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Hitachi Universal Storage Platform V
Installation Planning Guide

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MK-97RD6668-07

Contents

Preface

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

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

This preface includes the following information:

Notice: The use of the Hitachi Universal Storage Platform V 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 V.

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 V 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 V microcode 60-06-1*x* and higher.

Document Revision Level

Revision	Date	Description
MK-97RD6668-00	November 2007	Initial release
MK-97RD6668-01	May 2008	Revision 1, supersedes and replaces MK-97RD6668-00
MK-97RD6668-02	August 2008	Revision 2, supersedes and replaces MK-97RD6668-01
MK-97RD6668-03	November 2008	Revision 3, supersedes and replaces MK-97RD6668-02
MK-97RD6668-04	February 2009	Revision 4, supersedes and replaces MK-97RD6668-03
MK-97RD6668-05	July 2009	Revision 5, supersedes and replaces MK-97RD6668-04
MK-97RD6668-06	November 2009	Revision 6, supersedes and replaces MK-97RD6668-05
MK-97RD6668-07	February 2010	Revision 7, supersedes and replaces MK-97RD6668-06

Source Document(s) for this Revision

Exhibit M1, DKC610I Disk Subsystem, Hardware Specifications, revision 17

Changes in this Revision

Added the specifications for the following item:

- 2-TB SATA HDD (DKC-F6101-2R0HS)

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
Chapter 1, Planning for Installation	Describes the responsibilities and tasks involved in installation planning for the Universal Storage Platform V. Also, provides the Installation Planning Checklist for the Universal Storage Platform V.
Chapter 2, Installation Requirements	Provides the installation requirements for the Universal Storage Platform V.

Chapter	Description
Appendix A, Units and Unit Conversions	Provides conversions for standard (U.S.) and metric units of measure associated with the Universal Storage Platform V.
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 V" refers to all models of the Universal Storage Platform V 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 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 KB or $1{,}024^2$ bytes
1 GB = 1,024 MB or $1{,}024^3$ bytes
1 TB = 1,024 GB or $1{,}024^4$ bytes
1 PB = 1,024 TB or $1{,}024^5$ 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 messages displayed on the host systems.
- The exact content of any error messages displayed by Storage Navigator.
- The Storage Navigator configuration information (use the FD Dump Tool).
- 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: 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 Corporation.)

1

Planning for Installation

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

- 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 V.

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 customer-supplied hardware required for storage system installation (for example, electrical connectors and receptacles, rack)
- 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 a successful installation and configuration of the Universal Storage Platform V

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 V storage system:

1. **Read this document** carefully to understand the installation requirements for the Universal Storage Platform V. 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 V storage system.
3. **Complete the** Installation Planning Checklist on page 1-3 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).
5. **Work with your Hitachi Data Systems account team** during the installation planning process for the Universal Storage Platform V.

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 V 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 V.

Definition of terms:

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

Equipment: The hardware delivered to the customer site that includes the Universal Storage Platform V 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 V 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 on page 2-2		
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 on page 2-2		
Is the receiving area adequate for equipment delivery and unloading?		
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 on page 2-3		
If the equipment will be stored after delivery and prior to installation, does the storage location meet the environmental requirements for the USP V?		
Facilities Requirements on page 2-4		
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 V?		
Is the customer-supplied hardware (for example, connectors, receptacles, cables) ready for the installation?		
Physical Specifications and Requirements on page 2-5		
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 on page 2-20		
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?		
Power Specifications and Requirements on page 2-20		
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 on page 2-30		
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 V?		

2

Installation Requirements

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

- Safety Requirements
- Delivery Requirements
- Storage Requirements
- Facilities Requirements
- Physical Specifications and Requirements
- Electrical Specifications and Requirements: Three-Phase
- Electrical Specifications and Requirements: Single-Phase
- 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 V 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.

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.

There are three shipping crate options: Simple Pack, Full Pack and Wood Crated. Their dimensions are (height x width x length):

Simple Pack: 73 x 29 x 37 inches or 185 x 73 x 68 centimeters

Full Pack: 82 x 36 x 43 inches or 109 x 95 x 111 centimeters

Wood Crated: 83 x 39 x 46 inches or 211 x 99 x 117 centimeters

See Dimensions and Weight on page 2-5 for the dimensions of the USP V components.

See Service Clearance, Floor Cutout, and Floor Load Rating on page 2-10 for dimensions of the USP V product (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. A single USP V Disk Controller (DKC) can weigh up to a maximum of approximately 1670 lbs., and a Disk Unit (DKU) can weigh up to approximately 1660 lbs.

Packaging adds the following amounts to each shipped unit:

Simple Pack: 25 lbs. (11.4 kg)

Full Pack: 150 lbs. (68.1 kg)

Wood Crated: 250 lbs. (113.4 kg)

Consult your Bill of Materials to establish the anticipated summary weights for these deliveries.

See Dimensions and Weight on page 2-5 for the weight specifications for the Universal Storage Platform V components.

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 V (See Table 2-1).

Table 2-1: Environmental Specifications for Storage

Parameter	Shipping & Storage[1]	
	Low	High
Temperature	5°F (–25°C)	140°F (60°C)
Relative Humidity[2]	5 – 95%	
Max. Wet Bulb	84°F (29°C)	
Temperature Deviation	36°F/hour (20°C/hour)	

1. For storage, pack the equipment using the factory packing.
2. No condensation in or around the drive should be observed under any conditions.

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 tile 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 V.
- **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 V.

Physical Specifications and Requirements

Figure 2-1 shows a physical overview of the Universal Storage Platform V (maximum configuration shown). The physical specifications and requirements for the Universal Storage Platform V include:

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

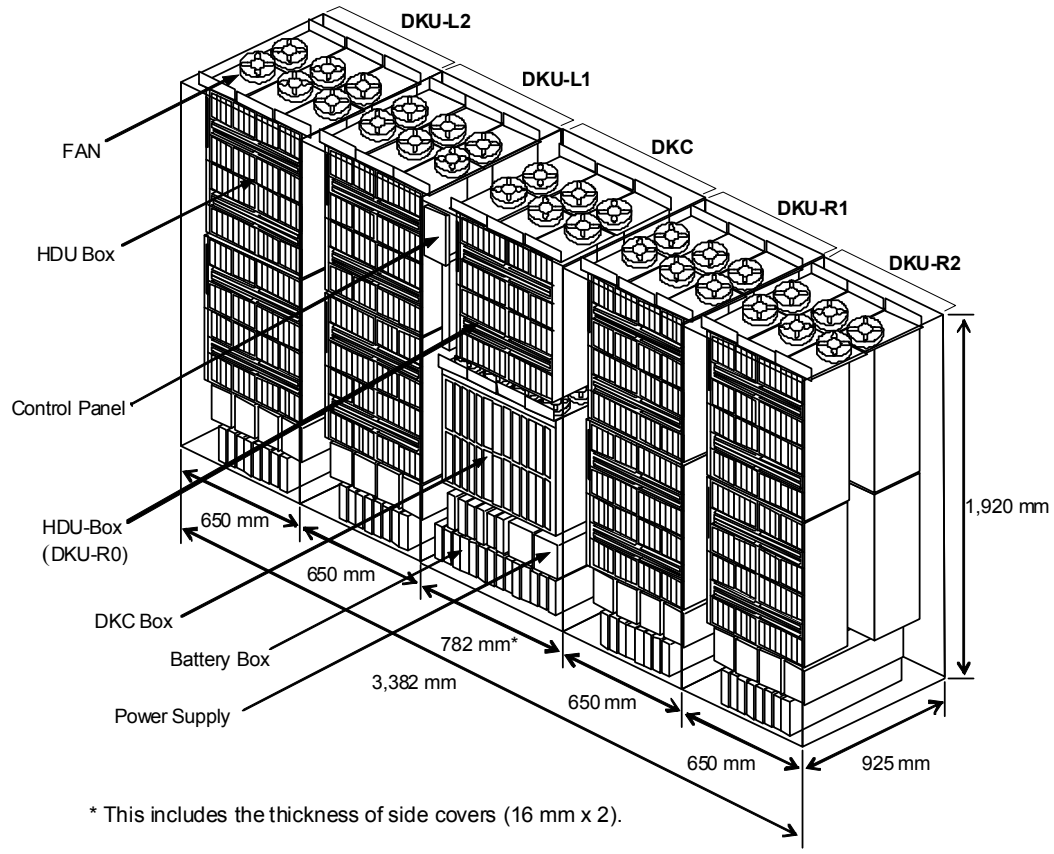


Figure 2-1: Physical Overview of the Universal Storage Platform V

Dimensions and Weight

This section provides the dimension and weight specifications for the Universal Storage Platform V frames and components:

Figure 2-2 shows the dimensions of the disk controller (DKC) frame. Figure 2-3 on page 2-6 shows the dimensions of the disk unit (DKU) frame. Figure 2-4 on page 2-7 shows the dimensions of the five frame USP V model. Table 2-2 on page 2-8 lists the dimension and weight specifications for the DKC-F610I (disk controller frame) components. Figure 2-3 on page 2-9 lists the dimension and weight specifications for the DKC-F605I (disk unit frame) components.

