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Hitachi Universal Storage Platform VM

Installation Planning Guide

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Hitachi Data Systems

MK-97RD6679-08

Contents

Preface

This document provides installation and configuration planning information for the Hitachi Universal Storage Platform VM (USP VM) storage system.

Please read this document carefully to understand the installation requirements for the Universal Storage Platform VM, and maintain a copy for reference.

This preface includes the following information:

Notice: The use of the Hitachi Universal Storage Platform VM and all other Hitachi Data Systems products is governed by the terms of your agreement(s) with Hitachi Data Systems.

Safety and Environmental Notices

Federal Communications Commission (FCC)

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 his or her own expense.

“EINE LEICHT ZUGÄNGLICHE TRENN VORRICHTUNG, MIT EINER KONTAKT ÖFFNUNGSWEITE VON MINDESTENS 3mm IST IN DER UNMITTELBAREN NÄHE DER VERBRAUCHERANLAGE ANZUORDNEN (4 POLIGE ABSCHALTUNG).”

Maschinenlärminformationsverordnung 3. GSGV, 18.01.1991: Der höchste Schalldruckpegel beträgt 70 db(A) oder weniger gemäß ISO 7779.

CLASS 1 LASER PRODUCT

WARNING: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

WARNUNG: Dies ist ein Produkt der Klasse A. In nichtgewerblichen Umgebungen können von dem Gerät Funkstörungen ausgehen, zu deren Beseitigung vom Benutzer geeignete Maßnahmen zu ergreifen sind.

Intended Audience

This document is intended for system administrators, Hitachi Data Systems representatives, and authorized service providers who are involved in installation planning for the Hitachi Universal Storage Platform VM.

Readers of this document should have at least the following knowledge and experience:

- You should have a background in data processing and understand RAID storage systems and their basic functions..
- You should befamiliar with the location where the Universal Storage Platform VM will be installed, including knowledge of physical characteristics, power systems and specifications, and environmental specifications.

Product Version

This document revision applies to Universal Storage Platform VM microcode 60-06-1*x* and higher.

Document Revision Level

Revision	Date	Description
MK-97RD6679-00	November 2007	Initial release
MK-97RD6679-01	December 2007	Supersedes and replaces MK-97RD6679-00
MK-97RD6679-02	August 2008	Supersedes and replaces MK-97RD6679-01
MK-97RD6679-03	November 2008	Supersedes and replaces MK-97RD6679-02
MK-97RD6679-04	January 2009	Supersedes and replaces MK-97RD6679-03
MK-97RD6679-05	July 2009	Supersedes and replaces MK-97RD6679-04
MK-97RD6679-06	November 2009	Supersedes and replaces MK-97RD6679-05
MK-97RD6679-07	February 2010	Supersedes and replaces MK-97RD6679-06
MK-97RD6679-08	February 2011	Supersedes and replaces MK-97RD6679-07

Source Documents for this Revision

Exhibit M1, DKC615I Disk Subsystem, Hardware Specifications, revision 15

Changes in this Revision

- Updated service clearance and floor cutout drawings (Chapter 2).
- Updated support contact information and storage capacity values.

Document Organization

The following table provides an overview of the contents and organization of this document. Click the chapter title in the first column to go to that chapter. The first page of every chapter provides links to the sections in that chapter.

Chapter	Description
Chapter 1, Planning for Installation	Describes the responsibilities and tasks involved in installation planning for the Universal Storage Platform VM. Also, provides the Installation Planning Checklist for the Universal Storage Platform VM.
Chapter 2, Installation Requirements	Provides the installation requirements for the Universal Storage Platform VM.
Appendix A, Units and Unit Conversions	Provides conversions for standard (U.S.) and metric units of measure associated with the Universal Storage Platform VM.
Acronyms and Abbreviations	Defines the acronyms and abbreviations used in this document.

Referenced Document

- *Hitachi Universal Storage Platform V/VM User and Reference Guide*, MK-96RD635

Document Conventions

The term “Universal Storage Platform VM” refers to all models of the Universal Storage Platform VM storage system, unless otherwise noted.

This document uses the following icons to draw attention to information:

Icon	Meaning	Description
	Note	Calls attention to important and/or additional information.
	Tip	Provides helpful information, guidelines, or suggestions for performing tasks more effectively.
	Caution	Warns the user of adverse conditions and/or consequences (e.g., disruptive operations).
	WARNING	Warns the user of severe conditions and/or consequences (e.g., destructive operations).

Convention for Storage Capacity Values

Physical and logical storage capacities of disk drives in Hitachi Data Systems storage products are calculated based on the following values

Logical Units: Block Size - 512 Bytes (Logical Disk Capacity)	
1 KB (kilobyte) = 1,024 bytes (2^{10})	1 TB (terabyte) = $1{,}024^4$ bytes
1 MB (megabyte) = $1{,}024^2$ bytes	1 PB (petabyte) = $1{,}024^5$ bytes
1 GB (gigabyte) = $1{,}024^3$ bytes	1 EB (exabyte) = $1{,}024^6$ bytes

Logical storage capacity values (logical device capacity) are calculated based on the following values:

Hard Disk Drives (HDDs) (Physical Disk Capacity)	
1 KB = 1,000 bytes	1 TB = $1{,}000^4$ bytes
1 MB = $1{,}000^2$ bytes	1 PB = 1,0005 bytes
1 GB = 1,0003 bytes	1 EB = 1,0006 bytes

Getting Help

The Hitachi Data Systems customer support staff is available 24 hours a day, seven days a week. If you need technical support, log on to the Hitachi Data Systems Support Portal for contact information: https://hdssupport.hds.com

Comments

Please send us your comments on this document: doc.comments@hds.com. Include the document title, number, and revision and refer to specific section(s) and paragraph(s) whenever possible.

Thank you! (All comments become the property of Hitachi Data Systems.)

1

Planning for Installation

This chapter describes the requirements and procedures for planning to install the Universal Storage Platform VM.

- Responsibilities
- Installation Planning Tasks
- Installation Planning Checklist

Responsibilities

The responsibilities for installation planning are shared by the customer and the Hitachi Data Systems account team. The required installation planning tasks must be scheduled and completed to ensure successful and efficient installation of the Universal Storage Platform VM.

Customer Responsibilities

You are responsible for:

- Performing the Installation Planning Tasks described below.
- Verifying that all installation requirements have been met by completing the Installation Planning Checklist in this document
- Providing the customer-supplied hardware that is required for storage system installation (for example, electrical connectors and receptacles, rack)
- Observing all applicable safety requirements at all times

NOTE: The Universal Storage Platform VM must be installed by trained Hitachi Data Systems personnel or trained Authorized Service Providers. The Universal Storage Platform VM is not a customer-installable product.

Hitachi Data Systems Responsibilities

Your Hitachi Data Systems account team will assist you throughout the installation planning process.

The Hitachi Data Systems account team is responsible for:

- Assisting you as needed during the installation planning process for your specific site and operational configuration
- Coordinating Hitachi Data Systems resources to ensure a successful installation and configuration of the Universal Storage Platform VM

Installation Planning Tasks

You, the customer, are responsible for performing the following tasks, with assistance as needed from the Hitachi Data Systems account team, to prepare for installation of the Universal Storage Platform VM storage system:

1. **Read this document** carefully to understand the installation requirements for the Universal Storage Platform VM. You will use the information in this document to determine the specific requirements for your installation.
2. **Review the *Hitachi User and Reference Guide*** (MK-96RD635) to familiarize yourself with the components, features, and functions of the Universal Storage Platform VM storage system.
3. **Complete the** Installation Planning Checklist on page 1-4 in this document before equipment delivery to verify that all installation requirements are met.

If any requirements are not met, make the changes required to meet the requirements. Be sure to allow enough time to complete the required changes, so your site is ready when the equipment arrives.

4. **Provide the customer-supplied hardware** required for installation and configuration (for example, connectors, electrical receptacles, and rack).
5. **Customer-supplied rack:** If the Universal Storage Platform VM will be installed in a customer-supplied rack, review the documentation for the rack with your Hitachi Data Systems account team to ensure that the rack meets all applicable requirements.

   Installation of the Universal Storage Platform VM in a customer-supplied rack requires more time than installation in an HDS-supplied rack. Please allow an additional five hours for installation in a customer-supplied rack.
6. **Work with your Hitachi Data Systems account team** during the installation planning process for the Universal Storage Platform VM.

Installation Planning Checklist

The following checklist will assist you as you perform your installation. You can make copies of this checklist for each installation you perform and check each step after it has been performed. Keep the blank checklist in this document for future use to verify that all installation requirements for the Universal Storage Platform VM have been met. Successful completion of this checklist (Yes is checked for all entries) will ensure smooth and efficient installation of the Universal Storage Platform VM.

Definition of terms:

Data center: The room at the customer site in which the Universal Storage Platform VM will be installed.

Equipment: The hardware delivered to the customer site that includes the Universal Storage Platform VM storage system components and rack(s).

Location: The specific location in the data center (area or "footprint" on the floor) where the Universal Storage Platform VM will be installed.

Customer Information		**Date:**	
Company:			
Address:			
Contact:		Phone:	
		Mobile:	
		E-mail:	
Contact:		Phone:	
		Mobile:	
		E-mail:	
Hitachi Data Systems Information			
Contact:		Phone:	
		Mobile:	
		E-mail:	
Contact:		Phone:	
		Mobile:	
		E-mail:	
Notes			

Installation Planning Checklist	Yes	No
Safety Requirements		
Is the data center equipped to protect equipment form fire?		
Is the data center free of hazards (for example, cables that obstruct access)?		
Delivery Requirements		
Is the receiving area adequate for equipment delivery and unloading? (overall height: 84 in, 2.134 m)		
Does the equipment fit through doors, halls, elevators, and stairs?		
Do the floors, elevators, stairs, and ramps support the weight of the equipment?		
Storage Requirements		
If the equipment will be stored after delivery and prior to installation, does the storage location meet the environmental requirements for the USP VM?		
Facilities Requirements		
Is the data center fully operational (for example, power, air conditioning, cabling, fire protection system)?		
Does the data center have a raised tile floor?		
Does the data center provide adequate protection from ESD?		
Does the data center provide adequate protection from electrical/radio frequency interference?		
Does the data center provide adequate protection from dust, pollution, and particulate contamination?		
Does the data center provide adequate acoustic insulation for operating the USP VM?		
Is the customer-supplied hardware (for example, connectors, receptacles, cables) ready for the installation?		
Physical Specifications and Requirements		
Does the location meet the requirements for service clearance and cable routing (for example, floor cutouts)?		
Does the location meet the requirements for floor load rating?		
Power Specifications and Requirements		
Does the data center meet the AC input power requirements?		
Does the data center meet the circuit breaker and plug requirements?		
Does the data center meet the requirements for connection to UPS?		
Environmental Specifications and Requirements		
Does the data center meet the requirements for temperature?		
Does the data center meet the requirements for humidity?		
Does the data center meet the requirements for altitude?		
Does the data center meet the requirements for air flow?		
Does the data center meet the requirements for vibration and shock?		
Operational Requirements		
Does the data center provide a Local Area Network (LAN) or telephone line for Hi-Track®?		
Does the data center provide a LAN for Storage Navigator?		
Does the location meet the cable length requirements for the front-end directors?		
Does the location meet the requirements for attaching external storage to the USP VM?		

2

Installation Requirements

This chapter provides general requirements for installing the Universal Storage Platform VM storage system.

- Safety Requirements
- Delivery Requirements
- Storage Requirements
- Facilities Requirements
- Physical Specifications and Requirements
- Power Specifications and Requirements
- Environmental Specifications and Requirements
- Operational Requirements

NOTE: The general information in this chapter is provided to assist in installation planning and may not be complete. The installation and maintenance documents used by Hitachi Data Systems personnel (for example, the Maintenance Manual) contain complete information, including specifications. The exact electrical power interfaces and requirements for each site must be determined and verified to meet applicable local regulations.

Safety Requirements

Safety requirements for Universal Storage Platform VM installation include:

- **Safety regulations:** The data center must comply with all applicable safety regulations, standards, and requirements.
- **Fire protection:** The data center must have an operational fire protection system.
- **Hazards:** The data center must be free of hazards (for example, cables on the floor that block access or cause people to trip).

Observe the following general safety requirements:

- **Cabling:**
  - Do not block walkways when routing cables.
  - Do not place heavy materials on cables.
  - Do not place cables near any possible source of heat.
- **Warning labels:** Obey all warning labels. When warning labels become dirty or start peeling off, replace them.
- **Authorized personnel:** Allow only qualified and authorized personnel (for example, a, certified electrician) to perform hazardous tasks.

Delivery Requirements

The customer site must accommodate the delivery and movement of the equipment to the installation location in the data center. This section provides delivery requirements for the following system configurations:

- Universal Storage Platform VM installed in an HDS-supplied rack
- Universal Storage Platform VM to be installed in a customer-supplied rack

Universal Storage Platform VM in HDS-Supplied Rack

The following sections describe the delivery requirements for installing the Universal Storage Platform VM in an HDS-supplied rack.

Dimensions

The loading bay, hallways, doors, elevators, and stairs must be large enough to allow the delivered equipment (USP VM components already installed in a rack) to be moved to the installation location.

The shipping crate dimensions are:

Height: 84 inches (2.134 meters) (overall height including palette)
Width: 42 inches (1066.8 mm)
Depth: 55 inches (1397 mm)

See Dimensions and Weight on page 2-6 for the dimensions of the USP VM components.

See Service Clearance, Floor Cutout, and Floor Load Rating on page 2-9 for dimensions of the USP VM in the HDS-supplied rack (uncrated and unpacked).

Weight

The floors, elevators, stairs, and ramps must be able to support the weight of the delivered equipment as it is moved to the installation location. Spreader plates may be required to distribute the load and/or protect the floor as the equipment is moved to the installation location.

The weight of the delivered equipment depends on the storage system configuration. The weight for a fully configured storage system could reach 1600 or 1700 pounds (726 to 771 kilograms).

See Dimensions and Weight on page 2-6 for the weight specifications for the Universal Storage Platform VM components.

Universal Storage Platform VM in Customer-Supplied Rack

The following sections describe the delivery requirements for the Universal Storage Platform VM in a customer-supplied rack.

Dimensions

The loading bay, hallways, doors, elevators, and stairs must be large enough to allow the delivered equipment (USP VM components) to be moved to the installation location.

Please contact your Hitachi Data Systems team for details on the shipping crate dimensions.

Weight

The floors, elevators, stairs, and ramps must be able to support the weight of the delivered equipment as it is moved to the installation location. Spreader plates may be required to distribute the load and/or protect the floor as the equipment is moved to the installation location.

See Floor Loading on page 2-15 for the weight specifications for the USP VM in a customer-supplied rack.

Lift

Have a lift device available to raise and position the USP VM components during the installation. If you cannot provide a lift device, arrange personnel to be available to help lift and position the components.

Customer-Supplied Rack

Please observe the following.

- The rack(s) must be in the data center ready for the Universal Storage Platform VM.
- The rack(s) must meet or exceed all physical specifications listed in this document.
- Ensure blanking panels cover all open areas on the front side of the rack.
- Remove all packaging materials from the rack(s).

- The required quantity and type of power receptacles must be fully tested and available near the rack(s).

Rail Kits

Hitachi's Universal Rail Kits must be used for installation in a customer-supplied rack. These rail kits have been qualified to meet the size and strength requirements for the USP VM. Each kit contains two individual rails and the required fastening hardware. The required type and quantity of rail kits are based on the system configuration and are automatically included and shipped with the USP VM components. Your Hitachi Data Systems team has detailed information about installing the rail kits.

Storage Requirements

If the delivered equipment must be stored after delivery and prior to installation, the storage location must meet the environmental requirements for the Universal Storage Platform VM (See Table 2-1).

Table 2-1: Environmental Specifications for Storage

Parameter	Shipping & Storage*	
	Low	High
Temperature	5 (–25) °F (°C)	140 (60) °F (°C)
Relative Humidity	5 – 95%	
Max. Wet Bulb	84 (29) °F (°C)	
Temperature Deviation	36 (20) °F/hour (°C/hour)	

* For storage, pack the equipment using the factory packing.

