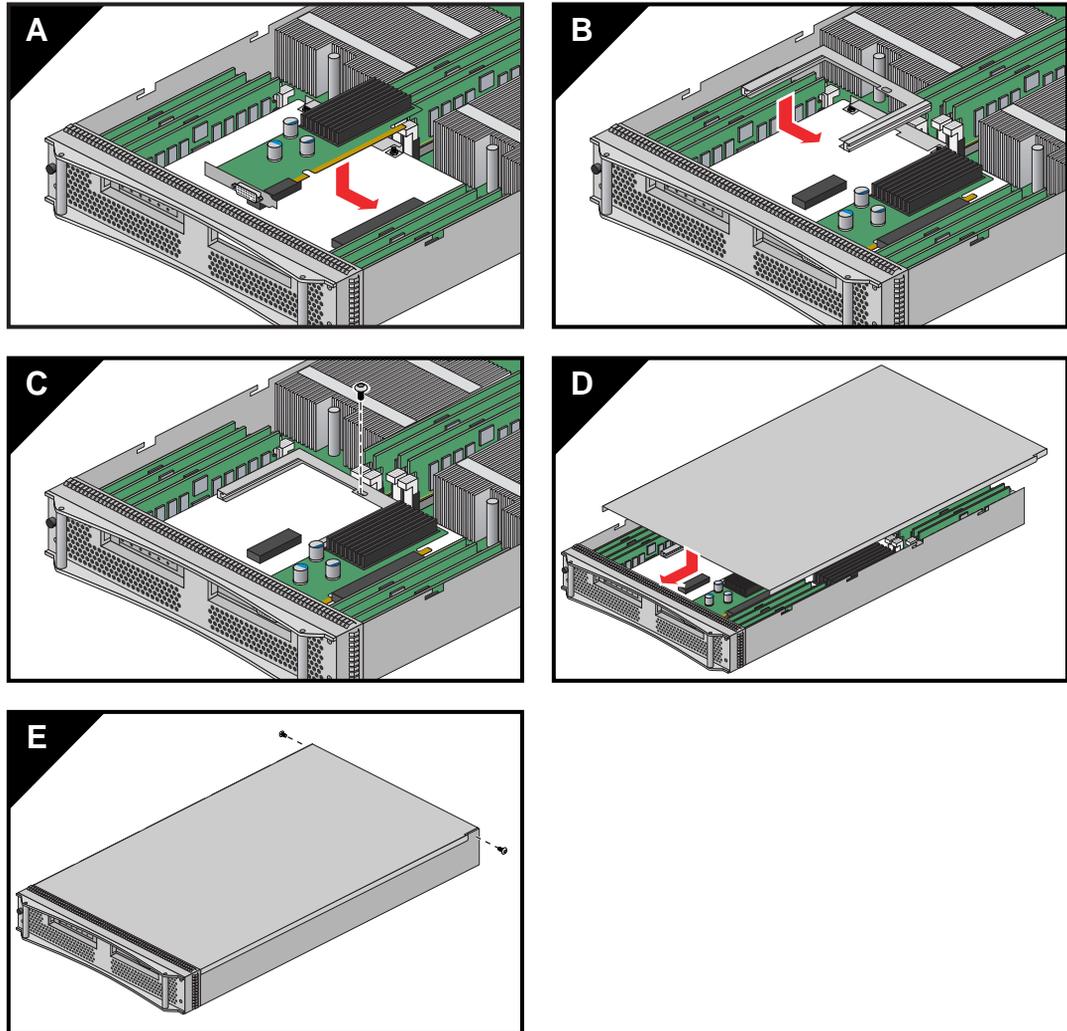
Figure 5-6   Replace PCIe Card

9. Re-secure the C-shaped bracket that holds the PCIe option cards in place on the blade's riser.

10. Replace the blade's sheetmetal top cover and securing screws.

11. Slide the blade back into the IRU and restart the system or blade, see Figure 5-7 for an example.
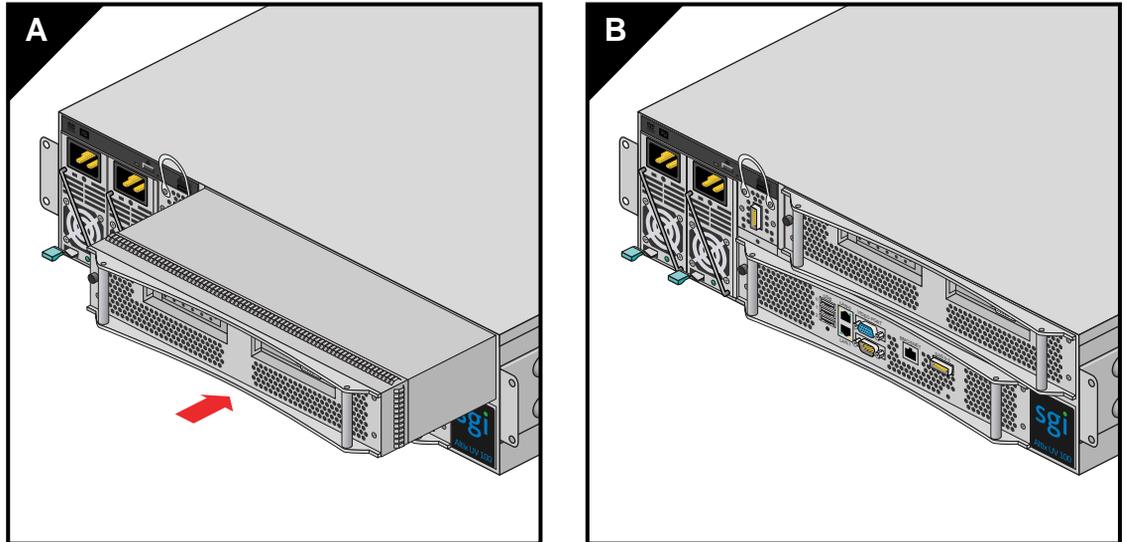
Figure 5-7   Reinstall PCIe Riser Blade in the UV 100

