AssuredSAN Pro 5000 Series
FRU Installation and Replacement Guide

Adobe PostScript

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About this guide

This guide identifies Pro 5000 Series FRUs (field-replaceable units), and describes how to remove or install them within the AssuredSAN™ Pro 5000 Series storage enclosure products listed below:

- Fibre Channel Controller enclosure: 5720
- Internet SCSI (10GbE) Controller enclosure: 5420
- Expansion enclosures: 5120/5130

For a complete description of base product models and add-on components, see the "Product models" topic within the Setup Guide. See Storage enclosure overview on page 11 for descriptions of enclosures.

Intended audience

This guide is intended for storage system administrators.

Prerequisites

Prerequisites for installing and using this product include knowledge of:

- Servers and computer networks
- Network administration
- Storage system installation and configuration
- Storage area network (SAN) management and direct attach storage (DAS)
- Fibre Channel (FC), Internet SCSI (iSCSI), and Ethernet protocols

Related documentation

Table 1 Related documents

For information about	See
Enhancements, known issues, and late-breaking information not included in product documentation	Release Notes
Overview of product shipkit contents and setup tasks	Getting Started*
Regulatory compliance and safety and disposal information	AssuredSAN Product Regulatory Compliance and Safety*
Installing and using optional host-based software components (CAPI Proxy, MPIO DSM, VDS Provider, VSS Provider, SES Driver)	AssuredSAN Installing Optional Software for Microsoft Windows® Server
Using a rackmount bracket kit to install an enclosure into a rack	AssuredSAN Rackmount Bracket Kit Installation* or AssuredSAN 2-Post Rackmount Bracket Kit Installation*
Product hardware setup and related troubleshooting	AssuredSAN Pro 5000 Series Setup Guide
Obtaining and installing a license to use licensed features	AssuredSAN Pro 5000 Series Obtaining and Installing a License
Using the web interface to configure and manage the product	AssuredSAN Pro 5000 Series Storage Management Guide
Using the command-line interface (CLI) to configure and manage the product	AssuredSAN Pro 5000 Series CLI Reference Guide
Event codes and recommended actions	AssuredSAN Pro 5000 Series Event Descriptions Reference Guide

* Printed document included in product shipkit.

For additional information, see Dot Hill's Customer Resource Center web site: http://crc.dothill.com.

Document conventions and symbols

Table 2 Document conventions

Convention	Element
Blue text	Cross-reference links and e-mail addresses
Blue, underlined text	Web site addresses
Bold text	- Key names - Text typed into a GUI element, such as into a box - GUI elements that are clicked or selected, such as menu and list items, buttons, and check boxes
Italic text	Text emphasis
`Monospace` text	- File and directory names - System output - Code - Text typed at the command-line
`Monospace, italic` text	- Code variables - Command-line variables
`Monospace, bold` text	Emphasis of file and directory names, system output, code, and text typed at the command-line

△ **CAUTION:** Indicates that failure to follow directions could result in damage to equipment or data.

IMPORTANT: Provides clarifying information or specific instructions.

NOTE: Provides additional information.

TIP: Provides helpful hints and shortcuts.

1 FRUs

AssuredSAN Pro 5000 Series paged storage systems consist of a base configuration and possible add-on components. A base configuration includes a controller enclosure attached to either one 24-drive expansion enclosure or two 12-drive expansion enclosures for a minimum of 48 disk slots (see the "Product models" and "Supported configurations" topics in the Setup Guide for more information about base model configurations and add-on components). This document addresses available FRUs at the enclosure level.

Available FRUs

You can determine which FRUs pertain to your storage enclosure using the Command-line Interface (CLI). Access the controller via a Telnet client; log into the controller over the network (default user name `manage` and password `!manage`). If the default user or password—or both—have been changed for security reasons, enter the secure login credentials instead of the defaults shown above.

Enter a `show frus` query.

Execution of the `show frus` CLI command displays controller metadata, followed by the FRU information pertaining to chassis (with midplane), I/O modules (IOMs), and power supplies.

📝 **NOTE:** See *AssuredSAN Pro 5000 Series CLI Reference Guide* for more information.

You can also determine which FRUs pertain to your storage enclosure by visual inspection of the component, noting *serial number* and *part number*. This method applies to disk drives. FRUs and FRU make-up are subject to change independent of documentation versions. Information about FRUs and other components can also be viewed via the Storage Management Console (SMC).

See Dot Hill's products: http://www.dothill.com/products page for the latest product information. See the customer resource center (CRC) site for interoperability information: http://crc.dothill.com.

Select **Interoperability Matrix** > **AssuredSAN 5000 Series** article for the latest compatibility data

Storage enclosure overview

📝 **NOTE:** Tables and companion illustrations show field-replaceable units for Pro 5000 Series products.

Table 3 provides summary descriptions of the individual enclosure models used by supported Pro 5000 Series configurations (also see Automatic pooling for disks in supported configurations on page 19).

Table 3 Individual enclosure models comprising Pro 5000 Series storage systems

AssuredSAN Pro 5000 Series storage enclosure matrix					
2.5" 24-drive Controller enclosures (SFF)[1]			3.5" 12-drive Controller enclosures (LFF)[2]		
Model	Description	Form	Model	Description	Form
5720	Fibre Channel (8 Gb FC) host ports	2U24	—	Not applicable	2U12
5420	Internet SCSI (10GbE) host ports	2U24	—		2U12
2.5" 24-drive Expansion enclosure (SFF)[1,3]			3.5" 12-drive Expansion enclosure (LFF)[1,4]		
Model	Description	Form	Model	Description	Form
5120	SFF-8088 mini-SAS (6 Gb)	2U24	5130	SFF-8088 mini-SAS (6 Gb)	2U12

[1]AssuredSAN Pro 5000 Series does not support a standalone 24-drive controller enclosure; it must at minimum be attached to either one 24-drive expansion enclosure, or two 12-drive expansion enclosures for a minimum of 48 disk slots (see Pro 5000 Series Setup Guide > Supported base configurations).

[2]AssuredSAN Pro 5000 Series does not support a 12-drive controller enclosure.

[3]The 5120 can be cabled to a supported base configuration to add storage (see supported configurations in Setup Guide).
[4]The (5130 x 2) can be cabled to a supported base configuration to add storage (see supported configurations in Setup Guide).

Table 4 shows components for 2.5" 24-drive reduced-depth enclosure models (2U24). Table 5 on page 16 shows components for 3.5" 12-drive standard-depth enclosure models (2U12).

Tables and supporting illustrations (following tables) show components for the Pro 5000 Series product line that can be ordered for replacement in the field. **Contact your account manager for packaged FRU numbers and ordering information**. Data addressing Pro 5000 Series 24-drive and 12-drive enclosure products is provided to supplement the illustrated replacement procedures described in Chapter 2 — Procedures. The illustrations following herein show 2U24 and 2U12 chassis used in 24-drive and 12-drive enclosures, respectively.

FRUs addressing 24-drive enclosures

The reduced-depth 2U24 chassis—configured with 24 2.5" disks—is used exclusively for Pro 5000 Series controller enclosures. Supported expansion enclosures use this chassis and the 2U12 chassis.

Table 4 Pro 5000 Series product components for reduced-depth 24-drive enclosures

Item	Enclosure component descriptions
1	Disk drive (SFF)
	a) 2.5" disk drive module (disks of differing type/speed and storage capacity: SAS, SSD)
	b) Air management module (blank to maintain optimum air flow within enclosure) [Future]
2	Ear kit
	a) Left ear assembly (including ear cover)
	b) Right ear assembly (including ear cover)
	Also see Enclosure bezel for 24-drive models on page 15
3	Chassis (sheet metal flanges on internal IOM bay assembly are omitted from Figure 1 for visual clarity)
4	Midplane (included with chassis)
5	Power supplies (one shown)
	a) AC power supply for enclosure (newer power supplies do not have a power switch)
	b) DC power supply for enclosure
6	Expansion module for enclosure (one shown, two required per expansion enclosure)
	5120, 1JM, mini-SAS (SFF-8088), 2-port [6Gb]
7	Enclosure cover (included with chassis)
	Controller module for enclosure [two required per controller enclosure] (see Figure 2 on page 14)
	a) 5720, 1RM, FC, 4-port [2/4/8 Gb]
	b) 5420, 1RM, iSCSI, 4-port [10GbE]
	Small form-pluggable (SFP) connectors (see Figure 2 on page 14)
	a) Fibre Channel SFP transceiver (applies to 5720 models only)
	b) 10GbE SFP+ transceiver (applies to 5420 models only)
Not shown	Rail kits (variable options)
	a) Rack mount kit, shelf, short, All HW 22.5" - 31"
	b) Rack mount kit, shelf, long, All HW 25" - 36"
	c) Rack mount bracket kit, 2-Post adjustable, All HW
Not shown	Cable kit [Cable package: mini-SAS (SFF-8088) to mini-SAS (SFF-8088)]

Table 4 Pro 5000 Series product components for reduced-depth 24-drive enclosures (continued)

Item	Enclosure component descriptions
Not shown	Cable kit [Cable package: USB Type B; CLI (USB)]
Not shown	AC power cord compatible with AC power supply unit; or DC power cable compatible with DC power supply unit

NOTE: Numbered items from Table 4 are shown in Figure 1. Tinted items from Table 4 are shown in Figure 2 on page 14.
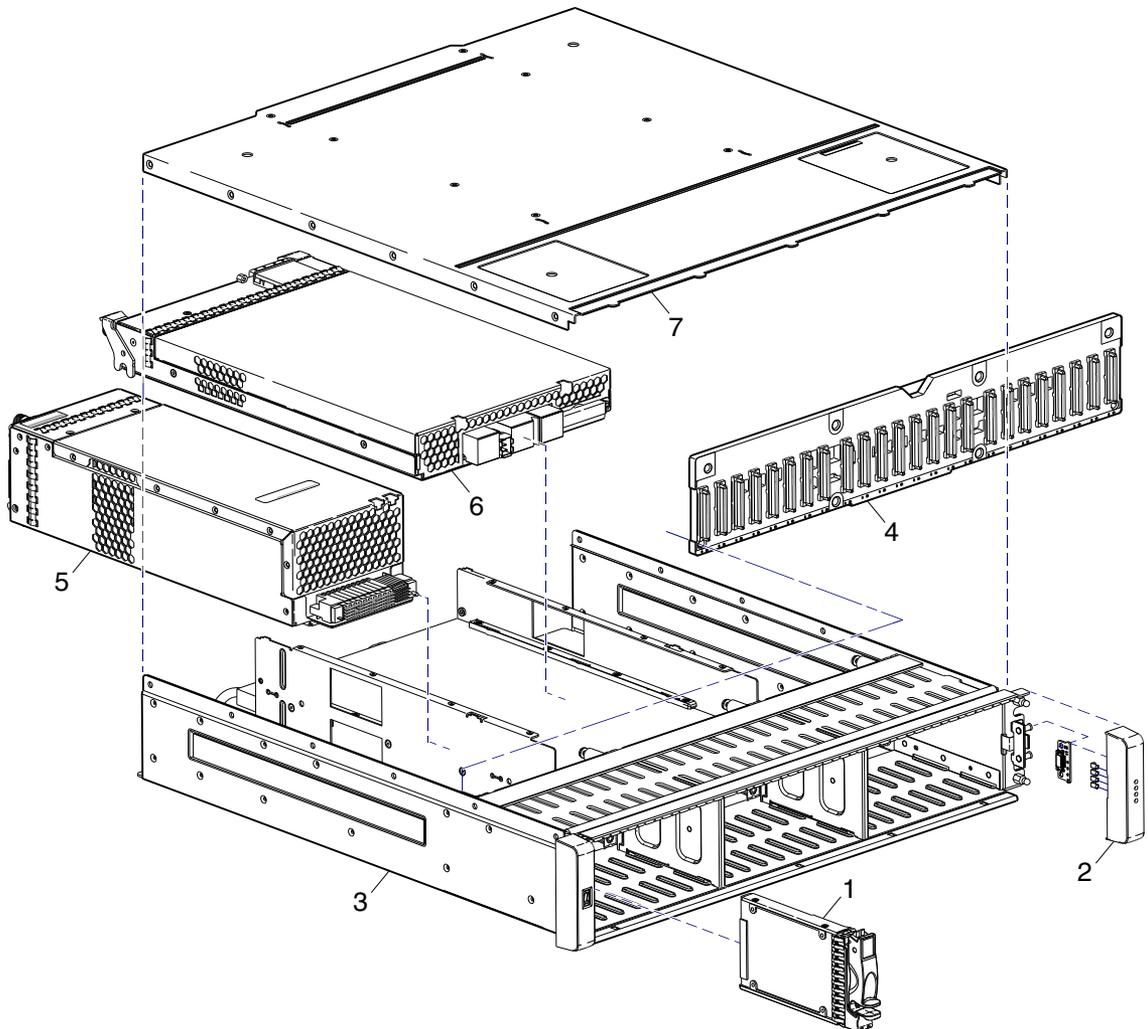
Figure 1 Exploded view — controller or expansion enclosure (reduced-depth 2U24)

Figure 1 through Figure 5 illustrate 24-drive enclosure models. Item No.6 (above) is a supported expansion module. Figure 2 shows a newer Pro 5000 Series controller module also supported by the enclosure. Although Figure 1 shows ear caps (item No.2), newer product models use an enclosure bezel instead of ear caps. The enclosure bezel is shown in Figure 3 on page 14 (removed) and Figure 4 on page 15 (installed), respectively.

📝 **NOTE:** The following illustrations further describe Table 4 components for the 24-drive chassis:
- Controller module pictorial — Figure 2 on page 14
- Assembly — Figure 3 and Figure 4 on page 15
- Internal components sub-assembly — Figure 5 on page 15

5720 or 5420 controller module
(enlarged relative to Figure 1)
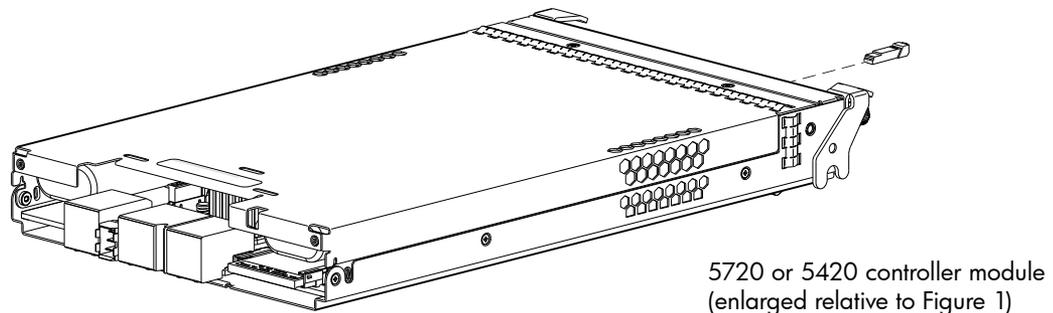
Figure 2 Pro 5000 Series controller module with SFP or SFP+ transceiver

The controller module shown in Figure 2 is used instead of the expansion module (item No.6 in Figure 1) when the chassis is configured for either a 5720 or 5420 controller enclosure, rather than a 5120 expansion enclosure. The transceiver is shown exploded from the IOM.