Facilities Requirements

The customer site must meet the following facilities requirements:

- **General:** The data center must be fully operational (for example, power, air conditioning, cabling, fire-protection system).
- **Floor:** The data center must have a raised floor.
- **ESD:** The data center must provide adequate protection from electrostatic discharge (ESD).
- **Electrical interference:** The data center must provide adequate protection from electrical/radio frequency interference.
- **Dust, pollution, and particulate contamination:** The data center must provide adequate protection from dust, pollution, and particulate contamination.
- **Acoustics:** The data center must provide adequate acoustic insulation for operating the Universal Storage Platform VM.
- **Customer-supplied hardware:** The customer supplied hardware (e.g., connectors, receptacles, customer-supplied racks) must be available and ready for installing the Universal Storage Platform VM.

Physical Specifications and Requirements

This section is split into two parts:

- HDS-Supplied Rack
- Customer-Supplied Rack on page 2-12

HDS-Supplied Rack

Figure 2-1 shows a physical overview of the Universal Storage Platform VM in the HDS-supplied racks. The physical specifications and requirements for this configuration of the Universal Storage Platform VM include:

- Dimensions and Weight
- Service Clearance, Floor Cutout, and Floor Load Rating

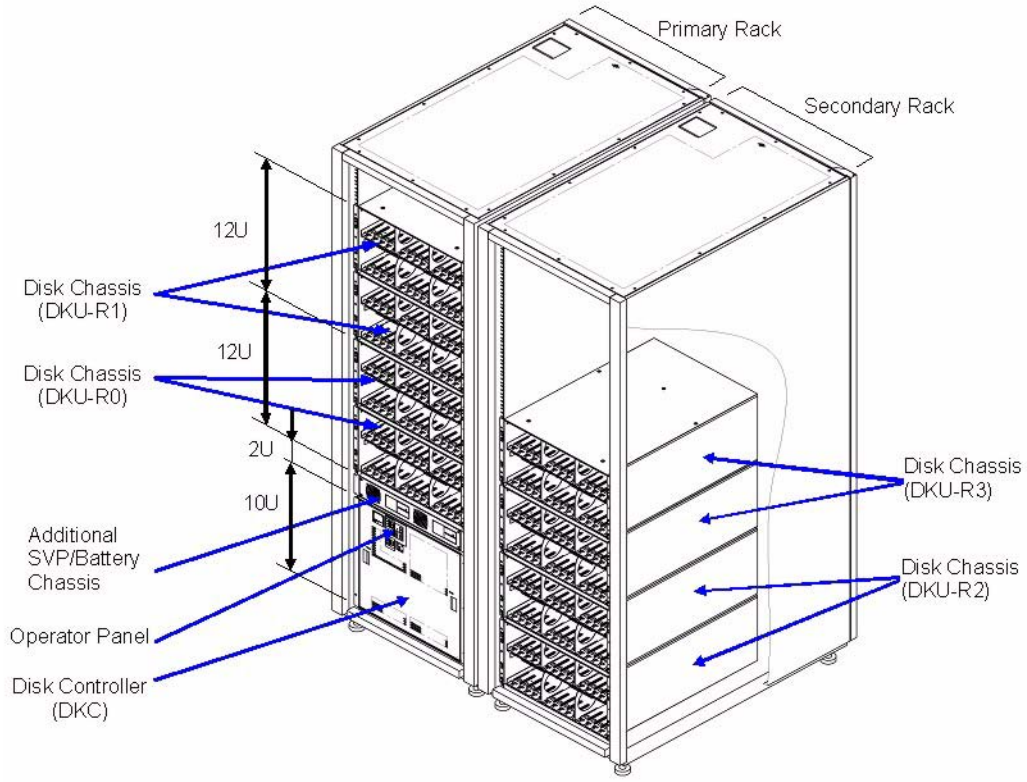


Figure 2-1: Physical Overview of the Universal Storage Platform VM

Dimensions and Weight

Figure 2-2 shows the dimensions of the single rack configuration with the HDS-supplied rack. Figure 2-3 on page 2-7 shows the dimensions of the twin rack configuration with the HDS-supplied rack. Table 2-2 on page 2-7 lists the dimensions and weight specifications for the Universal Storage Platform VM components.

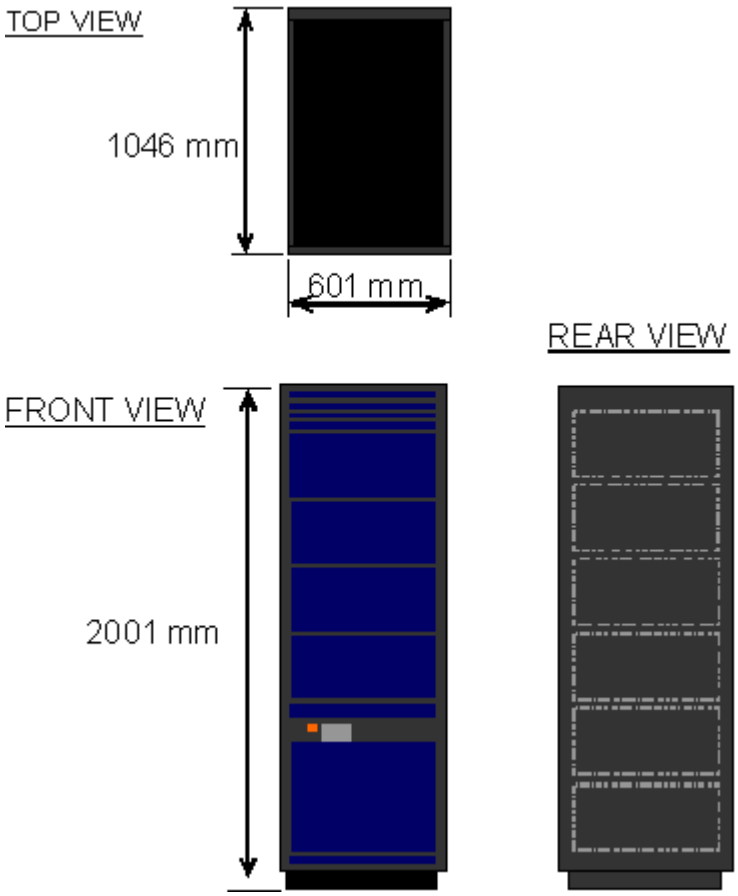


Figure 2-2: Dimensions, Single-Rack Configuration

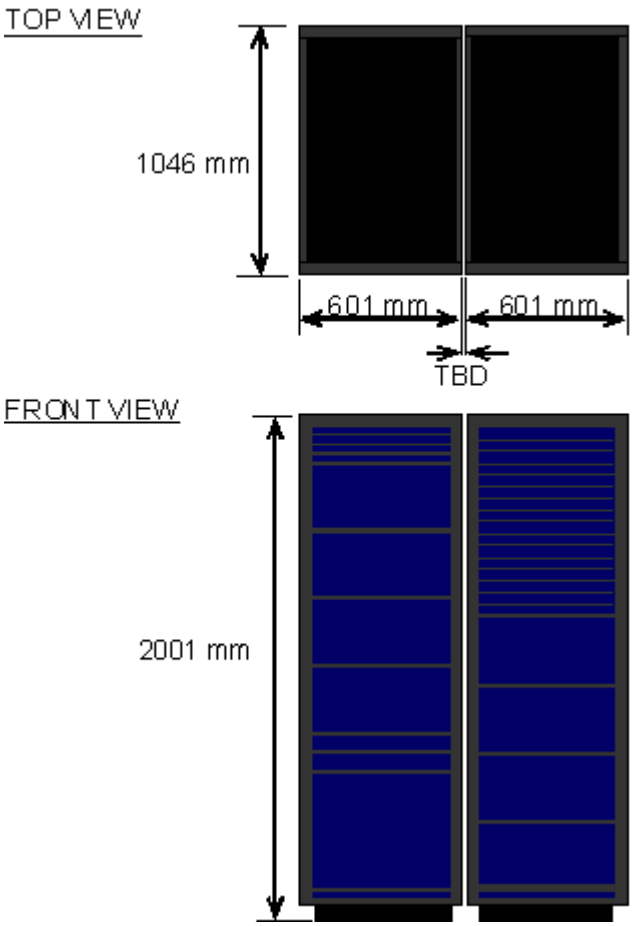


Figure 2-3: Dimensions, Twin-Rack Configuration

Table 2-2: Component Weight and Dimensions

Model Number	Weight (kg)	Dimension (mm)		
		Width	Depth	Height
DKC615I-5	70	445	800	438
DKC-F615I-B2	80.5	445	647	522
DKC-F615I-SBX	13	445	800	84
DKC-F615I-LGAB	11	—	—	—
DKC-F615I-PLUC	2.0	—	—	—
DKC-F615I-PHUC	4.0	—	—	—
DKC-F615I-PLEC	1.5	—	—	—
DKC-F615I-PHEC	2.5	—	—	—
DKC-F615I-UC0	3.2	—	—	—
DKC-F615I-UC1	2.1	—	—	—
DKC-F615I-EXC0	6.2	—	—	—
DKC-F615I-SX	1.2	—	—	—
DKC-F615I-S2GQ	0.08	—	—	—
DKC-F615I-S4GQ	0.08	—	—	—
DKC-F615I-DKA	2.6	—	—	—

Table 2-2: Component Weight and Dimensions (Continued)

Model Number	Weight (kg)	Dimension (mm)		
		Width	Depth	Height
DKC-F615I-EDKA	2.6	—	—	—
DKC-F615I-CX	2.2	—	—	—
DKC-F615I-C4G	0.08	—	—	—
DKC-F615I-C8G	0.08	—	—	—
DKC-F615I-C16G	0.08	—	—	—
DKC-F615I-8S	2.7	—	—	—
DKC-F615I-8MFS	3.0	—	—	—
DKC-F615I-8MFL	3.0	—	—	—
DKC-F615I-8FS	2.8	—	—	—
DKC-F615I-16FS	3.0	—	—	—
DKC-F610I-8US	3.0	—	—	—
DKC-F615I-1FL	0.02	—	—	—
DKC-F615I-1FS	0.02	—	—	—
DKC-F610I-1UL	0.02	—	—	—
DKC-F610I-1US	0.02	—	—	—
DKC-F615I-SVP	4.1	—	—	—
DKC-F615I-SVPV	4.1	—	—	—
DKC-F615I-MDM	0.07	—	—	—
DKC-F615I-72KS	0.9	—	—	—
DKC-F615I-146KS	0.9	—	—	—
DKC-F615I-300KS	0.9	—	—	—
DKC-F615I-0R7HS	0.9	—	—	—
DKC-F615I-300KM	0.9	—	—	—
DKC-F615I-400JS	0.9	—	—	—
DKC-F615I-1R0HS	0.9	—	—	—
DKC-F615I-2R0HS	0.9	—	—	—
DKC-F615I-450KS	0.9	—	—	—
DKC-F605I-200S1	0.5	—	—	—
DKC-F605I-400S1	0.5	—	—	—
DKC-F605I-600KS	0.9	—	—	—

Service Clearance, Floor Cutout, and Floor Load Rating

This section describes the service clearance requirements (a + b) for the Universal Storage Platform VM storage system in the HDS-supplied rack, based on the floor load rating and the clearance (c) and required floor cutouts for cabling.

- **Single rack:** Figure 2-4 on page 2-10 shows the service clearance and floor cutout requirements for the single rack configuration. Table 2-3 on page 2-10 shows the floor load rating and clearance requirements for this configuration.
- **Two racks:** Table 2-5 on page 2-11 shows the service clearance and floor cutout requirements for the twin rack configuration. Table 2-4 on page 2-11 shows the floor load rating and clearance requirements for this configuration.

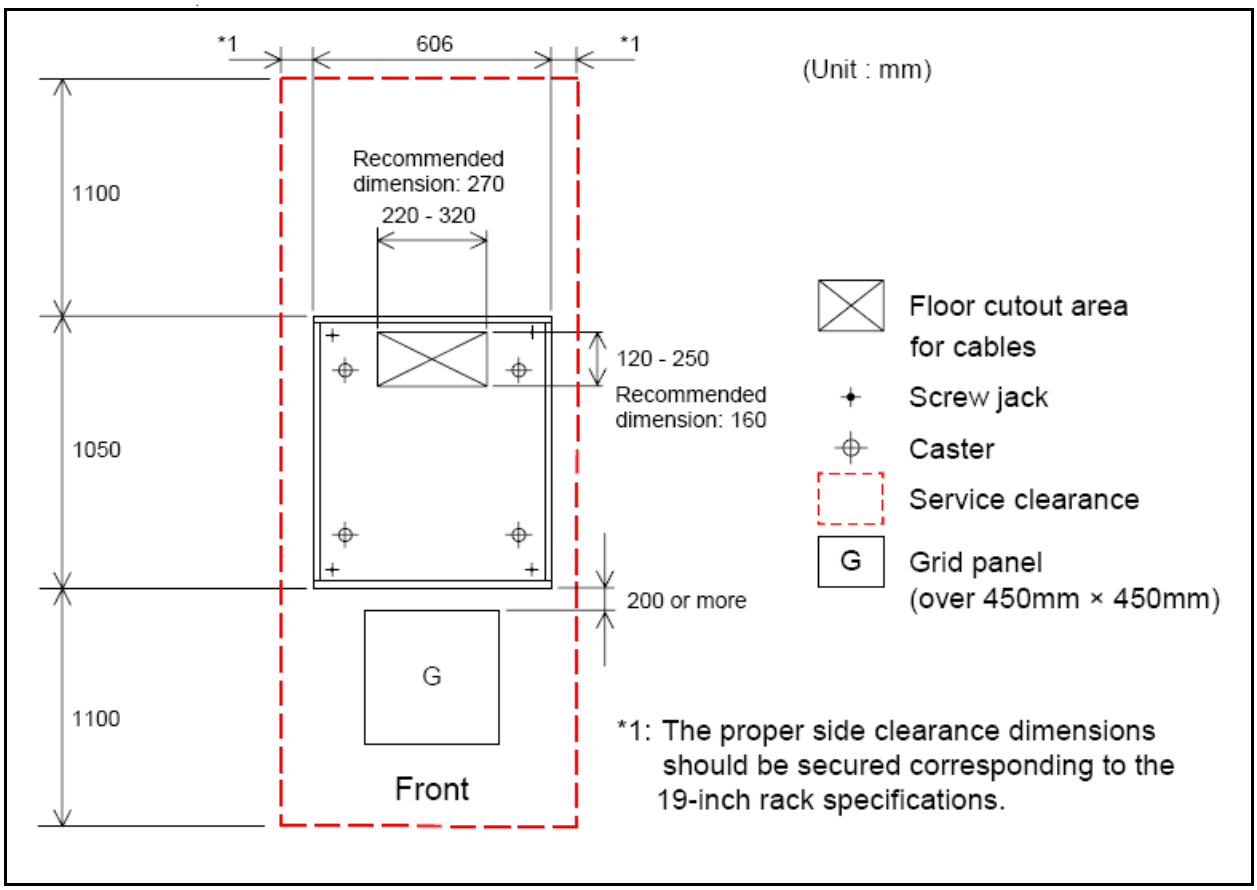


Figure 2-4: Service Clearance and Floor Cutouts: Single Rack

Table 2-3: Floor Load Rating and Clearances: Single Rack

Floor Load Rating kg/m^2 (lb./ft.^{2})	Required Clearance (a+b) m				
	Clearance (c) m				
	C=0	C=0.2	C=0.4	C=0.6	C=1.0
500 (102.4)	0.2	0.2	0.2	0.2	0.2
450 (92.2)	0.2	0.2	0.2	0.2	0.2
400 (81.9)	0.2	0.2	0.2	0.2	0.2
350 (71.7)	0.3	0.2	0.2	0.2	0.2
300 (61.4)	0.6	0.4	0.3	0.2	0.2

NOTE: For safe and efficient maintenance operations, clearance (c) should be made as large as possible. Actual clearances for installation should be determined after consulting with the site/facilities manager, as clearances can vary, depending on building conditions.