Installing or Replacing a Drive

The Altix UV 100 IRU holds up to four hard disk drives or one optional DVD and three hard drives in a tray. The drive tray is located in the upper left-hand corner of the IRU (above the system power supplies (see Figure 5-8). The drive-tray interface cabling supports four devices total. You can operate the DVD and three hard drives at the same time. Optionally - you can operate four hard disk drives in the enclosure drive tray if you are not using a DVD drive.
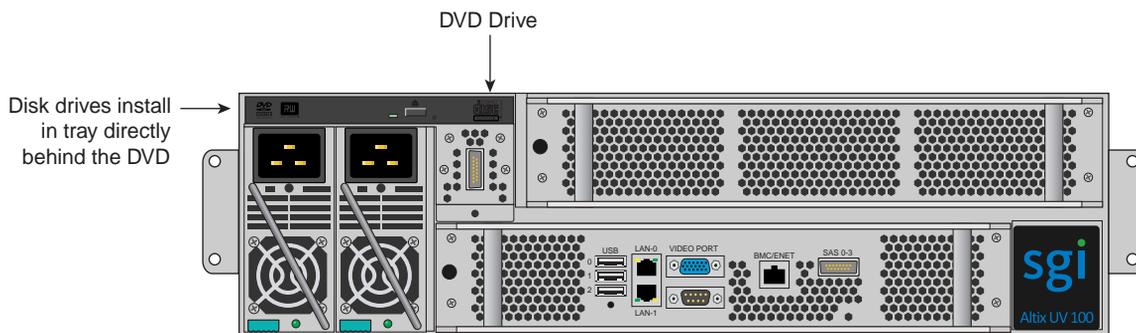
Figure 5-8   Location of Disk Drive Tray

Tools Needed to Replace a Drive

Each hard disk drive in the Altix UV 100 IRU drive tray is secured by four 1/4-inch (6.35 mm) locked nuts. These nuts secure the drive's "mounting bracket" to fixed screws attached to the sheet metal tray used in the IRU. You will need a 7/32-inch (5.56 mm) nut driver or adjustable wrench to remove/replace hard disk drives.

The optional DVD drive is secured to the front section of the IRU's drive tray via Torx-head screws. Use a T10 Torx driver to remove/replace the DVD's retention screws.

Hard Drive Remove and Replace Procedures

Use the following steps and illustrations to add or replace a hard disk drive in the Altix UV 100:

1. Shut down the IRU's operating system. Use the instructions in Chapter 1 of this manual if you are unfamiliar with the procedure.

2. Unplug both the IRU's power supplies.

3. Unplug the SAS drive cable from the front of the drive tray (next to the power supplies).

4. Undo the drive tray retention screw by inserting a T10 Torx driver into the screw hole directly below the SAS cable connection you removed in the previous step.

5. Remove the retention screw and set it aside, see Figure 5-9 for an example.

6. Grasp the handle just above the SAS connector on the tray and pull it straight out until you can place your other hand under it for support.

Figure 5-9   UV 100 Drive Tray Removal

7. Continuing to support the center part of the tray, pull it fully out of the enclosure and place on a static-free working surface.

8. If replacing an existing hard disk drive, undo the four 7/32-inch (5.56 mm) locking nuts holding it to the drive tray; then unplug the power/data cable and extract the drive. See Figure 5-10 on page 68 for an example.

9. Select the tray location for the new hard disk drive. If the new drive is not equipped with a UV 100 style mounting bracket (sled), remove the old drive's sled and install the hardware on the replacement drive. Check with your support provider if you do not have the appropriate sled hardware to install additional drives in the tray.

