

# EonStor DS 3000 Series Hardware Manual

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## Safety precaution

Read these instructions carefully before you install, operate, or transport the Infortrend 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 40°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 that 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 ensure 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.

### **Important notice**

The use of Infortrend certified components is strongly recommended to ensure compatibility, quality, and normal operation with your Infortrend products. Please contact your distributor for a list of Infortrend 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.

### **About this manual**

The manual introduces hardware components of EonStor DS 3000 storage systems and expansion enclosures. It also describes how to install, monitor, and maintain them.

- For non-serviceable components, please contact our support sites.
- Firmware operation: Consult the Firmware User Manual on the CD-ROM.
- EonOne software: Consult the EonOne User Manual on the CD-ROM.



## Revision history

| Version | Date           | Description   |
|---------|----------------|---|
| 1.0     | September 2015 | Initial release   |
| 1.1     | January 2014   | Added 3024B series (2.5" form factor)                                       |
| 1.2     | October 2014   | Added 12 Gbps host port LED definition                                      |
| 1.3     | June 2017      | Added 3000U series<br>Wording fixes   |
| 1.4     | June 2018      | Fixed cabling connection of 3000U series<br>Removed all "unified" instances |



## Hardware specifications

### Specification summary

|                                 |   |
|---------------------------------|---|
| <b>Form factor</b>              | <ul style="list-style-type: none"> <li>- 2U 12-bay EonStor DS 3012U</li> <li>- 2U 24-bay EonStor DS 3024UB</li> <li>- 3U 16-bay EonStor DS 3016U</li> <li>- 4U 24-bay EonStor DS 3024U</li> </ul>   |
| <b>Controller</b>               | Dual redundant controllers  |
| <b>Cache memory</b>             | <ul style="list-style-type: none"> <li>- 8 GB DDR4 (2 x 4 GB)</li> <li>- 16 GB DDR4 (4 x 4 GB)</li> <li>- 32 GB DDR4 (4 x 8 GB)</li> <li>- 64 GB DDR4 (4 x 16 GB)</li> <li>- 128 GB DDR4 (4 x 32 GB)</li> </ul> <p><b>Note: The installed default memory varies by model, region, and other factors. Contact your local sales representative for details.</b></p>   |
| <b>Host ports</b>               | <p><b>Onboard Gb/s ports:</b></p> <ul style="list-style-type: none"> <li>- 8 x 1 Gb/s iSCSI ports (4 per controller)</li> </ul> <p><b>More host options:</b></p> <ul style="list-style-type: none"> <li>- 16 x 16 Gb/s Fibre Channel ports (8 per controller)*</li> <li>- 16 x 8 Gb/s Fibre Channel ports (8 per controller)*</li> <li>- 16 x 10 Gb/s iSCSI ports/ SFP+ (8 per controller)</li> <li>- 8 x 10 Gb/s iSCSI ports/ RJ-45 (4 per controller)</li> <li>- 8 x 12 Gb/s SAS ports (4 per controller)</li> <li>- 16 x 10 Gb/s FCoE ports (8 per controller)</li> <li>- 8 x 56Gb/s Infiniband ports (4 per controller)**</li> </ul> <p><b>More host options:***</b></p> <ul style="list-style-type: none"> <li>- 4 or 8 x 10 Gb/s iSCSI ports/ SFP+ and four 16 Gb/s Fibre Channel ports</li> <li>- 4 or 8 x 10 Gb/s iSCSI ports/ SFP+ and eight 8 Gb/s Fibre Channel ports</li> </ul> <p>* Supports point-to-point and switch modes<br/> ** For Linux only<br/> *** Host boards 1 and 2</p> |
| <b>Cache backup technique</b>   | BBU + Flash module  |
| <b>Drive connectivity</b>       | 12 Gb/s SAS connectivity  |
| <b>Maximum number of drives</b> | <p><b>DS 3012U</b></p> <ul style="list-style-type: none"> <li>- System: 12</li> <li>- Expansion: 432</li> </ul> <p><b>DS 3024UB</b></p> <ul style="list-style-type: none"> <li>- System: 24</li> <li>- Expansion: 444</li> </ul> <p><b>DS 3016U</b></p> <ul style="list-style-type: none"> <li>- System: 16</li> <li>- Expansion: 436</li> </ul> <p><b>DS 3024U</b></p> <ul style="list-style-type: none"> <li>- System: 24</li> <li>- Expansion: 444</li> </ul>  |

(see next page)



## Specification summary

|                                     |   |
|-------------------------------------|---|
| <b>Drive advanced features</b>      | S.M.A.R.T. support, automatic bad sector reassignment, dedicated bandwidth to each connected drive  |
| <b>Supported drives</b>             | 2.5-inch SAS SSD<br>2.5-inch SATA SSD*<br>2.5-inch 100000 RPM SAS HDD<br>3.5-inch 7200 RPM Nearline SAS HDD<br>3.5-inch 7200 RPM SATA HDD*<br>* MUX board is required when using SATA drives<br>NOTE: Refer to the Compatibility Matrix for the latest compatibility details.   |
| <b>RAID functionality</b>           | Global, dedicated, or enclosure hot spare<br>RAID level supported: 0, 1 (0 + 1), 3, 5, 6, 10, 30 60<br>Online expansion:<br>- Adding new drives<br>- Copying and replacing drives of larger capacity<br>RAID migration:<br>- Configurable stripe size and write policy per system<br>- Intelligent drive handling <ul style="list-style-type: none"> <li>• In degraded mode: skips irreparable blocks to continue rebuild</li> <li>• In normal operation: data-block verification and repair</li> </ul> |
| <b>Data service</b>                 | Thin provisioning<br>SED (self-encrypting drives)<br>SSD cache*<br>Automated storage tiering*<br>Remote replication*: Synchronous or asynchronous for both block level and file level<br>Location replication**: Snapshot, volume copy/mirror<br>* Optional<br>** Available with Standard license and optional Advanced license   |
| <b>Availability and reliability</b> | - Redundant, hot-swappable hardware modules<br>- CacheSafe technology<br>- Multipathing support (MPIO)<br>- Device mapper support   |
| <b>Management</b>                   | - Web-based SANWatch management software<br>- RS232 serial port for local access to firmware-embedded utility<br>- Automated cache flush and caching mode operation per enclosure status<br>- Telnet and SSH system monitoring via Ethernet<br>- Platform-independent firmware management GUI<br>- LCD keypad panel for monitoring and access all configuration options<br>- Module status LED indicators: component presence detection and thermal sensors via I2C bus                                 |

(see next page)



## Specification summary

|                             |  |
|-----------------------------|--|
| <b>OS support</b>           | <ul style="list-style-type: none"> <li>- Windows® Server 2008/R2*</li> <li>- Windows® Server 2012/R2*</li> <li>- Windows® Server 2016*</li> <li>- Red Hat® Enterprise Linux®</li> <li>- SUSE® Linux® Enterprise</li> <li>- Sun® Solaris™</li> <li>- MacOS® X</li> <li>- HP-UX</li> <li>- IBM® AIX®</li> <li>- VMware®</li> <li>- Citrix® XenServer®</li> <li>- OpenStack Cinder</li> </ul> <p><b>* Includes Hyper-V</b></p> <p><b>Note: Contact your local sales representative for the latest OS support details.</b></p>   |
| <b>Service and support</b>  | <p>Standard services:</p> <ul style="list-style-type: none"> <li>- 3-year limited hardware/software warranty</li> <li>- 8 x 5 phone, web, and email support</li> </ul> <p>Upgraded/extended services:</p> <ul style="list-style-type: none"> <li>- Replacement of part dispatch on the next business day (up to 5 years)</li> <li>- Advanced service of 24/7 phone, web, email support, and on site diagnostics on the next business day</li> <li>- Premium service of 24/7 phone, web, email support, and on site diagnostics in 4 hours</li> </ul> <p><b>Note: The upgraded/extended services are optional and vary by region.</b></p> |
| <b>Power</b>                | <ul style="list-style-type: none"> <li>- Power supply: 2 x Redundant/hot-swappable 460 W</li> <li>- AC voltage: 100 VAC @ 8A to 240 VAC @ 4A with PFC (auto-switching)</li> <li>- Frequency: 50 - 60 Hz</li> </ul>   |
| <b>Environment</b>          | <p><b>Temperature:</b></p> <ul style="list-style-type: none"> <li>- Operating: 0°C - 40°C without BBU/CBM, 0°C - 35°C with BBU/CBM</li> <li>- Non-operating: -40°C - 60°C</li> </ul> <p><b>Altitude:</b></p> <ul style="list-style-type: none"> <li>- Sea level to 3660 m (12,000 ft.) operating/sea level to 12,192 m (40,000 ft.) non-operating</li> <li>- Relative humidity: 5% - 95% non-condensing, operating and non-operating</li> </ul>  |
| <b>Regulations</b>          | <p>Safety: UL, BSMI, CB, EAC</p> <p>Electromagnetic compatibility: CE, BSMI, FCC, KC</p>   |
| <b>Weight (without HDD)</b> | <p><b>DS 3012U:</b> 13.60 kg/29.98 lbs</p> <p><b>DS 3024UB:</b> 19.58 kg/43.17 lbs</p> <p><b>DS 3016U:</b> 21.66 kg/47.75 lbs</p> <p><b>DS 3024U:</b> 27.44 kg/60.49 lbs</p>   |

(see next page)



## Specification summary

|                          |  |
|--------------------------|--|
| <b>Dimension</b>         | <b>DS 3012U:</b> 448 mm x 88 mm x 500 mm<br><b>DS 3024UB:</b> 448 mm x 88 mm x 500 mm<br><b>DS 3016U:</b> 448 mm x 130 mm x 500 mm<br><b>DS 3024U:</b> 448 mm x 175 mm x 500 mm<br><b>Notes:</b> <ul style="list-style-type: none"><li>• The dimensions do not include chassis ears/protrusions.</li><li>• The dimension order is W x H x D.</li></ul> |
| <b>Package dimension</b> | <b>DS 3012U:</b> 770 mm x 350 mm x 580 mm<br><b>DS 3024B:</b> 770 mm x 350 mm x 580 mm<br><b>DS 3016U:</b> 770 mm x 450 mm x 570 mm<br><b>DS 3024U:</b> 780 mm x 340 mm x 580 mm<br><b>Note:</b> The dimension order is W x H x D.   |
| <b>Regulation</b>        | Safety: UL, BSMI, CB, EAC<br>Electromagnetic compatibility: CE, BSMI, FCC, KC  |
| <b>Notification</b>      | Various event notification methods including email, LAN broadcast, fax, SNMP trap, and SMS.  |
| <b>Green design</b>      | 80 PLUS-certified power supplies delivering more than 80% energy efficiency<br>Intelligent multi-level drive spin-down   |

**NOTE:** For the expansion enclosures, please refer to the data sheet or download it from our [official website](#).

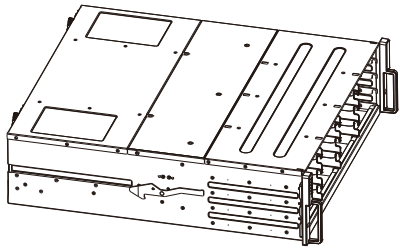


## Package contents

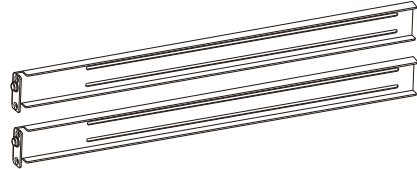
Check the unpacking list for the complete list of contents and exact quantity of the components of your system.

**NOTE:** The contents and quantity may vary depending on the system model and order requests.

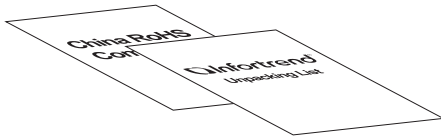
### System package



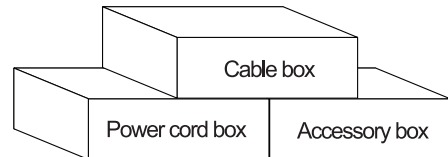
Enclosure chassis



Rackmount kit

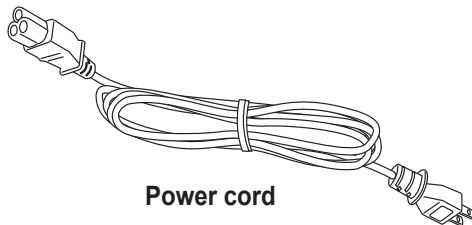


Unpacking list and China RoHS compliance documentation

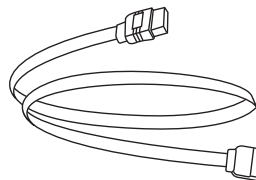


Power cord, cable, and accessory boxes

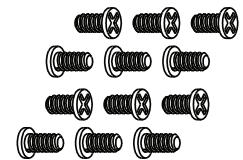
### Power cord, cable, and accessory boxes



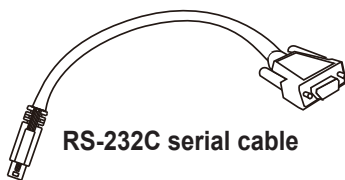
Power cord



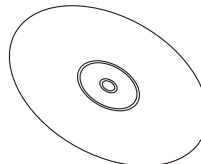
SAS cable



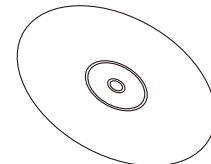
3.5-inch HDD screws  
2.5-inch HDD screws



RS-232C serial cable



Software CD



Product CD



Quick configuration guide

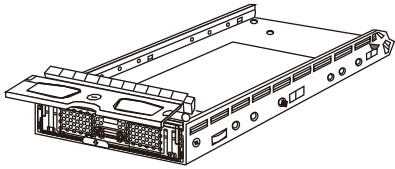


Quick installation guide

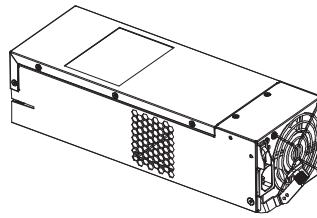




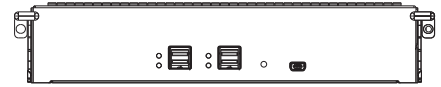
## Pre-installed components



HDD tray

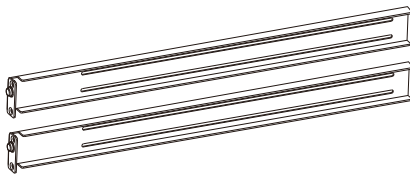


PSU/Cooling module

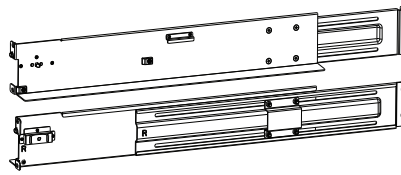


Controller module\*

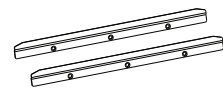
## Rackmount kit contents



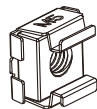
Rack ear mounting bracket for rack ear mount kit



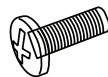
Slide rail mounting bracket for slide rail kit



Inner glides



M5 Cage nut



M5 Truss head screw



No 6-32 Hexagon washer screw



25.4 mm  
No. 10-32 screw



25 mm  
M6 screw



25 mm  
M5 screw

Mounting enclosure screws and nuts

# Product introduction

This chapter introduces the look and feel of EonStor DS 3000 systems, features, and the supported components.

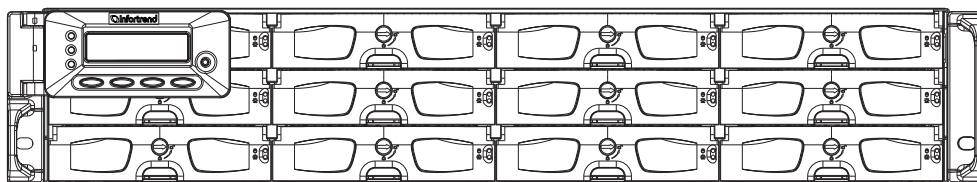
## 1.1 Overview

This manual introduces EonStor DS 3000 systems that support 12 Gbps SAS hard drives. The systems are designed to utilize 2.5-inch and 3.5-inch hard drives. Drive capacity can be expanded by attaching expansion hard drive enclosures.

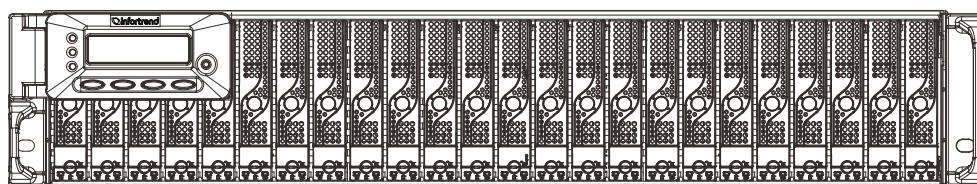
### 1.1.1 Model variations

The EonStor DS 3000 systems are available in a variety of form factors.

#### 2U systems

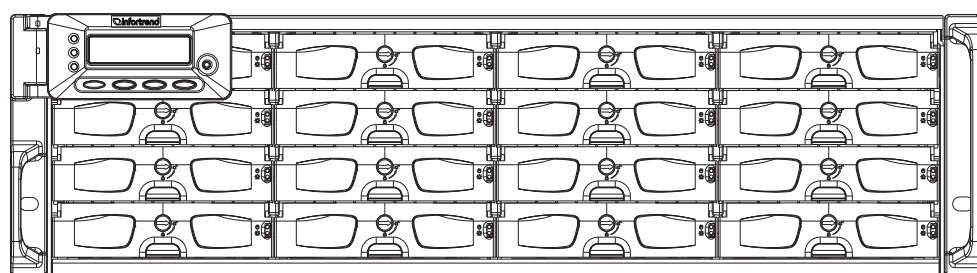


DS 3012U



DS 3024 UB

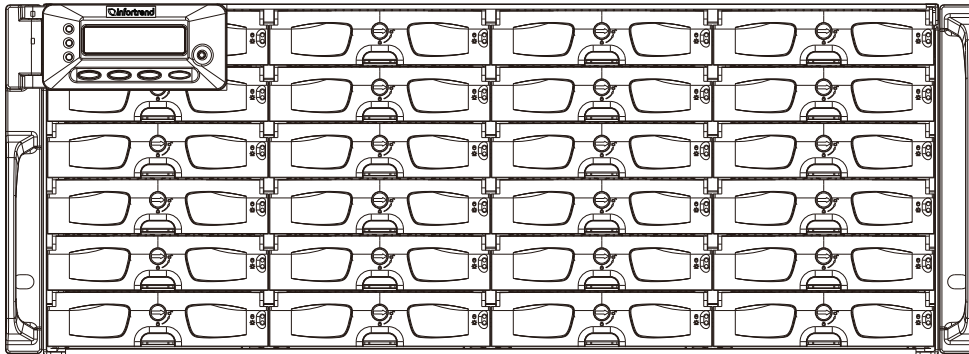
#### 3U system



DS 3016U



## 4U systems



DS 3024U

### 1.1.2 Major components

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**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.

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#### Controller and interface

The system has controllers, and each controller comes with pre-installed DIMM modules. It 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 cache 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.

#### Expansion controller and interface

The expansion enclosure is managed by the expander controllers that distribute data flow to individual disk drives and report the operating status through a proprietary enclosure service via in-band protocols. The enclosure, along with other expansion systems, connects to a SAN system and serves as a building block of a scalable configuration.

For supported protocols, the firmware supports communications with enclosure devices, SAS/SATA disk drives, and a SAN system that features SAS expansion ports.

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, Near-line SAS, and cost-effective SATA-II or SATA-III hard drives or SSDs. This connection is ideal for adding large capacity storages to a storage pool.



## Power supply unit with built-in cooling module

For 2U and 3U series, two cooling modules are built into the PSU to protect the system from overheating while the two hot-swappable PSUs provide constant power to the system. The modular architecture of the system and easy accessibility to all major components provide you an easy maintenance.

For 4U series, there are two types of cooling modules:

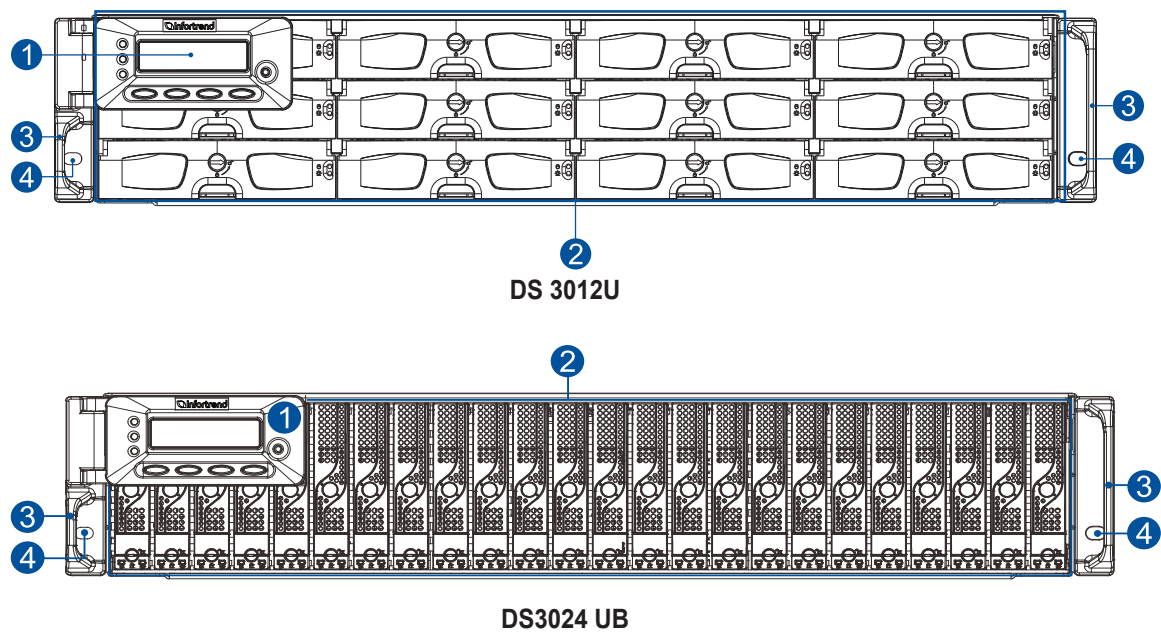
- The redundant cooling type is located at the center of the enclosure, which independently ventilates the system and keeps the operating temperatures under optimal condition.
- The cooling type, which is built with the PSU, helps with the PSU's temperature.

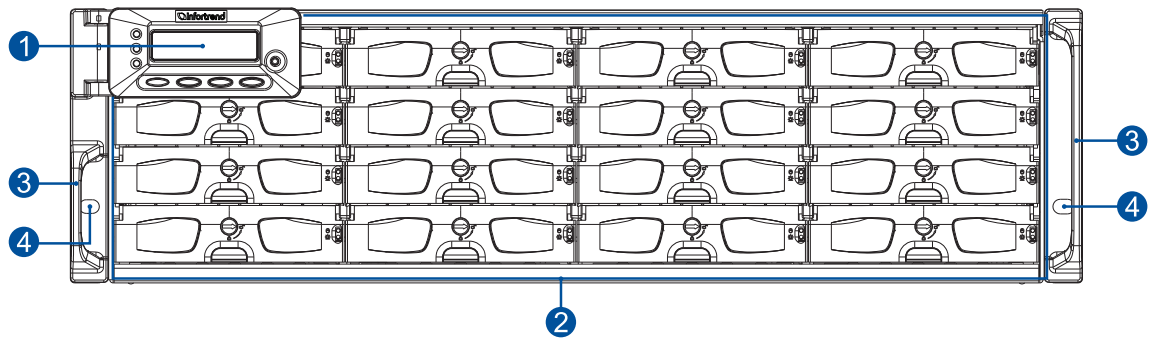
## 1.2 Chassis

This section describes the front and rear panels of EonStor DS 3000 series' rugged storage chassis. These chassis are designed to allow installation to the rack or a cabinet.

