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Hitachi Universal Storage Platform VM

Installation Planning Guide

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MK-97RD6679-00

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) Statement

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 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.

This document assumes the following:

- The user has a background in hardware installation for computer systems.
- The user is familiar with the location where the Universal Storage Platform VM will be installed, including knowledge of physical characteristics, power systems and specifications, environmental specifications.

Product Version

This document revision applies to Universal Storage Platform VM microcode 60-02-0*x* and higher.

Document Revision Level

Revision	Date	Description
MK-97RD6679-00	November 2007	Initial release, supersedes and replaces MK-97RD6079

Changes in this Revision

- Added information on the 750-GB hard disk drive (Table 2-2, Table 2-8).

Document Organization

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

Chapter	Description
Planning for Installation	Describes the responsibilities and tasks involved in installation planning for the Universal Storage Platform VM. Provides the Installation Planning Checklist for the Universal Storage Platform VM.
Installation Requirements	Provides the installation requirements for the Universal Storage Platform VM.
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 Documents

- *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).
	DANGER	Provides information about how to avoid physical injury to yourself and others.
	ELECTRIC SHOCK HAZARD!	Warns the user of electric shock hazard. Failure to take appropriate precautions (e.g., do not touch) could result in serious injury.
	ESD Sensitive	Warns the user that the hardware is sensitive to electrostatic discharge (ESD). Failure to take appropriate precautions (e.g., grounded wrist strap) could result in damage to the hardware.

Convention for Storage Capacity Values

Physical storage capacity values (e.g., disk drive capacity) are calculated based on the following values:

1 KB = 1,000 bytes
1 MB = $1,000^2$ bytes
1 GB = $1,000^3$ bytes
1 TB = $1,000^4$ bytes
1 PB = $1,000^5$ bytes

Logical storage capacity values (e.g., logical device capacity) are calculated based on the following values:

1 KB = 1,024 bytes
1 MB = $1,024^2$ bytes
1 GB = $1,024^3$ bytes
1 TB = $1,024^4$ bytes
1 PB = $1,024^5$ bytes
1 block = 512 bytes

Getting Help

If you need to call the Hitachi Data Systems Support Center, make sure to provide as much information about the problem as possible, including:

- The circumstances surrounding the error or failure.
- The exact content of any error message(s) displayed on the host system(s).
- The service information messages (SIMs), including reference codes and severity levels, displayed by Storage Navigator.

The Hitachi Data Systems customer support staff is available 24 hours a day, seven days a week. If you need technical support, please call:

- United States: (800) 446-0744
- Outside the United States: (858) 547-4526

Comments

Please send us your comments on this document. Make sure to include the document title, number, and revision. Please refer to specific section(s) and paragraph(s) whenever possible.

- **E-mail:** doc.comments@hds.com
- **Fax:** 858-695-1186
- **Mail:**
  Technical Writing, M/S 35-10
  Hitachi Data Systems
  10277 Scripps Ranch Blvd.
  San Diego, CA 92131

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

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 in this document.
- 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 (e.g., electrical connectors and receptacles).
- Observing all applicable safety requirements at all times.

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 smooth installation and configuration of the Universal Storage Platform VM.

Installation Planning Tasks

The customer is 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 *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 Checklist** 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 that the site is ready when the equipment arrives.
4. **Provide the customer-supplied hardware** that is required for installation and configuration (e.g., connectors, receptacles).
5. **Work with your Hitachi Data Systems account team** during the installation planning process for the Universal Storage Platform VM.

Installation Planning Checklist

Complete the checklist below (online or hardcopy) 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		
Is the data center equipped to protect equipment from fire?		
Is the data center free of hazards (e.g., cables that obstruct access)?		
Delivery		
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		
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		
Is the data center fully operational (e.g., power, air conditioning, cabling, fire protection system)?		
Does the data center have a tiled raised 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 operation of the USP VM?		
Is the customer-supplied hardware (e.g., connectors, receptacles, cables) ready for the installation?		
Physical		
Does the location meet the requirements for service clearance and cable routing (e.g., floor cutouts)?		
Does the location meet the requirements for floor load rating?		
Power		
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		
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		
Does the data center provide a LAN (or phone 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 the installation requirements for the Universal Storage Platform VM storage system.

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 (e.g., Maintenance Manual) contain complete specifications. The exact electrical power interfaces and requirements for each site must be determined and verified to meet the applicable local regulations.

Safety Requirements

The safety requirements for Universal Storage Platform VM installation are:

- **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 (e.g., cables on the floor that obstruct access).

Observe the following general safety requirements:

- **Cabling:**
  - Do not obstruct 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 (e.g., certified electrician) to perform tasks that may be hazardous to persons and/or equipment.

Delivery Requirements

The customer site must accommodate the delivery and movement of the equipment to the installation location in the data center.

The delivery requirements for Universal Storage Platform VM installation are:

- **Dimensions:** The loading bay, hallways, doors, elevators, and stairs must be large enough to allow the delivered equipment 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 Service Clearance, Floor Cutout, and Floor Load Rating for the dimensions of the USP VM product (uncrated and unpacked).

  See Dimensions and Weight for the dimensions of the USP VM components.

- **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 maximally configured storage system could reach 1600 or 1700 pounds (726 to 771 kilograms).

