Quantum®

CRU Installation and Replacement Guide

QX and QXS

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Contents

Chapter 1: About This Guide

This chapter contains the following topics:

About This Guide

This guide describes how to remove and replace the QX and QXS RAID chassis and expansion chassis FRUs/CRUs. The applicable systems include:

- QXS-312/412 Hybrid
- QXS-324/424 Hybrid
- QXS-448/648 Hybrid
- QXS-456/656 Hybrid
- StorNext QXS-1200/2400
- StorNext QXS-5600
- StorNext QX-1200/2400

ⓘ **Note:** Some parts may not be exactly the same item in older systems; the system parts are representative of the type parts within the above listed systems.

Intended Audience

This guide is intended for storage system administrators.

Prerequisites

Prerequisites for 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) , SAS, and Ethernet protocols

Related Documentation

For information about	See
Web links to download Quantum QX and QXS Storage guides listed below, but not shipped with the product	*QX and QXS Documentation Sheet**
Enhancements, known issues, and late-breaking information not included in product documentation	*QX or QXS Release Notes*
Product overview and overview of setup tasks	*QX and QXS Getting Started Guide*
Regulatory compliance and safety and disposal information	*QX and QXS Series Product Regulatory Compliance and Safety **
Using a 12- and 24-drive rackmount bracket kit to install an chassis into a rack	*QX/QXS 12- and 24-Drive Rackmount Bracket Kit Installation Guide*
Using a 48-drive rackmount bracket kit to install an chassis into a rack	*QXS 48-Drive Rackmount Bracket Kit Installation Guide*
Using a 56-drive rackmount bracket kit to install an chassis into a rack	*QXS 56-Drive Rackmount Bracket Kit Installation Guide*
Installing the front bezel on a QX and QXS system	*QX and QXS Bezel Installation Guide*
Product hardware setup and related troubleshooting	*QX and QXS Setup Guide*

For information about	See
Using the CLI to configure and manage the product	*QX and QXS CLI Reference Guide*
Identifying and installing or replacing CRUs	*QX & QXS CRU Installation and Replacement Guide*
Events that the QX and QXS Series may report, and recommended actions to take in response to those events	*QX and QXS Event Descriptions Reference Guide*
Managing a QXS system by using its primary web interface (V3), the Disk Management Utility	*QXS Disk Management Utility User Guide V3*
Managing a QX and QXS system by using its secondary web interface (V2), the Disk Management Utility	*QX and QXS Disk Management Utility User Guide V2*

* Printed document included with product

For additional information, go to Quantum's website,

Document Conventions and Symbols

Table 1: 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

Note: Note emphasizes important information related to the main topic.

Caution: Caution indicates potential hazards to equipment or data.

WARNING: Warning indicates potential hazards to personal safety.

Chapter 2: CRUs

This chapter contains the following topics:

Available CRUs

You can determine which CRUs pertain to your storage chassis 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 crus` query.

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

> ℹ **Note:** See *Quantum QX and QXS: CLI Reference Guide* for more information.

You can also determine which CRUs pertain to your storage chassis by visual inspection of the component, noting *serial number* and *part number*. This method applies to drives. CRUs and CRU make-up are subject to change independent of documentation versions. Information about CRUs and other components can also be viewed via Disk Management Utility.

See www.quantum.com for the latest product information.

Storage Chassis Overview

This guide identifies CRUs used in the 2U12 (12 drives), 2U24 (24 drives), 2U48 (48 drives) and 4U56 (56 drives) products and describes how to remove and install the applicable CRUs.

The QXS-3/4/6 Series RAID chassis offer the following host interfaces:

- CNC controller modules

  - FC SFP option supporting (4/8/16 Gb)

  - iSCSI (10 GbE) SFP option

  - iSCSI (1 Gb) SFP option (Copper RJ-45)

- HD mini-SAS (12 Gb) controller modules

Note: The StorNext QX-1200, QX-2400, QXS-1200, QXS-2400, and QXS-5600 use FC host interfaces.

The QXS-3/4/6 Series products support both traditional linear storage and new virtual storage, which uses paged-storage technology. For linear storage, a group of disks with an assigned RAID level is called a *vdisk* or *linear disk group*. For virtual storage, a group of disks with an assigned RAID level is called a *virtual disk group*. This guide uses the term *vdisk* when specifically referring to linear storage, and uses the term *disk group* otherwise.

The QXS-3/4/6 Series RAID chassis support attachment of expansion chassis for added storage. Refer to the *QX and QXS Setup Guide* for additional information.

Storage Chassis

Table 2 on the next page provides a list of the QXS-3/4/6 Series Hybrid, StorNext QXS, and StorNext QX systems (models, host interface, drives, form factor, and number of controllers).

Note: All systems ship with two controllers installed, except for the QXS-312 and QXS-324. The QXS-312 and QXS-324 systems can ship with one or two controllers installed.

Table 2: QX and QXS Storage Systems

Model	Host Interfaces	Drive	Form Factor	Number of Controllers
QXS-312/QXS-412	CNC* or SAS	3.5" LFF (12 drives)	2U12	2
QXS-324/QXS-424	CNC* or SAS	2.5" SFF (24 drives)	2U24	2
QXS-448/QXS-648	CNC* or SAS	2.5" SFF (48 drives)	2U48	2
QXS-456/QXS-656	CNC* or SAS	3.5" LFF (56 drives)	4U56	2
StorNext QXS-1200 or QX-1200	FC only	3.5" LFF (12 drives)	2U12	2
StorNext QXS-2400 or QX-2400	FC only	SFF (24 drives)	2U24	2
StorNext QXS-5600	FC only	LFF (56 drives)	4U56	2

*CNC (converged network controller) allows for FC, iSCSI (10GbE), iSCSI (1 Gb) host interface connections using SFPs.

User Interfaces

The storage chassis support two versions of the web-based application for configuring, monitoring, and managing the storage system. Both web-based application GUI versions (Disk Management Utility V3 and Disk Management Utility V2), and the command-line interface are briefly described:

• Disk Management Utility V3 is the new primary web interface for the chassis, providing access to all common management functions for both linear and virtual storage.

Refer to *QXS Disk Management Utility User Guide V3* for additional information.

• Disk Management Utility V2 is a secondary web interface for the chassis, providing access to traditional linear storage functions. This legacy interface provides certain functionality that is not available in the primary interface.

Refer to *QX and QXS Disk Management Utility User Guide V2* for additional information.

• The command-line interface (CLI) enables you to interact with the storage system using command syntax entered via the keyboard or scripting. You can set a CLI preference to use V3 or V2 terminology in command output and system messages.

Refer to *QX and QXS CLI Reference Guide* for additional information.

Contact your account manager for packaged CRU numbers and ordering information. Data addressing the products is provided to supplement the illustrated replacement procedures described in .

Refer to the following section for applicable CRUs and illustrations of the chassis components.

CRUs for 12-drive Chassis

The 2U12 chassis—configured with 12 LFF drives (3.5")—is used for QXS-312, QXS-412, QXS-1200, and QX-1200 RAID chassis and optional expansion chassis.

Figure 1: Bezel assembly - front view

The figure below shows a pictorial view of a 12-drive chassis. The bezel attaches to the chassis ball studs. The bezel installation process is the same for the 2U12/2U24/2U48 chassis.

Figure 2: Orientation key
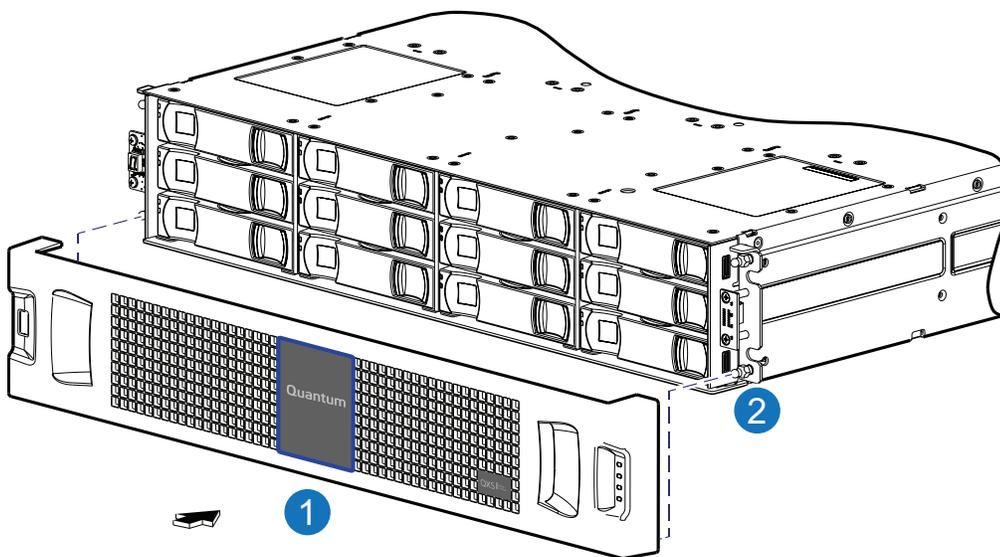
1. Bezel	2. Ball Studs

RAID or Expansion Chassis (2U12)

Figure 3 below provides an illustration of the RAID or expansion chassis (2U12 chassis).

Figure 3: Exploded view — RAID or expansion chassis (2U12)
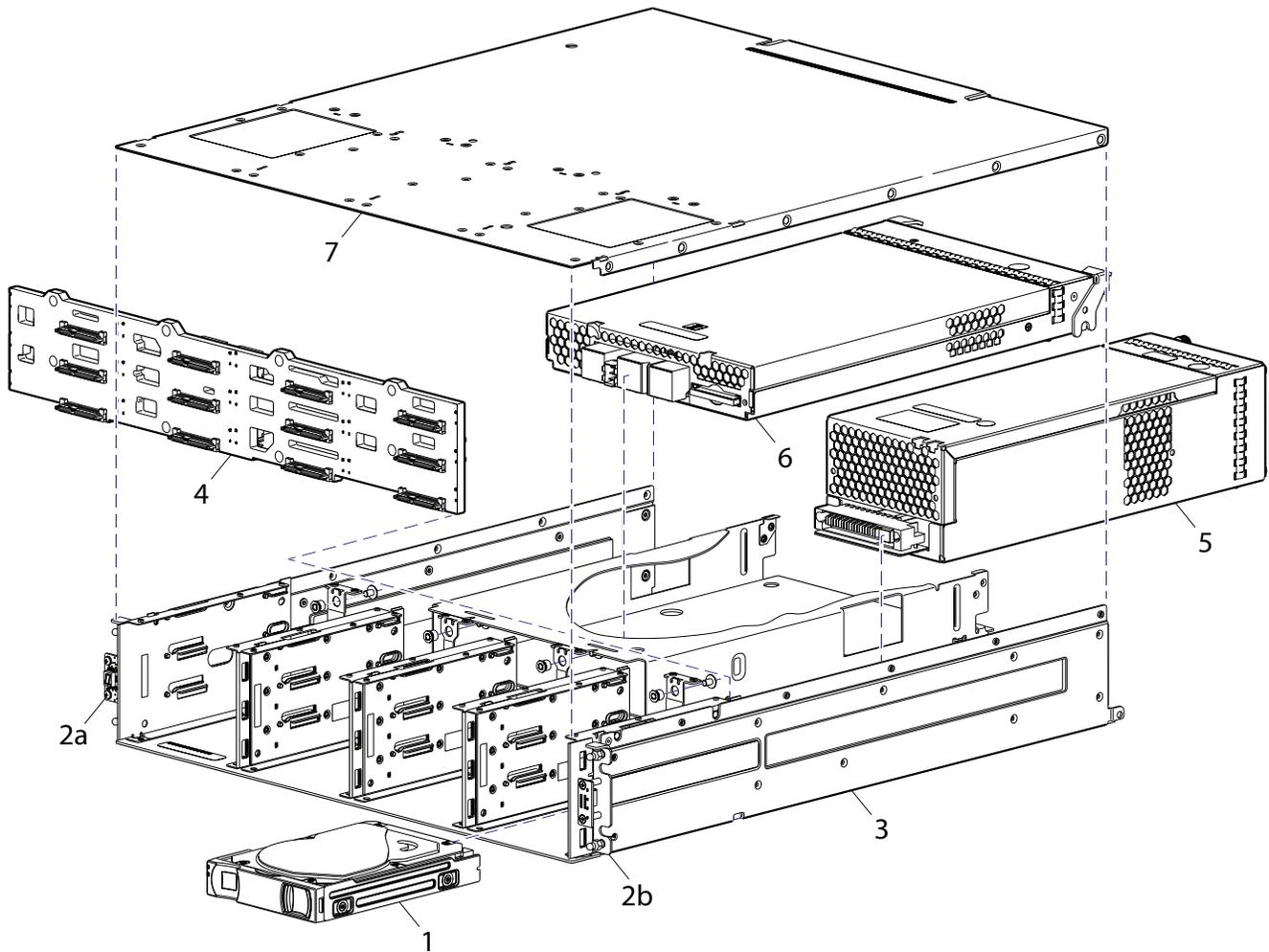
Table 3: Product components for 12-drive chassis

Item	Chassis component descriptions
1	Drive (LFF)
	a) 3.5" drive module (drives of different type/speed and storage capacity: SAS, SSD)
	b) HDDs or SSDs supported
2	a) Left ear assembly
	b) Right ear assembly
3	Chassis
4	Midplane (included with chassis)
5	Power supplies (one shown)
	a) AC power supply for chassis (newer power supplies do not have a power switch)
	b) DC power supply for chassis
6	Controller I/O module for chassis (one shown)
7	Chassis cover (included with chassis)
Not shown	Chassis bezel sub-assembly featuring EMI shield and removable air filter (see Newer Bezel Assemblies on page 12)

Figure 3 on the previous page through Figure 7 on page 12 illustrate 12-drive chassis models. Figure 6 on page 12 provides an assembly of the exploded view shown in Figure 3 on the previous page, and Figure 7 on page 12 shows an assembly of component CRUs within the chassis. Although not shown in Figure 3 on the previous page, newer product models use an chassis bezel instead of ear caps (no longer used). The chassis bezel is shown in Figure 5 on the next page (removed) and Figure 6 on page 12 (installed), respectively.

> **ⓘ Note:** The following illustrations further describe components for the 12-drive chassis:

- Controller I/O module pictorial — Figure 4 on the next page
- Assembly — Figure 5 on the next page and Figure 6 on page 12
- Internal components sub-assembly — Figure 7 on page 12

Controller I/O Module

Figure 4 on the next page provides an illustration of the controller I/O module with a SFP transceiver.

