

SGI® UV 3000 System User Guide

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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[®] UV 3000 family of servers. It also provides the standard procedures for powering on and powering off the system, basic troubleshooting and maintenance information, and important safety and regulatory specifications.

Audience

This guide is written for owners, system administrators, and users of SGI UV 3000 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 installation or service provider should perform all the set up, addition, or replacement of parts, cabling, and service of your SGI UV 3000 system, with the exception of the following items that you can perform yourself as needed:

- Using your system console controller to enter commands and perform system functions such as powering on and powering off, as described in this guide.
- Adding and replacing PCIe cards in stand-alone service nodes.
- Adding and replacing disk drives in stand-alone service nodes.
- Using the On/Off switch and other switches on the rack PDUs.
- 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 overall system control network interface and provides basic instructions for operating the controllers.
- Chapter 3, "System Overview," provides technical overview information needed to understand the basic functional architecture of the SGI UV 3000 systems.
- Chapter 4, "Rack Information," describes the rack sizes and general features.
- Chapter 5, "Optional Octal Router Chassis Information," describes the optional NUMAlink router technology available in SGI UV 3000 systems consisting of two or more racks. This router technology is available in an enclosure "package" known as the Octal Router Chassis.
- Chapter 6, "Add or Replace Procedures," provides instructions for installing or removing the customer-replaceable components of your system.
- Chapter 7, "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 UV 3000 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 UV 3000 series system at the time this document was published:

• SGI UV CMC Software User Guide (P/N 007-5636-00x)

This guide describes how to use the system console controller commands to monitor and manage your SGI UV 3000 system via line commands. 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 UV 10, UV 20, UV 30, UV 300 or UV 300EX.

• SGI UV RMC Software User Guide (P/N 007-6361-00x)

At time of publication, each UV 3000 system includes a rack management controller (RMC). The SGI UV RMC Software User Guide describes:

- Connecting to the RMC
- Using RMC commands
- Using open source ipmitool(1) commands for remote management

You can use the RMC commands and open source ipmitool(1) commands to monitor and manage SGI UV 3000 systems locally or remotely.

SGI UV System Software Installation and Configuration Guide (P/N 007-5948-00x)

In UV systems that come with pre-installed Linux software operating systems; this document describes how to re-install it when necessary. Also, this guide is a reference document for people who manage the operation of SGI UV 3000 systems. It explains how to perform general system configuration and operation under Linux for SGI UV. For a list of manuals supporting SGI Linux releases and SGI online resources, see the SGI Performance Suite documentation.

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

This guide includes a chapter that covers advanced tuning strategies for applications running on SGI UV 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.

SGI Foundation Software release notes and the SGI Performance Suite release notes contain information about the specific software packages provided in those products. The release notes also list SGI publications that provide information about the products. The release notes are available in the following locations:

Online at Supportfolio (only by signing in to Supportfolio): https://support.sgi.com/login

- SGI Foundation Software release notes are posted to the following website: <u>https://support.sgi.com/content_request/194480/index.html</u>
- The SGI Performance Suite release notes are posted to the following website: <u>https://support.sgi.com/content_request/786853/index.html</u>
- On the product media. The release notes reside in a text file in the /docs directory on the product media. For example, /docs/SGI-MPI-1.x-readme.txt.
- On the system. After installation, the release notes and other product documentation reside in the /usr/share/doc/packages/product directory.
- 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.
<pre>man page(x)</pre>	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

SGI provides a comprehensive product support and maintenance program for its products, as follows:

- 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.)

You can contact SGI in any of the following ways:

- Send e-mail to the following address: techpubs@sgi.com
- Contact your customer service representative and ask that an incident be filed in the SGI incident tracking system.

SGI values your comments and will respond to them promptly.

Operation Procedures

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

- "Precautions" on page 1
- "Power Connections Overview" on page 2
- "System Connections Overview" on page 8
- "UV 3000 System Connections" on page 10
- "Controlling the UV 3000 System" on page 13
- "Optional In-Rack Console Server and Flat-Panel Interface" on page 19
- "Optional SGI Remote Services (SGI RS)" on page 21
- "Optional Components" on page 24

Precautions

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

- "ESD Precaution" on page 1
- "Safety Precautions" on page 2

ESD Precaution

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

Wear a grounding wrist strap when you handle any 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 91.



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.

Power Connections Overview

Prior to operation, your SGI UV 3000 system should be set up and connected by a professional installer. If you are powering on the system for the first time or want to confirm proper power connections, 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. Setting the circuit breakers on the PDUs to the "On" position will apply power to the system's blade enclosures and will start the CMC in each of the enclosures. Note that the CMC in each blade enclosure stays powered on as long as there is power coming into the unit. Turn off the PDU breaker switch on each of the PDUs that supply voltage to the enclosure's power supplies if you want to remove all power from the unit.

When possible, each power supply in a blade enclosure should be connected to a different PDU within the rack. This will ensure the maximum amperage output of a single PDU is not exceeded if a power supply fails.

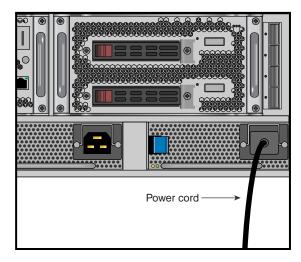


Figure 1-1UV 3000 Blade Enclosure Power Supply and Cable Location Example

- 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 storage enclosure) is in the **1** (on) position.
- 4. Make sure that all PDU circuit breaker switches (see the examples in Figure 1-2 on page 6 and Figure 1-3 on page 7) are turned on to provide power to the server when the system is powered on.

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 UV 3000 blade enclosure that you want to power on, make sure that the power cables are plugged into all the power supplies correctly, see the example in Figure 1-1. Setting the circuit breakers on the PDUs to the "On" position will apply power to

the individual UV 3000 IRUs and will start the RMC node if it is plugged into the same PDU. Turn off the PDU breaker switch on the PDU(s) that supply voltage to the chassis or RMC power supplies if you want to remove all power from a particular unit.

- 3. If you plan to power on a UV 3000 system 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 are turned on to provide power to the server when the system is powered on.

SGI UV 3000 PDUs

The SGI UV 3000 systems can use different types of power distribution units (PDUs). The type used can depend on operating location (country) and power needs. The following subsections list optional North American and International PDU information available at the time this document was published. Check with your SGI sales or service organization for additional information.

North America PDU Options

- Two outlet single-phase 220V PDU (C19 outlets @ 16 Amps max per outlet)
 - NEMA L6-30 plug with 3.66 m cable (24 Amp max output per PDU)
- Eight outlet single-phase 220V PDU (IEC320 C13 outlets 15 Amp max on each)
 - NEMA L6-30 plug with 3.66 m cable (24 Amp max output per PDU)
- Nine outlet three-phase 220V PDU (IEC320 C19 outlets @ 20 Amps max per outlet)
 - 4-wire, delta-connected 60 Amp IEC60309 plug with 3.66 m cable
- Nine outlet three-phase 220V PDU w/monitoring (C19 outlets)
 - same specifications as (9-outlet unit) above
- Eighteen outlet three-phase 480V PDU w/monitoring (three-pin Souriau outlets for North America only)
 - 60A, 277/480V, IEC60309 560P7W plug with 2.44 m cable

International PDU Options

•

- Two outlet single-phase 220V PDU (IEC320 C19 outlets A 16 Amps max per outlet)
 - NEMA L6-30 plug with 3.66 m cable (24 Amp max output per PDU)
- Eight outlet single-phase 220V PDU (IEC320 C13 outlets @ 15 Amps max per outlet)
 - IEC60309 plug with 3.66 m cable (32 Amp max output per PDU)
- Nine outlet three-phase 220V PDU (IEC320 19 outlets @ 20 Amps max per outlet)
 - 5-wire, 415V, 32A IEC60309 plug (WYE) with 3.66 m cable (60 Amp max per PDU)
- Nine outlet three-phase 220V PDU w/monitoring (C19 outlets)
 - same specifications as (9-outlet unit) above

Additional PDU Overview information

Note: SGI PDUs are designed to fit into SGI racks. The use of SGI PDUs in 3rd-party racks may require custom mounting hardware. If SGI PDUs are not used, the installer needs to connect each power supply to a 20-Amp certified circuit breaker with properly rated C13/C14 cordage.

Figure 1-2 on page 6 shows an example of an eight-plug single-phase PDU that can be used in the SGI UV 3000 rack system. This unit is primarily used to support auxiliary equipment in the rack.

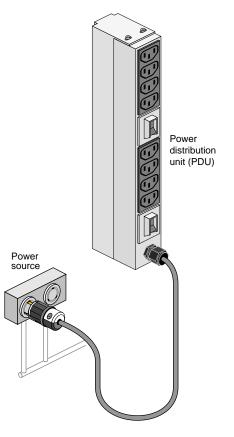


 Figure 1-2
 Single-Phase 8-Outlet PDU Example

Figure 1-3 shows an example of a three-phase PDU that can be used in the SGI UV 3000 system. These PDUs are used to distribute power to the UV blade enclosures when the system is configured with three-phase power.



Figure 1-3 Three-Phase PDU Example

System Connections Overview

You can monitor and interact with your SGI UV 3000 server from the following sources:

- Using the optional SGI 1U rackmount console option you can connect directly to the system console node for basic monitoring and administration of the system. See "1U Console Plus Admin Server Option" in Chapter 2 for more information.
- A PC or workstation on the local area network (LAN) can connect to the RMC's external Ethernet port and set up remote console sessions.

These console connections enable you to view the status and error messages generated by the chassis management controllers in your SGI UV 3000 system. For example, you can monitor error messages that warn of power or temperature values that are out of tolerance. See the section "1U Console Plus Admin Server Option" in Chapter 2, for additional information. The following subsections describe the options for establishing and using communication connections to work with your SGI UV 3000.

Connecting to the UV System Control Network

All SGI UV 3000 systems use a rack management controller (RMC) node which communicates with the chassis management controllers (CMCs) which in turn communicate with the blade management controllers (BMCs). These components in concert are generically known as the system control network. The SGI UV 3000 system control network provides control and monitoring functionality for each chassis, blade, power supply, and fan assembly in the system.

The RMC is connected to each of the CMCs in the system via an external Ethernet cable. CMCs are connected to the BMCs via the chassis backplane. Note that the RMC supports a maximum of 24 Ethernet ports for CMC interconnect. The CMCs and their enclosures must all be localized.

Note that the RMC does not contain a BMC or directly physically connect with any blade BMC.

