



PAC Storage PS/PSe 3000/4000 G3 Series Hardware Manual

Version 2.0 (January 2024)

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Table of Contents

Safety Precaution	vi
About this Manual	viii
Revision History	ix
Hardware Specifications	xi
Package Contents	xiii
 Chapter 1: Product Introduction	
1.1 Overview	1-1
1.1.1 Model Variations.....	1-3
1.1.2 Major Components.....	1-4
1.2 Chassis	1-5
1.2.1 Front Panel.....	1-5
1.2.2 Rear Panel	1-8
1.2.3 Internal Backplane	1-18
1.3 Front Panel Components	1-19
1.3.1 LEDs and Button Panel.....	1-19
1.3.2 Drive Tray and Drive Tray LEDs.....	1-20
1.4 Rear Panel Components	1-21
1.4.1 Controller Module Interfaces	1-21
1.4.2 Controller Module Interfaces of the JBOD Models	1-22
1.4.3 PSUs and Cooling Modules	1-23
1.4.4 Super Capacitor and Flash Backup Module.....	1-27
1.5 System Monitoring Features	1-28
1.5.1 Expansion Enclosure Support.....	1-28
1.5.2 Audible Alarms	1-29
1.6 Hot-swappable Components	1-29
 Chapter 2: Hardware Installation	
2.1 Installation Prerequisites	2-1
2.2 Installing the Rackmount Kit	2-3
2.2.1 Installing Rackmount for 12-bay, 16-bay, and 24-bay Models.....	2-3
2.2.2 Installing Rackmount for 40-bay and 60-bay Models	2-6
2.2.3 Installing the Adjuster Pillars for 60-bay Models	2-10
2.2.4 Installing Rackmount for 90-bay Models	2-13
2.3 Installing Drives	2-15
2.3.1 Drive Installation Prerequisites.....	2-15
2.3.2 Installing Drives for 12-bay, 16-bay, and 24-bay Models.....	2-16
2.3.3 Installing Drives for 40-bay Models	2-19
2.3.4 Installing Drives for 60-bay Models	2-25
2.3.5 Installing Drives for 90-bay Models	2-30
2.4 Installing the Cable Management Arm and Accessories	2-35
2.4.1 Installing the Cable Management Arm for 40-bay and 60-bay Models	2-35
2.4.2 Installing the Cable Management Arm for 90-bay Models	2-37
2.5 Installing Host Boards / Expansion Boards (Optional)	2-41

2.6	Connections.....	2-46
2.6.1	General Considerations in Connecting Devices.....	2-46
2.6.2	Expansion Connections	2-48
2.6.3	Power Connection.....	2-58
2.6.4	Management Tool Connections.....	2-63
2.6.5	Scale-out Cluster Connection	2-65
2.6.6	Turning Off the System	2-66
 Chapter 3: System Monitoring		
3.1	Monitoring Features	3-1
3.2	LEDs.....	3-2
3.2.1	Front Panel LEDs.....	3-2
3.2.2	Drive LEDs.....	3-6
3.2.3	Controller LEDs.....	3-8
3.2.4	PSU Module LEDs	3-9
3.2.5	Fan Module LEDs	3-10
3.2.6	1GbE Management Port (RJ-45) LEDs.....	3-11
3.2.7	Onboard 12Gb/s SAS Expansion Port LEDs	3-11
3.2.8	Onboard 25GbE Port (SFP28) LEDs	3-12
3.2.9	Host Board LEDs	3-13
3.2.10	JBOD 12Gb/s SAS Expansion Controller LEDs.....	3-19
3.3	Alarms and I²C Bus.....	3-20
 Chapter 4: System Maintenance		
4.1	Replaceable Components.....	4-1
4.2	Replacing a PSU Module.....	4-2
4.2.1	Replacing a PSU for 12-bay, 16-bay, and 24-bay Models.....	4-2
4.2.2	Replacing a PSU for 12-bay Models (EU Version).....	4-4
4.2.3	Replacing a PSU for 16-bay and 24-bay Models (EU Version).....	4-5
4.2.4	Replacing a PSU for 40-bay and 60-bay Models	4-6
4.2.5	Replacing a PSU for 90-bay Models	4-7
4.3	Replacing a Fan Module.....	4-8
4.3.1	Replacing a Fan Module for 12-bay Models (EU Version).....	4-8
4.3.2	Replacing a Fan Module for 16-bay and 24-bay Models (EU Version).....	4-9
4.3.3	Replacing a Fan Module for 90-bay Models	4-10
4.3.4	Replacing the Cooling Module for 40-bay and 60-bay Models	4-11
4.4	Replacing a Controller Module.....	4-14
4.5	Replacing/Installing a Memory Module	4-18
4.6	Replacing a Host Board / Expansion Board.....	4-21
4.7	Replacing a Super Capacitor	4-23
4.8	Replacing a Drive.....	4-25
4.8.1	Replacing a Drive for 12-bay, 16-bay, and 24-bay Models.....	4-25
4.8.2	Replacing a Drive for 40-bay, 60-bay, and 90-bay Models.....	4-27

4.9	Restoring Default Settings.....	4-29
4.9.1	Restoring System Default Settings	4-29
4.9.2	Restoring the Password	4-29

Appendices

Certifications

User Warning

UL Caution, Safety, and Warning Markings

Safety Precaution

Read these instructions carefully before you install, operate, or transport the PAC Storage storage systems and expansion systems.

Energy Hazards Precaution

This equipment is intended to be used in a restricted access location, like a computer room. Only allow access to SERVICE PERSONS or users who have been instructed about the metal chassis of the equipment, which may have hazardous energy that service persons must pay attention or take special protection before touching it. Also, the access is through the use of a key or security identity system. Only the authorized and well-trained personnel can access the restricted access location.

Installation and Operation

- Install the rack cabinet and the associated equipment at a site where the ambient temperature (special room cooling equipment may be required) stays lower than 35°C.
- Install the power source socket outlet near the enclosure where it is easily accessible and ground the rack cabinet.
- Secure airflow clearance inside and around the rack cabinet.
 - Secure an 18 to 20 cm clearance on the rear side.
 - Do not cover the enclosure openings.
 - Route the cables inside the rack cabinet.
 - Do not leave drive bays empty as it will affect airflow efficiency.
- Secure each enclosure module using its retention screws.
- Place power cords and other cables away from foot traffic. Do not place items on top of power cords and ensure they do not rest against data cables.
- Install all modules to the enclosure before turning on the systems.
- Ensure that the correct power range is tested before turning on.
- DO NOT remove the covers or replaceable modules if they are not faulty.
- If the system is not used for a long period of time, disconnect it from the power outlet to avoid transient over-voltage.
- For power source redundancy, please make sure that the two PSUs are plugged into two different power sources (i.e. different circuit breakers).

Service and Maintenance

- Keep the faulty module in place until you have a replacement unit; an empty module greatly affects the airflow efficiency within the enclosure.
- During service operation, place the enclosure on a soft and clean surface to prevent exterior damage. Do not place tools or other items on top.
- When transporting the enclosure, repackage all disk drives separately in the original package foam blocks. Replaceable modules can stay in the enclosure if you are using the original package; if not, repackage them separately as well.
- Disconnect the power cords before servicing or cleaning the enclosure.

- Use a slightly moistened paper sheet or cloth for cleaning. Avoid using liquid or sprayed detergent.
- When replacing components, insert them as gently as possible while assuring full engagement. Vibration and shock can easily damage hard drives.
- Only qualified service personnel should open the enclosure.
- Contact service personnel if any of the following situations occurs:
 - The power cord or plug is damaged.
 - The enclosure has been exposed to moisture.
 - The system has not been working properly.
 - The enclosure was dropped against a hard surface.
 - The enclosure shows obvious signs of breakage.
- To move the enclosure, more than one person might be necessary due to its weight. Drives should be removed from the enclosure beforehand.
- If there are any removal/insert/change of type of host board, the system will reset to default system and NAS settings to prevent previous settings from creating unexpected behavior with the new hardware change. Therefore, please export the NVRAM before making any changes.

Important Notice

The use of PAC Storage certified components is strongly recommended to ensure compatibility, quality, and normal operation with your PAC Storage products. Please contact your distributor for a list of PAC Storage certified components (e.g. SFP, SFP+, HBA card, iSCSI cable, FC cable, memory module, etc.).

ESD Precautions

- Handle the modules by their retention screws, ejector levers, or the module's metal frame/faceplate only. Avoid touching the PCB boards or connector pins.
- Use a grounded wrist strap and an anti-static work pad to discharge static electricity when installing or operating the enclosure.
- Avoid dust, debris, carpets, plastic, vinyl, and Styrofoam in your work area.
- Do not remove any module or component from its anti-static bag before installation takes place.
- Drives must not be stacked on top of each other without their protective drive trays. Even when drives are fixed in the drive trays, contacting the exposed PCB or rear-side interface may damage the drives.

Rackmount Safety Instructions

The storage enclosure is intended to be rack-mounted. Following concerns should be heeded when mounting the enclosure into a rack cabinet:

- An enclosure without disk drives can weigh over 30 kilograms. Two (2) people are required to install or relocate the subsystem. Drives should be removed from the enclosure before moving the subsystem.
- The enclosure is to be installed for operation in an environment with maximum ambient temperature (T_{ma}) below 35°C.
- Installation of the enclosure in a rack should be such that the amount of air flow required for safe operation of the enclosure is not compromised.

- The openings on the enclosure are for air circulation to protect it from overheating. DO NOT cover or obstruct the openings.
- Carefully mount the enclosure into the rack in such a manner that the enclosure will not be hazardous due to uneven mechanical loading.
- Consideration should be given to the connection of the enclosure to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- Proper grounding, over-current protection, and stability features should be provided with the rack cabinet into which the system is mounted.
- Maintain reliable earthing of a rackmounted enclosure. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips).

About this Manual

The manual introduces hardware components of PAC Storage PS/PSe 3000/4000 G3 series storage systems and expansion enclosures. It also describes how to install, monitor, and maintain them.

- For non-serviceable components, please contact our support sites.
- EonOne software: Consult the EonOne User Manual on PAC Storage's website.

Revision History

Version	Date	Description
1.0	October 2022	Initial release
1.1	October 2022	<ul style="list-style-type: none"> - Renamed manual title to include PSe 3000/4000 G3 series - Added new model information: PSe 3000/4000 G3 series - Enhanced front panel LED descriptions and corresponding actions in 3.2.1 Front Panel LEDs - Minor corrections and content updates
1.2	December 2022	<ul style="list-style-type: none"> - Added new model information: PS/PSe 3040T/4040 G3 series - Added U.2 SSD installation instructions for PS/PSe 3060TC/4060C G3 - Enhanced drive installation instructions - Corrected front panel images of PS/PSe 3060T/4060 G3 - Minor corrections and content updates
1.3	February 2023	<ul style="list-style-type: none"> - Added new model information: EU version of 2U 12-bay, 3U 16-bay, and 4U 24-bay models with new PSUs and fan modules - Added 100GbE host board information - Updated front panel LED descriptions and corresponding actions in 3.2.3 Controller LEDs - Minor corrections and content updates
1.4	February 2023	<ul style="list-style-type: none"> - Updated default memory specifications - Added a note to specify that CHA and CHB are priority DIMM slots in 4.5 Replacing/Installing a Memory Module - Minor corrections and content updates
1.5	March 2023	<ul style="list-style-type: none"> - Updated default memory specifications - Minor corrections and content updates
1.6	April 2023	<ul style="list-style-type: none"> - Added new model information: PS/PSe 3090T/4090 G3 series - Added new JBOD model information: JB 3090 - Updated instructions on installing the cable management arm - Minor corrections and content updates
1.7	May 2023	<ul style="list-style-type: none"> - Updated drive numbering of PS/PSe 3040T/4040/3060T/4060 G3 - Minor corrections and content updates
1.8	August 2023	<ul style="list-style-type: none"> - Specify that dual-controller models have two management ports in 1.4.1 Controller Module Interfaces - Updated user warning in the appendices
1.9	October 2023	<ul style="list-style-type: none"> - Updated 2.5" NVMe drive tray images of PS/PSe 3090T/4090 G3 - Updated enclosure images of PS/PSe 3090T/4090 G3 - Updated rail kit images of PS/PSe 3040T/4040/3060T/4060 G3 - Updated images of removing enclosure covers for PS/PSe 3040T/4040 G3 - Updated expansion enclosure specifications - Updated instructions on restoring default settings - Minor corrections and content updates

Version	Date	Description
2.0	January 2024	<ul style="list-style-type: none"> - Updated enclosure images of 60-bay models (with a new cooling module design; drawer cage canceled) - Updated images of cable management arm installation for 90-bay models - Added instructions on replacing the new type of cooling module for 40-bay and 60-bay models - Added rack size requirements for 90-bay models - Added new 25GbE x2 and 25GbE x4 host board information - Added FC 32Gb/s x4 host board LED descriptions - Re-structured Chapter 2 and Chapter 4 to enhance reading experience - Removed software CD information - Minor corrections and content updates

Hardware Specifications

Specification Summary

Form Factor	2U 12-bay PAC Storage PS/PSe 3012/4012 G3 3U 16-bay PAC Storage PS/PSe 3016/4016 G3 4U 24-bay PAC Storage PS/PSe 3024/4024 G3 4U 40-bay PAC Storage PS/PSe 3040T/4040 G3 4U 60-bay PAC Storage PS/PSe 3060T/4060 G3 4U 90-bay PAC Storage PS/PSe 3090T/4090 G3
CPU	PS/PSe 3000 G3 series: Intel® Xeon® D 4-Core PS/PSe 4000 G3 series: Intel® Xeon® D 6-Core
Controller	PS G3 series: Dual redundant or single upgradable to dual redundant PSe G3 series: Single
Onboard iSCSI Ports (per Controller)	2 x 25GbE ports (SFP28) (not present on PS/PSe 4000 G3 series)
Onboard SAS Expansion Ports (per Controller)	2 x 4 Lane 12Gb/s SAS ports
Host Board Options	<p>All series</p> <p>4 x 16Gb/s FC ports 2 x 32Gb/s FC ports 4 x 32Gb/s FC ports 2x 10GbE ports (SFP+) 2 x 25GbE ports (SFP28) 4 x 25GbE ports (SFP28) 2 x 12Gb/s SAS ports</p> <p>4U 40-bay / 4U 60-bay / 4U 90-bay only</p> <p>1 x 100GbE (QSFP28), RDMA 2 x 100GbE (QSFP28), RDMA</p> <p>NOTE:</p> <p>1. For redundant-controller models, identical host board combinations must be used, in the same order, on both controllers.</p> <p>2. For complete information, refer to the Host Board and Memory Guide on PAC Storage's official website (go to Support > Technical Support, find your model, and then go to Downloads).</p>
Cache Memory (per Controller)	<p>2U 12-bay / 3U 16-bay / 4U 24-bay: Default DDR4 8GB, up to 192GB</p> <p>4U 40-bay / 4U 60-bay: Default DDR4 12GB, up to 192GB</p> <p>4U 90-bay: Default DDR4 16GB, up to 192GB</p> <p>NOTE: For more details, refer to the Host Board and Memory Guide on PAC Storage's official website (go to Support > Technical Support, find your model, and then go to Downloads).</p>
Cache Backup Technology	Super capacitor + flash backup module
Maximum Number of Drives	Via expansion enclosures, per appliance: 896
Supported Drives	<p>2.5" SAS SSD 2.5" SAS HDD 3.5" NL-SAS HDD 2.5" SATA SSD, 3.5" SATA HDD (single-controller models only) 2.5" NVMe SSD (NVMe SSD cache models only; must be purchased from PAC Storage)</p> <p>NOTE: For the latest compatibility details, refer to the Compatibility Guide on PAC Storage's official website (go to Support > Technical Support, find your model, and then go to Downloads).</p>

(See next page)

Expansion Enclosures	JB 3012A, JB 3016A, JB 3060L, JB 3090 NOTE: For more information regarding storage expansion via expansion enclosures, refer to the Expansion Guide on PAC Storage's official website (go to Support > Technical Support, find your model, and then go to Downloads).
Green Design	80 PLUS-certified power supplies delivering more than 80% energy efficiency Intelligent multi-level drive spin-down
Power	Redundant and hot-swappable power supplies 2U 12-bay / 3U 16-bay / 4U 24-bay 2 x 530W 80 PLUS Bronze 100VAC / 50-60Hz / 10A 200VAC / 50-60Hz / 5A 2 x 800W 80 PLUS Titanium (EU version) 100-127VAC / 50-60Hz / 10A 200-240VAC / 50-60Hz / 5A 4U 40-bay / 4U 60-bay 2 x 1200W 80 PLUS Platinum 100-127VAC / 50-60Hz / 10A 200-240VAC / 50-60Hz / 8A 2 x 1300W 80 PLUS Titanium (EU version) 100-127VAC / 50-60Hz / 12A 200-240VAC / 50-60Hz / 8.5A 4U 90-bay 2 x 1600W 80 PLUS Titanium 100-127VAC / 50-60Hz / 12A 200-240VAC / 50-60Hz / 10A
Environment	Temperature - Operating: 0°C to 40°C without CBM, 0°C to 35°C with CBM - Non-operating: -40°C to 60°C Altitude - Operating: Sea level to 3,048m (10,000ft.) - Non-operating: Sea level to 12,192m (40,000ft.) Relative humidity 5 to 95% non-condensing, operating and non-operating
Regulatory	Safety: UL, BSMI, CB Electromagnetic compatibility: CE, BSMI, FCC
Dimensions (W x H x D)	2U 12-bay: 449 x 88 x 509.8 mm 3U 16-bay: 449 x 130 x 509.8 mm 4U 24-bay: 449 x 174.6 x 509.8 mm 4U 40-bay: 443.2 x 176 x 735.8 mm 4U 60-bay: 443.2 x 176 x 849.8 mm 4U 90-bay: 435 x 176 x 1088.8 mm NOTE: The dimensions do not include chassis ears/protrusions.
Package Dimensions (W x H x D)	2U 12-bay: 780 x 379 x 588 mm 3U 16-bay: 780 x 423 x 588 mm 4U 24-bay: 780 x 465 x 588 mm 4U 40-bay: 625 x 460 x 1032 mm 4U 60-bay: 620 x 460 x 1140 mm 4U 90-bay: 620 x 500 x 1400 mm

NOTE: Product specifications are subject to change without notice. Please refer to PAC Storage's official website for the latest information.

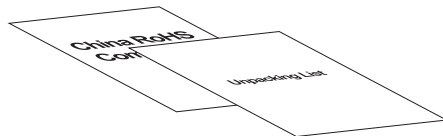
Package Contents

Check the **Unpacking List** for the complete list of contents.

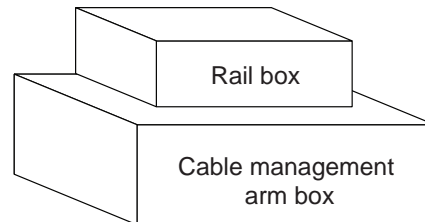
NOTE:

- The contents and quantity may vary depending on the system model and order requests.
 - All images in this manual are for illustration purposes only and may not be an accurate depiction.
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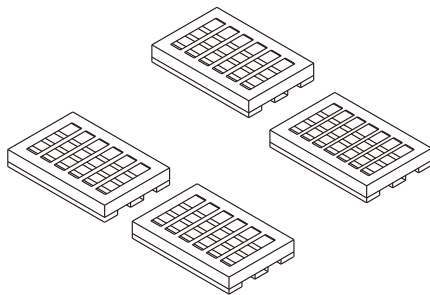
System Package



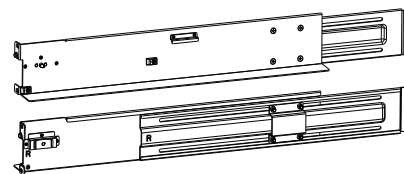
Unpacking list and China RoHS compliance documentation



Cable management arm and rail boxes for 40-bay, 60-bay, and 90-bay models



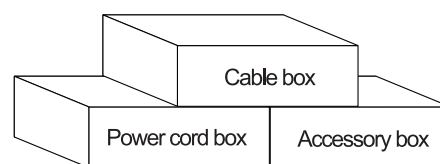
Tray EPE for 12-bay, 16-bay, and 24-bay models



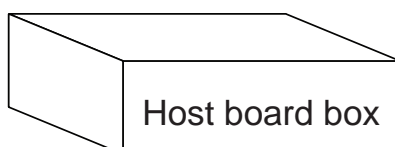
Rackmount kit for 12-bay, 16-bay, and 24-bay models



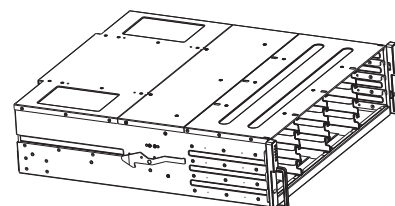
Tray box for 12-bay, 16-bay, and 24-bay models



Power cord, cable, and accessory boxes

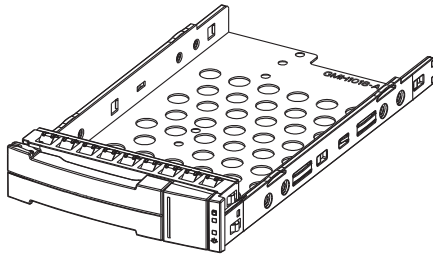


Host board box (optional)



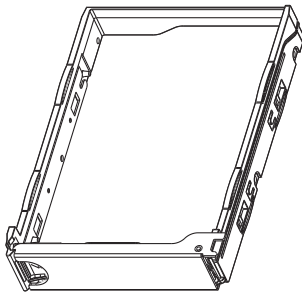
Enclosure chassis

Tray EPE Content for 12-bay, 16-bay, and 24-bay Models

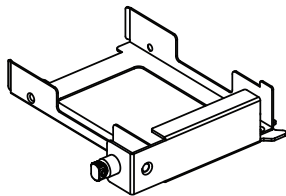


Drive tray

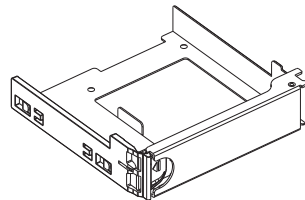
Tray Box Content for 40-bay, 60-bay, and 90-bay Models



3.5" drive tray

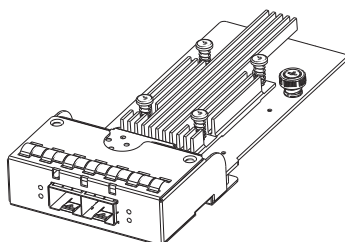


Type I NVMe SSD tray
for 90-bay models
(NVMe SSD cache models only)



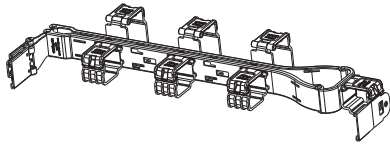
Type II NVMe SSD tray
for 90-bay models
(NVMe SSD cache models only)

Host Board Box (Optional)



Host board

Cable Management Arm and Rail Boxes for 40-bay, 60-bay, and 90-bay Models



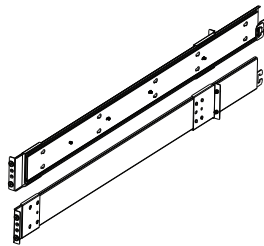
Cable management arm



Inner latch
for 90-bay models



M4 4mm screws
for 90-bay models



Rack slide rails
(left and right)



M5 cage nut



M4 6mm screw



Ø5.1mm washer

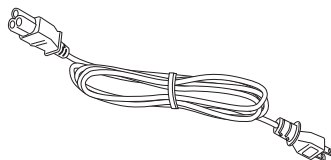


M5 10mm screw

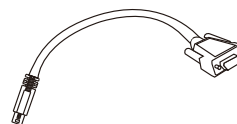
Screws, washers, and nuts for
mounting enclosure

NOTE: For the exact contents in the boxes, refer to **2.2 Installing the Rackmount Kit** and **2.4 Installing the Cable Management Arm and Accessories**.

Power Cord, Cable, and Accessory Boxes



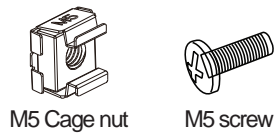
Power cord



RS-232C serial cable
(mini USB to DB9)

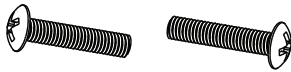


Quick installation guide



M5 Cage nut

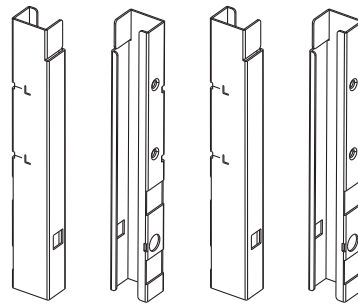
M5 screw



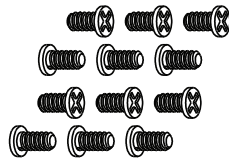
No. 10-32 screw

M6 screw

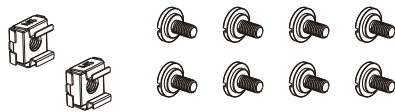
**Screws and nuts for mounting enclosure
for 12-bay, 16-bay, and 24-bay models**



**Adjuster pillars
for 60-bay models**



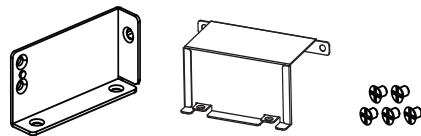
**2.5"/" drive tray screws
for 12-bay, 16-bay, and 24-bay models**



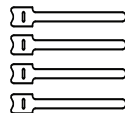
**Screws and cage nuts for pillars
for 60-bay models**



**2.5" NVMe SSD drive tray screws
for 90-bay models
(NVMe SSD cache models only)**



**Cable management brackets and screws
for 90-bay models**

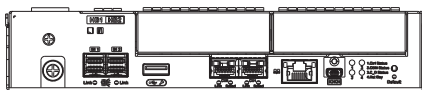


**Velcro cable ties
for 90-bay models**

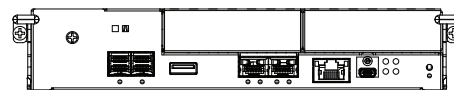


**Wire mount
for 90-bay models**

Pre-installed Components in the Enclosure Chassis

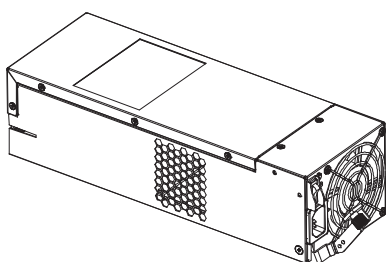


Controller module (including DIMM)

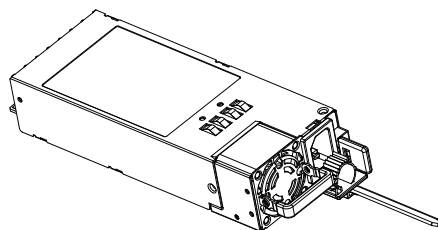


**Controller module (including DIMM)
for 12-bay, 16-bay, and 24-bay models
(EU version)**

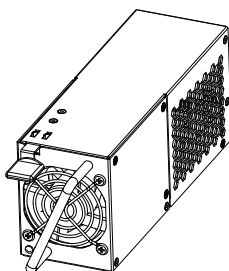
NOTE: Onboard 25GbE ports are present on selected models.



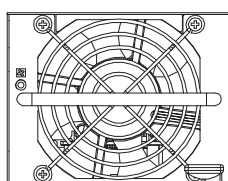
**PSU/cooling module
for 12-bay, 16-bay, and 24-bay models**



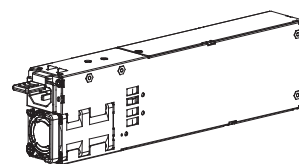
**PSU/cooling module
for 12-bay, 16-bay, and 24-bay models
(EU version)**



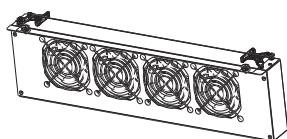
**Fan module
for 12-bay models
(EU version)**



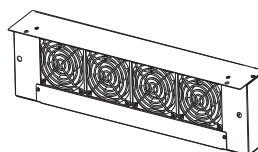
**Fan module
for 16-bay and 24-bay models
(EU version)**



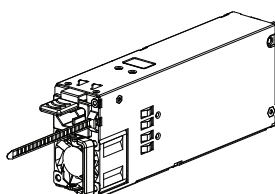
**PSU/cooling module
for 40-bay and 60-bay models**



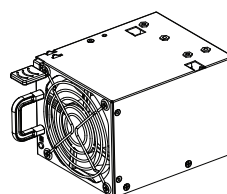
**Type I internal cooling module
for 40-bay and 60-bay models**



**Type II internal cooling module
for 40-bay and 60-bay models**

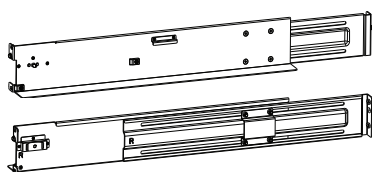


**PSU/cooling module
for 90-bay models**



**Fan module
for 90-bay models**

Rackmount Kit for 12-bay, 16-bay, and 24-bay Models



Slide rail kit

NOTE: See 2.2 Installing the Rackmount Kit for the exact contents in the slide rail kit.

Product Introduction

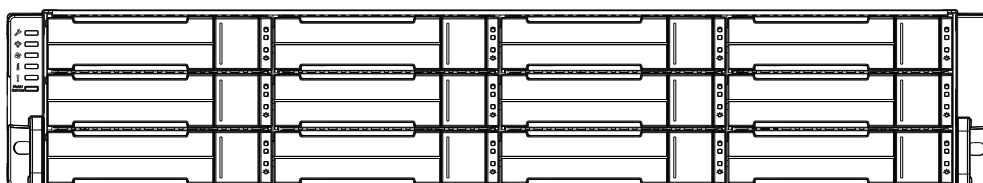


This chapter introduces the hardware design of the PAC Storage PS/PSe 3000/4000 G3 series systems, including their features and supported components.

1.1 Overview

PAC Storage PS/PSe 3000/4000 G3 systems are designed to utilize 2.5-inch or 3.5-inch drives. Storage capacity can be expanded by connecting expansion enclosures (also called JBODs) to the storage system or via scale-out expansion.

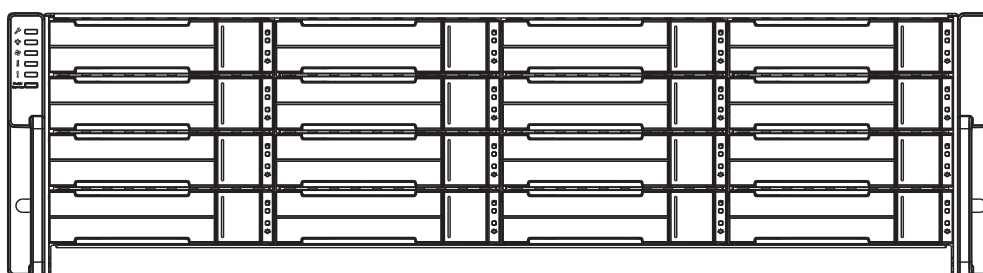
2U Systems



PS 3012/4012 G3

PSe 3012/4012 G3

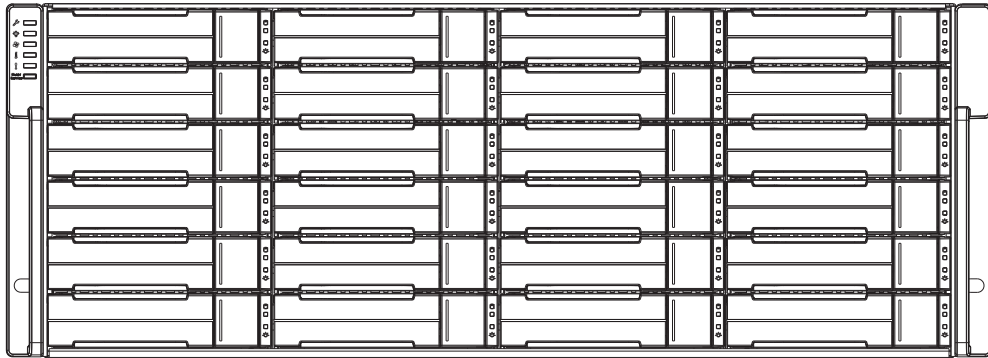
3U Systems



PS 3016/4016 G3

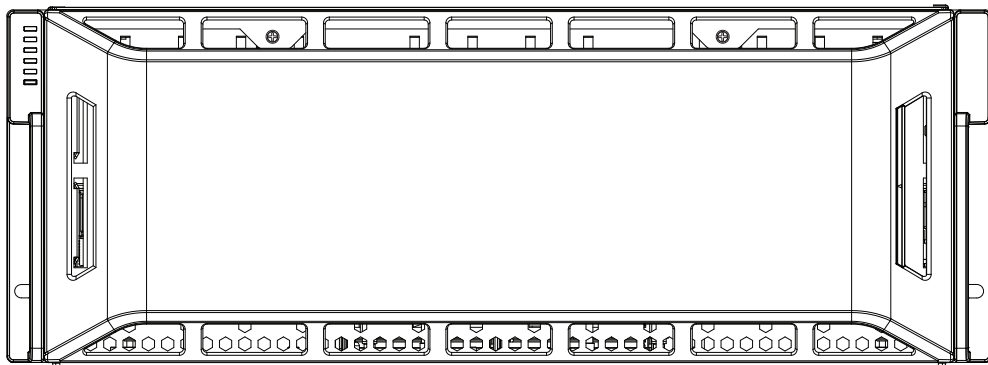
PSe 3016/4016 G3

4U Systems



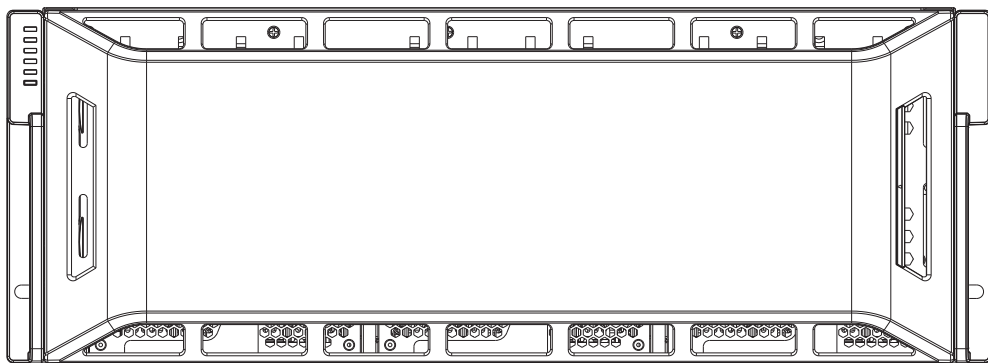
PS 3024/4024 G3

PSe 3024/4024 G3



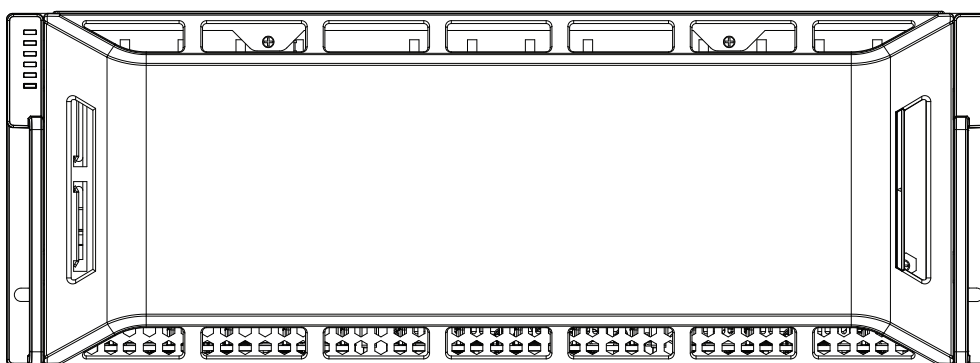
PS 3040T/4040 G3

PSe 3040T/4040 G3



PS 3060T/4060 G3

PSe 3060T/4060 G3



PS 3090T/4090 G3

PSe 3090T/4090 G3

1.1.1 Model Variations

The naming rules are detailed in the examples below.

PS 3060RT3C: PS^(A) + 30^(B) + 60^(C) + R^(D) + T^(E) + 3^(F) + C^(G)

PSe 40123: PSe^(A) + 40^(B) + 12^(C) + ^(D) + ^(E) + 3^(F)

Part	Description
A	PS = PAC Storage PS system PSe = PAC Storage PSe system
B	30 = 4-core CPU 40 = 6-core CPU
C	12= 12 drive bays 60 = 60 drive bays
D	R = dual redundant controllers S = single controller, upgradable to dual redundant controllers A blank indicates single controller, not upgradable.
E	T = Turbo performance (high IOPS) This part is left blank for standard models.
F	3 indicates the third generation.
G	C = NVMe SSD cache model This part is left blank for standard models.

NOTE: For the latest product line, refer to PAC Storage's official website.

1.1.2 Major Components

NOTE: Upon receiving the system, check the package contents and compare them to the **Unpacking List**. If one or more of the modules are missing, please contact your system vendor.

Controller and Interface

Each system has one or two controllers, and each controller comes with pre-installed DIMM modules. PS G3 series also has a **CBM** (cache backup module), a module that has a **super capacitor** and an **FBM** (flash backup module). With the CBM, the cached data is quickly distributed to the FBM to save the data permanently with the support of the super capacitor if power outage occurs. With the super capacitor's fast-charging feature, it can distribute a fair supply of power to the controller, so the controller can save cached data to the FBM immediately and permanently.

Also, the embedded firmware features earth-friendly and smart algorithms that you can use to customize your system's hardware settings such as power-saving modes, variable fan speeds, and exiled drive handling.

NOTE: The CBM is an optional component on PSe G3 series.

Expansion Controller and Interface

The expansion enclosure is managed by expander controllers that distribute data flow to individual disk drives and report operating status through a proprietary enclosure service via in-band protocols.

For physical connection, the SAS interface provides easy cabling routes via mini-SAS connectors. With the backplane-adapting SAS or SATA drives, the system can support enterprise-class SAS, Nearline SAS, and cost-effective SATA-II or SATA-III hard drives or SSDs. This connection is ideal for adding large capacity to a storage pool.

NOTE: SATA drives are supported on single-controller expansion systems only.

Power Supply Unit and Cooling Fan Module

There are two PSUs in the system. Each PSU is hot-swappable and is built with a fan to protect the system from overheating while providing constant power. Additional fan modules are also pre-installed on the new EU version of PS/PSe 3012/4012/3016/4016/3024/4024 G3.

For PS/PSe 3040T/4040/3060T/4060 G3 systems, there is also a cooling module located at the center of the enclosure, which ventilates the system and keeps the operating temperatures under optimal condition.

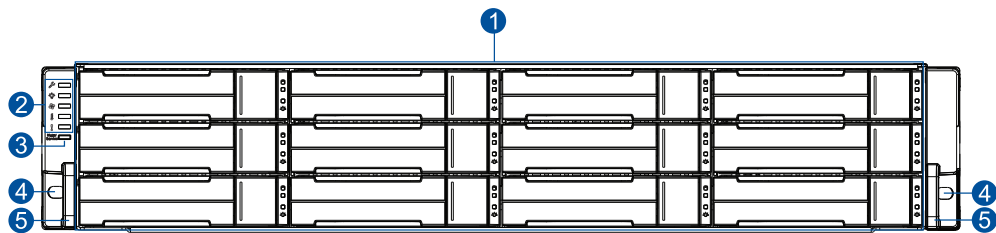
The modular architecture of the system and easy accessibility to all major components provide you an easy maintenance.

1.2 Chassis

This section describes the front and rear panels of the storage chassis. The chassis are designed to allow installation to the rack or a cabinet.

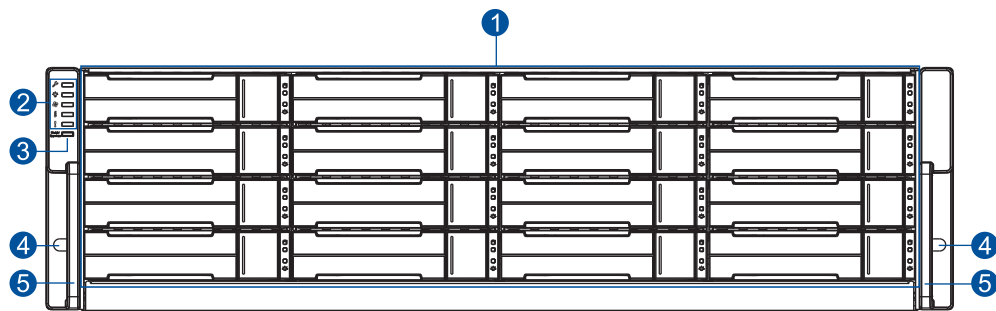
1.2.1 Front Panel

2U Systems



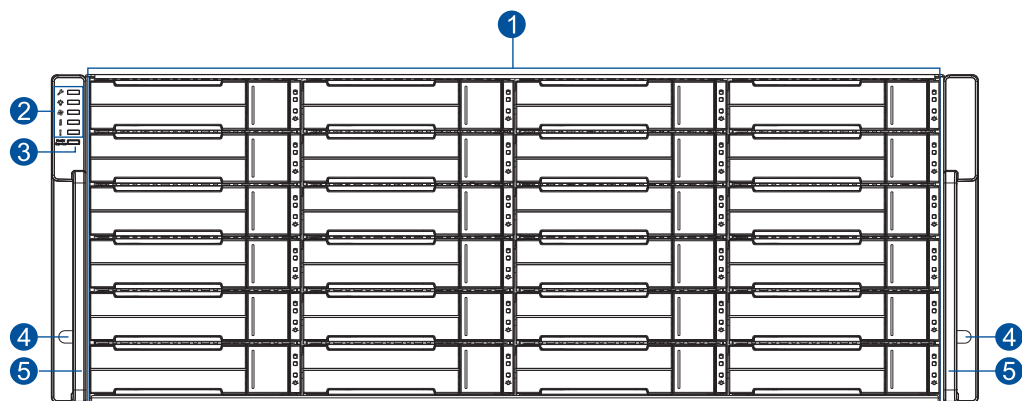
PS/PSe 3012/4012 G3

3U Systems



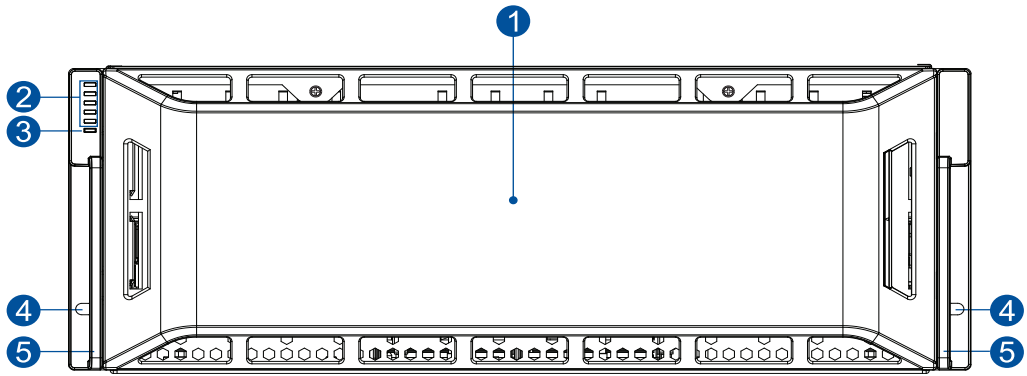
PS/PSe 3016/4016 G3

4U Systems

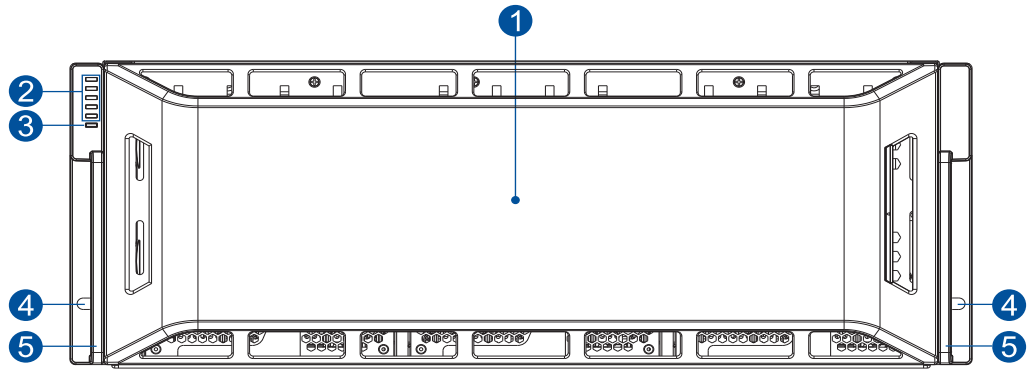


PS/PSe 3024/4024 G3

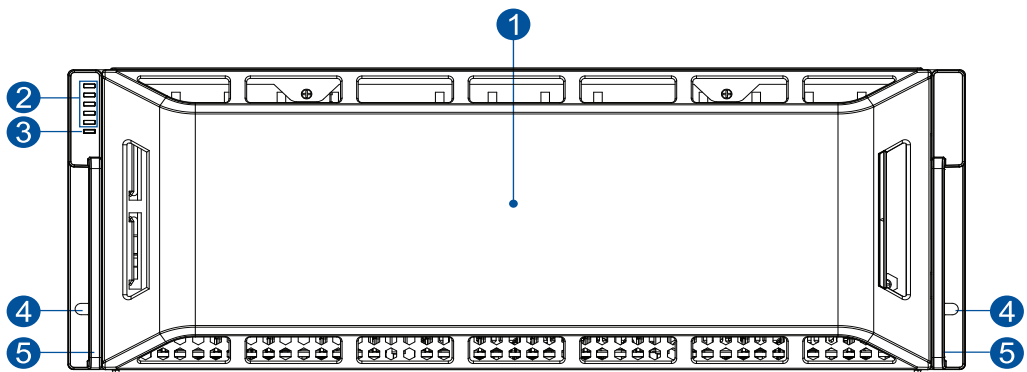
NOTE: Refer to the **Front Component Description Table** for details.



PS/PSe 3040T/4040 G3



PS/PSe 3060T/4060 G3



PS/PSe 3090T/4090 G3

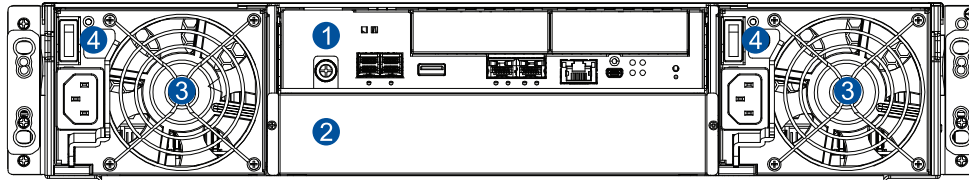
NOTE: Refer to the **Front Component Description Table** for details.

Front Component Description Table

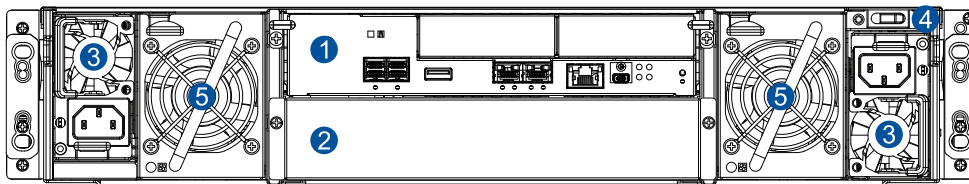
Number	Part	Description
①	Drive Trays	Each drive tray is hot-swappable and holds a 2.5-inch or 3.5-inch drive.
	System Cover	This cover hides and protects the components of the system.
②	LED Panel	LED panel has service, power, cooling module, temperature, and system fault LEDs.
③	Mute Button/ Service LED	This button mutes the alarm while the embedded Service LED notifies you that the system requires service.
④	Rackmount Holes	These holes secure the enclosure to the rackmount system with the mounting screws.
⑤	Handles	These handles allow you to push/pull the enclosure to/from the cabinet installed in the rackmount system.