### 1.2.1 Front panel

#### 2U/3U systems

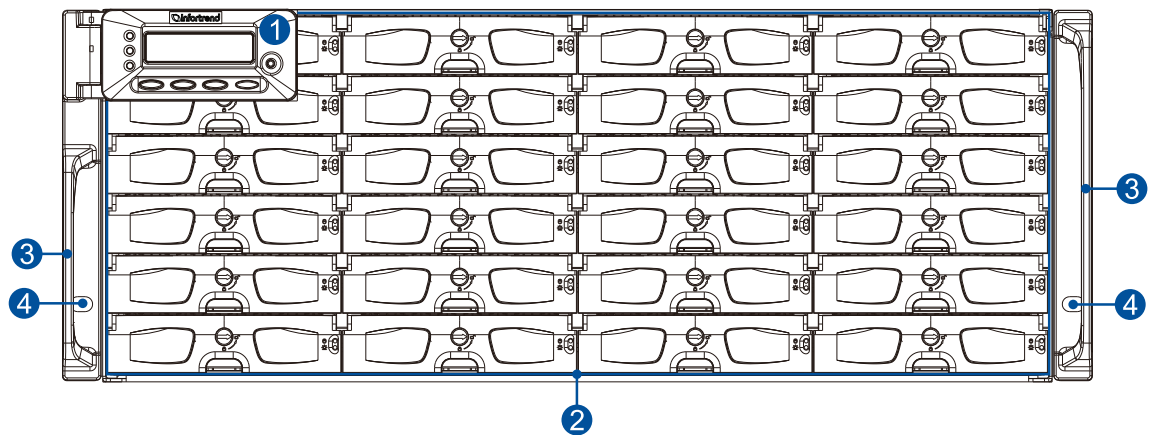




**DS 3016U**

| Number | Part                         | Description  |
|--------|------------------------------|--|
| 1      | Buttons, LEDs, and LCD panel | This panel comprises of buttons, LEDs, and LCD panel for system events and firmware configuration.           |
| 2      | Drive trays                  | Each drive tray is hot-swappable and holds a 3.5-inch hard drive.  |
| 3      | Handles                      | Use the handles to push/pull the enclosure to/from the cabinet installed in the slide rail rackmount system. |
| 4      | Rackmount holes              | These holes secure the enclosure to the rackmount system with mounting screws.                               |

#### 4U systems



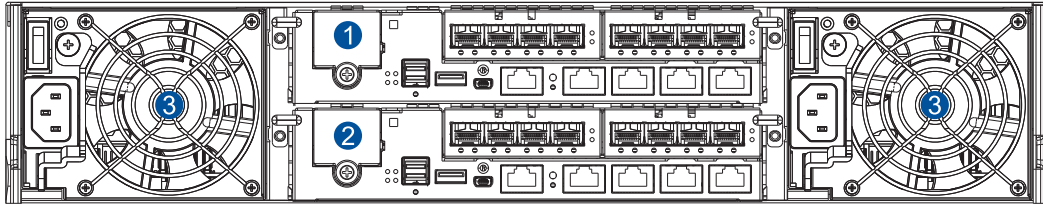
**DS 3024U**

| Number | Part                         | Description  |
|--------|------------------------------|--|
| 1      | Buttons, LEDs, and LCD panel | This panel comprises of buttons, LEDs, and LCD panel for system events and firmware configuration.           |
| 2      | Drive trays                  | Each drive tray is hot-swappable and holds a 3.5-inch hard drive.  |
| 3      | Handles                      | Use the handles to push/pull the enclosure to/from the cabinet installed in the slide rail rackmount system. |
| 4      | Rackmount holes              | These holes secure the enclosure to the rackmount system with mounting screws.                               |



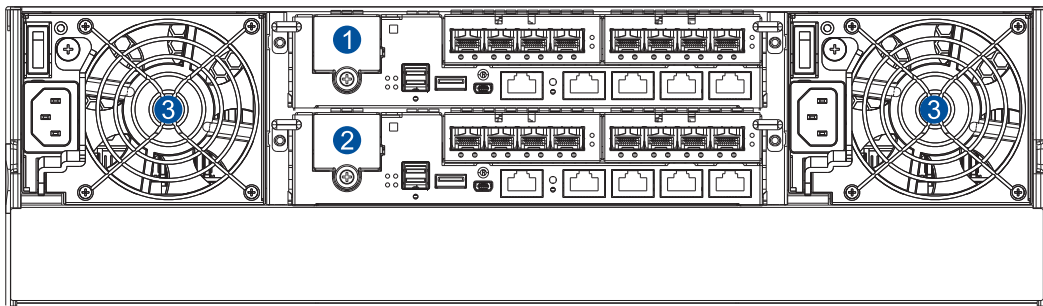
## 1.2.2 Rear panel

### 2U systems



DS 3012U/DS 3024B

### 3U/4U systems



DS 3016U/DS 3024U

| Number | Part                       | Description  |
|--------|----------------------------|--|
| ①      | Controller A               | This module is the main system component that contains the main circuit board with various interfaces.                               |
| ②      | Controller B or dummy cage | This part contains the second controller for dual-controller expansion. For single-controller expansion, this contains a dummy cage. |
| ③      | PSU and cooling modules    | These hot-swappable PSUs provide power to the system and each PSU has a cooling module.  |

#### WARNING!

- DO NOT remove the redundant components.
- DO NOT remove 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 provides logic level signals and low voltage power paths. The thermal sensors and I<sup>2</sup>C devices are embedded to detect system temperatures and PSU/cooling module operating status. This board is comprised of non user-serviceable components.

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**WARNING!**

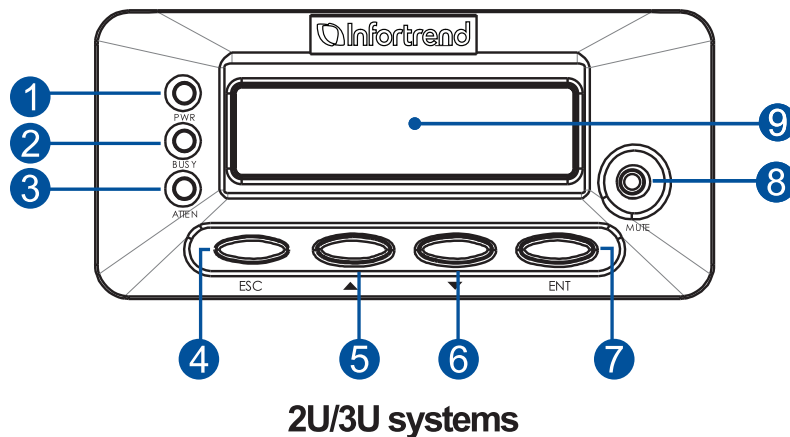
- Accessing the backplane board may lead to serious damage to the system.
  - Physical contact with the backplane board may cause electrocution.
- 

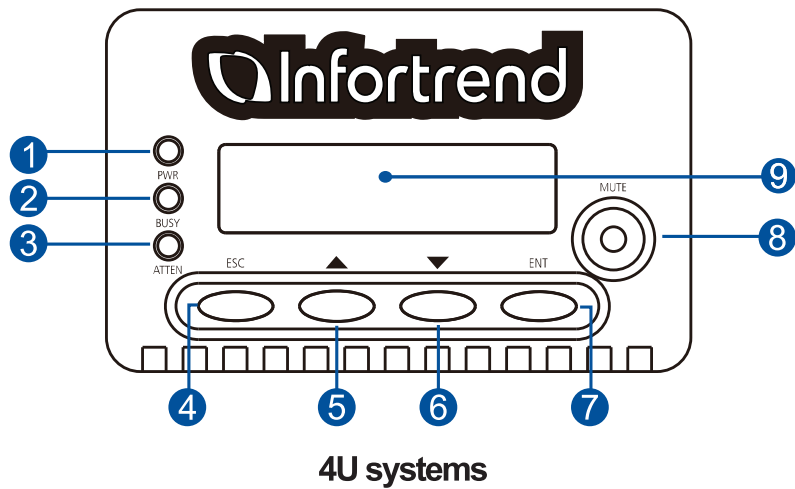
## 1.3 Front panel components

This section describes the components of DS system's front panel components.

### 1.3.1 Buttons, LEDs, and LCD panel

The LEDs on this panel allow you to know your system's current status when turned on, while the buttons have specific functions that you can set.





| Number | Part          | Description   |
|--------|---------------|---|
| ①      | Power LED     | This LED provides the status of the system's power.   |
| ②      | Busy LED      | This LED provides the status when the system has active traffic on the host/drive channels. |
| ③      | Attention LED | This LED provides the status of the component.  |
| ④      | Escape button | Press this button to skip the current event/operation.                                      |
| ⑤      | Up button     | Press this button to scroll up menus.   |
| ⑥      | Down button   | Press this button to scroll down menus.   |
| ⑦      | Enter button  | Press this button for two seconds to enter the main menu.                                   |
| ⑧      | Mute button   | Press this button to mute the alarm.  |
| ⑨      | LCD screen    | This 16 x 2-character screen displays the functions of the firmware-embedded utility.       |

**NOTE:** For more details regarding the LEDs and their respective status, refer to **3.1.1 LEDs**.

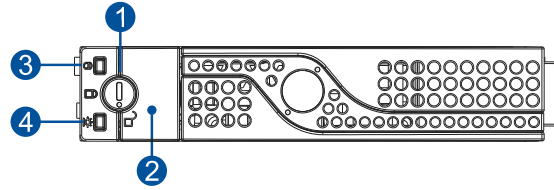
**WARNING!** If critical faults are indicated on the LED panel, verify the cause of the problem as soon as possible and contact your system vendor for a module replacement.



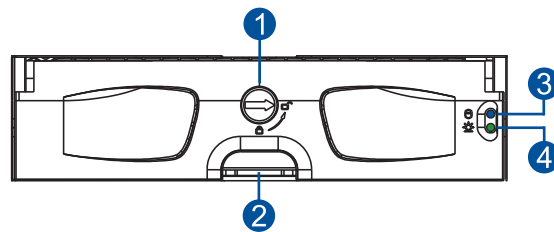


### 1.3.2 Drive tray bezel

The drive tray bezel is designed to accommodate both SAS and SATA-interfaced hard disk drives. Get familiarized of the components of your system's drive tray bezel.



2.5-inch drive tray



3.5-inch drive tray

| Number | Part              | Description  |
|--------|-------------------|--|
| ①      | Rotary bezel lock | This bezel lock secures the drive tray to the chassis .    |
| ②      | Release button    | This button dislodges the drive trays from the chassis.    |
|        | Drive busy LED    | This LED provides the status of the hard disk drive.       |
| ③      | Power status LED  | This LED provides the power status of the hard disk drive. |

**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.

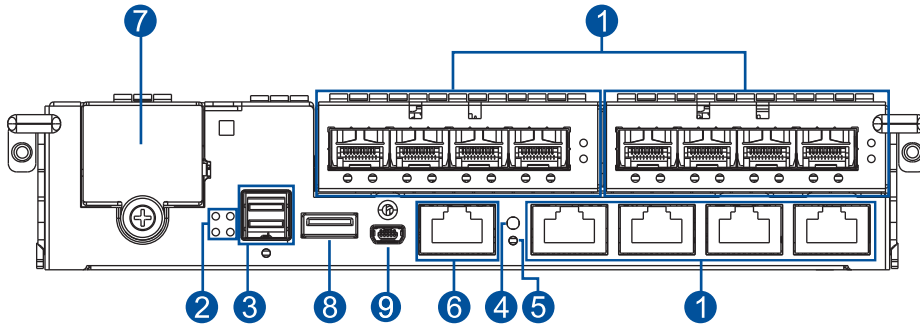


## 1.4 Rear panel components

This section describes the components of DS 3000 system's rear panel components.

### 1.4.1 Controller module interface

The I/O interfaces of the controller module allow you to connect to other devices and the LEDs allow you to know the status of your controller.



| Number | Part                     |
|--------|--------------------------|
| ①      | Host ports               |
| ②      | Controller status LED    |
| ③      | SAS expansion port/s     |
| ④      | Restore Default button   |
| ⑤      | Restore Default LED      |
| ⑥      | Ethernet management port |
| ⑦      | Super capacitor          |
| ⑧      | USB service port         |
| ⑨      | Mini USB port (console)  |

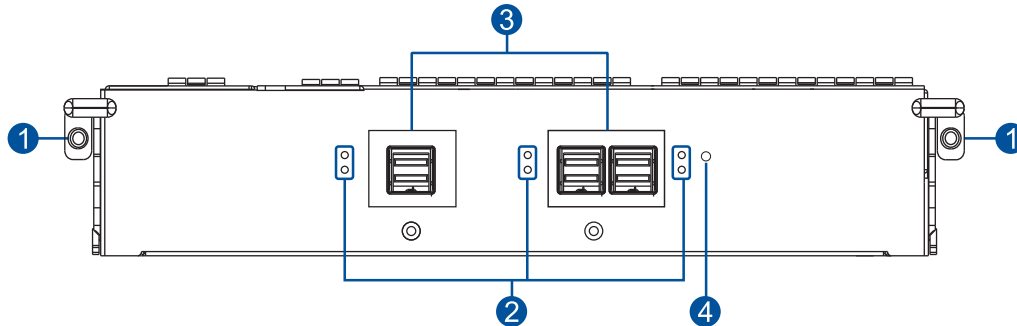
**WARNING!** You can only remove the controller when you already have the replacement. The EonStor controller is built of sensitive components. Unnecessary tampering may damage the controller.

**NOTE:** For more information about super capacitor, see section **1.4.4 Super capacitor and flash backup module**.

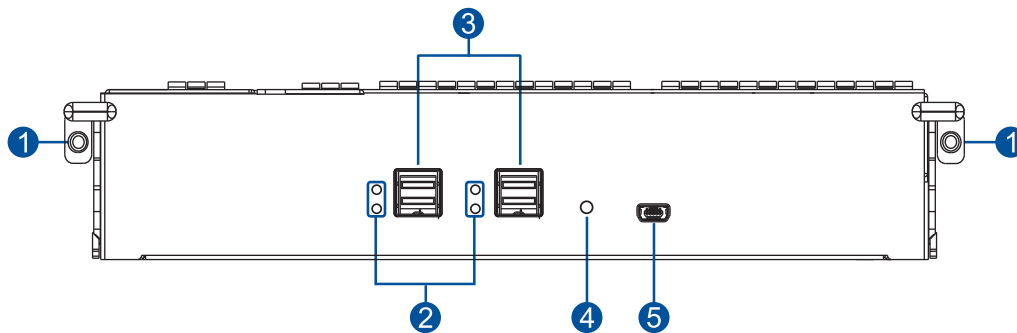


## 1.4.2 Expansion system controller module interface

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



Expansion controller type 1



Expansion controller type 2

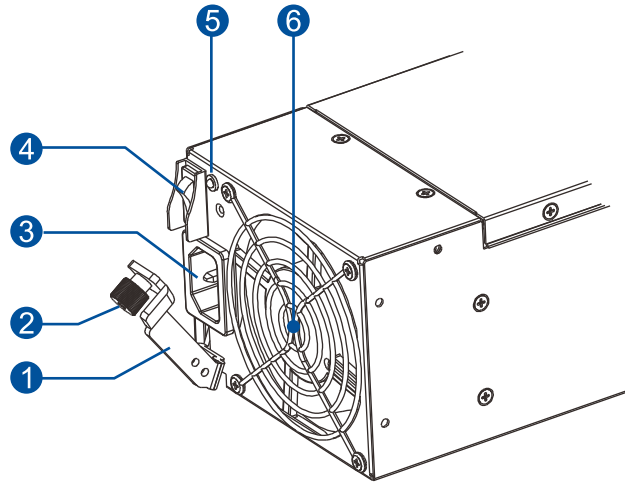
| Number | Part                           |
|--------|--------------------------------|
| ①      | Extraction levers/screw holes  |
| ②      | SAS expansion port status LEDs |
| ③      | SAS expansion ports            |
| ④      | Controller status LED          |
| ⑤      | Mini USB port                  |

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



### 1.4.3 PSUs and cooling modules

The DS 3000 series systems have redundant, hot-swappable PSUs that help with the airflow, providing an efficient ventilation.



| Number | Part             |
|--------|------------------|
| ①      | Extraction lever |
| ②      | Retention screw  |
| ③      | Power socket     |
| ④      | Power switch     |
| ⑤      | PSU status LED   |
| ⑥      | Cooling module   |

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 temperature failed.
- Elevated temperature: If the temperature breaches the upper threshold set for any of the interior temperature sensors.

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**NOTES:**

- The PSUs have specific installation orientations for left and right cooling module slots. Refer to the label at the back of the expansion.
  - There are two upper temperature thresholds: one for event notification and the other for triggering high fan rotation speed.
-



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**WARNING!**

- If any of the LEDs lights up in red, please contact your local vendor to request for a replacement immediately.
- When removing the system 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 cooling module(s) as it may cause disruption of the airflow resulting in overheating.

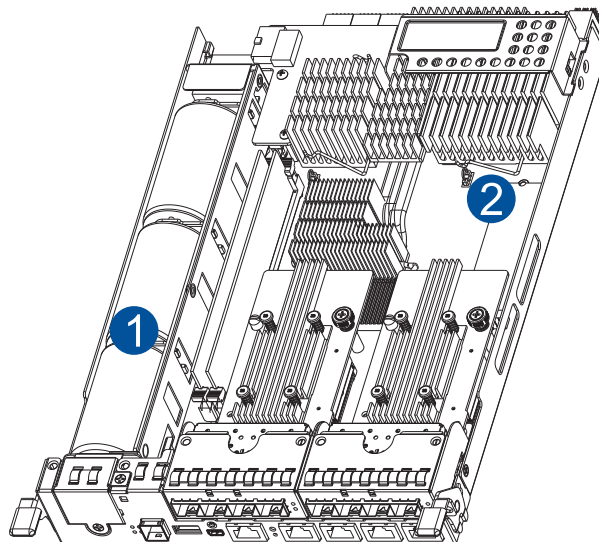
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**CAUTION!** Keep your body away from the moving parts of the system.

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#### 1.4.4 Super capacitor and flash backup module

The DS 3000 series system also has a CBM (Cache Backup Module), which is comprised of a super capacitor and flash backup module, installed in the controller. The super capacitor stores cached data to the flash backup module permanently in case of power interruption or outage.



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**NOTE:** The super capacitor is partially charged when shipped. When you turn ON the system, the super capacitor charges to its full capacity for a few minutes. If it is not charging, there may be a problem. Contact your system vendor immediately. You can also check the status of the super capacitor via SANWatch or the firmware. Refer to the manuals for more details.

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## 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 DS 3000 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)
- Disk drives

#### Expansion system identifier

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

If more than one expansion system is connected to the managing DS 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.

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**NOTE:** The expansion system IDs are numbers 1 to 15. For more details, see section **2.3.6 Expansion connections**.

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#### Cooling module speed adjustment

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

#### Expansion enclosure status monitoring

When connecting with expansion systems, you can acquire the component status with other enclosures via a propriety enclosure monitoring service using the in-band connectivity. No additional management connection is required.

#### I<sup>2</sup>C bus

The detection circuitry and temperature sensors are interfaced via a non-user-serviceable I<sup>2</sup>C bus. When the expansion systems are connected to DS controllers, the component status is reported through in-band protocols over expansion links, which is managed by a proprietary enclosure service.

#### Firmware (FW) and SANWatch

- **Firmware:** The firmware (FW) is preloaded and is used to configure the system. Access the FW via a terminal emulation program running on a management computer connected to the system's serial port.
- **SANWatch:** SANWatch is another browser-based GUI (graphic user interface) software that you can install into a local or remote computer and access via the network. The managing system communicates with the array via connection of the existing host links or the Ethernet link to the array's Ethernet 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.

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**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.

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## 1.6 Hot-swappable components

The system also 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 modules (dual-controller models)
- PSU (including cooling modules)
- Hard drive

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

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**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 already a replacement. For more information on replacing hot-swappable components, see chapter **System maintenance**.

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# Hardware installation

# 2

This chapter describes installing the modular components such as hard drives, cards, 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.
- **Hard drives**  
The SAS/SATA drives are purchased separately and must be available before the system installation.
- **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.
- **Cables**  
All cables that connect the system to the hosts are purchased separately. Contact your vendor for the list of compatible cables.
- **Rackmount equipment**  
The rack slide rails are optional accessories. If you need to install it, see section **2.2.2 Installing the mounting kit**.

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

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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.





## 2.2 Installation procedures

This section details the installation procedures of the system, its components, and connections between equipment. The installation procedures in this section 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.

### 2.2.1 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 bundled with in your package.

#### Accessory box contents

This box contains the following:

- Serial port cable
- Screws
- Quick installation guide
- Support CD (SANWatch Management software and manual, firmware operation manual)
- Product utility CD (Hardware manual)

#### Pre-installed components

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

- Controllers
- LED front panels
- PSUs including the cooling modules
- DIMM modules
- CBM (cache backup module)
- Host board/s

#### Components that need user installation

You must do the following installation:

- Assembling of the system to the rack/cabinet
- Assembling the hard drives to the hard drive tray
- Cabling in between systems

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**NOTE:** To install the system to the rack/cabinet, see section **2.2.2 Installing the mounting kit**.

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### 2.2.2 Installing the mounting kit

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

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**IMPORTANT!** Please contact our technical support team if you need further help in installing your system/enclosure to the rack.

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#### Preparing the user-provided tools

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

- 1 x Medium-sized Phillips screwdriver
- 1 x Small-sized Phillips screwdriver
- 1 x Medium-sized flat blade screwdriver



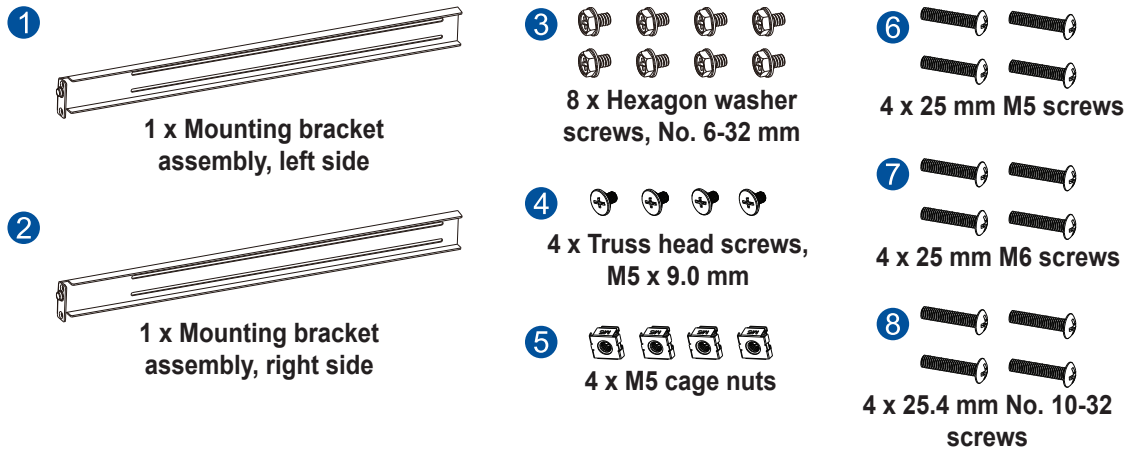
## Types of mounting kit

There are two types of mounting kit:

- Rack ear mount kit
- Slide rail kit

## Rack ear mount kit contents

Check your rack ear mount kit for the following contents.

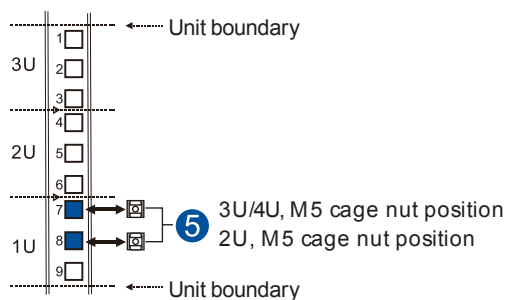


## Assembling the rack ear mount kit

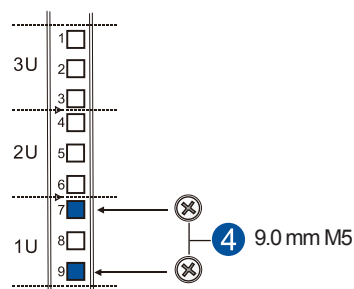
To assemble the rack ear mount kit:

1. Determine the position where the system will be installed to the front and rear rack posts, then insert the cage nuts into the designated holes on the front rack posts.

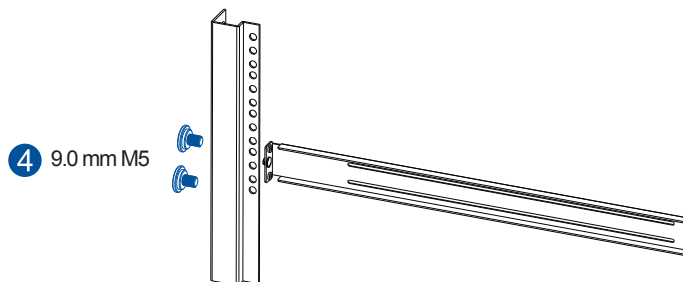
### Front rack post



### Rear rack post



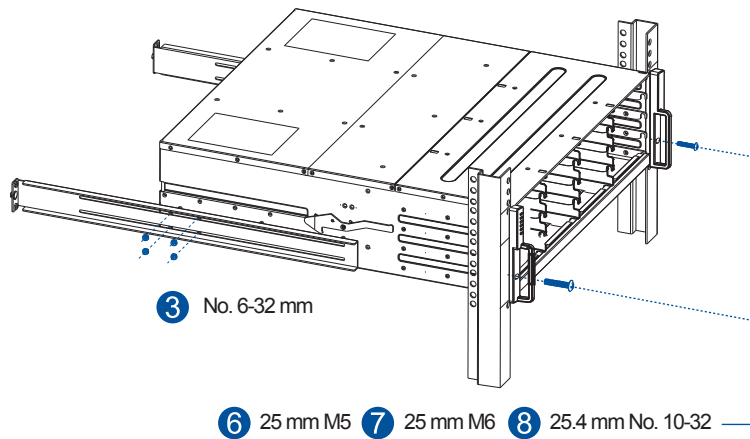
2. Install the fixed rails to the rear posts using the truss head screws.





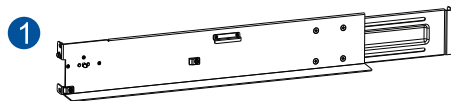
## Installing the enclosure to the rack ear mount

To install the enclosure to the rack ear mount, this requires an assistance of another person. While the other person holds the enclosure at the installation height, the other person secures the enclosure using four 25 mm M5 screws at the front and eight no. 6-32 screws on the side panels, four on each side.

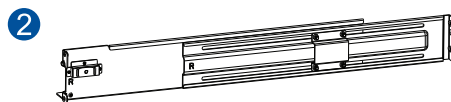


## Slide rail kit contents

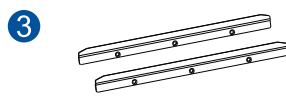
Check your slide rail kit for the following contents.



1 x Mounting bracket assembly, left side



1 x Mounting bracket assembly, right side



2 x Inner glides



8 x Hexagon washer screws, No. 6-32 mm



8 x 9.0 mm M5 Truss head screws



4 x M5 cage nuts



4 x 25 mm M5 screws



4 x 25 mm M6 screws



4 x 25.4 mm No. 10-32 screws

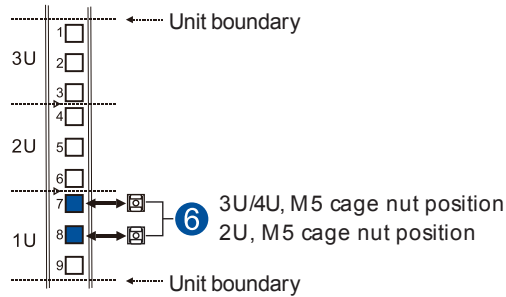


## Assembling the slide rail kit

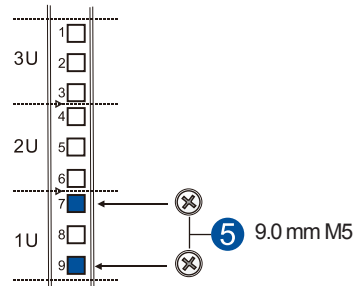
To assemble the slide rail kit:

1. Determine the position where the system will be installed to the front and rear rack posts, then insert the cage nuts into the designated holes on the front rack posts.