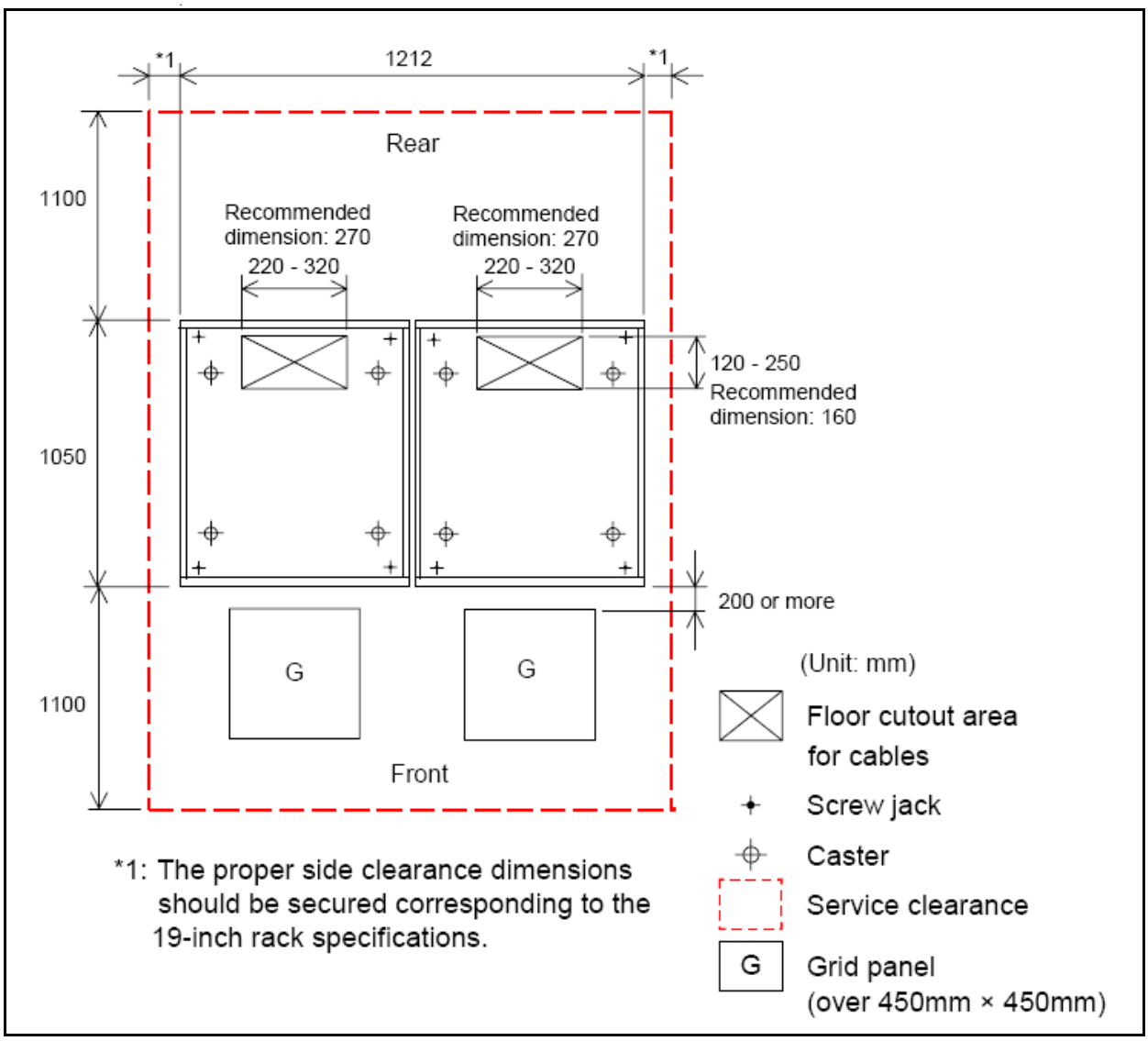


Figure 2-5: Service Clearance and Floor Cutouts: Two Racks

Table 2-4: Floor Load Rating and Clearances: Two Racks

Floor Load Rating kg/m^2 (lb./ft.^{2})	Required Clearance (a+b) m				
	Clearance (c) m				
	C=0	C=0.2	C=0.4	C=0.6	C=1.0
500 (102.4)	0.2	0.2	0.2	0.2	0.2
450 (92.2)	0.2	0.2	0.2	0.2	0.2
400 (81.9)	0.2	0.2	0.2	0.2	0.2
350 (71.7)	0.4	0.3	0.2	0.2	0.2
300 (61.4)	0.8	0.6	0.5	0.4	0.2

NOTE: For safe and efficient maintenance operations, clearance (c) should be made as large as possible. Actual clearances for installation should be determined after consulting with the site/facilities manager, as the clearances can vary, depending on building conditions.

Customer-Supplied Rack

This section lists the physical specifications and requirements for installing the Universal Storage Platform VM in a customer-supplied rack.

Rack Dimensions

- Height: 1900–2000 mm
- Width: 600–610 mm
- Depth: Minimum of 1000 mm

Minimum U Height

The minimum height is 36U.

While your initial system configuration may not require 36U, this amount of space is required for a full configuration. Initially allocating this amount of space minimizes the time required to reposition equipment in the future.

Rail Kits

Figure 2-6 on page 2-13 shows the general positioning of the rail kits with the 3U rail kits shown in blue and the 2U rail kits shown in orange. Figure 2-7 on page 2-14 shows the rail kit alignment and spacing. The SVP/Battery Backup Chassis obtains its power from the Control Frame and must be installed directly above the Control Frame.

NOTE: During the initial installation of a USP VM that does not include an additional SVP/Battery Backup Chassis, leave a 2U space vacant above the Control Frame for future installation of the chassis.

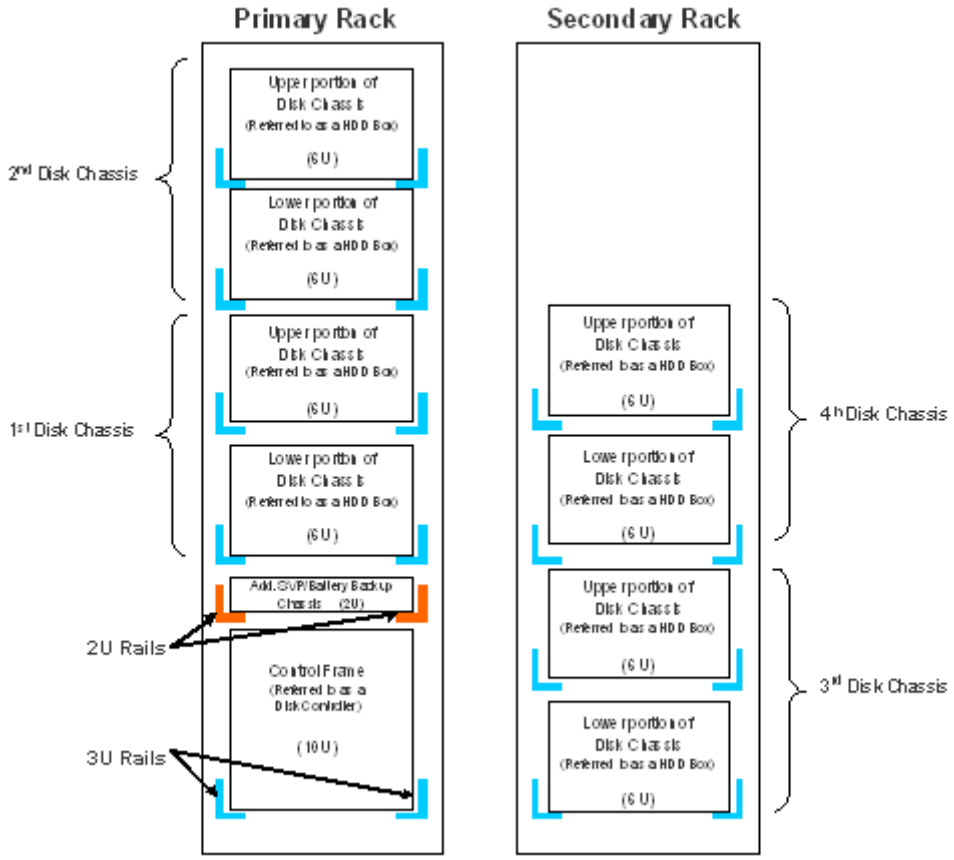


Figure 2-6: Rail Kit Positioning in a Customer-Supplied Rack

Table 2-5 lists the required rail kit for each component.

Table 2-5: Rail Kit Spacing Requirements

Component	Required Rail Kit
Control Frame	Requires one 3U rail kit, product code 7846464.
Disk Chassis	Each Disk Chassis requires two 3U rail kits, product code 7846464. One kit will support the lower portion of the disk chassis and the second kit will support the upper portion of the disk chassis.
Additional SVP/ Battery Backup Chassis	Requires one 2U rail kit, product code 7846417.

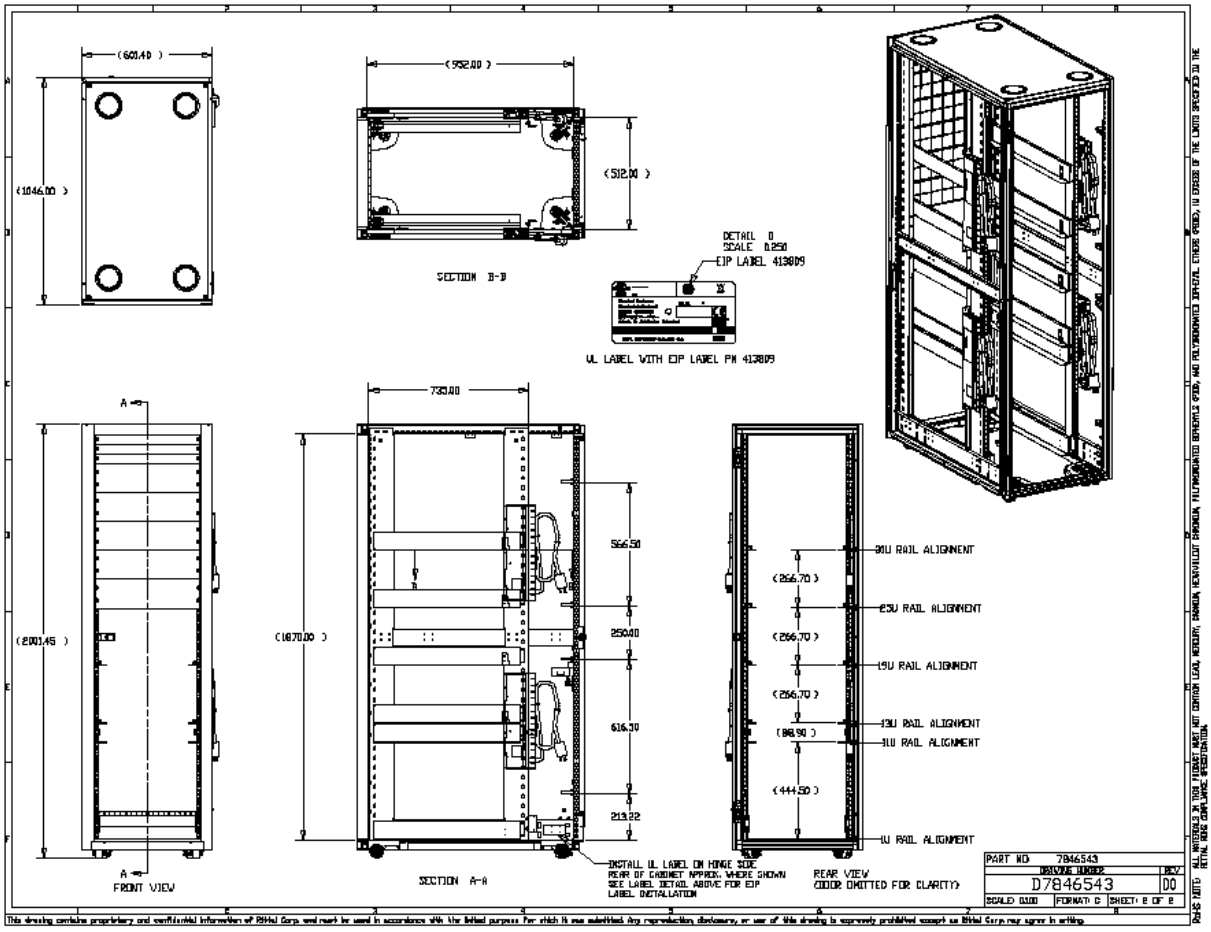


Figure 2-7: Rail Kit Alignment and Spacing

Maximum USP VM Components to be Installed in the Primary Rack

First Disk Chassis = 12U; Second Disk Chassis = 12U; Control Frame = 10U.

Additional SVP/Battery Backup Chassis = 2U.

- This chassis obtains its power from the control frame and must be installed directly above the control frame.
- When installing a USP VM that does not include this chassis, leave a 2U space vacant above the control frame to allow for the installation of the chassis in the future.
- This chassis is required when one or both of the following conditions are met:
  - System is equipped with 80 GB or more of cache memory. In this instance, an additional battery will be installed within the chassis.
  - The secondary (back-up) service processor (SVP) will be installed. The secondary SVP will be installed in this chassis.

Maximum USP VM Components to be Installed in the Secondary Rack

3rd Disk Chassis = 12U; 4th Disk Chassis = 12U.

Floor Loading

Static: Over 500 kg.

Dynamic: Over 900 kg.

- Approximate weight of components:
  - Control frame (fully loaded): 238 lbs (108 kg)
  - Additional SVP/battery backup chassis (fully loaded): 64 lbs (29 kg)
  - Disk chassis (fully loaded): 313 lbs (142 kg)

Door Requirements

Front Door: Not used.

- Each component is covered by a bezel provided by Hitachi Data Systems. The bezels attach to each component and allow appropriate air flow intake required for cooling. The front of the rack must not block air flow.
- You must provide blanking panels to cover all remaining open spaces on the front side of the rack.
- If the rack must have a front door, the door must open more than 90 degrees to provide adequate access during the installation process and must not interfere with any lift device that may be used during the installation. In addition, this front door must have more than 50% perforation to allow sufficient air flow input.

Rear Door: Required

- Must have more than 50% perforation to allow sufficient air flow output.
- Must be able to open greater than 90 degrees to provide adequate access.

Minimum distance between components and nearby surfaces

- Minimum distance required between back side of control frame and rear door for cabling: 120 mm
- Minimum distance required between back side of disk chassis and rear door for cabling: 120 mm
- Minimum distance between left side of disk chassis and side panel: 70 mm
- Minimum distance between right side of disk chassis and side panel: 70 mm

Cooling/Fan Requirements

System components include fans to provide the necessary cooling. Air flows in through the front bezel to the rear of the component and exits via the perforations in the rear door.

The rack does not need to be equipped with a fan.

Power Specifications and Requirements

This section is split into two parts:

- HDS-Supplied Rack, and
- Customer-Supplied Rack on page 2-25

HDS-Supplied Rack

This section describes the power specifications and requirements for the Universal Storage Platform VM storage system with the HDS-supplied rack:

- Power Specifications and Power Supplies
- Breaker Configurations
- Power Connection
- Input Voltage and Input Frequency
- Circuit Breakers and Plugs

Power Specifications and Power Supplies

Table 2-6 lists the power specifications for the Universal Storage Platform VM, including inrush current, leakage current, input current, and steady current. Figure 2-8 on page 2-17 shows the locations of the power supplies.