1.2.2 Rear Panel

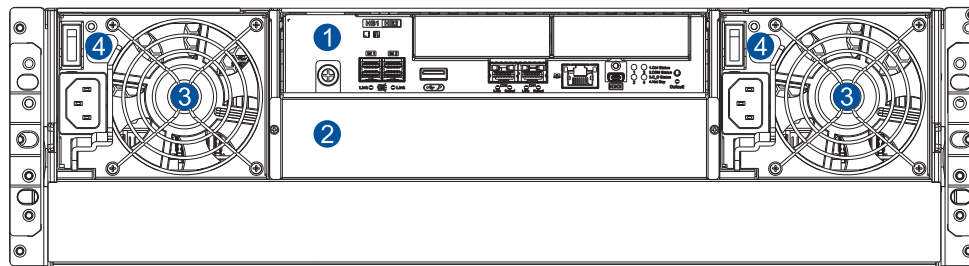
PS/PSe 3000 G3 Single-controller Systems



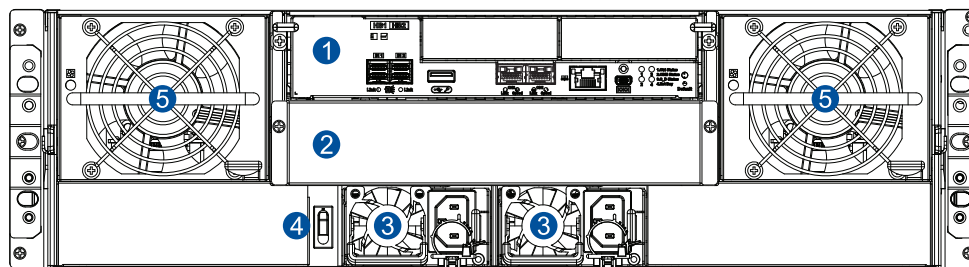
PS 3012S G3 / PSe 3012 G3



PS 3012S G3 / PSe 3012 G3
(EU version)

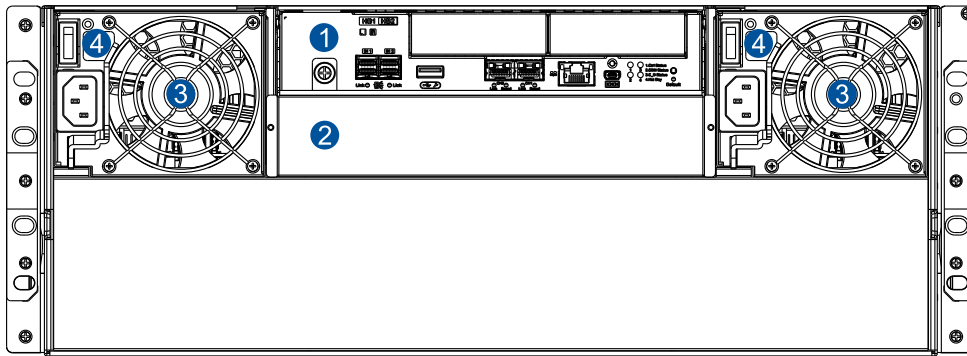


PS 3016S G3 / PSe 3016 G3

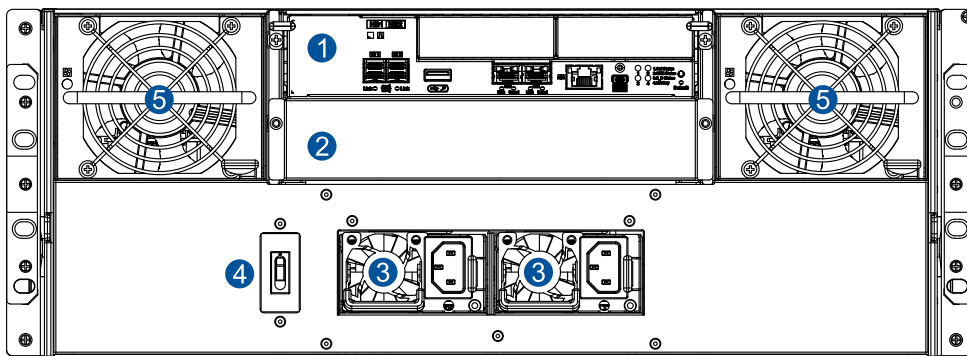


PS 3016S G3 / PSe 3016 G3
(EU version)

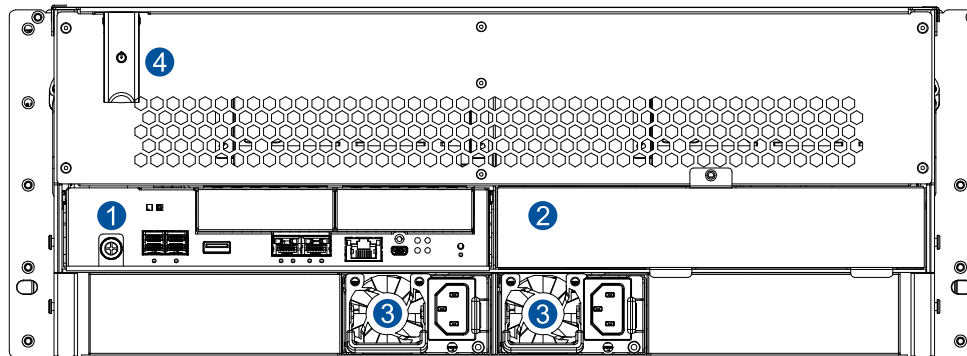
NOTE: Refer to the **Rear Component Description Table** for details.



PS 3024S G3 / PSe 3024 G3

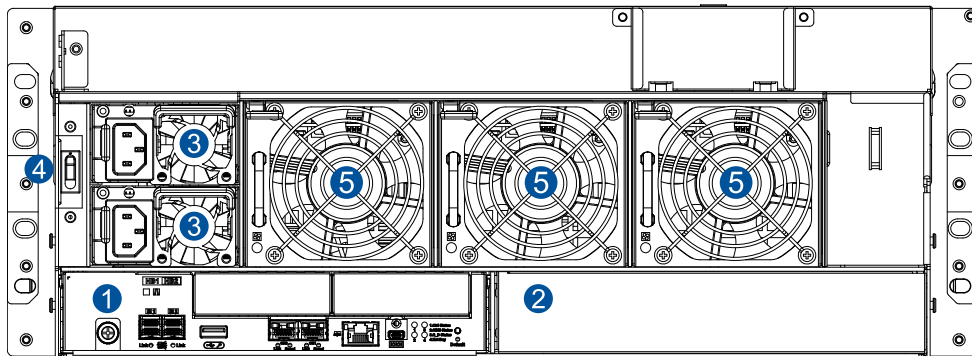


PS 3024S G3 / PSe 3024 G3
(EU version)



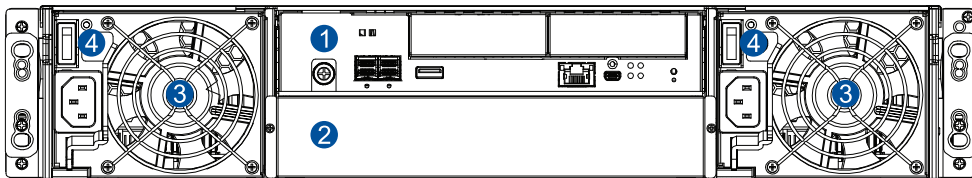
PS 3040ST G3 / PSe 3040T G3
PS 3060ST G3 / PSe 3060T G3

NOTE: Refer to the **Rear Component Description Table** for details.

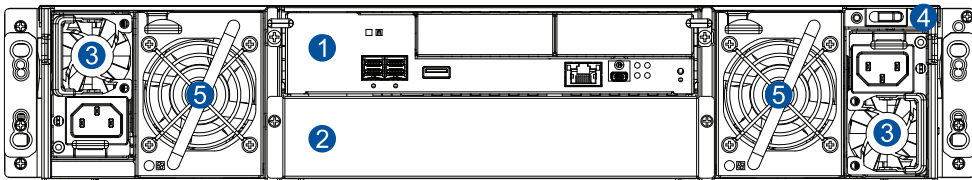


PS 3090ST G3 / PSe 3090T G3

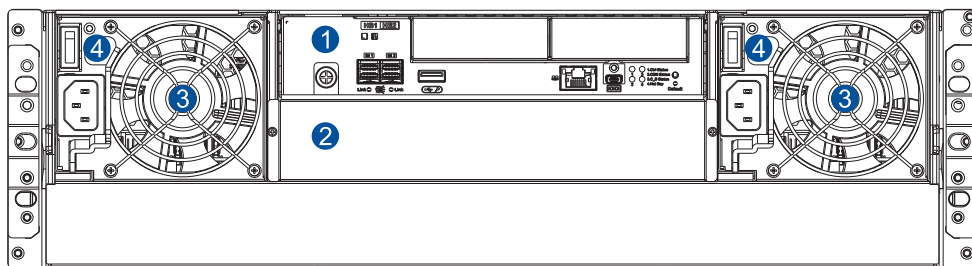
PS/PSe 4000 G3 Single-controller Systems



PS 4012S G3 / PSe 4012 G3

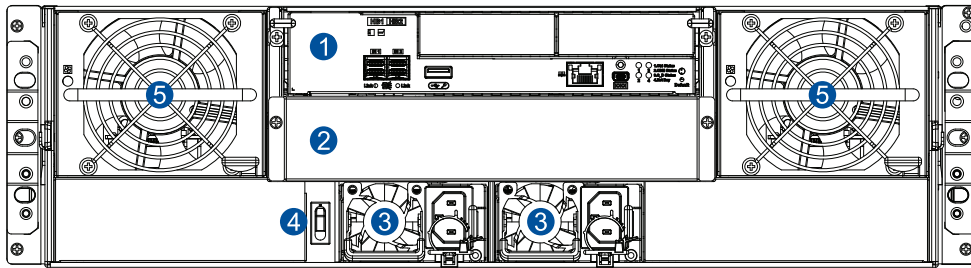


PS 4012S G3 / PSe 4012 G3
(EU version)

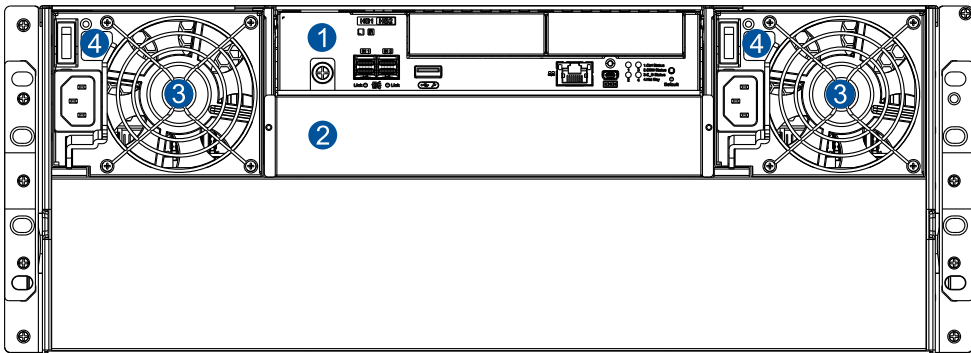


PS 4016S G3 / PSe 4016 G3

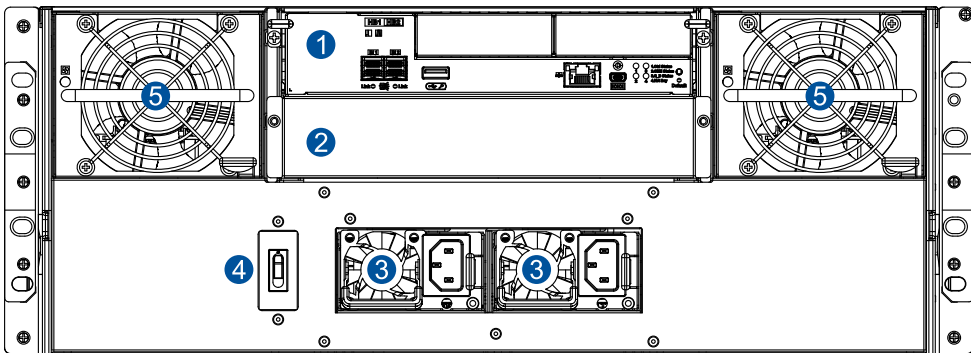
NOTE: Refer to the **Rear Component Description Table** for details.



PS 4016S G3 / PSe 4016 G3
(EU version)

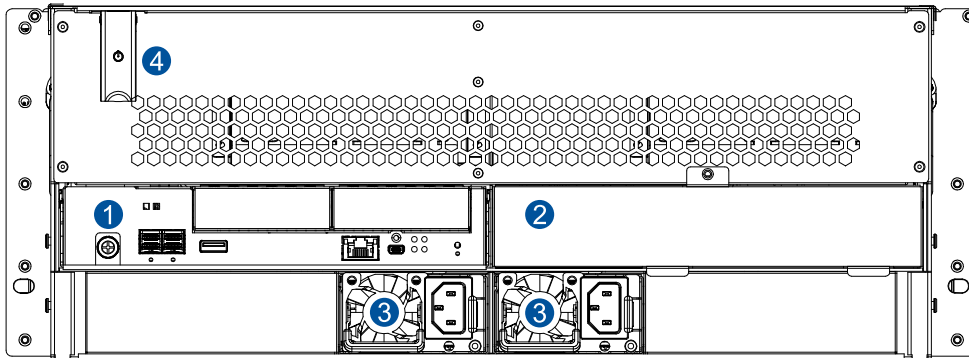


PS 4024S G3 / PSe 4024 G3

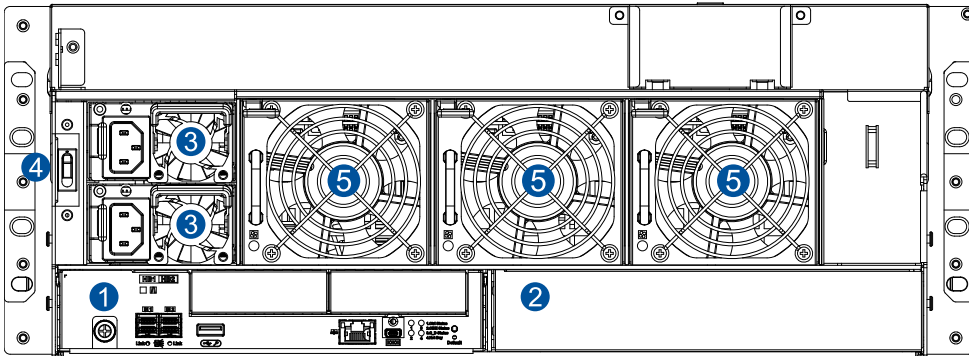


PS 4024S G3 / PSe 4024 G3
(EU version)

NOTE: Refer to the **Rear Component Description Table** for details.



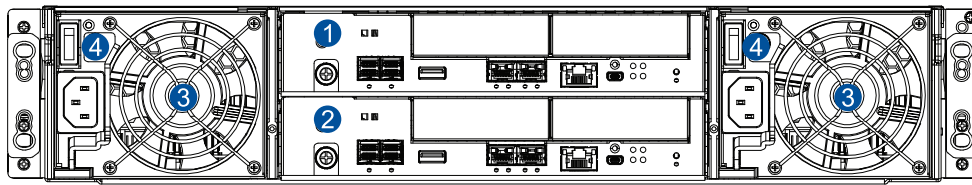
PS 4040S G3 / PSe 4040 G3
PS 4060S G3 / PSe 4060 G3



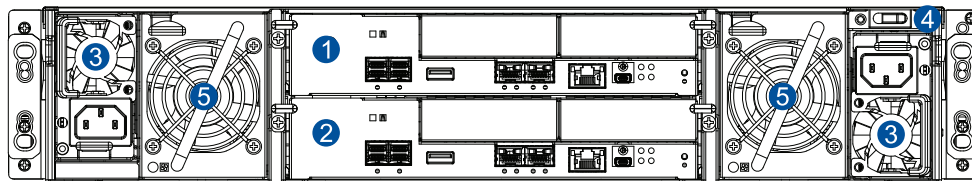
PS 4090S G3 / PSe 4090 G3

NOTE: Refer to the **Rear Component Description Table** for details.

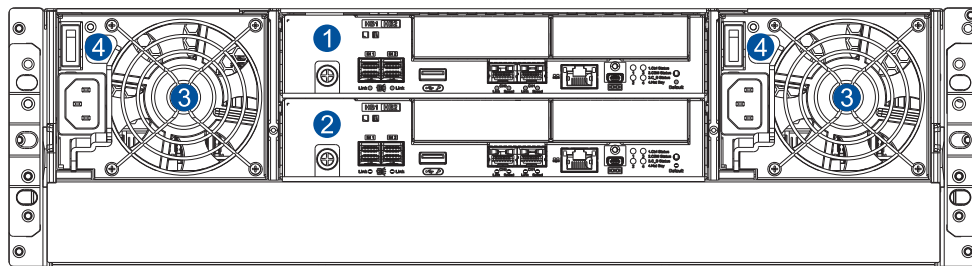
PS 3000 G3 Dual-controller Systems



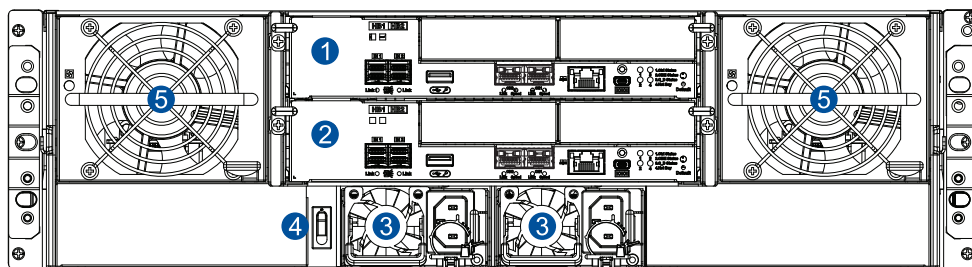
PS 3012R G3



PS 3012R G3
(EU version)

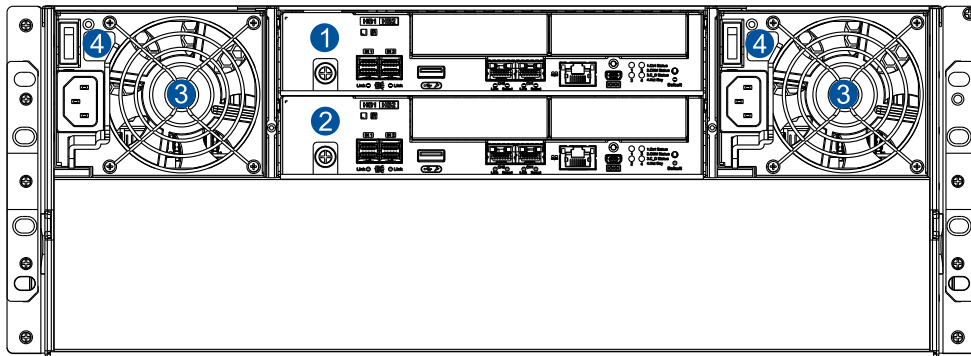


PS 3016R G3

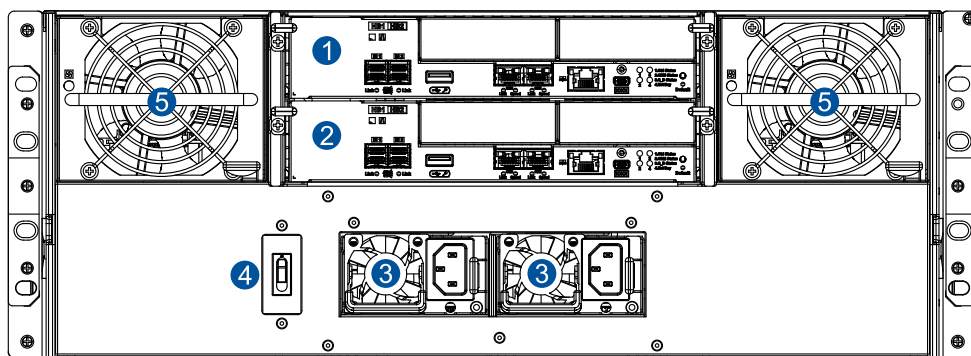


PS 3016R G3
(EU version)

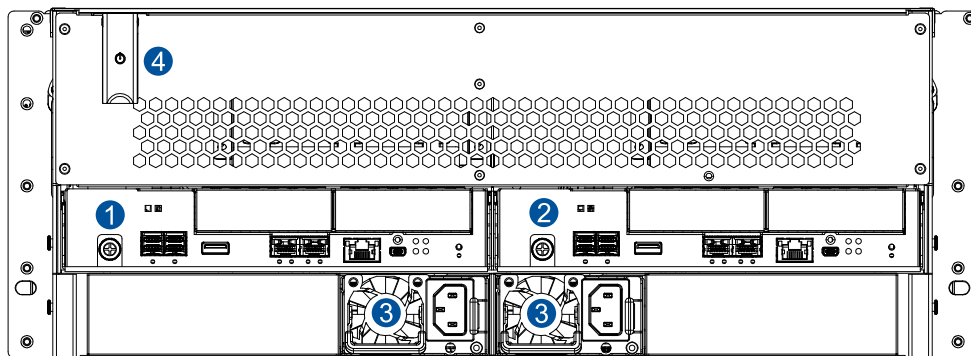
NOTE: Refer to the **Rear Component Description Table** for details.



PS 3024R G3

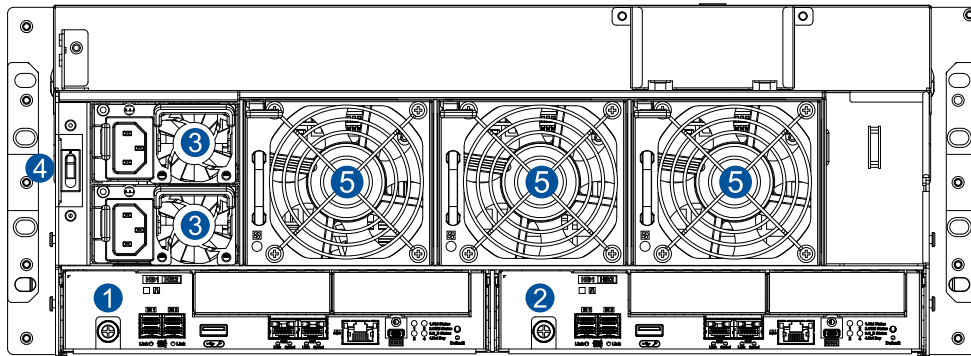


PS 3024R G3
(EU version)



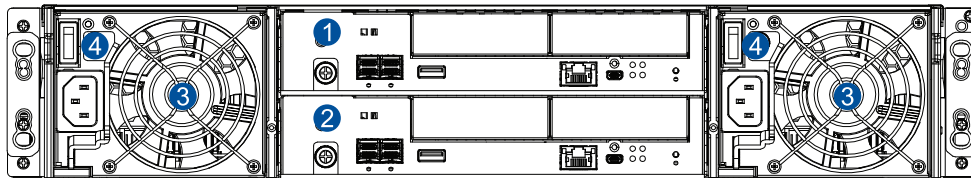
PS 3040RT G3 / PS 3060RT G3

NOTE: Refer to the **Rear Component Description Table** for details.

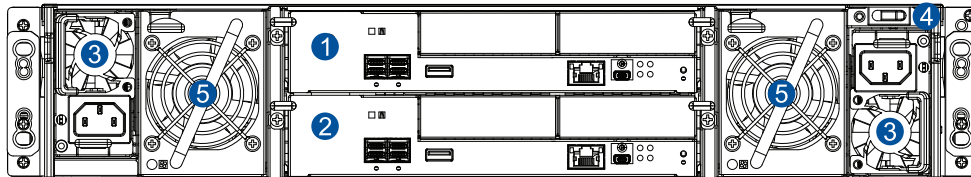


PS 3090RT G3

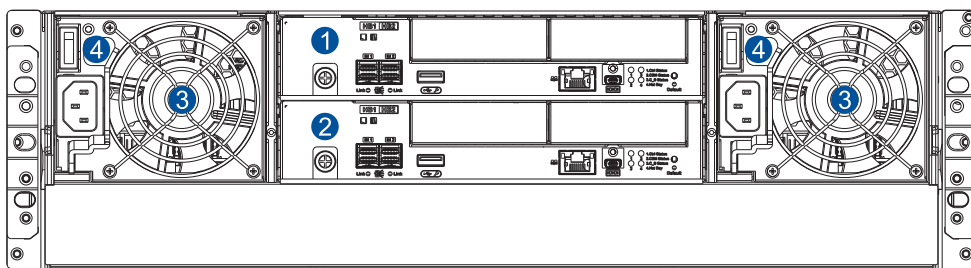
PS 4000 G3 Dual-controller Systems



PS 4012R G3

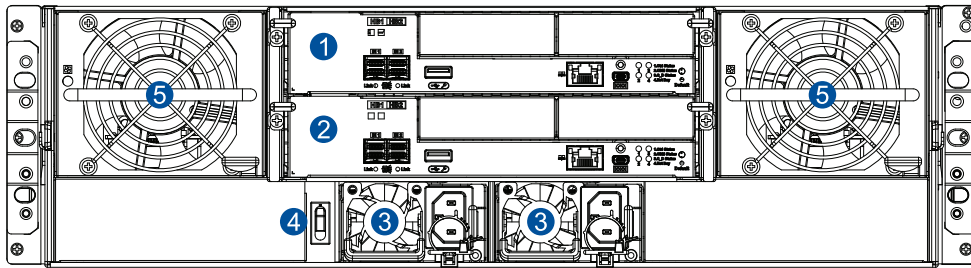


PS 4012R G3
(EU version)

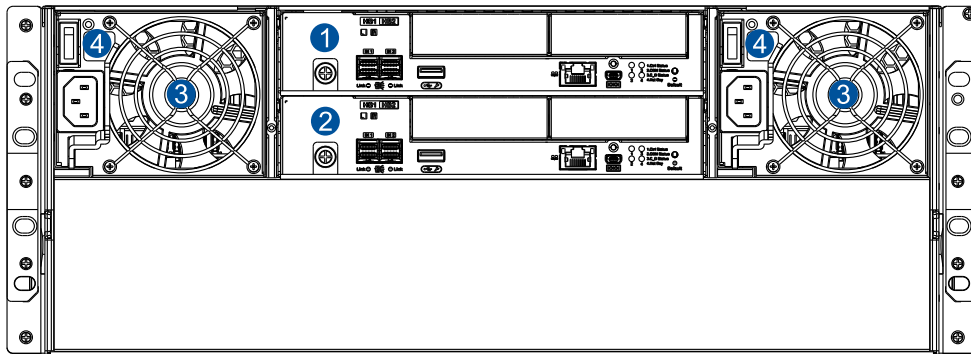


PS 4016R G3

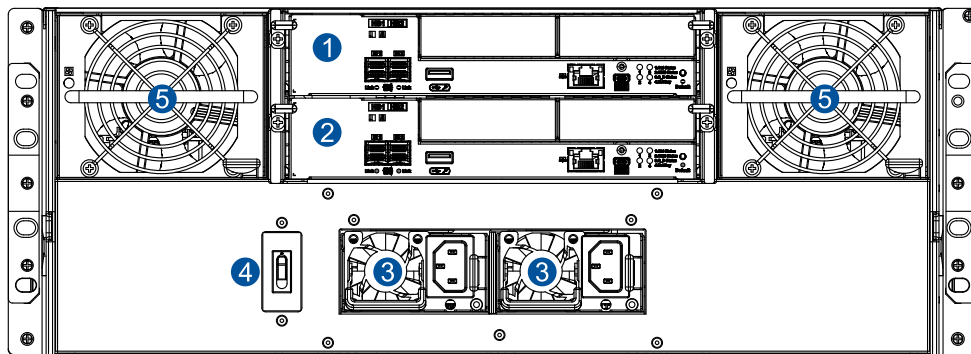
NOTE: Refer to the **Rear Component Description Table** for details.



PS 4016R G3
(EU version)

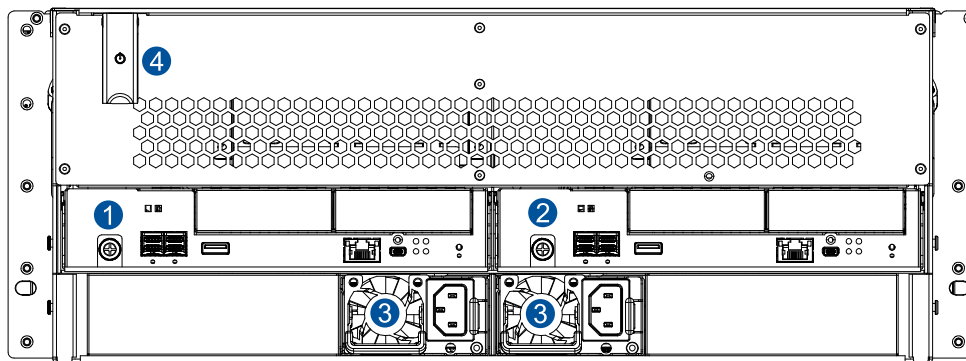


PS 4024R G3

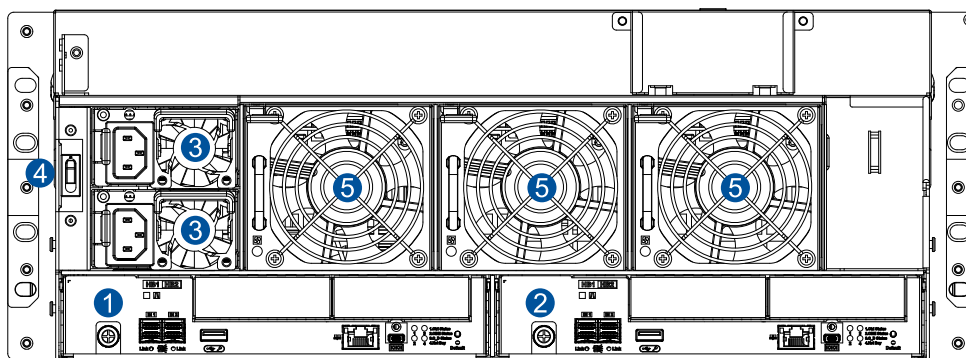


PS 4024R G3
(EU version)

NOTE: Refer to the **Rear Component Description Table** for details.



PS 4040R G3 / PS 4060R G3



PS 4090R G3

Rear Component Description Table

Number	Part	Description
①	Controller A	This controller module contains the SAS expansion board which distributes I/O functions to and from the managing RAID system. This also handles the status of the components via the SAS links with the RAID system.
②	Controller B or Dummy Cage	This part contains the second controller, also called the redundant controller. This controller takes over the system functions when Controller A fails to process. For single controller system, this contains a dummy cage.
③	PSU/Cooling Module	These hot-swappable PSUs provide power to the storage system and each PSU has a cooling module.
④	Power Button	These buttons allow you to turn ON/OFF your storage system.
⑤	Fan Module	Certain models come with separate fan modules that help with ventilation.

WARNING!

- DO NOT remove the redundant components.
- DO NOT replace the redundant components without a replacement on hand.

1.2.3 Internal Backplane

The internal backplane is a circuit board that separates the front and rear parts of the chassis. This board provides logic level signals and low voltage power paths. The thermal sensors and I²C devices are embedded to detect system temperatures and PSU operating status. This board is comprised of non user-serviceable components.

WARNING!

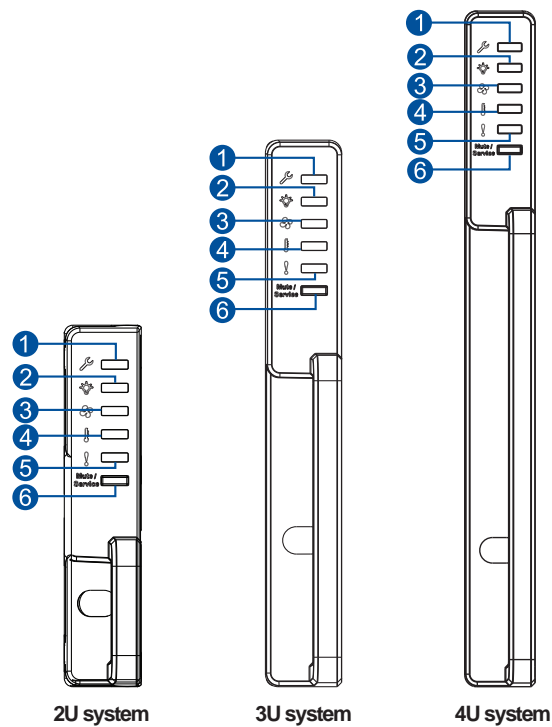
- Accessing the backplane board may lead to serious damage to the system.
 - Physical contact with the backplane board may cause electrocution.
-

1.3 Front Panel Components

This section describes the front panel components.

1.3.1 LEDs and Button Panel

The LEDs on the panels allow you to monitor your system's current status when turned on.



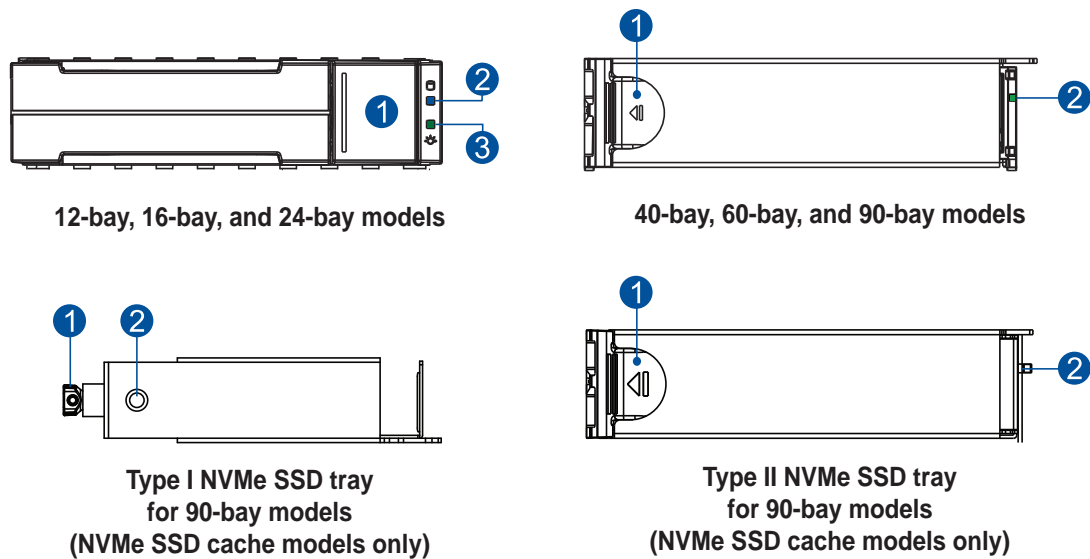
Number	Part	Description
①	Service LED	This LED indicates whether the system requires service or is currently being serviced (i.e. repaired).
②	Power LED	This LED provides the system's power status.
③	Cooling Module LED	This LED provides the cooling module's status.
④	Temperature LED	This LED provides the system's temperature status.
⑤	System Fault LED	This LED provides the system's operation status.
⑥	Mute Button/ Service LED	This button mutes the alarm while the embedded Service LED notifies you that the system requires service

NOTE: For more details regarding the LEDs and their respective status, refer to **3.2.1 Front Panel LEDs**.

WARNING! If critical faults are indicated on the LED panel, verify the cause of the problem as soon as possible and contact your system vendor for a module replacement.

1.3.2 Drive Tray and Drive Tray LEDs

The components of the drive tray are designed to facilitate drive installation and drive status monitoring.



Number	Part	Description
1	Release Button	This button unlocks the drive tray from the drive tray slot.
2	Drive Busy LED	This LED provides the status of the drive.
3	Power Status LED	This LED provides the power status of the drive.

NOTE:

- Drive trays of PS/PSe 3040T/4040/3060T/40603090T/4090 G3 are located inside the enclosure.
- For more details regarding the LEDs and their descriptions, refer to **3.2.2 Drive LEDs**.

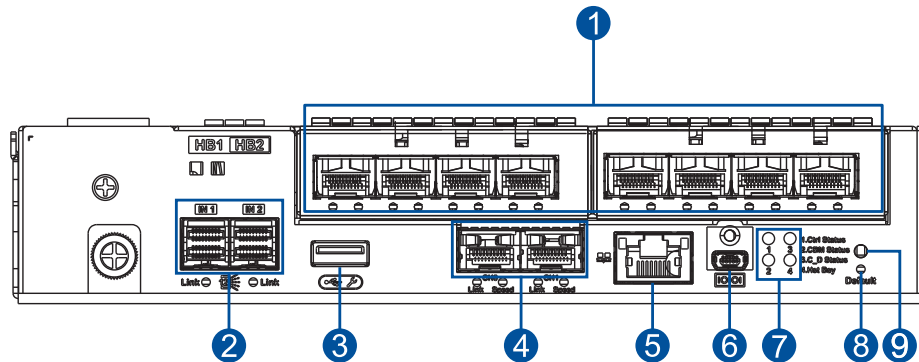
WARNING! Be careful not to drop or put heavy objects on the drive tray, as these may cause to bend or deform the drive tray's structure. If the drive tray is deformed, it may not fit into the system's drive bay.

1.4 Rear Panel Components

This section describes the rear panel components.

1.4.1 Controller Module Interfaces

The I/O interfaces of the controller module allow you to connect to other devices, while the LEDs enable you to monitor the status of your controller.



Number	Part	Number	Part
1	Host Board Ports (Optional)	6	Serial Port (Mini USB Connector)
2	SAS Expansion Ports	7	Controller Status LEDs
3	USB 3.0 Port (for Service Only)	8	Restore Default LED
4	Onboard Dual Port 25GbE (PS/ PSe 3000 G3 Series Only)	9	Restore Default Button
5	Ethernet Management Port		

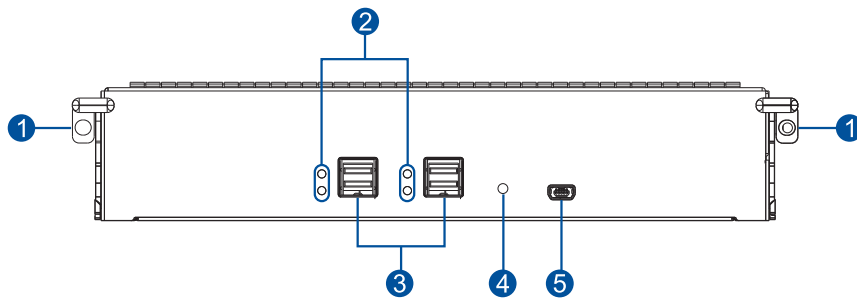
WARNING! The controller module is built of sensitive and non-replaceable components. You can only replace the controller module when you already have a replacement. Unnecessary tampering may damage the controller.

NOTE:

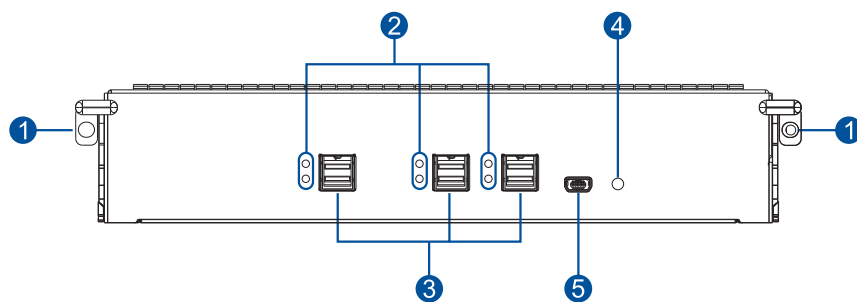
- An “R” model has two Ethernet management ports, one per controller.
- Host boards are add-on components.
- Whenever an onboard host port cable is not plugged in, insert a dust cap (bundled in the package) into the port.

1.4.2 Controller Module Interfaces of the JBOD Models

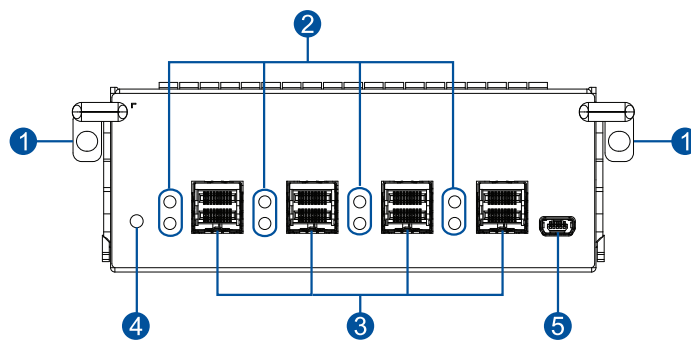
The expansion controller contains a circuit board within a metal canister, integrated with the hot-swap docking connectors at the backend. The SAS wide ports on the interface faceplate connect to a managing PS/PSe system or other expansion systems.



JB 3012A/3016A



JB 3060L



JB 3090

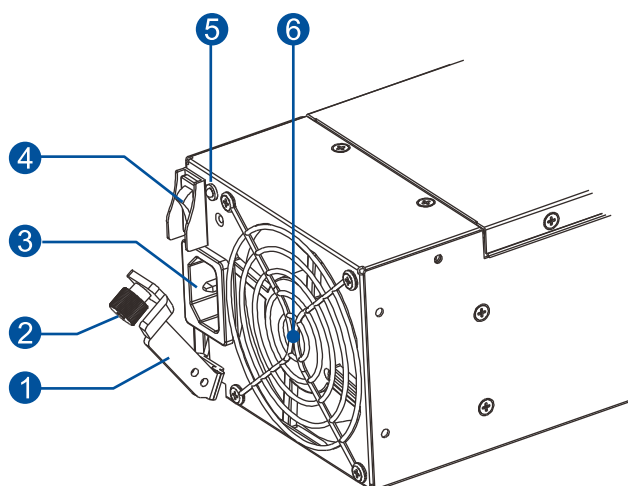
Number	Part
①	Extraction Levers / Screw Holes
②	SAS Expansion Port Status LEDs
③	SAS Expansion Ports
④	Controller Status LED
⑤	Mini USB Service Port

WARNING! You can only remove the controller when you already have the replacement. The JBOD (expansion) controller is built of sensitive components. Unnecessary tampering may damage the controller.

1.4.3 PSUs and Cooling Modules

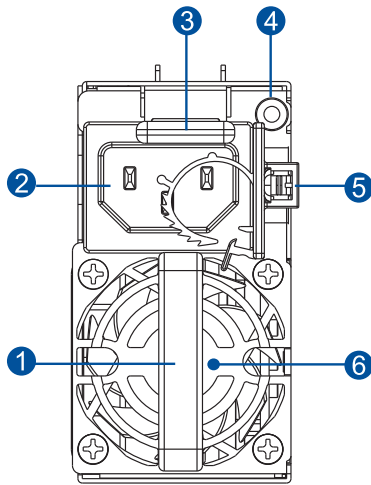
The PS/PSe 3000/4000 G3 series system has two redundant, hot-swappable PSUs that provide and power, each PSU is built with a cooling fan that helps with the airflow, providing an efficient ventilation.

PSU/Cooling Module for 12-bay, 16-bay, and 24-bay Models

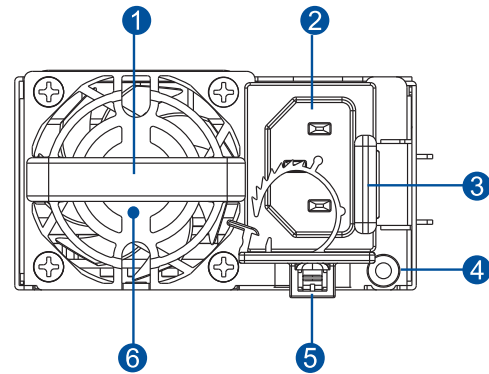


Number	Part	Number	Part
①	Extraction Lever	④	Power Switch
②	Retention Screw	⑤	PSU Status LED
③	Power Socket	⑥	Fan

PSU/Cooling Module for 12-bay, 16-bay, and 24-bay Models (EU Version)

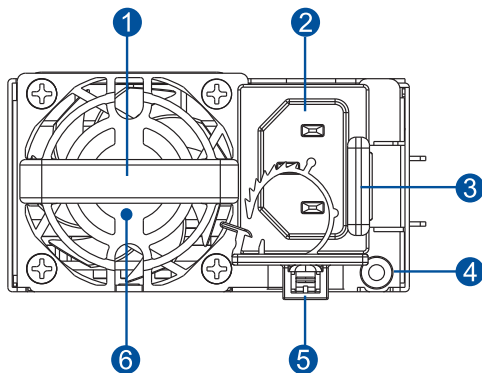


12-bay models
(EU version)

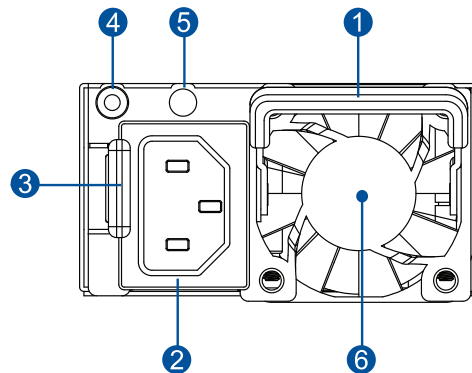


16-bay and 24-bay models
(EU version)

PSU/Cooling Module for 40-bay, 60-bay, and 90-bay Models



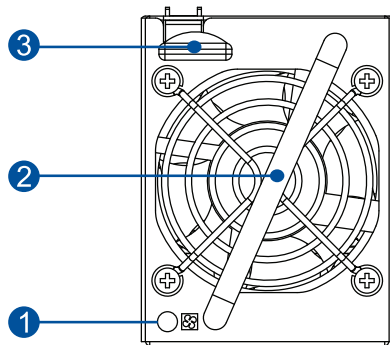
40-bay and 60-bay models



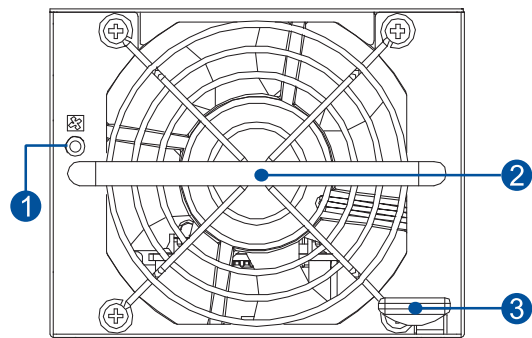
90-bay models

Number	Part	Number	Part
1	Extraction Handle	4	PSU Status LED
2	Power Socket	5	Mounting Hole (with a mounted cable tie)
3	Retention Lever	6	Fan

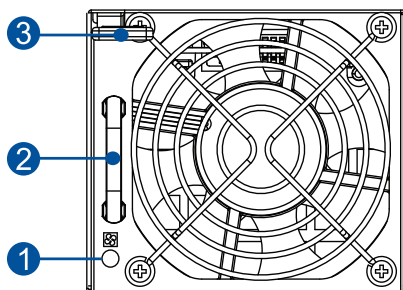
Fan Module



12-bay models
(EU version)



16-bay and 24-bay models
(EU version)

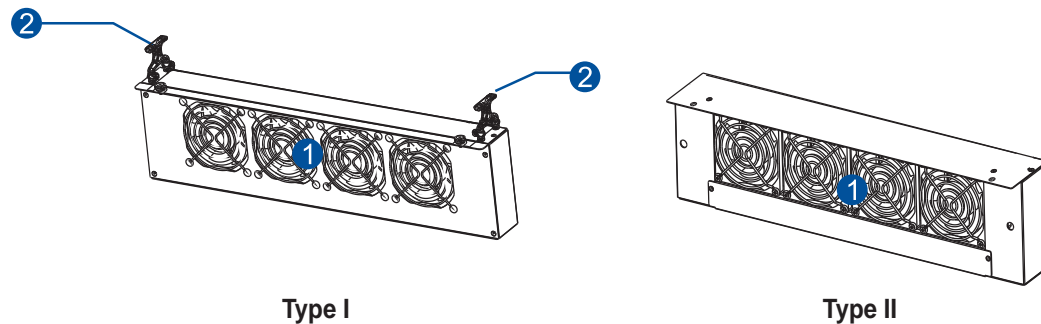


90-bay models

Number	Part
①	Fan Module LED
②	Extraction Handle
③	Retention Lever

Internal Cooling Module for 40-bay and 60-bay Models

The cooling module has four fans that help with the ventilation inside the chassis.



Number	Part
1	Cooling Fans
2	Extraction Handles

When the cooling modules operate under normal conditions, the cooling fans run at a low speed. The cooling fans raise their rotation speed to increase the airflow under the following conditions:

- Component failure: if the cooling module, PSU, or a temperature sensor failed.
- Elevated temperature: if the temperature breaches the upper threshold set for any of the interior temperature sensors.
- During the initialization stage, the cooling fans operate at a high speed. The speed is lowered when the initialization is completed and no errors are detected.

NOTE: There are two upper temperature thresholds: one for event notification and the other for triggering high fan rotation speed. You can change the preset values for event notification using the firmware-embedded configuration utility. Refer to the firmware operation manual for details.

