



SGI™ 3000 Family Site Planning Guide

007-3601-002.1

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Record of Revision

Version	Description
001	July 2000 Original printing.
002	May 2001 Added SGI Onyx 3000 series system information and updated other information throughout.
002.1	June 2001 Revised tables in Chapters 7 and 8 to include the SGI Onyx 3200 system.

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About This Guide

What This Guide Contains

The *SGI 3000 Family Site Planning* guide contains the following chapters:

Chapter 1, “Overview”

Describes the information that helps management and site preparation personnel prepare for an SGI Origin 3000 series server or SGI Onyx 3000 series system installation. It includes general site planning concepts as well as specific site specifications and requirements that you may use as a guide during the site planning and preparation process.

Chapter 2, “Site Preparation Concepts”

Describes the site planning process and provides a detailed discussion of the issues involved in any site preparation. For the 3000 family-specific site planning information, refer to the subsequent sections of this guide.

Chapter 3, “SGI Origin 3000 Series Features, Configurations, and Components”

Describes the configuration classes, brick types, and cooling requirements for the Origin 3000 series server.

Chapter 4, “SGI Origin 3000 Server Series Layouts”

Describes the layouts for a typical system and floor panels as well as the expansion plan for the Origin 3000 series server.

Chapter 5, “SGI Onyx 3000 Series Features, Configurations, and Components”

Describes the configuration classes, brick types, and cooling requirements for the Onyx 3000 series system.

Chapter 6, “SGI Onyx 3000 Series System Layouts”

Describes the layouts for a typical system and floor panels as well as the expansion plan for the Onyx 3000 series system.

Chapter 7, “System Physical Specifications”

Describes the specifications for the SGI 3000 family rack system and the system components in detail.

Chapter 8, “Site Requirements”

Describes the information and guidelines necessary to plan your access route and to meet the environmental and power requirements for your system.

Chapter 9, “Securing the Cabinets”

Describes the four M12 threaded weld nut locations that are used to secure each 3000 family system to the computer room subfloor.

Chapter 10, “Equipment Separation Limits”

Describes the recommended separation limits between the various components of a 3000 family system.

Chapter 11, “Site Planning Checklist”

Describes the site planning checklist that you can use as an organizational tool during the site planning and preparation process.

Chapter 12, “Summary”

Describes the methods available for contacting your SGI site planning representative.

Appendix A, “U.S. Customary Measure and Metric Measure Conversion”

Describes the conversions between U.S. customary and metric measures, Fahrenheit-to-Celsius temperature, and Celsius-to-Fahrenheit temperature.

Appendix B, “Regulatory Specifications”

Describes several national and international specifications to which the SGI 3000 family products conform.

Audience for This Guide

This guide is intended to be used by people who are responsible for physical site planning and preparation.

By planning for your SGI Origin 3000 series server or SGI Onyx 3000 series system installation, you will have the opportunity to make adjustments to your site and order any additional facility equipment, thereby reducing the time required to install your system.

Obtaining Publications

To obtain SGI documentation, go to the SGI Technical Publications Library at <http://techpubs.sgi.com>.

Reader Comments

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We value your comments and will respond to them promptly.

Overview

This document provides information that helps management and site preparation personnel prepare for an SGI Origin 3000 series server or SGI Onyx 3000 series system installation. It includes general site planning concepts as well as specific site requirements that you may use as a guide during the site planning and preparation process. Hereinafter, the term *SGI 3000 family* is used to indicate both SGI Origin 3000 and SGI Onyx 3000 series systems.

SGI site planning representatives are available in the United States of America for site planning consultation; contact a site planning representative by telephone in the USA at +1 888 744 8638, extension 676-2820; at +1 715 726 2820; by fax at +1 715 726 2969; or by e-mail at site@sgi.com.

You will also want to discuss your site planning, preparation, and installation plans with your SGI account manager. Contact your account manager to obtain configuration information for any system.

Use the following steps as a planning guide for your system installation:

1. Identify the space, power, and environmental requirements for the system.
2. Select a location for the system and identify any necessary modifications.
3. Prepare the site according to the guidelines in this publication. You may use the site planning checklist in Chapter 11 of this document as a guide.

Site Preparation Concepts

This section of the *SGI 3000 Family Site Planning* guide provides a general overview of the site planning process and information about the issues that are involved in any site preparation. For the 3000 family-specific site planning information, refer to the subsequent chapters of this document.

Not all of the items listed here apply to every installation. For example, if the system that you plan to install is a single small workstation, the delivery route probably does not present a problem. However, it is a good idea to briefly consider each question for any system installation.

Physical Location

This section addresses the issues that you need to consider when you select a physical location for a new system.

Selecting a Delivery Route

To ensure that the system can be delivered to the planned location, answer the following questions before you plan a delivery route for the new system:

- Will the shipping crate fit through doorways and hallways and on elevators?

In addition to measuring the width of the hallways along the planned delivery route, measure corners where the system might get stuck, the width and height of doorways and elevators, and other areas that may cause problems. Table 7-1 on page 42 and Table 7-2 on page 43 list the relevant system dimensions.

- If the shipping crate cannot be transported to the final destination, can you unpack the system somewhere else?

Often it is possible to unpack the system in a hallway or on a loading dock, and then roll the system to its final destination.

- Is the floor strong enough to support the weight of the system?

The rack loaded with bricks can be very heavy. Determine the weight of each rack and verify that the floor along the delivery route can handle the weight. Refer to Table 7-1 on page 42 or Table 7-2 on page 43 for the maximum weight per system rack.

- Is the elevator capable of lifting the system?

If the intended delivery route includes an elevator, check its weight capacity and size against the system specifications listed in Table 7-1 on page 42 or Table 7-2 on page 43. The use of freight blankets can reduce damage to the elevator or the system.

- Are there any steep angles, bumps, changes in level, or thick carpeting along the delivery route?

Large systems are typically equipped with casters. However, the casters are designed to roll easily only on relatively smooth, level surfaces. Ramps, sliding door channels, rough flooring, and even thick carpeting may present difficulty. If in doubt, arrange for additional assistance. The maximum access incline should not exceed 10 degrees (height:length = 1:6).

- Did you ensure that the leveling pads are fully retracted?

Some systems have screw-in leveling pads. If you move the system with these feet extended, severe damage to the chassis can occur. These feet sometimes unscrew during shipment. Before you unpack or move a system, ensure that the leveling pads are fully retracted. Refer to Chapter 9, “Securing the Cabinets” for more information about these leveling pads.

Selecting a Final Location

Consider the following issues when you select a final location for the system:

- Will the system fit in its intended location?

Carefully calculate the total system dimensions to ensure that it will fit in its intended final location.

- Does the intended system location provide adequate access space for maintenance?

Even if the system will fit in its intended final location, you must have room to maintain it. Ensure that you will have enough room to open the doors, remove boards, and accomplish other routine tasks. Table 7-1 on page 42 and Table 7-2 on page 43 list the relevant system dimensions and access requirements.

- Is the intended location subject to flooding, extremes of humidity or temperature, or any other factor that would make it inappropriate for sensitive electronic equipment?

The air temperature should not be too high and should not fluctuate dramatically, air should circulate freely and be relatively dust-free, and the system should not be exposed to any caustic or corrosive chemicals or vapors. Refer to the section titled “Environmental Requirements” on page 16 for system-specific requirements.

- Will the system interfere with normal traffic through aisles, hallways, or entrance ways in the intended location?
- Will the intended location enable you to conveniently perform routine operations, such as loading and unloading tapes or other media, attaching cables, and so on?
- Is the floor of the intended final location strong enough to support the weight of the system and any future expansions?

Large systems should be installed in computer rooms with raised floors. Pay particular attention to floor loading and weight distribution in this case.

Floor-loading specifications are typically calculated by averaging the total chassis weight that is distributed over the entire footprint of the chassis. Because the chassis sits on four casters or four leveling pads, the load at each of these four points is greater.

- Have you considered the site preparation cost and ease of installation at this location?
- Does the intended location of the system allow for future expansion plans?

Electrical Requirements

Most SGI 3000 family systems require electrical resources beyond those that are normally provided in a typical office environment. The following sections describe those requirements in general. These sections, along with the data presented in subsequent sections, can help you determine the exact requirements for the new system. Table 2-1 lists the electrical service requirements.

Table 2-1 Electrical Service Requirements

Electrical Service	Requirement
Phase imbalance	5% maximum (line-to-line, line-to-neutral)
Voltage harmonics	5% maximum total, 3% largest
Voltage deviation from sine wave	+5% to -10%
Voltage modulation	3% maximum
Transient voltage surges	+5%
Transient voltage sags	-5%
Frequency tolerance	5%
Frequency rate of change	Less than 1.0 Hz during any 10-cycle period

Voltage Requirements

SGI Origin 3400 and Origin 3800 servers can be shipped with the option of either single-phase or 3-phase input power. SGI Origin 3200 servers and all SGI Onyx 3000 series systems are shipped with single-phase power. Refer to the section titled “System Power Requirements” in Chapter 8 for the voltage requirements of the chassis. Your account manager must be made aware of your needs before the system is ordered.

Ensure that the required voltage is available and is within a reasonable distance of the intended location. If it is not, the site must be wired for the required voltage.

Different voltages are available in different countries. Japan uses a low voltage of 100 volts and a high voltage of 200 volts. The USA and Canada use a low voltage of 120 volts and high voltages of either 208 volts or 240 volts. Some other countries use 220 volts or 240 volts, but many have now switched to a 230-volt standard.

In this guide, *120 volts* is used to refer to the low range (and, except where otherwise indicated, includes Japan’s 100 volts), and *208 volts* is used to refer to the high range (except where otherwise indicated).

Power Requirements

Even one SGI 3000 family system rack can require more power than is routinely available in an office environment. A room full of racks will almost certainly require some specially installed electrical circuits. Refer to the section titled “System Power Requirements” in Chapter 8 for the power requirements of the rack in question.

Note: The wattages listed in this guide are the system maximums. While most systems never draw the maximum rated wattage, SGI recommends that you install wiring capable of supporting the system’s maximum potential wattage.

Power is measured in voltamperes (VA) and watts. Both measurements are important when you prepare to install wiring, power conditioning, and cooling.

A VA rating is a function of the voltage and amperage of a system. A watt rating is the VA rating multiplied by its power factor (refer to the section titled “Power Factor” on page 12). You can convert among amps, volts, VA, power factor, and watts by using the following formulas:

Single Phase

$$VA = (\text{Amps} \cdot \text{Volts})$$

$$VA = \left(\frac{\text{Watts}}{\text{Power Factor}} \right)$$

$$\text{Watts} = (VA \cdot \text{Power Factor})$$

$$\text{Amps} = \left(\frac{\text{Watts}}{\text{Volts} \cdot \text{Power Factor}} \right)$$

3 Phase

$$VA = (\text{Amps} \cdot \text{Volts} \cdot 1.73)$$

$$VA = \left(\frac{\text{Watts}}{\text{Power Factor}} \right)$$

$$\text{Watts} = (VA \cdot \text{Power Factor})$$

$$\text{Amps} = \left(\frac{\text{Watts}}{\text{Volts} \cdot \text{Power Factor} \cdot 1.73} \right)$$

Use this information and the information provided in Table 8-3 on page 52 and Table 8-4 on page 53 to determine the site power requirements.

If, after you add up the power requirements of all the devices in the room, you find that the total is close to the limit that the existing wiring can support, you should install additional power circuits to support the systems.

Grounding Requirements

- Ensure that the ground has sufficiently low impedance to limit the voltage to ground, and to facilitate the operation of protective devices in the electrical circuit.
- Ensure that all grounds entering the room are interconnected somewhere within the building to provide a common ground potential. This includes any separate power sources, lighting, convenience outlets and other grounded objects such as building steel, plumbing, and ductwork. Refer to the "Federal Information Processing Standards Publication (FIPS 94)" and the "National Electric Code (NEC)" for power, grounding, and life safety issues.

Warning: Any difference in ground potential greater than 250 millivolts between two racks that are connected with NUMAlink 3 or Xtown cables can cause severe equipment damage.

- To maintain your entire SGI 3000 family system at the same electrical potential, all multiple-rack systems must be bolted together.

Power Factor

Power factor is a number between 0 and 1 that represents the ratio of the total power in watts to the total voltamperage input. A system with a power factor of one (sometimes called "unity") is making full use of the energy that it draws. A system with a power factor of 0.75 is effectively using only three-quarters of the energy that it draws.

SGI 3000 family systems are power-factor corrected and thus have a power factor very close to 1. Some 3000 family peripherals do not have this correction built in.

Caution: Ensure that you consider the power factor of the system when you select an uninterruptible power supply (UPS).

Inrush Current

Inrush current is the peak current that flows into a power supply as AC power is applied. The inrush current is usually much higher than the nominal current. This temporary increase is due to the charging of the input filter capacitors in the power supply and is limited only by the input impedance of the power supply and the wiring that supplies power to the system.

The inrush current often far exceeds the rating of the electrical outlet to which the system is connected. If the system is connected directly to "wall power" (that is, it is not on a UPS or a standby power system [SPS]), this is typically not a problem. The peak inrush current lasts for only a part of one AC cycle (less than 1/60 of a second). This is not long enough to damage wiring and, in most cases, will not trip a circuit breaker (depending on the delay curves of the circuit breaker).

It is very important that you take the inrush current of the system into account when you select a UPS or SPS. Unlike power-company lines, these power-treatment devices may not be able to supply the current that is required during power-on, even if they are sized appropriately for nominal current loads. For more information, refer to the following “Power-line Treatment” section.

It is possible for the inrush current drawn by a device to cause a slight drop in the line voltage. Although it is very brief, this drop can, in unusual situations, be enough to cause problems in other devices on the same line.

Inrush current is a characteristic of the power supplies in a system. The inrush current values apply whether the system is heavily or lightly loaded. Therefore, although a lightly loaded system may draw less power while it is running, it may still draw a very large inrush current.

SGI 3000 family systems typically have very low inrush characteristics because of the method by which power supplies and bricks are sequenced.

Power-line Treatment

Power-line treatment may be required if the site has unstable power with problems such as fluctuating voltage, transients, surges and spikes, and noise. Common causes of unreliable power are old wiring; load-switching equipment, such as welding and plating devices; and variable-speed motors or motors that start and stop frequently.

A variety of devices are available to improve the quality of a power line, including:

- Line conditioners
- Line regulators
- Isolation transformers
- UPSs

Total Harmonic Distortion

Table 8-3 on page 52 and Table 8-4 on page 53 list total harmonic distortion (THD). Total harmonic distortion is a measure of the extent to which a waveform is distorted by harmonic content. This rating indicates how much the power supply in the system affects the quality of power delivered to other systems that are supplied by the same transformer.

Note: While the term *total harmonic distortion* can be applied to either voltage or current, all of the numbers listed in this guide apply to current.

Thermal Requirements

It is important that the SGI 3000 family systems be maintained within their rated thermal range.

Refer to the section titled “Environmental Requirements” in Chapter 8 for the temperature ranges for each rack, both operating and nonoperating as well as the recommended operating ambient temperature. Typically, the upper limit of the temperature range is more likely to become a problem than the lower limit.

Heat Output

All of the systems that this guide describes have a maximum rated operating temperature. Exceeding this temperature greatly increases the rate of hardware failure and, in many cases, causes the system to shut itself down.

All of the power consumed by a computer system must exist as some form of energy. For air-cooled systems, this energy exists in the form of heat in the surrounding air. Every watt drawn by a system is eventually dissipated as heat. This heat tends to raise the temperature of the air in the room that houses the system. Therefore, some method is needed to keep the temperature within the required range. The typical method is to install additional process cooling capacity.