10. Align the four holes in the new drive's sled with the four screws on the system drive tray. Be sure that the new drive's power/data connector is facing towards the interior of the IRU where the drive interface cables are routed. See Figure 5-11 on page 69 for an example.
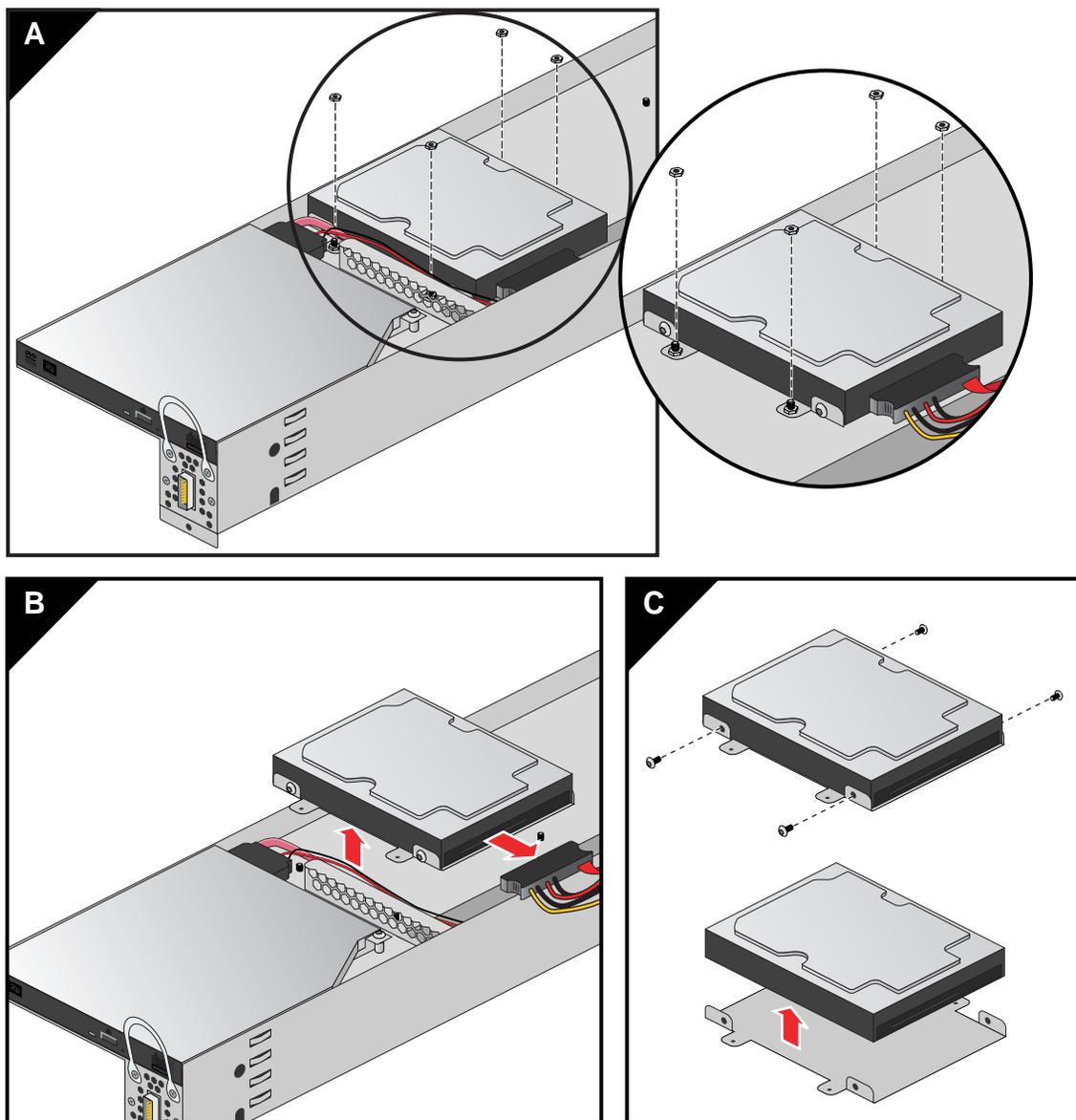
Figure 5-10   Hard Disk Drive Remove Example
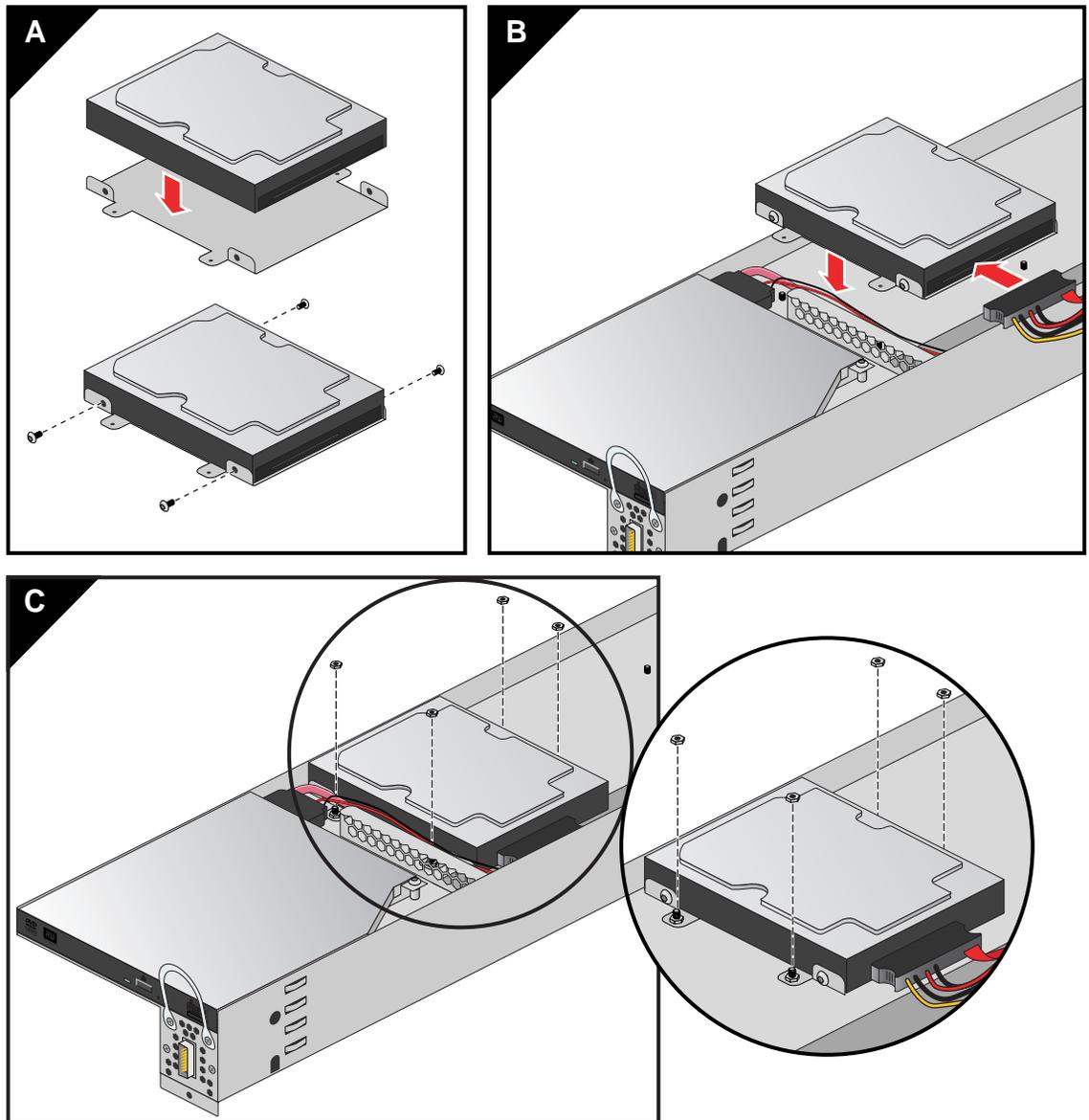
Figure 5-11   Install New Disk Drive Example

11. With the new drive in place, secure it with four 7/32-inch (5.56 mm) locking nuts and attach the power/data connector.

12. Slide the drive tray back into position and secure it with the T10 screw removed in step 1.
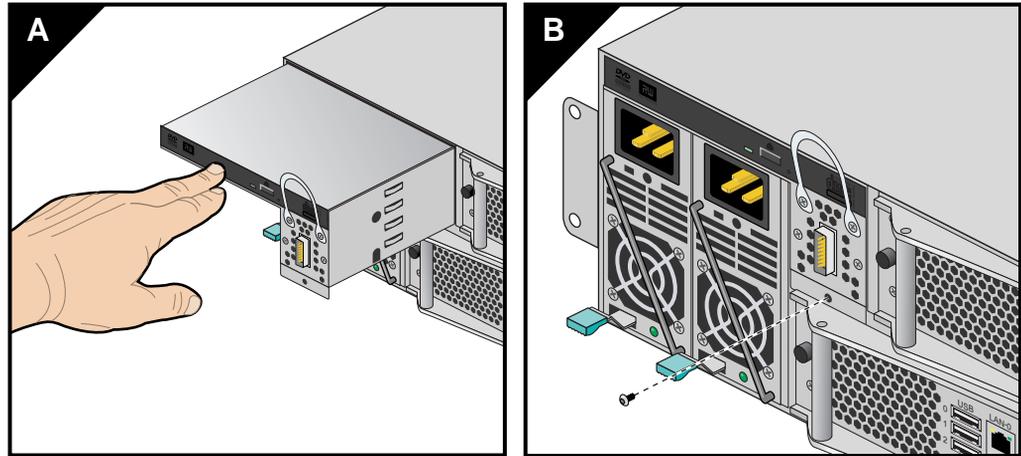
Figure 5-12   Replace the Disk Drive Tray

Installing or Replacing a DVD Drive

Use the following steps and illustrations to install or replace a DVD drive in the IRU:

1. Shut down the IRU's operating system. Use the instructions in Chapter 1 of this manual if you are unfamiliar with the procedure.

2. Unplug both the IRU's power supplies.

3. Unplug the SAS drive cable from the front of the drive tray (next to the power supplies).

4. Undo the drive tray retention screw by inserting a T10 Torx driver into the screw hole directly below the SAS cable connection you removed in the previous step.