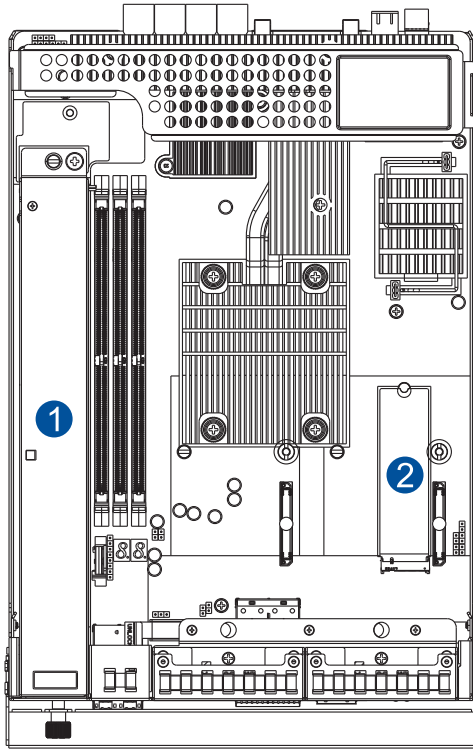
WARNING!

- If any of the LEDs lights up in amber, contact your local vendor to request for a replacement immediately.
 - When removing the system PSU/cooling module, pull the module for about 3 inches then wait for at least 10 seconds before removing the whole module from the enclosure.
 - DO NOT run the system with faulty PSU/cooling module(s) as it may cause disruption of the airflow resulting in overheating.
-

CAUTION! Keep your body away from the moving parts of the system.

1.4.4 Super Capacitor and Flash Backup Module

PS 3000/4000 G3 series system has a CBM (Cache Backup Module), which is composed of a super capacitor and a flash backup module, installed in the controller. The super capacitor provides power, allowing the system to store cached data to the flash backup module permanently in case of power interruption or outage.



NOTE:

- The picture of the controller module is for reference only.
- The CBM is an optional component on PSe G3 series.

Number	Part
1	Super Capacitor
2	Flash Backup Module

The super capacitor is partially charged when shipped. When you turn ON the system, the super capacitor will charge to its full capacity, which will take a few minutes. You can check the status of the super capacitor in EonOne. To do so, follow the steps below:

1. Log in to EonOne. Go to **Main menu > Settings > Device > System**.
2. Select RAID from the scroll down list, and click **Enclosure view**.
3. Click on the controller module in the enclosure image that appears.
4. View the **CBM status** in the right-hand pane. The status should display **Normal** with a green check after the super capacitor has been fully charged.

NOTE: If the super capacitor is not charging, there may be a problem. Contact your system vendor immediately. See also **4.7 Replacing a Super Capacitor** for details.

1.5 System Monitoring Features

This section describes the different types of system monitoring features that provide the operating status of each component.

1.5.1 Expansion Enclosure Support

Monitoring System

A managing PS/PSe system is aware of the status of connected expansion system's components such as:

- Expander controller (presence, voltage, and thermal readings)
- PSU/Cooling module
- Enclosure thermal sensor
- Service (the Service LED signals the specific enclosure)
- Hard disk drives

Expansion System Identifier

The managing system sets off the alarm and delivers the warning messages if there is a conflict between the expansion systems.

If more than one expansion system is connected to the managing PS/PSe system, each needs a unique enclosure ID set using the rotary switch on the LED panel. For example, the firmware automatically disconnects the second expansion system if it is connected online and comes with an ID identical to the first expansion system.

NOTE: The expansion system IDs are numbers 1 to 15. For more details, see section **2.6.2 Expansion Connections**.

Cooling Module Speed Adjustment

If any of the detected temperature readings breaches the temperature threshold, the firmware running on the managing PS/PSe system automatically increases the rotation speed of all cooling fans.

Expansion Enclosure Status Monitoring

The system connecting with expansion systems (JBOD) can acquire the component status with other enclosures via a proprietary enclosure monitoring service using the in-band connectivity. No additional management connection is required.

I²C Bus

The detection circuitry and temperature sensors are interfaced via a non-user-serviceable I²C bus. When the expansion systems are connected to PS/PSe controllers, the component status is reported through in-band protocols over expansion links, which is managed by a proprietary enclosure service.

EonOne and Firmware

- **EonOne:** EonOne is a browser-based GUI (graphical user interface) software tool that you can install on a local or remote computer and access via the network. EonOne communicates with the storage system via connection of the existing host links or the Ethernet cable to the storage system's Ethernet management port.

- **Firmware (FW):** The preloaded firmware configures the system settings. You can view system settings from the FW menu via a terminal emulation program running on a management computer connected to the storage system's serial port.

1.5.2 Audible Alarms

The system comes with audible alarms that are triggered when certain active components fail or when specific controller or system thresholds exceed. Whenever you hear an audible alarm, you must determine the cause and solve the problem immediately.

Event notification messages indicate the completion or status of array configuration tasks and are always accompanied by two or three successive and prolonged beeps. You can turn off the alarm using the mute button on the front panel. button.

NOTE: For the location of the mute button, see **1.3.1 LEDs and Button Panel**.

WARNING! Failure to respond when an audible alarm is set off can lead to permanent damage to the system. When you hear an audible alarm, solve the problem immediately.

1.6 Hot-swappable Components

The system has a number of hot-swappable parts that you can change while the system is still online without affecting its operational integrity.

These hot-swappable components are user-maintained:

- Controller module
- PSU/cooling module
- Fan module
- HDD and SSD

IMPORTANT! Only remove these hot-swappable components when replacement is needed.

NOTE: A normal airflow ensures sufficient cooling of the system and this can only be attained when all components are properly installed. Remember to only remove the failed component if there is a replacement on hand. For more information on replacing hot-swappable components, see **Chapter 4 System Maintenance**.

Hardware Installation 2

This chapter describes installing the modular components such as hard drives, host boards, and other optional installation or connections such as expansions and rackmount.

2.1 Installation Prerequisites

Take note of the following installation prerequisites before you start with the installation:

- **Static-free installation environment**
Install the system in a static-free environment to minimize the possibility of ESD (electrostatic discharge) damage.
- **Component check**
Before the installation, ensure that you received all required components by verifying the package contents with the **Unpacking List** document. This document is included in the package. If there are items missing and/or damaged, contact your vendor for a replacement.
- **Drives**
The SAS/SATA drives are purchased separately and must be available before the system installation.
- **Cables**
All cables that connect the system to the hosts are purchased separately. Contact your vendor for the list of compatible cables.
- **Memory modules**
If you want to change the pre-installed DIMM modules, ensure that they are compatible and purchased from a qualified vendor. Contact your vendor for the list of compatible DIMMs.
- **Rackmount equipment**
The rack slide rails are optional accessories. If you need to install them, see section **2.2 Installing the Rackmount Kit**.

IMPORTANT! Install the system first to the rack or cabinet before installing the drives into the system.

Ensure that you are familiar with the exact position of each plug-in module and interface connector. Also, ensure to handle the cables with care when connecting between systems installed in the rack with a correct routing paths carefully planned. DO NOT bend or twist the cables as this may cause emission interference and accidental cable disconnection.

Installation Procedures

The installation procedures in this chapter are in order, so it is strongly recommended that you follow the said order to reduce the time consumed during installation and prevent installation mistakes, technical mishaps, or physical injuries.

Unpacking the System

When your system package has arrived, check and confirm if the contents of your package are complete by referring to the **Unpacking List** document, which is included in your package.

Pre-installed Components

Below are the components that are pre-installed in the system:

- Controller
- LED front panel
- DIMM module
- CBM, including a super capacitor and an FBM (default for PS G3 series, optional for PSe G3 series)
- PSU including cooling module
- Fan module (for EU version and 90-bay models)
- Internal cooling module (for 40-bay and 60-bay models)

Components that Need User Installation

You must do the following installation:

- Assemble the system to a rack or a cabinet
- Install drives into drive trays and tray bays
- Install host boards or expansion boards
- Connect cables to hosts, expansion enclosures, power outlets, and management tools

User-provided Tools

Before assembling the rackmount kit, you must prepare the following tools:

- Phillips screwdriver (medium size)
- Flat blade screwdriver (small size)
- Anti-static wrist wrap
- RJ-45 LAN cables
- Host link cables

2.2 Installing the Rackmount Kit

This section details the overview of the rackmount kit, its assembly, and installation with the storage system.

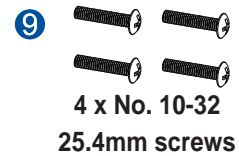
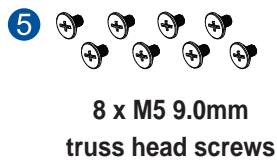
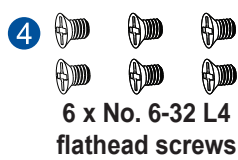
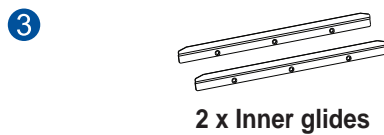
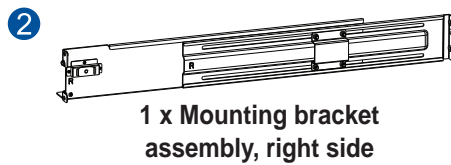
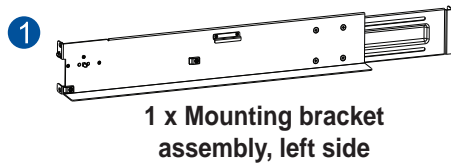
2.2.1 Installing Rackmount for 12-bay, 16-bay, and 24-bay Models

IMPORTANT!

- Refer to sections **ESD Precautions** and **Rackmount Safety Instructions** for safety information.
- Please contact our technical support team if you need further help with installing your system/ enclosure to the rack.

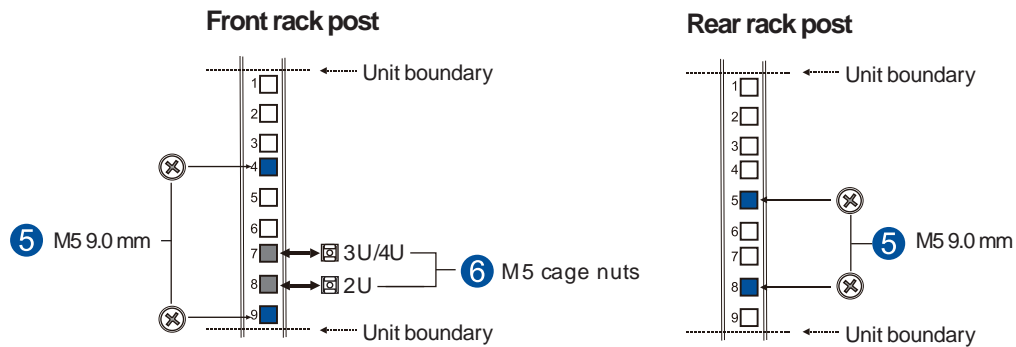
Checking the Slide Rail Kit Contents

Check your slide rail kit for the following contents.

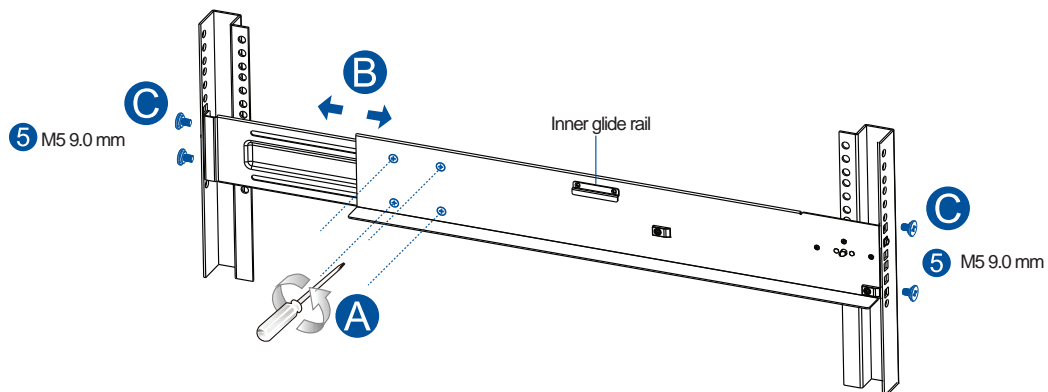


Assembling the Slide Rail Kit

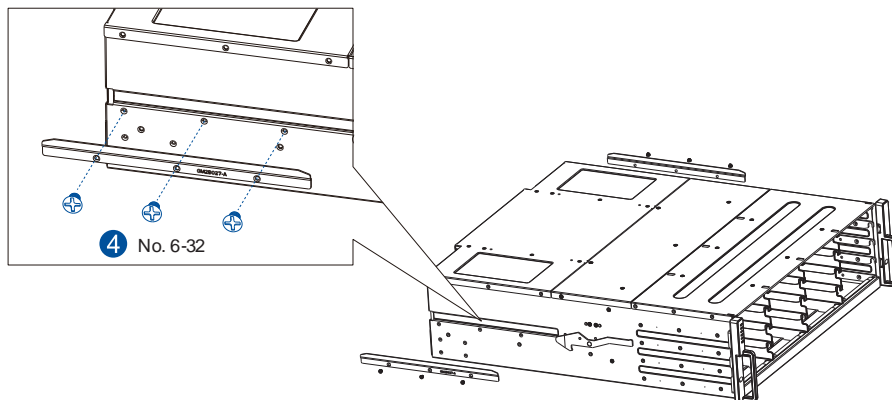
1. Determine the position where the enclosure will be installed to the front and rear rack posts. Then insert the cage nuts into the designated holes on the front rack posts and the truss head screws on the front and rear rack posts.



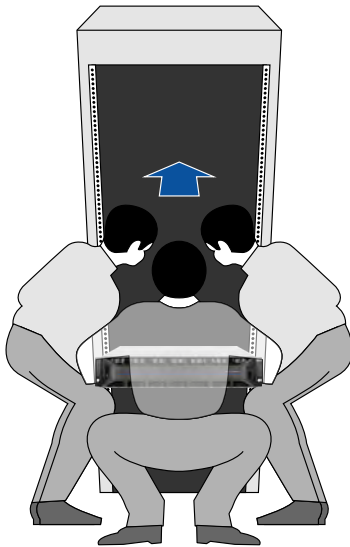
2. Loosen the four screws on the slide rail (A), adjust its length (B), and then secure the slide rail to the front and rear rack posts with the M5 9.0mm screws (C). Tighten the four screws on the slide rail to fix the length.



3. Attach the inner glides to both sides of the enclosure with the no. 6-32 flathead screws.

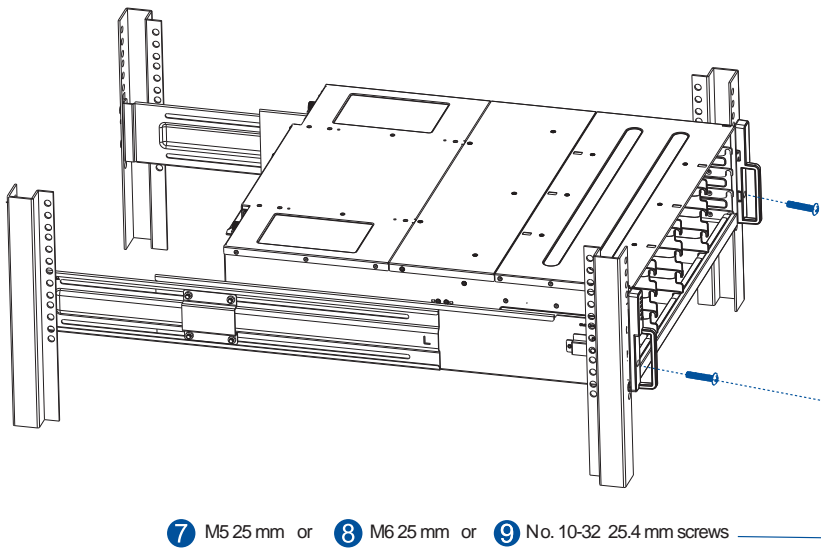


4. With the assistance of two other people, lift and insert the enclosure onto the slide rails. Ensure that the inner glides on both sides of the enclosure meet the inner glide rails.



NOTE: The image is for illustration purposes only. DO NOT install drives yet.

5. Secure the enclosure with the M5, M6, or no. 10-32 screws from the front.



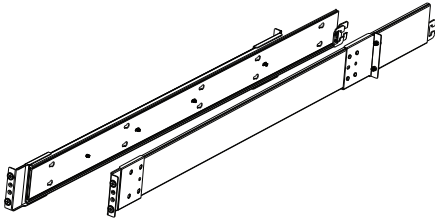
Once the enclosure is assembled to the cabinet, you can proceed to install other components.

2.2.2 Installing Rackmount for 40-bay and 60-bay Models

Checking the Slide Rail Kit Contents

Check your rackmount slide kit for the following contents.

1



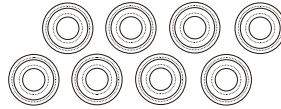
2 x Rack slide rails (left and right)

3



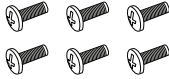
2 x M5 cage nuts

4



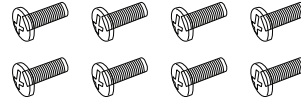
8 x Ø5.1mm washers

2



6 x M4 6mm screws

5

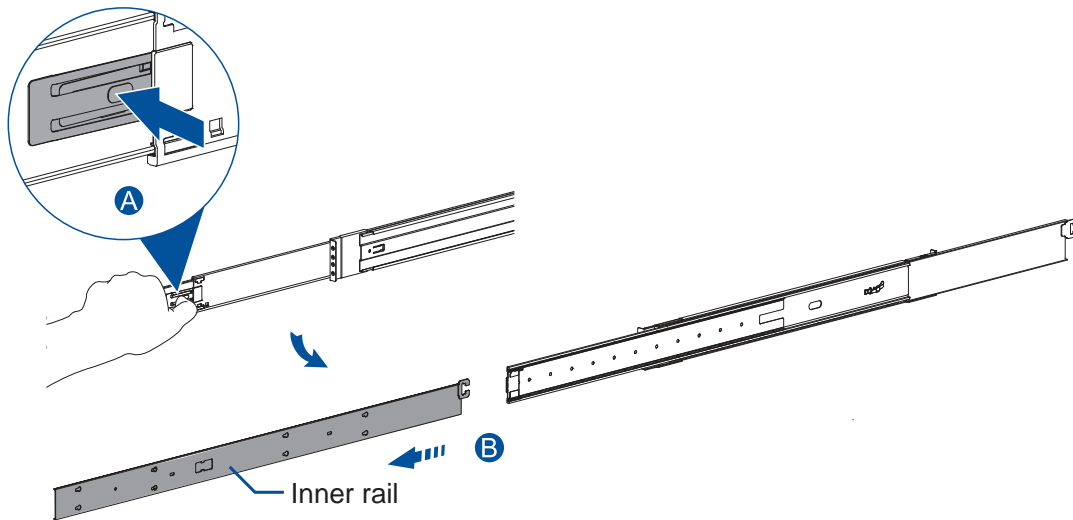


8 x M5 10mm screws

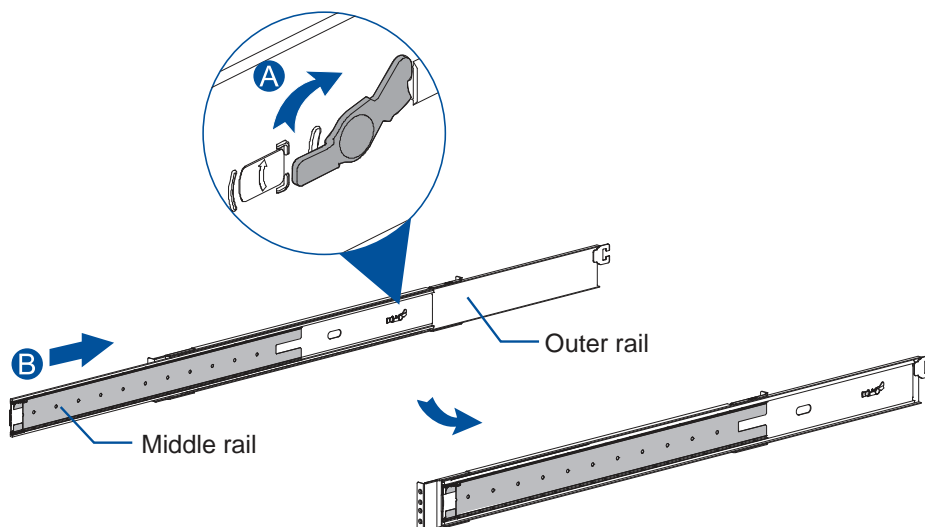
NOTE: The rack slide rails (outer and middle rails) are assembled together with the enclosure slide rails (inner rails).

Assembling the Slide Rail Kit

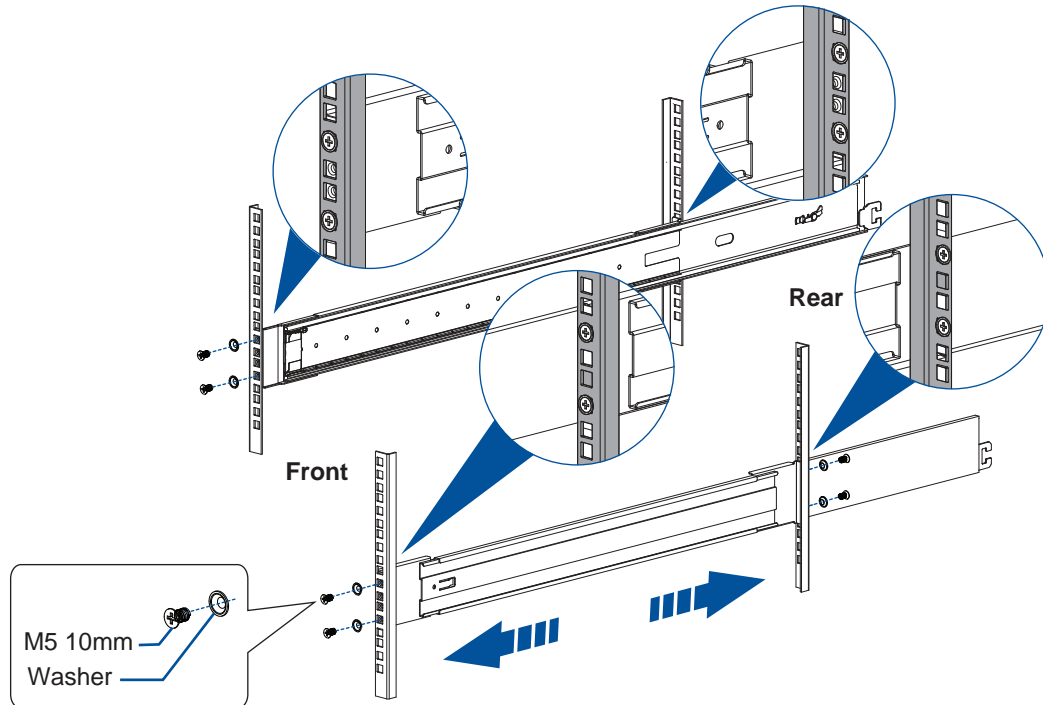
1. Press the release tab (A), and remove the inner rail from the slide rail kit (B).



2. Move the lever in the direction indicated by the engraved arrow (A), and slide the middle rail back into the outer rail (B).

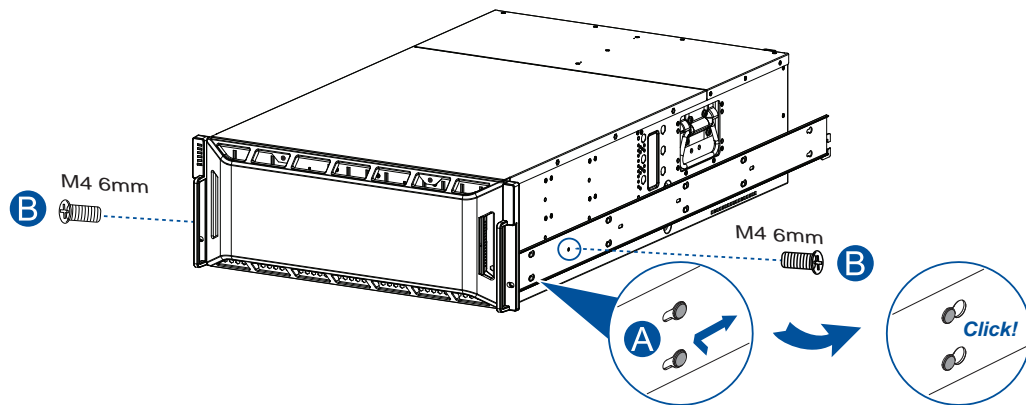


3. Determine the location where you want to install the slide rails to the rack posts.
4. Attach the slide rails to the rack posts using eight M5 10mm screws and washers, four for front posts and the other four for rear posts.

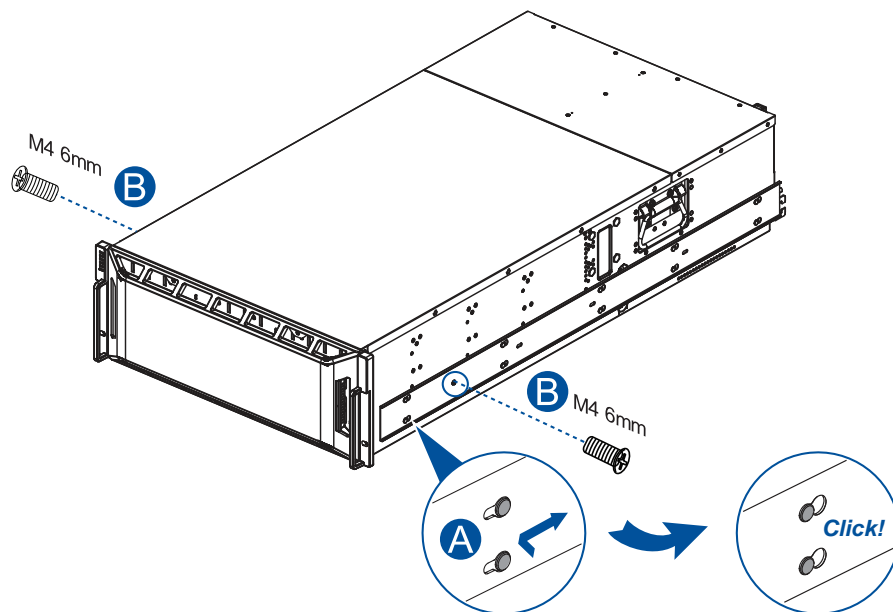


5. Attach the inner rails to the sides of the enclosure. Make sure that the pins on the enclosure click into the holes in the inner rails (A). Then secure the inner rails to the enclosure with the M4 6mm screws provided (B).

- **40-bay model**



- **60-bay model**



For 40-bay models, complete the steps in **2.3 Installing Drives** to install drives and the rackmount. For 60-bay models, continue with **2.2.3 Installing the Adjuster Pillars for 60-bay Models** in the next section.

2.2.3 Installing the Adjuster Pillars for 60-bay Models

Due to the measurement of the 4U 60-bay enclosure and the position selected to secure the front rack posts on the chassis guide, you may need to install the adjuster pillars so that the rear end of the enclosure will not protrude from the rear end of the cabinet.

Determing If the Adjuster Pillars Are Needed

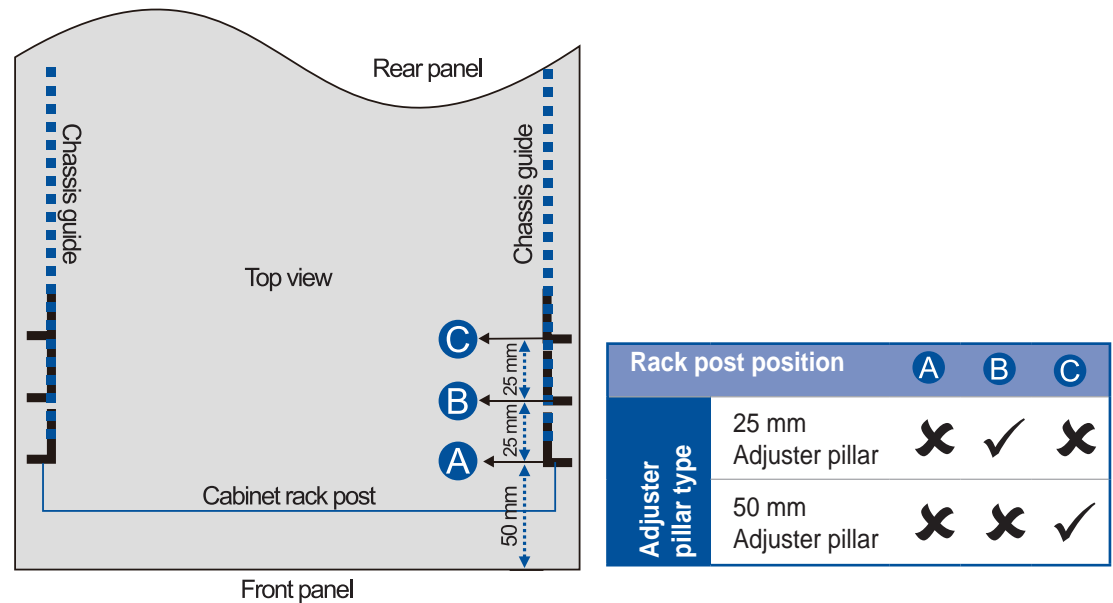
The illustration and the table below show the generic structure of the cabinet and the position of the adjuster pillars according to its measurement.

If your front rack posts are secured on the chassis guide at:

- position A, you do not need to install the adjuster pillars.
- position B, install the 25mm adjuster pillars.
- position C, install the 50mm adjuster pillars.

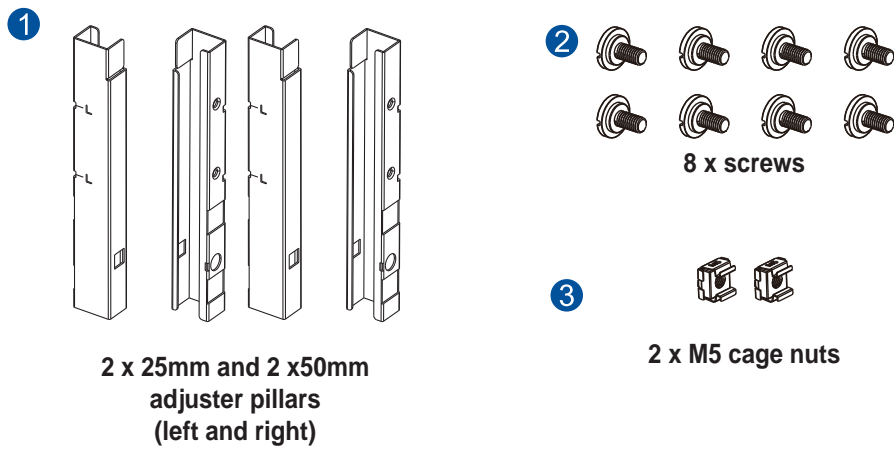
NOTE: Rack post installation positions comply with the rackmount server chassis standards of SSI (Server System Infrastructure).

Cabinet structure



Checking the Adjuster Pillar Kit Contents

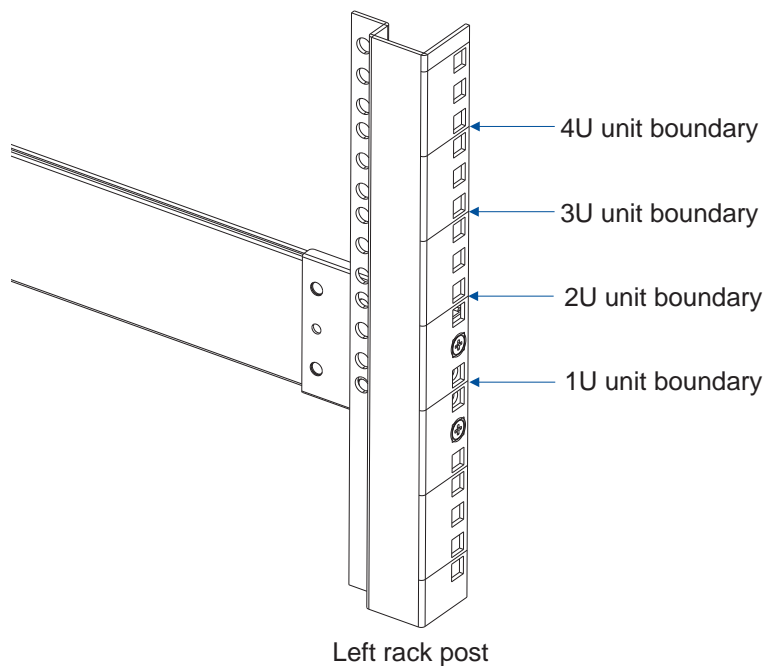
Check your adjuster pillar kit for the following contents.



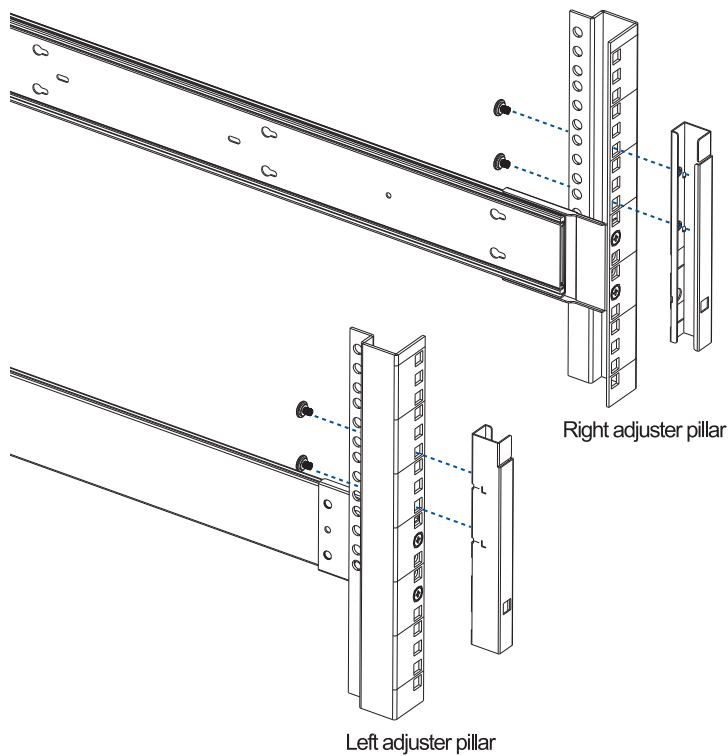
NOTE: The adjuster pillar kit is needed only if the rear end of your system protrudes from the rear end of the cabinet.

Assembling the Adjuster Pillar Kit

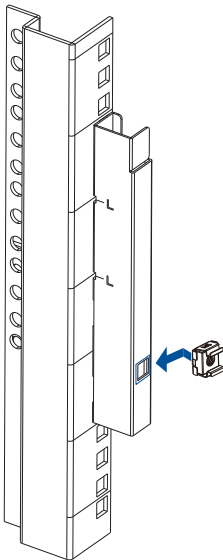
1. Check the unit boundary on the front rack posts.



2. Orient the left and right adjuster pillars and secure them with the included screws at the 2U and 3U positions on the front rack posts.



3. Insert the two included cage nuts into the cage nut holes on the adjuster pillars to secure the enclosure in place later.



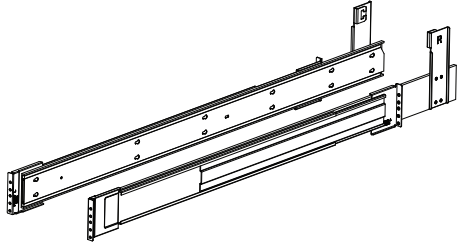
Continue with the steps in **2.3 Installing Drives** to install drives and the rackmount.

2.2.4 Installing Rackmount for 90-bay Models

Checking the Slide Rail Kit Contents

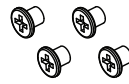
Check your rackmount slide kit for the following contents.

1



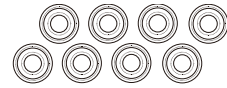
2 x Rack slide rails (left and right)

2



4 x M4 4mm screws

3



8 x Ø5.1mm washers

4



2 x M5 25mm screws

5

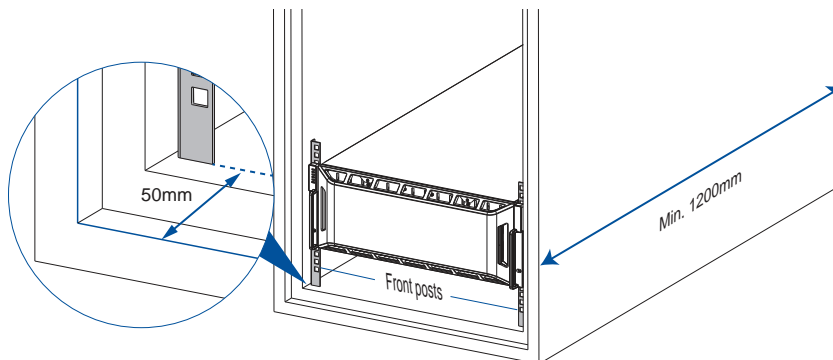


8 x M5 10mm screws

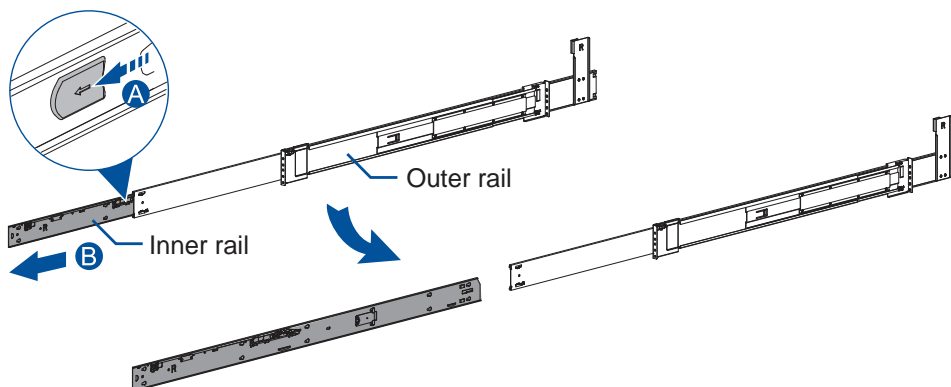
NOTE: The inner rails are assembled together with the entire slide rails.

Assembling the Slide Rail Kit

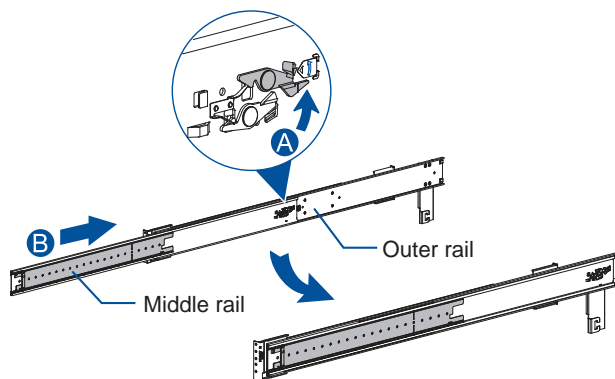
IMPORTANT! The rack depth must be at least 1200mm, and the front posts must be positioned 50mm from the front rack door (based on the EIA Standard EIA-310-D for 19" racks).



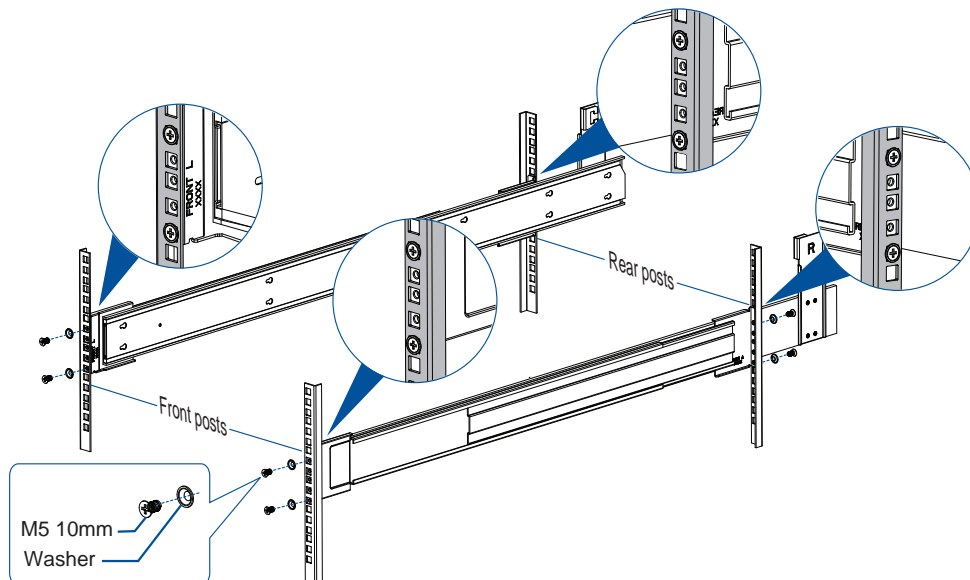
1. Pull out the inner rail until it is fully extended. Press the release tab (A) and remove the inner rail from the outer rail (B).



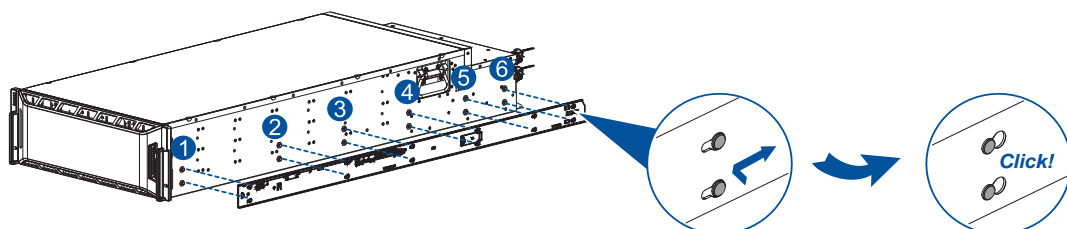
2. Push the lever in the direction indicated by the arrow (A), and slide the middle rail back into the outer rail (B).



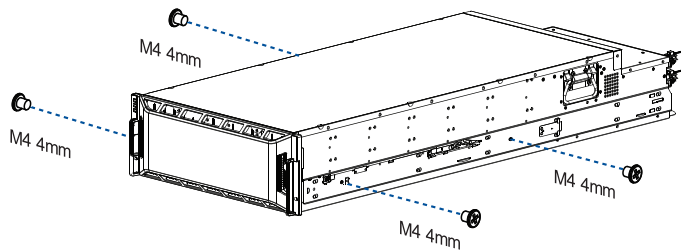
3. Secure the outer rails to the front and rear rack posts with the M5 10mm screws and washers provided.



4. Attach the inner rails to the sides of the enclosure. Make sure that the pins on the enclosure click into the holes in the inner rails.



5. Secure the inner rails to the enclosure with the M4 4mm screws provided.



Continue with the steps in **2.3 Installing Drives** to install drives and the rackmount.

2.3 Installing Drives

This section details drive requirements and installation procedures.

2.3.1 Drive Installation Prerequisites

IMPORTANT!

- The drives are purchased separately.
 - NVMe SSDs must be purchased from PAC Storage.
 - ONLY install the drive trays to the system if the system is already mounted to the rack. If the drives are installed to the system before the system is mounted to the rack, the system will be heavy to mount and possible impact during installation may damage the drives.
 - Handle the drives with extreme care and observe all ESD prevention procedures when installing the drives (refer to **ESD Precautions**).
 - ONLY use the screws that are bundled in the system package. Securing the drives with longer screws may damage them.
-

When purchasing drives, ensure to consider the following factors:

- **Capacity**

Purchase the drives that have the same capacity. The storage uses the *least common denominator* approach, which means that the maximum capacity used in each drive to create a RAID array is the maximum capacity of the smallest drive. We strongly suggest using large storage capacity hard drives.

IMPORTANT!

- The drives may carry different block numbers, which means that the capacity may not be the same even if they are of the same model with the same rate capacity made by the same manufacturer.
 - When configuring the drives into a RAID array, you can use a smaller capacity as the *maximum disk capacity* in every drive. For configuration options, refer to the PAC Storage User Manual on PAC Storage's website.
-

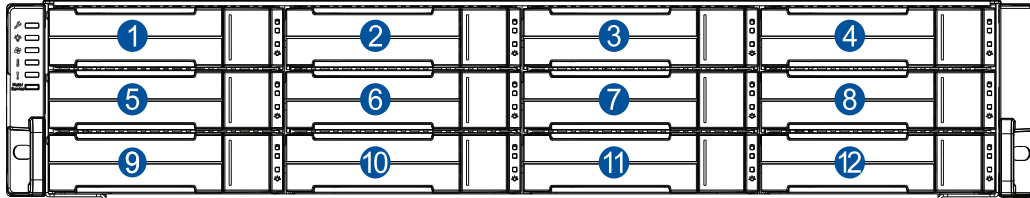
- **Drive Type**

Refer to **Hardware Specifications** for details. See also the Compatibility Guide (QVL) for supported drives, available on PAC Storage's official website. Go to **Support > Technical Support**, find your model, and then go to **Downloads**.

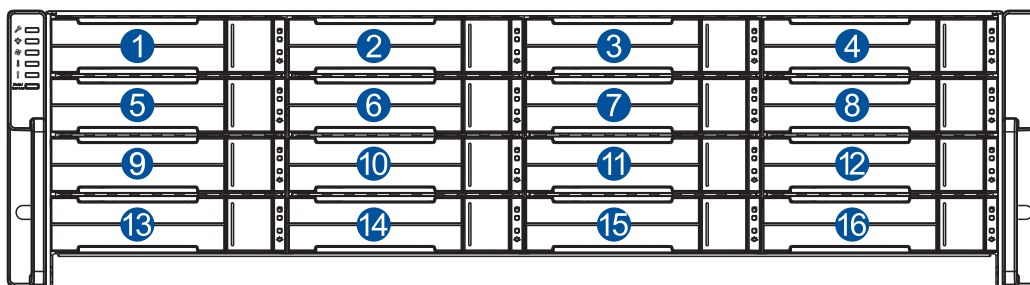
2.3.2 Installing Drives for 12-bay, 16-bay, and 24-bay Models

Drive Numbering

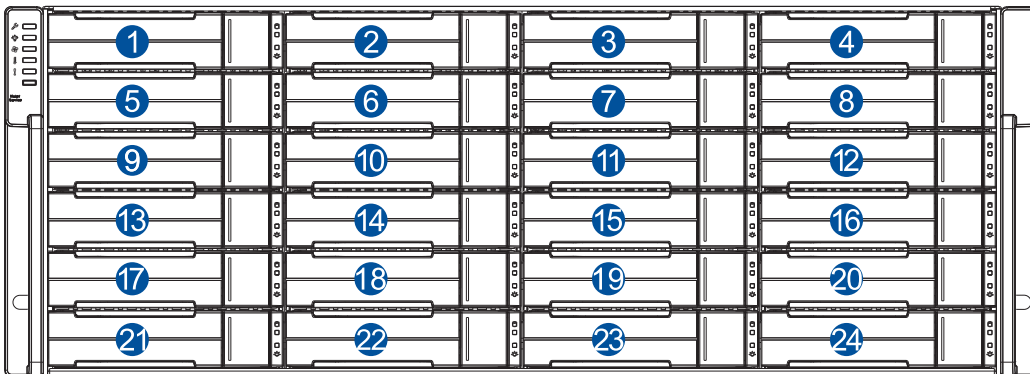
Familiarize yourself with the exact order of the drives.



PS/PSe 3012/4012 G3



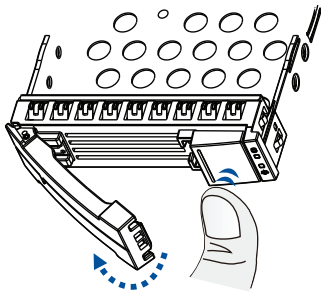
PS/PSe 3016/4016 G3



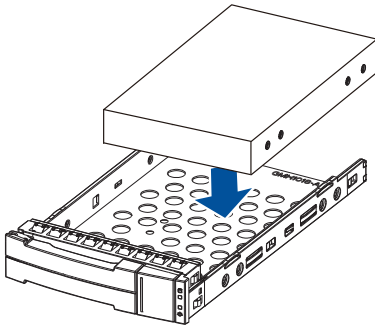
PS/PSe 3024/4024 G3

Installing a Drive into a Drive Bay

1. Press the release button to open the spring handle of a drive tray.

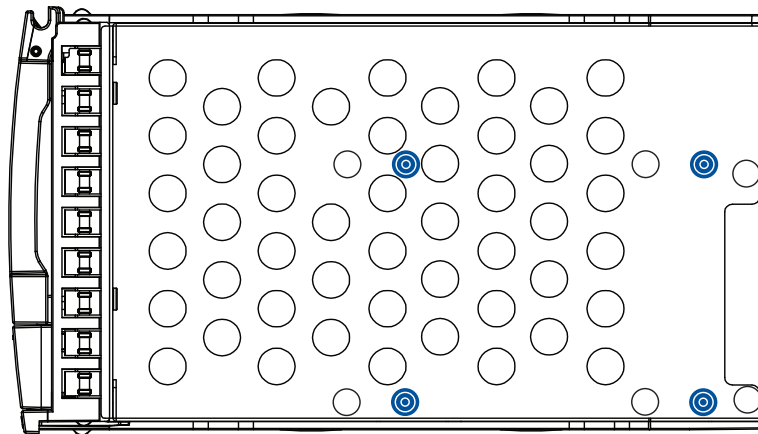


2. Place a drive into the tray, with the interface connectors facing the open side of the tray and the drive label facing up.