  See Dimensions and Weight for the weight specifications for the Universal Storage Platform VM components.

Storage Requirements

If the delivered equipment needs to 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 °F (°C)	5 (-25)	140 (60)
Relative Humidity (%) *4	5 – 95	
Max. Wet Bulb °F (°C)	84 (29)	
Temperature Deviation °F/hour (°C/hour)	36 (20)	

* For storage, the equipment should be packed with factory packing.

Facilities Requirements

The customer site must meet the following facilities requirements:

- **General:** The data center must be fully operational (e.g., power, air conditioning, cabling, fire protection system).
- **Floor:** The data center must have a tiled 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 operation of the Universal Storage Platform VM.
- **Customer-supplied hardware:** The customer-supplied hardware (e.g., connectors, receptacles) must be available and ready for installation of the Universal Storage Platform VM.

Physical Specifications and Requirements

Figure 2-1 shows a physical overview of the Universal Storage Platform VM. The physical specifications and requirements for the USP VM include:

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

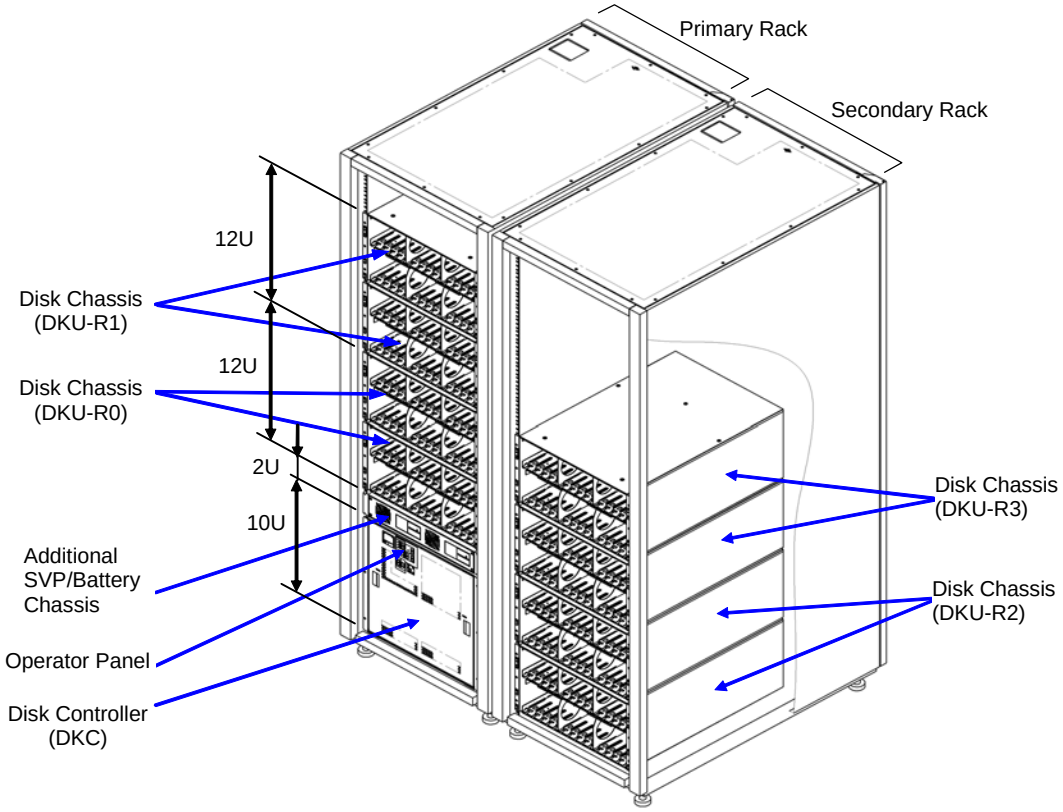


Figure 2-1 Physical Overview of the Universal Storage Platform VM

Dimensions and Weight

Figure 2-2 shows the dimensions of the single-rack configuration. Figure 2-3 shows the dimensions of the twin-rack configuration. Table 2-2 lists the dimension and weight specifications for the Universal Storage Platform VM components.