The maximum heat dissipation-to-air per rack is listed in Table 7-1 on page 42 and Table 7-2 on page 43.

Air-conditioning Terminology

Air-conditioning capacity is generally measured in Btu/hr, tons, or kilocalories (kcal).

A Btu, or British thermal unit, is the amount of energy needed to raise the temperature of one pound of water by one degree Fahrenheit at a constant pressure of one atmosphere.

One ton of air conditioning removes 12,000 Btu of heat energy per hour.

The more systems that are installed in a given area, the larger the air-conditioning capacity that is required. It is important to calculate the total thermal load of the systems that you will be installing and determine whether the existing air-conditioning system can handle the additional load. If not, you must provide additional cooling capacity.

Calculating Thermal Load

The thermal load can be determined as follows:

1. Add the wattages of all the items in the room.
2. Calculate Btu/hour by multiplying the total wattage by 3.41.
3. Calculate the kcal/hour by multiplying the total wattage by 3.23.
4. Calculate the tons of air-conditioning load by dividing Btu/hr by 12,000.
 $1 \text{ kBtu/hr} = 1000 \text{ Btu/hr}$
 $12,000 \text{ Btu/hr} = 1 \text{ ton of air-conditioning load}$

The calculations described here give results that represent the maximum thermal output of the equipment. These calculations, and the numbers given in Table 8-1 on page 50, Table 7-1 on page 42, and Table 7-2 on page 43 are based on maximum rated wattage.

The thermal figures quoted in this guide are likely to be worst-case figures.

Some sources quote a “typical” thermal output for a system, which may be significantly less than the numbers listed in this guide. Selecting an air-conditioning capacity that accommodates the “worst-case” thermal output, however, helps to minimize system problems later.

When you calculate the air-conditioning capacity that is required, be sure to include the heat load from computer equipment that is already installed at the site, noncomputer equipment that is already installed at the site, and the computer equipment that is being added. Also remember to include noncomputer equipment that is already installed or will be installed, and other factors such as solar gain, outside ambient air temperatures, and the number of people who work in the room.

Thermal Gradient

Table 8-1 includes a maximum thermal gradient for each system. The thermal gradient is the rate at which the temperature changes, which is typically expressed in degrees per hour. Temperature changes that are more rapid than the given rate can damage some of the components in the systems.

Unless otherwise indicated, the thermal gradients listed apply whether or not the system is operating.

Cooling In Mission-critical Installations

In mission-critical installations, it is important to consider what would happen if an air conditioner failed. Complete consideration of this topic is beyond the scope of this guide; however, consider the following questions:

- Should the site have multiple air-conditioning units, each able to maintain a safe temperature?
- If an air conditioner fails, how long can the systems run before they get too warm and must be shut off?
- Can the air conditioner be repaired before the systems get too warm?

Environmental Requirements

Electromagnetic interference (EMI), electrostatic discharge (ESD), vibration, and humidity can cause problems for computer systems.

Electromagnetic Interference

Electromagnetic interference (EMI) is caused by malfunctioning, incorrectly manufactured, or incorrectly installed devices that radiate electrical signals. Common sources of EMI include electronic, telephone, and communications equipment. EMI transmissions can be conducted or emitted.

Use properly shielded connectors and cables throughout the site.

Caution: Failure to use shielded cables where appropriate may violate FCC regulations and void the manufacturer's warranty.

Electrostatic Discharge

SGI designs and tests its products to ensure that they resist the effects of electrostatic discharge (ESD). However, it is still possible for ESD to cause problems that range from data errors and lockups to permanent component damage. To protect the systems from ESD, follow these precautions:

- Minimize the use of carpeting at computer locations (or consider special static-reducing carpet).
- Ensure that all electronic devices are properly grounded.
- Keep chassis doors and access panels closed while the system is operating.
- Fasten all screws, thumbnail-fasteners, and slide locks securely.
- Use a grounded static wrist strap whenever you work with the chassis or components.
- Use antistatic packing material for storage and transportation.
- Clear the site of all devices that create static electricity or provide possible sources of EMI.

Vibration

The SGI 3000 family product line is designed for typical office computing environments; it requires no special modifications or protection. If you plan to install a system at an industrial site, ensure that vibration does not exceed the limits that are listed in Table 7-1 on page 42 and Table 7-2 on page 43.

Humidity

Table 8-1 on page 50 lists the maximum humidity levels for each rack, both operating and nonoperating; and Table 8-2 on page 51 lists the recommended operating relative humidity. Exposure to humidity levels above the rated maximums, or exposure to condensation, can cause equipment damage.

Humidity Gradient

Table 8-1 lists the maximum humidity gradient for the system. The humidity gradient is the rate at which the humidity changes, which is typically expressed in percent relative humidity per hour. Humidity changes that are more rapid than the given rate can damage some of the components in the systems.

Unless otherwise indicated, the humidity gradients that are listed apply whether or not the system is operating.

Ergonomic Requirements

When you select a physical location, pay attention to ergonomic considerations. The location of a system often restricts the location of the devices that attach to it, such as monitors, keyboards, and so on. Decisions that are made during the installation process can affect workers much later.

In addition to attached devices, consider other issues such as noise, temperature, air quality, and so on, some of which may be affected by the addition of the new system.

Acoustics

All of the acoustic measurements provided in this document are in dBa (decibels absolute) rather than dB (decibels). This is a measurement of weighted absolute noise power, and it includes frequency corrections.

The acoustic measurements listed in Table 7-1 on page 42 and Table 7-2 on page 43 are approximate. Acoustic values depend on many factors that are outside the control of the manufacturer. Room characteristics such as carpeting and wall coverings affect the noise levels at an installation.

If a site exceeds desirable noise levels, try these remedies:

- Reduce the quantity of flat reflective surfaces, such as glass, tile, or metal.
- Add sound-absorbing wall coverings, drapes, and ceiling tiles.
- Add sound baffles in critical locations (without blocking airflow).
- Modify the office space to separate the operators from the hardware.

Local Regulations

Before you install a system, become familiar with any applicable local regulations. Because these vary dramatically by country and state, it is impossible to provide a complete list of such regulations. These regulations, however, might involve:

- Power
- Emissions
- Safety issues
- Ergonomic and health issues
- Telecommunications

Planning for the Future

Even if the existing infrastructure can handle the immediate site needs, consider the future plans. It is much easier to provide enough space, power, air-conditioning capacity, and other resources in advance than it is to add them later.

SGI Origin 3000 Series Features, Configurations, and Components

The SGI Origin 3000 series servers are distributed shared memory (DSM) computer systems that scale from 2 to 512 processors. In a DSM system, each processor contains memory that it shares with the other processors in the system. The modularity of the DSM systems combines the advantage of low-entry cost with global scalability in processors, memory, and I/O. The Origin 3000 series is expandable in units of bricks; a brick consists of four CPUs and any memory and electronics that are required for operation as a DSM. The Origin 3200 servers can house two or four CPU bricks. The Origin 3400 servers and Origin 3800 servers can each house four CPU bricks.

The Origin 3000 series server uses SGI NUMA, which is a cache-coherent nonuniform memory access architecture that ensures that the cache of the processors contains valid data. For example, if a processor alters a cache location and another processor has a copy of that location in its cache, the processor that holds the copy will be notified that the memory location no longer contains valid data. SGI NUMA architecture also supports varied access times for local and remote memory references.

The Origin 3000 series server:

- Supports the MIPS R12000 processor and its successors
- Uses a peripheral component interface (PCI) based I/O system as its primary I/O system; a secondary I/O system supports the legacy Crosstalk I/O (XIO) system of the SGI Origin 2000 servers and Silicon Graphics Octane systems
- Uses the IRIX operating system that includes the baseline features of the IRIX 6.5 release
- Uses fan-assisted ambient air cooling
- Receives power from power bays
- Serves as the host processor for InfiniteReality3 graphics
- Consists of compute nodes that are linked by a NUMALink 3 interconnect network
- Contains components that are packaged into standard 19-inch rackmounted subassemblies called *bricks*
- Expands by increasing either the number of bricks or the memory size
- Has three levels of system control

SGI Origin 3000 Series Server Configurations

SGI configures the SGI Origin 3000 series servers to contain both standard and optional equipment. The configuration of each computer system depends on customer requirements.

Three Origin 3000 series servers are available: the 3200, the 3400, and the 3800. Refer to Table 3-1 for more information about each system class.

Table 3-1 Origin 3000 Series Server Configurations

Origin 3000 Series Class	Number of Compute Racks	Number of I/O Racks	Number of Processors
3200	1	0	2 to 8
3400	1	0 or 1	4 to 32
3800	1 to 16	1 to 8	16 to 512

The Origin 3000 series server configurations range from a 2-processor single-rack system to a 512-processor multiple-rack system. The Origin 3000 series server configurations that include more than 512 processors are possible via clustering of the systems.

The Origin 3000 series short rack can house the following standard 19-inch rackmounted subassemblies: C brick, D brick, I brick, P brick, and X brick. The standard Origin 3200 system uses the short rack.

The Origin 3000 series tall rack can house the following standard 19-inch rackmounted subassemblies: C brick, D brick, I brick, P brick, and X brick. The Origin 3400 and Origin 3800 systems use the tall rack.

SGI Origin 3000 Series Server Bricks

The SGI Origin 3000 series servers are based on assemblages of CPU/memory, I/O, and peripheral enclosures referred to as *bricks*. These bricks may be mixed and matched within a standard 19-inch system rack to provide the desired system configuration. NUMALink 3 cables connect the bricks.

Customers may install bricks in any existing standard 19-in. rack if the system contains eight CPUs or fewer and the rack meets size, cabling, and airflow requirements of the individual racks. Systems with larger configurations (more than eight CPUs) require an Origin 3000 series rack; the 3000 series rack includes special cable management and power distribution infrastructure.

The SGI 3200 rack has 17U (usable spaces) of configured height. The SGI 3400 and 3800 rack have 39U (usable spaces) of configured height. 1U equals 1.75 inches (44.5 mm).

Table 3-2 lists the Origin 3000 series brick types, functions, and vertical rack heights.

Figure 3-1 shows the various Origin 3000 series brick types installed in the 3000 series racks.

Table 3-2 Origin 3000 Series Brick Types, Functions, and Heights

Brick Type	Components	Height
C Brick	Provides the compute functionality for the system in either 2 or 4 processors per C brick	3U
D Brick	Houses a maximum of 12 disk drives	4U
I Brick	Provides the I/O functions for basic 3000 series servers and boot I/O functions for large 3000 series servers	4U
P Brick	Seats the PCI cards that communicate with peripheral devices	4U
R Brick	Routes information between C bricks	2U
X Brick	Provides XIO slots that are compatible with XIO slots in SGI Origin 2000 and Octane series	4U

3: SGI Origin 3000 Series Features, Configurations, and Components

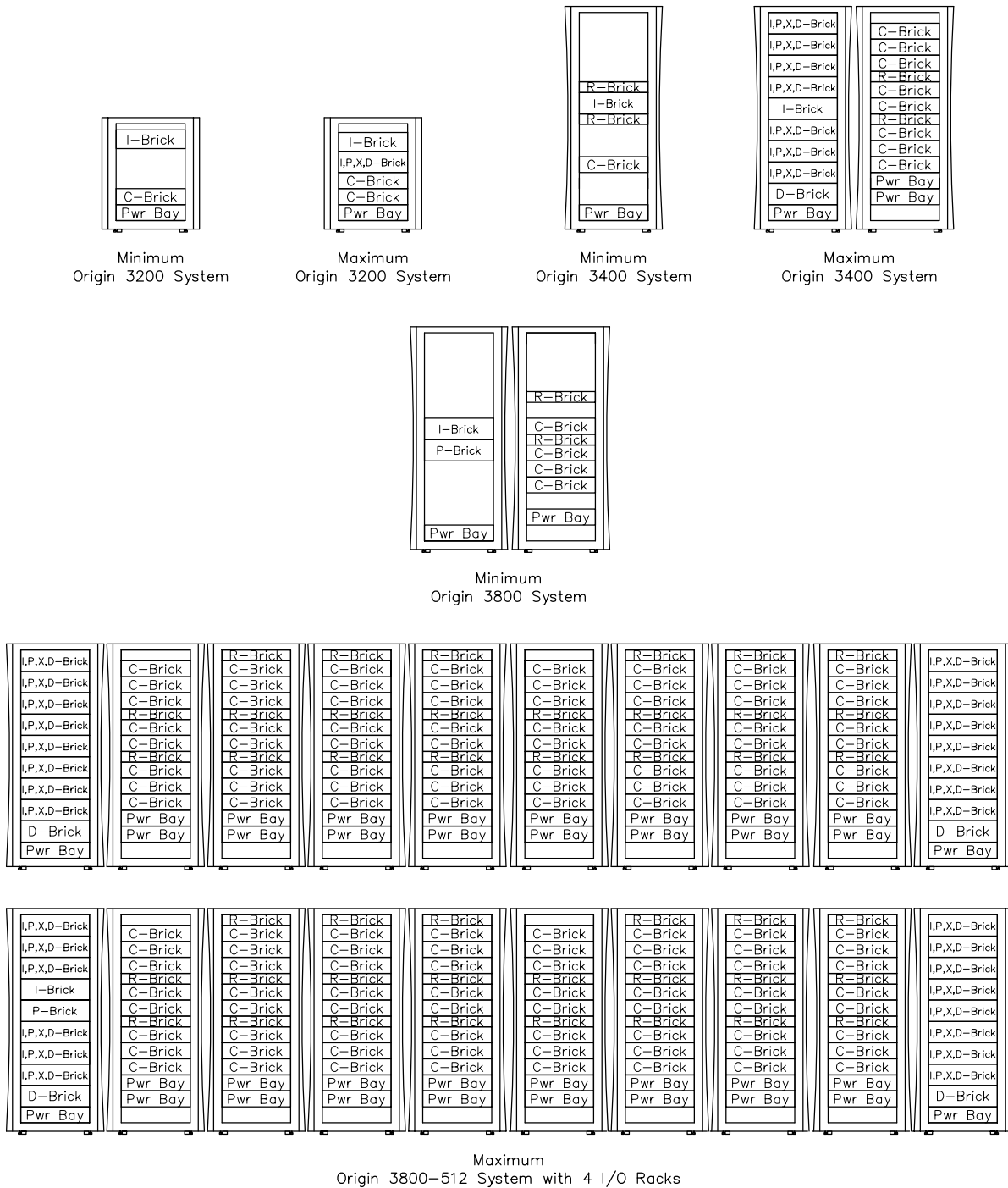


Figure 3-1 Typical Origin 3000 Series Server Configurations

System Control

The purpose of the SGI Origin 3000 series system control is to:

- Manage power control and sequencing
- Provide environmental control and monitoring
- Initiate system resets
- Provide storage for identification and configuration information
- Provide a console/diagnostic and scan interface

The SGI Origin 3000 series system control comprises three levels:

- L1 controller - brick-level system controller
- L2 controller - rack-level system controller
- L3 controller - system-level controller

L1 Controller

The L1 controller is not configurable; it is designed into all bricks except the D brick.

L2 Controller

The L2 controller is optional in SGI Origin 3200 systems; however, it is required with all SGI Origin 3400 and 3800 systems. The L2 controller is a 5.5 in. x 11.1 in. PCB assembly that is mounted in the top of the rack. The L2 controller does not use configurable rack space. It receives 48-Vdc power (30 watts) from the power bay.

