Hitachi Virtual Storage Platform 5000 Series

90-08-2x or later

Hardware Guide

This document describes the hardware components, lists the physical and operational specifications, and provides general operating information for the VSP 5000 series storage systems.

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Contents

Preface....5
Safety and environmental information....5
Intended audience....5
Product version....5
Release notes....6
Changes in this revision....6
Conventions for storage capacity values....6
Accessing product documentation....7
Getting help....7
Comments....7
Chapter 1: Hitachi Virtual Storage Platform 5000 series overview....8
Features....8
Storage system specifications....9
Chapter 2: Hardware overview....12
Hardware components....12
Controller chassis....12
Controller board....16
10-Gbps iSCSI board(optical)....18
16-Gbps or 32-Gbps Fibre Channel (4-port) board....20
Back-end module....22
Fabric-acceleration module....23
Drive box....24
Data storage drives....37
Node interconnect switch....38
Interconnect switch....43
Service processor....43
Ethernet Switch (SSVP)....45
Interconnect switch power supply....47
LED locations for high availability node....48
Chapter 3: Specifications....51
Storage system specifications....51
Physical specifications....53

Electrical specifications....60
Environmental specifications....62
Mechanical environmental specifications....64
Chapter 4: Turning storage system power on and off....65
System idle mode....65
Normal power on/off procedures....66
Power on procedures....66
Power off procedures....67
Emergency power off/on procedures....67
Turning off power to the storage system during an emergency....67
Turning on power to the storage system after an emergency shutdown....68
Chapter 5: Site preparation....69
Site preparation checklist....69
Site planning....70
Installation site considerations....71
Floor cutout and service clearance....71
Floor load rating....73
Installing anti-tilt bracket for Universal V3 Rack....73
Chapter 6: Component list....75

Preface

This guide provides technical information about the Hitachi Virtual Storage Platform 5000 series storage systems.

Please read this document carefully to understand how to use this product, and maintain a copy for reference purposes.

Safety and environmental information

Caution: Before operating or working on the Virtual Storage Platform 5000 series storage system, read the safety and environmental information in Safety requirements and Regulatory Compliance.

Intended audience

This document is intended for system administrators, Hitachi Vantara representatives, and authorized service providers who install, configure, and operate Virtual Storage Platform 5000 series storage systems.

Readers of this document should be familiar with the following:

- Data processing and RAID storage systems and their basic functions.
- The Virtual Storage Platform 5000 series storage systems and the *Product Overview*.
- The Storage Navigator software.
- The concepts and functionality of storage provisioning operations in the use of Hitachi Dynamic Provisioning, Hitachi Dynamic Tiering software, and Hitachi Data Retention Utility.

Product version

This document revision applies to storage system microcode version 90-08-2x or later.

Release notes

Read the release notes before installing and using this product. They may contain requirements or restrictions that are not fully described in this document or updates or corrections to this document. Release notes are available on the Hitachi Vantara Support Website: https://knowledge.hitachivantara.com/Documents.

Changes in this revision

- Added support for the 32 Gbps Longwave SFP.

Conventions for storage capacity values

Physical storage capacity values (for example, disk drive capacity) are calculated based on the following values:

Physical capacity unit	Value
1 kilobyte (KB)	1,000 (10^3) bytes
1 megabyte (MB)	1,000 KB or $1{,}000^2$ bytes
1 gigabyte (GB)	1,000 MB or $1{,}000^3$ bytes
1 terabyte (TB)	1,000 GB or $1{,}000^4$ bytes
1 petabyte (PB)	1,000 TB or $1{,}000^5$ bytes
1 exabyte (EB)	1,000 PB or $1{,}000^6$ bytes

Logical capacity values (for example, logical device capacity, cache memory capacity) are calculated based on the following values:

Logical capacity unit	Value
1 block	512 bytes
1 cylinder	Mainframe: 870 KB Open-systems: ▪ OPEN-V: 960 KB ▪ Others: 720 KB
1 KB	1,024 (2^{10}) bytes

Logical capacity unit	Value
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 EB	1,024 PB or $1{,}024^6$ bytes

Accessing product documentation

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Thank you!

Chapter 1: Hitachi Virtual Storage Platform 5000 series overview

The Virtual Storage Platform 5000 series storage system is a high-performance, large-capacity data storage system. The storage system consists of a controller chassis, one or more drive chassis, and internal PCIe switches with copper or optical interfaces and is powered by a new multi-node architecture available in 2, 4, 8, and 12 controller systems.

The Virtual Storage Platform 5000 series is shipped to customers as factory-integrated storage systems installed in a Hitachi Universal rack, with all components mounted and cabled, and all software and software licenses installed by Hitachi Vantara representatives. All systems incorporate state-of-the-art virtualization, data-management, and fault-tolerant technologies.

Features

The Virtual Storage Platform 5000 series (VSP 5000 series) storage systems are high-performance, large-capacity, enterprise RAID storage systems that reliably deliver more data faster than ever for open-systems and mainframe applications. VSP 5000 series features all-flash and hybrid models that can scale up in capacity and also scale out for performance, allowing for massive consolidation of workloads for cost savings and providing unparalleled performance, efficiency, and reliability with response times as low as 39 µs. These enterprise-level storage systems are available in configurations with up to 69 PB of raw capacity and with scalability to handle up to 33 million IOPS.

Key features

- **Agility and scalability**

  VSP 5100 and VSP 5200 all-flash arrays (AFAs) are scale-up enterprise storage platforms with one pair of controller nodes supporting open and mainframe workloads. VSP 5500 and VSP 5600 AFAs start with a single node pair and can scale out to three node pairs. All of these models are also available as hybrid arrays (VSP 5100H, VSP 5200H, VSP 5500H, VSP 5600H) that support the following drive types:

  - NVMe SCM
  - NVMe SSD
  - SAS SSD
  - SAS FMD (available only when upgrading to VSP 5600)
  - SAS HDD

  Note: The VSP 5100 and VSP 5200 models support either SAS or NVMe configurations, while VSP 5500 and VSP 5600 support mixed SAS and NVMe backend configurations.

- **All-flash performance accelerated by NVMe technology**

  NVMe drives provide high throughput and low latency to achieve high response performance, enabling large volumes of data to be processed rapidly with response times as low as 39 microseconds. NVMe storage class memory (SCM) drives provide significantly quicker access to data, up to 10 times faster than flash drives, and are more durable than flash drives.

- **Reliability and resiliency**

  Leveraging hot-swappable components, nondisruptive maintenance and upgrades, and outstanding data protection, VSP 5000 series offers complete system redundancy and is backed by a 100% data availability guarantee. The active-active controller architecture of VSP 5000 series protects against local faults and performance issues, and hardware redundancy eliminates all active single points of failure, no matter how unlikely, to provide the highest level of reliability and data availability.

Storage system specifications

The following table lists the technical specifications of the Hitachi Virtual Storage Platform 5000 series storage system.

Item			Specification
System	2.5-inch SAS HDD/SSD	Maximum number of drives	2-node system: 768 4-node system: 1,536 6-node system: 2,304
	3.5-inch SAS HDDs	Maximum number of drives	2-node system: 384 4-node system: 768 6-node system: 1,152
	Number of FMDs	Maximum number of drives	2-node system: 192 4-node system: 384 6-node system: 576
	Number of NVMe drives	Maximum number of SSDs	2-node system: 96 4-node system: 192 6-node system: 288
		Maximum number of SCM drives	2-node system: 33 4-node system: 66 6-node system: 99
	RAID group configuration	RAID 6	▪ 6D+2P ▪ 14D+2P
		RAID 5	▪ 3D+1P ▪ 7D+1P
		RAID 1 (RAID 1+0)	▪ 2D+2D ▪ 4D+4D
	Maximum number of spare drives		2-node system: 64 4-node system: 128 6-node system: 192
	Maximum number of volumes		65,280
	Maximum storage system capacity (physical capacity) (30-TB 2.5-inch SAS SSDs)		2-node system: 23.1 PB (20.5 PiB) 4-node system: 46.2 PB (41 PiB 6-node system: 69.3 PB (61.5 PiB)
	Maximum external configuration		255 PiB
Memory	Cache memory capacity		512 GiB to 6,144 GiB

Item			Specification
Storage interface	Controller-drive box (DKC-DB) interface		SAS/Dual Port NVMe/Dual Port (SAS and NVMe cannot be intermixed within each node pair.)
	Data transfer rate	SAS Interface	12 Gbps
		NVMe (PCIe) Interface	8 Gbps
	Maximum number of back-end modules (BEMs) (also called disk boards, or DKBs		2-node system: 8 4-node system: 16 6-node system: 24
Device interface	Channel type	Open Systems	Fibre Channel Shortwave Fibre Channel Longwave iSCSI (Optic)
		Mainframe	Fibre Channel Shortwave Fibre Channel Longwave
	Data trasfer rate	Fibre Channel	Open System: 4/8/16/32 Gbps Mainframe: 4/8/16 Gbps
		iSCSI (Optic)	10 Gbps
	Maximum number of CHB		2-node system: 16 2-node system: 32 6-node system: 48

Chapter 2: Hardware overview

The storage system consists of a controller chassis using a multi-node architecture that deploys a copper or optical link, as well as the basic rack layouts similar to previous model.

Hardware components

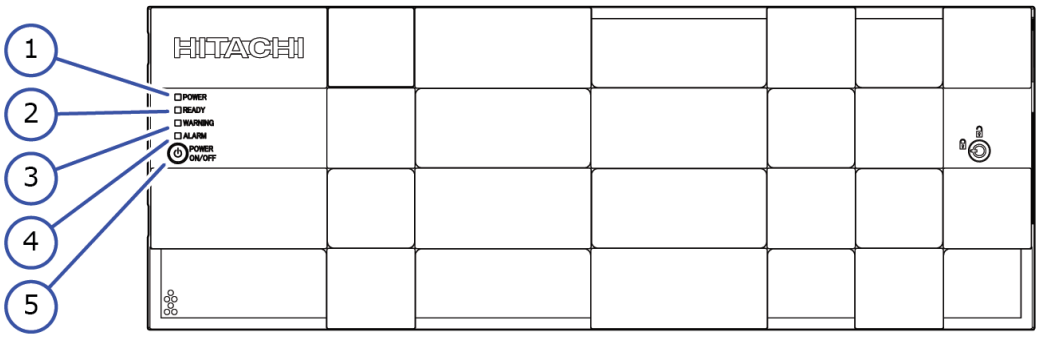
The storage system consists of a controller chassis comprising controller boards, drive chassis in which drives are installed, and a node interconnect switch consisting of interconnect switches and an SVP. The storage system also includes cache memory (DIMM) and cache flash memory (CFM).

The controller chassis, drive chassis, and node interconnect switch are installed in a 19-inch Hitachi Universal rack.

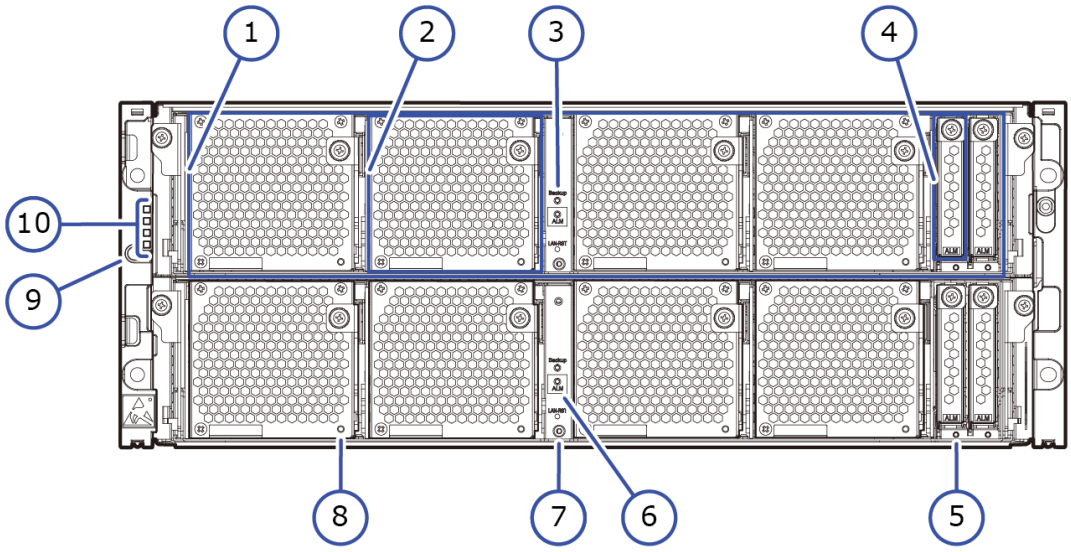
Controller chassis

The controller chassis consists of a controller board, front-end module, back-end module, fabric-acceleration module, power supply, and cache flash memory. Controllers are storage system components that cache and manage data, and provide hosts with a coherent, virtualized view of the system. A controller chassis contains two nodes with a 4U controller each, making the chassis 8U high. A storage system can contain 2 to 6 nodes, depending on the storage system model.

The compression accelerator module, which includes the compression accelerator and a fan, is a hardware component for the VSP 5200 and VSP 5600. The compression accelerator performs compression for these models instead of the storage system controllers, resulting in improved performance for the controllers.

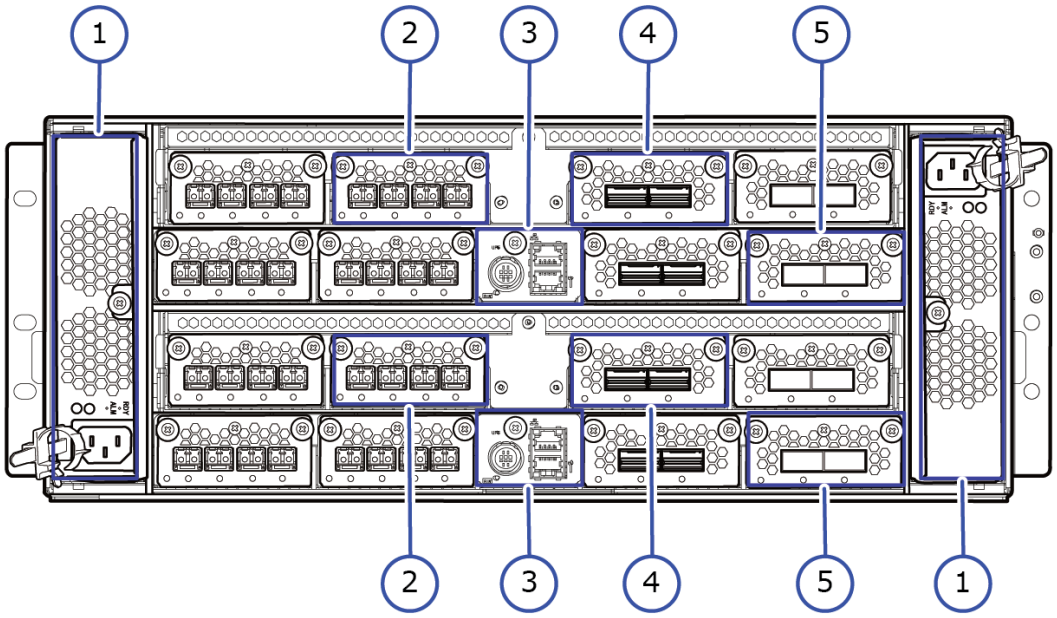


Number	Item	Description
1	POWER LED	Green: Storage system is powered on. Amber: Storage system is receiving power.
2	READY LED	Green: Normal operation.
3	WARNING LED	Off: Normal operation. Amber: Component requires maintenance. Blink: Failure requires maintenance. **Note**: When System Option Mode 1097 is set to ON, the WARNING LED does not blink, even if the following failure service information messages (SIM) are issued: 452xxx, 462xxx, 3077xx, 4100xx, and 410100. LED might turn off during user maintenance.
4	ALARM LED	Off: Normal operation. Red: Processor failure (system might be down). For assistance, contact customer support: https://support.hitachivantara.com/en_us/contact-us.html.
5	POWER ON/OFF (main switch)	Powers the storage system.