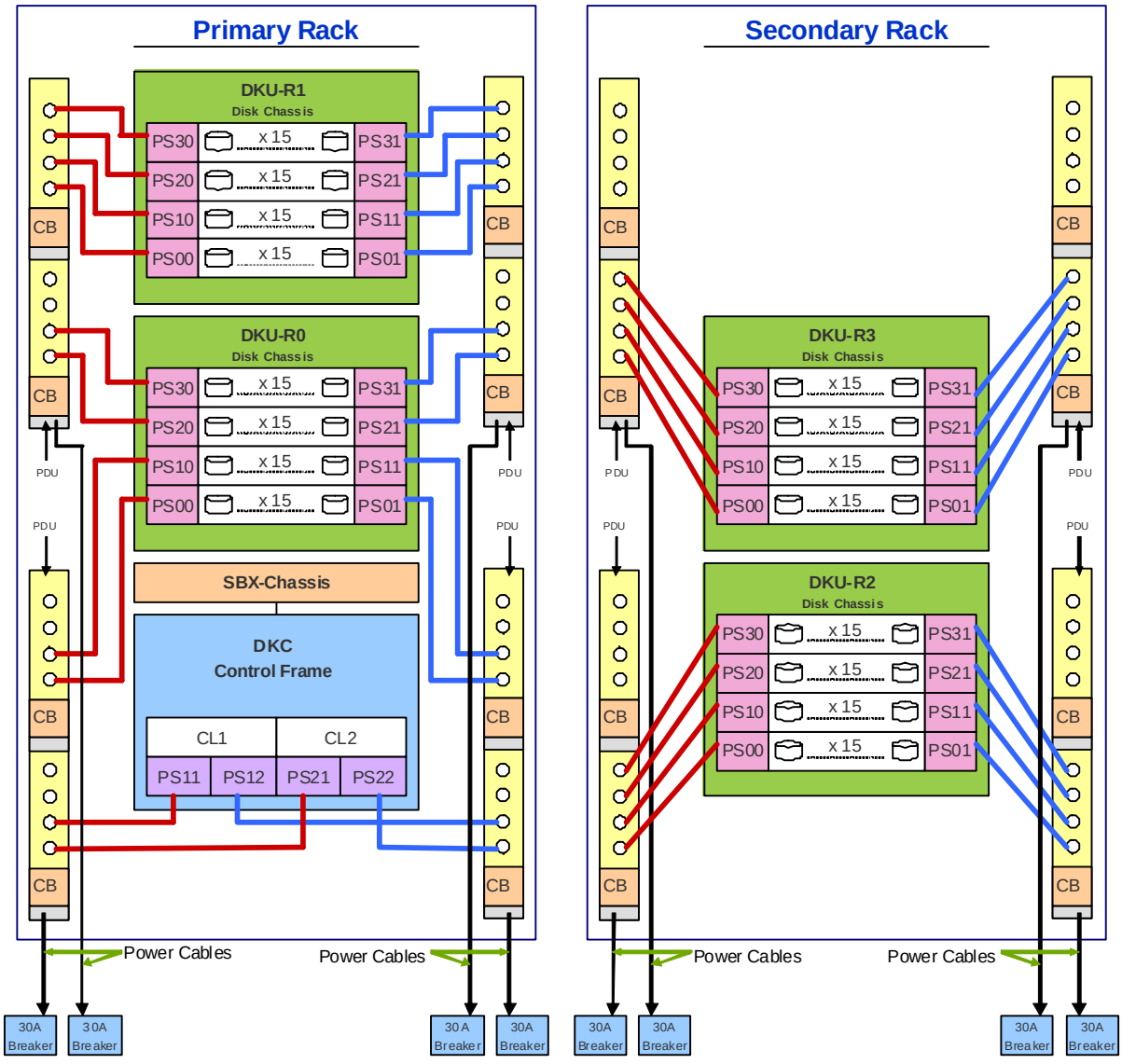
Table 2-6: Current Specifications

Power Supply Location	Input Power	Inrush Current			Leakage Current	Input Current *1	Steady Current *2
		1st (0-p)	2nd (0-p)	1st (0-p) Time (-25%)			
DKCPS11,12	1-phase	10.5 A	7.0 A	0.2 ms	0.29 mA	5.6 A	2.8 A
DKCPS21,22	1-phase	10.5 A	7.0 A	0.2 ms	0.29 mA	5.6 A	2.8 A
DKUPSx 01,11,21,31	1-phase	12.5 A	5.0 A	0.2 ms	0.2 mA	2.4 A	1.2 A
DKUPSx 00,10,20,30	1-phase	12.5 A	5.0 A	0.2 ms	0.2 mA	2.4 A	1.2 A

1. This is the maximum current when there is one AC input power line (nonredundant configuration).
2. This is the maximum current when there are two AC input power lines (redundant configuration).

Maximum Configuration – Control Frame, Additional SVP/Battery Backup Chassis and four Disk Chassis

- Each rack contains four Power Distribution Units (PDU)
- Each PDU includes two groups of four receptacles [IEC 320-C13]
- Each receptacle group has its own Circuit Breaker (CB) 16Amp [20 Amp Trip]
- For systems installed in the Americas the PDU power cord has a 1-Phase, NEMA L6-30P 30A, 250V plug
- For systems installed in EMEA/APAC the PDU power cord has a 1-Phase, IEC 309, 32A, 250V plug



DKC = Control Frame	SBX-Chassis = Additional SVP/Battery Backup Chassis (Power obtained from DKC Control Frame)	DKU = Disk Chassis
CB = Circuit Breaker	CL1 = Cluster 1, CL2 = Cluster 2	PS = Power Supply

Figure 2-8: Power Supply Locations

Breaker Configurations

For both racks, AC power is supplied to each power distribution unit (PDU) from the breaker. Figure 2-9, Figure 2-10, and Figure 2-11 show the breaker configurations for the primary and secondary racks and diskless system, respectively.

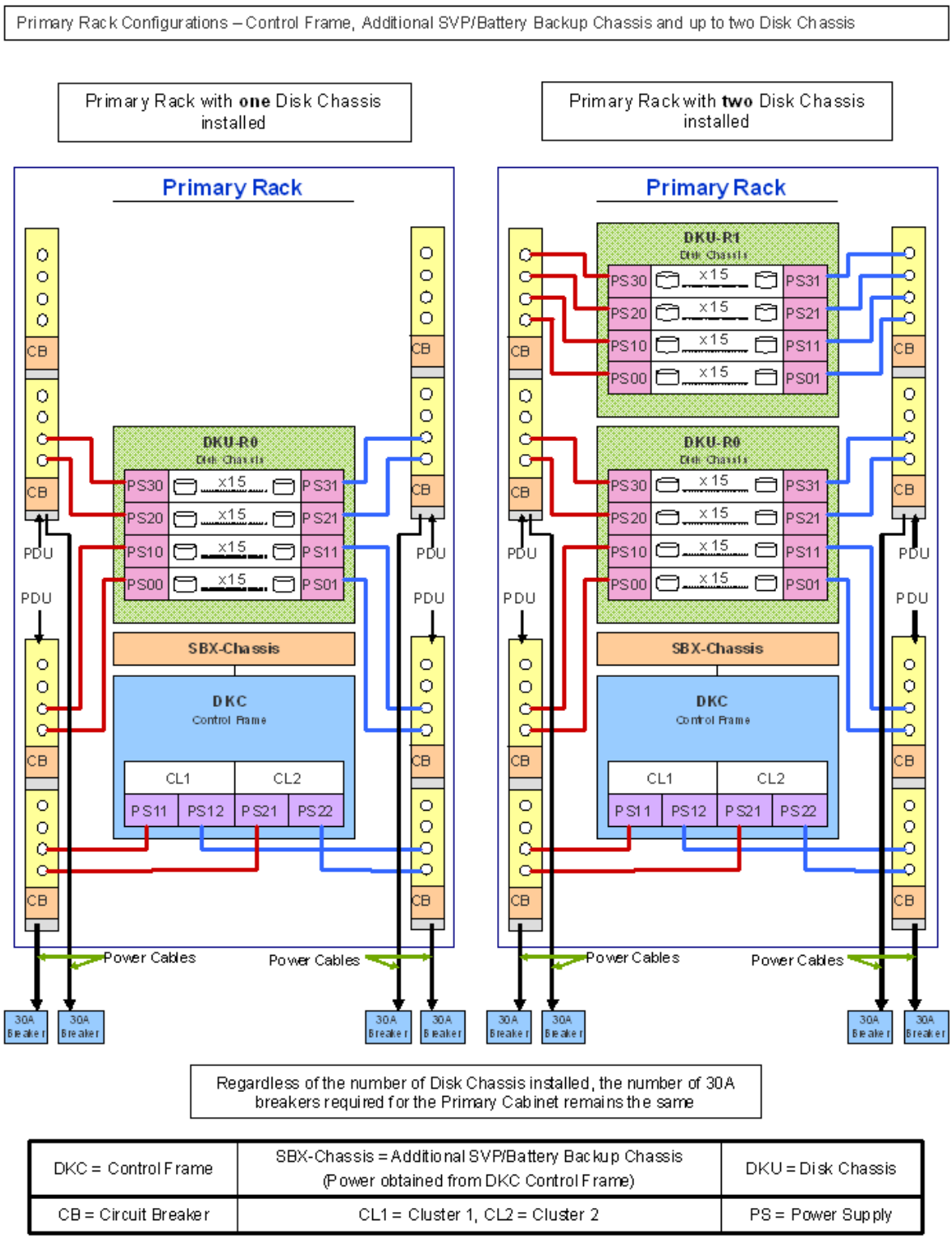
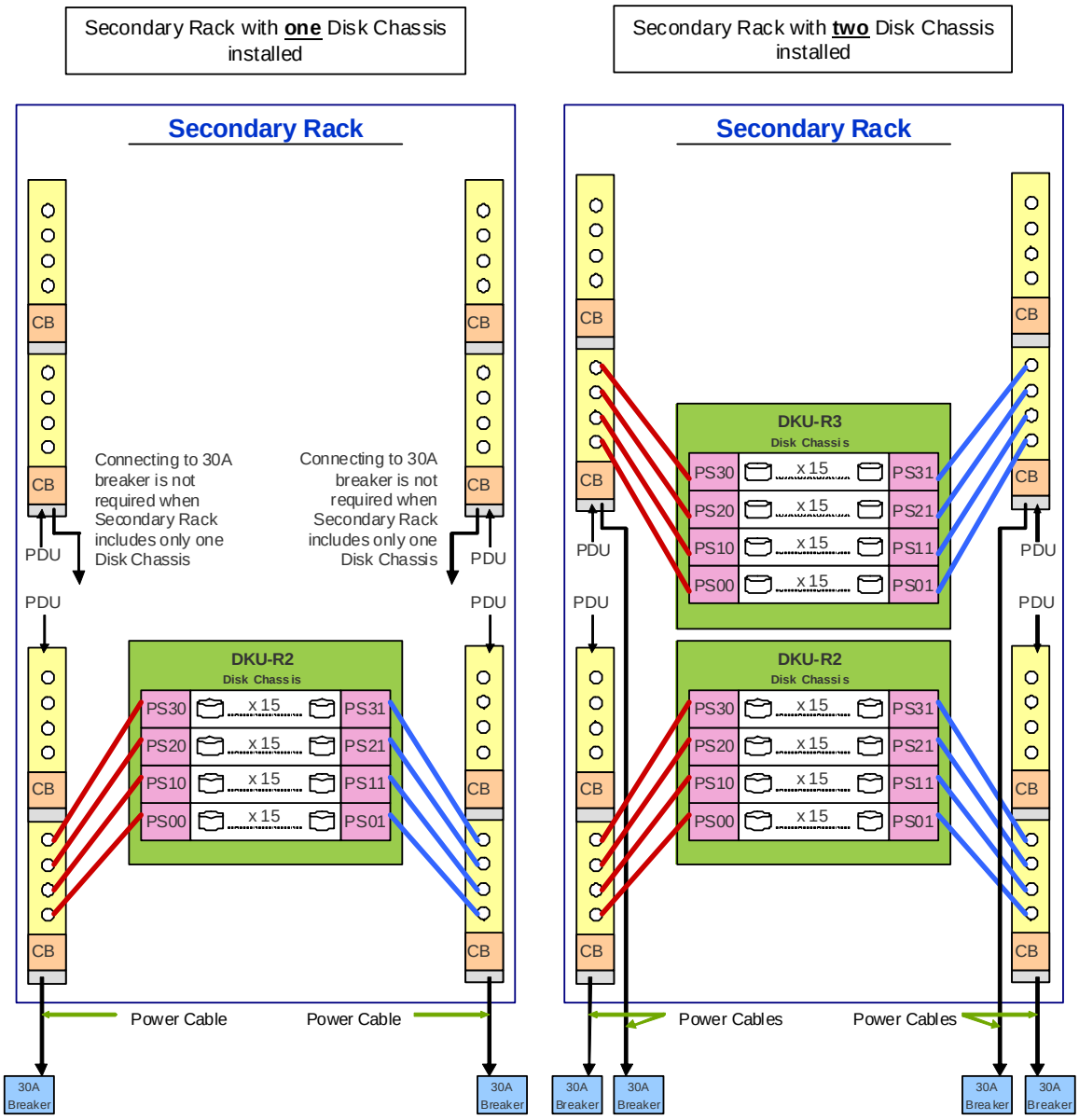


Figure 2-9: Breaker Configurations for the Primary Rack

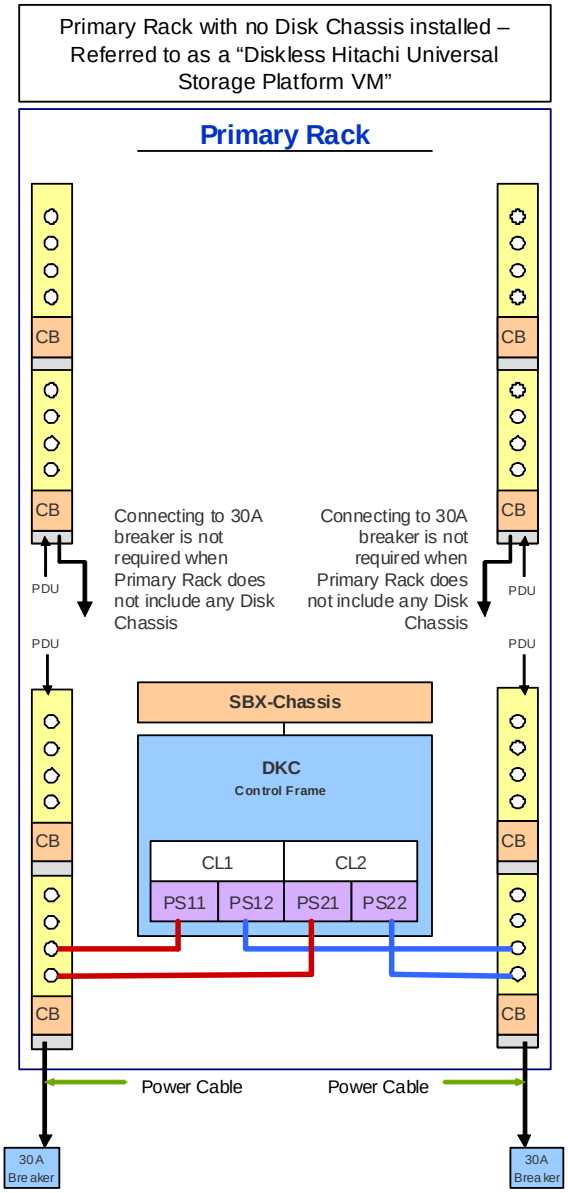
Secondary Rack Configurations – Including one or two Disk Chassis



DKC = Control Frame	SBX-Chassis = Additional SVP/Battery Backup Chassis (Power obtained from DKC Control Frame)	DKU = Disk Chassis
CB = Circuit Breaker	CL1 = Cluster 1, CL2 = Cluster 2	PS = Power Supply

Figure 2-10: Breaker Configurations for the Secondary Rack

Primary Rack Configuration – Control Frame, Additional SVP/Battery Backup Chassis and no Disk Chassis



DKC = Control Frame	SBX-Chassis = Additional SVP/Battery Backup Chassis (Power obtained from DKC Control Frame)	
CB = Circuit Breaker	CL1 = Cluster 1, CL2 = Cluster 2	PS = Power Supply

Figure 2-11: Breaker Configurations for a Diskless System

Power Connection

The AC power input for the Universal Storage Platform VM has a duplex PDU structure. This duplex structure enables the entire rack to remain powered on if power is removed from one of the two power distribution panels (PDPs).

- **Direct connection to power.** Figure 2-12 shows the power connections when the AC input lines are connected directly to the power facility.

CAUTION! When installing the USP VM, connect the AC cables between the PDUs and PDPs correctly. Otherwise, a system failure occurs when one of the AC inputs is interrupted. Figure 2-12 **shows the correct connections (drawing on the left) and incorrect connections (drawing on the right).**

- Power connection through UPS. Figure 2-14 shows the power connections when half of the AC input lines are connected to an uninterruptible power supply (UPS), and the other half of the AC input lines are connected directly to the power facility.

