CHALLENGE™/Onyx™
Site Preparation Guide

Document Number 108-7040-040

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Document Number 108-7040-040

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Chapter 1

Overview

This guide provides site preparation information for the CHALLENGE™ and Onyx™ deskside and rackmount systems and the Vault system. This guide is intended for Silicon Graphics® system support engineers and other site personnel responsible for planning the installation of these systems.

The Challenge and Onyx deskside chassis have many physical similarities to the Single Tower and Crimson™ systems.

The Challenge and Onyx rackmount chassis are 19-inch rack systems with multiple cardcages and backplanes and up to 24 board slots, depending upon configuration. The Challenge and Onyx rackmount systems are replacements for the POWER Center™ (Predator) system.

The Vault chassis is a 19-inch rack system with multiple SCSI device racks for up to 56 3.5-inch devices, depending upon configuration. It is physically similar to the Challenge and Onyx rackmount chassis.

1.1 Guide Organization

This guide contains these chapters:

- Chapter 1, “Overview” defines the purpose of this guide and lists related product documents.
- Chapter 2, “Site Preparation” lists the general activities required to prepare a site for a system.
- Chapter 3, “Preparing the Physical Location” describes how to prepare your physical location, such as providing space and air conditioning.
- Chapter 4, “Preparing Site Power” describes how to prepare your power requirements, such as installing power circuits and cables.
- Chapter 5, “Cabling Local and Peripheral Devices” describes the cables and connectors for local and peripheral devices.

1.2 Related Documents

This section lists and briefly describes documents for the Challenge, Onyx, and Vault products.

1.2.1 Deskside Documents

The following is a list of deskside system documents:

- *CHALLENGE/Onyx Deskside Installation Instructions* (P / N 108-7039-*xxx*) provides the information to install and test a deskside system. This document also contains removal and replacement procedures for field replaceable units (FRUs).
- *CHALLENGE Deskside Owner's Guide* (P / N 007-1732-*xxx*) provides information for an enduser to operate the deskside server system and to install system peripherals.
- *Onyx Deskside Owner's Guide* (P / N 007-1733-*xxx*) provides information for an enduser to operate the deskside graphics workstation system and to install system peripherals.

1.2.2 Rackmount Documentation List

The following is a list of rackmount system documents:

- *CHALLENGE/Onyx Rackmount Installation Instructions* (P / N 108-7042-*xxx*) provides the information to install and test a rackmount system. This document also contains removal and replacement procedures for field replaceable units (FRUs).
- *CHALLENGE Rackmount Owner's Guide* (P / N 007-1735-*xxx*) provides information for an enduser to operate the rackmount server system and to install system peripherals.
- *Onyx Rackmount Owner's Guide* (P / N 007-1736-*xxx*) provides information for an enduser to operate the rackmount graphics workstation system and to install system peripherals.
- *CHALLENGE Vault Rack and SCSIBox 2 Installation Instructions* (P / N 108-7044-*xxx*) provides the information to install, configure, and test a Vault storage rack and the SCSIBox 2. This guide also provides software information to reconfigure IRIX™ to recognize the additional devices.
- *CHALLENGE Vault Rack and SCSIBox 2 Owner's Guide* (P / N 007-1762-*xxx*) describes how to operate the Vault and SCSIBox 2 and also how to install drives into the Vault storage rack.

1.2.3 Other Related Documents

This section lists manuals that relate to both the deskside and rackmount systems:

- *CHALLENGE/Onyx Diagnostics Roadmap* (P / N 108-7045-*xxx*) describes procedures to operate the four classes of diagnostic tests for the deskside and rackmount systems.
- *CHALLENGE/Onyx Peripherals Guide* (P / N 007-1781-*xxx*) describes peripheral hardware and software setup and storage device jumpering information for deskside and rackmount chassis.

- *IRIX Advanced Site and Server Administration Guide* (3 volumes: P / N 007-0603-*xxx*, 007-1446-020, 007-1654-*xxx*) explains how to use advanced IRIX™ operating system utilities and how to perform standard system administration.

Chapter 2

Site Preparation

This chapter describes the general activities required to prepare for the arrival and installation of a Challenge or Onyx system.

2.1 Organizing Activities

First read this chapter for an overview of site preparation activities, and then use Table 2-1 to track progress for your particular location and system. The rest of this guide provides specific details for each major activity, organized by product.

The extent of site preparation depends on the size and complexity of the ordered system. Small systems are easily installed with little or no modification to the existing site. Large systems require more preparation, with their greater requirements for power, air conditioning, and other factors. While preparing a site, always keep in mind the configuration of the equipment.

Some sites require specialized knowledge to plan and install services such as power and safety equipment. Always follow local and regional codes and recommendations while performing activities under regulation. When using consultants, verify that they are licensed and knowledgeable about local regulations.

Site preparation also involves thinking about the future. As configurations grow, site requirements change. While planning a site, consider how and when a site will need modification, and plan accordingly.

To minimize mistakes and unforeseen situations for complex sites, assign one person as a coordinator to read this guide and assign tasks. Table 2-1 is only a guideline and cannot cover all circumstances involved in site preparation. Also, many activities are interdependent and involve compromises. After the coordinator evaluates the dependencies and compromises, this guide can be divided among several people so that activities can be performed at the same time.

Start with the activities that take the longest time. Pay particular attention to activities that involve dependency on others, such as having an electrician install power circuits.

When you have completed the activities outlined in Table 2-1, the site is prepared and is ready to receive the system. To proceed, read Section 2.2, “Preparing to Receive a

Shipment," then continue to the installation instructions provided for the system. See Chapter 1 for a list of documents.

Activity	Date Completed	Notes
Prepare to receive shipment	__/__/__	
required tools	__/__/__	
size and weight of shipping cartons	__/__/__	
assistance for moving large objects	__/__/__	
Prepare physical location	__/__/__	
system chassis	__/__/__	
local devices: monitor, keyboard, mouse	__/__/__	
expansion chassis	__/__/__	
Check environmental conditions	__/__/__	
air conditioning	__/__/__	
electrical interference (EMI, ESD)	__/__/__	
vibration	__/__/__	
acoustics	__/__/__	
site safety	__/__/__	
Install power	__/__/__	
determine power requirements	__/__/__	
install power circuits	__/__/__	
install safety and protection equipment	__/__/__	
Prepare cabling for local devices	__/__/__	
monitors	__/__/__	
terminals	__/__/__	
input devices	__/__/__	
serial devices	__/__/__	
parallel devices	__/__/__	
networks	__/__/__	
printers	__/__/__	
modems	__/__/__	

Table 2-1 Site Preparation Checklist

2.2 Preparing to Receive a Shipment

To prepare for the arrival of a system, plan these activities:

- obtaining tools required to receive and install equipment
- arranging assistance for moving large and/or heavy cartons and crates
- checking the path to the system's destination

2.2.1 Tools for Receiving and Installing Systems

Use Table 2-2 to determine the tools required for each listed activity.

Activity	Component	Tools Required
unloading crates	Deskside	pallet jack (up to 300 lbs)
	Rackmount	forklift (can require up to a 1,500 lb capacity)
	Vault	forklift (can require up to a 1,400 lb capacity)
opening shipping cartons or crates	Deskside	knife (to cut strapping bands) wrench, 7/16" or adjustable
	Rackmount, Vault	gloves (protection from crate splinters) pliers (for stuck fasteners)
	Monitor, destination kit	knife (to cut packing tape)
moving system		low-profile dolly that keeps chassis vertical; moving blankets or wraps
installing chassis		under normal circumstances, no tools are required; for adding optional components, a medium slothead and a cross-recess screwdriver may be required
connecting cables		small slothead and cross-recess screwdrivers
stabilizing chassis (seismic protection)	Rackmount, Vault	stabilizers, 2.5" length minimum, to fit one of two types of nuts on the chassis underside: 1) 1/2-13 UNC (Unified National Coarse) 2) M-20

Table 2-2 Tools Required for Receiving and Installing Systems

2.2.2 Arranging for Assistance

Assistance is required to:

- receive a shipment
- uncrate a chassis

Rackmount and Vault chassis require assistance to unbolt and remove the crate's front panel and to remove the chassis from the crate.

- move a chassis

  Rackmount and Vault chassis require assistance to move the chassis any distance.

2.2.3 Checking the Delivery Route

Walk through the proposed route for moving a system to its destination. Pay particular attention to corners, ramps, restricted doorways, low ceilings, and fixed obstructions. Table 2-3 shows the shipping dimensions of the main containers.

System	Shipping Dimensions		
	Height	Width	Depth
Deskside	42" (107 cm)	32" (81.3 cm)	37" (94 cm)
Rackmount and Vault	74.5" (190 cm)	46" (117 cm)	59.5" (152 cm)

Table 2-3 Shipping Dimensions

Caution: Always use assistance when moving equipment up or down ramps. For rackmount systems, use a minimum of three individuals. On fully configured systems, up to five people may be required to safely move the chassis. Avoid ramps that exceed a 20° angle.

For installations above or below ground floor, check that the system is within the size and weight limits of elevators or similar cargo machinery. If available, use freight blankets on elevator sides. Use straps to keep the chassis from shifting while being moved in an elevator.

For uncrated deskside chassis, the wheels work well on smooth surfaces but are not designed for carpeting and rough flooring.

Chapter 3

Preparing the Physical Location

This chapter discusses how to prepare a physical location for a system:

- provide space for the system chassis (including any expansion chassis)
- for graphics systems, provide space for local devices: monitor, keyboard, mouse
- check the site's environmental factors
- consider installation and routine activities

3.1 Providing Space for a System Chassis

Using the clearance guidelines in this section, select a location that allows proper airflow, cabling, routine activities, and maintenance. As a general rule, use these guidelines to ensure the best system performance. All systems include thermal overrides to prevent damage caused by excessive heat, but an improperly positioned system leads to unnecessary service calls and system downtime.

Every location and system is different, requiring flexibility during installation. This section provides minimum space guidelines for a fully loaded system. The space guidelines can be reduced approximately 10–20 percent for:

- systems that are not fully configured, depending on the number and type of devices installed in the chassis
- Silicon Graphics systems arranged next to each other

The final test for any system is actual operation, and some adjustments may be required after initial installation.

This section describes the space requirements for these chassis:

- deskside
- rackmount
- Vault

3.1.1 Deskside Space Requirements

To determine the minimum space requirements for a chassis, add the chassis dimensions shown in Figure 3-1 and the appropriate clearances shown in Table 3-1.

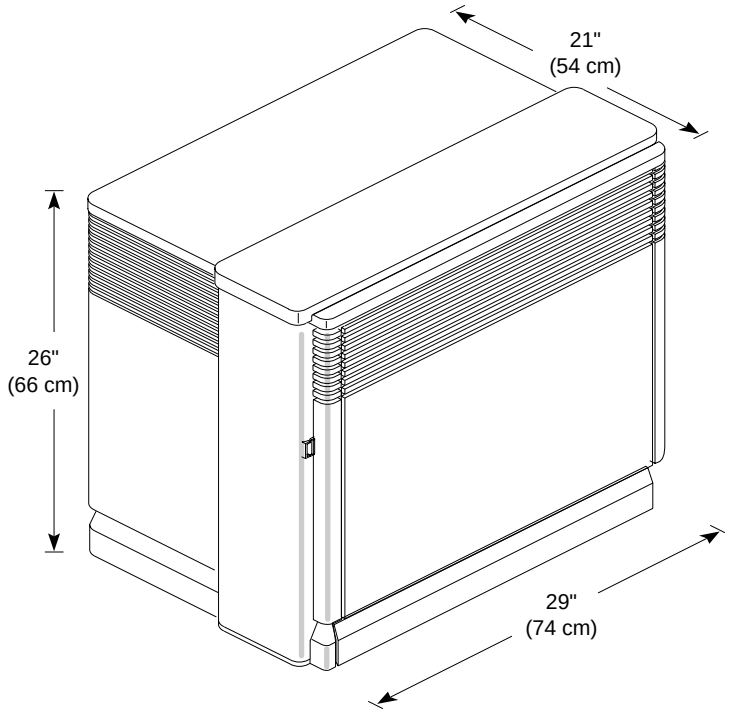


Figure 3-1 Deskside Chassis Dimensions

Top Clearance	Left Side[a]	Right Side[a]	Front	Back
More than 6”	3” (8 cm)	≥ 6” (15 cm)	≥ 6” (15 cm)	≥ 6” (15 cm)
Less than 6”	6” (15 cm)	≥ 10” (25 cm)	≥ 8” (20 cm)	≥ 8” (20 cm)

Table 3-1 Deskside Airflow Clearances

[a]As viewed from the front of the chassis

The different clearances are based on the airflow requirements of the chassis. If the top of the chassis is unobstructed, less clearance is required on the sides and back. If the top of the chassis is obstructed, however, the sides and back of the chassis must compensate for the smaller air exhaust path. Figure 3-2 shows the airflow path of the chassis.

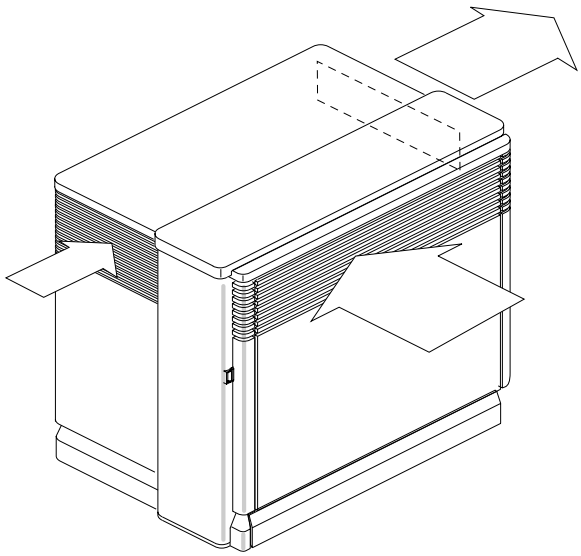


Figure 3-2 Deskside Chassis Airflow

Additional space is required to service the chassis, such as connecting or disconnecting cables and changing internal drives, boards, and other components. Be sure to allow sufficient space either in front of or behind the chassis to facilitate future installation, service, and cabling activities. The chassis includes wheels for easier front-to-back movement. See Figure 3-3 for the wheel locations. You can fix the wheels in place by using the chassis levelers or by using a wheel chock (Silicon Graphics part number 040-0220-001).

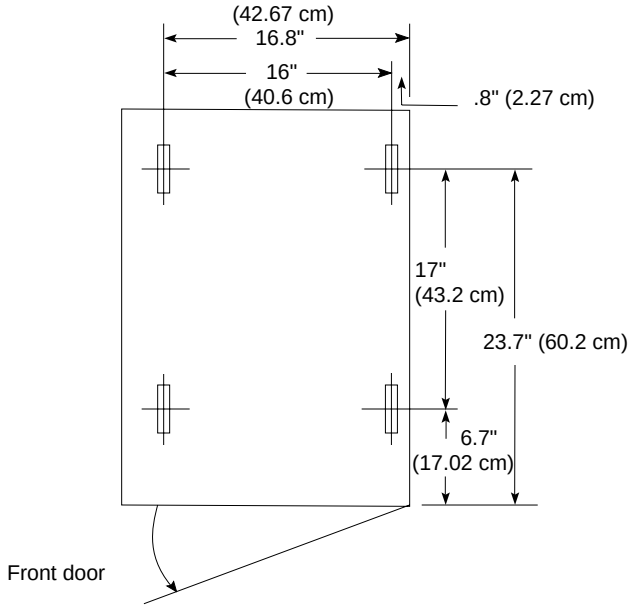


Figure 3-3 Deskside Wheel Locations (Bottom View)

3.1.2 Deskside Physical Specifications

Table 3-2 summarizes the physical requirements of the deskside chassis.

Parameter	Characteristic
Dimensions, chassis	
height	26” (66 cm)
width	21” (53.3 cm)
depth	29” (73.7 cm)
Dimensions, shipping	
height	37” (94 cm)
width	32” (81.3 cm)
depth	42” (107 cm)
Weight	
minimum	195 lbs (88.5 kg)
maximum	300 lbs (136 kg)
shipping	325 lbs (147 kg)

Table 3-2 Deskside Physical Specifications

3.1.3 Rackmount Space Requirements

Provide a location for a rackmount chassis, with clearance for the front and rear cabinet doors in their fully opened positions. The chassis requires minimal side clearances because most of the airflow and servicing is through the front, rear, and top of the chassis. Side access is required to:

- remove and install a midplane
- remove and install a SCSI box

For activities requiring side access, determine if the chassis can be rolled forward or backward to provide adequate side clearance. If an installation is semipermanent, such as at sites with chassis bolted directly to the floor to prevent movement, allow a total width of 96 inches (244 cm). Use the dimensions shown in Figure 3-4 for rackmount chassis clearance.