Figure 4: Controller I/O module with SFP transceiver
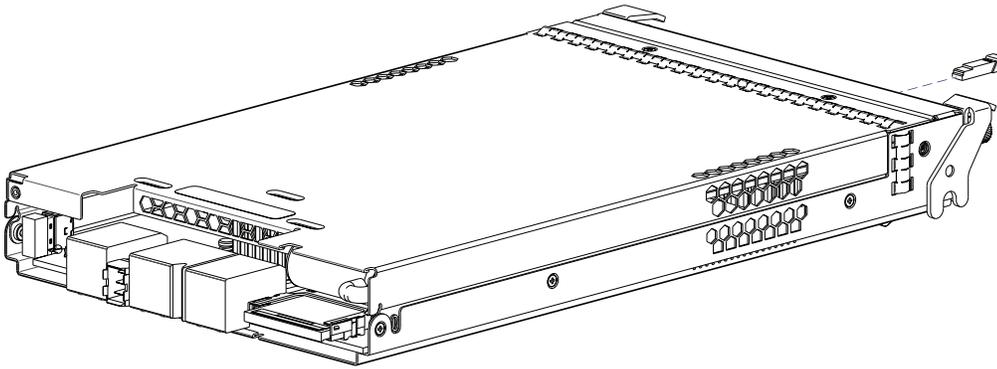
The controller I/O module shown in is used instead of the expansion module (item No.6 in) when the chassis is configured as a RAID chassis, rather than an expansion chassis. The transceiver is shown exploded from the IOM in the CNC example. Controller I/O modules equipped with CNC ports support qualified FC (8 Gbit/s, 16 Gbit/s), 10GbE iSCSI, and 1 Gb RJ-45 SFP options. Controller I/O modules equipped with HD mini-SAS ports use qualified SFF-8644 external connectors.

Bezel Assembly

⚠️ **Caution:** Whether configured with or without an air filter, to ensure adequate EMI protection for the drives, the bezel should be properly installed while the chassis is in operation.

Figure 5: Partial assembly showing bezel alignment (2U12)
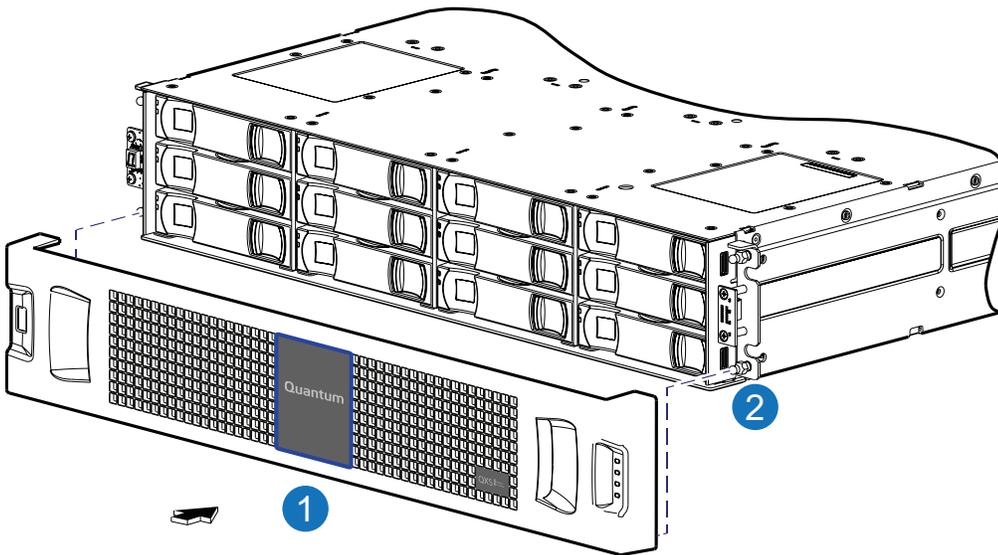
1. Bezel	2. Ball Studs

Orient the bezel assembly to align its back side with the front face of the chassis as shown. Face the front of the chassis, and while supporting the base of the bezel, position it 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 chassis.

To remove the bezel, while facing the front of the chassis, insert the index finger of each hand into the top of the respective (left or right) pocket opening, and insert the middle finger of each hand into the bottom of the respective opening, with thumbs on the bottom of the bezel face. Gently pull the top of the bezel while applying slight inward pressure below, to release the bezel from the ball studs.

> ℹ **Note:** For more information about servicing or replacing the removable air filter option for this particular bezel, refer to the *Bezel Installation* instructions included in your product ship kit.

Figure 6: Chassis assembly with bezel installed (2U12)
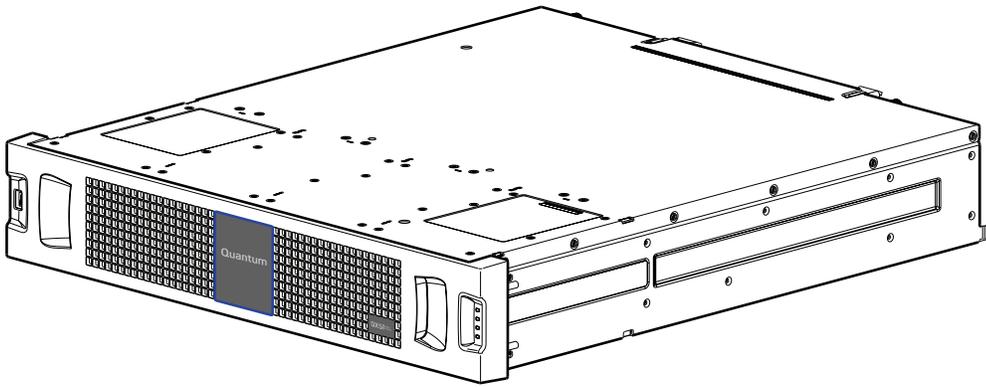
Figure 7: Chassis architecture — internal components sub-assembly (2U12)
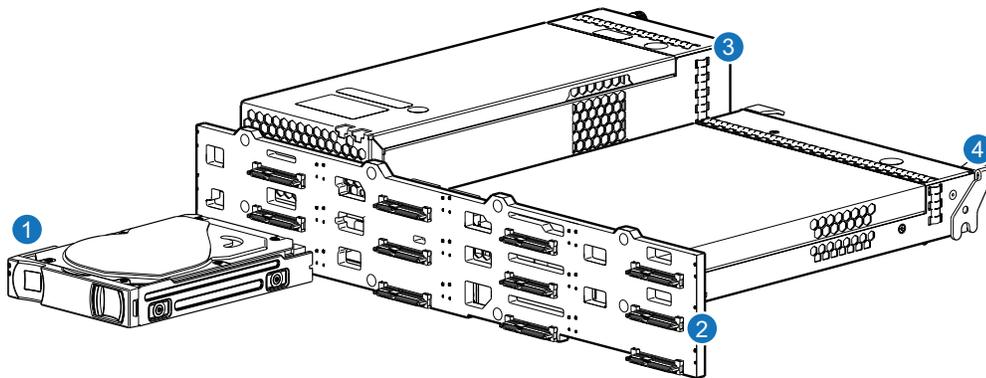
1.	**Drive module**	3.	**Power supply unit**
2.	**Midplane**	4.	**I/Omodule**

Newer Bezel Assemblies

Newer models of the LFF 12-drive chassis support a bezel sub-assembly that attaches to the front of the

chassis (see Figure 5 on page 11). The bezel—comprised of a vented cover attached to an EMI (Electromagnetic Interface) shield—is pre-assembled and packed with foam into a box included in the master shipping container. The bezel might optionally include a removable air filter that can be serviced or replaced. Hard copy instructions for attaching/removing the bezel, and for servicing or replacing the air filters, are provided in the shipping container of a new chassis.

CRUs for 24-drive Chassis

The 24-drive chassis (2U24 chassis)—configured with 24 SFF drives (2.5")—is used for the RAID chassis and optional expansion chassis in the QXS-324, QXS-424, QXS-2400. and QX-2400 systems.

Figure 8: Bezel assembly - front view
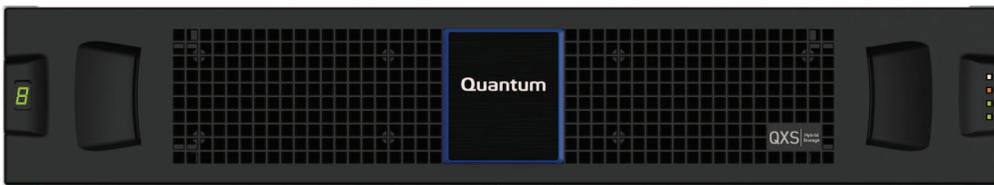
The figure below shows a pictorial view of a 24-drive chassis. The bezel attaches to the chassis ball studs. The bezel installation process is the same for the 2U12/2U24/2U48 chassis.

Figure 9: Partial assembly showing bezel alignment (2U24)
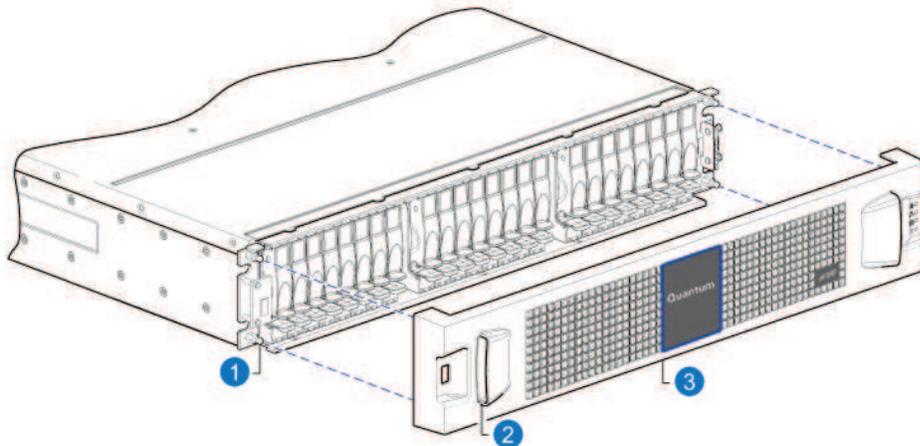
1. **Ball stud on chassis ear (4 places)**   3. **Bezel**
2. **Pocket opening (2 places)**

> ℹ **Note:** Numbered items from Table 4 on the next page are shown in Figure 10 on the next page. Tinted items from Table 4 on the next page are shown in Figure 11 on page 16.

RAID or Expansion Chassis (2U24)

Figure 10 below provides an illustration of the RAID or expansion chassis (2U24 chassis).

Figure 10: Exploded view — RAID or expansion chassis (2U24)
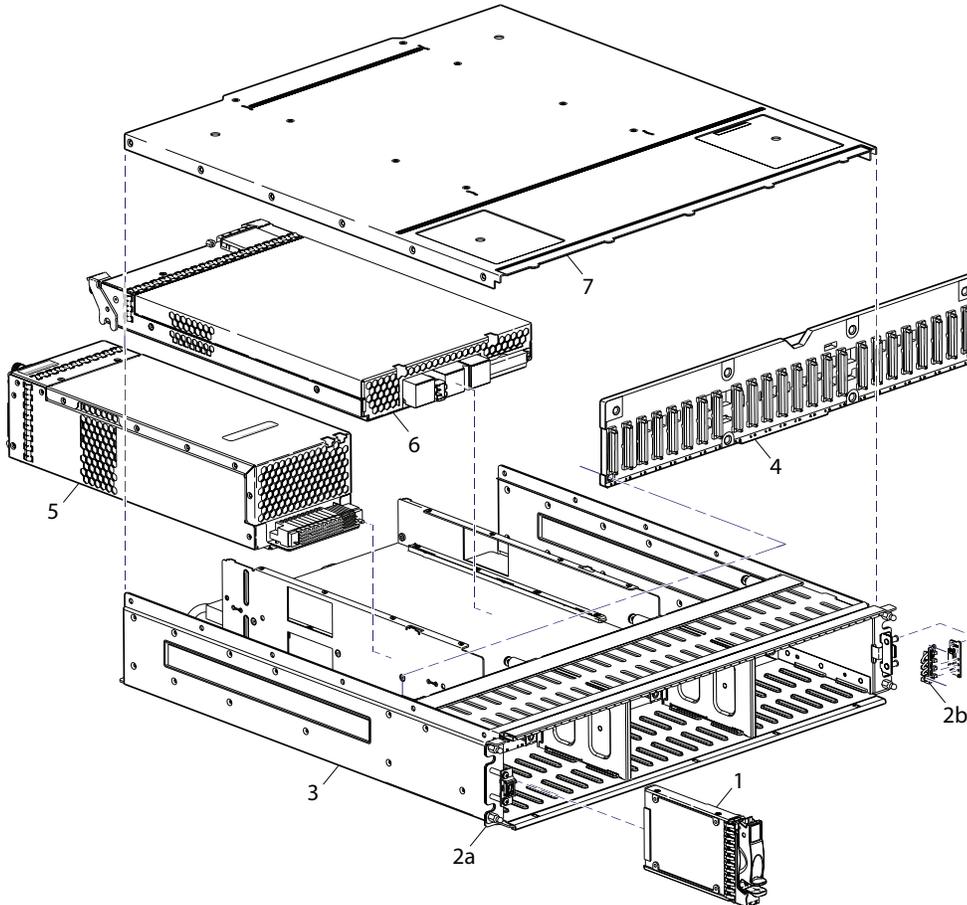
Table 4: Product components for 24-drive chassis

Item	Chassis component descriptions
1	Drive (SFF)
	a) 2.5" drive module (drives of different type/speed and storage capacity: SAS, SSD)
	b) HDDs or SSDs supported

Item	Chassis component descriptions
2	Ear kit
	a) Left ear assembly
	b) Right ear assembly
	Also see Newer Bezel Assemblies on page 18
3	Chassis (sheet metal flanges on internal IOM bay assembly are omitted from Figure 10 on the previous page for visual clarity)
4	Midplane (included with chassis)
5	Power supplies (one shown)
	a) AC power supply for chassis (newer power supplies do not have a power switch)
	b) DC power supply for chassis
6	I/O module for chassis (one shown, two allowed per chassis)
	4124, 1JM, mini-SAS (SFF-8088), 2-port [6 Gbit/s]
7	Chassis cover (included with chassis)
	Controller I/O module for chassis [two allowed per RAID chassis] (see Figure 11 on the next page)
	a) 4824, 1RM, 4-port CNC, FC [8/16 Gbit/s] SFP option
	Small form-pluggable (SFP) connectors (see Figure 11 on the next page)
	a) SFP transceiver (applies to CNC models only: FC, 10GbE iSCSI, 1 Gb iSCSI)
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: 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

Figure 10 on page 14 through Figure 14 on page 18 illustrate 24-drive chassis models. Item No.6 (above) is a supported expansion module. Figure 11 below shows a newer controller I/O module also supported by the chassis. Although not shown in Figure 10 on page 14, newer product models use an chassis bezel instead of ear caps (no longer used). The chassis bezel is shown in Figure 9 on page 13 (removed) and in Figure 13 on the next page (installed), respectively.