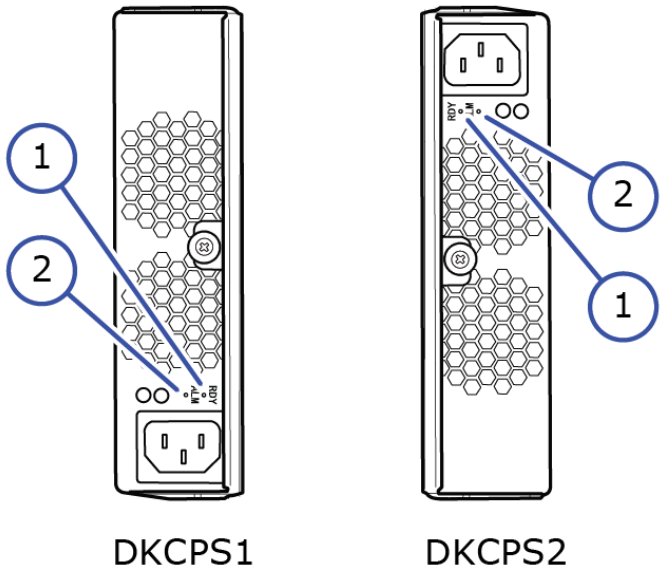


Number	Item	Description
1	Controllers	Controller 1 (bottom) and Controller 2 (top).
2	Backup module	N/A
3	BACKUP LED	Green: Power restoration in progress following power outage. Fast blink green: Restoring. Slow blink green: Restoring, or sequential shutdown in progress.
4	Cache flash memory	N/A
5	ALM LED (for cache flash memory)	Red: Cache flash memory can be removed.
6	CTL ALM LED	Red: Controller can be removed. Blink red: Failure with the power supply unit of the controller. Amber: LAN reset switch was pressed.
7	LAN-RST switch	Use only when instructed by customer support.
8	STATUS LED (for BKMF)	Green: Charging of the battery in the backup module is complete. Red: Backup module can be removed. Blink red one time: Main battery failure. Blink red two times: Backup battery failure.

Number	Item	Description
		Blink red three times: Both batteries failed or preventive maintenance replacement of batteries can run. Off: Battery is not mounted, battery-mounting failure occurred, or firmware is being upgraded. Off is normal status for configurations without batteries.
9	POWER ON/OFF (main switch)	Powers the storage system.
10	POWER, READY, WARNING, and ALARM LEDs	**Note**: When System Option Mode 1097 is set to ON, the WARNING LED does not blink, even if the following failure service information messages (SIM) are issued: 452xxx, 462xxx, 3077xx, 4100xx, and 410100.

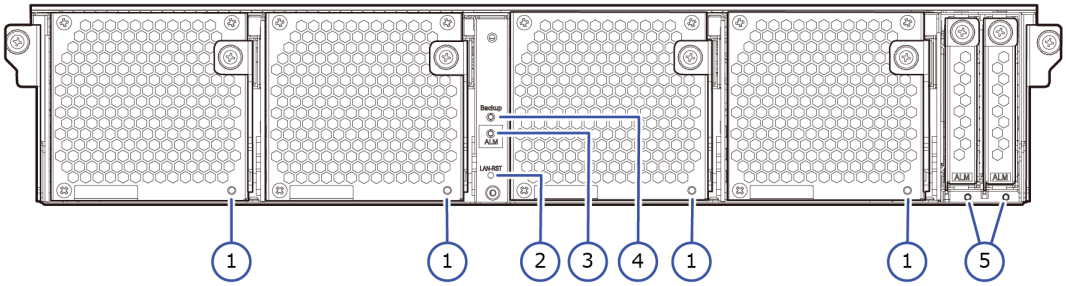


Number	Item
1	Power supply unit
2	Front-end module
3	LAN blade
4	Fabric-acceleration module
5	Back-end module



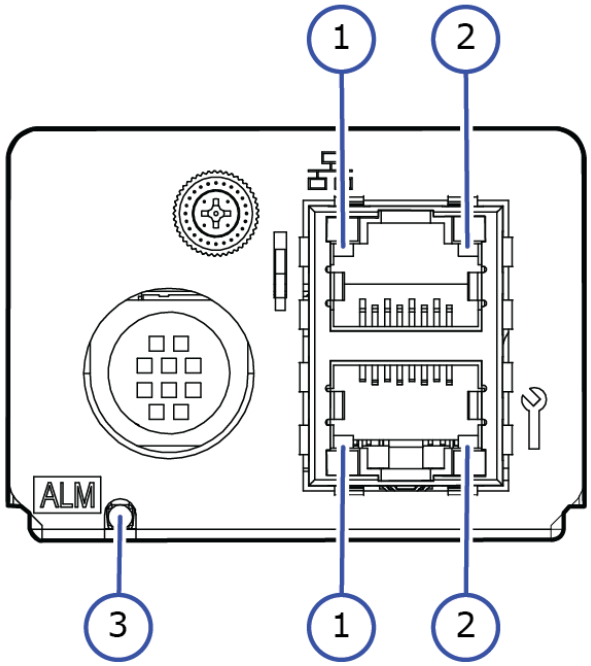
Number	Item	Description
1	ALM / RDY LED	Red: Power supply unit can be replaced.
2	RDY LED	Green: Normal operation.

Controller board



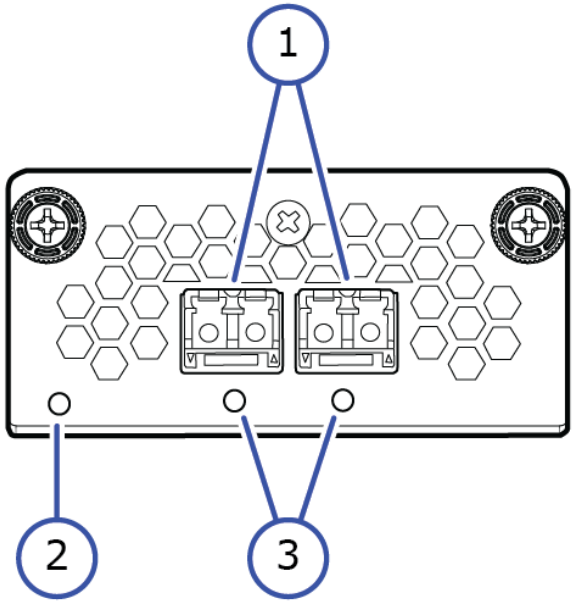
Number	Item	Description
1	STATUS	LED Off: Battery is uninstalled, installed improperly or BKMF firmware is replaced (in case of a configuration with no battery installed, the LEDs for BKMF-10 and BKMF-20 go out). Green On: Battery is fully charged. Green Blinking: Battery is charged or discharged. Red On: BKMF has an error. Red Blinking: BKMF can be removed. A failure occurred in the battery or preventive maintenance replacement of the batteries is possible.
2	LAN-RST	This is a switch for GUM reset. If GUM reboot fails, reset GUM forcibly from the hardware.
3	CTL ALM	Red On: The controller board is ready to be removed (when the maintenance work requiring insertion and removal of the controller board is performed). A failure is detected in the controller board (when the maintenance work mentioned above is not performed). Red Blinking: A failure is detected in the controller board, cache memory, or cache flash memory (CFM). Amber On: Indicates that the LAN RESET switch is pressed.

Number	Item	Description
4	BACKUP STS	Green On : Indicates that power outage has occurred or power restoration is in progress after power outage. ▪ Fast blinking (On and off are repeated at 0.1-second intervals.): The data is being restored. ▪ Slow blinking (On and off are repeated at 0.5-second intervals.): A planned power off is being executed or the data is being stored.
5	ALARM	Red On: Cache Flash Memories are removable.



Number	Item	Description
1	ACT/LINK LED	Amber: Link status/data transfer status.
2	SPEED LED	On: Link speed = 1 Gbps. Off: Link speed = 10 Mbps/100 Mbps.
3	LAN ALARM LED	Red: The removal of the LAN Board is possible.

10-Gbps iSCSI board(optical)



Number	Item	Description
1	ISCSI connectors	Connect to Ethernet cables.
2	STATUS LED	Green: Front-end module is in the power-on state. Red: Front-end module has an error.
3	PORT LED	Red: SFP has an error. Blue: Normal link status. Blink blue: Front-end module is in communication status.

Note: The VSP 5000 series storage systems do not support iSCI link aggregation.

Port assignments for 10-Gbps iSCSI board

Number	Port 1	Port 2
CHB-01A	1A	3A
CHB-01B	1C	3C
CHB-01E	1E	3E

Number	Port 1	Port 2
CHB-01F	1G	3G
CHB-02A	1B	3B
CHB-02B	1D	3D
CHB-02E	1F	3F
CHB-02F	1H	3H
CHB-11A	2A	4A
CHB-11B	2C	4C
CHB-11E	2E	4E
CHB-11F	2G	4G
CHB-12A	2B	4B
CHB-12B	2D	4D
CHB-12E	2F	4F
CHB-12F	2H	4H

16-Gbps or 32-Gbps Fibre Channel (4-port) board

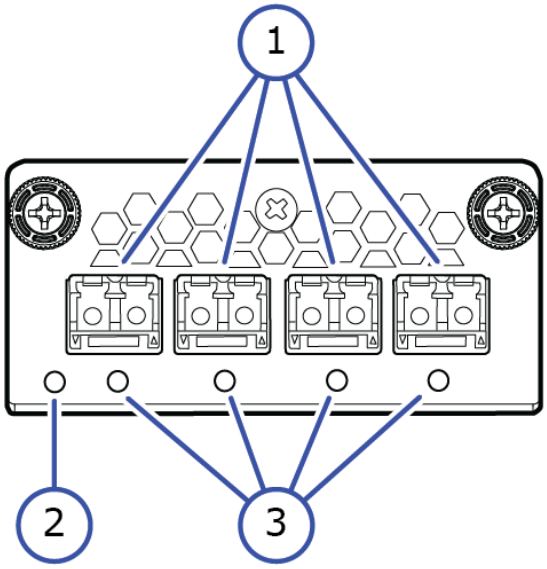


Table 1 16-Gbps, 32-Gbps Fibre Channel

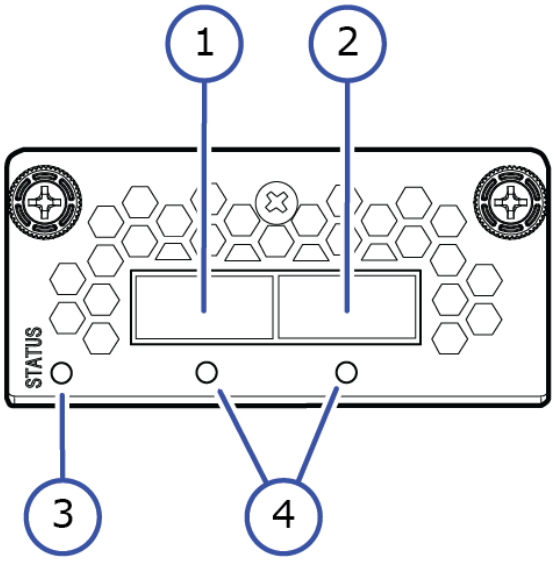
Number	Item	Description
1	Fibre Channel connectors	Connect to Fibre Channel cables.
2	STATUS LED	Green: Front-end module is in the power-on state. Red: Front-end module has an error.
3	PORT LED	Red: Small form-factor pluggable can be removed. Blue: Normal link status at 16-Gbps (16-Gbps). Blue: Normal link status at 32-Gbps (32-Gbps). Green: Normal link status at 4-Gbps or 8-Gbps (16-Gbps). Green: Normal link status at 8-Gbps or 16-Gbps (32-Gbps).

Port assignments for 16-Gbps or 32-Gbps Fibre Channel board

Number	Port 1	Port 2	Port 3	Port 4
CHB-01A	1A	3A	5A	7A
CHB-01B	1C	3C	5C	7C
CHB-01E	1E	3E	5E	7E
CHB-01F	1G	3G	5G	7G
CHB-02A	1B	3B	5B	7B
CHB-02B	1D	3D	5D	7D
CHB-02E	1F	3F	5F	7F
CHB-02F	1H	3H	5H	7H
CHB-11A	2A	4A	6A	8A
CHB-11B	2C	4C	6C	8C
CHB-11E	2E	4E	6E	8E
CHB-11F	2G	4G	6G	8G

Number	Port 1	Port 2	Port 3	Port 4
CHB-12A	2B	4B	6B	8B
CHB-12B	2D	4D	6D	8D
CHB-12E	2F	4F	6F	8F
CHB-12F	2H	4H	6H	8H

Back-end module

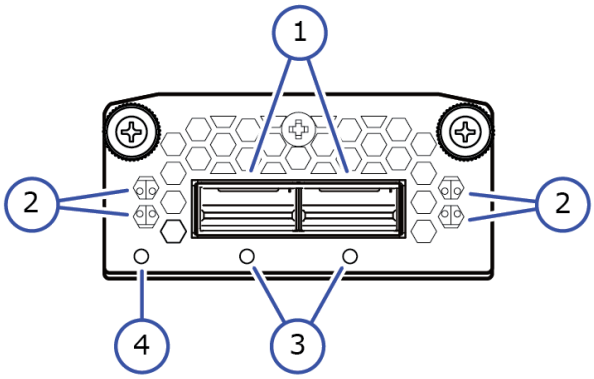


Number	Item	Description
1	PATH 0 connector	Connect to a drive tray.
2	PATH 1 connector	Connects to a drive tray.
3	STATUS LED	Green: Back-end module is in the power-on state. Red: Back-end module can be removed safely.
4	PORT LED	Blue: Link status is normal.

Port assignments for the back-end module

Number	Port 0	Port 1
DKB-01D	01D-0	01D-1
DKB-01H	01H-0	01H-1
DKB-02D	02D-0	02D-1
DKB-02H	02H-0	02H-1
DKB-11D	11D-0	11D-1
DKB-11H	11H-0	11H-1
DKB-12D	12D-0	12D-1
DKB-12H	12H-0	12H-1

Fabric-acceleration module



Number	Item	Description
1	Ports	
2	TBD	Blinking (Yellow): The target port is incorrectly connected. On (Yellow): Any of the ports is incorrectly connected. Green: Not used.
3	PORT (LINK/LOCATE)	On (Blue): Linked state. Blinking (Red): A failure has occurred. The port is blocked. On (Red): The cable can be removed.

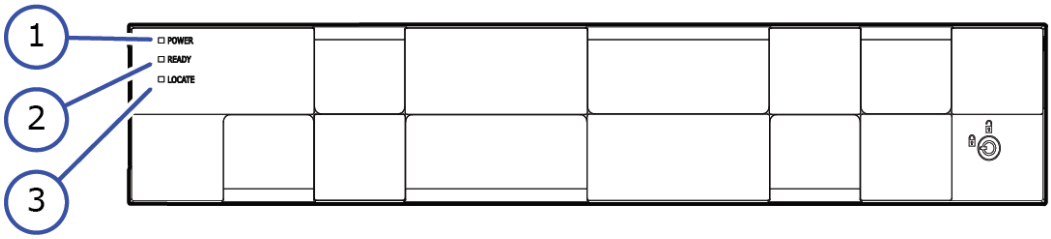
Number	Item	Description
		Off: Link down state.
4	STATUS	On (Green): The module is powered on. On (Red): The module can be removed. Off: The module is powered off.

Port assignments for fabric-acceleration module

Fabric-Acceleration Module Number	Port 0	Port 1
HIE-01C	HIE-01C-0	HIE-01C-1
HIE-01G	HIE-01G-0	HIE-01G-1
HIE-02C	HIE-02C-0	HIE-02C-1
HIE-02G	HIE-02G-0	HIE-02G-1
HIE-11C	HIE-11C-0	HIE-11C-1
HIE-11G	HIE-11G-0	HIE-11G-1
HIE-12C	HIE-12C-0	HIE-12C-1
HIE-12G	HIE-12G-0	HIE-12G-1

Drive box

Drive boxes are compact storage enclosures that hold large numbers of drives and can be installed in a small rack space (EIA-standard rack units).



Number	Item	Description
1	POWER LED	Green: Storage system is powered on.
2	READY LED	Green: Normal operation.
3	LOCATE LED	Amber: Failure requires maintenance. The LED can be lit/turned off by the Maintenance Utility.