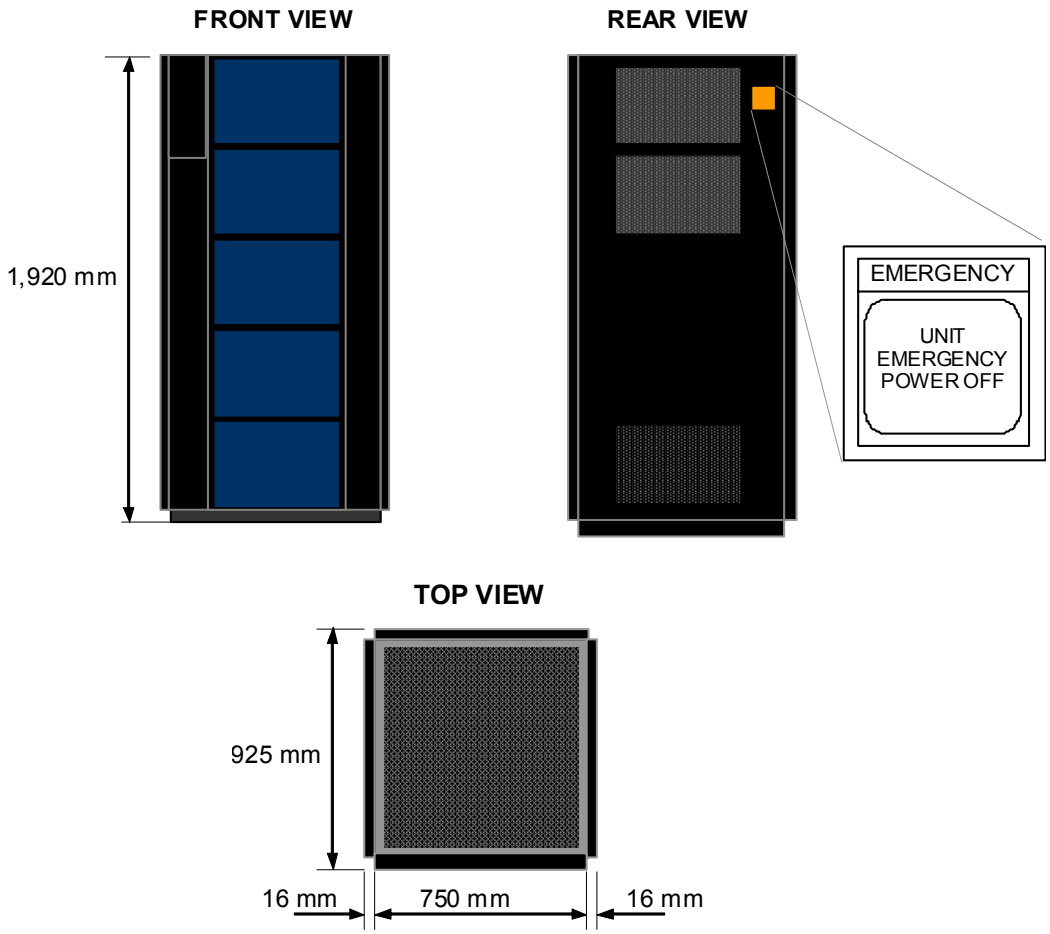


Figure 2-2: Physical Dimensions: Disk Controller Frame

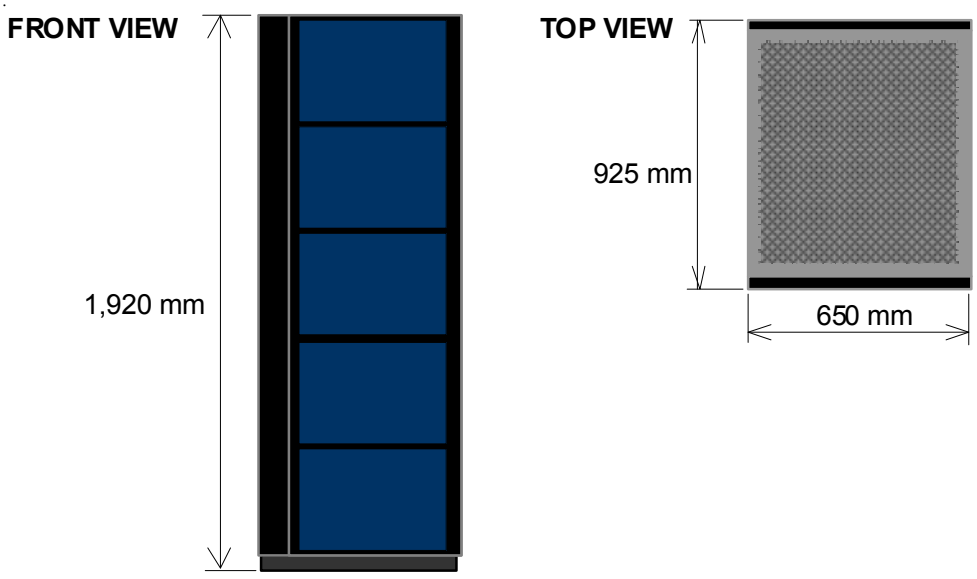
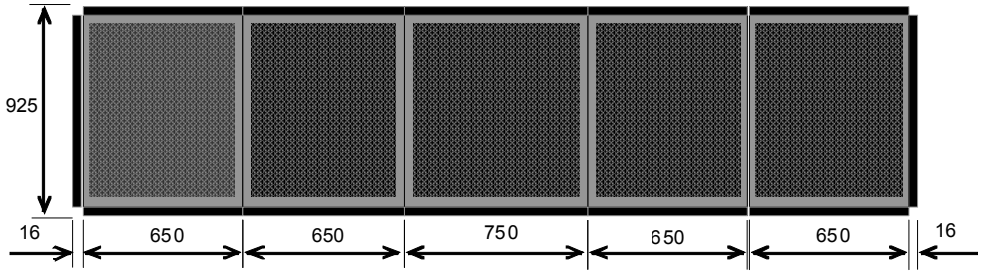


Figure 2-3: Physical Dimensions: Disk Unit Frame

TOP VIEW (Unit: mm)



FRONT VIEW

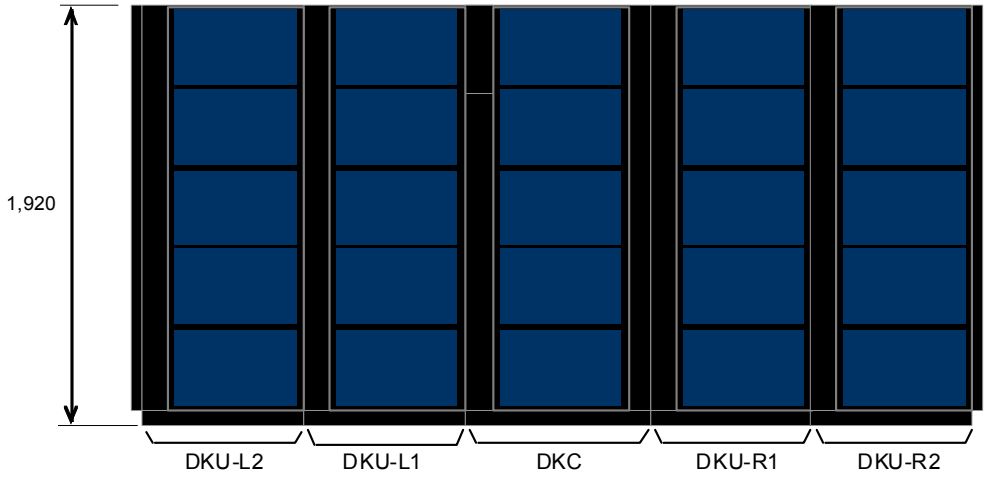


Figure 2-4: Physical Dimensions: Five Frames (1 DKC, 4 DKUs)

Table 2-2: DKC610I-5 Component Specifications: Weight and Dimension

Model Number	Model Name	Weight (kg)	Dimension (mm)		
			Width	Depth	Height
DKC-610I-5	Disk Controller Frame	386.0	782*	925	1,920
DKC-F610I-DH	DKC Door Kit (HDS)	90	—	—	—
DKC-F6101-DS	DKC Door Kit (Sun)	90	—	—	—
DKC-F610I-3PS	AC Box Kit (3-phase 30A)	4.3	—	—	—
DKC-F610I-3EC	Power Cable Kit (3-phase 30A for Europe)	2.8	—	—	—
DKC-F610I-3UC	Power Cable Kit (3-phase 30A for USA)	4.9	—	—	—
DKC-F6105I-1PS	AC Box Kit (1-phase 50A)	4.0	—	—	—
DKC-F610I-1EC	Power Cable Kit (1-phase 50A for Europe)	2.8	—	—	—
DKC-F610I-1UC	Power Cable Kit (1-phase 50A for USA)	4.7	—	—	—
DKC-F610I-1PSD	AC Box Kit (1-phase 30A)	4.3	—	—	—
DKC-F610I-1ECD	Power Cable Kit (1-phase 30A for Europe)	2.8	—	—	—
DKC-F610I-1UCD	Power Cable Kit (1-phase 30A for USA)	4.7	—	—	—
DKC-F610I-APC	Additional Power Supply	12	—	—	—
DKC-F610I-AB	Additional Battery	14	—	—	—
DKC-F610I-ABX	Additional Battery	36	—	—	—
DKC-F610I-CX	Cache Memory Adapter	2.2	—	—	—
DKC-F610I-C4G	Cache Memory Module (4GB)	0.08	—	—	—
DKC-F610I-C8G	Cache Memory Module (8GB)	0.08	—	—	—
DKC-F610I-C16G	Cache Memory Module (16GB)	0.08	—	—	—
DKC-F610I-SX	Shared Memory Adapter	1.2	—	—	—
DKC-F610I-S2GQ	Shared Memory Module (2GB)	0.08	—	—	—
DKC-F610I-S4GQ	Shared Memory Module (4GB)	0.08	—	—	—
DKC-F610I-S8GQ	Shared Memory Module (8GB)	0.08	—	—	—
DKC-F610I-CSW	Data Path Expansion Kit	1.8	—	—	—
DKC-F610I-CBEX	Memory Back up Expansion KIT (12V)	0.12	—	—	—
DKC-F610I-DBEX	Memory Back up Expansion KIT (56V)	0.12	—	—	—
DKC-F610I-IPV6	IPV6 Upgrade Kit	—	—	—	—
DKC-F610I-DKA	Disk Adapter	2.6	—	—	—
DKC-F610I-EDKA	Encrypting Disk Adapter	2.6	—	—	—
DKC-F610I-SVP	SVP High Reliability Support Kit	4.1	—	—	—
DKC-F610I-SVPV	SVP High Reliability Support Kit (IPV6)	4.1	—	—	—
DKC-F610I-PCI	Power Control Interface Kit	0.3	—	—	—
DKC-F610I-R1DC	Device Interface Cable	4.4	—	—	—
DKC-F610I-R1UC	Device Interface Cable	5.7	—	—	—
DKC-F610I-L1DC	Device Interface Cable	4.3	—	—	—
DKC-F610I-L1UC	Device Interface Cable	5.8	—	—	—
DKC-F610I-MDM	Modem Card Kit	0.07	—	—	—

Table 2-2: DKC610I-5 Component Specifications: Weight and Dimension

Model Number	Model Name	Weight (kg)	Dimension (mm)		
			Width	Depth	Height
DKC-F610I-8S	Serial 8-port Adapter	2.7	—	—	—
DKC-F610I-8MFS	Mainframe Fibre 8 port Adapter (Short Wavelength 1-4Gbps)	3.0	—	—	—
DKC-F610I-8MFL	Mainframe Fibre 8 port Adapter (Long Wavelength 1-4Gbps)	3.0	—	—	—
DKC-F610I-8FS	Fibre 8-port Adapter (1-4Gbps)	2.8	—	—	—
DKC-F610I-8US	Fibre 8-port Adapter (2-8Gbps)	3.0	—	—	—
DKC-F610I-16FS	Fibre 16-port Adapter (1-4Gbps)	3.0	—	—	—
DKC-F610I-1FL	Fibre SFP Transceiver (Long Wavelength 4G)	0.02	—	—	—
DKC-F610I-1UL	Fibre SFP Transceiver (Long Wavelength 8G)	0.02	—	—	—
DKC-F610I-1FS	Fibre SFP Transceiver (Short Wavelength 4G)	0.02	—	—	—
DKC-F610I-1US	Fibre SFP Transceiver (Short Wavelength 8G)	0.02	—	—	—

* This includes the thickness of side covers (16mm × 2).