WARNING! Figure 2-13 **describes a dangerous and incorrect power cabling method for connecting the DKC within the primary rack.**

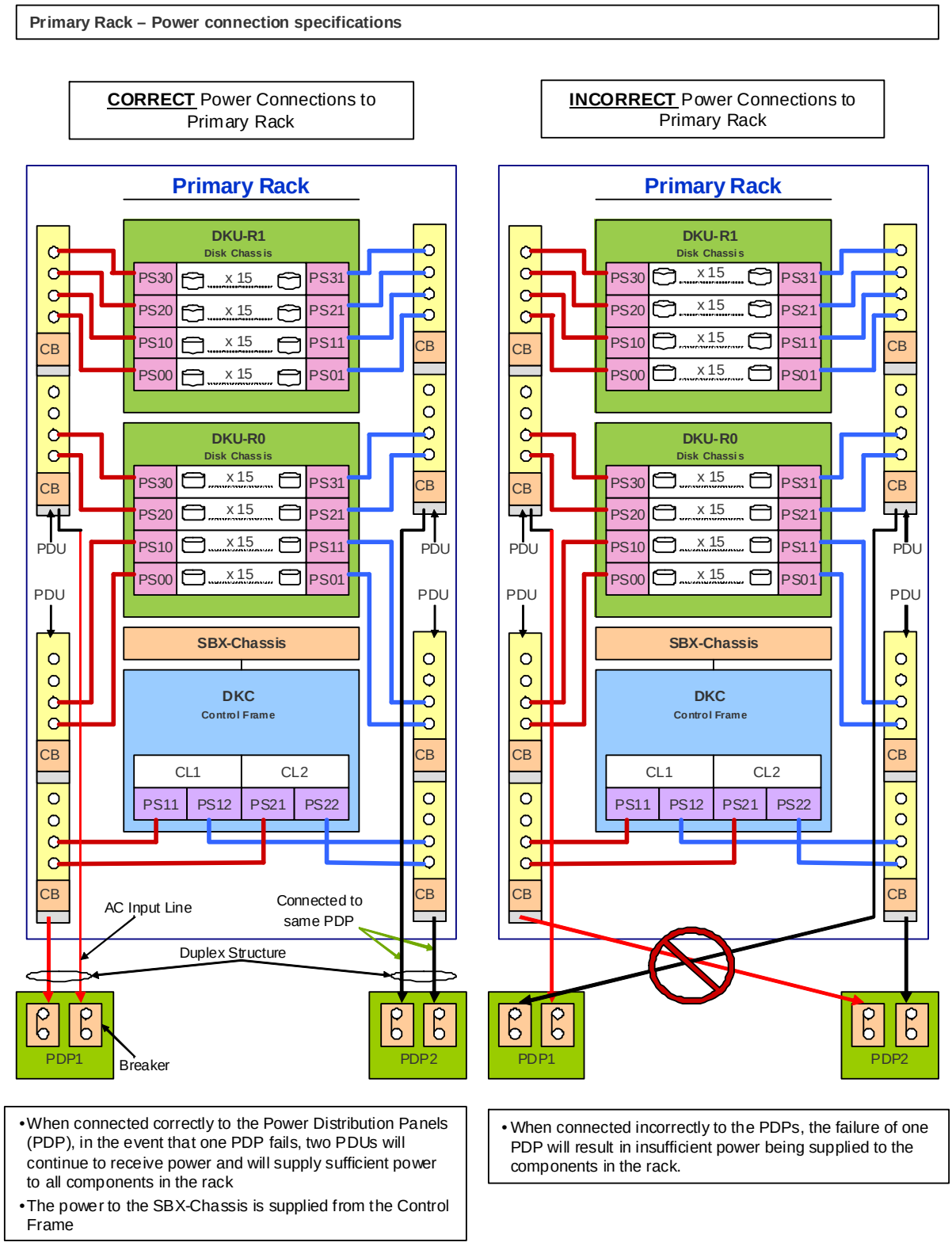


Figure 2-12: Direct Power Connection

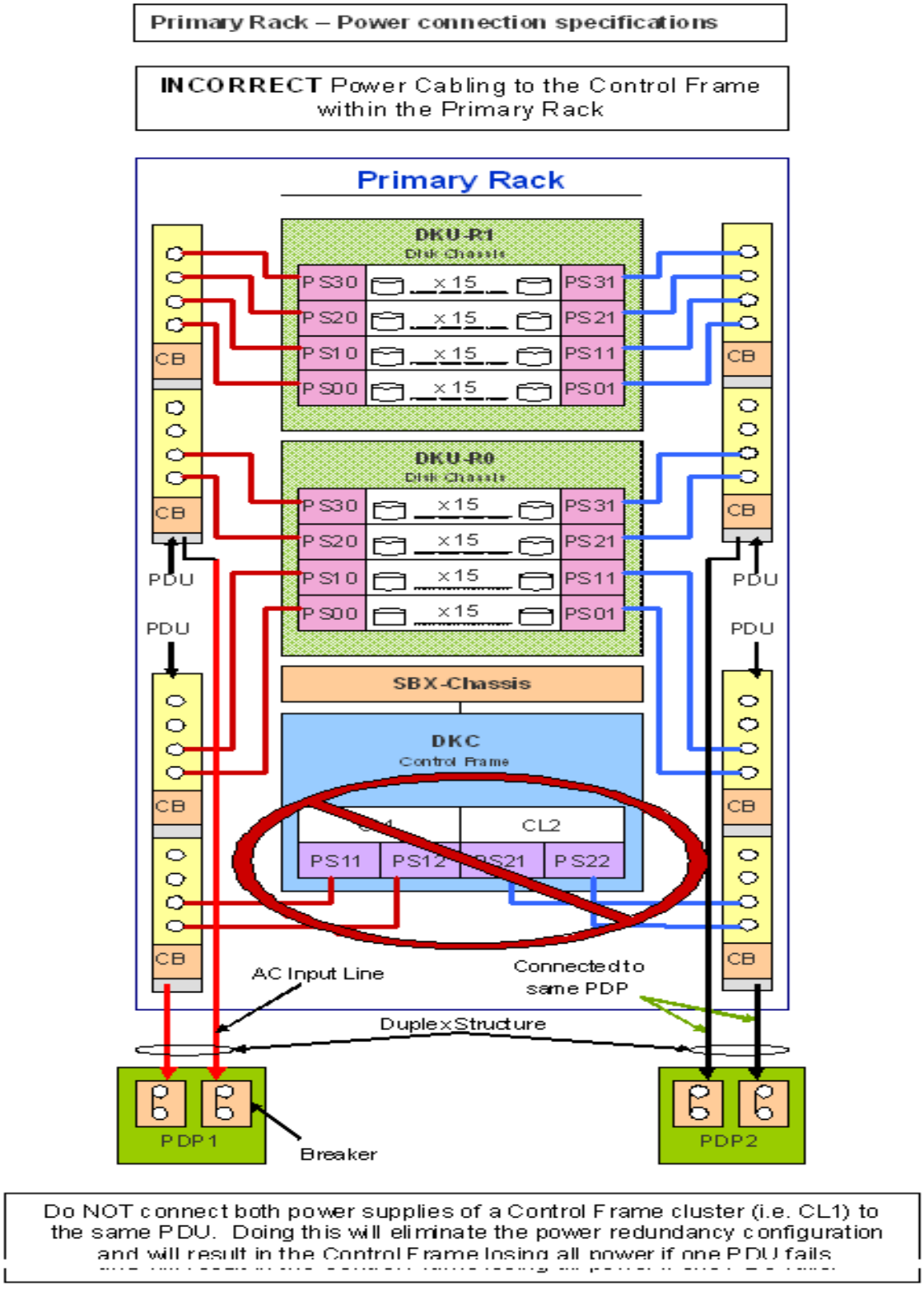


Figure 2-13: Incorrect Cabling in the Primary Rack

For the AC Input power, connect one pair of PDUs from each rack to the UPS and the other pair of PDUs from each rack to the PDP

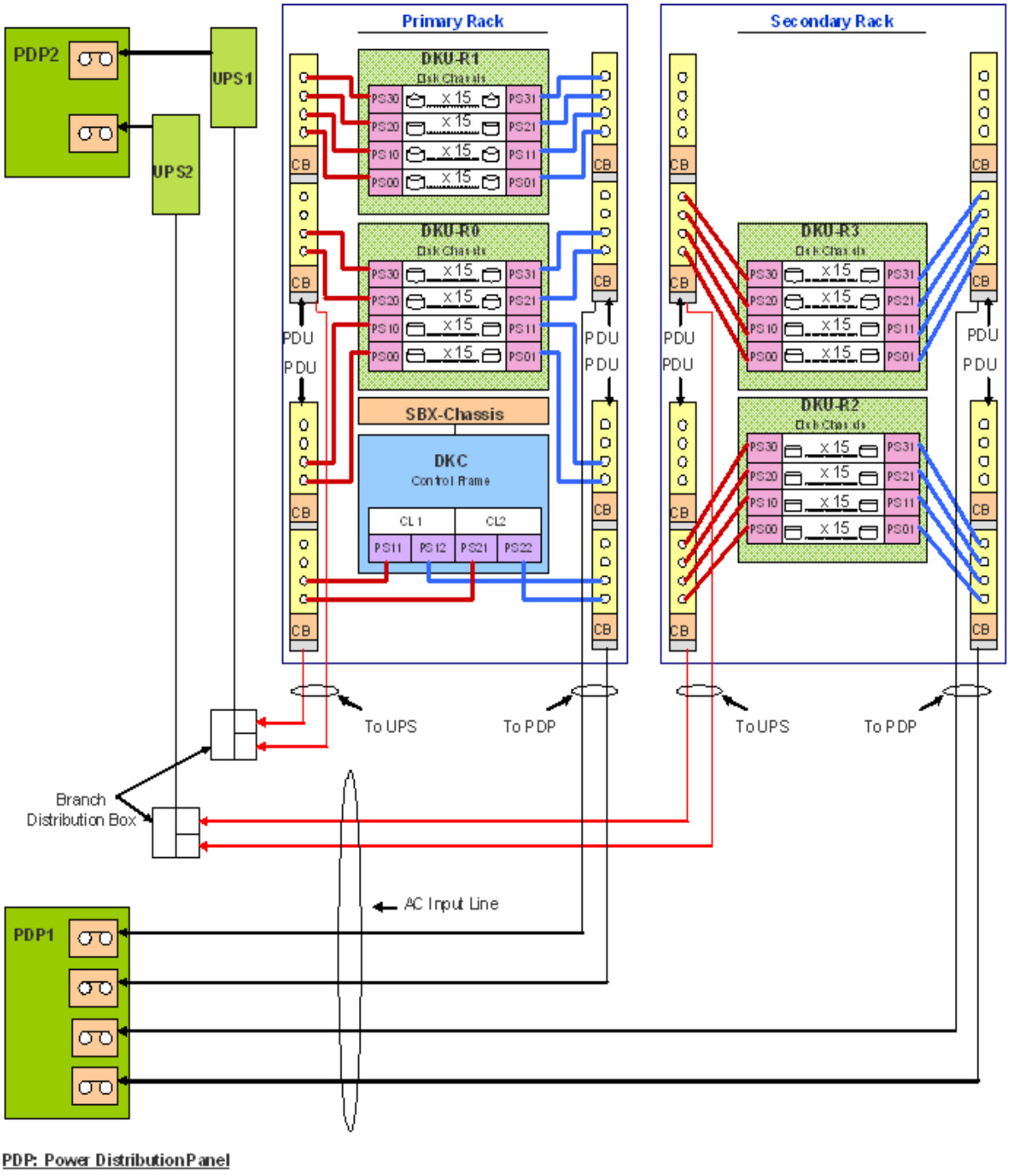


Figure 2-14: Power Connection through UPS

Input Voltage and Input Frequency

Table 2-7 lists the input voltage and input frequency requirements for the Universal Storage Platform VM.

Table 2-7: Input Voltage and Input Frequency Requirements

Frequency	Input Voltages (AC)	Conditions	Tolerance (%)
60Hz ±2Hz	200V, 208V, or 230V	1 Phase 2 Wire + Ground	+6% or –8%
50Hz ±3Hz	200V, 220V, 230V, or 240V	1 Phase 2 Wire + Ground	+6% or –8%

Circuit Breakers and Plugs

The PDU plugs are appropriate for the power sources at the installation sites:

- For installations within the U.S., the plugs are NEMA L6 30P, rated as 30A and 250V, and have two 16A circuit breakers with 20A trip values.
- For installations outside the U.S., the plugs are IEC 309, rated as 32A and 250V, and have two 16A circuit breakers with 20A trip values.

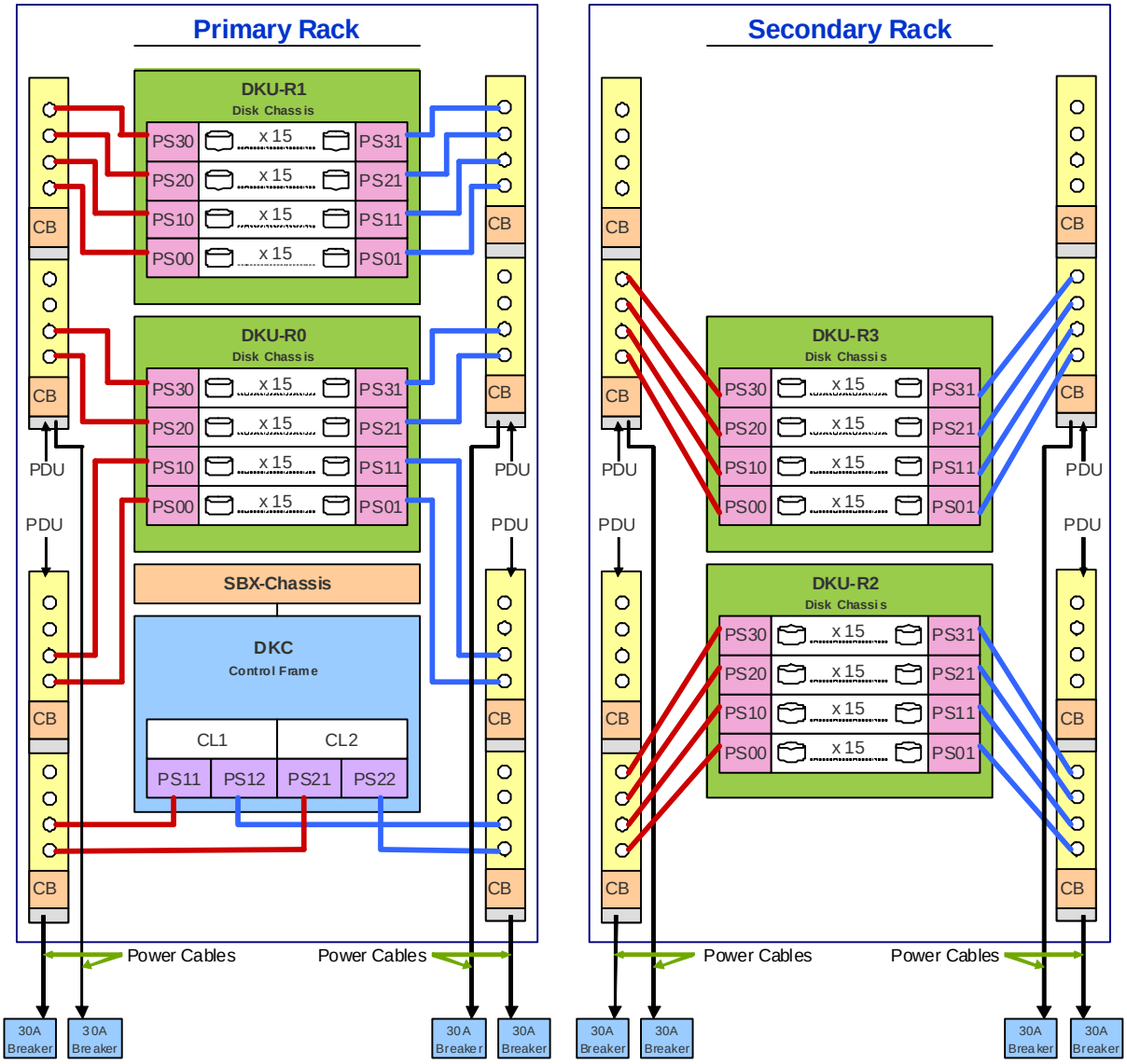
Customer-Supplied Rack

This section describes the power specifications and requirements for installing the Universal Storage Platform VM storage system in a customer-supplied rack.