Ball stud on chassis ear
(Typical 4 places)

Enclosure bezel sub-assembly
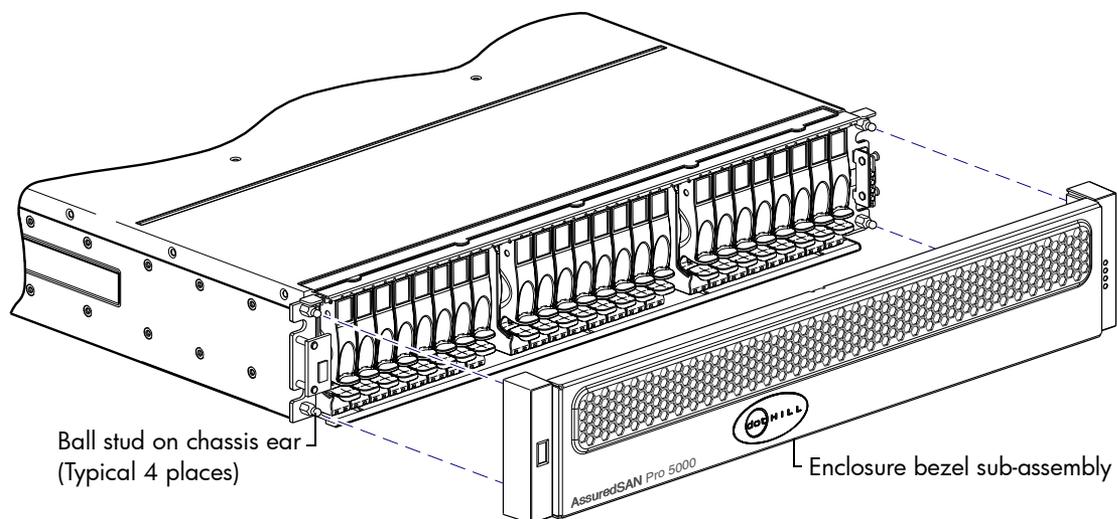
Figure 3 Partial assembly showing bezel alignment (reduced-depth 2U24)

Position the bezel such that the mounting sleeves within the integrated ear caps align with the ball studs, and then gently push-fit the bezel onto the ball studs to attach the bezel to the front of the enclosure. To remove the bezel, while facing the front of the enclosure, place index and middle fingers of each hand on the top of the bezel—near each end—with thumbs on the bezel bottom. Gently pull the top of the bezel while applying slight inward pressure below, to release the bezel from the ball studs.

Figure 4 Controller enclosure assembly with bezel installed (reduced-depth 2U24)
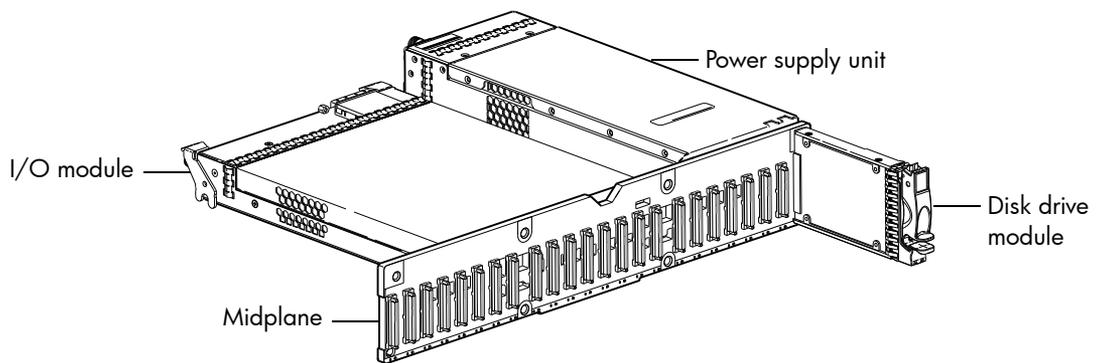
Figure 5 Controller enclosure architecture — internal components sub-assembly (reduced-depth 2U24)

Enclosure bezel for 24-drive models

Newer models of the SFF 24-drive enclosure support a bezel sub-assembly that attaches to the front of the chassis (see Figure 3 on page 14). The bezel—comprised of a vented sheet metal cover secured to an ear cap on each end—is pre-assembled and packed with foam into a box included in the master shipping container.

📝 **NOTE:** The enclosure bezel geometry shown in illustrations within this document may be slightly different than the bezel shipped with your product, but the ball stud attachment points are the same.

Bezel attachment and removal instructions are provided beneath Figure 3 on page 14.

FRUs addressing 12-drive enclosures

The 12-drive enclosure is not used as a controller enclosure for AssuredSAN Pro 5000 Series products. Whether used in a base configuration, or for expanding storage, this expansion enclosure is added in two-enclosure increments featuring 24 disks per component add-on.

Table 5 Pro 5000 Series product components for standard-depth 12-drive enclosures

Item	Enclosure component descriptions
1	Disk drive (LFF)
	a) 3.5" disk drive module (disks of differing type/speed and storage capacity: SAS, SSD)
	b) Air management module (blank to maintain optimum air flow within enclosure) [Future]
2	Ear kit
	a) Left ear assembly (including ear cover)
	b) Right ear assembly (including ear cover)
	Also see Enclosure bezel for 12-drive model on page 18
3	Chassis
4	Midplane (included with chassis)
5	Power supplies (one shown)
	a) AC power supply for enclosure (newer power supplies do not have a power switch)
	b) DC power supply for enclosure
6	Expansion module (one shown)
	5130, 1JM, mini-SAS (SFF-8088) connection [6Gb]
7	Enclosure cover (included with chassis)
Not shown	Rail kits (variable options)
	a) Rack mount kit, shelf, short, All HW 22.5" - 31"
	b) Rack mount kit, shelf, long, All HW 25" - 36"
	c) Rack mount bracket kit, 2-Post adjustable, All HW
Not shown	Cable kit [Cable package: mini-SAS (SFF-8088) to mini-SAS (SFF-8088)]
Not shown	Cable kit [Cable package: USB Type B; CLI (USB)]
Not shown	AC power cord compatible with AC power supply unit; or DC power cable compatible with DC power supply unit

📝 **NOTE:** Numbered items from Table 5 are shown in Figure 6.
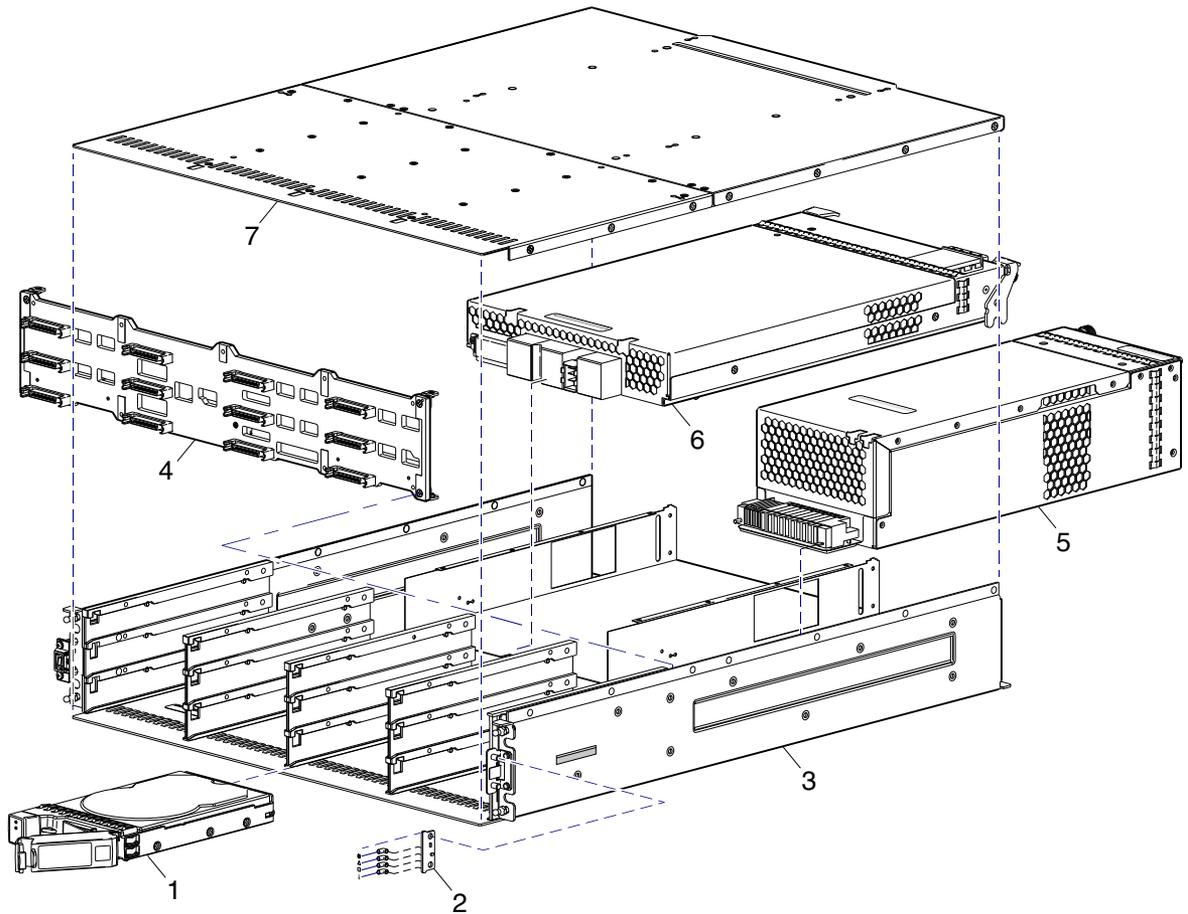
Figure 6 Exploded view — expansion enclosure (standard-depth 2U12)

Figure 6 through Figure 9 illustrate 12-drive enclosure models. Figure 8 on page 18 provides an assembly of the exploded view shown in Figure 6, and Figure 9 on page 18 shows an assembly of component FRUs within the enclosure. Figure 6 does not show a cover for the ear bezel components (item No.2). Newer product models use an enclosure bezel instead of ear caps. The enclosure bezel is shown in Figure 7 on page 18 (removed) and Figure 8 on page 18 (installed), respectively.

📝 **NOTE:** The following illustrations further describe components for the 12-drive chassis:

- Assembly — Figure 7 and Figure 8
- Internal components sub-assembly — Figure 9
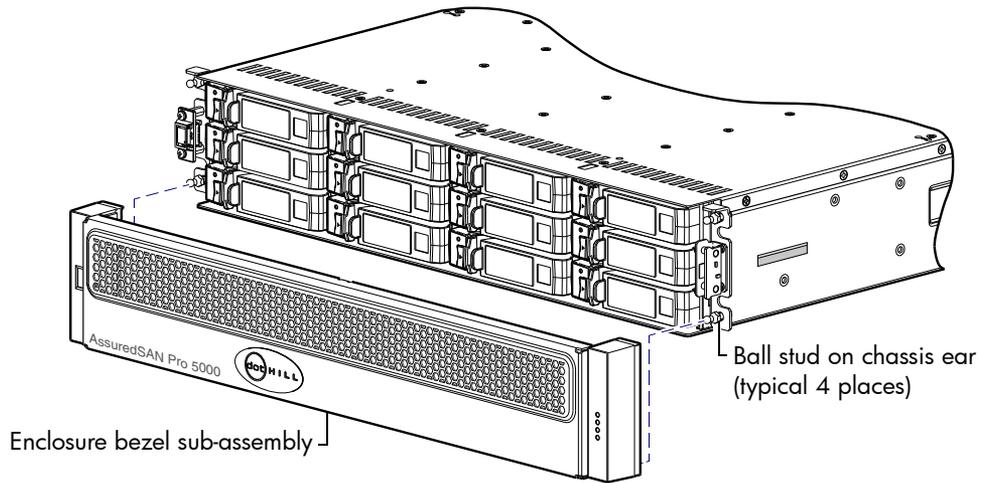
Figure 7 Partial assembly showing bezel alignment (standard-depth 2U12)

Position the bezel such that the mounting sleeves within the integrated ear caps align with the ball studs, and then gently push-fit the bezel onto the ball studs to attach the bezel to the front of the enclosure. To remove the bezel, while facing the front of the enclosure, place index and middle fingers of each hand on the top of the bezel—near each end—with thumbs on the bezel bottom. Gently pull the top of the bezel while applying slight inward pressure below, to release the bezel from the ball studs.
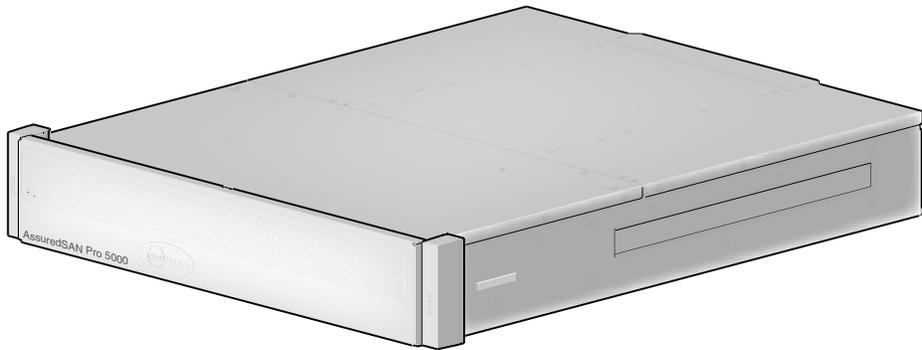
Figure 8 Expansion enclosure assembly with bezel installed (standard-depth 2U12)
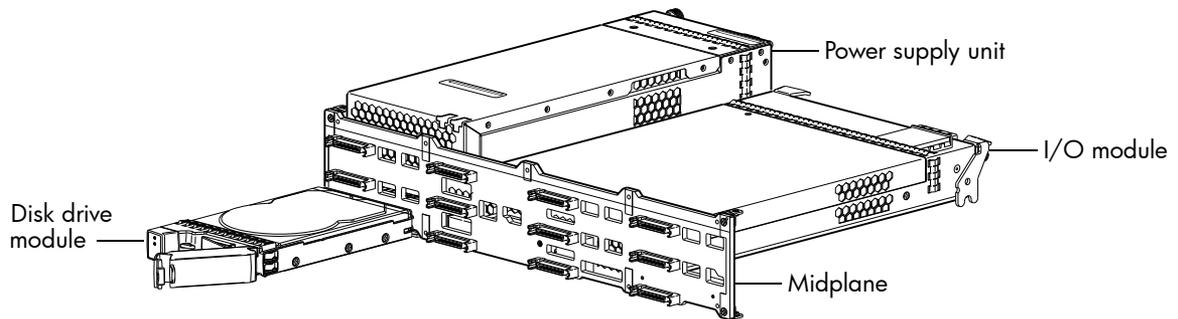
Figure 9 Expansion enclosure architecture — internal components sub-assembly (standard-depth 2U12)

Enclosure bezel for 12-drive model

Newer models of the LFF 12-drive enclosure support a bezel sub-assembly that attaches to the front of the chassis (see Figure 7 on page 18). The bezel—comprised of a vented sheet metal cover secured to an ear cap on each end—is pre-assembled and packed with foam into a box included in the master shipping container.