Table 2-3: DKC-605I Component Specifications: Weight and Dimensions

Model Number	Model Name	Weight (kg)	Dimension (mm)		
			Width	Depth	Height
DKC-F605I-18	Disk Array Frame	324	650	925	1,920
DKC-F605I-DH	DKU Door Kit (HDS)	40	—	—	—
DKC-F605I-DS	DKU Door Kit (Sun)	40	—	—	—
DKC-F605I-AKT	DKU Expansion Kit	37.7	—	—	—
DKC-F605I-EXC	Device Interface Cable (DKU - DKU)	2.8	—	—	—
DKC-F605I-72KS	1 HDD Canister (72G/15k/4G-FC)	0.9	—	—	—
DKC-F605I-146KS	1 HDD Canister (146G/15k/4G-FC)	0.9	—	—	—
DKC-F605I-300JS	1 HDD Canister (300G/15k/2G-FC)	0.9	—	—	—
DKC-F605I-300KS	1 HDD Canister (300G/15k/4G-FC)	0.9	—	—	—
DKC-F605I-300KM	1 HDD Canister (300G/15k/4G-FC)	0.9	—	—	—
DKC-F605I-0R7HS	1 HDD Canister (750G/7.2k/4G-FC)	0.9	—	—	—
DKC-F605I-400JS	1 HDD Canister (400G/10k/4G-FC)	0.9	—	—	—
DKC-F605I-1R0HS	1 HDD Canister (1T/7.2k/4G-FC)	0.9	—	—	—
DKC-F6051-2R0HS	1 HDD Canister (2T/7.2k/4G-FC)	0.9	—	—	—
DKC-F605I-450KS	1 HDD Canister (450G/15k/4G-FC)	0.9	—	—	—
DKC-F605I-600KS	1 HDD Canister (600G/15k/4G-FC)	0.9	—	—	—
DKC-F605I-72S1	1 Flash drive Canister (146G/4G-FC)	0.5	—	—	—
DKC-F605I-146S1	1 Flash drive Canister (72G/4G-FC)	0.5	—	—	—
DKC-F605I-200S1	1 SSD Canister (200G/4G-FC)	0.5	—	—	—
DKC-F605I-400S1	1 SSD Canister (400G/4G-FC)	0.5	—	—	—

Service Clearance, Floor Cutout, and Floor Load Rating

This section specifies the service clearance and floor cutout requirements for the five configurations of the Universal Storage Platform V storage system.

One-Frame Configuration: Figure 2-5 on page 2-11 shows the service clearance and floor cutout requirements for the single frame configuration. Table 2-4 on page 2-11 shows the floor load rating and clearance requirements for this configuration.

Two-Frame Configuration: Figure 2-6 on page 2-12 shows the service clearance and floor cutout requirements for the two-frame configuration. Table 2-5 on page 2-12 shows the floor load rating and clearance requirements for this configuration.

Three-Frame Configuration: Figure 2-7 on page 2-13 shows the service clearance and floor cutout requirements for the three-frame configuration. Table 2-6 on page 2-13 shows the floor load rating and clearance requirements for this configuration.

Four-Frame Configuration: Figure 2-8 on page 2-14 shows the service clearance and floor cutout requirements for the four-frame configuration. Table 2-7 on page 2-14 shows the floor load rating and clearance requirements for this configuration.

Five-Frame Configuration: Figure 2-9 on page 2-15 shows the service clearance and floor cutout requirements for the five-frame configuration. Table 2-8 on page 2-15 shows the floor load rating and clearance requirements for this configuration.

One-Frame Configuration

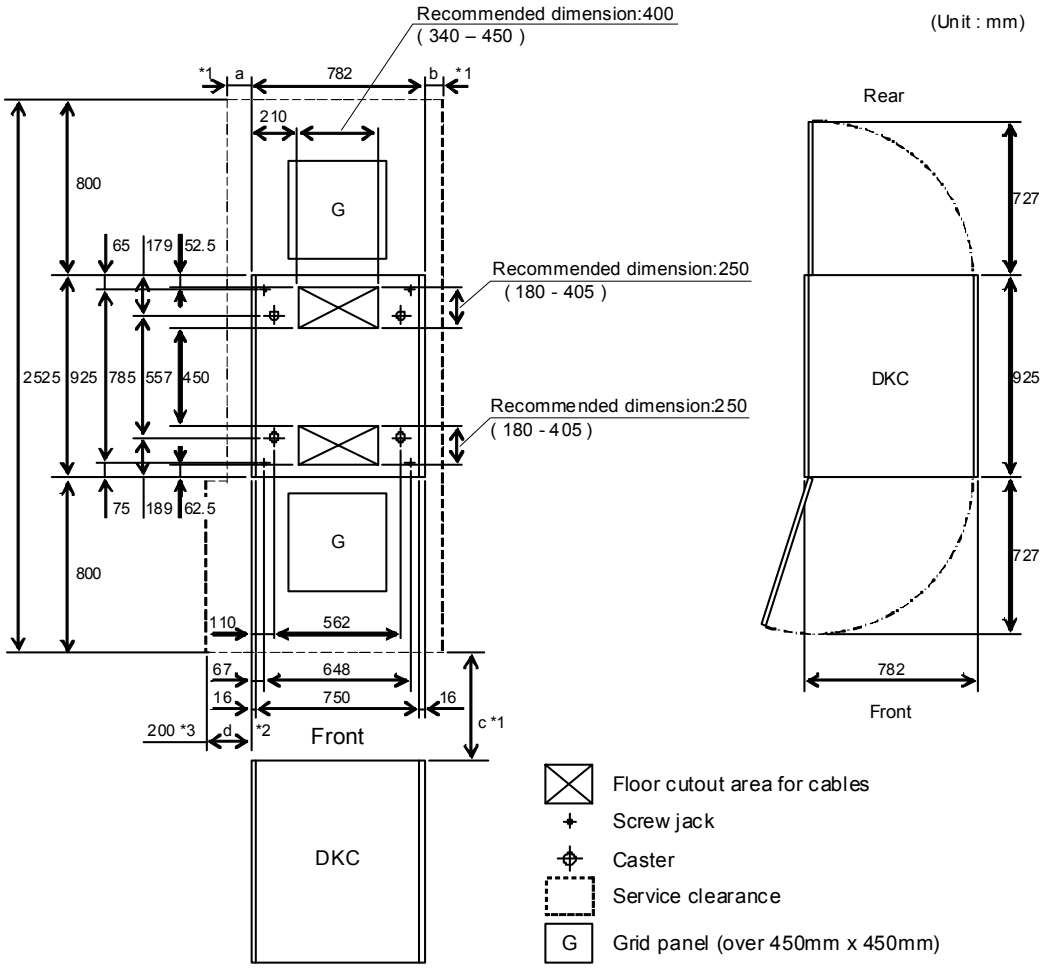


Figure 2-5: Service Clearance and Floor Cutouts: Single Frame

Table 2-4: Floor Load Rating and Clearances: Single Frame

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)	0.4	0.3	0.2	0.1	0.0
450 (92.2)	0.5	0.4	0.3	0.2	0.1
400 (81.9)	0.8	0.6	0.5	0.4	0.2
350 (71.7)	1.1	0.9	0.8	0.6	0.4
300 (61.4)	1.7	1.4	1.2	1.1	0.8