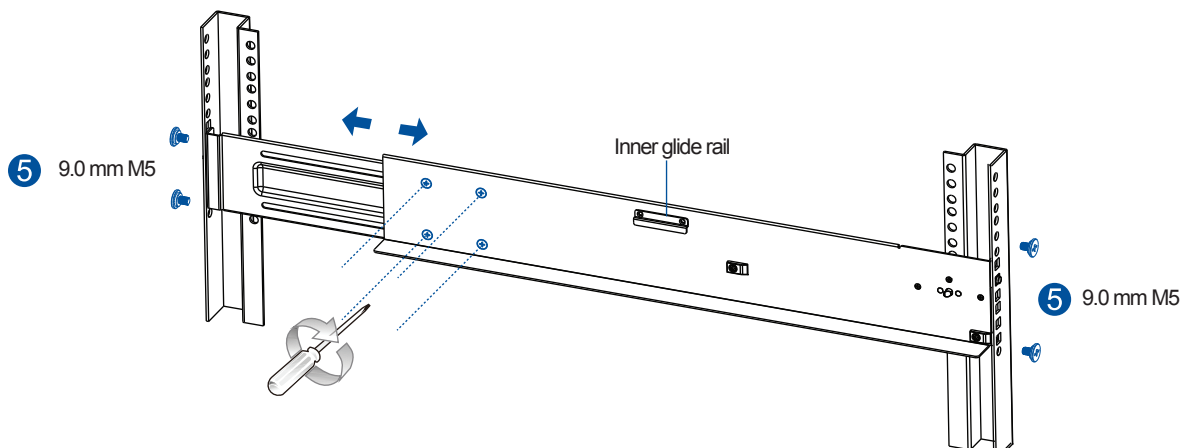
### Front rack post



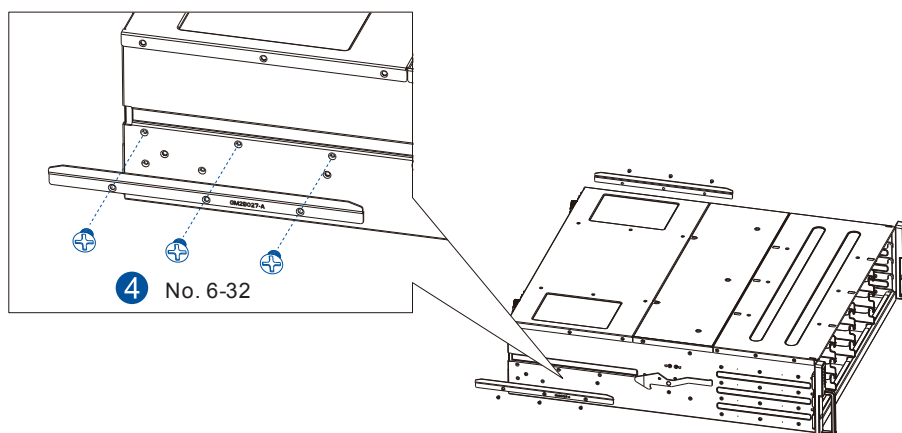
### Rear rack post



2. Loosen the four screws on the slide rails then adjust its length. After the length adjustment, secure the slide rails to the front and rear posts with the truss head screws.



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

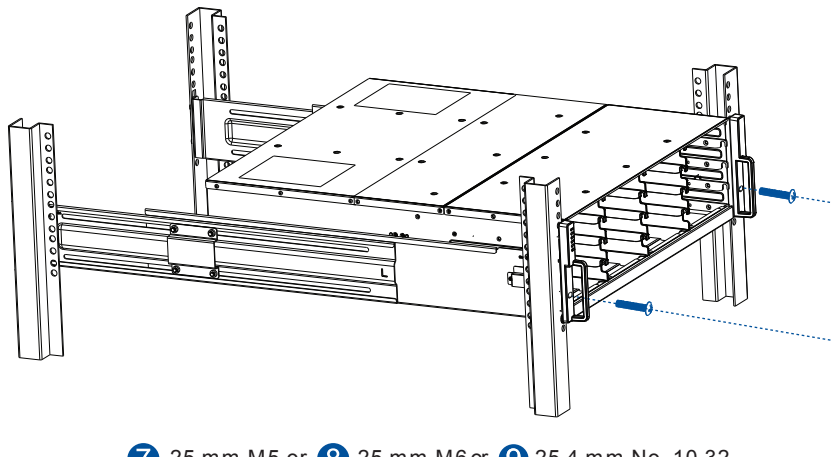




4. With the assistance of another person, lift and insert the enclosure onto the slide rail. Ensure that the inner glides on both sides of the enclosure meet the inner glide rail.



5. Secure the enclosure using the M5, M6, or no. 10-32 screws on the front.



When the enclosure is already assembled to the cabinet, you can proceed to the next installation procedures of other components.



### 2.2.3 Installing the hard drives

This section gives you an overview of the hard drive requirements, installation, and important notices that you must take note.

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**NOTE:** The hard drives are purchased separately.

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**IMPORTANT!**

- Ensure to install the enclosure to the rack first before installing the hard drives to the enclosure's drive bay.
  - You must install at least four (4) hard drives for RAID 5 configuration or five (5) hard drives for RAID 6 configuration to create an initial volume.
- 

#### Hard drive installation prerequisites

When purchasing hard drives, ensure to consider the following factors:

- **Capacity (Mb/Gb)**

Purchase the hard drives that have the same capacity. This SAN storage use 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 to use large storage capacity hard drives.

---

**IMPORTANT!**

- The hard 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 hard drives into a RAID array, you can use a smaller capacity as the *maximum disk capacity* in every hard drive. For configuration options, refer to the interface-specific firmware manual that came with your enclosure.
- 

- **Profile**

The drive trays and bays of the system are designed for 2.5-inch or 3.5-inch hard drives, depending on your EonStor storage system.

- **Drive type**

The system uses 12 Gbps SAS, SATA, and near-line 2.5-inch and 3.5-inch hard drives.

---

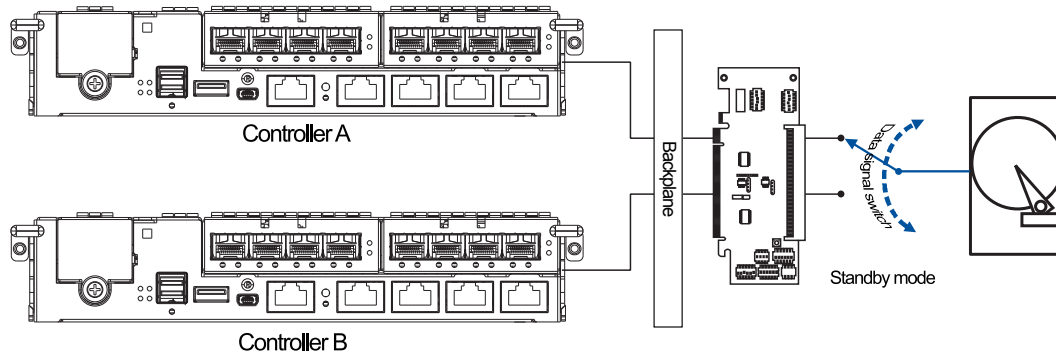
**IMPORTANT!**

- Ensure that you purchase the correct hard drives.
  - If you prefer using SATA hard drives in the attached expansions, ensure that you purchase MUX kits.
-



## Understanding the MUX kit's port mechanism

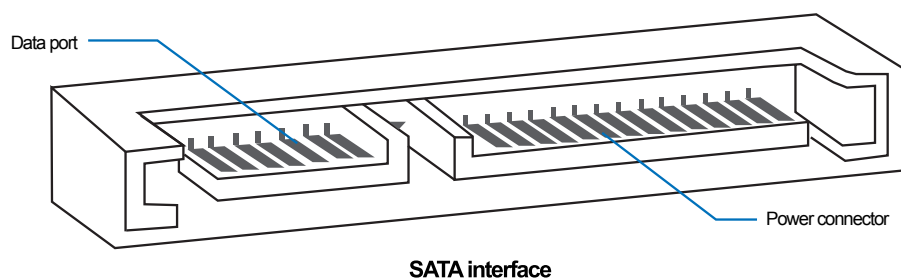
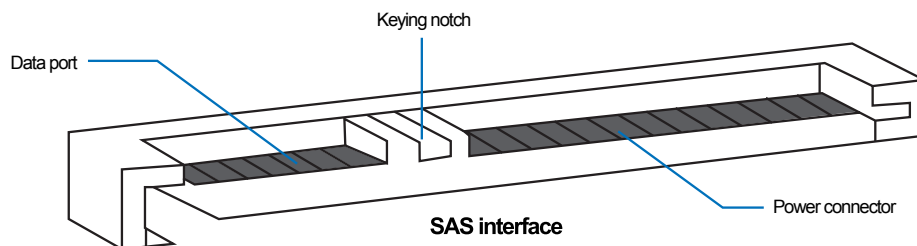
If you install a SATA hard drive in a dual-controller system, this may require an MUX board. The MUX board is paired with a hard drive in order to switch data signals between controllers A and B's signal ports.



Under normal circumstances, the controller B's signal ports is in standby mode.

## SAS and SATA interfaces

The SAS interface features a dual-ported connectivity with pins on both sides of its connector while the SATA drives have only one port. In a redundant-controller system, the MUX-supported drive trays must be separately purchased and applied. The single-controller expansion systems do not require MUX kit.



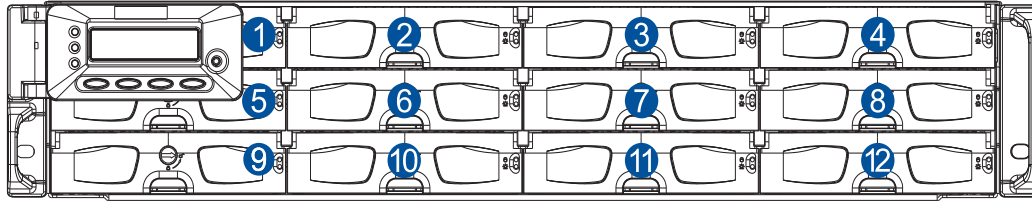
### IMPORTANT!

- ONLY install the drive trays to the system if the system is already mounted to the rack. If the hard drives are installed to the system before mounting to the rack, the system will be heavy to mount and possible impact during installation may damage the hard drives.
- Handle the disk drives with extreme care and observe all ESD prevention procedures when installing the hard drives.
- ONLY use the screws that are bundled in the system package. Securing the drives with longer screws may damage them.

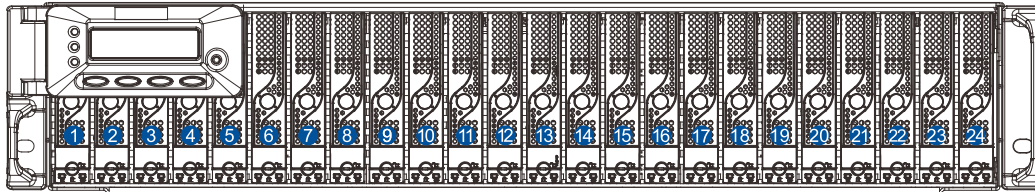


## Hard drive designation

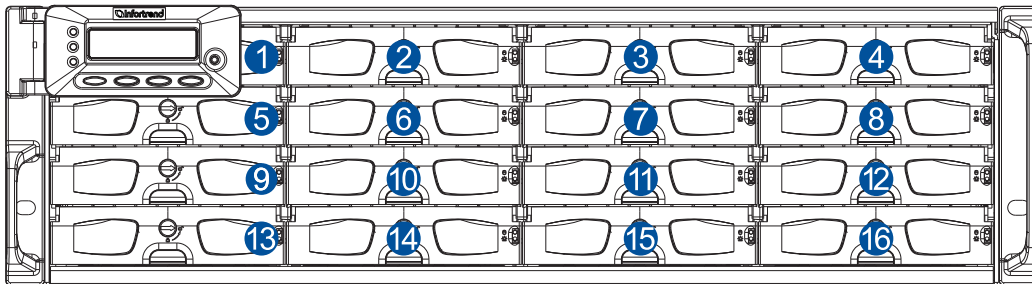
Get to know the exact order of the hard drives to avoid removing the drives out of the enclosure.



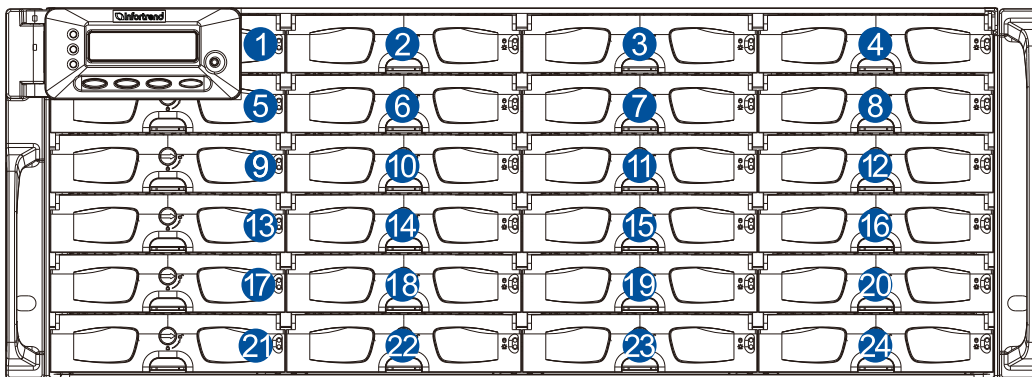
DS 3012U



DS 3024 UB



DS 3016U



DS 3024U

**IMPORTANT!** Install at least four hard drives for RAID 5 and five hard drives for RAID 6 to create an initial volume.

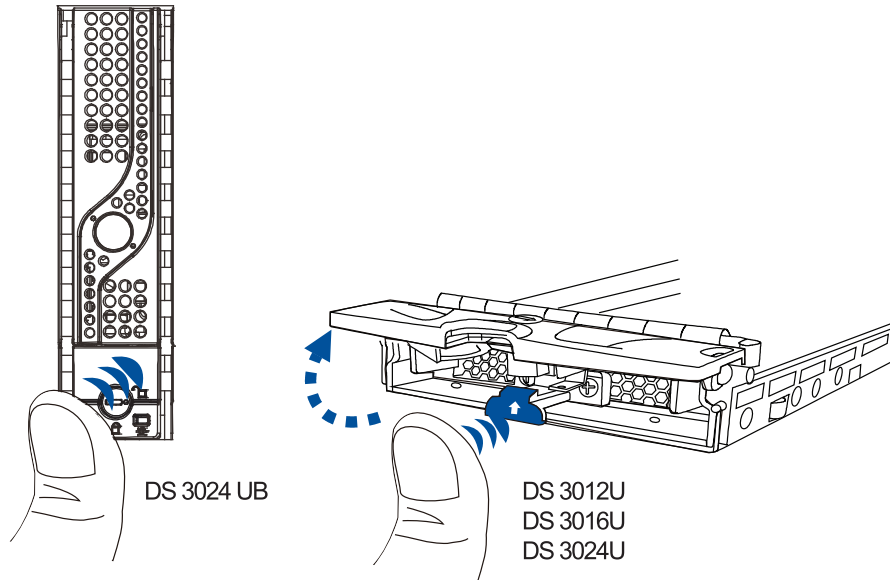




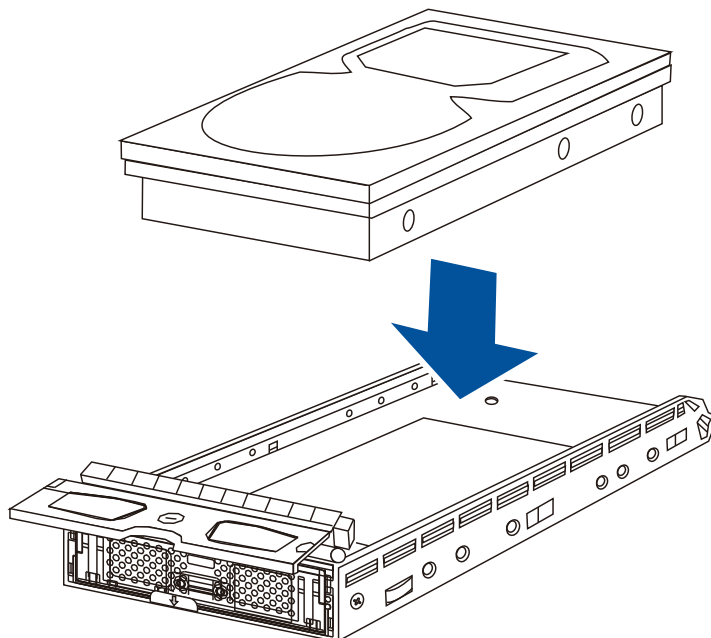
## Installing the hard drive into the drive tray and enclosure

To install the hard drive into the drive tray and enclosure, follow the steps below:

1. Press the release button to open the bezel, then gently pull out the tray.



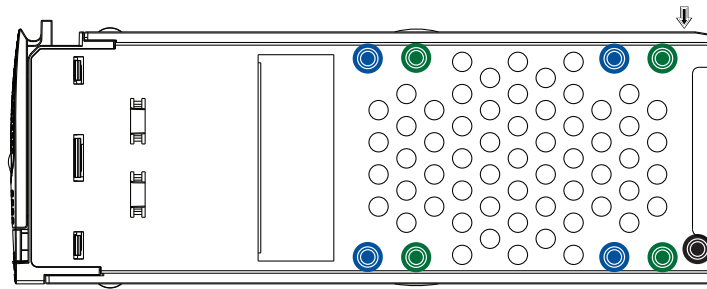
2. Orient the hard drive to the tray with the interface connectors facing the open side of the tray and the label is facing up.








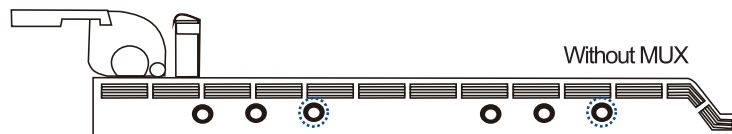
- Secure the drive to the correct holes of the tray using the four bundled screws.

### 2.5-inch drive tray



-  SAS HDD (without MUX)
-  SATA HDD (with MUX)
-  MUX board screw holes

### 3.5-inch drive tray



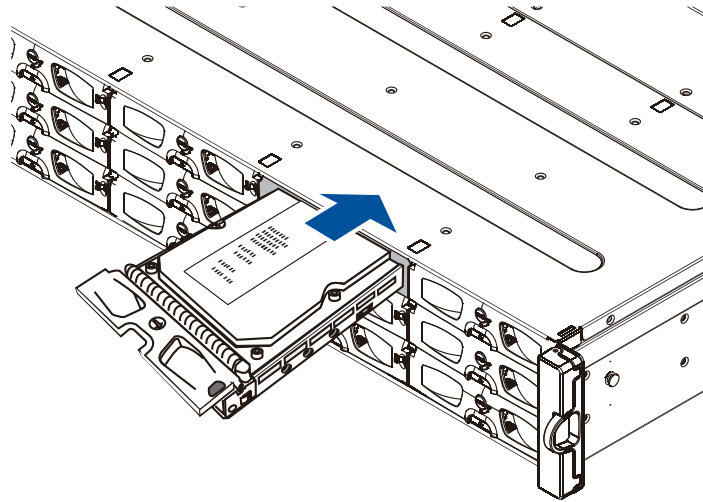
SAS HDD in single/dual controller systems  
SATA HDD in single controller systems



SATA HDD in dual controller systems



4. Insert the assembled hard drive and tray to the enclosure with the tray bezel open.

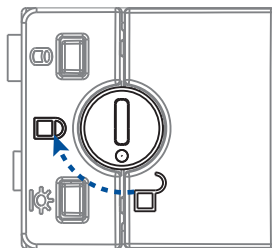


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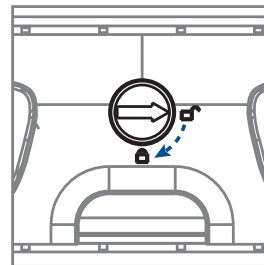
**WARNING!** Ensure that your system has all the drive bays occupied with the drive trays even if there are no hard drives installed. Without the drive trays, the ventilation is compromised and may cause overheating.

---

5. When fully inserted, close the front bezel, then turn the bezel lock to its lock position using a small-sized flathead screwdriver.



DS 3024 UB



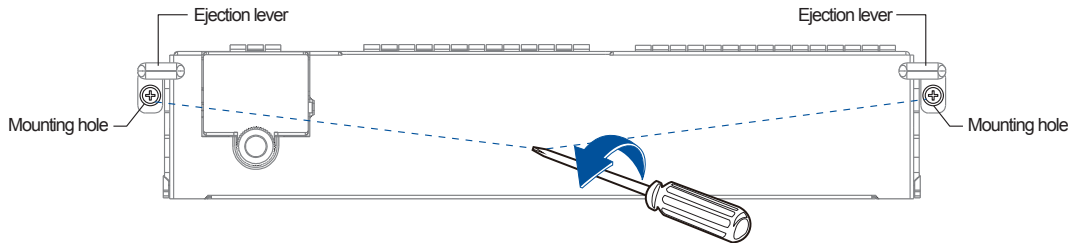
DS 3012U  
DS 3016U  
DS 3024U



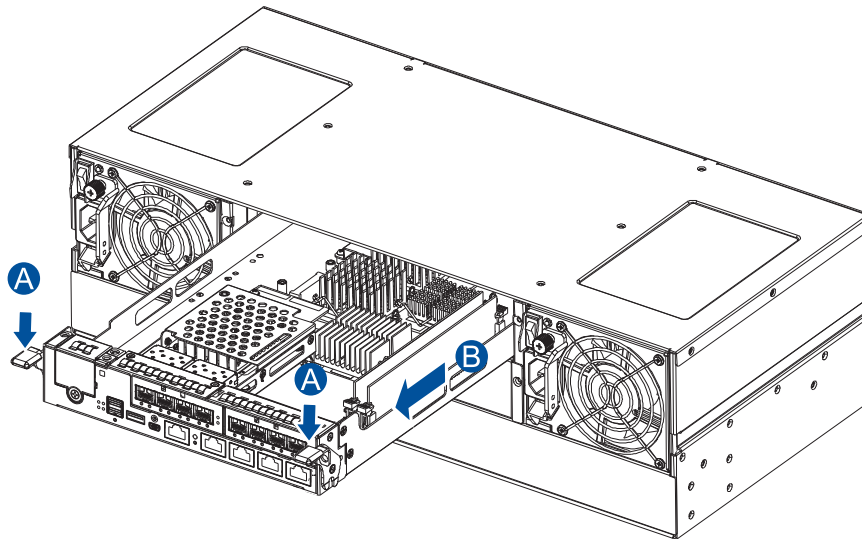
## 2.2.4 Installing the controller

To install the controller:

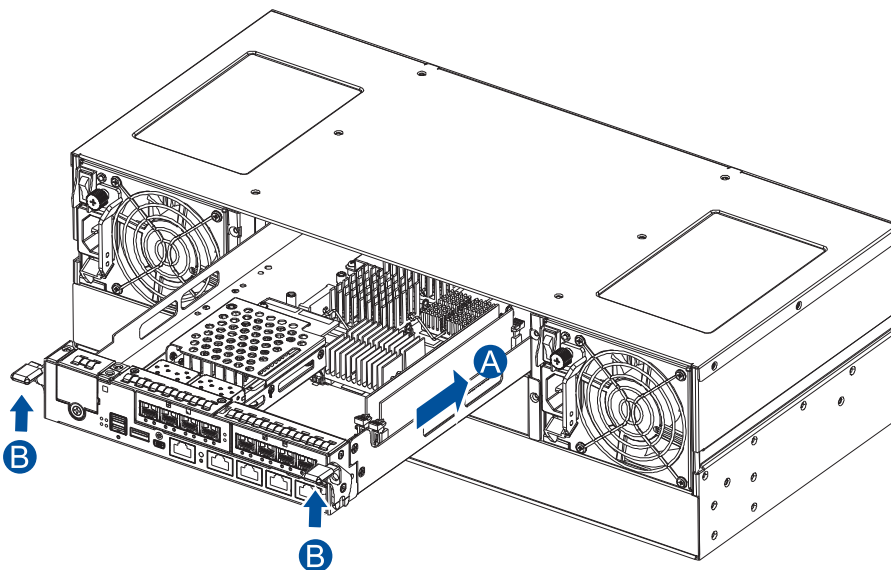
1. Shut down your system.
2. On the dummy controller, unfasten the retention screws under the ejection levers.



3. Push down the ejection levers to dislodge the controller from the system, then pull to remove from the enclosure.

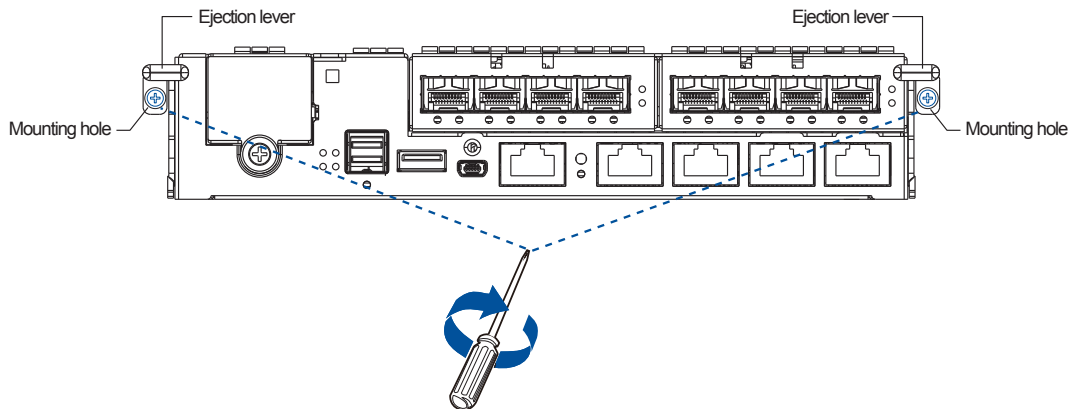


4. Insert the controller carefully into the module slot. When you feel a contact resistance, push the controller with a small but careful force, then move the ejection levers upwards to secure the controller to the enclosure.