The L2 controller is required in a rack when:

- The rack contains an R brick
- Remote maintenance of the system is required
- A rack display is desired

L3 Controller

The L3 controller is a system-level controller. The L3 controller is SGI software that runs on a stand-alone workstation or laptop computer. The L3 connects to the L2 controllers via a 10BaseT Ethernet hub. In an SGI Origin 3200 system, the L3 can connect directly to an L1 controller in a C brick via a USB port. The L3 controller is optional in all system sizes.

SGI Origin 3000 Server Series Layouts

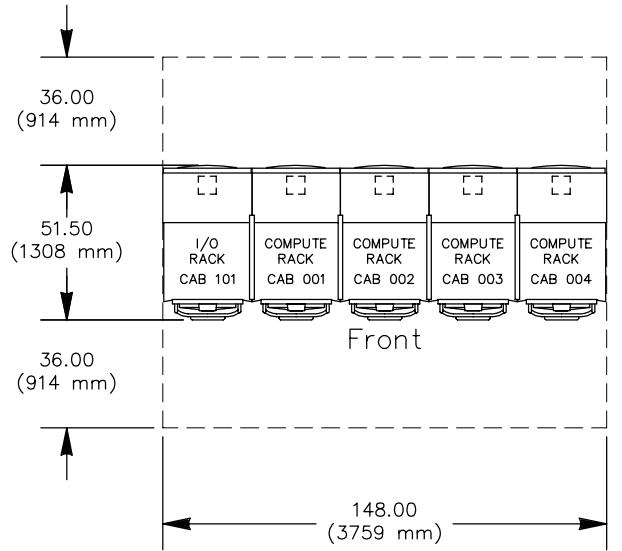
Systems that are installed on raised-floor panels require a floor cutout below each rack to accommodate the entrance of data and power cables.

Figure 4-1 and Figure 4-2 show the recommended service clearances and overall dimensions for 128-, 256- and 512-processor systems.

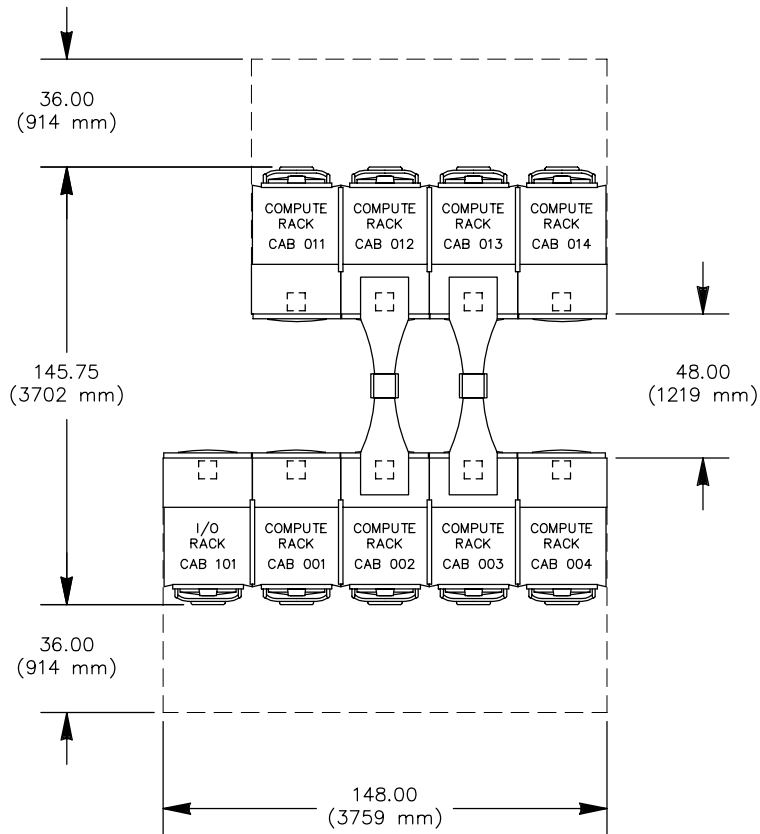
SGI recommends placing a perforated floor panel in front of each SGI Origin 3000 series server rack for an additional supply of cooling air. Racks with 32 to 512 processors will be arranged in the order shown.

Figure 4-3 through Figure 4-6 show the upgrade path.

E-mail site@sgi.com to request templates of the standard and optional floor layouts.

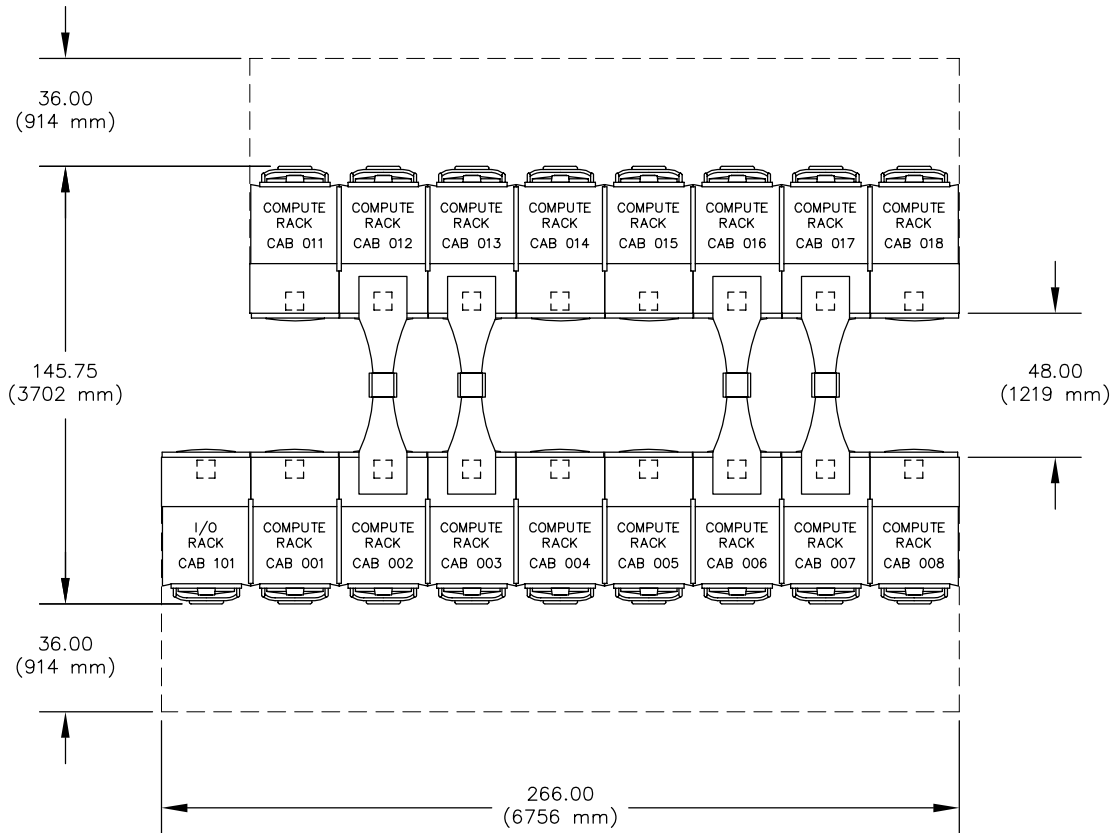


Origin 3800 Server 128 Processors



Origin 3800 Server 256 Processors

Figure 4-1 Required Service Clearances (128 Processors and 256 Processors)



3800 Server 512 Processors

Figure 4-2 Required Service Clearances (512 Processors)

4: SGI Origin 3000 Server Series Layouts

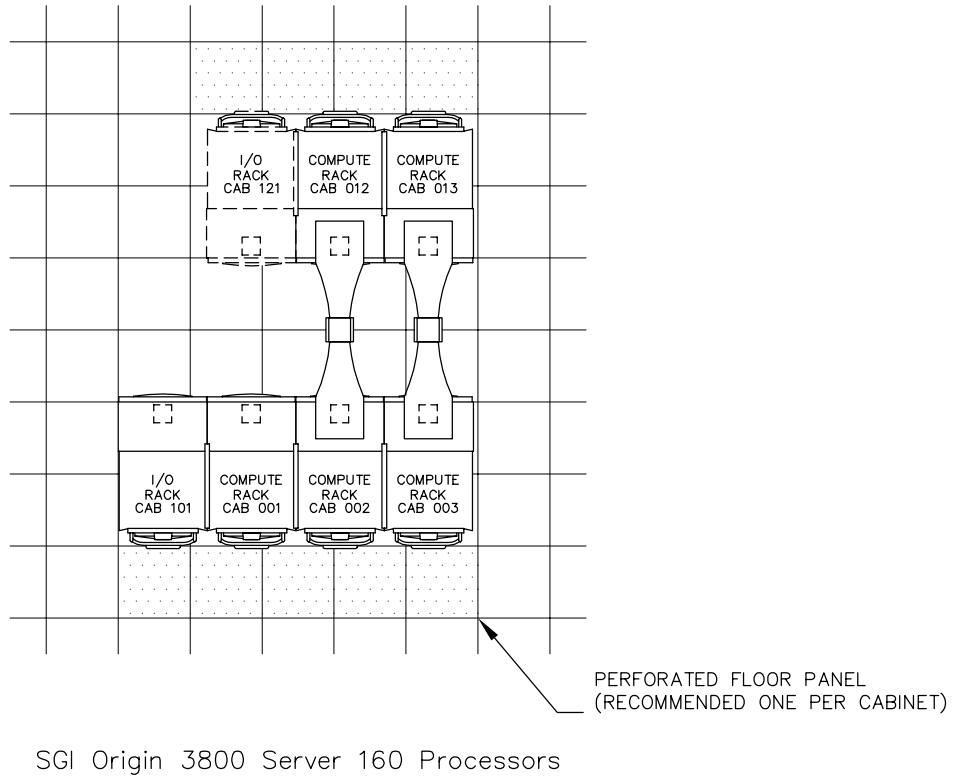
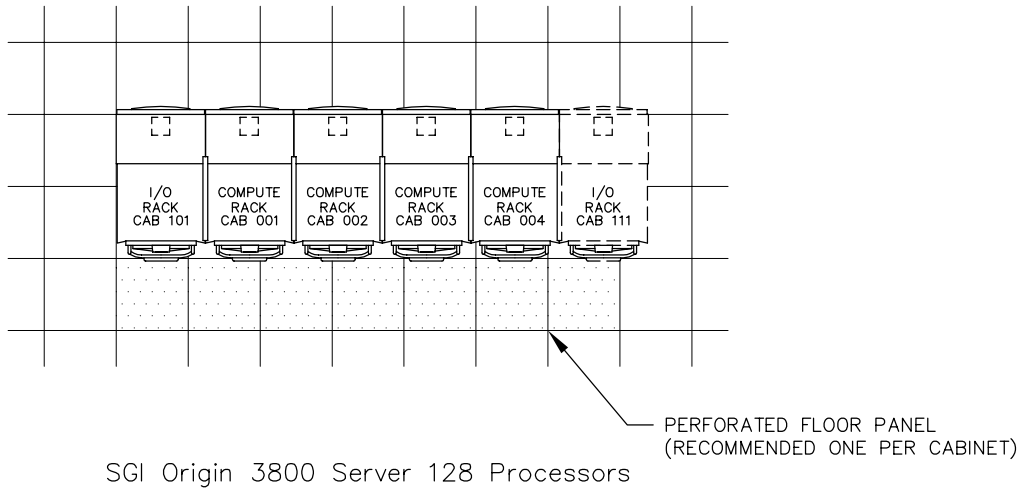
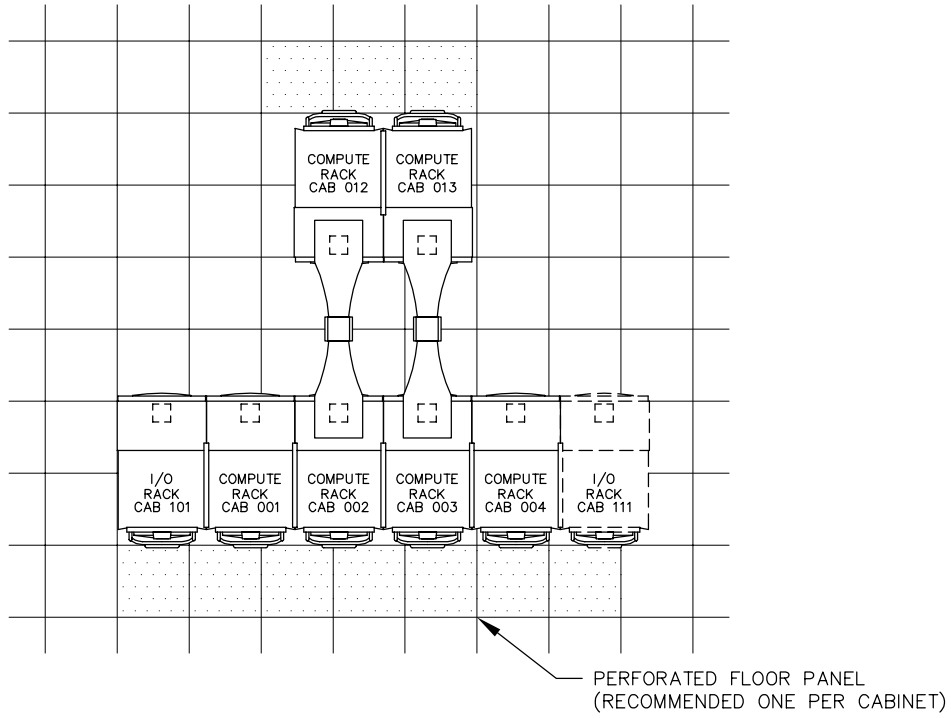
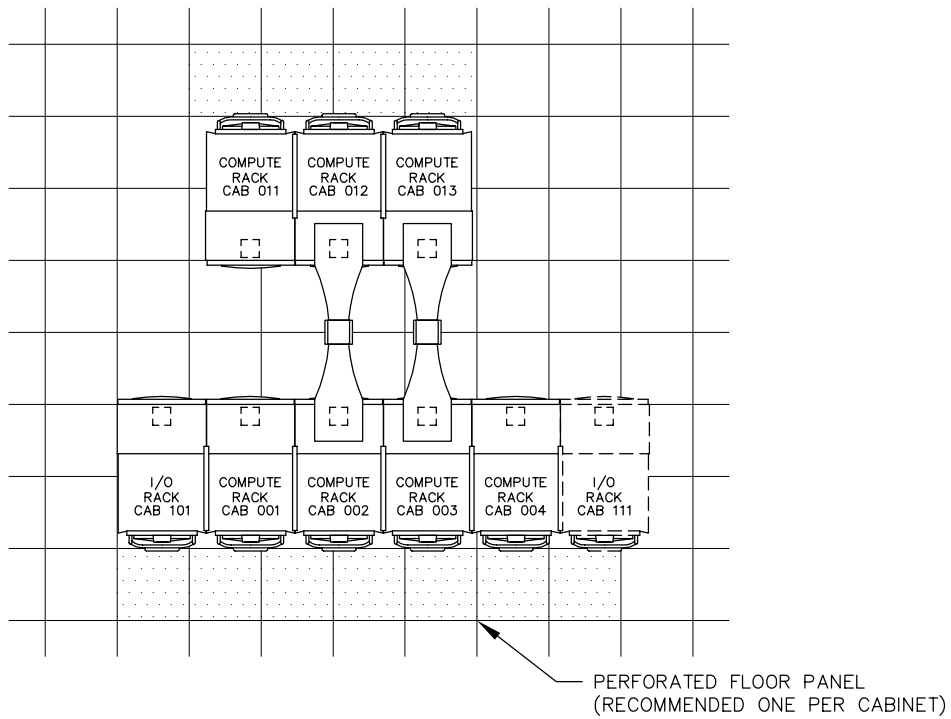