Two-Frame Configuration

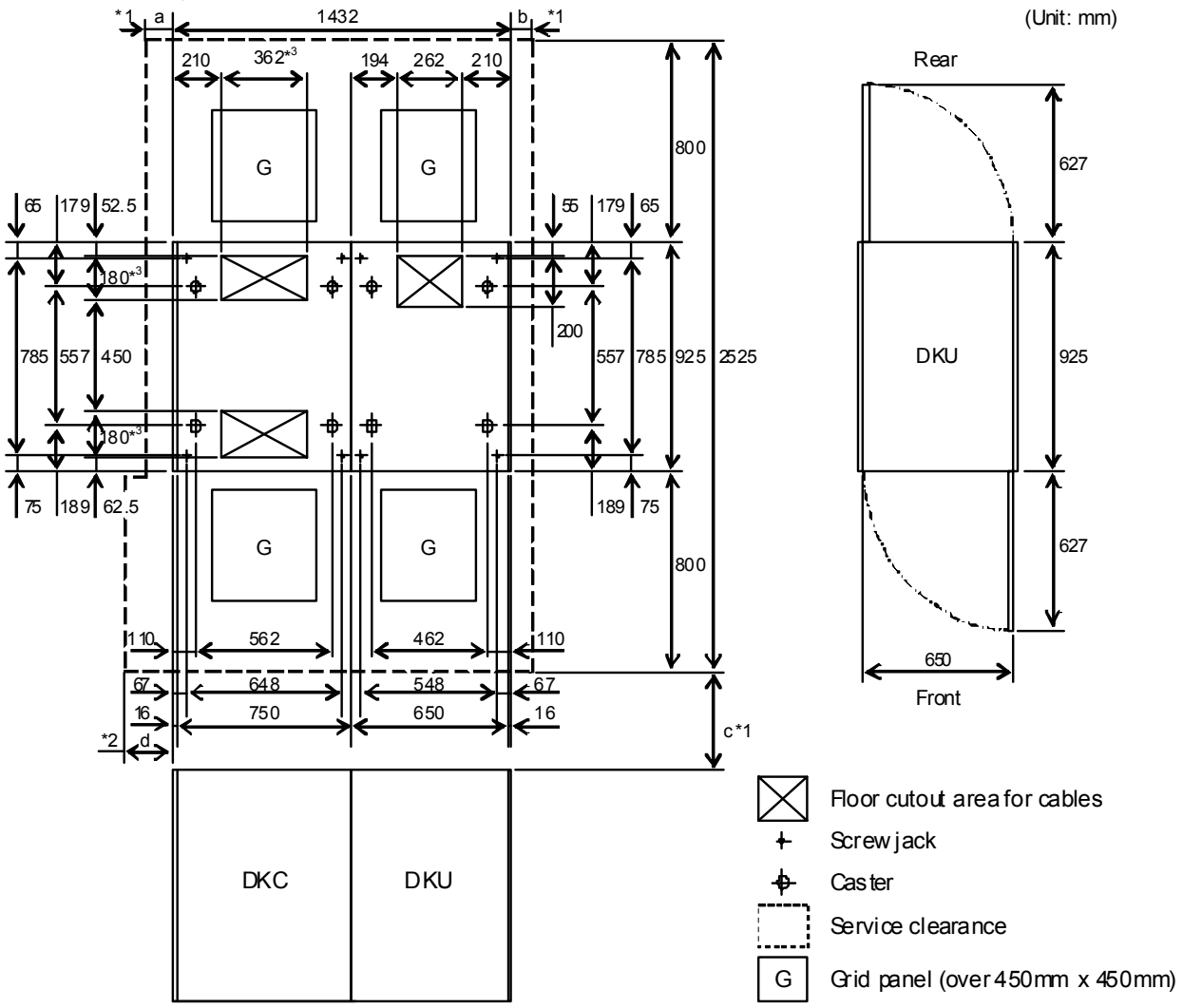


Figure 2-6: Service Clearance and Floor Cutouts: Two Frames

Table 2-5: Floor Load Rating and Clearances: Two Frames

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)	0.8	0.6	0.4	0.2	0.0
450 (92.2)	1.1	0.9	0.6	0.5	0.2
400 (81.9)	1.6	1.3	1.0	0.8	0.5
350 (71.7)	2.3	1.9	1.6	1.3	0.9
300 (61.4)	3.3	2.8	2.4	2.1	1.6

Three-Frame Configuration

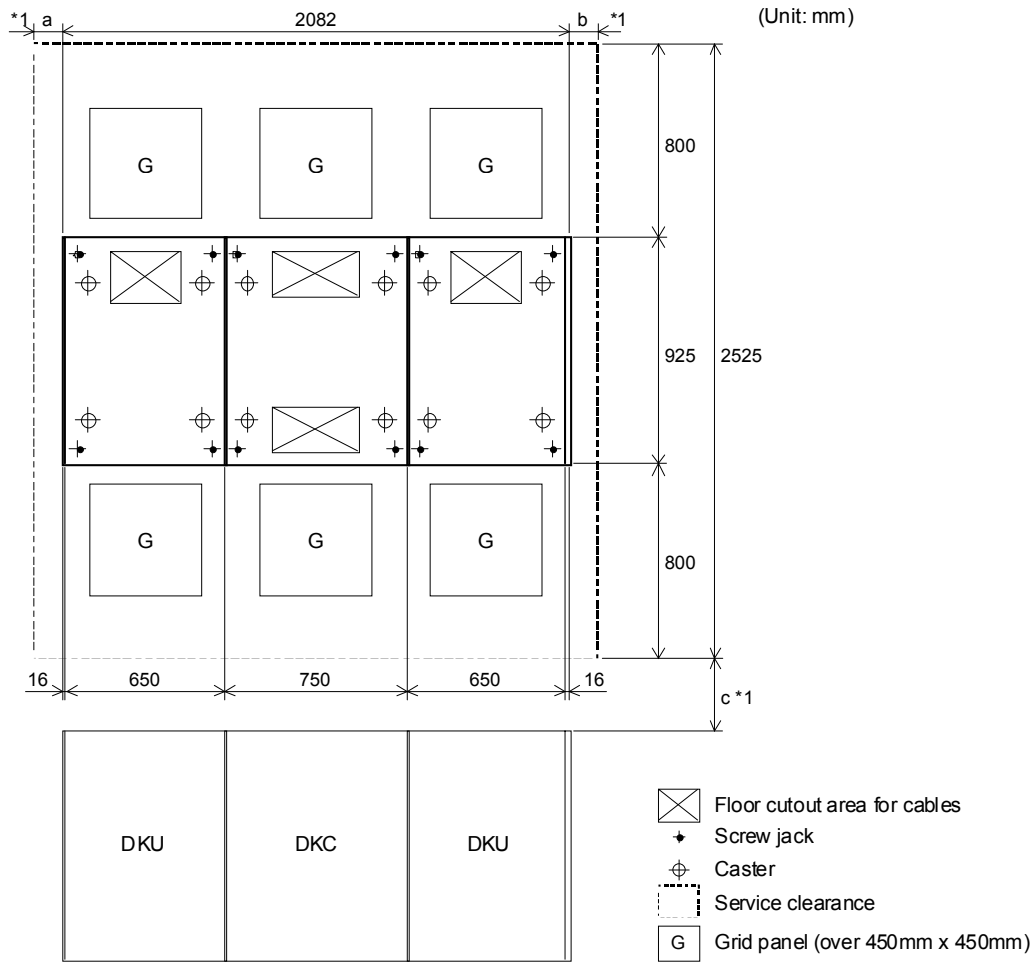


Figure 2-7: Service Clearance and Floor Cutouts: Three Frames

Table 2-6: Floor Load Rating and Clearances: Three Frames

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)	1.2	0.9	0.6	0.3	0.0
450 (92.2)	1.7	1.3	1.0	0.7	0.3
400 (81.9)	2.4	1.9	1.5	1.2	0.7
350 (71.7)	3.4	2.8	2.3	2.0	1.4
300 (61.4)	4.9	4.2	3.6	3.1	2.4

Four-Frame Configuration

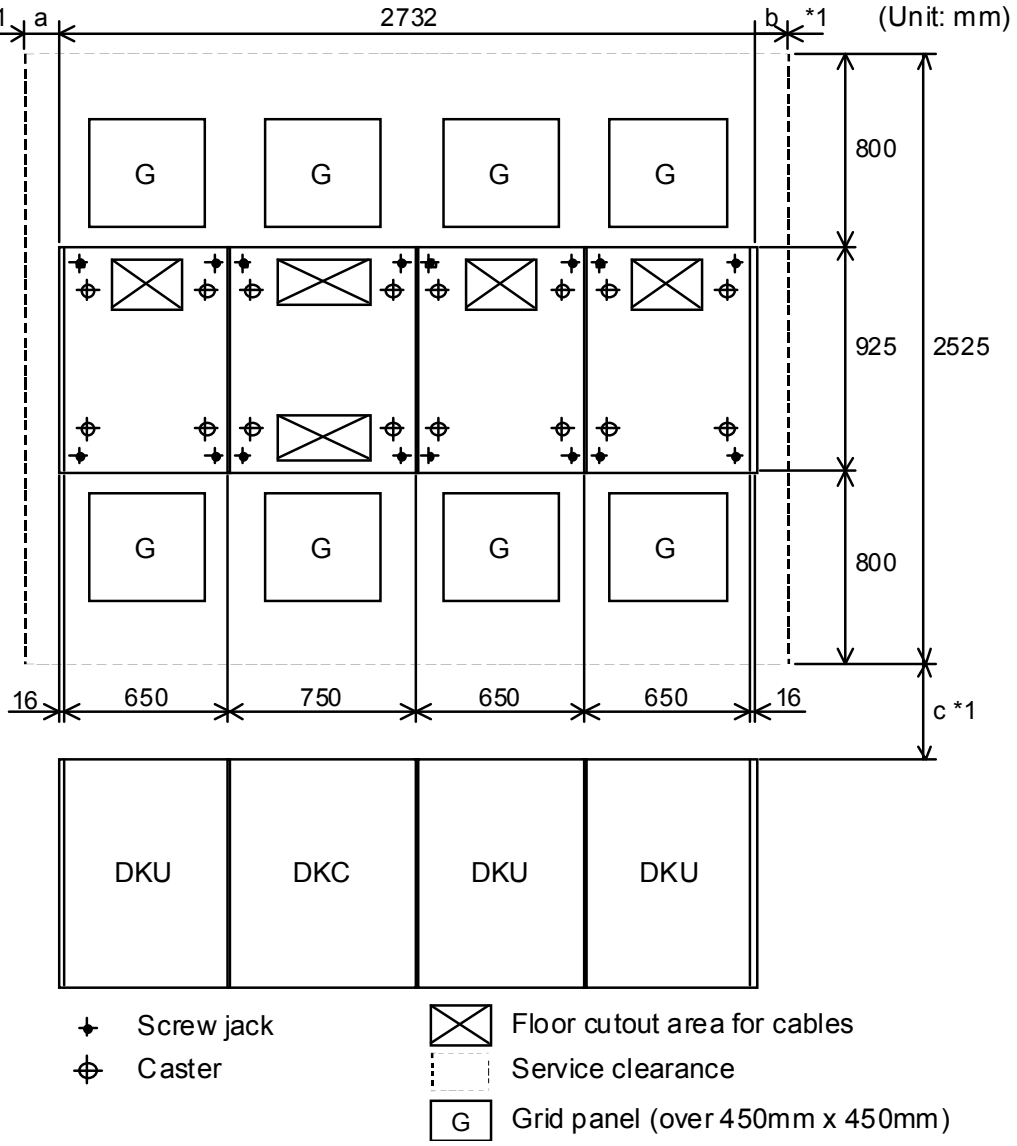


Figure 2-8: Service Clearance and Floor Cutouts: Four Frames

Table 2-7: Floor Load Rating and Clearances: Four Frames

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)	1.6	1.2	0.8	0.5	0.0
450 (92.2)	2.3	1.8	1.3	1.0	0.4
400 (81.9)	3.2	2.6	2.1	1.7	1.0
350 (71.7)	4.5	3.8	3.1	2.6	1.8
300 (61.4)	6.5	5.6	4.8	4.2	3.1