Controller I/O Module

ℹ️ **Note:** The following illustrations further describe components for the 24-drive chassis:

- Controller I/O module pictorial — Figure 11 below

- Assembly — Figure 9 on page 13 and Figure 13 on the next page

- Internal components sub-assembly — Figure 14 on page 18

Figure 11: Controller I/O module with SFP transceiver
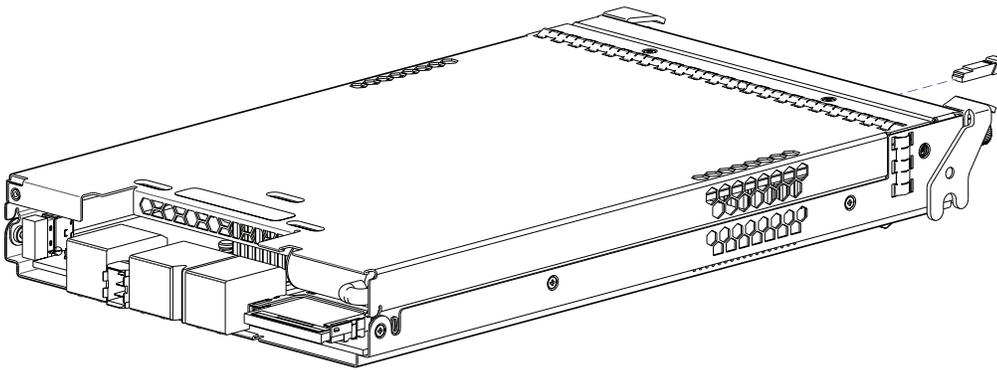
The controller I/O module shown in Figure 11 above is used instead of the expansion module (item No.6 in Figure 10 on page 14) when the chassis is configured as a RAID chassis, rather than an expansion chassis. The transceiver is shown exploded from the IOM in the CNC example. Controller I/O modules equipped with CNC ports support qualified FC (8 Gbit/s, 16 Gbit/s), 10GbE iSCSI, and 1 Gb RJ-45 SFP options.

Figure 12: Partial assembly showing bezel alignment (2U24)
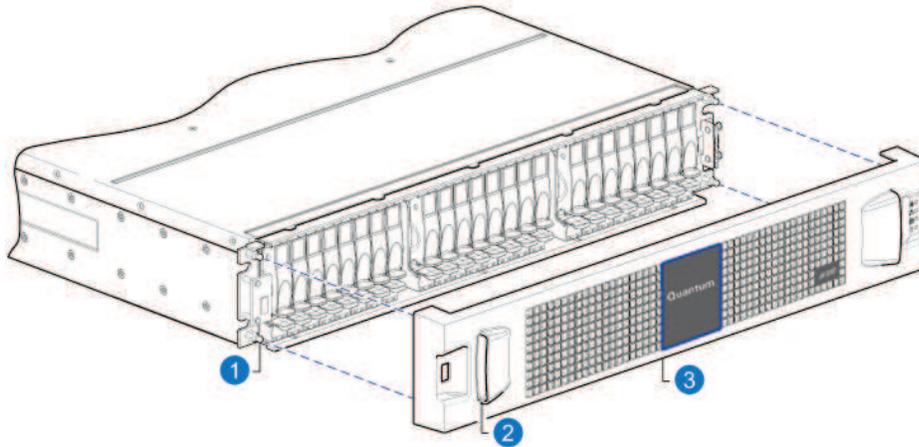
1.	**Ball stud on chassis ear (4 places)**	**3.**	**Bezel**
2.	**Pocket opening (2 places)**		

Bezel Assembly

Orient the bezel assembly to align its back side with the front face of the chassis as shown. Face the front of the chassis, and while supporting the base of the bezel, position it 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 chassis.

To remove the bezel, while facing the front of the chassis, insert the index finger of each hand into the top of the respective (left or right) pocket opening, and insert the middle finger of each hand into the bottom of the respective opening, with thumbs on the bottom of the bezel face. Gently pull the top of the bezel while applying slight inward pressure below, to release the bezel from the ball studs.

Figure 13: RAID chassis assembly with bezel installed (2U24)
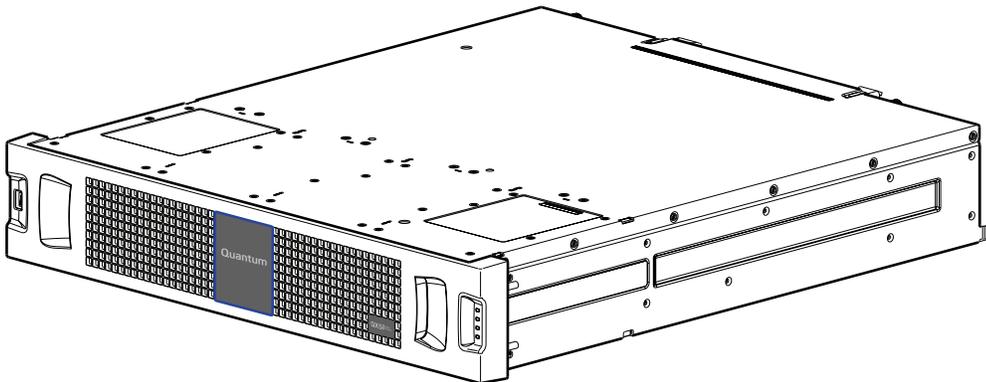
Figure 14: RAID chassis architecture — internal components sub-assembly (2U24)
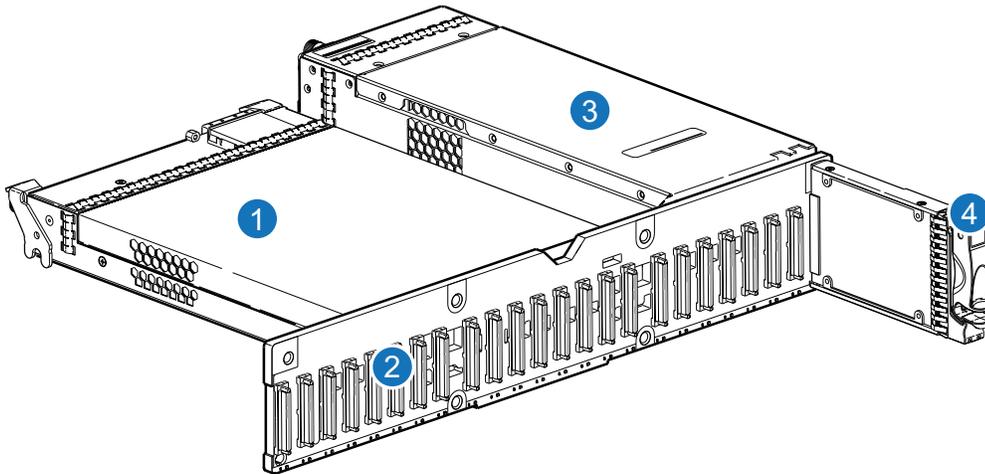
1. **I/O module**   3. **Power supply unit**
2. **Midplane**   4. **Drive module**

Newer Bezel Assemblies

Newer models of the SFF 24-drive chassis support a bezel sub-assembly that attaches to the front of the chassis (see Figure 9 on page 13). The bezel—comprised of a vented cover featuring integrated ear caps— is pre-assembled and packed with foam into a box included in the master shipping container.

CRUs for 48-drive Chassis

The 48-drive chassis (2U48 chassis), configured with 48 SFF drives (2.5"), is used within the RAID chassis and optional expansion chassis in the QXS-448 and QXS-648 systems.

Figure 15: Bezel assembly - front view
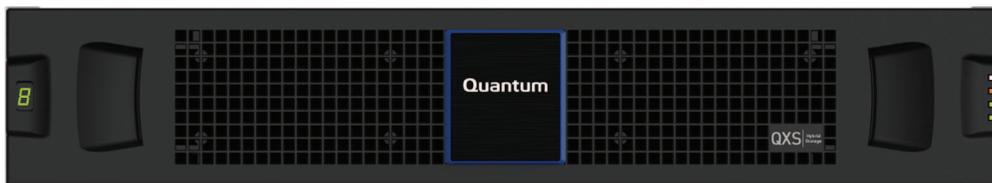
The figure below shows a pictorial view of a 48-drive chassis. with three drawers. The bezel attaches to the chassis ball studs. The bezel installation process is the same for the 2U12/2U24/2U48 chassis.

Figure 16: Partial assembly showing bezel alignment with 2U48 chassis
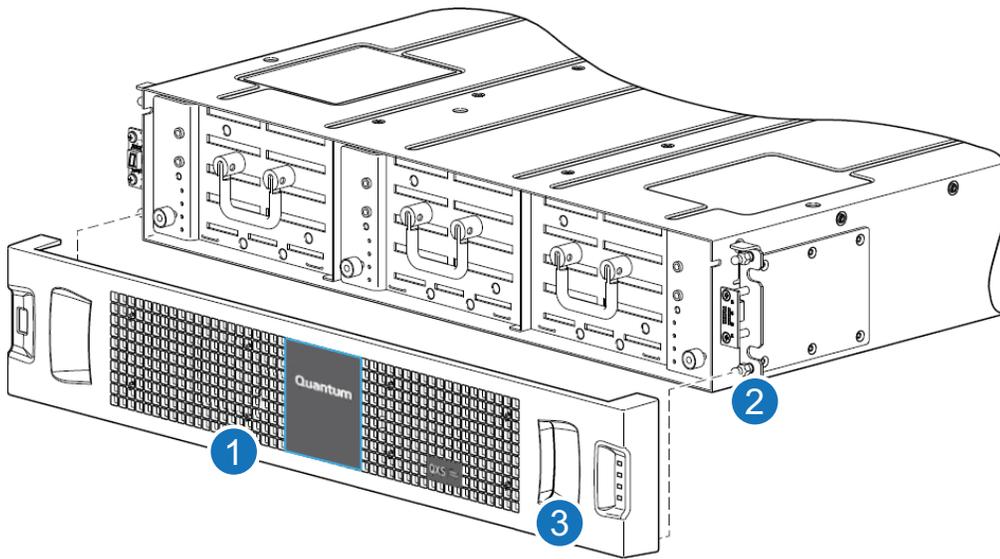
1. **Chassis bezel (includes EMI shield for drives)**
2. **Ball stud on chassis ear (typical 4 places on chassis)**
3. **Pocket opening (typical 2 places on bezel)**

Use and for location and descriptions of chassis components.

RAID or Expansion Chassis (2U48)

provides an illustration of the RAID or expansion chassis (2U48 chassis).

Figure 17: Exploded view: RAID or expansion chassis (2U48)

Illustrated Parts Breakdown: 2U48 Chassis FRUs
(For clarity, redundant assembly components are not shown)

Orientation Key

Aft

Fore

Front

Right Side

8

7

4

6

5

2a (Note 1)

1a

1c

1b

2b

3

(Note 1)

90°

Notes:
1. The enclosure bezel is only partially shown.
2. The bezel is equipped with an EMI shield.
3. The bezel must be attached during enclosure operation.
4. Remove the bezel to access front panel components.
5. Use management interfaces in lieu of removing bezel.
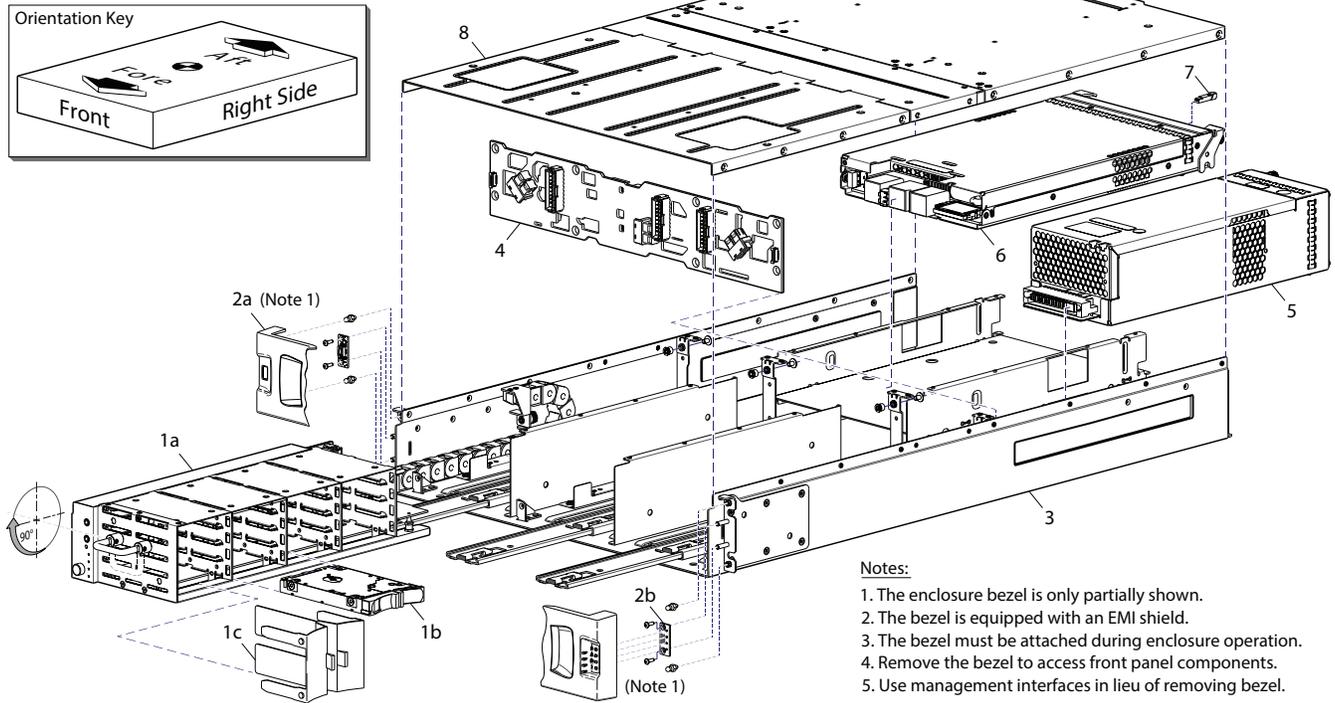
Table 5: 48-Drive chassis

Item	Chassis component descriptions
1	Chassis drawer (one drawer shown—pulled forward to drawer stop—included with chassis)
	a) Empty drawer chassis assembly (PCBAs, power module and SAS data cable connector)
	b) 2.5" disk drive module (disks of differing type/speed and storage capacity: SAS, SSD)
	c) Air Management Solution insert (blank to maintain optimum air flow within chassis)
2	Ear kit
	a) Left ear assembly
	b) Right ear assembly
	Also see Figure 16 on the previous page

Item	Chassis component descriptions
3	Chassis [with drawer slide and igus chain (data and power cables) shown]
4	Midplane (included with chassis)
5	Power supplies (one AC PSU module shown)
6	Controller I/O module for chassis [two per RAID chassis] (see CNC controller I/O module with SFP transceiver on the next page)
	a) 4-port CNC, FC [8/16 Gbit/s] SFP option
	b) 4-port CNC, iSCSI [10GbE] SFP option
	c) 4-port CNC, iSCSI [1 Gbit/s] RJ-45 SFP option
	d) HD mini-SAS, 4-port [12 Gbit/s] SFF-8644 external connector
7	Small form-pluggable (SFP) connector (applies to CNC controller I/O modules only)
8	Chassis cover (included with chassis)
Not shown	Expansion I/O module (two per chassis when configured as an expansion chassis)
	J6G48, 1JM, mini-SAS (SFF-8088), 2-port [6 Gbit/s]
Not shown	Rail kit [Rack mount rail kit, assembly, All HW]
Not shown	Cable kit [Cable package: mini-SAS (SFF-8088) to mini-SAS (SFF-8088)] Cable kit [Cable package: HD mini-SAS (SFF-8644) to HD mini-SAS (SFF-8644)] Cable kit [Cable package: HD mini-SAS (SFF-8644) 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.