Figure 4-3 Standard Floor Layouts Placed on 24 in. x 24 in. Floor Panels

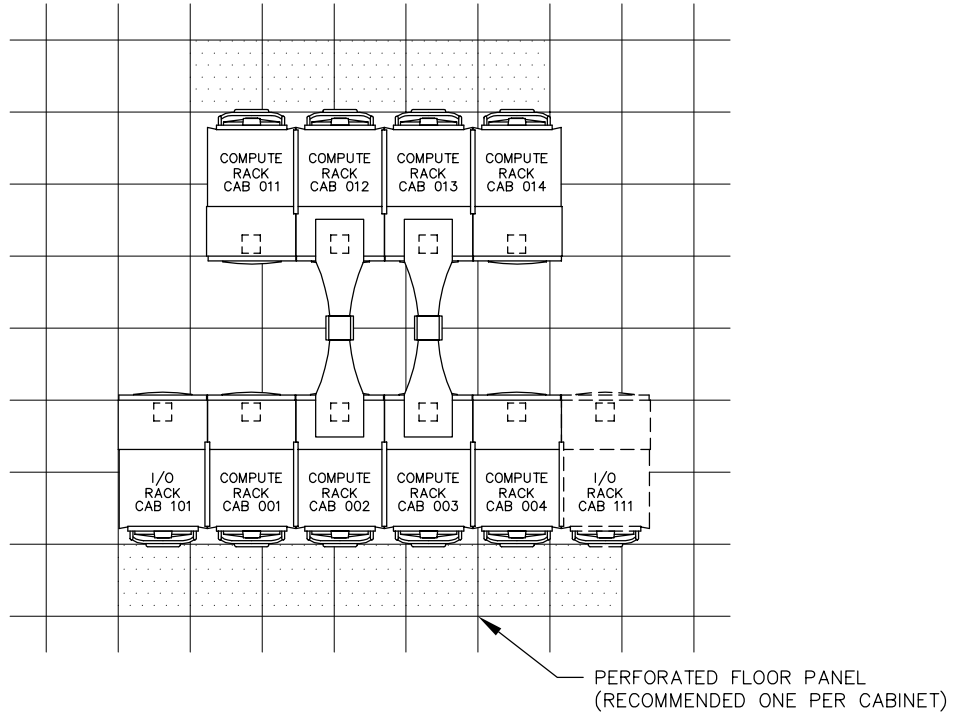


SGI Origin 3800 Server 192 Processors

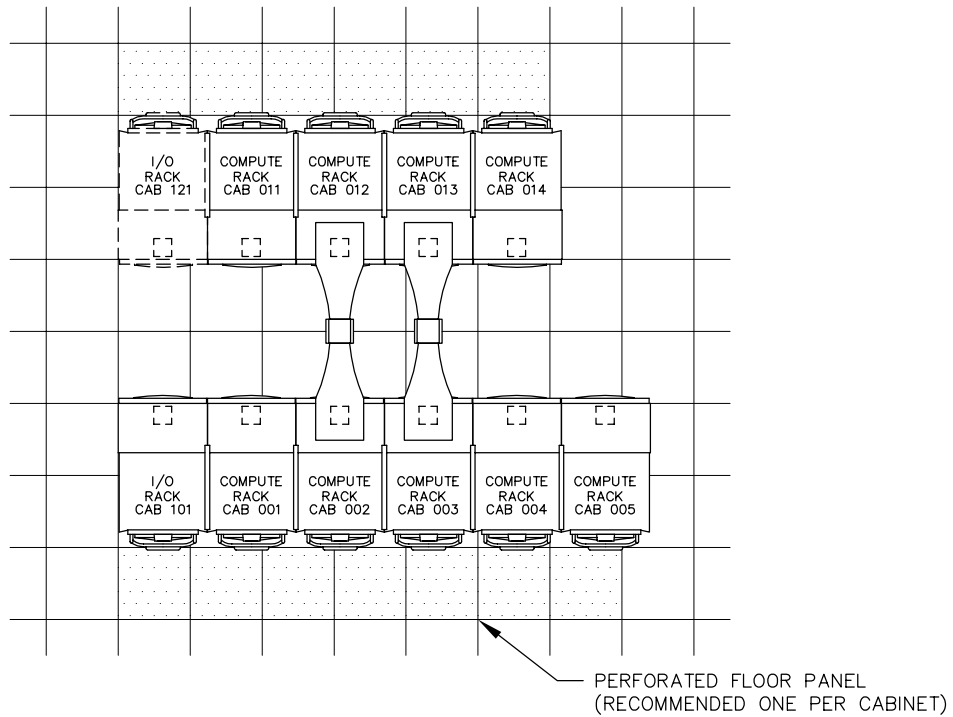


SGI Origin 3800 Server 224 Processors

Figure 4-4 Standard Floor Layouts Placed on 24 in. x 24 in. Floor Panels

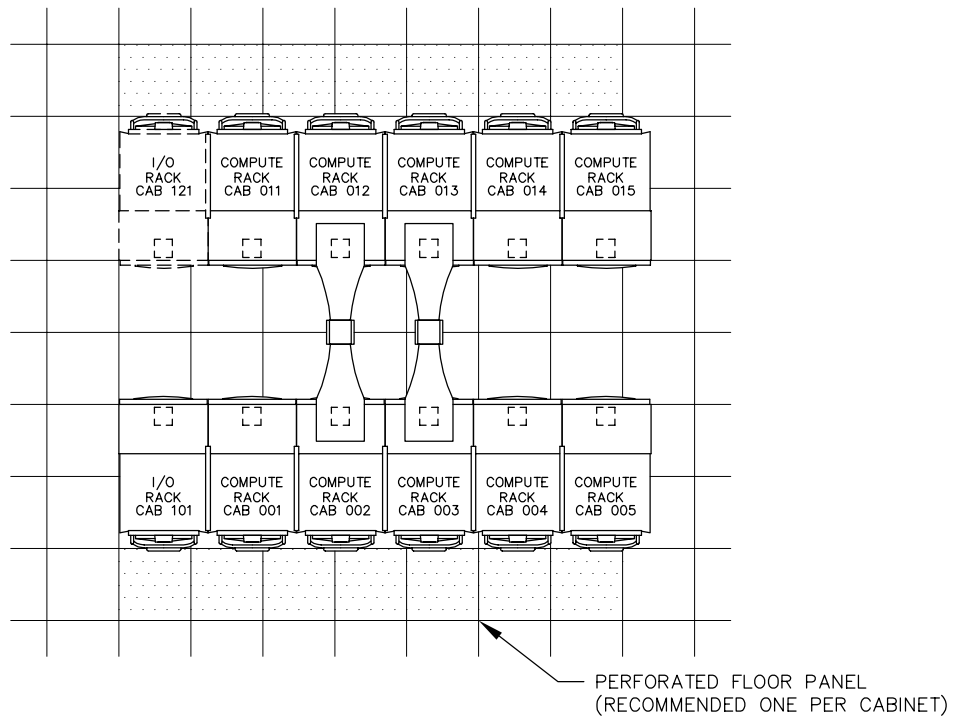


SGI Origin 3800 Server 256 Processors

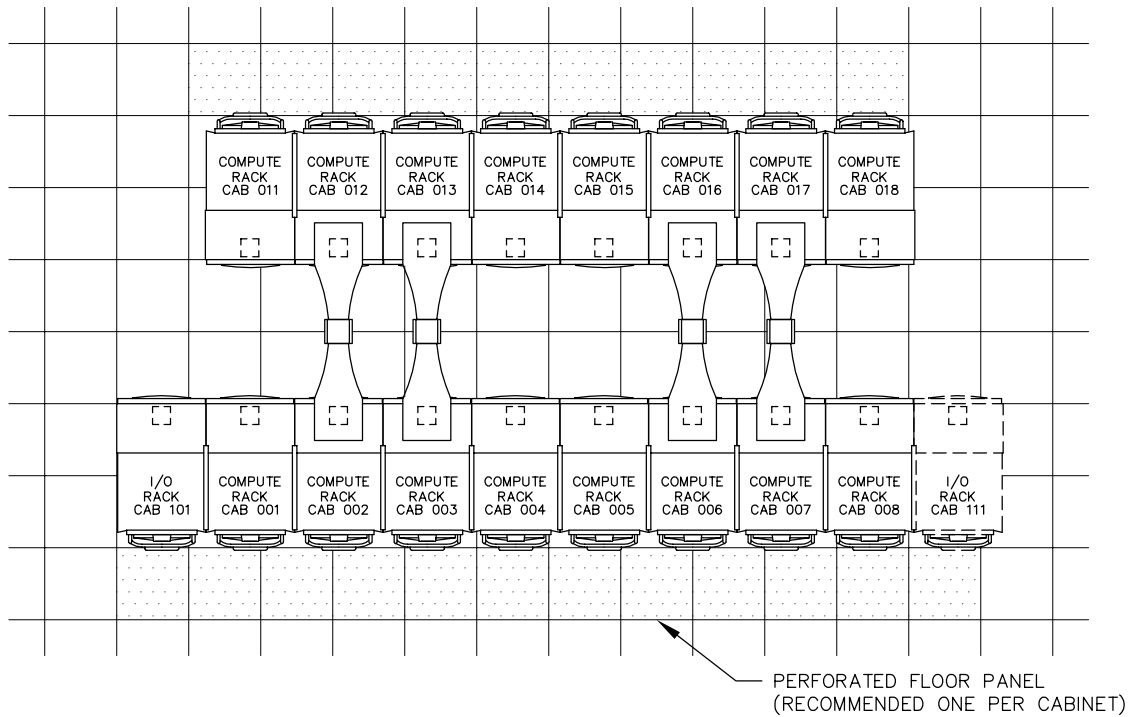


SGI Origin 3800 Server 288 Processors

Figure 4-5 Standard Floor Layouts Placed on 24 in. x 24 in. Floor Panels



SGI Origin 3800 Server 320 Processors



SGI Origin 3800 Server 512 Processors

Figure 4-6 Standard Floor Layouts Placed on 24 in. x 24 in. Floor Panels

SGI Onyx 3000 Series Features, Configurations, and Components

The SGI Onyx 3000 series systems are single or multipipe rackmounted graphics interface systems that are based on the SGI Origin 3000 series servers and visualization systems. The SGI Onyx 3000 series rackmount system is a graphics supercomputer that is designed to meet the demanding requirements of visual simulation, postproduction, multimedia, and distributed computing environments.

The compute power for the SGI Onyx 3000 series is provided by the SGI Origin 3000 series of multiprocessor distributed shared memory (DSM) computer systems. The SGI Onyx 3000 series uses a global-address-space cache-coherent multiprocessor that scales to 512 processors (~102 GFLOPS peak) in a cache-coherent domain.

Note: This chapter was written for a configuration with a maximum of 512 processors and 16 graphics pipes. At the time this guide was printed, a maximum of 32 processors and 8 pipes was supported.

The Onyx 3000 series systems provide the following graphics features:

- 1 to 16 graphics-pipe configurations
- Optional support of up to eight monitors on each pipe
- SuperWide (1920 x 1200) high-resolution monitors
- PCI-based digital audio processing
- Beeping keyboard for support of "bell"

The Onyx 3000 series systems also provide the following features:

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

SGI Onyx 3000 Series System Configurations

The SGI Onyx 3000 series is a highly configurable and flexible system architecture that is available in a single-rack or multirack system. Refer to Table 5-1 for more information about each system class.

Table 5-1 Onyx 3000 Series System Configurations

Onyx 3000 Series Class	Number of Compute Racks	Number of I/O Racks	Number of Processors	Number of Pipelines
3200	1	0	2 to 8	1 or 2
3400	1	0 or 1	4 to 32	1 to 8
3800	1 to 16	1 to 8	16 to 128	1 to 16

The single rack SGI Onyx 3200 system is configurable from two to eight 64-bit microprocessors, 512 MB to 16 GB of main memory, a wide variety of I/O interfaces, and one or two individual graphics workstation pipes.

The multirack SGI Onyx 3400 system is configurable from four to thirty-two 64-bit microprocessors, 512 MB to 64 GB of main memory, a wide variety of I/O interfaces, and one to eight individual graphics pipes.

The multirack SGI Onyx 3800 system is configurable from 16 to 128 64-bit microprocessors, 2 GB to 256 GB of main memory, a wide variety of I/O interfaces, and one to eight individual graphics pipes.

Because of the G brick, all SGI Onyx 3000 series systems use the 3000 series tall rack, which is 39U. 1U equals 1.75 inches (44.5 mm). Each graphics rack can hold a maximum of two G bricks. The 3000 series rack includes special cable management and power distribution infrastructure.

SGI Onyx 3000 Series System Bricks

The SGI Onyx 3000 series systems are based on assemblages of graphics, CPU/memory, I/O, and peripheral enclosures referred to as *bricks*. These bricks may be mixed and matched to provide the desired system configuration. NUMALink 3 cables connect the bricks.

Table 5-2 lists the Onyx 3000 series brick types, functions, and vertical rack heights.

Figure 5-1 shows the various Onyx 3000 series brick types installed in the 3000 series racks.

Table 5-2 Onyx 3000 Series Brick Types, Functions, and Heights

Brick Type	Components	Height
C Brick	Provides the compute functionality for the system in either 2 or 4 processors per C brick	3U
D Brick	Houses a maximum of 12 disk drives	4U
G Brick	Provides the graphic functionality for the Onyx 3000 series systems	18U
I Brick	Provides the I/O functions for basic 3000 series systems and boot I/O functions for large 3000 series systems	4U
P Brick	Seats the PCI cards that communicate with peripheral devices	4U
R Brick	Routes information between C bricks	2U
X Brick	Provides XIO slots that are compatible with XIO slots in SGI Origin 2000 and Octane series	4U



Figure 5-1 SGI Onyx 3000 Series System Configurations

System Control

The purpose of the SGI Onyx 3000 series system control is to:

- Manage power control and sequencing
- Provide environmental control and monitoring
- Initiate system resets
- Provide storage for identification and configuration information
- Provide a console/diagnostic and scan interface

The SGI Onyx 3000 series system control comprises three levels:

- L1 controller - brick-level system controller
- L2 controller - rack-level system controller
- L3 controller - system-level controller

L1 Controller

The L1 controller is not configurable; it is designed into all bricks except the D brick.

L2 Controller

All SGI Onyx 3000 series systems require an L2 controller. The L2 controller is a 5.5 in. x 11.1 in. PCB assembly that is mounted in the top of the compute rack. A graphics rack does not have an L2 controller. The L2 controller does not use configurable rack space. It receives 48-Vdc power (30 watts) from the power bay.

L3 Controller

The L3 controller is a system-level controller. The L3 controller is SGI software that runs on a stand-alone workstation or laptop computer. The L3 connects to the L2 controllers via a 10BaseT Ethernet hub. In an SGI Onyx 3200 system, the L3 can connect directly to an L1 controller in a C brick via a USB port. The L3 controller is optional in all system sizes.

SGI Onyx 3000 Series System Layouts

Note: This chapter was written for a configuration with a maximum of 512 processors and 16 graphics pipes. At the time this document was printed, a maximum of 32 processors and 8 pipes was supported.

Systems that are installed on raised-floor panels require a floor cutout below each rack to accommodate the entrance of data and power cables.

Figure 6-1 shows the recommended service clearances and overall dimensions for Onyx 3400 and 3800 systems with one I/O rack and Onyx 3800 systems with more than one I/O rack.