Five-Frame Configuration

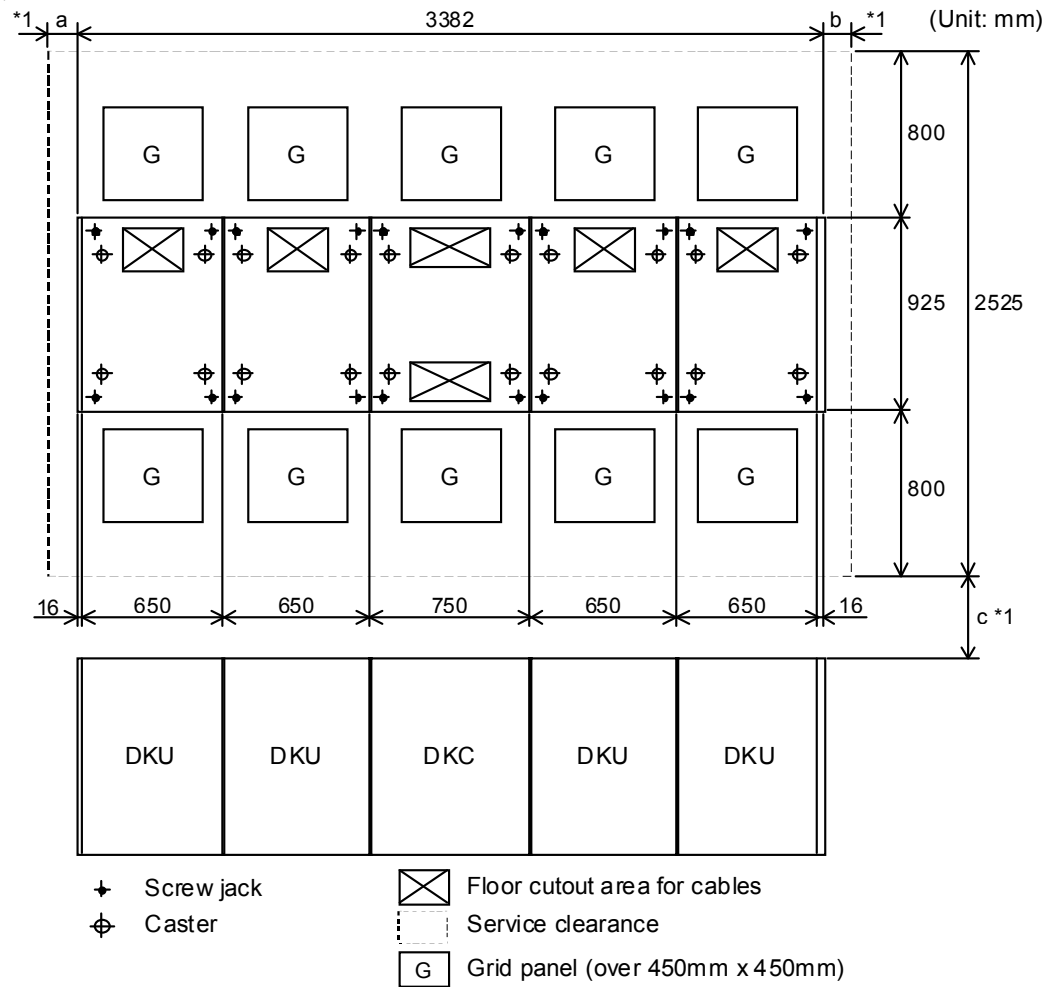


Figure 2-9: Service Clearance and Floor Cutouts: Five Frames

Table 2-8: Floor Load Rating and Clearances: Five Frames

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)	2.0	1.5	1.0	0.6	0.0
450 (92.2)	2.8	2.2	1.7	1.2	0.6
400 (81.9)	4.0	3.2	2.6	2.1	1.3
350 (71.7)	5.6	4.7	3.9	3.3	2.3
300 (61.4)	8.2	7.0	6.0	5.2	3.9

Electrical Specifications and Requirements: Three-Phase

The Universal Storage Platform V supports three-phase and single-phase power. This section provides electrical specifications and requirements for three-phase storage systems. The three-phase model supports 30A power.

- Current Specifications for Three-Phase
- Power Cables and Connectors for Three-Phase
- Input Voltage Tolerances for Three-Phase

Current Specifications for Three-Phase

Table 2-9 lists the current specifications for the three phase Universal Storage Platform V storage system.

Table 2-9: Current Specifications: Three-Phase

Frame	Inrush Current			Leakage Current	Steady Current
	1st (0-p)	2nd (0-p)	1st (0-p) Time (-25%)		
DKC-610I-5	30A	24A	40ms	3.1mA	13.0A (200V) 6.9A (380V)
DKC-F605I-18	40A	36A	80ms	2.8mA	10.4A (200V) 5.5A (380V)

Power Cables and Connectors for Three-Phase

Table 2-10 lists the power cables and connectors for the three phase Universal Storage Platform V storage system. The user must supply all power receptacles and connectors for the storage system. Thomas & Betts (T&B) type connectors (or Hubbell or Leviton) are recommended for 60-Hz systems.

For information on power connection specifications for locations outside the U.S., contact the Hitachi Data Systems Support Center for the specific country.

NOTE: Each Universal Storage Platform V disk unit frame requires two power connections for power redundancy. It is strongly recommended that the second power source be supplied from a separate power boundary to eliminate source power as a possible single (nonredundant) point of failure.

Table 2-10: Power Cables and Customer Supplied Connectors: 3-Phase

Item	DKC610I-5	DKC-F605I-18
Circuit Breaker	30A	30A
Number of Plug	2	2
AC Box Kit	DKC-F610I-3PS	DKC-F610I-3PS

Table 2-10: Power Cables and Customer Supplied Connectors: 3-Phase

Item	DKC610I-5	DKC-F605I-18
AC Power Cable-50Hz: Europe	DKC-F610I-3EC	DKC-F610I-3EC
AC Power Cable-60Hz: USA	DKC-F610I-3UC	DKC-F610I-3UC
PCI cable	Additionally ordered (channel to disk controller)	–
Host Interface cable	Additionally ordered (channel to disk controller)	–

Input Voltage Tolerances for Three-Phase

Table 2-11 lists the input voltage tolerances for the three-phase USP V storage system. Transient voltage conditions must not exceed +15-18% of nominal and must return to a steady-state tolerance within of +6 to –8% of the normal related voltage in 0.5 seconds or less. Line-to-line imbalance voltage must not exceed 2.5%. Non-operating harmonic contents must not exceed 5%.

Table 2-11: Input Voltage Specifications: Three-Phase

Frequency	Input Voltages (AC)	Wiring	Tolerance	Remarks
60 Hz ± 2Hz	200V, 208V, 230V	3-phase, 3 wire + ground	+6% or –8%	North America 200V
50 Hz ± 3Hz	200V, 220V, 230V, 240V	3-phase, 3 wire + ground	+6% or –8%	Europe 200V
50 Hz ± 3Hz	380V, 400V, 415V	3-phase, 4 wire + ground	+6% or –8%	Europe

NOTE: These specifications apply to the power supplied to the USP V storage system, not to the storage system's internal power system.

Electrical Specifications and Requirements: Single-Phase

The Universal Storage Platform V supports three-phase and single-phase power. This section provides electrical specifications and requirements for single-phase storage systems. The single-phase model supports 50A power.

- Current Specifications for Single-Phase
- Power Cables and Connectors for Single-Phase
- Input Voltage Tolerances for Single-Phase

Current Specifications for Single-Phase

Table 2-12 lists the current specifications for the single-phase Universal Storage Platform V storage system.

Table 2-12: Current Specifications: Single-Phase

Frame	Input Current	Inrush Current			Leakage Current	Steady Current
		1st (0-p)	2nd (0-p)	1st (0-p) Time (-25%)		
DKC-610I-5	50A	50A	40A	80ms	2.8mA	22.6A
DKC-F605I-18	50A	80A	70A	100ms	2.5mA	18.0A

Power Cables and Connectors for Single-Phase

Table 2-13 lists the power cables and connectors for the single-phase Universal Storage Platform V storage system. The user must supply all power receptacles and connectors for the storage system. Thomas & Betts (T&B) type connectors (or Hubbell or Leviton) are recommended for 60-Hz systems.

For information on power connection specifications outside the U.S., contact the Hitachi Data Systems Support Center for the specific country.

NOTE: Each Universal Storage Platform V disk unit frame requires two power connections for power redundancy. It is strongly recommended that the second power source be supplied from a separate power boundary to eliminate source power as a possible single (nonredundant) point of failure.

Table 2-13: Power Cables and Customer Supplied Connectors: Single-Phase

Item	DKC610I-5		DKC-F605I-18	
Circuit Breaker	30A	50A	30A	50A
Number of Plugs	2 / 4	2	2 / 4	2
AC Box Kit	DKC-F610I-1PSD	DKC-F610I-1PS	DKC-F610I-1PSD	DKC-F610I-1PS
AC Power Cable 50Hz for Europe	DKC-F610I-ECD	DKC-F610I-1EC	DKC-F610I-1ECD	DKC-F610I-1EC
AC Power Cable 60Hz for USA	DKC-F610I-1UCD	DKC-F610I-1UC	DKC-F610I-1UCD	DKC-F610I-1UC
PCI Cable	Additionally ordered (channel to disk controller		Ò	
Host Interface cable	Additionally ordered (channel to disk controller		Ò	

NOTE: When two sets of DKC-F610I-APC (Additional Power Supply) are installed in DKC, the power must be supplied through 4 power plugs per DKC frame. When the DKC-F605I-ATK (DKU Expansion Kit) is installed in DKU, the power must be supplied through 4 power plugs per DKU frame. In this case, two sets of the AC power cable options are required.

Input Voltage Tolerances for Single-Phase

Table 2-14 lists the input voltage tolerances for the single-phase USP V storage system. Transient voltage conditions must not exceed +15-18% of nominal and must return to a steady-state tolerance between +6 and –8% of the normal related voltage in 0.5 seconds or less. Line to line imbalance voltage must not exceed 2.5%. Non-operating harmonic contents must not exceed 5%.