Controller I/O Module

Figure 18 on the next page provides an illustration of the controller I/O module with an SFP transceiver (right side of graphic).

Figure 18: CNC controller I/O module with SFP transceiver
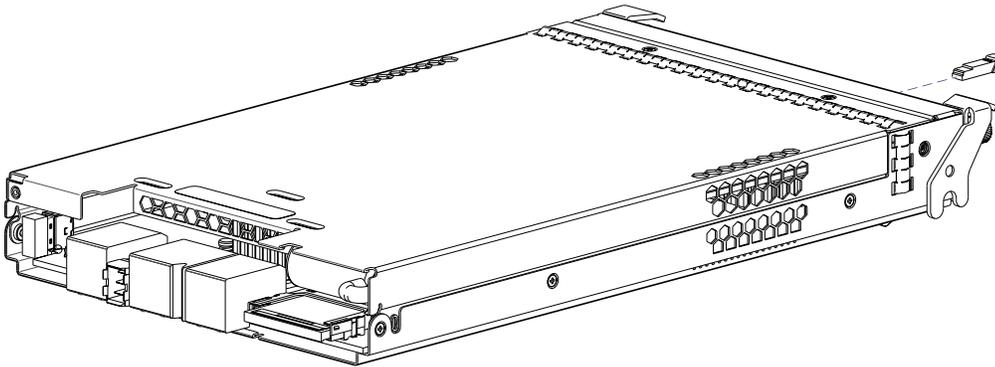
The transceiver is shown exploded from the IOM in the CNC example. Controller I/O modules equipped with CNC ports support qualified FC (8 Gbit/s, 16 Gbit/s), 10GbE iSCSI, and 1 Gb RJ-45 SFP options. Controller I/O modules equipped with HD mini-SAS ports use qualified SFF-8644 external connectors.

Drawer Assembly

Figure 19 below provides an illustration of the chassis with the bezel installed. The bezel must be removed to access the drawers within the 48-drive chassis.

Figure 19: Chassis assembly with bezel installed (2U48)
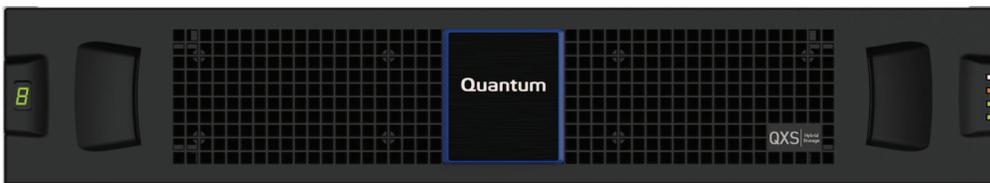
> **ⓘ Note:** Refer to the QX and QXS Bezel Installation Guide for bezel installation instructions.

Assembly with Bezel Removed

Figure 20 on the next page provides an illustration of the bezel removed from the 48-drive chassis (drawer handles visible).

Figure 20: Chassis assembly with bezel removed (2U48)
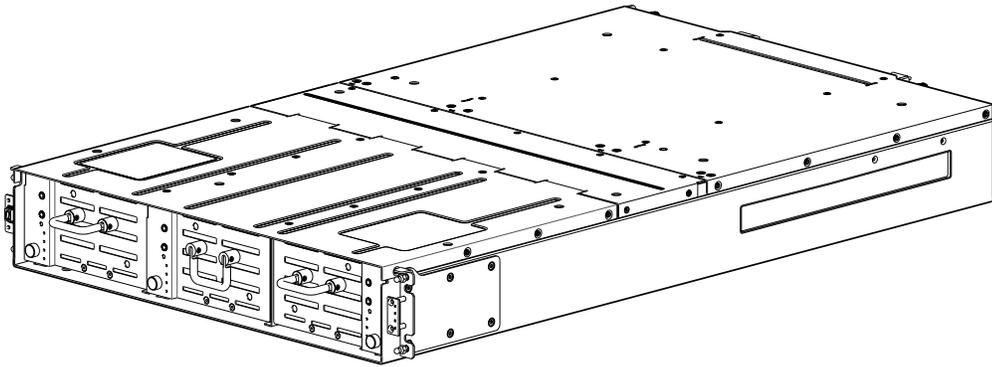
Internal Components

provides an illustration of the internal components in the 48-drive chassis (only 1 drawer shown).

Figure 21: Chassis architecture: internal components sub-assembly (2U48)
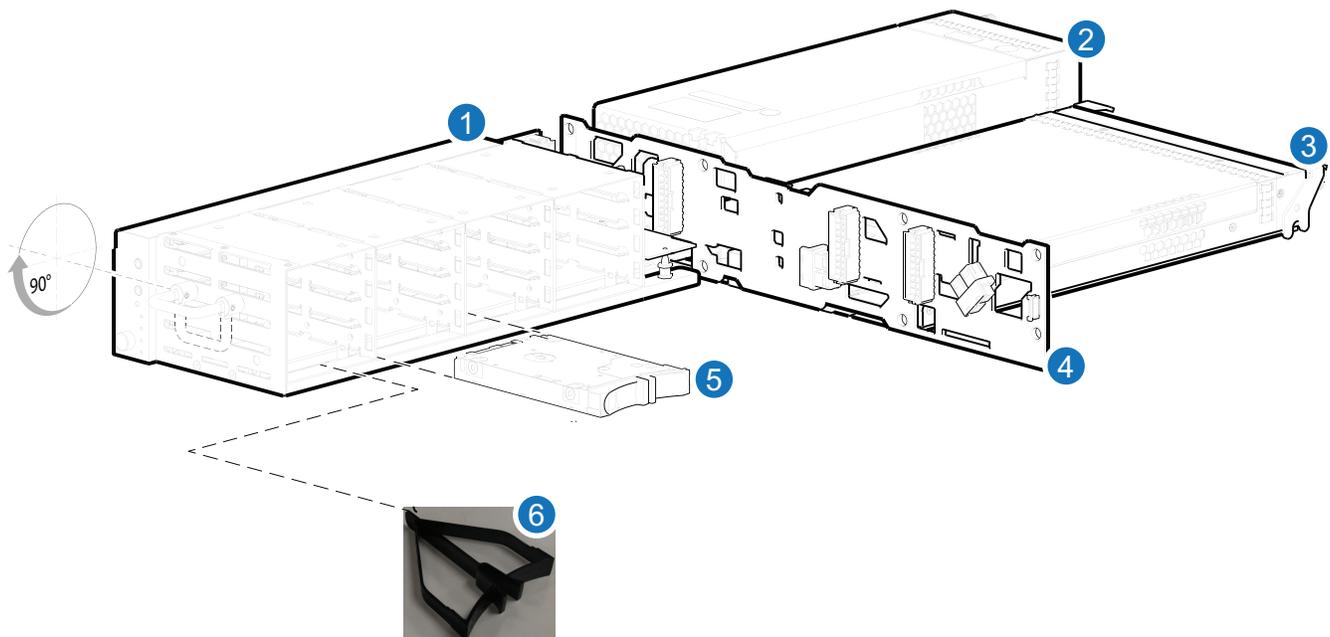
1. **Chassis drawer**   4. **Midplane**

2. **Power supply**   5. **Drive module**

3. **Controller I/O module**   6. **AMS insert**

Bezel Assembly

The 48-drive 2U48 chassis supports a bezel sub-assembly that attaches to the front of the chassis (see Figure 16 on page 19). The bezel—comprised of a vented cover attached to an EMI (Electromagnetic Interference) shield—is pre-assembled and packed with foam into a box included in the master shipping container.

Figure 22: Partial assembly showing bezel alignment with 2U48 chassis
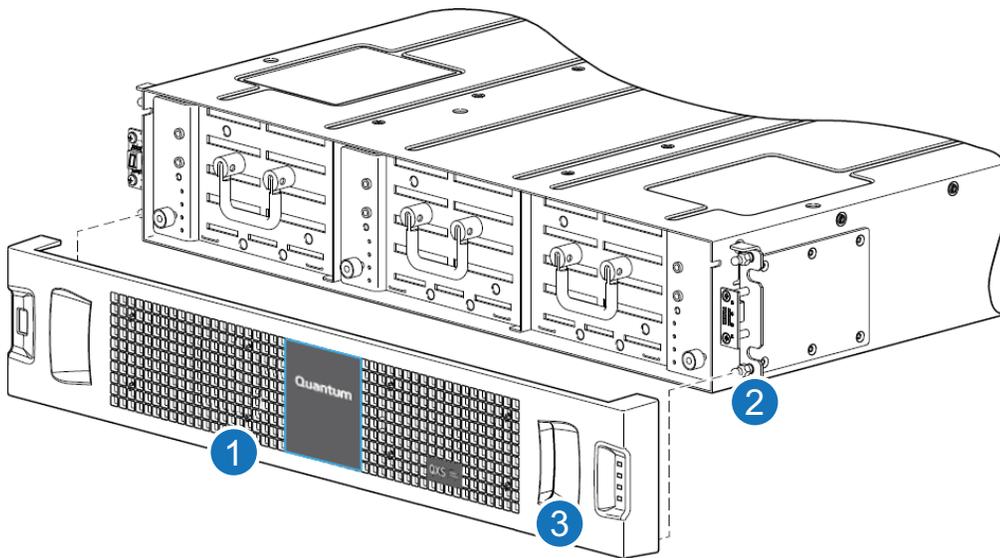
1. **Chassis bezel (includes EMI shield for drives)**	3. **Pocket opening (typical 2 places on bezel)**
2. **Ball stud on chassis ear (typical 4 places on chassis)**	

Opening and Closing a Drawer

You can open a drawer for visual inspection of drive bays. Before accessing the drawer via its handle, you must first remove the chassis bezel (see chassis bezel removal on page 74). Given that the chassis bezel is required to provide EMI protection, you should re-attach the bezel to the chassis after examining the drawer.

1. Using a Torx T15 or straight blade screwdriver, loosen the drawer stop screw on the front face of the drawer.

   - Once the screw is loosened, turn the outer thumbwheel counter-clockwise to unlock the drawer. Take care not to remove the screw.

   - Figure 23 on the next page provides a 2U48 drive chassis front panel with bezel removed and showing drawer 0 (left), drawer 1 (middle), and drawer 2 (right).

Figure 23: Opening a drawer: loosen the drawer stop screw
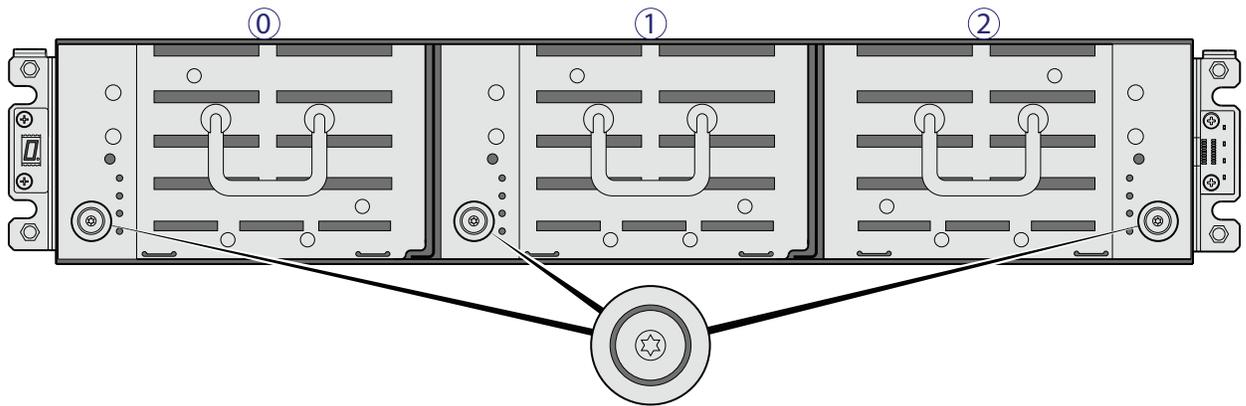
> ℹ **Note:** Loosen the screw on the target drawer.

2. Revolve the drawer handle upwards by 90 degrees to enable pulling the drawer outward for viewing drives.

   The drawer handle functions identically on all drawers.

Figure 24: Opening a drawer: revolve the handle
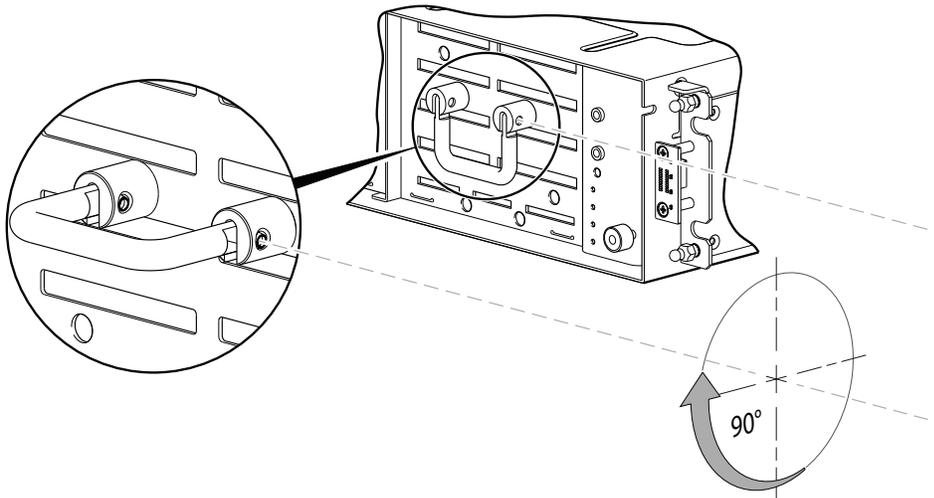
3. Face the front of the drawer—and using the handle—pull the drawer outward along the drawer slide.