SGI recommends placing a perforated floor panel in front of each SGI Onyx 3000 series system rack for an additional supply of cooling air.

E-mail site@sgi.com to request templates of the standard and optional floor layouts.

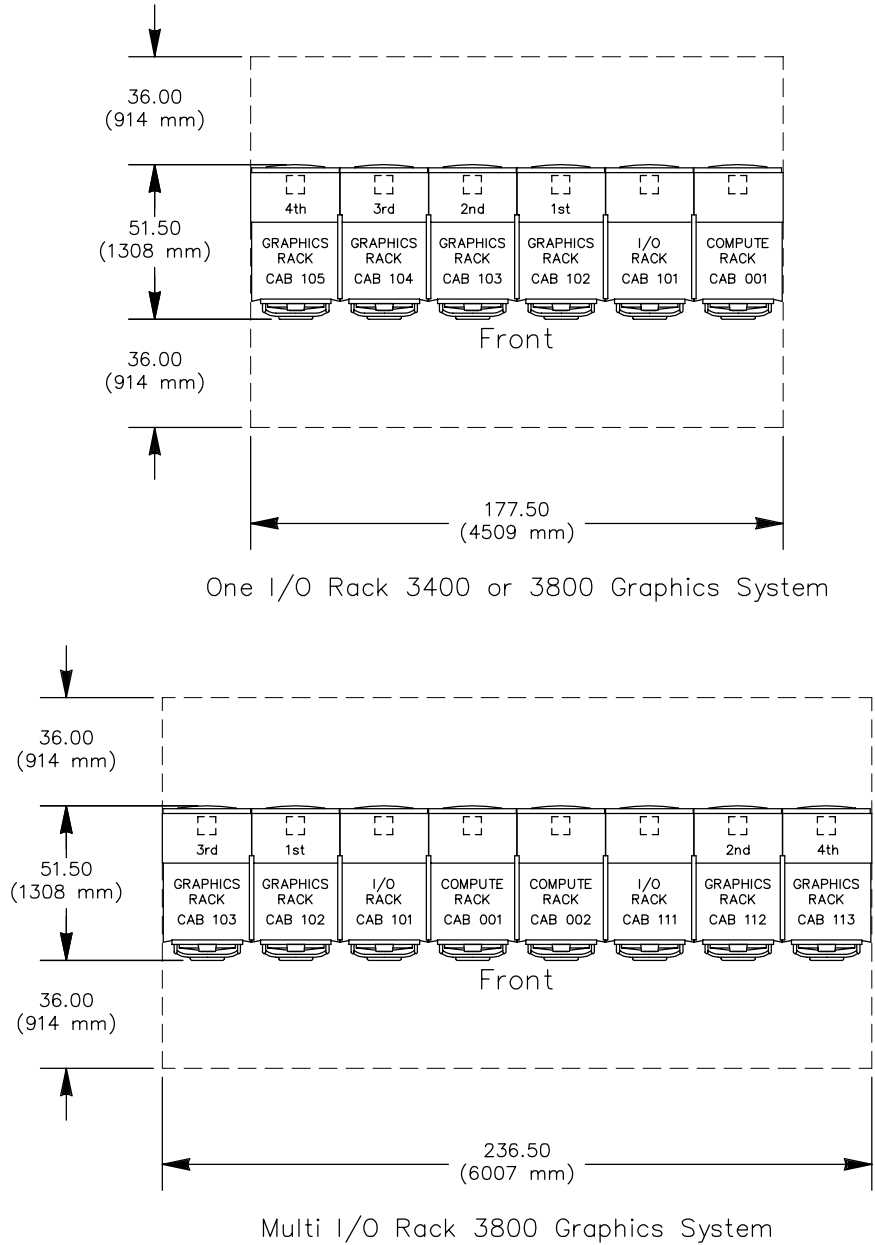


Figure 6-1 Required Service Clearances

System Physical Specifications

The SGI 3000 family systems consist of a variety of standard and optional equipment. Each rack or peripheral device and each system configuration has unique physical characteristics.

Table 7-1 provides the specifications for the SGI Origin 3200 rack system. The following subsections describe the system components in detail.

Table 7-2 provides the specifications for the SGI Onyx 3000 series and the SGI Origin 3400 or 3800 single-rack system.

All specifications in Table 7-1 are per rack unless otherwise noted.

Table 7-1 Physical Specifications for the SGI Origin 3200 Series System

Characteristic	Specification
Cabinet Characteristics:	
Height	36.06 in. (916 mm)
Width	25.38 in. (645 mm)
Depth	40.63 in. (1032 mm)
Maximum weight	475 lbs (215 kg)
Shipping Size:	
Height	48.75 in. (1238 mm)
Width	29.25 in. (743 mm)
Depth	42.75 in. (1086 mm)
Shipping weight	550 lbs (249 kg)
Access Requirements:	
Front	36.00 in. (914 mm)
Rear	36.00 in. (914 mm)
Side	None
Acoustical noise level	Less than 62 dBA
Maximum heat dissipation to air Cabinet	4.06 kBtu/hr (1.19 kW)
Maximum airflow (intake, front; exhaust, rear)	Less than 2000 CFM (0.94 m ³ /s)
Vibration:	
Nonoperational (sine sweep)	3-200-3 Hz, 0.5g @ 1 octave/min (vertical orientation)
Operational (sine sweep)	5-500-5 Hz, 0.25g @ 1 octave/min (vertical orientation)

All specifications in Table 7-2 are per rack unless otherwise noted.

Table 7-2 Physical Specifications for the SGI Onyx 3000 Series, Origin 3400, and Origin 3800 Systems

Characteristic	Specification
Cabinet Characteristics:	
Height	74.25 in. (1886 mm)
Width	30.00 in. (762 mm)
Depth	51.50 in. (1308 mm)
Maximum weight	
Compute rack	1145 lbs (519 kg)
I/O rack	1225 lbs (556 kg)
Onyx 3200	925 lbs (420 kg)
Graphics rack (2 G bricks)	850 lbs (385 kg)
Shipping Size:	
Height	80.00 in. (2032 mm)
Width	41.50 in. (1054 mm)
Depth	62.75 in. (1594 mm)
Shipping weight (maximum)	
Compute rack	1508 lbs (684 kg)
I/O rack	1588 lbs (720 kg)
Onyx 3200	1288 lbs (585 kg)
Graphics rack (2 G bricks)	1213 lbs (550 kg)
Access Requirements:	
Front	36.00 in. (914 mm)
Rear	36.00 in. (914 mm)
Side	None
Acoustical noise level	Less than 62 dBA
Maximum heat dissipation to air	
Compute rack	9.62 kBtu/hr (2.82 kW)
I/O rack	7.30 kBtu/hr (2.14 kW)
Onyx 3200	10.78 kBtu/hr (3.16 kW)
Graphics rack (2 G bricks)	13.65 kBtu/hr (4.00 kW)
Maximum airflow (intake, front; exhaust, rear)	Less than 3200 CFM (1.51 m ³ /s)
Vibration:	
Nonoperational (sine sweep)	3-200-3 Hz, 0.5g @ 1 octave/min (vertical orientation)
Operational (sine sweep)	5-500-5 Hz, 0.25g @ 1 octave/min (vertical orientation)

Figure 7-1 illustrates a single SGI Origin 3200 server short rack. Figure 7-2 illustrates a single SGI 3000 family tall rack. Figure 7-3 illustrates two SGI 3000 family tall racks that are connected via an overhead trellis.

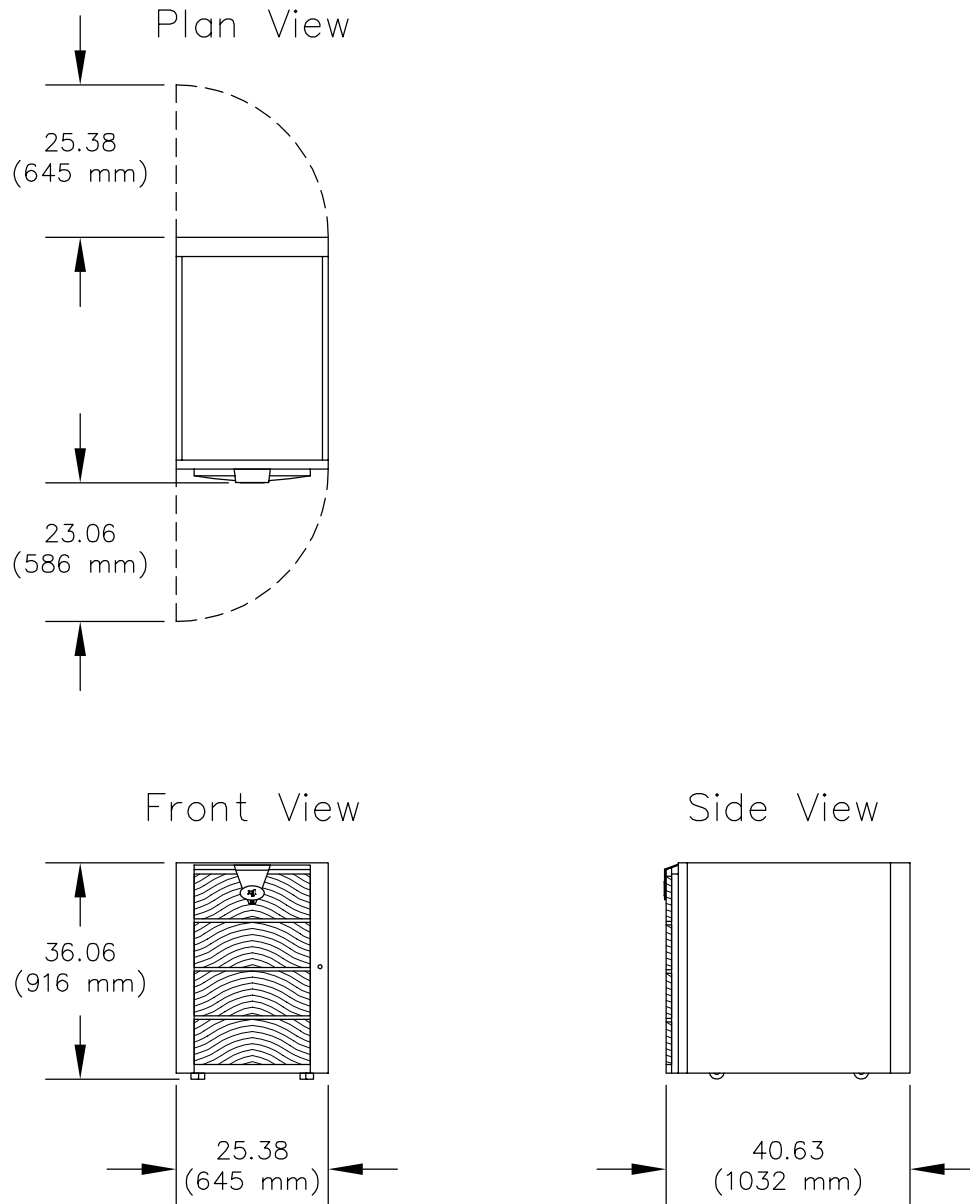


Figure 7-1 System Cabinet (Short Rack)

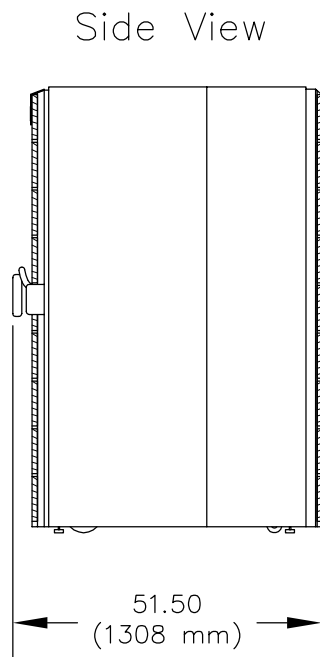
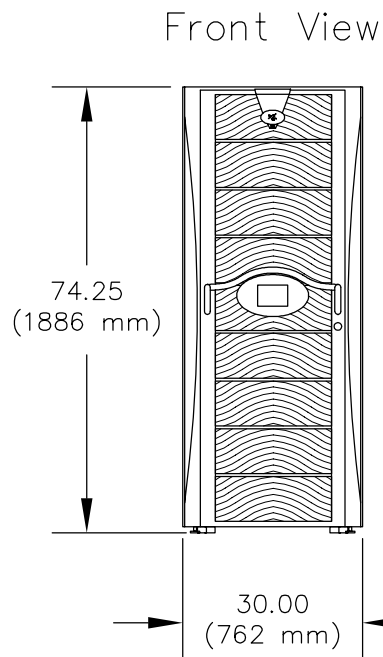
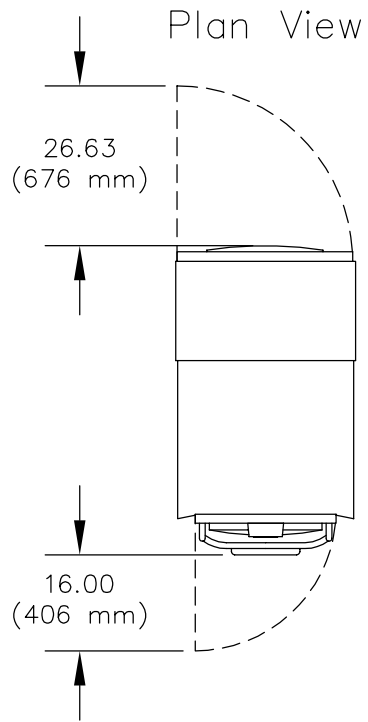


Figure 7-2 System Cabinet (Tall Rack)

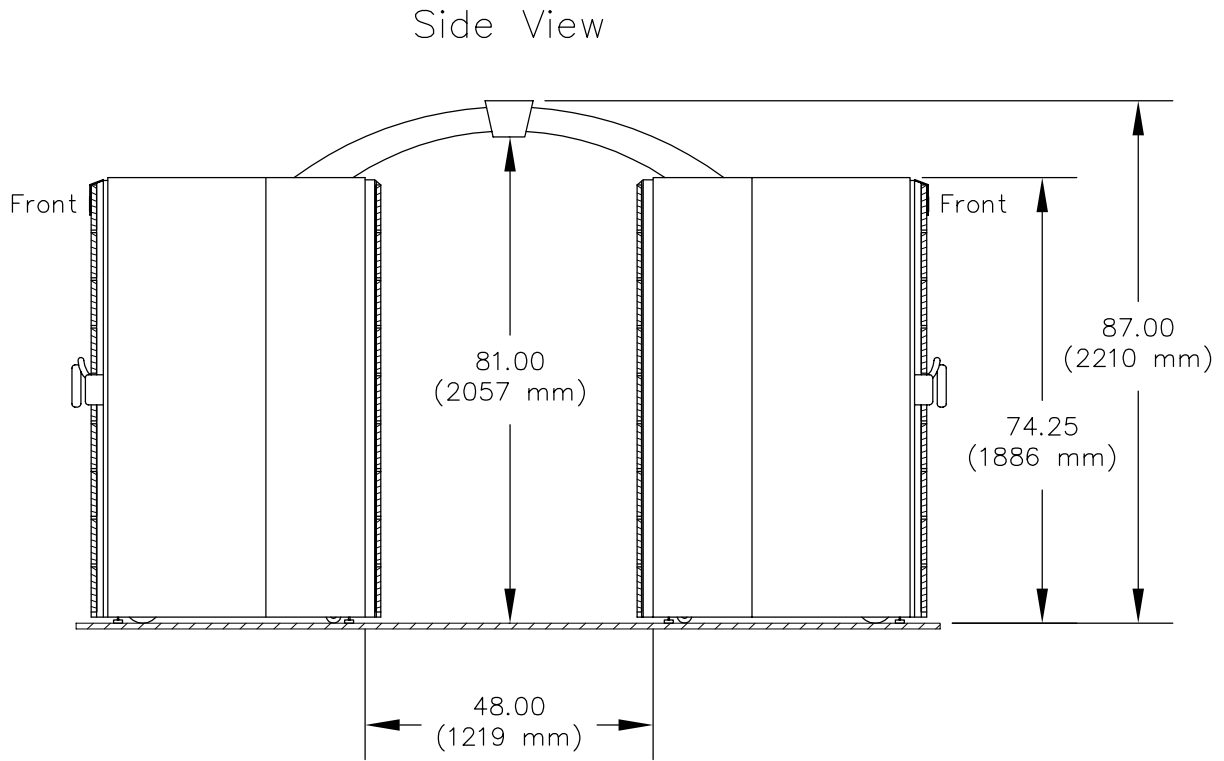


Figure 7-3 Two Tall Racks with an Overhead Trellis

Site Requirements

Use the information and guidelines in this chapter to plan your access route and to meet the environmental and power requirements for your system.