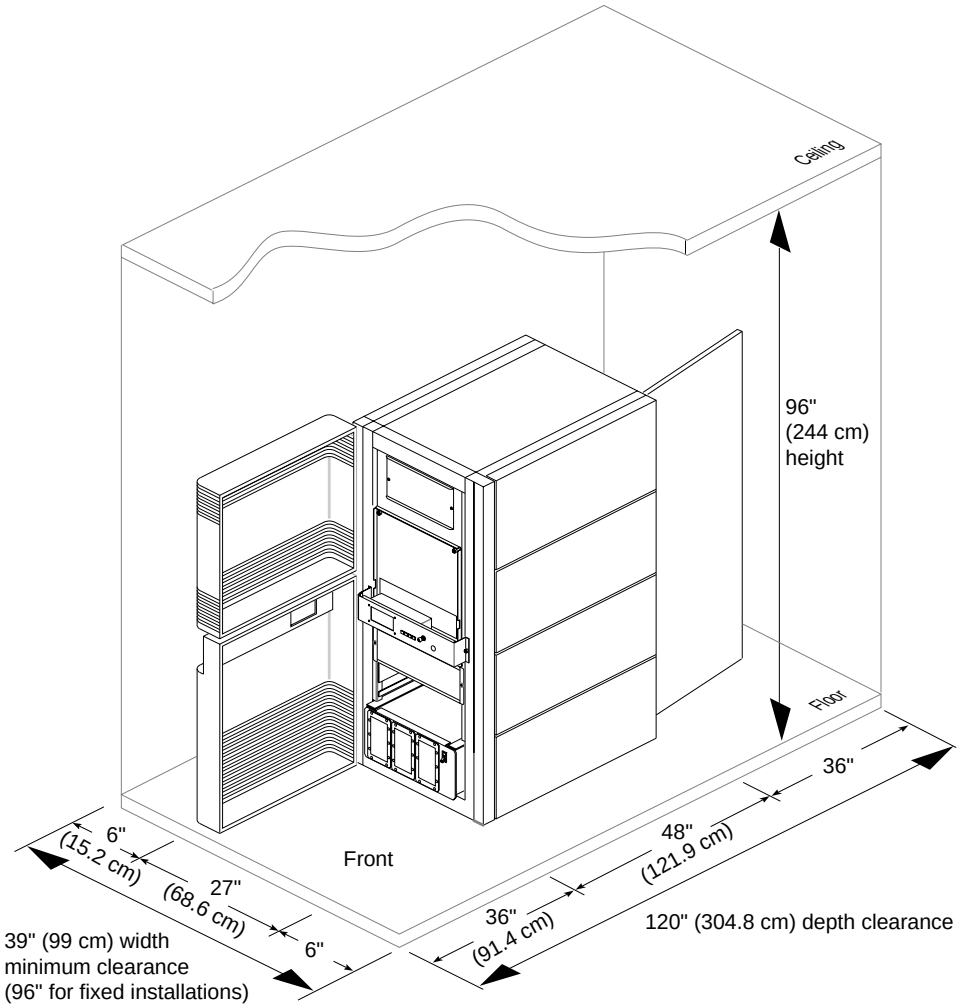


Figure 3-4 Rackmount Chassis Clearance

Position the chassis so that it receives proper air circulation. See Figure 3-5 for the airflow through the chassis. An ideal location provides cool air near the chassis air intake vents and warm air removal near the chassis air outlets. Air temperature should not fluctuate dramatically, and the air should circulate freely.

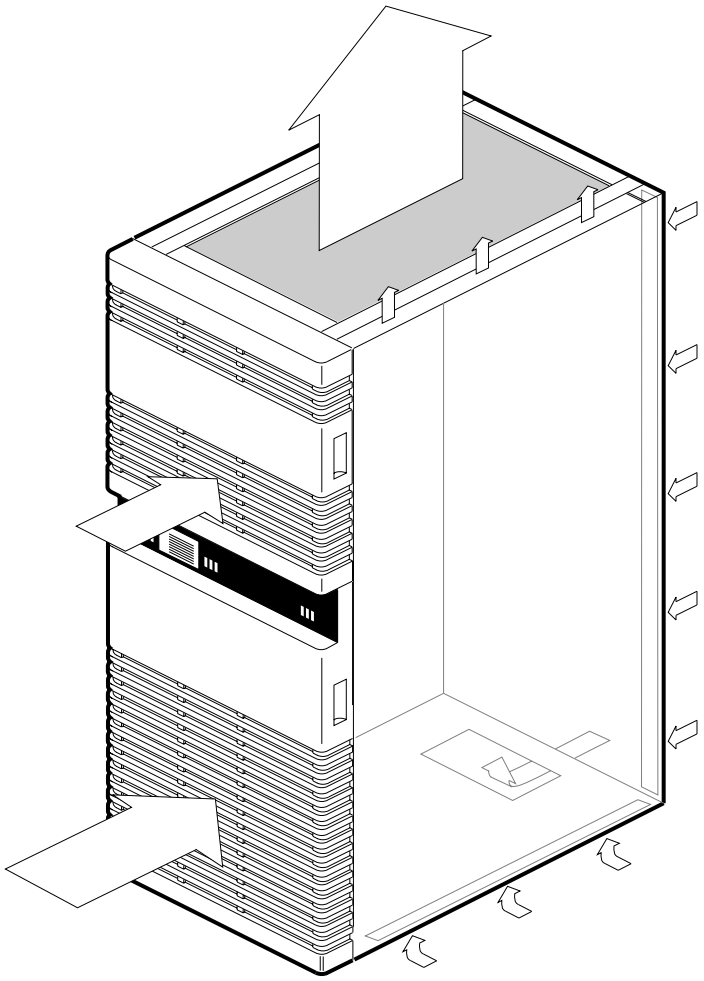


Figure 3-5 Rackmount Chassis Airflow

Note: Keep the top of the chassis clear of any obstruction. The top of the chassis is the primary air venting surface and is not structurally designed to hold weight.

3.1.4 Rackmount Floor Loading

Compare the floor-load rating of the site with the values listed in Table 3-3. Some site floor-load ratings are as low as 100 lb / ft^2 To ensure that the flooring is adequate for all future chassis upgrades, you must make sure the floor-load rating meets 133 lb / ft^2.

Chassis Configuration	Weight	Floor-load Rating (lb/$ft.^2$)
Minimum	560 lbs (254 kg)	62 lb / ft^2 (249 kg / m^2)
Maximum	1,200 lbs (544 kg)	133 lb / ft^2 (533 kg / m^2)

Table 3-3 Rackmount Floor-load Requirements

For installations on raised floors, check that the construction will properly support the distribution of the weight. The rackmount chassis uses four casters and four stabilizing levelers that distribute the weight load to the site floor. See Figure 3-6 for the caster and leveler locations. If a floor is modified, such as by cutting new access panels in computer floor tiles, determine if additional reinforcement is required.

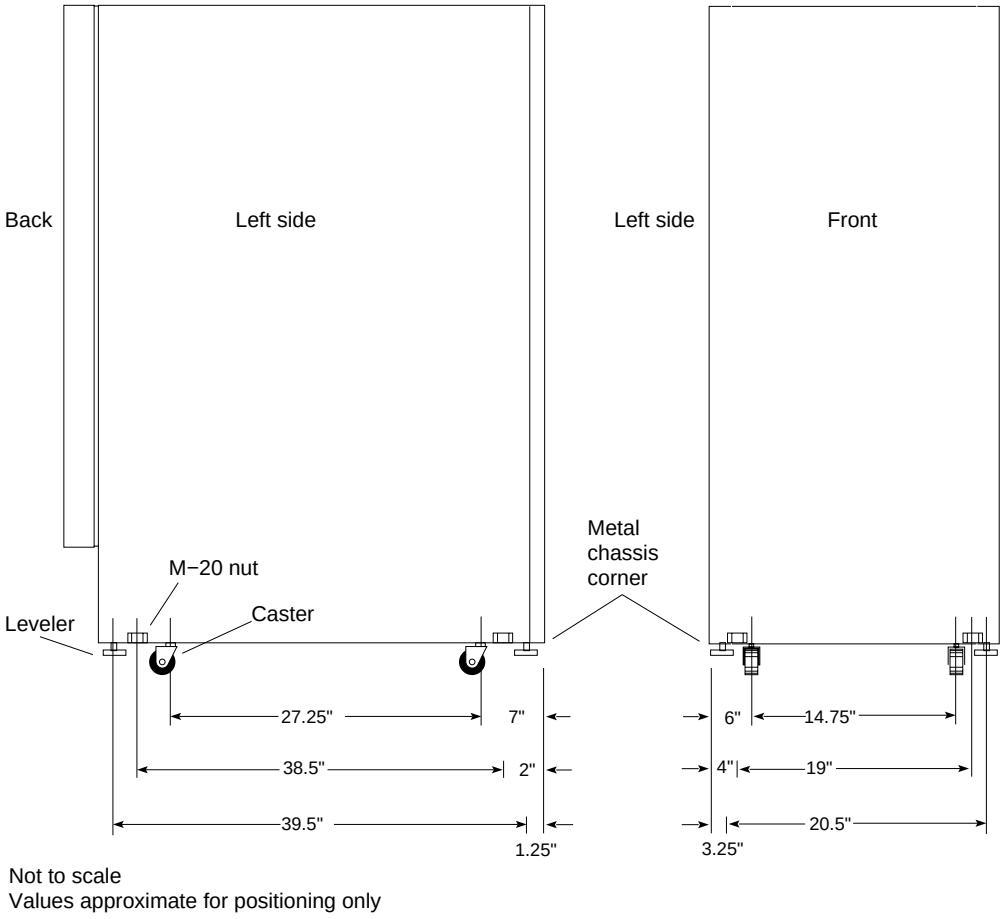


Figure 3-6 Rackmount Caster and Leveler Locations

3.1.5 Rackmount Physical Specifications

Table 3-4 summarizes the physical requirements of the rackmount chassis.

Parameter	Characteristic
Dimensions, chassis	
height	62.3” (159 cm)

Table 3-4 Rackmount Physical Specifications

Parameter	Characteristic
width	27” (69 cm)
depth	48” (122 cm)
Dimensions, shipping	
height	74.5” (189 cm)
width	46” (117 cm)
depth	59.5” (151 cm)
Weight	
minimum	560 lbs (254 kg)
maximum	1,200 lbs (544 kg)
shipping	1,500 lbs (680 kg)
Cardcage dimensions (2 and 3)	
height	15” (38 cm)
width	17.345” (44 cm)
depth	19” (48.3 cm)

Table 3-4 Rackmount Physical Specifications

3.1.6 Vault Space Requirements

Position a Vault chassis with the clearances shown in Figure 3-7. The side clearances allow the front doors to pivot on their hinges. The front and back clearances are required for access to the inside of the chassis and for proper airflow. The top clearance is required for airflow.

If an installation is semipermanent, such as at sites with the chassis bolted directly to the floor to prevent movement, allow 34 inches between the system chassis and any other device to allow servicing through the system chassis side panels. The Vault chassis requires no servicing through the side panels.

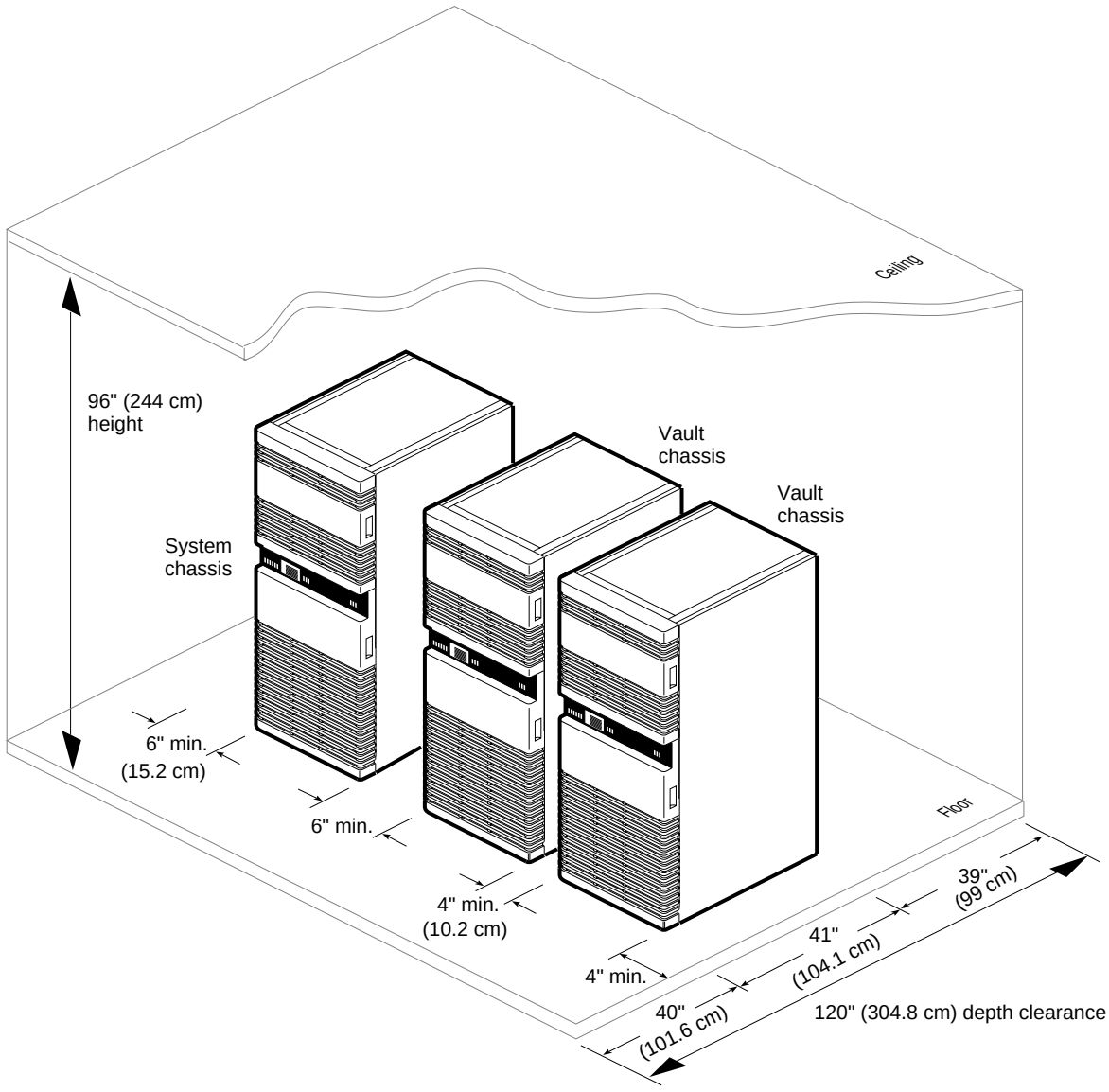


Figure 3-7 Vault Chassis Clearance (Minimum)

Note: Keep the top of the chassis clear of any obstruction. The top of the chassis is the primary air venting surface and is not structurally designed to hold weight.

Check that the site provides proper air circulation. Figure 3-8 shows the airflow path of the chassis.

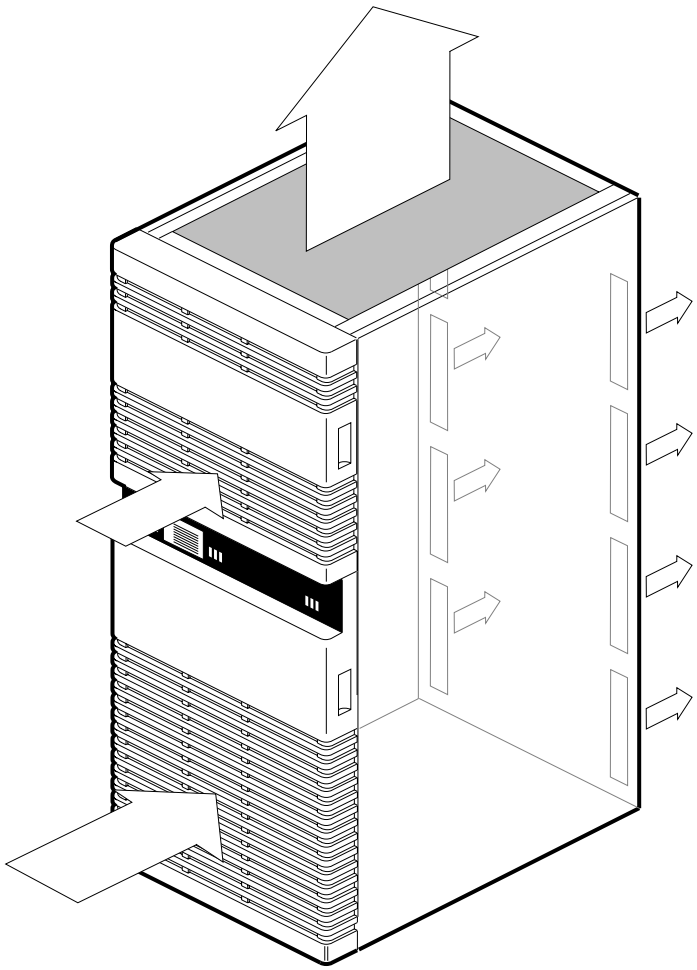


Figure 3-8 Vault Chassis Airflow

Note: Be sure to allow sufficient space behind the chassis to facilitate future installation, cabling, and service activities.

3.1.7 Vault Floor Loading

Check the floor-load rating of the site with the values listed in Table 3-5. Some site floor-load ratings are as low as 100 lb / ft^2. To ensure that the flooring is adequate for all future chassis upgrades, you must make sure the floor-load rating meets 111 lb / ft^2.

Note: For Vaults sharing floor space with a Rackmount chassis, the floor-load rating must meet 133 lb / ft^2.

Chassis Configuration	Weight	Floor-load Rating (lb/$ft.^2$)
Typical	650 lbs (295 kg)	72 lb / ft^2 (288.8 kg / m^2)
Maximum	1,000 lbs (454 kg)	111 lb / ft^2 (444.3 kg / m^2)

Table 3-5 Vault Floor-load Requirements

For installations on raised floors, check that the construction will properly support the weight distribution. The Vault chassis uses four casters and four stabilizing levelers that distribute the weight load to the site floor. See Figure 3-9 for the caster and leveler locations. If a floor is modified, such as by cutting new access panels in computer floor tiles, determine if additional reinforcement is required.