- Figure 2-15: Maximum configuration - control frame, additional SVP/ battery backup chassis and four disk chassis
- Figure 2-16: Primary rack configuration - control frame, additional SVP/ battery backup chassis and up to two disk chassis
- Figure 2-17: Primary rack configuration - control frame, additional SVP/ battery backup chassis and no disk chassis
- Figure 2-18: Secondary rack configurations - including one or two disk chassis
- Figure 2-19, Figure 2-20: Primary rack - power connection specifications
- Figure 2-21: Connecting to universal power supply (UPS)
- Power Distribution Units for Customer-Supplied Rack on page 2-33

Maximum Configuration – Control Frame, Additional SVP/Battery Backup Chassis and four Disk Chassis

- Each rack contains four Power Distribution Units (PDU)
- Each PDU includes two groups of four receptacles [IEC 320-C13]
- Each receptacle group has its own Circuit Breaker (CB) 16Amp [20 Amp Trip]
- For systems installed in the Americas the PDU power cord has a 1-Phase, NEMA L6-30P 30A, 250V plug
- For systems installed in EMEA/APAC the PDU power cord has a 1-Phase, IEC 309, 32A, 250V plug



DKC = Control Frame	SBX-Chassis = Additional SVP/Battery Backup Chassis (Power obtained from DKC Control Frame)	DKU = Disk Chassis
CB = Circuit Breaker	CL1 = Cluster 1, CL2 = Cluster 2	PS = Power Supply

Figure 2-15: Maximum Configuration - Control Frame, Additional SVP/ Battery Backup Chassis and four Disk Chassis

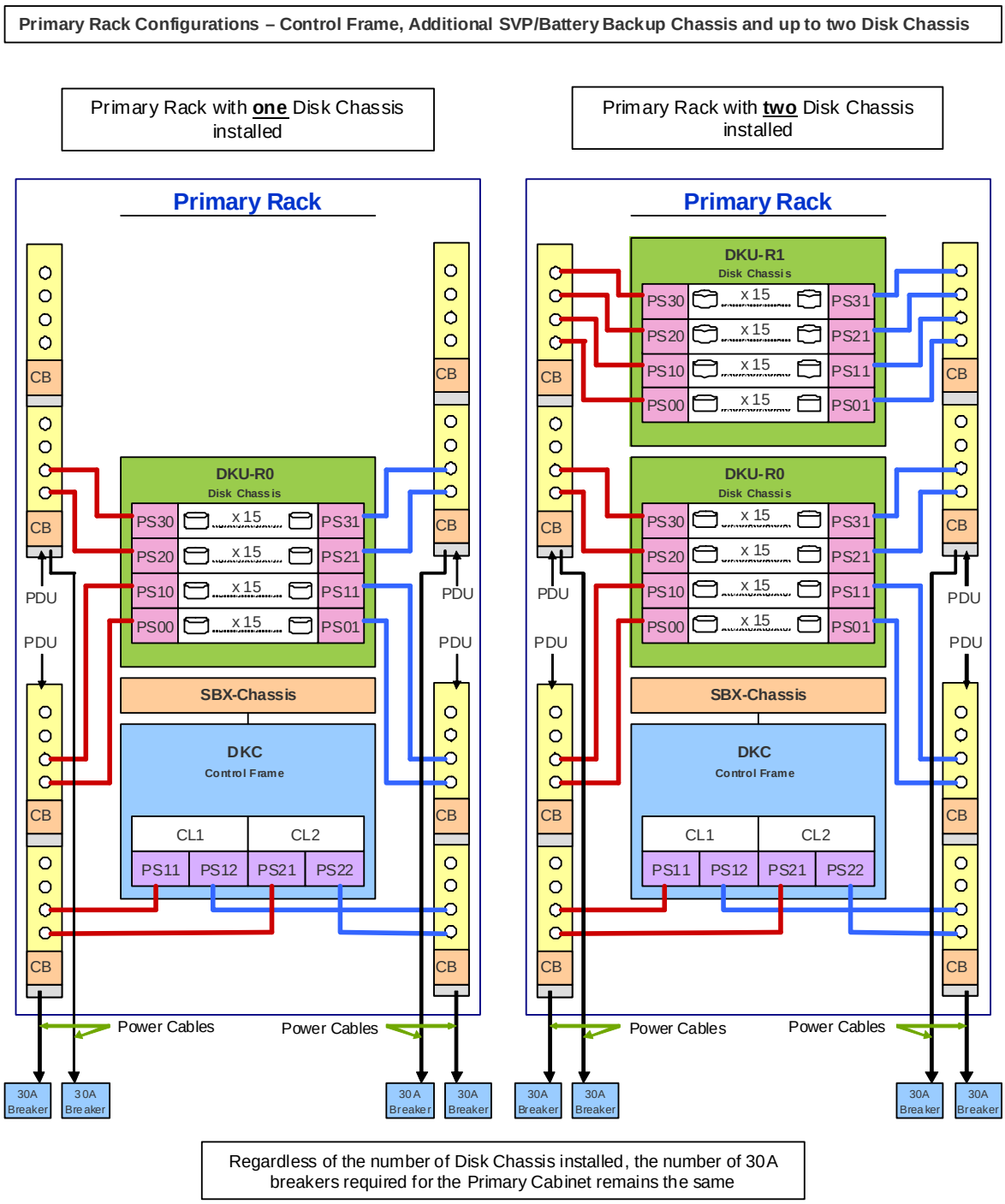
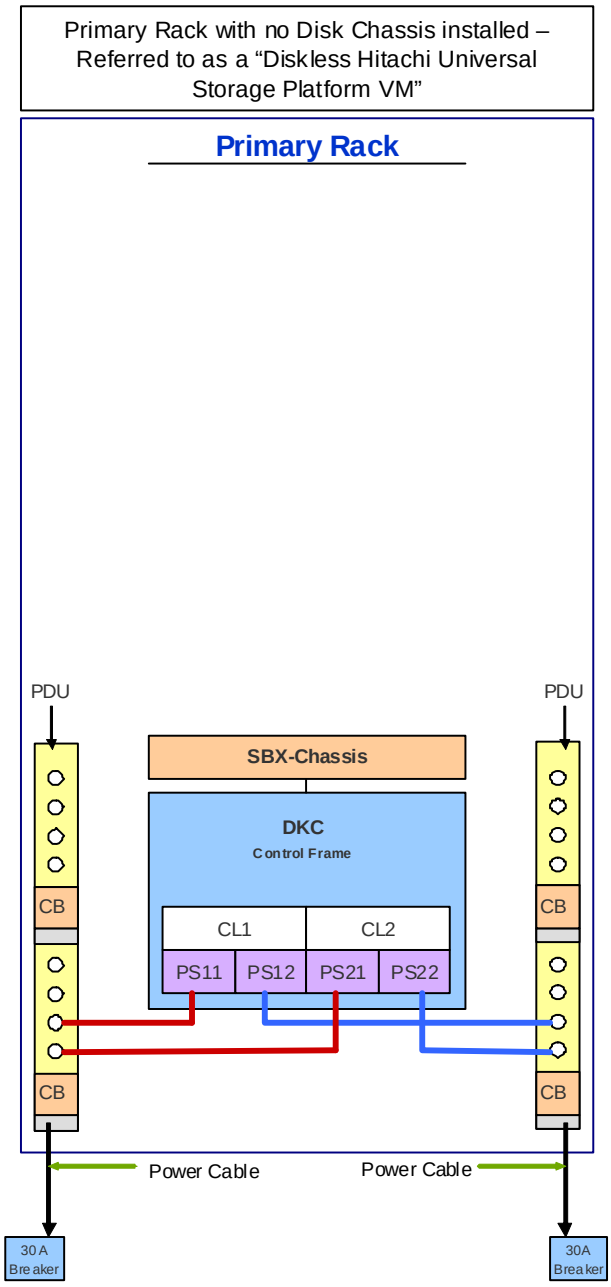


Figure 2-16: Primary Rack Configuration - Control Frame, Additional SVP/Battery Backup Chassis And Up To Two Disk Chassis



DKC = Control Frame	SBX-Chassis = Additional SVP/Battery Backup Chassis (Power obtained from DKC Control Frame)	
CB = Circuit Breaker	CL1 = Cluster 1, CL2 = Cluster 2	PS = Power Supply

Figure 2-17: Primary Rack Configuration - Control Frame, Additional SVP/Battery Backup Chassis And No Disk Chassis