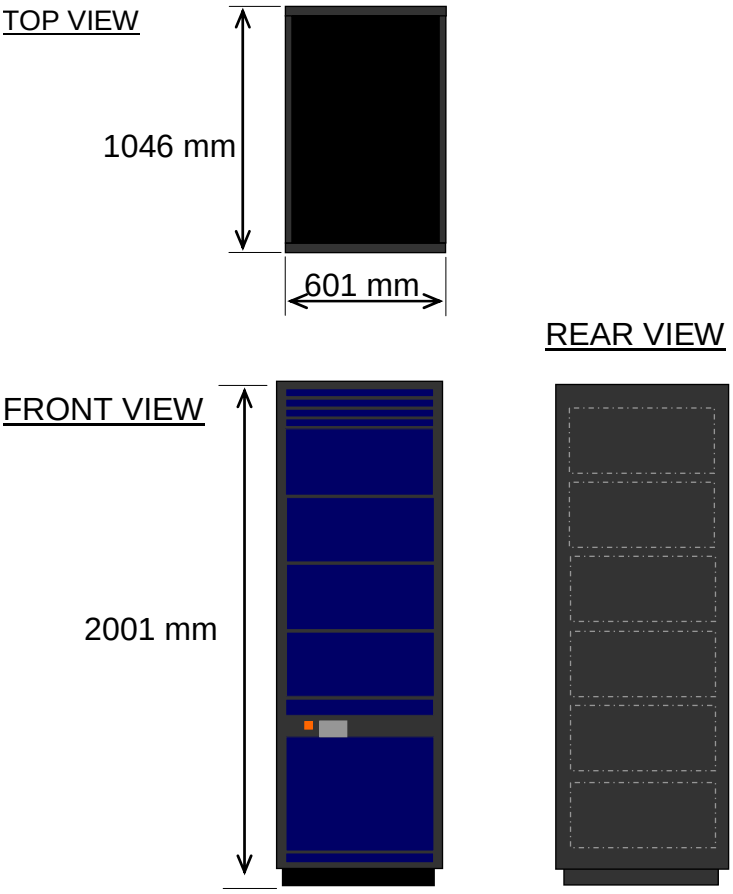


Figure 2-2 Physical Dimensions: Single-Rack Configuration

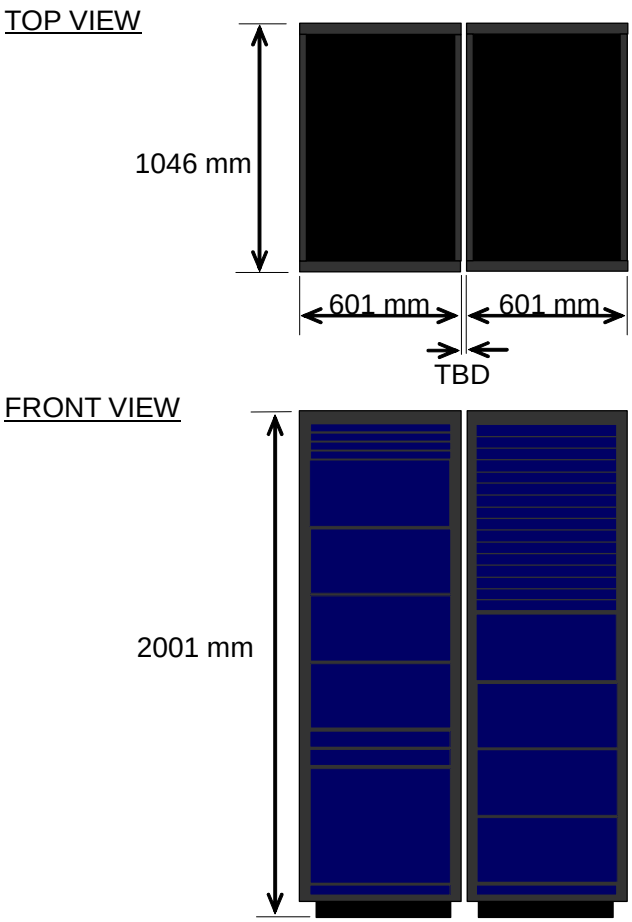


Figure 2-3 Physical Dimensions: Twin-Rack Configuration

Table 2-2 Component Specifications: Weight and Dimension

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-S4GQ	0.08	—	—	—
DKC-F615I-DKA	2.6	—	—	—
DKC-F615I-CX	2.2	—	—	—
DKC-F615I-C4G	0.08	—	—	—
DKC-F615I-C8G	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-F615I-1FL	0.02	—	—	—
DKC-F615I-1FS	0.02	—	—	—
DKC-F615I-SVP	4.1	—	—	—
DKC-F615I-MDM	0.07	—	—	—
DKC-F615I-72KS	0.9	—	—	—
DKC-F615I-146KS	0.9	—	—	—
DKC-F605I-300KS	0.9	—	—	—
DKC-F605I-0R7HS	0.9	—	—	—

Service Clearance, Floor Cutout, and Floor Load Rating

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

- Figure 2-4 shows the service clearance and floor cutout requirements for the single-rack configuration. Table 2-3 shows the floor load rating and clearance requirements for this configuration.
- Figure 2-5 shows the service clearance and floor cutout requirements for the twin-rack configuration. Table 2-4 shows the floor load rating and clearance requirements for this configuration.

Notes:

- 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 could vary depending on the building conditions.