5. Remove the retention screw and set it aside.

6. Grasp the handle just above the SAS connector on the tray and pull it straight out until you can place your other hand under it for support.
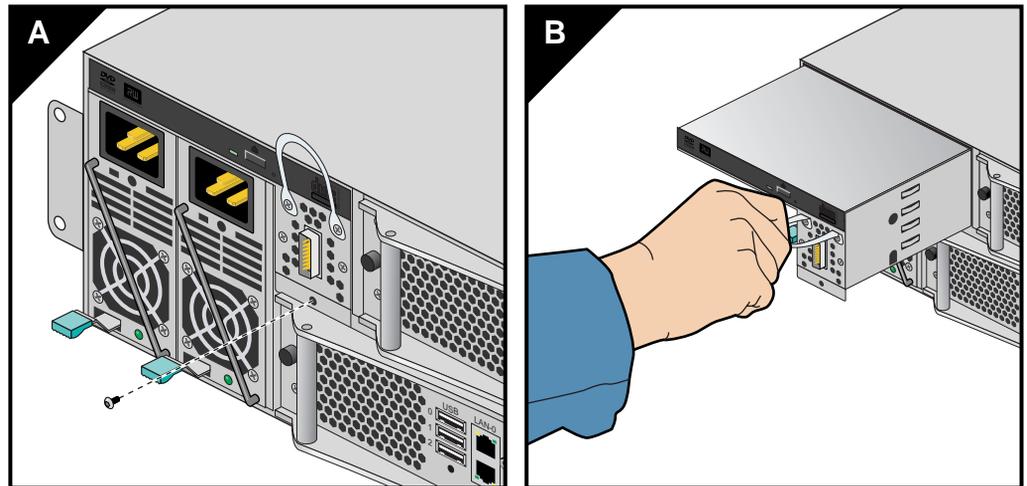
7. Continuing to support the center part of the tray, pull it fully out of the enclosure and place on a static-free working surface.
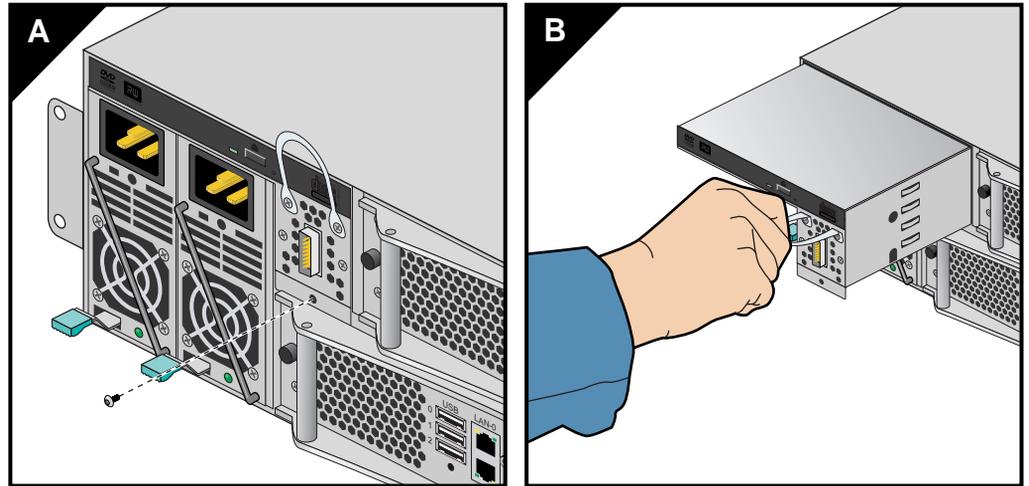
Figure 5-13   UV 100 Drive Tray Removal

8. Remove the two torx screws that hold the front handle on the tray, then remove the front handle. Skip the next four steps if no DVD is currently installed on the drive tray.

9. If replacing an existing DVD drive, unscrew the T10 Torx screw that holds the DVD's "L"-shaped retention bracket in place and set it aside, see Figure 5-14 for an example.

10. Disconnect the existing power and data cables from the failed DVD.

11. Pull the DVD forward and then up to free the DVD from the tray.

12. Remove the two screws from the metal brackets on the left and right sides of the DVD (four screws total). Note that the metal bracket has little hooks in the front to secure the front of the DVD to the tray.
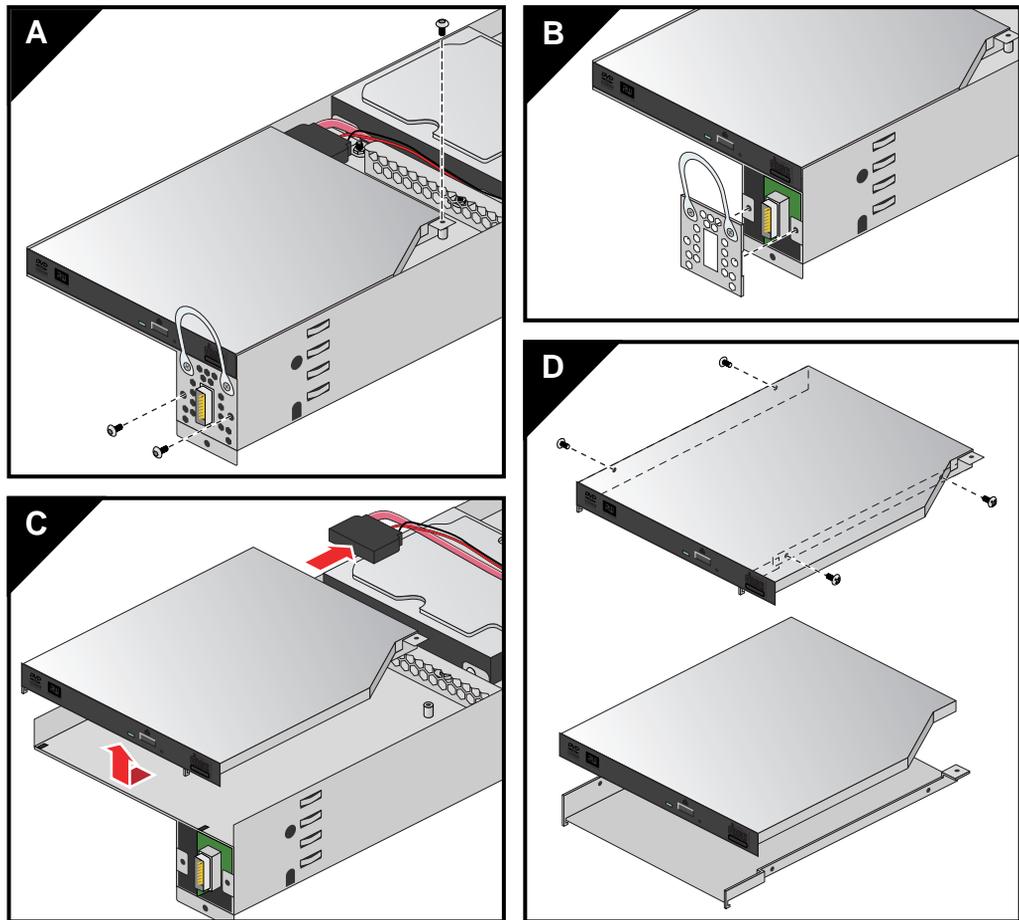
Figure 5-14   UV 100 DVD Removal

13. Install the two screws from the metal brackets on the left and right sides of the new DVD (four screws total). See Figure 5-15 for an example.