NOTE: The enclosure bezel geometry shown in illustrations within this document may be slightly different than the bezel shipped with your product, but the ball stud attachment points are the same.

Bezel attachment and removal instructions are provided beneath Figure 7 on page 18.

Automatic pooling for disks in supported configurations

SMC provides an automatic pooling feature for provisioning disks in properly configured enclosures. During first-time configuration of a new system, auto-pool enables you to quickly provision the storage in all connected enclosures so that you can start creating volumes and mapping them to hosts. Over the life of the system, auto-pool enables you to add disks or enclosures to provide additional storage for existing storage pools. Auto-pool also enables you to remove storage.

IMPORTANT: See Disk drive slot numbers and auto-pool provisioning on page 30 for more information.

AssuredSAN Pro 5000 Series does not support a standalone 24-drive controller enclosure; it must at minimum be attached to either one 24-drive expansion enclosure or two 12-drive expansion enclosures for a minimum of 48 disk slots. The minimum storage pool size is 500 GB. RAID-6 and RAID-10 components require two spares per disk type used in a supported storage configuration.

IMPORTANT: See the "Supported configurations topic" in the *AssuredSAN Pro 5000 Series Setup Guide* for information about base configurations and add-on components.

The supported configuration illustrations in the Setup Guide are provided for visual reference, and serve as a reminder that auto-pool requires certain types of disks to be in certain slots within the enclosure.

TIP: See the "System concepts" topic in the Storage Management Guide for an overview of product feature characteristics pertaining to Pro 5000 Series paged storage systems.

2 Procedures

This chapter provides procedures for replacing FRUs (field-replaceable units), including precautions, removal instructions, installation instructions, and verification of successful installation. Each procedure addresses a specific task. Certain procedures refer to related documentation. See Related documentation on page 9 for a list of these documents and where to find them online.

Electrostatic discharge

Before you begin *any* of the procedures, consider the following precautions and preventive measures.

Preventing electrostatic discharge

To prevent electrostatic discharge (ESD) from damaging the system, be aware of the precautions to consider when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

△ **CAUTION:**   Parts can be damaged by electrostatic discharge. Follow these precautions:
- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-protected workstations.
- Place parts in a static-protected area before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly.
- Remove clutter (plastic, vinyl, foam) from the static-protected workstation.

Grounding methods to prevent electrostatic discharge

Several methods are used for grounding. Adhere to the following precautions when handling or installing electrostatic-sensitive parts.

△ **CAUTION:**   Parts can be damaged by electrostatic discharge. Use proper anti-static protection:
- Keep the replacement FRU in the ESD bag until needed; and when removing a FRU from the enclosure, immediately place it in the ESD bag and anti-static packaging.
- Wear an ESD wrist strap connected by a ground cord to a grounded workstation or unpainted surface of the computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm (± 10 percent) resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- If an ESD wrist strap is unavailable, touch an unpainted surface of the chassis before handling the component.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, have an authorized reseller install the part. For more information on static electricity or assistance with product installation, contact an authorized reseller.

Replacing chassis FRU components

Chassis FRUs replace a damaged chassis or chassis components. A fully functional chassis requires successful installation of the following components:

- Two controller modules of the same model type (per controller enclosure)
  See Replacing a controller module or expansion module on page 23 for more information.
- All disk drives
  See Replacing a disk drive module on page 29 for more information.
- Two power supply modules of the same type (both AC or both DC)
  See Replacing a power supply module on page 35 for more information.
- Two ear bezels (complementary left and right ear kits)
  See Replacing ear bezels on page 41 for more information

> **NOTE:** Newer product models use an enclosure bezel instead of ear covers. If your model is equipped with a bezel instead of ear covers, see the appropriate illustration for bezel installation and removal:
> - See Figure 3 on page 14 for 2U24 enclosure bezel alignment.
> - See Figure 7 on page 18 for 2U12 enclosure bezel alignment.

- Two expansion modules of the same model type (per expansion enclosure)
  See Replacing a controller module or expansion module on page 23 for more information.

In addition to the FRUs identified above, replacement procedures are provided to address specific interface protocols and replacement of the enclosure chassis:

- Removal and installation of a Fibre Channel transceiver
  See Replacing a Fibre Channel transceiver on page 44 more information.
- Removal and installation of a 10GbE SFP+ transceiver
  See Replacing a 10GbE SFP+ transceiver on page 46 for more information.
- Removal and installation of a storage enclosure chassis
  See Replacing a storage enclosure chassis on page 46 for more information.

Replacement of chassis FRU components are described within this chapter.

> **NOTE:** AssuredSAN Pro 5000 Series controller enclosures support hot-plug replacement of redundant controller modules, fans, power supplies, and I/O modules. Hot-add of drive enclosures is also supported.

> **TIP:** Many procedures refer to component LEDs and LED statuses. See the *AssuredSAN Pro 5000 Series Setup Guide* for descriptions of model-specific front panel and rear panel LEDs.

> **TIP:** Within the *AssuredSAN Pro 5000 Series Setup Guide*, see "Troubleshooting > Fault isolation methodology" for information about using health icons/values—in addition to using LEDs—for verifying component failure before actually replacing the FRU.

Replacing a controller module or expansion module

In a dual-controller configuration, controller and expansion modules are hot-swappable, which means you can replace one module without halting I/O to storage-pool components, or powering off the enclosure. In this case, the second module takes over operation of the storage system until you install the new module.

You may need to replace a controller module or an expansion module when:

- The Fault/Service Required LED is illuminated
- Health status reporting in SMC indicates a problem with the module
- Events in SMC indicate a problem with the module
- Troubleshooting indicates a problem with the module

△ **CAUTION:** When replacing a Pro 5000 Series controller set supporting AssuredRemote with a Pro 5000 Series controller set that does not support this licensed feature, you must first delete all replication sets before swapping the controller modules. Not doing so will lead to unexpected results, and there is no way to delete replication sets after the installation. See the following for additional information:

- AssuredSAN Pro 5000 Series Storage Management Guide
- AssuredSAN Pro 5000 Series CLI Reference Guide

Before you begin

Removing a controller or expansion module from an operational enclosure significantly changes air flow within the enclosure. Openings must be populated for the enclosure to cool properly. Leave modules in the enclosure until ready to install a replacement. Pro 5000 Series controller enclosures support dual-controller configuration only. Single-controller support is provided only when a controller fails over to its partner controller. A controller module must be installed in each I/O module slot to ensure sufficient airflow through the enclosure during operation.

If replacing both controllers, use SMC to record configuration settings before installing the new controller modules. See Removing a controller module or expansion module on page 26, and Installing a controller module or expansion module on page 27 for instructions on installing an additional controller module.

△ **CAUTION:** When replacing a controller module, ensure that less than 10 seconds elapse between inserting it into a slot and fully latching it in place. Not doing so might cause the controller to fail. If it is not latched within 10 seconds, remove the controller module from the slot, and repeat the process.

Configuring partner firmware update

In a dual-controller system in which Partner Firmware Update (PFU) is enabled, when you update firmware on one controller, the system automatically updates the partner controller. Disable partner firmware update *only* if requested by a service technician.

Use SMC or the CLI to change the PFU setting.

Using SMC

📝 **NOTE:** See *AssuredSAN Pro 5000 Series Storage Management Guide*, and read the following topics:

- Getting started > Firmware update
- Working in the System topic > Updating firmware > Best practices for firmware update
- Working in the System topic > Updating firmware > Updating controller module firmware

1. Sign-in to SMC using default user `manage` and password `!manage`.

If the default user or password—or both—have been changed for security reasons, enter the secure login credentials instead of the system defaults shown above.

2. Click in the System panel in the banner and select **Update Firmware**.

   The Update Firmware panel opens. The Update Controller Modules tab shows versions of firmware components that are currently installed in each controller.

3. Under Partner Firmware Update, check **Enabled**, then click **Set**.

4. Click **OK**.

Using the CLI

1. Log-in to the command-line interface using default user `manage` and password `!manage`.

   If the default user or password—or both—have been changed for security reasons, enter the secure login credentials instead of the system defaults shown above.

2. To verify that partner firmware upgrade is enabled, run the following command:

   `show advanced-settings`

3. If partner firmware upgrade is disabled, enable it by running the following command:

   `set advanced-settings partner-firmware-upgrade enabled`

📝 **NOTE:**   See *AssuredSAN Pro 5000 Series CLI Reference Guide* for additional information.

Verifying component failure

Select from the following methods to verify component failure:

- Use SMC to check the health icons/values of the system and its components to either ensure that everything is okay, or to drill down to a problem component. SMC uses health icons to show OK, Degraded, Fault, or Unknown status for the system and its components. If you discover a problem component, follow the actions in its Health Recommendations field to resolve the problem.

- As an alternative to using SMC, you can run the `show system` command in the CLI to view the health of the system and its components. If any component has a problem, the system health will be Degraded, Fault, or Unknown. If you discover a problem component, follow the the actions in its Health Recommendations field to resolve the problem.

- Monitor event notification — With event notification configured and enabled, use SMC to view the event log, or use the CLI to run the `show events detail` command to see details for events.

- Check Fault/Service Required LED (back of enclosure): Amber = Fault condition

- Check that the FRU OK LED (back of enclosure) is off

Stopping I/O

When troubleshooting disk drive and connectivity faults, ensure you have a current full backup. As an additional data protection precaution, stop all I/O to the affected storage-pool components.

📝 **IMPORTANT:**   Stopping I/O to a storage-pool component is a host-side task, and falls outside the scope of this document.

When on-site, you can verify that there is no I/O activity by briefly monitoring the system LEDs; however, when accessing the storage system remotely, this is not possible. Remotely, you can use the `show storage-status` command to determine if input and output has stopped. Perform the steps below:

1. Using the CLI, run the `show storage-status` command.

   The `Number of Reads` and `Number of Writes` outputs show the number of these operations that have occurred since the statistic was last requested.

2. Run the `show storage-status` command a second time.

   This provides you a specific window of time (the interval between requesting the statistics) to determine if data is being written to or read from the storage-pool component.

3. If any reads or writes occur during this interval, a host is still reading from or writing to this storage-pool component. Continue to stop IOPS from hosts, and repeat step 1 until the `Number of Reads` and `Number of Writes` statistics are zero.

> **NOTE:** See *AssuredSAN Pro 5000 Series CLI Reference Guide* for additional information.

Shutting down a controller module

Shutting down the Storage Controller in a controller module ensures that a proper failover sequence is used, which includes stopping all I/O operations and writing any data in write cache to disk. If the Storage Controller in both controller modules is shut down, hosts cannot access the system's data. Perform a shut down before you remove a controller module from an enclosure, or before you power off its enclosure for maintenance, repair, or a move.

> △ **CAUTION:** You can continue to use the CLI when either or both Storage Controllers are shut down, but information shown might be invalid.

Use SMC or the CLI to perform a shut down.

Using SMC

1. Sign-in to SMC using default user `manage` and password `!manage`.
   If the default user or password—or both—have been changed for security reasons, enter the secure login credentials instead of the system defaults shown above.
2. In the System panel in the banner, click and select **Restart System**. The Controller Restart and Shut Down panel opens.
3. Select the **Shut Down** operation, which automatically selects the controller type **Storage**.
4. Select the controller module to shut down: A, B, or both.
5. Click **OK**. A confirmation panel appears.
6. Click **Yes** to continue; otherwise, click **No**. If you clicked Yes, a message describes shutdown activity.

> **NOTE:** If an iSCSI port is connected to a Microsoft Windows host, the following event is recorded in the Windows event log: `Initiator failed to connect to the target`.

> **NOTE:** See *AssuredSAN Pro 5000 Series Storage Management Guide* for additional information.

Using the CLI

1. Log-in to the CLI using default user `manage` and password `!manage`.
   If the default user or password—or both—have been changed for security reasons, enter the secure login credentials instead of the system defaults shown above.
2. In a dual-controller system, verify that the partner controller is online by running the command:
   `show controllers`
3. Shut down the failed controller—A or B—by running the command:
   `shutdown a` or `shutdown b`
   The blue OK to Remove LED (back of enclosure) illuminates to indicate that the controller module can be safely removed.
4. Illuminate the identification LED of the enclosure that contains the controller module to remove by running the command:
   `set led enclosure 0 on`

NOTE: See *AssuredSAN Pro 5000 Series CLI Reference Guide* for additional information.

Removing a controller module or expansion module

IMPORTANT:

- In a single-controller configuration, if you desire to transport CompactFlash to a replacement controller, remove the controller module only after the cache is copied to CompactFlash, which is indicated by the Cache Status LED being off. Transporting of cache **must** be performed by a qualified service technician. Single-controller support is provided only when a controller fails over to its partner controller. Pro 5000 Series storage enclosures are configured with dual IOMs.

- In a single-controller environment, you must stop I/O and power off the enclosure before replacing the controller module. Single-controller support is provided only when a controller fails over to its partner controller.

- In a dual-controller environment, you may hot-replace a controller module in an operational enclosure, provided you first shut down the faulty controller using either SMC or the CLI.

See CAUTION bullets regarding "electrostatic discharge" and "anti-static protection" .

NOTE: Within these procedures, illustrations featuring controller module face plates are generic. They do not show host interface ports, and they pertain to all Pro 5000 Series controller module models. For illustrations of model-specific controller face plates, see the *AssuredSAN Pro 5000 Series Setup Guide*.

Illustrations in the controller module replacement procedures show rear panel views of the enclosure, and IOMs are properly aligned for insertion into the rear panel of the enclosure.

1. Verify that you have successfully shut down the controller module using SMC or the CLI.
2. Locate the enclosure whose Unit Locator LED (front right ear) is illuminated, and within the enclosure, locate the controller module whose OK to Remove LED is blue (rear panel).
3. Disconnect any cables connected to the controller.

   Label each cable to facilitate re-connection.
4. Turn the thumbscrews counterclockwise until they disengage from the controller (see Figure 10 on page 26).