Figure 25: Opening and closing drawer
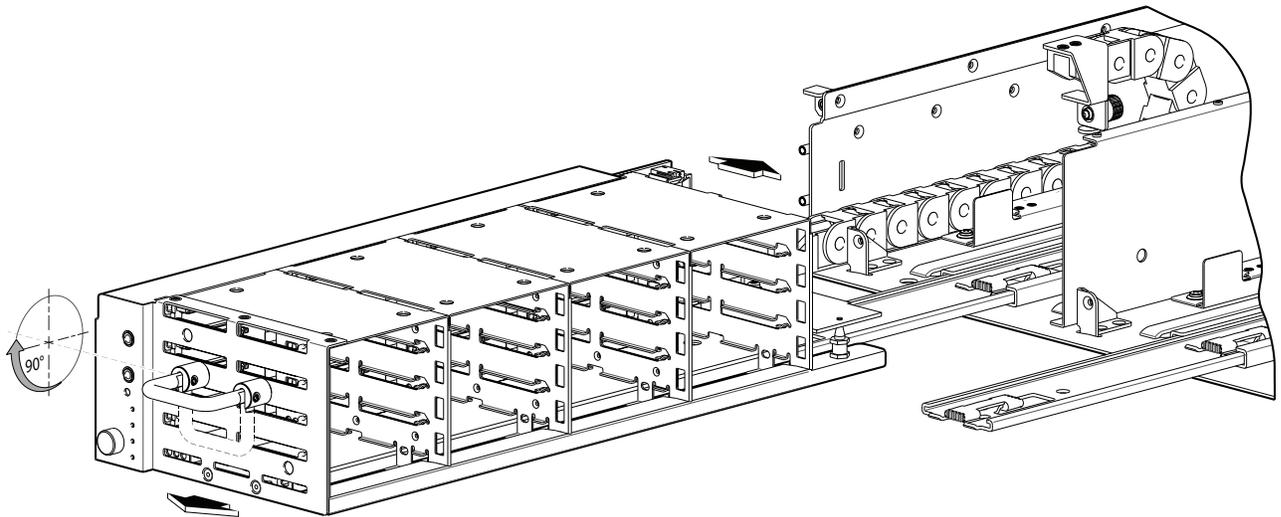
4. Pull the drawer outward until it meets the drawer stop.

   To close the drawer, simply slide the drawer into the chassis along the drawer slide until it properly seats in the drawer bay.

   - Take care to ensure there are no loose cable wires protruding beyond the limits of the igus chainflex cable.

   - After closing the drawer, revolve the handle downwards such that it is flush with the drawer front panel—in its stowed position—and re-attach the bezel to the front of the chassis.

CRUs for 56-drive Chassis

The 2U56 chassis—configured with 56 LFF drives (3.5")—is used for RAID chassis and optional expansion chassis in the QXS-456, QXS-656, and QXS-5600 systems.

Figure 26: Bezel assembly - front view
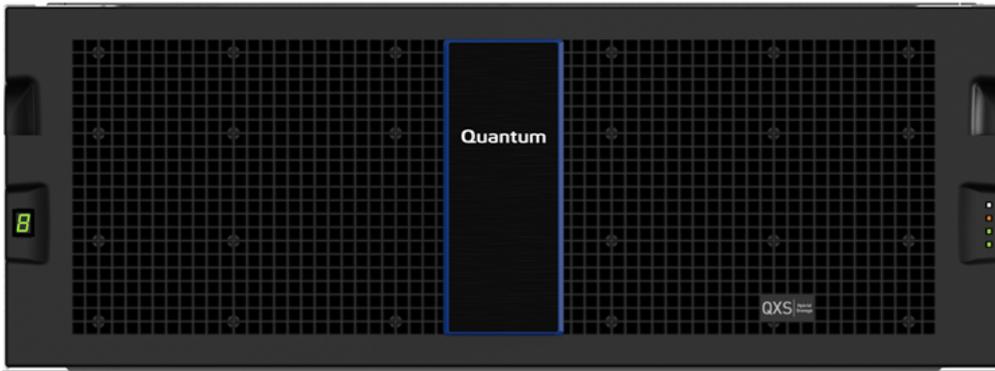
The figure below shows a pictorial view of a 56-drive chassis. The bezel slips over the two upturned flanges (bottom of chassis) and attaches to the chassis ball studs (top of chassis).

Figure 27: Orientation Key
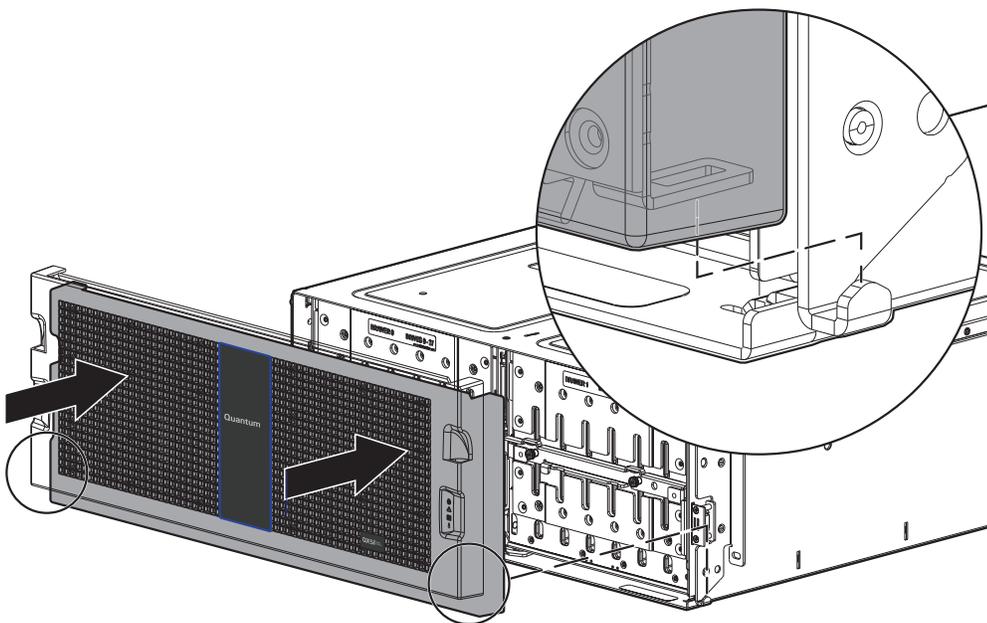
Use Table 6 on the next page and Figure 28 on the next page for location and descriptions of chassis components.

> ⓘ **Note:** Numbered items from Table 6 on the next page are shown in Figure 28 on the next page . Tinted items from Table 6 on the next page are shown in Figure 29 on page 30.

RAID or Expansion Chassis (4U56)

Figure 28 below provides an illustration of the RAID or expansion chassis (4U56 chassis).

Figure 28: Exploded view — RAID or expansion chassis (4U56)

Illustrated Parts Breakdown: 4U56 Chassis FRUs
(For clarity, redundant assembly components are not shown)

Notes:
1. The enclosure bezel is only partially shown.
2. Ear kits are shown assembled and exploded.
3. The bezel is equipped with an EMI shield.
4. The bezel must be attached during enclosure operation.
5. Remove the bezel to access front panel components.
6. Use management interfaces in lieu of removing bezel.

Table 6: Product components for 56-drive chassis

Item	Chassis component descriptions
1	Chassis drawer (shown pulled forward to drawer stop)
	a) Empty drawer chassis assembly (PCBAs, power module and SAS data cable connector)
	b) 3.5" drive module (drives of different type/speed and storage capacity: SAS, SSD)

Item	Chassis component descriptions
2	Ear kit
	a) Left ear assembly
	b) Right ear assembly
	Also see Partial assembly showing bezel alignment (2U24) on page 13
3	Chassis [with drawer slide and igus chain (data and power cables) shown]
4	Midplane (included with chassis)
5	Power supplies (one shown)
	a) AC power supply for chassis
	b) Power supply extension module
6	Igus chainflex assembly (Shown coiled, with unplugged data and power cables. Connectors plug into horizontal PCBA at back-end of drawer)
7	Fan Control Module (two per chassis)
8	Controller I/O module for chassis [two per controller chassis] (see Controller I/O module with SFP transceiver on page 16)
	a) 4-port CNC, FC [8/16 Gbit/s] SFP option
	b) HD mini-SAS, 4-port [12 Gbit/s]
9	Small form-pluggable (SFP) connector (applies to CNC controller I/O modules only)
10	Chassis cover (included with chassis)
Not shown	Expansion I/O module (two per chassis when configured as an expansion chassis)
	J6G56, 1JM, mini-SAS (SFF-8088), 2-port [6 Gbit/s]
Not shown	Rail kit [Rack mount rail kit, assembly, All HW]
Not shown	Cable kit [Cable package: mini-SAS (SFF-8088) to mini-SAS (SFF-8088)] Cable kit [Cable package: HD mini-SAS (SFF-8644) to HD mini-SAS (SFF-8644)] Cable kit [Cable package: HD mini-SAS (SFF-8644) to mini-SAS (SFF-8088)]

Controller I/O Module

Figure 29 on the next page provides an illustration of the controller I/O module with an SFP transceiver (right side of graphic).

Figure 29: CNC controller I/O module with SFP transceiver
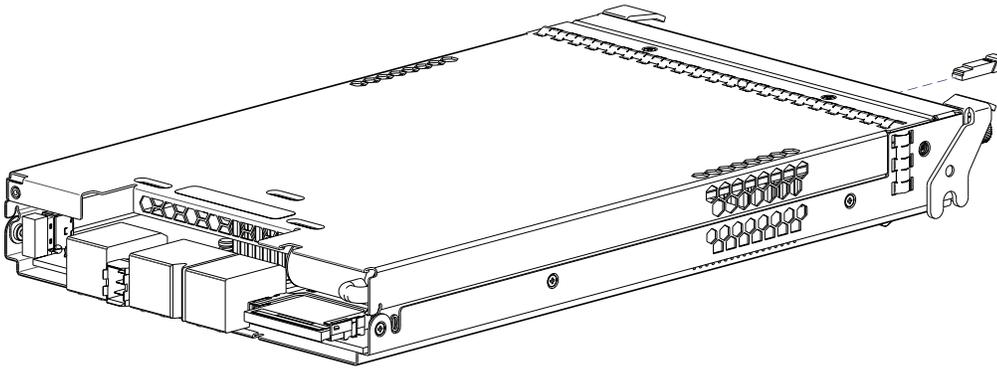
The transceiver is shown exploded from the IOM in . Controller I/O modules equipped with CNC ports support qualified FC (8 Gbit/s, 16 Gbit/s), 10GbE iSCSI, and 1 Gb RJ-45 SFP options. Controller I/O modules equipped with HD mini-SAS ports use qualified SFF-8644 external connectors.

Drawer Assembly

, , , and provide illustrations of the 4U56 drawer assembly.

Figure 30: Partial assembly showing bezel alignment (4U56)
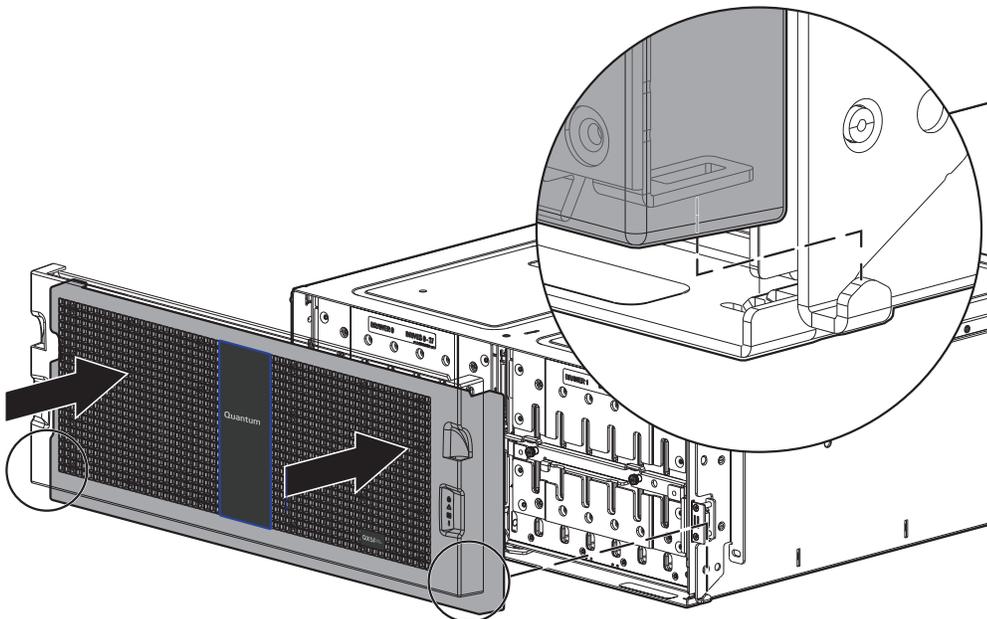
ⓘ **Note:** Refer to the *QX and QXS Bezel Installation Guide* for bezel installation instructions.

Assembly with Bezel Installed

Figure 31 below provides an illustration of the bezel installed on the 4U56 chassis.

Figure 31: Assembly with bezel installed (4U56)
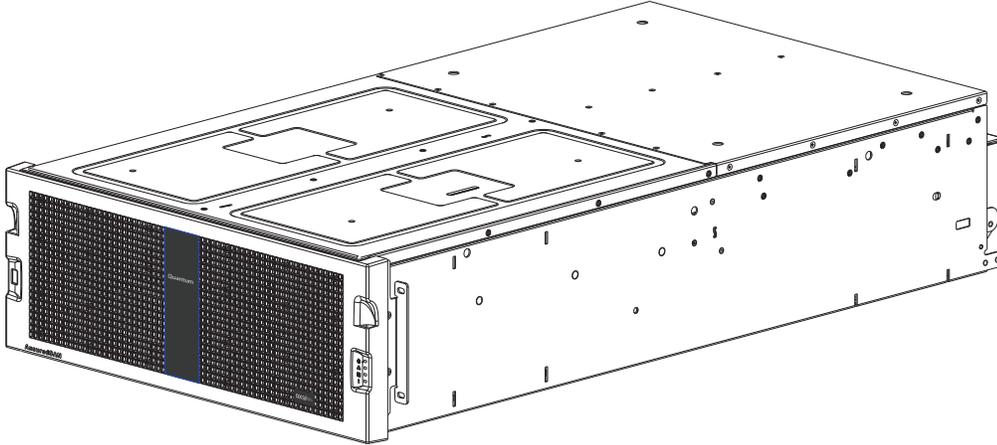
Assembly with Bezel Removed

Figure 32 below provides an illustration of the bezel removed from the 4U56 chassis (drawer handles visible).

Figure 32: Assembly with bezel removed (4U56)
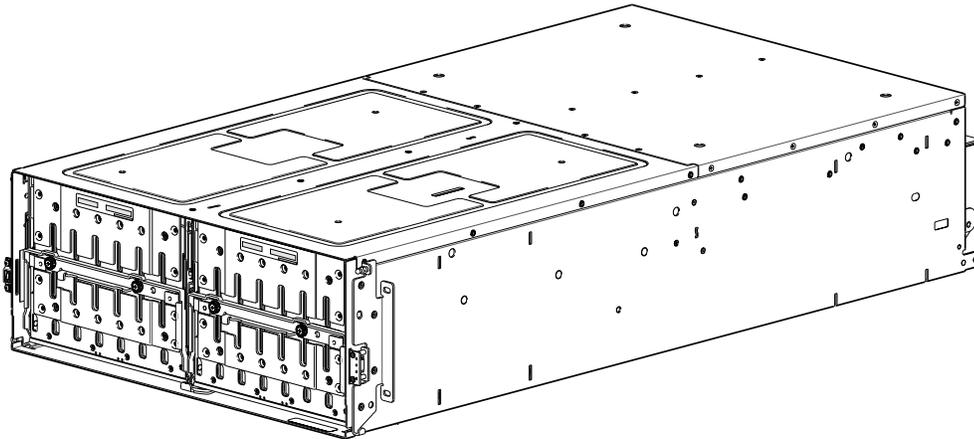
Internal Components

Figure 33 below provides an illustration of the internal components in the 4U56 chassis (only 1 drawer shown).