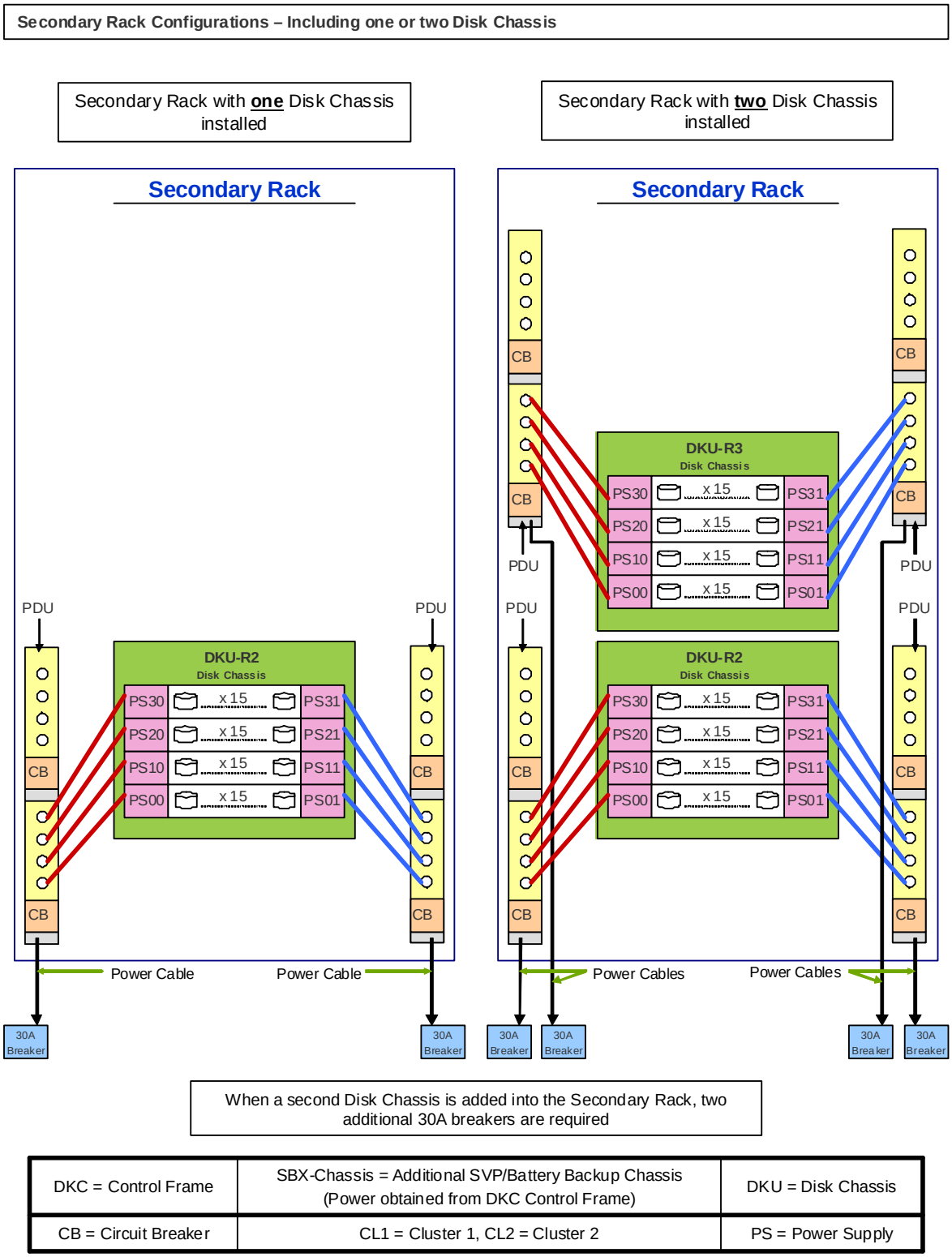


Figure 2-18: Secondary Rack Configurations - One Or Two Disk Chassis

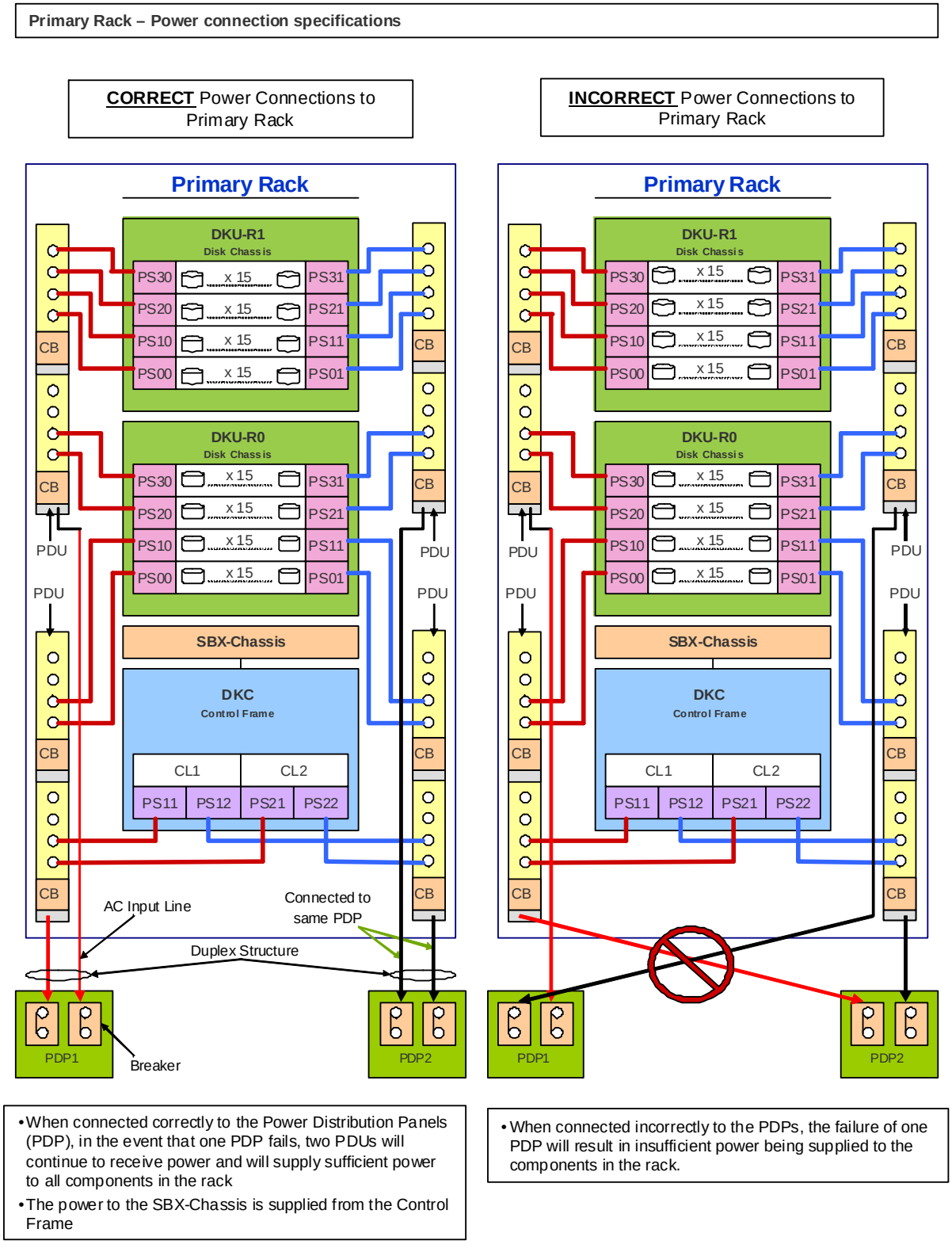


Figure 2-19: Primary Rack - Power Connection Specifications

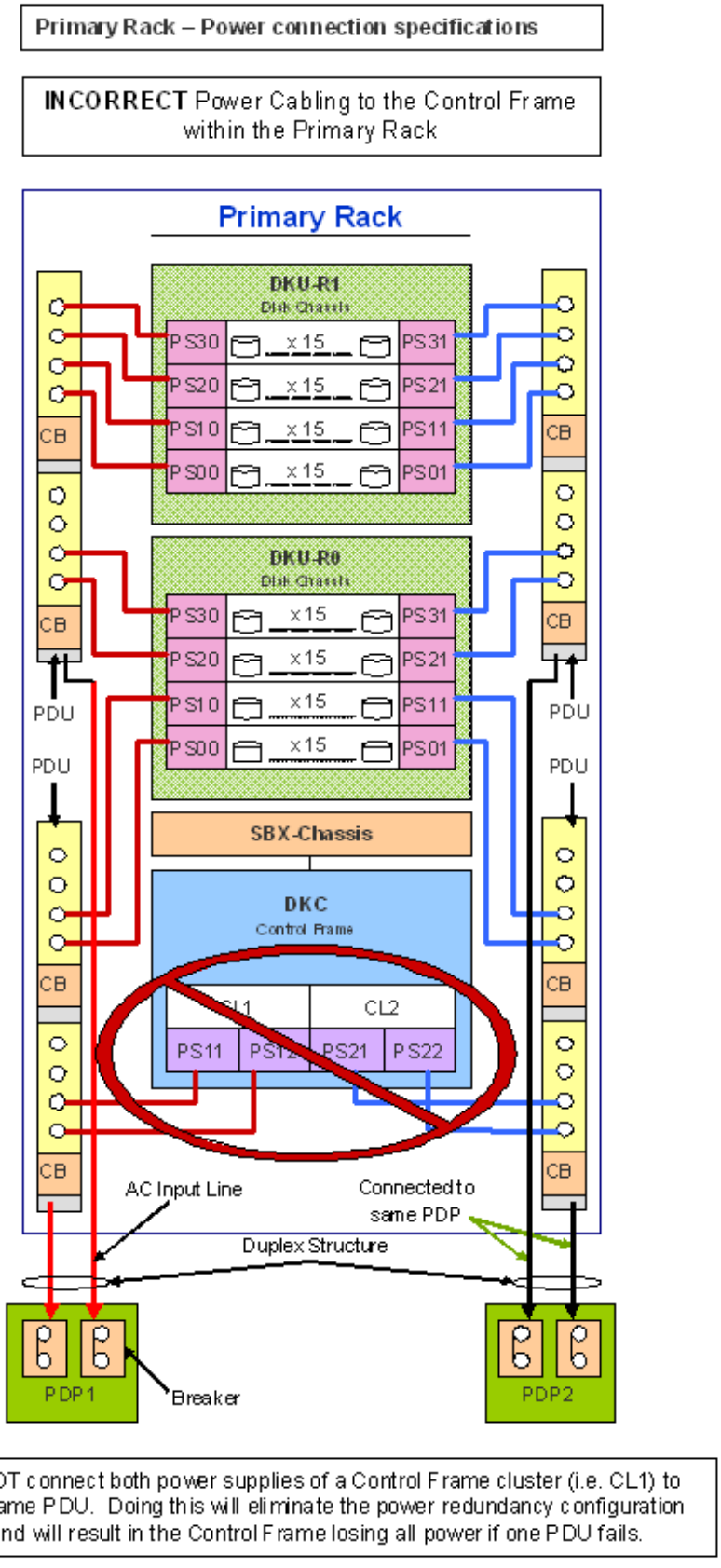


Figure 2-20: Primary Rack - Power Connection Specifications

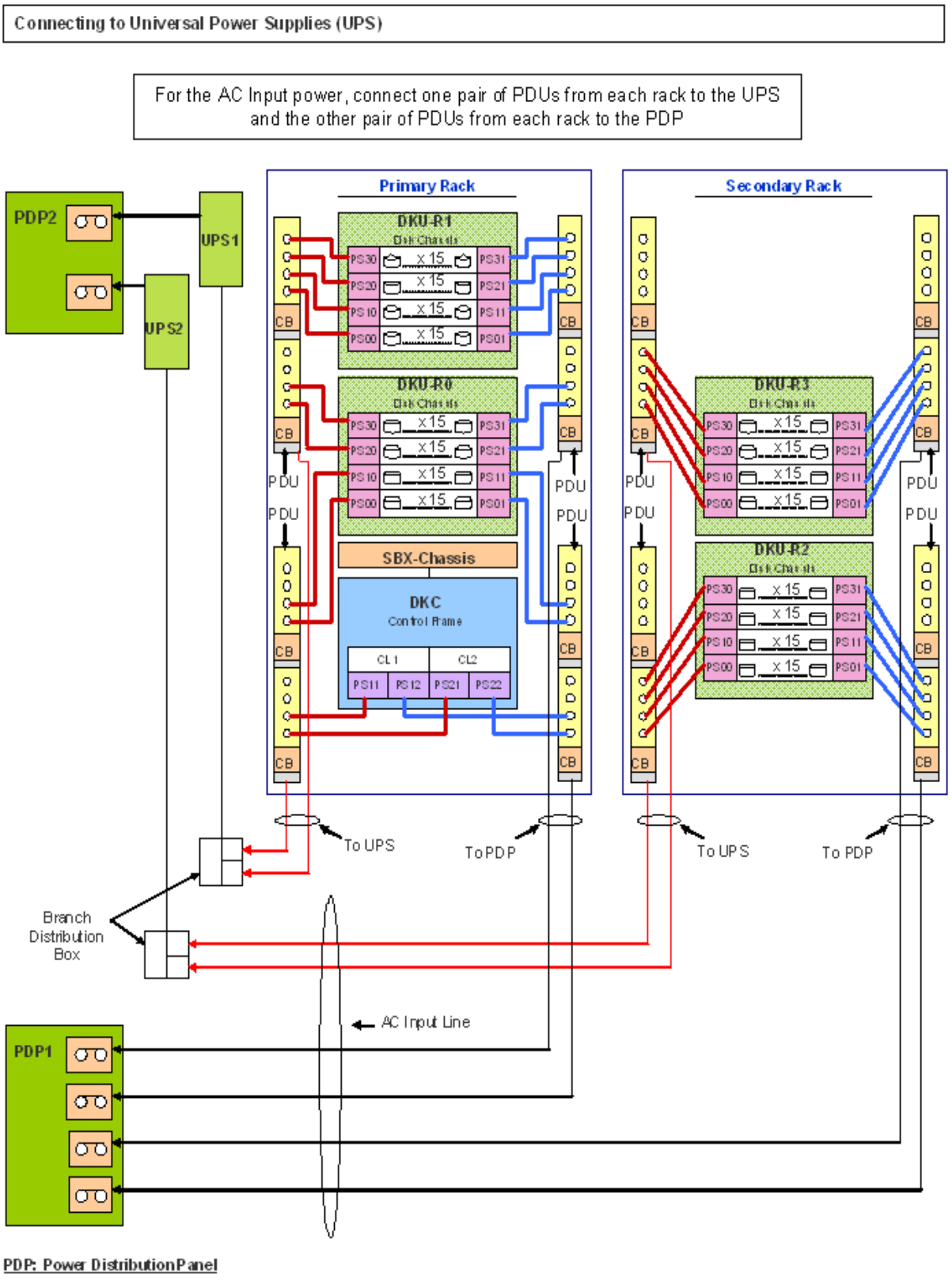


Figure 2-21: Connecting to Universal Power Supply (UPS)

Power Distribution Units for Customer-Supplied Rack

It is strongly recommend that you purchase all necessary PDUs from Hitachi Data Systems. System failure or damage attributed to customer-supplied components is not covered by Hitachi Data Systems' support agreements. PDUs must provide the capability to latch power cables.

- For systems installed in the Americas, Hitachi Data Systems provides a 30Amp, 250V PDU. It includes two 16A circuit breakers with 20 AMP trip. Each circuit breaker is associated with four IEC 320-C13 receptacles to provide a total of eight receptacles per PDU. The 12-foot power cable is a NEMA L6-30P with a 30A, 250V plug. Figure 2-22 shows a diagram of this PDU with specifications. This PDU can be purchased from Hitachi Data Systems by referencing product code 9960623. Customer-supplied PDUs must meet or exceed these specifications.
- For systems installed in Europe, Middle East, Africa, or Asia Pacific, Hitachi Data Systems provides a 32Amp, 250V PDU. It includes two 16A circuit breakers with 20 AMP trip. Each circuit breaker is associated with four IEC 320-C13 receptacles to provide a total of eight receptacles per PDU. The 12-foot power cable is an IEC 309 with a 32A, 250V plug. Figure 2-23 shows a diagram of this PDU with specifications. This PDU can be purchased from Hitachi Data Systems by referencing product code 9960624. Customer-supplied PDUs must meet or exceed these specifications.

If the option for Hitachi Data Systems' PDUs is selected, the appropriate type and quantity of PDU kits based on the system configuration are supplied. Customer-supplied PDUs must meet the specifications listed in this document and must be installed in the rack and functionality verified prior to the installation of the Hitachi Universal Storage Platform VM system.

The number of PDUs that must be installed in a rack depends on the number of components installed in the rack. Table 2-8 specifies the number of PDUs to order for both the primary and secondary racks regardless of whether the PDUs are ordered from Hitachi Data Systems or another supplier. The table also specifies the number of power receptacles that the customer must make available.

Table 2-8: Number of PDUs for the Primary and Secondary Racks

Primary Rack	Requirements
Control Frame only	Two PDUs and two power receptacles
Control Frame and one Disk Chassis	Four PDUs and four power receptacles
Control Frame and two Disk Chassis	Four PDUs and four power receptacles
Note: The additional SVP/battery backup chassis obtains its power from the control frame and does not utilize any PDU receptacles.	
Secondary Rack	**Requirements**
One Disk Chassis	Two PDUs and two power receptacles
Two Disk Chassis	Four PDUs and four power receptacles

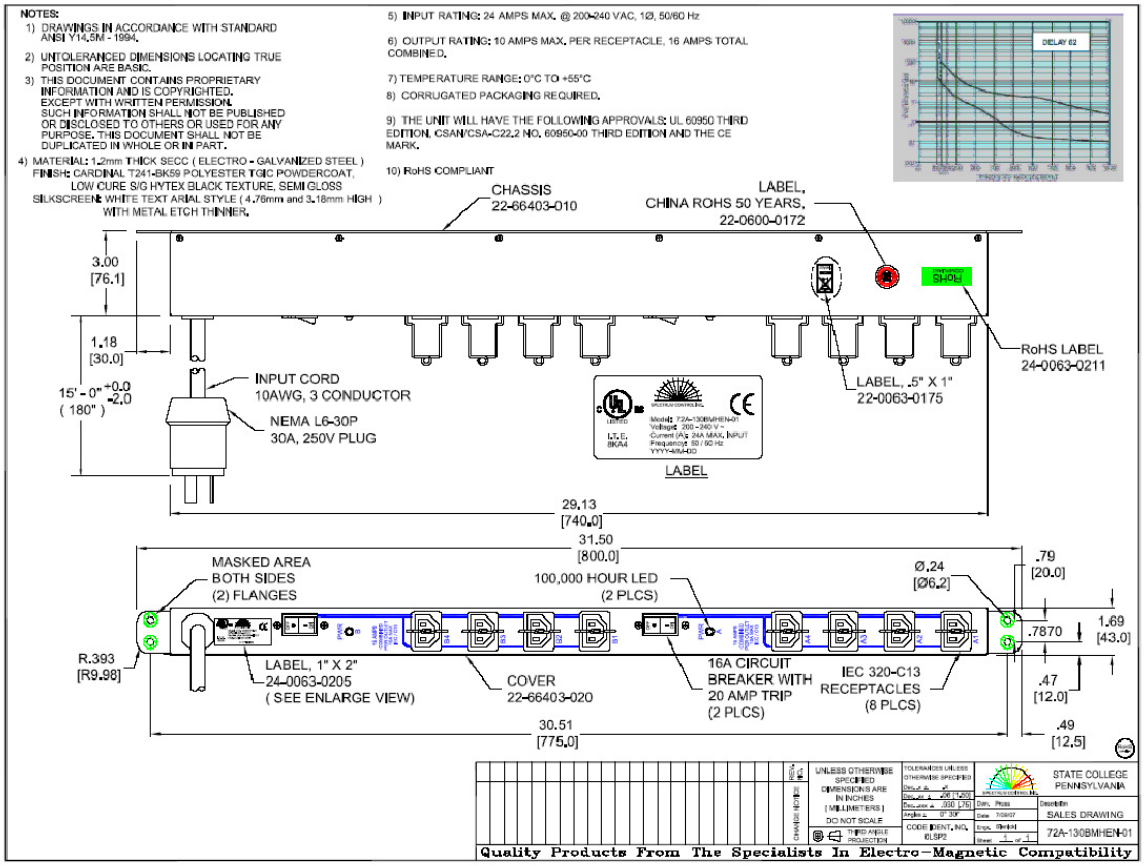


Figure 2-22: PDU for the Americas

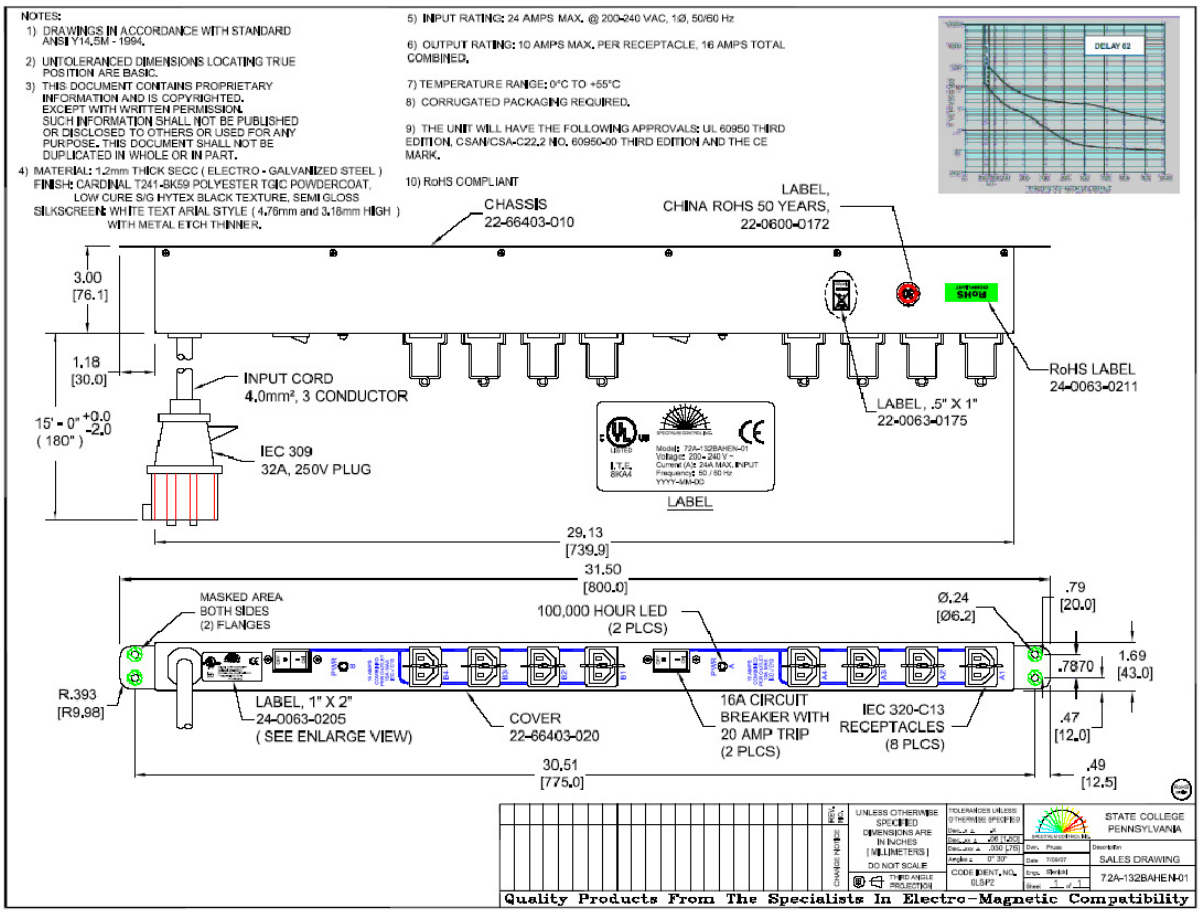


Figure 2-23: PDU for Europe, Middle East, Africa, and Asia Pacific

Proper cabling is mandatory to ensure that a continuous power supply is provided to each component in the event of a PDU failure. Each component ordered includes the necessary cables to connect to the PDUs. The Hitachi Data Systems personnel must refer to maintenance documentation for the correct cabling techniques.