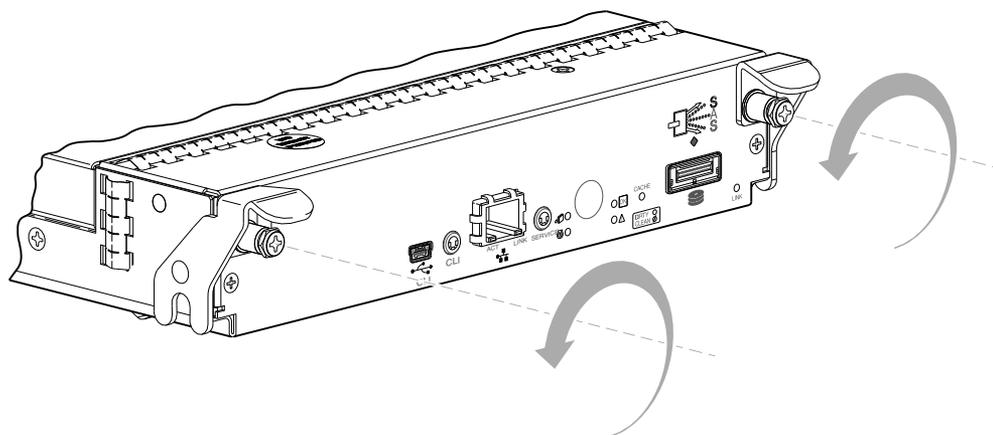**Figure 10** Disengaging a controller module

5. Press both latches downward to disconnect the controller module from the midplane (see Figure 11 on page 27).
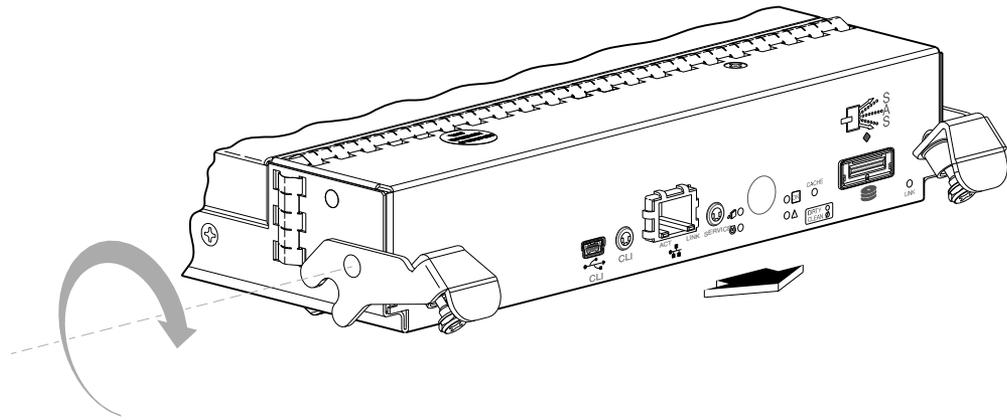
Figure 11 Extracting a controller module

6. Pull the controller module straight out of the enclosure such that the controller module remains level during removal (see Figure 12).
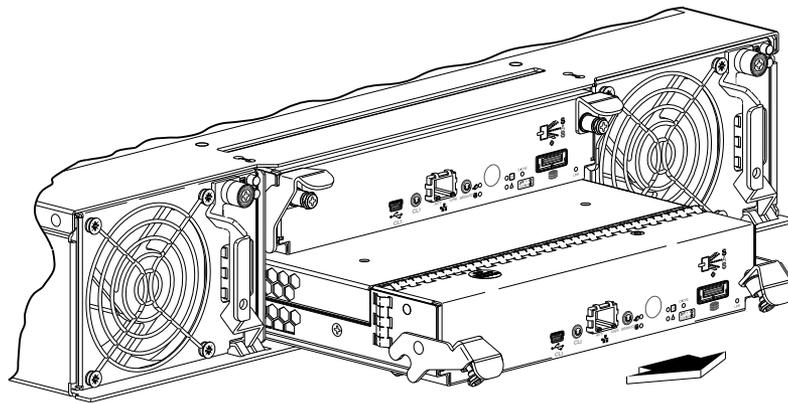

Figure 12 Removing a controller module

Installing a controller module or expansion module

☼ **TIP:** You can install a controller module into an enclosure that is powered on, provided you wait 60 seconds after removing the old controller module. Check controller and midplane power connectors before inserting the new controller module into the enclosure.

See CAUTION bullets regarding "electrostatic discharge" and "anti-static protection" on page 21.

1. Loosen the thumbscrews; press the latches downward (see Figure 13 on page 28).
2. Ensuring that the controller module is level, slide it into the enclosure as far as it will go (1).
   A controller module that is only partially-seated will prevent optimal performance of the controller enclosure. Verify that the controller module is fully-seated before continuing.
3. Press the latches upward to engage the controller module (2); turn the thumbscrews clockwise until finger-tight.
4. Reconnect the cables.

📝 **NOTE:** See the web-posted *AssuredSAN Pro 5000 Series Setup Guide* for cabling information.
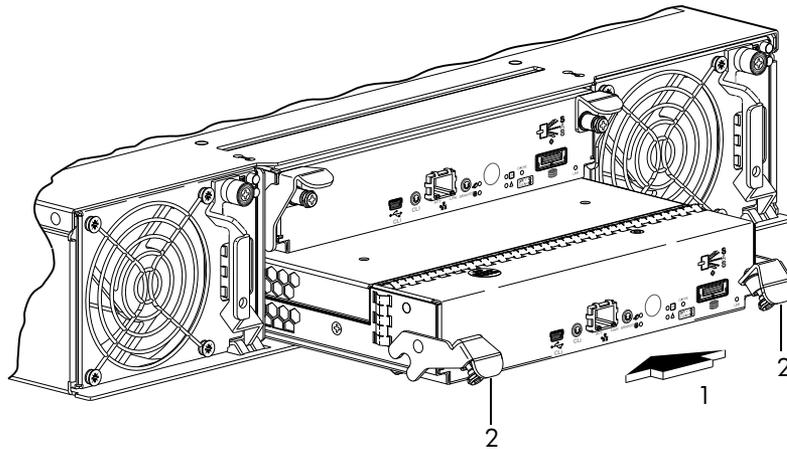
Figure 13 Inserting a controller module

IMPORTANT: In a dual-controller system in which PFU is enabled, when you update firmware on one controller, the system automatically updates the partner controller.

Verifying component operation

After replacing the controller module, verify that the FRU OK LED (rear panel) illuminates green, indicating that the controller has completed initializing, and is online/operating normally. It may take two to five minutes for the replacement controller to become ready. If you are replacing either controller module, and PFU is enabled, you may need to wait 30 minutes to ensure that the two controllers—with their respective ownership of the storage-pool components—have enough time to fully stabilize.

Use SMC or the CLI to perform a restart *only* if necessary.

IMPORTANT: See the "Restarting controllers" topic in the Storage Management Guide for more information.

Using SMC

1. Sign-in to SMC using default user `manage` and password `!manage`.

   If the default user or password—or both—have been changed for security reasons, enter the secure login credentials instead of the system defaults shown above.

2. In the System panel in the banner, click and select **Restart System**. The Controller Restart and Shut Down panel opens.

3. Select the **Restart** operation.

4. Select the controller type to restart: **Management** or **Storage**.

5. Select the controller module to restart: A, B, or both.

6. Click **OK**. A confirmation panel appears.

7. Click **Yes** to continue; otherwise, click **No**. If you clicked Yes, a message describes restart activity.

NOTE: If an iSCSI port is connected to a Microsoft Windows host, the following event is recorded in the Windows event log: `A connection to the target was lost, but Initiator successfully reconnected to the target.`

Using the CLI

If the enclosure's Unit Locator LED is on, run the following command to turn it off:

    set led enclosure 0 off

If the Fault/Service Required LED is amber, the controller module has not gone online, and likely failed its self-test. Put the module online by restarting the controller, or by checking the event log for errors.

To restart the Management Controller (A or B), run the following command:

    restart mc a or restart mc b or restart mc both

To restart the Storage Controller (A or B), run the following command:

    restart sc a or restart sc b or restart sc both

☆ **TIP:** See the *AssuredSAN Pro 5000 Series Setup Guide* for descriptions of model-specific LEDs.

Updating firmware

You can view the current versions of firmware in controller modules, expansion modules, and disks, and you can also install new firmware versions.

☆ **TIP:** To ensure success of an online update, select a period of low I/O activity. This helps the update complete as quickly as possible and avoids disruptions to hosts and applications due to timeouts. Attempting to update a storage system that is processing a large I/O-intensive batch job will likely cause hosts to lose connectivity with the storage system.

An enclosure must contain two I/O modules (IOMs) of the same type. Both IOMs should run the same firmware version. Storage systems in a replication set must run the same firmware version. You can update the firmware in each IOM by loading a firmware file obtained from the enclosure vendor.

If the PFU option is enabled, when you update one controller, the system automatically updates the partner controller. If PFU is disabled, after updating firmware on one controller, you must log into the partner controller's IP address and perform this firmware update on that controller also.

📝 **NOTE:** If a storage-pool component is quarantined, firmware update is not permitted due to the risk of losing unwritten data that remains in cache for the component volumes. Before you can update firmware, you must resolve the problem that is causing the component to be quarantined. See information about events 172 and 485 in the Event Descriptions Reference Guide.

For best results, the storage system should be in a healthy state before starting firmware update. You can update firmware using SMC or using FTP (File Transfer Protocol). See the Storage Management Guide for more information.

📝 **IMPORTANT:** Before updating firmware for the first time, see the "Best practices for firmware update" topic in the *AssuredSAN Pro 5000 Series Storage Management Guide.*

Replacing a disk drive module

A disk drive module consists of a disk in a sled. Disk drive modules are hot-swappable, which means they can be replaced without halting I/O to the storage-pool components, or powering off the enclosure.

Disk drive slot numbers and auto-pool provisioning

SMC provides an automatic pooling feature (known as auto-pool) for provisioning disks in selected, properly configured enclosures for use in tiers in storage pools, as spares, or as SSD read cache. During first-time configuration of a new system, auto-pool enables you to quickly provision the storage in all connected enclosures so that you can start creating volumes and mapping them to hosts. Over the life of the system, auto-pool enables you to add disks or enclosures to provide additional storage for existing storage pools. Auto-pool also enables you to remove storage from available storage in the system; for example, an enclosure of disks or a storage pool and all of its disks. You can also upgrade storage by removing individual components or tiers per enclosure; for example, you can upgrade from read cache to full SSD.

☼ **TIP:**   See the "System concepts" topic in the Storage Management Guide for an overview of product feature characteristics pertaining to Pro 5000 Series paged storage systems.

The following rules apply to auto-pool:

- The storage system must include a minimum of 48 disks (storage enclosures must be fully-populated).
- In an enclosure, all disks of the same type/speed must have the same capacity—measured in blocks.
- The storage system must include two spares per disk type for RAID-6 and RAID-10 components.
- You must have a minimum of 500 GB in your storage pool — not including spares or read cache.
- For provisioning to start, all disks must be in a good state. If the system detects a bad disk, auto-pool will not proceed. Spares cannot be used while storage pools are being provisioned.
- A storage-pool component will be constructed with disks that are of the same type/speed and have the same capacity, and are in the same enclosure. A component cannot span enclosures.
- Storage pool components comprised of disks in 24-disk enclosures are created in symmetrical sets that are balanced between the two storage pools. For provisioning to start, there must be enough disks available to create all components in a set. Components comprised of disks in a 12-disk enclosure can be assigned to either pool (either automatically or manually).
- If auto-pool fails for an enclosure, all changes for that enclosure are discarded.

Auto-pool requires certain types of disks to be in specific slots. Table 6 below shows a legend for the following figures:

- Figure 14 on page 31 (Disk slot configuration options for 24-drive enclosures)
- Figure 15 on page 31 (Disk slot configuration options for 12-drive enclosures)

These figures show supported configuration options for disks used in Pro 5000 Series enclosures, and how those disks will be provisioned by auto-pool with regard to slot affinity (certain types of disks must reside in specific slots, and these locations cannot change).

See Figure 14 on page 31. For example, controller enclosure option 1 shows that the enterprise disks in slots 0—19 will be provisioned for use in storage pools A and B in the Standard tier, one SSD will be configured as SSD read cache for each storage pool, and the enterprise SAS disks in slots 22—23 will be spares for the Standard tier.

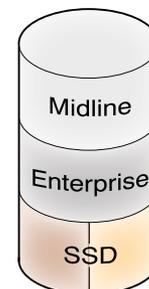| Disk type	Result of auto–pool provisioning	Code	
Midline SAS	(8+2) RAID–6 or (5+5) RAID–10 component in Archive tier	A/B	
	Spare for Archive tier	S	Midline
Enterprise SAS	(8+2) RAID–6 or (5+5) RAID–10 component in Standard tier	A/B	Enterprise
	Spare for Standard tier	S	
SAS SSD	2–disk RAID–1 component in Performance tier	A/B	SSD
	SSD read cache (RAID cache)	A/B	

Table 6   Auto-pool provisioning for tiered storage

This section provides an overview for using supported disks in specific slots of respective enclosures supported by Pro 5000 Series firmware. Illustrations in disk drive module replacement procedures show front panel views of each enclosure, and disks are properly aligned for insertion into the front panel of the enclosure.

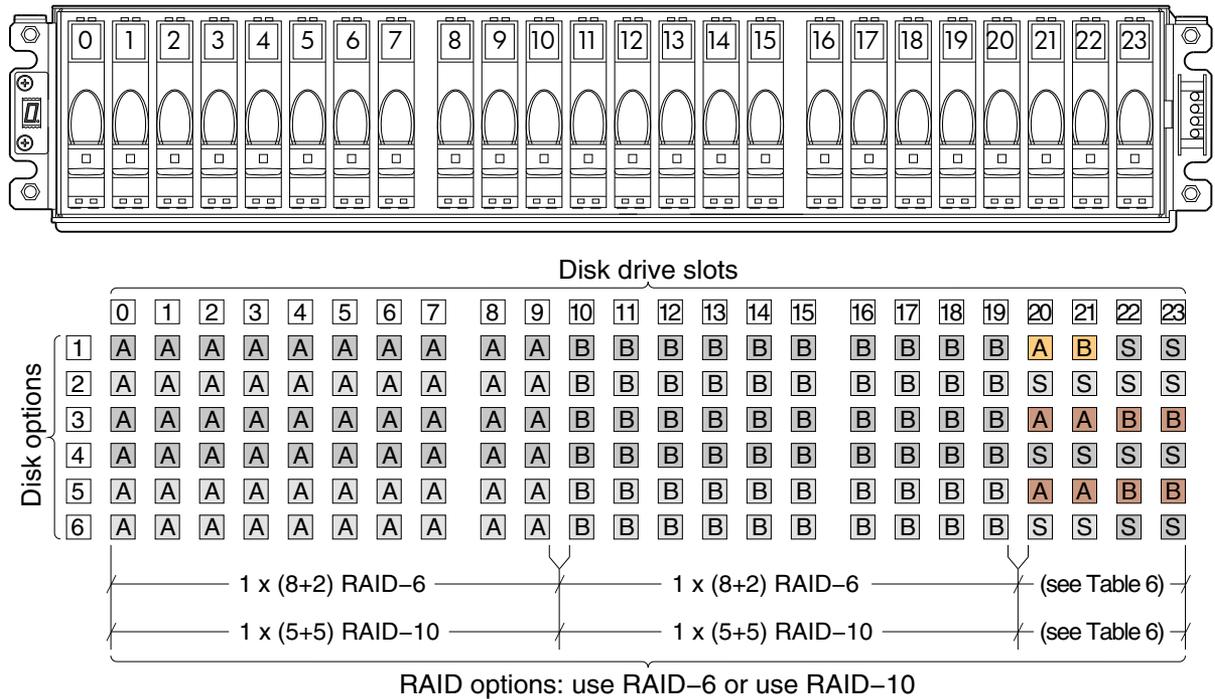## Disk slot configuration — 24-drive enclosures

Figure 14 Disk slot configuration for 24-drive enclosures

Disk drive slot numbering of the 24-drive enclosure corresponds to numbering shown in the matrix above. Refer to Table 6 on page 30 for tiered-storage disk codes.