Figure 33: Assembly with internal components (4U56/1 drawer)
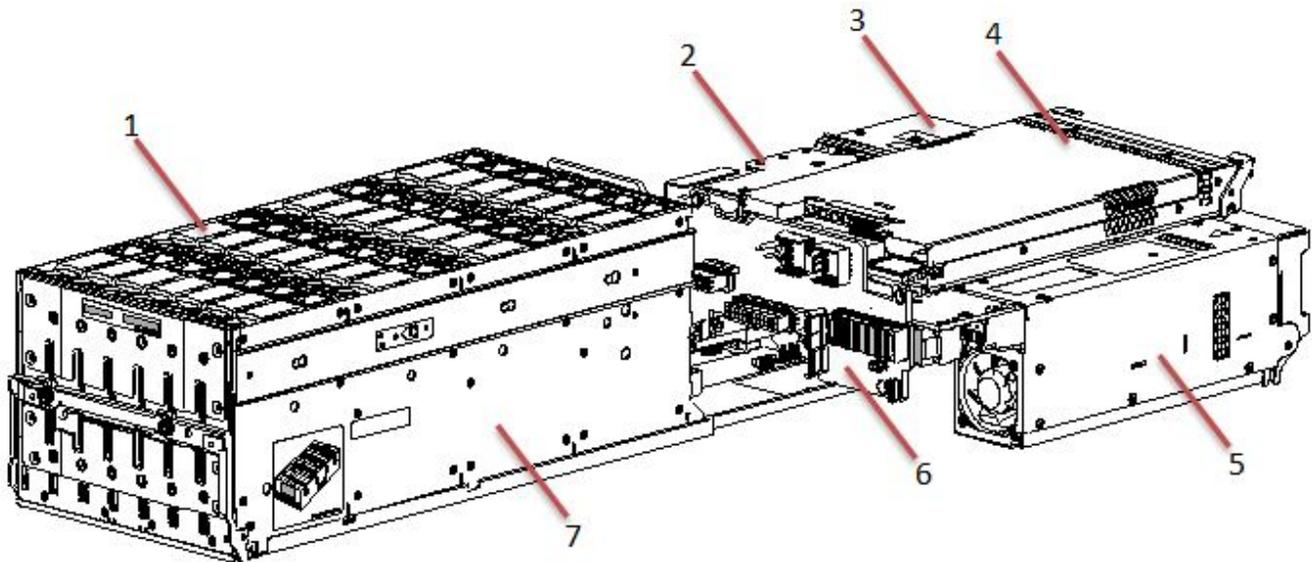
1.	**Drive module**	5.	**Power supply**
2.	**Igus chainflfex assembly**	6.	**Midplane**
3.	**Fan control module**	7.	**Chassis drawer**
4.	**IOM**		

Bezel Assembly

The bezel assembly is easy to install and remove. Refer to Figure 34 on the next page for an illustraion of installing and removing the bezel assembly.

> ℹ **Note:** The 56-drive 4U56 chassis supports a bezel assembly that attaches to the front of the chassis. The bezel—comprised of a vented cover attached to an EMI (Electromagnetic Interference) shield—is pre-assembled and packed with foam into a box included in the master shipping container.

Installing the Bezel

Orient the chassis bezel to align its back side with the front face of the chassis. Tilt the bezel forward, and guide the two angle-bracket slots on the backside of the bezel onto the two upturned flanges located on side mount brackets near the front of the chassis (on the exterior left and right chassis walls). Then, gently push the sleeves onto the ball studs as shown in Figure 34 on the next page.

Figure 34: Partial assembly showing bezel alignment (4U56)
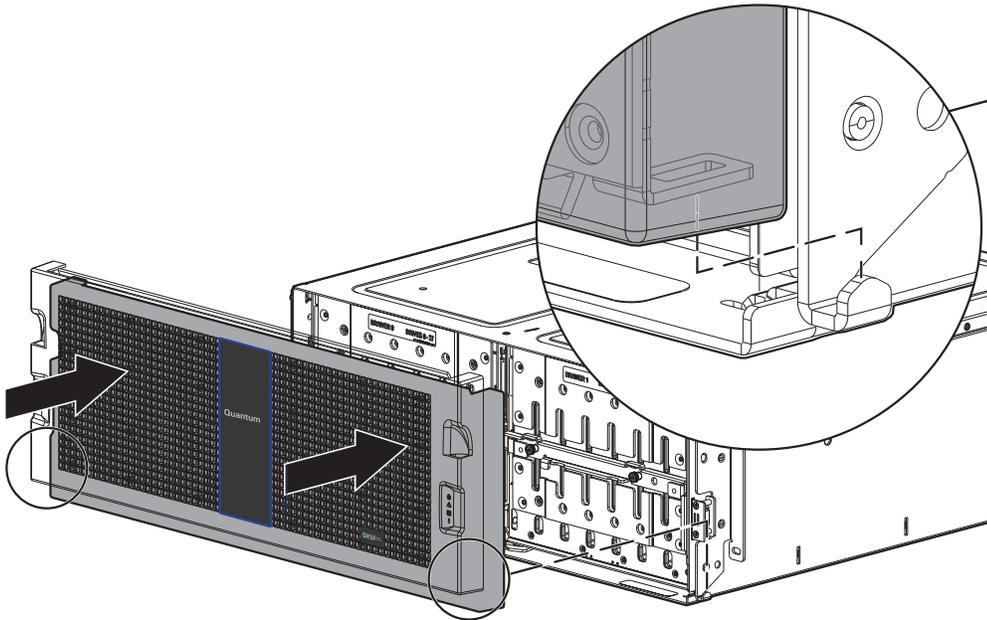
Removing the Bezel

Refer to Figure 35 on the next page. While facing the front of the chassis, insert the index finger of each hand into the top of the respective (left or right) pocket opening. Gently pull the top of the bezel while applying slight inward pressure below to release the top sleeves from the ball studs. Lift the bezel upwards to allow the angle-bracket slots to clear the upturned mounting flanges.

Figure 35: Removing Bezel (4U56)
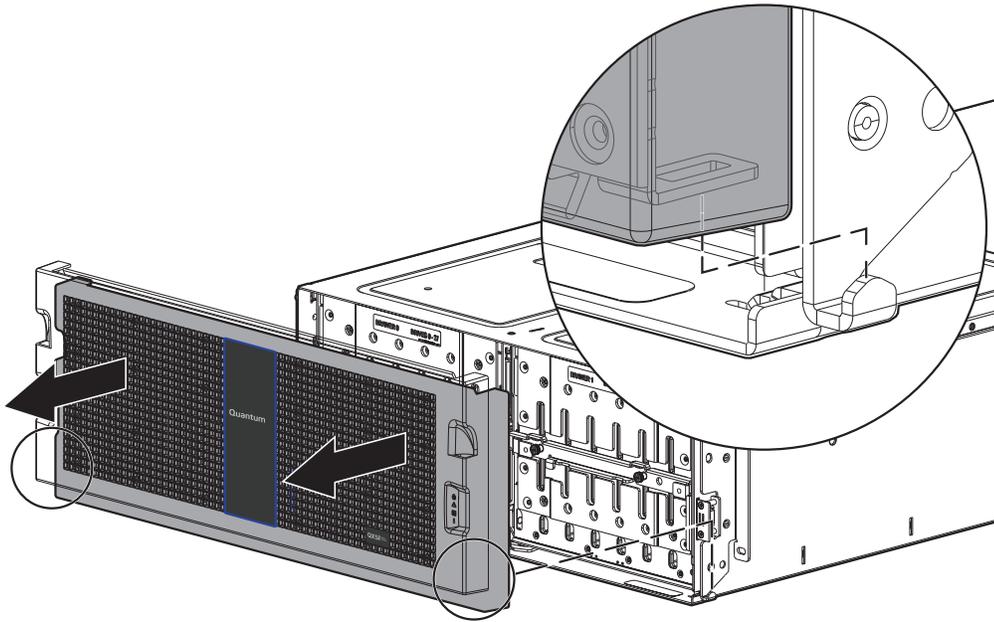
Opening a Drawer

Once you have removed the bezel, you can access the drawers. Refer to .

Figure 36: RAID chassis assembly with bezel installed (4U56)
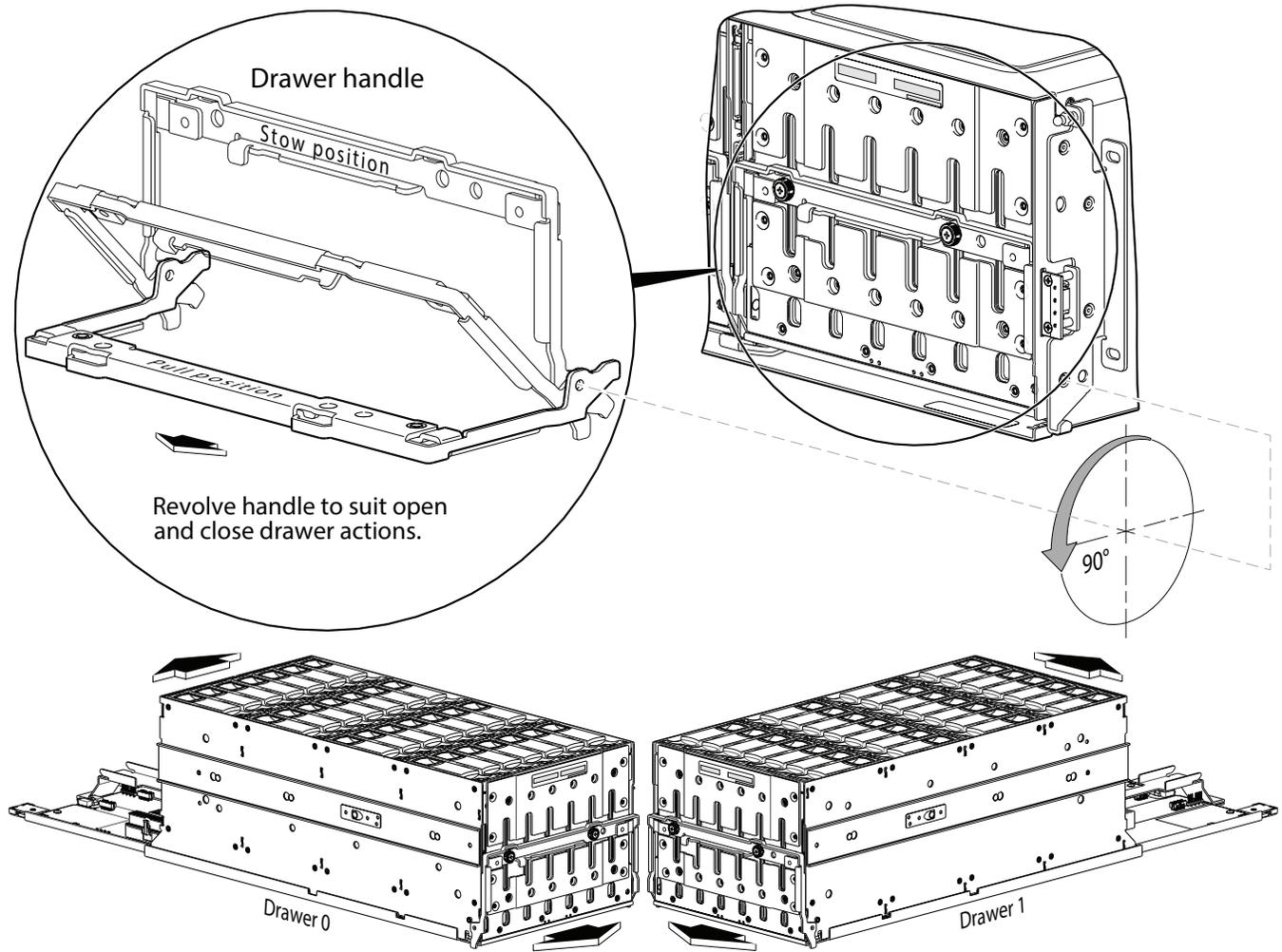
To open a drawer, you must first revolve the pull-handle downwards by 90° to enable pulling the drawer outward for viewing drives. The handle can be in the stowed position when pushing the drawer back into the chassis along the drawer slide.
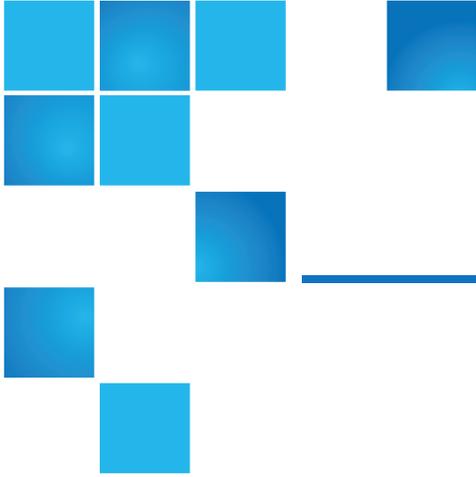
Chapter 3: Procedures

This chapter contains the following topics:

Procedures Overview

This chapter provides procedures for replacing CRUs (customer-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 2 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 chassis, 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 about 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 I/O modules of the same model (for a given RAID chassis)

  🛈 **Note:** Each I/O module (IOM) slot within the chassis must contain an IOM to enable optimum air flow through the chassis during operation. Whether configured as a RAID chassis or a drive chassis, the QXS chassis supports dual-controller configuration only.

  See Replacing a Controller I/O Module or Expansion I/O Module on the next page for more information.

- All drives modules (SAS, SSD)

  See Replace a 56-Drive Module on page 77 for more information.

- Two power supply modules of the same type (both AC or both DC)

  See Replace a 56-Drive Chassis PSU and Fan Module on page 103 for more information.

- Two ears with components installed (complementary left and right ear kits)

See Replacing ear components on page 45 for more information; also see 56-Drive Chassis Ear Components on page 120 for 4U56 chassis bezel alignment.

> **ⓘ Note:** Newer product models use an chassis 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 56-Drive Chassis Ear Components on page 120 for 4U56 chassis bezel alignment.
> - See Figure 9 on page 13 for 2U24 chassis bezel alignment.
> - See Figure 5 on page 11 for 2U12 chassis bezel alignment.