Planning Your Access Route

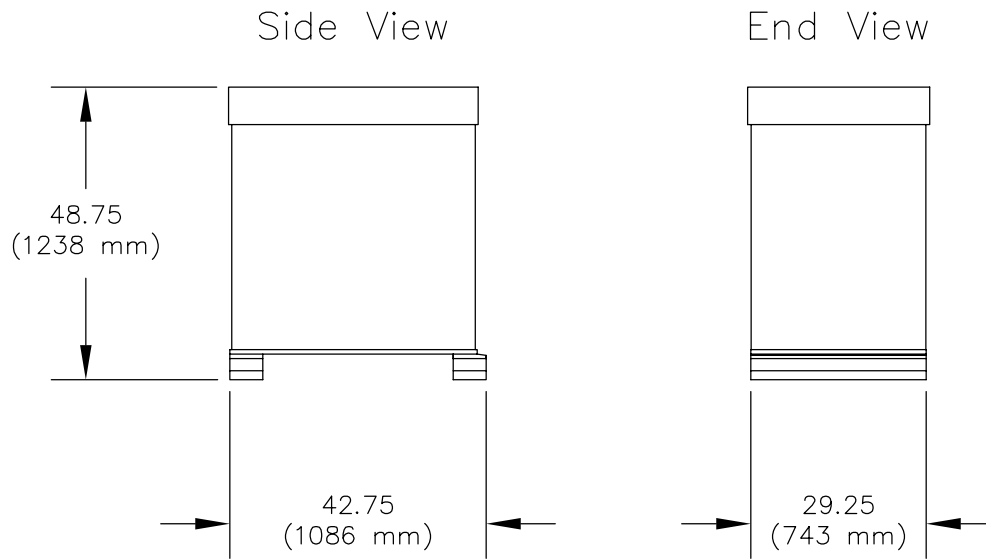
The standard dock height for freight trailers in the USA is approximately 48.00 in. (1219 mm) from the ground. If your loading dock is standard height, you may use a pallet jack to unload the system, in most cases. If the loading dock is not standard height, you must provide a forklift or other means to unload the system. The maximum access incline should not exceed 10 degrees (height:length = 1:6). If you have concerns about your site access route, contact a site planning representative by telephone in the USA at +1 888 744 8638, extension 676-2820; at +1 715 726 2820; by fax at +1 715 726 2969; or by e-mail at *site@sgi.com*.

Each SGI 3000 family system ships on a pallet in its own container, which includes an attached ramp for system removal from the pallet. You must provide a pallet jack, preferably one with 48-inch (1219-mm) tines, to move each container to the approximate system location, where it can be removed from the pallet and moved to its final destination in the computer room.

SGI recommends that you leave each system cabinet in its shipping crate until it reaches its final destination. If the crate is too large for the planned access route, you may remove the cabinets from the containers and wheel the cabinets on their casters through your facility to the computer room.

Figure 8-1 and Figure 8-2 illustrate the shipping configuration of an SGI 3000 family system.

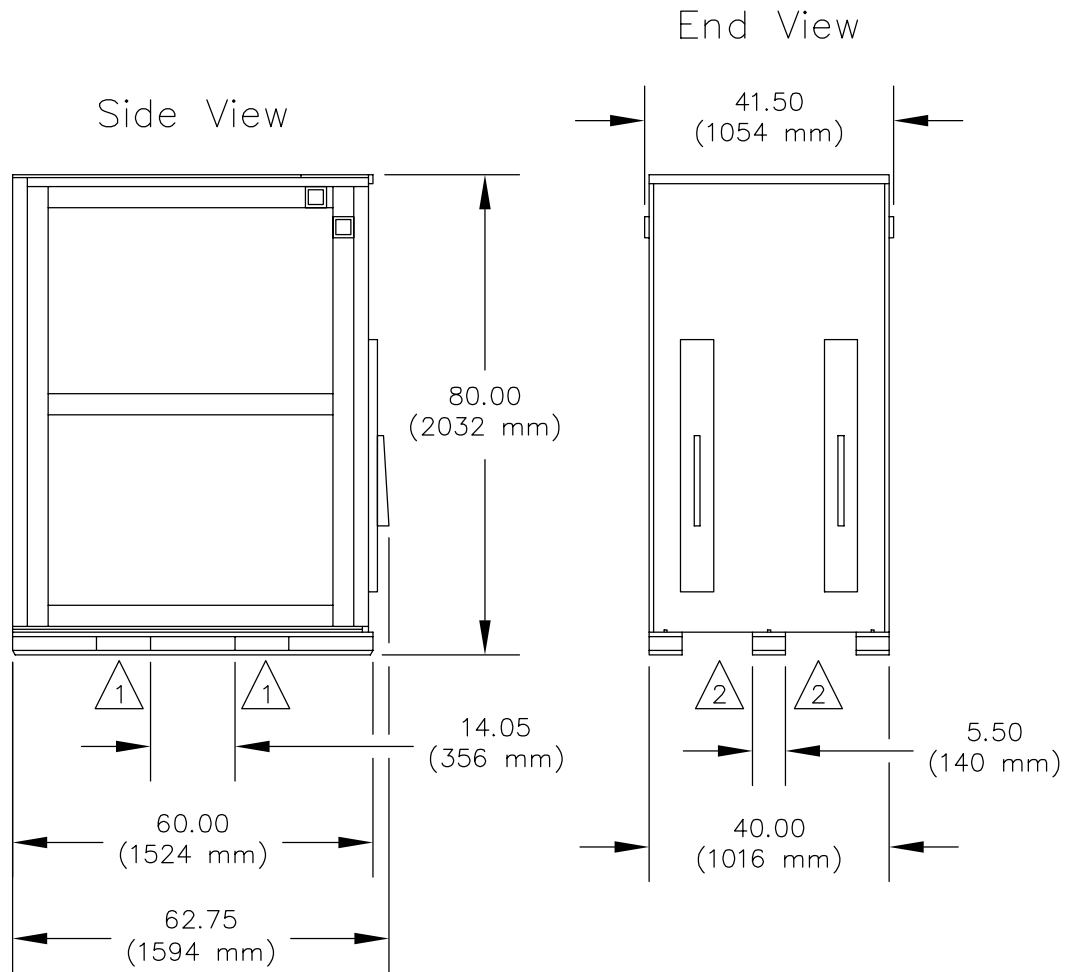
8: Site Requirements



Note:

The shipping container consists of a wooden pallet and a corrugated paper cover. A ramp is enclosed in the shipping container to facilitate the removal of the short rack from the pallet.

Figure 8-1 System Cabinet Shipping Configuration (**Short Rack**)



① Lift opening 9.00 x 2.25 (229 mm x 57 mm)

② Lift opening 11.75 x 3.75 (298 mm x 95 mm)

Note:

The shipping container consists of a wooden pallet with removable wooden sides and top. An end panel serves as a ramp for unloading the rack.

Figure 8-2 System Cabinet Shipping Configuration (Tall Rack)

Environmental Requirements

The SGI 3000 family systems operate in typical conditions for digital devices that are marketed for commercial and scientific environments. The air-conditioning system at your facility must ensure that the intake air to each SGI 3000 series system meets the requirements in Table 8-1. Table 8-1 lists the maximum requirements. Table 8-2 lists the optimum operating point and the recommended operating range. SGI strongly recommends that you adhere to the recommended operating ranges to minimize component failures.

Each system cabinet receives intake air through the front of the cabinet and exhausts heated air through the back of the cabinet. When you install the system, ensure that heated air from other equipment does not discharge toward the air intakes of any system cabinets. The equipment can overheat if heated air enters the front or top intake of any system.

Refer to Table 8-1 for the environmental requirements for the 3000 family systems.

Table 8-1 System Environmental Requirements (Maximum)

Characteristic	Specification
Temperatures:	
Operating 0 to 5,000 ft (0 to 1524 m) ^a	41 to 95 °F (5 to 35 °C)
Operating 5,000 to 10,000 ft (1524 to 3048 m) ^a	41 to 86 °F (5 to 30 °C)
Nonoperating	-40 to 140 °F (-40 to 60 °C)
Maximum Thermal Gradient	18 °F (10 °C) per hour
Relative Humidity:	
Operating ^a	10% to 95% noncondensing
Nonoperating	10% to 95% noncondensing
Maximum Humidity Gradient	10% relative humidity per hour
Altitude:	
Operating	0 to 10,000 ft (0 to 3048 m)
Nonoperating	0 to 40,000 ft (0 to 12192 m)

^a Temperature sensors in each 3000 family system automatically power down the system when the intake temperature reaches 104 °F (40 °C) or if internal electronics reach an unsafe operating temperature.

Table 8-2 System Environmental Requirements (Optimum)

Characteristic	Specification
Temperatures:	
Optimum Operating	72 °F (22 °C)
Recommended Operating	68 °F to 74 °F (20 to 23 °C)
Humidity:	
Optimum Operating	45% (noncondensing)
Recommended Operating	40% to 50% (noncondensing)

System Power Requirements

Table 8-3 lists the electrical specifications for the SGI Origin 3200 server.

Table 8-4 lists the electrical specifications for the Origin 3400 and 3800 servers and Onyx 3000 series systems.

Note: Table 8-3 and Table 8-4 list the maximum numbers; other configurations might require significantly less power.

The calculated power consumption for specific 3000 family rack configurations is available from your SGI site planning representative. Refer to Chapter 12, “Summary” for contact information.

Note: In order to maintain a ground potential of less than 250 millivolts between interconnected 3000 family systems, SGI requires that all power circuits that supply power to a 3000 family system originate from the same distribution panel if possible. If not, they must originate from the same source (transformer). Electrical work and installations must comply with all applicable local, state, and national electrical codes.

SGI makes every effort to minimize the effects of power failures and interruptions to the system hardware. Studies indicate that computer systems that are subjected to repeated power interruptions and fluctuations experience higher component failure rates than systems with stable power sources.

SGI encourages you to install a stable power source, such as an uninterruptible power system (UPS), to minimize component failures.

Each 3000 family system and each piece of support equipment requires its own customer-supplied receptacle. If you have difficulty obtaining the correct receptacles as listed in Table 8-3 and Table 8-4, please contact your account manager.

Table 8-3 Electrical Specifications for the Origin 3200 Server

Electrical Service	Specifications
Input voltage	180 - 254 Vac, single phase
Frequency	47 to 63 Hz
Maximum power consumption	1.21 kVA (1.19 kW)
Hold-up time	20 milliseconds
Total harmonic distortion (THD)	Less than 14% THD-Rms
Power cable: (1 supplied)	8-ft (2.4-m) pluggable drop cord
Power receptacle (1 required)	NEMA 6-15R (North America/Japan) or Country specific (International)

Table 8-4 Electrical Specifications for the Origin 3400 and 3800 Servers and the Onyx 3000 Series Systems

Electrical Service	Specifications
Input Voltage:	
Single-phase option	180 to 254 Vac
Three-phase options (Origin 3400 and 3800 only)	180 to 254 Vac (North America/Japan) or 312 to 440 Vac (International)
Maximum Power Consumption:	
Compute rack	2.88 kVA (2.82 kW)
I/O rack	2.18 kVA (2.14 kW)
Onyx 3200	3.22 kVA (3.16 kW)
Graphics rack (2 G bricks)	4.08 kVA (4.00 kW)
Hold-up time	20 milliseconds
Total harmonic distortion (THD)	Less than 14% THD-Rms
Power Cable: (supplied)	
SGI 3400 compute rack (single phase)	(2) or (4) 8-ft (2.4-m) pluggable drop cords
SGI 3800 compute rack (single phase)	(4) 8-ft (2.4-m) pluggable drop cords
I/O rack (single phase)	(2) 8-ft (2.4-m) pluggable drop cords
Onyx 3200 (single phase)	(3) 8-ft (2.4-m) pluggable drop cords
Graphics rack (2 G bricks, single phase)	(3) 8-ft (2.4-m) pluggable drop cords
Compute rack or I/O rack (three phase)	(1) 8-ft (2.4-m) pluggable drop cord
Power Receptacle: (required)	
SGI 3400 compute rack (single phase)	(2) or (4) NEMA L6-30R (North America/Japan) or (2) or (4) 32 Amp, IEC60309 (International)
SGI 3800 compute rack (single phase)	(4) NEMA L6-30R (North America/Japan) or (4) 32 Amp, IEC60309 (International)
I/O (single phase)	(2) NEMA L6-30R (North America/Japan) or (2) 32 Amp, IEC60309 (International)
Onyx 3200 (single phase)	(3) NEMA L6-30R (North America/Japan) or (3) 32 Amp, IEC60309 (International)
Graphics rack (2 G bricks, single phase)	(2) NEMA L6-30R and (1) 6-15R (North America/Japan) or (2) 32 Amp, IEC60309 and (1) 16 Amp, Country-specific (International)
Compute rack or I/O rack (three phase)	(1) 60 Amp, 4-wire, IEC60309 (North America/Japan) or (1) 32 Amp, 5-wire, IEC60309 (International)

In addition to the equipment that Table 8-3 and Table 8-4 list, your system configuration might also include optional equipment such as modems, printers, and additional displays. Please plan your facility electrical and air-conditioning requirements accordingly.

If you have a system configuration that requires specific power specifications, contact a site planning representative by e-mail at site@sgi.com.

Remote Support

SGI offers a remote support package that enables an off-site support specialist to maintain your SGI 3000 family system.

The connection is provided from SGI call centers through a dedicated, restricted access communication hub to a service processor that connects to your SGI system. This high-speed, secure link is constantly monitored and controlled to ensure security for you and your system users.

Remote support is implemented only with your consent.

To use remote support, you need to install a dedicated, integrated services digital network (ISDN) line. SGI supplies a router that provides connection to an ISDN U interface in the USA and to an S/T interface in Europe. This router is housed in one of the I/O racks. Data telephone lines should be separate outside telephone lines. Some PBX systems can degrade the effective bandwidth of these lines.

Contact your local SGI customer service representative or account manager for additional information about remote support.

Embedded Support Partner (ESP) is a new tool that is available for your use. ESP integrates monitoring, notifying, and reporting operations. It enables users to monitor one or more systems at a site from a local or remote connection. ESP detects system conditions that indicate potential problems and then notifies the appropriate personnel. This enables SGI customers and support personnel to proactively support systems and resolve issues before they develop into actual failures.