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

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

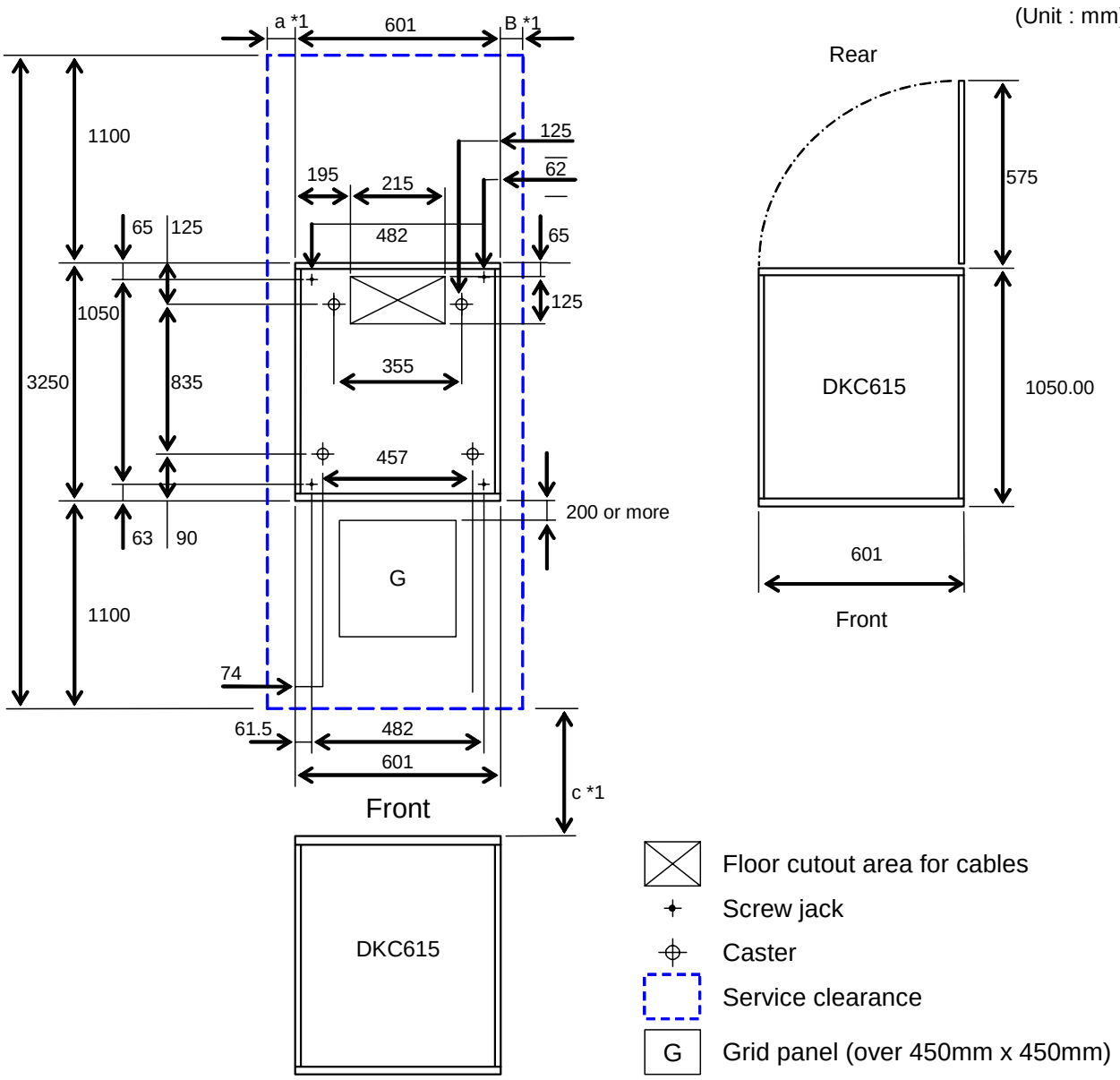


Figure 2-4 Service Clearance and Floor Cutouts: Single Rack

Notes:

1. Clearance (a+b) depends on the floor load rating and clearance (c). See Table 2-3 for floor load rating and clearance requirements.

   Leave clearance of 100 mm on both sides of the storage system when the stabilizer plate(s) are to be attached after the storage system is installed. When storage systems of the same type are to be installed adjacent to each other, the minimum clearance between the storage systems is 100 mm.
2. Dimensions in parentheses show allowable range of the floor cutout dimensions. Position the floor cutout in the center of the storage system. The position may be off-center if the cutout allows smooth entrance of an external cable. Check the relation between the positions of the cutout and the opening on the bottom plate of the storage rack, and verify that it is within the allowable range.
3. This dimension varies depending on the floor cutout dimensions.