14. Plug the DVD power and data cables into the new DVD drive and place it within the "L"-shaped bracket - the front of the drive should face the end of the drive tray.

15. Place the DVD back onto the tray and slide it back making sure the front hooks of the metal brackets secure the front of the DVD to the tray.

16. Screw the "L" bracket retention screw back into the drive tray so that the DVD is held firmly in place within the tray.
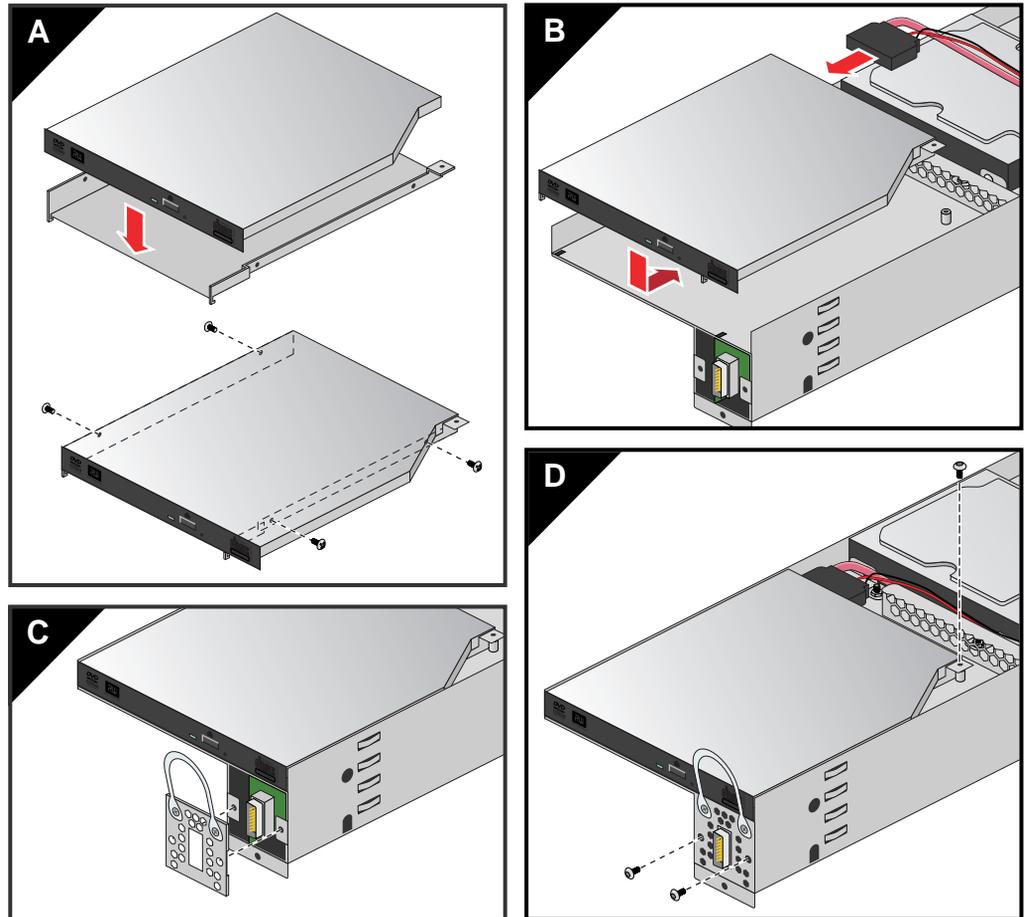
Figure 5-15   Replace the DVD Drive

17. Replace the tray's front handle using the two torx screws previously removed.

18. Carefully slide the drive tray back into the Altix UV 100 enclosure and secure it to the enclosure with the screw removed in step 5. See Figure 5-16 for an example.
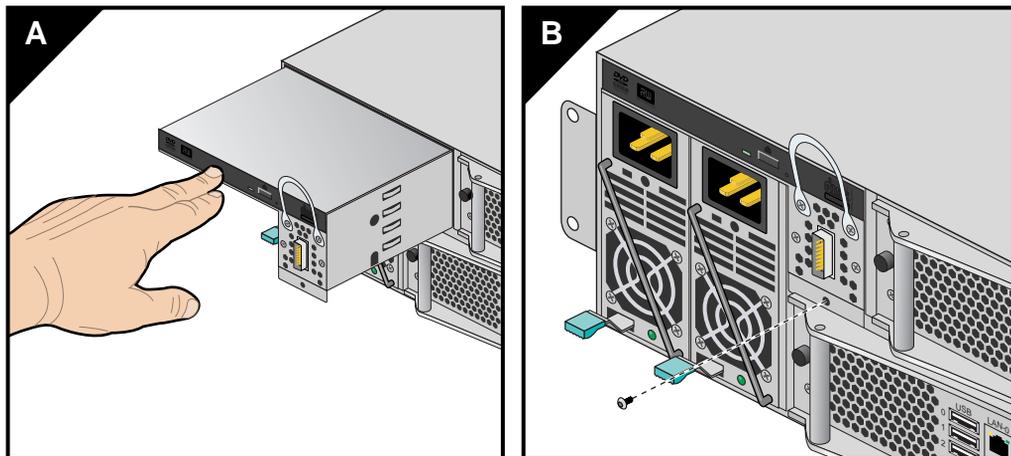
Figure 5-16   Replace the DVD Tray in the Enclosure

19. Plug the SAS cable back into the connector on the front of the drive tray.

20. Reconnect both of the IRU's power supplies and restart the system. Use the instructions in Chapter 1 of this manual if you are unfamiliar with the power-on procedure.

Troubleshooting and Diagnostics

This chapter provides the following sections to help you troubleshoot your system:

- "Troubleshooting Chart" on page 76
- "LED Status Indicators" on page 77
- "SGI Electronic Support" on page 80

Troubleshooting Chart

Table 6-1 lists recommended actions for problems that can occur. To solve problems that are not listed in this table, use the SGI Electronic Support system or contact your SGI system support engineer (SSE). For more information about the SGI Electronic Support system, see the "SGI Electronic Support" on page 80.