3. Secure the drive to the correct holes of the tray with four of the provided screws.

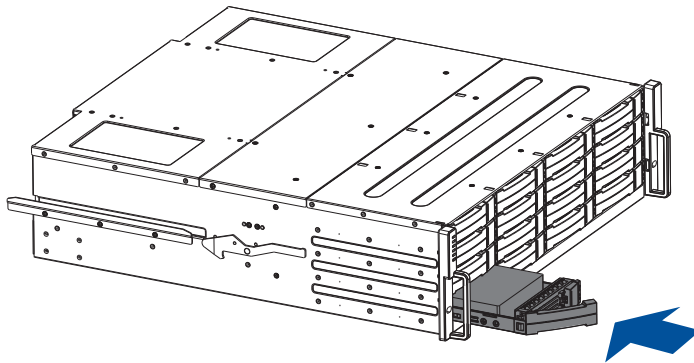
Screw holes for 2.5" HDD/SSD



Screw holes for 3.5" HDD



4. With the spring handle open, insert the assembled drive and drive tray into the enclosure.



WARNING! Ensure that your system has all the drive bays occupied with the drive trays even if there are no drives installed. Without the drive trays, the ventilation is compromised, which may cause overheating.

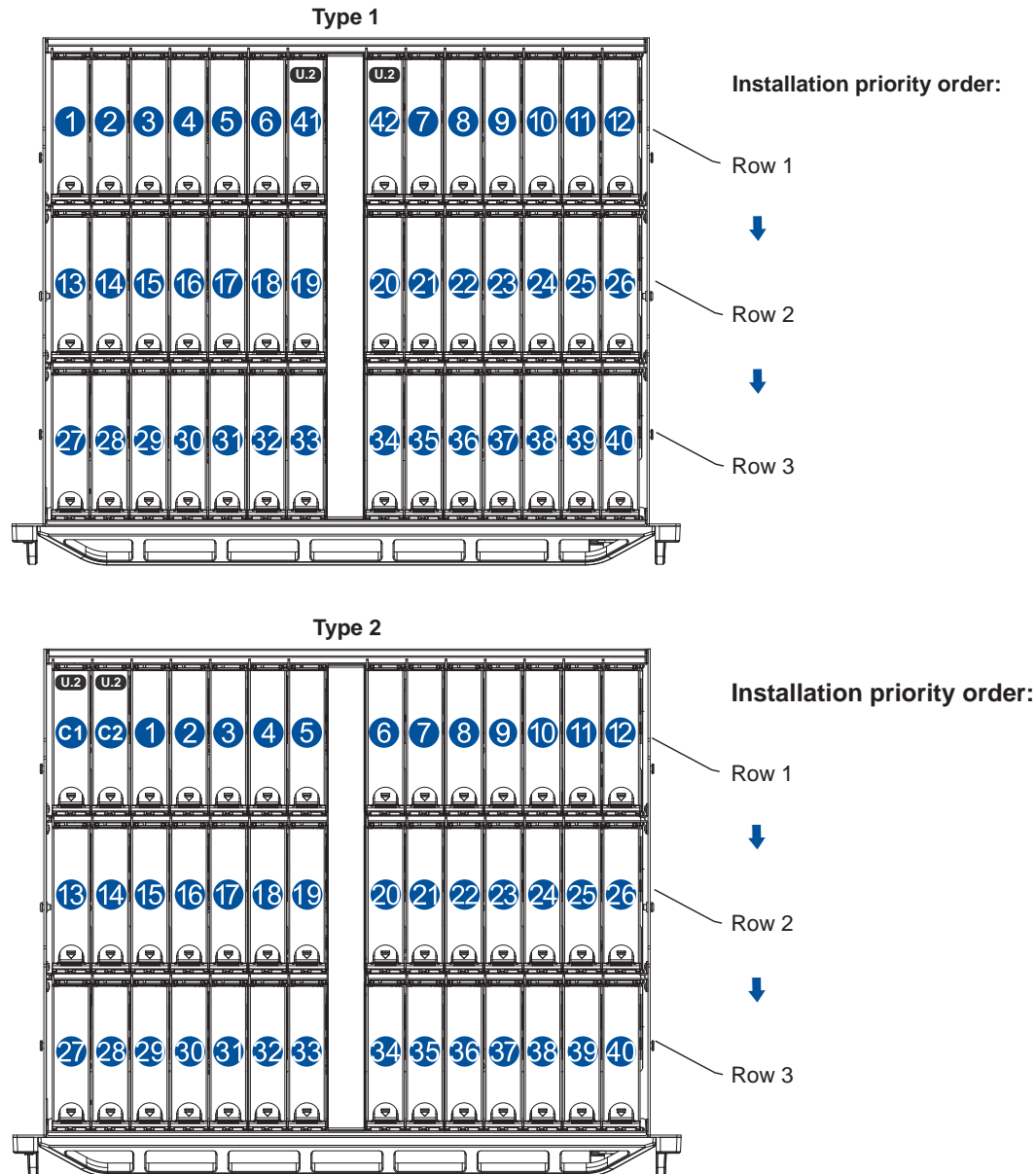
5. Close the spring handle when the drive is fully inserted into the drive bay.



2.3.3 Installing Drives for 40-bay Models

Drive Numbering of 40-bay Models

Familiarize yourself with the exact order of the drives.

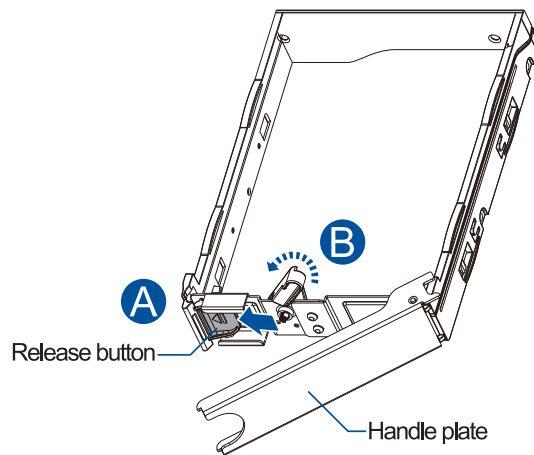


IMPORTANT!

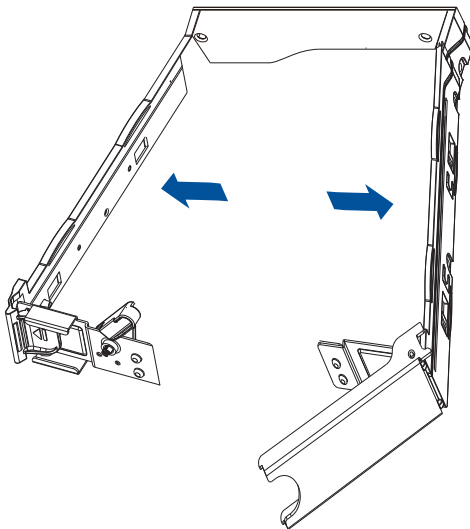
- There are two types of drive numbering for PS/PSe 3040T/4040 G3. Refer to the labels on the chassis.
- For PS/PSe 3040**T**C/4040**C** G3 (models with NVMe SSD cache), install the two NVMe SSDs into drive bays 41 and 42 / C1 and C2. Other types of drives cannot be installed into these bays.
- To optimize the internal airflow and prevent drives from overheating, we strongly recommend that you install your drives following the priority order: Install drives into the drive bays in row 1 first, then in row 2, and finally in row 3.

Installing a Drive into a 3.5" HDD Drive Tray

1. Push the release button to the left (A). Move the tray lever to the left (B) to unlock the sides.

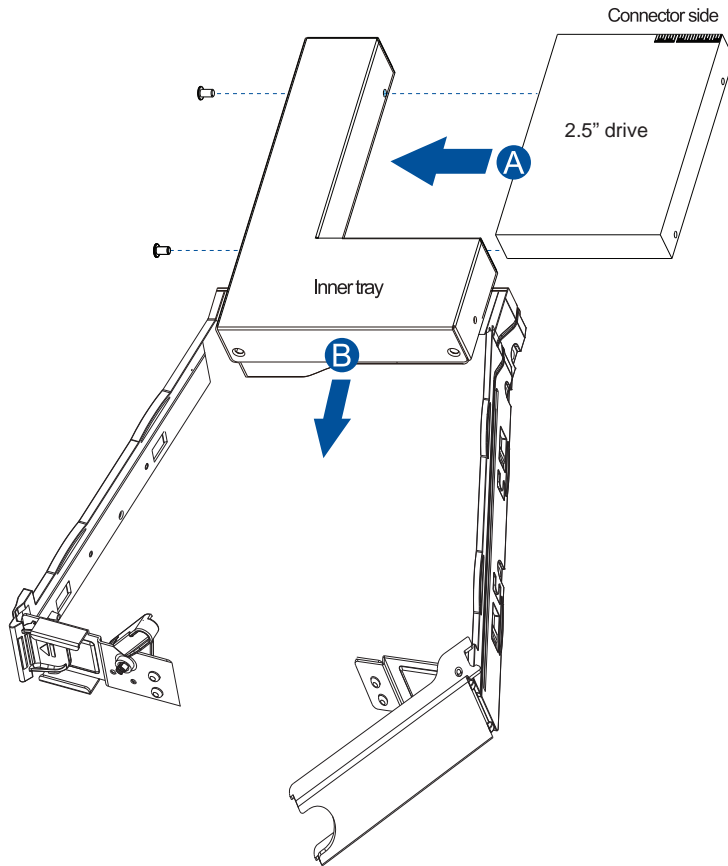


2. Pull both sides outwards to widen the tray.

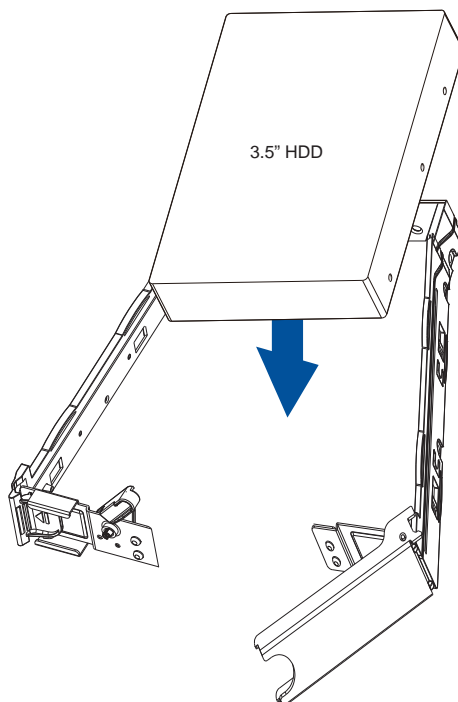


3. Insert a drive into the tray.

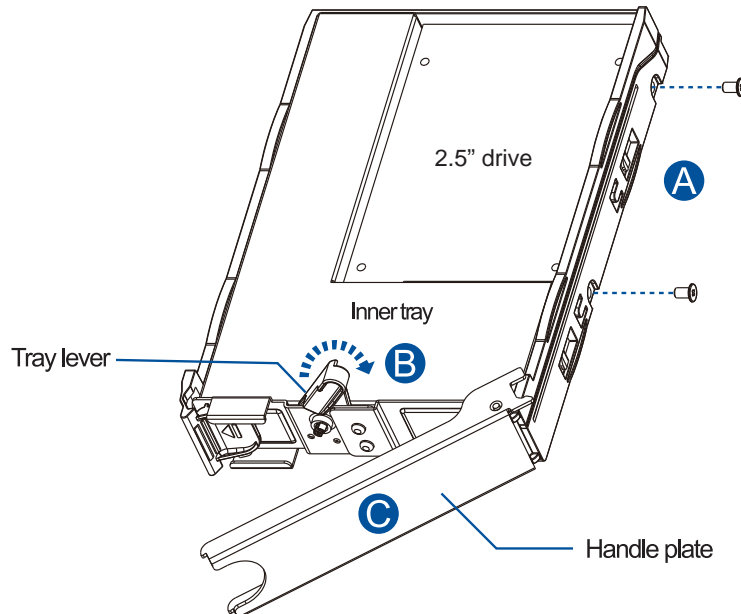
- For a 2.5" drive, secure the drive first to an inner tray with two of the provided screws (A), and orient the inner tray's pin holes to the main drive tray's pins on the sides (B).



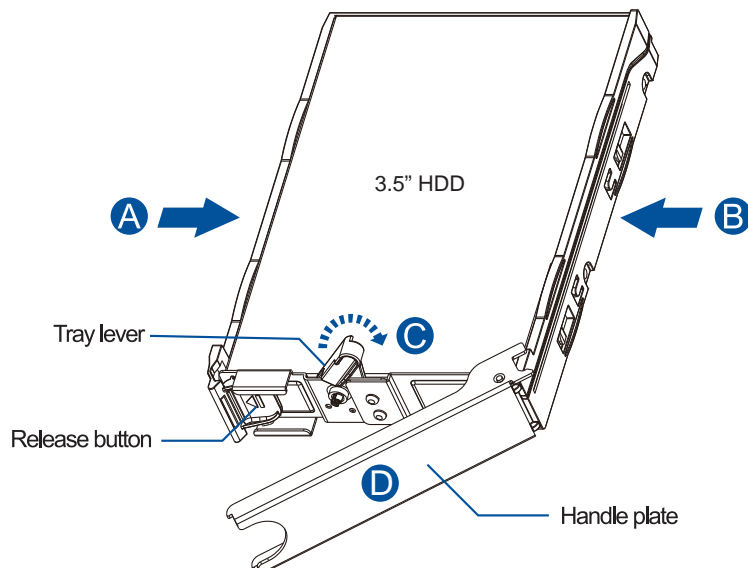
- For a 3.5" hard drive, orient the drive to the drive tray's pins on the sides.



4. Snap back the sides of the tray to the original position.
- For a 2.5" drive, secure the drive and tray assembly with two of the provided screws (A), and move the tray lever to the right (B). Keep the handle plate open (C).



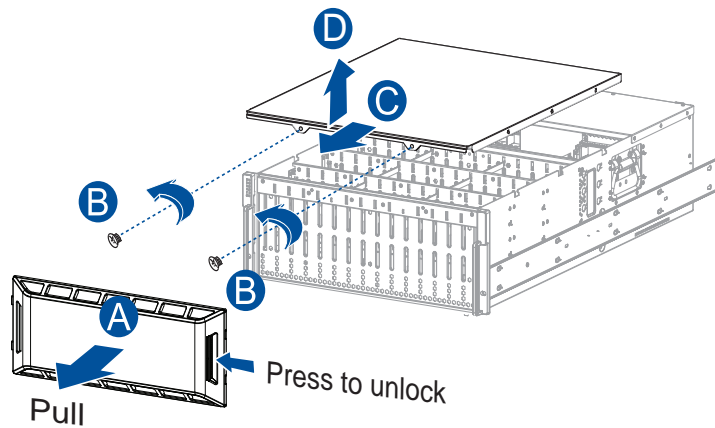
- For a 3.5" drive, secure the side that has the release button (A) to the drive first, then the side with the handle plate (B). Move the tray lever to the right (C). Keep the handle plate open (D).



IMPORTANT! Ensure that the drive is secured to the drive tray before installing the assembly into the enclosure.

Installing a Drive into the Enclosure for 40-bay Models

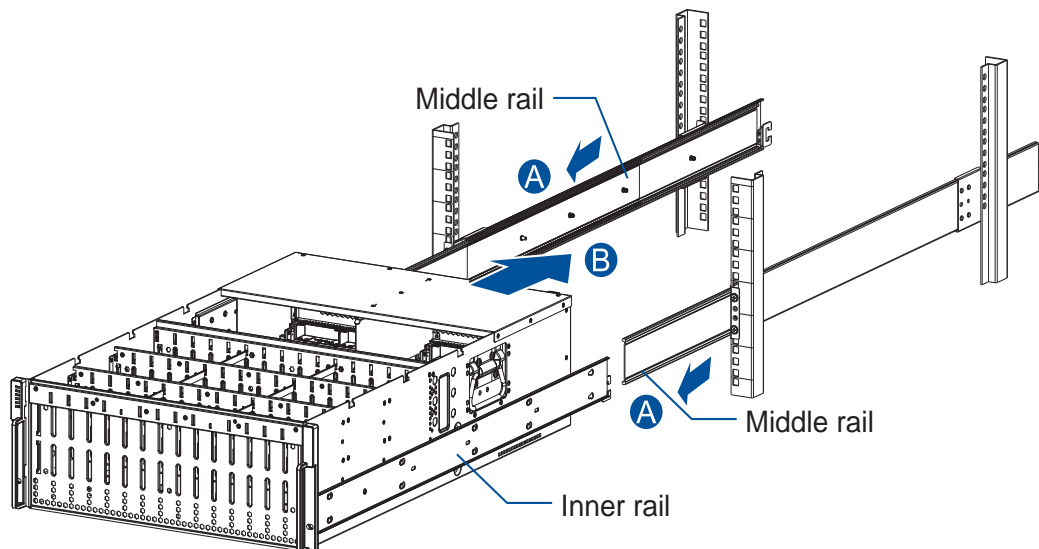
1. Remove the front cover of the enclosure (A). Remove the two screws that secure the top cover (B). Gently slide the top cover forwards (C) and then lift it up (D).



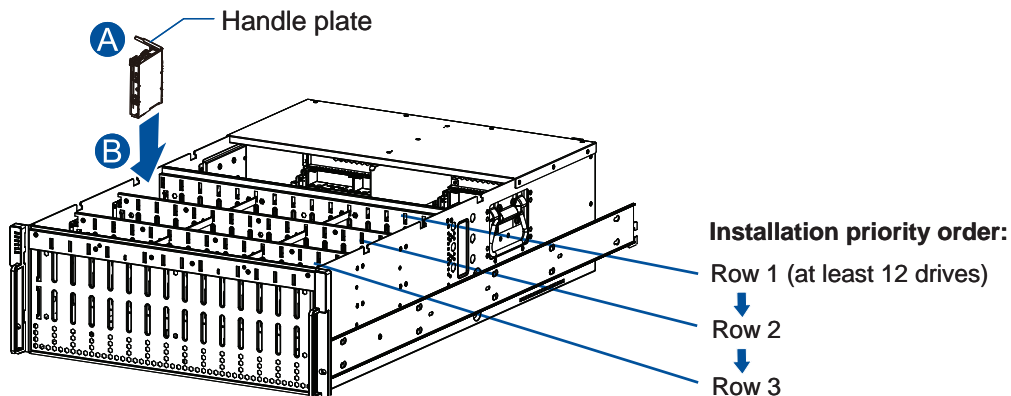
2. Pull out the middle rails until they are fully extended (A). With the help of another person, lift the enclosure, align the inner rails with the middle rails, and install the enclosure onto the slide rails (B).

IMPORTANT!

- Due to the weight of the enclosure, seek assistance from at least 2 persons to install the enclosure to the rack.
 - Install the enclosure to the rack before installing drives into the enclosure.
-

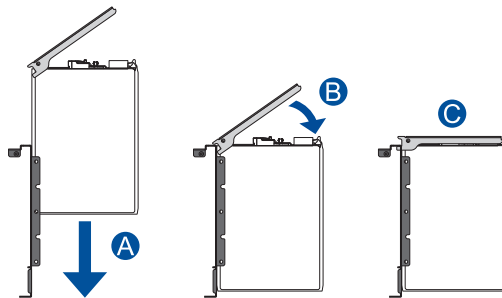


3. With the handle plate open (A), insert the drive and tray assembly into a drive slot (B).



WARNING! For cooling purposes, follow the installation priority order as illustrated above.

4. Insert the drive all the way down until it connects with the enclosure (A), and then close the handle plate to secure the drive tray in place (B). Ensure that the handle plate is clamped on the drive (C).

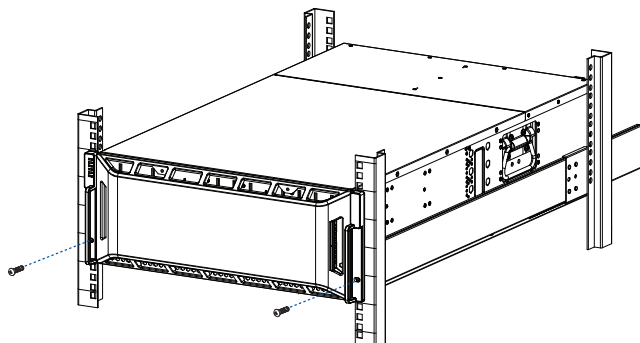


5. For **PS/PSe 3040TC/4040C G3**: Install the two NVMe SSDs into the designated drive bays. Note that other types of drives cannot be installed into these drive bays on PS/PSe 3040TC/4040C G3. Refer to **Drive Numbering of 40-bay Models** for details.

WARNING! Ensure that every drive slot is occupied with a drive tray even if no drive is installed. Without the drive trays, the ventilation is compromised, which may cause overheating.

6. Put the top cover back, tighten the two screws to secure the top cover, and then put the front cover back. Insert the entire enclosure to the rack. Use two M5 20mm screws to fasten the enclosure to the front rack posts.

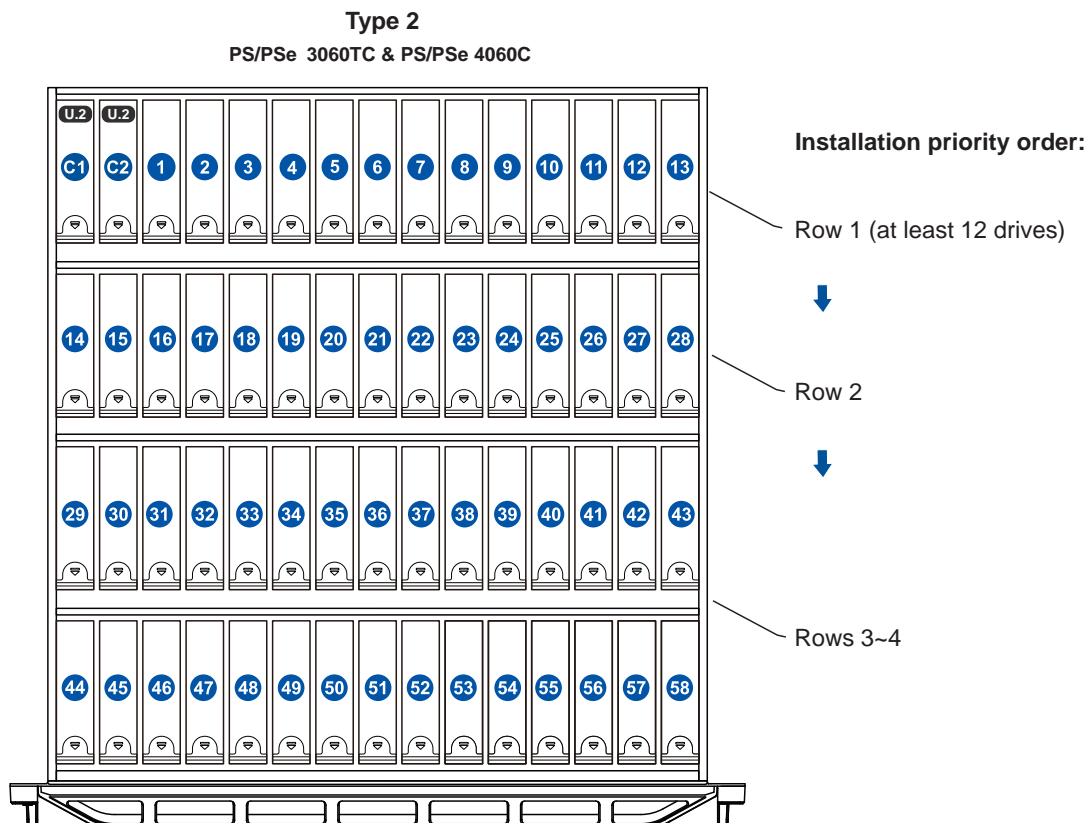
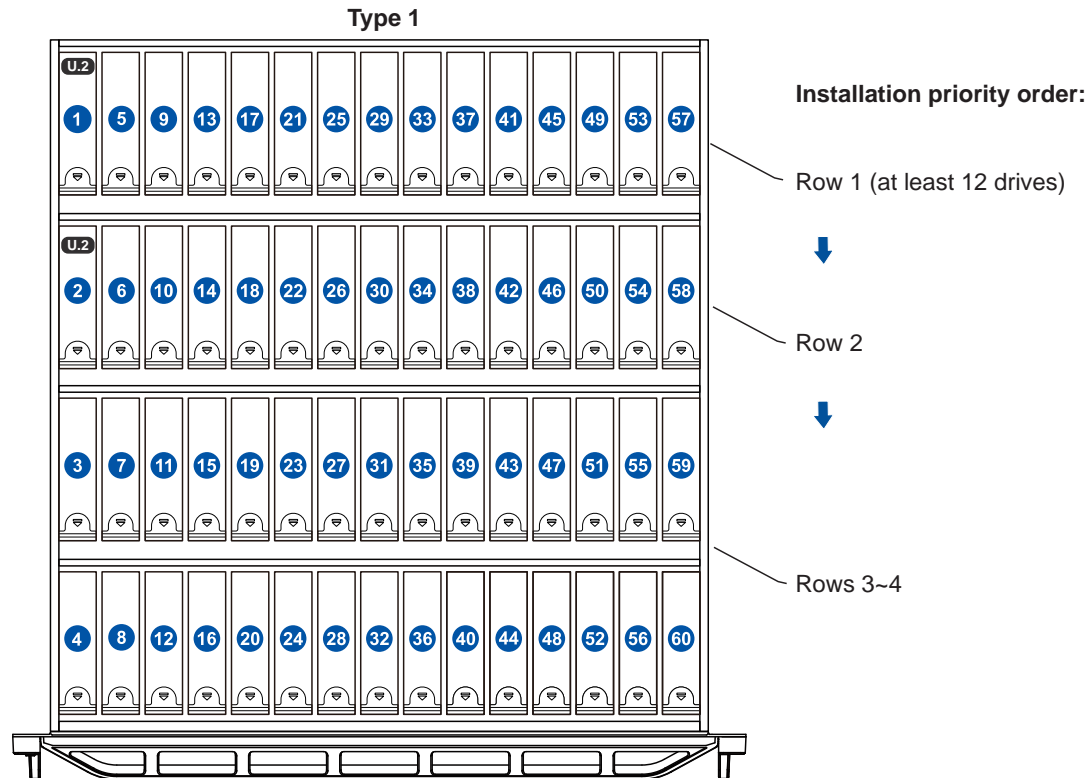
NOTE: If the rack posts have unthreaded mounting holes, insert two M5 cage nuts to these holes, and then use the M5 20mm screws to secure the enclosure to the rack.



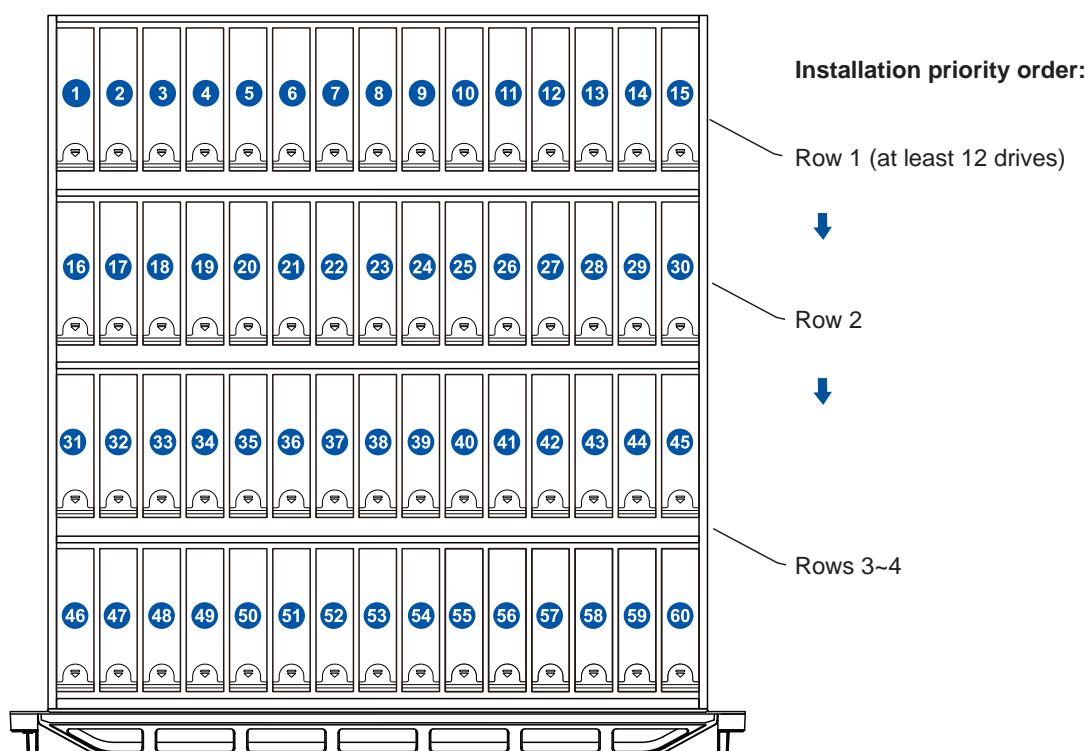
2.3.4 Installing Drives for 60-bay Models

Drive Numbering of 60-bay Models

Familiarize yourself with the exact order of the drives.



Type 2
Other models



IMPORTANT!

- There are two types of drive numbering for PS/PSe 3060T/4060 G3. Refer to the labels on the chassis.
- For PS/PSe 3060TC/4060C G3 (models with NVMe SSD cache), install the two NVMe SSDs into drive bays 1 and 2 / C1 and C2. Other types of drives cannot be installed into these bays.
- To optimize the internal airflow and prevent drives from overheating, we strongly recommend that you install your drives following the priority order: Install drives into the drive bays in row 1 first, then in row 2, and finally in row 3 and row 4.

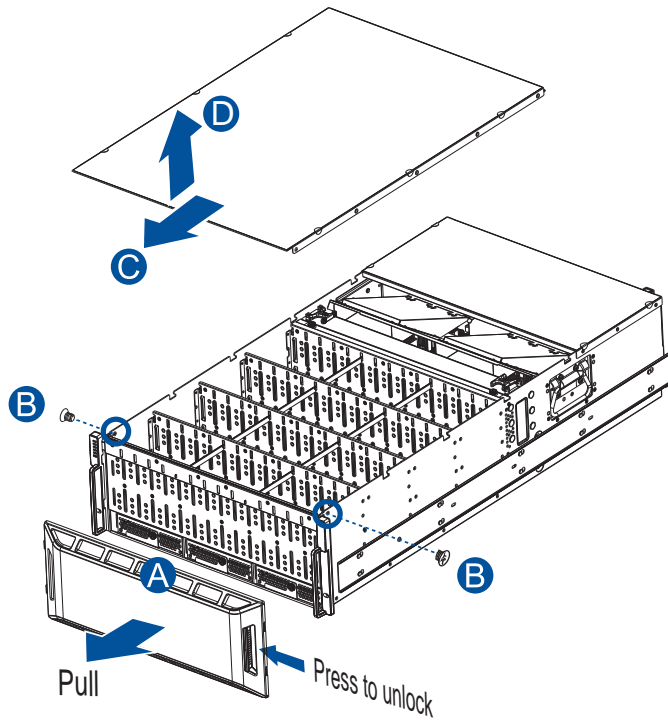
Installing a Drive into a 3.5" HDD Drive Tray

Refer to “Installing a Drive into a 3.5” HDD Drive Tray” on page 2-20 for details.

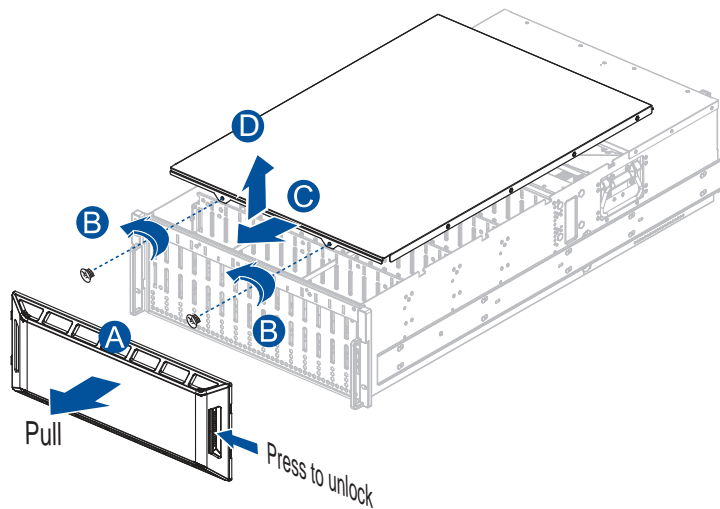
Installing a Drive into the Enclosure for 60-bay Models

1. Remove the front cover of the enclosure (A). Remove the two screws that secure the top cover (B). Gently slide the top cover forwards (C) and then lift it up (D).

- **Type I Enclosure**



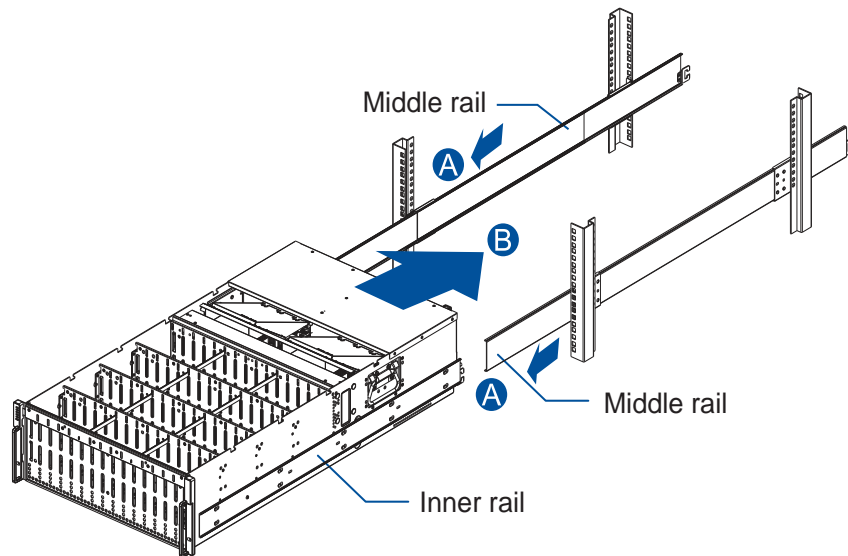
- **Type II Enclosure**



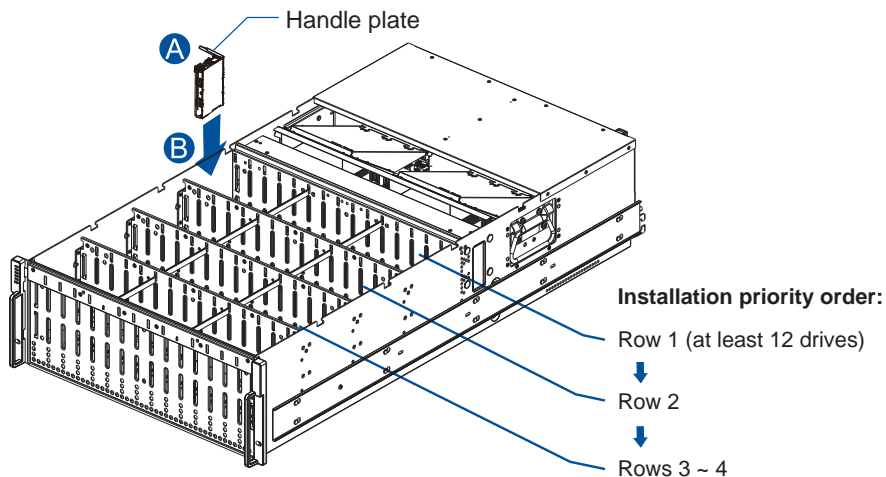
2. Pull out the middle rails until they are fully extended (A). With the assistance of another person, lift the enclosure, align the inner rails with the middle rails, and insert the enclosure onto the slide rails (B).

IMPORTANT!

- Due to the weight of the enclosure, seek assistance from at least 2 persons to install the enclosure into a rack.
 - Install the enclosure onto the slide rails before installing drives into the enclosure.
-

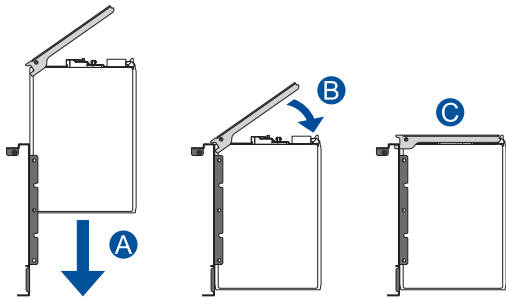


3. With the handle plate open (A), insert the drive and tray assembly into a drive slot (B).



WARNING! For cooling purposes, follow the installation priority order as illustrated above.

4. Insert the drive all the way down until it connects with the enclosure (A), and then close the handle plate to secure the drive tray in place (B). Ensure that the handle plate is clamped on the drive (C).

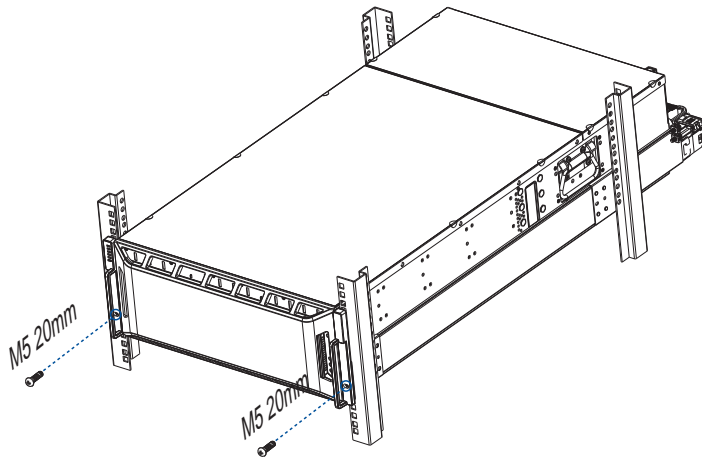


5. For **PS/PSe 3060TC/4060C G3**: Install the two NVMe SSDs into the designated drive bays. Note that other types of drives cannot be installed into these drive bays on PS/PSe 3060TC/4060C G3. Refer to **Drive Numbering of 60-bay Models** for details.

WARNING! Ensure that every drive slot is occupied with a drive tray even if no drive is installed. Without the drive trays, the ventilation is compromised, which may cause overheating.

6. Put the top cover back, tighten the two screws to secure the top cover, and then put the front cover back. Insert the entire enclosure to the rack. Use two M5 20mm screws to fasten the enclosure to the front rack posts.

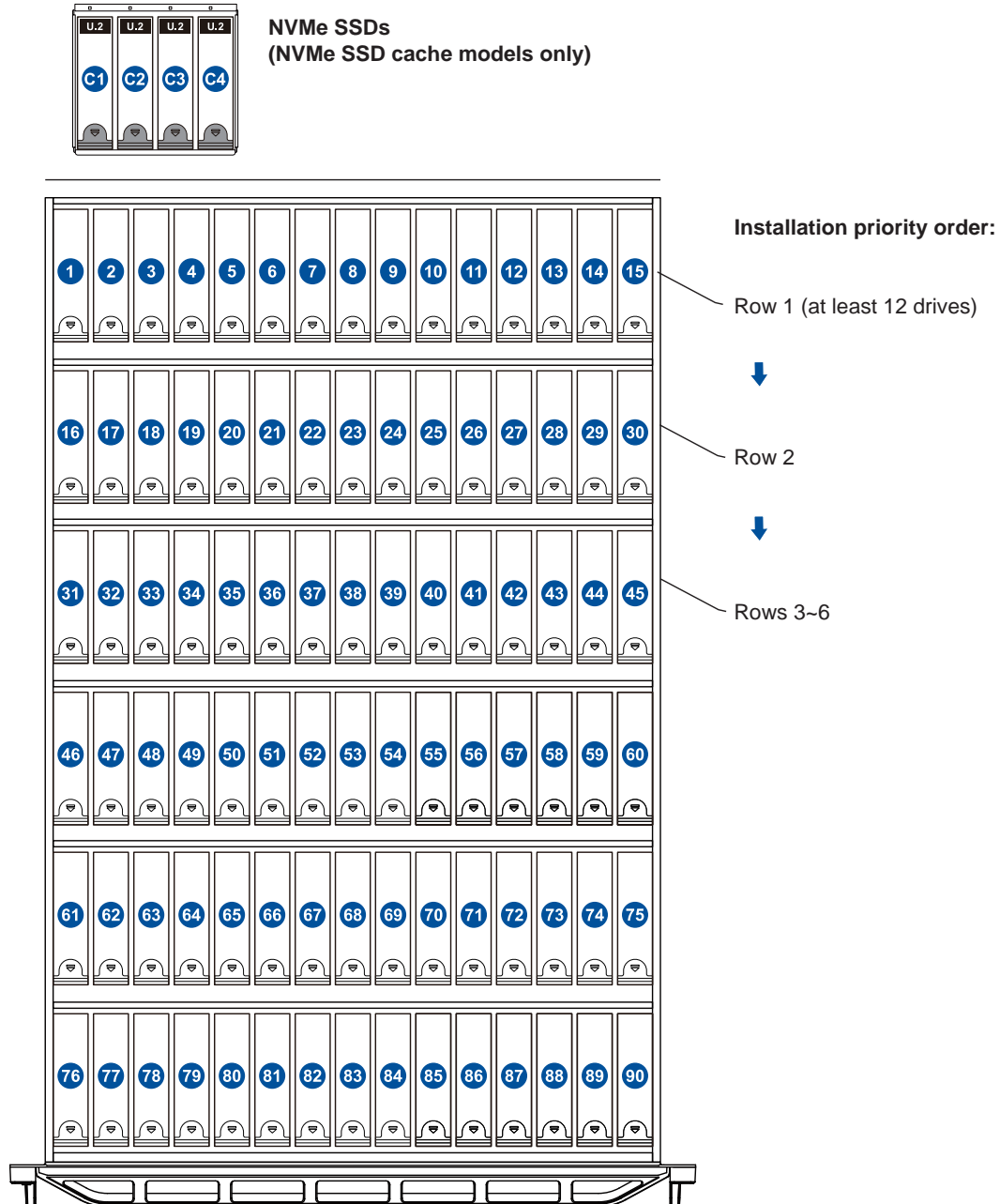
NOTE: If the rack posts have unthreaded mounting holes, insert two M5 cage nuts to these holes, and then use the M5 20mm screws to secure the enclosure to the rack.



2.3.5 Installing Drives for 90-bay Models

Drive Numbering of 90-bay Models

Familiarize yourself with the exact order of the drives.



IMPORTANT!

- To optimize the internal airflow and prevent drives from overheating, we strongly recommend that you install your drives following the priority order: Install drives into the **blue** slots first, then the **gray** slots, and finally the white slots.
- For PS/PSe 3090TC/4090C G3 (models with NVMe SSD cache), install the four NVMe SSDs into drive bays C1 to C4. Other types of drives cannot be installed into these bays.

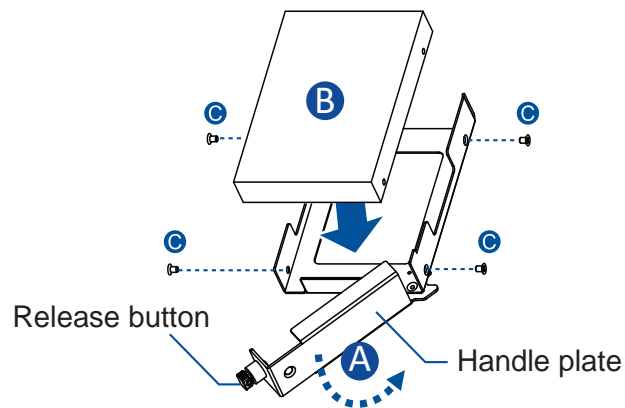
Installing a Drive into a 3.5" HDD Drive Tray

Refer to “Installing a Drive into a 3.5” HDD Drive Tray” on page 2-20 for details.

Installing a Drive into a 2.5" Drive Tray (for NVMe SSD Cache Models Only)

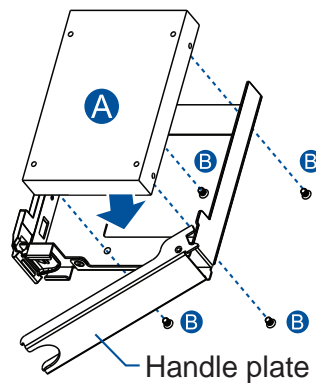
- **Type I Drive Tray**

1. Press the release button of the drive tray to open the handle plate (A).
2. Place an SSD into the drive tray (B).
3. Secure the SSD to the tray with four of the provided screws (C). Keep the handle plate open.



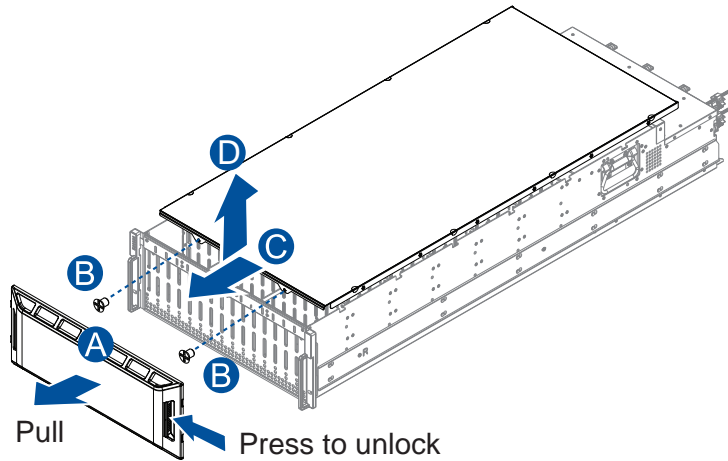
- **Type II Drive Tray**

1. Place an SSD into the drive tray (A).
2. Secure the SSD to the tray with four of the provided screws (B). Keep the handle plate open.

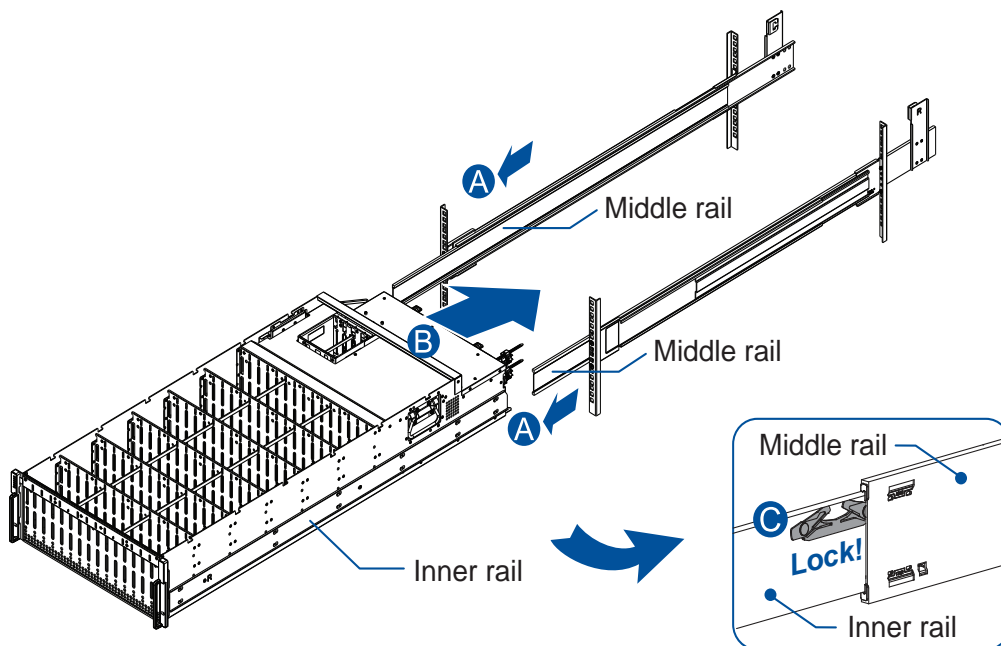


Installing a Drive into the Enclosure for 90-bay Models

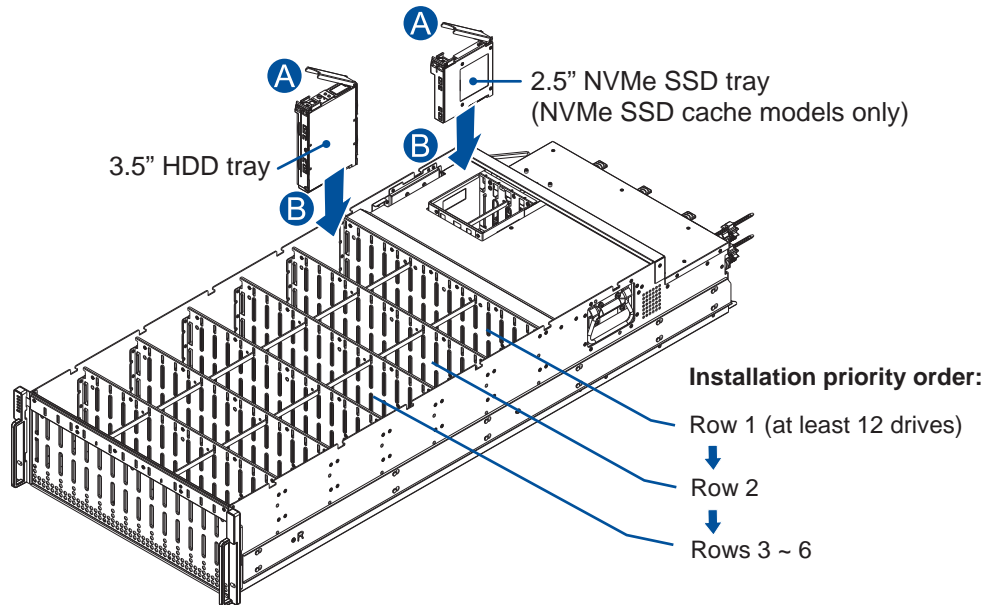
1. Remove the front cover of the enclosure (A). Remove the two screws that secure the top cover (B). Gently slide the top cover forwards (C) and then lift it up (D).