The RMC/CMC network provides the following functionality:

- Powering the entire system on and off.
- · Powering individual UV chassis on and off.
- Monitoring the environmental state of the system, including voltage levels.
- Monitors and controls status LEDs on the enclosure.

- Supports entry of controller commands to view and/or change system configuration parameters. See the *SGI UV RMC Software User Guide* (P/N 007-6361-00*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 OS.
- Provides the ability to flash system BIOS.

RMC System Control Access

Access to the SGI UV 3000 system controller network is accomplished by the following methods:

- A LAN connection to the RJ-45 **WAN** port on the RMC node, (see Figure 1-4).
- A USB-to-micro-USB serial connection to the "Console" port (see **CNSL** in Figure 1-4) on the RMC front panel example.

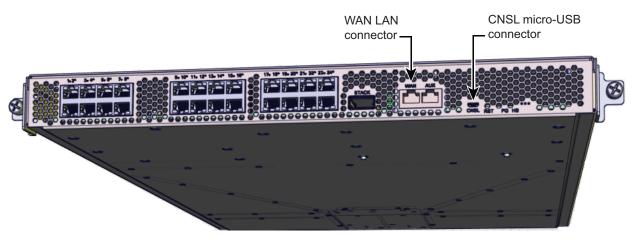


Figure 1-4 SGI UV RMC Front Panel Connections Example

Once a connection to the RMC is established, the connection can be used to monitor, configure, power on and power off the UV3000 system.

UV 3000 System Connections

Administrative commands for the SGI UV 3000 system are through the RMC interface/UV command line interface (CLI) or through an IPMI 2.x LAN interface.

The Ethernet connection is the most common method of accessing the system console. The RMC acts as an administrative focal-point for UV 3000 systems.

Administrators/users can perform one of the following options for connectivity:

- An in-rack or portable system console can be directly connected to the RMC micro-USB connect port, (labeled **CNSL** see Figure 1-4 on page 9). This requires connecting from a laptop or workstation that is physically located near the system. Note that the USB connection requires use of a terminal emulator on the connected system.
- A LAN connection allows access to the RMC via ssh, or via an IPMI 2.x client. The RMC supports a limited IPMI 2.x interface, basically allowing powering the system on/off from an IPMI client. This LAN connection must be made to the RJ-45 **WAN** port on the RMC. The connection can be used with a local or remote IPMI-enabled console device.

Note: The RMC firmware is not fully IPMI 2.x compliant and IPMI 2.x is not a supported interface if the UV3000 system is partitioned.

Serial Port Connection to the RMC

Use a USB-to-micro-USB cable to administer your system locally from the RMC.

Connect the cable from your administrative laptop or other device directly to the port labeled **CNSL** on the RMC, reference the location shown in Figure 1-5 on page 11. Note that the RMC will not (by default) require a password when you login via the **CNSL** port.

The console type and how these console types are connected to the SGI UV 3000 systems is determined by what console option is chosen. Establishing a serial console connection to the RMC does require specific functional parameters which are listed in the next subsection.

USB-Connected Console Hardware Requirements

The local USB-connected 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)

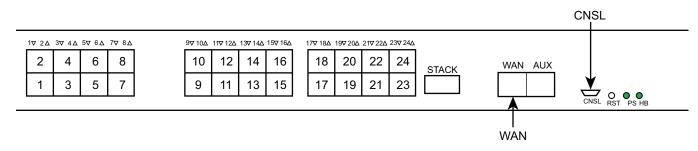


Figure 1-5 RMC Ethernet LAN (WAN Port) and CNSL Location Example

Ethernet (LAN) Connection to the RMC

If you have an SGI UV 3000 system and wish to use a remote or local system to administer the UV system via LAN, you can connect via Ethernet cable to the RMC node's **WAN** port (identified in Figure 1-5).

If you intend to use a LAN-connected administrative server to communicate with the RMC, the RMC will either need to be assigned:

- A DHCP IP address
- Or, you will need to configure it with a static IP address

See the following subsections for more information.

Establishing RMC 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 RMC's micro-USB serial port, refer to Figure 1-4 on page 9.

LAN Network (LAN RJ-45) connections to the SGI UV 3000 RMC are always made via the **WAN** port.

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

To use the serial port connection, you must attach and properly configure a micro-USB interface cable to the RMC's **CNSL** port. Configure the serial port as described in "USB-Connected Console Hardware Requirements" on page 11.

When the serial port session is established, the console will show an RMC login, and the user can login to the RMC as user "root". Note that there is not (by default) a password required to access the RMC via the **CNSL** port.

Using DHCP to Establish an IP Address

To obtain and use a DHCP generated IP address, plug the RMC's external RJ-45 network port (**WAN**) into a network that provides IP addresses via DHCP; the RMC can then acquire an IP address.

To determine the IP address assigned to the RMC, you must first establish a connection to the RMC's USB port (as indicated in the section "USB-Connected Console Hardware Requirements" on page 11), and run the command "ifconfig eth1". This will report the IP address that the RMC is configured to use.

To switch from a static IP back to DHCP, the configuration file /etc/sysconfig/ifcfg-eth1 on the RMC 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 RMC to use a static IP address, the /etc/sysconfig/ifcfg-eth1 on the RMC must be edited.

The configuration file should be modified to contain these lines:

BOOTPROTO=dhcp

must be commented out, and the entries:

BOOTPROTO=static IPADDR= NETMASK=

must be uncommented and set appropriately. Obtain the appropriate values for the IPADDR and NETMASK from your system administrator/IT organization.

GATEWAY=<network gateway IP address> HOSTNAME=<hostname to use>

Note that the GATEWAY and HOSTNAME lines are optional.

Once the changes are made, save the file and reboot the RMC. After it reboots, it will be configured with the specified IP address.

Controlling the UV 3000 System

The following subsections describe options for controlling the SGI UV 3000 using LAN or serial interface methods.

UV 3000 IPMI 2.x Administration Overview

IPMI 2.x protocols can be used to monitor and/or administer a UV 3000 system remotely using system management software available at the customer site. IPMI 2.x can provide remote access to multiple users at different locations for networking. It also allows a user/system administrator to monitor and manage specific computer events remotely.

Note that the IPMI interface operates independently from the operating system. IPMI 2.x commands can be used to query inventory information, or to perform recovery procedures such as issuing requests from a local or remote console via LAN for system power-up, power-down or rebooting. The IPMI 2.x default username and password are ADMIN and ADMIN.

Availability of these functions will vary based on end user hardware/software options and configurations. Check with your SGI sales or service representative for available options. See Figure 1-5 on page 11 for an example location of the RMC's **WAN** connector port.

Power On Example Using the RMC Network Connection

You can use a network connection to power on your UV 3000 system as described in the following steps:

1. You can use the IP address of the RMC to perform an SSH login, as follows:

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

Typically, the default LAN password for the RMC set out of the SGI factory is **root**.

The following example shows the RMC prompt:

SGI UV3000 RMC, Rev. 1.1.xx [Bootloader 1.1.x]

```
RMC:r001i01c>
```

This refers to rack 1, RMC 1.

2. Power up your UV 3000 system using the power on command, as follows:

RMC:> power on

The system will take time to fully power up (depending on size and options). Larger systems take longer to fully power on. See the following subsections for more information on the system command line interface and usage of commands.

The Command Line Interface

The UV command line interface is accessible by logging directly into a rack management controller (RMC). Note that the interface is nearly identical to a CMC login.

Log in as root, (default password **root**) when logging into the RMC. As in this example:

asylum\$ ssh root@uv3000-rmc

root@uv3000-rmc's password: **root** SGI UV3000 RMC, Rev. 1.1.*xx* [Bootloader 1.1.*x*] RMC:r001i01c> **help**

Once a connection to the RMC is established, system control commands can be entered. See the following subsection for some examples.

See "Powering On and Off from the Command Line Interface" on page 16 for additional specific examples of using the CLI commands.

Example CLI Commands Used

The following is a list of some available UV CLI commands:

auth	authenticate SSN/APPWT change
bios	perform bios actions
bmc	access BMC shell
rmc	access RMC shell
config	show system configuration
consol	e 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 ' <c< td=""><td>md>help' for help on individual commands.</td></c<>	md>help' for help on individual commands.

Powering On and Off from the Command Line Interface

	The SGI UV 3000 command line interface is accessible by logging into the RMC as root .
	Information on booting Linux from the shell prompt is included at the end of the subsection ("Monitoring Power On Example" on page 16). The following command options may be used with the RMC CLI:
Power On Example	
	usage: power [-vcow] on up [TARGET]turns power on
	-v,verboseverbose output-c,clearclear EFI variables (system and partition targets only)-o,overrideoverride partition check-w,watchwatch boot progress
Power Down Example	
	usage: power [-vo] off down [TARGET]shuts power down
Reset System Example	
	usage: power [-vchow] reset [TARGET]resets the system power
Power Status Check Example	
	usage: power [-vl0ud] status [TARGET]checks power-on status
	To monitor the power-on sequence during boot, see the next section "Monitoring Power On Example".
Monitoring Power On Example	