- Two expansion modules of the same model (per optional expansion chassis)*

  See Replacing a Controller I/O Module or Expansion I/O Module below for more information.

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

- Removal and installation of a Fibre Channel transceiver

  See Replace an FC Transceiver on page 124 more information.

- Removal and installation of a storage chassis

  See Replace a Storage Chassis on page 127 for more information.

Replacement of chassis FRU components are described within this chapter.

> **ⓘ Note:** RAID chassis support hot-plug replacement of redundant controller I/O modules, fans, power supplies, and I/O modules. Hot-add of drive chassis is also supported.

> **ⓘ Note:** Many procedures refer to component LEDs and LED statuses. See the *QX and QXS Setup Guide* for descriptions of model-specific front panel and rear panel LEDs.

> **ⓘ Note:** Within the *QX and QXS 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 I/O Module or Expansion I/O Module

In a dual-controller configuration, controller I/O and expansion I/O modules are hot-swappable, which means you can replace one module without halting I/O to drive groups, or powering off the chassis. 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 I/O module or an expansion I/O module when:

- The Fault/Service Required LED is illuminated
- Health status reporting in Disk Management Utility indicates a problem with the module

- Events in Disk Management Utility indicate a problem with the module

- Troubleshooting indicates a problem with the module

ℹ **Note:** RAID chassis equipped with CNC controller I/O modules support the optionally-licensed remote replication feature; whereas chassis equipped with SAS controller I/O modules do not.

⚠ **Caution:** When replacing a Quantum QXS Storage controller set supporting remote replication feature with a Quantum QXS Storage controller set that does not support this licensed feature, you must first delete all replication sets before swapping the controller I/O 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:

- Disk Management Utility (V2 or V3)

- QX and QXS CLI Reference Guide

Before You Begin

Removing a controller I/O or expansion I/O module from an operational chassis significantly changes air flow within the chassis. Openings must be populated for the chassis to cool properly. Leave modules in the chassis until ready to install a replacement. If replacing both controllers in the dual-control chassis, use the Disk Management Utility to record configuration settings before installing the new controller I/O modules.

See Removing a Controller I/O Module or Expansion I/O Module on page 45, and Installing a Controller I/O Module or Expansion I/O Module on page 49 for instructions on installing an additional controller I/O module.

⚠ **Caution:** When replacing a controller I/O 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 I/O module from the slot, and repeat the process.

The two controller I/O modules installed in the chassis must be of the same model type. When replacing both controller I/O modules in an operational chassis, follow these guidelines:

1. Replace one controller as described in these instructions.

2. Wait 30 minutes: this pause ensures that the controller and its ownership of drive groups has sufficient time to stabilize (also Verifying Component Operation on page 51).

3. Check the system status and event logs to verify that the system is stable.

4. Replace the partner controller as described in these instructions.

Configure 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 *WBI*, *Disk Management Utility User Guide V3*, or the *CLI Reference Guide* to change the PFU setting and to update the controller firmware.

Disk Management Utility User Guide V3

⚠ **Caution:** See the "Updating firmware" topic within the *Quantum QXS Disk Management Utility User Guide V3*before performing a firmware update.

1. Sign-in to Disk Management Utility 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 **Action** > **Update Firmware**.

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

ℹ **Note:** The Disk Management Utility User Guide V3 does not provide a check-box for enabling or disabling Partner Firmware Update for the partner controller.

   To enable or disable the setting, use the `set advanced-settings` command, and set the `partner-firmware-upgrade` parameter. See the *CLI Reference Guide* for more information about command parameter syntax. Also see Using the CLI on the next page.

3. Click **Apply**.

Disk Management Utility User Guide V2

⚠ **Caution:** See the "Updating firmware" topic within the *Disk Management Utility User Guide V2* before performing a firmware update.

1. Sign-in to Disk Management Utility 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 Configuration View panel, right-click the system and select **Configuration** > **Advanced Settings** > **Firmware**.

3. Either select (check) the **Partner Firmware Update** check box to enable the option, or clear the check box to disable the option.

4. Click **Apply**.

Using the CLI

You can set a CLI preference to use V3 or V2 terminology in command output and system messages.

> **Note:** The following CLI commands enable you to set the management mode to V3 or V2:
> -Use **set protocols** to change the default management mode.
> -Use **set cli-parameters** to change the current management mode for the CLI session.
> The system defaults to V3 for new customers and V2 for existing users. See the CLI Reference Guide for more information).

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 *QX and QXS CLI Reference Guide* for additional information.

Verify Component Failure

Select from the following methods to verify component failure:

- Use Disk Management Utility 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. Disk Management Utility 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 Disk Management Utility, 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 Disk Management Utility 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 chassis): Amber = Fault condition.

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

Stop I/O

When troubleshooting drive and connectivity faults, stop I/O to the affected vdisks from all hosts and remote systems as a data protection precaution. As an additional data protection precaution, it is helpful to conduct regularly scheduled backups of your data.

⚠️ **Caution:** Stopping I/O to a vdisk 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 vdisk-statistics` command to determine if input and output has stopped. Perform these steps:

1. Using the CLI, run the `show vdisk-statistics` command.

   The `Number of Reads` and `Number of Writes` outputs show the number of these operations that have occurred since the statistic was last reset, or since the controller was restarted. Record the numbers displayed.

2. Run the `show vdisk-statistics` 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 drive. Record the numbers displayed.

3. To determine if any reads or writes occur during this interval, subtract the set of numbers you recorded in Step 1 from the numbers you recorded in Step 2.

   - If the resulting difference is zero, then I/O has stopped.

   - If the resulting difference is not zero, a host is still reading from or writing to the drive group. Continue to stop I/O from hosts, and repeat Step 1 and Step 2 until the difference in Step 3 is zero.

ℹ️ **Note:** See *QX and QXS CLI Reference Guide* for additional information.

Shut Down the Controller I/O Module

Shutting down the Storage Controller in a controller I/O module ensures that a proper failover sequence is used, which includes stopping all I/O operations and writing any data in write cache to drive. If the Storage Controller in both controller I/O modules is shut down, hosts cannot access the system's data. Perform a shut down before you remove a controller I/O module from an chassis, or before you power off its chassis 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 *WBI*, *Disk Management Utility User Guide V3*, or the CLI to perform a shut down.

Using Disk Management Utility V3

1. Sign-in to the disk management utility 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.

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 I/O 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.

Using Disk Management Utility V2

1. Sign-in to Disk Management Utility 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 Configuration View panel, right-click the system and select **Tools** > **Shut Down or Restart Controller**.

   The Shut Down or Restart Controller panel appears.

3. In the Shut Down or Restart Controller panel, set the options:

   - **Operation**: select **Shut down**.
   - **Controller type**: select **Storage**.
   - Within the **Controller** field, select **A**, **B**, or **Both**.

4. Click **Shut down now**. A confirmation dialog appears.

5. Click **Yes** to continue; otherwise click **No**. If you clicked Yes, a second confirmation dialog appears.

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

> **Note:** See the *Disk Management Utility (V2)* for additional information.

Using the CLI

You can set a CLI preference to use v3 or v2 terminology in command output and system messages.

> **Note:** The following CLI commands enable you to set the management mode to V3 or V2:
> -Use **set protocols** to change the default management mode.
> -Use **set cli-parameters** to change the current management mode for the CLI session.
> The system defaults to V3 for new customers and V2 for existing users. See the CLI Reference Guide for more information).

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 chassis) illuminates to indicate that the controller I/O module can be safely removed.

4. Illuminate the identification LED of the chassis that contains the controller I/O module to remove by running the command:
   `set led enclosure 0 on`

> **ⓘ Note:** See *QX and QXS CLI Reference Guide* for additional information.

Removing a Controller I/O Module or Expansion I/O Module

> **⚠ Caution:** Dual-Controller Configurations
> - In dual-controller configurations featuring one healthy partner controller, there is no need to transport failed controller cache to a replacement controller because the cache is duplicated between the controllers (subject to volume write optimization setting).
> - In a dual-controller environment, you may hot-replace a single controller I/O module in an operational chassis, provided you first shut down the faulty controller using the Disk Management Utility or the CLI.
> - In a dual-controller environment—if replacing both controller I/O modules—you must adhere to the instructions provided in Before You Begin on page 40.

> **⚠ Caution:** Single-Controller Configurations
> - 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 (see Transporting CompactFlash).
> - In a single-controller environment, you must stop I/O and power off the chassis before replacing the controller module.

For more information, see Preventing Electrostatic Discharge on page 37 and Grounding Methods to Prevent Electrostatic Discharge on page 38.

> **ⓘ Note:** Within these procedures, illustrations featuring controller I/O module face plates are generic. They do not show host interface ports, and they pertain to all Quantum controller I/O module models. For illustrations of model-specific controller face plates, see the *QX and QXS Storage Setup Guide*.

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

1. Verify that you have successfully shut down the controller I/O module using Disk Management Utility or the CLI.

2. Locate the chassis whose Unit Locator LED (front right ear) is illuminated, and within the chassis, locate the controller I/O 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 37 below).

Figure 37: Disengaging a controller I/O module
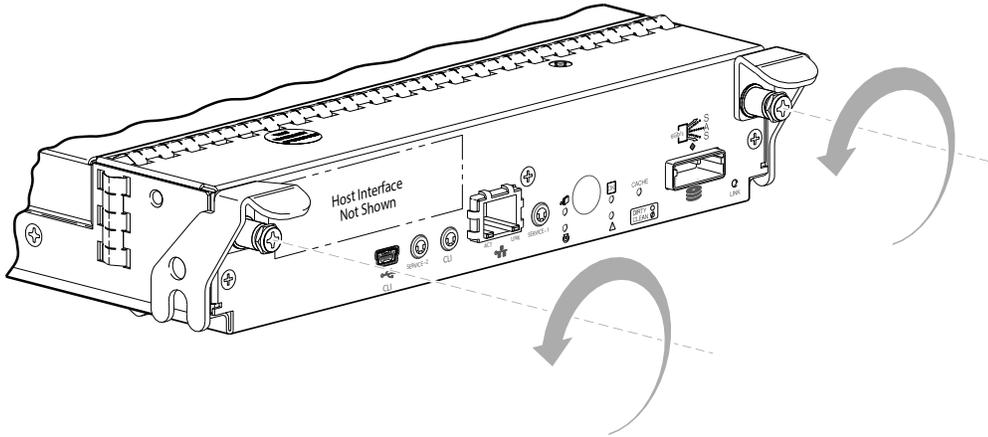
5. Press both latches downward to disconnect the controller I/O module from the midplane (see Figure 38 below).

Figure 38: Extracting a controller I/O module
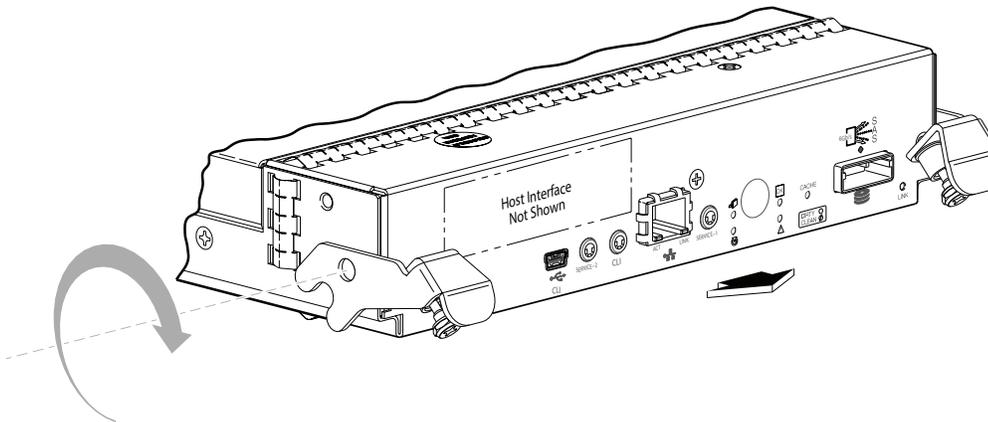
6. Pull the controller I/O module straight out of the chassis such that the controller I/O module remains level during removal (see Figure 39 on the next page).

   - Refer to Figure 39 on the next page for 12-drive, 24-drive, or 48-drive controller I/O module locations (2U).

   - Refer to Figure 40 on the next page for the 56-drive controller I/O module locations (4U).

7. Remove the 12-drive, 24-drive, or 48-drive controller I/O module from the chassis (2U).

Figure 39: Removing a controller I/O module (2U)
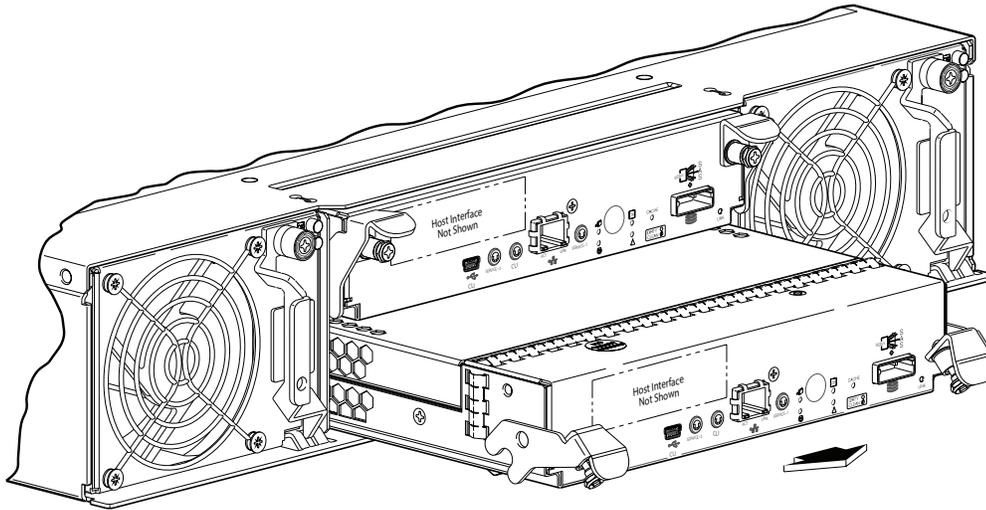
8. Remove the 56-drive controller I/O module from the chassis (4U).