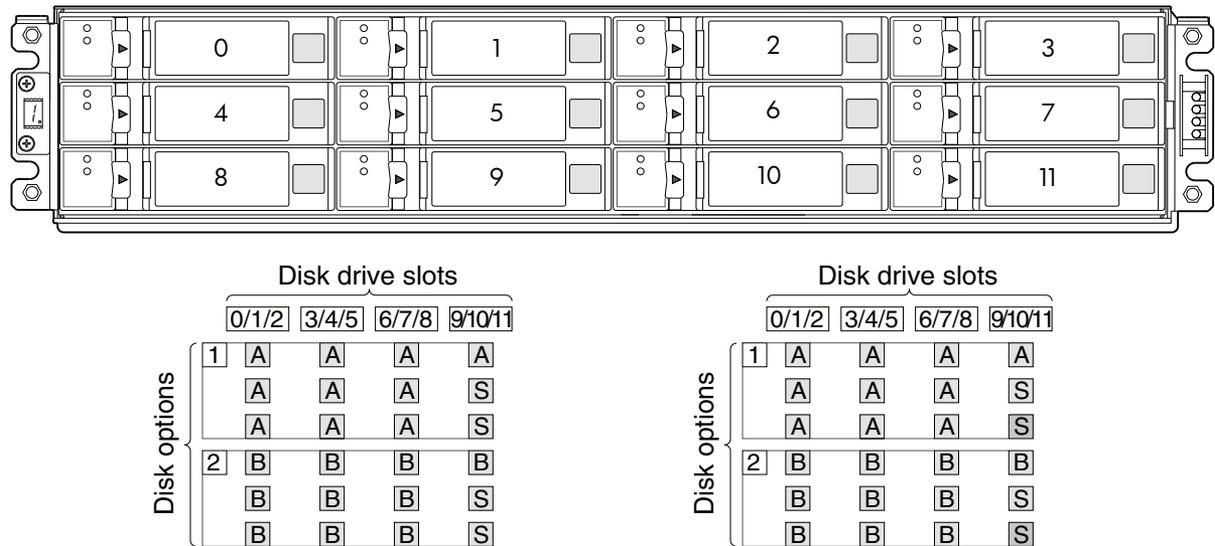## Disk slot configuration — 12-drive enclosures

Figure 15 Disk slot configuration options for 12-drive enclosures

Disk drive slot numbering for the 12-drive enclosure corresponds to numbering shown in the matrix above. Refer to Table 6 on page 30 for tiered-storage disk codes.

☼ **TIP:** See the "Supported base configurations" topic in the *AssuredSAN Pro 5000 Series Setup Guide* for color-coded illustrations showing disk-to-slot assignments for supported product models.

Before you begin

△ **CAUTION:** Removing a disk drive module impacts the airflow and cooling ability of the enclosure. If the internal temperature exceeds acceptable limits, the enclosure may overheat and automatically shut down or restart. To avoid potential overheating, wait 20 seconds to allow the internal disks to stop spinning, then insert the new disk drive module.

See CAUTION bullets regarding "electrostatic discharge" and "anti-static protection" on page 21.

Verifying component failure

Before replacing a disk, perform the following steps to ensure that you have correctly identified the module requiring removal and replacement.

△ **CAUTION:** Failure to identify the correct disk drive module could result in data loss if the wrong disk is removed from the enclosure. If your enclosure has a bezel, remove it to view disk LEDs. Alternatively, you can observe disk component health via SMC.

When a disk drive fault occurs, the failed disk's fault indicator LED, located on the enclosure's front panel, illuminates solid amber (see the *AssuredSAN Pro 5000 Series Setup Guide* for a description of LEDs and disk drive slot numbering for your enclosure). You can determine from visual inspection which disk in the enclosure is experiencing a fault/failure using the fault LED for your disk type.

📝 **NOTE:** Newer product models use an enclosure bezel instead of ear covers. If your model is equipped with a bezel instead of ear covers, see the appropriate illustration for bezel installation and removal:
- See Figure 3 on page 14 for 2U24 enclosure bezel alignment.
- See Figure 7 on page 18 for 2U12 enclosure bezel alignment.

Alternatively, you can observe disk component health using management interfaces to verify component failure or component operation (see Using management interfaces on page 50 for more information).

Removing a disk drive module

1. Follow one of two sub-steps below, according to your product disk drive type (see Figure 16):
   a. SFF disk (stands on edge) — Squeeze the latch release flanges together to disengage the disk drive module, and swing the pivoting portion of the latch upwards by 45° (see Figure 17 on page 33).
   b. LFF disk (lays on side) — Squeeze the latch release flanges inward to disengage the disk drive module, and swing the pivoting portion of the latch outwards by 45° (see Figure 17 on page 33).
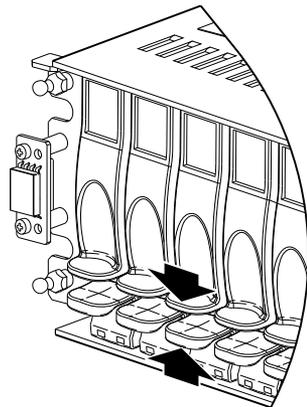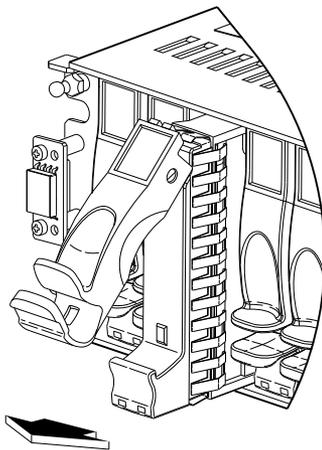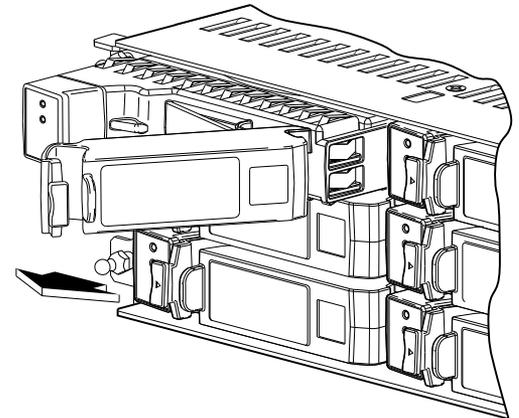
SFF 2.5" disk or blank
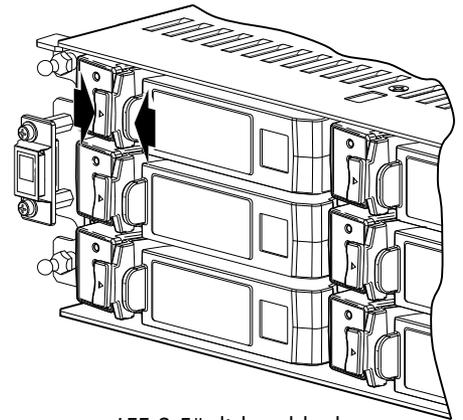
LFF 3.5" disk or blank
(standard-depth enclosure)

Figure 16 Disengaging a disk drive module

2. Wait 20 seconds for the internal disks to stop spinning.

3. Follow one of the two sub-steps below, according to your product disk drive type (see Figure 17):

   a. SFF disk — Grasp the front of the plastic sled, and pull the disk drive module straight out of the chassis, taking care not to drop the module.

   b. LFF disk — Grasp the front of the plastic sled, and pull the disk drive module straight out of the chassis, taking care not to drop the module.
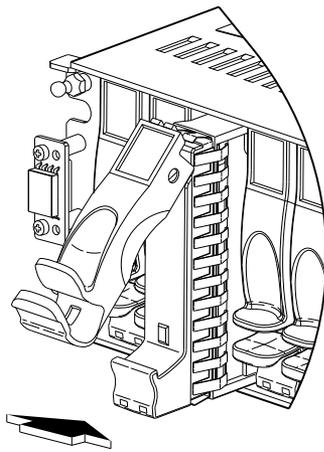

Extract SFF disk or blank

Extract LFF disk or blank
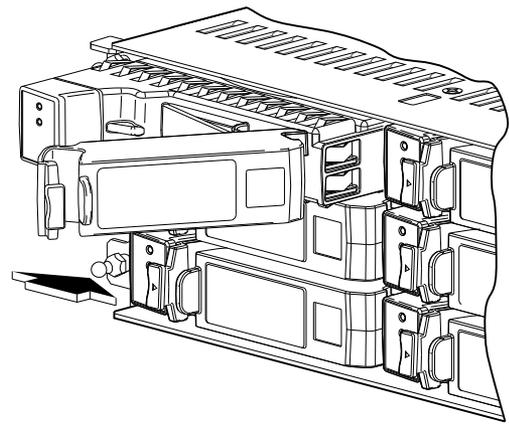(standard-depth enclosure)

Figure 17 Removing a disk drive module

Installing a disk drive module

1. Follow *one* of the two sub-steps below, according to your product disk drive type:

   a. SFF disk — Squeeze the latch release flanges together, and then pull the latch, rotating it upward until it is fully open (see Figure 16 on page 33 and Figure 17 on page 33).

   b. LFF disk — Squeeze the latch release flanges inward, and then pull the latch, rotating it outward until it is fully open (see Figure 16 on page 33 and Figure 17 on page 33).

2. Follow *one* of the two sub-steps below, according to your product disk drive type:

   a. SFF disk — With the LEDs oriented to the bottom, slide the disk drive module into the drive slot as far as it will go (see left illustration in Figure 18 on page 34).

   b. LFF disk — With the LEDs oriented to the left, slide the disk drive module into the drive slot as far as it will go (see right illustration in Figure 18 on page 34).

Insert SFF disk or blank

Insert LFF disk or blank
(standard-depth enclosure)

Figure 18 Installing a disk drive module

3. Follow *one* of the two sub-steps below, according to your product's disk drive type:
   a. SFF disk — Rotate the latch downward until it clicks closed to firmly seat the disk drive module in the enclosure midplane.
   b. LFF disk — Rotate the latch inward until it clicks closed to firmly seat the disk drive module in the enclosure midplane.

   The installed disk drive module should now appear as shown in .

📝 **NOTE:** Allow at least 30 seconds to elapse when jointly completing the "Removing a disk drive module" and "Installing a disk drive module" procedures.

If using SMC, execute steps 4 through 6 to complete this procedure. If using the CLI, execute steps 7 and 8 to complete this procedure.

Using SMC:

4. Sign in to SMC (use default user `manage` and password `!manage`, or the appropriate username and password if they have been changed).
5. Click the **System** topic. The System panel opens.
6. Click the **Table** tab to determine whether the health of the new disk is OK. If the health is OK, then the disk drive module installation process is complete. If the health is not OK, then hover over the disk to display details about it, such as Status and Heath Recommendations.

Using the CLI:

7. Log in to the CLI (use default user `manage` and password `!manage`, or the appropriate username and password if they have been changed).
8. To view information about disks, run the following command:

   ```
   show disks <disk-ID>
   ```

   Disks are specified by enclosure ID and slot number. Enclosure IDs increment from 1. Disk IDs increment from 1 in each enclosure (e.g., `show disks 1.7`). Entering the command shown above will display the disk health. If health is not OK, the command output will also display recommended actions.

Determine if a disk is missing

You can determine whether a disk is missing by using management interfaces.

Using SMC

1. Sign-in to SMC using default user `manage` and password `!manage`.

   If the default user or password—or both—have been changed for security reasons, enter the secure login credentials instead of the system defaults shown above.

2. Click the **System** topic. The System panel opens.
   - Select the **Front** tab to display a pictorial representation of disks within slots, and hover over individual disks to view the metadata such as location, usage, tier, type, and size.
   - You can hover over enclosure ears to see metadata for specific enclosures in the system.
   - Select the **Table** tab to display a tabular view of information about physical components in the system.
3. Using the Front and Table views, look for gaps in the disk location sequence to determine if a disk is missing.

Using the CLI

1. Log-in to the command-line interface (CLI) using default user `manage` and password `!manage`.

   If the default user or password—or both—have been changed for security reasons, enter the secure login credentials instead of the system defaults shown above.

2. To determine location of a missing or faulty drive, run the following command:

   ```
   show disks
   ```

   The command outputs a listing of detected disks' properties by location. Review the information, and look for gaps in the disk location sequence to determine whether any disks are missing.

Verifying component operation

Check that the Power/Activity/Fault LED (LFF disks) or Power/Activity LED (SFF disks)—located on the front face of the disk drive escutcheon—is illuminated green. On LFF disks, this is the bottom LED. On SFF disks, this is the left LED. Both sets of LEDs are shown in Figure 18 on page 34.

☼ **TIP:**   See the *AssuredSAN Pro 5000 Series Setup Guide* for descriptions of disk drive LEDs and other front panel LEDs pertaining to 2U12 and 2U24 controller enclosures.

Also see Using management interfaces on page 50 as an alternative to physically observing LEDs to verify component operation.

Replacing a power supply module

This section provides procedures for replacing a failed AC or DC power supply module, also referred to as a power supply unit (PSU). Illustrations in power supply module replacement procedures show rear panel views of the enclosure, and PSUs are properly aligned for insertion into the rear panel of the enclosure.

△ **CAUTION:**   Power supply FRU replacement activities can cause enclosure cables to disconnect and disks to go offline.

When replacing a power supply FRU, you might accidentally disconnect cables, causing disks to go offline. As a precaution—before installing or replacing a FRU—you should stop I/O to all storage-pool components. If stopping I/O is not possible, the next best action is to defer FRU replacement until such time as it is possible to stop all I/O. If immediate replacement is necessary during I/O, ensure that all cables are securely fastened, and *proceed with great caution* as you replace the power supply FRU within the controller enclosure. Be very careful if moving a cabled/operational enclosure during the FRU replacement process.

A single PSU is sufficient to maintain operation of the enclosure. You need not halt operations and completely power-off the enclosure when replacing only one PSU; however, a complete shutdown is required if replacing both power supply units.

☼ **TIP:**   See Table 7 on page 36 for additional information about power supply faults and recommended actions.

Before you begin

> △ **CAUTION:** Removing a power supply unit significantly disrupts the enclosure's airflow. Do not remove the PSU until you have received the replacement module.

See CAUTION bullets regarding "electrostatic discharge" and "anti-static protection" on .

Verifying component failure

When either a fan or power supply component fails, SMC provides notification; faults are recorded in the event log; and the PSU's status LED color changes to amber to indicate a fault condition.

Table 7 Power supply faults and recommended actions

Problem	Recommended action
Power supply fan warning or failure, or power supply warning or failure Event code 168	• Verify that all fans are working using SMC. Click the System tab within the topics pane and from the System topic, select the **Rear** tab. Hover over each power supply module to view health attributes. You can also select the **Table** tab and view health status for power supply modules and other components in tabular form. • Optionally, you can verify that all fans are working using the CLI. The `show fans` command will output health status for fans in the specified enclosure. • Ensure that the power supply modules are properly seated and secured within their slots. • Ensure that no slots are left open for more than two minutes. If you must replace the FRU, leave the old module in place until the replacement arrives to maintain optimal airflow and avoid overheating.
Power supply module failure status, or voltage event notification Event code 168	• Verify that the power supply module is powered on. If your power supply module has a power switch, verify that it is switched on. • Verify that the power cables are securely attached to the power supply module and the appropriate power source. • Replace the FRU if necessary.
AC Power Good LED is off	Same as above.
DC Voltage/Fan Fault/Service Required LED is illuminated	Replace the power supply module FRU.