2. Pull the middle rails out until they are fully extended (A). With the assistance of another person, lift the enclosure, align the inner rails with the middle rails, and insert the enclosure onto the slide rails (B). Gently slide the enclosure into the rack until the inner rails are stuck in the lock position (C).

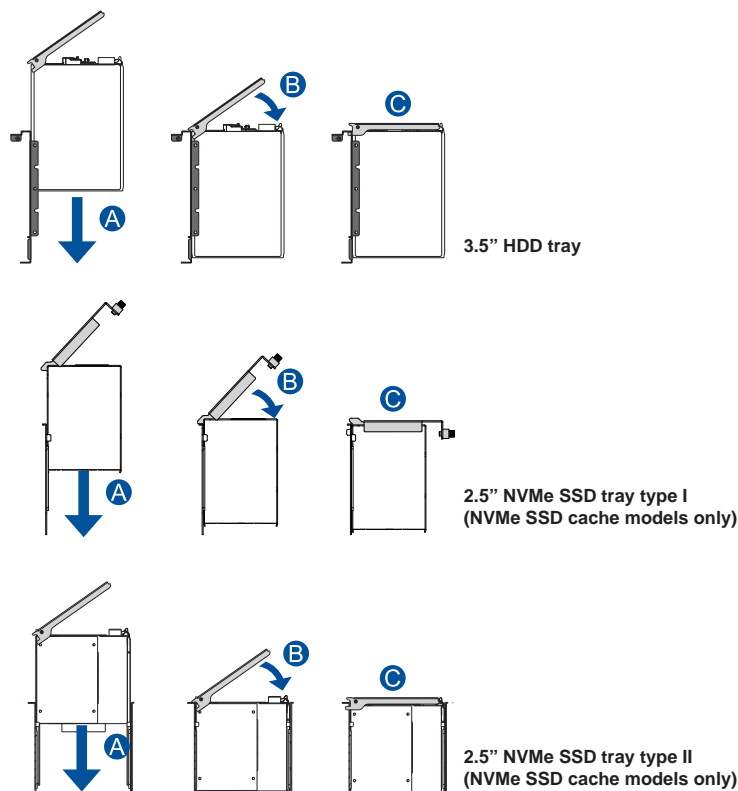


3. With the handle plate open (A), insert a drive and tray assembly into a drive slot (B).



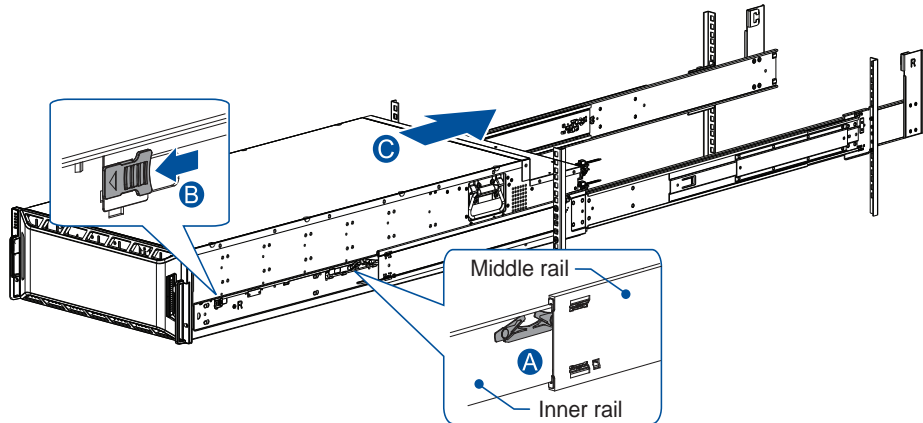
WARNING! For cooling purposes, follow the installation priority order as illustrated above.

4. Insert the drive all the way down until it connects with the enclosure (A), and then close the handle plate to secure the drive tray in place (B). Ensure that the handle plate is clamped on the drive (C).



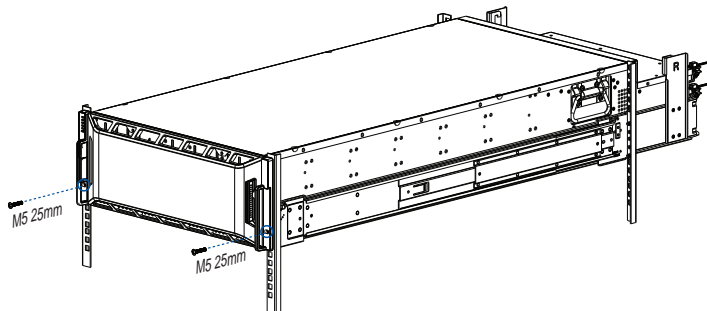
WARNING! Ensure that every drive slot is occupied with a drive tray even if no drive is installed. Without the drive trays, the ventilation is compromised, which may cause overheating.

5. Put the top cover back, fasten the two screws to secure the top cover, and then put the front cover back. With the enclosure stuck in the lock position (A), push the release tab on each inner rail to release the lock (B), and gently slide to insert the entire enclosure into the rack (C).



6. Secure the enclosure to the front rack posts using two M5 25mm screws.

NOTE: If the rack posts have unthreaded mounting holes, insert two M5 cage nuts to these holes first, and then use the M5 25mm screws to secure the enclosure to the rack.

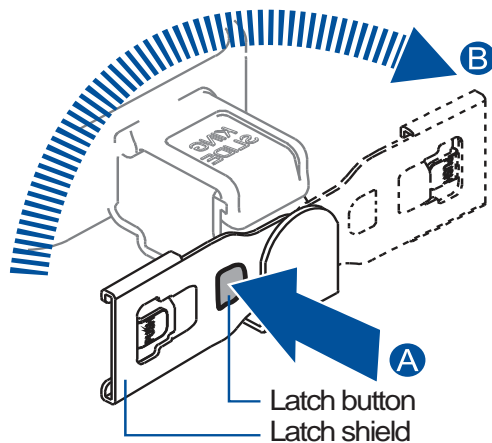


2.4 Installing the Cable Management Arm and Accessories

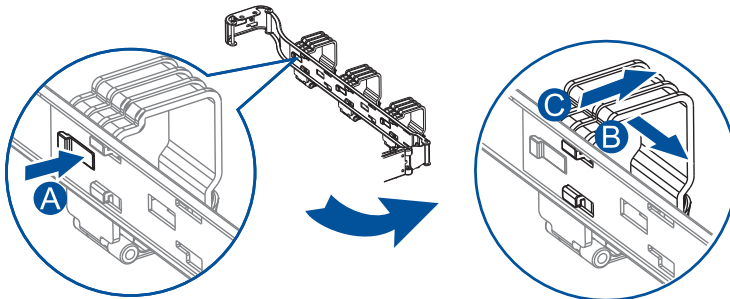
The cable management arm allows you to keep the cables in place for a clutter-free rackmount system.

2.4.1 Installing the Cable Management Arm for 40-bay and 60-bay Models

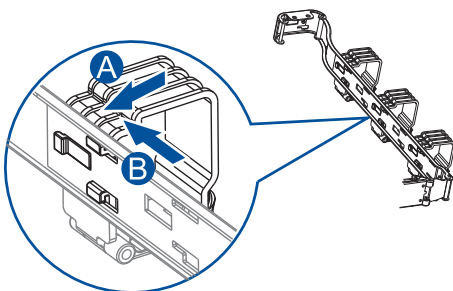
1. Press the latch button at each end of the cable management arm (A), and then rotate the latch shield 180° (B).



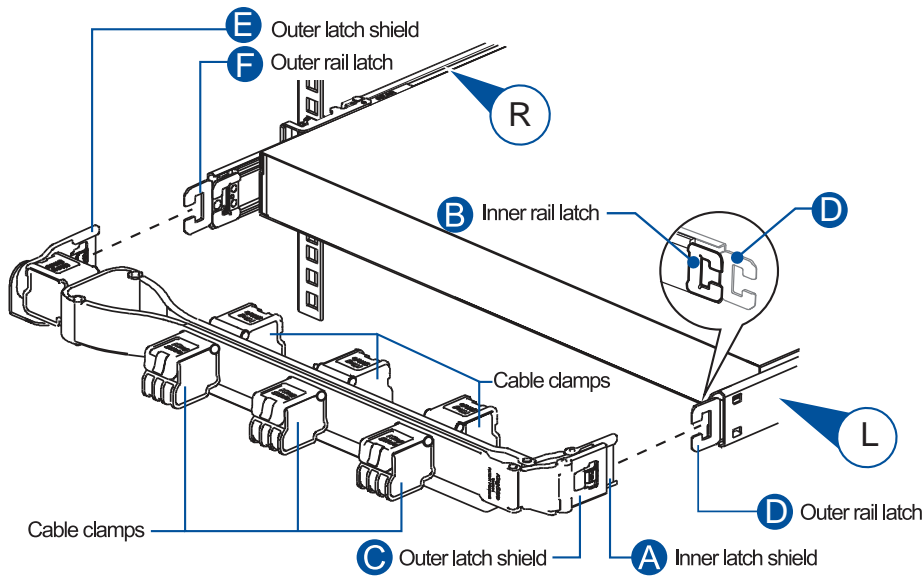
2. If you need to adjust a cable clamp's position, follow the steps below.
 - a. Press the flat part of the bigger latch to release the cable clamp (A), push the cable clamp in the direction as illustrated below (B), and remove it from the cable management arm (C).



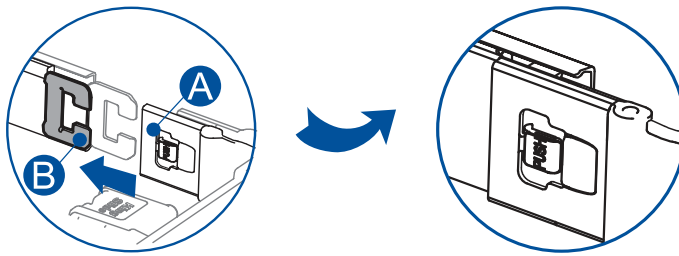
- b. Move the cable clamp to the desired position. Insert the three latches into the respective holes in the arm (A), and push the cable clamp towards the bigger latch until all three latches snap into place (B).



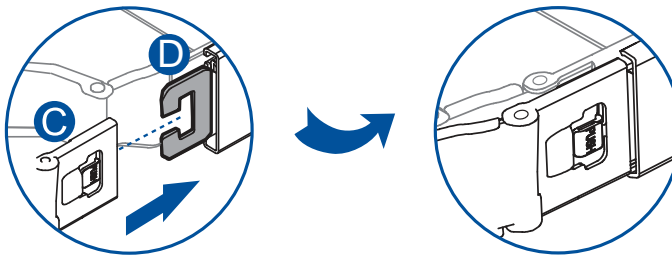
3. Connect the latch shields of the cable management arm to the latches of the slide rails.



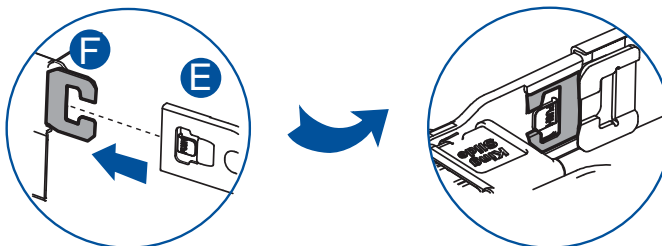
- Connect the inner latch shield (A) of the cable management arm to the inner latch (B).



- Connect the outer latch shield (C) of the cable management arm to the outer latch (D).



- Connect the outer latch shield (E) of the cable management arm to the outer latch (F).

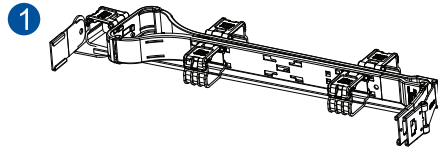


2.4.2 Installing the Cable Management Arm for 90-bay Models

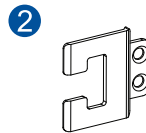
Checking the Cable Management Arm Kit and Accessory Box Contents

Check the following contents in the cable management arm kit and the accessory box that came with the package of your storage enclosure.

- **Cable Management Arm Kit Contents**



1 x Cable management arm

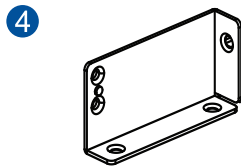


1 x Inner latch

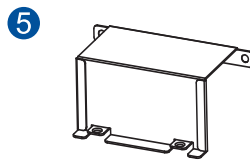


2 x M4 4mm screws
for securing the inner latch

- **Accessory Box Contents**



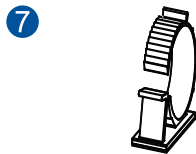
1 x Side bracket
for securing the inner latch



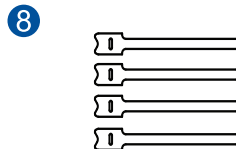
1 x L-shaped bracket
for securing cables



5 x #6-32 4mm screws
for securing the brackets



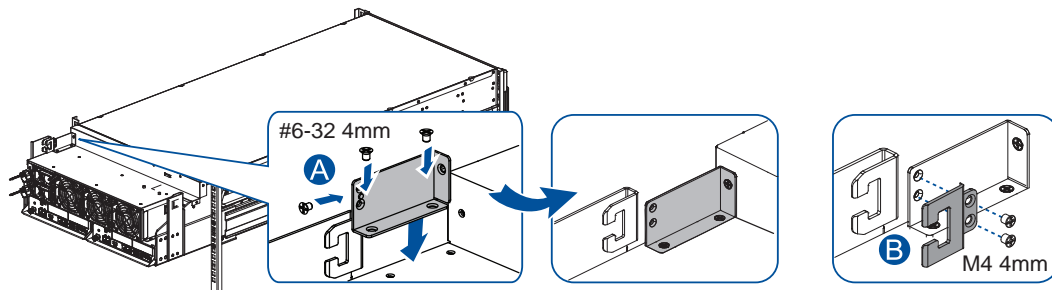
1 x Wire mount



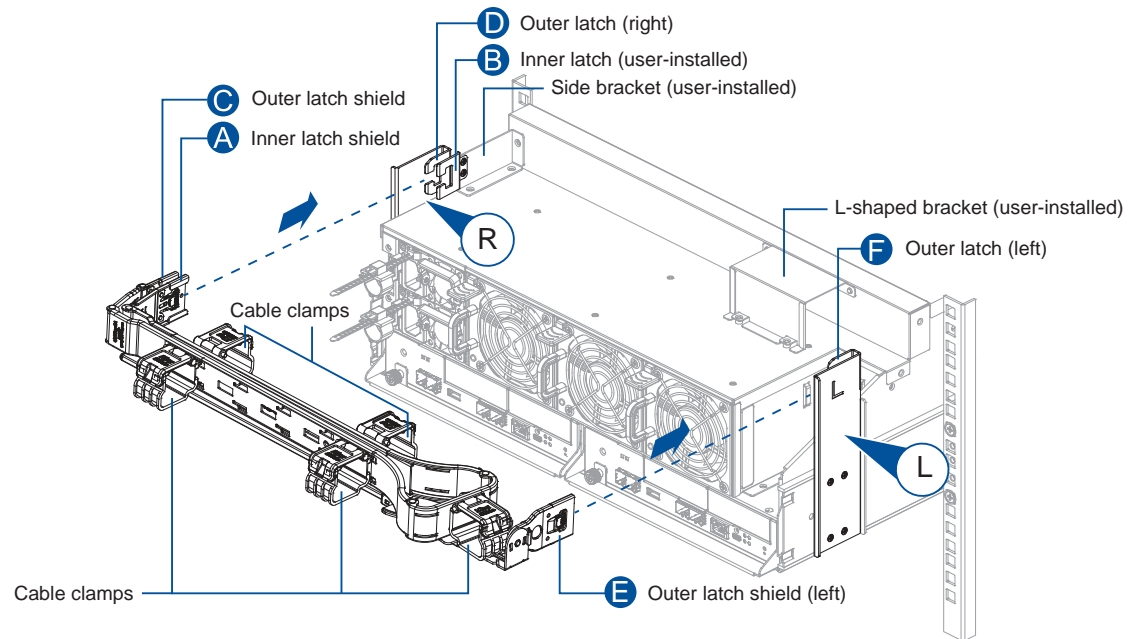
4 x Cable ties

Installing the Cable Management Arm and Accessories

1. Install the side bracket to the rear of the enclosure with three #6-32 4mm screws (A), and then install the inner latch to the bracket with two M4 4mm screws (B).

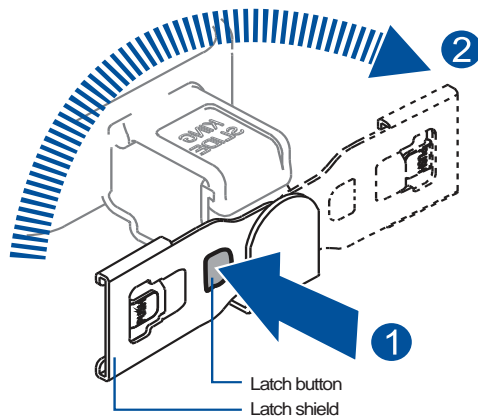


2. Determine the direction to install the cable management arm.

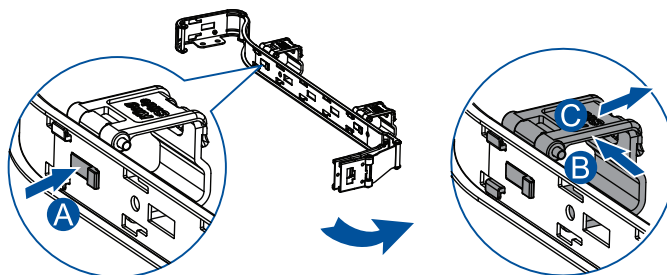


Rotate the latch shields if necessary.

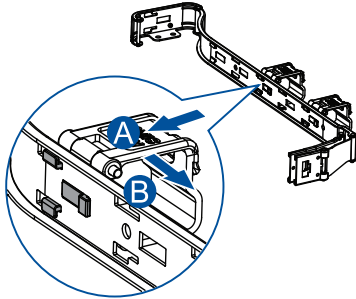
- **For latch shields (A) and (C):** Rotate the latch shield 180° directly.
- **For latch shield (E):** Press the latch button (1), and rotate the latch shield 180° (2).



3. If you need to adjust a cable clamp's position, follow the steps below.
 - a. Press the flat part of the bigger latch to release the cable clamp (A), push the cable clamp in the direction as illustrated below (B), and remove it from the cable management arm (C).

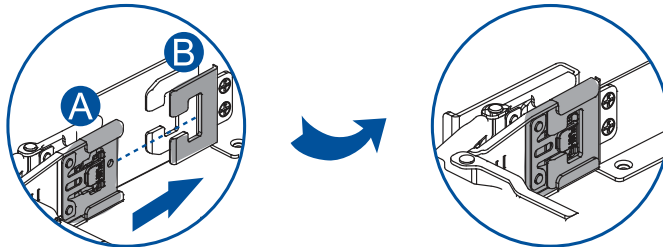


- b. Move the cable clamp to the desired position. Insert the three latches into the respective holes in the arm (A), and push the cable clamp towards the bigger latch until all three latches snap into place (B).

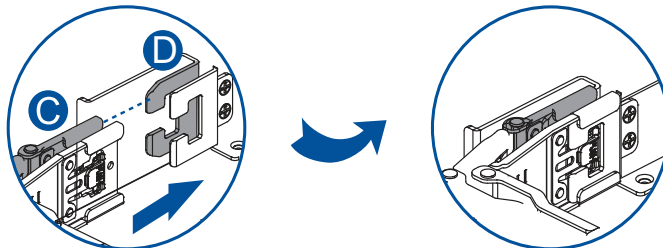


4. Connect the latch shields of the cable management arm to the inner and outer latches.

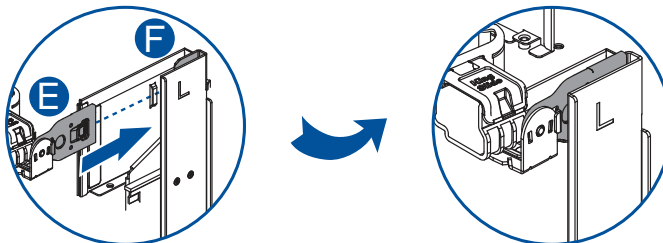
- Connect the inner latch shield (A) of the cable management arm to the inner latch (B) on the storage enclosure.



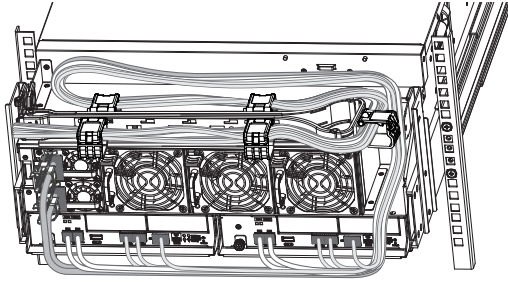
- Connect the outer latch shield (C) of the cable management arm to the outer latch (D) on the right rail.



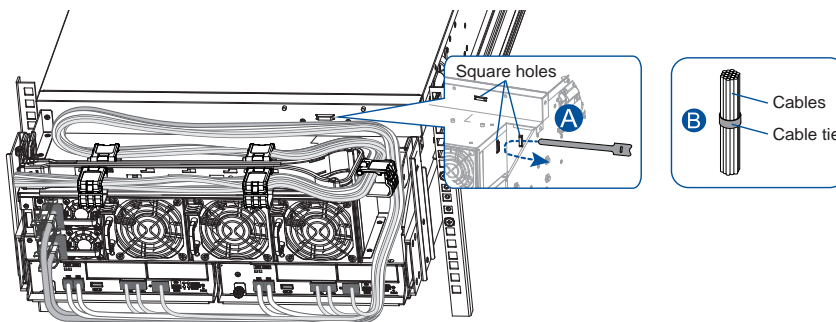
- Connect the outer latch shield (E) of the cable management arm to the outer latch (F) on the left rail.



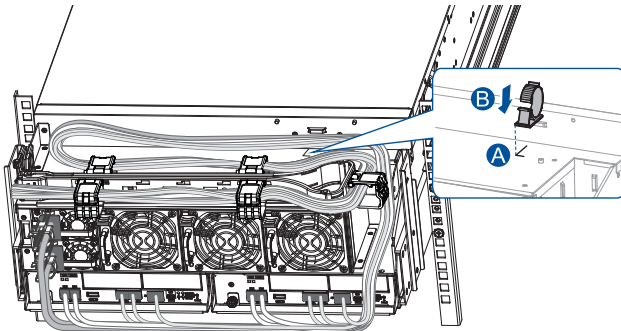
5. Route the cables through the cable clamps to keep them in place.



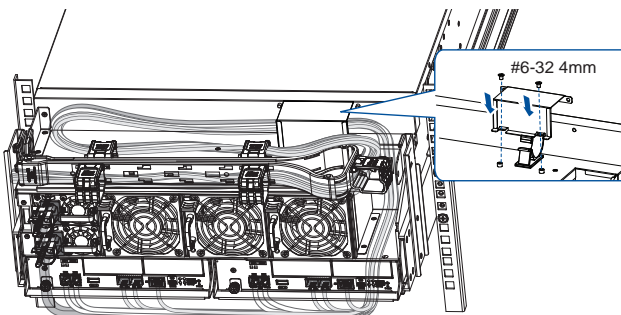
6. **Secure the cables with a cable tie.** Put a cable tie through one of the square holes in the rear of the enclosure (A), and wrap the cables with the cable tie (B). Do the same with another cable tie and square hole if necessary.



7. **Secure the cables with the wire mount** if you have a large number of cables. Align the wire mount with the engraved mark on the enclosure (A), and attach it to the enclosure using the double-sided tape on the wire mount's bottom (B). Route the cables through the wire mount to keep them in place.



8. **Install the L-shaped bracket to the enclosure** with two #6-32 4mm screws. Route the cables through the bracket.



NOTE: The L-shaped bracket secures the cables in place when you slide the enclosure out of the rack for maintenance.

2.5 Installing Host Boards / Expansion Boards (Optional)

IMPORTANT!

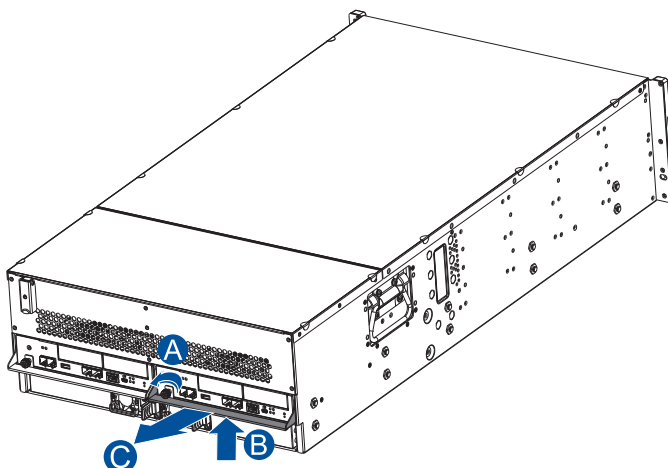
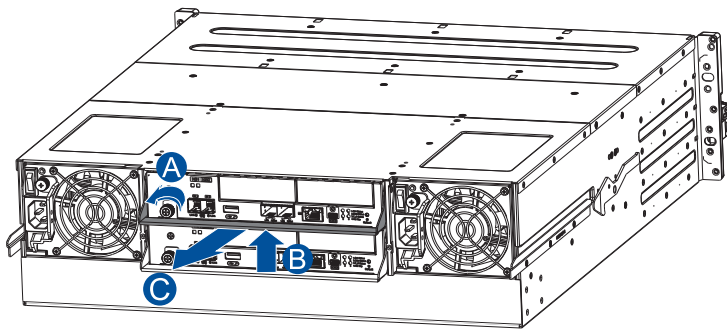
- A downtime may occur when installing/replacing a host board.
- When you add or replace a host board, the firmware automatically restores the default factory settings of your system.
- When installing a host board on a single-controller system, shut down the applications and the system first.
- For dual-controller systems, identical host board combinations must be used, in the same order, on both controllers.
- For a 25GbE x 2 or a 100GbE x 2 host board, both ports on the same host board must be set to the same channel type (block-level or file-level).
- For a 25GbE x 4 host board, all ports on the same host board must be set to the same channel type (block-level or file-level).
- Refer to the **Host Board and Memory Guide** on PAC Storage's official website for more information, including supported host board types, supported combinations, and important notes.

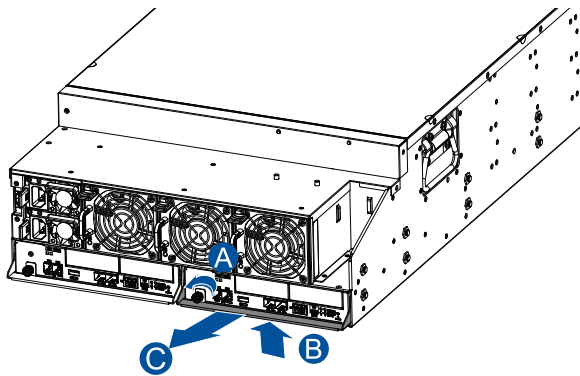
Installing a Host Board

1. Disconnect all cables from the controller module.
2. Remove the controller module from the enclosure.

- **Global Version**

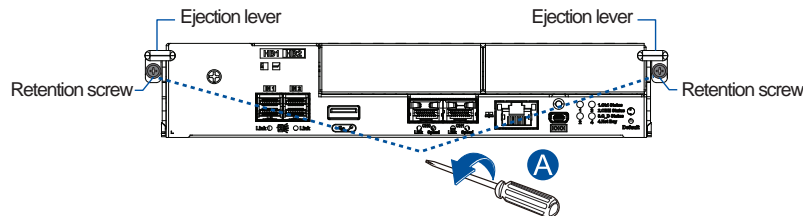
Loosen the thumb screw that secures the controller module (A). Push the handle upwards first (B), and then pull it out to remove the controller module from the enclosure (C).



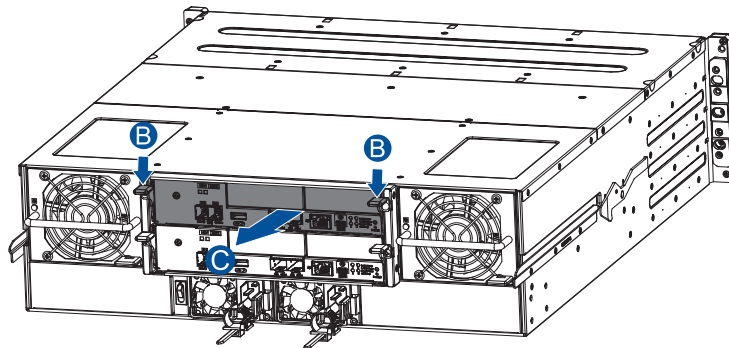


- **12-bay, 16-bay, and 24-bay Models, EU Version**

Remove the retention screws below the controller module's ejection levers (A).



Push the ejection levers downwards to dislodge the controller (B), and then pull to remove the controller from the enclosure (C).

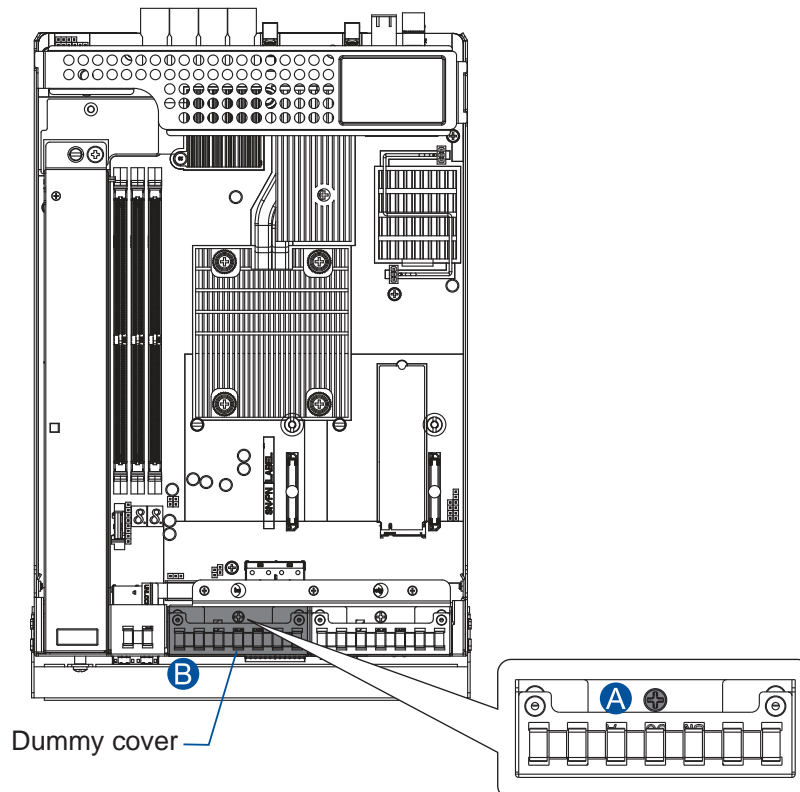


3. If the controller has a super capacitor, remove it from the controller. See section **4.7 Replacing a Super Capacitor** for details. Alternatively, wait for at least 30 seconds after the 7-segment LED in the controller turns OFF.

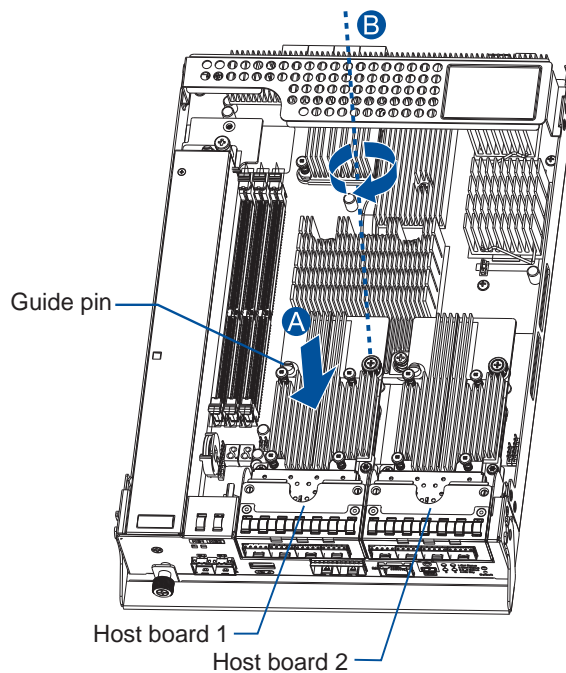


IMPORTANT! Ensure to follow this step; otherwise, the super capacitor may emit electricity, which can damage the DIMMs and host boards.

4. Remove the screw that secures the dummy cover to the controller (A), and then remove the dummy cover from the controller (B).



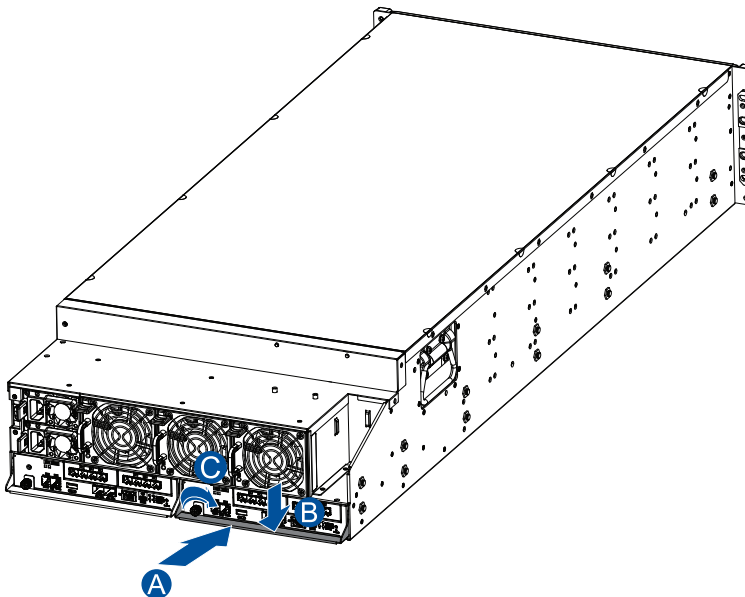
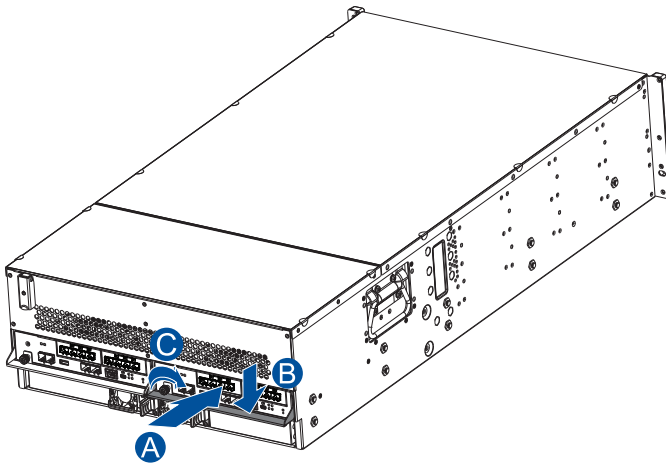
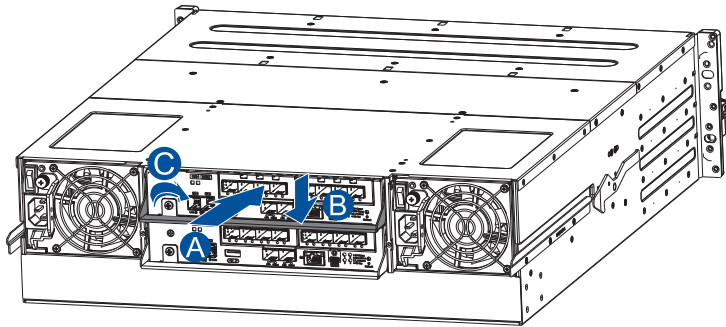
5. Use the guide pin to position the host board onto the slot. Place it carefully (A), and then tighten the thumb screw to secure the host board in place (B).



6. Install the controller back into the enclosure.

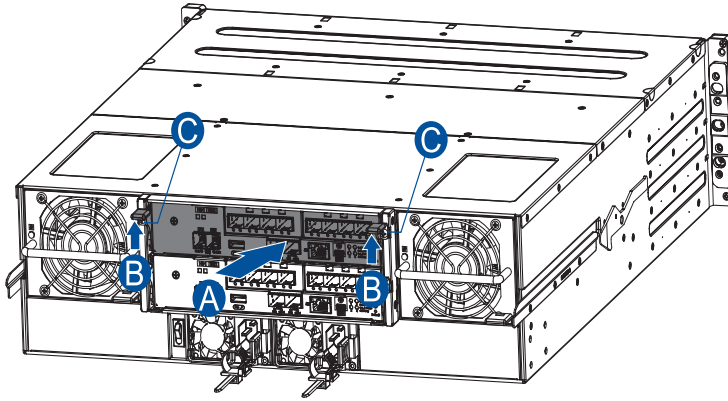
- **Global Version**

Insert the controller back into the module slot carefully (A). When it is fully inserted, push the handle downwards (B) and tighten the thumb screw to secure the controller into the chassis (C).



- **12-bay, 16-bay, and 24-bay Models, EU Version**

Insert the controller back into the module slot (A). When you feel a contact resistance, use a small but careful force to push the ejection levers upwards (B). Then secure the controller with the retention screws removed in step 2 (C).



7. Reconnect the cables to the controller module.

2.6 Connections

This section details the connection procedures of PS/PSe system to the expansions, power source, connection status, topologies, and other connection configurations.

2.6.1 General Considerations in Connecting Devices

When selecting the number of hard drives to assemble a logical drive, the host channel bandwidth and the performance of each drive must be considered. It is a good practice that you calculate the performance against the host port bandwidth when designing an application topology.

For example, if eight drives are included in a logical drive and is associated with a host ID (LUN mapping), the combined performance of this logical drive must estimate the channel bandwidth. If two 6-drive logical arrays are associated with two IDs residing in a single host channel, there may be a trade-off with the performance.

If your system comes with a total of eight or more host ports, we recommend that you use more disk drives to an expansion so that you can create a host-port that corresponds to 6-member logical drives (RAID 5) or 8-member logical drives (RAID 6). These logical drives bring up the bandwidth of each host.

You must also take note of these considerations:

- A spare drive that carries no data stripes and does not contribute to disk-level performance. For performance data information of your hard drive, refer to its documentation.
- Disk drives in the same logical drive must have the same capacity, but it is preferred that all disk drives in a chassis have the same capacity. Tiered storage configuration is supported in this setup. However, you must not include both SAS and SATA drives in a logical drive.
- A spare drive must have a minimum capacity equivalent to the largest drive that needs replacement. If the capacity of the spare drive is less than the capacity of the drive to be replaced, the controller will not proceed with the failed drive rebuild.
- When connecting between devices, follow all the specifications. Pay attention to the signals and avoid electronic noise from adjacent interfaces. DO NOT put power cords on optical cables.
- When rackmounting, leave enough space for the cables. DO NOT bend them to a diameter of less than 76 mm (3 inches).
- Route the cables away from places where it can be damaged by other devices such as foot traffic or fan exhaust.
- DO NOT over-tighten, twist, or bend the cables.

Configuring the Host-Side Topologies

When configuring host-side topologies, avoid the points of failure. It is recommended that the host ports are connected to at least two HBAs (Host Bus Adapters).

NOTE:

- To manage the fault-tolerant data paths and optimize data throughput on multiple data paths, you must apply multipathing utilities such as Linux Device Mapper.
 - Host port channel designation may vary by system. Refer to the topologies of this manual to create your own connections that suit your needs.
-

Configuring the Host-Side Parameters

For the host-side parameters, we strongly recommend that you use the default settings of your system. If you need to adjust the host-side parameters, consult your on-site technical personnel or seek technical support from your vendor.

Familiarizing the Maximum Concurrent Host LUN Connection (Nexus in SCSI)

The menu option *Max Number of Concurrent Host-LUN Connection* allows you to set the maximum number of concurrent host LUN connections. This is the arrangement of the controller internal resources to use with a number of current host nexus.

For example, if you have four hosts (A, B, C, and D) and four host IDs/LUNs (IDs 0, 1, 2, and 3) in a configuration, where:

- Host A accesses ID 0 (one nexus)
- Host B accesses ID 1 (one nexus)
- Host C accesses ID 2 (one nexus)
- Host D accesses ID 3 (one nexus)

These connections are queued in the cache, which are called four nexus. If there is an I/O in the cache with these four nexus and another host I/O comes with a nexus different from the four in the cache (e.g. host A accesses ID 3), the controller returns as busy. This happens with the concurrent active nexus. If the cache is cleared, it accepts four different nexus again. Many I/O operations can be accessed via the same nexus.

Knowing the Maximum Queued I/O Count

The menu option *Maximum Queued I/O Count* allows you to configure the maximum number of I/O operations per host channel that can be accepted from the servers. The predefined range is from 1 to 1024 I/O operations per host channel. You can also choose **Auto**, which sets the automatic configuration. The default value is 256 I/O operations. The appropriate setting for this option depends on how many I/O operations the attached servers are performing. This varies according to the amount of the host memory present as well as the number of drives and their respective sizes. Usually, the optimum performance occurs from using **Auto** or **256** settings. For more information, refer to the firmware manual that came with your system.

2.6.2 Expansion Connections

A SAS host link cable is bundled per expansion package. If you need to purchase other cables, or if you need other cables of different lengths, contact your vendor.

Before configuring the expansions, you must take note of the following important points:

- For a cleaner and clutter-free rack system, have a carefully planned routing path when connecting between systems.
- All SAS cables are sensitive and must be handled with care. DO NOT bend or twist the cables when connecting the systems installed to the rack.

Configuring the SAS Expansion

The SAS expansion port of the PS/PSe system connects to the expansion systems. For dual-controller systems, each expansion port connects to a controller of another expansion system, making a fault-tolerant linkage to different SAS domains.

The following principles apply to storage and expansion system connections:

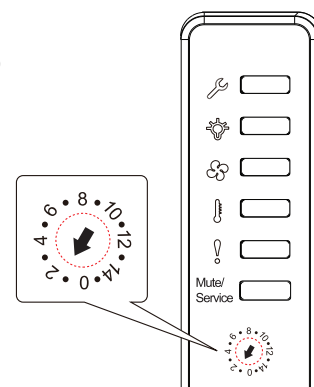
- Dual-controller storage connects to dual-controller expansion systems
- Single-controller storage connects to single-controller expansion systems
- A longer cable is available in making expansion links with a dual-controller configuration. If you need to connect expansion systems from two opposite directions, you may need a longer cable. Routing between two different connections can avoid loss of data links if one expansion fails to operate.

Setting Expansion IDs

Each expansion system must have a unique ID, which you can configure on the rotary ID switch using a small flat-blade screwdriver.

You must take note of the following when setting IDs on expansion systems:

- When setting an ID on an expansion system, you must start from 1. The order starts from the expansion enclosure that is closest to the managing PS/PSe enclosure.
- Refer to **Hardware Specifications** for compatible expansion models.
- For more information, refer to the **Expansion Guide** on PAC Storage's official website. Go to **Support > Technical Support**, find your model, and then go to **Downloads**.



Configuration Rules

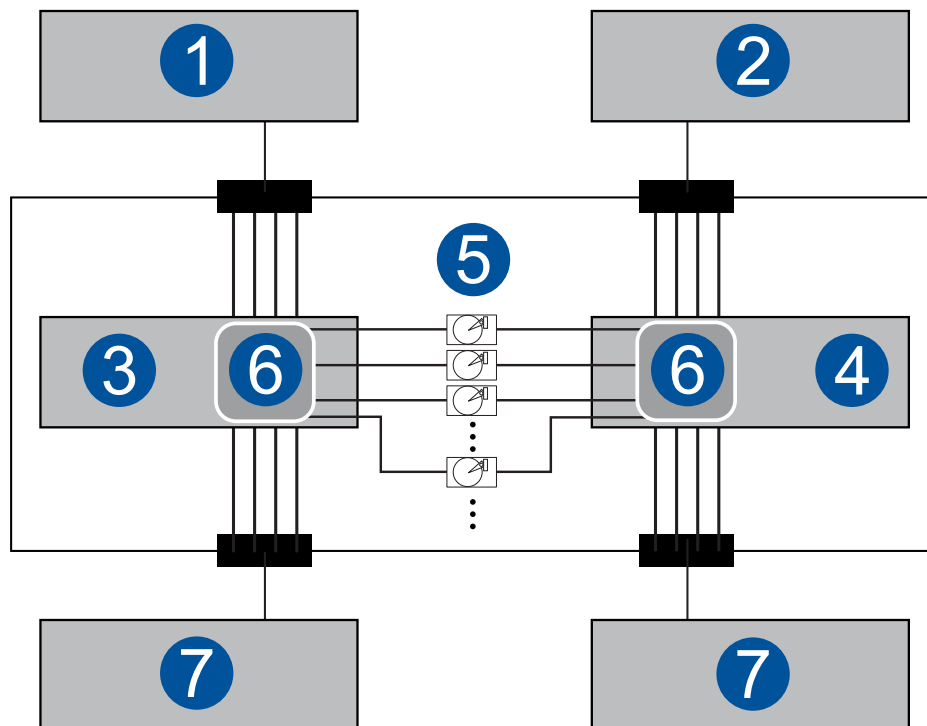
To connect the SAS interfaces across storage and expansion systems, you must take note of the following:

- **Fault-Tolerant Links in a Dual Controller Combination**

Corresponding to the dual-port interfaces of the SAS drives, two physical links are available per disk drive, routed across the backplane board, then to a SAS expander, and interfaced via a 4x wide external SAS port.

- **With Data Paths via Separate SAS Domains**

Access to disk drives can be continued in the event of a failure from a cable link or SAS expansion controller.