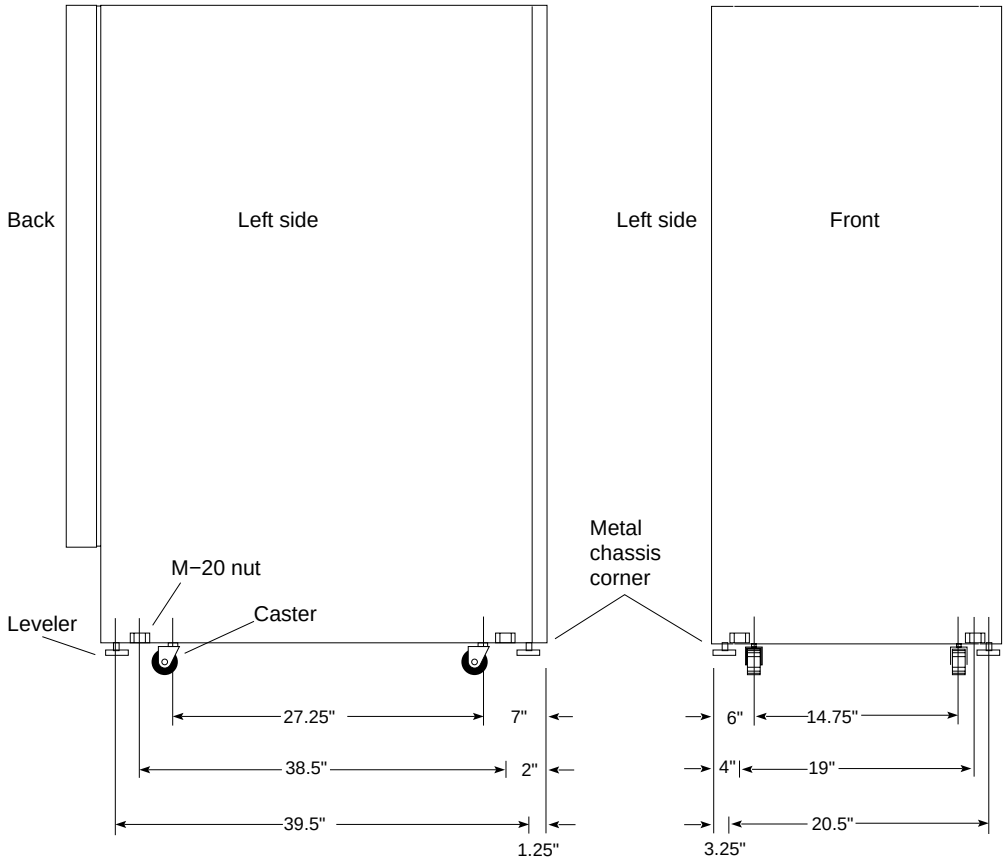


Figure 3-9 Vault Caster and Leveler Locations

3.1.8 Vault Physical Specifications

Table 3-6 summarizes the physical requirements of the Vault chassis.

Parameter	Characteristic
Dimensions, chassis	
height	62.3” (159 cm)
width	27” (69 cm)
depth	48” (122 cm)
Dimensions, shipping	
height	74.5” (189 cm)
width	46” (117 cm)
depth	59.5” (151 cm)
Weight	
typical	650 lbs (295 kg)
maximum	1,000 lbs (454 kg)
shipping, maximum	1,390 lbs (590 kg)

Table 3-6 Vault Physical Specifications

3.2 Space Requirements for Local Devices

This section defines the space required for these local devices provided with graphics systems:

- monitor
- keyboard and mouse

Note: Server systems do not support graphics devices. All interaction is performed through an ASCII terminal.

3.2.1 Space Requirements for a Monitor

Provide the space shown in Figure 3-10 for a 19” or 21” monitor.

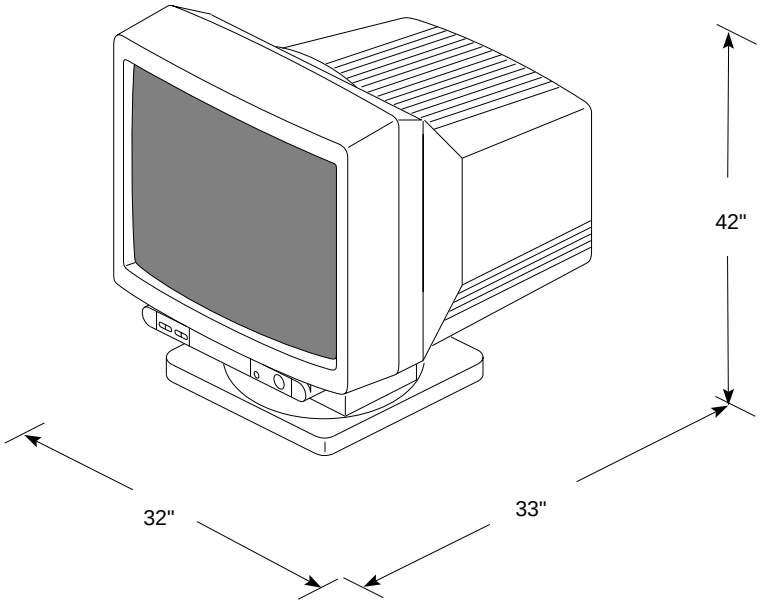


Figure 3-10 Monitor Minimum Space Requirements

The monitor location must be within cabling distance of the main chassis, which is 30 feet for the standard monitor cable. See Chapter 5 for additional information on cables.

If several monitors are positioned in one location, maintain a minimum distance of three feet between monitors to eliminate visual artifacts on the monitor screens caused by electromagnetic interference (EMI).

Allow sufficient space to connect cables to the monitor, particularly when using a cable with 13W3 connectors and EMI filters. To reduce the possibility of signal reflection in a monitor cable, keep all bends in the cable to less than 90° when connecting the cable to a monitor. If a cable must be bent at 90°, keep the inside radius of the bend to a minimum of 3 inches. This guideline also applies when connecting a monitor cable to a chassis.

Note: Check local regulations to ensure that the site complies with ergonomic and related codes.

Table 3-7 summarizes the monitor physical requirements.

Parameter	Characteristic	
	19” Monitor	**21” Monitor**
Height	18.4” (46.7 cm)	18.4” (46.7 cm)
Width	19.2” (48.8 cm)	19.7” (50 cm)
Depth	21” (53.4 cm)	21.4” (54.3 cm)
Weight	99 lbs (45 kg)	83 lbs (38 kg)

Table 3-7 Monitor Physical Specifications

3.2.2 Space Requirements for a Keyboard and Mouse

For graphics systems with a keyboard, provide desk or tray space within cabling distance of the system chassis (30 feet for the standard keyboard cable) and comfortable viewing distance of the related monitor. See Chapter 5 for additional information on cables.

A mouse connects directly to the keyboard. See Figure 3-11 for the dimensions of a typical keyboard and mouse layout.

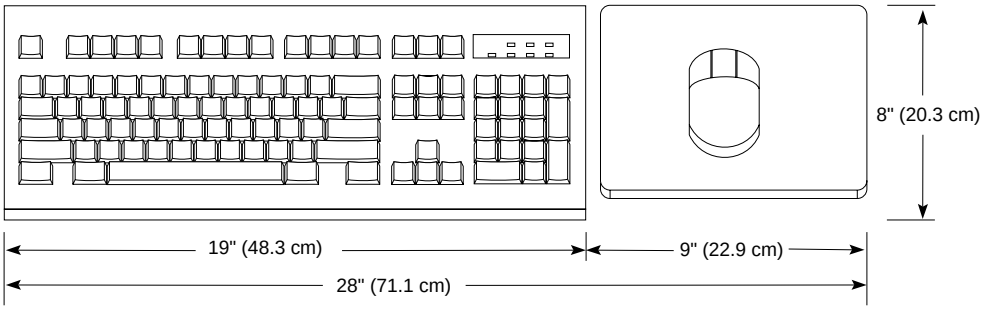


Figure 3-11 Keyboard and Mouse Space Requirements

3.3 Environmental Conditions

Check your site for these environmental factors:

- air conditioning
- electrical interference (EMI, ESD)
- vibration
- acoustics
- safety

3.3.1 Air Conditioning

Each site must provide proper air temperature, humidity, and filtration. Use Table 3-8, Table 3-9, and Table 3-10 to prepare the site air conditioning.

Note: Temperature ranges apply to systems inside a building and out of direct sunlight. For installations at or above 8,000 feet, the system fans must be set on high-speed during operation.

Parameter	Characteristic
Air temperature range	
operating	5° to 35° C at sea level 5° to 30° C above 5,000 feet
nonoperating	–20˚ to 60˚ C at sea level
Heat dissipation (maximum configurations)	
server and graphics chassis, 110V	6,500 Btu / hour (.54-ton AC load)
server and graphics chassis, 220V	8,100 Btu / hour (.68-ton AC load)
monitor, 19-inch and 21-inch	512 Btu / hour (.042-ton AC load)
Humidity range	
operating	10 to 80%, noncondensing
nonoperating	10 to 95%, noncondensing
Altitude	
operating	10,000 feet MSL, maximum
nonoperating	40,000 feet MSL, maximum

Table 3-8 Deskside Environmental Specifications

Note: MSL indicates mean (average) sea level or 29.92” (76 cm) of mercury barometric pressure.

Parameter	Characteristic
Air temperature range	
operating	5˚ to 35˚ C at sea level 5˚ to 30˚ C above 5,000 feet
nonoperating	–20˚ to 60˚ C at sea level
Heat dissipation (maximum configurations)	
server and graphics chassis, 220V 1-phase	16,000 Btu / hour (1.3-ton AC load)
server and graphics chassis, 220V 3-phase	24,000 Btu / hour (2-ton AC load)
Humidity range	
operating	10 to 80%, noncondensing
nonoperating	10 to 95%, noncondensing
Altitude	

Table 3-9 Rackmount Environmental Specifications

Parameter	Characteristic
operating	10,000 feet MSL, maximum
nonoperating	40,000 feet MSL, maximum

Table 3-9 Rackmount Environmental Specifications

Note: MSL indicates mean (average) sea level or 29.92” (76 cm) of mercury barometric pressure.

Parameter	Characteristic
Air temperature range	
operating	5˚ to 35˚ C at sea level 5˚ to 30˚ C above 5,000 feet
nonoperating	–20˚ to 60˚ C at sea level
Heat dissipation (maximum configuration)	12,000 Btu / hour (1-ton AC load)
Humidity range	
operating	10 to 80%, noncondensing
nonoperating	10 to 95%, noncondensing
Altitude	
operating	10,000 feet MSL, maximum
nonoperating	40,000 feet MSL, maximum

Table 3-10 Vault Environmental Specifications

Note: MSL indicates mean (average) sea level or 29.92” (76 cm) of mercury barometric pressure.

3.3.2 Electrical Interference

Two primary sources of problems for computer systems are electromagnetic interference (EMI) and electrostatic discharge (ESD).

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 transmission can be either conducted or emitted.

Use properly shielded connectors and cables throughout the site to prevent the new system from generating EMI.

Challenge / Onyx systems meet the EMI ratings for FCC Class A; VDE Level A; DOC Class A; VCCI Class 1; and CISPR-22, Class 1.

Caution: Failure to use shielded cables with the system violates FCC regulations and voids the manufacturer's warranty.

Silicon Graphics designs and tests its products to be resistant to the effects of ESD. ESD can cause problems ranging from data errors and lockups to permanent component damage. To protect the systems from electrostatic discharge (ESD), use these precautions:

- Minimize the use of carpeting at computer locations.
- Verify that all electronic devices are properly grounded.
- Keep all doors and access panels closed during computer operation.
- Keep all screws, slide locks, and thumbnails fastened securely.
- Use a static strap whenever working with the chassis or components.
- Use antistatic packing material for storage and transportation.
- Clear the site of all devices that create static electricity or possible sources of EMI.

3.3.3 Vibration

The Challenge / Onyx product line is designed for the typical office and computing environment, requiring no special modifications or protection. If a system is installed at an industrial site, check that vibrations are kept within the limits shown in Table 3-11 for the entire product line.

Description	Value
Sustained vibration, operating	Less than 5-10 Hz at 0.01" total excursion, 10-500 Hz at 0.1 g
Peak vibration, operating	Less than 5-10 Hz at 0.02" total excursion, 10-500 Hz at 0.1 g
Sensitive (harmonic) frequencies, operating	8-33 Hz, depending on configuration

Table 3-11 Challenge / Onyx Vibration Limits

3.3.4 Acoustics

Check that the additional computer equipment acoustics (noise-emission levels) are within the limits for the particular site. See Table 3-12.

Parameter	Level
Deskside chassis	
typical	57 dB
maximum	65 dB

Table 3-12 Challenge / Onyx Acoustic Levels

Parameter	Level
Rackmount chassis	
typical	60 dB
maximum	66 dB
Vault	
maximum	65 dB

Table 3-12 Challenge / Onyx Acoustic Levels

Note: Check local codes to ensure that the site is compliant with worker safety regulations, such as those provided by UL, TUV, and CSA.

The systems are designed for office environments such as large offices, shared work areas, and computer rooms. The measurements in this section are only guidelines because acoustics depend on many factors 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:

- Reduce the amount of flat reflective surfaces such as glass, tile, or metal.
- Add sound-absorbing carpet, wall coverings, and drapes.
- Add sound baffles in critical locations and be careful not to block airflow.
- Install ceiling tiles with sound-absorbing properties.
- Modify office space to isolate operators and hardware.

3.4 Site Safety

Check the site to ensure that it meets these safety considerations:

- Emergency routes are clear and unobstructed by equipment, particularly cables crossing paths and aisles.
- Sufficient fire extinguishing equipment rated for computer equipment is provided.
- Electrical breakers are available.

Note: Check local code for additional safety factors affecting the site.

Table 3-13 lists the safety organizations that approve these systems.

Safety Agency	Approval
UL	Listed under 1950 Information Technology Equipment
Canadian Standards Association (CSA)	Certified under CSA 22.2 No. 950-M89—Information Technology Equipment

Table 3-13 Safety Agency Approval List

Safety Agency	Approval
TUV	Licensed under CENELEC European Norm EN 60 950 / 06.88

Table 3-13 Safety Agency Approval List

Caution: All plenum cabling (through ceilings and walls) must meet local codes for fire safety. Plenum cabling should be provided by the user.

3.5 Operating Considerations

Verify that the selected physical location does not interfere with:

- routine operations, such as loading media and attaching cables
- normal traffic through aisles, hallways, or entrances
- future expansion plans

Also, evaluate the site to ensure that the equipment is protected from potential flooding and other exposure to water, particularly in underground installations or sites at low elevation.

For work areas near the computer equipment, check that the ergonomic considerations of personnel are met, particularly air quality, temperature, and sound.

Chapter 4

Preparing Site Power

This chapter describes the power requirements for the Challenge, Onyx, and Vault product configurations and shows you how to prepare the site power for a system by:

- determining the power requirements of the ordered system
- installing power circuits
- installing safety and protection equipment

Warning: A licensed electrician should inspect and/or perform all wiring to ensure that the installation meets local and country electrical codes.

4.1 Determining Power Requirements

This section introduces and defines the power requirements for Challenge / Onyx products.

The Challenge / Onyx product line uses a modular, distributed power system to support a wide variety of chassis configurations. The power system uses off-line switchers (OLSs) to convert power input from AC to DC and distribute power inside a chassis. DC regulators installed on the CPU, memory, and IO4 boards step down the backplane voltage for use by those boards. Additional power boards supply the DC voltages required by the Challenge / Onyx and VME buses. This arrangement allows board-level voltage to be generated for populated cardcage slots only. See Table 4-1 to determine the number of OLSs used for each chassis configuration.

4.1.1 Chassis Power Requirements

Use Table 4-1 to determine the power requirements for each type of chassis. If you have multiple systems, each chassis must be separately plugged into its own circuit with circuit breaker protection.

Description	Country	Power VAC input			Hertz		Phase	Rating	Power Supply	
		nom	min	max	min	max		amps	watts	qty
Deskside 110VAC Nom	US / Japan	110	100	132	50	60	1	16	1500	1

Table 4-1 Challenge / Onyx System Power Requirements

Description	Country	Power VAC input			Hertz		Phase	Rating	Power Supply	
		nom	min	max	min	max		amps	watts	qty
Deskside 95VAC Nom	Japan	90	85	132	50	60	1	16	1200	1
Deskside 220VAC	US / Int'l	220	187	264	50	60	1	13	1900	1
Rackmount 220VAC 1P	US / Int'l	208	187	264	50	60	1	24	3800	2
Rackmount 220VAC 3P	US	208	187	264	50	60	3	24	5700	3
Rackmount 220VAC 3P	Int'l	400	360	480	50	60	3	24	5700	3
Vault 220VAC	US	208	187	264	50	60	1	12	2600	up to 7
Vault 220VAC	Int'l	208	187	264	50	60	1	12	2600	up to 7

Table 4-1 (continued) Challenge / Onyx System Power Requirements

4.1.2 Determining Voltage Requirements

A deskside server system always uses 110VAC wiring (except in Japan, where it is 95VAC). For a deskside graphics chassis, determine the number of devices in the existing configuration and add any planned future devices. If the total exceeds the number of devices shown in Table 4-2, install 220VAC wiring. It is much easier to install ample power during initial preparation than to upgrade power later when wiring is already in place and a site is in operation. If a chassis is unlikely to exceed the quantities shown in Table 4-2, install 110VAC wiring.