Power supply units

> ☑ **IMPORTANT:** Newer AC power supply units do not have power switches. These PSUs power on when connected to a power source, and power off when disconnected.

Power cycling procedures vary according to the type of power supply included with the enclosure. For controller and expansion enclosures configured with AC PSUs that do not have power switches, refer to the procedure described under AC PSU on page 37. For procedures pertaining to a) enclosures configured with DC PSUs, or b) previously installed expansion enclosures featuring power switches, see DC and AC PSUs with power switch on page 37.

AC PSU

Enclosures configured with AC PSUs that do not have a power switch rely on the power cord for power cycling. Connecting the cord from the PSU power cord connector to the appropriate power source facilitates power on; whereas disconnecting the cord from the power source facilitates power off.
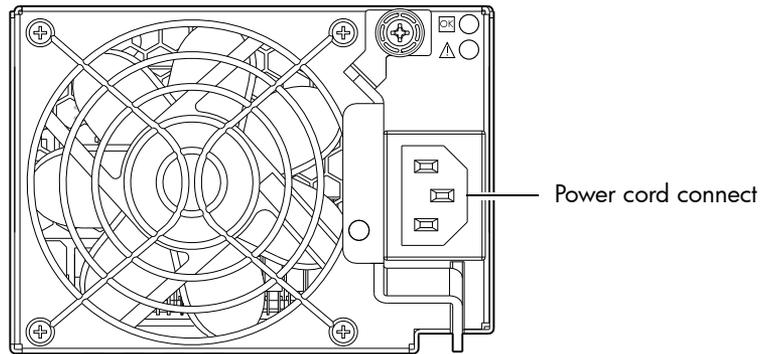

Figure 19 AC PSU

Powering off the PSU

1. Stop all I/O from hosts to the enclosure (see Stopping I/O on page 24).
2. Use management software to shut down any other system components necessary.

   Given that power switch shut-off does not apply to this particular power supply model, proceed to disconnecting the AC power cord.

Disconnecting an AC power cord

1. Disconnect the power cord's male plug from the power source.
2. Disconnect the power cord's female plug from the power cord connector on the PSU.

NOTE: See Connecting a power cable on page 40 for an illustration showing AC power cord connection/disconnection.

DC and AC PSUs with power switch

DC and legacy AC power supplies—each equipped with a power switch—are shown below.

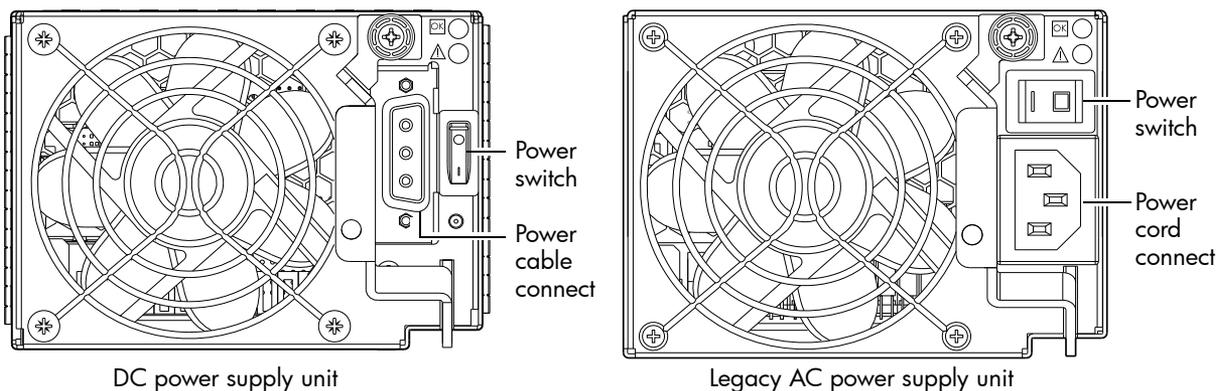DC power supply unit   Legacy AC power supply unit

Figure 20 DC and AC PSUs with power switch

Powering off the PSU

1. Stop all I/O from hosts to the enclosure (see Stopping I/O on page 24).
2. Use management software to shut down any other system components necessary.
3. If applicable, turn off the power switch on the PSU being replaced and on the replacement PSU.

Disconnecting an AC power cord

1. If applicable, verify that the power switch on the PSU being replaced is in the **Off** position.
2. Disconnect the power cord's male plug from the power source.
3. Disconnect the power cord's female plug from the power cord connector on the PSU.

📝 **NOTE:** See for illustrations showing both AC and DC power cord connection/disconnection.

Disconnecting a DC power cable

1. Verify that the power switch on the PSU being replaced is in the **Off** position.
2. Loosen the cable-locking screws that attach each D-shell connector to its power supply, and carefully disconnect the lugs on each cable wire component of the DC power cable from the DC power source (shows cable wire lugs and D-shell connector).
3. Loosen the cable-locking screws attaching the D-shell connector to the PSU, and disconnect the power cable from the PSU.

Removing a power supply unit

1. If replacing a single power supply module via hot-swap, proceed to step 3.
2. If replacing both power supply modules, verify that the enclosure is powered off.

   If the PSU model has a power switch, verify that the switch is set to the **Off** position.
3. Verify that the power cord is disconnected.
4. Turn the thumbscrew at the top of the latch counterclockwise to loosen and disengage it from the module; however, do not remove the thumbscrew from the latch.
5. Rotate the latch downward by approximately 45°, supplying leverage to disconnect the module from the internal connector.
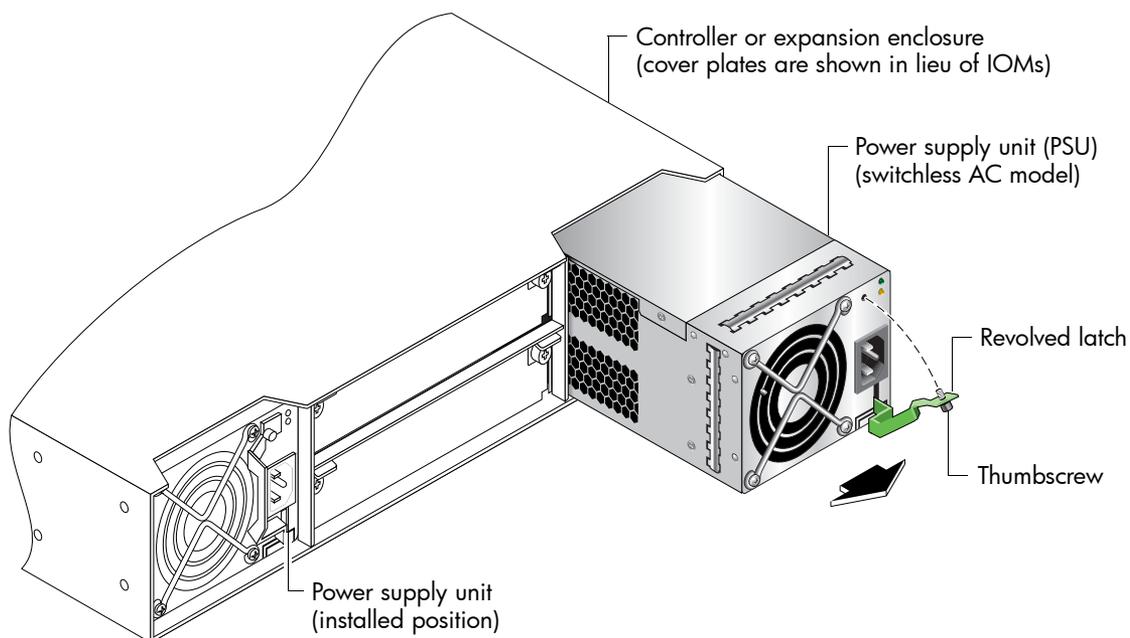
   See Figure 21 below.

Figure 21 Removing a power supply unit

6. Use the latch to pull the module straight out of the chassis slot, taking care to support the base of the PSU—with both hands—as you remove it from the enclosure.
7. If replacing two power supply modules, repeat step 3 through step 6.

△ **CAUTION:** Do not lift the module by its latch; doing so could damage the latch. Using both hands, lift and carry the module using its metal casing.

Installing a power supply unit

AC model without power switch

AC model with power switch
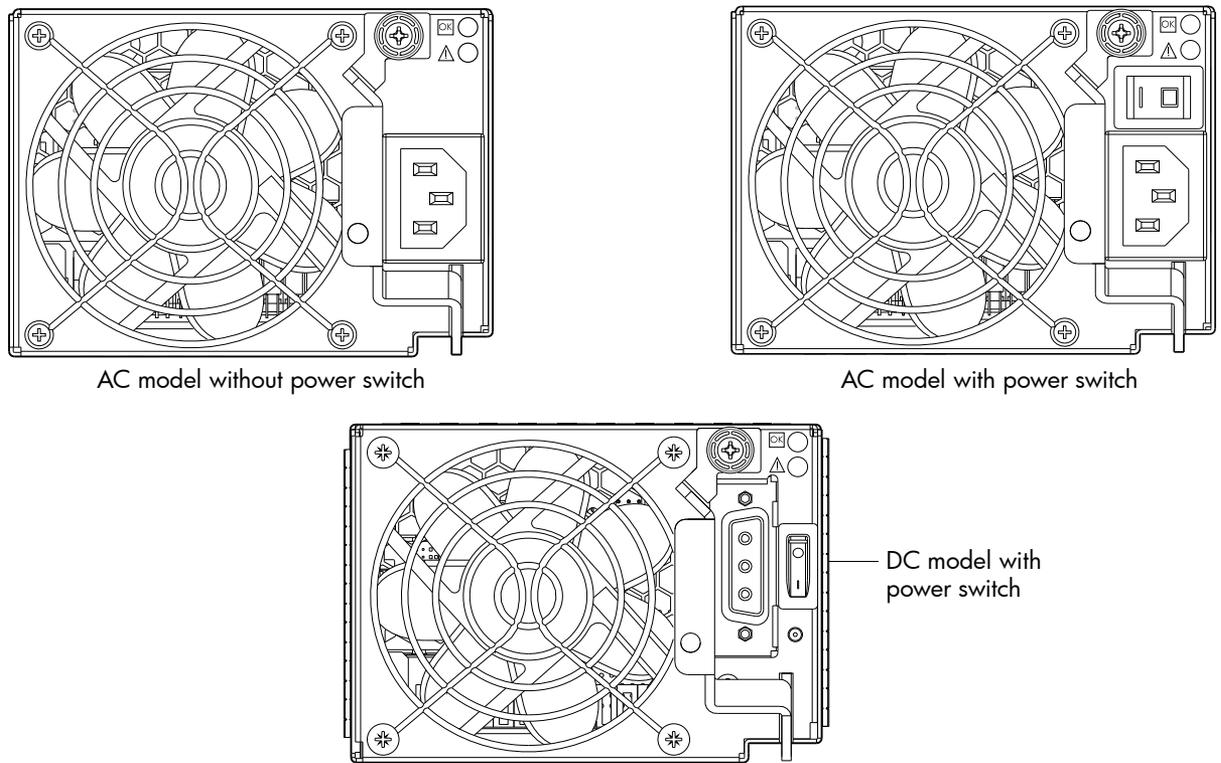
DC model with power switch

Figure 22 Orienting a power supply unit

To install a power supply module, perform the following steps:

1. Orient the PSU with the AC or DC power cable connector toward the right as shown in Figure 21 on page 38 and Figure 22, respectively.
2. With the latch in the open position, ensure that the power supply module is level, and slide it into the appropriate power supply slot as far as it will go.
3. Rotate the PSU latch upward until it is flush against the PSU face, ensuring that the connector on the PSU engages the connector inside the chassis.
4. Turn the thumbscrew located at the top of the power supply latch clockwise, until it is finger-tight, to secure the latch to the power supply unit within the enclosure.
5. If replacing two power supply modules, repeat step 1 through step 4.

📝 **NOTE:** AC PSUs—with or without a power switch—are compatible with one another in that the two different models can coexist in the same enclosure, and are interchangeable.
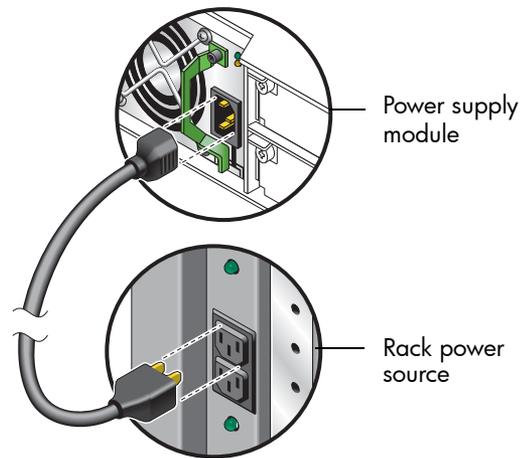
Connecting a power cable

This section addresses power cable connection for enclosures configured with either AC or DC power supply modules.

Connecting an AC power cord

The diagram at right pertains to AC PSU models (a switchless unit is shown).

1. Install the power cord:
   a. Connect the female plug to the AC PSU cord inlet.
   b. Connect the male plug to the rack power source.
   Verify connection of the primary power cord(s) from the rack to separate external power sources.
2. Power-on the newly-installed PSU:
   - Connecting the power cord effectively powers a switchless AC PSU on. Wait several seconds for the disks to spin up.
   - For AC PSUs equipped with a power switch, press the power switch to the **On** position.
     Wait several seconds for the disks to spin up.
3. If replacing two power supply modules, repeat step 1 and step 2.

Connecting a DC power cable

Locate the DC power cable that applies to the DC PSU being installed in the enclosure.
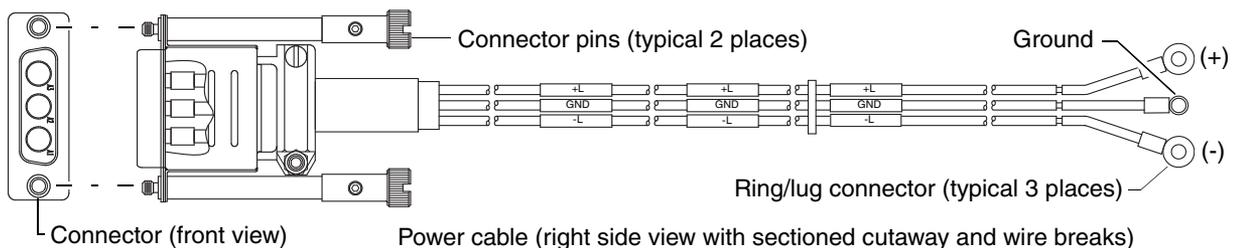

Figure 23 DC power cable featuring D-shell and lug connectors

1. Install the appropriate DC power cable:
   a. Connect a DC power cable to each DC power supply using the D-shell connector. Use the **UP>** arrow on the connector shell to ensure proper positioning (see adjacent left side view of D-shell connector).
   b. Tighten the screws at the top and bottom of the shell, applying a torque between 1.7 N·m (15 in·lb) and 2.3 N·m (20 in·lb), to securely attach the cable to the DC PSU.
   c. To complete the DC connection, secure the other end of each cable wire component of the DC power cable to the target DC power source.
   Check the three individual DC cable wire labels before connecting each cable wire lug to its power source. One cable wire is labeled ground (GND), and the other two are labeled positive (+L) and negative (-L), respectively (see Figure 23 above).
2. If you did not perform a hot-swap, power-on storage system components in the order indicated:
   Expansion enclosures *first*; controller enclosures *next*; data host *last* (if powered down for maintenance).
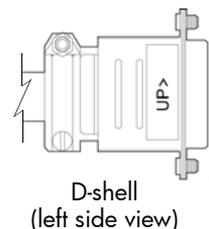
Verifying component operation

Examine PSU module status as indicated in the table below.