Network Connections

If you plan to add any optional network interfaces such as Ethernet to your SGI 3000 family system, you must ensure that you provide the proper cables and transceivers to match your network protocol. Contact your account manager to plan any optional network connections.

Raised-floor Installations

The SGI 3000 family system does not require a raised-floor system. However, SGI recommends a raised-floor system because it provides convenient routes for underfloor air circulation and for power and communication cabling.

SGI recommends a minimum raised-floor height of 12.00 in. (305 mm).

Each rack that you install on a raised floor requires a floor cutout for cabling. When you design your raised-floor system, place perforated floor panels or floor grilles near the base of the front of the system racks, not directly under them. Figure 8-3 and Figure 8-4 illustrate the floor cutout for a single 3000 series rack.

SGI supplies full-scale templates for the location of system floor cutouts on request. Contact SGI Site Planning personnel at site@sgi.com.

The computer room floor must support the weight of all the system racks in your configuration. Each component, except the short rack, rests on four leveling pads that concentrate the weight of the cabinet on a small surface area.

Additional floor support pedestals increase the floor-loading strength of the raised floor. If your computer site lies in an earthquake zone, you can secure the computer system components to the computer room subfloor for added stability. Refer to Chapter 9, “Securing the Cabinets”, or contact your site planning representative for additional details.

If you have any questions about the structural capabilities of any floor, please contact a qualified structural engineer. If you do not install your system on a raised floor, SGI recommends that you install flat cable covers to protect cables from damage and to protect computer room personnel from injury.

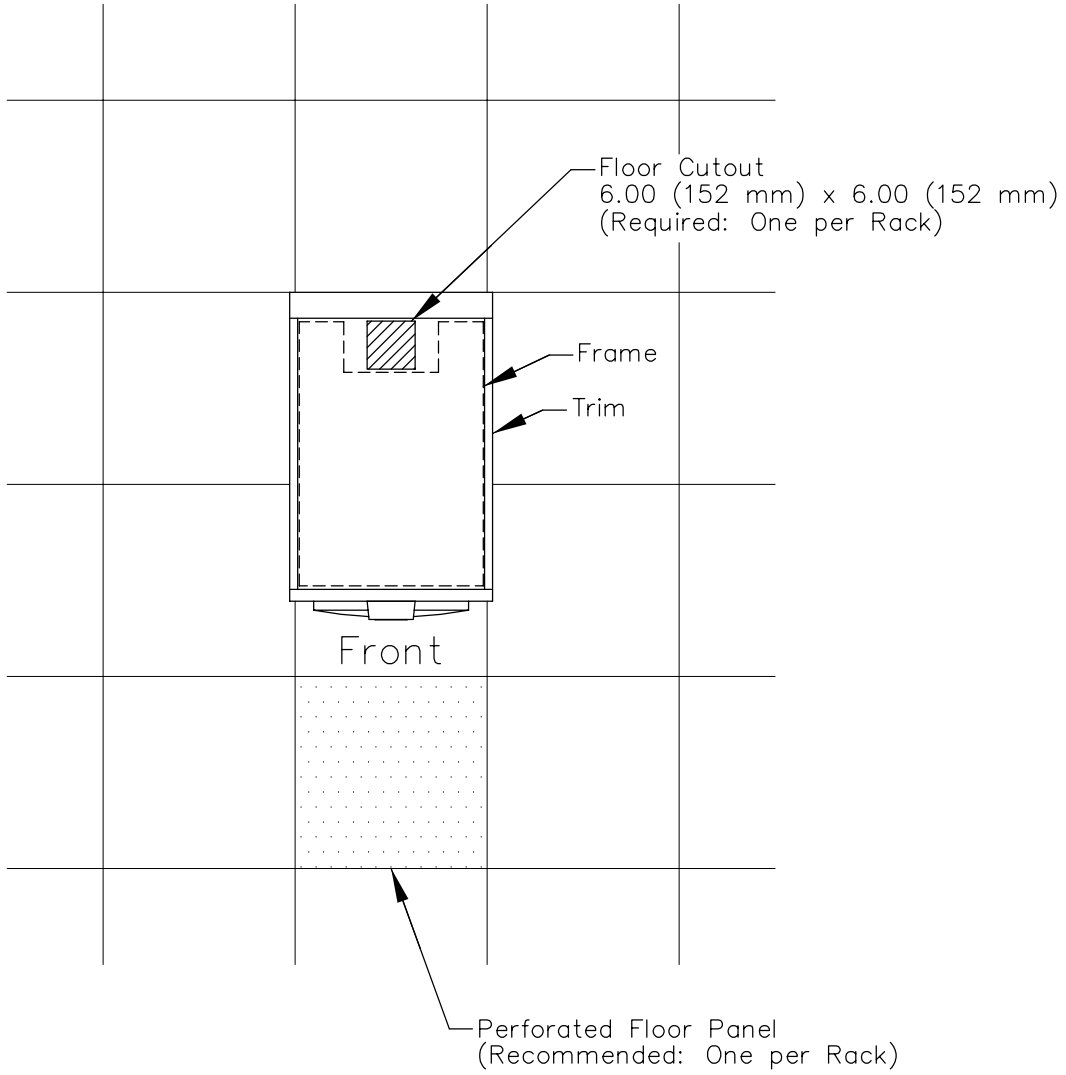


Figure 8-3 System Floor Cutout (Short Rack)

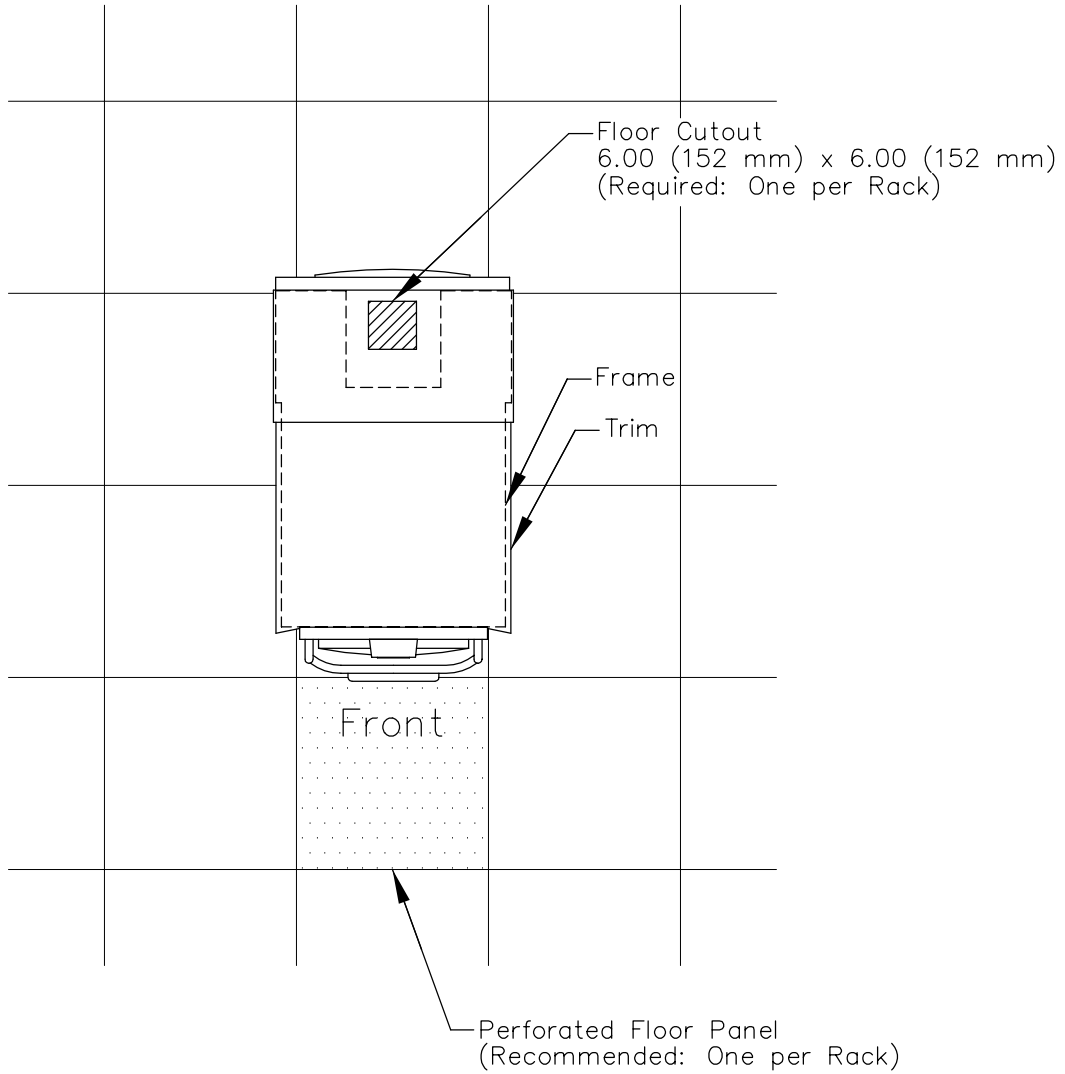


Figure 8-4 System Floor Cutout (Tall Rack)

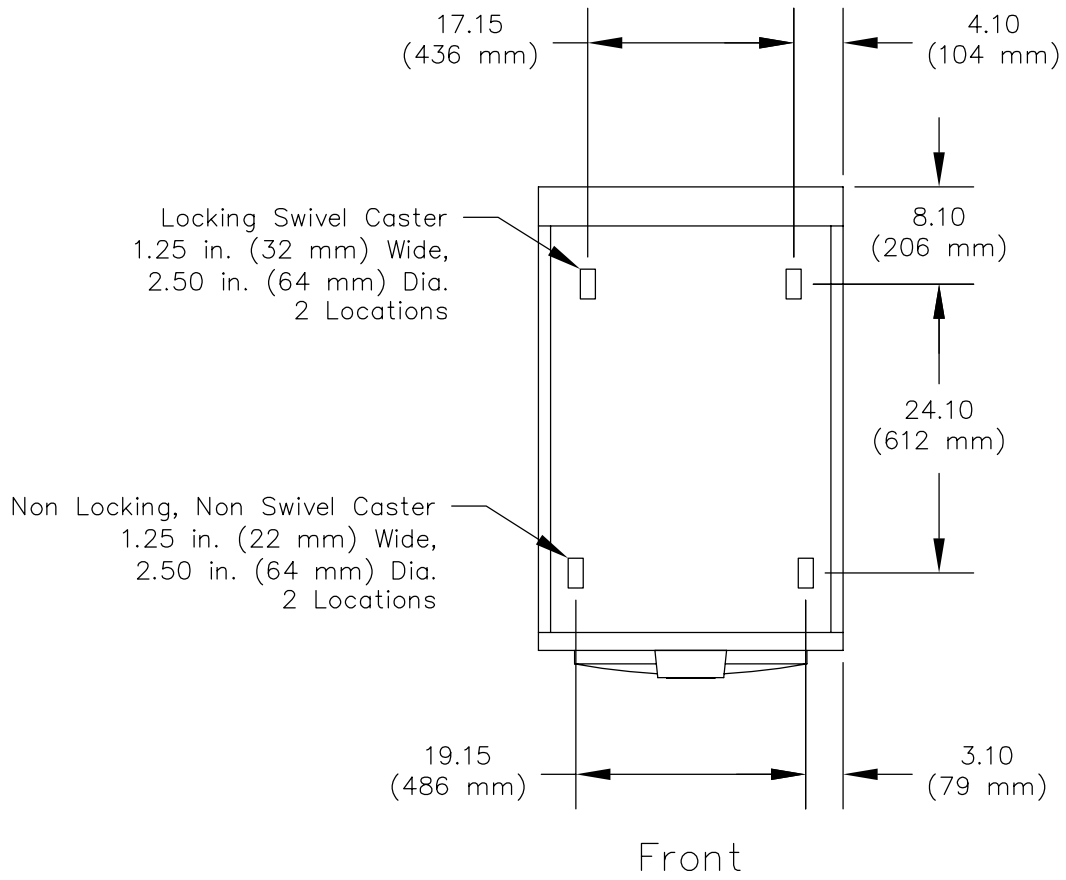


Figure 8-5 Caster Locations (Short Rack)

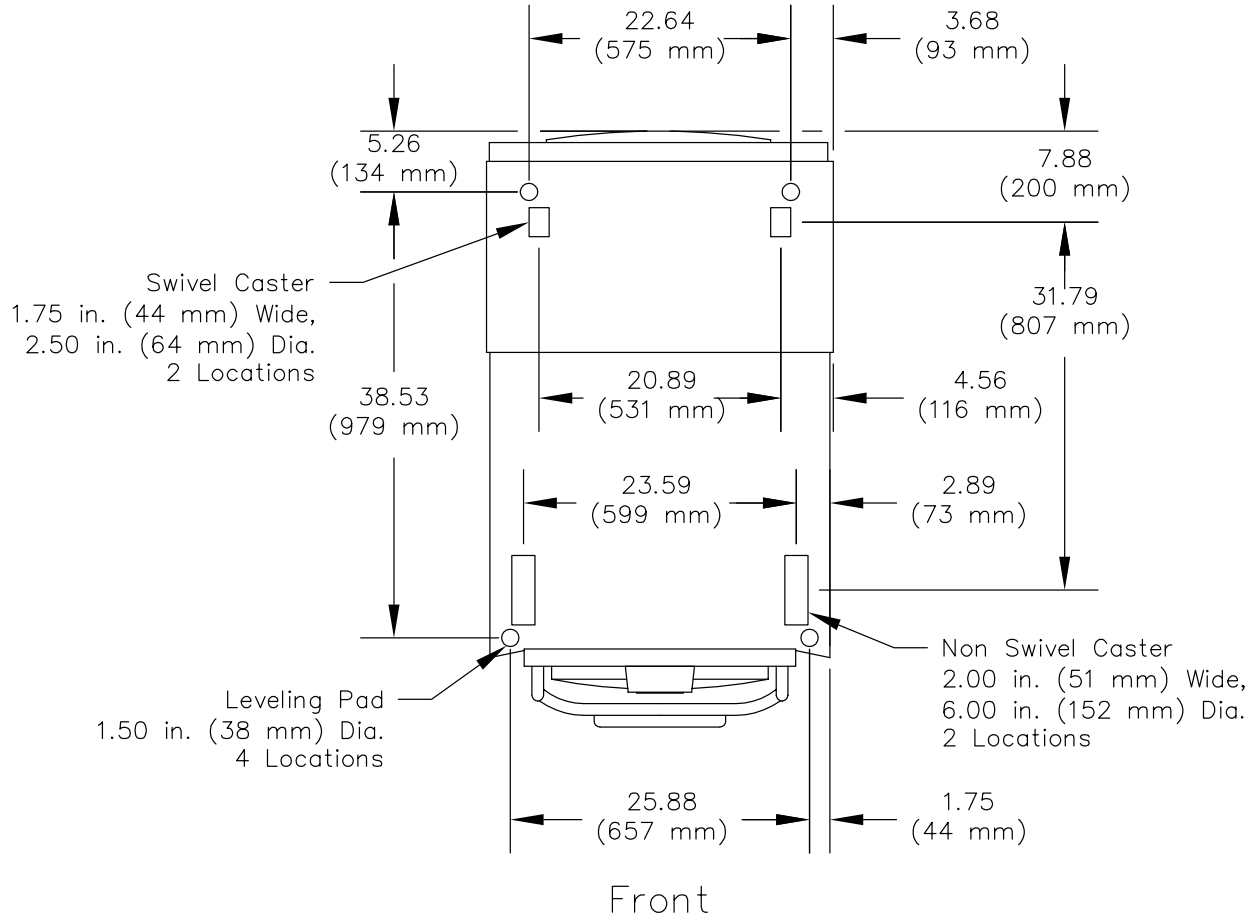


Figure 8-6 Caster and Leveler Locations (**Tall Rack**)

Securing the Cabinets

In areas that are prone to earthquakes, you should secure each SGI 3000 family system to the computer room subfloor. Four M12 threaded weld nuts are located on the underside of each cabinet frame for attachment to customer-supplied hold-down devices. The attachment points are shown in Figure 9-1 and Figure 9-2.