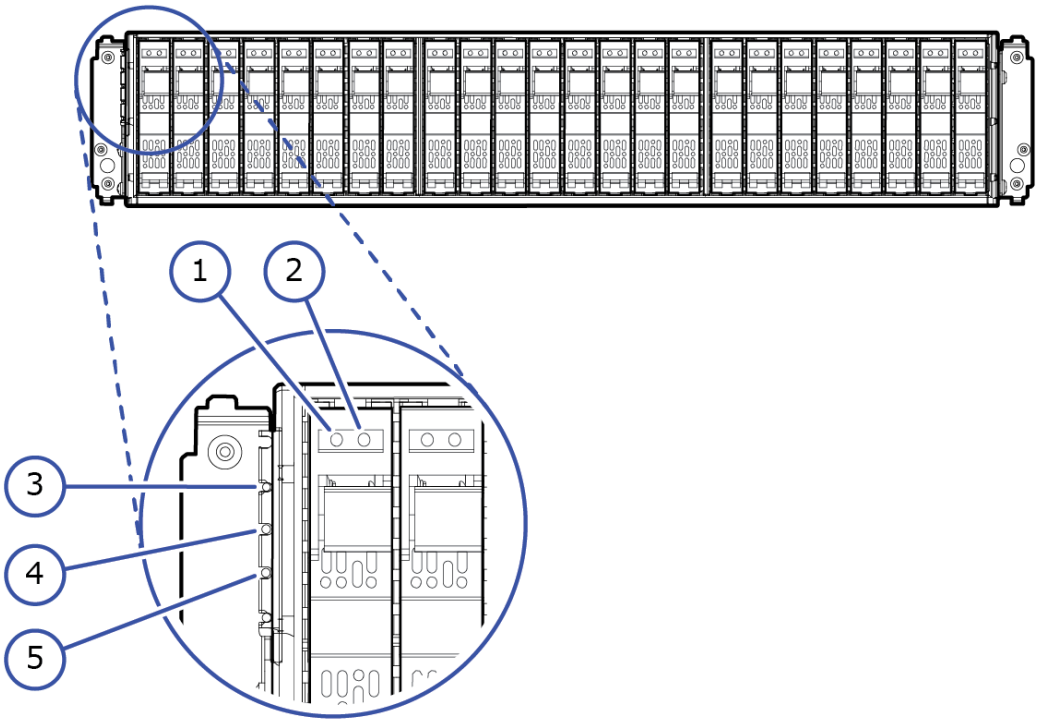
The storage systems supports the following drive boxes:

- Drive box for SBX (SAS SSDs)
- Drive box for UBX (SAS HDDs)
- Drive box for NBX (NVMe SCM/SSD)
- Drive box for FBX (FMD)

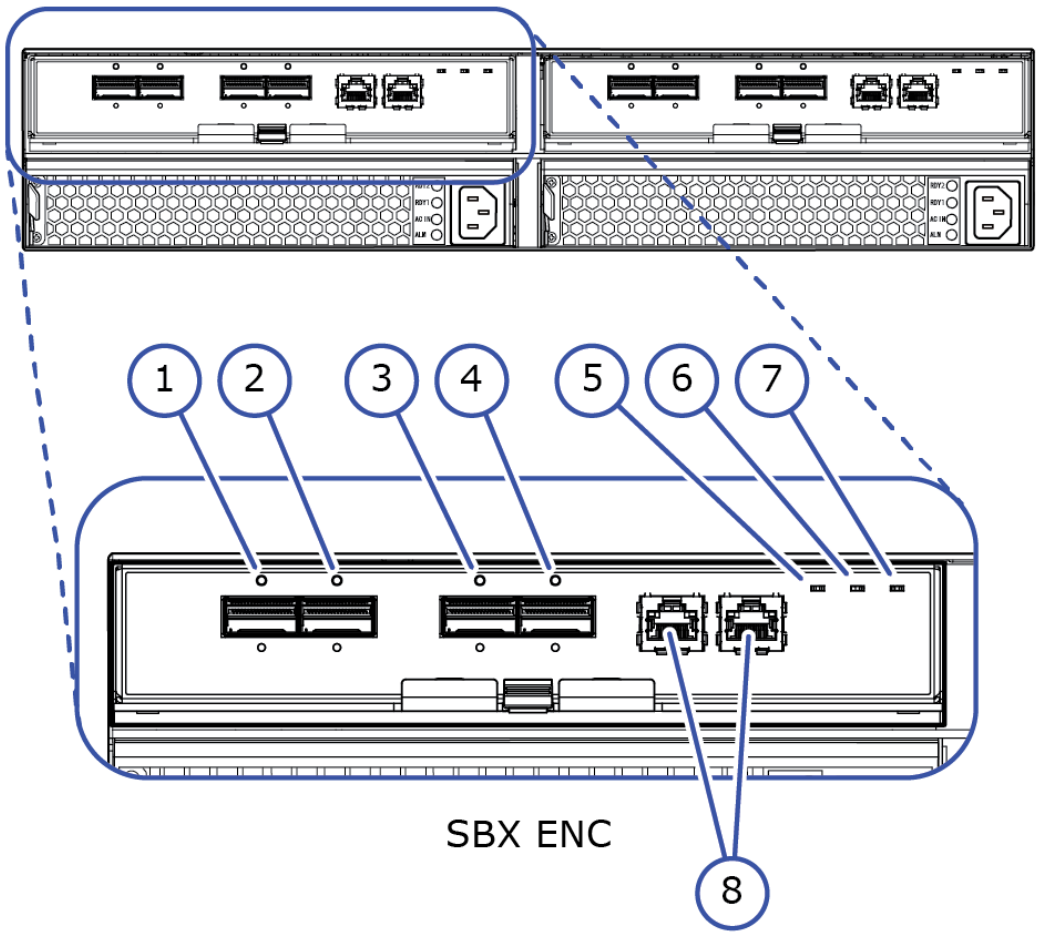
Drive Box for SBX

The media chassis for SBX contains four 2U drive boxes in which 2.5-inch disk drives and the 2.5-inch flash drives are installed. Each drive box consists of two enclosures and two power supplies with a built-in cooling fan.

The SBX holds 96 2.5-inch small form factor SAS SSD drives.

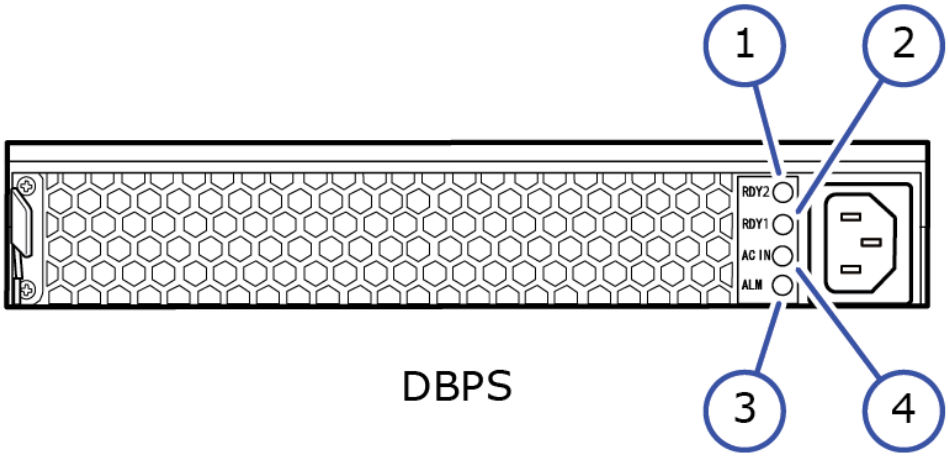


Number	Item	Description
1	ALM	Red: Indicates that the removal of the HDD/SSD is possible when the storage system is powered on.
2	ACT	Green: Indicates that the HDD/SSD is powered on. Blinking Green: Indicates that the HDD/SSD is active. The blink speed may differ between HDDs and SSDs; however, this does not indicate a disk error or failure.
3	POWER	Green: Indicates that the power supply is supplied to the storage system.
4	READY	Green: Indicates that the ENC is operating normally.
5	LOCATE	Amber: Indicates the location of the chassis that detects a failure. The LED can be lit/turned off by Maintenance Utility.



Number	Item	Description
1	PATH (IN side)	Green: Indicates that the IN side is linked up.
2	PATH (OUT side)	Green: Indicates that the OUT side is linked up.
3	PATH (IN side)	Green: Indicates that the IN side is linked up.
4	PATH (OUT side)	Green: Indicates that the OUT side is linked up.
5	POWER	Green: Indicates that the power is supplied to the ENC.
6	LOCATE	Amber: A LED to specify the chassis location on the rear of the chassis. The LED can be lit/turned off by Maintenance Utility.

Number	Item	Description
7	ALARM (REPLACE)	Red: Lights up when replacement of the ENC is possible.
8	Console port	Not in use

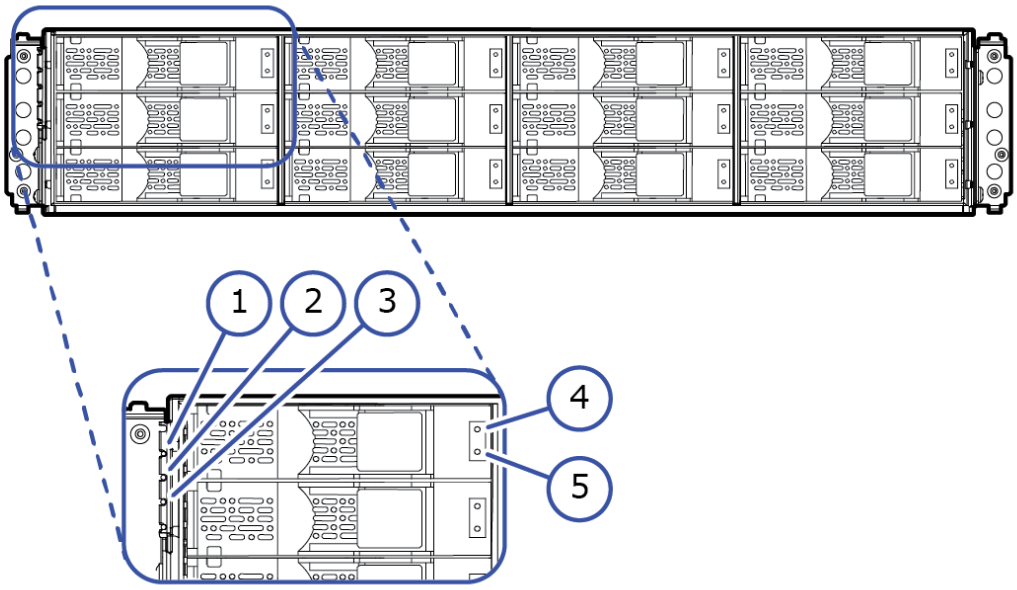


Number	Item	Description
1	RDY2	Green: Normal operation Off: Erroneous operation or out of operation
2	RDY1	Green: Normal operation Off: Erroneous operation or out of operation
3	AC IN	Green: Indicates that AC input is normal.
4	ALM (REPLACE)	Red: Indicates when the power supply can be replaced.

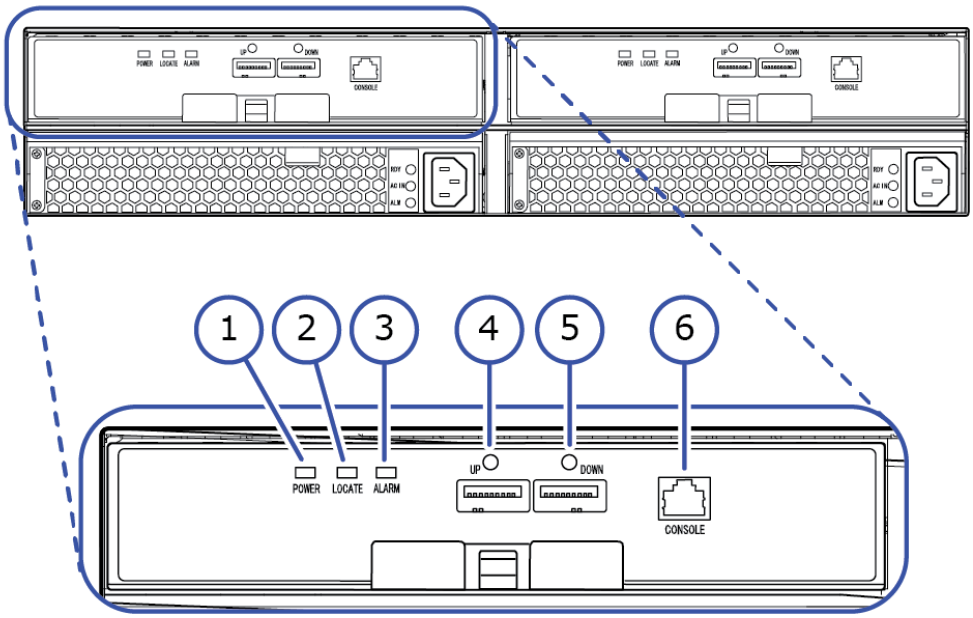
Drive Box for UBX

The media chassis for UBX contains eight 2U drive boxes in which 3.5-inch disk drives are installed. Each drive box consists of two ENCs and two power supplies with a built-in cooling fan.

The UBX holds 96 3.5-inch large form factor SAS HDD drives.

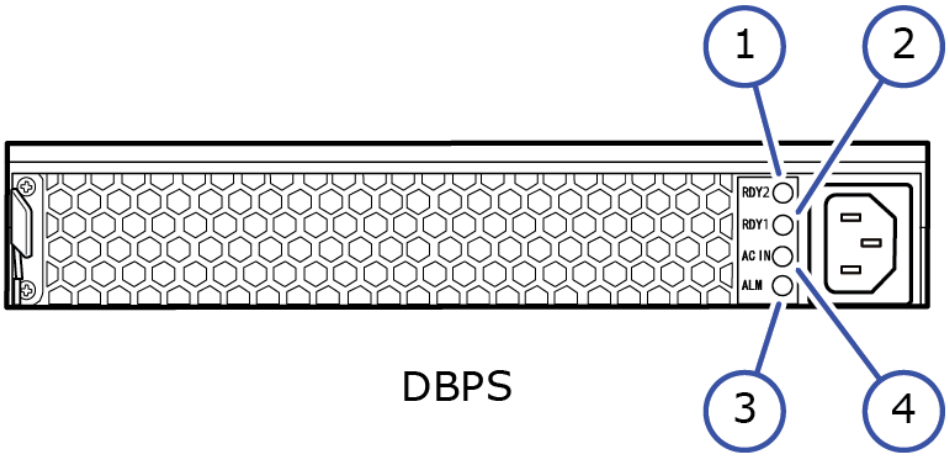


Number	Item	Description
1	POWER	Green: Indicates that the power supply is supplied to the storage system.
2	READY	Green: Indicates that the ENC is operating normally.
3	LOCATE	Amber: Indicates the location of the chassis that detects a failure. The LED can be lit/turned off by Maintenance Utility.
4	ACT	Green: Indicates that the HDD/SSD is powered on. Blinking Green: Indicates that the HDD/SSD is active. The blink speed may differ between HDDs and SSDs; however, this does not indicate a disk error or failure.
5	ALM	Red: Indicates that the removal of the HDD/SSD is possible when the storage system is powered on.