5. To secure the controller to the chassis, fasten two retention screws to the controller's mounting holes under the ejection levers.



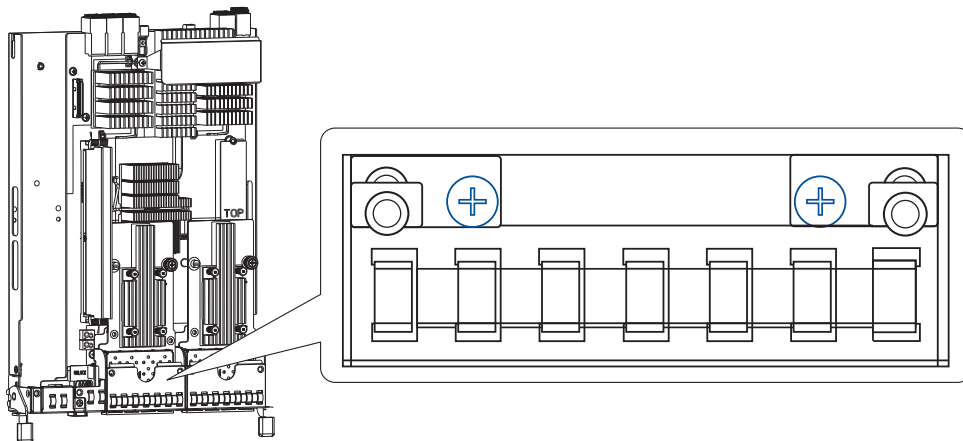
## 2.2.5 Installing the host boards

### NOTES:

- A downtime may occur when upgrading the controller/host board.
- To add or replace a host board, the firmware automatically restores the default factory settings of your system.

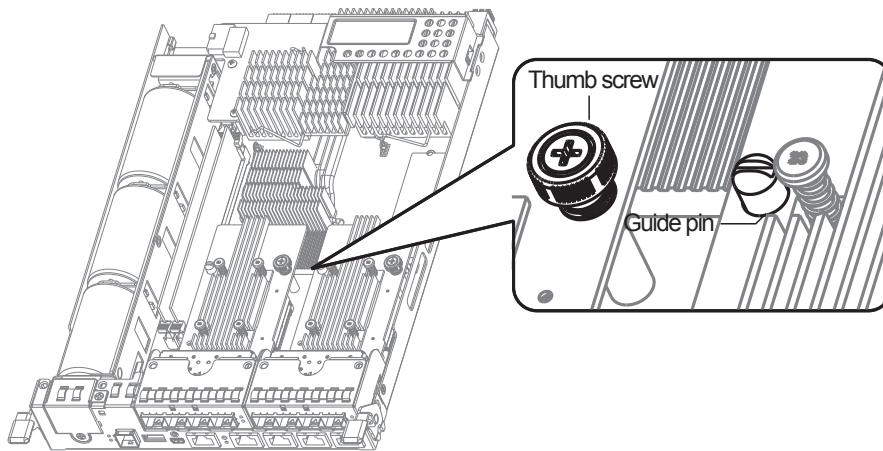
To install a host board:

1. Shut down your system and remove the controller from the enclosure.
2. Remove the screws that secure the dummy covers to the enclosure.

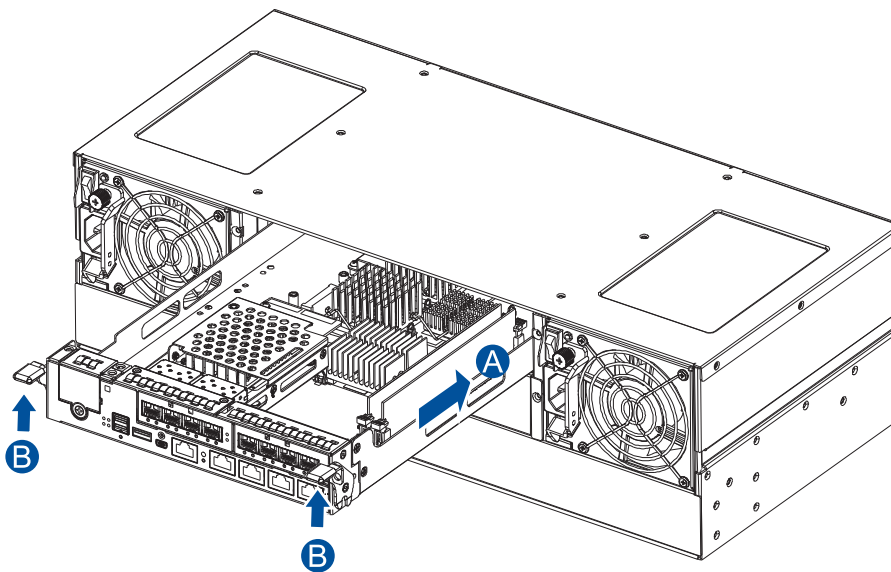




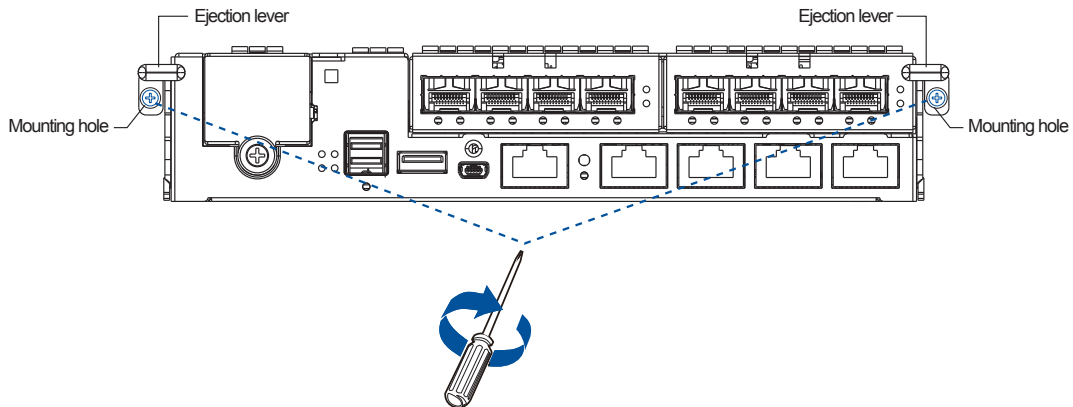
3. Orient the new host board to the controller's guide pin, place it carefully, then tighten the thumb screw to secure in place.



4. Insert the controller carefully into the module slot. When you feel a contact resistance, push the controller with a small but careful force, then move the ejection levers upwards to secure the controller to the enclosure.



- To secure the controller to the chassis, fasten two retention screws to the controller's mounting holes under the ejection levers.



## 2.3 Connections

This section details the connection procedures of DS 3000 system to the expansions, power source, connection status, topologies, and other connection configurations.

### 2.3.1 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 array must have the same capacity, but it is preferred that all drives in the chassis have the same capacity.
- 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 rackmounting, leave enough space for the cables. DO NOT bend them to a diameter of less than 76 mm (3 inches).



- 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.
- Route the cables away from places where it can be damaged by other devices such as fan exhaust or foot traffic.
- DO NOT overtighten, 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.

---

#### NOTES:

- To manage the fault-tolerant data paths and optimize data throughput on multiple data paths, you must apply MPIO software or other 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 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.





## 2.3.2 Fibre-Host connections

The Fibre Channel standard allows optical connections. The optical cables are used over long distances and have been proven to be more reliable. Due to the demands of high transfer rates, optical cables are preferred for a 4 Gbps, 8 Gbps, or 16 Gbps fiber connectivity and they are not vulnerable to EMI.

The fibre host ports are connected to fibre channel host adapters (HBA), that feature SFP interface with full duplex transfer support in a PCIe interface. For the latest certified items, please contact the vendor near you.

---

### WARNING!

- All fibre cables are sensitive and must be handled with care. To avoid interference, the cabling path must be carefully planned without the cables getting bent.
  - Lasers are hazardous and may cause blindness or permanent eye damage. Use them with utmost caution. Never look directly when lasers are turned on or operating.
- 

### Detecting auto speed

Speed auto-detection is specified by the Fibre channel standard. If a 16 Gbps port is connected to an 8 Gbps port, the speed slows down at 8 Gbps. If there are 16 Gbps ports on both ends of the link, the speed runs at 16 Gbps.

### SFP/SFP+ transceivers

As SFP transceiver converts electrical data signals into light signals then transfers these signals transparently via the optical fiber. A transceiver provides bi-directional data links, a laser transmitter (for fiber optic cables), LC connector, and a metal enclosure to lower the EMI.

Other features of a typical SFP transceiver include a single power supply, low power dissipation, and hot-swap capability. It is also important that the transceiver you use meets the FC performance and reliability specifications.

---

**WARNING!** The SFP transceiver has a laser diode featuring class 1 laser. To ensure safety, DO NOT remove any covers or attempt access of the inside of the device. If problems arise or if you need technical service, contact a qualified personnel.

---

### FC port dust plugs

Each FC port comes with a dust plug. Remove these plugs ONLY when you insert an SFP transceiver.

---

**NOTE:** Contact your vendor for the list of compatible components.

---

### Fibre-host topologies

The fibre-host standard supports three topologies:

- **Point-to-point topology**  
A direct connection between two fibre-channel devices. The simplest among the three topologies.
- **FB-AL (Fibre Channel Arbitrated Loop)**  
The fibre-channel devices are all connected to a loop. Each device is assigned to an AL\_PA (Arbitrated Loop Physical Address). FC-AL supports 124 devices in a single loop. This is the most commonly-used topology among the three.



- **Fabric switch**

This topology can support up to 224 fibre-channel devices and allows multiple devices to communicate simultaneously. A fibre switch is required to implement this topology.

---

**IMPORTANT!** If different servers need to access your logical drive, file locking, FC switch zoning, port binding, and multipath access control configurations are necessary.

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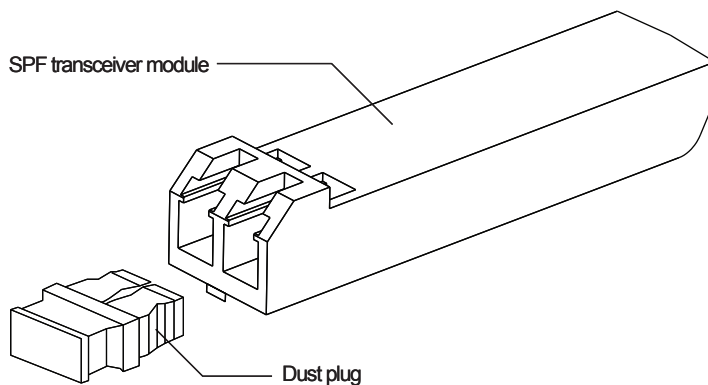
## Fibre cabling

Before you set up your fibre cabling connection, you must:

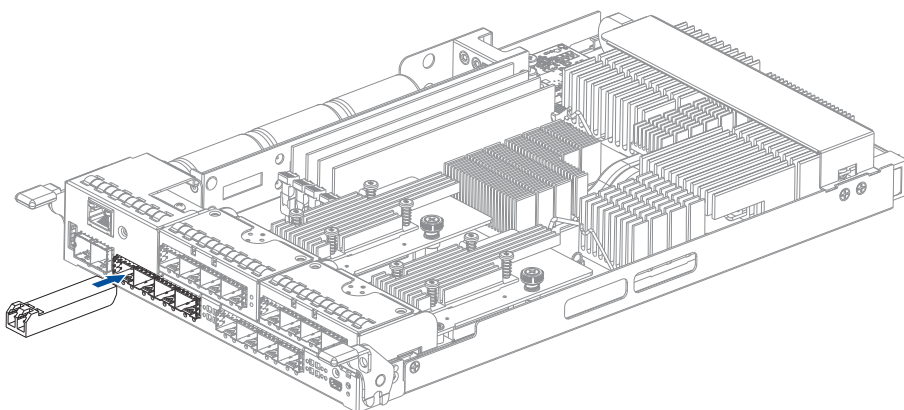
- Create a configuration plan. In addition to cabling topologies and the list of networking components, you must also include the firmware and software maintenance details.
- Confirm that your fibre-channel cable's loop measures 6 inches or longer.
- Ensure proper airflow and keep the cables away from ventilation outlets.

To connect devices using fibre cable:

1. Take out the SFP transceiver module from the static protective package.
2. Remove the dust plug from the transceiver module.

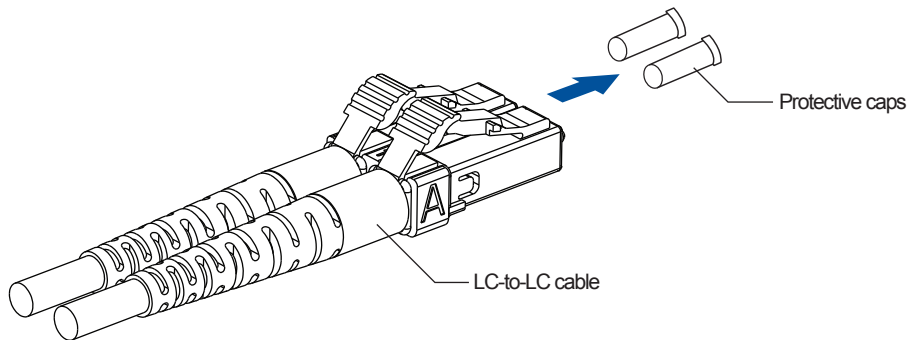


3. Insert the SFP module into one of the system host ports. The module snaps in place.

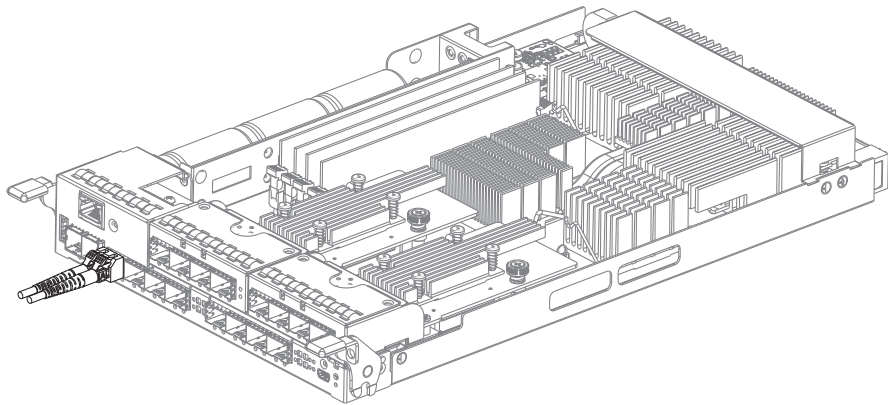




3. Remove the two protective caps from the LC-to-LC type cable. Save the protective caps for future use.



4. Insert the LC-to-LC cable to the SFP transceiver module already connected to the system. You can hear a clicking sound, securing the cable in place.

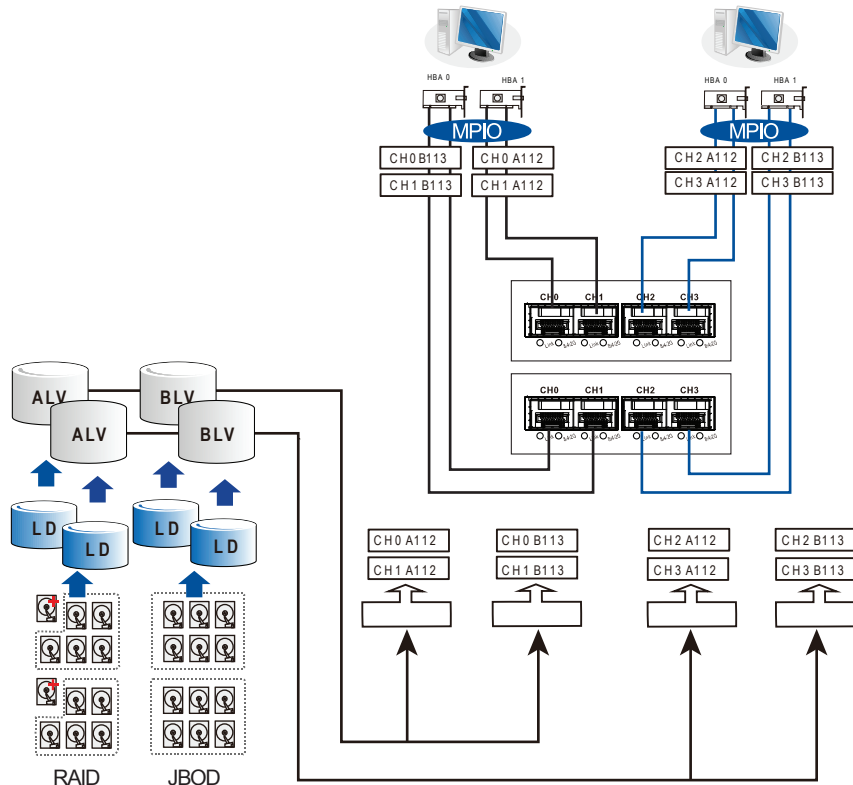


5. Remove the protective caps on the other end of the cable, then connect to an SFP transceiver module on a Fibre Channel switch port or a Fibre Channel host bus adapter (HBA) port.



### Simple end-to-end connection

This connection type shows a simple end-to-end connection, with each SFP port is connected to a host adapter. Multiple logical drives, logical volumes, and logical partitions are created and each partition is mapped to a corresponding host channel ID/LUN combination.



| Channels                  | Controller A              | Controller B       |
|---------------------------|---------------------------|--------------------|
| Host                      | CH0, CH1, CH2, CH3        | CH0, CH1, CH2, CH3 |
| Configuration information |                           |                    |
| Number of controllers     | 2                         |                    |
| Host servers              | 2                         |                    |
| Data path connection      | Fault-tolerant data paths |                    |

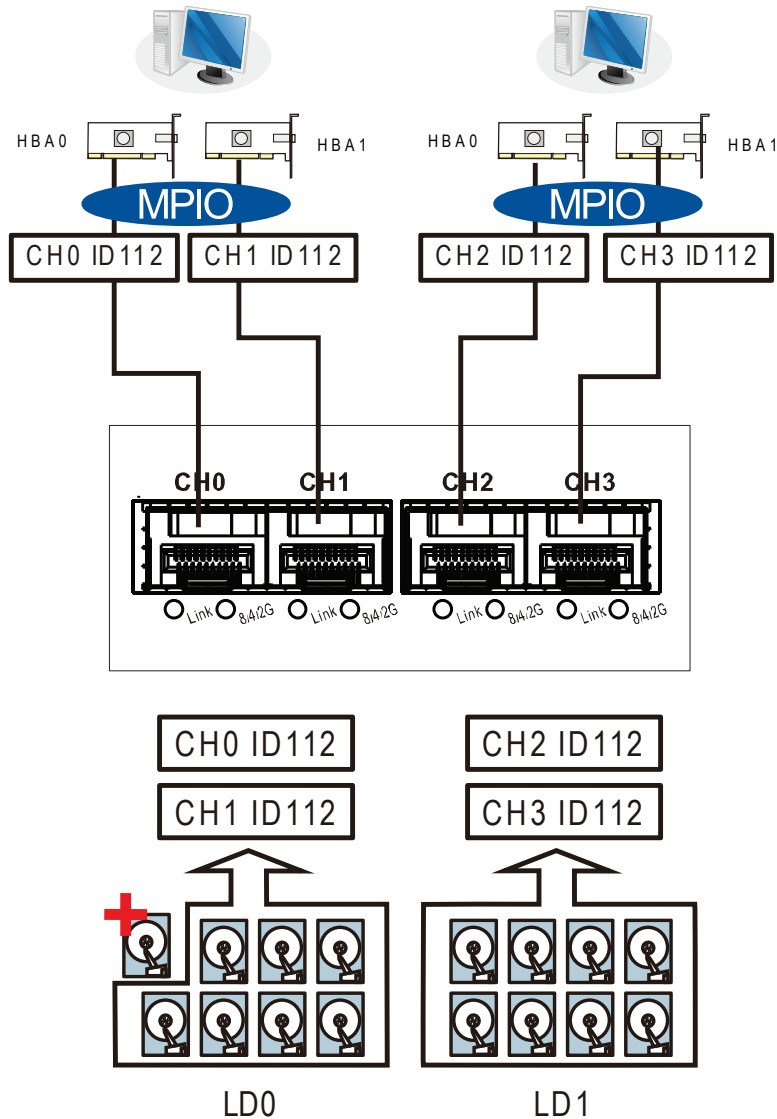
**NOTE:** You need a multipathing software such as **MPIO** or **Linux Device Mapper** to control and optimize the access to logical drives via multiple data paths.



## DAS (Direct-Attached) connection

This connection has more disk drives over SAS expansion links. With this connection, you can create more logical groups of drives. These logical drives use more host channel IDs or LUN numbers.

The two logical drives in the illustration below cannot equate the full power of the system. You can attach one or two more expansion enclosures to achieve more end-to-end performance.



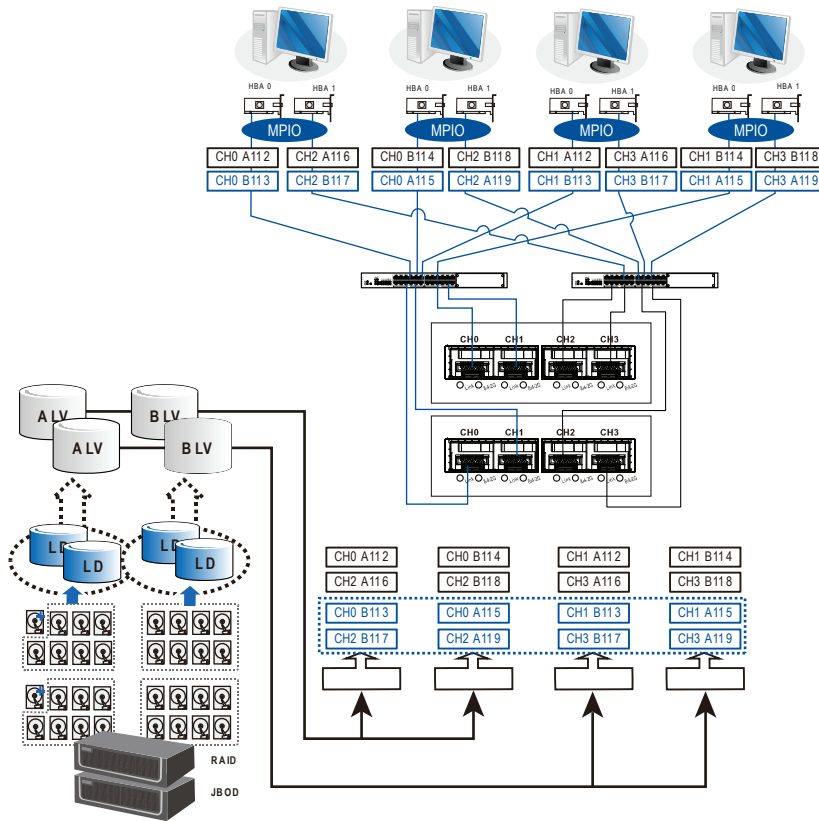
| Channels                  | Controller A  |
|---------------------------|---|
| Host                      | CH0, CH1, CH2, CH3                                      |
| Configuration information |   |
| Number of controllers     | 1   |
| Host servers              | 2   |
| Data path connection      | Simple end-to-end connections with fault-tolerant pairs |

**NOTE:** If a server has multiple data paths to a SAN storage, a multipathing software such as MPIO, is needed.



## Switched fabric connection in dual controller

In this type of connection, the channel link bypass is provided by external FC switches. Each application server shown in the illustration below is equipped with two HBAs with FC links, connecting via two FC switches to the SFP ports on individual controllers.



| Channels                         | Controller A                | Controller B       |
|----------------------------------|-----------------------------|--------------------|
| Host                             | CH0, CH1, CH2, CH3          | CH0, CH1, CH2, CH3 |
| <b>Configuration information</b> |                             |                    |
| Number of controllers            | 2                           |                    |
| Host servers                     | 4 (or more via FC switches) |                    |
| FC switches                      | 2 (or 1 into 2 zones)       |                    |
| Data path connection             | Fault-tolerant data paths   |                    |

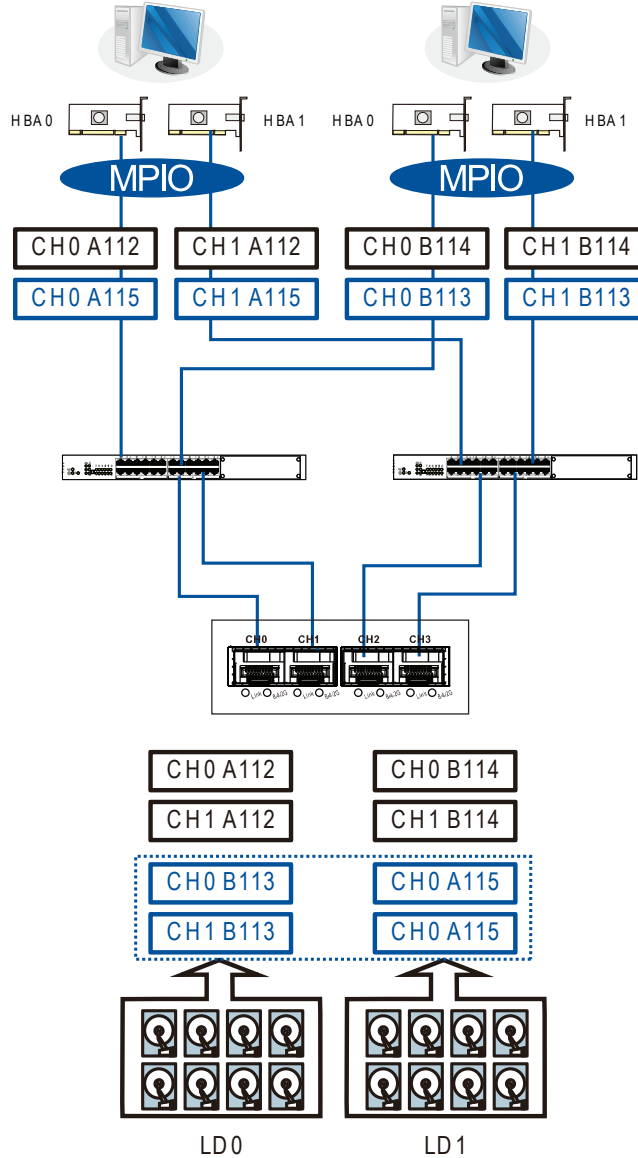
Each logical partition is redundantly mapped to multiple host channel IDs in an AAPP (Active-Passive-Passive-Passive) configuration. Logical volumes are managed by either controller A or controller B. The passive IDs will only become functional when a single controller fails in the system.