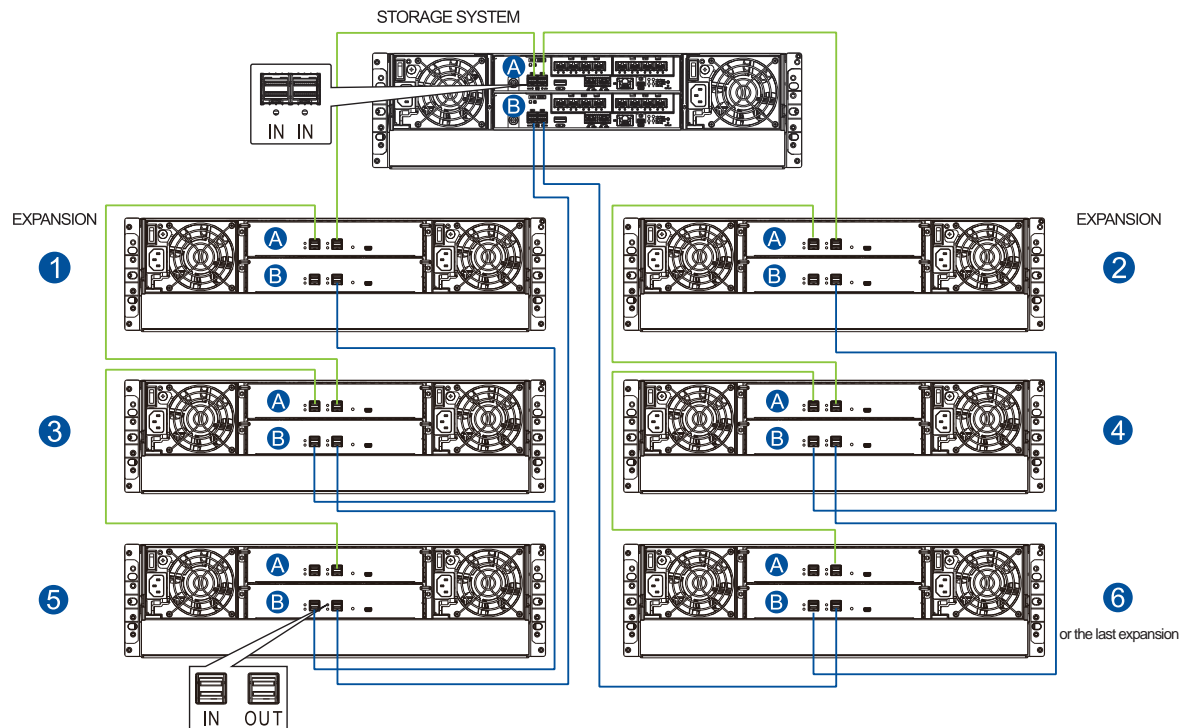
Number	Description
1	RAID controller A
2	RAID controller B
3	Expansion system controller A
4	Expansion system controller B
5	Dual-port SAS drives
6	Expander
7	To another expansion system

- **Fault-Tolerant Links to SAS Disk Drives**

- The SAS expansion cables are bundled with the expansion systems. Take note that if there are many expansion systems connected, a longer SAS external cable, approximately measured 120 cm, may be needed to connect an expansion system from the opposite direction for a higher redundancy.
- One expansion link connects the expansion system from a storage system with HBA/RAID card to the nearest expansion system, then to the most distant expansion system. Another expansion link connects to the most distant expansion system, from the opposite direction to the first expansion system from the storage system.
- Each expander controller on the SAS expansion system controls a *SAS Domain* that connects to one of the alternative interfaces of the disk drives in the enclosure. For example, one expander unit controls Domain A while the other expander controls Domain B. In a fault-tolerant topology, the SAS external links always connect to the SAS ports of the same SAS domain.
- Identify the SAS domains by the location of the expanders: the left controller is controller A, the right is controller B.

Connecting Expansion Systems

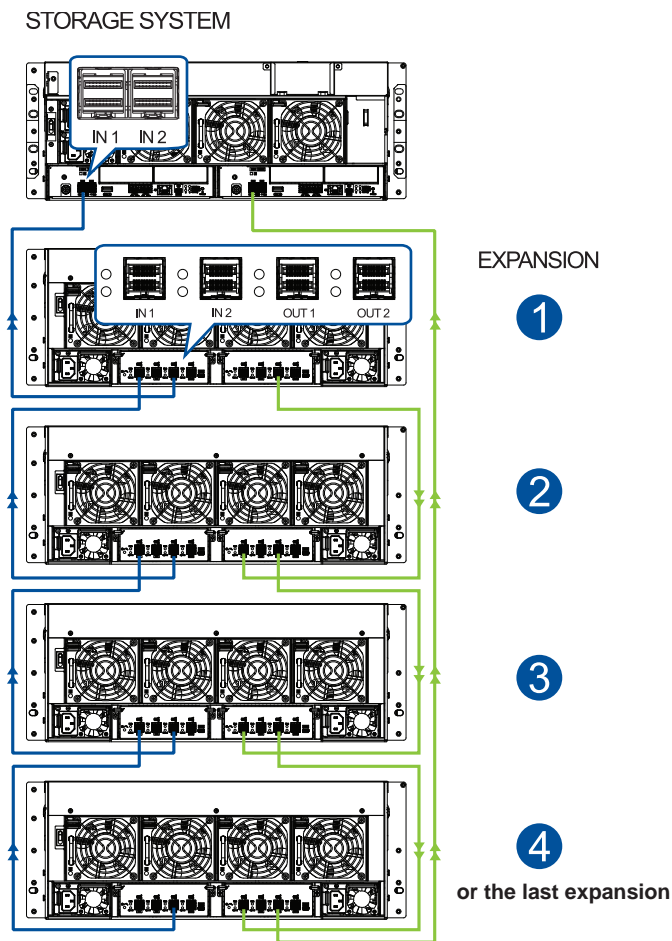
- Connecting Dual-controller Expansions Using the Onboard SAS Expansion Ports



- Storage controller **A**: left SAS port **IN** → Expansion **1**, controller **A**: SAS port **OUT**
- Expansion **1**, controller **A**: SAS port **IN** → Expansion **3**, controller **A**: SAS port **OUT**
- Expansion **3**, controller **A**: SAS port **IN** → Expansion **5**, controller **A**: SAS port **OUT**
- Storage controller **A**: right SAS port **IN** → Expansion **2**, controller **A**: SAS port **OUT**
- Expansion **2**, controller **A**: SAS port **IN** → Expansion **4**, controller **A**: SAS port **OUT**
- Expansion **4**, controller **A**: SAS port **IN** → Expansion **6** or last, controller **A**: SAS port **OUT**
- Storage controller **B**: left SAS port **IN** → Expansion **5**, controller **B**: SAS port **OUT**
- Expansion **5**, controller **B**: SAS port **IN** → Expansion **3**, controller **B**: SAS port **OUT**
- Expansion **3**, controller **B**: SAS port **IN** → Expansion **1**, controller **B**: SAS port **OUT**
- Storage controller **B**: right SAS port **IN** → Expansion **6** or last, controller **B**: SAS port **OUT**
- Expansion **6** or last, controller **B**: SAS port **IN** → Expansion **4**, controller **B**: SAS port **OUT**
- Expansion **4**, controller **B**: SAS port **IN** → Expansion **2**, controller **B**: SAS port **OUT**

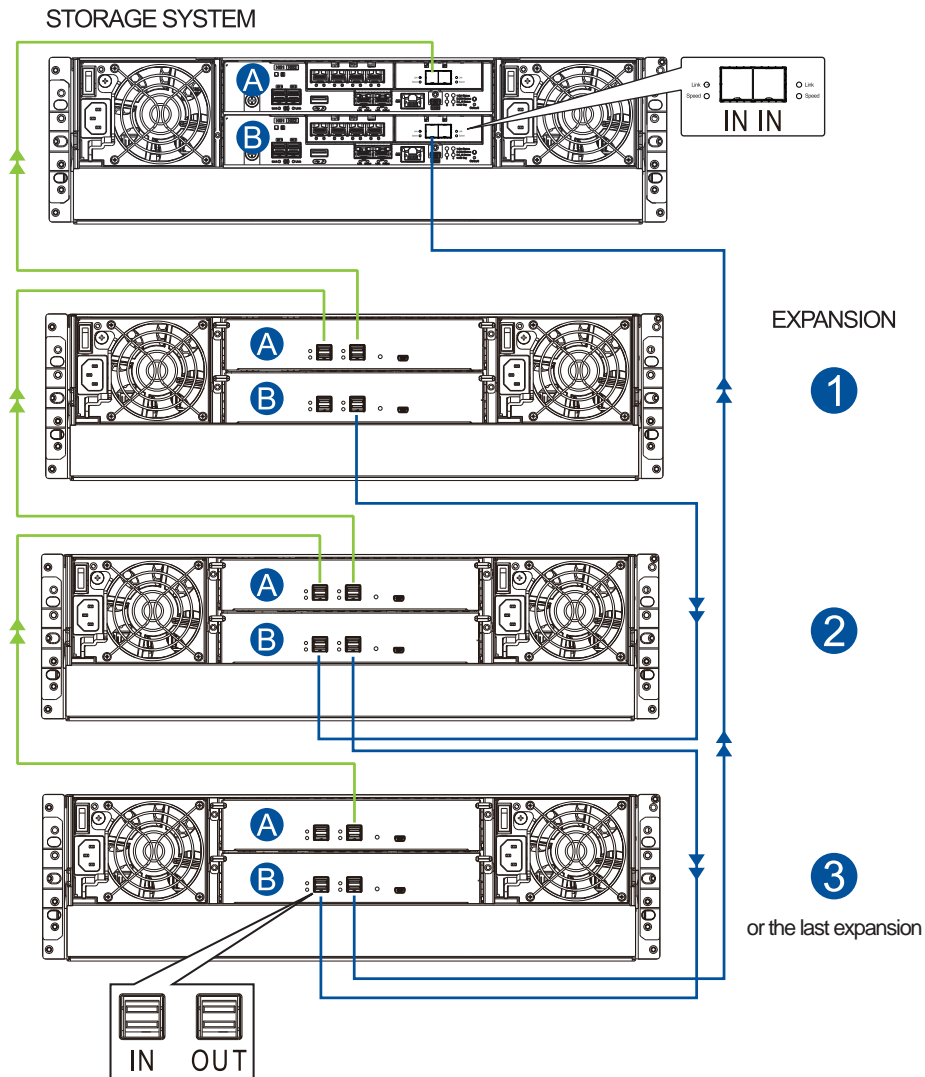
Connecting Expansion Systems

- Connecting Dual-controller Expansions Using the Onboard SAS Expansion Ports



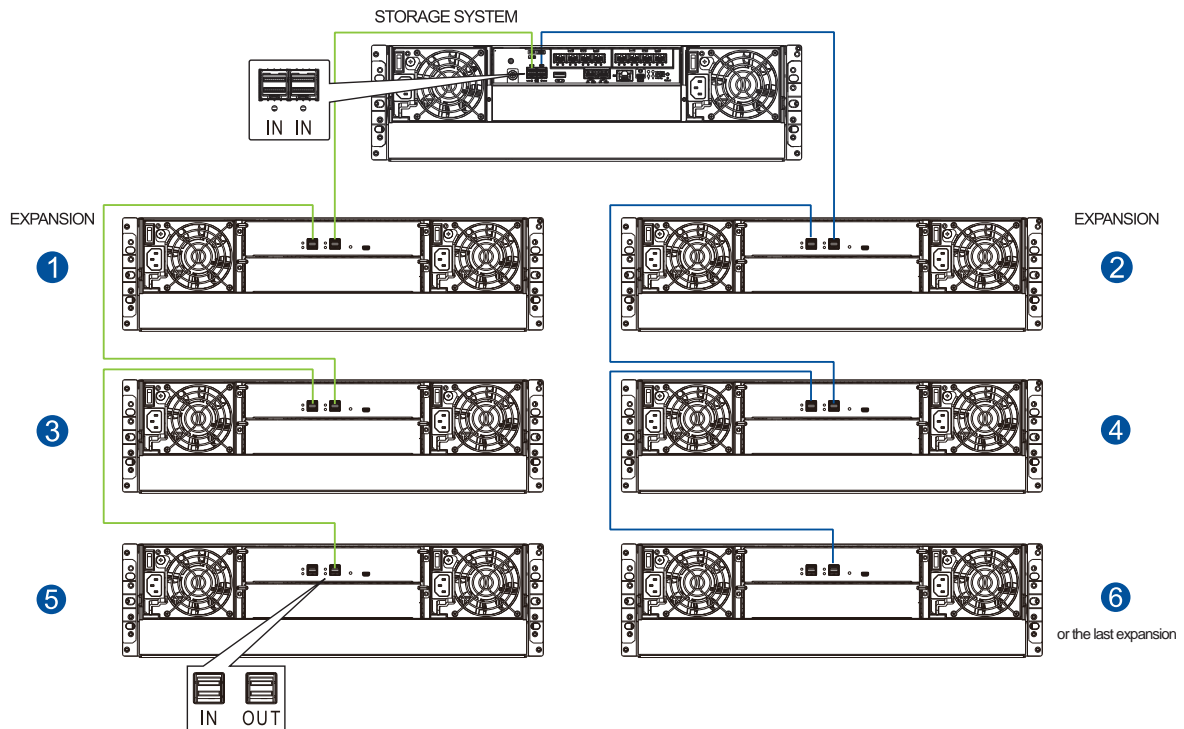
- Storage controller **A**: SAS port **IN1** → Expansion **1**, controller **A**: SAS port **OUT1**
- Expansion **1**, controller **A**: SAS port **IN1** → Expansion **2**, controller **A**: SAS port **OUT1**
- Expansion **2**, controller **A**: SAS port **IN1** → Expansion **3**, controller **A**: SAS port **OUT1**
- Expansion **3**, controller **A**: SAS port **IN1** → Expansion **4**, controller **A**: SAS port **OUT1**
- Storage controller **B**: SAS port **IN1** → Expansion **4**, controller **B**: SAS port **OUT1**
- Expansion **4**, controller **B**: SAS port **IN1** → Expansion **3**, controller **B**: SAS port **OUT1**
- Expansion **3**, controller **B**: SAS port **IN1** → Expansion **2**, controller **B**: SAS port **OUT1**
- Expansion **2**, controller **B**: SAS port **IN1** → Expansion **1**, controller **B**: SAS port **OUT1**

- Connecting Dual-controller Expansions Using SAS Expansion Boards



- Storage controller **A**: expansion board SAS port **IN** → Expansion **1**, controller **A**: SAS port **OUT**
- Expansion **1**, controller **A**: SAS port **IN** → Expansion **2**, controller **A**: SAS port **OUT**
- Expansion **2**, controller **A**: SAS port **IN** → Expansion **3** or last, controller **A**: SAS port **OUT**
- Storage controller **B**: expansion board SAS port **IN** → Expansion **3** or last, controller **B**: SAS port **OUT**
- Expansion **3** or last, controller **B**: SAS port **IN** → Expansion **2**, controller **B**: SAS port **OUT**
- Expansion **2**, controller **B**: SAS port **IN** → Expansion **1**, controller **B**: SAS port **OUT**

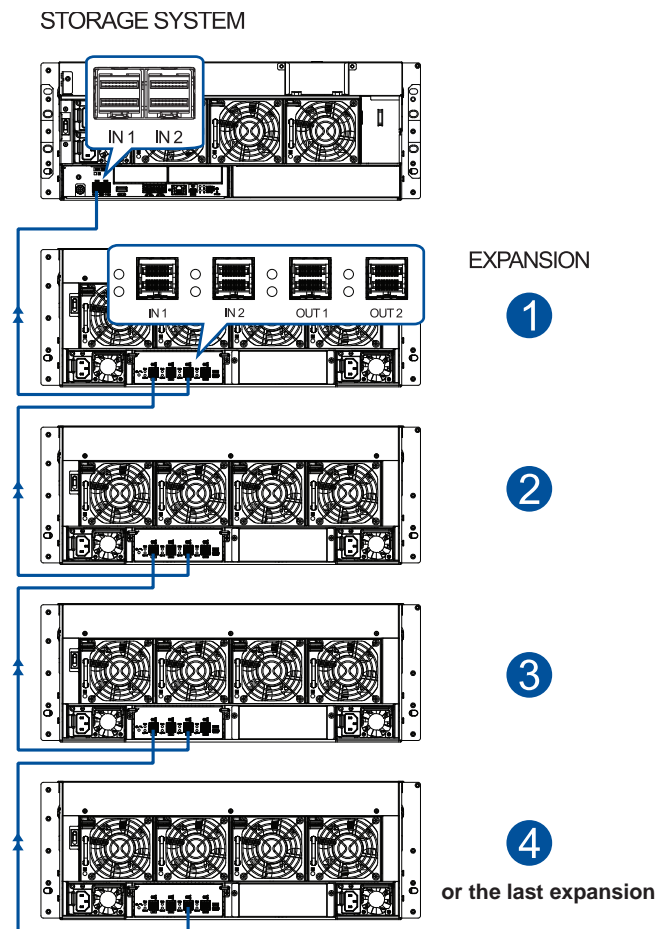
- **Connecting Single-controller Expansions Using the Onboard SAS Expansion Ports**



- Storage controller: left SAS port **IN** → Expansion ①: SAS port **OUT**
- Expansion ①: SAS port **IN** → Expansion ③: SAS port **OUT**
- Expansion ③: SAS port **IN** → Expansion ⑤: SAS port **OUT**
- Storage controller: right SAS port **IN** → Expansion ②: SAS port **OUT**
- Expansion ②: SAS port **IN** → Expansion ④: SAS port **OUT**
- Expansion ④: SAS port **IN** → Expansion ⑥ or last: SAS port **OUT**

Connecting Expansion Systems

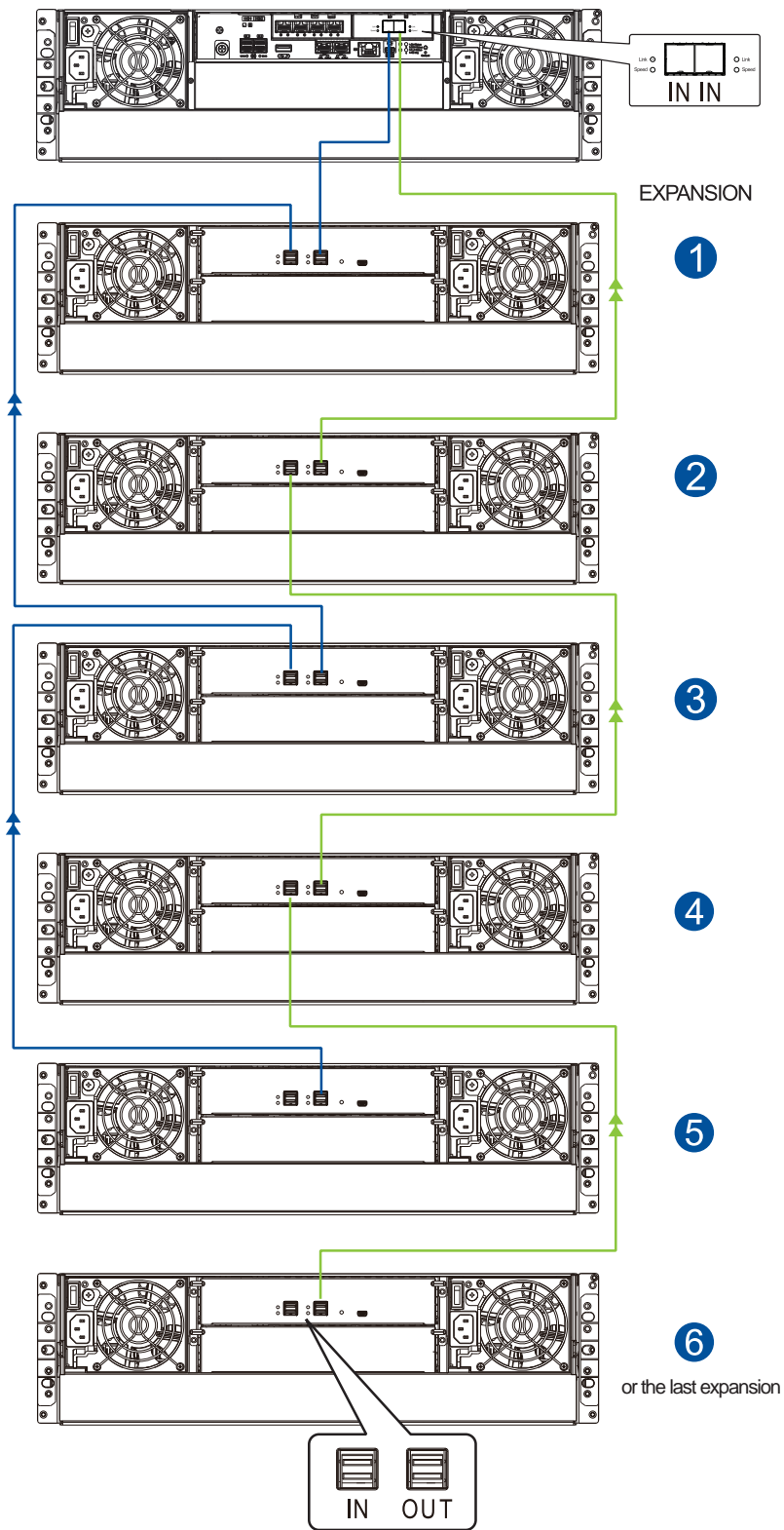
- Connecting Single-controller Expansions Using the Onboard SAS Expansion Ports



- Storage controller: SAS port **IN1** → Expansion ①: SAS port **OUT1**
- Expansion ①: SAS port **IN1** → Expansion ②: SAS port **OUT1**
- Expansion ②: SAS port **IN1** → Expansion ③: SAS port **OUT1**
- Expansion ③: SAS port **IN1** → Expansion ④: SAS port **OUT1**

- Connecting Single-controller Expansions Using a SAS Expansion Board

STORAGE SYSTEM



(See next page)

- Storage controller: host board SAS port **IN** → Expansion ①: SAS port **OUT**
- Expansion ①: SAS port **IN** → Expansion ③: SAS port **OUT**
- Expansion ③: SAS port **IN** → Expansion ⑤: SAS port **OUT**
- Storage controller: host board SAS port **IN** → Expansion ②: SAS port **OUT**
- Expansion ②: SAS port **IN** → Expansion ④: SAS port **OUT**
- Expansion ④: SAS port **IN** → Expansion ⑥ or last: SAS port **OUT**

2.6.3 Power Connection

Before connecting to a power source, ensure that all components are properly installed and the management interfaces are properly connected.

Check the following:

- All drives are correctly installed into the drive trays.
- All drive trays are installed into the system, whether or not they contain a drive.
- The system is connected to host computers, management computers, or external networking devices with the correct cables.

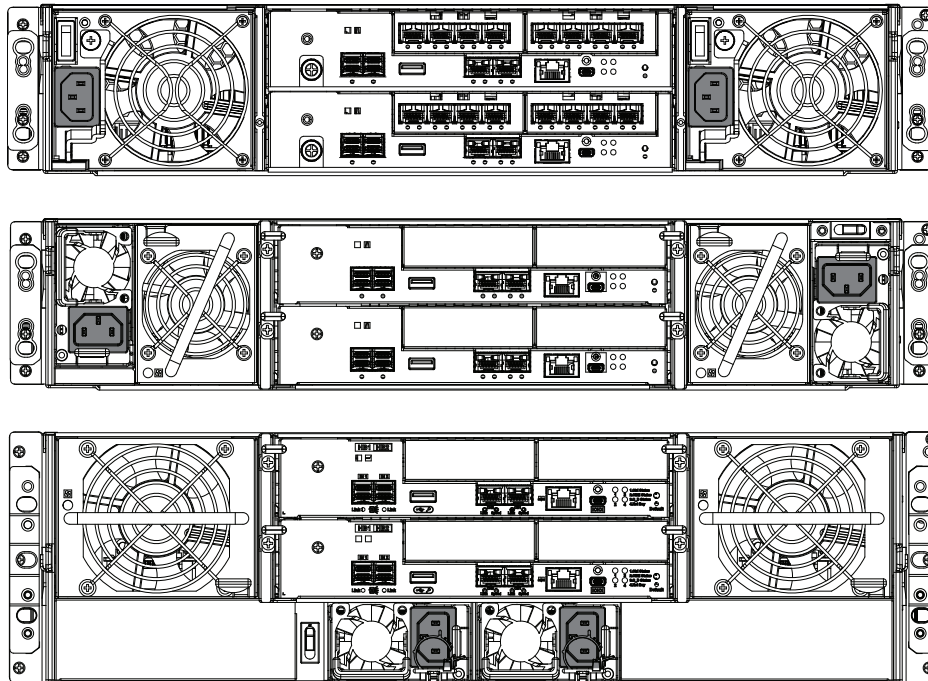
IMPORTANT! Ensure to use the power cables with at least 1.2 meters in length. DO NOT use extension cables as the power cables are designed to connect **ONLY and DIRECTLY** to relocatable power taps (RPTs) on server cabinets.

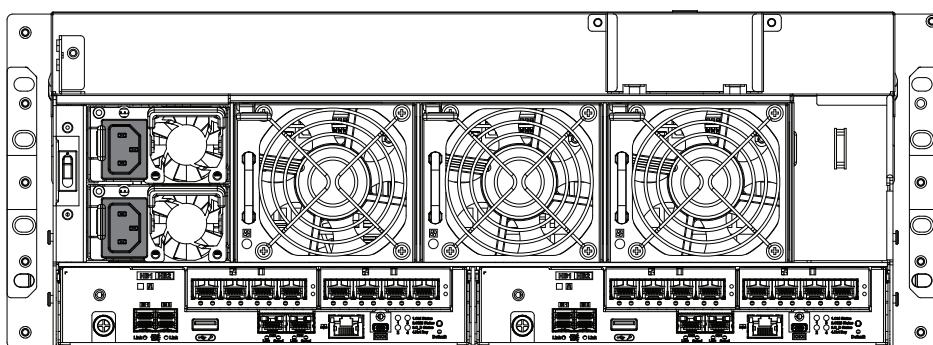
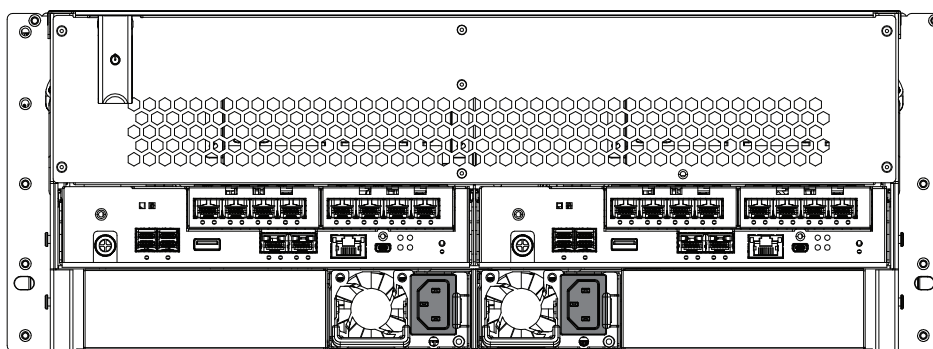
- Ensure that the ambient temperature is not more than 35°C (with CBM).

Connecting to Power Source

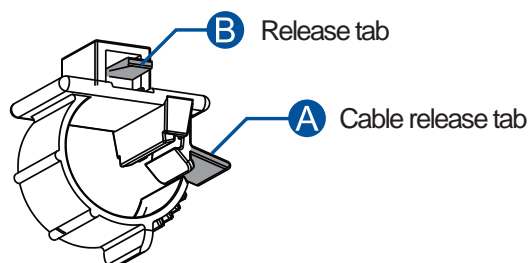
1. Connect the bundled power cords to the power sockets for both PSUs.

IMPORTANT! DO NOT plug the system to a power outlet yet.





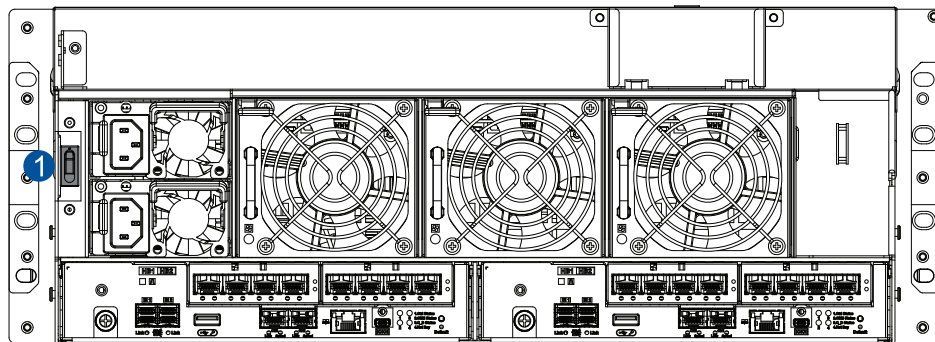
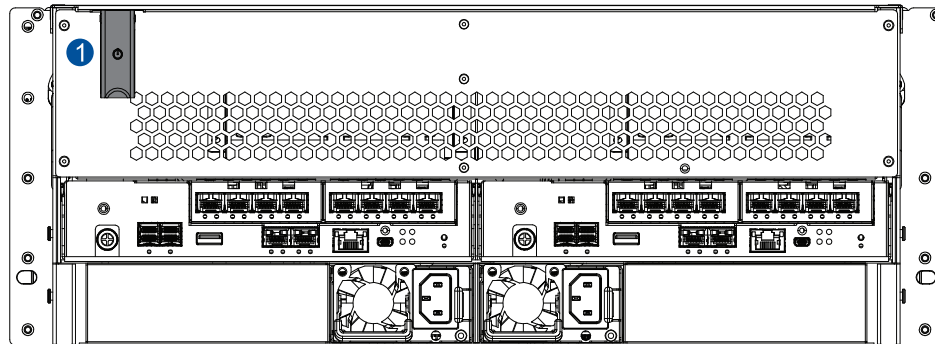
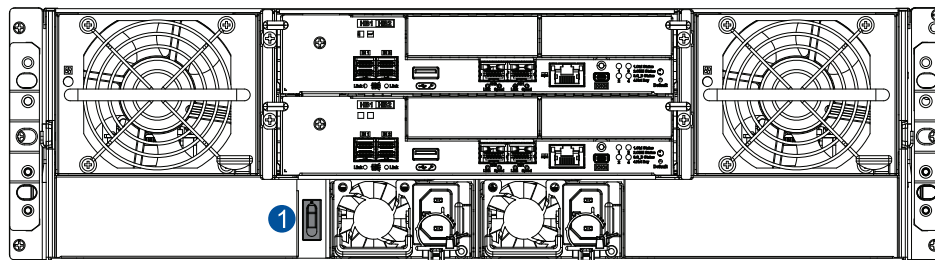
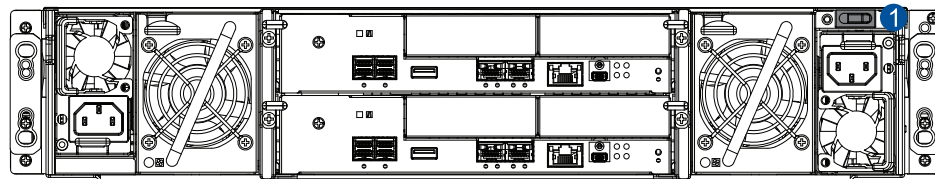
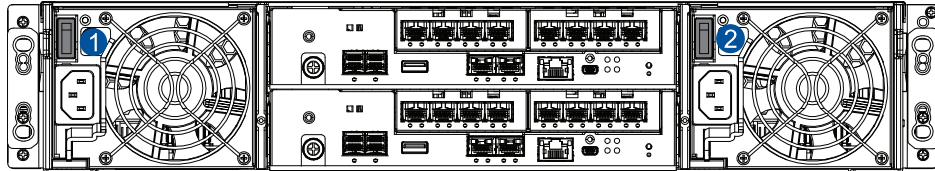
2. Use the cable release tab (A) to open the cable clamp, insert the power cord, and then close the cable clamp until you hear a snap. To adjust the cable's position and tightness, use the cable clamp's release tab (B).



3. Connect the power cord to a power outlet. Repeat step 2 and step 3 for the other power cord.

Turning On the System

1. Turn on the networking devices.
2. Turn on the JBOD/expansion systems (if applicable).
3. Press the power switch to turn on the storage system. For models with two power switches, press the switches from left to right.



4. Turn on the application servers.

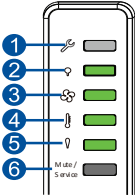
Checking the Power Status

Once the system is on, no LEDs should light up in red or amber, nor should you hear an alarm from the system. Start verifying the system status via the following interfaces:

- Front Panel, Drive Tray, PSU, and Fan Module LEDs


Front panel LEDs

Item Name	Status
1 Service	Off
2 Power	Green
3 Cooling fan	Green
4 Temperature	Green
5 System fault	Green
6 Mute/Service button	



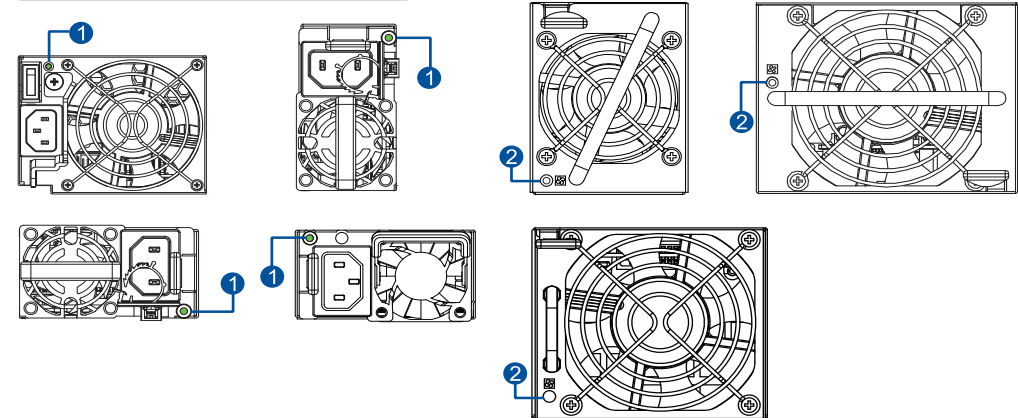
Drive tray LEDs

Item Name	Status	Description
1 Drive busy	Blue	Drive detected
	Blinking blue	R/W activity
	Off	No activity
2 Power status	Green	On
	Red	Failed



PSU & fan module LEDs

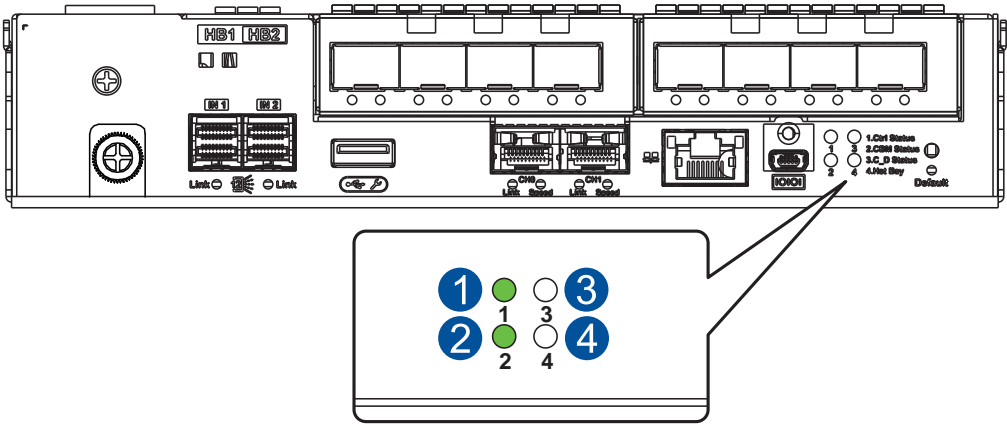
Item Name	Status
1 PSU	Green
2 Fan module	Off



NOTE:

- Cache dirty LED may occasionally blink in amber, which indicates the NAS OS is in operation.
- Check the power status LED on the front panel to know the main power status of the system.
- The fan module is present on certain types of models (EU version) only.
- Refer to **3.2 LEDs** for more information regarding the LED description.

• **Controller Module LEDs**



Number	LED Name	Status
1	Control Status	Green
2	CBM Status	PS: Green PSe: Off without CBM (default); Green with CBM (optional)
3	Cache Dirty	Off
4	Host Busy	Blinking green / Off

NOTE: Refer to section 3.2 LEDs for more information regarding the LED description.

2.6.4 Management Tool Connections

To connect your storage to management interfaces, you need the following:

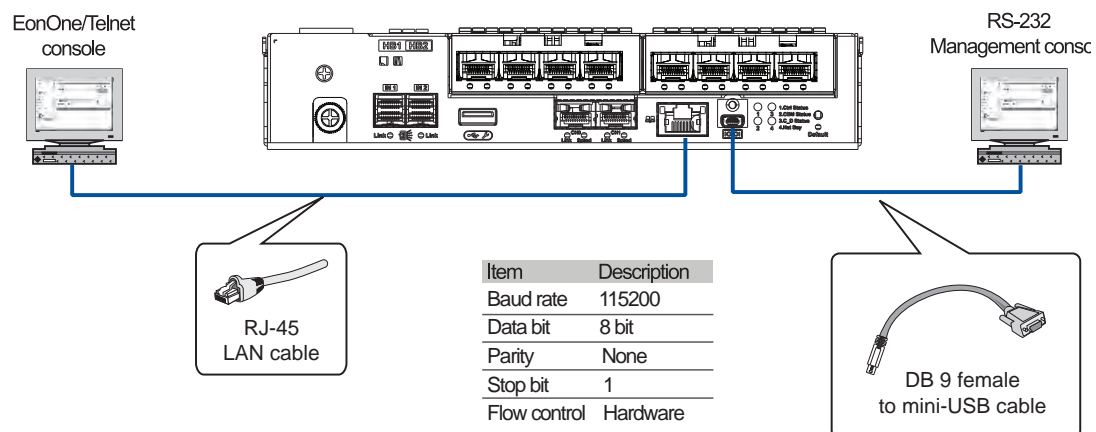
- RJ-45 LAN cable (user supplied)
- DB9 female to mini USB cable (bundled with the package)

IMPORTANT! Always connect to the primary controller.

NOTE: A null modem may be required if you are using a 3rd party cable.

You can access the storage system via the following interfaces:

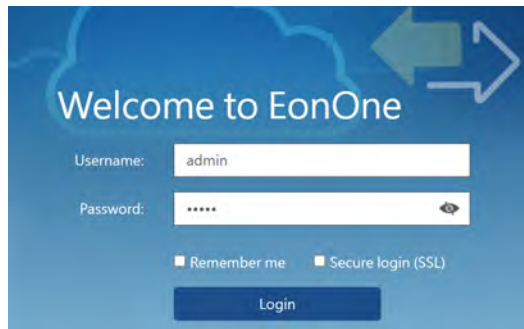
- **Ethernet management port (out-of-band connection)**
Access the storage system from a remotely connected computer using RJ-45 Ethernet cables.
- **Onboard host ports or host board ports (in-band connection)**
Access the storage system from the host servers through the host links.
- **Serial port**
Access the storage system directly from the computer via the RS-232C serial port.



Using EonOne

Manage the storage system using the EonOne GUI software.

1. Connect the storage system to a remote computer via the Ethernet management port.
2. Launch a web browser and enter the IP address of the Ethernet management port. You must obtain the IP address, either a static IP address or DHCP, from your network administrator. If neither is available, use the default address <10.10.1.1>.
3. Enter **admin** into the Username and Password fields to log in to EonOne.



Using Central EonOne

Manage multiple storage systems using Central EonOne.

1. Connect the storage system to a remote computer via the management Ethernet port or to a host PC.
2. Install the Central EonOne software suite. To download it, go to PAC Storage's website > **Support > Technical Support**, find your model, and then go to **Downloads**.
3. Launch Central EonOne and enter **admin** into the Username and Password fields.
4. Add the storage system to the **Device List**.
5. Click the **Settings** icon in the top-right corner to configure the storage system.
6. Activate the license.
 - a. Click **System > License Management > Generate the license application file**. Download will start immediately and the file will be saved on your computer.
 - b. Visit the PAC Storage website to register using the generated License Application File. The license number is attached to the software license envelope.
 - c. Enter the license number, download the **License Key File**, and then upload it to EonOne to activate the license.

Using the firmware menu

View storage settings using the firmware menu.

1. Connect your computer to the storage system via the RS-232C serial port.
2. Launch VT-100 terminal emulation software on your PC.
3. Configure the serial port as shown above to connect the system. The main firmware menu appears.
4. Use the arrow keys to select from the menu.

NOTE: Refer to the **PAC Storage User Manual** for details.

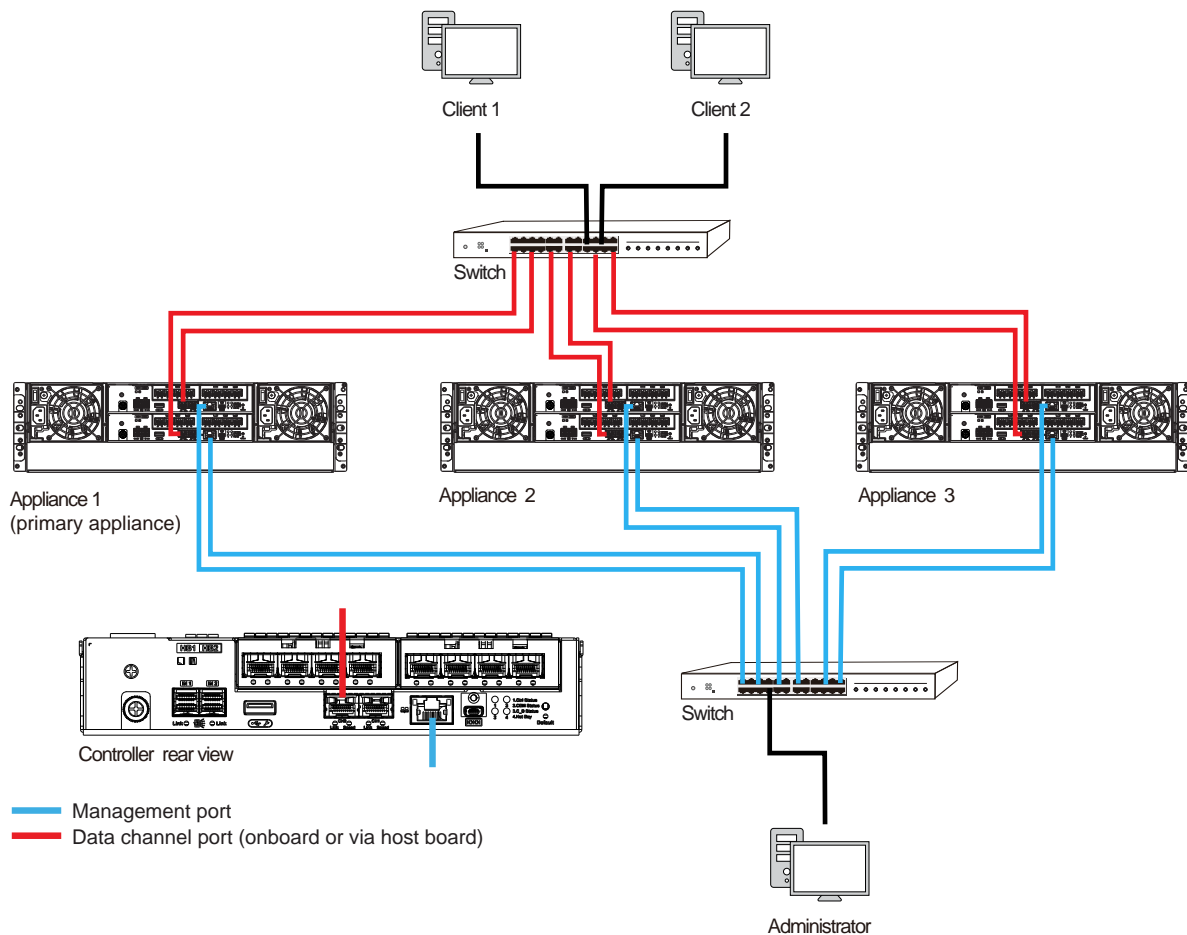
2.6.5 Scale-out Cluster Connection

Via scale-out, you can connect multiple storage appliances to increase storage performance and capacity. Initial deployment can start with only one appliance. As your data grows over time, you add more appliances one by one, forming a scale-out cluster of up to four appliances, with the first one acting as the primary appliance. Each appliance can then be connected to expansion enclosures to further increase storage capacity.

Cable Connection

The drawing below illustrates cable connection of a cluster with three storage appliances.

- Connect the **management ports** on each storage appliance to the same network that the administrator's computer is connected to (marked in blue below).
- Connect the **data channel ports** on each storage appliance to another network that clients are connected to (marked in red below).



Scale-out Settings

After connecting networking cables, log in to EonOne using the management IP of the first appliance. Then enable scale-out and complete required settings. For a step-by-step tutorial on scale-out settings, refer to the **PS Installation Guide** on PAC Storage's official website. Go to **Support > Technical Support**, find your model, and then go to **Downloads**.

NOTE:

- The scale-out feature is also supported on one single appliance.
- Additional licenses are required for a file-level cluster with two or more appliances.

2.6.6 Turning Off the System

Before turning off the system, ensure that no processes are taking place such as **Regenerate Logical Drive Parity** or **Media Scan**.

To turn off the system:

1. Close all applications to stop the I/O access to the system.
2. Flush the cache to clear the DRAM data. If the DRAM contains cached data, the Cache Dirty LED lights up in amber.
3. Flush all cached data using the controller's shutdown function to prepare the RAID system for a safe power shutdown. Refer to the **PAC Storage User Manual** for details.
4. Once the cache is flushed, turn off the system.

System Monitoring

3

This chapter details the monitoring features and the status of PAC Storare PS/PSe 3000/4000 G3 series systems.

3.1 Monitoring Features

The system is equipped with self-monitoring features that help you keep track of the system's operating status.

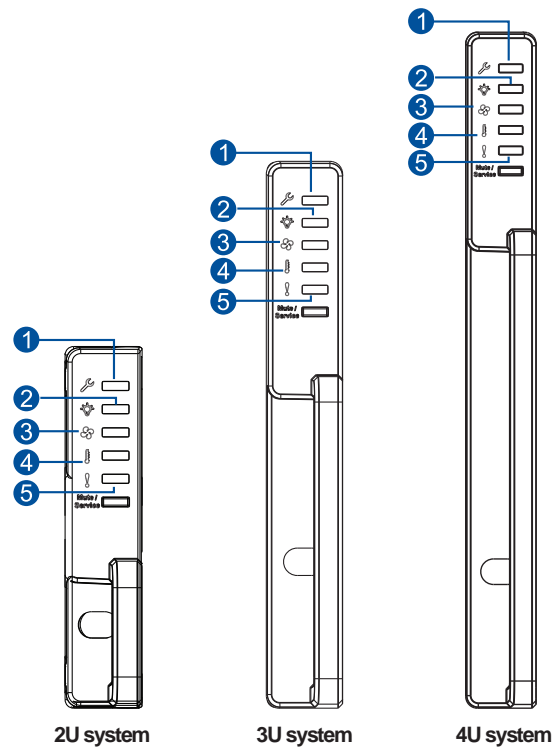
You can monitor your system's status with the following features:

- **Firmware**
The firmware manages the controllers of the system, which is accessible in a terminal program via the serial port.
- **EonOne**
EonOne is a browser-based GUI (graphical user interface) software tool that you can install into a local or remote computer and access via the network. For more information, refer to the **PAC Storage User Manual** on PAC Storage's official website (go to **Support > Technical Support**, find your model, and then go to **Downloads**).
- **LEDs**
The LEDs are indicators that notify you of the system status, events, and errors or failed operations. The LEDs are located on both front and rear panels of the chassis.
- **Audible Alarms**
The audible alarms are triggered in case of system failures.

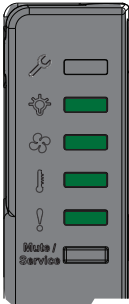
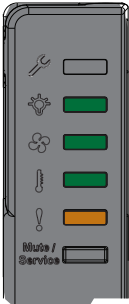


3.2 LEDs

3.2.1 Front Panel LEDs

This section details the system LEDs and their descriptions (see next page).

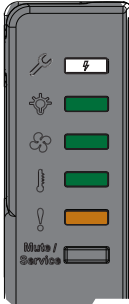
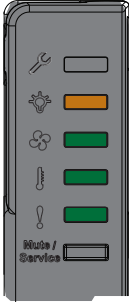
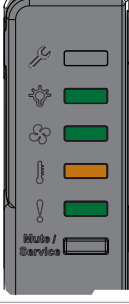



Number	LED Name	Number	LED Name
1	Service	4	Temperature
2	Power	5	System Fault
3	Cooling Module		

Color/Status	Description	Action
	The system is operating normally.	No action required.
	<ul style="list-style-type: none"> A controller cannot be detected. Memory is not installed. Wrong BIOS self-test 	<ol style="list-style-type: none"> Power off the system and remove the controller. Make sure that all the DIMMS are properly installed. Then install the controller back. For a dual-controller model, repeat the above for the other controller. Power up the system. If unresolved, contact technical support.
	A power cable is disconnected, a drive/PSU failure occurred, etc.	<ol style="list-style-type: none"> Check the event log in EonOne, verify the cause, and take corresponding actions. If unresolved, contact technical support.
	The system memory is not enough.	<ol style="list-style-type: none"> Power off the system and remove the controller. Make sure that the memory size is equal to or larger than the default memory size per controller (see the Note below). Also make sure that all the DIMMs are properly installed. Then install the controller back. For a dual-controller model, repeat the above for the other controller. Power up the system. If unresolved, contact technical support.

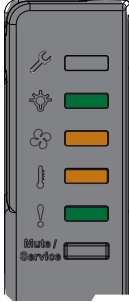
NOTE:

- Refer to **Hardware Specifications > Cache Memory (per Controller)** for the default memory size per controller.
- Refer to **Chapter 4 System Maintenance** to remove, check, reinstall, or replace a component.