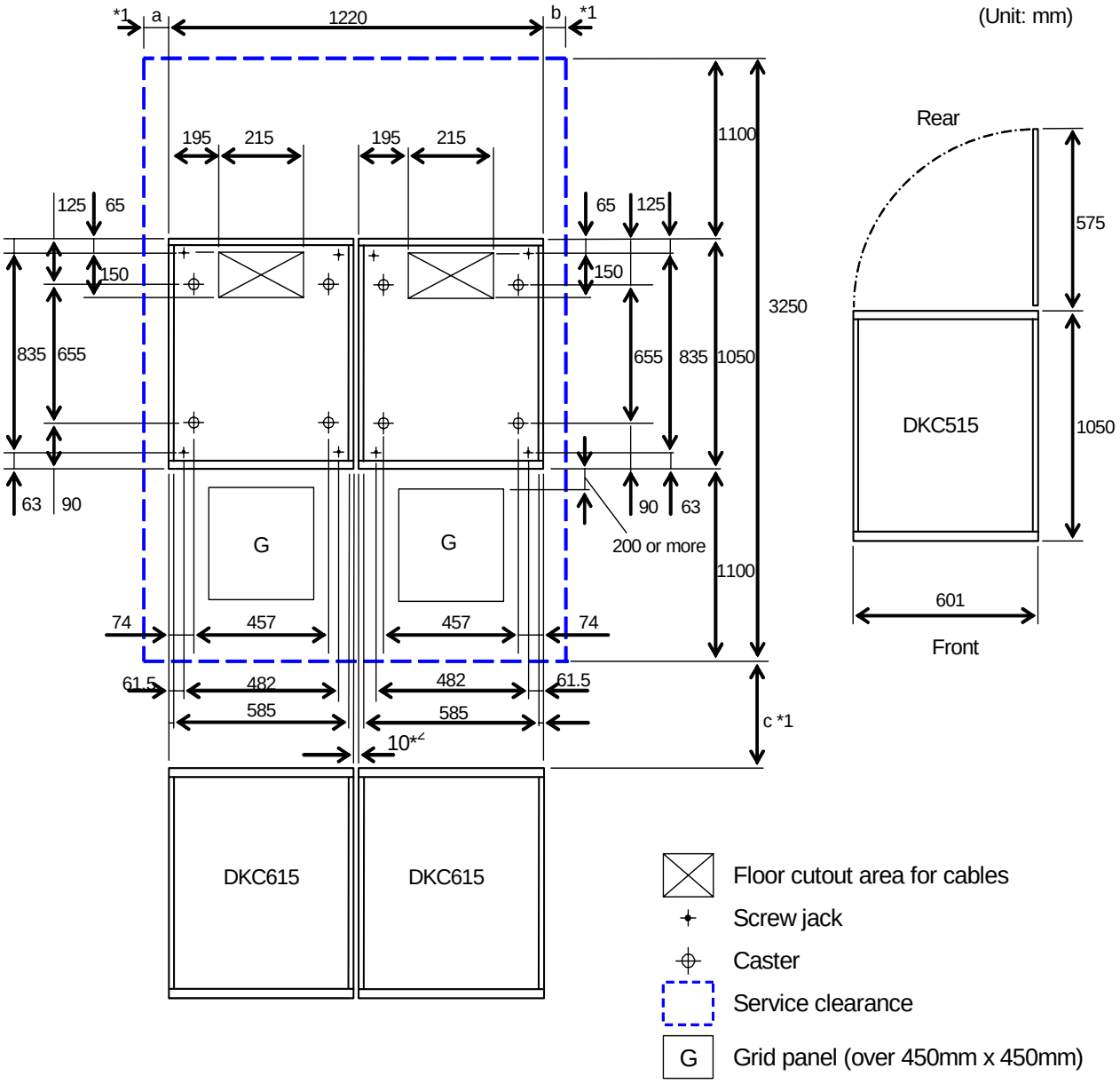


Figure 2-5 Service Clearance and Floor Cutouts: Two Racks

Notes:

1. Clearance (a+b) depends on the floor load rating and clearance (c). See Table 2-4 for floor load rating and clearance requirements.

   Allow clearance of 100 mm on both sides of the storage system when the stabilizer plate(s) are to be attached after the storage system is installed. The stabilizer plates have dimensions (H x W x D) of 74 mm x 500 mm x 220 mm or 2.9 inches x 19.6 inches x 8.6 inches.

   When storage systems of the same type are to be installed adjacent to each other, the minimum clearance between the storage systems is 100 mm.

2. When installing a second rack, be sure to leave a 10-mm space.

Power Specifications and Requirements

This section describes the power specifications and requirements for the Universal Storage Platform VM storage system:

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

Power Specifications and Power Supplies

Table 2-5 lists the power specifications for the Universal Storage Platform VM, including inrush current, leakage current, input current, and steady current. Figure 2-6 shows the locations of the power supplies.

Table 2-5 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

Notes:

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

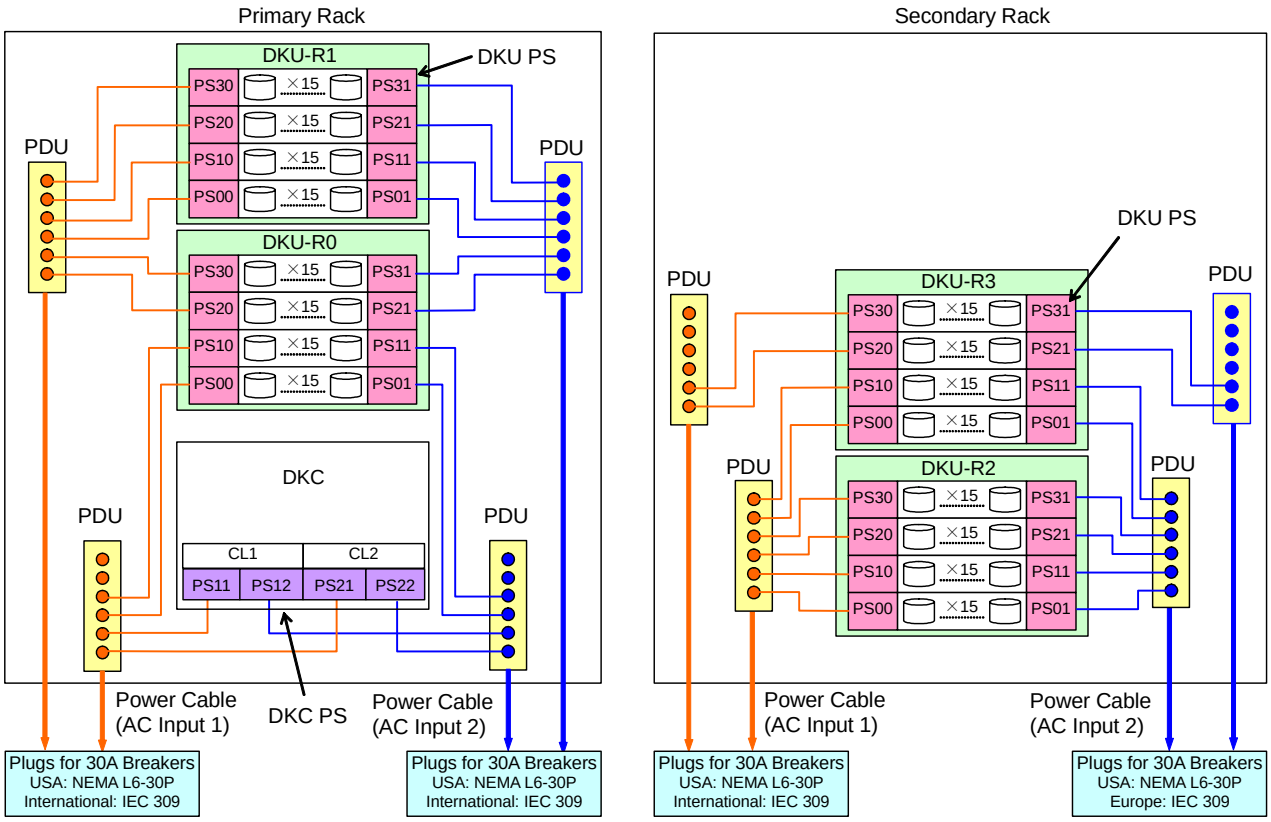
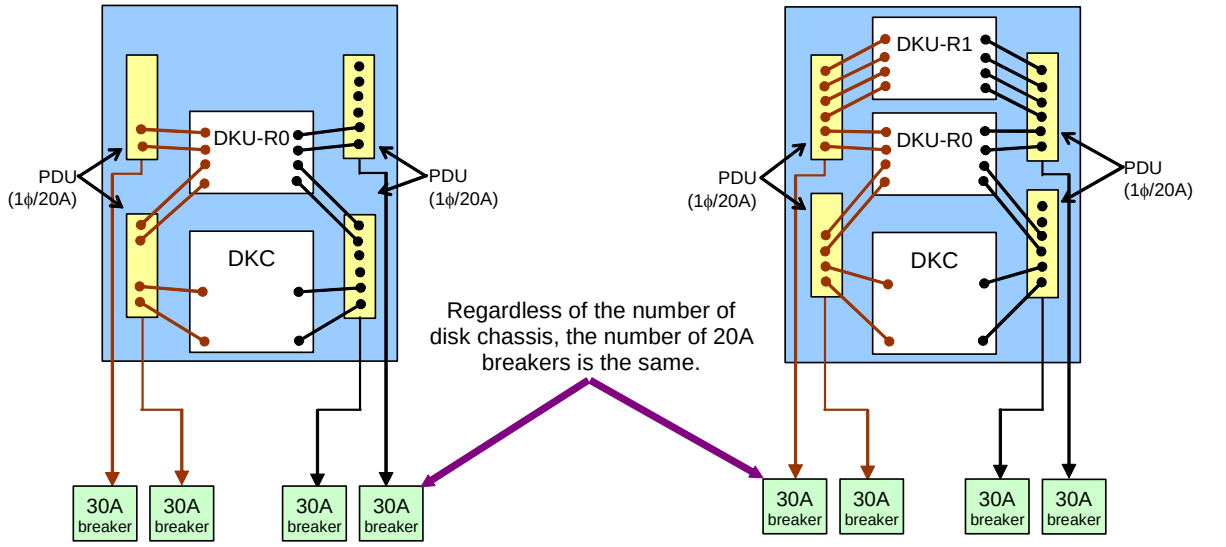


Figure 2-6 Power Supply Locations

Breaker Configurations

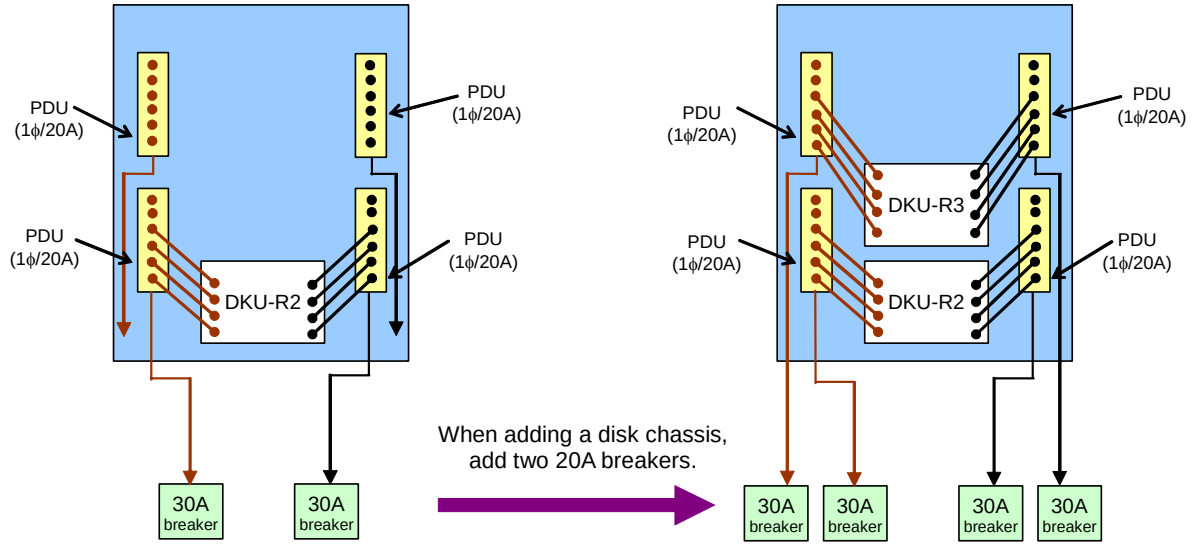
For both racks, AC power is supplied to each power distribution unit (PDU) from the breaker. Figure 2-7 and Figure 2-8 show the breaker configurations for the primary and secondary racks, respectively.