Device Name	Maximum Number of Devices
RM board	2
CPU board, 4 R4400 each	2
Disk	7
VME board	3

Table 4-2 Maximum Configurations for a 110VAC, 1500-watt Deskside Chassis

For a rackmount chassis, determine if the chassis will have a third cardcage added when this option is available. For chassis requiring the third cardcage, prepare the circuit so that it is easily changed to 3-phase when required. Preparing the circuit in advance is much easier than upgrading power later when wiring is already in place and the site is in operation. If there are no plans to include a third cardcage in the chassis, wire the circuit for 220VAC 1-phase power.

4.1.3 KVA and KBTU Ratings

Table 4-3 provides KVA (kilo voltamps) and KBTU (kilo British thermal units) ratings for the Challenge / Onyx deskside and rackmount systems. These values help to determine the type of uninterruptible power supply (UPS) to purchase for these systems.

Chassis	KVA	KBTU
All Challenge / Onyx L (Deskside) systems	2.4	8.16
All Challenge / Onyx XL (Rackmount) systems	7.2	24.5

Table 4-3 KVA and KBTU Ratings

Note: The KVA factor is determined by dividing the output of the power supply / supplies by its efficiency ratings. For example, an OLS with a power output of 1900 watts and an efficiency rating of 80 percent, has a VA value of about 2400 (rounded off to the nearest hundred) or a KVA value of 2.4. The KBTU rating is determined by multiplying the KVA value by 3.4.
The values in Table 4-3 are based on systems containing all the possible options.

4.1.4 Planning Extensive Installations

For installations with more than two or three chassis, create a power budget and wiring scheme that considers both existing equipment and future expansion. Considerations include:

- an emergency power cutoff for disconnecting power to the main circuitry, with the controls located near the primary exit doors
- convenience outlets for test and auxiliary devices
- equipment ground and safety ground sources that match site power loads

4.2 Installing Power Circuits

This section shows you how to install a power circuit by performing these tasks:

- reviewing the site's physical requirements
- wiring the main branch circuit
- wiring the chassis branch circuits

In addition, Section 4.2.4 identifies the various power cables and connectors, and Section 4.2.5 diagrams the chassis internal wiring for all power configurations.

4.2.1 Reviewing the Site's Physical Requirements

Ensure that power outlets are within the maximum cabling distance of the chassis and monitors. Monitors require a wall outlet since the chassis do not provide any peripheral power outlets. The typical cable length is 10 feet. See Table 4-6 and Table 4-7 through Table 4-15 for more details on cables.

Maximum cable lengths are based on the wire gauge of the standard power cables. Consult with a licensed electrician to determine the wire gauge for custom cables.

Make sure that power cables are properly routed and guarded, particularly in areas frequented by personnel. Check the cabling plans to verify that sufficient length is allowed for proper slack through all routing, especially for indirect routing that runs cables along walls or in ceiling racks.

If an existing main power circuit is selected for the new computer equipment, check the circuit for any electrical noise-generating equipment, such as motors, calculators, and typewriters, and transfer these devices to a circuit other than ones servicing computer equipment.

4.2.2 Wiring the Main Branch Circuit

Evaluate the quality of the power supplied by the local power company. Reliable computer operation requires power that is mostly free of fluctuations, transients, surges and spikes, and noise. If the local power quality is questionable, line conditioning equipment may be required.

Install a main branch circuit panel with properly rated circuit breakers for each branch circuit in the panel. Consider adding an emergency power shutdown control to this main panel, as discussed in Section 4.3.2, "Emergency Power Shutdown Control." Figure 4-1 shows the wiring for a main branch circuit panel.

Warning: A licensed electrician should inspect and/or perform all wiring to ensure that the installation meets local and country electrical codes.

Caution: For connection to IT power systems, a four-pole breaker must be provided at the building site.

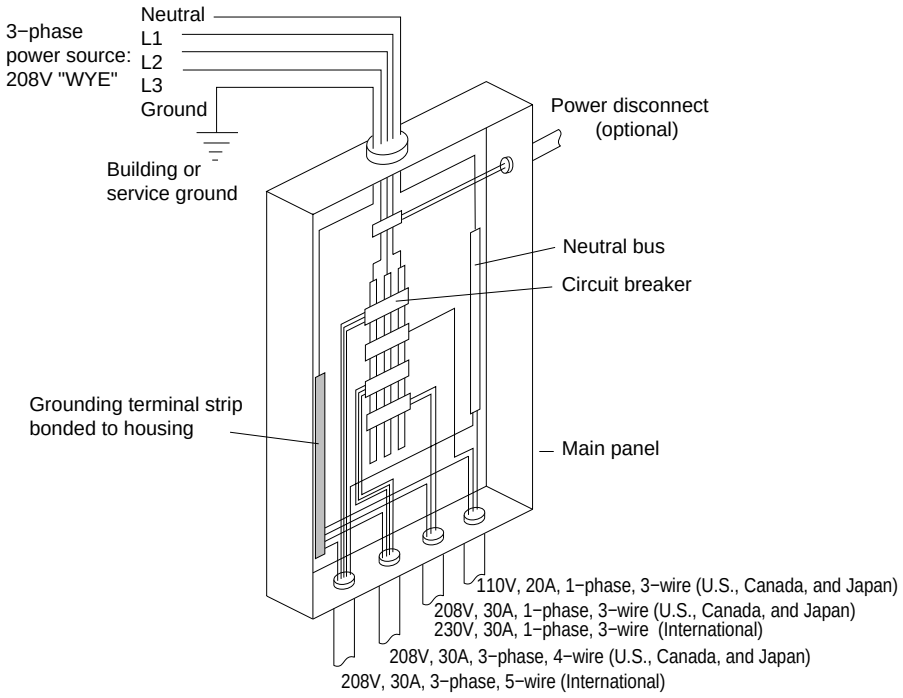


Figure 4-1 Main Branch Circuit Wiring

4.2.3 Wiring Chassis Branch Circuits

Provide a separate power circuit for each chassis. Wire the circuits using the diagrams and tables in this section for the deskside and rackmount chassis.

4.2.3.1 CHALLENGE L and Onyx L (Deskside Systems)

Table 4-4 provides power wiring configurations for the deskside systems.

Note: The Onyx L, 20-span configuration, requires 220VAC power.

System Type	U.S./Canada/Japan Wiring Configuration	International Wiring Configuration
CHALLENGE L	Phase to neutral (115VAC) See Figure 4-2.	Phase to neutral (230VAC) See Figure 4-3.
Onyx L (10-span)	Phase to neutral (115VAC) See Figure 4-2.	Phase to neutral (230VAC) See Figure 4-4.
Onyx L (20-span)	Phase to phase (208VAC) See Figure 4-3.	Phase to neutral (230VAC) See Figure 4-4.

Table 4-4 CHALLENGE L and Onyx L (Deskside Systems) Power Configurations

4.2.3.2 CHALLENGE XL and Onyx XL (Rackmount Systems)

Table 4-5 provides power wiring configurations for the rackmount systems.

System Type	U.S. /Canada/Japan Wiring Configuration	International Wiring Configuration
CHALLENGE XL and Onyx XL without the Cardcage 3 option	1- phase to 1-phase (208VAC) See Figure 4-5.	1-phase to neutral (230VAC) See Figure 4-6.
CHALLENGE XL and Onyx XL with the Cardcage 3 option	3-phase (208VAC) See Figure 4-7.	3-phase plus neutral (230VAC) WYE See Figure 4-8.

Table 4-5 CHALLENGE XL and Onyx XL (Rackmount Systems) Power Configurations

The power supplies in Challenge / Onyx systems include advanced power factor correction circuitry. Therefore, the power source lines are affected by the power load of the chassis as a 99 percent pure resistive load. The power supplies also provide 3-phase power balance between phases within +/- 10 percent maximum by specification, and +/- 2 percent nominal.

"Three-phase" typically refers to the phase-to-phase voltage, which in many international countries is called 400VAC 3-phase. Since Challenge / Onyx systems are connected to an international power source using the "WYE" method, the chassis power supplies use the 230VAC phase-to-neutral voltage and not the 400VAC phase-to-phase voltage. Internal to a Challenge / Onyx rackmount chassis, voltage is always 187 to 264VAC.

Caution: For 3-phase, 5-wire (international) Challenge / Onyx XL rackmount systems, ensure that the electrical outlet connecting to the system is a 5-wire, WYE-type connector having both neutral and earth ground terminals as well as a terminal for each of the 3-phase conductors. Verify the integrity of the neutral connection to avoid damage to the power supplies.

The branch circuit wiring should be provided with an insulated grounding conductor that is identical in size, insulation material, and thickness to the earthed and unearthed branch-circuit supply conductors. (The grounding conductor should be green, with or without one or more yellow stripes.) This grounding or earthing conductor should be connected to earth at the service equipment or, if supplied by a separately derived system, at the supply transformer or motor-generator set.

The attachment-plug receptacles in the vicinity of the unit or system should all be of an earthing type, and the grounding or earthing conductors serving these receptacles should be connected to earth at the service equipment.

See Figure 4-2 through Figure 4-8 to determine the proper wiring for various types of chassis branch circuits.

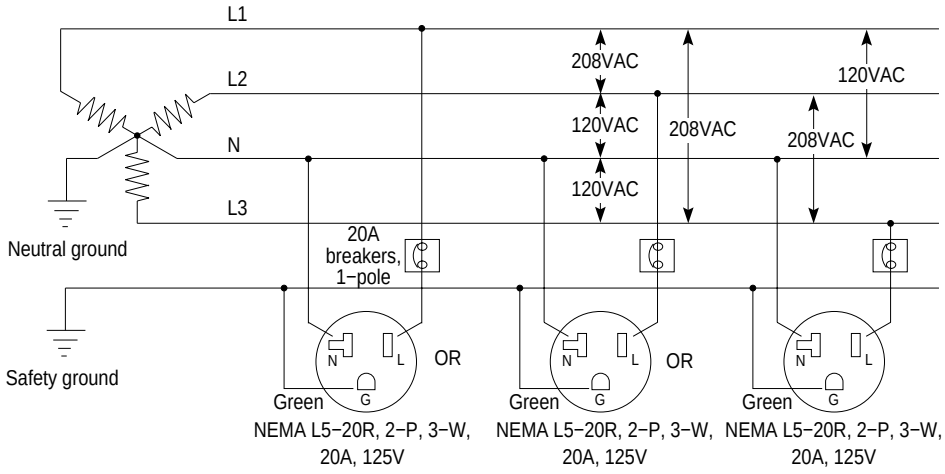


Figure 4-2 Branch Circuit Diagram for 120VAC, 3-wire, 1-phase, U.S., Canada, and Japan (CHALLENGE L and Onyx L/10-span Deskside Systems)

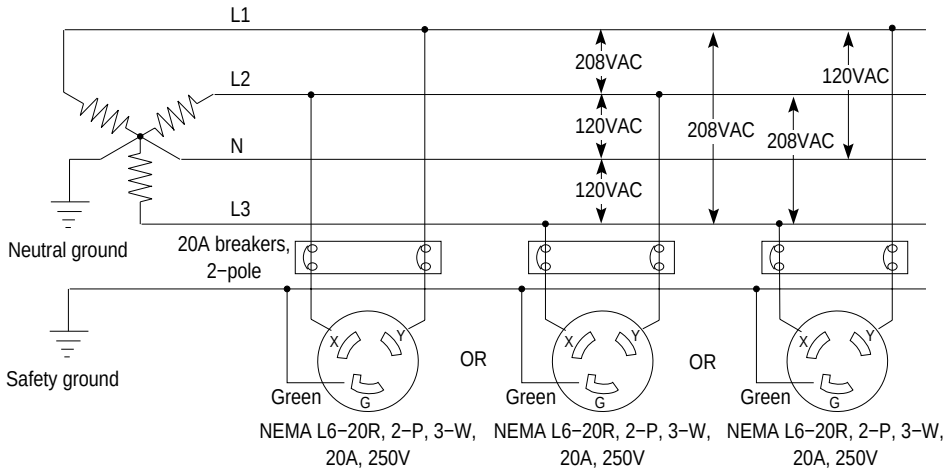


Figure 4-3 Branch Circuit Diagram for 208VAC, 3-wire, 1-phase, U.S., Canada, and Japan (Onyx L/20-span Deskside Systems)

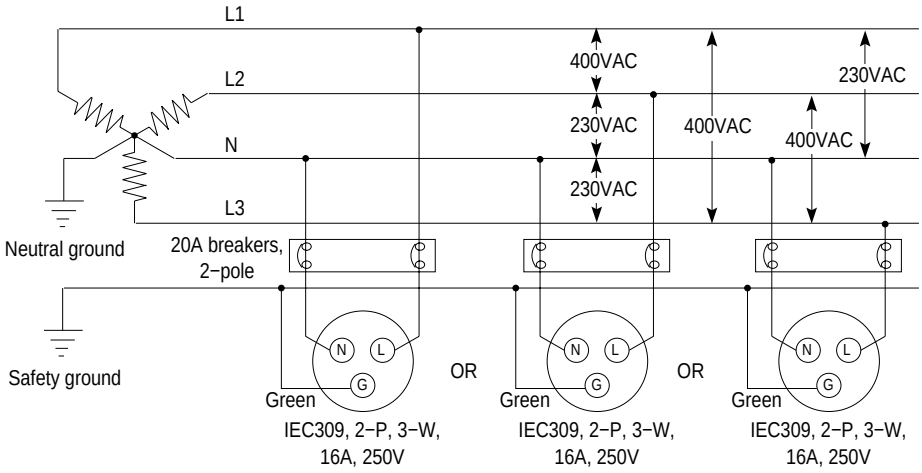


Figure 4-4 Branch Circuit Diagram for 230VAC, 3-wire, 1-phase, International (Onyx L/20-span Deskside Systems)

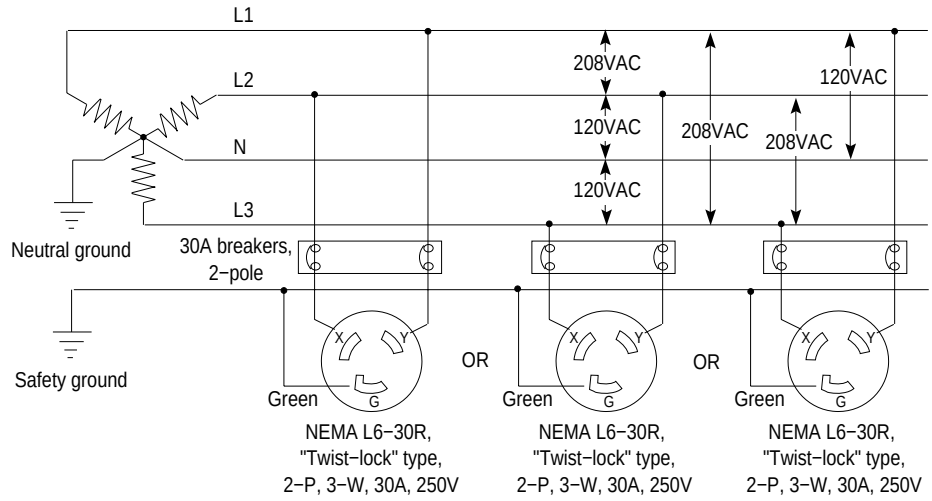


Figure 4-5 Branch Circuit Diagram for 208VAC, 3-wire, 1-phase, U.S., Canada, and Japan (CHALLENGE XL and Onyx XL Rackmount Systems—No Third Card Cage)

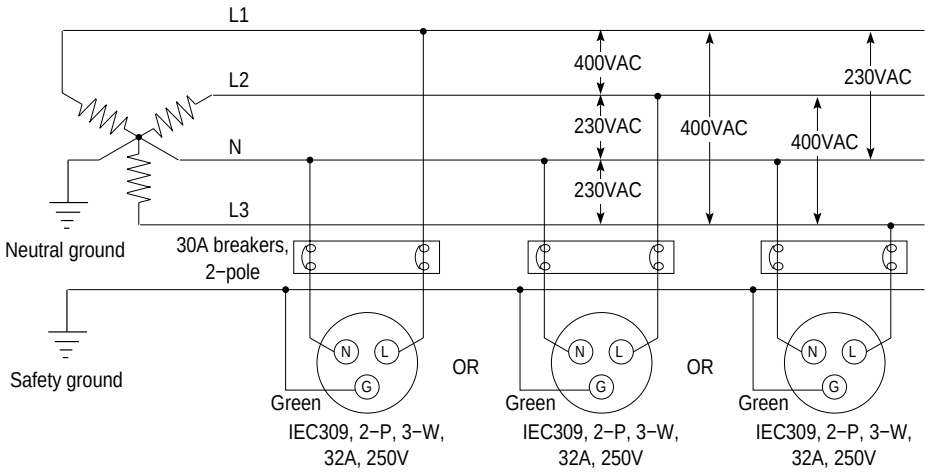


Figure 4-6 Branch Circuit Diagram for 230VAC, 3-wire, 1-phase, International (CHALLENGE XL and Onyx XL Rackmount Systems—No Third Card Cage)