Color/Status	Description	Action
	System boot failed (Service LED flashing in white).	<ol style="list-style-type: none"> 1. Identify the faulty controller(s). 2. Replace the faulty controller(s). 3. If unresolved, contact technical support.
	One of the PSUs is faulty.	<ol style="list-style-type: none"> 1. Check the PSU LEDs on the rear panel to find the faulty PSU. 2. Remove and reinstall the PSU properly. 3. If unresolved, replace the PSU. 4. If still unresolved, contact technical support.
	The system temperature is too high.	<ol style="list-style-type: none"> 1. Make sure that the rear openings are NOT covered. 2. Make sure that the environmental temperature is within the normal range (see the Note below). 3. If unresolved, contact technical support.
	<ul style="list-style-type: none"> • A cooling fan built with the PSU is faulty. • A cooling fan inside the enclosure is faulty (4U 40-bay / 4U 60-bay models). 	<ol style="list-style-type: none"> 1. Check the cooling fans on the rear panel. Replace the PSU that has the faulty cooling fan. 2. For 4U 40-bay / 4U 60-bay models, open the top cover to check the cooling fans inside the enclosure. Replace the entire cooling module if any of the fans is faulty. 3. If unresolved, contact technical support.

NOTE:

- Refer to **Hardware Specifications > Cache Memory (per Controller)** for the default memory size per controller.
- Refer to **Chapter 4 System Maintenance** to remove, check, reinstall, or replace a component.

Color/Status	Description	Action
	<p>A cooling fan is faulty and the system temperature is too high.</p>	<ol style="list-style-type: none"> 1. Make sure that the rear openings are NOT covered. 2. Make sure that the environmental temperature is within the normal range (see the Note below). 3. Check the cooling fans on the rear panel. Replace the PSU that has the faulty cooling fan. 4. For 4U 40-bay / 4U 60-bay models, open the top cover to check the cooling fans inside the enclosure. Replace the entire cooling module if any of the fans is faulty. 5. If unresolved, contact technical support.

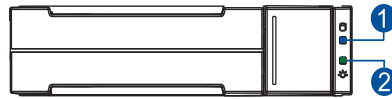
NOTE:

- Refer to **Hardware Specifications > Environment** for the normal temperature range.
- Refer to **Chapter 4 System Maintenance** to remove, check, reinstall, or replace a component.

3.2.2 Drive LEDs

Drive LEDs indicate the drive status. When you get notified by a drive failure message, check the drive tray LEDs to find the failed drive.

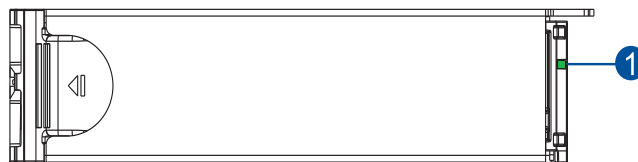
- **12-bay, 16-bay, and 24-bay Models (3.5" HDD Drive Tray)**



PS 3012/4012 Gen2, PS 3016/4016 Gen2, and PS 3024/4024 Gen2

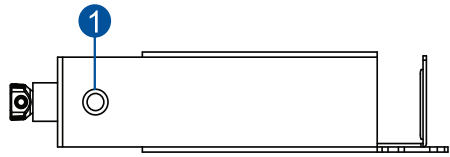
Number	LED Name	Color/ Status	Description
1	Drive Busy		Data is being written to or read from the drive. The drive is busy.
			Data is being written to or read from the drive. The drive is extremely busy.
		OFF	The drive is plugged in but there is no activity going on.
2	Power Status		The drive bay is occupied and working normally.
			The drive failed or a connection problem occurred.

- **40-bay, 60-bay, and 90-bay Models (3.5" HDD Drive Tray)**

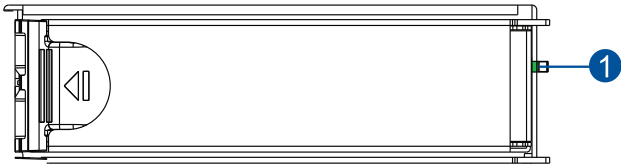


Number	LED Name	Color/ Status	Description
1	Drive Busy		Data is being written to or read from the drive. The drive is busy.
			The drive is plugged in but there is no activity going on.
			The drive failed or a problem occurred.

- 90-bay Models (2.5" NVMe SSD Drive Tray)



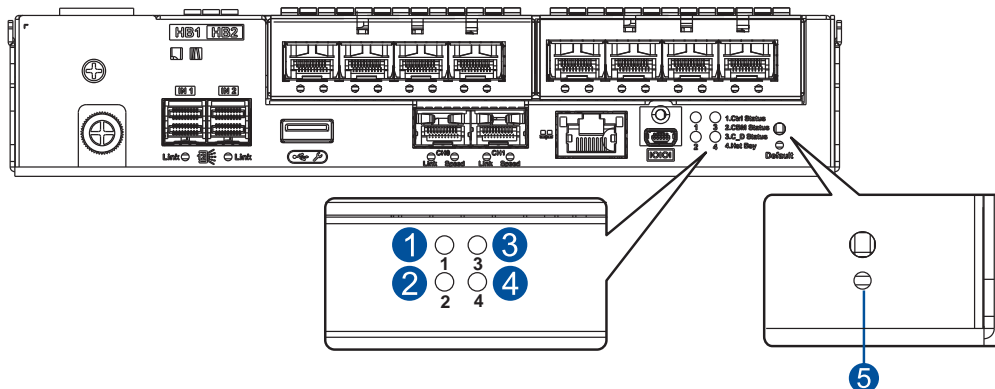
Type I



Type II

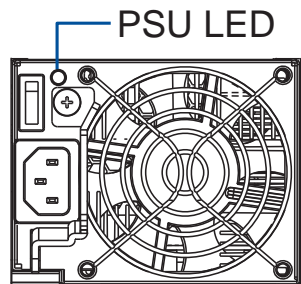
Number	LED Name	Color/ Status	Description
1	Drive Busy		Data is being written to or read from the drive. The drive is busy.
			The drive is plugged in but there is no activity going on.
			The drive failed or a problem occurred.

3.2.3 Controller LEDs

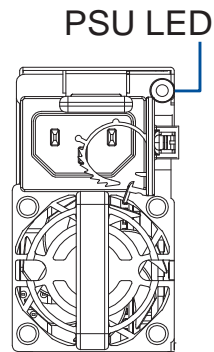


Number	LED Name	Color/Status	Description
1	Control Status	●	The controller is operating normally.
		●	<ul style="list-style-type: none"> The controller is initializing. A component has failed or inappropriate RAID configurations have caused system faults.
2	CBM Status	●	<ul style="list-style-type: none"> The super capacitor and FBM (flash backup module) are installed in the system. The CBM (cache backup module) is ready for operation.
		●	<ul style="list-style-type: none"> The CBM failed in operating, either the super capacitor or the FBM. Either the super capacitor or the FBM is missing.
		⚡	The super capacitor is charging.
		OFF	The super capacitor is not installed in the system.
3	Cache Dirty	●	<ul style="list-style-type: none"> Cache memory is dirty. Data in the FBM is flushed to the cache. Errors occurred with cache memory (ECC errors). Data is flushed from the FBM to the drives when power is restored. The super capacitor temperature reading is abnormal (out of 0°C to 35°C range). The super capacitor is not present.
		⚡	The cached data is being transferred to the FBM after a power outage. Once the transfer is done, all LEDs will turn off. This signal is local to each controller.
		OFF	The cache is clean and the super capacitor can sustain the memory in case of power loss.
4	Host Busy	⚡	Traffic is going on the host bus.
		OFF	No traffic is going on the host bus.
5	Restore Default	●	Successfully reset the controller after pressing and holding the restore default button.

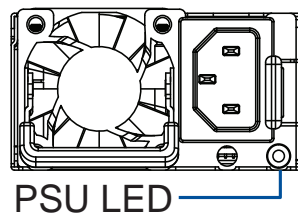
3.2.4 PSU Module LEDs



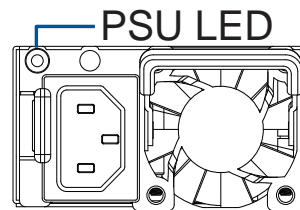
12-bay, 16-bay, and 24-bay models







12-bay models
(EU version)



16-bay and 24-bay models (EU version)
40-bay and 60-bay models



90-bay models

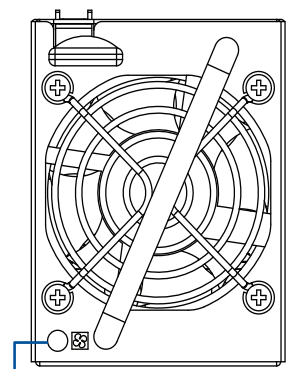
Color/Status	Description
	The system is connected to the power source but the system is not turned on.
	The PSU is operating normally.
	The PSU is operating under high temperature or with slow fan speed.
	<ul style="list-style-type: none">The PSU is faulty.Over Voltage Protection (OVP) / Over Power Protection (OPP) / Over Current Protection (OCP) is activated.The fan built with the PSU is faulty.
OFF	The system is not connected to power.

The PSU LED alerts you of the current status of your PSU and cooling module components. When either of the components fails, you must replace the PSU immediately

WARNING! Keep your fingers away from moving parts of the system to prevent technical mishaps and physical injuries.

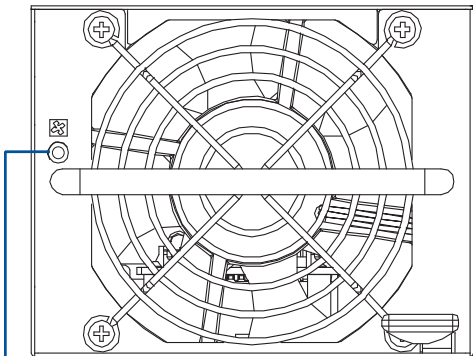
NOTE: For more details, refer to **4.2 Replacing a PSU Module**.

3.2.5 Fan Module LEDs



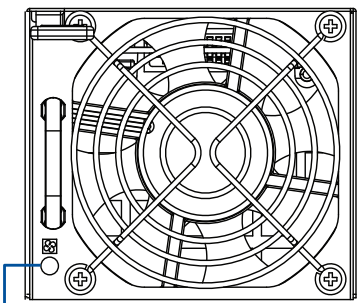
Fan module LED

12-bay models
(EU version)



Fan module LED

12-bay and 16-bay models
(EU version)



Fan module LED

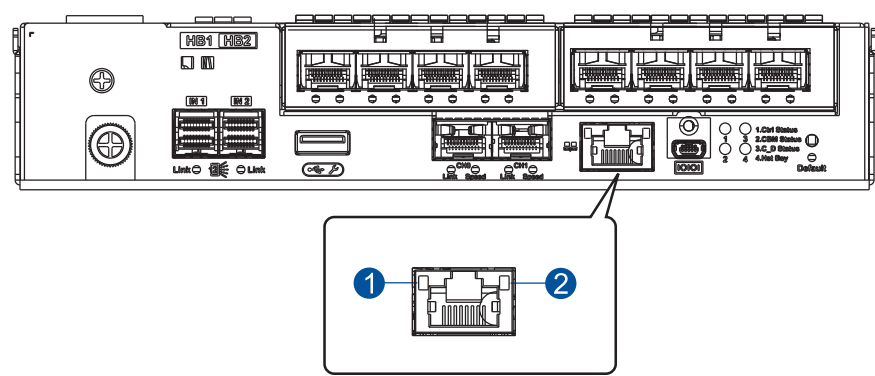
90-bay models

Color/Status	Description
OFF	The fan module is operating normally.
●	The fan module is faulty.

WARNING! Keep your fingers away from moving parts of the system to prevent technical mishaps and physical injuries.

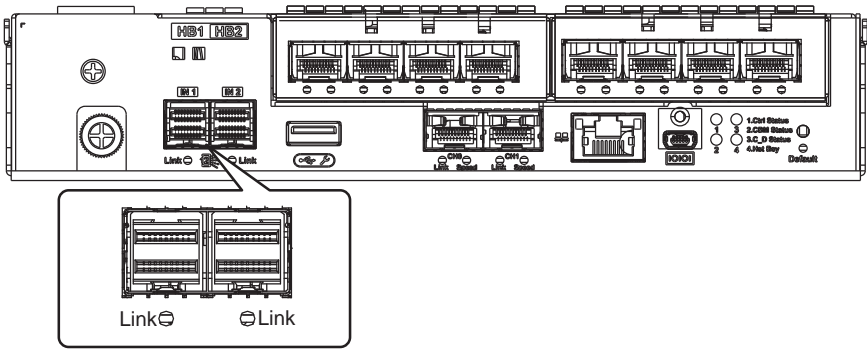
NOTE: For more details, refer to **4.3 Replacing a Fan Module**.

3.2.6 1GbE Management Port (RJ-45) LEDs



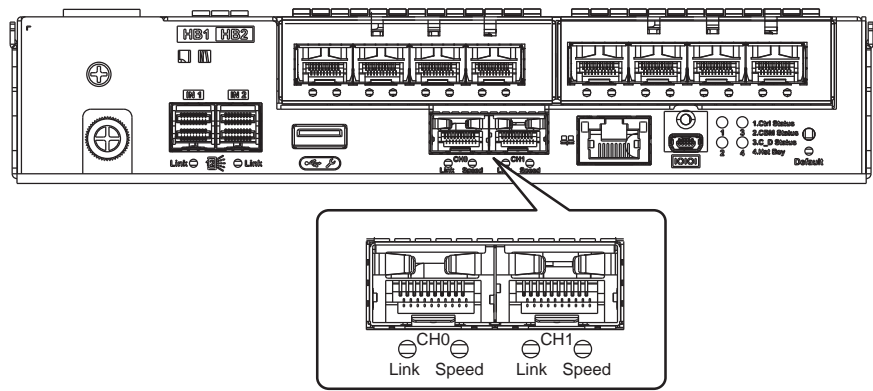
Number	LED Name	Color/Status	Description
1	Speed		1Gb connection is established.
		OFF	10/100Mb connection is established.
2	Link/Active		A connection is established.
			Data I/O is ongoing.
		OFF	No connection is established.





3.2.7 Onboard 12Gb/s SAS Expansion Port LEDs



LED Name	Color/Status	Description
Link/Active		All 4 PHY links are validly linked.
		Less than 4 PHY links are connected (at least one of the PHYs has failed).
	OFF	All 4 PHY links are offline.

3.2.8 Onboard 25GbE Port (SFP28) LEDs

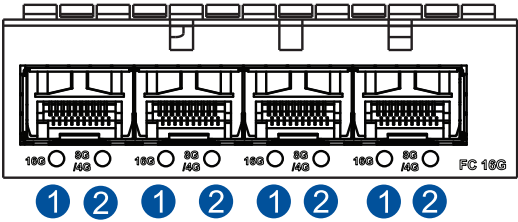


LED Name	Color/Status	Description
Link/Active		A connection is established.
		Data I/O is ongoing.
	OFF	No connection is established.
Speed		25Gb connection is established.
		10Gb connection is established.
	OFF	No connection is established.

NOTE: Onboard 25GbE ports are present on selected models only.

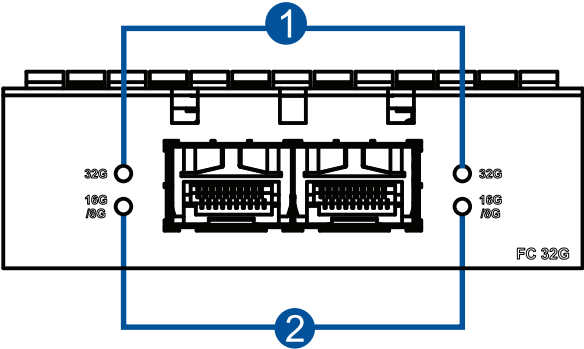
3.2.9 Host Board LEDs

- 16Gb/s Fiber Channel Host Board LEDs



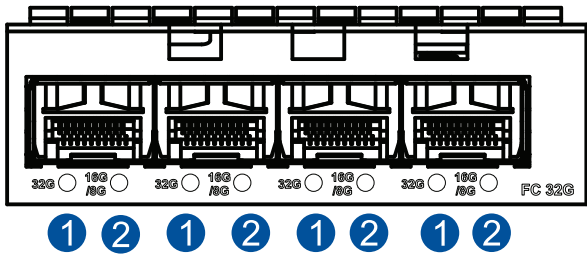
Number	LED Name	Color/ Status	Description
1	16Gb/s Speed		A connection is established.
		(fast)	Data I/O is ongoing.
		(slow)	No link/connection is established.
2	8Gb/s Speed		A connection is established.
		(fast)	Data I/O is ongoing.
		(slow)	No link/connection is established.
	4Gb/s Speed		A connection is established.
		(fast)	Data I/O is ongoing.
		(slow)	No link/connection is established.

- 32Gb/s x2 Fiber Channel Host Board LEDs



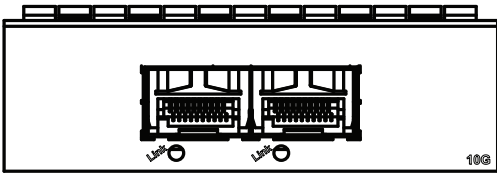
Number	LED Name	Color/ Status	Description
1	32Gb/s Speed		A connection is established.
		(fast)	Data I/O is ongoing.
		(slow)	No link/connection is established.
2	16Gb/s Speed		A connection is established.
			Data I/O is ongoing.
		OFF	No link/connection is established.
	8Gb/s Speed		A connection is established.
			Data I/O is ongoing.
		OFF	No link/connection is established.

- 32Gb/s x4 Fiber Channel Host Board LEDs



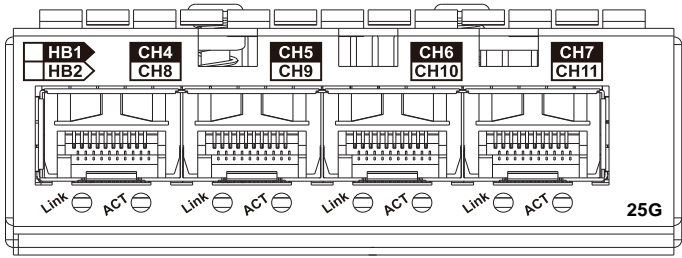
Number	LED Name	Color/Status	Description
1	32Gb/s Speed		A connection is established.
		(fast)	Data I/O is ongoing.
		(slow)	No link/connection is established.
2	16Gb/s Speed		A connection is established.
		(fast)	Data I/O is ongoing.
		(slow)	No link/connection is established.
	8Gb/s Speed		A connection is established.
		(fast)	Data I/O is ongoing.
		(slow)	No link/connection is established.

• 10GbE Host Board (SFP+) LEDs



LED Name	Color/Status	Description
Link/Active		A connection is established.
		Data I/O is ongoing.
	OFF	No connection is established.

• 25GbE x4 Host Board Port LEDs

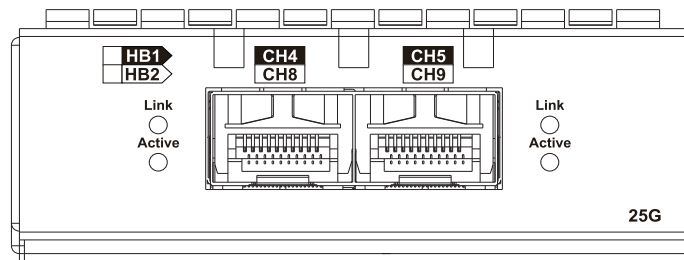




LED name	Color/Status	Description
Link		25Gb/s connection is established.
		10Gb/s or 10Gb/s connection is established.
	OFF	No connection is established.
Active		Data I/O is ongoing.
	OFF	No data I/O.

IMPORTANT! For a 25GbE x4 host board, all ports on the same host board must be set to the same channel type (block-level or file-level).

- **25GbE x2 Host Board (SFP28) LEDs***

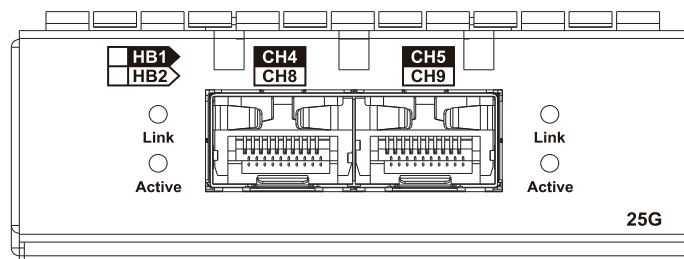
Part number: PSRES25G1HIO2






LED name	Color/Status	Description
Link		25Gb/s connection is established.
	OFF	<ul style="list-style-type: none"> • 10Gb/s or 1Gb/s connection is established (when Active = blinking amber). • No connection is established (when Active = OFF).
Active		Data I/O is ongoing.
	OFF	No data I/O.

- **25GbE x2 Host Board (SFP28) LEDs**

Part number: PSRES25G3HIO2

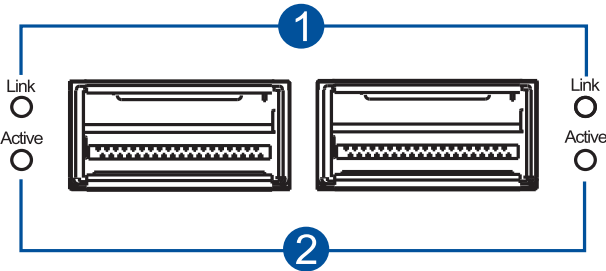





LED name	Color/Status	Description
Link		25Gb/s connection is established.
		10Gb/s or 10Gb/s connection is established.
	OFF	No connection is established (when Active = OFF).
Active		Data I/O is ongoing.
	OFF	No data I/O.

NOTE:

- For a 25GbE x2 host board, both ports on the same host board must be set to the same channel type (block-level or file-level).
- There are two types of 25GbE x2 host boards. Refer to the pictures and part numbers above to identify your host board.
- 25GbE x2 host board with P/N PSRES25G1HIO2 has been discontinued (EOL).

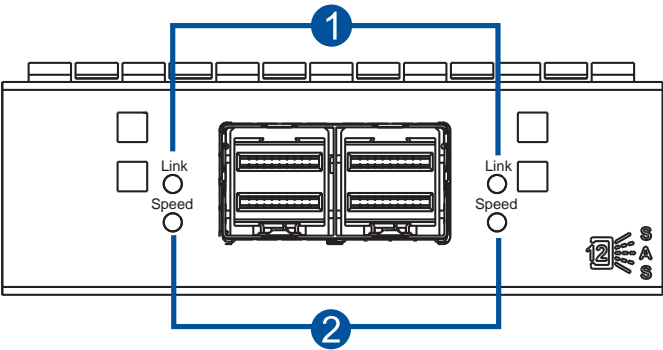
- 100GbE (QSFP28) Host Board Port LEDs






Number	LED Name	Color/Status	Description
1	Link		100Gb connection is established.
			50/25/10/1Gb connection is established.
		OFF	No connection is established.
2	Active		Data I/O is ongoing.
		OFF	No data I/O.

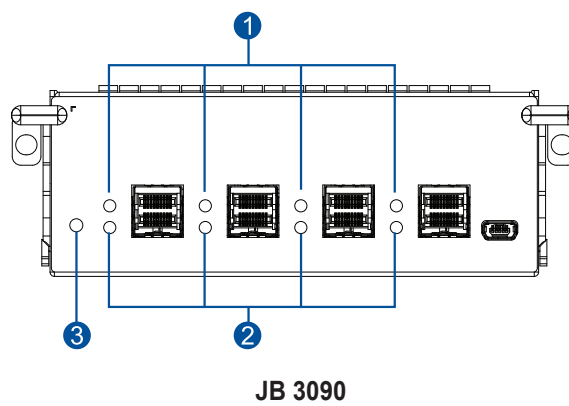
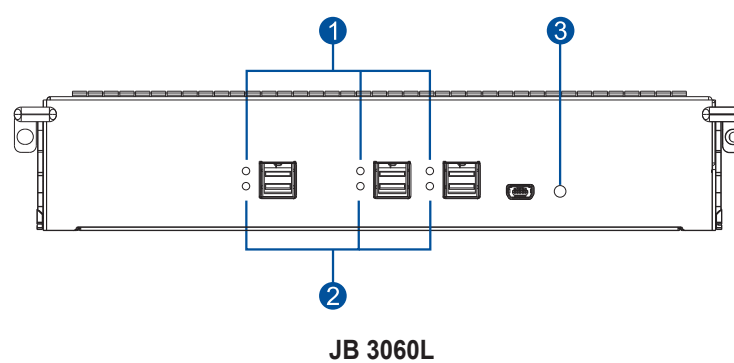
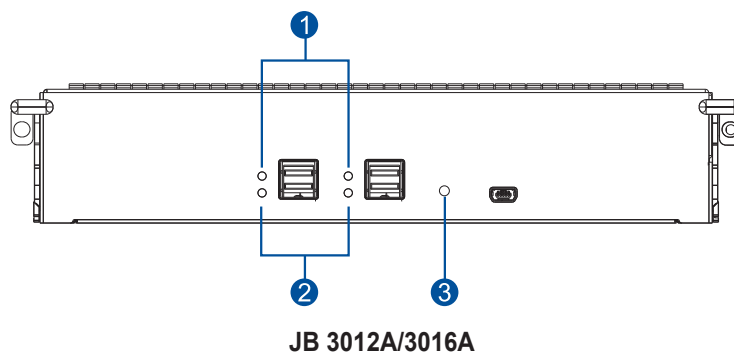
IMPORTANT! For a 100GbE x2 host board, both ports on the same host board must be set to the same channel type (block-level or file-level).







- 12Gb/s SAS Host/Expansion Board LEDs



Number	LED Name	Color/Status	Description
1	Link		A connection is established.
		OFF	No connection is established.
2	Speed		12Gb connection is established.
			6Gb connection is established.
		OFF	No connection is established.

3.2.10 JBOD 12Gb/s SAS Expansion Controller LEDs



Number	LED Name	Color/Status	Description
1	Link		All PHYs are validly linked.
			One of the PHYs has failed.
		OFF	All PHYs are offline.
2	Speed		12Gb/s link speed
			6Gb/s or 3Gb/s link speed
		OFF	No connection
3	Controller Status		The controller is operating normally.
			<ul style="list-style-type: none"> A component failure occurred. Initialization is ongoing.

3.3 Alarms and I²C Bus

This section details the system alarms and I²C bus.

Audible Alarms

You will hear an audible alarm if any of the following components fails:

- Cooling modules
- PSU modules
- Drives
- Sensors or presence detection circuitries

If you hear an audible alarm, ensure to read the error message on the terminal or EonOne screen to determine the cause of the alarm. Take appropriate actions to solve the problem. You can turn off the alarm using the mute button on the front panel.

NOTE: When the temperature exceeds the preset threshold, the controller's charger circuits stop charging. You will receive a messages that says *Thermal Shutdown/Enter Sleep Mode*. When the temperature falls back to normal range, the super capacitor resumes charging.

I²C bus

The operating status of the PSU and cooling fan modules are collected via the I2C serial bus. If either of the modules fails, the system detects the failure and you will be notified via the same methods as stated in the section on audible alarms.

System Maintenance

4

This chapter provides maintenance and replacement procedures of replaceable components of your system.

4.1 Replaceable Components

The following components are replaceable on your system:

- PSU/cooling module
- Fan module
- Controller module
- Memory module
- Host board
- Super capacitor
- HDD/SSD

WARNING!

- DO NOT remove a defective component from the system until you have the replacement on hand. Doing so may disrupt the internal airflow.
 - Consult with qualified engineers who are familiar with the system to recommend component replacements.
 - DO NOT use excessive force when installing a replaceable module. Forced installation of the module can damage the connector pins of the system, the module, or the internal backplane.
-

4.2 Replacing a PSU Module

Replace a defective PSU module immediately, but only if you have the replacement.

WARNING! Although the system can still operate with a defective PSU, it is not recommended that you use it for an extended period of time.

IMPORTANT! For single-controller systems, you must shut down your system before replacing a PSU module.

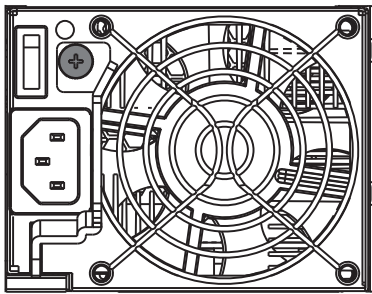
4.2.1 Replacing a PSU for 12-bay, 16-bay, and 24-bay Models

1. Shut down the system, turn off the PSU, and then unplug the power cord.

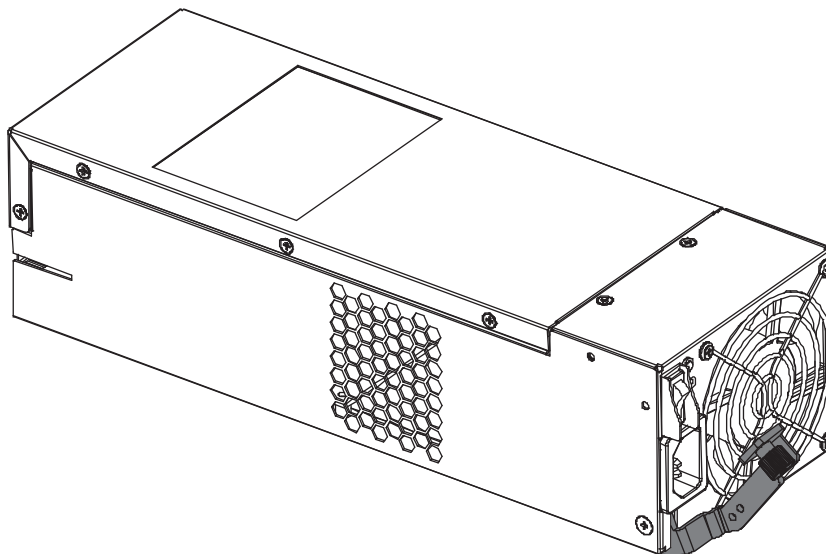


CAUTION! Disconnect all power sources to avoid shock hazards.

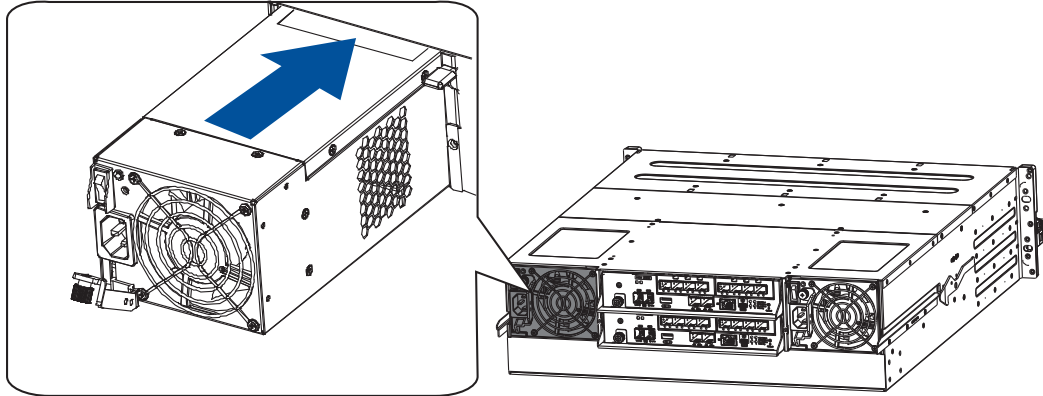
2. Loosen the retention screw that secures the extraction lever to the chassis.



3. Pull down the extraction lever to dislodge the PSU module from the backplane connectors, and then gently pull the PSU module from the system. If the system is mounted to the rackmount, carefully support its weight with the rack while removing the module.



4. Insert the replacement PSU module with the extraction lever pointing outwards, and then push it into the chassis. When you feel a resistance, push the extraction lever to lodge the PSU module to the backend connectors.



5. Secure the PSU to the systems using the retention screw that you removed in step 2.
6. Reconnect the power cord.
7. Power on the PSU module.

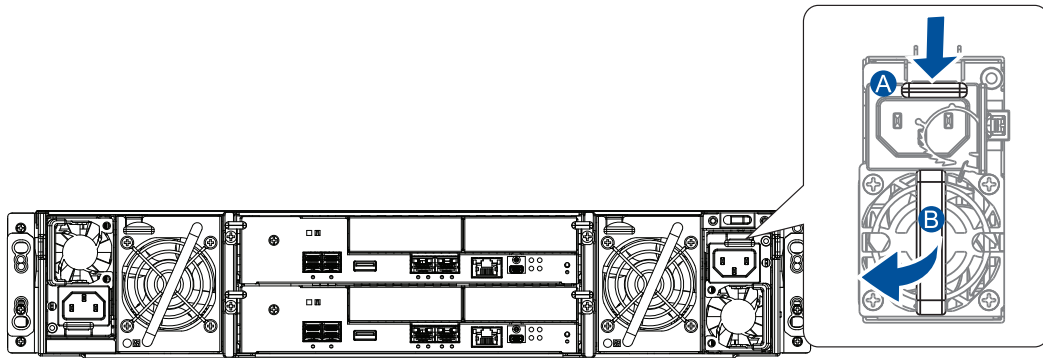
4.2.2 Replacing a PSU for 12-bay Models (EU Version)

1. Shut down the system, and then unplug the power cord.

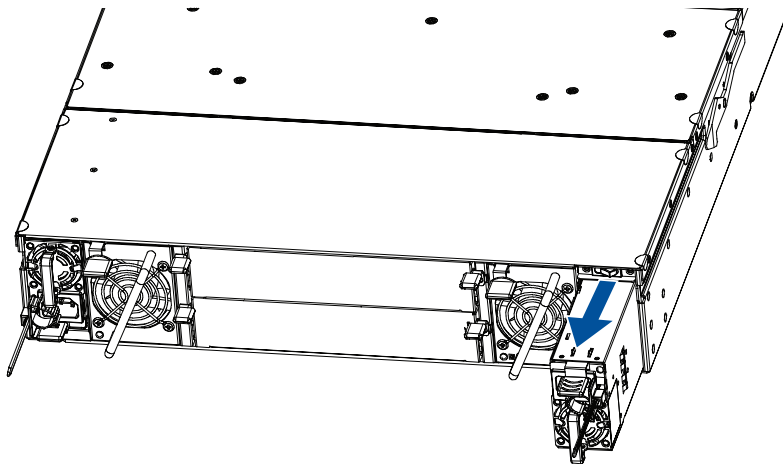


CAUTION! Disconnect all power sources to avoid shock hazards.

2. Press the PSU's retention lever towards the power socket (A), and then pull out the extraction handle (B).



3. Hold the extraction handle, and then pull gently to remove the PSU from the system.



NOTE: The illustration is for reference only.

4. Insert the replacement PSU into the enclosure and push it gently. When you feel a resistance, push the module to lodge it to the backend connectors. Once lodged, the retention lever clicks back into place.
5. Reconnect the power cord.
6. Turn on the system.

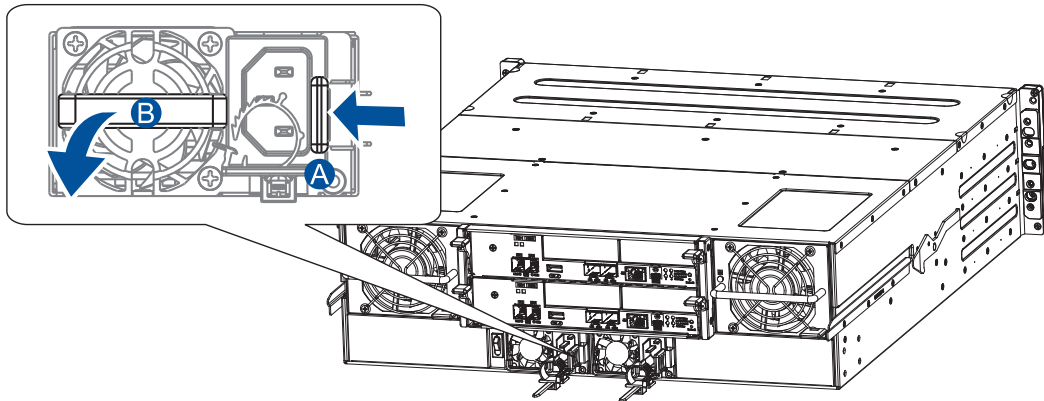
4.2.3 Replacing a PSU for 16-bay and 24-bay Models (EU Version)

1. Shut down the system, and then unplug the power cord.

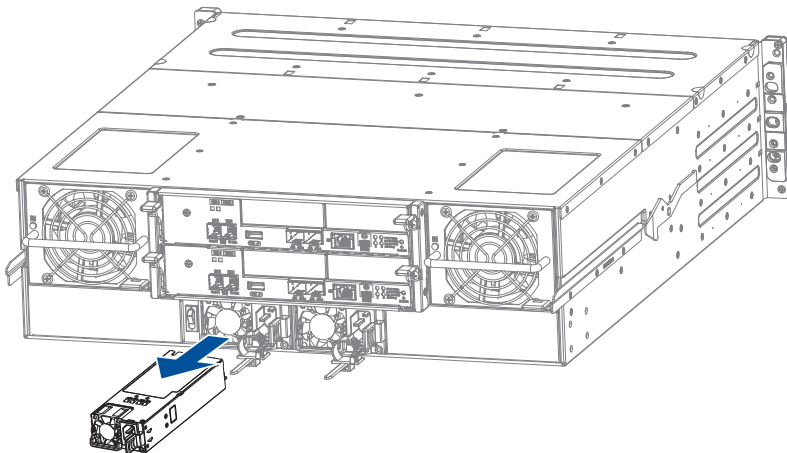


CAUTION! Disconnect all power sources to avoid shock hazards.

2. Press the PSU's retention lever towards the power socket (A), and then pull out the extraction handle (B).



3. Hold the extraction handle then pull gently to remove the PSU from the system.



4. Insert the replacement PSU into the enclosure and push it gently. When you feel a resistance, push the module to lodge it to the backend connectors. Once lodged, the retention lever clicks back into place.
5. Reconnect the power cord.
6. Turn on the system.

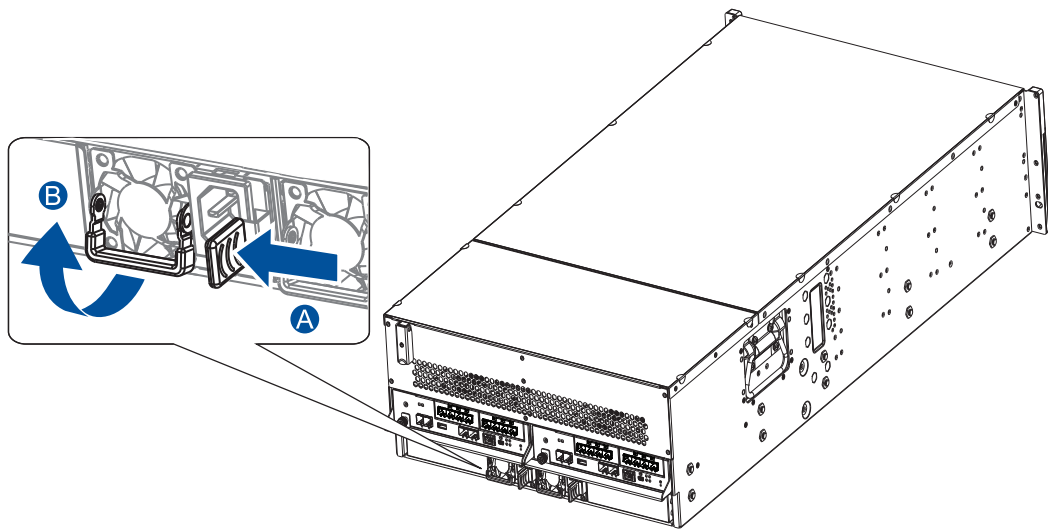
4.2.4 Replacing a PSU for 40-bay and 60-bay Models

1. Shut down the system, and then unplug the power cord.

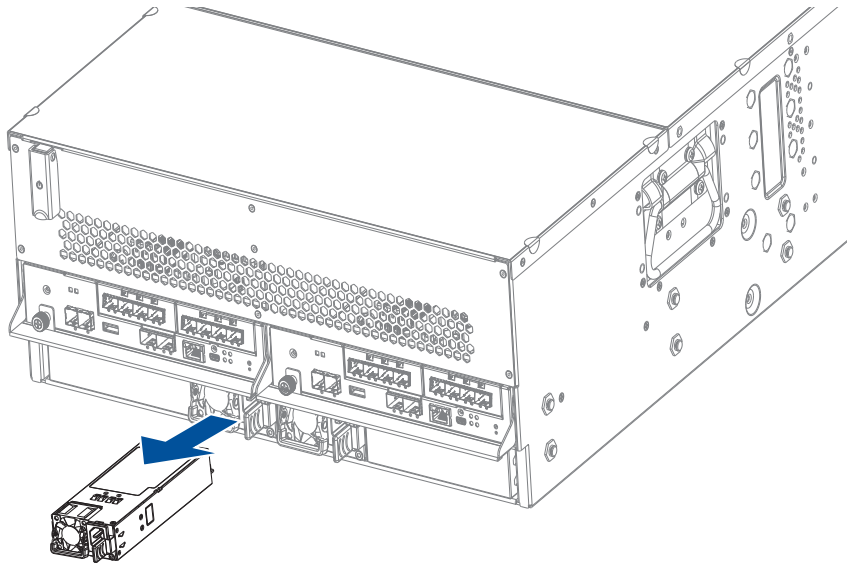


CAUTION! Disconnect all power sources to avoid shock hazards.

2. Press the PSU's retention lever towards the power socket (A), and then pull out the extraction handle (B).



3. Hold the extraction handle then pull gently to remove the PSU from the system.



4. Insert the replacement PSU into the enclosure and push it gently. When you feel a resistance, push the module to lodge it to the backend connectors. Once lodged, the retention lever clicks back into place.
5. Reconnect the power cord.
6. Turn on the system.

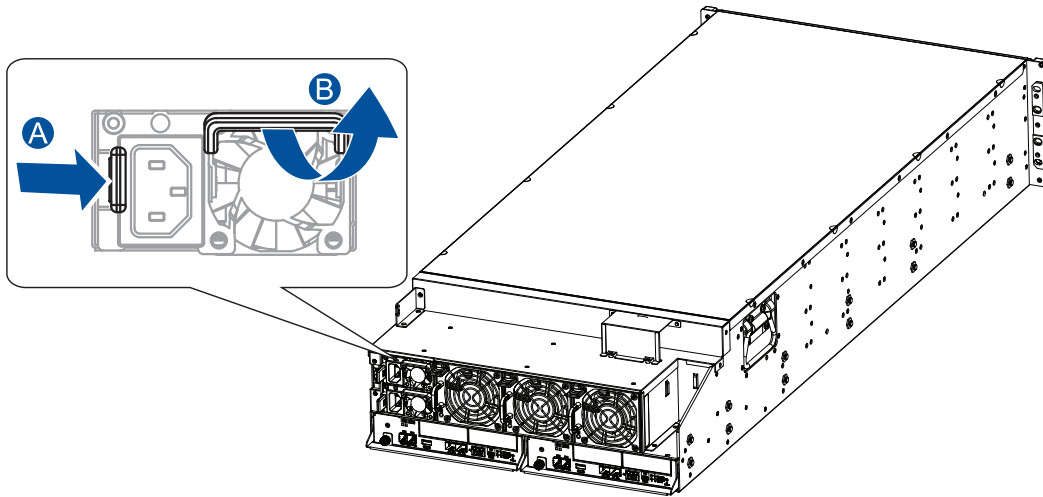
4.2.5 Replacing a PSU for 90-bay Models

1. Shut down the system, and then unplug the power cord.

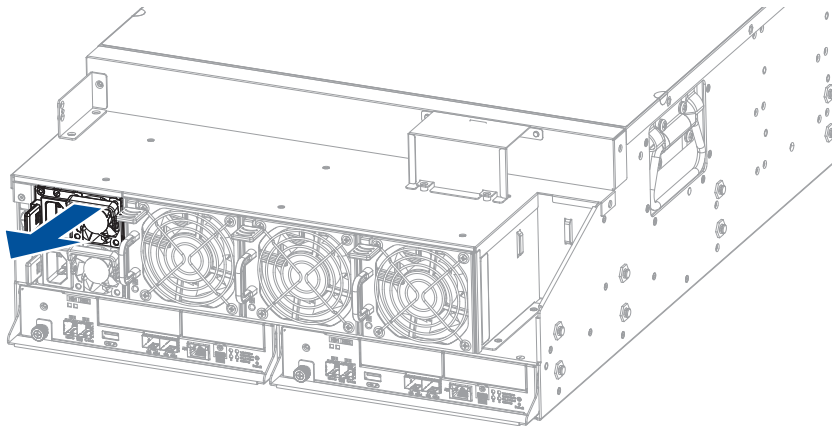


CAUTION! Disconnect all power sources to avoid shock hazards.

2. Press the PSU's retention lever towards the power socket (A), and then pull out the extraction handle (B).



3. Hold the extraction handle then pull gently to remove the PSU from the system.



4. Insert the replacement PSU into the enclosure and push it gently. When you feel a resistance, push the module to lodge it to the backend connectors. Once lodged, the retention lever clicks back into place.
5. Reconnect the power cord.
6. Turn on the system.

4.3 Replacing a Fan Module

WARNING!

- Only qualified personnel are allowed to replace fan modules to avoid damage and injuries.
- Replace a faulty fan only when you have the replacement fan on hand.

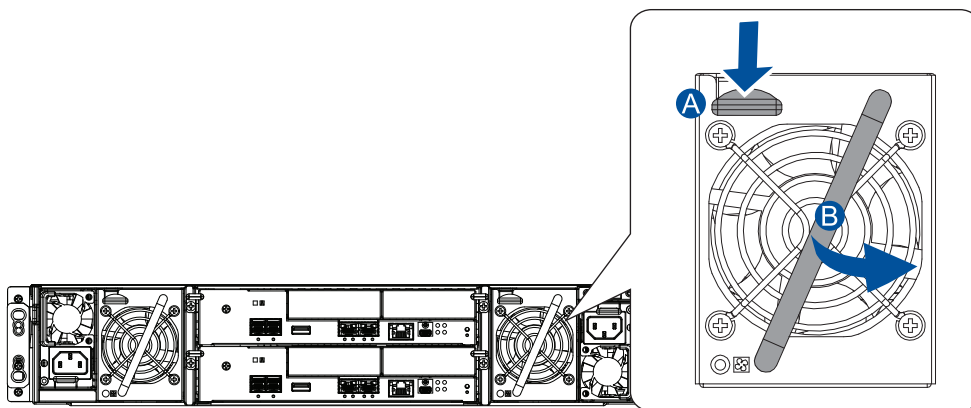
4.3.1 Replacing a Fan Module for 12-bay Models (EU Version)

1. Shut down the system, and then unplug the power cords.

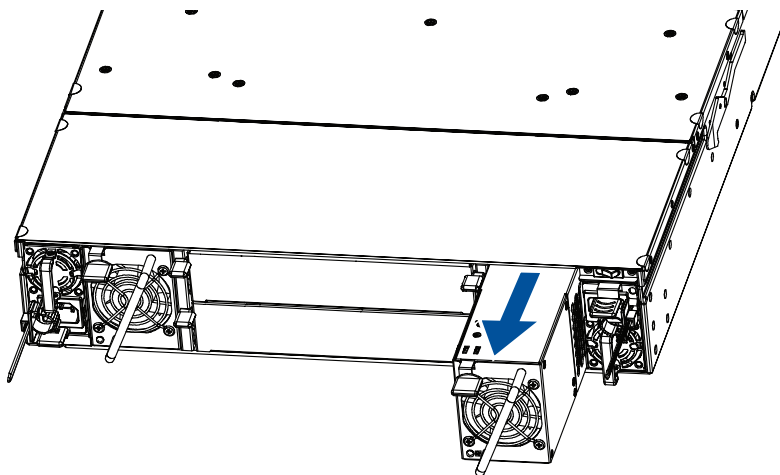


CAUTION! Disconnect all power sources to avoid shock hazards.

2. Press the fan module's retention lever downwards (A), and then pull out the extraction handle (B).



3. Hold the extraction handle, and then pull gently to remove the fan module from the system.



NOTE: The illustration is for reference only.

4. Insert the replacement fan module into the enclosure and push it gently. When you feel a resistance, push the module to lodge it to the backend connectors.
5. Connect the power cords.
6. Turn on the system.