Table 8 Power supply unit LED descriptions

LED No./Description	Color	State	Definition
1 — Input Source Power Good	Green	On	Power is on and input voltage is normal.
		Off	Power is off, or input voltage is below the minimum threshold.
2 — Voltage/Fan Fault/ Service Required	Amber	On	Output voltage is out of range, or a fan is operating below the minimum required RPM.
		Off	Output voltage is normal.

LEDs for a PSU are located in the top right corner of the module face, as shown in Figure 22 on page 39.

The top LED corresponds to LED number (1) above, and the bottom LED corresponds to number (2) above. If the Voltage/Fan Fault/Service Required LED is illuminated amber, the PSU module has not gone online, and likely failed its self-test. Remove and reinstall the PSU module. In addition to viewing the PSU LEDs, verify that the cooling fans are spinning. Also see Using management interfaces on page 50 as an alternative to physically observing LEDs to verify component operation.

Replacing ear bezels

Before you begin

△ **CAUTION:**   Verify that you have the proper FRU kit (left or right) for the ear bezel that is being replaced.

See CAUTION bullets regarding "electrostatic discharge" and "anti-static protection" on page 21.

Enclosure ear bezel FRUs are available for the left and right ears of the chassis front panel. The following ear bezel replacement procedure applies to ear kits provided with the 2U24 and 2U12 enclosure models, respectively. Refer to the following illustration(s) pertaining to your product ear kit. Illustrations in ear bezel replacement procedures show front panel views of each enclosure, and ear bezel components are properly aligned for attachment to the ears on the front panel of the enclosure.

2U24 Ear bezels

Figure 24 illustrates ear bezel replacement relative to 2U24 models. See Removing ear bezel components and Installing ear bezel components on page 43.
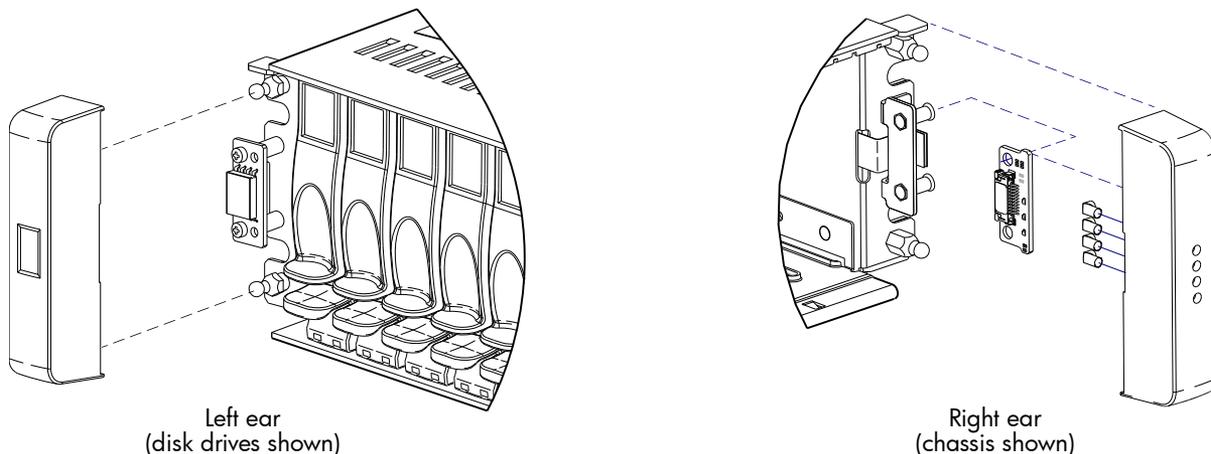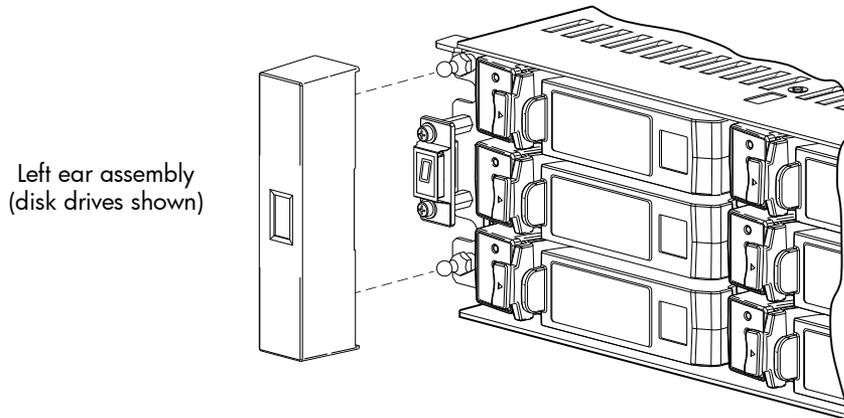

Left ear
(disk drives shown)
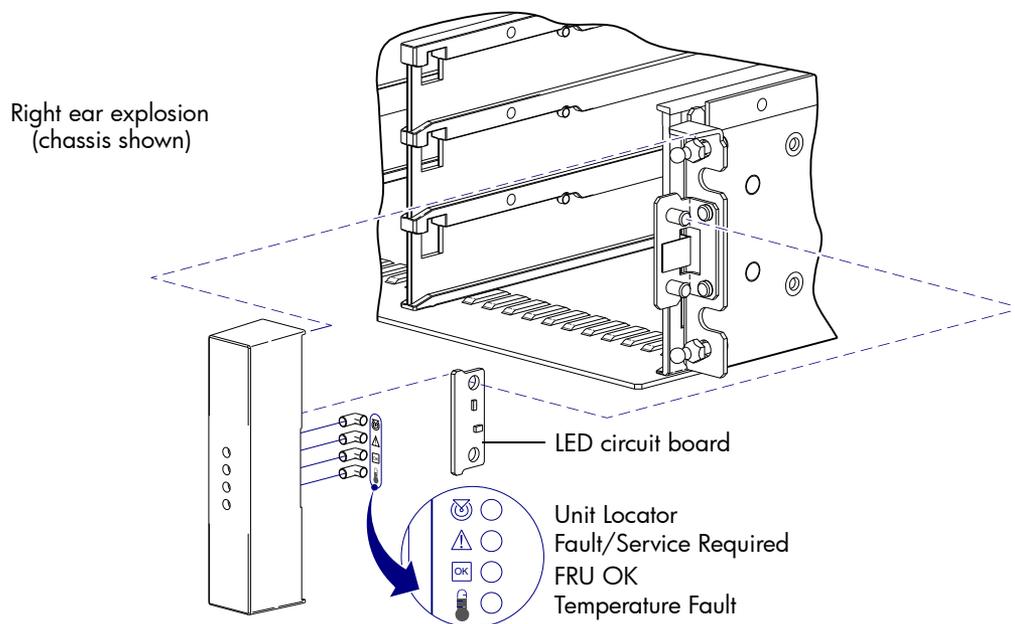
Right ear
(chassis shown)

Figure 24 Replacing ear bezels — 2U24 models

NOTE: Although the illustrations above show ear caps, newer product models feature an enclosure bezel instead of ear caps.

The enclosure bezel attaches to the same ball studs on the left and right ears that are used to fasten ear caps (see Figure 24 on page 41). See Figure 3 on page 14 and Enclosure bezel for 24-drive models on page 15 for bezel attachment and removal details.

2U12 Ear bezels

Figure 25 and Figure 26 illustrate ear bezel replacement for 2U12 models. See Removing ear bezel components and Installing ear bezel components on page 43.

Left ear assembly (disk drives shown)

Figure 25 Replacing left ear bezels — 2U12 models

Right ear explosion (chassis shown)

LED circuit board

Unit Locator
Fault/Service Required
FRU OK
Temperature Fault

Figure 26 Replacing right ear bezels — 2U12 models

NOTE: Although the illustrations above show ear caps, newer product models feature an enclosure bezel instead of ear caps.

The enclosure bezel attaches to the same ball studs on the left and right ears that are used to fasten ear caps (see Figure 25 and Figure 26 on page 42). See Figure 7 on page 18 and Enclosure bezel for 12-drive model on page 18 for bezel attachment and removal details.

Removing ear bezel components

See Figure 24 on page 41 (2U24 chassis), Figure 25 on page 42, and Figure 26 (2U12 chassis) when removing the ear bezel sub-assemblies.

1. Stop all I/O from hosts to the system.
2. Use management software to shut down any other components necessary.
3. Power off the enclosure.
4. Gently squeeze the sides of the ear cover, and pull it straight forward to remove the ear from the push-fit mounting ball studs.

> 📝 **NOTE:** Newer product models use an enclosure bezel instead of ear covers. If your model is equipped with a bezel instead of ear covers, see the appropriate illustration for bezel removal:
> - See Figure 3 on page 14 for reduced-depth 2U24 enclosure bezel removal.
> - See Figure 7 on page 18 for standard-depth 2U12 enclosure bezel removal.

5. Loosen the hexagonal nuts that secure the LED circuit board to the mounting pins on the flange.
6. Remove the LED circuit board.

   Figure 26 on page 42 lists LEDs common to the right ear of both 2U24 and 2U12 enclosures.

Installing ear bezel components

See Figure 24 on page 41 (2U24 chassis), Figure 25 on page 42, and Figure 26 (2U12 chassis) when installing the ear bezel sub-assemblies.

1. Verify that the enclosure is powered off.
2. Install the LED circuit board:
   a. Insert the mounting pins into the though holes in the LED circuit board and mounting flange.
   b. Thread the hexagonal nuts onto the inserted pins, and turn the nuts clockwise to tighten.
3. Gently slip the ear cover over onto the push-fit mounting ball studs, taking care to guide the LED indicators through the cover's through holes.

> 📝 **NOTE:** Newer product models use an enclosure bezel instead of ear covers. If your model is equipped with a bezel instead of ear covers, see the appropriate illustration for bezel installation:
> - See Figure 3 on page 14 for reduced-depth 2U24 enclosure bezel installation.
> - See Figure 7 on page 18 for standard-depth 2U12 enclosure bezel installation.

4. Power on the enclosure.

> 💡 **TIP:** See the *AssuredSAN Pro 5000 Series Setup Guide* for descriptions of front panel LEDs.

Verifying component operation

Enclosure status LEDs are located on the front of the controller enclosure. During normal operation, the FRU OK and Temperature Fault LEDs are green, and the other status LEDs located on the right ear are off.

Replacing a Fibre Channel transceiver

This section provides steps for replacing a small form-factor pluggable (SFP transceiver) connector used in a Fibre Channel (FC) controller module host port. An example SFP connector is shown below. It is pictorially-oriented to align for insertion into the FC host interface port, such that the connector is flush with the IOM face plate on the enclosure rear panel.
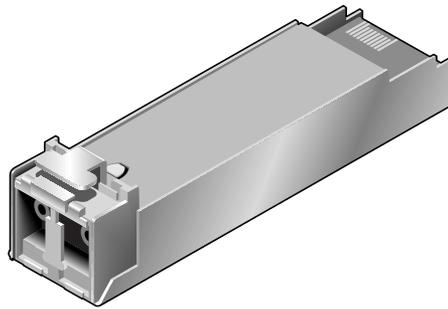
Figure 27 Sample SFP connector

> 📝 **NOTE:** See the "5720 controller module — rear panel components" topic within the Setup Guide for an illustration showing an SFP installed within the IOM.

Before you begin

> ⚠ **CAUTION:** Mishandling fibre-optic cables can degrade performance. Do not twist, fold, pinch, or step on fibre-optic cables. Do not bend them tighter than a 2-inch radius.

See CAUTION bullets regarding "electrostatic discharge" and "anti-static protection" on .

> ⚠ **CAUTION:** To prevent potential loss of access to data, be sure to identify the *correct* cable and SFP connector for subsequent removal.

Verifying component failure

Transceivers are part of a data path that includes multiple components, such as the transceiver, a cable, another SFP, and an HBA (host bus adapter). A reported fault can be caused by any component in the data path. To identify the location of the fault, check the Link Status and Activity LEDs on the controller enclosure and server. Also, check the cable for kinks, crimping or other possible damage.

> ☆ **TIP:** See the *AssuredSAN Pro 5000 Series Setup Guide* for descriptions of rear panel LEDs.

Removing an SFP module

Perform the following procedure to remove an SFP connector. When removing an FC SFP that has previously limited the port speed—and replacing it with a higher-rated SFP—it is possible, though rare, that auto-negotiation will not enable the higher port speed. Rebooting the array or the host resolves the problem.

1. Disconnect the fibre-optic interface cable by squeezing the end of the cable connector.

   If the SFP does not have a cable, it should have a plug (retained from installation).
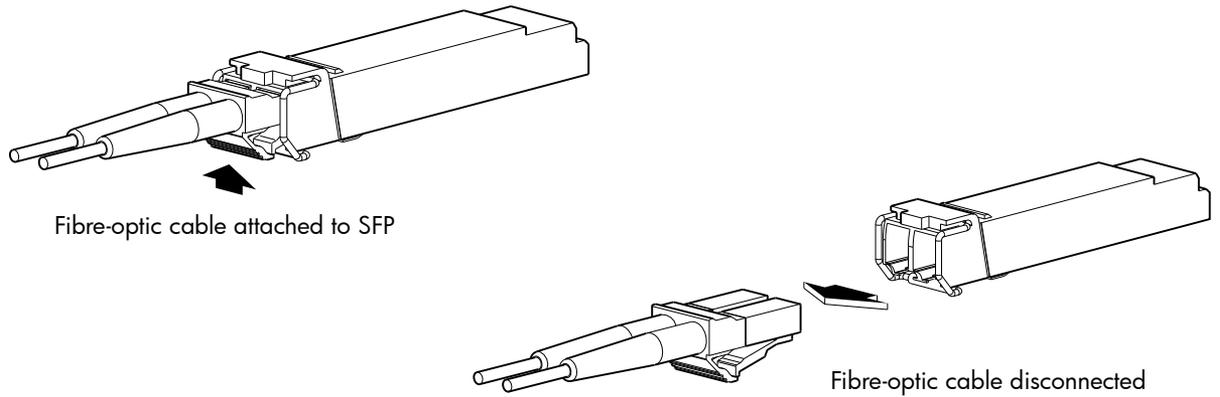
Fibre-optic cable attached to SFP

Fibre-optic cable disconnected

Figure 28 Disconnect fibre-optic interface cable from SFP

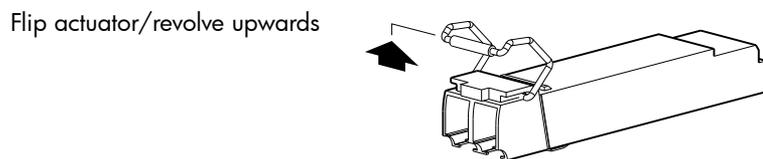**2.** SFPs are commonly held in place by a small wire bail actuator. Flip the actuator up.