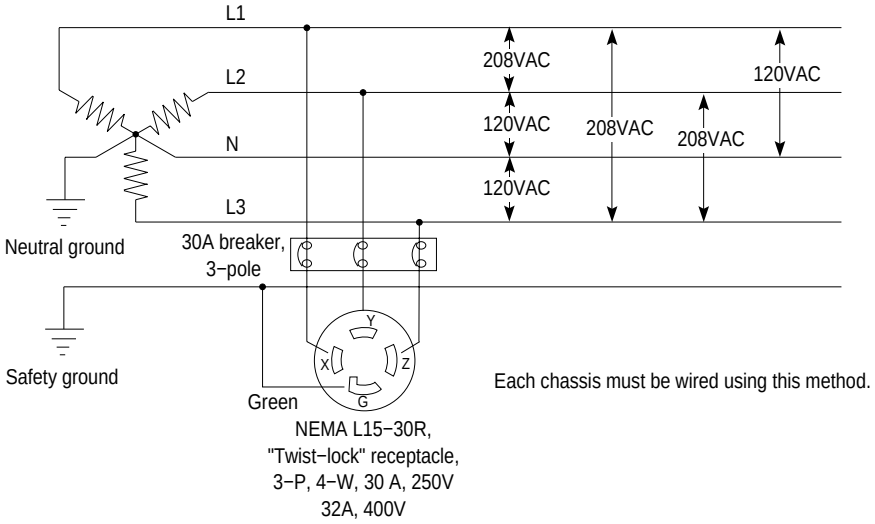


Figure 4-7 Branch Circuit Diagram for 230VAC, 4-wire, 3-phase, U.S., Canada, and Japan (CHALLENGE / Onyx XL Rackmount Systems—with Third Card Cage)

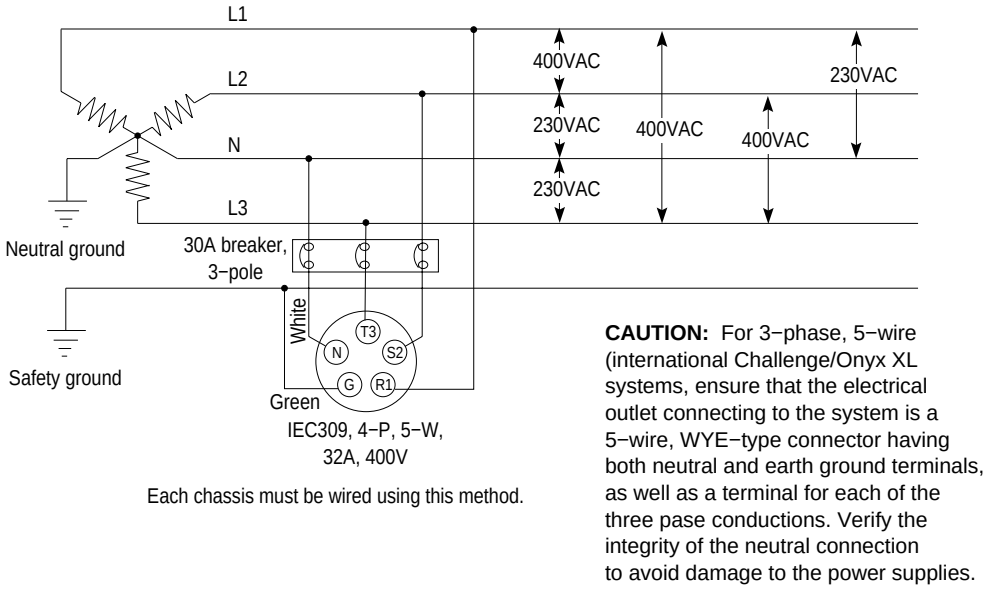


Figure 4-8 Branch Circuit Diagram for 400VAC, 5-wire, 3-phase, WYE-connected, International (CHALLENGE / Onyx XL Rackmount Systems—with Third Card Cage)

4.2.3.3 Additional Power Guidelines

This subsection provides additional power guidelines for 1- and 3-phase use.

- On a 3-phase power distribution system, each phase is 120 degrees out of phase, and the following formula applies:

  VAC phase-to-phase = VAC phase-to-neutral multiplied by 1.732

- If you are connecting from 1-phase to another single-phase, this setup is still referred to as 1-phase (or single-phase) connection in the power industry.
- If you are connecting equipment to all three phases, this setup is referred to as a 3-phase connection.

4.2.4 Power Cables and Connectors

Table 4-6 summarizes the power cables and connectors for each power configuration, and Table 4-7 through Table 4-15 shows the physical appearance of each standard cable.

Description	Cable Connector at Chassis End	Cable Connector at Power Source End	Cable Type	Power Source Connector
Deskside 110VAC Nom (P / N 9350050)	IEC320-C19	NEMA 5-20P	UL / CSA	NEMA 5-20R
Deskside 95VAC Nom (P / N 9350050)	IEC320-C19	NEMA 5-20P	UL / CSA	NEMA 5-20R

Table 4-6 Challenge / Onyx System Power Cable and Connector Specifications

Description	Cable Connector at Chassis End	Cable Connector at Power Source End	Cable Type	Power Source Connector
Deskside 220VAC				
U.S., Canada, and Japan (P / N 9350051)	IEC320-C19	NEMA 6-20P	UL / CSA	NEMA 6-20R
International (P / N 9350054)	IEC320 C19	IEC309, 2-P, 3-W, 16A, 240V	HAR	IEC309, 16A / 240V, 2P + Ground
Rackmount 220VAC 1P				
U.S., Canada, and Japan (P / N 108-0180-003)	NEMA L6-30R	NEMA L6-30P, 2-P, 3-W, 30A, 250V	UL / CSA	NEMA L6-30R
International (P / N 018-0341-001)	NEMA L6-30R	IEC309, 2-P, 3-W, 32A, 240V	HAR	IEC309, 32A / 240VAC, 2P + Ground
Rackmount 220VAC 3P				
U.S., Canada, and Japan (P / N 018-0350-003)	Fixed	NEMA L15-30P, 3-P, 4-W, 30A, 250V	UL / CSA	NEMA L15-30R
International (P / N 018-0351-001)	Fixed	IEC309, 4-P, 5-W, 32A, 415V	HAR	IEC309, 32A / 380 to 415VAC, 3P + N + Ground
Vault 220VAC				
U.S., Canada, and Japan (P / N 018-0280-002)	Fixed	NEMA L6-30P, 2-P, 3-W, 30A, 250V	UL / CSA	NEMA L6-30R
International (P / N 018-0276-001)	Fixed	IEC309, 2-P, 3-W, 32A, 240V	HAR	IEC309 32A / 240VAC, 2P + Ground

Table 4-6 Challenge / Onyx System Power Cable and Connector Specifications

Part Number	Description
9350050	Deskside power cable, 110VAC, U.S., Canada, and Japan: round UL / CSA cable, 10' length; NEMA 5-20P plug at source end, IEC320-C19 receptacle at chassis end. See Figure 4-9.

Table 4-7 Deskside Power Cable, 110VAC, U.S., Canada, and Japan

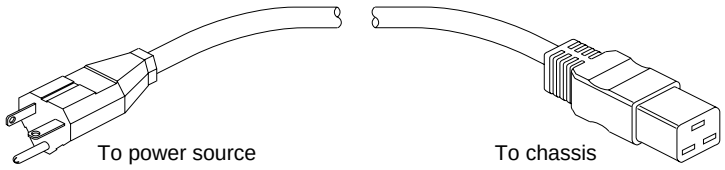


Figure 4-9 Deskside Power Cable, 110VAC, U.S., Canada, and Japan

Part Number	Description
9350051	Deskside power cable, 220VAC, U.S., Canada, and Japan: round UL / CSA cable, 10' length; NEMA 6-20P plug at source end, IEC320-C19 receptacle at chassis end. See Figure 4-10.

Table 4-8 Deskside Power Cable, 220VAC, U.S., Canada, and Japan

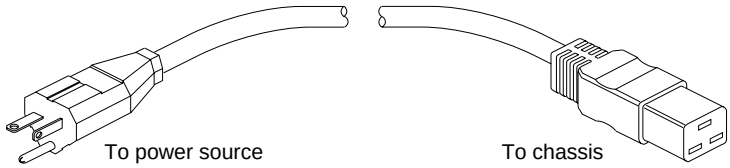


Figure 4-10 Deskside Power Cable, 220VAC, U.S., Canada, and Japan

Part Number	Description
9350054	Deskside power cable, 220VAC, international: round HAR cable, 10' length; IEC309, 2-P, 3-W, 16A, 240V plug at source end, IEC320-C19 receptacle at chassis end. See Figure 4-11.

Table 4-9 Deskside Power Cable, 220VAC, International

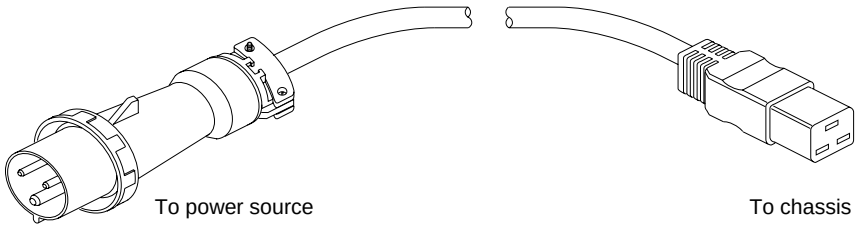


Figure 4-11 Deskside Power Cable, 220VAC, International

Part Number	Description
018-0180-003	Rackmount power cable, 220VAC, 1-phase, U.S.: round UL/CSA cable, 10' length, NEMA L6-30P, 2-P, 3-W, 30A, 250V plug at source end, NEMA L6-30R receptacle at chassis end. NOTE: This cable plugs into a twist-lock 30A, 250V branch circuit receptacle such as a Hubbel receptacle, part number 2620-A (non-isolated ground) or IG-2620-A (isolated ground). See Figure 4-12.

Table 4-10 Rackmount Power Cable, 220VAC, 1-phase, U.S.

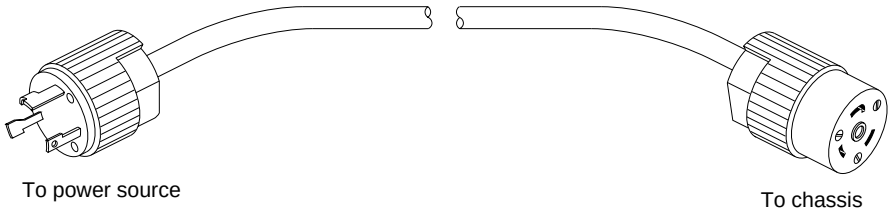


Figure 4-12 Rackmount Power Cable, 220VAC, 1-phase, U.S.

Part Number	Description
018-0341-001	Rackmount power cable, 220VAC, 1-phase, international: round HAR cable, 10' length, IEC309, 2-P, 3-W, 32A, 240V plug at source end, NEMA L6-30R receptacle at chassis end. See Figure 4-13.

Table 4-11 Rackmount Power Cable, 220VAC, 1-phase, International

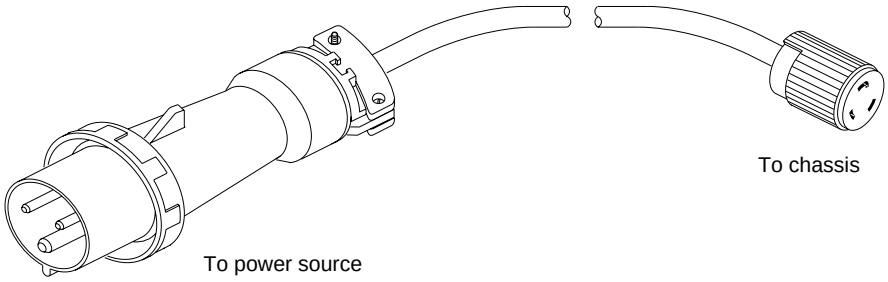


Figure 4-13 Rackmount Power Cable, 220VAC, 1-phase, International

Part Number	Description
018-0350-003	Rackmount power cable, 220VAC, 3-phase, U.S.: round UL/CSA cable, 10’ length, NEMA L15-30P, 3-P, 4-W, 30A, 250V plug at source end, fixed cord at chassis end. NOTE: This cable plugs into a twist-lock 30A, 3-phase, 250V branch circuit receptacle such as a Hubbel receptacle, part number 2720-A (non-isolated ground) or IG-2720-A (isolated ground). See Figure 4-14.

Table 4-12 Rackmount Power Cable, 220VAC, 3-phase, U.S.

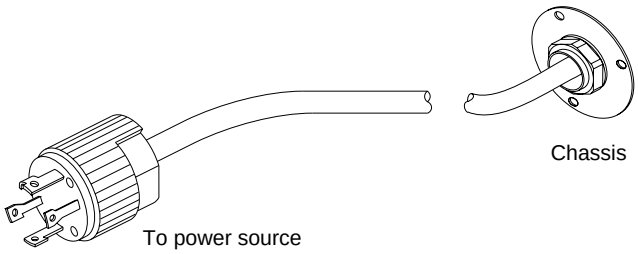


Figure 4-14 Rackmount Power Cable, 220VAC, 3-phase, U.S.

Part Number	Description
018-0351-001	Rackmount power cable, 400VAC, 3-phase, international: round HAR cable, 10’ length; IEC309, 4-P, 5-W, 32A, 415V plug at source end, fixed cord at chassis end. See Figure 4-15.

Table 4-13 Rackmount Power Cable, 400VAC, 3-phase, International

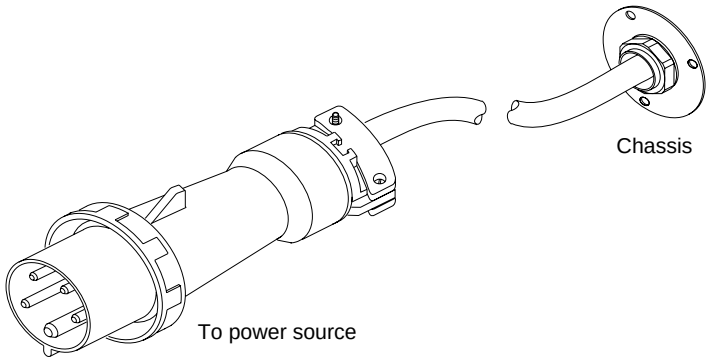


Figure 4-15 Rackmount Power Cable, 400VAC, 3-phase, International

Part Number	Description
018-0280-002	Vault power cable, 220VAC, 1-phase, U.S.: round UL / CSA cable, 10’ length; NEMA L6-30P, 2-P, 3-W, 30A, 250V plug at source end, fixed cord at chassis end. See Figure 4-16.

Table 4-14 Vault Power Cable, 220VAC, 1-phase, U.S.

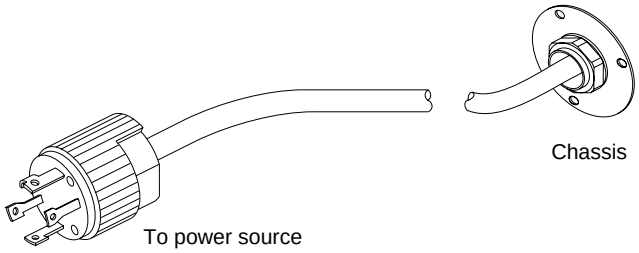


Figure 4-16 Vault Power Cable, 220VAC, 1-phase, U.S.

Part Number	Description
018-0276-001	Vault power cable, 220VAC, 1-phase, international: round HAR cable, 10’ length; IEC309, 2-P, 3-W, 32A, 240V plug at source end, fixed cord at chassis end. See Figure 4-17.

Table 4-15 Vault Power Cable, 220VAC, 1-phase, International

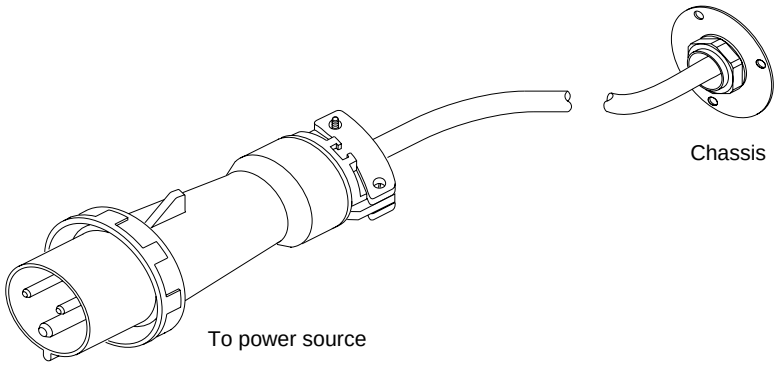


Figure 4-17 Vault Power Cable, 220VAC, 1-phase, International

4.2.5 Chassis Internal Power Circuits

This section provides wiring diagrams for Challenge / Onyx internal power circuits.

4.2.5.1 Deskside Chassis Wiring for 110 and 220VAC, 3-wire, 1-phase Power

Figure 4-18 provides a deskside chassis wiring diagram for 110VAC and 220VAC, 3-wire, 1-phase power circuits.

Note: The power supply uses auto-switching to convert either 110VAC or 220VAC to the levels required by the chassis. No manual configuration of the power supply is required.

Warning: A deskside graphics system can exceed the capabilities of 110VAC wiring when the chassis is upgraded to various configurations. Always check the configuration requirements of an upgraded chassis and modify site power to 220VAC as required.