Configuration with one disk chassis (DKC-F615I-B2) installed

Configuration with two disk chassis (DKC-F615I-B2) installed

Figure 2-7 Breaker Configurations for the Primary Rack



Configuration with one disk chassis (DKC-F615I-B2) installed

Configuration with two disk chassis (DKC-F615I-B2) installed

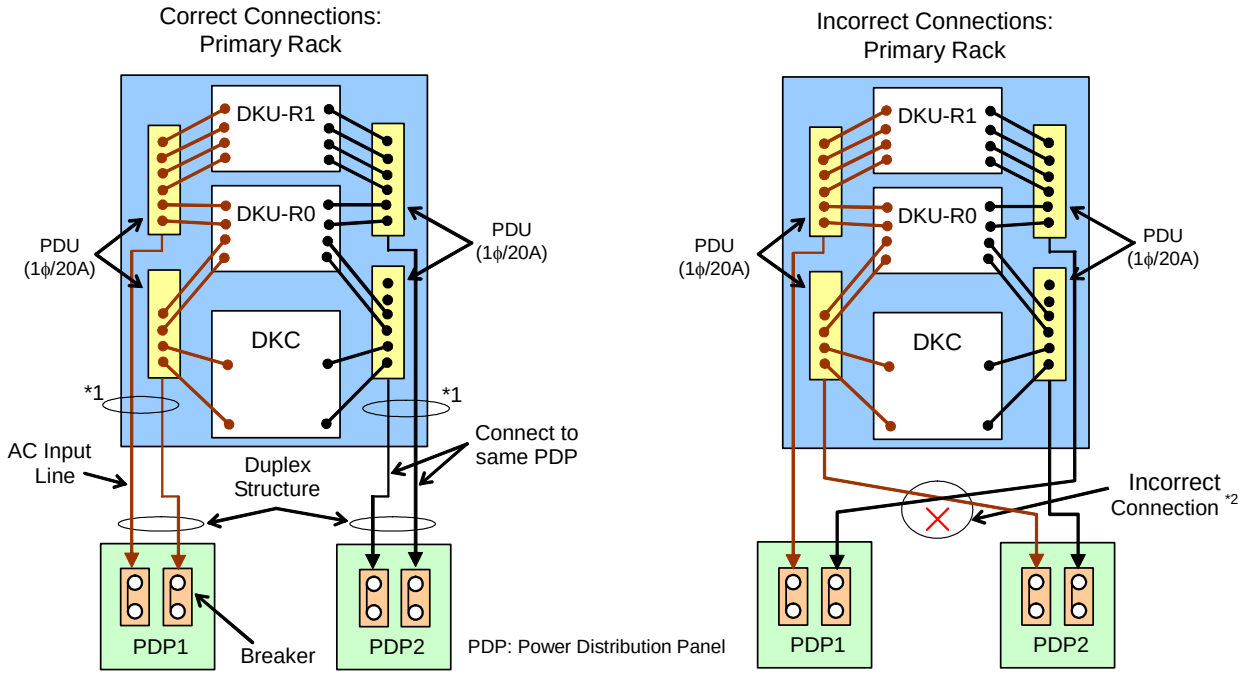
Figure 2-8 Breaker Configurations for the Secondary Rack

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 in the event that power is removed from one of the two power distribution panels (PDPs).

- **Direct connection to power.** Figure 2-9 shows the power connections when the AC input lines are connected directly to the power facility.
- **Power connection through UPS.** Figure 2-10 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.

Caution: When installing the USP VM, be sure to connect the AC cables between the PDUs and PDPs correctly. If these cables are connected incorrectly, a system failure will occur when one of the AC inputs is interrupted. Figure 2-9 illustrates the correct connections (drawing on the left) and the incorrect connections (drawing on the right).



*1: When connected correctly, two of the four PDUs can supply power to the entire rack.

*2: If connected incorrectly, the two PDUs cannot supply power to the entire rack, which causes a system failure.