Table 6-1   Troubleshooting Chart

Problem Description	Recommended Action
The system will not power on.	Ensure that the power cords of the IRU are seated properly in the power receptacles.
	Ensure that the PDU circuit breakers are on and properly connected to the wall source.
	If the power cord is plugged in and the circuit breaker is on, contact your SSE.
An individual IRU will not power on.	Ensure the power cables of the IRU are plugged in.
	Confirm the PDU(s) supporting the IRU are on.
The system will not boot the operating system.	Contact your SSE.
An amber LED illuminates on a blade.	See Table 6-2 on page 77 for a description of the status message.
The amber (yellow) status LED of a power supply is lit or the LED is not lit at all. See Table 6-2 on page 77.	Ensure the power cable to the supply is firmly connected at both ends and that the PDU is turned to on. Check and confirm the supply is fully plugged into it's slot. If the green LED does not light, contact your support engineer.
The PWR LED of a populated PCIe slot is not illuminated.	Reseat the PCI card.
The Fault LED of a populated PCIe slot is illuminated (on).	Reseat the card. If the fault LED remains on, replace the card.
The amber LED of a disk drive is on.	Replace the disk drive.

LED Status Indicators

There are a number of LEDs on the front of the IRUs that can help you detect, identify and potentially correct functional interruptions in the system. The following subsections describe these LEDs and ways to use them to understand potential problem areas.

IRU Power Supply LEDs

Each power supply installed in an IRU has a bi-color status LED. The LED will either light green or amber (yellow), or flash green or yellow to indicate the status of the individual supply. See Table 6-2 for a complete list.

Table 6-2   Power Supply LED States

Power supply status	Green LED	Amber LED
No AC power to the supply	Off	Off
Power supply has failed	Off	On
Power supply problem warning	Off	Blinking
AC available to supply (standby) but IRU is off	Blinking	Off
Power supply on (IRU on)	On	Off

Compute/Memory Blade LEDs

Each compute/memory blade installed in an IRU has a total of 19 LED indicators visible behind the perforated sheetmetal of the blade. Note that the heartbeat LEDs may not be available or functional on all versions of the compute blades:

At the bottom end (or left side) of the blade:

- There are 8 amber heartbeat LEDs
- One green 12V power good LED
- One blue unit identifier (UI) LED
- One green 3.3V auxiliary power LED

At the top end (or right side) of the blade:

- There are four green NumaLink status LEDs

- An auxiliary power good green LED

- System power good green LED

- Ethernet 0 green LED

- Ethernet 1 green LED

If the blade is properly seated and the system is powered on and there is no LED activity showing on the blade, it must be replaced. Table 6-3 lists the blade's LED status information, Figure 6-1 on page 79 shows the locations of the blade LEDs.

Table 6-3   Altix UV Blade LED Status Information

LED #	LED color	LED status information/message
01	Amber	CPU 0 heartbeat
02	Amber	CPU 1 heartbeat
03	Amber	CPU 0 heartbeat
04	Amber	CPU 1 heartbeat
05	Amber	CPU 0 heartbeat
06	Amber	CPU 1 heartbeat
07	Amber	CPU 0 heartbeat
08	Amber	CPU 1 heartbeat
09	Green	12V power good to blade
10	Blue	Unit (blade) Identifier - blade is selected when lighted
11	Green	3.3V auxiliary power is present on the blade
12	Green	NUMALink 0 status on blade
13	Green	Auxiliary power to blade is good
14	Green	NUMALink 01 status on blade
15	Green	System power to blade is good

Table 6-3 (continued)   Altix UV Blade LED Status Information

LED #	LED color	LED status information/message
16	Green	NUMALink 02 status on blade
17	Green	Ethernet 0 activity on blade
18	Green	NUMALink 03 status on blade
19	Green	Ethernet 1 activity on blade
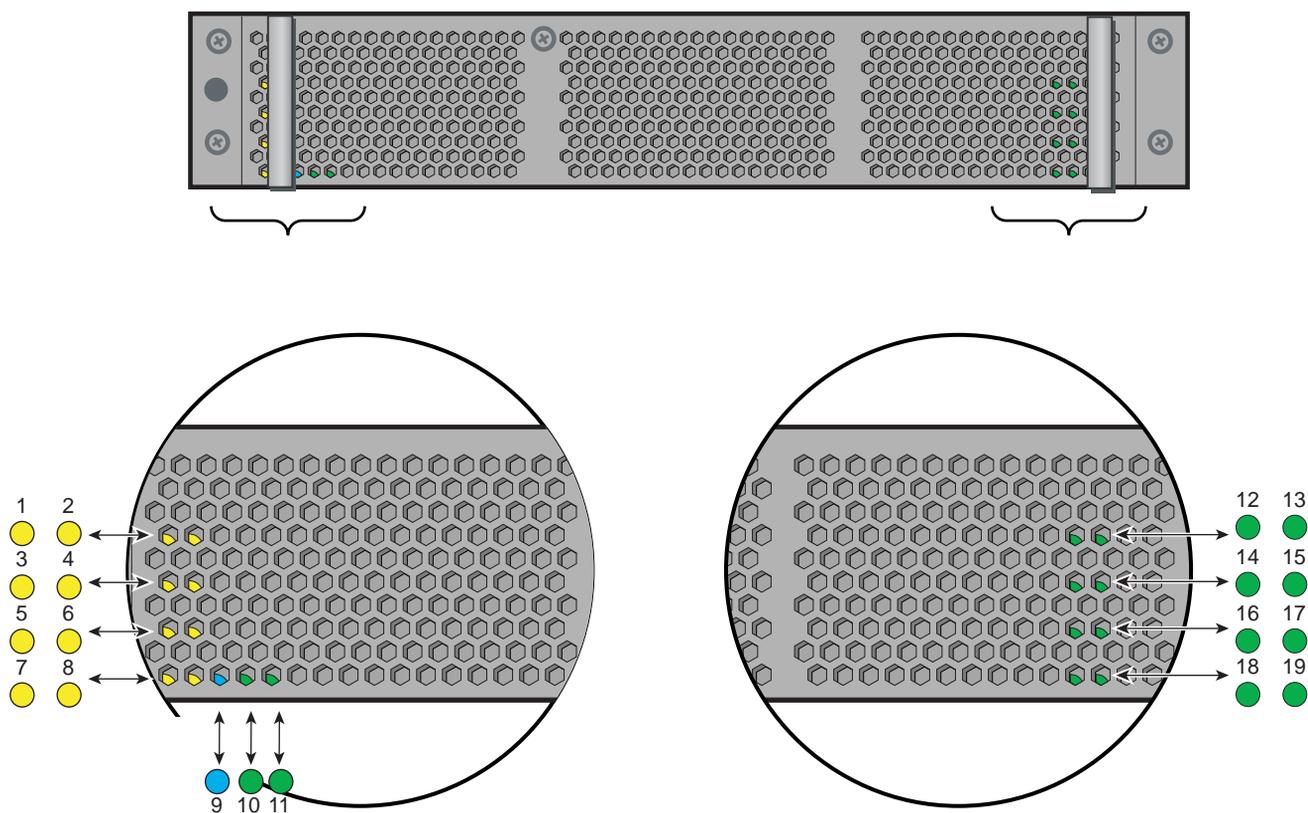
Figure 6-1   UV Compute Blade Status LED Locations