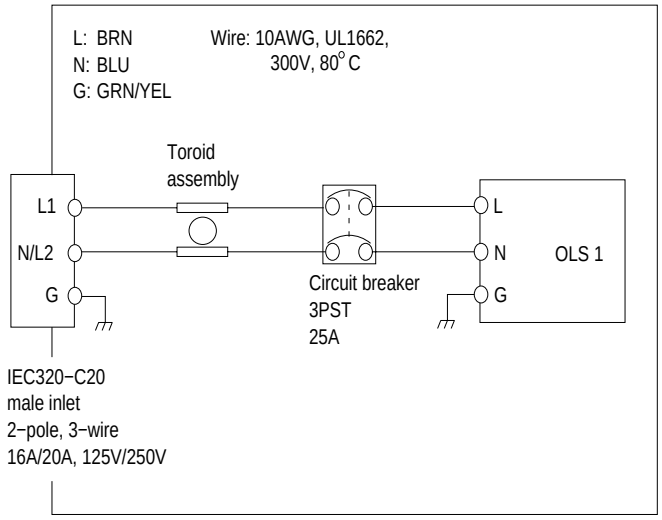


Figure 4-18 Deskside Chassis Wiring Diagram for 110VAC and 220VAC, 3-wire, 1-phase Power

4.2.5.2 Rackmount Chassis Wiring for 220VAC, 3-wire, 1-phase Power

Figure 4-19 provides a rackmount chassis wiring diagram for 220VAC, 3-wire, 1-phase power circuits.

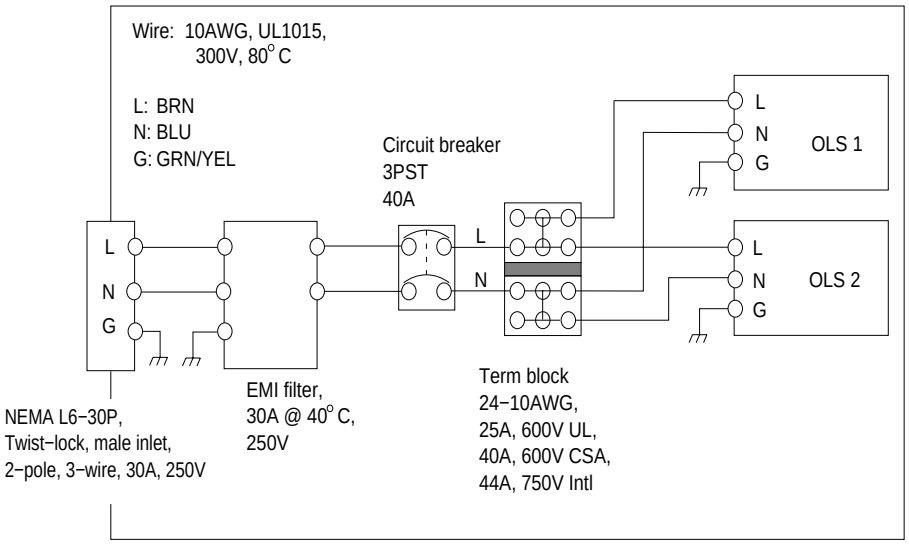


Figure 4-19 Rackmount Chassis Wiring Diagram for 220VAC, 3-wire, 1-phase Power (U.S., Canada, and Japan)

4.2.5.3 Rackmount Chassis Wiring for 220VAC, 4-wire, 3-phase Power

Figure 4-20 provides a rackmount chassis wiring diagram for 220VAC, 4-wire, 3-phase power circuits.

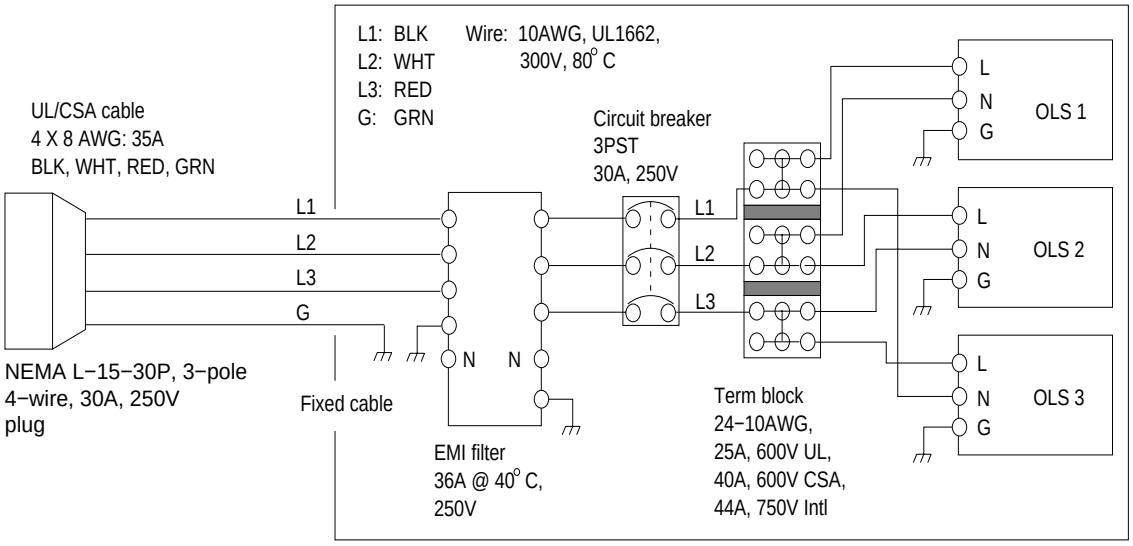


Figure 4-20 Rackmount Chassis Wiring Diagram for 220VAC, 4-wire, 3-phase Power (U.S., Canada, and Japan)

4.2.5.4 Rackmount Chassis Wiring for 400VAC, 5-wire, 3-phase Power

Figure 4-21 provides a rackmount chassis wiring diagram for 400VAC, 5-wire, 3-phase power circuits.

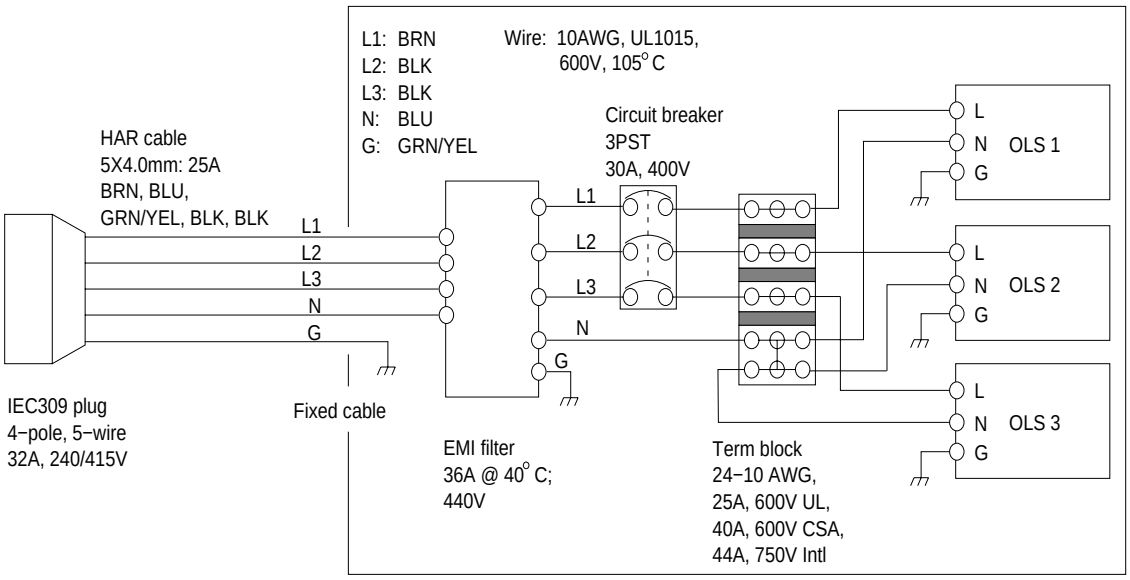


Figure 4-21 Rackmount Chassis Wiring Diagram for 400VAC, 5-wire, 3-phase Power (International)

4.2.5.5 Vault Chassis Wiring for 220VAC, 3-wire, 1-phase Power

Figure 4-22 provides a vault chassis wiring diagram for 220VAC, 3-wire, 1-phase power circuits.

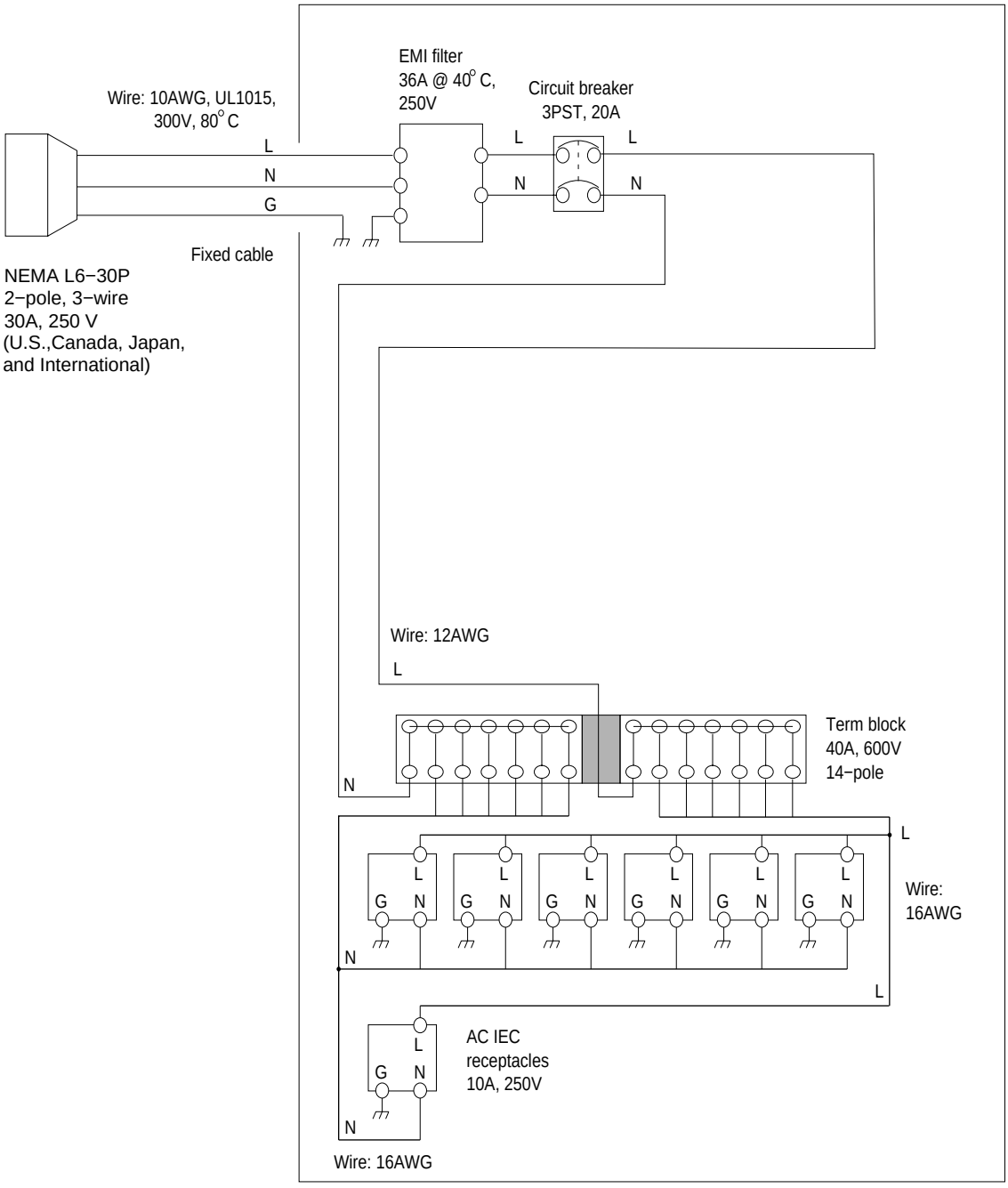


Figure 4-22 Vault Chassis Wiring Diagram for 220VAC, 3-wire, 1-phase Power

4.3 Installing Safety and Protection Equipment

Depending on the location and size of an installation site, consider the following for safety and protection:

- cable management equipment
- an equipment emergency power shutdown control
- fire fighting equipment with an electrical rating
- lightning protection
- power-line treatment, such as an uninterruptible power supply (UPS)

4.3.1 Installing Cable Management Equipment

Cable management equipment protects personnel from electrical accidents and equipment from premature wear and accidental loss of power. Cable management equipment includes cable routing guides and trays, walkway guards, and plug restraints.

Install cable management equipment if:

- people require access to locations with power cables or connections
- power cables could become disconnected
- power cables pass across aisles or other paths

Always isolate power cables from signal cables to minimize the transmission of noise from the power to the signal cables.

Warning: Check the cable management equipment specifications for power cable limitations. Improperly installed cable management equipment can cause unsafe working conditions.

4.3.2 Emergency Power Shutdown Control

An emergency power shutdown control is a safety feature that protects personnel and equipment from these hazardous electrical situations:

- personnel are exposed to or in contact with electrical sources
- large installations have many components to power off quickly during emergencies
- site is subject to power outages, drop-outs, and surges

Install an emergency power shutdown control at the main entries to the computer location. For large installations, place an additional control within easy reach of the main administrator's station. The control must be wired to the main branch circuit panel to disconnect power to all computer equipment at the location.

Warning: A licensed electrician should inspect and/or perform all wiring to ensure that the installation meets local and country electrical codes.

4.3.3 Fire Fighting Equipment with an Electrical Rating

Check the site for adequate fire fighting equipment for the new computer devices. Place an adequate number of small fire extinguishers (rated for electrical fires) at entrances, exits, and other obvious locations. Bear in mind that some fire extinguishing equipment leaves no residue, while other equipment can destroy sensitive components and surfaces.

Note: While Halon fire protection systems are ideal for suppressing fire without damaging computer equipment, Halon systems are being phased out because of their deleterious effects on the environment. If a site already uses Halon, check the national and local environmental codes and guidelines and plan accordingly.

For larger installations involving several system chassis, consider isolating all computers in one room and providing room-level fire protection.

Warning: Use licensed professionals to install extensive fire protection systems. Room-level fire protection typically relies on gas evacuation within an enclosed area. In addition, adequate warnings, overrides, and training must be provided to ensure personnel safety.

4.3.4 Lightning Protection

Install lightning protection at the site if:

- the site is in an electrical storm area
- the local utility company uses lightning protection on the primary power source
- an overhead power service provides the site's primary power

Lightning protection also helps prevent damage at locations with large power surges, such as in some industrial settings and at locations with older or overburdened power grids.

Consult with a licensed professional or appropriate organization for assistance with lightning protection systems within the site's area.

For more information on protecting people and equipment from lightning hazards within the U.S., obtain a copy of The National Fire Protection Association's Lightning Protection Code (NFPA Standard 78).

4.3.5 Power-line Treatment

Power-line treatment may be required if the site uses unreliable 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
- uninterruptible power supplies (UPS)

Note: See Section 4.1.3, “KVA and KBTU Ratings,” for information on determining the type of UPS to use for a system.

Consult with a licensed professional or an appropriate organization for assistance with selecting and installing power-line treatment equipment.

For more information on power treatment within the U.S., contact these organizations:

- The National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161
- The Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY 10022
- The American National Standards Institute, 1430 Broadway, New York, NY 10018

Chapter 5

Cabling Local and Peripheral Devices

This chapter describes the signal connectors and cables for local and peripheral devices used with Challenge/Onyx systems.

5.1 Connector Panels

Standard device cabling is supported by one I/O board and its related connectors on a common I/O panel. For graphics systems, a second panel provides video connection. See Figure 5-1. Table 5-1 through Table 5-9 provide a description of the connectors on the main I/O panel and provides a description of the connectors on the video panel.

Table 5-18 and Table 5-19 lists the signal pinouts for the 68-pin SCSI connectors on the system I/O panel. Table 5-20 and Table 5-21 provide 50-pin SCSI pinout details for reference information.

To attach more devices than are supported on the main I/O panel, additional hardware is required. Contact your local sales engineer for details.