The MPIO driver is needed on the application servers. This driver communicates with the system firmware and performs load balance and automated distribution of I/Os across the preferred paths (active IDs on data paths). TPGS (Target Port Group Service) is supported so that the I/Os are routed to the preferred paths.



### Switched fabric connection in single controller

In this type of connection, each SFP port is connected to an FC switch then to the host adapters. Each logical partition is mapped to a single host channel ID. If you prefer path redundancy, you can map a logical partition to IDs residing on two different channels.



| Channels                  | Controller A   |
|---------------------------|--|
| Host                      | CH0, CH1, CH2, CH3   |
| Configuration information |  |
| Number of controllers     | 1  |
| Host servers              | 4  |
| Data path connection      | The data paths are connected to one or more FC switches. The SAN management measures, such as switch zoning and port binding, must be taken to avoid multiple servers from accessing the same LUN. |

If multiple servers detect a mapped volume, you have to avoid access contention using file locking software, port binding, or zoning feature of the FC switches, which limits the access from host to a specific LUN. If you have two servers in a clustered configuration, the clustering software will perform the access control.



---

**IMPORTANT!**

- We suggest you to use an enclosure-specific spare drive to prevent it from participating in the rebuild of a logical drive on another enclosure. You can refer to the ID tags on the host links to see the related LUN mapping and cable links routing paths.
  - You need MPIO driver to manage the access via two different HBA ports. This driver communicates with the system firmware and performs load balance and automated distribution of I/O.
- 

### 2.3.3 SAS - host connections

This section details about the connections between SAS and host using SAS cables. The SAS cables (8 pairs of 28 mm AWG) are characterized by the following:

- 100 Ohms
- Black color
- UL-approved, lead free 50 cm, 120 cm, or 170 cm in length
- Connectors must be secured to the receptacle of the chassis using a latching mechanism

---

**WARNING!** The SAS cables are sensitive and must be handled with care. To prevent interference within the rackmount, the cable routing path must be carefully planned and the cables must not be bent.

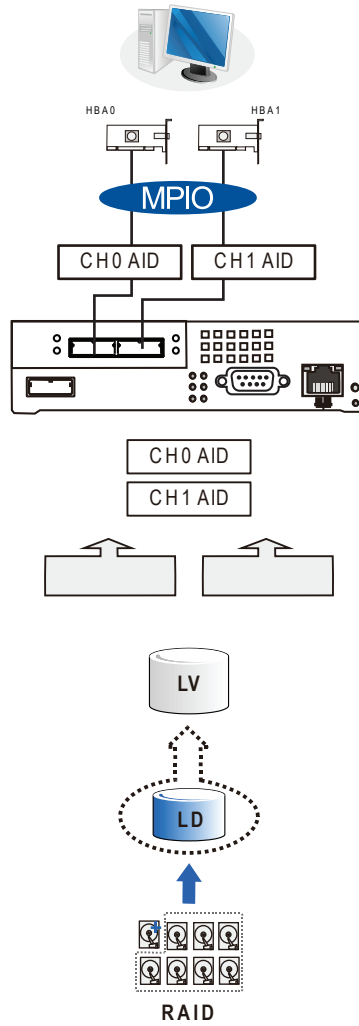
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- Single-controller models



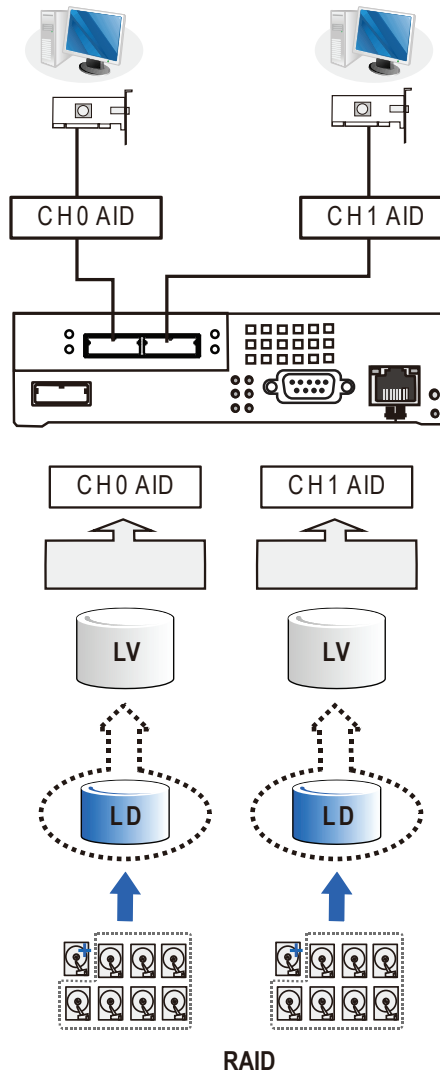
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**NOTES:**

- With more hard drives over SAS expansion links, you can create more logical groups of drives. Avail the logical partitions using more LUNs.
  - If your operating system is Windows® 2003 server, you need a multipathing software such as **MPIO** or **Linux Device Mapper** to control and optimize the access to logical drives via multiple data paths.
-



## DAS (Direct-Attached Storage) connection to two servers



**NOTE:** If you want your LUN to be accessible by multiple hosts, use locking or multipath access control.



### 2.3.4 Ethernet - host connections

Before performing the connections between Ethernet and host, take note of the following requirements:

- Ethernet cables are user-supplied. We recommend you to use CAT5e shielded STP type network cables or cables with better performance types (important for meeting the requirements imposed by emission standards).
- Use of straight-through Ethernet cables with RJ-45 plugs.
- Use of cross-over cables. These cables can be automatically detected and rerouted for a valid connection.

See below the list of connection types:

- Directly to iSCSI initiators (software or hardware) or via the Gigabit Ethernet switches.
- To servers equipped with iSCSI HBA, preferably a hardware TOE (TCP/IP Offload Engine) card, then to client stations with an Ethernet NIC or iSCSI HBA.
- The system presents its logical volumes via SCSI-like IDs and LUNs. These RAID volumes then appear as iSCSI targets via the network.

---

**IMPORTANT!** Even though the iSCSI initiator software is a cost-effective way of building an iSCSI SAN, this software initiator adds additional workload to the server CPU. We recommend you to apply iSCSI HBAs that come with TCP/IP offload engines in order to reduce overhead.

---

#### Network and host connection topologies

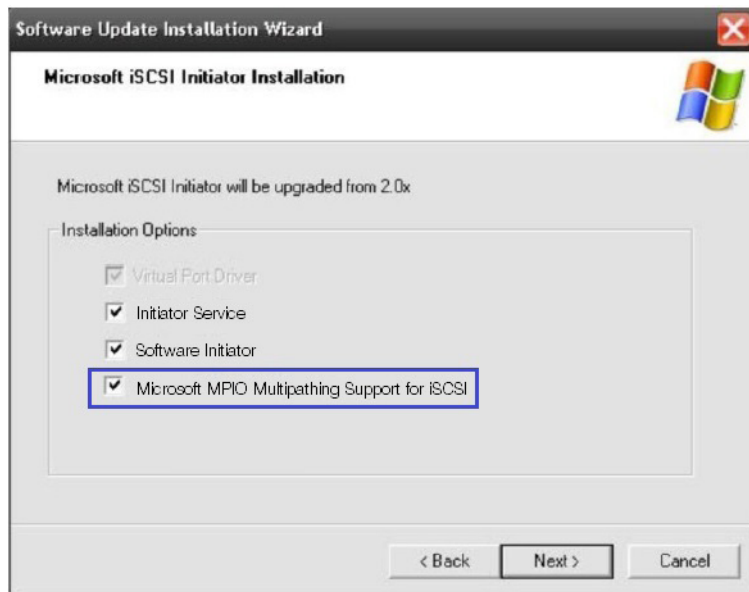
The iSCSI host ports must be connected to Ethernet network devices and iSCSI initiators that comply with IEFT iSCSI standard (RFC 3720). The network connection of the iSCSI ports is flexible. The use of network connecting devices, subnet, name servers, or iSCSI management software varies from case to case.

Note that the host NIC ports and the storage system's iSCSI host ports must be configured in the same subnet, and the following:

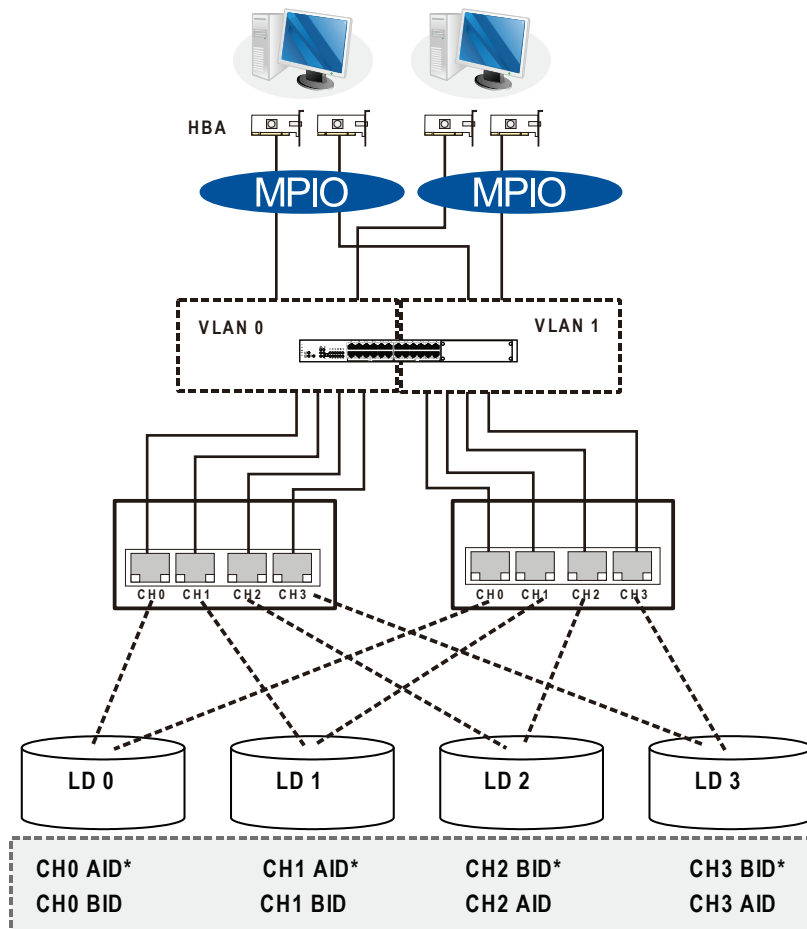
- Use the Ethernet Management port for management purposes only such as SANWatch or telnet console. This port must not be used for I/O transactions.
- Configurations such subnet or virtual LAN can separate iSCSI host links, decrease overhead, and eliminate the impact of link failure.
- Multiple arrays or logical partitions can be created and made available separately via different IDs or LUNs on host ports. Usually, a RAID5 logical drive of 8 members sometimes brings optimal array performance.



**IMPORTANT!** If you are using Microsoft's software initiator, uncheck the embedded MPIO function when installing the software as the MPIO selection creates conflict with MPIO driver.



### High availability IP SAN with redundant controller





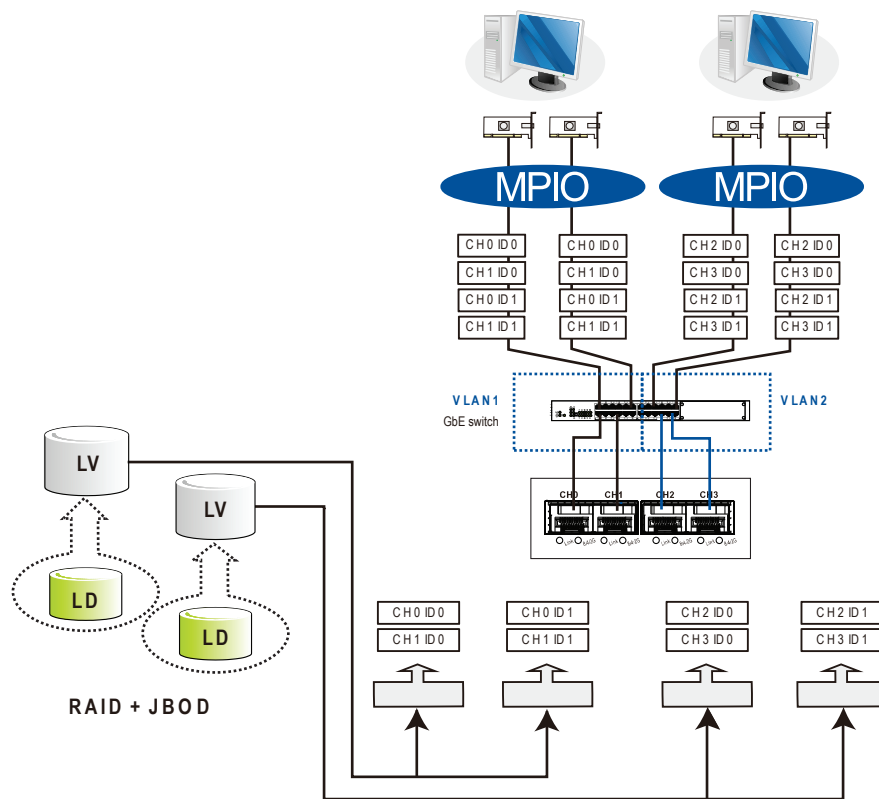
| Component          | Description  |
|--------------------|--|
| SAN storage system | Redundant controllers with a total of 8 host ports   |
| HBA                | iSCSI initiators, preferably PCIe TCP/IP offload engine (TOE)-capable cards  |
| GbE cables         | GbE network cables   |
| GbE switch         | Ports divided into 2 virtual LANs to separate access from host to targets  |
| Software           | MPIO to manage the fault-tolerant paths with failover/failback and load balance capabilities. Use MPIO multipathing software for the operating system to identify the alternative paths to the same logical drive.   |
| RAID configuration | <ul style="list-style-type: none"> <li>• This configuration does not support remote replication functionality. To set up remote replication, refer to High Availability IP SAN with Port Trunk (Remote Replication Enabled) or High Availability IP SAN with Port Trunk (Remote Replication Enabled).</li> <li>• Four logical drives (each logical drive has four member drives). You can include the drives from the expansion systems for better performance.</li> <li>• LD0 mapped to CH0 AID and CH0 BID; LD assigned to controller A</li> <li>• LD1 mapped to CH1 AID and CH1 BID; LD assigned to controller A</li> <li>• LD2 mapped to CH2 AID and CH2 BID; LD assigned to controller B</li> <li>• LD3 mapped to CH3 AID and CH3 BID; LD assigned to controller B</li> </ul> |
| CH0 AID            | Logical drive assignment   |
| CH1 AID            |  |
| CH2 BID            |  |
| CH3 BID            |  |

---

**IMPORTANT!** In the event of single-controller failure, a logical drive drive is accessed via the host IDs managed by the alternate controller. The host and port IDs do not failover to the remaining controller. In this case, MPIO driver is necessary for path redundancy and controller failover.

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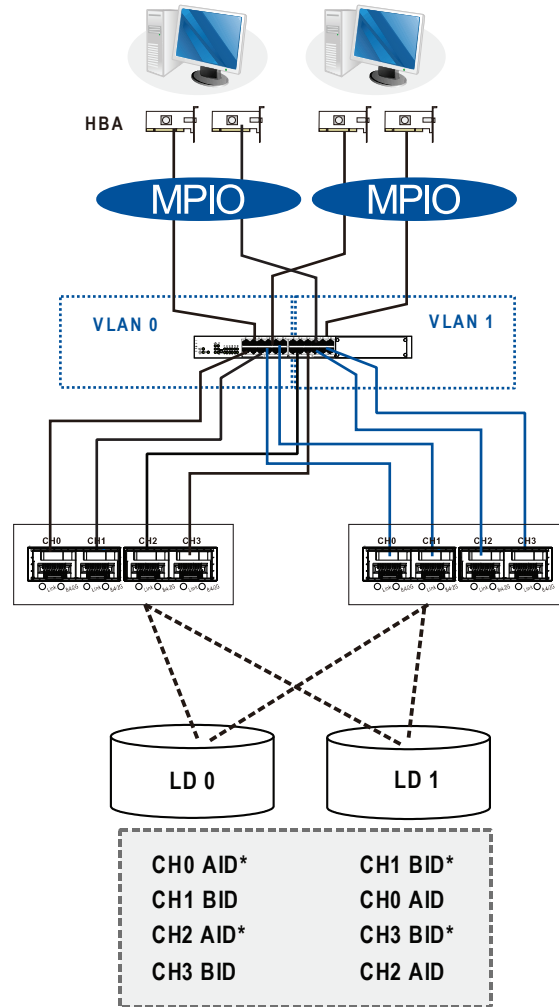
## Single-Controller with fault-tolerant path



| Component          | Description   |
|--------------------|---|
| SAN storage system | Single-controller with 4 host ports   |
| HBA or NIC         | iSCSI initiators, preferably PCIe TCP/IP offload engine (TOE)-capable cards   |
| GbE cables         | GbE network cables  |
| Software           | MPIO to manage the fault-tolerant paths with failover/failback and load balance capabilities.   |
| RAID configuration | <ul style="list-style-type: none"> <li>Four logical partitions (created from two logical volumes)</li> <li>Two logical volumes (each contains a logical drive)</li> </ul> <p><b>NOTE:</b> Each logical partition appears on two different host links for fault tolerance. Use MPIO software so that your operating system can identify the alternate paths to the same logical drive.</p> |



## High Availability IP SAN (Recommended for remote replication)



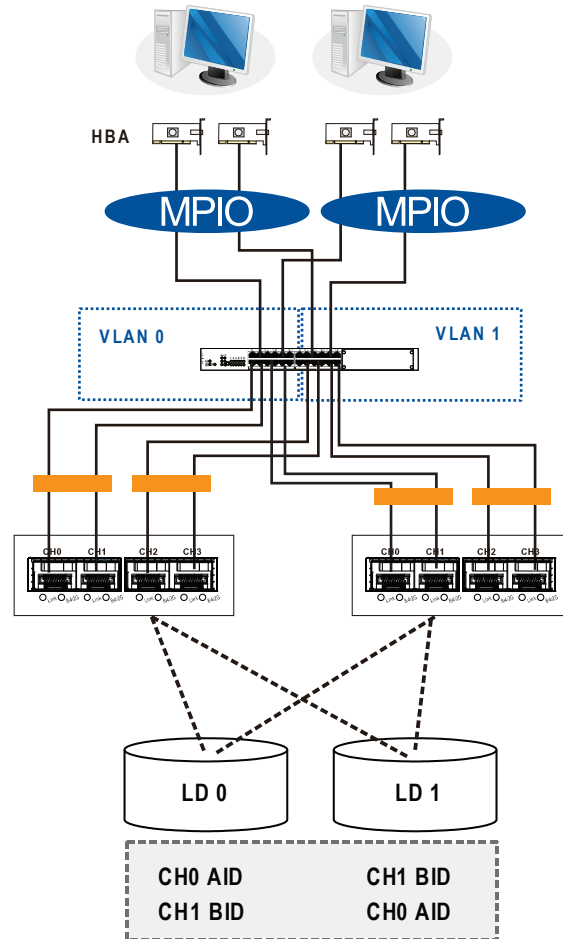
| Component          | Description  |
|--------------------|--|
| SAN storage system | Redundant controllers with eight host ports  |
| HBA                | iSCSI initiators, preferably PCIe TCP/IP offload engine (TOE)-capable cards  |
| GbE cables         | GbE network cables   |
| GbE switch         | Ports divided into 2 virtual LANs. Both controllers are linked to both virtual LAN zones.  |
| Software           | MPIO to manage the fault-tolerant paths with failover/failback and load balance capabilities. Use MPIO multipathing software for the operating system to identify the alternative paths to the same logical drive.   |
| RAID configuration | <ul style="list-style-type: none"> <li>Two logical drives; each has eight member drives. You can create more logical drives from the drives in the expansion systems.</li> <li>LD0 mapped to CH0 AID, CH1 BID, CH2 AID, and CH3 BID. LD must be assigned to controllers A and B to enable remote replication.</li> <li>LD1 mapped to CH1 BID, CH0 AID, CH3 BID, and CH2 AID. LD must be assigned to controllers A and B to enable remote replication.</li> </ul> |





**IMPORTANT!** For systems operating in Windows® 2003 server, and in the event of single-controller failure, a logical drive is accessed via the host IDs managed by the alternate controller. The host and port IDs do not failover to the remaining controller. In this case, MPIO driver is necessary for path redundancy and controller failover.

### High Availability IP SAN with Port Trunk (Remote replication-enabled)



| Component          | Description  |
|--------------------|--|
| SAN storage system | Redundant controllers with eight host ports  |
| HBA                | iSCSI initiators, preferably PCIe TCP/IP offload engine (TOE)-capable cards  |
| GbE cables         | GbE network cables; port trunking marked in orange rectangles  |
| GbE switch         | Ports divided into 2 virtual LANs. Both controllers are linked to both virtual LAN zones.  |
| Software           | MPIO to manage the fault-tolerant paths with failover/failback and load balance capabilities. Use MPIO multipathing software for the operating system to identify the alternative paths to the same logical drive. |

(see next page)

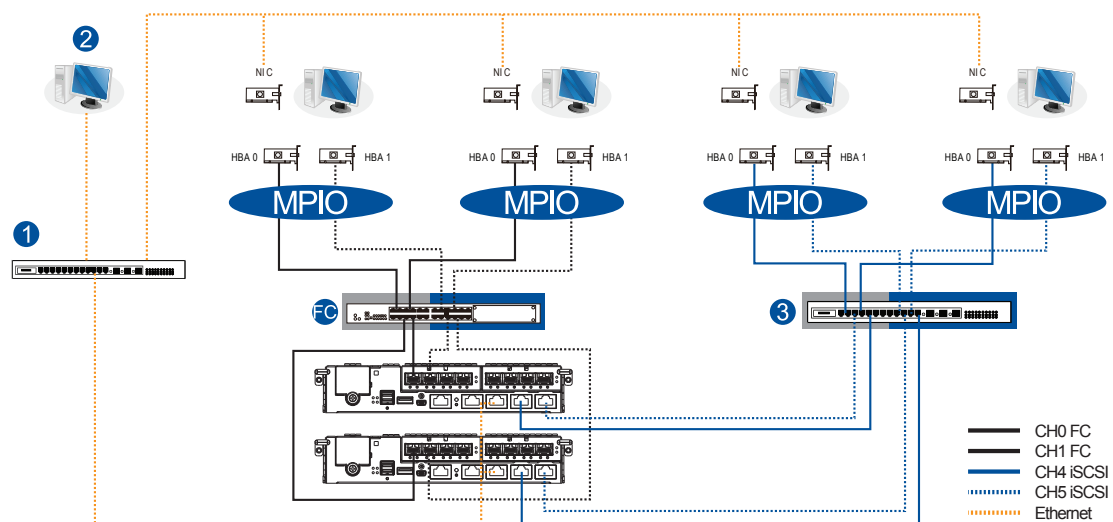


| Component          | Description   |
|--------------------|---|
| RAID configuration | <ul style="list-style-type: none"><li>• Two logical drives and each has eight member drives. You can create more logical drives from the drives in the expansion systems.</li><li>• LD0 mapped to CH0 AID, CH1 BID. LD must be assigned to controllers A and B to enable remote replication.</li><li>• LD1 mapped to CH1 BID, CH0 AID. LD must be assigned to controllers A and B to enable remote replication.</li></ul> |

### 2.3.5 Hybrid host connections

For hybrid systems that feature two additional iSCSI ports, you can use these systems for remote replication or for host LUN mapping.

#### Single Hybrid Unit connected to FC/iSCSI hosts



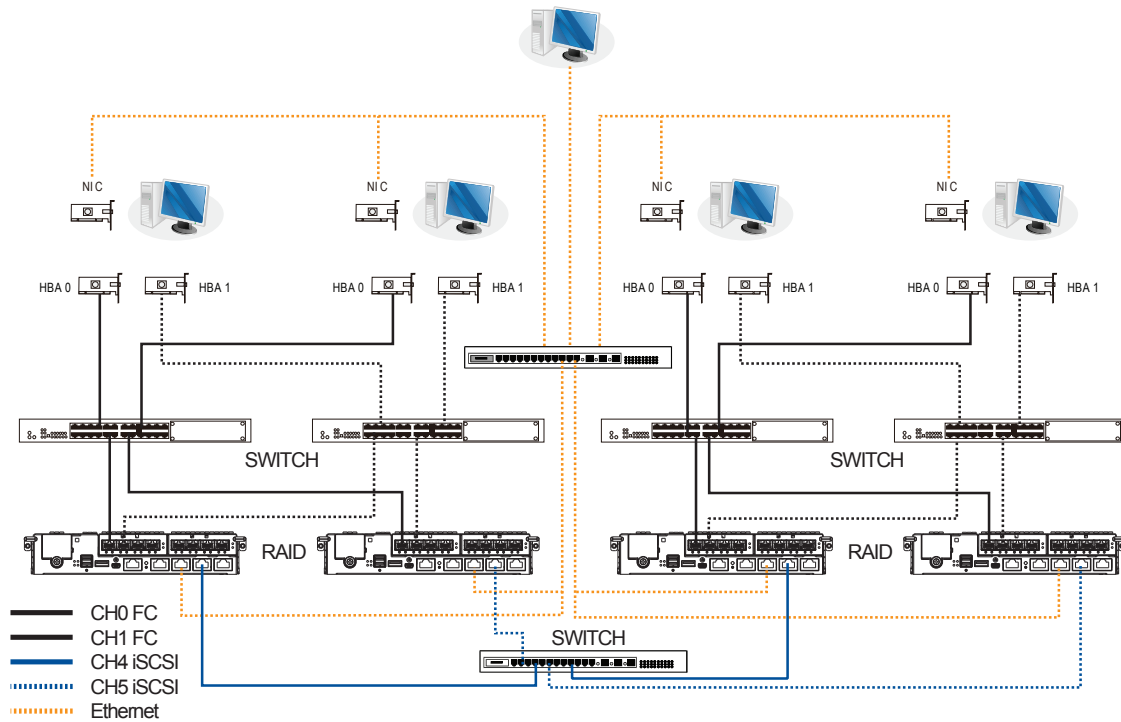
When connected to FC and iSCSI hosts, the connections are working in their respective speeds. This connection maximizes the number of connections while keeping the optimum performance gained by the high-speed FC link and FC switch.