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

RMC:> uvcon uvcon: attempting connection to localhost...

```
uvcon: connection to RMC (localhost) established.
uvcon: requesting baseio console access at r001i01b00...
uvcon: tty mode enabled, use 'CTRL-]' 'q' to exit
uvcon: console access established
uvcon: RMC <--> 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 when needed.

Depending on the size of your system, it can take 5 to 10 minutes for the UV 3000 system to boot to the EFI shell. When the shell> prompt appears, enter fs0: as in the following example:

shell> fs0:

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

fs0:> /efi/suse/elilo.efi

The ELILO Linux Boot loader is called and various SGI configuration scripts are run and the SUSE Linux Enterprise Server 12 Service Pack *x* installation program appears.

Power off an SGI UV 3000 System

To power down the UV 3000 system, use the power off command, as follows: RMC:> power off ==== r001i01c (PRI) ==== You can also use the power status command, to check the power status of your system RMC:> power status ==== r001i01c (PRI) ==== on: 0, off: 16, unknown: 0, disabled: 0

Optional In-Rack Console Server and Flat-Panel Interface

A console is defined as a connection to the RMC (via an IPMI 2.x-enabled server) that provides access to the UV system. SGI offers a rackmounted console server and flat panel interface option that provides localized administrative function for the system. The in-rack option is sold as a complete hardware/software solution that installs in the SGI UV 3000 system rack or I/O rack.

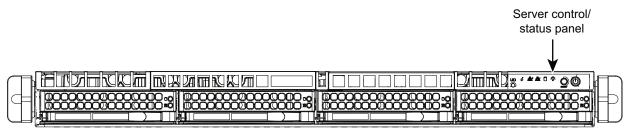
A console can also be a LAN-attached personal computer, laptop or workstation (RJ45 Ethernet connection). Serial-over-LAN is enabled by default on the IPMI 2.x-enabled console server and normal output through the RS-232 port is disabled. In certain limited cases, a dumb (RS-232) terminal could be used to communicate directly with the IPMI 2.x administrative server. This connection is typically used for service purposes or for system console access in smaller systems, or where an external LAN connection is not used or available. Check with your service representative if use of an RS-232 terminal is required for your system.

Optional In-Rack Console Server

For end users who require an in-rack server/console as part of their UV 3000 system, a 1U server node is offered in combination with a rack-mounted flat-panel console.

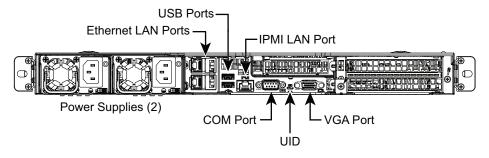
The in-rack IPMI 2.x-enabled server (Figure 1-6) is a dual-processor serverboard based on the Intel C612 chipset. The serverboard supports two Intel Xeon E5-2600 series processors. Separate QPI link pairs connect the two processors and the I/O hub in a network on the board.

For more information on the in-rack server option, see the *SGI Rackable C1104-GP2 and C1110-GP2 System User Guide*, (P/N 007-6388-00*x*). This guide discusses the use, maintenance and operation of the 1U server.



3.5" Disk Drives (4)





The flat panel interface console connects at the rear of the IPMI 2.x-enabled rackmount console server as shown in Figure 1-7.

Figure 1-7 Optional (In-Rack) Administrative Console Server Rear View Example

The flat-panel console interface option (see Figure 1-8 on page 21) 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.

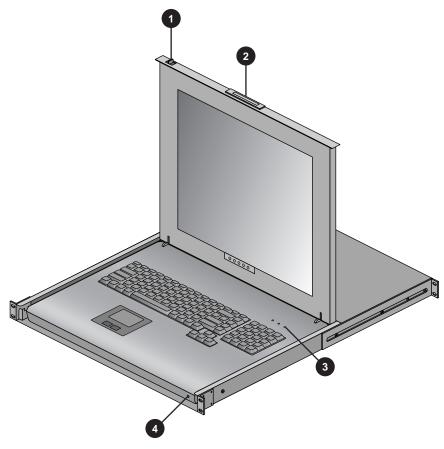


Figure 1-8 Flat Panel Rackmount Console Interface Option

Optional SGI Remote Services (SGI RS)

The optional SGI RS system automatically detects system conditions that indicate potential future problems and then notifies the appropriate personnel. This enables you and SGI global support teams to proactively support systems and resolve issues before they develop into actual failures.

SGI Remote Services provides a secure connection to SGI Customer Support - on demand. This can ensure business continuance with SGI systems management and optimization.

SGI Remote Services Primary Capabilities

- 24x7 remote monitoring and data gathering of SGI UV customer systems
- Alerts and notification on changes, failures and potential failures
- Log files immediately available
- Configuration fingerprint
- Secure file transfer
- Optional secure remote access to customer systems

SGI Remote Services Benefits

- Improved uptime and system availability
- Proactive identification of issues before they create an outage
- Increase system stability by monitoring hardware and software version compatibility
- Reduced time to resolve support cases
- Greater operational efficiency
- Less involvement of customer staff during troubleshooting
- Faster support case resolution
- Improved productivity

Proactive potential problem identification can result in higher system availability

Automated Alerts and, in some instances, Case Opening results in faster problem resolution time and less direct involvement required by Customer Support Teams. SGI Remote Services are available for all UV systems and also other specific SGI systems.

SGI Remote Service Operations Overview

An SGI Support Services Software Agent runs on each SGI system at your location, enabling remote system monitoring and secure communication to SGI Support staff. Your basic hardware and software configuration as well as system health information is captured and stored in the Cloud. Figure 1-9 shows an example visual overview of the monitoring and response process.

Cloud intelligence automatically reviews select Event Logs around the clock (every five minutes) to identify potential failure information. If the Cloud intelligence detects a critical Event, it notifies SGI support personnel.

This monitoring requires no changes to customer systems or firewalls as long as the SGI Agent can send HTTPS messages to highly secure Cloud and Global Access Servers. It will also have no impact on customer network or system performance. All communication between SGI global support and customer systems is kept secure using Secure Socket Layer (SSL) encryption. All communication with SGI is initiated from the customer site using HTTPS protocol on port 443.

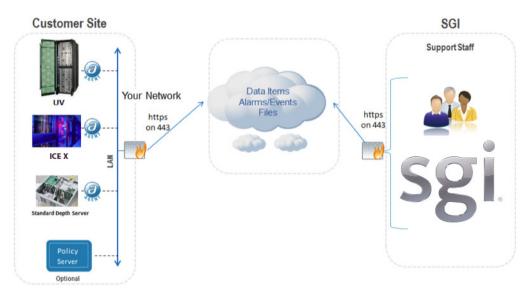


Figure 1-9SGI Remote Services Process Overview

Optional Components

Besides adding a network-connected system console and basic VGA monitor, you can also order the following types of hardware options on your SGI UV 3000 series server:

- Peripheral component interface (PCIe) cards in an optional PCIe expansion chassis.
- PCIe cards in a blade-mounted PCIe riser card.
- Disk drives in your dual disk drive riser card equipped compute blade.

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 SGI UV 3000 series systems:

- The optional full -height two-slot internal PCIe blade is a dual-node compute blade that supports one full-height x16 PCIe Gen3 card in the top slot and one low-profile x16 PCIe Gen3 card in the lower slot. See Figure 1-10 on page 25 for an example.
- The optional dual low-profile PCIe blade supports two PCIe x16 Gen3 cards. See Figure 1-11 on page 25 for an example.
- An optional external PCIe I/O expansion chassis supports up to four PCIe cards. The external PCIe chassis is supported by connection to a compute blade using an optional host interface card (HIC). Each x16 PCIe enabled blade host interface connector can support one I/O expansion chassis.

Important: PCIe cards installed in an optional two-slot PCIe blade 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(s).

Not all blades or PCIe cards may be available with your system configuration. Check with your SGI sales or service representative for availability.

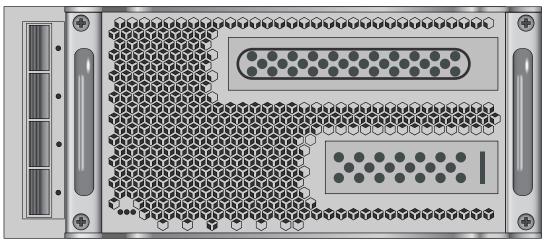


Figure 1-10 PCIe Option Blade Example with Full-Height and Low-Profile Slots

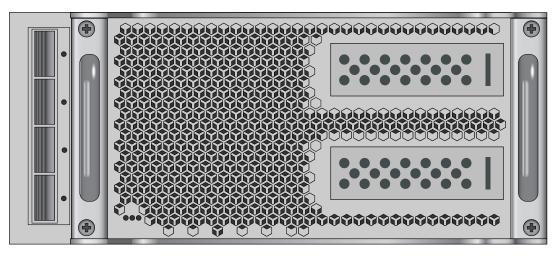


 Figure 1-11
 PCIe Option Blade Example with Two Low-Profile Slots

PCIe Drive Controllers in BaselO Blade

The SGI UV 3000 system offers an optional RAID or non-RAID (JBOD) PCIe-based drive controller that resides in the BaseIO blade's PCIe slot. Figure 1-12 shows an example of the system disk HBA controller location in the BaseIO blade.

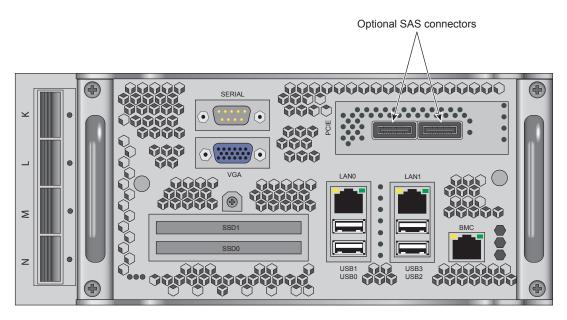


Figure 1-12 BaseIO Blade and PCIe Disk Controller Example

RAID PCIe Disk Controller

At the time this document was published, the optional RAID controller used in the BaseIO blade PCIe slot is an LSI MegaRAID SAS 9280-8e. This PCIe 2.0 card uses two external SAS control connectors and supports the following:

- RAID levels 0, 1, 5, 6, and 10
- Advanced array configuration and management utilities
- Support for global hot spares and dedicated hot spares
- Support for user-defined stripe sizes: 8, 16, 32, 64, 128, 256, 512, or 1024 KB

The RAID controller also supports the following advanced array configuration and management capabilities:

- Online capacity expansion to add space to an existing drive or a new drive
- No reboot necessary after expansion
- Online RAID level migration, including drive migration, roaming and load balancing
- Media scan
- User-specified rebuild rates (specifying the percentage of system resources to use from 0 percent to 100 percent)