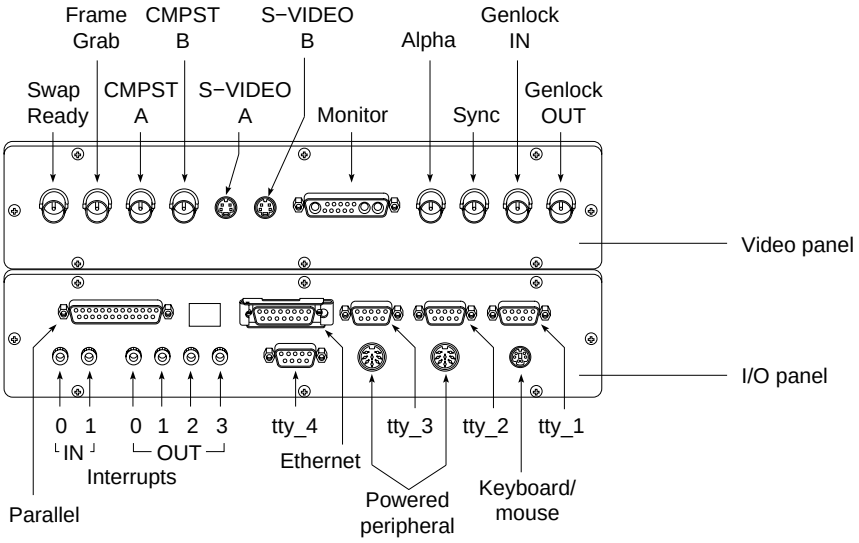


Figure 5-1 Challenge / Onyx System Main and Video Connector Panels

Description	Pin	Signal	Flow (from chassis)
Parallel port. See Figure 5-2. 25-pin D-sub receptacle.	1	STB (Data Strobe)	
	2	Data 0	
	3	Data 1	
	4	Data 2	
	5	Data 3	
	6	Data 4	
	7	Data 5	
	8	Data 6	
	9	Data 7	
	10	Data ACK	
	11	Busy	
	12	PE: Paper Empty	
	13	SLCT: Select / Online	
	14	AUTOFD	

Table 5-1 Parallel Port

Description	Pin	Signal	Flow (from chassis)
	15	ERROR	
	16	INIT (reset)	
	17	SLCTIN	
	18-25	GND	

Table 5-1 Parallel Port

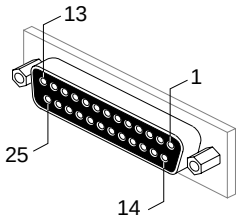


Figure 5-2 Parallel Port

Description	Pin	Signal	Flow (from chassis)
Ethernet port. See Figure 5-3. 15-pin AUI (attachment unit interface) according to IEEE 802.3 specification. Pin pairs 2:9, 3:10, and 5:12 are twisted pairs. Cabling is 9-conductor.	1	Logic GND	
	2	Collision+	two-way
	3	TXD+	two-way
	4	Logic GND	
	5	RXD+	two-way
	6	Power Return	input
	7	NC	
	8	Logic GND	
	9	Collision–	two-way
	10	TXD–	two-way
	11	Logic GND	
	12	RXD–	two-way
	13	Power (+12V)	output

Table 5-2 Ethernet Port

Description	Pin	Signal	Flow (from chassis)
	14	Logic GND	
	15	NC	

Table 5-2 Ethernet Port

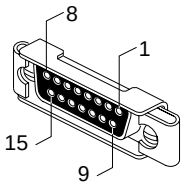


Figure 5-3 Ethernet Port

Description	Pin	Signal	Flow (from chassis)
Serial port tty_1. See Figure 5-4. 9-pin D-sub receptacle. RS-232 protocol.	1	NC	
	2	TXD	output
	3	RXD	input
	4	RTS	output
	5	CTS	input
	6	GND	
	7	GND	
	8	DCD	input
	9	DTR	output

Table 5-3 Serial Port tty_1

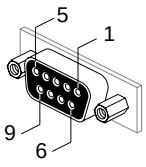


Figure 5-4 Serial Port tty_1

Description	Pin	Signal	Flow (from chassis)
Serial ports tty_2, tty_3 for unpowered peripherals. See Figure 5-5. 9-pin D-sub receptacle. RS-232 protocol. Serial ports tty_2 and tty_3 provide a choice of 9-pin D-sub or an 8-pin DIN receptacle. (See below.) Only one receptacle from each port can be used at a given time.	1	not used	
	2	TXD	output
	3	RXD	input
	4	RTS	output
	5	CTS	input
	6	GND	
	7	GND	
	8	DCD	input
	9	DTR	output

Table 5-4 Serial Ports tty_2, tty_3 for Unpowered Peripherals

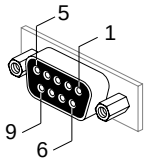


Figure 5-5 Serial Ports tty_2, tty_3 for Unpowered Peripherals

Description	Pin	Signal	Flow (from chassis)
Serials ports tty_2, tty_3 for powered peripherals. See Figure 5-6. 8-pin DIN receptacle.	1	DTR	output
	2	CTS	input
	3	Stereo Sync	output
	4	RXD	input

Table 5-5 Serials Ports tty_2, tty_3 for Powered Peripherals

Description	Pin	Signal	Flow (from chassis)
	5	TXD	output
	6	GND	
	7	GND	
	8	Power +10V	output

Table 5-5 Serials Ports tty_2, tty_3 for Powered Peripherals

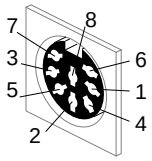


Figure 5-6 Serials Ports tty_2, tty_3 for Powered Peripherals

Description	Pin	Signal	Flow (from chassis)
Serial port tty_4 RS-422 protocol. See Figure 5-7. 9-pin D-sub receptacle.	1	DTR	output
	2	TXD low -[a]	two-way
	3	RXD low -[b]	two-way
	4	DCD	input
	5	CTS	input
	6	GND	
	7	TXD high +[a]	two-way
	8	RXD high +[b]	two-way
	9	RTS	output

Table 5-6 Serial Port tty_4 RS-422 Protocol

[a]Pins 2 and 7 must be twisted pair in cable.

[b]Pins 3 and 8 must be twisted pair in cable.

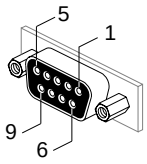


Figure 5-7 Serial Port tty_4 RS-422 Protocol

Description	Pin	Signal	Flow (from chassis)
System interrupt IN ports 0, 1. See Figure 5-8.	tip	Interrupt	input
	ring	Power +5V	
	sleeve	Shield	

Table 5-7 System Interrupt IN

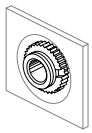


Figure 5-8 System Interrupt IN

Description	Pin	Signal	Flow (from chassis)
System interrupt OUT ports 0, 1, 2, 3. See Figure 5-9.	tip	Interrupt	output
	ring	Power +5V	
	sleeve	Shield	

Table 5-8 System Interrupt OUT

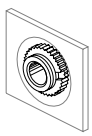


Figure 5-9 System Interrupt OUT

Description	Pin	Signal	Flow (from chassis)
Keyboard / mouse port. See Figure 5-10. 6-pin receptacle	1	KBD_RXD	input
	2	MOUSE_RXD	input
	3	SIG GND	
	4	Power +12V	output
	5	KBD_TXD	output
	6	NC	

Table 5-9 Keyboard / Mouse Port

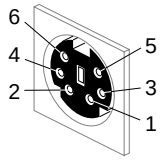


Figure 5-10 Keyboard / Mouse Port

Description	Pin	Signal	Flow (from chassis)
Swap Ready port. See Figure 5-11. BNC receptacle. Impedance 75 ohms.	center	SWAP_READY	two-way
	shield	Chassis GND	

Table 5-10 Swap Ready Port

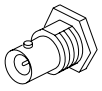


Figure 5-11 Swap Ready Port

Description	Pin	Signal	Flow (from chassis)
Frame Grab port. See Figure 5-12. BNC receptacle. Impedance 75 ohms.	center	FRAME_GRAB	input
	shield	Chassis GND	

Table 5-11 Frame Grab Port

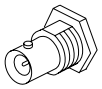


Figure 5-12 Frame Grab Port

Description	Pin	Signal	Flow (from chassis)
Composite video ports A, B. See Figure 5-13. BNC receptacle. Impedance 75 ohms.	center	CMPST_A or CMPST_B	output
	shield	Chassis GND	

Table 5-12 Composite Video Ports A, B

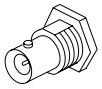


Figure 5-13 Composite Video Ports A, B

Description	Pin	Signal	Flow (from chassis)
S-VIDEO ports A, B. See Figure 5-14. 4-pin receptacle. NTSC or PAL-compatible.	1	LUMOND	output
	2	CHRMOND	output

Table 5-13 S-VIDEO Ports A, B

Description	Pin	Signal	Flow (from chassis)
	3	LUM	output
	4	CHRM	output

Table 5-13 S-VIDEO Ports A, B

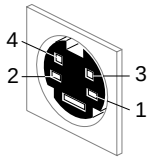


Figure 5-14 S-VIDEO Ports A, B

Description	Pin	Signal	Flow (from chassis)
Monitor port. See Figure 5-15. 13W3 receptacle.	A1	Red	output
	A2	Green	output
	A3	Blue	output
	1	NC	
	2	Monitor type 0	input
	3	NC	
	4	Stereo Sync[a]	output
	5	Stereo Power +10V[a]	output
	6	Monitor Type 1	input
	7	Monitor Type 2	input
	8	GND	
	9	GND[a]	
	10	GND[a]	

Table 5-14 Monitor Port

[a]On some cables these signals are NC.

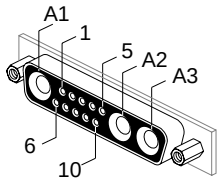


Figure 5-15 Monitor Port (13W3 Receptacle)

Description	Pin	Signal	Flow (from chassis)
Alpha port. See Figure 5-16. BNC receptacle. Impedance 75 ohms.	center	Alpha	output
	shield	Chassis GND	

Table 5-15 Alpha Port

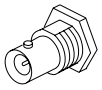


Figure 5-16 Alpha Port

Description	Pin	Signal	Flow (from chassis)
Sync port. See Figure 5-17. BNC receptacle. Impedance 75 ohms.	center	Sync	output
	shield	Chassis GND	

Table 5-16 Sync Port

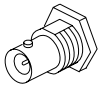


Figure 5-17 Sync Port

Description	Pin	Signal	Flow (from chassis)
Genlock IN, Genlock OUT. See Figure 5-18. BNC receptacle. Impedance 75 ohms.	center	Genlock loop-through	two-way
	shield	Chassis GND	

Table 5-17 Genlock IN, Genlock OUT

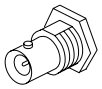


Figure 5-18 Genlock IN, Genlock OUT

Signal Name	Pin Number	Pin Number	Signal Name
GND	1	35	-DB(12)
GND	2	36	-DB(13)
GND	3	37	-DB(14)
GND	4	38	-DB(15)
GND	5	39	-DB(P1)
GND	6	40	-DB(0)
GND	7	41	-DB(1)
GND	8	42	-DB(2)
GND	9	43	-DB(3)
GND	10	44	-DB(4)
GND	11	45	-DB(5)
GND	12	46	-DB(6)
GND	13	47	-DB(7)
GND	14	48	-DB(P)
GND	15	49	GND
GND	16	50	GND

Table 5-18 68-pin, Single-ended, High-density SCSI Pinouts

Signal Name	Pin Number	Pin Number	Signal Name
TERMPWR	17	51	TERMPWR
TERMPWR	18	52	TERMPWR
Reserved	19	53	Reserved
GND	20	54	GND
GND	21	55	-ATN
GND	22	56	GND
GND	23	57	-BSY
GND	24	58	-ACK
GND	25	59	-RST
GND	26	60	-MSG
GND	27	61	-SEL
GND	28	62	-C/D
GND	29	63	-REQ
GND	30	64	-I/O
GND	31	65	-DB(8)
GND	32	66	-DB(9)
GND	33	67	-DB(10)
GND	34	68	-DB(11)

Table 5-18 (continued) 68-pin, Single-ended, High-density SCSI Pinouts

See Figure 5-19 below:

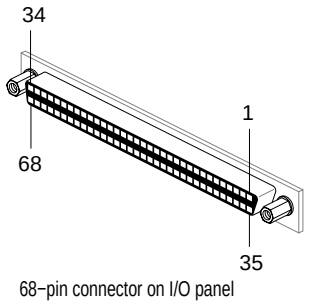


Figure 5-19 68-pin Connector on I/O Panel

Note: Read the following information regarding the SCSI signal pinouts. See Table 5-18.

A hyphen preceding a signal name indicates that the signal is active low.

8-bit devices that connect to the P-cable leave these signals open: -DB(8), -DB(9), -DB(10), -DB(11), -DB(12), -DB(13), -DB(14), -DB(15), -DB(P1). All other signals are connected as shown in this table.

Signal Name	Pin Number	Pin Number	Signal Name
+DB(12)	1	35	-DB(12)
+DB(13)	2	36	-DB(13)
+DB(14)	3	37	-DB(14)
+DB(15)	4	38	-DB(15)
+DB(P1)	5	39	-DB(P1)
GND	6	40	GND
+DB(0)	7	41	-DB(0)
+DB(1)	8	42	-DB(1)
+DB(2)	9	43	-DB(2)
+DB(3)	10	44	-DB(3)
+DB(4)	11	45	-DB(4)
+DB(5)	12	46	-DB(5)
+DB(6)	13	47	-DB(6)
+DB(7)	14	48	-DB(7)
+DB(P)	15	49	-DB(P)
DIFFSENS	16	50	GND
TERMPWR	17	51	TERMPWR
TERMPWR	18	52	TERMPWR
Reserved	19	53	Reserved
+ATN	20	54	-ATN
GND	21	55	GND
+BSY	22	56	-BSY
+ACK	23	57	-ACK
+RST	24	58	-RST
+MSG	25	59	-MSG
+SEL	26	60	-SEL
+C/D	27	61	-C/D

Table 5-19 68-pin, Differential, High-density SCSI Pinouts

Signal Name	Pin Number	Pin Number	Signal Name
+REQ	28	62	-REQ
+I/O	29	63	-I/O
GND	30	64	GND
+DB(8)	31	65	-DB(8)
+DB(9)	32	66	-DB(9)
+DB(10)	33	67	-DB(10)
+DB(11)	34	68	-DB(11)

Table 5-19 (continued) 68-pin, Differential, High-density SCSI Pinouts

See Figure 5-20 below:

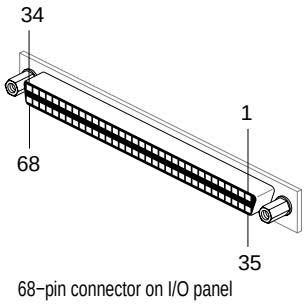


Figure 5-20 68-pin Connector on I/O Panel

Note: Read the following information regarding the SCSI signal pinouts. See Table 5-19.

A hyphen preceding a signal name indicates that the signal is active low.

8-bit devices that connect to the P-cable leave these signals open: -DB(12), -DB(13), -DB(14), -DB(15), -DB(P1), -DB(8), -DB(9), -DB(10), -DB(11), +DB(12), +DB(13), +DB(14), +DB(15), +DB(P1), +DB(8), +DB(9), +DB(10), and +DB(11). All other signals are connected as shown in this table.

Signal Name	Pin Number	Pin Number	Signal Name
GND	1	26	-DB(0)
GND	2	27	-DB(1)
GND	3	28	-DB(2)
GND	4	29	-DB(3)
GND	5	30	-DB(4)

Table 5-20 50-pin Single-ended, Standard SCSI Pinouts

Signal Name	Pin Number	Pin Number	Signal Name
GND	6	31	-DB(5)
GND	7	32	-DB(6)
GND	8	33	-DB(7)
GND	9	34	-DB(P)
GND	10	35	GND
GND	11	36	GND
GND	12	37	GND
Reserved	13	38	TERMPWR
GND	14	39	GND
GND	15	40	GND
GND	16	41	-ATN
GND	17	42	GND
GND	18	43	-BSY
GND	19	44	-ACK
GND	20	45	-RST
GND	21	46	-MSG
GND	22	47	-SEL
GND	23	48	-C/D
GND	24	49	-REQ
GND	25	50	-I/O

Table 5-20 (continued) 50-pin Single-ended, Standard SCSI Pinouts

See Figure 5-21 below:

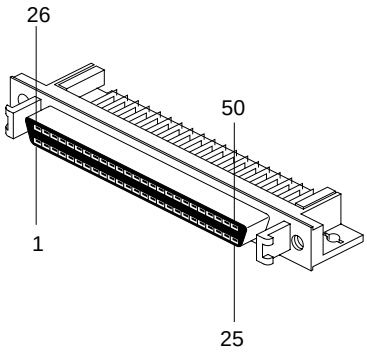


Figure 5-21 50-pin Connector on I/O Panel for Older-style Systems

Note: Read the following information regarding the SCSI signal pinouts. See Table 5-20.

A hyphen preceding a signal name indicates that the signal is active low.

The signal labeled “Reserved” is connected to ground in the bus terminator assemblies or in the end devices on the SCSI cable. The “reserved” line should be open in the other SCSI devices but may be connected to ground.

Note: The 50-pin SCSI connector is not available on the front panel of CHALLENGE/Onyx system. It is listed here for reference only.

Signal Name	Pin Number	Pin Number	Signal Name
GND	1	26	GND
+DB(0)	2	27	-DB(0)
+DB(1)	3	28	-DB(1)
+DB(2)	4	29	-DB(2)
+DB(3)	5	30	-DB(3)
+DB(4)	6	31	-DB(4)
+DB(5)	7	32	-DB(5)
+DB(6)	8	33	-DB(6)
+DB(7)	9	34	-DB(7)
+DB(P)	10	35	-DB(P)
DIFFSENS	11	36	GND

Table 5-21 50-pin, Differential, High-density SCSI Pinouts

Signal Name	Pin Number	Pin Number	Signal Name
Reserved	12	37	Reserved
TERMPWR	13	38	TERMPWR
Reserved	14	39	Reserved
+ATN	15	40	-ATN
GND	16	41	GND
+BSY	17	42	-BSY
+ACK	18	43	-ACK
+RST	19	44	-RST
+MSG	20	45	-MSG
+SEL	21	46	-SEL
+C/D	22	47	-C/D
+REQ	23	48	-REQ
+I/O	24	49	-I/O
GND	25	50	GND

Table 5-21 (continued) 50-pin, Differential, High-density SCSI Pinouts

See Figure 5-22 below:

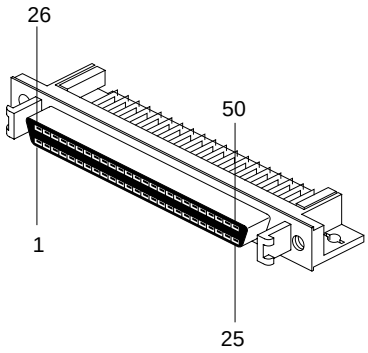


Figure 5-22 50-pin Connector on I/O Panel for Older-style Systems

Note: Read the following information regarding the SCSI signal pinouts. See Table 5-21.