UBX ENC

Number	Item	Description
1	POWER	Green: Indicates that the power is supplied to the ENC.
2	LOCATE	Amber: A LED to specify the chassis location on the rear of the chassis. The LED can be lit/turned off by Maintenance Utility.
3	ALARM (REPLACE)	Red: Lights up when replacement of the ENC is possible.
4	PATH (IN side)	Green: Indicates that the IN side is linked up.
5	PATH (OUT side)	Green: Indicates that the OUT side is linked up.
6	Console port	Not in use

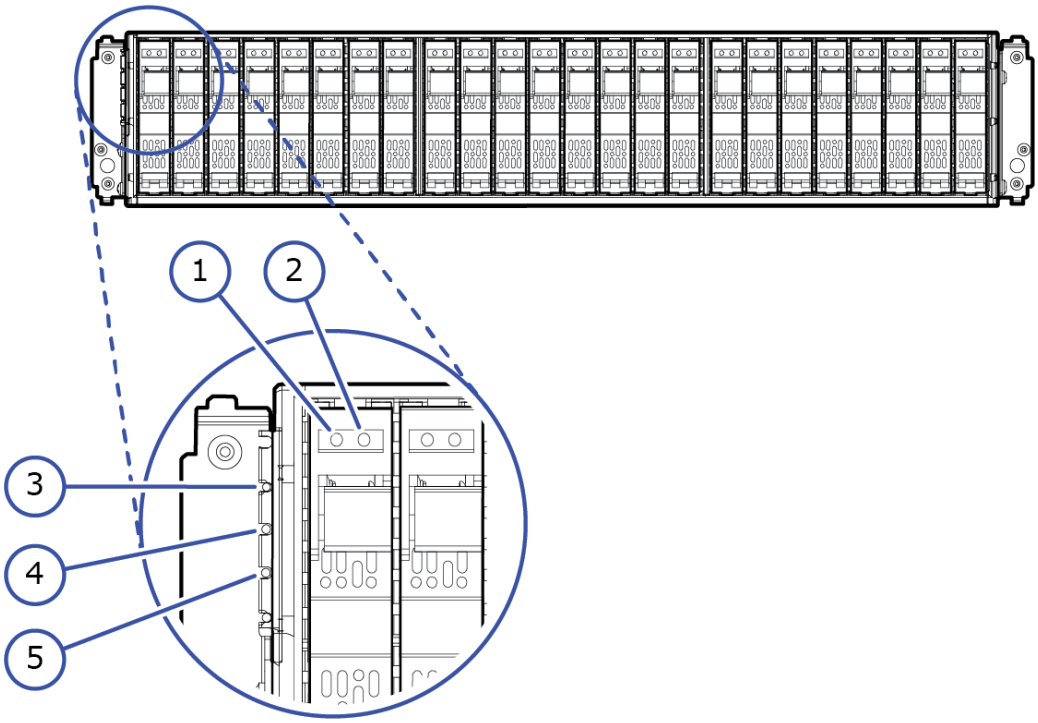


Number	Item	Description
1	RDY2	Green: Normal operation Off: Erroneous operation or out of operation
2	RDY1	Green: Normal operation Off: Erroneous operation or out of operation
3	AC IN	Green: Indicates that AC input is normal.
4	ALM (REPLACE)	Red: Indicates when the power supply can be replaced.

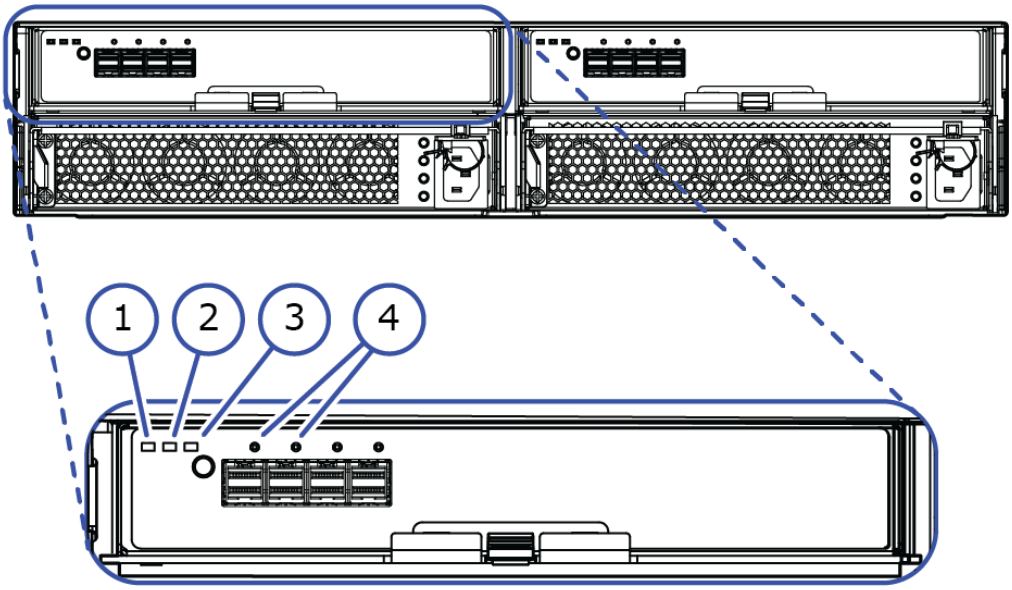
Drive Box for NBX

The media chassis for NBX contains four 2U drive boxes in which 2.5-inch NVMe drives are installed. Each drive box consists of two ENCs and two power supplies with a built-in cooling fan.

The NBX holds 96 2.5-inch NVMe SSD drives or 33 2.5-inch NVMe SCM drives.

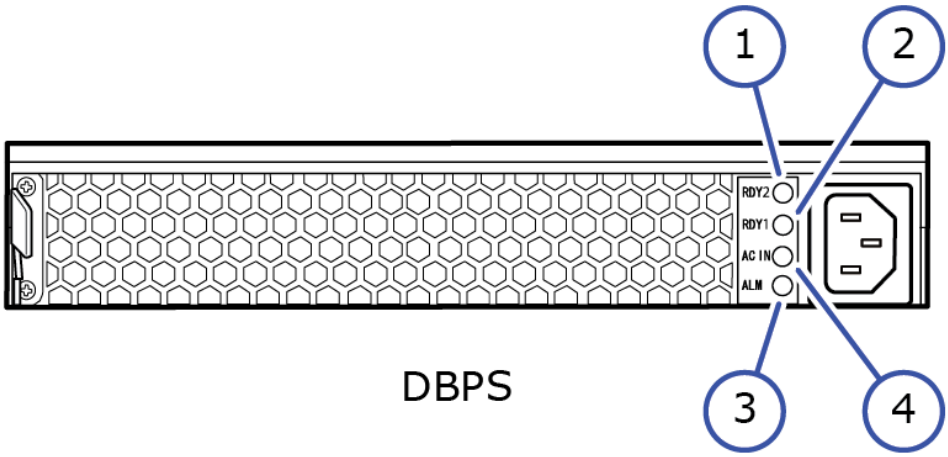


Number	Item	Description
1	ALM	Red: Indicates that the removal of the HDD/SSD is possible when the storage system is powered on.
2	ACT	Green: Indicates that the HDD/SSD is powered on. Blinking Green: Indicates that the HDD/SSD is active. The blink speed may differ between HDDs and SSDs; however, this does not indicate a disk error or failure.
3	POWER	Green: Indicates that the power is supplied to the ENC.
4	READY	Green: Indicates that the ENC is operating normally.
5	LOCATE	Amber: A LED to specify the chassis location on the rear of the chassis. The LED can be lit/turned off by Maintenance Utility.



NBX ENC

Number	Item	Description
1	POWER	Green: Indicates that the power is supplied to the ENC.
2	LOCATE	Amber: A LED to specify the chassis location on the rear of the chassis. The LED can be lit/turned off by Maintenance Utility.
3	ALARM	Red: Indicates that the removal of the HDD/SSD is possible when the storage system is powered on.
4	LINK	Blue: Indicates that PCIe between DKBN and ENC is linked up.

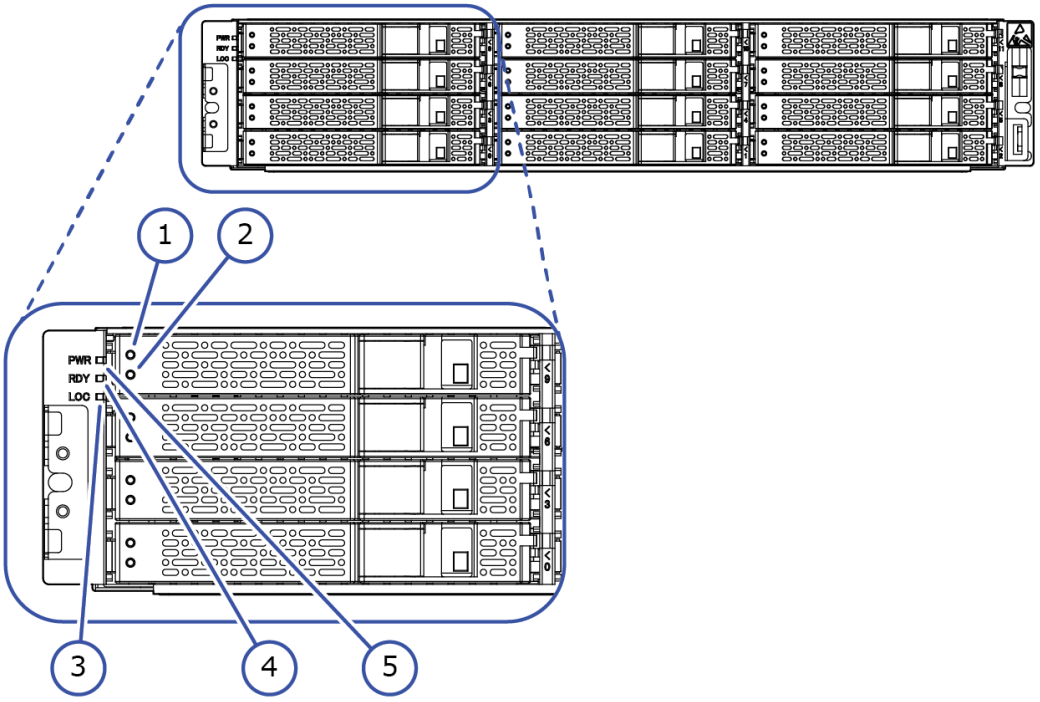


Number	Item	Description
1	RDY2	Green: Normal operation Off: Erroneous operation or out of operation
2	RDY1	Green: Normal operation Off: Erroneous operation or out of operation
3	AC IN	Green: Indicates that AC input is normal.
4	ALM (REPLACE)	Red: Indicates when the power supply can be replaced.

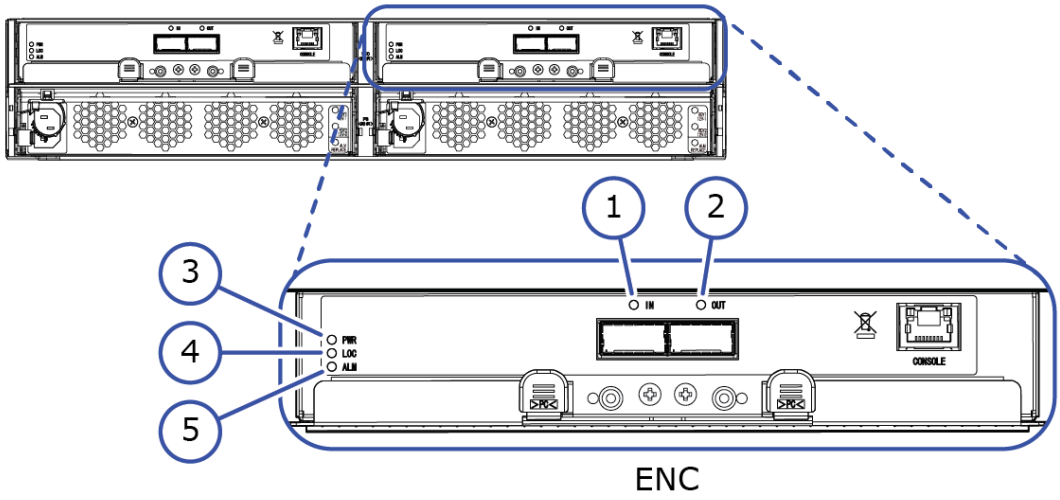
Drive Box for FBX

The media chassis for FBX contains four 2U drive boxes in which FMD drives are installed. Each drive box consists of two ENCs and two power supplies with a built-in cooling fan.

The FBX holds 48 Hitachi flash module drives (FMDs).

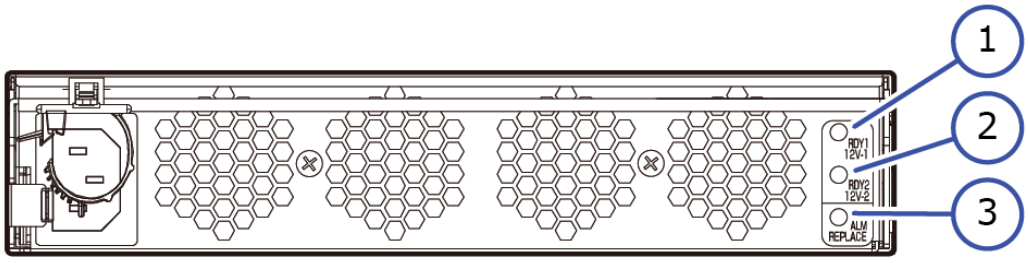


Number	Item	Description
1	ACT	Green: Indicates FMD status. Blinking Green: Indicates that the FMD is active. The blink speed may differ between FMD LEDs; however, this does not indicate a disk error or failure.
2	ALM	Red: Indicates that the removal of the FMD is possible when the storage system is powered on.
3	POWER	Green: Indicates that the power supply is supplied to the storage system.
4	READY	Green: Indicates that the ENC is operating normally.
5	LOCATE	Amber: Indicates the location of the chassis that detects a failure. The LED can be lit/turned off by Maintenance Utility.



ENC

Number	Item	Description
1	PATH (IN side)	Green: Indicates that the IN side is linked up.
2	PATH (OUT side)	Green: Indicates that the OUT side is linked up.
3	POWER	Green: Indicates that the power is supplied to the ENC.
4	LOCATE	Amber: A LED to specify the chassis location on the rear of the chassis. The LED can be lit/turned off by Maintenance Utility.
5	ALARM (REPLACE)	Red: Lights up when replacement of the ENC is possible.



DBPS

Number	Item	Description
1	RDY 1	Green: Normal operation Off: Erroneous operation or out of operation
2	RDY 2	Green: Normal operation Off: Erroneous operation or out of operation
3	ALM REPLACE	Red: Indicates when the power supply can be replaced.

Data storage drives

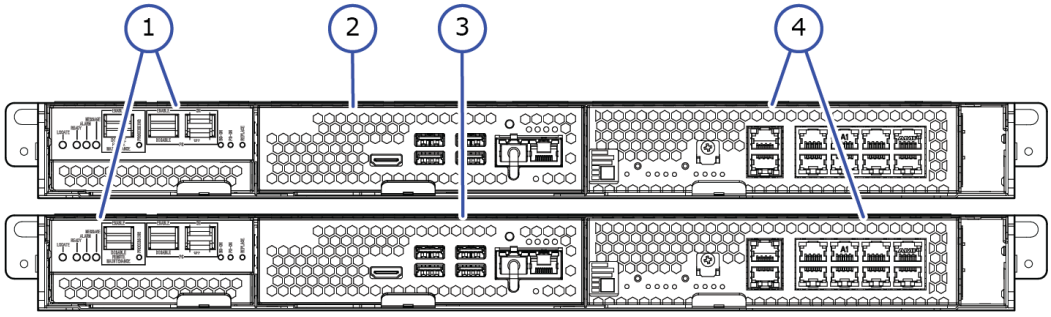
The following table lists and describes the data storage drives supported by the storage systems:

Group	Interface	Size (inch)	Transfer rate (Gbps)	Revolution Speed (min^{-1}) or Flash Memory Technology	Capacity
HDD	NL-SAS	3.5	12	7,200	▪ 10 TB ▪ 14 TB
HDD	SAS	2.5	12	10,000	▪ 2.4 TB
SSD	SAS	2.5	12	MLC/TLC	▪ 960 GB* ▪ 1.9 TB ▪ 3.8 TB ▪ 7.6 TB ▪ 15.3 TB ▪ 30 TB
SSD	NVMe	2.5	8	TLC	▪ 1.9 TB ▪ 3.8 TB ▪ 7.6 TB ▪ 15.3 TB ▪ 30 TB
SCM	NVMe	2.5	8	SCM	▪ 375 GB ▪ 750 GB ▪ 1.5 TB

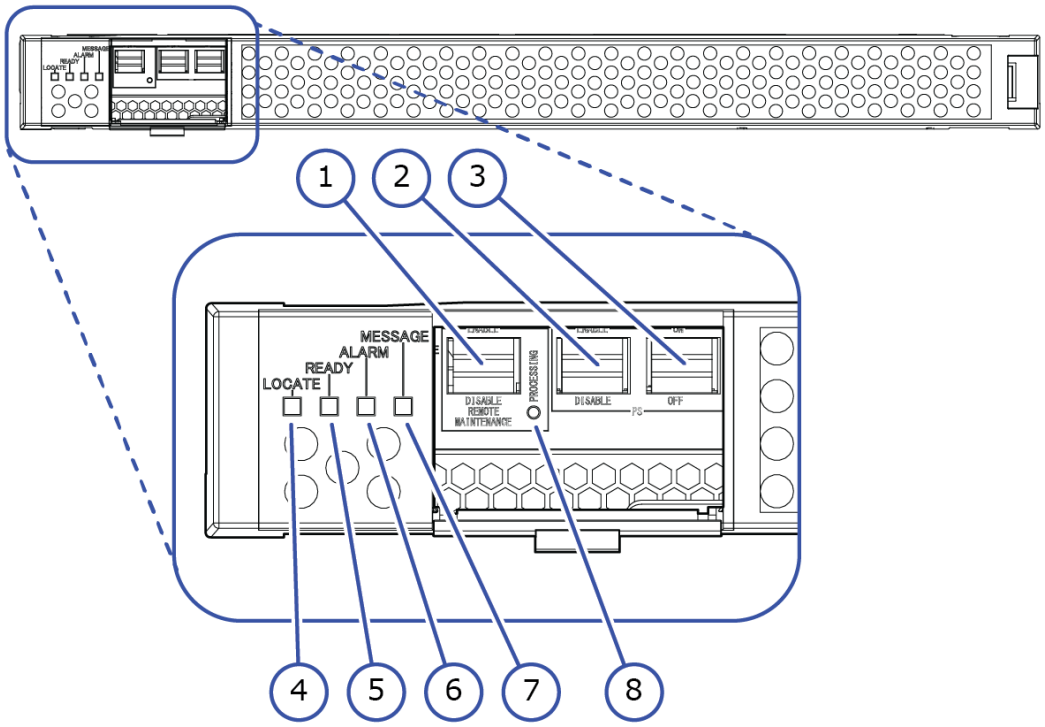
Group	Interface	Size (inch)	Transfer rate (Gbps)	Revolution Speed (min^{-1}) or Flash Memory Technology	Capacity
* Supported only on VSP 5200 and VSP 5600 with upgrade.					