#### NOTES:

- To gain optimum performance, ensure that the LAN switch **1** for the management station **2**, the LAN switch for the systems, and the iSCSI switch **3** for iSCSI host link are separated.
- If they are not separated, the host may consider that the iSCSI connection is a part of the host connection and might use it for data I/O, even if the iSCSI ports are not mapped to the host. As a result, the data transaction speed slows down to iSCSI connection's level and the fast FC connection bandwidth may be spent without use.



## Utilizing Hybrid iSCSI ports for Data Replication



The illustration above depicts the utilization of the iSCSI host ports for remote data replication.

Two hybrid systems, a source system and a target system, reside within the same virtual pool but are physically apart. You can create a volume copy/mirror pair for data protection without relying on slow management LAN cable connections. In such case, you can link the hybrid systems using iSCSI host ports. If the distances between systems are far, additional switches may be required.



### 2.3.6 Expansion connections

A SAS host link 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 paths 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 connects to expansion systems. For dual-controller systems, each expansion port connects to a controller of another expansion system, making fault-tolerant links to different SAS domains.

The following principles apply to SAN storage and expansion system connections:

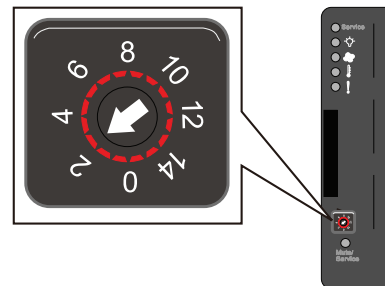
- Dual-controller SAN storage connects to a single-controller expansion system
- Single-controller SAN storage connects to a single-controller expansion system
- A longer cable is available in making expansion links with a dual-controller configuration. If you need to connect expansion systems from two 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 the expansion IDs

Each expansion system must have a unique ID and you can configure the ID via the rotary ID switch. To set the expansion IDs, use a small flat-blade screwdriver.

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

- Set the IDs from 1 to 15. The order starts from the expansion that is closest to the managing DS enclosure.
- Ensure to set a unique ID on each enclosure so that the SAS WWN addresses of the disk drives are properly assigned. The SAN storage system firmware automatically manages these addresses.





## Configuration rules

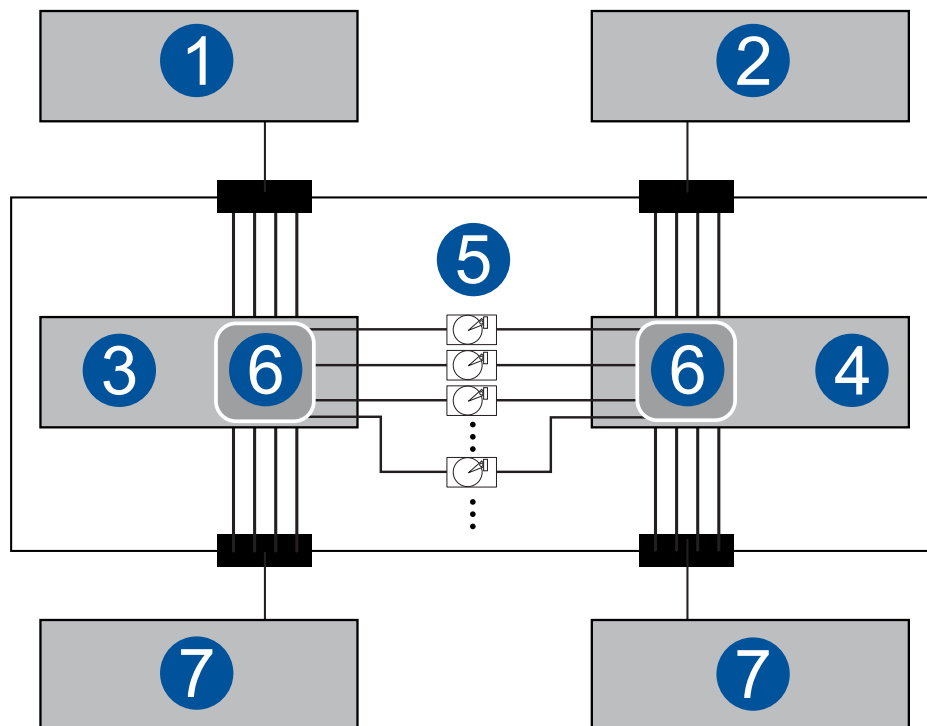
To connect the SAS interfaces across SAN storage and expansion systems, you must take note of the following:

- **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   |

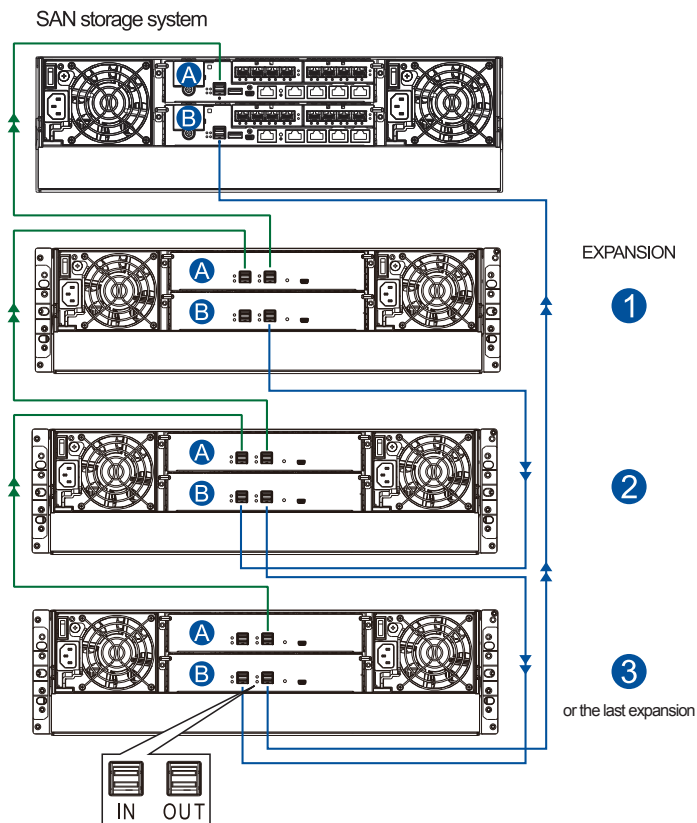


- **Fault-tolerant links to SAS disk drives**

- 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 SAN 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 SAN 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 upper controller is controller A, the lower one is controller B.
- On a SAN storage system, each controller is considered as managing a separate SAS domain. With the help of the port selector mechanism on the MUX boards, the idea of SAS domain applies even when SATA drives are used in a dual-controller expansion system.

### Connecting expansion systems

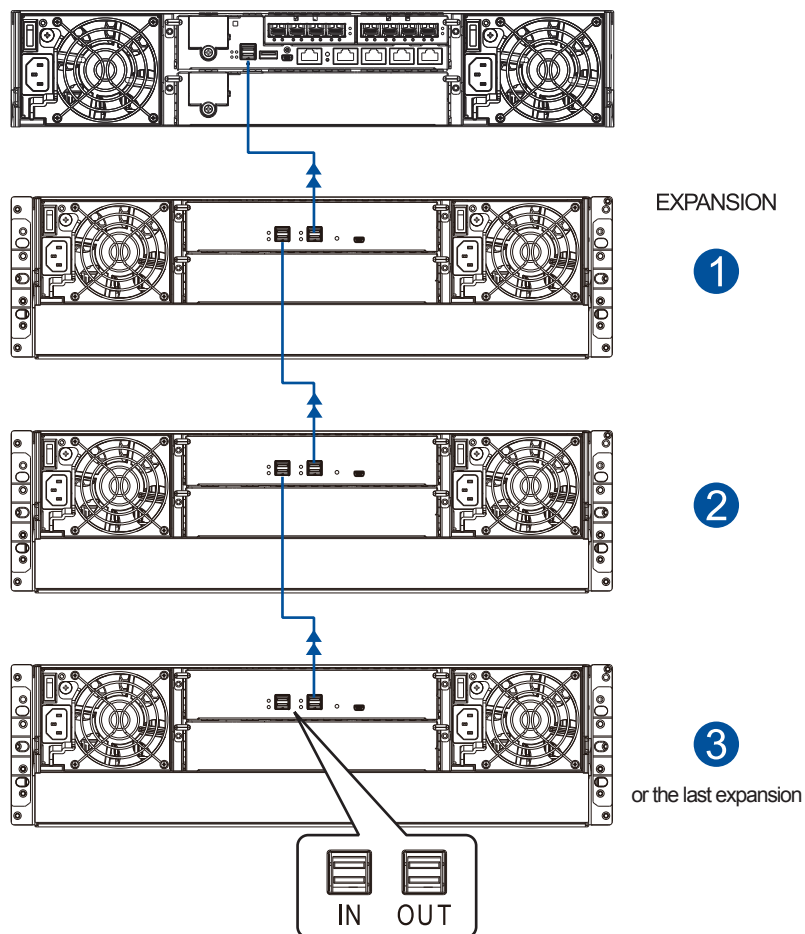
- Connecting dual-controller expansions





- SAN storage controller **A**: 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**
  
  - SAN storage controller **B**: 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

SAN storage system



- SAN storage controller: SAS port **IN** → Expansion **1**: SAS port **OUT**
- Expansion **1**: SAS port **IN** → Expansion **2**: SAS port **OUT**
- Expansion **2**: SAS port **IN** → Expansion **3** or last: SAS port **OUT**

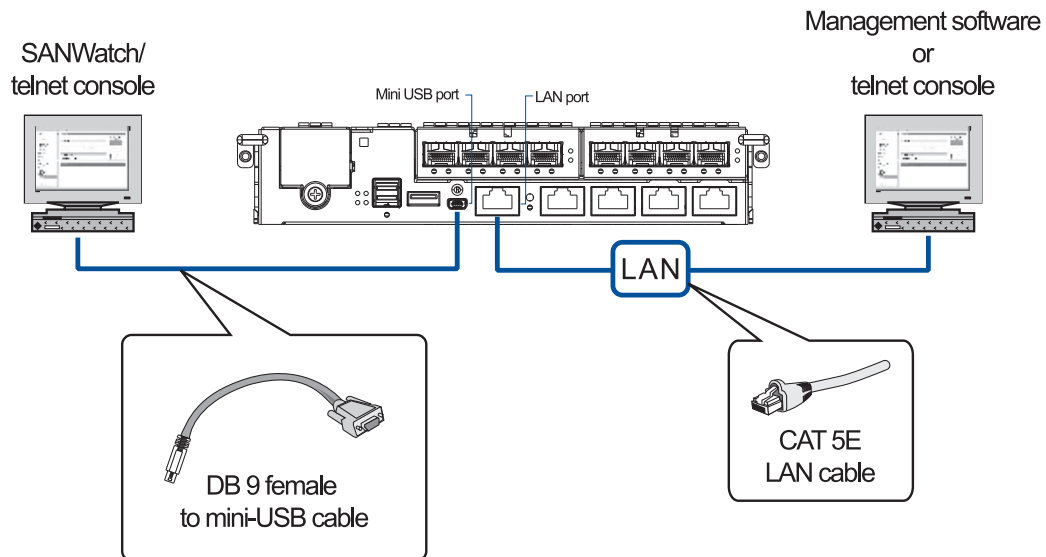


### 2.3.7 Management console connections

To connect you SAN storage to external consoles, you need the following:

- DB 9 female to mini-USB cable (bundled with the package)
- CAT 5e LAN cable (user supplied)

#### Connecting SAN storage to external consoles



See below table for the list of default values of the serial port.

|                     |          |
|---------------------|----------|
| <b>Baud rate</b>    | 38400    |
| <b>Data bit</b>     | 8        |
| <b>Parity</b>       | None     |
| <b>Stop bit</b>     | 1        |
| <b>Flow control</b> | Hardware |

#### NOTES:

- A null modem may be required if you are using a third party cable.
- For TCP/IP connection and firewall configuration, refer to your management software's online help or user manual. If your network is not running the DHCP server protocols, you can use the default IP **10.10.1.1** if you are accessing for the first time.





### 2.3.8 Power connection

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

Take a look at the list below and check the following:

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

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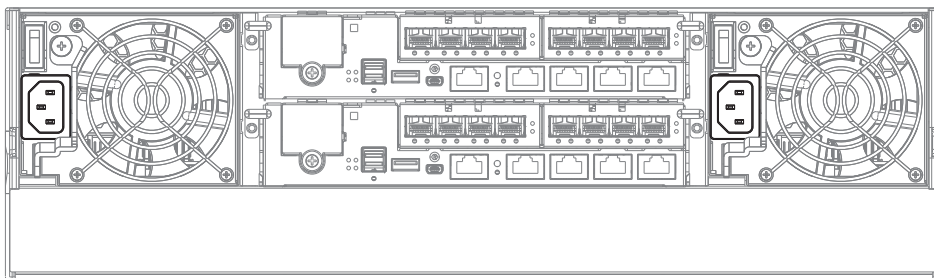
**IMPORTANT!** Ensure to use the power cables with at least 1.2 meters in length. DO NOT use extension cables as the power cables are designed to connect **ONLY and DIRECTLY** to relocatable power taps (RPTs) on server cabinets.

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4. Ensure that the ambient temperature is not less than 35°C.

#### Connecting to power source

Use the bundled power cables and connect them to the power sockets for both PSUs.

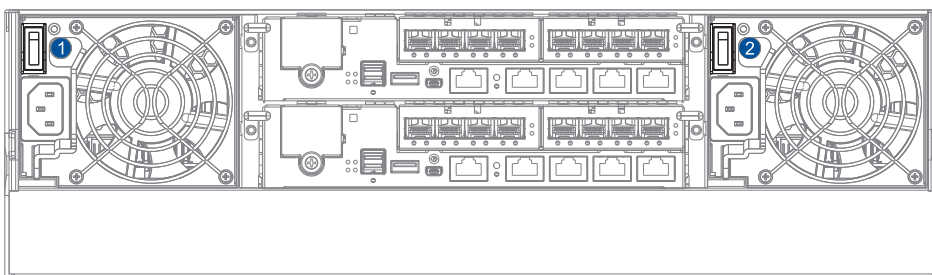


#### Turning on the system

Before turning on the DS system, you must turn on the expansion enclosures first if your network configuration consists of multiple arrays.

To turn on the system:

1. Press the power switches located at the PSUs, from left to right order.



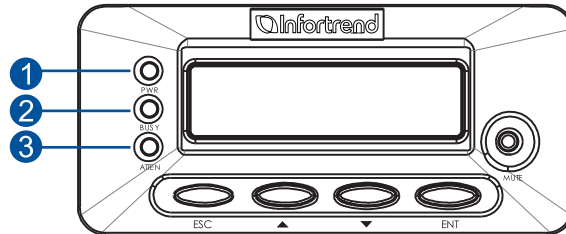
2. Turn on the networking devices.
3. Press the power button on the DS system's front panel and the host computers.



## 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:

- LCD panel LEDs



| Number | Name      | Status |
|--------|-----------|--------|
| 1      | Power     | OFF    |
| 2      | Host Busy | ON     |
| 3      | Attention | OFF    |

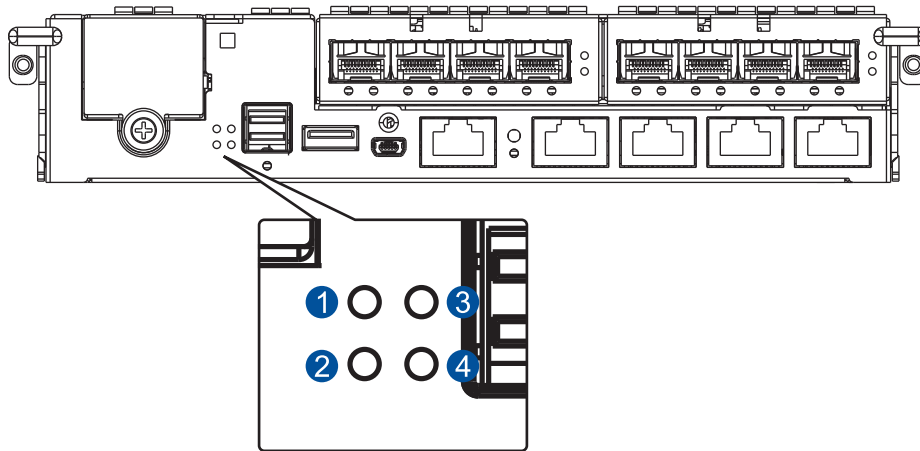
When the system starts up, the LCD screen displays the following order:

|                    |  |
|--------------------|--|
| Initializing...    | This displays when the PSUs are turned on.                     |
| Please Wait...     |  |
| Power On Self Test | The system is performing a POST (power on self-test).          |
| Please Wait...     |  |
| Power on           | The system POST is completed.                                  |
| Init Completed...  |  |
| ES80xx             | The system is accessing various interfaces.                    |
| ES80xx             |  |
| xGB RAM, Wait...   | The system is verifying the installed memory.                  |
| ES80xx             | The system is now ready. You can start configuring the system. |
| ES80xx x           |  |
| Ready              | The system is ready for I/O operation.                         |

**NOTE:** When turning ON the DS system, wait for the LCD screen to display *READY* or *No Host LUN*.



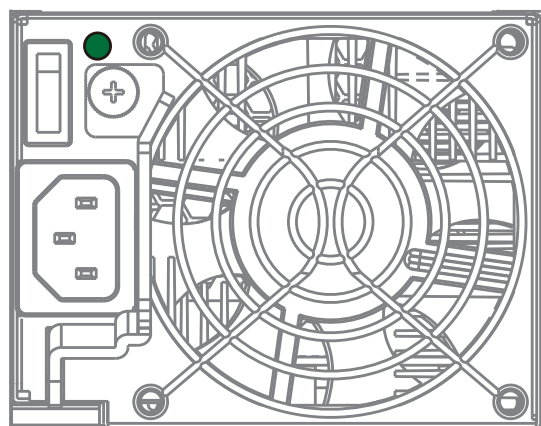
- Controller module LEDs



| Number | Name           | Status |
|--------|----------------|--------|
| 1      | Cache Dirty    | OFF    |
| 2      | Host Busy      | OFF    |
| 3      | Control Status | ON     |
| 4      | CBM Status     | ON     |

**NOTE:** Refer to chapter **System maintenance** for more information regarding the LED description.

- PSU and cooling module LED



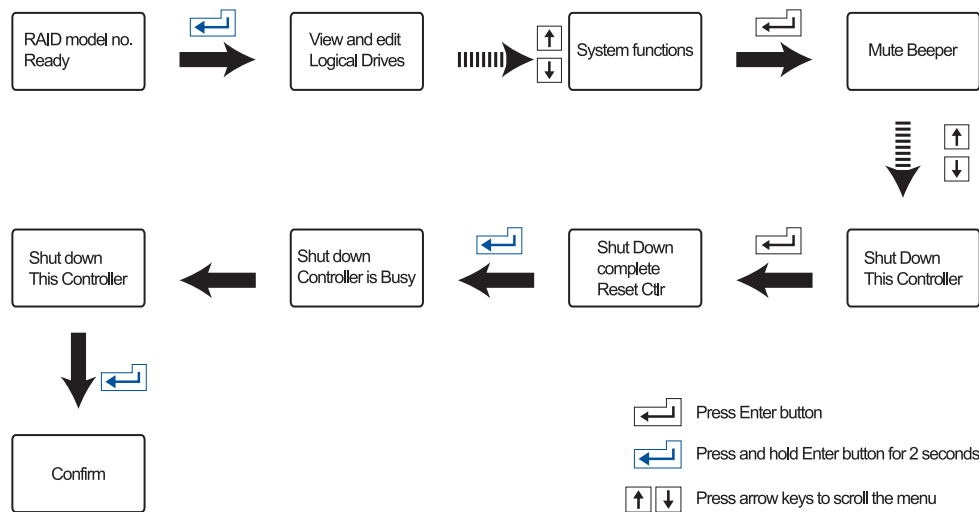


## Turning off the system

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 is lit in amber.
3. Flush all cached data using the controller's shutdown function to prepare the RAID system for a safe power shutdown. To do this, refer to the LCD screen with the illustrated order below:



# 3

# System monitoring

This chapter details the monitoring features and the status of EonStor DS 3000 systems.

## 3.1 Monitoring features

The EonStor DS 3000 series 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. For more details, see the firmware manual in the bundled CD.
- **SANWatch**  
SANWatch is a browser-based GUI (graphic user interface) software that you can install into a local or remote computer and access via the network. You can refer to SANWatch manual in your bundled CD for more information.
- **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. For more information, see **PSU/Cooling module LED**.

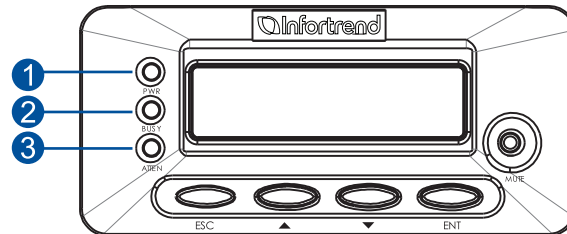


### 3.1.1 LEDs

This section details the system LEDs and their descriptions.

#### Front panel LEDs

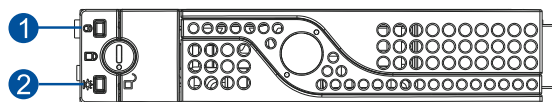
- Panel LEDs



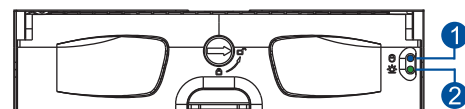
| Number | LED name            | Color | Description   |
|--------|---------------------|-------|---|
| ①      | Power<br>(PWR)      | ●     | The system is ON and the system status is normal.                 |
|        |                     | OFF   | The system is OFF or the system has failed.                       |
| ②      | Busy<br>(BUSY)      | ⚡     | There is an active traffic on the host/drive channels.            |
|        |                     | OFF   | There is no activity on the host/drive channels.                  |
| ③      | Attention<br>(ATTN) | ●     | A component failure/status event occurred.                        |
|        |                     | OFF   | The system and all its components are in normal operation status. |

NOTE: The ATTN LED lights up during the bootup process. Once the system successfully boots up, this LED will turn off.

- Drive tray LEDs



2.5-inch drive tray



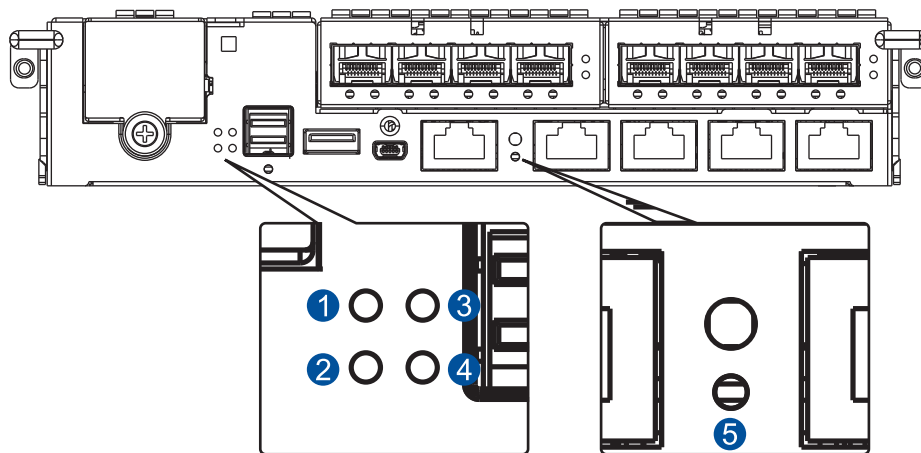
3.5-inch drive tray

| Number | LED name     | Color | Description  |
|--------|--------------|-------|--|
| ①      | Drive Busy   | ⚡     | Data is being written or read from the drive. The drive is busy. |
|        |              | ●     | The hard drive is plugged in but there is no activity going on.  |
| ②      | Power status | ●     | The drive bay is occupied and working normally.                  |
|        |              | ●     | Disk drive failed or connection problem occurred.                |



## Rear panel LEDs

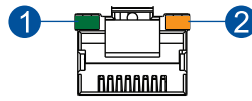
- Controller LEDs



| Number | LED name        | Color | Description   |
|--------|-----------------|-------|---|
| ①      | Cache Dirty     | ●     | <ul style="list-style-type: none"> <li>• Cache memory is dirty.</li> <li>• Data in flash backup module is flushed to the cache.</li> <li>• Errors occurred with cache memory (ECC errors).</li> <li>• Data is flushed from flash backup module to drive when the power is restored.</li> <li>• The supercapacitor temperature reading is abnormal (out of 0 - 35°C range).</li> <li>• The supercapacitor is not present.</li> </ul> |
|        |                 | ⚡     | The cached data is being transferred to the flash module 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 supercapacitor can sustain the memory in case of power loss.   |
| ②      | Host Busy       | ●     | Traffic going on the host bus.  |
| ③      | Control Status  | ●     | A controller is operating normally.   |
|        |                 | ●     | <ul style="list-style-type: none"> <li>• A component has failed or inappropriate RAID configurations caused system faults.</li> <li>• The controller is initializing.</li> </ul>  |
| ④      | CBM Status      | ●     | <ul style="list-style-type: none"> <li>• Both supercapacitor and flash modules are installed in the system.</li> <li>• The CBM is ready for operation.</li> </ul>   |
|        |                 | ●     | <ul style="list-style-type: none"> <li>• The CBM failed in operating, either the supercapacitor or flash module.</li> <li>• Either the supercapacitor or the flash module is missing.</li> </ul>  |
|        |                 | ⚡     | The supercapacitor is charging.   |
| ⑤      | Restore Default | ●     | Successfully reset the controller after the press and hold the Restore Default button.  |

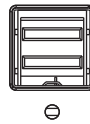


- **1 G Ethernet management port LEDs**



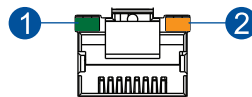
| Number | LED name    | Status   | Description   |
|--------|-------------|----------|---|
| ①      | Speed       | ON       | 1 Gb connection is established.   |
|        |             | OFF      | <ul style="list-style-type: none"> <li>• 10/100 Mb connection is established.</li> <li>• No connection is established.</li> </ul> |
| ②      | Link/Active | ON       | A connection is established.  |
|        |             | Flashing | Data I/O is ongoing.  |
|        |             | OFF      | No connection is established.   |

- **SAS expansion port LED**



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

- **10 G Ethernet port LEDs**



| Number | LED name    | Color/Status | Description                          |
|--------|-------------|--------------|--------------------------------------|
| ①      | Speed       | ●            | 10 Gb connection is established.     |
|        |             | ●            | 1 Gb connection is established.      |
|        |             | OFF          | 10/100 Mb connection is established. |
| ②      | Link/Active | ON           | A connection is established.         |
|        |             | Flashing     | Data I/O is ongoing.                 |
|        |             | OFF          | No connection is established.        |





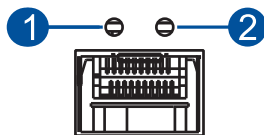
- **16 G Fibre channel port LEDs**



| Number | LED name    | Color/ Status | Description                               |
|--------|-------------|---------------|---|
| ①      | Link/Active | ON            | A connection is established.              |
|        |             | Flashing      | Data I/O is ongoing.                      |
|        |             | OFF           | No connection is established.             |
| ②      | Speed       | ● (Green)     | 16 Gb connection is established.          |
|        |             | ● (Yellow)    | 8 Gb connection is established.           |
|        |             | OFF           | 4 Gb or slower connection is established. |

- **8 G Fibre channel port LEDs**

These ports, if your system has them, deliver fast I/O performance for SAN applications. You can use optical cables for long distances, which proved to be reliable for this kind of setup.