A hyphen preceding a signal name indicates that the signal is active low.

The signals labeled “Reserved” are connected to ground in the bus terminator assemblies or in the end devices on the SCSI cable. The “reserved” lines should be open in the other SCSI devices but may be connected to ground.

Note: The 50-pin SCSI connector is not available on the front panel of CHALLENGE / Onyx system. It is listed here for reference only.

5.2 68-pin to 50-pin SCSI Converter Cables

Table 5-22 lists the different 68-pin to 50-pin SCSI converter cables available through Silicon Graphics. Figure 5-23 illustrates the connectors for these cables.

Cable Part Number	Cable Type
018-0347-*xxx*	3-ft, external, single-ended SCSI cable
018-0348-*xxx*	15-ft external, single-ended SCSI cable
018-0349-*xxx*	50-ft, external, differential swizzle SCSI cable

Table 5-22 68-pin to 50-pin SCSI Converter Cable Types

Caution: The 50-foot external, differential swizzle SCSI cable (P / N 018-0349-*xxx*) should *be used only* when connecting an CHALLENGE / Onyx L or XL system to a SCSIBox 1 (P / N P4-XBXD). Otherwise, damage could result to the SCSI devices, controller, and bus.

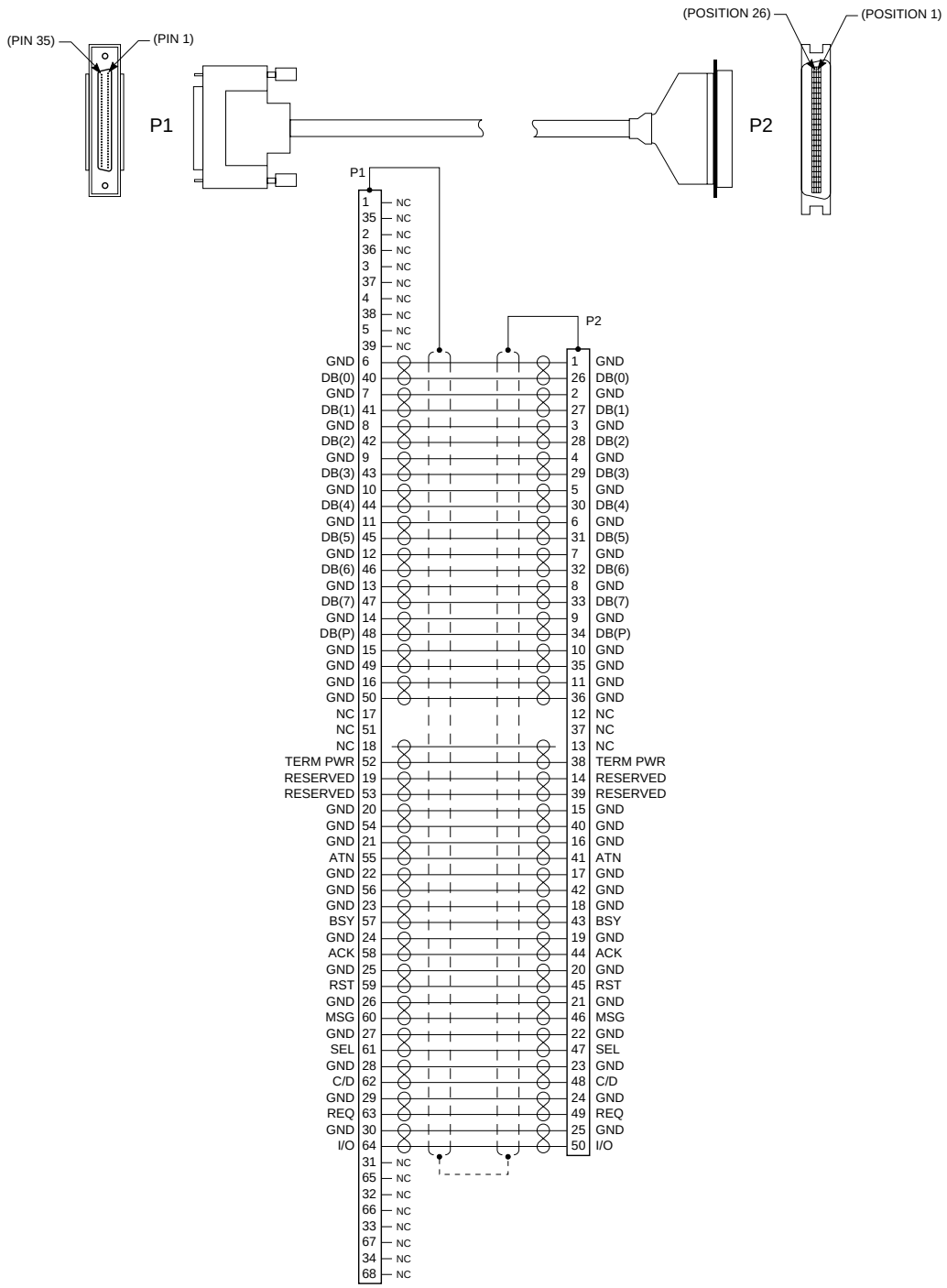
Figure 5-23 3-foot and 15-foot Single-ended SCSI Cable and 50-foot Differential Swizzle SCSI Cable

5.3 Monitor Cables

This section identifies the monitor cables provided by Silicon Graphics. See Table 5-23 for a summary of monitor cables and Table 5-24 through Table 5-29 for specific details of each cable.

Description	Length	Connectors	Part Number
Extension cable	15’	13W3 plug, both ends	018-0285-001
Extension cable	15’	13W3 plug to 3 BNC plugs	018-0286-001
Extension cable	75’	13W3 plug, both ends	018-8094-002
Adapter cable	1’	13W3 receptacle to 3 BNC plugs	018-0343-001
Adapter cable	1’	13W3 plug to 3 BNC receptacles	018-0344-001
Extension cable	75’	3 BNC plugs, both ends	018-0275-003

Table 5-23 Monitor Cable Summary



To attach a second graphics monitor to a Challenge / Onyx chassis, additional hardware is required to provide a second set of signals. Contact your local sales engineer for details.

Part Number	Description
018-0285-001	Monitor extension cable, round, 15’ length, shielded, 13W3 hybrid plugs at each end of cable. See Figure 5-24.

Table 5-24 Monitor Extension Cable, Round, 15’ Length, Shielded, 13W3 Hybrid Plugs at Each End of Cable

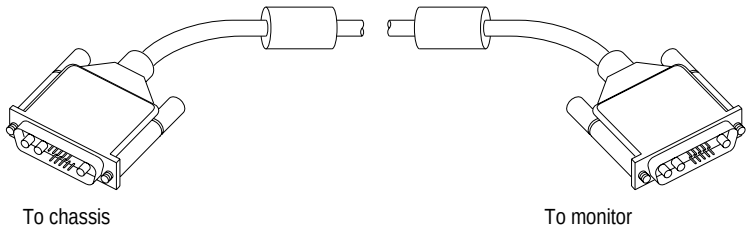


Figure 5-24 Monitor Extension Cable, Round, 15’ Length, Shielded, 13W3 Hybrid Plugs at Each End of Cable

Part Number	Description
018-0286-001	Monitor extension cable, round, 15’ length, shielded, 13W3 hybrid plug at chassis end, 3 BNC plugs (RGB) at monitor end. See Figure 5-25.

Table 5-25 Monitor Extension Cable, Round, 15’ Length, Shielded, 13W3 Hybrid Plug at Chassis End, 3 BNC Plugs (RGB) at Monitor End

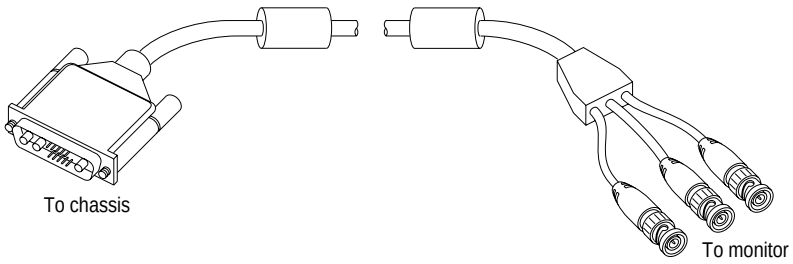


Figure 5-25 Monitor Extension Cable, Round, 15’ Length, Shielded, 13W3 Hybrid Plug at Chassis End, 3 BNC Plugs (RGB) at Monitor End

Part Number	Description
018-8094-002	Monitor extension cable, round, 75’ length, shielded, 13W3 hybrid plugs at each end of cable. See Figure 5-26.

Table 5-26 Monitor Extension Cable, Round, 75’ Length, Shielded, 13W3 Hybrid Plugs at Each End of Cable

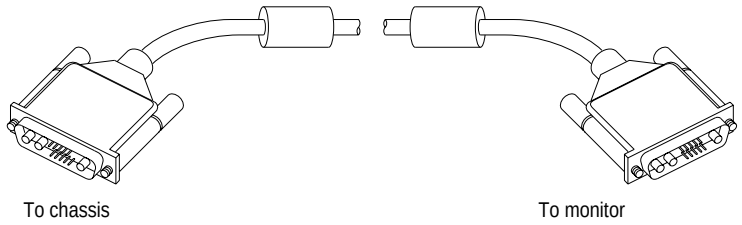


Figure 5-26 Monitor Extension Cable, Round, 75’ Length, Shielded, 13W3 Hybrid Plugs at Each End of Cable

Part Number	Description
018-0343-001	Monitor adapter cable, round, 1’ length, shielded, 13W3 hybrid receptacle at one end, 3 BNC plugs (RGB) at other end. See Figure 5-27.

Table 5-27 Monitor Adapter Cable, Round, 1’ Length, Shielded, 13W3 Hybrid Receptacle at One End, 3 BNC Plugs (RGB) at Other End

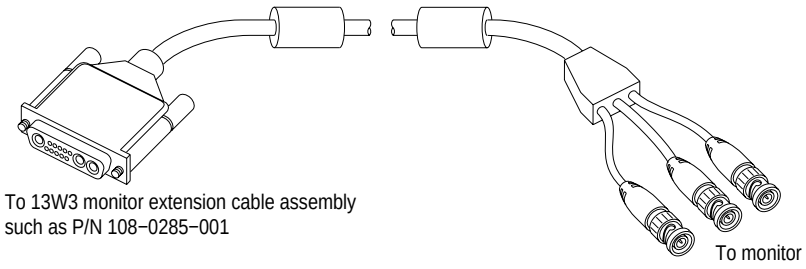


Figure 5-27 Monitor Adapter Cable, Round, 1’ Length, Shielded, 13W3 Hybrid Receptacle at One End, 3 BNC Plugs (RGB) at Other End

Part Number	Description
018-0344-001	Monitor adapter cable, round, 1’ length, shielded, 13W3 hybrid plug at one end, 3 BNC receptacles (RGB) at other end. See Figure 5-28.

Table 5-28 Monitor Adapter Cable, Round, 1’ Length, Shielded, 13W3 Hybrid Plug at One End, 3 BNC Receptacles (RGB) at Other End

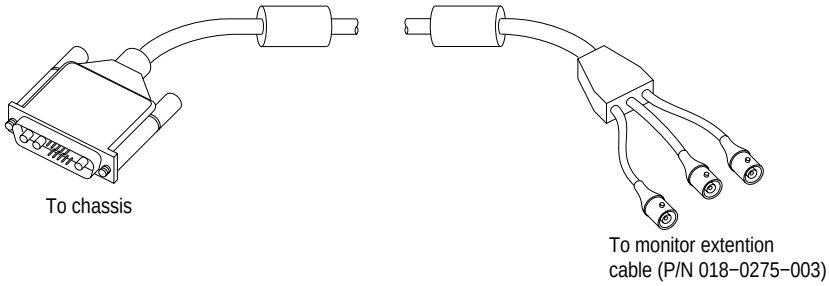


Figure 5-28 Monitor Adapter Cable, Round, 1’ Length, Shielded, 13W3 Hybrid Plug at One End, 3 BNC Receptacles (RGB) at Other End

Part Number	Description
018-0275-003	Monitor extension cable, round, 75’ length, shielded, 3 BNC plugs (RGB) at both ends. See Figure 5-29.

Table 5-29 Monitor Extension Cable, Round, 75’ Length, Shielded, 3 BNC Plugs (RGB) at Both Ends

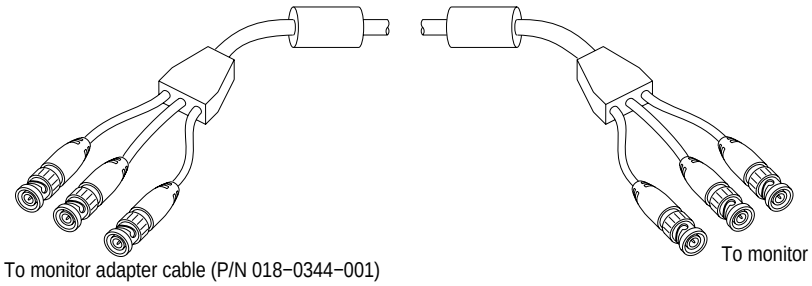


Figure 5-29 Monitor Extension Cable, Round, 75’ Length, Shielded, 3 BNC Plugs (RGB) at Both Ends

5.4 Input Device Cables

The main keyboard (and mouse) connects to a dedicated port using a standard 30-foot cable. If a longer cable is required, order the 75-foot extension cable. These cables are shown in Table 5-30 and Table 5-31.

Part Number	Description
081-0345-001	Keyboard / mouse extension cable, round, 30' length, shielded, 6-pin circular mini-DIN plugs at both ends. See Figure 5-30.

Table 5-30 Keyboard / Mouse Extension Cable, Round, 30' Length, Shielded, 6-pin Circular Mini-DIN Plugs at Both Ends

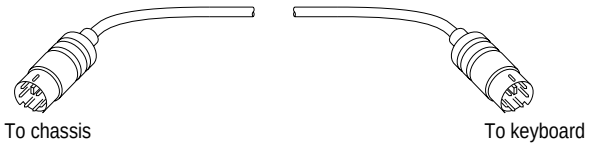


Figure 5-30 Keyboard / Mouse Extension Cable, Round, 30' Length, Shielded, 6-pin Circular Mini-DIN Plugs at Both Ends

Part Number	Description
081-0075-001	Keyboard / mouse extension cable, round, 75' length, shielded, 6-pin circular mini-DIN plugs at both ends. See Figure 5-31.

Table 5-31 Keyboard / Mouse Extension Cable, Round, 75' Length, Shielded, 6-pin Circular Mini-DIN Plugs at Both Ends

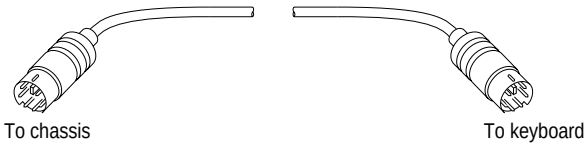


Figure 5-31 Keyboard / Mouse Extension Cable, Round, 75' Length, Shielded, 6-pin Circular Mini-DIN Plugs at Both Ends

All other input devices connect to the chassis using serial ports. For detailed specifications, see Section 5.5, "Serial Device Cables."

5.5 Serial Device Cables

Serial devices connect to the chassis using four serial ports. Two serial ports support either powered devices (through the one of the two circular 8-pin DIN connectors) or unpowered devices (through tty_2 and tty_3). The serial port can support one of these connector types at a time. These two ports use the RS-232 protocol. A third serial port (tty_1) provides an unpowered connection using the RS-232 protocol. A fourth serial port (tty_4) provides connection for devices requiring the RS-422 protocol. See Table 5-3 through Table 5-6 for detailed specifications for each serial port.

5.6 Parallel Device Cables

The parallel port supports devices requiring a 25-pin Centronics®-compatible connection. See Table 5-1 for detailed specifications for the parallel port.

5.7 Network Cables

Network cables can be attached to the network port using a 15-pin AUI receptacle. See Table 5-2 for detailed specifications on the network port.

To determine cable lengths and other network details, read the material provided with the networking equipment, or refer to a networking guide.

5.8 Modem Cables

To attach a modem to the system, connect a modem or null modem cable to one of the 9-pin serial connectors located on the I/O panel. If a 9-pin to 25-pin adapter is used, the adapter must be placed at the modem, and a cable with a 9-pin plug must be connected to the I/O panel. Placing an adapter directly on the chassis connector blocks the chassis door, which must be closed for proper operation.

Note: This product requires the use of external shielded cables in order to maintain compliance with Part 15 of the FCC rules. Not all vendor serial cables are compatible with shielding requirements.

Refer to the *IRIX Advanced Site and Server Administration Guide* for more information about modem configuration.

5.9 Rackmount System Interrupt Cables

See Table 5-32 for detailed specifications on the rackmount system interrupt cables.

Part Number	Description
9290054	Rackmount system interrupt cable, round, 35’ length, 3.5 mm 3-conductor plugs at both ends, wired straight-through. See Figure 5-32.

Table 5-32 Rackmount System Interrupt Cable

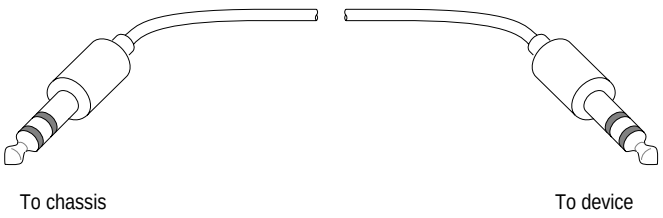


Figure 5-32 Rackmount System Interrupt Cable

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