Node interconnect switch

The node interconnect switch is a 1U switch chassis that contains interconnect and management components, including two interconnect switches, the service processor (SVP), an ethernet switch (SSVP), the operation panel, and two power supplies with a built-in cooling fan. The primary and secondary node interconnect switches must be installed in the storage system. For the secondary node interconnect switch, the SVP and SSVP are optional.

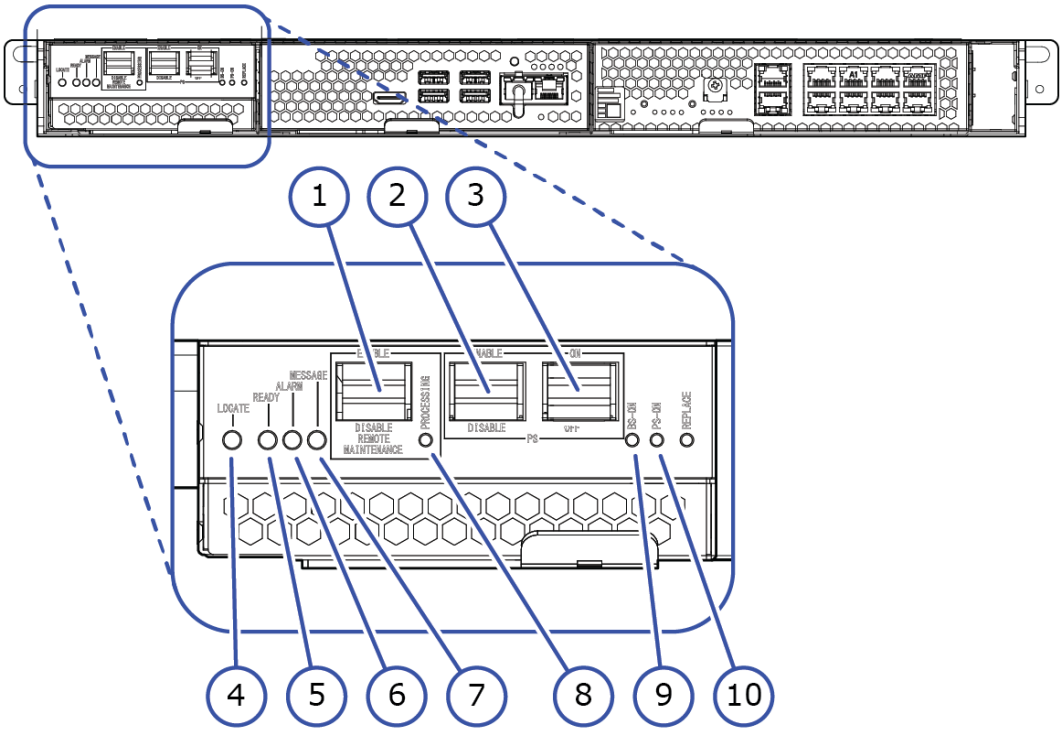


Identifier	Name	Description
1	Operation Panel	The operation panel shows system status with LED and controls power on and off of the storage system.
2	Backup Service Processor	A redundant SVP in case the main SVP fails.
3	Main Service Processor	The SVP provides status information about the storage system.
4	Ethernet Switch (SSVP)	The SSVP is a LAN hub that connects the SVP to each controller chassis, optional SSVP, and maintenance PC.



Number	Item	Description
1	REMOTE MAINTENANCE ENABLE/DISABLE	Used to enable or disable the remote maintenance of the storage system. ENABLE: Remote maintenance is allowed. DISABLE: Remote maintenance is not allowed.
2	PS SW ENABLE	Move this switch to the ENABLE position to allow the PS ON/PS OFF switch to power on or power off the storage system.
3	PS ON/PS OFF	To power on or off the storage system, move this switch while holding the PS SW ENABLE switch in the ENABLE position.
4	LOCATE	Amber: The node interconnect switch needs maintenance. Off: Normal condition.
5	READY	Green: I/O operation on the channel interface is possible. Off: Not ready.
6	ALARM	Red: The storage system is down, or an MP block occurred.

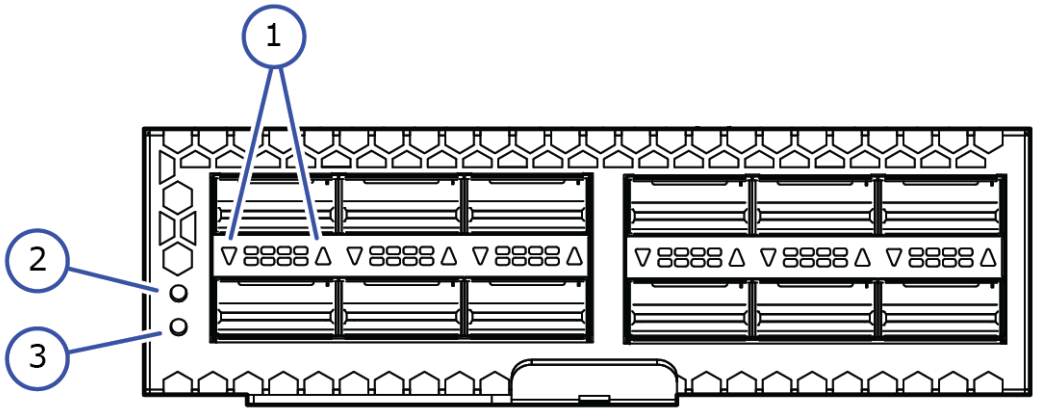
Number	Item	Description
		Off: Not in the alarm status.
7	MESSAGE	Amber: The storage system is down, or an MP block occurred. The storage system detected a failure, and a SIM related to the failure was reported to the SVP. The LED continues to light until the maintenance personnel changes the SIM attribute to 'complete'. One blinking amber: SVP became faulty in a single SVP configuration. Two blinking amber: SVPs became faulty in a dual SVP configuration. If one of the two SVPs becomes faulty in a dual SVP configuration, this LED does not blink.
8	REMOTE MAINTENANCE PROCESSING	Amber: Remote maintenance (ASSIST) is being operated.



Number	Item	Description
1	REMOTE MAINTENANCE ENABLE/DISABLE	Used to enable or disable the remote maintenance of the storage system. ENABLE: Remote maintenance is allowed. DISABLE: Remote maintenance is not allowed.
2	PS SW ENABLE	Move this switch to the ENABLE position to allow the PS ON/PS OFF switch to power on or power off the storage system.
3	PS ON/PS OFF	To power on or off the storage system, move this switch while holding the PS SW ENABLE switch in the ENABLE position.
4	LOCATE	Amber: The node interconnect switch needs maintenance. Off: Normal condition.
5	READY	Green: I/O operation on the channel interface is possible. Off: Not ready.
6	ALARM	Red: The storage system is down, or an MP block occurred. Off: Not in the alarm status.
7	MESSAGE	Amber: The storage system is down, or an MP block occurred. The storage system detected a failure, and a SIM related to the failure was reported to the SVP. The LED continues to light until the maintenance personnel changes the SIM attribute to 'complete'. One blinking amber: SVP became faulty in a single SVP configuration. Two blinking amber: SVPs became faulty in a dual SVP configuration. If one of the two SVPs becomes faulty in a dual SVP configuration, this LED does not blink.
8	REMOTE MAINTENANCE PROCESSING	Amber: Remote maintenance (ASSIST) is being operated.
9	BS ON	Amber: The auxiliary power supply in the storage system is powered on.

Number	Item	Description
10	PS ON	Green: The storage system is powered on.

Interconnect switch



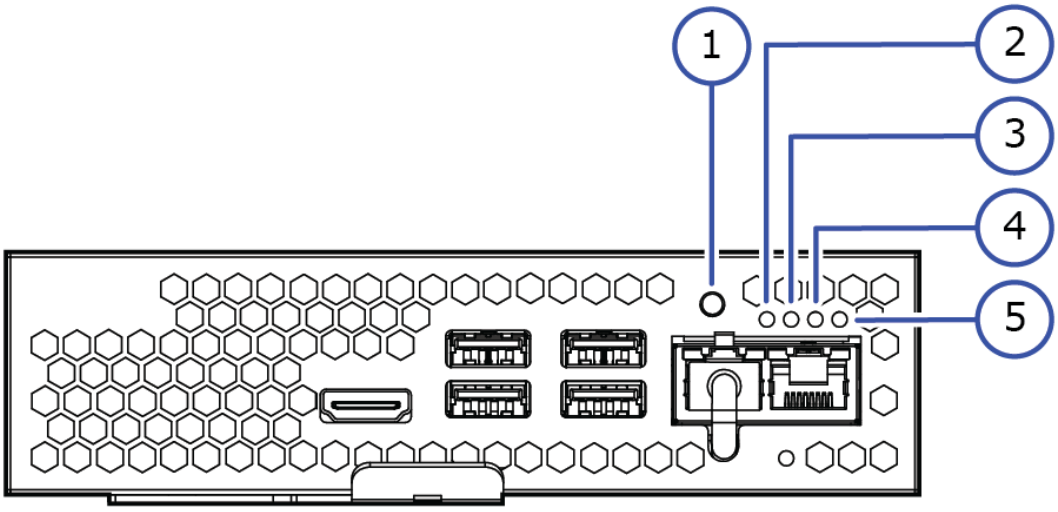
ISW

Number	Item	Description
1	PORT	Red: The cable needs maintenance. Blinking Red: Error state (not linked state). Blinking Amber/Green): Error state (linked state). Green: Normal state (linked state). Off: Link down state.
2	ALARM	On: An error has occurred.
3	POWER	On: The ISW is powered on.

Service processor

The service processor (SVP) is integrated into the controller and can only be used by authorized Hitachi Vantara personnel. The SVP enables the Hitachi Vantara representative to configure, maintain, service, and upgrade the storage system, and it also hosts the Hitachi Device Manager - Storage Navigator software. The SVP collects performance data for key hardware components and is connected with a service center for remote maintenance of the storage system. The SVP does not have access to any user data stored on the storage system.

If an optional second SVP is installed, the primary SVP is the active unit while the secondary SVP acts as a hot standby. If the primary SVP fails, the hot standby SVP takes over. In this way, the dual-SVP configuration eliminates single points of failure with the SVP.



SVP

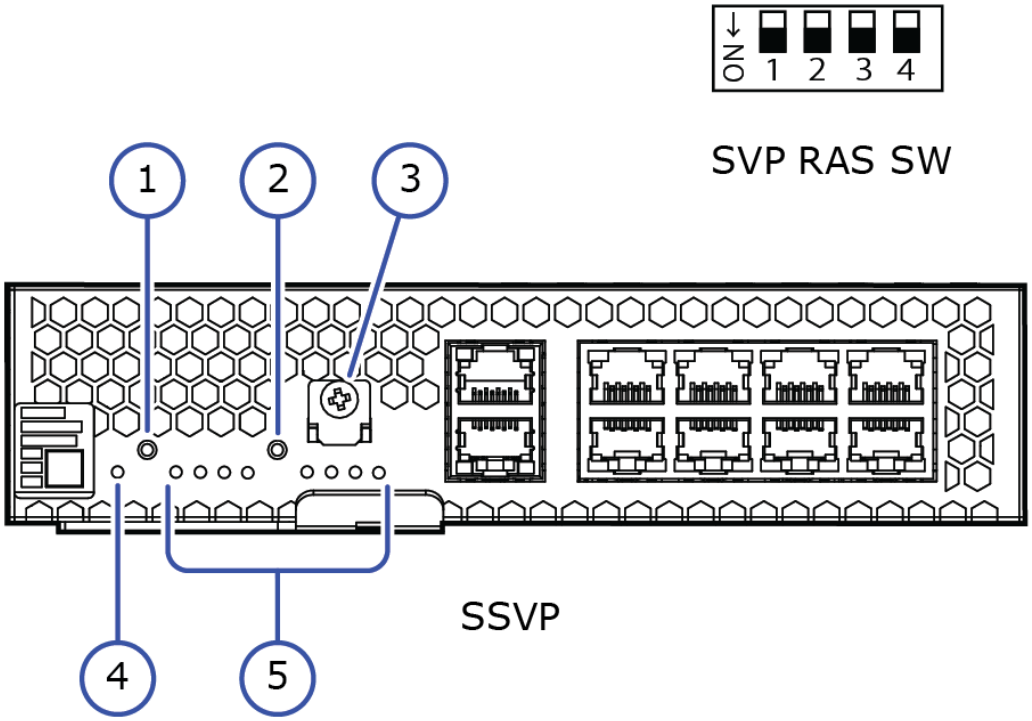
Number	Item	Description
1	SVP PS ON/OFF	Used to power on or off the SVP power supply. Holding down this switch shuts down the power supply.
2	SVP POWER	Green: The SVP power supply is powered on.
3	SVP DCIN	Green: The SVP is receiving DC power.
4	SVP HDD	Green: The HDD in the SVP is being accessed.
5	SVP SHUT DOWN	Red: The SVP can be removed when the storage system is powered on.

The table lists the technical specifications of the service processor.

Component	Specifications
Operating System	Windows 10 IoT Enterprise 2019 LTSC
CPU	Intel® Core™ i3-6100U Processor

Component	Specifications
Internal Memory	8 GiB
Disk drive	256GiB (SATA3.0 mSATA)
LAN	On-Board 10Base-T/ 100Base-TX /1000Base-T x 2 Port
USB	Version 3.0 x 4 ports
Because the SVP has no monitor or keyboard, a maintenance PC must be connected to the SVP to view the information collected by the SVP.	

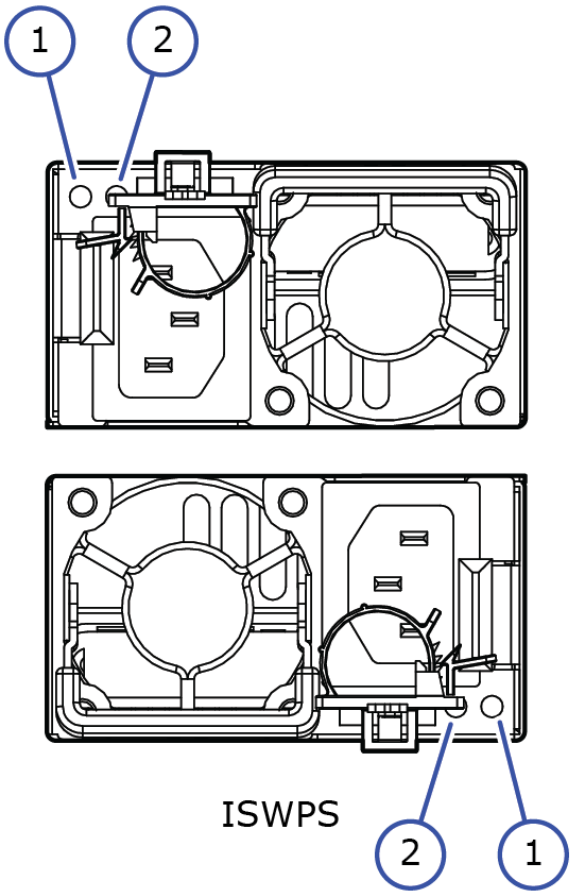
Ethernet Switch (SSVP)



Number	Item	Description
1	SSVP RESET	Used to reset the hardware of the SSVP.
2	SVP RAS SET	Used to set the RAS function of the SVP. Use this switch together with the SVP RAS switches #2, #3, and #4.
3	SVP RAS	#1 : The SVP PS ON/OFF INH switch to suppress rebooting the SVP. #2, #3, and #4 : Used with the SVP RAS SET switch to set each function of the SVP. See table below for functions.
4	SSVP REP	The SSVP is ready to be replaced for maintenance. This LED is lit by SVP control.
5	SVP STATUS	This LED is turned on or off by program control via a RAS driver.