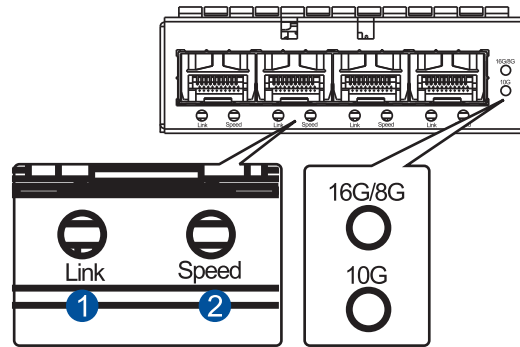


| Number | LED name    | Color/ Status | Description                     |
|--------|-------------|---------------|---------------------------------|
| ①      | Link/Active | ON            | A connection is established.    |
|        |             | OFF           | A link is broken.               |
| ②      | Speed       | ● (Green)     | 8 Gb connection is established. |
|        |             | ● (Orange)    | 4 Gb connection is established. |
|        |             | OFF           | No connection is established.   |

**NOTE:** For higher and speedier transfer rates, we suggest you to use optical cables for 4/8 Gb fiber connectivity. These cables are not susceptible to EMI (electromagnetic interference).



- Converged host board LEDs

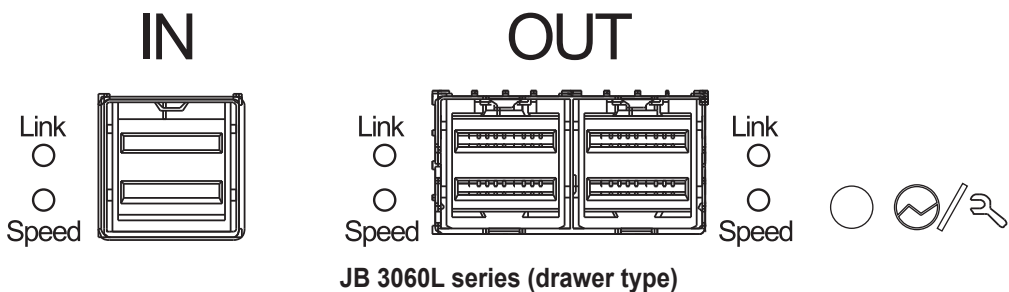
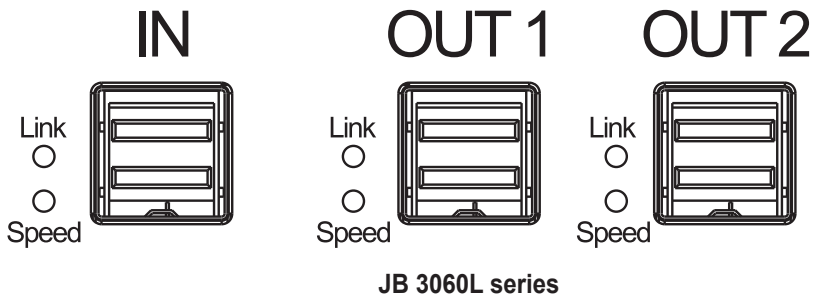
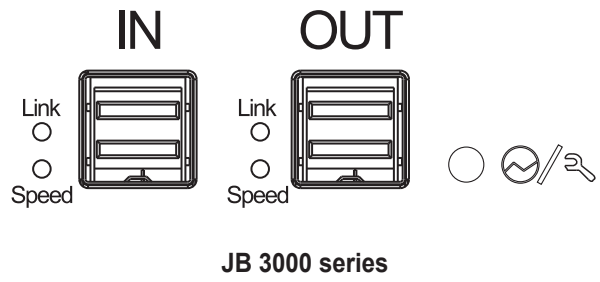


| Number | LED name | Color/ Status | Description                  |                   |               |
|--------|----------|---------------|------------------------------|-------------------|---------------|
| ①      | Link     | ●             | A connection is established. |                   |               |
|        |          | OFF           | A link is broken.            |                   |               |
| ②      | Speed    |               | 16 G Fibre channel           | 8 G Fibre channel | 10 G Ethernet |
|        |          | ●             | 16 G FC                      | 8 G FC            | 10 G Ethernet |
|        |          | ●             | 8 G FC                       | 4 G FC            | -----         |
|        |          | OFF           | 4 G FC or no link            | 2G FC or no link  | No link       |

| LED name | Connection type | Color/ Status | Description             |
|----------|-----------------|---------------|-------------------------|
| 16 G/ 8  | Fibre channel   | ●             | 16 G Fiber channel mode |
|          |                 | ●             | 8 G Fiber channel mode  |
| 10 G     | Ethernet        | ●             | 10 G Ethernet mode      |

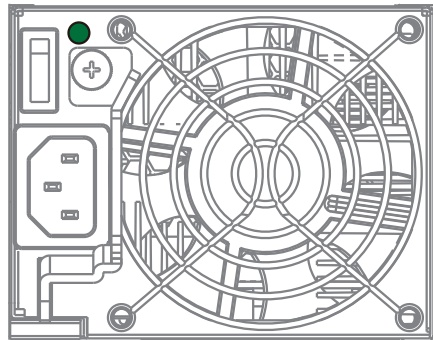





- 12 G SAS expansion controller LEDs



| LED name    | Status   | Description   |
|-------------|----------|---|
| Link/Active | ON       | All PHYs are validly linked.  |
|             | Flashing | One of the PHYs has failed.   |
|             | OFF      | All PHYs are offline.   |
| Speed       |          | 12 Gb link speed  |
|             |          | 6 Gb/3 Gb link speed  |
|             | OFF      | No connection   |
|             |          | The controller is operating normally.   |
|             |          | <ul style="list-style-type: none"> <li>A component failure occurred.</li> <li>Initialization is ongoing.</li> </ul> |

- **PSU/Cooling module LED**



| Color   | Description  |
|---|--|
|  | The system is connected to the power source but the system is not turned on. |
|  | The PSU/cooling module is operating normally.                                |
|  | The PSU/cooling module is faulty.  |

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, see section **Replacing the PSU/cooling module**.

---

### 3.1.2 Alarms and I<sup>2</sup>C bus

This section details the system alarms and I<sup>2</sup>C bus.

#### Audible alarms

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

- Cooling fan modules
- PSU modules
- Hard disk drives
- Sensors or presence detection circuitries

If you hear an audible alarm, ensure to read the error message on the terminal or SANWatch 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. To know more of the alarm beep patterns, see the Troubleshooting Guide included in the bundled CD.

---

**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 battery resumes charging.

---

#### I<sup>2</sup>C bus

The operating status of the PSU and cooling fan modules are collected via the I<sup>2</sup>C serial bus. If either of the modules fails, the system detects the failure and you will be notified via the same methods stated in audible alarms.

# System maintenance

# 4

This chapter provides maintenance and replacement procedures of replaceable components of your EonStor DS 3000 system.

## 4.1 Replaceable components

Your EonStor DS system is comprised of replaceable components:

- PSU module
- Hard disk drives

---

### 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 the 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.
- 

### 4.1.1 Power supply module/cooling module

The PSUs are configured in a redundant configuration, with each PSU housed in a robust steel canister.

#### Detecting a failed PSU

If a PSU module fails, the system notifies you via the following indicators:

- The PSU LED lights in red
- Audible alarm

---

**NOTE:** See section 3.1.2 Alarms and I2C bus for more details.

---

- Firmware utility

---

**NOTE:** Refer to the Firmware User Manual in the bundled CD for more details.

---

- SANWatch Manager software

---

**NOTE:** Refer to SANWatch User Manual in the bundled CD for more details.

---



## Replacing the PSU/cooling module

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

---

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

---

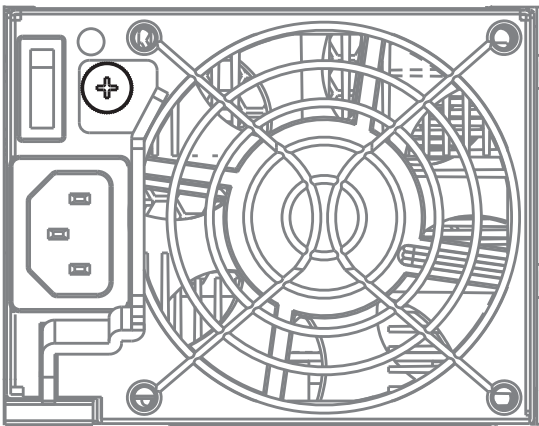
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**NOTE:** For more information, contact your system vendor.

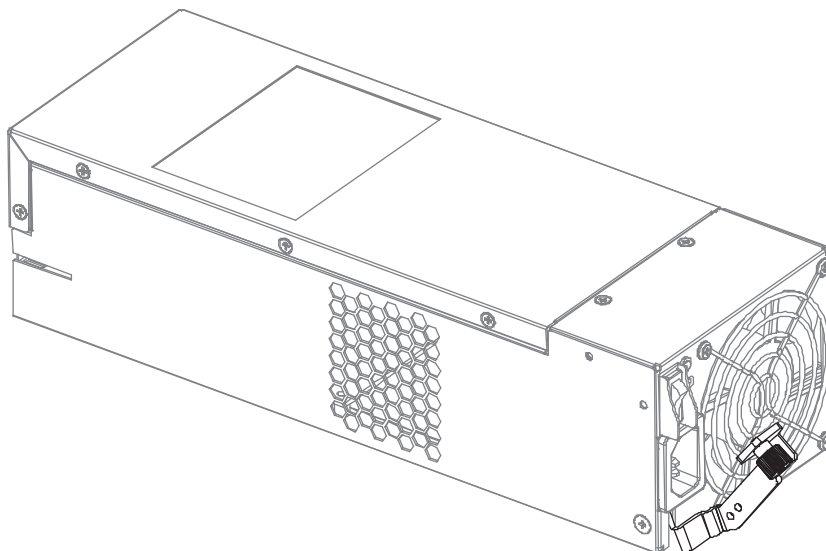
---

To replace the PSU:

1. Shut down the system, turn off the PSU then unplug the power cord.
2. Loosen the screw that secures the extraction handle to the chassis.

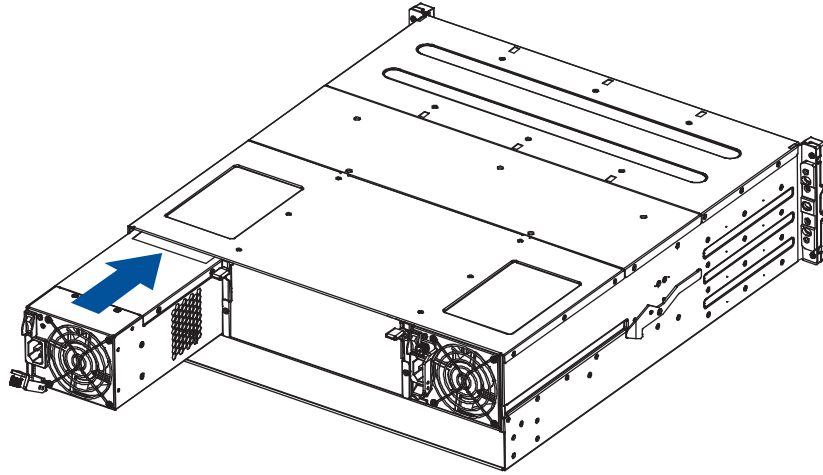


3. Pull down the extraction handle to dislodge the PSU from the backplane connectors, then gently pull the PSU from the system. If the system is mounted to the rackmount, carefully support its weight with the rack while removing the module.





4. Insert the replacement PSU/cooling module with the extraction handle pointing outwards, then push into the chassis. When you feel a resistance, push the extraction handle to lodge the PSU/cooling module to the back-end connectors.



5. Fasten the thumb screw to secure the PSU to the system.
6. Connect the power cord.
7. Turn on the PSU module.



## 4.1.2 Replacing the hard drive

### WARNING!

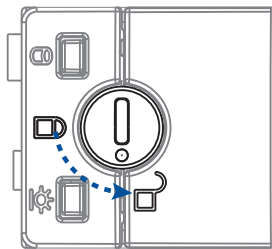
- Ensure to have a replacement ready before replacing the hard drive. DO NOT leave the drive tray open for long periods to prevent disruption of internal airflow.
- Handle the hard drives with extreme care. Hold them by the edges and avoid touching the circuits and interface connectors.

To replace the hard drive:

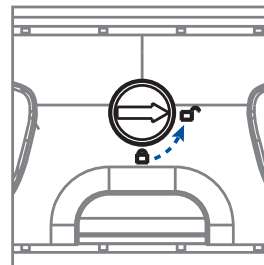
1. Identify the faulty hard drive using the SANWatch software or the LEDs on the drive tray.

**NOTE:** See section **Hard drive designation** for the order of the drive bays.

2. When the faulty hard drive is located, turn the bezel lock to its unlock position using a small-sized flathead screwdriver.

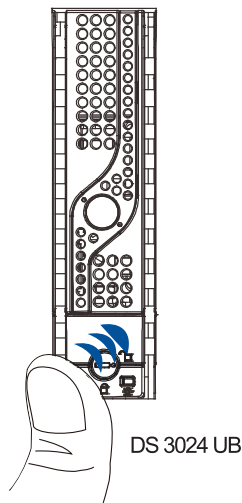


DS 3024 UB

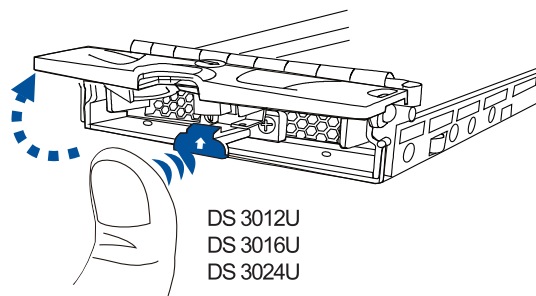


DS 3012U  
DS 3016U  
DS 3024U

3. Press the release button to open the bezel, wait for 30 seconds for the hard drive to spin down, then gently pull out the tray.



DS 3024 UB



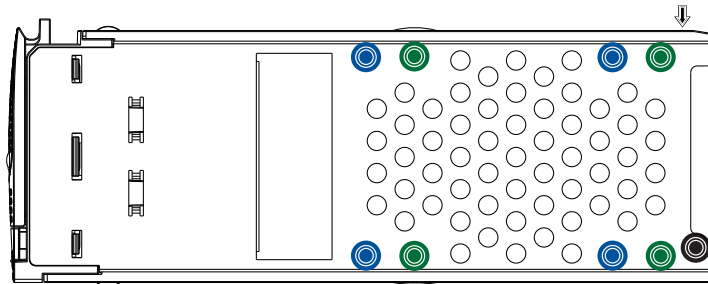
DS 3012U  
DS 3016U  
DS 3024U





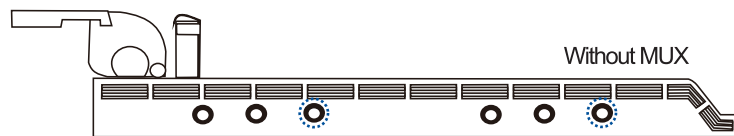
3. Remove the retention screws from the drive tray to dislodge the hard drive.

### 2.5-inch drive tray

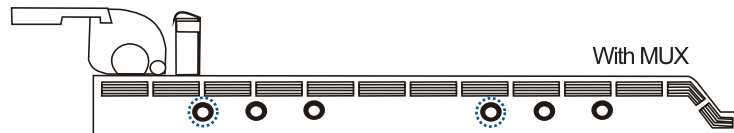


- SAS HDD (without MUX)
- SATA HDD (with MUX)
- MUX board screw holes

### 3.5-inch drive tray



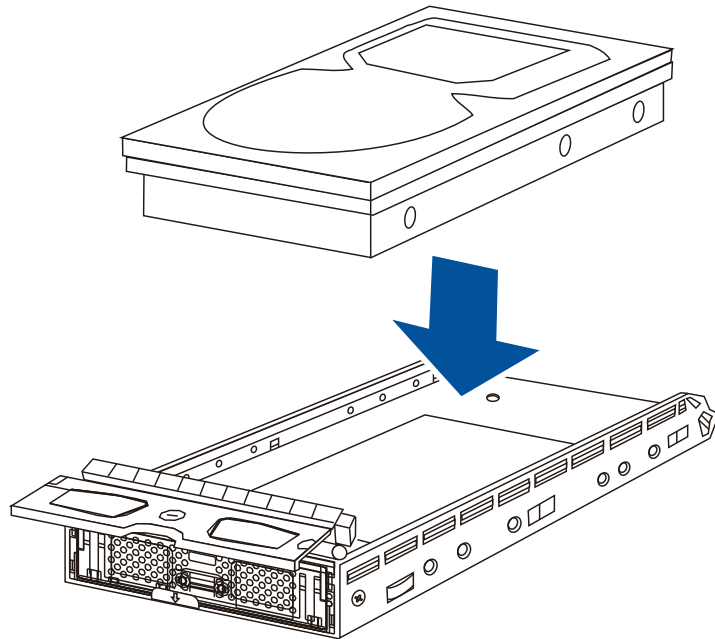
SAS HDD in single/dual controller systems  
SATA HDD in single controller systems



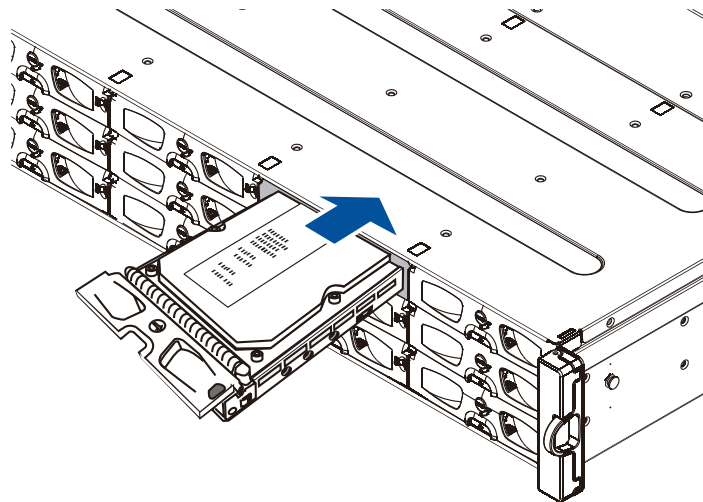
SATA HDD in dual controller systems



4. Install the replacement hard drive to the drive tray and secure the drive using the retention screws you removed in step 3.



5. Insert the assembled hard drive and drive tray to the bay with the front bezel open.



5. When the tray is fully inserted to the bay, close the front bezel.

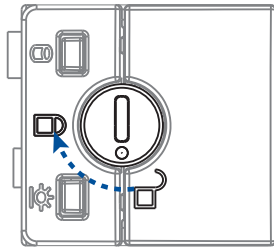
---

**IMPORTANT!** Ensure that there is no more drive error reported.

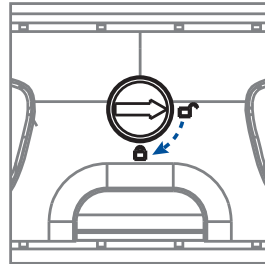
---



- When fully inserted, close the front bezel, then turn the bezel lock to its lock position using a small-sized flathead screwdriver.



DS 3024 UB



DS 3012U  
DS 3016U  
DS 3024U

### 4.1.3 Replacing the controller module

In replacing a controller in a dual-controller system, ensure that the replacement controller's firmware matches with the controller that you want to get replaced. The replacement provided to you has the firmware version on the label of the packaging.

Use SANWatch to find out the firmware version of the present controller. From SANWatch GUI, go to **Storage Manager > Information > Enclosure View**.

---

**WARNING!** DO NOT use the controller modules from different models. Each module has a unique ID which is applied to the host port names. If you insist on using other models' controller modules, you may encounter SAN problems on multiple systems.

---

---

**IMPORTANT!** When removing/installing a controller in a single-controller system, ensure that you shut down you applications and the system.

---

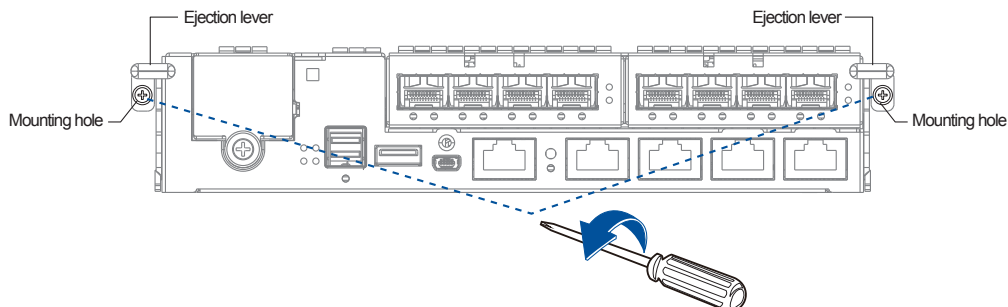
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**NOTE:** Refer to SANWatch user manual for more details.

---

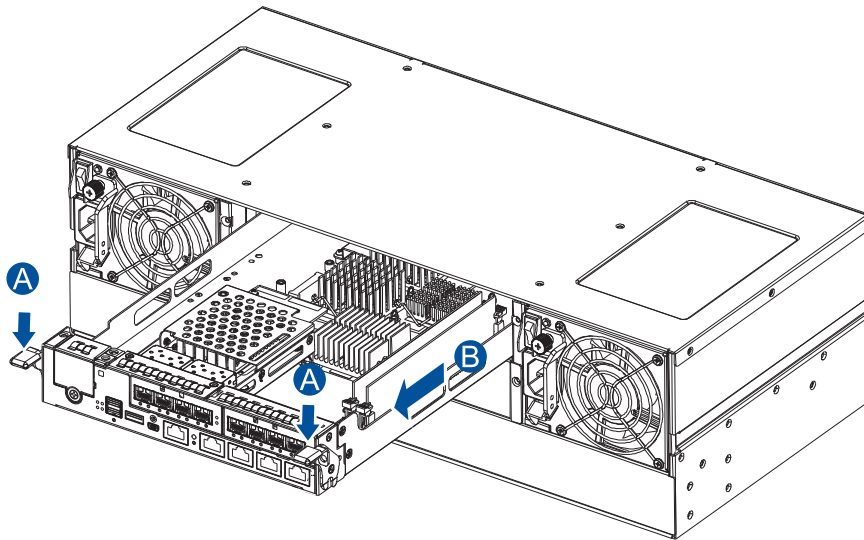
To replace the controller module:

- From your system's software, go to **Main Menu > System Functions > Shutdown controller** function to stop all I/O access to the system and the cached data are distributed to the disk drives.
- Shut down the system, switch off the power buttons, and unplug the power cords from the PSUs.
- Disconnect all cables from the controller module that you want to be replaced.
- Loosen the screws that secure the controller module's ejection levers to the chassis.

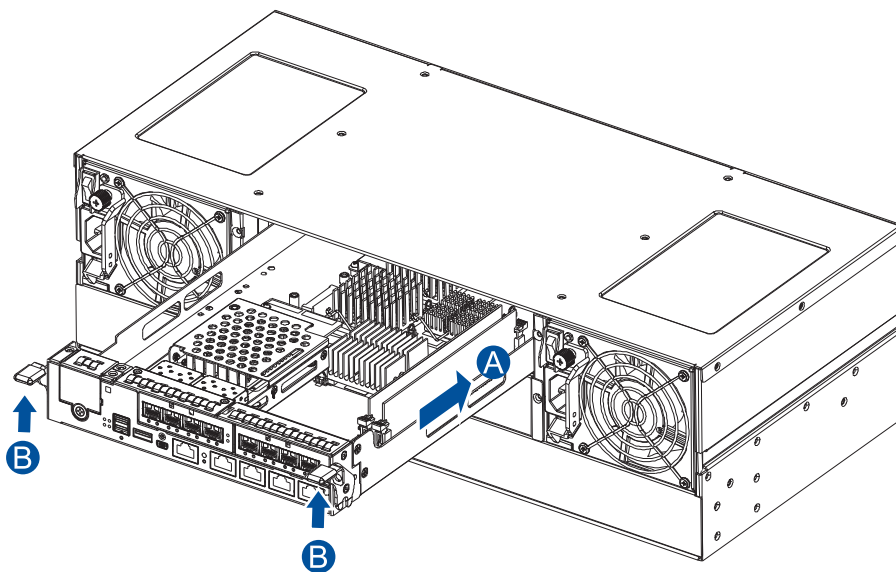




5. Push down the ejection levers to dislodge the controller from the system (A), then pull to remove from the enclosure (B).