PDUs must be installed so their receptacles face the rear of the rack. This positioning is required to enable the power cords to be successfully attached. Figure 2-24 shows correctly positioned PDUs.

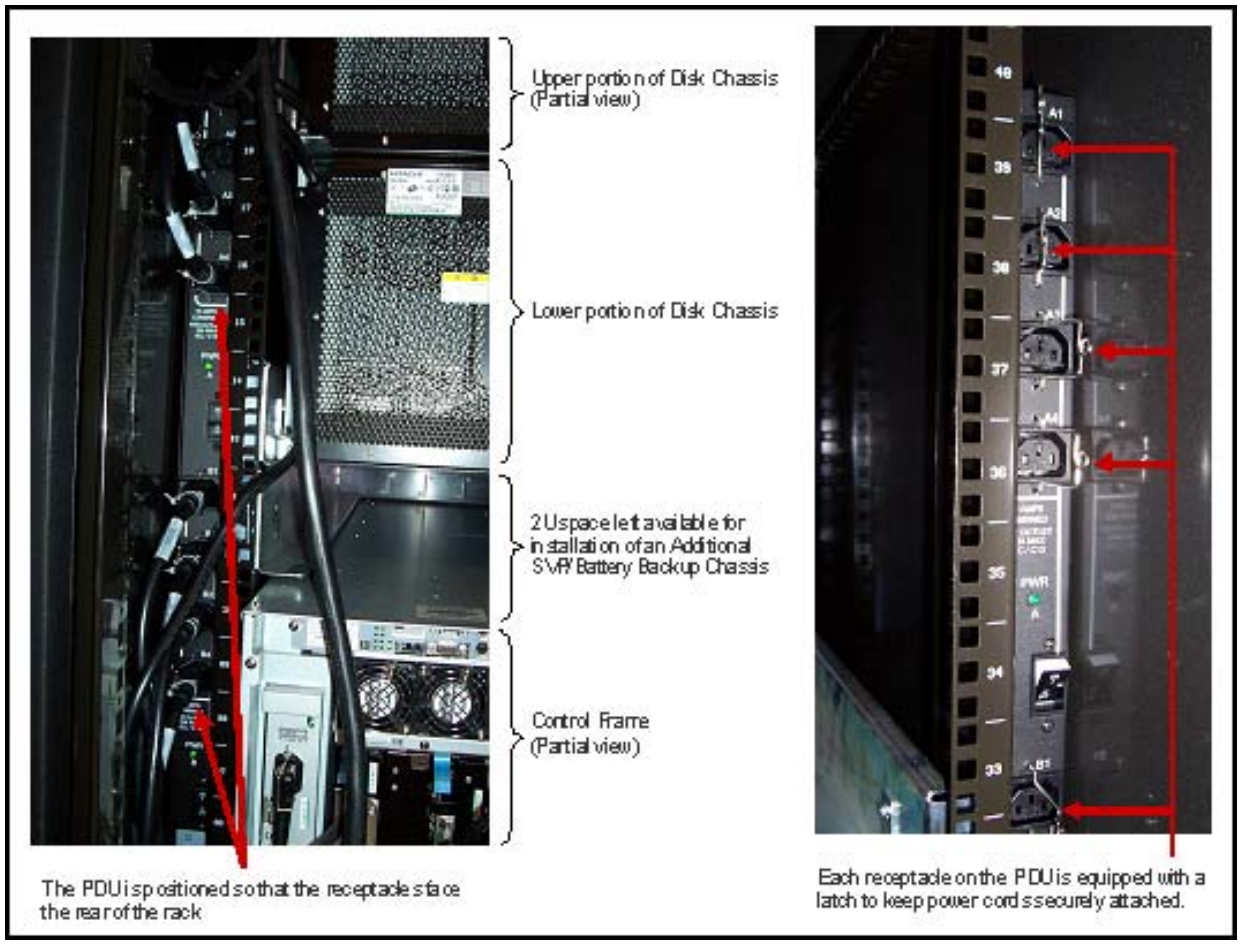


Figure 2-24: Correct Positioning of PDUs

Environmental Specifications and Requirements

The environmental specifications and requirements for the Universal Storage Platform VM include:

- Temperature, Humidity, and Altitude
- Heat Output, Power Consumption, and Air Flow
- Loudness
- Vibration and Shock

Temperature, Humidity, and Altitude

specifies the temperature, humidity, and altitude requirements for the Universal Storage Platform VM. The recommended operational room temperature is 21–24°C (70–75°F).

Table 2-9: Environmental Specifications

Parameter	Operating*1		Non-Operating*2		Shipping & Storage*3	
	Low	High	Low	High	Low	High
Temperature °F (°C)	60 (16)	90 (32)	14 (–10)	109 (43)	5 (–25)	140 (60)
Relative Humidity (%)*4	20 – 80		8 – 90		5 – 95	
Max. Wet Bulb °F (°C)	79 (26)		81 (27)		84 (29)	
Temperature Deviation °F/hour (°C/hour)	18 (10)		18 (10)		36 (20)	
Altitude	–60 m to 3,000 m				–	

NOTE:

1. The requirements for operating condition should be satisfied before the storage system is powered on. Do not exceed a maximum temperature of 90°F (32°C) at the air intakes.
2. Non-operating condition includes both packing and unpacking conditions unless otherwise specified.
3. For shipping/storage, pack the equipment using the factory packing.
4. No condensation in or around the drive should be observed under any conditions.

Heat Output, Power Consumption, and Air Flow

Table 2-10 lists the power consumption, heat output, and air flow requirements for the USP VM. These data apply to both 60Hz and 50Hz storage systems. Fans are not required for customer-supplied racks. Airflow is from front to back.

Table 2-10: Heat Output, Power, and Air Flow Specifications

Model Number	Heat Output (kW)	Power consumption (kVA)	Air Flow (m^3/min)
DKC615I-5	0.291	0.30	4.3
DKC-F615I-B2	0.233	0.24	5.0
DKC-F615I-SBX	0.012	0.013	1.3
DKC-F615I-LGAB	0.015	0.015	–
DKC-F615I-PLUC	–	–	–
DKC-F615I-PHUC	–	–	–
DKC-F615I-PLEC	–	–	–
DKC-F615I-PHEC	–	–	–
DKC-F615I-UC0	–	–	–
DKC-F615I-UC1	–	–	–
DKC-F615I-EXC0	–	–	–
DKC-F615I-SX	0.005	0.005	–
DKC-F615I-S4GQ	0.013	0.013	–
DKC-F615I-DKA	0.097	0.100	–
DKC-F615I-EDKA	0.099	0.102	–
DKC-F615I-CX	0.005	0.005	–
DKC-F615I-C4G	0.015	0.015	–
DKC-F615I-C8G	0.019	0.020	–
DKC-F615I-C16G	0.019	0.020	–
DKC-F615I-8S	0.146	0.150	–
DKC-F615I-8MFS	0.146	0.150	–
DKC-F615I-8MFL	0.146	0.150	–
DKC-F615I-8FS	0.130	0.135	–
DKC-F615I-16FS	0.146	0.150	–
DKC-F615I-1FL	–	–	–
DKC-F615I-1FS	–	–	–
DKC-F615I-SVP	0.073	0.075	–
DKC-F615I-SVPV	0.073	0.075	–
DKC-F615I-MDM	0.006	0.006	–
DKC-F615I-72KS	0.020	0.021	–
DKC-F615I-146KS	0.020	0.021	–
DKC-F615I-300KS	0.020	0.021	–
DKC-F615I-0R7HS	0.018	0.019	–
DKC-F615I-300KM	0.020	0.021	–
DKC-F615I-400JS	0.020	0.021	–

Table 2-10: Heat Output, Power, and Air Flow Specifications (Continued)

Model Number	Heat Output (kW)	Power consumption (kVA)	Air Flow (m^3/min)
DKC-F615I-1R0HS	0.019	0.020	–
DKC-F615I-2R0HS	0.019	0.020	–
DKC-F615I-450KS	0.020	0.021	–
DKC-F605I-200S1	0.010	0.011	–
DKC-F605I-400S1	0.010	0.011	–
DKC-F605I-600KS	0.020	0.021	—

Loudness

The acoustic emission values [loudness in dB(A)] for the Universal Storage Platform VM storage system are:

- Front/rear = 65 dB(A)
- Both sides = 65 dB(A)

Vibration and Shock

Table 2-11 lists the vibration and shock tolerances for the USP VM. The USP VM can be subjected to vibration and shock up to these limits and still perform normally. Consider these requirements if there are large generators located on the floor above or below the storage system. Generators or any other source of vibration, if not insulated or shock mounted, can cause excessive vibration that may adversely affect the storage system.

Table 2-11: Vibration and Shock Tolerances

Parameter	Condition		
	Operating	Non-Operating	Shipping or Storage
Vibration	5-10 Hz: 0.25 mm 10-300 Hz: 0.49 m/s^2	5-10 Hz: 2.5 mm 10-70 Hz: 4.9m/s^2 70-99 Hz: 0.05 mm 99-300 Hz: 9.8m/s^2	Sine Vibration*2: 4.9 m/s^2, 5 min. At the resonant frequency with the highest displacement found between 3 and 100 Hz. Random Vibration*3: 0.147 m^2/s^3, 30 min., 5-100 Hz
Shock	–	78.4 m/s^2, 15 ms	Horizontal: Incline Impact 4 ft./s (1.22 m/s)*4 Vertical: Rotational Edge 0.5 ft. (0.15 m)*5

Notes:

1. The vibration specifications apply to all three axes.
2. See ASTM D999-91, Standard Methods for Vibration Testing of Shipping Containers.
3. See ASTM D4728-01 Test Method for Random Vibration Testing of Shipping Containers.
4. See ASTM D5277-92, Standard Test Methods for Performing Programmed Horizontal Impacts Using an Inclined Impact Tester.
5. See ASTM D6055-96, Standard Test Methods for Mechanical Handling of Unitized Loads and Large Shipping Cases and Crates.

Operational Requirements

The operational requirements for the Universal Storage Platform VM include:

- **LAN connection (or analog phone line) for Hi-Track®**

  The Hi-Track maintenance support tool monitors the operation of the Universal Storage Platform VM, collects hardware status and error data, and transmits this data via LAN (or modem) to the Hitachi Data Systems Support Center. In the event of a component failure, Hi-Track reports the failure to the Support Center, with no action required on the part of the user. Hi-Track enables most problems to be identified and fixed prior to actual failure, and the advanced redundancy features enable the storage system to remain operational even if one or more components fail.

- **LAN for Storage Navigator**

  Hitachi Storage Navigator communicates directly with the Universal Storage Platform VM via LAN to obtain system configuration and status information and send user-requested commands to the storage system. Storage Navigator serves as the integrated interface for all Resource Manager components.

- **Cable length for front-end directors**

  Table 2-12 lists the cable length requirements for the front-end directors (FEDs) in the Universal Storage Platform VM.

- **External storage**

  If you plan to attach external storage to the Universal Storage Platform VM, be sure to include the appropriate power and space requirements in your planning.

Table 2-12: FED Cable Length Requirements

Cable	Maximum Cable Length (Data Transfer Rate)
ESCON	3 km
FICON Short Wave 50/125-µm multimode 62.5/125-µm multimode	500 m (100 MB/s), 300 m (200 MB/s), 150 m (400 MB/s) 300 m (100 MB/s), 150 m (200 MB/s), 75 m (400 MB/s)
FICON Long Wave	10 km
Fibre Channel Short Wave 50/125-µm multimode 62.5/125-µm multimode	500 m (100 MB/s), 300 m (200 MB/s), 150 m (400 MB/s) 300 m (100 MB/s), 150 m (200 MB/s), 75 m (400 MB/s)
Fibre Channel Long Wave	10 km

A

Units and Unit Conversions

Table A-1 provides conversions for metric and standard (U.S.) units of measure associated with the Hitachi Universal Storage Platform VM storage system. For information on physical and logical storage capacity values on the USP VM storage system, see Convention for Storage Capacity Values.

Table A-1: Conversions for Metric and Standard (U.S.) Units of Measure

From	Multiply By:	To Get:
British thermal units (BTU)	0.251996	Kilocalories (kcal)
British thermal units (BTU)	0.000293018	Kilowatts (kW)
Inches (in)	2.54000508	Centimeters (cm)
Feet (ft.)	0.3048006096	Meters (m)
Square feet ($ft.^2$)	0.09290341	Square meters (m^2)
Cubic feet per minute ($ft.^3$/min.)	0.028317016	Cubic meters per minute (m^3/min.)
Pound (lb.)	0.4535924277	Kilogram (kg)
Kilocalories (kcal)	3.96832	British thermal units (BTU)
Kilocalories (kcal)	1.16279×10^{-3}	Kilowatts (kW)
Kilowatts (kW)	3412.08	British thermal units (BTU)
Kilowatts (kW)	859.828	Kilocalories (kcal)
Millimeters (mm)	0.03937	Inches (in)
Centimeters (cm)	0.3937	Inches (in)
Meters (m)	39.369996	Inches (in)
Meters (m)	3.280833	Feet (ft.)
Square meters (m^2)	10.76387	Square feet ($ft.^2$)
Cubic meters per minute (m^3/min.)	35.314445	Cubic feet per minute ($ft.^3$/min)
Kilograms (kg)	2.2046	Pounds (lb.)
Ton (refrigerated)	12,000	BTUs per hour (BTU/hr.)
Degrees Fahrenheit (°F)	First subtract 32, then multiply: °C = (°F – 32) x 0.555556	Degrees Celsius (°C)

Table A-1: Conversions for Metric and Standard (U.S.) Units of Measure

From	Multiply By:	To Get:
Degrees Celsius (°C)	First multiply, then add 32: °F = (°C x 1.8) + 32	Degrees Fahrenheit (°F)
Degrees Fahrenheit per hour (°F/hour)	0.555555	Degrees Celsius per hour (°C/hour)
Degrees Celsius per hour (°C/hour)	1.8	Degrees Fahrenheit per hour (°F/hour)

Acronyms and Abbreviations

A	ampere
ASTM	American Society for Testing Materials
BED	back-end director
BS	basic (power) supply
BTU	British Thermal unit
°C	degrees Celsius
ca	cache
CHA	channel adapter (another name for front-end director)
dB(A)	decibel (A-weighted)
DKA	disk adapter (another name for back-end director)
DKC	disk controller
DKU	disk unit
ESD	electrostatic discharge
FCC	Federal Communications Commission
FED	front-end director
g	acceleration of gravity (9.8 m/s^2) (unit used for vibration and shock)
GB	gigabyte (see Convention for Storage Capacity Values)
HDS	Hitachi Data Systems
Hz	Hertz
IEC	International Electrotechnical Commission
in.	inch(es)
KB	kilobyte (see Convention for Storage Capacity Values)
Kcal	kilocalorie
kg	kilogram
km	kilometer
kVA	kilovolt-ampere

kW	kilowatt
LAN	local area network
lb	pound
LDEV	logical device
LW	long wavelength
m	meter
mA	milliampere
max.	maximum
MB	megabyte (see Convention for Storage Capacity Values)
mm	millimeter
ms	millisecond
NEMA	National Electrical Manufacturers Association
PB	petabyte (see Convention for Storage Capacity Values)
PDP	power distribution panel
PDU	power distribution unit
PS	power supply
sec.	second
SIM	service information message
SVP	service processor
SVPV	Service processor for Microsoft Vista applications
SW	switch, short wavelength
TB	terabyte (see Convention for Storage Capacity Values)
UPS	uninterruptible power supply
UPS VM	Hitachi Universal Storage Platform VM
VA	volt-ampere
VAC	volts AC
W	watt

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