- Nonvolatile random access memory (NVRAM) of 32 KB for storing RAID system configuration information; the MegaRAID SAS firmware is stored in flash ROM for easy upgrade.

Non-RAID PCIe Disk Controller

At publication time, the LSI 9200-8e low-profile PCIe drive controller HBA is the default non-RAID system disk controller for the SGI UV 3000. This drive controller has the following features:

- Supports SATA and SAS link rates of 1.5 Gb/s, 3.0 Gb/s, and 6.0 Gb/s
- Provides two x4 external mini-SAS connectors (SFF-8088)
- The HBA has onboard Flash memory for the firmware and BIOS
- The HBA is a 6.6-in. x 2.713-in., low-profile board
- Supports eight-lane, full-duplex PCIe 2.0 performance
- The HBA has multiple status and activity LEDs and a diagnostic UART port
- A x8 PCIe slot is required for the HBA to operate within the system

System Control

This chapter describes the general interaction and functions of the overall SGI UV 3000 system control. System control parameters depend somewhat on the overall size and complexity of the SGI UV 3000 but will generally include the following:

- The administrative LAN-to-RMC server (IPMI 2.x-enabled) and connects to the RMC's (**WAN**) RJ-45 Ethernet port
- The rack management controller (RMC) node (one in each UV 3000 system)
- The individual chassis-based board management controllers (BMCs) report to the RMC
- A chassis management controller (CMC) board resides in each IRU. The CMC supports
 powering up and down of the compute blades and environmental monitoring of the IRU.

Note: SGI offers a rack-mounted flat panel console option that attaches to a rack-mounted administrative server node's video, keyboard and mouse connectors. These two hardware options each require 1U of space within the rack (2U total). This combination acts as an "in-rack" console/server option for users who want localized system administration.

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 RMC system controller network is used. This Ethernet connection is made from a local or remote IPMI-enabled PC/workstation which acts as a gateway and buffer between the internal UV system control network and any other public or private local area networks.

Important: The SGI UV system control network is a private, closed network. It should not be reconfigured in any way to change it from the standard SGI UV factory installation. It should not be directly connected to any other network. The 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 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.

RMC and System Management Overview

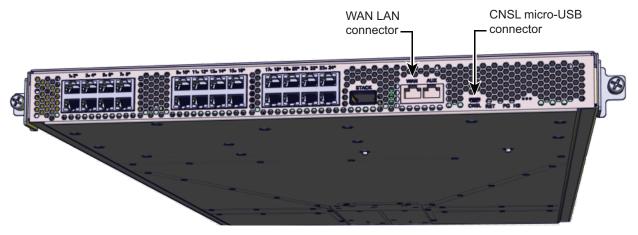
The RMC is a separate stand-alone 1U controller installed in the SGI UV 3000 system rack. The RMC acts as a gateway and buffer between the UV system control network and any other public or private local area networks or administrative systems used to communicate with and control the UV 3000. An Ethernet connection directly from the RMC to a local private or public Ethernet allows the system to be administered directly from a local or remote console system. Figure 2-1 shows a front-view example of the RMC unit.

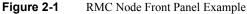
The system controller network is designed into all IRUs. Controllers within the system report and share status information via the CMC Ethernet interconnects. This maintains controller configuration and topology information between all controllers in an SSI. Figure 2-2 on page 32 shows an example system control network using an optional and separate (remote) workstation to monitor SGI UV 3000 systems. It is also possible to connect an optional PC or (in-rack) console (see Figure 2-4 on page 36) directly to the RMC.

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 user's guide for your mass storage option for more information on this topic.

For information on software commands used for administering network connected SGI UV 3000 systems using the SGI RMC node, see the SGI RMC Software User's Guide (P/N 007-6361-00x).

For information on administering network connected SGI systems using the SGI Management Center, see the SGI Management Center Administration Guide for Clusters, (P/N 007-6358-00x).





CMC Overview

The CMC system for the SGI UV 3000 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. A CMC port from each chassis management controller connects to a dedicated Ethernet switch that provides a synchronous clock signal to all the CMCs in an SSI.

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

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 the RMC as well as other CMCs within the SSI. Note that the RMC node, optional mass storage units and any PCIe expansion enclosures do *not* have a CMC installed.

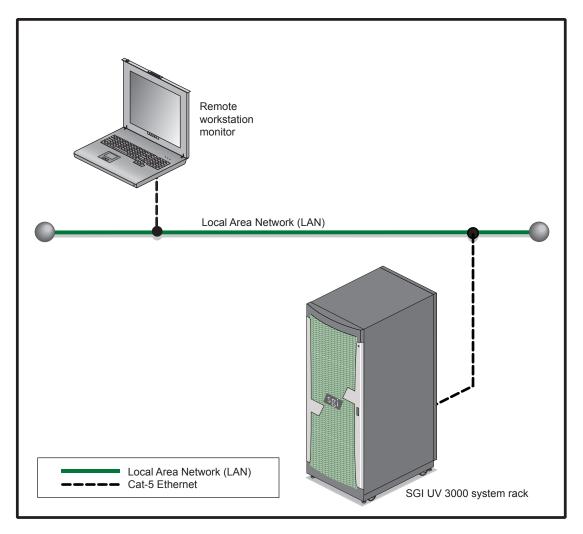


Figure 2-2 SGI UV 3000 LAN-attached Remote System Control Example

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 board and the higher level control system used in the RMC and administration 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 via the RMC and the administrative node. Note that blades equipped with an optional BaseIO riser board have a dedicated BMC Ethernet port.

System Controller Interaction

In all SGI UV 3000 servers all the system controller types (RMCs, CMCs and BMCs) communicate with each other in the following ways:

- System control commands and communications are passed between the RMC and CMCs via a private dedicated Gigabit Ethernet network. The CMCs communicate directly with the BMC in each installed blade by way of the IRU's internal backplane.
- All CMCs can communicate with each other via an Ethernet "ring" configuration network established within an SSI.
- In larger configurations the system control communication path may include a private, dedicated Ethernet switch that allows communication between an RMC and multiple SSI environments.

IRU Controllers

All IRUs have a chassis management controller (CMC) board installed. The following subsection describes the basic features of the controllers:

Note: For additional information on controller commands, see the *SGI UV CMC Software User 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.

- 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 process
- Provides the ability to create multiple system partitions
- Provides the ability to flash system BIOS

1U Console Plus Admin Server Option

The SGI optional 1U console (Figure 2-3 on page 35) is a rackmountable unit that includes a built-in keyboard/touchpad. It uses a 17-inch (43-cm) LCD flat panel display of up to 1280 x 1024 pixels. The 1U console works in concert with a 1U server (see Figure 2-4 on page 36) to provide an "in-rack" local administrative system directly attached to the RMC.

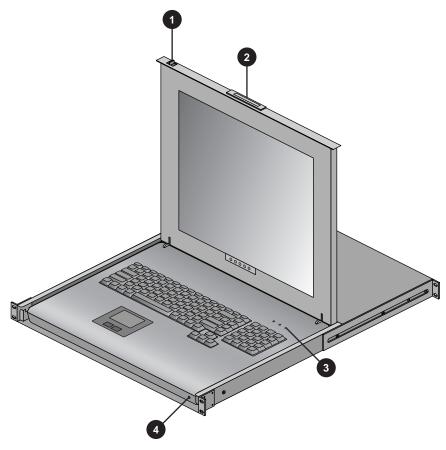


Figure 2-3 Optional 1U Rackmount Console

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 system administration server using USB and HD15M connectors or through an optional KVM switch. See Figure 2-4 for the 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.

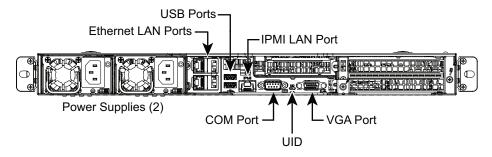


Figure 2-4 Optional (In-Rack) 1U System Administration Node Rear View

System Overview

This chapter provides an overview of the physical and architectural aspects of your SGI UV 3000 series system. The major components of the SGI UV 3000 series systems are described and illustrated.

The SGI UV 3000 series is a family of cache-coherent Non-Uniform Memory Access (ccNUMA), computer systems that can scale from 2 to 128 Intel-based compute blades as a cache-coherent single system image (SSI). At time of publication all SGI UV 3000 system blades are based on Intel Xeon E5-4600 v3 processors. Future releases may scale to larger blade or processor counts for single system image (SSI) applications. Contact your SGI sales or service representative for the most current information on these topics.

In a ccNUMA system, each processor board (node) contains memory that it shares with the other processors in the system. Because the 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 SGI UV 3000 series system in your lab or server room. Each 42U SGI rack holds one to four 10-U high enclosures that support up to eight compute/memory and I/O sub modules known as "blades." These blades contain printed circuit boards (PCBs) with ASICS, processors, memory components and I/O chipsets mounted on a mechanical carrier. The blades slide directly in and out of the SGI UV 3000 IRU enclosures.

This chapter consists of the following sections:

- "System Models" on page 39
- "System Architecture" on page 41
- "System Features" on page 43
- "System Components" on page 48

Figure 3-1 shows the front view of a single-rack SGI UV 3000 system.

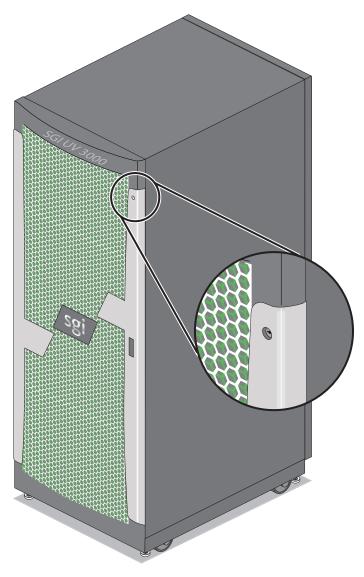


Figure 3-1 SGI UV 3000 D-Rack System and Front Lock Example

System Models