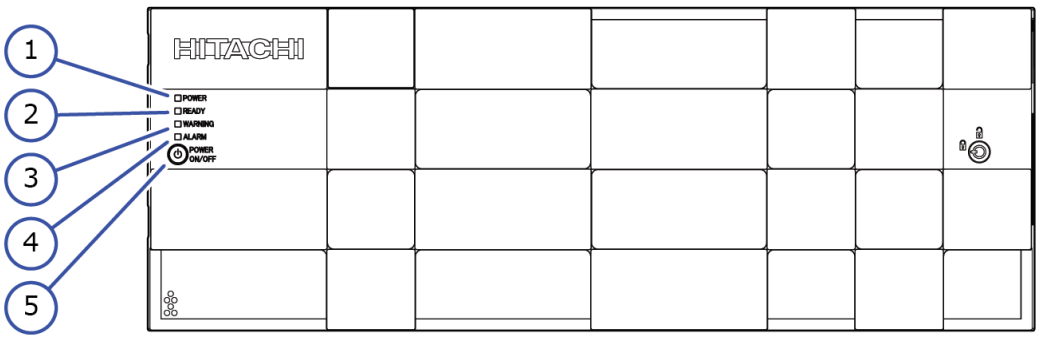
Setting	Operation	#2	#3	#4	SVP RAS SET switch
SVP IP ADDRESS DISPLAY	First time	ON	OFF	OFF	Press down
HUB RESET	First time	ON	OFF	ON	Press down
Disabling the setting, or canceling the first operation	First time	ON	ON	ON	Press down
	Second time	OFF	OFF	OFF	Press down
SVP PASSWORD/IP ADDRESS INITIALIZATION	First time	ON	ON	ON	Press down
	Second time	OFF	OFF	ON	Press down

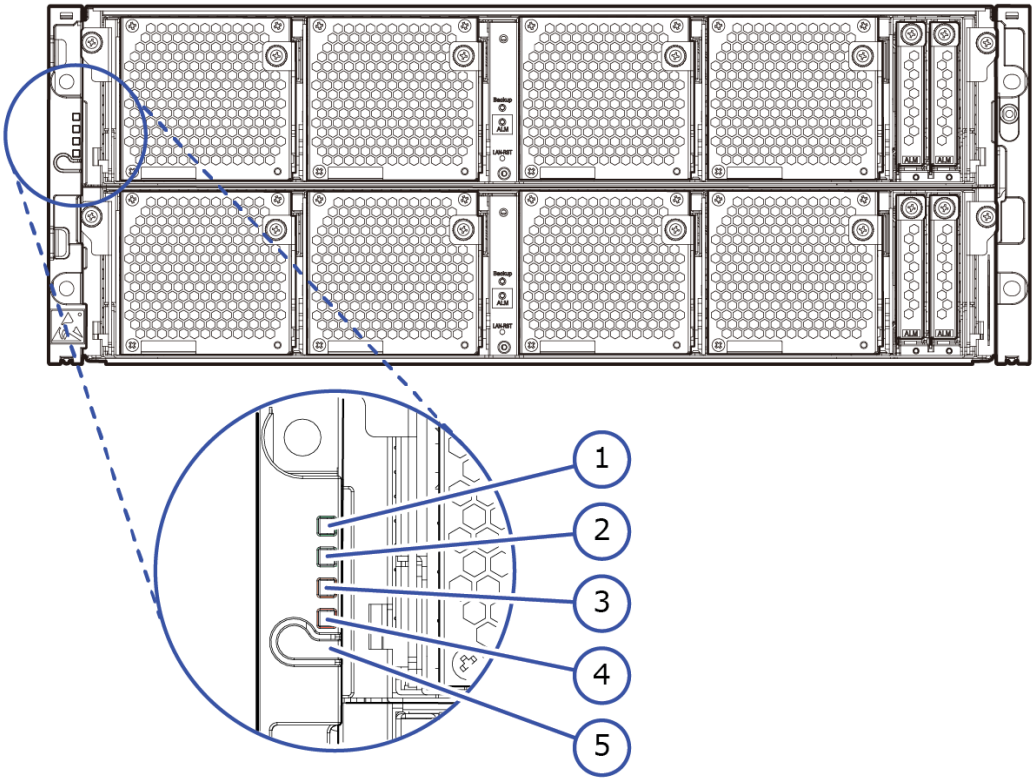
Interconnect switch power supply



Number	Item	Description
1	PORT	Blue: AC input is normal.
2	ALM/RDY	Red: The ISWPS is ready to be replaced. Green: The ISWPS is operating normally.

LED locations for high availability node





Number	Item	Description
1	POWER LED	Green: Storage system is powered on. Amber: Storage system is receiving power.
2	READY LED	Green: Normal operation.
3	WARNING LED	Off: Normal operation. Amber: Component requires maintenance. Blink: Failure requires maintenance. **Note**: When System Option Mode 1097 is set to ON, the WARNING LED does not blink, even if the following failure service information messages (SIM) are issued: 452xxx, 462xxx, 3077xx, 4100xx, and 410100.

Number	Item	Description
		LED might turn off during user maintenance.
4	ALARM LED	Off: Normal operation. Red: Processor failure (system might be down). For assistance, contact customer support: https://support.hitachivantara.com/en_us/contact-us.html.
5	POWER ON/OFF (main switch)	Powers the storage system.

Chapter 3: Specifications

The storage system use the following specifications.

The Hitachi Virtual Storage Platform 5000 series (VSP 5000 series) storage systems are designed to operate in a controlled environment such as a data center. The following tables provide the environmental, electrical, and physical requirements and specifications for the storage systems.

Storage system specifications

The following table lists the technical specifications of the Hitachi Virtual Storage Platform 5000 series storage system.

Item			Specification
System	2.5-inch SAS HDD/SSD	Maximum number of drives	2-node system: 768 4-node system: 1,536 6-node system: 2,304
	3.5-inch SAS HDDs	Maximum number of drives	2-node system: 384 4-node system: 768 6-node system: 1,152
	Number of FMDs	Maximum number of drives	2-node system: 192 4-node system: 384 6-node system: 576
	Number of NVMe drives	Maximum number of SSDs	2-node system: 96 4-node system: 192 6-node system: 288
		Maximum number of SCM drives	2-node system: 33 4-node system: 66 6-node system: 99
	RAID group configuration	RAID 6	▪ 6D+2P ▪ 14D+2P

Item			Specification
		RAID 5	▪ 3D+1P ▪ 7D+1P
		RAID 1 (RAID 1+0)	▪ 2D+2D ▪ 4D+4D
	Maximum number of spare drives		2-node system: 64 4-node system: 128 6-node system: 192
	Maximum number of volumes		65,280
	Maximum storage system capacity (physical capacity) (30-TB 2.5-inch SAS SSDs)		2-node system: 23.1 PB (20.5 PiB) 4-node system: 46.2 PB (41 PiB 6-node system: 69.3 PB (61.5 PiB)
	Maximum external configuration		255 PiB
Memory	Cache memory capacity		512 GiB to 6,144 GiB
Storage interface	Controller-drive box (DKC-DB) interface		SAS/Dual Port NVMe/Dual Port (SAS and NVMe cannot be intermixed within each node pair.)
	Data transfer rate	SAS Interface	12 Gbps
		NVMe (PCIe) Interface	8 Gbps
	Maximum number of back-end modules (BEMs) (also called disk boards, or DKBs		2-node system: 8 4-node system: 16 6-node system: 24
Device interface	Channel type	Open Systems	Fibre Channel Shortwave Fibre Channel Longwave iSCSI (Optic)
		Mainframe	Fibre Channel Shortwave Fibre Channel Longwave
	Data trasfer rate	Fibre Channel	Open System: 4/8/16/32 Gbps Mainframe: 4/8/16 Gbps
		iSCSI (Optic)	10 Gbps

Item		Specification
	Maximum number of CHB	2-node system: 16 2-node system: 32 6-node system: 48

Physical specifications

The following table provides power consumption, heat output, and airflow specifications of the individual Virtual Storage Platform 5000 series system components.

Component	Component model number	Maximum power consumption (VA)	Maximum heat output	Airflow (m^3/min) *	Weight (kg)
Primary controller chassis	DKC910I-CBX	920	874	5.4	70.0
Primary controller chassis	DKC910I-CBXCL	881	838	5.4	70.4
Secondary controller chassis	DKC-F910I-CBX2	469	446	3.0	41.6
Secondary controller chassis	DKC-F910I-CBXCL2	430	409	3.0	42.0
SFF drive chassis	DKC-F910I-SBX	1,221	1,160	12.8	68
LFF drive chassis	DKC-F910I-UBX	1,000	920	18.9	126.0
FMD Drive Chassis	DKC-F910I-FBX	620	590	6.4	76.7
Controller Chassis Bezel	DKC-F910I-CBLFB	-	-	-	1.0
Controller Chassis Bezel	DKC-F910I-CBLFBA	-	-	-	1.2
Drive Chassis Bezel	DKC-F910I-DBFB	-	-	-	0.5
Drive Chassis Bezel	DKC-F910I-DBFBA	-	-	-	0.5
HSN Chassis Bezel	DKC-F910I-HSNFB	-	-	-	0.6
HSN Chassis Bezel	DKC-F910I-HSNFBA	-	-	-	0.6
Flash Module Bezel	DKC-F910I-FBFB	-	-	-	0.7
Flash Module Bezel	DKC-F910I-FBFBA	-	-	-	0.9

Component	Component model number	Maximum power consumption (VA)	Maximum heat output	Airflow (m^3/min) *	Weight (kg)
Additional Service Processor	DKC-F910I-SVP	16.0	15.2	-	0.7
Additional RAID Controller Kit	DKC-F910I-CTL	390	370	-	11.4
Additional RAID Controller Kit	DKC-F910I-CTLCL	351	333	-	11.8
RAID Controller Upgrade Kit	DKC-F910I-CTLUG	260	247	-	6.6
Compression Accelerator Fan Module	DKC-F910I-ACLF	19.5	18.5	-	1.2
Power Supply Unit	DKC-F910I-CBPSU	-	-	-	2.2
Safety Cover for empty CTL slot	DKC-F910I-SCFC	-	-	-	1.8
Additional Hub	DKC-F910I-HUB	12.0	11.4	-	0.5
Fan Module	DKC-F910I-FANM	22.7	21.6	-	1.1
Operation Panel Kit	DKC-F910I-OPPNL	1.0	1.0	-	0.37
Mainframe Fibre 4-port 16G Host Adapter for Shortwave	DKC-F910I-4MS16	23.5	22.3	-	0.5
Mainframe Fibre 4-port 16G Host Adapter for Longwave	DKC-F910I-4ML16	23.5	22.3	-	0.5

Component	Component model number	Maximum power consumption (VA)	Maximum heat output	Airflow (m^3/min) *	Weight (kg)
Fibre 4-port 32Gbps Ready Host Adapter	DKC-F910I-4HF32R	24.9	22.4	-	0.5
iSCSi 2-port 10G Host Adapter	DKC-F910I-2HS10S	22.8	21.6	-	0.5
SFP for 16Gbps Longwave	DKC-F810I-1PL16	-	-	-	0.02
SFP for 16Gbps Shortwave	DKC-F810I-1PS16	-	-	-	0.02
SFP for 32Gbps Longwave	DKC-F810I-1PL32	-	-	-	0.02
SFP for 32Gbps Shortwave	DKC-F810I-1PS32	-	-	-	0.02
Disk Adapter	DKC-F910I-BS12G	17.2	16.0	-	0.5
Encryption Disk Adapter	DKC-F910I-BS12GE	17.2	16.0	-	0.5
Cache Memory 64GB	DW-F850-CM64GL	5.0	4.8	-	0.054
Cache Memory 32GB	DW-F850-CM32G	4.2	4.0	-	0.054
Cache Memory 64GB	DW-F850-CM64G	5.0	4.8	-	0.054
Cache Flash Memory 45	DKC-F910I-BM45	6.8	6.5	-	0.2
Cache Flash Memory 45 with encryption	DKC-F910I-BM4E	6.8	6.5	-	0.2
Cache Flash Memory 95	DKC-F910I-BM95	6.8	6.5	-	0.2

Component	Component model number	Maximum power consumption (VA)	Maximum heat output	Airflow (m^3/min) *	Weight (kg)
Cache Flash Memory 95 with encryption	DKC-F910I-BM9E	6.8	6.5	-	0.2
Rack Rail	A34V-600-850-UNI-S.P	-	-	-	-
HSN Chassis Rail	3292455-001	-	-	-	-
Rack Rail	A34V-600-850-UNI-S.P	-	-	-	-
Drive Chassis Rail for FBX	A3BF-HK-GL-740-1-S.P L	-	-	-	-
PCIe Cable set for primary module CBXA	DKC-F910I-MCC1	-	-	-	0.1
PCIe Cable set for primary module CBXB	DKC-F910I-MCC2	-	-	-	0.1
PCIe Cable 5m	DKC-F910I-MFC5	-	-	-	0.2
PCIe Optical Module	DKC-F910I-PQSFP	-	-	-	0.005
SAS Optical Module	DKC-F910I-SQSFP	-	-	-	0.005
Optical Cable 10m	DKC-F910I-MPC10	-	-	-	0.2
Optical Cable 20m	DKC-F910I-MPC20	-	-	-	0.3
Optical Cable 30m	DKC-F910I-MPC30	-	-	-	0.4
Optical Cable 100m	DKC-F910I-MPC1H	-	-	-	1.0

Component	Component model number	Maximum power consumption (VA)	Maximum heat output	Airflow (m^3/min) *	Weight (kg)
SAS Cable set for Disk Adapter	DKC-F910I-SCCS	-	-	-	1.4
QSFP Metal Cable 1m	DW-F800-SCQ1	-	-	-	0.2
QSFP Metal Cable 1.5m	DW-F800-SCQ1F	-	-	-	0.2
RJ45 bundled LAN Cable Kit	DKC-F910I-LC	-	-	-	0.2
RJ45 Cable 5m	DKC-F910I-LC5	-	-	-	0.3
RJ45 Cable 10m	DKC-F910I-LC10	-	-	-	0.5
RJ45 Cable 20m	DKC-F910I-LC20	-	-	-	0.9
RJ45 Cable 30m	DKC-F910I-LC30	-	-	-	1.4
RJ45 Cable 100m	DKC-F910I-LC1J	-	-	-	4.7
SFF 2.4TB Disk Drive	DKC-F810I-2R4JGM	14.0	13.0	-	0.26
LFF 14TB Disk Drive	DKC-F810I-14RH9M	21.0	20.0	-	0.77
SFF 960GB SSD Drive	DKC-F810I-960MGM	14.0	13.0	-	0.21
SFF 1.9TB SSD Drive	DKC-F810I-1T9MGM	14.0	13.0	-	0.21
SFF 3.8TB SSD Drive	DKC-F810I-3R8MGM	14.0	13.0	-	0.21

Component	Component model number	Maximum power consumption (VA)	Maximum heat output	Airflow (m^3/min) *	Weight (kg)
SFF 7.6TB SSD Drive	DKC-F810I-7R6MGM	14.0	13.0	-	0.21
SFF 15TB SSD Drive	DKC-F810I-15RMGM	14.0	13.0	-	0.21
SFF 30TB SSD Drive	DKC-F810I-30RMGM	14.0	13.0	-	0.21
7TB Flash Module Drive	DKC-F810I-7R0FP	30.0	28.0	-	1.4
14TB Flash Module Drive	DKC-F810I-14RFP	30.0	28.0	-	1.4
NVMe Disk Adapter	DKC-F910I-BN8G	21.5	20.5	-	0.5
NVMe Disk Adapter	DKC-F910I-BN8GE	21.5	20.5		0.5
NVMe SFF Drive Chassis	DKC-F910I-NBX	1221	1160	16.4	62
NVMe Chassis Rail	A3BF-HK-GL-740-1-S.P	-	-	-	-
NVMe Cable set for NVMe Disk Adapter	DKC-F910I-NCCS	-	-	-	1.1
SFF 1.9TB NVMe Drive	DKC-F910I-1R9RVM	20	19	-	0.21
SFF 3.8TB NVMe Drive	DKC-F910I-3R8RVM	20	19	-	0.21
SFF 7.6TB NVMe Drive	DKC-F910I-7R6RVM	20	19	-	0.21

Component	Component model number	Maximum power consumption (VA)	Maximum heat output	Airflow (m^3/min) *	Weight (kg)
SFF 15TB NVMe Drive	DKC-F910I-15RRVM	20	19	-	0.21
SFF 30TB NVMe Drive	DKC-F910I-30RRVM	20	19	-	0.21
SCM 375GB NVMe Drive	DKC-F910I-375YVM	20	19	-	0.19
* Maximum values when all fans rotate at the maximum speed					

Electrical specifications

The Hitachi Virtual Storage Platform 5000 series storage system power distribution units (PDUs) support single-phase AC power.