6. Insert the replacement controller carefully into the controller module slot. When you feel a contact resistance, push the controller with a small but careful force (A), then move the ejection levers upwards to secure the controller to the enclosure (B).



7. Reconnect the cables to the controller's ports.
8. Turn on the system then check the messages on the system's LCD panel, SANWatch, or firmware utility. The power LEDs turn on when the system is successfully initiated online.
9. From your firmware, look for **Restore NVRAM from Disks** or **Restore NVRAM from Files** to restore your previous ID/LUN mapping configuration.



## 4.1.4 Replacing the memory module

The controller comes with a pre-installed DRAM module(s). You can upgrade or replace it when the bundled module malfunctions.

---

### IMPORTANT!

- If your controller has two modules, you must identify the correct module that is no longer working before you proceed with the replacement.
  - We strongly recommend you to NOT use the removed DRAM module from a failed controller of a different storage system.
  - Contact your system vendor to help you purchase the compatible DRAM modules.
- 

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

---

To replace the memory module:

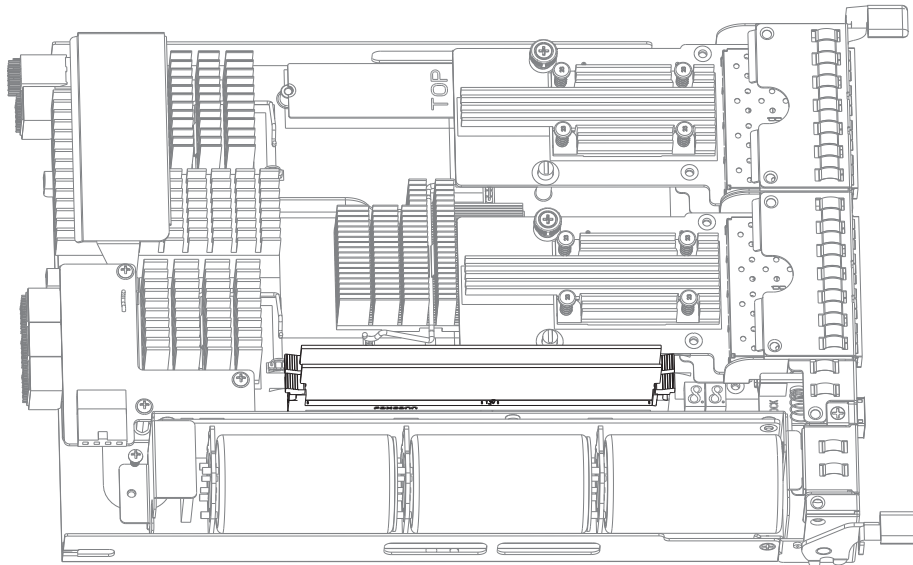
1. Shut down your system, unplug the power cords, then remove the controller. Wait for a minute for the remaining electric current to dissipate.

---

**NOTE:** See section **4.1.3 Replacing the controller module** for details.

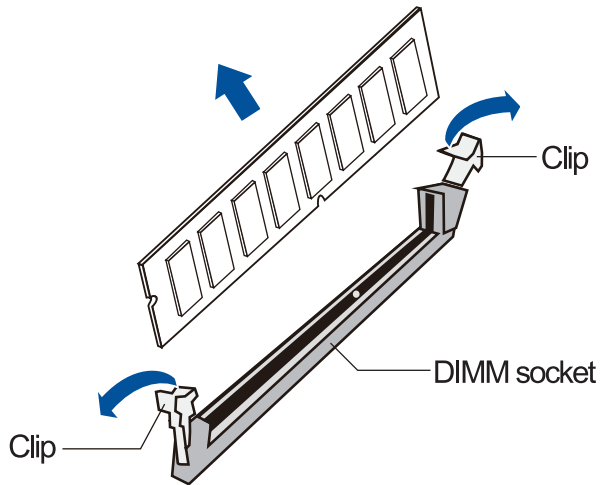
---

2. Look for the DIMM slots in the controller.

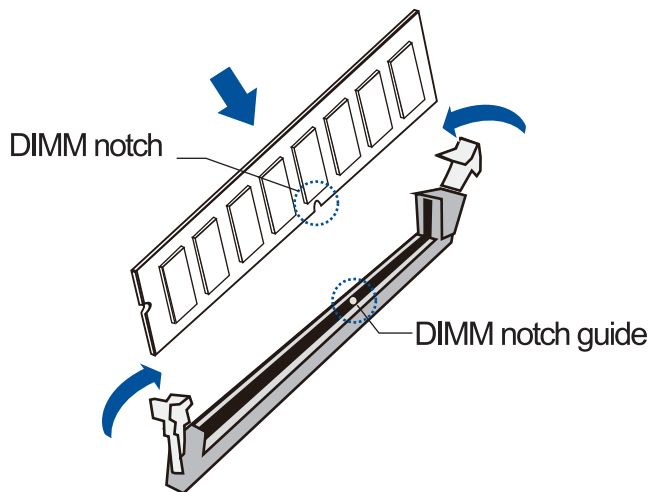




3. Push down the clips to release the DRAM module from the DIMM socket.



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



5. Reinstall the controller module into the chassis.



### 4.1.5 Replacing the CBM (Cache Backup Module) components

The CBM is comprised of a super capacitor and the FBM (flash backup module). The super capacitor allows your controller to provide more power during a power outage, supporting the controller to save the data to the FBM.

---

**WARNING!** Ensure that you have the replacement on hand before replacing your current CBM.

---

#### Super capacitor fault conditions and precautions

If a super capacitor leaks, gives off bad odor, generates 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 the 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 the super capacitor

To replace the super capacitor:

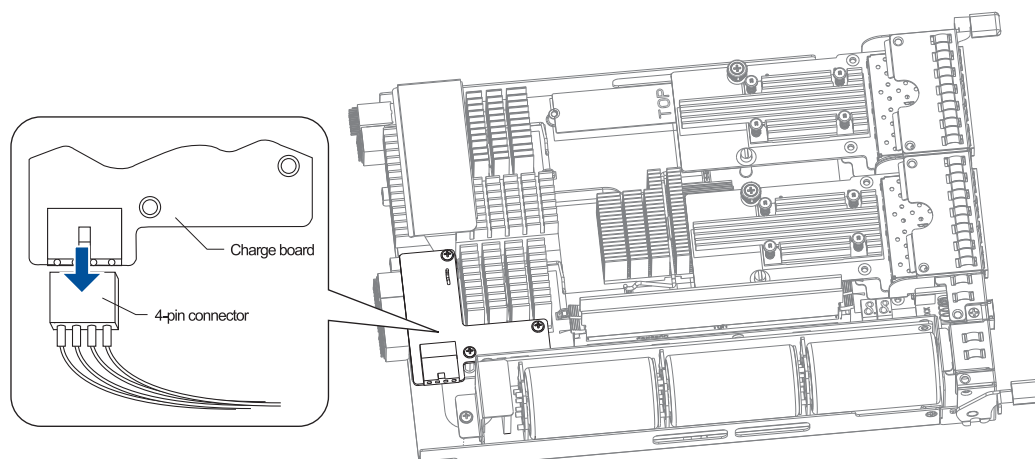
1. Shut down your system, unplug the power cords, then remove the controller. Wait for a minute for the remaining electric current to dissipate.

---

**NOTE:** See section 4.1.3 **Replacing the controller module** for details.

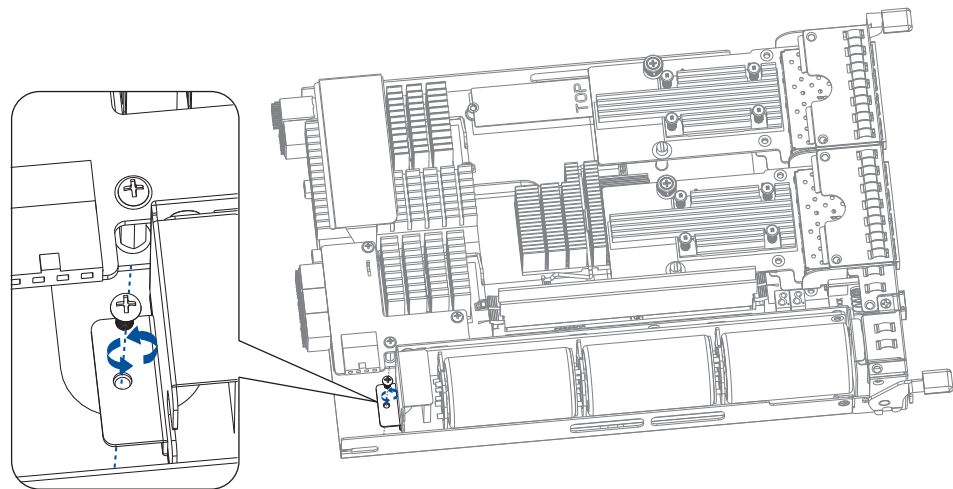
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2. From the controller board, disconnect the 4-pin connector from the charge board.

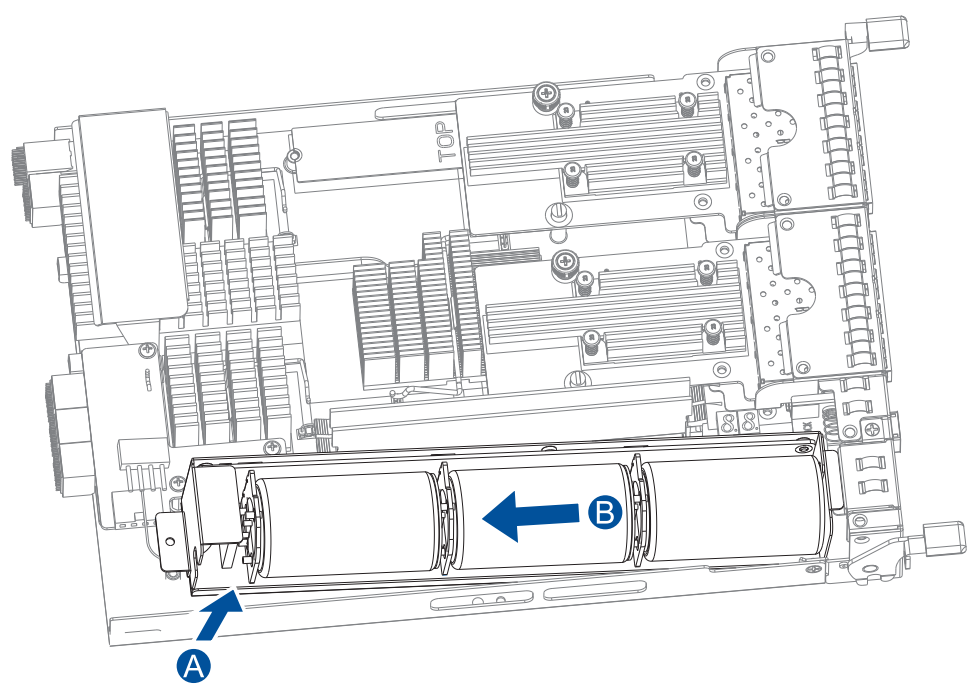




3. Loosen the screw that secures the super capacitor to the controller.



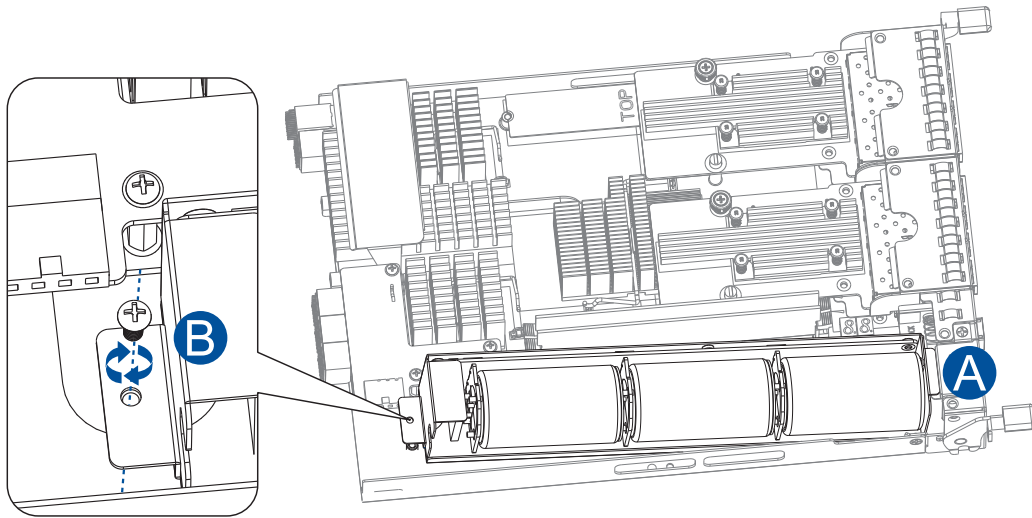
4. Remove the screw, lift the super capacitor in a 45° angle (A), then remove the super capacitor from the chassis (B).



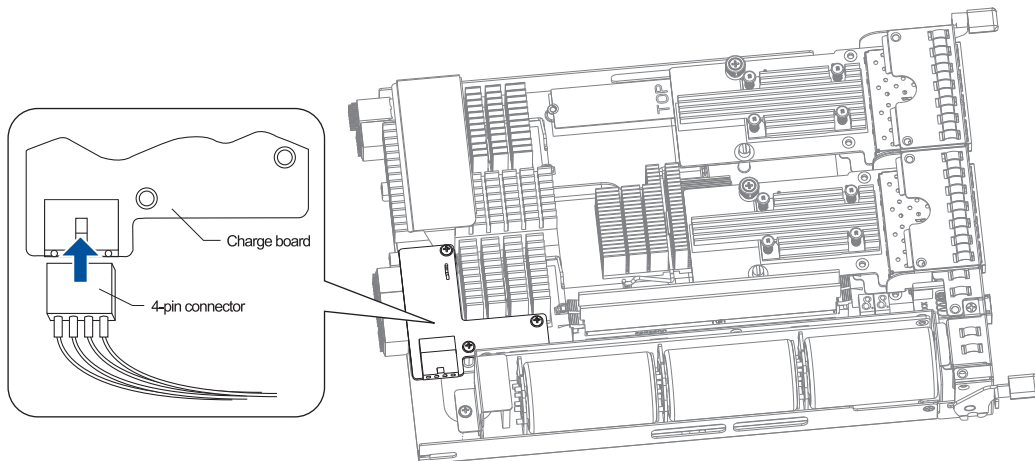




5. To install the replacement super capacitor, insert the protrusion metal on the super capacitor base on the controller (A), then secure it with the screw (B) you removed in step 3.



6. From the controller board, connect the 4-pin connector to the charge board.



7. Insert the controller back to the enclosure.



## Replacing the FBM (Flash Backup Module)

You can install two FBMs in the controller. If there are two host boards installed, you must remove the second host board if you want to gain access to both FBMs.

---

**NOTE:** Refer to section 4.1.6 **Replacing the host board** when replacing/uninstalling a host board.

---

To replace the FBM:

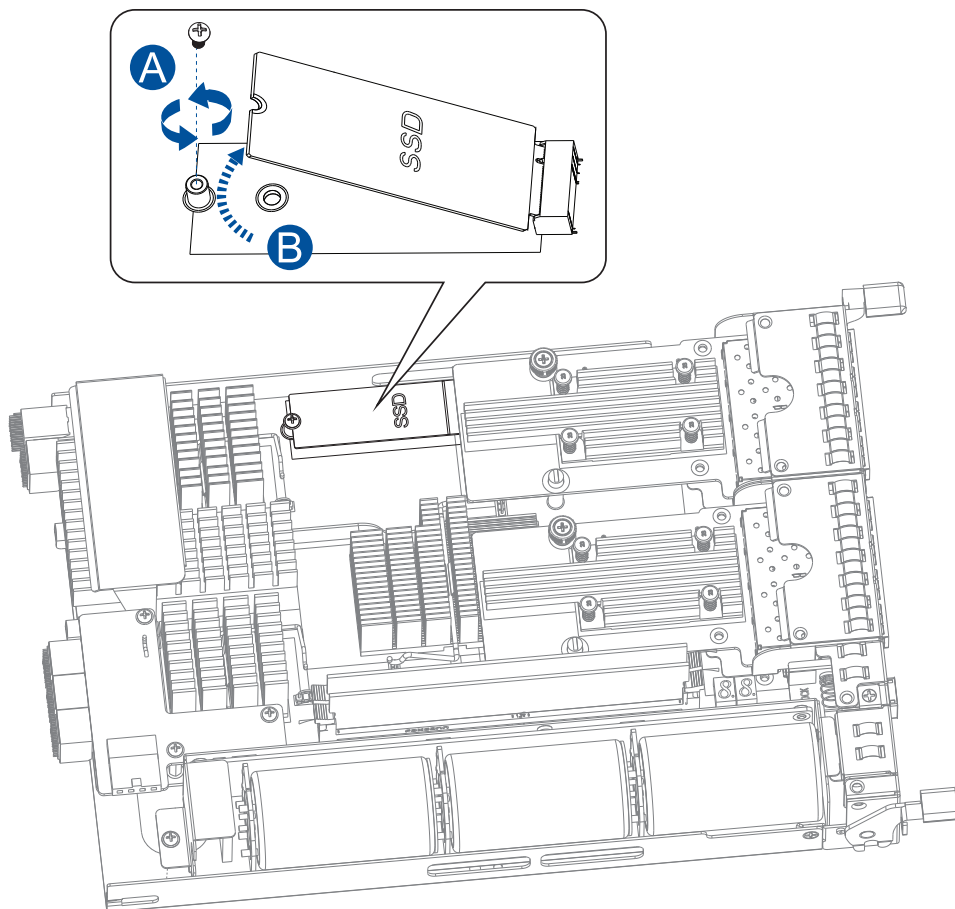
1. Shut down your system, unplug the power cords, then remove the controller. Wait for a minute for the remaining electric current to dissipate.

---

**NOTE:** See section 4.1.3 **Replacing the controller module** for details.

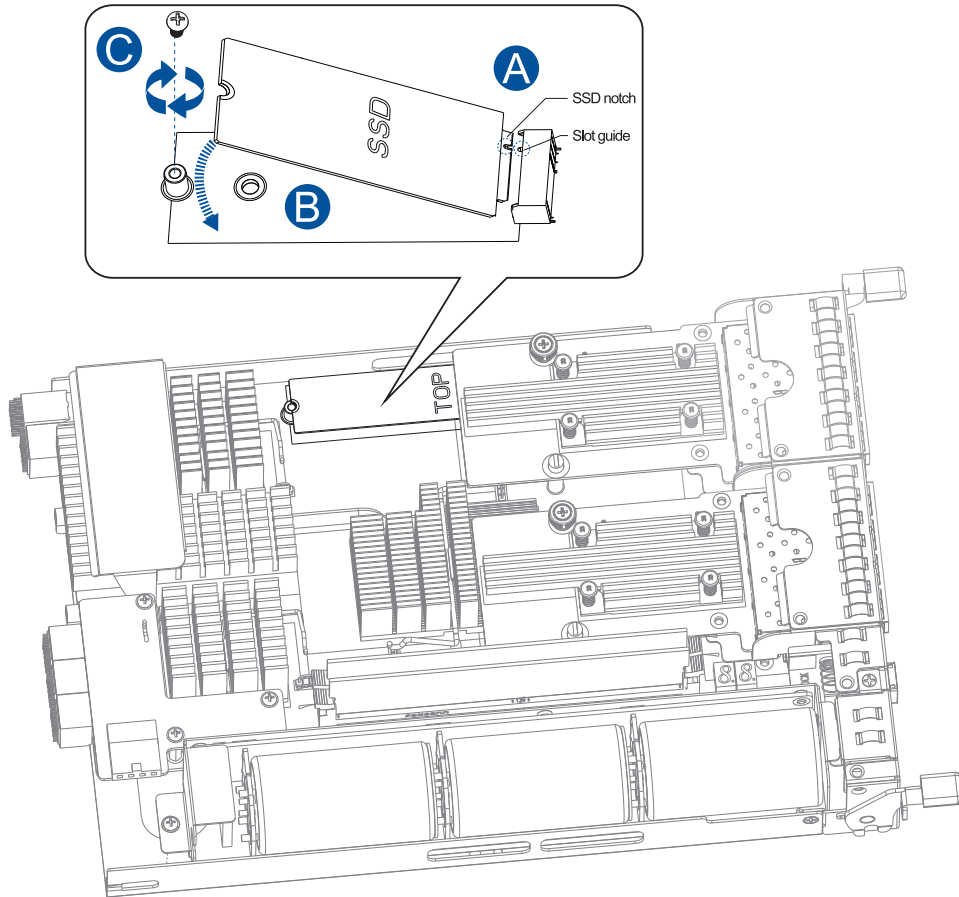
---

2. Loosen the screw (A) that secures the FBM to the controller, then lift it up to a 45° angle (B) and remove it from the board.





3. Orient and insert the replacement FBM's SSD notch to the base board's slot guide (A) in a 45° angle, place on top of the base board with the notch on the screw hole (B), then secure the FBM to the board with a screw (C) you removed in step 2.



4. Insert the controller back to the enclosure.



## 4.1.6 Replacing the host board

Before installing the host board, you must take note of the following considerations:

- If you're replacing the host board for an upgrade, a controller/host board downtime may occur.
- If you add or replace a host board, the firmware automatically restores the system to its factory settings.

To replace the host board:

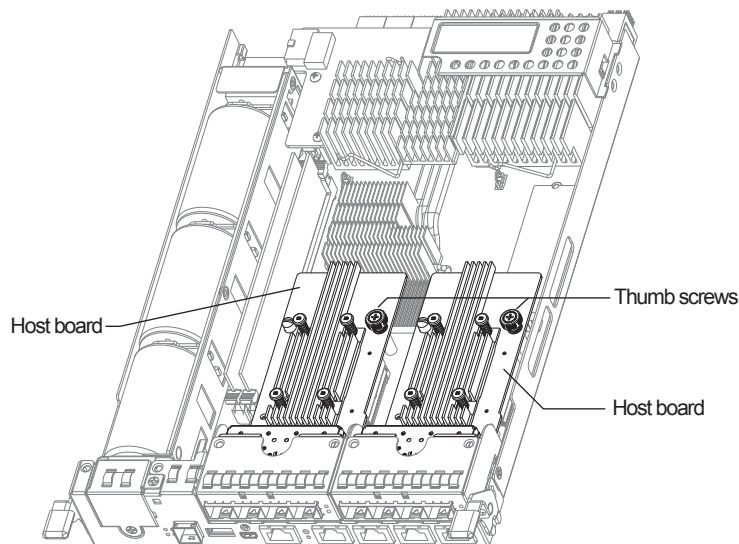
1. Shut down your system, unplug the power cords, then remove the controller. Wait for a minute for the remaining electric current to dissipate.

---

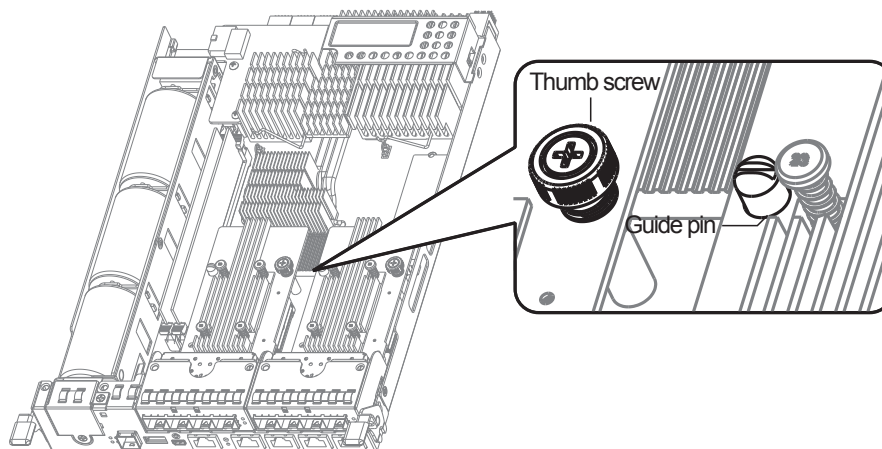
NOTE: See section 4.1.3 **Replacing the controller module** for details.

---

2. Loosen the thumb screw that secures the host board to the controller then lift the host board gently.



3. Orient the new/replacement host board to the controller's guide pin, place it carefully, then tighten the thumb screw to secure in place.



4. Insert the controller back to the enclosure.

# Appendices



## Certifications

### Summary

|                    |   |
|--------------------|---|
| <b>Safety</b>      | UL 60950-1 second edition<br>BSMI CNS 14336-1: 99 年版<br>CB IEC 60950-1:2005 (Second Edition) + Am 1:2009<br>+ Am 2:2013<br>EAC TP TC 004/2011, TP TC 020/2011 |
| <b>EMC</b>         | CE EN 55032:2012 +AC:2013/EN61000-3-2:2014<br>/EN 61000-3-3: 2013/EN 55024:2010+A1:2015<br>BSMI (CNS 13438)<br>FCC (FCC Part 15, subpart B)                   |
| <b>Environment</b> | IEC 60068-2<br>MIL-STD-810E/883E<br>ISTA<br>ASTM-D3332<br>IPC-TM-650  |
| <b>Others</b>      | ISO7779/3744<br>RoHS<br>Microsoft WHQL-Windows Server 2003  |

## 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.

### 警告使用者

這是甲類資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當對策

### 사용자 안내문

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

## Contact information

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