The basic enclosure within the SGI UV 3000 system is the 10U high "individual rack unit" (IRU). The IRU enclosure contains up to eight compute blades connected to each other via a backplane. Each IRU has ports that are brought out to external NUMAlink 6 connectors. The 42U rack for this server houses all IRU enclosures, option modules, and other components; up to 64 processor sockets in a single rack. The SGI UV 3000 server system requires a minimum of one BaseIO equipped blade for every 128 system blades. Higher blade or socket counts supported in an SSI may be available in future releases, check with your SGI sales or service representative for the most current information.

Note: Systems operated without an optional administration node must have an optional external DVD drive available to connect to the BaseIO blade.

Figure 3-2 shows an example of how IRU placement is done in a single-rack SGI UV 3000 server.

The system requires a minimum of one 42U tall rack with three single-phase power distribution unit (PDU) plugs per IRU installed in the rack. Three outlets are required to support each power shelf. There are three power supplies per power shelf and two power connections are required for an optional 1U system administration node and one for an optional 1U terminal.

You can also add additional PCIe expansion enclosures or RAID and non-RAID disk storage to your server system. Power outlet needs for these options should be calculated in advance of determining the number of outlets needed for the overall system.

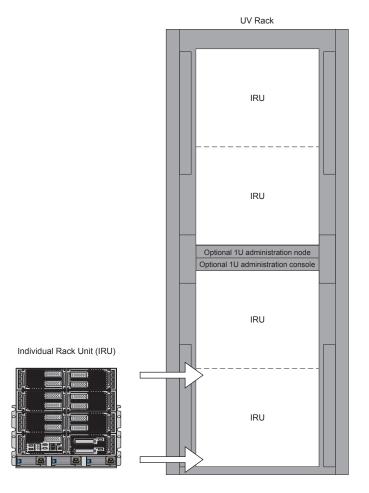


Figure 3-2 SGI UV 3000 IRU and Rack Example

System Architecture

The SGI UV 3000 computer system is based on a cache-coherent Non-Uniform Memory Access (ccNUMA) shared memory architecture. The system uses a global-address-space, cache-coherent multiprocessor that scales up to 128 blades in a single-system image. Because it is modular, the UV 3000 system combines the advantages of lower entry cost with the ability to scale processor count, memory, and I/O independently in each rack. Note that larger SSI configurations may be offered in the future, contact your SGI sales or service representative for additional information.

The system architecture for the SGI UV 3000 system is a sixth-generation NUMAlink shared-memory architecture known as NUMAlink 6 or NL6. In the NUMAlink 6 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 and between each 10U IRU enclosure.

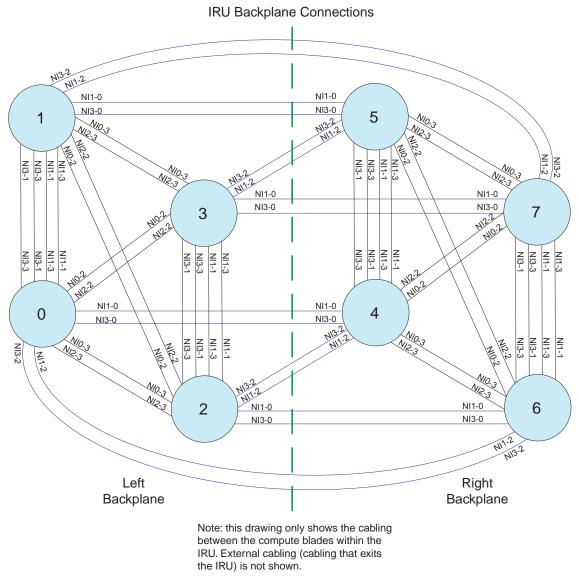
The basic expansion building block for the NUMAlink interconnect is the processor node; each processor node consists of a dual-Hub ASIC (also known as a HARP) and two multi-core processors with on-chip secondary caches. The Intel processors are connected to the dual-Hub ASICs via quick path interconnects (QPIs). Each dual-HUB ASIC is also connected to the system's NUMAlink interconnect fabric through one of sixteen NL6 ports.

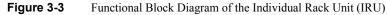
The dual-Hub ASIC is the heart of the processor and memory node blade technology. This specialized ASIC acts as a crossbar between the processors and the network interface. The Hub ASIC enables any processor in the SSI to access the memory of all processors in the SSI.

Figure 3-3 on page 42 shows a functional block diagram of the SGI UV 3000 series system IRU.

System configurations of up to eight IRUs can be constructed without the use of external routers. Routerless systems can have any number of blades up to a maximum of 64. Routerless system topologies reduce the number of external NUMAlink cables required to interconnect a system.

External optional routers are needed to support multi-rack systems with more than four IRUs, see Chapter 5, "Optional Octal Router Chassis Information" for more information.





System Features

The main features of the SGI UV 3000 series server systems are discussed in the following sections:

- "Modularity and Scalability" on page 43
- "Distributed Shared Memory (DSM)" on page 43
- "Chassis Management Controller (CMC)" on page 45
- "Distributed Shared I/O" on page 45
- "Reliability, Availability, and Serviceability (RAS)" on page 46

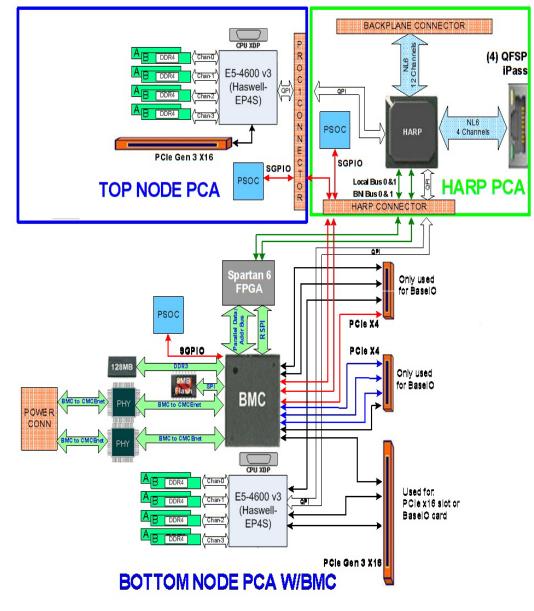
Modularity and Scalability

The SGI UV 3000 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, MIC/GPU capability 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 SGI UV 3000 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 is to say that 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 is directly connected to its resident socket, the memory is referred to as *local memory*. Figure 3-4 on page 44 shows a conceptual block diagram of the blade's memory, compute and I/O pathways.
- If a processor needs to access memory located in another socket, or on another blade 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.

Figure 3-4 SGI UV 3000 Blade Nodes Block Diagram Example

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 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 connection is used to support a BaseIO riser card. Only one BaseIO is supported in an SSI. The BaseIO must be the first blade (lowest) in the SSI.

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 SGI UV 3000 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 SGI UV 3000 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 SGI UV 3000 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. Note that this might not be possible in a "fully loaded" system. If all the blade positions are filled, be sure to consult with a service technician before removing a power supply while the system is running.
 - 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 SGI Remote Services (SGI RS), a tool that monitors the system; when a condition occurs that may cause a failure, the remote services software agent notifies the appropriate SGI personnel.
- Systems support 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:
 - All system faults are logged in files.
 - Memory can be scrubbed using error checking code (ECC) when a single-bit error occurs.

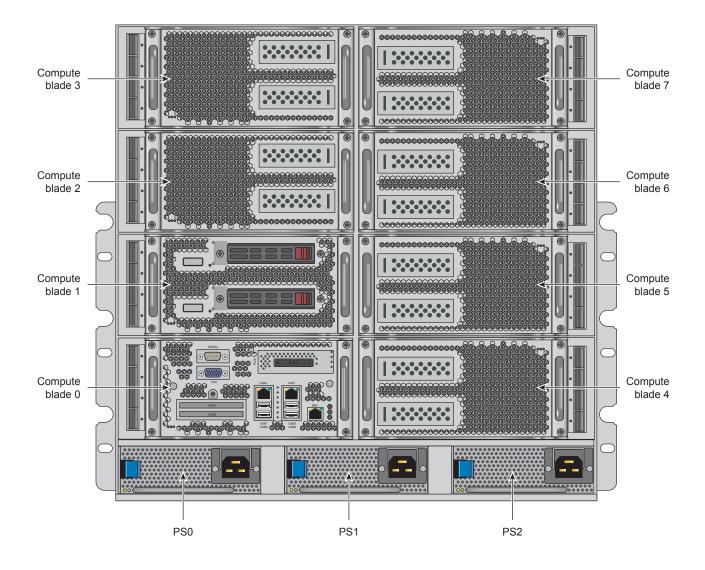
System Components

The SGI UV 3000 series system features the following major components:

- **24U or 42U rack.** These racks are used for both compute and I/O racks in the SGI UV 3000 system. Up to four IRUs can be installed in each 42U rack. There is also space for an RMC or optional administrative node and other optional 19-inch rackmounted components.
- Individual Rack Unit (IRU). This enclosure contains three power supplies, 2-8 compute/memory blades, BaseIO and other optional riser enabled blades for the SGI UV 3000. The enclosure is 10U high. Figure 3-5 on page 49 shows the SGI UV 3000 IRU system 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 BMC Ethernet port and three USB ports. System disks can be controlled by a PCIe disk controller installed in the BaseIO blade's PCIe slot. Figure 3-6 on page 50 shows a front-view example of the BaseIO blade.

Note: While the BaseIO blade is capable of RAID 0 support, SGI does not recommend the end user configure it in this way. RAID 0 offers no fault tolerance to the system disks, and a decrease in overall system reliability. The SGI UV 3000 ships with RAID 1 functionality (disk mirroring) configured if the option is ordered.

- **Dual disk enabled compute blade.** This riser enabled blade supports two hard disk drives that normally act as the system disks for the SSI. This blade must be installed adjacent to and physically connected with the BaseIO enabled compute blade. JBOD, RAID 0 and RAID 1 are supported. Note that you must have the BaseIO riser blade optionally enabled to use RAID 1 mirroring on your system disk pair.
- **Two-Slot Internal PCIe enabled compute blade.** The internal PCIe riser based compute blade supports two internally installed PCI Express option cards. Either two half-height or one half-height and one full-height cards are supported.
- **MIC/GPU PCIe enabled compute blade.** This blade supports one optional MIC or GPU card in the upper slot via PCIe interface to the bottom node board. Option cards are limited, check with your SGI sales or service representative for available types supported.
- External PCIe enabled compute blade. This PCIe enabled board is used in conjunction with an external PCIe expansion enclosure. A x16 adapter card connects from the blade to the external PCIe expansion enclosure.



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

Figure 3-5 SGI UV 3000 IRU System Components Example

Optional BaselO SSDs

The BaseIO blade can be configured with one or two internal 1.8-inch solid state drives (SSDs). These drives are located in the lower-left section of the BaseIO blade, as seen in Figure 3-6.

The SSDs can be configured as JBOD or RAID1. The RAID1 SSD pair is a software RAID1 and two SSDs must be ordered with the system BaseIO to enable this configuration.

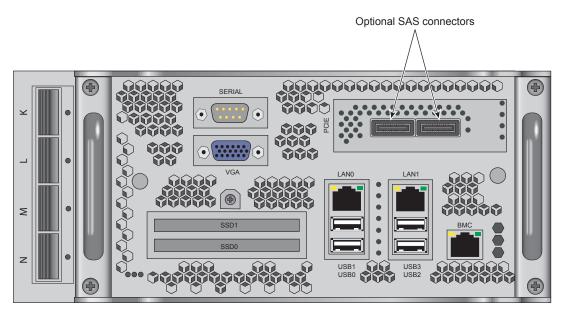


 Figure 3-6
 BaseIO Riser Enabled Blade Front Panel Example

MIC/GPU Enabled Compute Blade

The single-socket MIC/GPU enabled compute blade has one single socket node blade and supports one PCIe accelerator card. The MIC/GPU enabled compute blade has the following features:

- One HARP ASIC based board assembly with twelve NUMALink six (NL6) ports that connect the blade to the backplane and four NL6 ports connecting the blade to external QSFP ports.
- Specialized connectors support the connection to both the bottom compute node and the top MIC or GPU board assembly.
- One Bottom compute node board assembly with a single processor socket also supports eight memory DIMM slots.
- One baseboard management controller (BMC) and one x16 Gen3 PCIe full-height double-wide slot that supports a single MIC or GPU accelerator card.
- The accelerator card connects directly to the bottom compute board assembly via a ribbon cable and draws power from the IRU backplane.

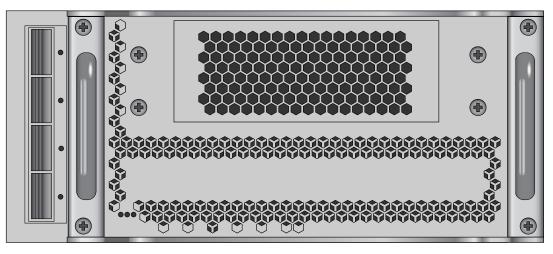


Figure 3-7

MIC/GPU Enabled Compute Blade Example Front View

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 rack, an IRU positioned in U01 through U10 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 3000 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 tall (42U) and short (24U) SGI UV 3000 racks in the following sections:

- "Overview" on page 53
- "SGI UV 3000 Series Rack (42U)" on page 54
- "SGI UV 3000 42U System Rack Technical Specifications" on page 58
- "The 24U (Short) Rack" on page 59

Overview

At the time this document was published only the tall (42U) SGI UV 3000 rack (shown in Figure 4-2) and the optional 24U (short rack) are available from the SGI factory for use with SGI UV systems. Other racks may be available to house the system IRUs, RMC, optional servers, storage and console equipment, check with your SGI sales or service representative for more information.

SGI UV 3000 Series Rack (42U)

The tall rack (shown in Figure 4-1 on page 55) has the following features and components:

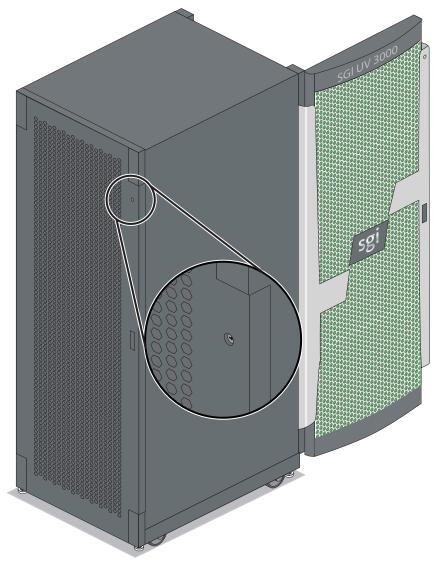
• Front and rear door. The front door is opened by grasping the outer end of the rectangular-shaped door piece and pulling outward. It uses a key lock for security purposes that should open all the front doors in a multi-rack system (see Figure 4-2 on page 56).

Note: The front door and rear door locks are keyed differently. The rear lock on an air-cooled rack is shown in Figure 4-1 on page 55. The optional water-chilled rear door (see Figure 4-3 on page 57) does 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 a 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 in the front floor and top of the rack. Multiple cables are attached to the front of the IRUs; therefore, a significant part of the cable management occurs in the front part of the rack. The stand-alone optional system administration node, system console and any optional storage modules installed in the same rack with the IRU(s) use rear cable management. Optional inter-rack communication cables can pass through the top of the rack. These are necessary whenever the system consists of multiple racks. I/O and power cables normally pass through the bottom of the 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.** Up to 15 outlets may be required for a single-rack IRU system as follows:
 - Allow three outlets for the first IRU
 - Two outlets for an optional administration node (server)
 - One outlet for an optional administration console
 - Two outlets for each storage or PCIe expansion chassis
 - Allow three more outlets for each additional IRU in the system

Note than an eight outlet single-phase PDU may be used for the administration node and other optional equipment.



Each three-phase power distribution unit has 21 outlet connections.

Figure 4-1 SGI UV Air-cooled D-Rack Example (Rear Lock Shown)

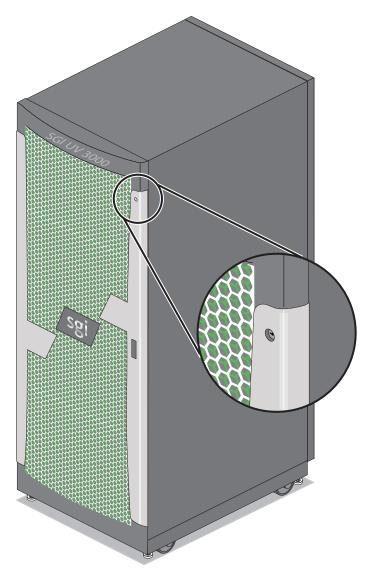
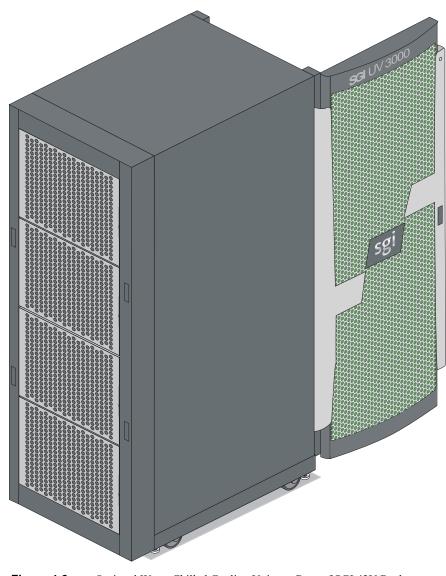


Figure 4-2 Front Lock on Tall (42U) Rack





SGI UV 3000 42U System Rack Technical Specifications

Table 4-1 lists the technical specifications of the SGI UV 3000 series tall rack.

Table 4-1 Tall 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)	2,206 lbs. (1,003 kg) air cooled 2,503 lbs. (1,359 kg) water assist cooling		
Single-rack system weight (approximate)	1,715 lbs. (779.5 kg) air cooled 2,012 lbs (914.5 kg) water assist cooling		
Voltage range	North America/International		
Nominal	200-240 VAC /230 VAC		
Tolerance range	180-264 VAC		
Frequency	North America/International		
Nominal	60 Hz /50 Hz		
Tolerance range	47-63 Hz		
Phase required	Single-phase or 3-phase		
Power requirements (max)	34.57 kVA (33.88 kW) approximate		
Hold time	16 ms		
Power cable	8 ft. (2.4 m) pluggable cords		

 Table 4-1
 Tall Rack Technical Specifications

Note: Racks equipped with optional top-mounted NUMAlink (ORC) routers have an additional weight of 53 lbs. (24.1 kg) plus the weight of additional cables.

The 24U (Short) Rack

The 24U (short) SGI rack can hold system compute nodes, IRUs, an RMC, switches, and optional storage or console equipment. Figure 4-4 shows a front-view example of the optional 24U rack used with SGI systems.

Note: The 24U rack uses single-phase power only.



Figure 4-4UV 24U (Short) Rack Example Front View

Figure 4-5 shows a rear-view example of the optional 24U rack used with SGI systems.

Caution: Always extend the rack's "leveling legs" prior to installation/extraction of any equipment in the rack's upper section.

Characteristic	Specification
Height	50.25 in. (127.6 cm) [24U internal height]
Width	24 in. (61 cm)
Depth	42 in. (106.7 cm)
Weight (full)	775 lbs (352.3 kg) approximate
Shipping length/width/height	50x36x60.25 in. (127x91.4x153 cm) in packaging
Empty rack shipping weight	269 lbs (122.3 kg) approximate (including pallet)
Full-rack total shipping weight	1,044 lbs (474.5 kg) approximate

Table 4-2 lists the technical specifications of the SGI 24U rack.

 Table 4-2
 Short (24U) Rack Technical Specifications



Figure 4-5SGI 24U (Short) Rack Rear View Example

Optional Octal Router Chassis Information

This chapter describes the optional NUMAlink router technology available in SGI UV 3000 systems consisting of two or more racks. This router technology is available in an enclosure "package" known as the Octal Router Chassis (ORC). This optional ORC chassis can be mounted on the top of the SGI UV 3000 rack. NUMAlink advanced router technology reduces UV 3000 system data transfer latency and increases bisection bandwidth performance. Router option information is covered in the following sections:

- "Overview" on page 61
- "SGI UV 3000 Series NUMAlink Octal Router Chassis" on page 62
- "SGI UV 3000 External NUMAlink System Technical Specifications" on page 64

Overview

At the time this document was published, external NUMAlink router technology was available to support from 2 to 512 SGI UV 3000 racks. Other "internal" NUMAlink router options are also available for high-speed communication between smaller groups of SGI UV 3000 racks. For more information on these topics, contact your SGI sales or service representative.

The standard routers used in the SGI UV 3000 systems are the NL6 router blades located internally to each IRU. Each of these first level routers contain a single 16-port NL6 HARP router ASIC. Twelve ports are used for internal connections (connecting blades together), the remaining four ports are used for external connections. The NUMAlink ORC enclosure is located at the top of each SGI UV 3000 rack equipped with the option. Each top-mounted NUMAlink ORC enclosure contains four or eight 16-port HARP ASIC based router boards. Each of these router boards has a single NL6 HARP router ASIC. This is the same router ASIC that is used in the NL6 router blades installed inside the system IRUs.

Note that the ORC chassis also contains a chassis management controller (CMC) board, two power supplies and its own cooling fans.

SGI UV 3000 Series NUMAlink Octal Router Chassis

The NUMAlink 6 ORC router is a 7U-high fully self contained chassis that holds up to eight 16-port NL6 router blade assemblies. Figure 5-1 shows an example rear view of the ORC with no power or NUMAlink cables connected.

The NUMAlink ORC is composed of the following:

- 7U-high chassis
- 4 or 8 HARP based router blade assemblies
- Cooling-fan assemblies
- Chassis Management Controller (CMC)/power supply assembly (with two power supplies)

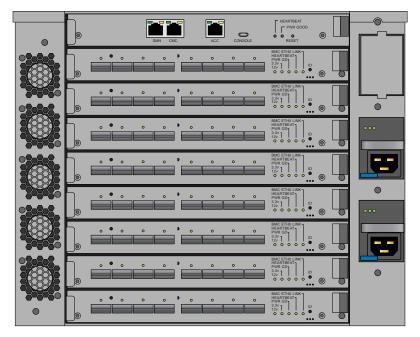


Figure 5-1 SGI UV 3000 Optional NUMAlink ORC (Rear View)

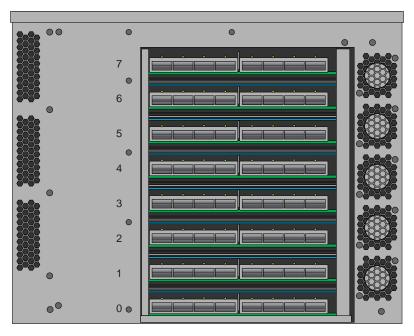


Figure 5-2 SGI UV 3000 Optional ORC Chassis Example (Front View)

Note: The NUMAlink unit's CMC is connected to the CMC in each IRU installed in the rack.

SGI UV 3000 External NUMAlink System Technical Specifications

Table 5-1 lists the basic technical specifications of the SGI UV 3000 series external NUMAlink ORC chassis.

Characteristic	Specification
Height	7U or 12.25 in. (31.1 cm)
Width	13.83 in. (35.13 cm)
Depth	14.66 in (37.24 cm)
Top-mount NUMAlink router weight (approximate)	53 lbs. (24.1 kg) not including attached cables
Power supply	Three 760-Watt hot-plug power supplies
Voltage range Nominal	North America/International 100-240 VAC /230 VAC
Frequency Nominal Tolerance range	North America/International 60 Hz /50 Hz 47-63 Hz
Phase required	Single-phase
Power cables	6.5 ft. (2 m) pluggable cords

 Table 5-1