The Hitachi rack comes with either two, four, or six PDUs, depending on the PDU model selected. The PDUs are installed vertically in the rack.

- If two PDUs are selected, one will be installed on the left side of the rack and the other will be installed on the right side.
- If four PDUs are selected, the PDUs will be half-length and mounted vertically, one above the other, with two on the left side of the rack and two on the right side.
- If six PDUs are selected, the PDUs will be 1/3-length and mounted vertically, one above the other, with three on the left side of the rack and two on the right side.

Note: The current and power specifications of the storage system in the following tables were measured in a controlled environment. To calculate the power and current draw, and heat output of a specific system, see Physical specifications (on page 53) or use the weight and power calculator at the following URL:https://www.hitachivantara.com/ext/weight-and-power-calculator.html .

If you need assistance using this tool, contact Hitachi Vantara Support athttps://support.hitachivantara.com/en/contact-support.html .

Item	Input Power	Inrush Current (Rating) *		Leakage Current	Inrush Current		
		When one PS is operating	When two PSs are operating		1st (0-p)	2nd (0-p)	1st (0-p) Time (-25%)
Node power supply	Single phase, AC200V to AC240V	7.2 A	3.6 A	1.75 mA	30 A	30 A	25 ms
DBPS (DBS2)		3.2 A	1.6 A	1.75 mA	30 A	30 A	25 ms
DBPS (DBL)		2.0 A	1.0 A	1.75 mA	30 A	30 A	25 ms
DBPS (DBF3)		3.1 A	1.55 A	1.75 mA	20 A	15 A	80 ms
DBPS (DBN)		4.0 A	2.0 A	1.75 mA	30 A	30 A	25 ms
Node interconnect switch power supply		1.2 A	0.6 A	1.75 mA	30 A	30 A	25 ms

* When two power supplies are operating, each power supply provides about half of the required power for the storage system. When only one of the two power supplies is operating, the power supply provides all required power for the storage system. Therefore, use the power supplies that meet the rated input current for when one power supply is operating.

The following table shows the supported input voltage and frequency for the controller chassis, drive box, and node interconnect switch.

Input voltage	Voltage tolerance	Frequency	Wire connection
200V to 240V	+10% or -11%	50Hz ± 2Hz 60Hz ± 2Hz	1 Phase 2 Wire + Ground

- Use PDU with the standard plug.
- If PDU is provided with connecting type B plug, use PDU with circuit breaker of 20 (16) A or less, or install circuit breaker of 20 (16) A in the power supply.

Environmental specifications

The following table lists the environmental specifications for the Hitachi Virtual Storage Platform 5000 series storage systems.

Note: Environmental conditions of operation should be completed before switch on a system

Table 2 Environmental specifications

Item	Condition		
	Operating	**Not operating**	**Shipping and storage**
Temperature range	10ºC to 40ºC[6]	-10ºC to 50ºC	-30ºC to 60ºC
Relative Humidity (No dew condensation)	8% to 80%	8% to 90%	5% to 95%
Max. Wet Bulb	29ºC	29ºC	29ºC
Temperature gradient per hour	10ºC	10ºC	10ºC
Dust	0.15 or less	-	-
Gaseous contaminants[2]	G1 classification levels		
Altitude (m)	~ 3,050 (10ºC ~ 28ºC) ~ 950 (10ºC ~ 40ºC)[6]	-60 to 3,000	-60 to 3,000
Noise Level (Recommended)	90 dB or less[1]	-	-
Chassis Acoustic Level [45]	▪ CBX: L_{pAm} 60dB, L_{wA} 6.6Bel ▪ CBXCL: L_{pAm} 65dB, L_{wA} 7.7Bel ▪ HSNBX: L_{pAm} 60dB, L_{wA} 6.6Bel ▪ DBS2: L_{pAm} 60dB, L_{wA} 6.4Bel ▪ DBL: L_{pAm} 60dB, L_{wA} 6.4Bel	▪ CBX: L_{pAm} 55dB ▪ CBXCL: L_{pAm} 55dB ▪ HSNBX: L_{pAm} 55dB ▪ DBS2: L_{pAm} 55dB ▪ DBL: L_{pAm} 55dB ▪ DBF3: L_{pAm} 55dB ▪ DBN: L_{pAm} 55dB	-

Item	Condition		
	Operating	**Not operating**	**Shipping and storage**
	▪ DBF3: L_{pAm} 60dB, L_{wA} 6.0Bel ▪ DBN: L_{pAm} 60dB, L_{wA} 6.0Bel		

1. Fire suppression systems and acoustic noise: Hitachi does not test storage systems and hard disk drives for compatibility with fire suppression systems and pneumatic sirens. Hitachi also does not provide recommendations or claim compatibility with any fire suppression systems and pneumatic sirens. Customer is responsible to follow their local or national regulations.
2. See ANSI/ISA-71.04-2013 Environmental Conditions for Process Measurement and Control Systems: Airborne Contaminants.
3. Meets the highest allowable temperature conditions and complies with ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) 2011 Thermal Guidelines Class A2. The maximum value of the ambient temperature and the altitude is from 35 degrees C at an altitude of 950 meters (3000 feet) to 28 degrees C at an altitude of 3050 meters (10000 feet). The allowable ambient temperature is decreased by 1 degree C for every 300-meter increase in altitude above 950 meters.
4. The acoustic level is measured under the following conditions in accordance with ISO7779 and the value is declared based on ISO9296.

   In a normal installation area (data center/general office), the storage system is surrounded by different elements from the following measuring conditions according to ISO, such as noise sources other than the storage system (other devices) , the walls and ceilings that reflect the sound.

   Therefore, the values described in the table do not guarantee the acoustic level in the actual installation area.

   - Measurement environment: In a semi-anechoic room whose ambient temperature is 23 degrees C ± 2 degrees C
   - Device installation position: The Controller Chassis is at the bottom of the rack and the Drive Box is at a height of 1.5 meters in the rack
   - Measurement position: 1 meter away from the front, rear, left, or right side of the storage system and 1.5 meters high (at four points)
   - Measurement value: Energy average value of the four points (front, rear, left, and right)
5. Sound pressure level [LA] changes from 45 dB to 63 dB according to the ambient temperature, drive configuration and operating status. The maximum could be 67 dB during maintenance procedure for failed ENC or Power Supply.
6. NVMe drives have a temperature range from 10ºC to 35ºC while in operation.

Mechanical environmental specifications

The following tables list the mechanical environmental conditions for the Hitachi Virtual Storage Platform 5000 series storage systems.

Table 3 Mechanical environmental conditions

Item	In operation	In non-operation
Vibration value of storage system	0.25Grms, 5-500Hz, 30min.	0.6Grms, 3-500Hz, 30min.
Vibration value of chassis	-	▪ 5G, 11ms half sine, 3axis direction ▪ 10G, 6ms, half sine, 3axis direction ▪ 10G, 11ms, half sine, bottom direction

Chapter 4: Turning storage system power on and off

The storage system can be powered on and off using the power control panel located on the node interconnect switch during normal operating conditions or a power failure. See Node interconnect switch (on page 38) for switch locations.

System idle mode

When the storage system power cables are plugged into the PDUs and the PDU breakers are on, the storage system is in idle (basic supply only) mode. When the storage system is in idle mode:

- The amber Basic Supply (BS) LED on the control panel is on. AC power is applied to the power supplies.
- The green READY LED is off. The controller chassis and drive boxes are not operational.
- The fans in both the controller chassis and drive boxes are running.
- The cache backup batteries are being charged.
- The storage system consumes significantly less power than it does in operating mode. For example, a storage system that draws 100 amps while operating draws only 40 to 60 amps in idle mode, depending on the number of drives in the system. The more drives, the more power is saved. See Table 4 Maximum idle power per component (on page 66) and Mechanical environmental specifications (on page 64).

To put the storage system into idle mode from the OFF condition:

1. Ensure power is available to the AC input boxes and PDUs in all racks.
2. Turn on all PDU power switches and circuit breakers.

To put the storage system into idle mode from a power on condition, perform the steps in Power off procedures (on page 67).

To shut down the storage system, perform the power off procedures, and then turn off all PDU circuit breakers.

Warning: Verify the storage system is turned off normally and in idle mode before turning off the PDU circuit breakers. Otherwise, turning off the PDU circuit breakers can leave the storage system in an abnormal condition.

Table 4 Maximum idle power per component

Component	Maximum idle power (VA)
Controller Chassis 0 or 1	500
SFF Drive Box (SBX)	1,040
LFF Drive Box (UBX)	1,440
FMD Drive Box (FBX)	1,720
NVME Drive Box (NBX)	2,000

Normal power on/off procedures

This section provides general information about turning on and turning off the power to the storage system. If further assistance is required, contact customer support.

Power on procedures

Before you begin

- Confirm the storage system is in idle mode. See System idle mode (on page 65).

Note: The control panel includes a safety feature to prevent the storage system power from being turned on or off accidentally. The PS ON/OFF switch does not work unless the ENABLE switch is moved to and held in ENABLE while the power switch is moved to ON or OFF.

Procedure

1. On the control panel, check the amber BS LED and make sure it is lit. It indicates that the storage system is in idle mode.
2. In the PS area on the control panel, move the ENABLE switch to the ENABLE position and hold it there. While holding the switch in the ENABLE position, move the PS ON/OFF switch to ON. Then release both switches.
3. Wait for the storage system to complete its power-on self-test and start processes. Depending on the storage system configuration, this can take several minutes.

   The storage system does not go to the READY state until the cache backup batteries are charged to at least 50%. The process can take 90 minutes if the batteries are completely discharged. The storage system generates a SIM that provides the status of the battery charge. See Cache backup batteries for information about the batteries.
4. When the system self-test is complete and all components are operating normally, the green READY LED turns ON and the storage system is ready for use.

   If the ALARM LED is also ON, or if the READY LED is not ON after 20 minutes, contact customer support for assistance.

Power off procedures

Follow this procedure exactly when powering off the storage system.

Caution: Except in an emergency, do not turn off the PDU breakers before turning off the power to the system. The system reacts as a power failure occurred and uses the cache backup batteries to keep the cache active until the data in the cache is transferred to the cache backup flash memory. When the cache backup batteries discharge power, the power-on time can be prolonged by the amount of charge remaining in the batteries. Fully discharged batteries take 90 minutes to charge.

Note: The control panel includes a safety feature to prevent the storage system power from being turned on or off accidentally. The PS power ON/OFF switch does not work unless the ENABLE switch is moved to and held in ENABLE while the power switch is moved to ON or OFF.

Before you begin

- Confirm all maintenance and software-specific shutdown procedures have been completed.
- Verify all I/O activity to the storage system has stopped. You can vary paths offline and shut down the attached hosts.

Procedure

1. In the PS area on the control panel, move the ENABLE switch to the ENABLED and hold it there. While holding the switch in ENABLED, move the PS ON/OFF switch to OFF. Then release both switches.
2. Wait for the storage system to complete its shutdown routines. Depending on the storage system configuration and certain MODE settings, you can wait 20 minutes for the storage system to copy data from the cache to the cache flash drives and for the disk drives to spin down.

   If the READY and PS LEDs do not turn OFF after 20 minutes, contact customer support for assistance.

Emergency power off/on procedures

The following describes how to shut off the system during an emergency situation and turning on power to the storage system after an emergency shutdown.

Turning off power to the storage system during an emergency

The storage system does not have an emergency power off switch. Use the following procedure to turn off the system during an emergency.

Note: When turning off the storage system, first turn off the PDUs connecting to the controllers and then turn off the PDUs connecting to the drive trays.

Procedure

1. Open the back doors of both racks that contain control units.
2. Turn off the circuit breakers in the following order:
   a. Turn off the circuit breakers in both lower PDUs in both racks.
   b. Turn off the circuit breakers in both upper PDUs in both racks with control units.
3. Open the back doors of all racks containing only drive units and, in any order, turn off the circuit breakers to all the PDUs.

Turning on power to the storage system after an emergency shutdown

To turn the power on to the storage system after an emergency shutdown, use the following instructions.

Note: When turning on the storage system, first turn on the PDUs connecting to the drive trays and then turn on the PDUs connecting to the controllers.

Procedure

1. In all system racks, turn on the circuit breakers in the PDUs supplying electrical power to the drive units.
2. In both controller racks, turn on the circuit breakers in the PDUs supplying electrical power to the controllers.
3. Turn on power to the system. For more information, see Normal power On/Off procedures (on page 66).

Chapter 5: Site preparation

The delivery and installation site for the storage system must meet certain requirements to ensure successful and efficient installation of the storage system.

Note: The following information is provided to assist in installation planning and is not intended to be complete. The installation and maintenance documents used by Hitachi Vantara personnel contain complete specifications. For further information about site preparation for storage system installation, contact customer support.

Site preparation checklist

Verify the availability of each item in the site preparation checklist.

The responsibilities for installation planning are shared by the customer and the Hitachi Vantara account team. The required installation planning tasks must be scheduled and completed to ensure successful and efficient installation of the storage system.

The following tasks might take several weeks to complete:

- Acquiring required power outlets.
- Adding or modifying air conditioning systems.
- Making room alterations to accommodate the storage system.
- Ordering third-party equipment, such as non-Hitachi racks, network switches, and host servers for the storage system.

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.

Requirement	Yes	No
Is the data center free of any equipment servicing hazards, such as electrical or data cables that obstruct access?		
Does the data center have a suppression system?		
Does the floor plan meet the service clearance and cutout requirements?		
Does the floor meet the load rating requirements?		

Requirement	Yes	No
Does the data center meet the environmental requirements including temperature, humidity, airflow, and acoustic?		
Is all equipment not supplied by Hitachi (for example, connectors, receptacles, and network switches) on site and ready for use?		
Are the input circuit breakers adequate for equipment loads?		
Are uninterruptible power supplies (UPS) in place?		
Have all sources of electrical interference been addressed?		
Does the site enforce access controls (for example, will Hitachi representatives need an escort)?		
Will the equipment fit through all doors and corridors and in elevators?		

Site planning

All planning activities should be scheduled and completed before the equipment is delivered.

The planning process includes:

- Planning hardware configuration, such as system component layout in the rack and drive allocation.
- Planning for specific network topologies, cabling configurations, network switches, and cabling of connected host computers.
- Ensuring all cables for specific controller and drive box configurations are properly ordered.
- Verifying all electrical service wiring is installed at the predetermined location.

Complete the suggested tasks before receiving and installing the storage system:

- Prepare a preliminary layout of the installation.
- Review the power and the heating, ventilation, and air-conditioning requirements before ordering any additional support equipment.
- Make a final layout of the installation and review the layout with the Hitachi Vantara representative.
- Verify the installation of electrical service wiring at the predetermined location is proper before installing the storage system.
- Verify all additional equipment, such as switches and host computers, is installed and operational.