Table 2-14: Input Voltage Specifications: Single-Phase

Frequency	Input Voltages (AC)	Wiring	Tolerance	Remarks
60Hz ± 2Hz	200V, 208V, 230V	Single-phase, 2 wire + ground	+6% or –8%	North America 200V
50Hz ± 3Hz	200V, 220V, 230V, 240V	Single-phase, 2 wire + ground	+6% or –8%	Europe 200V

NOTE: These specifications apply to the power supplied to the USP V storage system, not to the storage system's internal power system.

Power Specifications and Requirements

This section provides the power specifications and requirements for the Universal Storage Platform V storage system:

- Power Connection
- Breaker Configurations
- Circuit Breakers and Plugs
- AC Power Cables

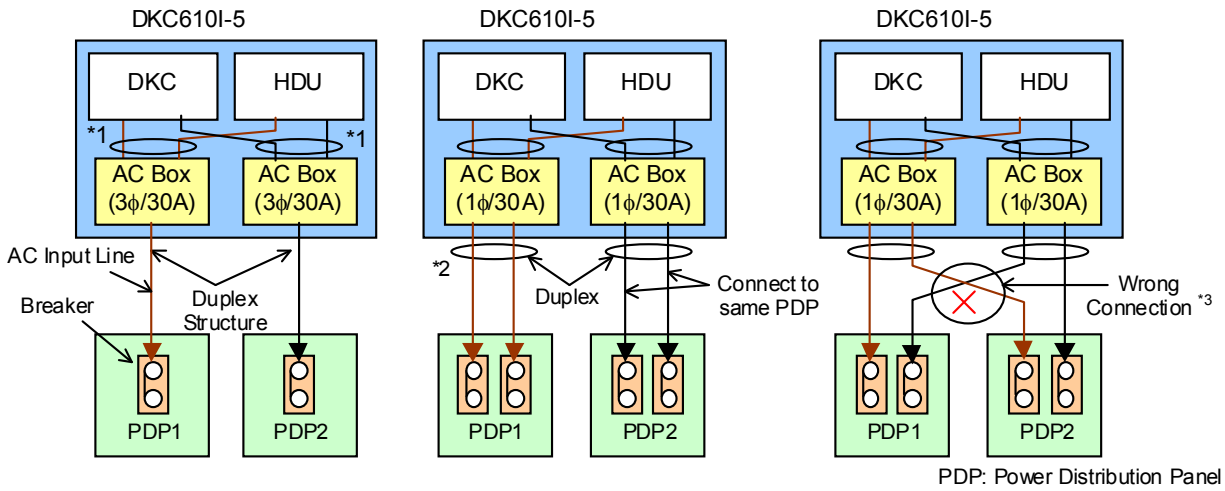
Power Connection

The AC power input to the Universal Storage Platform V has a duplex structure per AC box.

- **Direct connection to power.** Figure 2-10 shows the power connections for direct connection to the power facility.
- **Power connection through UPS.** Figure 2-11 shows the power connections for connection to an uninterruptible power supply (UPS).

CAUTION! When the storage system is being installed, be careful about the AC cable connection that connects the AC box and the power distribution panel (PDP). If the connection of the AC cable is not correct (see Figure 2-10), a system failure will occur when only one of the AC inputs fails.

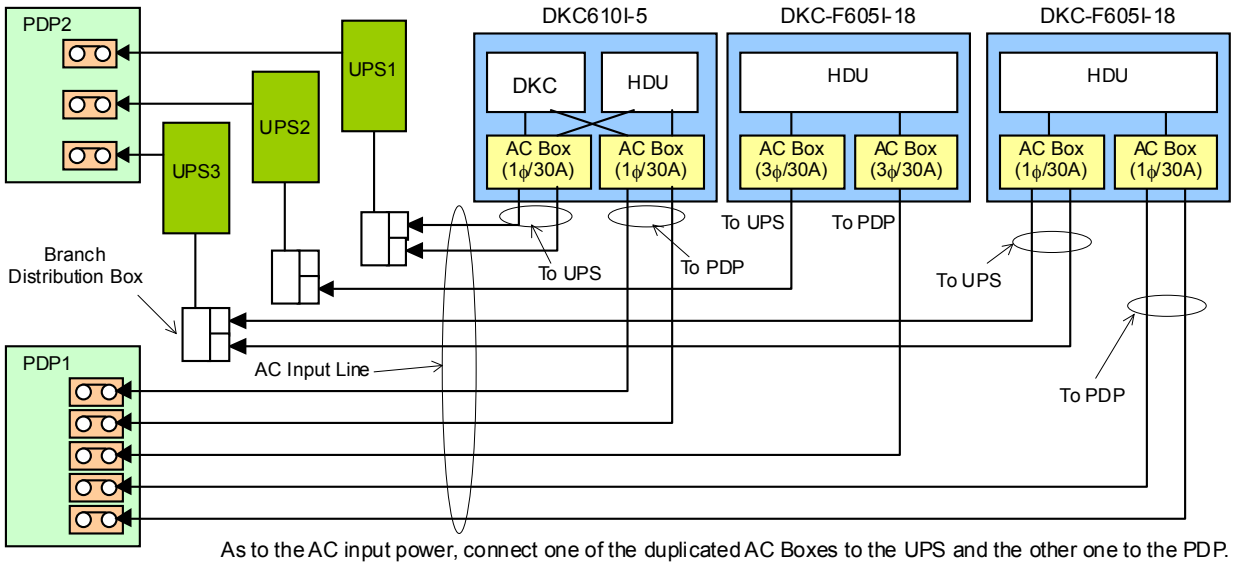
When AC input line is connected to direct Power Facility



*1: The output of one AC box supplies electric power to the whole DKC610I-5.
*2: Since two AC input lines to which electric power is supplied in one AC Box are not redundant, two AC input lines need to supply electric power.
*3: When PDP1 breaks, since the output of one AC box cannot supply the whole DKC610I-5, it causes a system failure.

Figure 2-10: Direct Power Connection

When AC input line is connected to UPS



As to the AC input power, connect one of the duplicated AC Boxes to the UPS and the other one to the PDP.

PDP: Power Distribution Panel

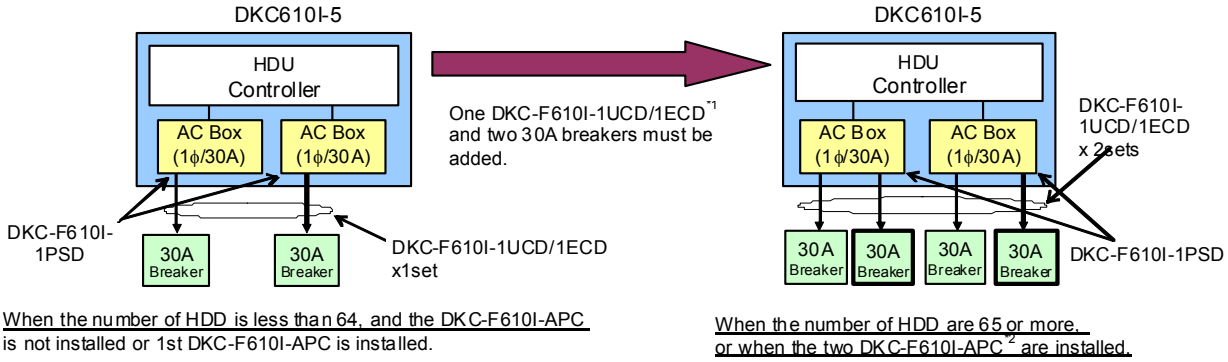
Figure 2-11: Power Connection through a UPS

Breaker Configurations

Figure 2-12 and Figure 2-13 on page 2-23 show the breaker configurations for the Universal Storage Platform V DKC and DKU frames, respectively.

DKC of 1-phase AC input model

- When 1-phase/30A is chosen



When the number of HDD is less than 64, and the DKC-F610I-APC is not installed or 1st DKC-F610I-APC is installed.

When the number of HDD are 65 or more, or when the two DKC-F610I-APC*2 are installed.

*1: When installing 2nd DKC-F610I-APC, it is necessary to change after the subsystem is shut down.
*2: When the configuration of the DKC is in one of the following cases, installation of 2nd DKC-F610I-APC is indispensable.
- When a total number of CHA and DKA options are 11 or more.
- When more than 3 sets of DKC-F610I-CX are installed.

- When 1-phase/50A is chosen

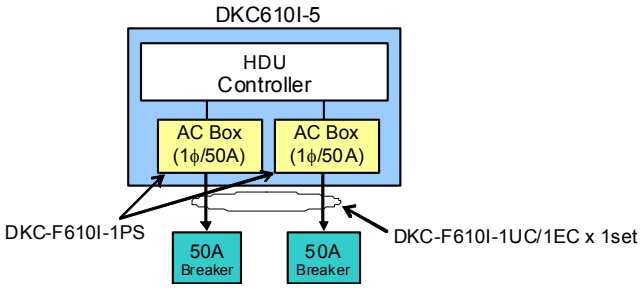
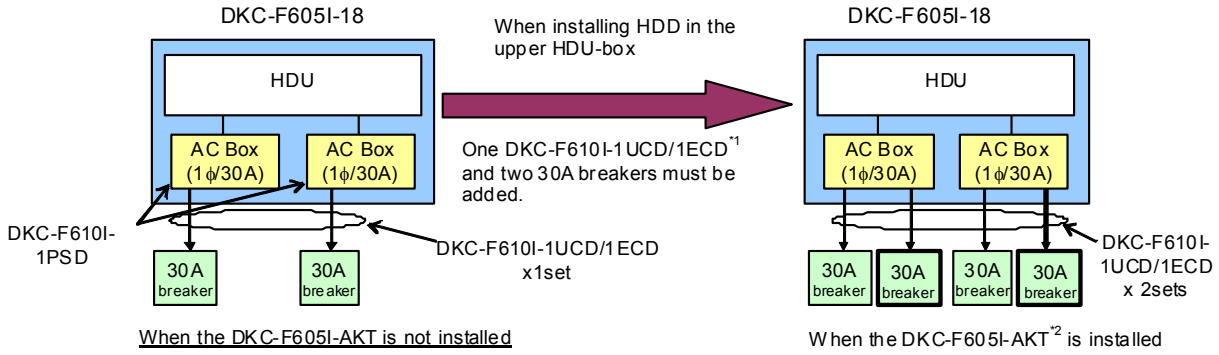


Figure 2-12: Breaker Configurations: DKC Frame

DKU of 1-phase AC input model

- When 1-phase/30A is chosen



*1: When installing the DKC-F605I-AKT, it is necessary to change after the subsystem is shut down.
*2: DKC-F605I-AKT must be added when installing HDD in the upper HDU-box.