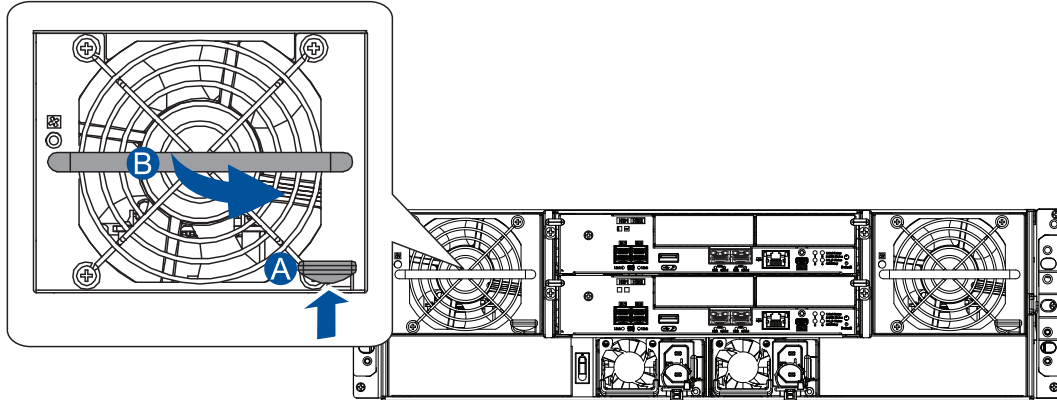
4.3.2 Replacing a Fan Module for 16-bay and 24-bay Models (EU Version)

1. Shut down the system, and then unplug the power cords.

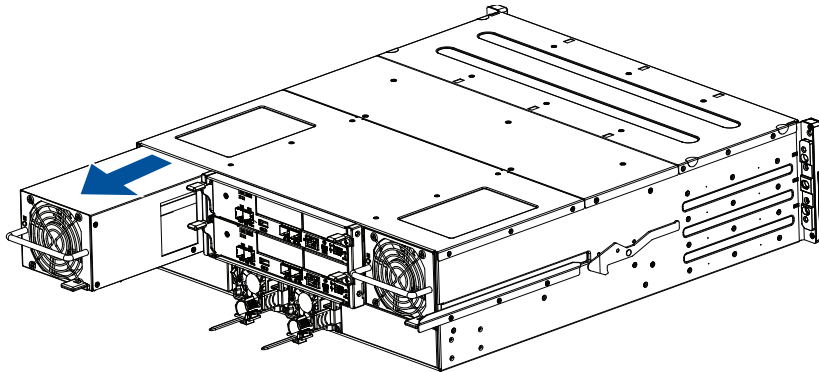


CAUTION! Disconnect all power sources to avoid shock hazards.

2. Press the fan module's retention lever upwards (A), and then pull out the extraction handle (B).



3. Hold the extraction handle, and then pull gently to remove the fan module from the system.



4. Insert the replacement fan module into the enclosure and push it gently. When you feel a resistance, push the module to lodge it to the backend connectors.
5. Connect the power cords.
6. Turn on the system.

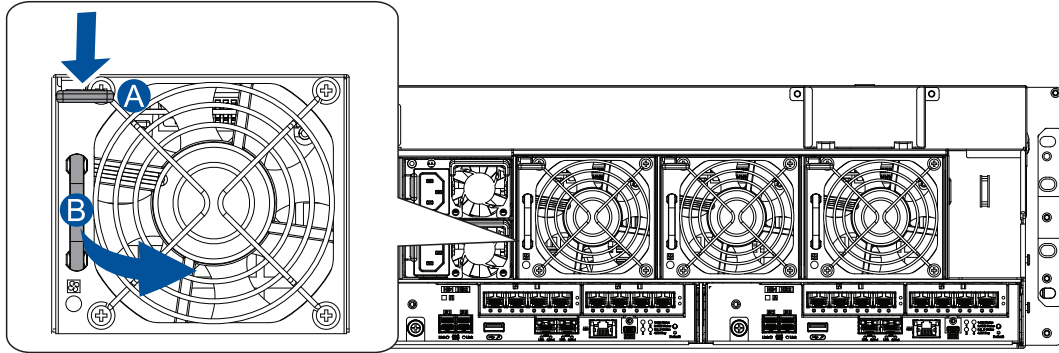
4.3.3 Replacing a Fan Module for 90-bay Models

1. Shut down the system, and then unplug the power cords.

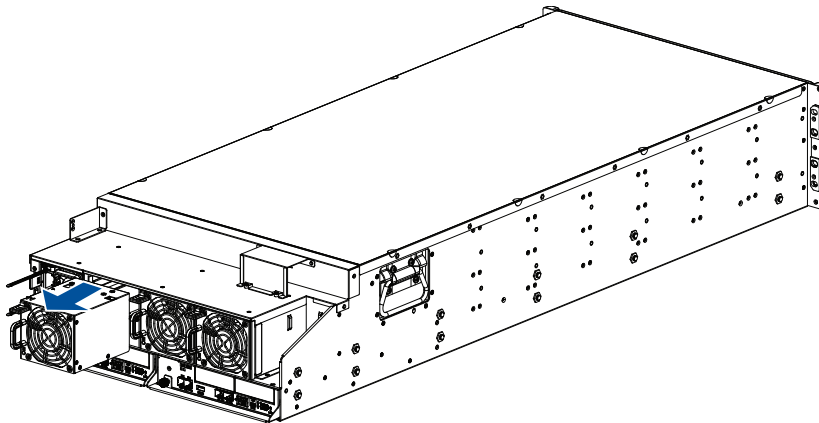


CAUTION! Disconnect all power sources to avoid shock hazards.

2. Press the fan module's retention lever downwards (A), and then pull out the extraction handle (B).



3. Hold the extraction handle, and then pull gently to remove the fan module from the system.



4. Insert the replacement fan module into the enclosure and push it gently. When you feel a resistance, push the module to lodge it to the backend connectors.
5. Connect the power cords.
6. Turn on the system.

4.3.4 Replacing the Cooling Module for 40-bay and 60-bay Models

1. Shut down the system, and then unplug the power cords.



CAUTION! Disconnect all power sources to avoid shock hazards.

2. Remove the front cover and the top cover from the enclosure.

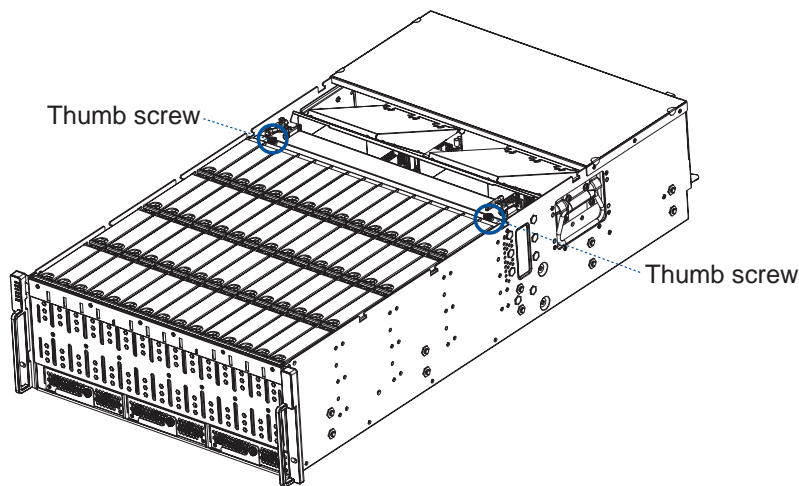
NOTE:

- For 40-bay models, refer to **Installing a Drive into the Enclosure for 40-bay Models** for details.
- For 60-bay models, refer to **Installing a Drive into the Enclosure for 60-bay Models** for details.

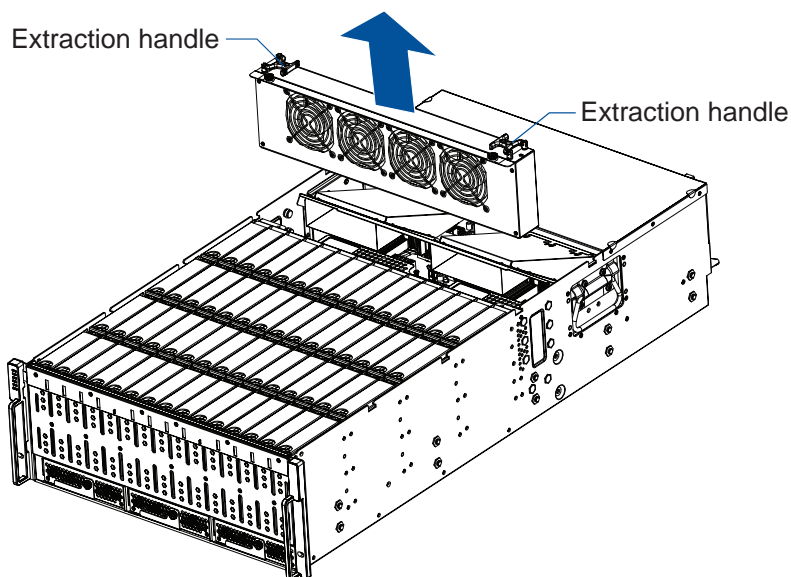
3. Remove the cooling module from the enclosure.

- **Type I Cooling Module (with Extraction Handles)**

- a. Loosen the thumb screws that secure the cooling module to the enclosure.



- b. Hold the extraction handles to pull out the cooling module from the enclosure.



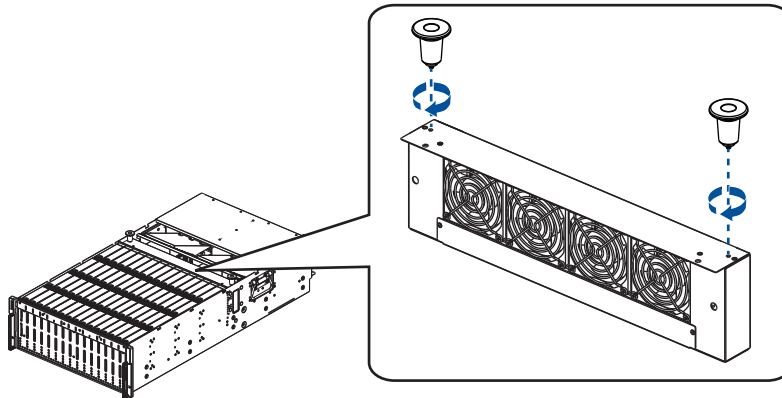
- **Type II Cooling Module (Without Extraction Handles)**

- a. Take out the two extraction screws from the FRU package.

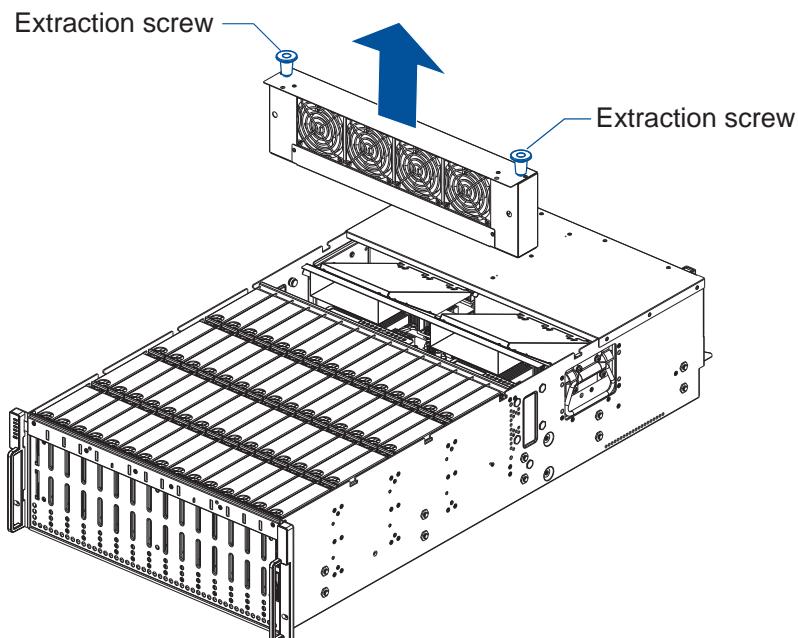


NOTE: The extraction screws are included in the FRU package, not in the original system package.

- b. Insert the extraction screws into the holes on the top of the cooling module, as shown below.



- c. Hold the extraction screws to pull out the cooling module from the enclosure.



(See next page)

4. Insert the replacement cooling module into the enclosure.
 - **Type I Cooling Module:** Hold the cooling module by the extraction handles. Once the cooling module has been installed into the enclosure, tighten the thumb screws to secure the cooling module in place.
 - **Type II Cooling Module:** Insert the extraction screws into the holes of the cooling module, then and hole the cooling module by the extraction screws. Once the cooling module has been installed into the enclosure, remove the extraction screws.
5. Put the top cover back, fasten the two screws to secure the top cover, and then put the front cover back.
6. Connect the power cords.
7. Turn on the system.

4.4 Replacing a Controller Module

Replace a controller module only when you have the replacement on hand.

WARNING! DO NOT use controller modules from different models. Each controller module has a unique ID which is applied to the host port names.

Checking the Firmware Version

Before replacing a controller, ensure that the replacement controller and the present controller have the same version of firmware.

- Replacement controller: Check the firmware version on the label of the packaging.
- Present controller: Log in to EonOne, go to **Settings > Update & security > Firmware update**, and check the current firmware version.

IMPORTANT! When removing/installing both controllers simultaneously in a dual-controller system, ensure that you shut down the applications and the system.

Replacing a Controller

1. Prepare a clean, static-free work pad or container to place the controller.
2. To replace the controller in a single-controller system or both controllers simultaneously in a dual-controller system, shut the system down. From EonOne, go to **Main Menu > System Functions > Shutdown controller** function to stop all I/O access to the system and ensure all cached data have been distributed to the drives. Press the power switches / power button to turn off the system, and unplug the power cords from the PSUs.

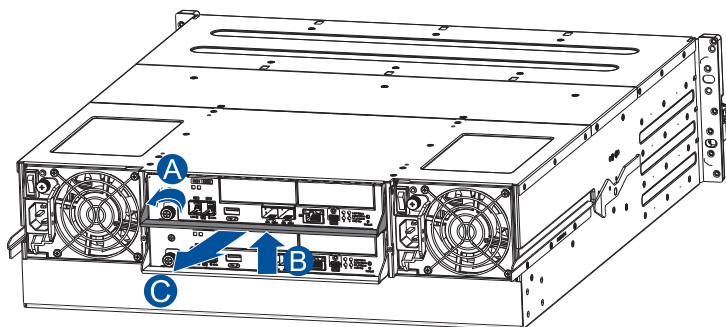


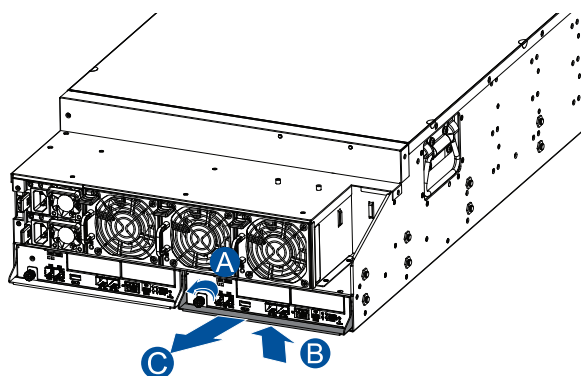
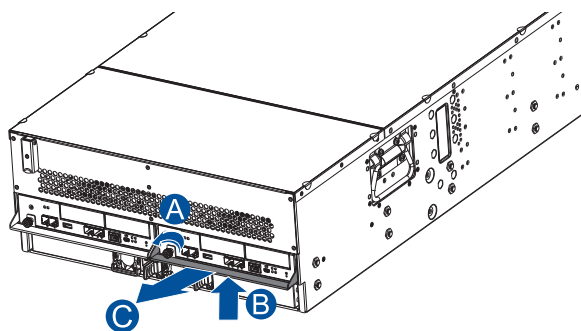
CAUTION! Disconnect all power sources to avoid shock hazards.

3. Disconnect all cables from the controller that you want to replace.
4. Remove the controller module from the enclosure.

- **Global Version**

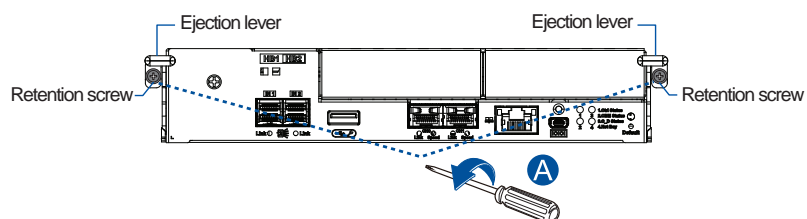
Loosen the thumb screw that secures the controller module (A). Push the handle upwards first (B), and then pull it out to remove the controller module from the enclosure (C).



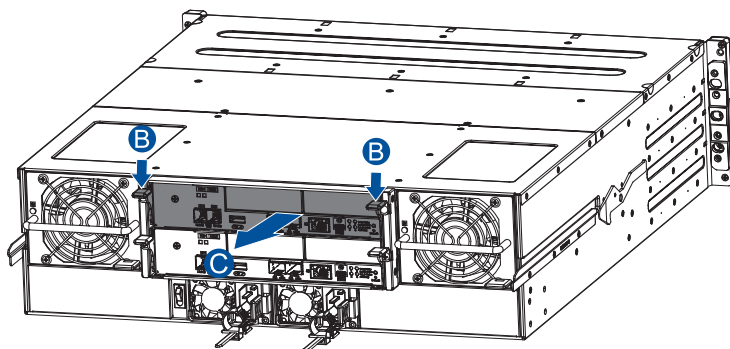


- **12-bay, 16-bay, and 24-bay Models (EU Version)**

Remove the retention screws below the controller module's ejection levers (A).



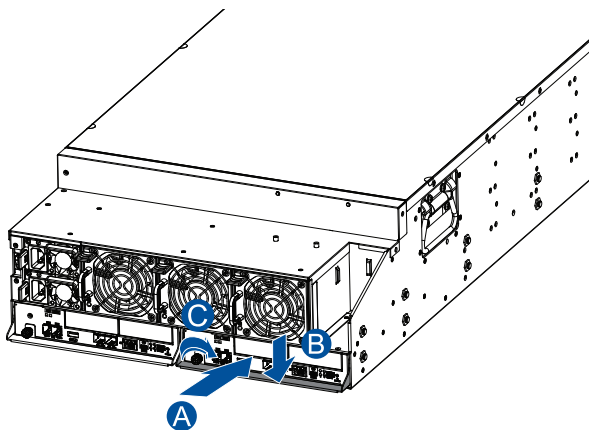
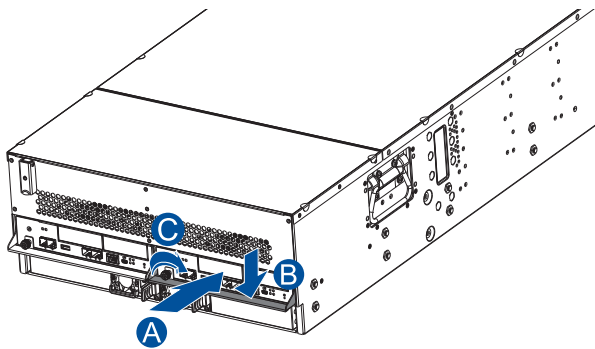
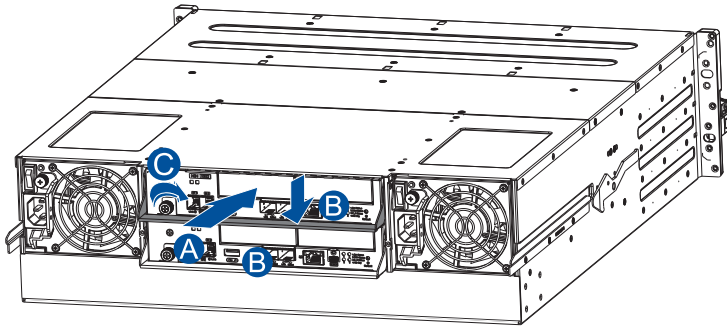
Push the ejection levers downwards to dislodge the controller (B), and then pull to remove the controller from the enclosure (C).



5. Install the replacement controller back into the enclosure.

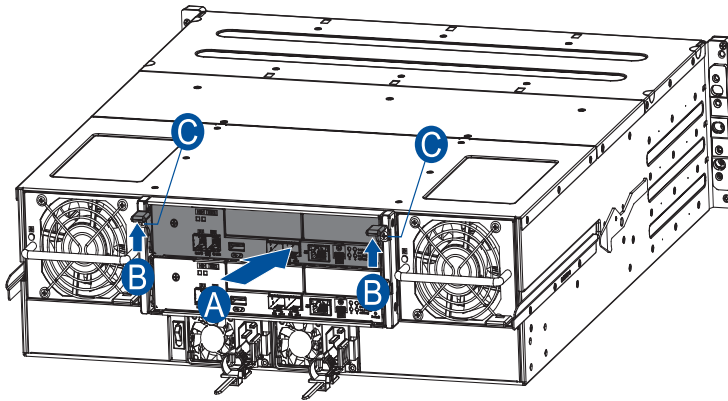
- **Global Version**

Insert the replacement controller carefully into the module slot (A). When it is fully inserted, push the handle downwards (B), and tighten the thumb screw to secure the controller into the chassis (C).



- **12-bay, 16-bay, and 24-bay Models (EU Version)**

Insert the replacement controller into the module slot (A). When you feel a contact resistance, use a small but careful force to push the ejection levers upwards (B). Then secure the controller with the retention screws.



6. Reconnect the cables to the controller's ports.
7. For replacing a controller in a single-controller system or both controllers simultaneously in a dual-controller system, power up the system. Check the messages on the system's EonOne or firmware utility. The power LEDs turn on when the system is successfully initiated online.

NOTE: Once the replacement controller becomes active online, the control status LED lights up in green. Refer to the rear panel LED descriptions in **3.2.3 Controller LEDs** for details.

8. For replacing a controller in a single-controller system or both controllers simultaneously in a dual-controller system, restore NVRAM data. From your firmware, look for **Restore NVRAM from Disks** or **Restore NVRAM from Files** to restore your previous ID/LUN mapping configuration.

4.5 Replacing/Installing a Memory Module

The controller comes with pre-installed DRAM modules. You can upgrade or replace them when the modules malfunction.

IMPORTANT!

- We strongly recommend NOT using a removed DRAM module from a failed controller of a different storage system.
 - Contact your system vendor to help you purchase the compatible DRAM modules.
 - When removing/installing a memory module in a single-controller system, ensure that you shut down the applications and the system.
-

NOTE: Refer to section **ESD Precautions** for safety information.

1. Identify the memory module you want to replace, and remove the controller from the enclosure. Refer to section **4.4 Replacing a Controller Module** for details.



CAUTION! Disconnect all power sources to avoid shock hazards.

2. Remove the super capacitor from the controller. See **Replacing a Super Capacitor** for details. Alternatively, wait for at least 30 seconds after the 7-segment LED in the controller turns OFF.

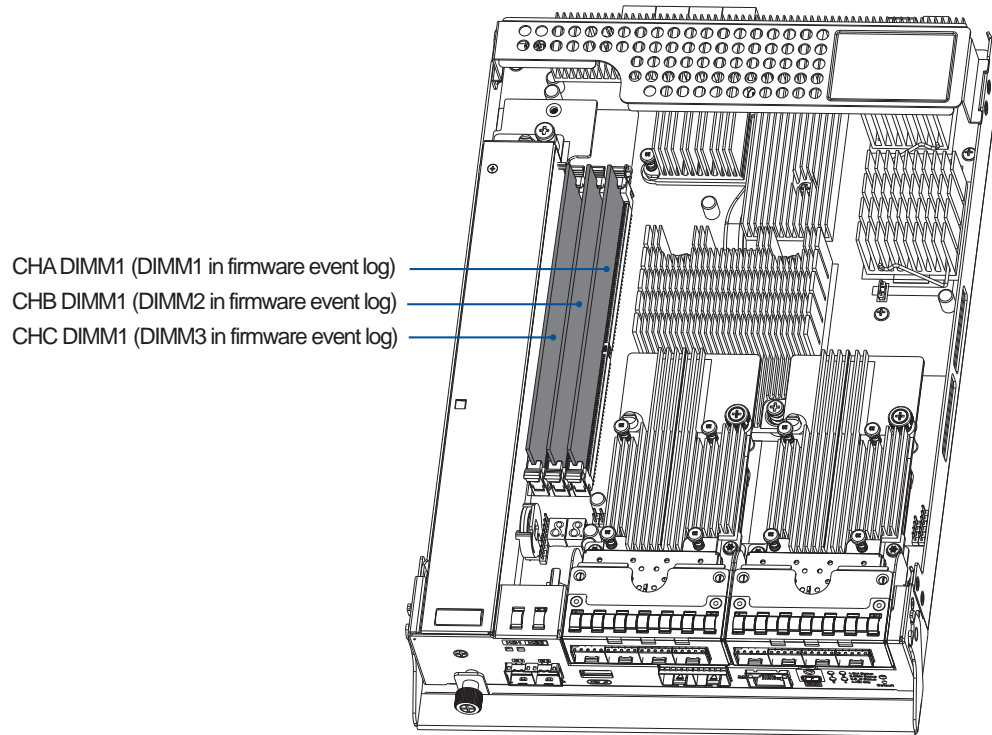


IMPORTANT! Ensure to follow this step; otherwise, the super capacitor may emit electricity, which can damage the DIMMs and host boards.

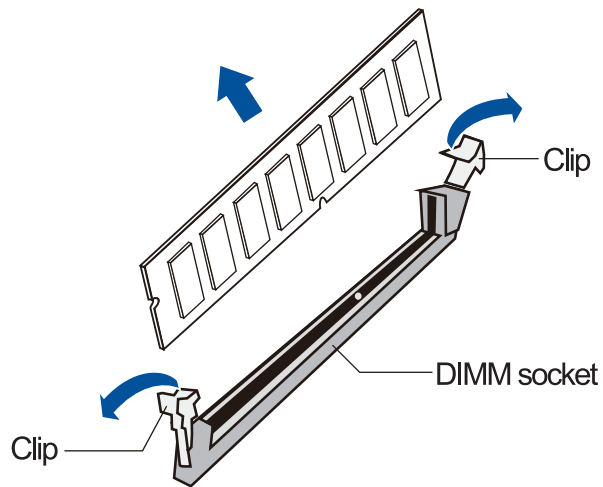
3. Locate the DIMM slots in the controller.

IMPORTANT!

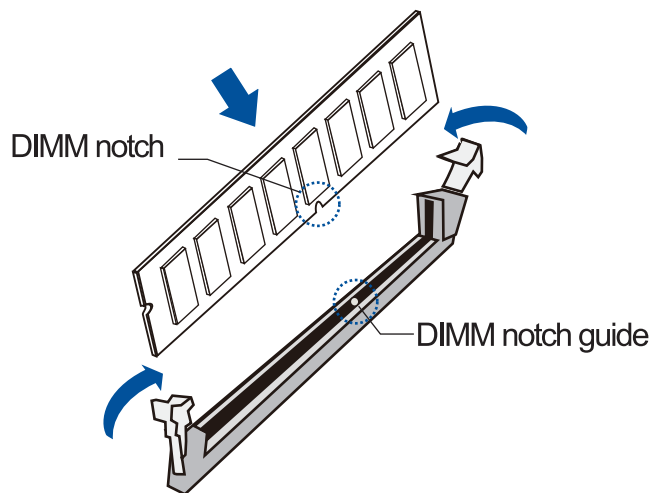
- CHA and CHB are the priority slots. If you install only two DIMMs, install them into these two slots first.
 - For supported memory configurations, refer to the **Host Board and Memory Guide** on PAC Storage's official website. Go to **Support > Technical Support**, find your model, and then go to **Downloads**.
-



4. Push down the clips to release the DIMM from the DIMM socket.



5. Insert the replacement DIMM carefully into the DIMM socket, with the DIMM's notch aligned to the DIMM socket's notch guide.



6. Reinstall the super capacitor back to the controller if you have removed it in step 2. See **Replacing a Super Capacitor** for details.
7. Reinstall the controller back to the enclosure.

4.6 Replacing a Host Board / Expansion Board

IMPORTANT!

- The new host board and the present one must be of the same type.
- A controller/host board downtime may occur if you replace a host board for an upgrade.
- The firmware automatically restores the system to its factory settings when adding or replacing a host board.

1. Identify the host board you want to replace, and remove the controller from the enclosure. Refer to section **4.4 Replacing a Controller Module** for details.



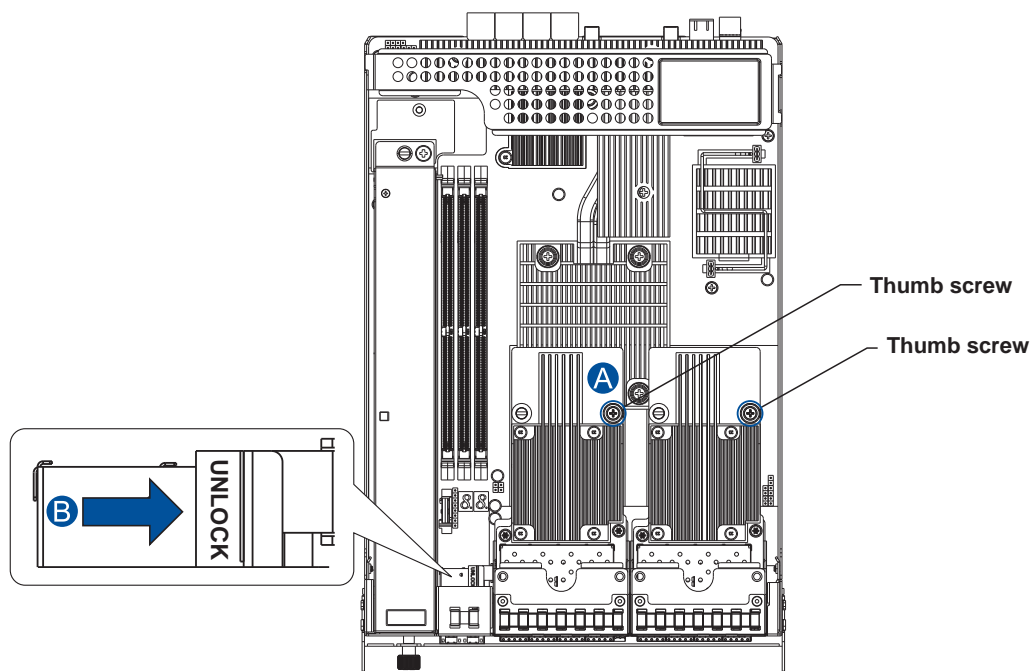
CAUTION! Disconnect all power sources to avoid shock hazards.

2. Remove the super capacitor from the controller. See **Replacing a Super Capacitor** for details. Alternatively, wait for at least 30 seconds after the 7-segment LED in the controller turns OFF.

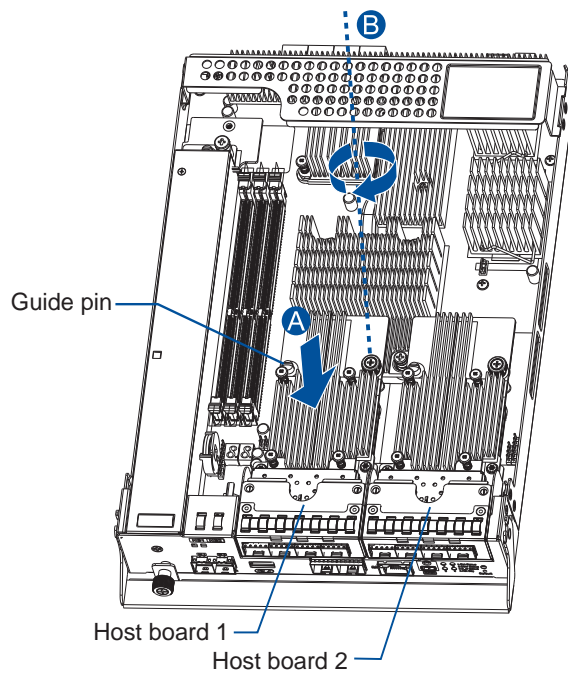


IMPORTANT! Ensure to follow this step; otherwise, the super capacitor may emit electricity, which can damage the DIMMs and host boards.

3. Loosen the thumb screw that secures the host board to the controller (A), push the release lever to the right to unlock the host board bracket (B), and then lift to remove the host board.



4. Use the guide pin to position the new host board to the host board slot. Place it carefully (A), and then tighten the thumb screw to secure the host board in place (B).



5. Reinstall the super capacitor back to the controller if you have removed it in step 2. See **Replacing a Super Capacitor** for details.
6. Reinstall the controller back to the enclosure.

4.7 Replacing a Super Capacitor

A super capacitor allows your controller to provide power during a power outage, supporting the controller to save the data to the flash backup module.

WARNING! Ensure that you have the replacement on hand before replacing your current super capacitor.

Super Capacitor Fault Conditions and Precautions

If a super capacitor leaks, gives off bad odor, generates abnormal amount of heat, becomes discolored or deformed, or appears abnormal when charging or storing, remove it from the system immediately.

These issues may be due to the following:

- The temperature sensor on the system's charger circuit reports a temperature that exceeds the preset threshold. The charger circuit enters to a low power and self-protection state.
- A super capacitor module has been charged for more than 10 minutes. When this occurs, the charger enters a timer fault state. Charging resumes automatically after you remove or reinstall the super capacitor, or after you reset the system.

When reinstalling/replacing the super capacitor, remember these precautions:

- ONLY use a replacement super capacitor supplied by an authorized distributor. Use of other capacitors voids your system's warranty.
- ONLY dispose your used/defective super capacitor at an authorized battery disposal sites.
- DO NOT place the super capacitor near a heat source.
- DO NOT immerse/submerge the super capacitor in water or other liquids.
- DO NOT disassemble or modify the super capacitor.
- DO NOT pierce, strike, throw, or exert pressure on the super capacitor.

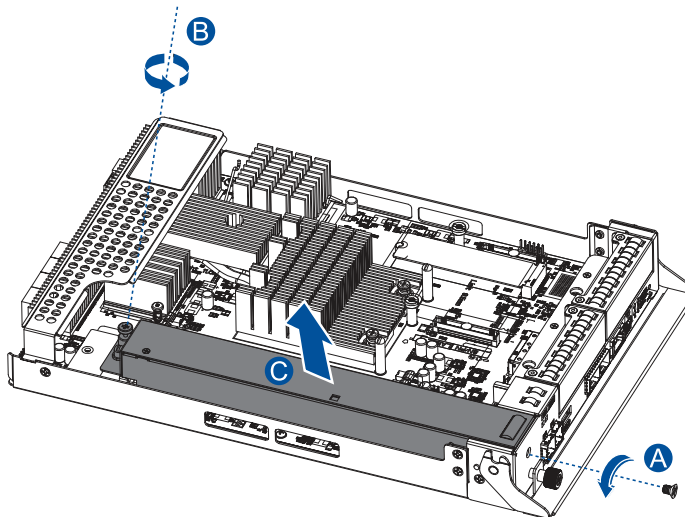
Replacing a Super Capacitor

1. Identify the super capacitor you want to replace, and remove the controller from the enclosure. Refer to section **4.4 Replacing a Controller Module** for details.

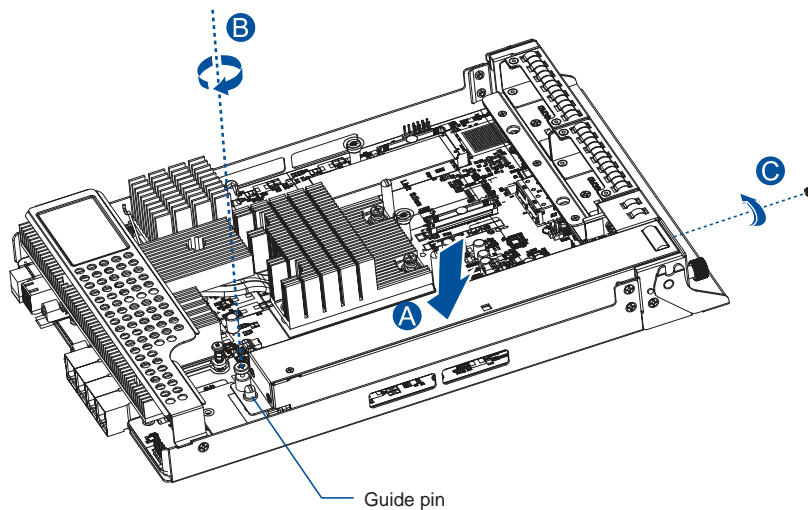


CAUTION! Disconnect all power sources to avoid shock hazards.

2. Remove the screw that secures the super capacitor to the controller (A). Loosen the screw that secures the super capacitor to the main board (B), and then grab the super capacitor by the middle to pull it out of the controller carefully (C).



3. Use the guide pin to position the new super capacitor to controller. Place it carefully (A), tighten the screw to secure it to the main board (B), and then tighten the screw you removed in step 2 to secure it to the controller (C).



4. Reinstall the controller back to the enclosure.

4.8 Replacing a Drive

WARNING!

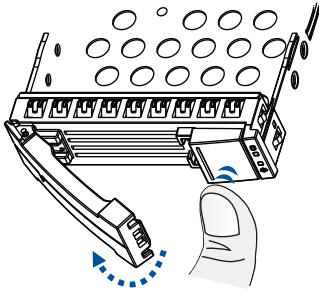
- Ensure to have the replacement ready before replacing a drive. DO NOT leave the drive tray open for long periods to prevent disruption of internal airflow.
- Handle the drives with extreme care. Hold them by the edges and avoid touching the circuits and interface connectors.

4.8.1 Replacing a Drive for 12-bay, 16-bay, and 24-bay Models

1. Identify the faulty drive using the drive tray LEDs or EonOne.

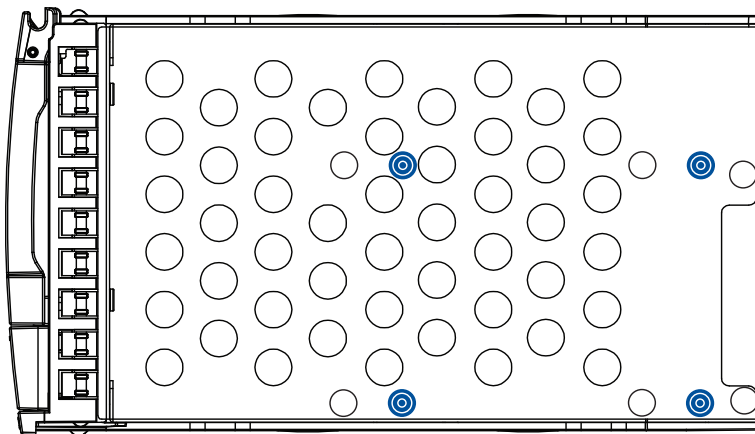
NOTE: See **Drive Numbering** in section 2.3.2 for the order of the drive bays.

2. When the faulty drive is located, push the release button to eject the drive tray, wait for 30 seconds for the drive to spin down, and then pull out the tray by holding the spring handle.



3. Remove the retention screws from the drive tray to dislodge the drive.

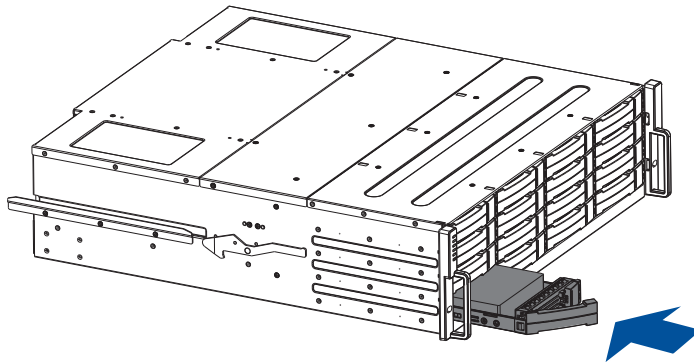
Screw holes for 2.5" HDD/SSD



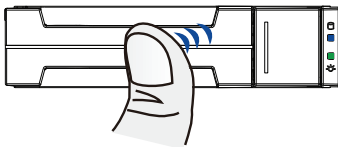
Screw holes for 3.5" HDD



4. Install the replacement drive into the drive tray, and then insert the assembled drive and drive tray into the bay with the spring handle open.



5. Close the spring handle when the drive is fully inserted into the drive bay.



IMPORTANT! Ensure that there is no more drive error reported in EonOne or the terminal.

4.8.2 Replacing a Drive for 40-bay, 60-bay, and 90-bay Models

Replacing a Drive in a 3.5" HDD Tray

1. Identify the faulty drive using the EonOne software.

NOTE:

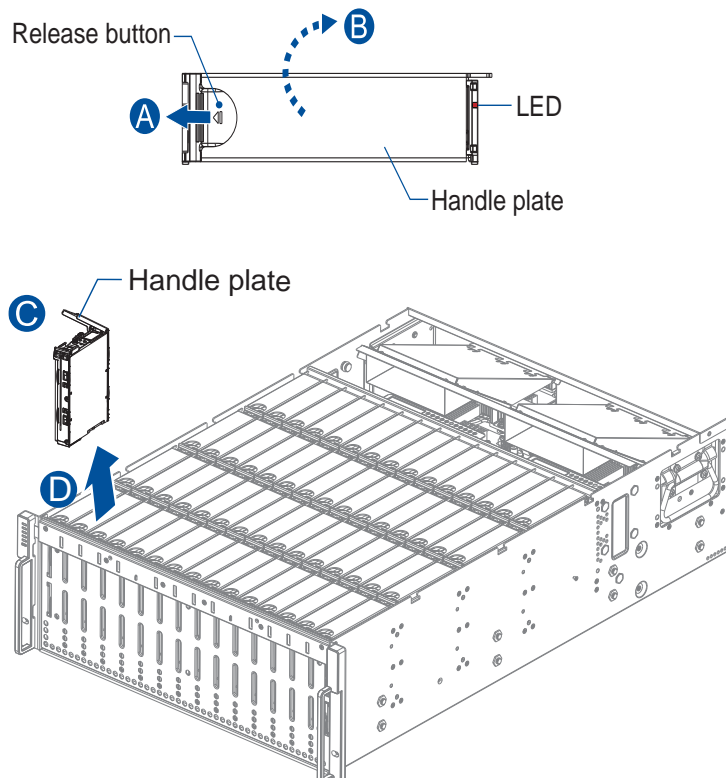
- For 40-bay models, refer to section 2.3.3 for the order of the drive bays.
 - For 60-bay models, refer to section 2.3.4 for the order of the drive bays.
 - For 90-bay models, refer to section 2.3.5 for the order of the drive bays.
-

2. Remove the front cover and top cover from the enclosure.

NOTE:

- For 40-bay models, refer to **Installing a Drive into the Enclosure for 40-bay Models** for details.
 - For 60-bay models, refer to **Installing a Drive into the Enclosure for 60-bay Models** for details.
 - For 90-bay models, refer to **Installing a Drive into the Enclosure for 90-bay Models** for details.
-

3. Locate the faulty drive with the LED lighting in red.
4. Remove the faulty drive from the enclosure.
 - a. Press the release button and push it in the direction indicated by the arrow (A). The handle plate will then pop up (B).
 - b. Pull the handle plate (C) and remove the assembled drive and tray from the enclosure (D).



5. Take out the faulty drive from the drive tray, assemble the drive replacement into the tray, and then install the assembly back into the system.

NOTE: See sections 2.3.3, 2.3.4, and 2.3.5 to complete drive replacement.

IMPORTANT! Ensure that there is no more drive error reported in EonOne or the terminal.

Replacing a Drive in a 2.5" NVMe SSD Tray (for 90-bay NVMe SSD Cache Models)

1. Identify the faulty drive using the EonOne software.

NOTE: See the drive numbering in section 2.3.5 for the order of the drive bays.

2. Remove the front cover and top cover from the enclosure.

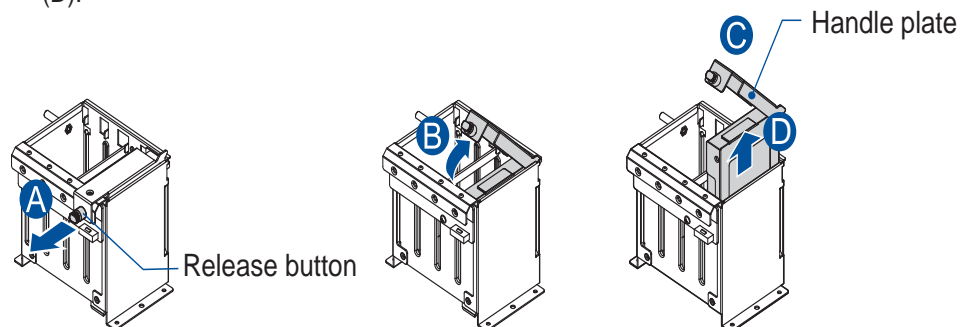
NOTE: Refer to **Installing a Drive into the Enclosure for 90-bay Models** for details.

- .3. Locate the faulty drive with the LED lighting in red.

4. Remove the faulty drive from the enclosure.

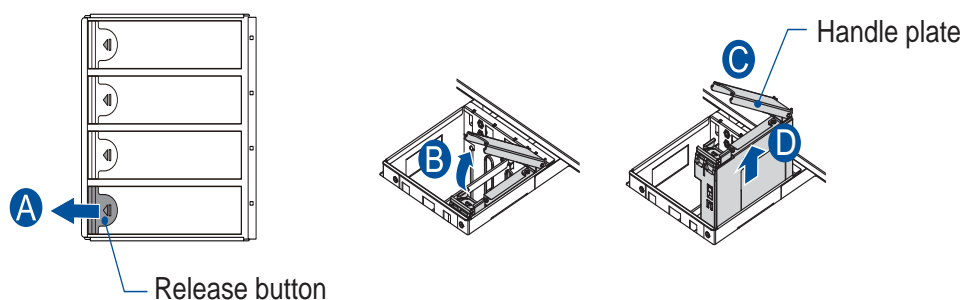
- **Type I**

- a. Pull the release button out (A) and lift it up (B).
- b. Then pull up the handle plate (C) and remove the assembled drive and tray from the enclosure (D).



- **Type II**

Press the release button and push it in the direction indicated by the arrow (A). The handle plate will then pop up (B). Then pull up the handle plate (C) and remove the assembled drive and tray from the enclosure (D).



(See next page)

5. Take out the faulty drive from the drive tray, assemble the drive replacement into the tray, and then install the assembly back into the system.

NOTE: See section 2.3.5 to complete drive replacement.

IMPORTANT! Ensure that there is no more drive error reported in EonOne or the terminal.

4.9 Restoring Default Settings

4.9.1 Restoring System Default Settings

You may need to restore the system to default settings in the following cases:

- When you need to create a new cluster to replace the current one.

IMPORTANT: Restoring the system to default settings is a last-resort function. All configurations will be erased.

To restore an appliance to default settings:

1. Stop all host IOs.
2. Shut down the appliance system from EonOne.
3. Once the appliance shuts down, press the power buttons at the rear panel to turn off the system.
4. Press and hold the Restore Default button on the controller with a sharp object (e.g. a straightened paperclip).
5. While holding the Restore Default button, press the power buttons to turn on the system.
6. Keep holding the Restore Default button for about one minute. Release the button when the Restore Default LED is lit in green with a beep from the buzzer (if not muted).

NOTE: See 1.4.1 **Controller Module Interfaces** for the location of the Restore Default button and the Restore Default LED.

4.9.2 Restoring the Password

In case you lose or forget the password for the administrator account, you can restore the password to access the storage system without affecting cluster configurations.

To restore the password:

1. While the system is operating, press and hold the Restore Default button on the controller with a sharp object (e.g. a straightened paperclip).
2. Keep holding the Restore Default button for about six seconds. Release the button when the Restore Default LED is lit in green with a beep from the buzzer (if not muted).
3. Wait for EonOne to redirect to the login page. The password will be restored to the default password (*admin*).

NOTE: See 1.4.1 **Controller Module Interfaces** for the location of the Restore Default button and the Restore Default LED.

Appendices



Certifications

Summary

Safety	UL 62368 BSMI CNS 15598-1 CB IEC 62368
EMC	CE EN 55032 / EN61000-3-2 / EN 61000-3-3 / EN 55035 BSMI (CNS 15936) FCC (FCC Part 15, subpart B)
Others	ISO 9001/14001 RoHS

User Warning

This is Class A Information Technology product which may cause radio frequency interference when used in a residential area, in which case the user will be required to take certain appropriate measures/troubleshooting.

警告

為避免電磁干擾，本產品不應安裝或用於居住環境。

UL Caution, Safety, and Warning Markings

SAFETY STOP - DO NOT ALTER	DISPOSITIF DE SÛRETÉ – NE PAS MODIFIER
CAUTION: This product is combustible. A protective barrier or thermal barrier is required as specified in the appropriate building code	ATTENTION: Ce produit est combustible. Une barrière de protection ou une barrière thermique est exigée par le code du bâtiment en vigueur.
WARNING – Interconnection of more than one power supply source to a section of grid rail bus may present a fire hazard.	AVERTISSEMENT – Interconnexion de plus d'une source d'alimentation à une section de bus sur rail grille peut présenter un risque d'incendie.
DANGER – RADIATION	DANGER – RAYONNEMENT