SGI Electronic Support

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

Figure 6-2 shows the sequence of events that occurs if you use all of the SGI Electronic Support capabilities.
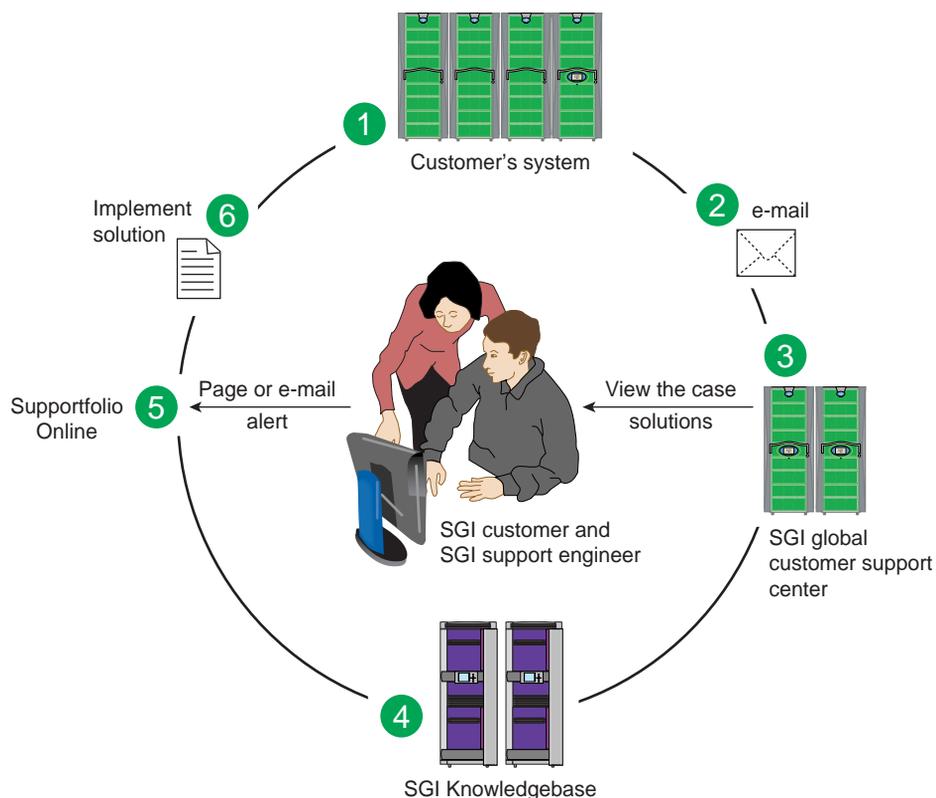
Figure 6-2   Full Support Sequence Example

The sequence of events can be described as follows:

1. Embedded Support Partner (ESP) software monitors your system 24 hours a day.

2. When a specified system event is detected, ESP notifies SGI via e-mail (plain text or encrypted).

3. Applications that are running at SGI analyze the information, determine whether a support case should be opened, and open a case if necessary. You and SGI support engineers are contacted (via pager or e-mail) with the case ID and problem description.

4. SGI Knowledgebase searches thousands of tested solutions for possible fixes to the problem. Solutions that are located in SGI Knowledgebase are attached to the service case.

5. You and the SGI support engineers can view and manage the case by using Supportfolio Online as well as search for additional solutions or schedule maintenance.

6. Implement the solution.

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

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

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

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

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

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

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

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

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

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

Technical Specifications and Pinouts

This appendix contains technical specification information about your system, as follows:

- "System-level Specifications" on page 83
- "Physical Specifications" on page 84
- "Environmental Specifications" on page 85
- "Power Specifications" on page 86
- "I/O Port Specifications" on page 87

System-level Specifications

Table A-1 summarizes the Altix UV 100 system configuration ranges. Note that while each compute/memory board can house two processor sockets; each socket can potentially hold four, six or eight processor "cores".

Table A-1   Altix UV 100 System Configuration Ranges

Category	Minimum	Maximum
Processors	8 processor cores (1 blade)[a]	768 processor cores
Individual Rack Units (IRUs)	1 per rack	12 per rack
Blades per IRU	1 per IRU	2 per IRU
Compute/memory blade DIMM capacity	8 DIMMs per blade	16 DIMMs per blade
CMC units	1 per IRU	1 per IRU
Number of BaseIO riser enabled blades	One per SSI	One per SSI

a. Dual-socket blades support eight to 16 cores per blade.

Physical Specifications

Table A-2 shows the physical specifications of the Altix UV 100 system.

Table A-2   Altix UV 100 Physical Specifications (42U rack)

Feature	Specification
Dimensions for a single 24-inch wide tall (42U) rack, including doors and side panels	Height: 79.5 in. (201.9 cm) Width: 31.3 in. (79.5 cm) Depth: 43.45 in. (110. 4 cm)
Shipping dimensions	Height: 81.25 in. (206.4 cm) Width: 42 in. (106.7 cm) Depth: 51 in. (129.5 cm)
Single-rack shipping weight (approximate)	1,370 lbs. (623 kg) air cooled
Single-rack system weight (approximate)	1,200 lbs. (545 kg) air cooled
Access requirements	
Front	48 in. (121.9 cm)
Rear	48 in. (121.9 cm)
Side	None

Environmental Specifications

Table A-3 lists the environmental specifications of the system.

Table A-3   Environmental Specifications

Feature	Specification
Temperature tolerance (operating)	+5 °C (41 °F) to +35 °C (95 °F) (up to 1500 m / 5000 ft.) +5 °C (41 °F) to +30 °C (86 °F) (1500 m to 3000 m /5000 ft. to 10,000 ft.)
Temperature tolerance (non-operating)	-40 °C (-40 °F) to +60 °C (140 °F)
Relative humidity	10% to 80% operating (no condensation) 8% to 95% non-operating (no condensation)
Power consumption full Altix UV 100 (rack)	18 kW approximate
Cooling requirement	Ambient air or optional water cooling
Air flow: intake (front), exhaust (rear)	Approximately 2,800 CFM (normal operation)
Maximum altitude	10,000 ft. (3,049 m) operating 40,000 ft. (12,195 m) non-operating

Power Specifications

Table A-4 shows the power specifications for the system.