- When 1-phase/50A is chosen

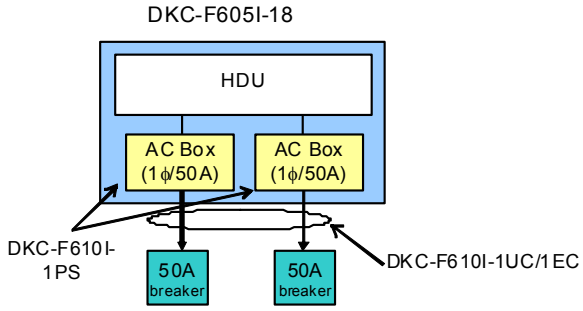


Figure 2-13: Breaker Configurations: DKU Frame

Circuit Breakers and Plugs

Table 2-15 lists the circuit breaker rating and required number of plugs.

Table 2-15: Requirements for Circuit Breakers and Plugs

Model	DKC610I-5		DKC-F605I-18	
	Rating	Number of Plugs	Rating	Number of Plugs
3-Phase	30A	2	30A	2
1-Phase	30A	2 / 4	30A	2 / 4
	50A	2	50A	2

AC Power Cables

Table 2-16 lists the specifications (part numbers or equivalent) for AC power cable plug and receptacle for 60 Hz.

Table 2-16: Plug and Receptacle: 60-Hz

Model	Model Number	Rating	Plug		Receptacle	
			Maker	Part #	Maker	Part #
1-Phase	DKC-F610I-1UCD	30A	Thomas & Betts	3750DP	Thomas & Betts	3933
	DKC-F610I-UC	50A	Thomas & Betts	9P53U2	Thomas & Betts	9C53U2 or 9R53U2W
3-Phase	DKC-F610I-3UC	30A	DDK	115J-AP8508	Thomas & Betts	3934

Table 2-17 and Figure 2-14 show the power cable and terminal dimensions for 50-Hz storage systems.

Table 2-17: Cable and Terminal Dimensions: 50-Hz

Model	Model Number	Rating	Power Cable			Terminal	
			Outer Sheath Overall Diameter	Insulator Outer Diameter	Electric Wire Cross-Section Area	Internal Diameter	External Diameter
			A	B	C	D	E
1-phase	DKC-F610I-1ECD	30A	14.5-20.0mm	5.2mm	6.0mm	6.4mm	12.0mm
	DKC-F610I-1EC	50A	20.0 - 25.5mm	6.6mm	10.0mm	6.4mm	12.0mm
3-phase	DKC-F610I-3EC	30A	18.0 - 24.5mm	5.2mm	6.0mm	6.4mm	12.0mm

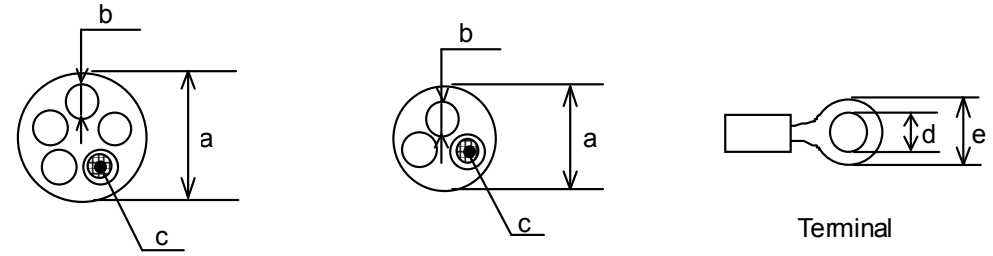


Figure 2-14: Cable and Terminal Dimensions: 50-Hz

Environmental Specifications and Requirements

This section provides the environmental specifications and requirements for the Universal Storage Platform V storage system:

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

Temperature, Humidity, and Altitude

Table 2-18 specifies the temperature, humidity, and altitude requirements for the Universal Storage Platform V. The recommended operational room temperature is 21–24°C (70–75°F).

Table 2-18: 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	–60m to 3,000m				–	

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

The Universal Storage Platform V is air cooled. Air must enter the storage system through the air flow intakes at the sides and bottoms of the frames and must be exhausted out of the top, so it is very important that the air intakes and outlets remain clear. Hitachi Data Systems recommends that under-floor air cooling has a positive pressure and meets the specifications listed in Table 2-19.

Table 2-19: Internal Air Flow

Storage System Configuration	Air Flow (m3/min)	Air Flow (ft3/min)
Controller Frame (all configurations)	34	1200.69
Disk Unit Frame (all configurations)	32	1130.06

Table 2-20 and Table 2-21 list the power consumption and heat output specifications and the air flow requirements for the disk controller and disk unit frame components of the Universal Storage Platform V. These data generally apply to both 60-Hz and 50-Hz storage systems. The USP V requires less power and puts out less heat than the Hitachi TagmaStore® Universal Storage Platform, so the air flow requirements are decreased.

Table 2-20: DKC-F610I Specifications: Heat Output, Power Consumption, Air Flow

Model Number	Model Name	Heat Output (kW)	Power Consumption (kVA)	Air Flow (m^3/min.)
DKC610I-5	Disk Controller Frame	0.834	0.860	34
DKC-F610I-DH	DKC Door Kit (HDS)	–	–	–
DKC-F6101-DS	DKC Door Kit (Sun)	–	–	–
DKC-F610I-3PS	AC Box Kit (3-phase 30A)	–	–	–
DKC-F610I-3EC	Power Cable Kit (3-phase 30A for Europe)	–	–	–
DKC-F610I-3UC	Power Cable Kit (3-phase 30A for USA)	–	–	–
DKC-F610I-1PS	AC Box Kit (1-phase 50A)	–	–	–
DKC-F610I-1EC	Power Cable Kit (1-phase 50A for Europe)	–	–	–
DKC-F610I-1UC	Power Cable Kit (1-phase 50A for USA)	–	–	–
DKC-F610I-1PSD	AC Box Kit (1-phase 30A)	–	–	–
DKC-F610I-1ECD	Power Cable Kit (1-phase 30A for Europe)	–	–	–
DKC-F610I-1UCD	Power Cable Kit (1-phase 30A for USA)	–	–	–
DKC-F610I-APC	Additional Power Supply	–	–	–
DKC-F610I-AB	Additional Battery	0.029	0.030	–
DKC-F610I-ABX	Additional Battery	0.128	0.132	–
DKC-F610I-CX	Cache Memory Adapter	0.005	0.005	–
DKC-F610I-C4G	Cache Memory Module (4GB)	0.015	0.015	–
DKC-F610I-C8G	Cache Memory Module (8GB)	0.019	0.020	–
DKC-F610I-C16G	Cache Memory Module (16GB)	0.019	0.020	–

Table 2-20: DKC-F610I Specifications: Heat Output, Power Consumption, Air Flow

Model Number	Model Name	Heat Output (kW)	Power Consumption (kVA)	Air Flow (m^3/min.)
DKC-F610I-SX	Shared Memory Adapter	0.005	0.005	–
DKC-F610I-S2GQ	Shared Memory Module (2GB)	0.013	0.013	–
DKC-F610I-S4GQ	Shared Memory Module (4GB)	0.013	0.013	–
DKC-F610I-CSW	Data Path Expansion Kit	0.029	0.03	–
DKC-F610I-CBEX	Memory Back-up Expansion KIT (12V)	0.01	0.01	–
DKC-F610I-DBEX	Memory Back-up Expansion KIT (56V)	0.01	0.01	–
DKC-F610I-DKA	Disk Adapter	0.097	0.100	–
DKC-F610I-EDKA	Encrypting Disk Adapter	0.099	0.102	–
DKC-F610I-SVP	SVP High Reliability Support Kit	0.073	0.075	–
DKC-F610I-SVPV	SVP High Reliability Support Kit (Vista OS)	0.073	0.075	–
DKC-F610I-PCI	Power Control Interface Kit	0.002	0.002	–
DKC-F610I-R1DC	Device Interface Cable	–	–	–
DKC-F610I-R1UC	Device Interface Cable	–	–	–
DKC-F610I-L1DC	Device Interface Cable	–	–	–
DKC-F610I-L1UC	Device Interface Cable	–	–	–
DKC-F610I-MDM	Modem Card Kit	0.006	0.006	–
DKC-F610I-8S	Serial 8-port Adapter	0.146	0.150	–
DKC-F610I-8MFS	Mainframe Fibre 8-port Adapter (Short Wavelength 1-4Gbps)	0.146	0.150	–
DKC-F610I-8MFL	Mainframe Fibre 8-port Adapter (Long Wavelength 1-4Gbps)	0.146	0.150	–
DKC-F610I-8FS	Fibre 8-port Adapter (1-4Gbps)	0.130	0.135	–
DKC-F610I-8US	Fibre 8-port Adapter (2-8Gbps)	0.146	0.150	–
DKC-F610I-16FS	Fibre 16-port Adapter (1-4Gbps)	0.146	0.150	–
DKC-F610I-1FL	Fibre SFP Transceiver (Long Wavelength 4G)	–	–	–
DKC-F610I-1FS	Fibre SFP Transceiver (Short Wavelength 4G)	–	–	–