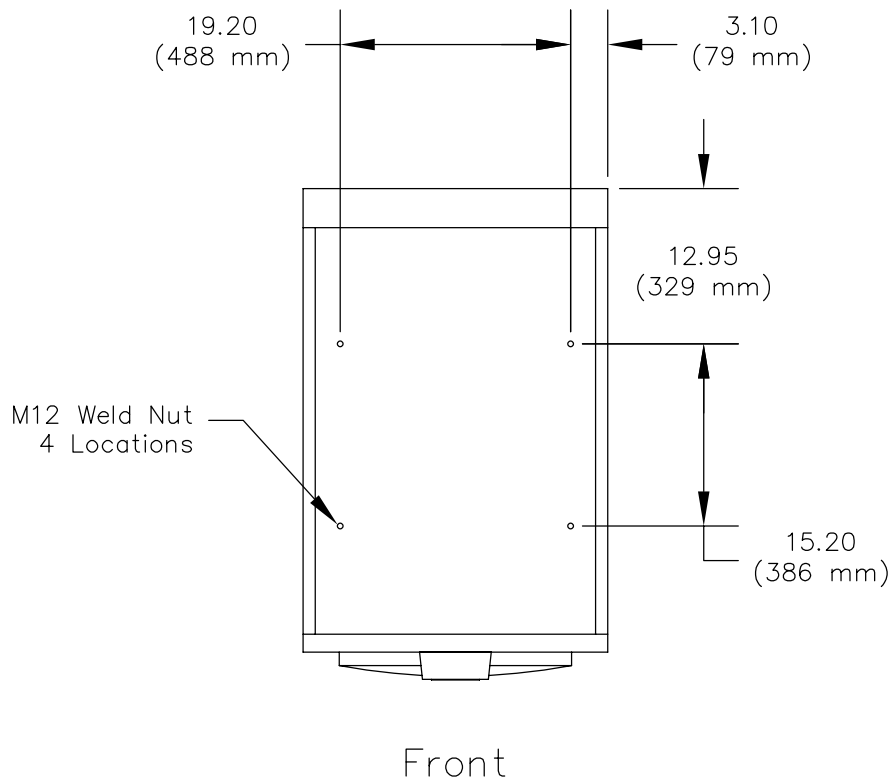


Figure 9-1 System Weld Nut Locations (**Short Rack**)

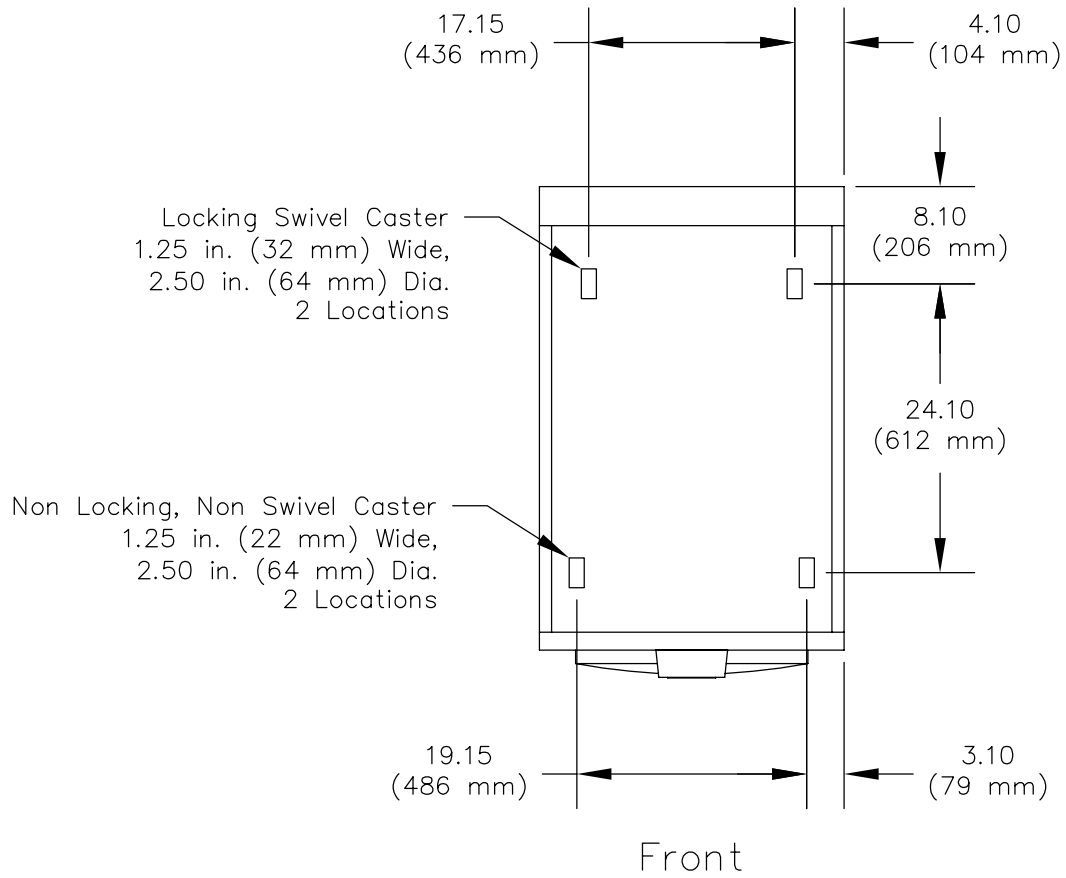
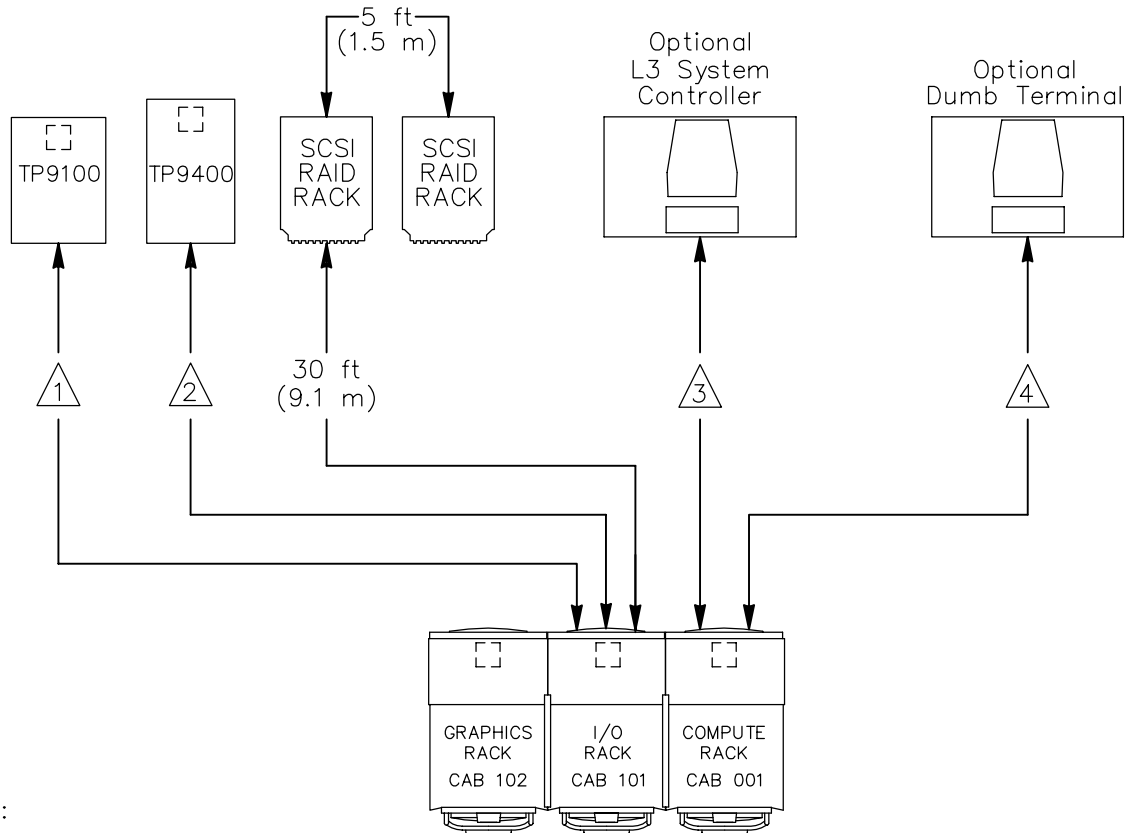


Figure 9-2 System Weld Nut Locations (**Tall Rack**)

Equipment Separation Limits

Prior to any site preparation, the arrangement of computer equipment within the facility must meet certain placement and separation requirements. You should prepare drawings that illustrate the arrangement and location of the computer equipment; you may ask SGI site planning personnel for assistance with the drawings.

Figure 10-1 illustrates the maximum recommended separation limits between the various components of an SGI 3000 family system.



Notes:

- 1 The TP9100 may be connected to any I/O rack that is configured with the system. Copper cables can be ordered up to 12 meters in length, and optical cables up to 100 meters in length. Contact your SGI account manager for details.
- 2 The TP9400 may be connected to any I/O rack that is configured with the system. Optical cables can be ordered up to 100 meters in length. Contact your SGI account manager for details.
- 3 The optional L3 system controller can be connected to the system via a customer supplied standard Ethernet cable.
- 4 An optional dumb terminal can be connected to a compute rack via an RS-232 serial connection.

Figure 10-1 Equipment Separation Limits

Site Planning Checklist

Table 11-1 provides a site planning checklist that you can use as an organizational tool during the site planning and preparation process. During the planning process, you might discover additional preparation issues at your site that this checklist does not address. To discuss your site plans and to resolve any issues, contact an SGI site planning representative by one of the methods listed in the summary of this document.

Table 11-1 Site Planning Checklist

Yes	No	Planning Issue	Comments
		Have you determined the system configuration? Configuration: _____	
		Have you determined the installation date? Date: _____	
		What is the total number of system cabinets?	
		Have you established the system location?	
		Does the equipment floor layout meet the equipment maintenance access requirements?	
		Is the equipment positioned so that the exhaust air of one heat-ejecting device does not enter the air inlet of another?	
		Have you identified an access route to the final system location?	
		Does the access route meet the access requirements for the system?	
		Does the access route meet the floor-loading requirements for the system?	
		Have you made provisions to cover irregular or engraved floor patterns along the access route to reduce vibration of the system while moving it?	
		Will customer assistance be available to help unload, unpack, and move the system during delivery?	

Table 11-1 (continued) Site Planning Checklist

Yes	No	Planning Issue	Comments
		Does your loading dock meet standard freight-carrier truck requirements? If not, have you allocated a forklift for delivery? Contact your site planning representative if you have concerns about your loading dock.	
		Is a pallet jack available on-site to move the system in its shipping container to the final system location?	
		Do the pallet-jack fork dimensions meet the requirements for the shipping container?	
		Are the elevator and elevator door dimensions adequate?	
		Is the elevator weight capacity adequate?	
		Does each ramp in the access route have an incline that is less than 10 degrees?	
		Did you order the power receptacles for your system?	
		Are the circuit breakers for all cabinets properly installed and labeled?	
		Are all power receptacles properly installed and labeled?	
		Are the floor cutouts properly positioned and free of sharp edges?	
		Are the recommended perforated floor panels properly positioned?	
		Is the computer room floor strong enough to support the weight of the system?	
		Can the computer room environment be properly maintained within the specifications listed in Table 8-1 on page 50?	
		Are telephone lines installed if you plan to implement remote support for your system?	
		Have you trained system administrators or enrolled operators in the necessary training courses?	

Summary

Now that you understand the basic configurations and requirements of the SGI 3000 family, you can make appropriate plans for your site. SGI site planning representatives are available for consultation regarding site planning and preparation. You may contact an SGI site planning representative by any of the following methods:

- Phone +1 715 726 2820, or in the USA: +1 888-744-8638, extension 676-2820
- Fax +1 715 726 2969
- E-mail *site@sgi.com*

SGI sales representatives and employees may access the following internal Site Planning Web site:

- <http://site.americas.sgi.com>

Appendix A

U.S. Customary Measure and Metric Measure Conversion

Table A-1 lists some useful conversions between U.S. customary measure and metric measure.

Table A-1 U.S. Customary to Metric Conversions

U.S. Customary	Metric
1 inch	2.54 cm
1 foot	30.48 cm
1 square foot (ft ²)	0.093 m ²
1 pound (lb)	0.4536 kg
1 lb/ft ²	4.88 kg/m ²
1 cubic feet per minute (cfm)	0.00047 m ³ /s
1 British thermal unit (Btu)	1055 joules
0.3937 in.	1 cm
39.37 in.	1 m
10.76 ft ²	1 m ²
2.205 lbs	1 kg
0.205 lb/ft ²	1 kg/m ²
2127.66 cfm	1 m ³ /s
0.00095 Btu	1 joule

Fahrenheit-to-Celsius Conversion

$$\frac{(F - 32) \cdot 5}{9} = C$$

Start with the temperature in Fahrenheit, subtract 32 degrees, multiply by 5, and divide by 9. The result is the temperature in Celsius.

Celsius-to-Fahrenheit Conversion

$$\left(\frac{C \cdot 9}{5}\right) + 32 = F$$

Start with the temperature in Celsius, multiply by 9, divide by 5, and add 32 degrees. The result is the temperature in Fahrenheit.

Regulatory Specifications

The following sections present information that may be important to the operation of your SGI system.

Manufacturer's Regulatory Declarations

The SGI 3000 family of products conforms to several national and international specifications and European Directives listed on the "Manufacturer's Declaration of Conformity." The CE insignia displayed on each device is an indication of conformity to the European requirements.

Caution: Each SGI system has several governmental and third-party approvals, licenses, and permits. Do not modify this product in any way that is not expressly approved by SGI. If you do, you may lose these approvals and your governmental agency authority to operate this device.

System Model Number

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

CE Notice and Manufacturer's Declaration of Conformity

Marking by 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; please contact your local SGI account representative to obtain a copy.

Electromagnetic Emissions

FCC Notice (USA Only)

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

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

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by 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 into 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: Users should note that changes or modifications to the equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Industry Canada Notice (Canada Only)

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

Cet appareil numérique n'émet pas de perturbations radioélectriques dépassant les normes applicables aux appareils numériques de Classe A prescrites dans le Règlement sur les interférences radioélectriques établi par le Ministère des Communications du Canada.

VCCI Notice (Japan Only)

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

Chinese Class A Regulatory Notice

警告使用者：

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

Korean Class A Regulatory Notice

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

Shielded Cables

The SGI 3000 family of products is FCC-compliant under test conditions that include the use of shielded cables between the system and its peripherals. Your system and any peripherals that you purchase from SGI have shielded cables. Shielded cables reduce the possibility of interference with radio, television, and other devices. If you use any cables that are not from SGI, ensure that they are shielded. Telephone cables do not need to be shielded.

Optional monitor cables supplied with your system use additional filtering that is molded into the cable jacket to reduce radio frequency interference.

Always use the cable that is supplied with your system. If your monitor cable becomes damaged, obtain a replacement cable from SGI.