 External NUMAlink Technical Specifications

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 65
- "Removing and Replacing an IRU Enclosure Power Supply" on page 67
- "Replacing a System Fan (Blower)" on page 69
- "Replacing a Blade-Mounted Drive" on page 72

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 66
- "Returning the System to Operation" on page 66



Warning: To avoid problems that could void your warranty, your SGI or other approved service provider should perform all the setup, addition, or replacement of parts, cabling, and service of your SGI UV 3000 system, with the exception of the following:

- 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 cards in the optional 1U PCIe expansion chassis.
- Using the ESI/ops panel (operating panel) on optional mass storage.
- Removing and replacing IRU power supplies, cooling fans and system disk drives.

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. The section "Powering On and Off from the Command Line Interface" in Chapter 1 provides additional information 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.

Note: Powering the system off is not a requirement when replacing a RAID 1 system disk. Addition of a non-RAID disk can be accomplished while the system is powered on, but the disk is not automatically recognized by system software.

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-up procedure, review the section "Powering On and Off from the Command Line Interface" in Chapter 1 for additional information.
- 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 7, for troubleshooting procedures.

Removing and Replacing an IRU Enclosure Power Supply

To remove and replace power supplies in an SGI UV 3000 IRU, you do not need any tools. Under most circumstances a single power supply in an IRU can be replaced without shutting down the enclosure or the complete system. In the case of a fully configured (loaded) enclosure, this may not be possible.

Caution: The body of the power supply may be hot; allow time for cooling and handle with care.

Use the following steps to replace a power supply in the blade enclosure box:

- 1. Open the front door of the rack and locate the power supply that needs replacement.
- 2. Disengage the power-cord retention clip and disconnect the power cord from the power supply that needs replacement.

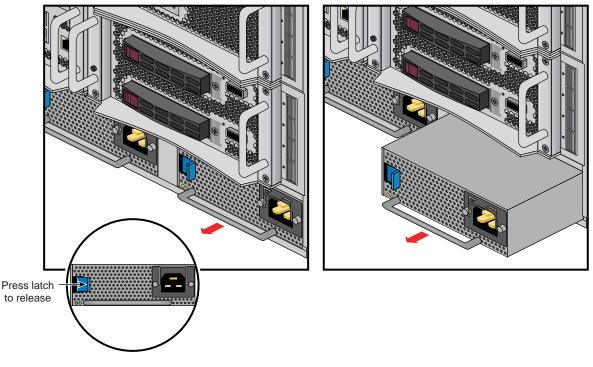


Figure 6-1 Removing an Enclosure Power Supply

- 3. Press the retention latch of the power supply toward the power connector to release the supply from the enclosure, see Figure 6-1 on page 67.
- 4. Using the power supply handle, pull the power supply straight out until it is partly out of the chassis. Use one hand to support the bottom of the supply as you fully extract it from the enclosure.
- 5. Align the rear of the replacement power supply with the enclosure opening, see Figure 6-2.
- 6. Slide the power supply into the chassis until the retention latch engages you should hear an audible click.
- 7. Reconnect the power cord to the supply and engage the retention clip.

Note: If AC power to the rear fan assembly is disconnected prior to the replacement procedure, all the fans will come on and run at top speed when power is reapplied. The speeds will readjust when normal communication with the IRU's CMC is fully established. See the section "Replacing a System Fan (Blower)" on page 69 for additional information on fan operation.

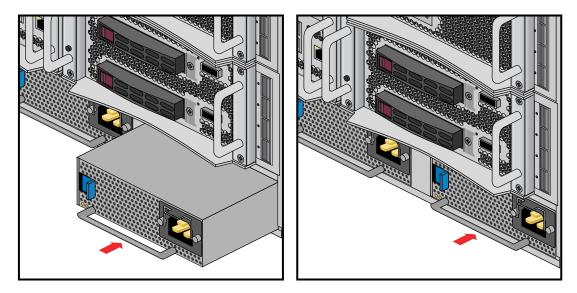


Figure 6-2 Replacing an IRU Enclosure Power Supply

Replacing a System Fan (Blower)

Chassis cooling for each UV 3000 IRU is provided by nine, heavy duty, counter-rotating fans. Each fan unit is made up of two fans joined back-to-back, which rotate in opposite directions. The counter-rotating action increases airflow and dampens vibration levels.

If one fan fails, the remaining fans will ramp up to full speed and the overheat/fan fail LED on the control panel will illuminate (the system can continue to run with a failed fan).

Note that each power supply in the system is cooled by an individual internal cooling fan.

The IRU enclosure cooling fans are positioned back-to-back with the blades in the UV enclosure. You will need to access the rack from the back to remove and replace a fan. The enclosure's system controller issues a warning message when a fan is not running properly. This means the fan RPM level is not within tolerance. Depending on system configuration, when a cooling fan fails, some or all of the following things happen:

1. The system console will show a warning indicating the rack and enclosure position

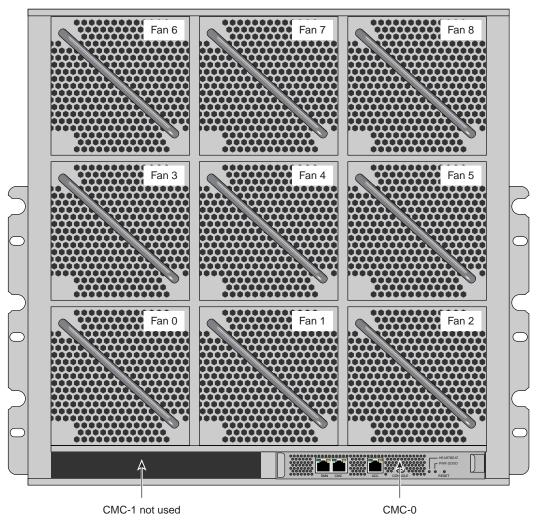
001c01 L2> Fan (number) warning limit reached @ 0 RPM

- 2. A line will be added to the L1 system controller's log file indicating the fan warning.
- 3. If optional SGI Remote Services (SGI RS) is used, a warning message will be sent to it also.

The chassis management controller (CMC) monitors the temperature within each enclosure. If the temperature increases due to a failed fan, the remaining fans will run at a higher RPM to compensate for the missing fan. The system will continue running until a scheduled maintenance occurs.

The fan numbers for the enclosure (as viewed from the rear) are shown in Figure 6-3 on page 70.

Note that under most circumstances a fan can be replaced while the system is operating. You will not need any tools to complete the replacement procedure.





Use the following steps and illustrations to replace an enclosure fan:

- 1. Open the rack's rear door and identify the fan that has failed, see Figure 6-4 on page 71.
- 2. Grasp the failed blower assembly handle and pull the fan straight out.

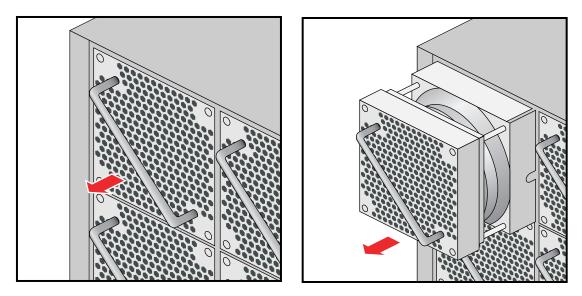


Figure 6-4 Removing a Fan From the Rear Assembly

- 3. Slide a new blower assembly completely into the open slot until the fan-interconnect engages and the new unit is flush with the rear of the assembly, see Figure 6-5 on page 72.
- 4. Confirm that the new fan is operational and close the rack's rear door.

Note: If you disconnected the AC power to the rear fan assembly prior to the replacement procedure, all the fans will come on and run at top speed when power is reapplied. The speeds will readjust when normal communication with the blade enclosure CMC is fully established.

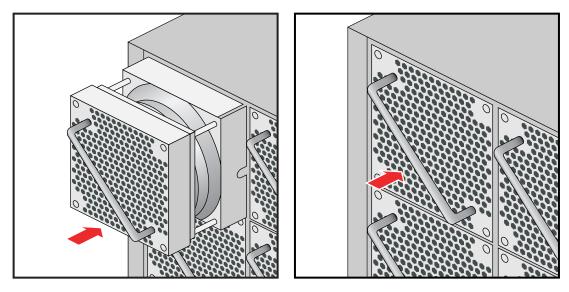


Figure 6-5Replacing an Enclosure Fan

Replacing a Blade-Mounted Drive

The dual-disk drive blade is used to house two disk drives as shown in Figure 6-6 on page 73. This section describes how to install or remove the drives. The blade supports RAID 1, RAID 0 and JBOD disk drives.

Note: A RAID 1 drive may be replaced while the system is operating. Removal of a JBOD or RAID 0 drive while the system is operating will cause generation of system errors and possible loss of data.

Use the following steps and illustrations to add or replace a disk drive in the dual disk drive riser blade.

To remove a disk drive:

- 1. Press in and down on the red button until the handle is released, see Figure 6-6 on page 73 for an example.
- 2. Pull the handle outward until the locking mechanism is fully cleared.
- 3. Grasp the disk drive by the side and extract it from the disk riser blade.

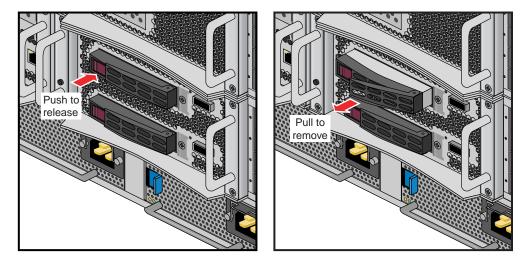


Figure 6-6 Removing the UV 3000 System Disk Example

Installation of a disk drive into the riser blade is the opposite of extraction, use the following steps:

- 1. Install a drive (pre-mounted on sled) into the dual-disk drive riser blade with the drive assembly oriented as shown in Figure 6-7 on page 74.
- 2. Slide the disk and sled into the riser until the actuating teeth can grab the riser plate.

Important: Use care - do not insert the drive too far into the disk riser blade.

3. Push the drive handle inward until the handle clicks into place (this completes the insertion of the disk drive).

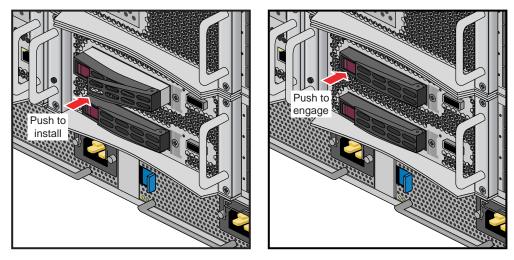


Figure 6-7 Replacing a UV 3000 Blade-Mounted Disk Example

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 79

Troubleshooting Chart

Table 7-1 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 representative. For more information about the SGI Electronic Support system, see the "Optional SGI Remote Services (SGI RS)" on page 21. For an international list of SGI support centers, see: http://www.sgi.com/support/supportcenters.html

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 technical support organization.	
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.	
No status LEDs are lighted on an individual blade.	Confirm the blade is firmly seated in the IRU enclosure. See also "Compute/Memory Blade LEDs" on page 78.	
The system will not boot the operating system.	Contact your SGI support organization: http://www.sgi.com/support/supportcenters.html	
The amber (yellow) status LED of an IRU power supply is lit or the LED is not lit at all. See Table 7-2 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 in. If the green LED does not light, contact your support organization.	
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.	

 Table 7-1