Figure 2-9 Direct Power Connection

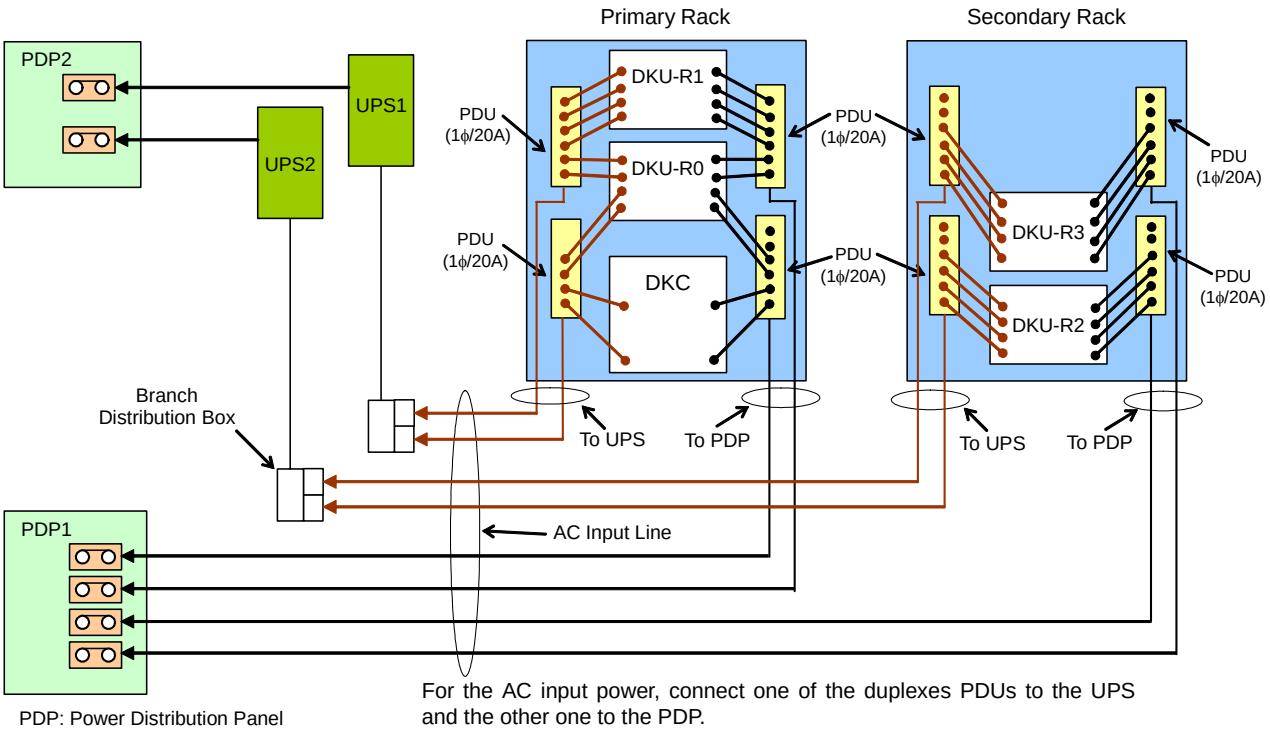


Figure 2-10 Power Connection through UPS

Input Voltage and Input Frequency

Table 2-6 lists the input voltage and input frequency requirements for the Universal Storage Platform VM.

Table 2-6 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, which are 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, which are rated as 32A and 250V and have two 16A circuit breakers with 20A trip values.

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

Table 2-1 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 2-7 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				—	

Notes:

1. The requirements for operating condition should be satisfied before the storage system is powered on. Maximum temperature of 90°F (32°C) should be strictly satisfied at air inlet portion.
2. Non-operating condition includes both packing and unpacking conditions unless otherwise specified.
3. For shipping/storage, the product should be packed with factory packing.
4. No condensation in or around the drive should be observed under any conditions.

Heat Output, Power Consumption, and Air Flow

Table 2-8 lists the power consumption and heat output specifications and the air flow requirements for the Universal Storage Platform VM. These data generally apply to both 60-Hz and 50-Hz storage systems. The Universal Storage Platform VM requires less power and puts out less heat than the Hitachi TagmaStore® Network Storage Controller, so the air flow requirements are decreased.

Table 2-8 Component Specifications: Heat Output, Power Consumption, and Air Flow

Model Number	Heat Output (kW)	Power Consumption (kVA)	Air Flow (m^3/min)
DKC615I-5	0.0291	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	—
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-CX	0.005	0.005	—
DKC-F615I-C4G	0.015	0.015	—
DKC-F615I-C8G	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-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-F605I-0R7HS	0.018	0.019	—

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 2-9 lists the vibration and shock tolerance data for the Universal Storage Platform VM. The USP VM can be subjected to vibration and shock up to these limits and still perform normally. The user should consider these requirements if installing the storage system near 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 affect the storage system.

Table 2-9 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 RJ-11 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 2-10 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 2-10 FED Cable Length Requirements

Cable	Maximum Cable Length (Data Transfer Rate)
ESCON	3 km
FICON Short Wave	
50/125-µm multimode	500 m (100 MB/s), 300 m (200 MB/s), 150 m (400 MB/s)
62.5/125-µm multimode	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	500 m (100 MB/s), 300 m (200 MB/s), 150 m (400 MB/s)
62.5/125-µm multimode	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) × 0.555556	Degrees Celsius (°C)
Degrees Celsius (°C)	First multiply, then add 32: °F = (°C × 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 and 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
SW	switch, short wavelength
TB	terabyte (see Convention for Storage Capacity Values)
UPS	uninterruptible power supply
USP VM	Hitachi Universal Storage Platform VM
VA	volt-ampere
VAC	volts AC
W	watt

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