Flip actuator/revolve upwards

Figure 29 Flip SFP actuator upwards

3. Grasp the SFP between your thumb and index finger, and carefully remove it from the controller module.

Installing an SFP module

Perform the following procedure to install an SFP connector.

1. To connect to an empty port, slide the SFP connector into the port until it locks into place.

If the SFP has a plug, remove it before sliding the connector into the FC port. Retain the plug.

2. Flip the actuator down.

Flip actuator/revolve downwards
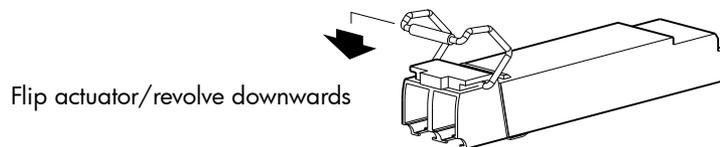
Figure 30 Flip SFP actuator downwards

3. Connect the fibre-optic interface cable into the duplex jack at the end of the SFP connector.

Connect fibre-optic cable to SFP

Fibre-optic cable attached to SFP
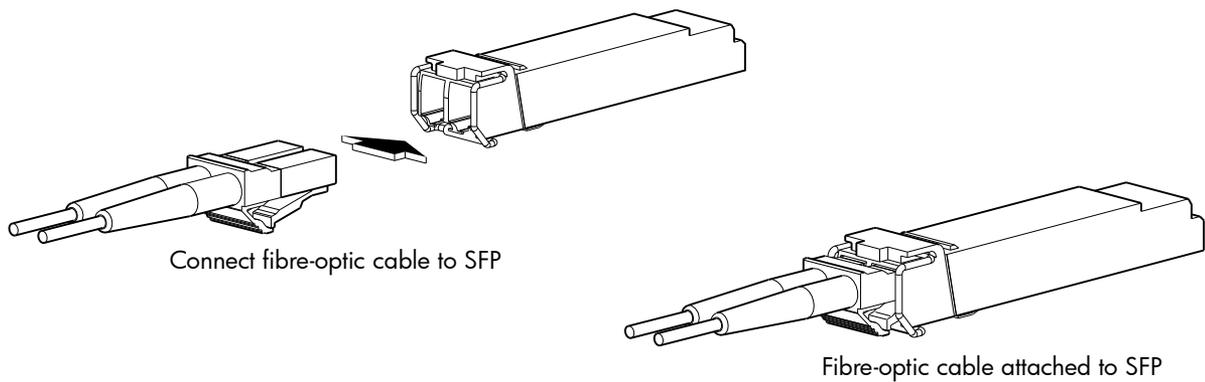
Figure 31 Connect fibre-optic interface cable to SFP

Verifying component operation

View the Link Status and Link Activity LEDs on the controller module face plate. A blinking LED indicates that no link is detected. Also check the link status and link activity LEDs on the host.

Replacing a 10GbE SFP+ transceiver

This section provides steps for removing and replacing a small form-factor pluggable plus (SFP+ transceiver) connector used in an Internet SCSI (iSCSI) controller host port. SFP+ connectors are similar in appearance to SFP connectors. These transceivers enable 10GbE equipment designs with high port density, based on electrical and mechanical enhancements to SFP specifications developed by the Small Form Factor (SFF) Committee.

Removing and replacing an SFP+ consists of the same basic steps described for removing and replacing an SFP in the preceding section. This procedure refers to the preceding Replacing a Fibre Channel transceiver instructions. When reviewing the procedure as it pertains to the 10Gb iSCSI host ports, note that your particular cables may be either copper or fibre-optic for the SFP+, depending upon how your system was initially configured, and the SFP+ option used.

Table 9 Removing and replacing a 10GbE SFP+ transceiver

To accomplish this sequential process	See the following procedures
1. Remove SFP+ connector.	a. Before you begin on page 44. b. Verifying component failure on page 44. c. Removing an SFP module on page 44.
2. Install the replacement SFP+ connector.	Installing an SFP module on page 45.
3. Verify proper operation for the removed and reinstalled component.	Verifying component operation on page 46.

📝 **NOTE:** See the "5420 controller module — rear panel components" topic within the Setup Guide for an illustration showing an SFP+ installed within the IOM.

Replacing a storage enclosure chassis

The controller enclosure or expansion enclosure chassis replacement procedure replaces a damaged chassis FRU, which consists of the structural support metal, the exterior sheet metal housing, and the assembled/installed midplane. The procedure includes removing all FRU components from a damaged chassis and installing them in a replacement chassis.

NOTE: AssuredSAN Pro 5000 Series storage enclosures using 2U24 or 2U12 chassis are described in FRUs addressing 24-drive enclosures on page 12 and FRUs addressing 12-drive enclosures on page 16.

Whether your controller enclosure product is a 2U24 or 2U12 model, a fully functional replacement chassis requires the successful removal and installation of the following components:

- All disk drive modules
- Two ear bezels (for left and right ears)

  Product models may use an enclosure bezel instead of left and right ear covers
- Two power supply units of the same type (both AC or both DC)
- One or two I/O modules (of the same model type)

Certain models also require the successful removal and installation of the following components:

- Fibre Channel transceiver (SFP for 5720 models)
- 10GbE SFP+ transceiver (SFP+ option for 5420 models)

This procedure makes extensive use of the FRU component procedures described elsewhere in Chapter 2. Perform this procedure by following the step-by-step process described below.

Before you begin

CAUTION: Do not remove the enclosure until you have received the replacement enclosure.

See CAUTION bullets regarding "electrostatic discharge" and "anti-static protection" on page 21.

1. Schedule down time that will allow for shutdown; sixty minutes of replacement work; and restart.
2. Verify the existence of a known/good backup of the system.
3. Record system settings for future use.
4. Label all cables.
5. Prepare a suitable static-protected work environment to accommodate chassis replacement.

Verifying component failure

The controller enclosure FRU includes the enclosure's metal housing and the midplane that connects I/O modules, disk drive modules, and power supply modules. This FRU replaces an enclosure that has been damaged, or whose midplane has been damaged.

Often, a damaged midplane will appear as though an I/O module has failed. If you replace an IOM, and it does not remedy the fault, you may need to replace the enclosure.

Alternatively, you can observe enclosure health (front panel and rear panel) using management interfaces to verify enclosure/component failure or enclosure/component operation (see Using management interfaces on page 50 for more information).

Preparing to remove a damaged storage enclosure chassis

Since you are removing and replacing an entire storage enclosure, neither the hot-swap capability that applies to replacing individual redundant FRUs in an operational storage enclosure, nor the hot-add of a drive enclosure to an operational storage system, apply to this procedure.

1. Stop all I/O from hosts to the system. See Stopping I/O on page 24.
2. Shut down the controllers. See Shutting down a controller module on page 25.
3. Power off the system (controller enclosure first; expansion enclosure(s) next). See Power supply units on page 36, and refer to the power cycling procedures pertaining to your enclosure's power supply modules.

Table 10 Removing and replacing a storage enclosure chassis and its FRUs

To accomplish this sequential process	See the following procedures
1. Remove disk drive modules from the damaged chassis.[1]	**a.** Before you begin on page 32. **b.** Removing a disk drive module on page 32.
2. Remove the ear bezel components from the damaged chassis.	**a.** Before you begin on page 41. **b.** Removing ear bezel components on page 43.
3. Remove the damaged storage enclosure chassis from the rack.	Removing a damaged storage enclosure chassis from the rack on page 49.
4. Remove the power supply units from the damaged chassis, and install them in the replacement chassis.	**a.** Before you begin on page 36. **b.** Power supply units on page 36. **c.** Removing a power supply unit on page 38. **d.** Installing a power supply unit on page 39.
5. Remove each IOM from the damaged chassis, and install it in the replacement chassis.[2]	**a.** Before you begin on page 23. **b.** Removing a controller module or expansion module on page 26. **c.** Installing a controller module or expansion module on page 27.
6. Remove each Fibre Channel transceiver from the damaged chassis, and install it in the replacement chassis (Fibre Channel models only).[3]	**a.** Before you begin on page 44. **b.** Removing an SFP module on page 44. **c.** Installing an SFP module on page 45.
7. Remove each 10GbE SFP+ module from the damaged chassis, and install it in the replacement chassis (10GbE iSCSI models only).[3]	Replacing a 10GbE SFP+ transceiver on page 46. Also see Steps 6a - 6c immediately above.
8. Install ear bezel components on the replacement chassis.	Installing ear bezel components on page 43.
9. Install the replacement storage enclosure chassis in the rack.	Installing the replacement storage enclosure in the rack on page 49.
10. Install disk drive modules in the replacement chassis.[1]	Installing a disk drive module on page 33.
11. Complete the installation process.	**a.** Connecting a power cable on page 40. **b.** Completing the process on page 49.
12. Verify proper operation for all removed and installed FRU components.	**a.** Disks—Verifying component operation on page 35. **b.** IOMs—Verifying component operation on page 28. **c.** PSUs—Verifying component operation on page 41. **d.** SFPs (if applicable)—Verifying component operation on page 46. **e.** SFP+ (if applicable)—Verifying component operation on page 46. **f.** Verify PFU enabled (if applicable)—Configuring partner firmware update on page 23.

[1]Within the replacement enclosure, reinstall each disk drive into the same disk slot from which it was removed from the damaged enclosure (see Disk drive slot numbers and auto-pool provisioning on page 30).

[2]Within the replacement enclosure, the IOM(s) must be reinstalled into the same IOM slots from which they were extracted from the damaged enclosure.

[3]The 5720 uses an SFP connector and the 5420 uses a 10GbE SFP+ connector.

Removing a damaged storage enclosure chassis from the rack

This section provides a procedure for removing a damaged storage enclosure chassis from its rack location.

△ **CAUTION:** It is recommended that all disk drive modules be removed before removing the enclosure. If this is not possible, two people are required to move the enclosure. See Removing a disk drive module on page 32.

1. Make sure the ear bezels are removed. See Removing ear bezel components on page 43.
2. Remove the retaining screws that secure the front and rear of the enclosure chassis to the rack and rails.
3. Maintaining a level position, carefully slide the enclosure chassis from the rack.
4. Place the chassis on a work surface near the replacement enclosure chassis, the removed disk drive modules, ear bezel components, and screws.
5. Remove the side bracket from each side of the damaged enclosure chassis, and retain these rackmount items with the other components for future use.

Installing the replacement storage enclosure in the rack

This section provides a procedure for installing the replacement enclosure in its rack location.

△ **CAUTION:** It is recommended that all disk drive modules be removed before lifting the enclosure. If this is not possible, two people are required to move the enclosure. See Removing a disk drive module on page 32.

📝 **NOTE:** Refer to Rackmount Bracket Kit Installation or 2-Post Rackmount Bracket Kit Installation for the correct procedure and mounting hardware.

1. Attach side brackets (standard rackmount installation) or main brackets (2-post rackmount installation) on the replacement enclosure chassis.
2. Support the bottom of the enclosure chassis. Carefully lift/align the chassis and while maintaining a level position for the enclosure, slide it into the rack.
3. Using the appropriate mounting hardware, secure the enclosure chassis to the rack.
4. Install the ear bezels. See Installing ear bezel components on page 43.
5. Using the applicable retaining screws, secure the front and rear or the enclosure chassis to the rack and rails.

Completing the process

This section provides a procedure for ensuring that the FRU components installed in the replacement controller enclosure chassis function properly.

1. Reconnect data cables between devices, as needed, to return to the original cabling configuration:
   • Between cascaded enclosures.
   • Between the controller and peripheral or SAN devices.
   • Between the controller enclosure and the host.
2. Reconnect power cables to the controller enclosure. See Connecting a power cable on page 40.
3. Turn on the power switch to power supply modules if they are equipped with power switches.

📝 **NOTE:** For powering-on AC PSUs with or without a power switch, and DC and AC PSUs with a power switch, see Power supply units on page 36.

Verifying component operation

1. Restart system devices in the following sequence. Allow time for each device to complete its Power On Self Tests (POST) before proceeding:

    a. Expansion enclosure(s)

    b. Controller enclosure

    c. Host (if powered down for maintenance)

2. Perform a rescan to force a fresh discovery of all expansion enclosures connected to the controller enclosure. This step clears the internal SAS layout information, reassigns enclosure IDs, and ensures that the enclosures are displayed in the proper order. Use either the CLI or SMC to perform the rescan:

    To perform a rescan using the CLI, enter the following command:

        rescan

    To perform a rescan using SMC, follow the substeps below:

    a. Verify that the controllers are operating normally.

    b. Do one of the following:

        • Point to the **System** tab and select **Rescan Disk Channels**.

        • In the **System** topic, select **Action** > **Rescan Disk Channels**.

        The Rescan Disk Channel panel opens.

    c. Click **Rescan**.

    See "Correcting enclosure IDs" in the Setup Guide for more information.

Using LEDs

View LEDs on the front and rear of the enclosure (see "LED descriptions" within the *AssuredSAN Pro 5000 Series Setup Guide* for more information).

Verify front panel LEDs:

• Verify that the Enclosure ID LED (located on the left ear) is illuminated green.

• Verify that the FRU OK and Temperature Fault LEDs are illuminated green, and that the Fault/Service Required LED is off (all three LEDs are located on the right ear).

• For LFF disks, verify that the Power/Activity/Fault LED (bottom LED on front of disk) is illuminated green or blinking green (If your product model has an enclosure bezel, remove it to view disk LEDs).

• For SFF disks, verify that the Power/Activity LED (left LED on front of disk) is illuminated green or blinking green (If your product model has an enclosure bezel, remove it to view disk LEDs).

Verify rear panel LEDs:

• Verify that each power supply module's Input Source Power Good LED (top LED on PSU) is illuminated green.

• Verify that the FRU OK LED on each IOM face plate is illuminated green, indicating that the module has completed initializing, and is online.

Using management interfaces

In addition to viewing LEDs as described above, you can use management interfaces to monitor the health status of the system and its components, provided you have configured and provisioned the system (see "Getting Started" within the *AssuredSAN Pro 5000 Series Storage Management Guide* for more information).

Select from the following methods to verify component operation:

• Use SMC to check the health icons/values of the system and its components to either ensure that everything is okay, or to drill down to a problem component. SMC uses health icons to show OK, Degraded, Fault, or Unknown status for the system and its components. If you discover a problem component, follow the actions in its Health Recommendations field to resolve the problem.

• As an alternative to using SMC, you can run the show system command in the CLI to view the health of the system and its components. If any component has a problem, the system health will be

Degraded, Fault, or Unknown. If you discover a problem component, follow the actions in its Health Recommendations field to resolve the problem.

- Monitor event notification — With event notification configured and enabled, you can view event logs to monitor the health of the system and its components. If a message tells you to check whether an event has been logged, or to view information about an event in the log, you can do so using either SMC or the CLI. Using SMC, you would view the event log and then hover over the event message to see detail about that event. Using the CLI, you would run the `show events detail` command (with additional parameters to filter the output) to see the detail for an event (see "Alphabetical list of commands > show events" within the *AssuredSAN Pro 5000 Series CLI Reference Guide* for more information about command syntax and parameters).

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