 Troubleshooting Chart

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 7-2 for a complete list.

 Table 7-2
 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 seven LED indicators visable behind the perforated sheetmetal of the blade.

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

- System power good green LED
- BMC heartbeat green LED
- Blue unit identifier (UID) LED
- BMC Ethernet 1 green LED
- BMC Ethernet 0 green LED
- Green 3.3V auxiliary power LED
- Green 12V power good 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. Figure 7-1 shows the locations of the blade LEDs.

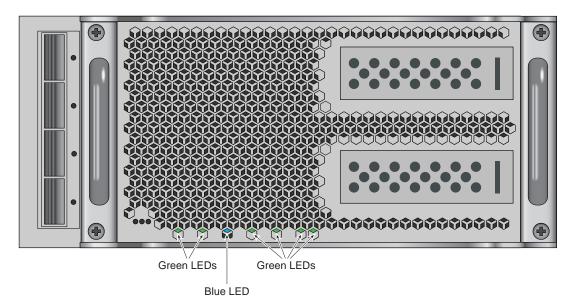


Figure 7-1 UV Compute Blade Status LED Locations Example

SGI Electronic Support

The following services are part of the available integrated SGI Electronic Support system:

SGI Remote Services (SGI RS)

The optional SGI RS system automatically detects system conditions that indicate potential future problems and then notifies the appropriate personnel. This enables you and SGI global support teams to pro-actively support systems and resolve issues before they develop into actual failures. SGI Remote Services provides a secure connection to SGI Customer Support, see "Optional SGI Remote Services (SGI RS)" in Chapter 1 for more information.

SGI Knowledgebase

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.

SGI Warranty Levels

SGI Electronic Support services are available to customers who have a valid SGI Warranty or extended support contract. Additional electronic services may become available after publication of this document. To purchase a support contract that allows you to use all available SGI Electronic Support services, contact your SGI sales representative. For more information about the various support contracts, see the following Web pages:

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

Technical Specifications and Pinouts

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

- "System-level Specifications" on page 81
- "Physical Specifications" on page 82
- "Environmental Specifications" on page 83
- "Power Specifications" on page 84
- "I/O Port Specifications" on page 85

System-level Specifications

Table A-1 summarizes the SGI UV 3000 system configuration ranges. Note that while each dual-node compute/memory blade holds two processor sockets (one per node board); each processor socket can support multiple "cores".

Category	Minimum	Maximum
Blades per system	(2 blades) ^a	128 blades
Individual Rack Units (IRUs)	1 per rack	4 per rack
Blades per IRU	2 per IRU	8 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 blades	One per SSI	One per SSI

Table A-1SGI UV 3000 System Configuration Ranges

a. Dual-node blades support two CPU sockets per blade using a variable number of cores.

Physical Specifications

Table A-2 shows the physical specifications of the SGI UV 3000 system.

Feature	Specification	
Dimensions for a single 24-inch wide tall rack, including doors and side panels		
Shipping dimensions	Height: 81.25 in. (206.4 cm) Width: 42 in. (106.7 cm) Depth: 52 in. (132.1 cm)	
Single-rack shipping weight (approximate)	2,206 lbs. (1,003 kg) air cooled 2,503 lbs. (1,359 kg) water assist cooling	
Single-rack system weight (approximate)	1,715 lbs. (779.5 kg) air cooled 2,012 lbs (914.5 kg) water assist cooling	
Access requirements		
Front	48 in. (121.9 cm)	
Rear	48 in. (121.9 cm)	
Side	None	
10U-high Individual Rack Unit (IRU) enclosure specifications	Dimensions: 17.5 in high x 19 in (flange width) wide x 27 in deep 44.45 cm high x 48.26 cm wide x 68.58 cm deep	

 Table A-2
 SGI UV 3000 Physical Specifications

Note: Racks equipped with optional top-mounted NUMAlink (ORC) routers have an additional weight of 53 lbs. (24.1 kg) plus the weight of additional cables.

Environmental Specifications

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

Table A-3Environmental 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)
Heat dissipation full	
SGI UV 3000 (rack)	115.6 kBTU/hr maximum (based on 33.88 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.

Feature	Specification	
Single-phase power requirements		
Voltage	200-240V (180-254 VAC min/max)	
Frequency	50-60 Hz	
Power	33.88 kW per 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	33.88 kW per compute rack	
Total harmonic distortion	Less than 10% at full load	

Table A-4Power Specifications

I/O Port Specifications

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

- "BaseIO VGA Port Information" on page 85
- "Ethernet Port" on page 87
- "Serial Ports" on page 88
- "USB Type A Connector" on page 90

BaselO VGA Port Information

The 15-pin VGA port on the BaseIO blade (see Figure A-1) has the following features:

- · Server-class 2D hardware acceleration support with integrated 24-bit RAMDAC
- Display resolution up to 1600 x 1200 @ 60Hz
- Up to 128 Mbytes DDRII memory interface support
- A single USB keyboard/mouse is supported by the baseIO blade connectors

The BaseIO VGA interface (see Table A-5 on page 86) can be used for all basic interaction with your SGI UV 3000 system. Note that it does **not** provide a direct interconnect to the system CMC.

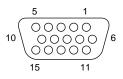


Figure A-1 VGA Port Pinouts

Table A-5	VGA Pin Functions	
Pin Number	Function	
1	Red	
2	Green	
3	Blue	
4	N/C	
5	Ground	
6	Ground	
7	Ground	
8	Ground	
9	Ground	
10	Ground	
11	N/C	
12	DDCDAT	
13	HSYNC	
14	VSYNC	
15	DDCCLK	

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-2 shows the Ethernet port.

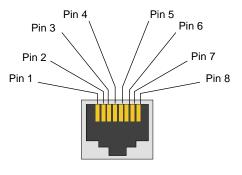




Table A-6 shows the cable pinout assignments for the Ethernet port operating in 10/100-Base-T mode and also operating in 1000Base-T mode.

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 –

Table A-6Ethernet Pinouts

NU = Not used

Serial Ports

The service nodes 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-3 shows a serial port.

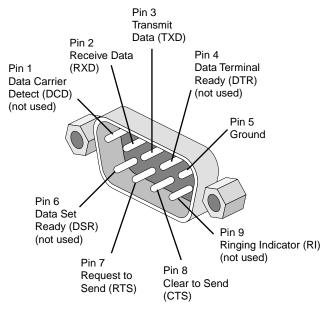


Figure A-3Serial Port Connector

Table A-	Table A-7 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	

Table A-7 shows pinout assignments for the 9-pin male DB-9 connector.

USB Type A Connector

Figure A-4 shows the USB type A connector provided on the baseIO riser blade that supports general USB applications and optional keyboard and mouse configurations.

Table A-8 lists the pin assignments for the USB type A connector.

Â	Â	Â	Ą	
1	2	3	4	

Figure A-4	Pin Number Locations for USB Type A Connector
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	e		
Signal	Color	Pin Number	
VCC	Red	1	
-Data	White	2	
+Data	Green	3	
Ground	Black	4	

Table A-8	Pin Assignments for USB	Type A Connector
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Safety Information and Regulatory Specifications

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

- "Safety Information" on page 91
- "Regulatory Specifications" on page 93

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.
- 3. Do not use this product near water.
- 4. Do not place this product or components of this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.
- 5. Slots and openings 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.
- 6. This product should be operated from the type of power indicated on the marking label. If you are not sure of the type of power available, consult your dealer or local power company.
- 7. Do not allow anything to rest on the power cord. Do not locate this product where people will walk on the cord.
- 8. Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a fire or electric shock. Never spill liquid of any kind on the product.

- 9. Do not attempt to service this product yourself except as noted in this guide. Opening or removing covers of node and switch internal components may expose you to dangerous voltage points or other risks. Refer all servicing to qualified service personnel.
- 10. Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
 - 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 since improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to normal condition.
 - 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.
- 11. 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.
- 12. Use only the proper type of power supply cord set (provided with the system) for this unit.
- 13. Do not attempt to move the system alone. Moving a rack requires at least two people.
- 14. 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 93
- "CE Notice and Manufacturer's Declaration of Conformity" on page 93
- "Electromagnetic Emissions" on page 94
- "Shielded Cables" on page 96
- "Electrostatic Discharge" on page 96
- "Laser Compliance Statements" on page 97
- "Lithium Battery Statement" on page 98

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-1 VCCI Notice (Japan Only)

Korean Class A Regulatory Notice

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

Figure B-2 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-ROM drive in this computer is a Class 1 laser product. The DVD-ROM 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 Statement



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.