Table 2-21: DKC-F605I Specifications: Heat Output, Power Consumption, Air Flow

Model Number	Model Name	Heat Output (kW)	Power Consumption (kVA)	Air Flow (m^3/min.)
DKC-F610I-1UL	Fibre SFP Transceiver (Long Wavelength 8G)	–	–	–
DKC-F610I-1US	Fibre SFP Transceiver (Short Wavelength 8G)	–	–	–
DKC-F605I-18	Disk Array Frame	0.601	0.62	32
DKC-F605I-DH	DKU Door Kit (HDS)	–	–	–
DKC-F605I-DH	DKU Door Kit (Sun)	–	–	–
DKC-F605I-AKT	DKU Expansion Kit	0.291	0.3	–
DKC-F605I-EXC	Device Interface Cable (DKU – DKU)	–	–	–
DKC-F605I-72KS	1 HDD Canister (72G/15k/4G-FC)	0.020	0.021	–
DKC-F605I-146KS	1 HDD Canister (146G/15k/4G-FC)	0.020	0.021	–
DKC-F605I-300JS	1 HDD Canister (300G/15k/2G-FC)	0.020	0.021	–
DKC-F605I-300KS	1 HDD Canister (300G/15k/4G-FC)	0.020	0.021	–
DKC-F605I-300KM	1 HDD Canister (300G/15k/4G-FC)	0.020	0.021	–
DKC-F605I-0R7HS	1 HDD Canister (750G/7.2k/4G-FC)	0.018	0.019	–
DKC-F605I-400JS	1 HDD Canister (400G/10k/4G-FC)	0.020	0.021	–
DKC-F605I-1R0HS	1 HDD Canister (1T/7.2k/4G-FC)	0.019	0.020	–
DKC-F6051-2R0HS	1 HDD Canister (2T/7.2k/4G-FC)	0.019	0.020	–
DKC-F605I-450KS	1 HDD Canister (450G/15k/4G-FC)	0.020	0.021	–
DKC-F605I-600KS	1 HDD Canister (600G/15k/4G-FC)	0.020	0.021	—
DKC-F605I-72S1	1 Flash drive Canister (72G/4G-FC)	0.010	0.011	–
DKC-F605I-146S1	1 Flash drive Canister (146G/4G-FC)	0.010	0.011	–
DKC-F605I-200S1	1 SSD Canister (200G/4G-FC)	0.010	0.011	–
DKC-F605I-400S1	1 SSD Canister (400G/4G-FC)	0.010	0.011	–

Loudness

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

Front/rear = 65 dB(A)

Both sides = 65 dB(A)

Vibration and Shock

Table 2-22 lists the vibration and shock tolerance data for the Universal Storage Platform V. The USP V 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 2-22: Vibration and Shock Tolerances

Parameter	Condition		
	Operating	**Non-Operating**	**Shipping or Storage**
Vibration*1	5-10Hz: 0.25 mm 10-300Hz: 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 100Hz. 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

*1: The vibration specifications apply to all three axes.
*2: See ASTM D999 01, 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, Test Methods for Performing Programmed Horizontal Impacts Using an Inclined Impact Tester.
*5: See ASTM D6055 96, Test Methods for Mechanical Handling of Unitized Loads and Large Shipping Cases and Crates.

Operational Requirements

This section provides the operational requirements for the Universal Storage Platform V storage system:

- Storage System Operations
- Cabling Requirements

Storage System Operations

LAN connection (or RJ-11 phone line) for Hi Track®

The Hi-Track maintenance support tool monitors the operation of the Universal Storage Platform V, 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 connection for Storage Navigator

Hitachi Storage Navigator communicates directly with the Universal Storage Platform V 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.

External storage

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

Cabling Requirements

Table 2-23 lists and describes the cables required for the USP V controller and disk unit frames. These cables must be ordered separately, and the quantity depends on the type and number of channels and ports. ExSA (ESCON), FICON, and fibre-channel cables are available from Hitachi Data Systems.

Table 2-23: Cable Requirements

Cable	Function/Description
PCI cable	Connects Universal Storage Platform V to CPU power control interface.

Table 2-23: Cable Requirements

Cable	Function/Description
FICON interface cables	Connects mainframe host systems, channel extenders, or FICON directors to USP V ports. Single-mode cables: • Yellow in color with SC- and LC-type connectors • 8-10 micron (9-micron single mode is most common) Multimode cables: • Orange cables with SC- and LC-type connectors • 50/125 micron and 62.5 micron multi-mode ***Note:*** The mainframe fibre adapters require LC-type connector. When a mainframe adapter is connected to a host or switch device with an SC-type connector, a cable with an LC-type connector plug at one end and an SC-type connector plug at the other end is required.
ExSA (ESCON) interface cables	Connects mainframe host systems, channel extenders, or ESCON directors to USP V ports. Multimode cable characteristics: • Commonly called jumper cables • Use LED light source • Plug directly on CHA cards • Orange cables with MT-RJ connectors* • Contain 2 fibers (transmit and receive) • 62.5 micron (up to 3 km per link) • 50 micron (up to 2 km per link) Mono/Single mode cable characteristics: • Required on XDF links between ESCDs or IBM 9036 ESCON remote control extenders • Use laser light source • Yellow in color with MT-RJ connectors* • 8-10 micron (9-micron single mode is most common) *MT-RJ: An MT-RJ connector miniaturizes an ESCON connector. When host side is an ESCON connector, use a cable connectable with an MT-RJ connector, otherwise a conversion kit is required.
Fibre cables	Connects open-system host to Universal Storage Platform V fibre-channel ports. Fibre cable types are 50 / 125 micron or 62.5 / 125 micron multimode. LC-type (little) connector is required for 4-Gbps and 2-Gbps ports. When a 4- or 2-Gbps port is connected to a host or switch device with an SC-type connector, a cable with an LC-type connector plug at one end and an SC-type connector plug at the other end is required.
Phone cable with RJ11 connector	Connects phone line to Universal Storage Platform V SVP and SVPV for Hi-Track.
10/100 BaseT (Cat 5) cable with RJ45 connector	Connects Storage Navigator PC to Universal Storage Platform V. Can also be used for connecting multiple USP V storage systems together (daisy-chain).
10Base2 cable (RG58) with BNC connector	Connects Storage Navigator to USP V, and allows connection to multiple Universal Storage Platform V storage systems (up to 8) without using a hub. Requires a transceiver.

Cable Length Requirements for Front-End Directors

Table 2-24 lists the cable length requirements for the front-end directors (FEDs) in the Universal Storage Platform V.

Table 2-24: FED Cable Length Requirements

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

Device Interface Cable Options

Figure 2-15 shows the layout and the device interface cable options for the Hitachi USP V.

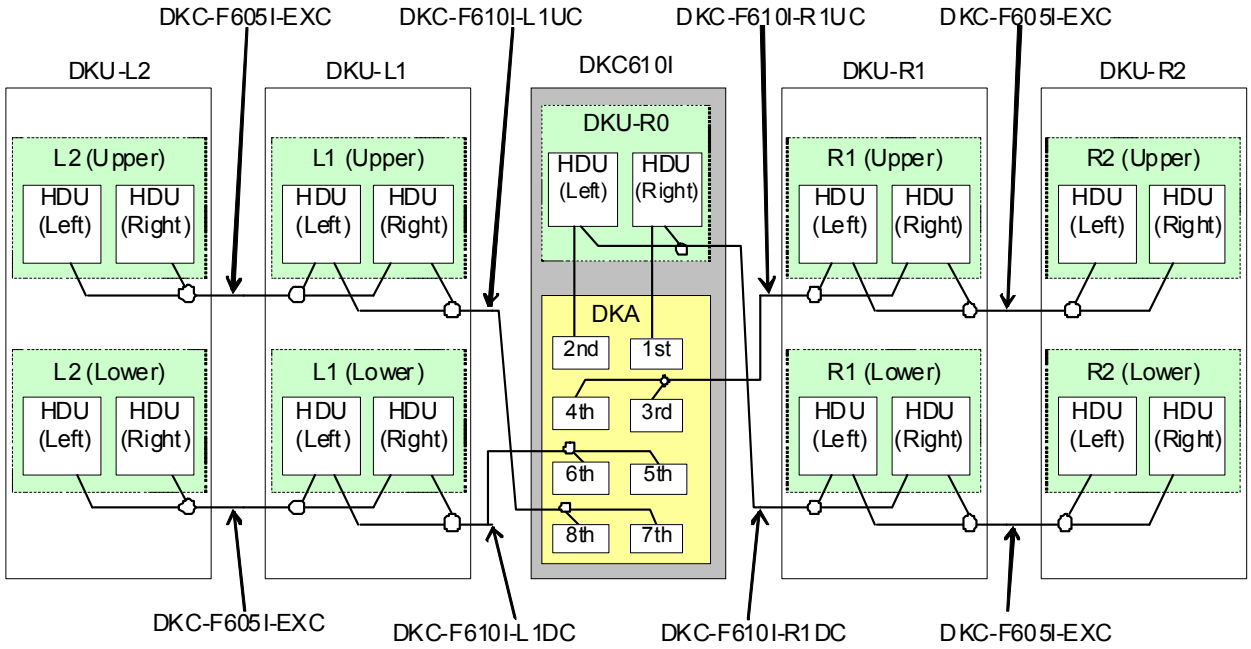


Figure 2-15: Layout and Device Interface Cable Options

To calculate the external cable length necessary to connect between two units, add the below the floor length to the length (L) from the floor to the connector on each unit. Figure 2-16 shows the length L (length from the floor to the connector on the DKC610I/DKC-F605I), and Table 2-25 specifies the value of length L for the PCI and AC power cables.

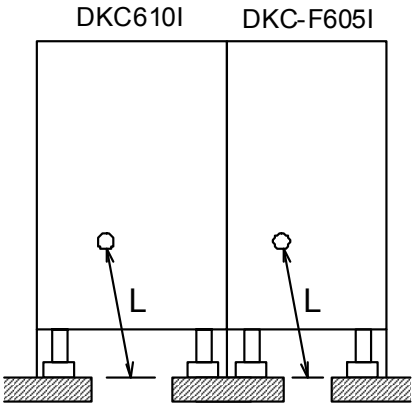


Figure 2-16: Length (L) from Floor to Connector (DKC and DKU Frames)

Table 2-25: Value of Length L

Cable Name	Length (L)
PCI Cable (DKC610I)	0.3m
AC power cable (DKC-F605I)	0.5m

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 V storage system. For information on physical and logical storage capacity values on the USP V 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 (also known as front-end director)
dB(A)	decibel (A-weighted)
DKA	disk adapter (also known as 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 V	Hitachi Universal Storage Platform V
VA	volt-ampere
VAC	volts AC
W	watt

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