Installation site considerations

When planning and preparing for the installation of a storage system, consider the following:

- The delivery area must provide enough space and floor strength to support the packaged equipment cartons for the storage system. Doorways and hallways must provide enough clearance to move the equipment safely from the delivery area to the destination.
- The computer room must have sufficient space to accommodate the storage system and other necessary equipment and provide minimum clearance around the storage system for service access and to verify proper weight distribution on the computer room floor. It must also include correctly positioned floor cutouts for the storage system's power and data cables.
- If the storage system arrives in hot or cold weather or you notice any condensation, do not unpack it until it has been allowed to reach room temperature or the condensation to clear (one to two hours). Immediately exposing the storage system to warm temperature can cause condensation to occur, which could damage the electronics. Maintain recommended humidity level and airflow rates.
- Take the necessary precautions to prevent electrostatic discharge (ESD). Verify that all equipment and flooring are grounded. Store spare electric parts in antistatic bags until you are ready to install them. When handling the storage system, wear protective devices like wrist straps, sole grounders, and conductive shoes.
- Proper environmental conditions for the storage system must be maintained. For optimal performance, storage systems require controlled environmental conditions that are often best facilitated through raised flooring and under-floor air conditioning. It is the responsibility of the customer to monitor this environment and ensure continued conformance with the recommended environmental specifications.
- The computer room must have adequate power facilities for the storage system. Adequate power is necessary to ensure reliable functioning of electronic equipment and for the safety of the customer's installation. The customer is responsible for procuring, installing, and maintaining adequate power to the equipment.

Floor cutout and service clearance

Be sure your site has sufficient space to accommodate the storage system.

When preparing the space required for your storage system, be sure the site:

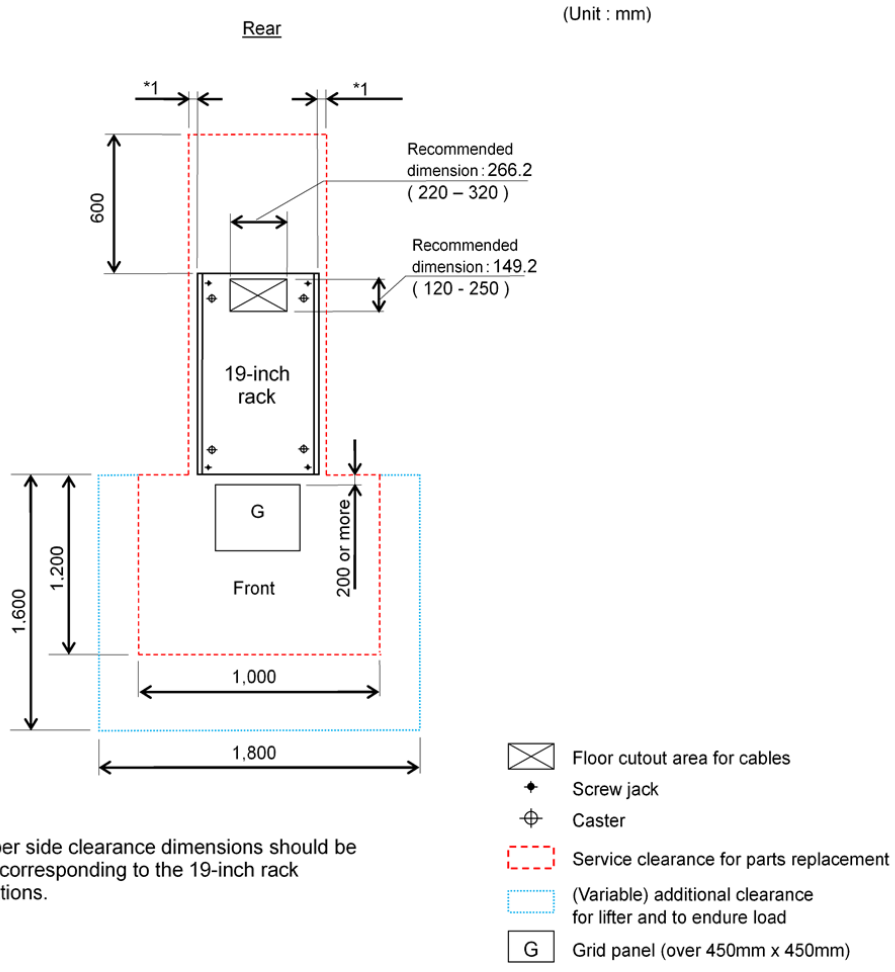
- Is large enough to hold the new storage system and other equipment.
- Provides minimum clearance around the storage system for service access and to verify proper weight distribution on the computer room floor.
- Includes correctly positioned floor cutouts for the storage system's power and data cables.

To verify there is sufficient space for the storage system, document your site's floor plan, including the locations of:

- Structural support columns and other immovable objects
- Walls
- All existing equipment, cabinets, racks, networking equipment, and other systems
- Where the new storage system will be installed
- Floor and electrical cutouts
- Interconnecting cables and power cords, including lengths
- Floor vents

The space requirements must take into consideration the total floor clearance required for the storage system. This includes:

- The space required by the equipment
- Service clearance - the floor space required to access the storage system.
- Additional space required to distribute the equipment weight on your computer room's raised floor. The amount of additional space required depends on your floor load rating.
- Additional space required to view the storage system LEDs on the front and rear panels.



*1: The proper side clearance dimensions should be secured corresponding to the 19-inch rack specifications.

If your computer room uses floor cutouts to route power and data cables, position the cutouts toward the center of the rack. If this is not possible, position the cutouts off-center from the rack as long as the cutout is within the allowable range and allows smooth routing and entrance of cables. Check the relationship between the position of the cutout and the cable openings on the rack.

Floor load rating

The floor space at the installation site must support the combined weight of all associated component and equipment. The maximum load rating is 709 kg.

Installing anti-tilt bracket for Universal V3 Rack

The anti-tilt bracket for the Hitachi Universal V3 Rack must be anchored to a rigid floor capable of holding a minimum of 79 kg (154 lbs).

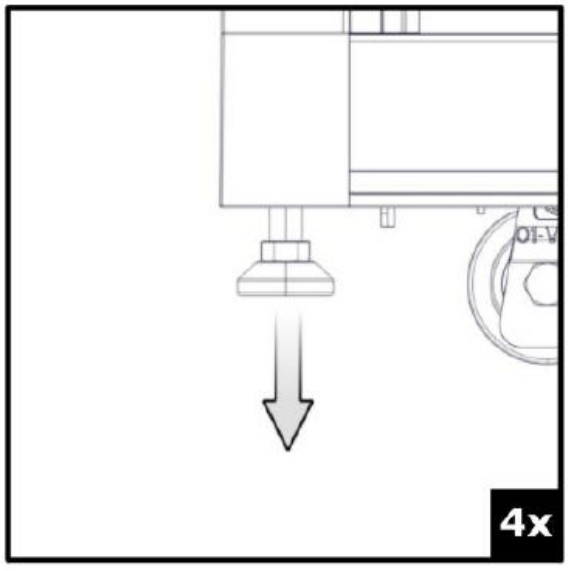
Before you begin

To install the anti-tilt bracket, you will need the following tools and components:

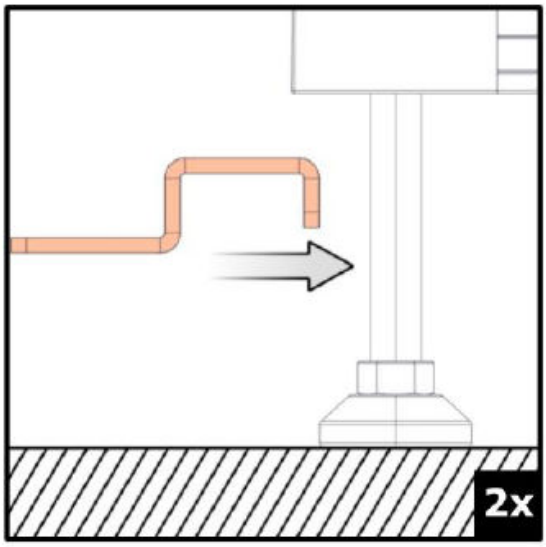
- T25 screwdriver
- Customer-supplied M10 or 3/8" screw capable of holding a minumum 79 kg (154 lbs)

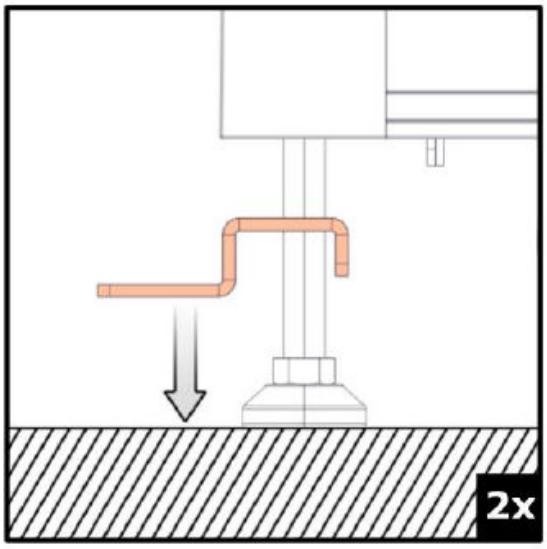
Procedure

1. Adjust the four retractable feet so the rack is level with the floor.

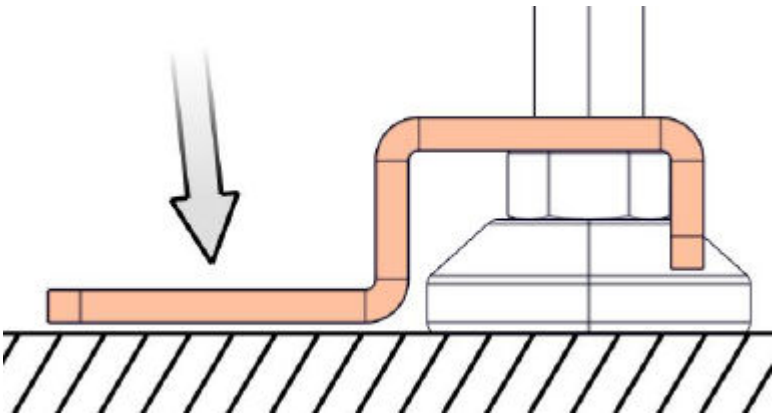


2. Attach two anti-tilt brackets to the feet on the back of the rack.





3. Using a minimum size of an M10 or 3/8" screw, fasten the bracket to the floor.



Chapter 6: Component list

The following table lists the components number for each storage system model.

Component	VSP 5000 series component number
Primary controller chassis	DKC910I-CBX
Primary controller chassis	DKC910I-CBXCL
Secondary controller chassis	DKC-F910I-CBX2
Secondary controller chassis	DKC-F910I-CBXCL2
SFF Drive Chassis	DKC-F910I-SBX
SFF Drive Chassis Encrypted	DKC-F910I-SBXE
LFF Drive Chassis	DKC-F910I-UBX
LFF Drive Chassis Encrypted	DKC-F910I-UBXE
FMD Drive Chassis	DKC-F910I-FBX
NVMe Drive Chassis	DKC-F910I-NBX
NVMe Drive Chassis Encrypted	DKC-F910I-NBXE
Controller Chassis Bezel	DKC-F910I-CBLFB
Drive Chassis Bezel	DKC-F910I-DBFB
Flash Module Bezel	DKC-F910I-FBFB
HSN Chassis Bezel	DKC-F910I-HSNFB
Controller Chassis Bezel	DKC-F910I-CBLFBA
Drive Chassis Bezel	DKC-F910I-DBFBA
Flash Module Bezel	DKC-F910I-FBFBA
HSN Chassis Bezel	DKC-F910I-HSNFBA
Additional RAID Controller Kit	DKC-F910I-CTL
Additional RAID Controller Kit	DKC-F910I-CTLCL
RAID Controller Upgrade Kit	DKC-F910I-CTLUG

Component	VSP 5000 series component number
Compression Accelerator Fan Module	DKC-F910I-ACLF
Power Supply Unit	DKC-F910I-CBPSU
Additional Service Processor	DKC-F910I-SVP
Additional Hub	DKC-F910I-HUB
Operation Panel Kit	DKC-F910I-OPPNL
Fan Module	DKC-F910I-FANM
Mainframe Fibre 4-port 16G Host Adapter for Shortwave	DKC-F910I-4MS16
Mainframe Fibre 4-port 16G Host Adapter for Longwave	DKC-F910I-4ML16
Fibre 4-port 32Gbps Ready Host Adapter	DKC-F910I-4HF32R
iSCSi 2-port 10G Host Adapter	DKC-F910I-2HS10S
SFP for 16Gbps Longwave	DKC-F810I-1PL16
SFP for 16Gbps Shortwave	DKC-F810I-1PS16
SFP for 32Gbps Longwave	DKC-F810I-1PL32
SFP for 32Gbps Shortwave	DKC-F810I-1PS32
Disk Adapter	DKC-F910I-BS12G
Encryption Disk Adapter	DKC-F910I-BS12GE
NVMe Disk Adapter	DKC-F910I-BN8G
Cache Memory 32GB	DW-F850-CM32G
Cache Memory 64GB	DW-F850-CM64G
Cache Memory 64GB	DW-F850-CM64GL
Cache Flash Memory 45	DKC-F910I-BM45
Cache Flash Memory 45 with encryption	DKC-F910I-BM4E
Cache Flash Memory 95	DKC-F910I-BM95
Cache Flash Memory 95 with encryption	DKC-F910I-BM9E

Component	VSP 5000 series component number
Controller Chassis Rail	DKC-F910I-3RBKT
Controller Chassis Rail	DKC-F910I-3RBKT2
HSN Chassis Rail	3292455-001
Chassis fixation bracket for CBXA/CBX	DKC-F910I-3RBKT
Chassis fixation bracket for CBXB/CBX2	DKC-F910I-3RBKT2
Drive Chassis Rail	A3BF-HK-GL-740-1-S.P
NVMe Chassis Rail	A3BF-HK-GL-740-1-S.P
Drive Chassis Rail for FBX	A3BF-HK-GL-740-1-S.P
PCIe Cable set for CBXA in primary CBX-Pair	DKC-F910I-MCC1
PCIe Cable set for CBXB in primary CBX-Pair	DKC-F910I-MCC2
PCIe Cable set for primary module CBX	DKC-F910I-MCC60
PCIe Cable set for primary module CBX2	DKC-F910I-MCC45
Safety Cover for empty CTL slot	DKC-F910I-SCFC
PCIe Cable 5m	DKC-F910I-MFC5
PCIe Optical Module	DKC-F910I-PQSFP
SAS Optical Module	DKC-F910I-SQSFP
Optical Cable 10m	DKC-F910I-MPC10
Optical Cable 20m	DKC-F910I-MPC20
Optical Cable 30m	DKC-F910I-MPC30
Optical Cable 100m	DKC-F910I-MPC1H
SAS Cable set for Disk Adapter	DKC-F910I-SCCS
SAS Cable 1m	DKC-F910I -SCQ1
SAS Cable 1.5m	DKC-F910I -SCQ1F
SAS Cable 5m	DKC-F910I-SCQ5A

Component	VSP 5000 series component number
NVMe Cable set for Disk Adapter	DKC-F910I-NCCS
RJ45 bundled LAN Cable Kit	DKC-F910I-LC
RJ45 Cable 0.6m	DKC-F910I-LC06
RJ45 Cable 5m	DKC-F910I-LC5
RJ45 Cable 10m	DKC-F910I-LC10
RJ45 Cable 20m	DKC-F910I-LC20
RJ45 Cable 30m	DKC-F910I-LC30
RJ45 Cable 100m	DKC-F910I-LC1J
HDD Canister (SAS 2.4TB)	DKC-F810I-2R4JGM
HDD Canister (SAS 14TB)	DKC-F810I-14RH9M
SSD Canister (960GB)	DKC-F810I-960MGM
SSD Canister (1.9TB)	DKC-F810I-1T9MGM
SSD Canister (3.8TB)	DKC-F810I-3R8MGM
SSD Canister (7.6TB)	DKC-F810I-7R6MGM
SSD Canister (15TB)	DKC-F810I-15RMGM
SSD Canister (30TB)	DKC-F810I-30RMGM
7TB Flash Module Drive	DKC-F810I-7R0FP
14TB Flash Module Drive	DKC-F810I-14RFP
NVMe SSD Canister (1.9TB)	DKC-F910I-1R9RVM
NVMe SSD Canister (3.8TB)	DKC-F910I-3R8RVM
NVMe SSD Canister (7.6TB)	DKC-F910I-7R6RVM
NVMe SSD Canister (15TB)	DKC-F910I-15RRVM
NVMe SSD Canister (30TB)	DKC-F910I-30RRVM
NVMe SCM Drive (375GB)	DKC-F910I-375YVM

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