Table A-4   Power Specifications

Feature	Specification
Single-phase power requirements	
Voltage	200-240V (180-254 VAC min/max)
Frequency	50-60 Hz
Power	~18 kW maximum per tall rack
Hold-up time	16 ms
Three-phase power requirements	
Voltage	US/Japan 208V (180-254 VAC)
	International 400V (312-440 VAC)
Frequency	50-60 Hz
Power	~18 kW per tall compute rack
Total harmonic distortion	Less than 10% at full load

I/O Port Specifications

This section contains specifications and port pinout information for the base I/O ports of your system, as follows:

Ethernet Port

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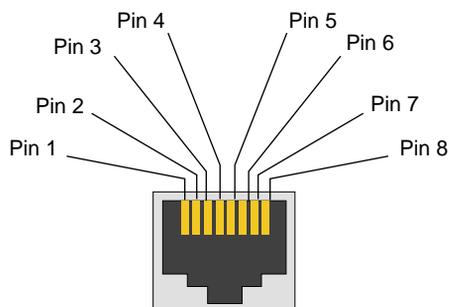
Figure A-1   Ethernet Port

Table A-5 shows the cable pinout assignments for the Ethernet port operating in 10/100-Base-T mode and also operating in 1000Base-T mode.

Table A-5   Ethernet Pinouts

Ethernet 10/100Base-T Pinouts		Gigabit Ethernet Pinouts	
Pins	**Assignment**	**Pins**	**Assignment**
1	Transmit +	1	Transmit/Receive 0 +
2	Transmit –	2	Transmit/Receive 0 –
3	Receive +	3	Transmit/Receive 1 +
4	NU	4	Transmit/Receive 2 +
5	NU	5	Transmit/Receive 2 –
6	Receive –	6	Transmit/Receive 1 –
7	NU	7	Transmit/Receive 3 +
8	NU	8	Transmit/Receive 3 –

NU = Not used

Serial Ports

The IRU and the optional router modules have 9-pin serial interface connectors. These ports are for console interface and are capable of transferring data at rates as high as 230 kbps. Other features of the ports include the following:

• Programmable data, parity, and stop bits

• Programmable baud rate and modem control

Figure A-2 shows a serial port.

Pin 3
Transmit
Data (TXD)

Pin 2
Receive Data
(RXD)

Pin 4
Data Terminal
Ready (DTR)
(not used)

Pin 1
Data Carrier
Detect (DCD)
(not used)

Pin 5
Ground

Pin 6
Data Set
Ready (DSR)
(not used)

Pin 9
Ringing Indicator (RI)
(not used)

Pin 7
Request to
Send (RTS)

Pin 8
Clear to Send
(CTS)
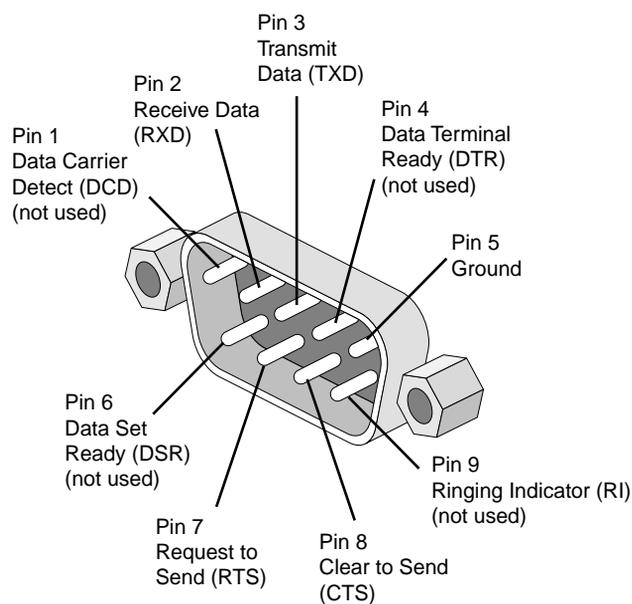
Figure A-2   Serial Port Connector

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 Type A Connector

Figure A-3 shows the USB type A connector provided on the base I/O that supports general USB applications and optional keyboard and mouse configurations.

Table A-7 lists the pin assignments for the USB type A connector.

Figure A-3   Pin Number Locations for USB Type A Connector

Table A-7   Pin Assignments for USB Type A Connector

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

Safety Information and Regulatory Specifications

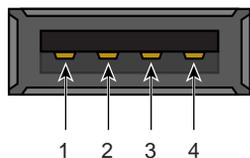This appendix provides safety information and regulatory specifications for your system in the following sections:

- "Safety Information" on page 93
- "Regulatory Specifications" on page 95

Safety Information

Read and follow these instructions carefully:

1. Follow all warnings and instructions marked on the product and noted in the documentation included with this product.

2. Unplug this product before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning. Do not use this product near water.

3. 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.

4. Slots and openings in the system 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.

5. 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.

6. Do not allow anything to rest on the power cord. Do not locate this product where people will walk on the cord.

7. 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.

8. 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.

9. Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

- When the power cord or plug is damaged or frayed.

- If liquid has been spilled into the product.

- If the product has been exposed to rain or water.

- If the product does not operate normally when the operating instructions are followed. Adjust only those controls that are covered by the operating instructions. Improper adjustment of other controls may result in damage.

- If the product has been dropped or the cabinet has been damaged.

- If the product exhibits a distinct change in performance, indicating a need for service.

Caution: Slide/rail mounted equipment is **not** to be used as a shelf or a workspace.

Figure B-1   Slide Rail Equipment Warning

10. If a lithium battery is a soldered part, only qualified SGI service personnel should replace this lithium battery. For other types, replace it only with the same type or an equivalent type recommended by the battery manufacturer, or the battery could explode. Discard used batteries according to the manufacturer's instructions.

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

12. Do not attempt to move the system alone. Moving a rack requires at least two people.

13. Keep all system cables neatly organized in the cable management system. Loose cables are a tripping hazard that cause injury or damage the system.

Regulatory Specifications

The following topics are covered in this section:

- "CMN Number" on page 96
- "CE Notice and Manufacturer's Declaration of Conformity" on page 96
- "Electromagnetic Emissions" on page 96
- "Shielded Cables" on page 98
- "Electrostatic Discharge" on page 98
- "Laser Compliance Statements" on page 99
- "Lithium Battery Statements" on page 100

This SGI system 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 system is on the system label, which is mounted inside the rear door on the base of the rack.

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-2   VCCI Notice (Japan Only)

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

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

Optional monitor cables supplied with your system use additional filtering molded into the cable jacket to reduce radio frequency interference. Always use the cable supplied with your system. If your monitor cable becomes damaged, 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 system. The shielded cables that came with the unit 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 DVD drive in this computer is a Class 1 laser product. The DVD drive's classification label is located on the drive.

Warning: **Avoid exposure to the invisible laser radiation beam when the device is open.**

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

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

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

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

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

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

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

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

Lithium Battery Statements

> **Warning:** There is danger of explosion if a lithium battery is incorrectly replaced in this product. Replace a battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.