Figure 40: Removing a controller I/O module (4U)
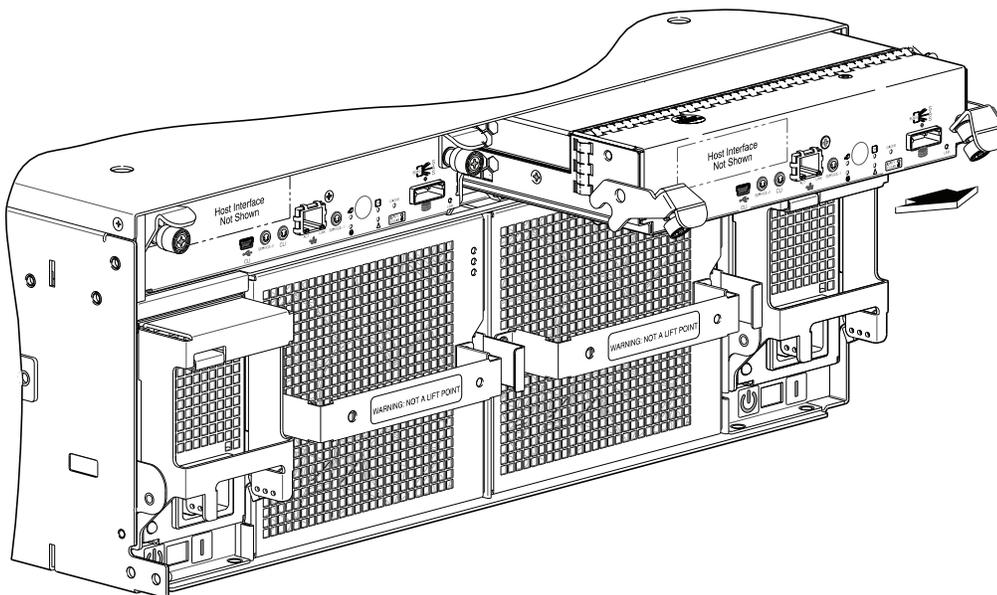
Transporting CompactFlash

This action applies to single-controller configurations only. To prevent data loss in single-controller configurations, the CompactFlash must be moved from the failed controller module to the new controller

module.

> ⚠️ **Caution:** Do not transport CompactFlash in dual-controller environments. Doing so could cause data corruption.

Figure 41: CompactFlash memory card
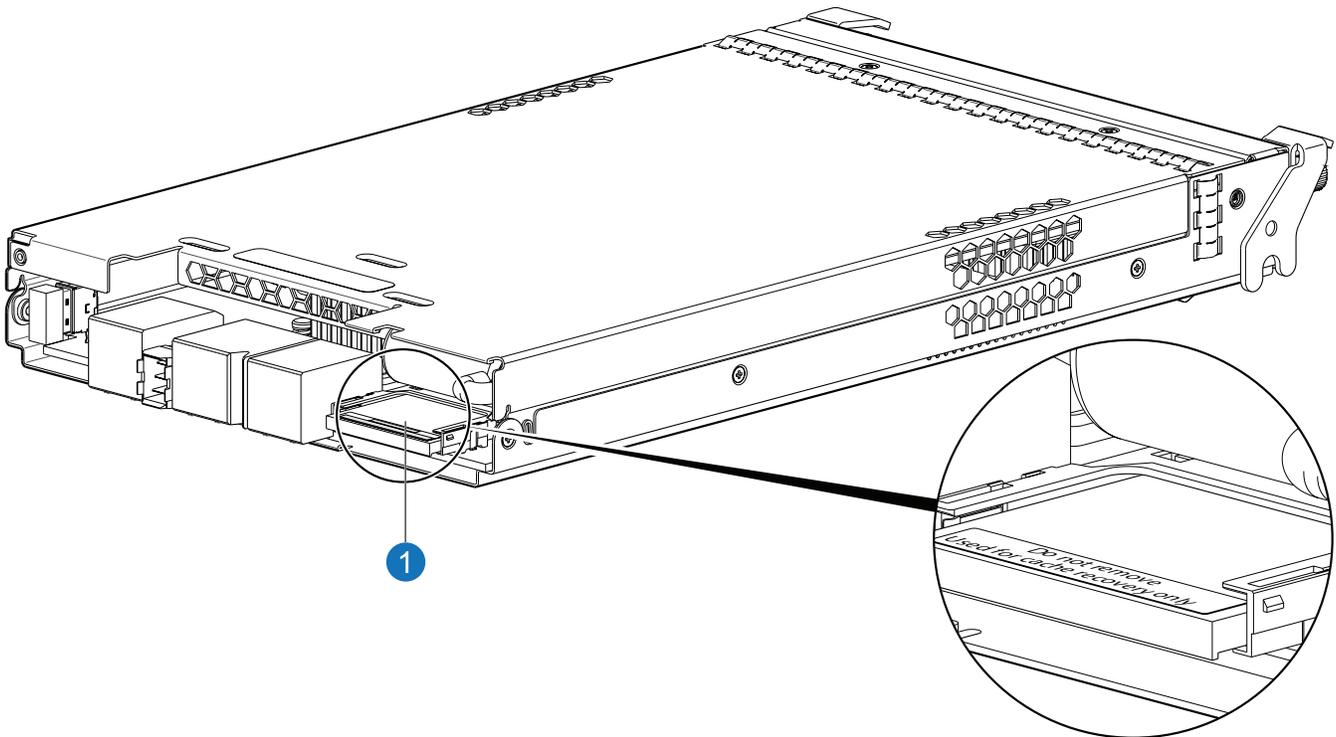
1. **CompactFlash card**

Confirm that transporting CompactFlash is the appropriate action to take as specified in the *QX and QXS Setup Guide*. Refer to when performing the step-procedure that follows.

> ℹ️ **Note:** See CAUTION bullets regarding "electrostatic discharge" and "anti-static protection".

1. Locate the CompactFlash memory card at the midplane-facing end of the failed controller module.

2. Grip the CompactFlash memory card and carefully pull it from the slot in the failed controller module.

3. Label the CompactFlash memory card as Data, and set it aside for safekeeping.

4. Locate the replacement controller module, and carefully remove its installed CompactFlash memory card.
   Take care not to confuse this disc with the one labeled Data.

5. Align the CompactFlash memory card labeled Data for insertion into the replacement controller module—then insert it into the slot—and push it forward until seated in place.

Installing a Controller I/O Module or Expansion I/O Module

ℹ Note: You can install a controller I/O module into an chassis that is powered on, provided you wait 60 seconds after removing the old controller I/O module. Check controller and midplane power connectors before inserting the new controller I/O module into the chassis.

For more information, see Preventing Electrostatic Discharge on page 37 and Grounding Methods to Prevent Electrostatic Discharge on page 38.

1. Loosen the thumbscrews; press the latches downward (see Figure 42 on the next page).

2. Ensuring that the controller I/O module is level, slide it into the chassis as far as it will go (1).

   A controller I/O module that is only partially seated will prevent optimal performance of the controller I/O module. Verify that the controller I/O module is fully seated before continuing.

3. Press the latches upward to engage the controller I/O module (2); turn the thumbscrews clockwise until finger-tight.

   - See Figure 42 on the next page for the 12-drive, 24-drive, or 48-drive controller I/O module installation.

   - See Figure 43 on the next page for the 56-drive controller I/O module installation.

4. Reconnect the cables.

   ℹ Note: See the *QX and QXS Setup Guide* for cabling information.

Figure 42 on the next page provides an illustration of the 12-drive, 24-drive, or 48-drive controller I/O module installation (2U).
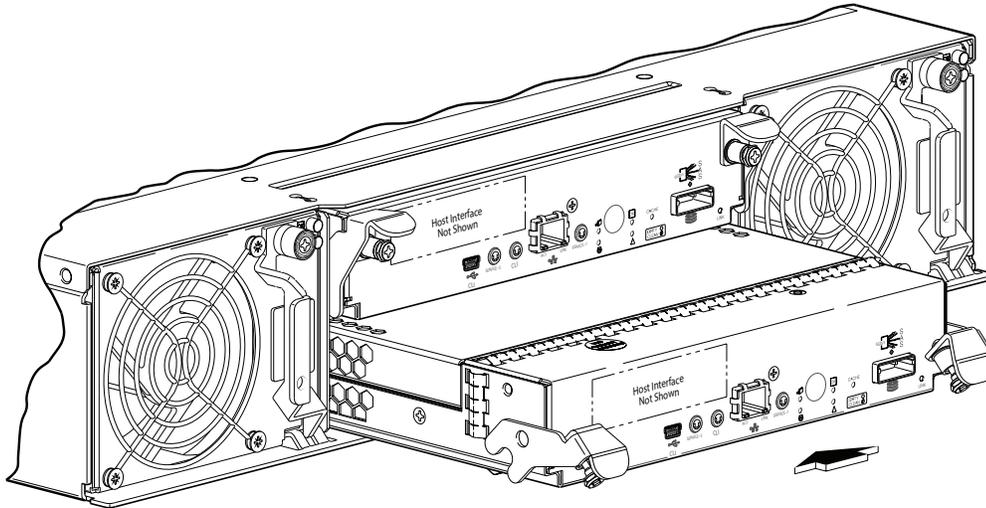
Figure 42: Inserting a controller I/O module (2U)

Figure 43 below provides an illustration of the 56-drive controller I/O module installation (4U).
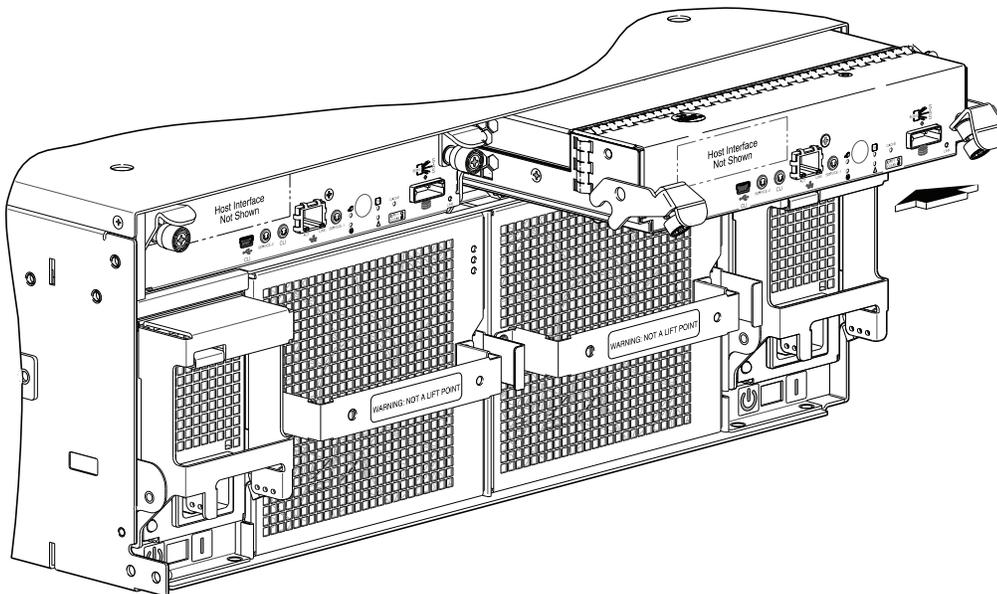
Figure 43: Inserting a controller I/O module (4U)

⚠ **Caution:** 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 I/O 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 I/O module, and PFU is enabled, you may need to wait 30 minutes to ensure that the two controllers—with their respective ownership of the vdisks—have enough time to fully stabilize.

Use Disk Management Utility or the CLI to perform a restart *only* if necessary.

⚠️ **Caution:** See the "Restarting controllers" topic in the *WBI or Disk Management Utility User Guide V3* for more information.

Using Disk Management Utility V3

1. Sign-in to Disk Management Utility 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 **Restart System**.

   The Controller Restart and Shut Down panel opens.

3. Select **Restart** operation

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

5. Select the controller I/O module to restart: **A**, **B**, or **Both**.

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

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

Using Disk Management Utility V2

1. Sign-in to Disk Management Utility 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 Configuration View panel, right-click the system and select **Tools** > **Shut Down** or **Restart Controller**.

3. In the main panel, set the options:

   - **Operation**: Select **Restart**.
   - **Controller Type**: Select the controller type to restart: **Management** or **Storage**.
   - **Controller**: Select the controller I/O module to restart: **A**, **B**, or **Both**.

4. Click **Restart now**. A confirmation panel appears.

5. Click **Yes** to continue; otherwise, click **No**. If you click Yes, a second confirmation diagram appears.

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

Using the CLI

You can set a CLI preference to use v3 or v2 terminology in command output and system messages.

> **Note:** The following CLI commands enable you to set the management mode to V3 or V2:
> -Use **set protocols** to change the default management mode.
> -Use **set cli-parameters** to change the current management mode for the CLI session.
> The system defaults to V3 for new customers and V2 for existing users. See the CLI Reference Guide for more information).

If the chassis'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 I/O 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
```

> **Note:** See the *QX and QXS Setup Guide* for descriptions of model-specific LEDs.

Updating Firmware

Always update controller firmware when:

- Installing a new system

- Adding drive expansion(s)

- Replacing a controller I/O module(s) or expansion I/O module(s)

> **Note:** Updating controller firmware with expansion modules active ensures that the controller firmware and expansion IOM firmware are at a compatible level.

You can view the current versions of firmware in controller I/O modules, expansion I/O modules (in the RAID or expansion chassis), and drives, and you can also install new firmware versions.

> **Note:** 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.

A RAID chassis can contain one or two controller I/O modules. In a dual-controller system, both controller I/O modules should run the same firmware version. Storage systems in a replication set must run compatible firmware versions. Always update controller firmware when replacing a controller I/O module.

If you have a dual-controller system and 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 vdisk is quarantined, firmware update is not permitted due to the risk of losing unwritten data that remains in cache for the vdisk volumes. Before you can update firmware, you must resolve the problem that is causing the vdisk to be quarantined, as described in the "Removing a vdisk from quarantine" topic in the *WBI User Guide* or online help.

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

⚠ Caution: See the "Updating firmware" topic in the *WBI* before performing a firmware update.

Remove or Install a 12- and 24-Drive Chassis Bezel

Before accessing front panel LEDs, and components, you must first remove the chassis bezel. The removal and installation process of the 12- and 24-drive chassis bezel is the same (only one graphic is shown below).

Figure 44: Partial assembly showing bezel alignment (representative example)

Attach the Chassis Bezel

1. Orient the bezel to align its back side with the front face of the chassis as shown in the figures above.

2. Face the front of the chassis, and while supporting the base of the bezel, position it such that the mounting sleeves within the integrated ear caps align with the ball studs.

3. Gently push-fit the bezel onto the ball studs to attach the bezel to the front of the chassis.

Remove the Chassis Bezel

1. While facing the front of the chassis, insert the index finger of each hand into the top of the respective (left or right) pocket opening shown in the figures above.

2. Insert the middle finger of each hand into the bottom of the respective opening, with thumbs on the bottom of the bezel face.

3. Gently pull the top of the bezel while applying slight inward pressure below, to release the bezel from the ball studs.

Replacing a 12- and 24-Drive Module

A drive module consists of a drive in a sled. Drive modules are hot-swappable, which means they can be replaced without halting I/O to the vdisks, or powering off the chassis. The new drive module must be of the same type, and possess capacity equal to or greater than the one being replaced. Otherwise, the storage system cannot use the new drive to reconstruct the disk group.

If one or more disks fail in a disk group and spares of the appropriate size (same or larger) and type (same as the failed disks) are available, the storage system automatically uses the spares to reconstruct the disk group. Disk group reconstruction does not require I/O to be stopped, so volumes can continue to be used while reconstruction is in progress.

If no spares are available, reconstruction does not start automatically. To start reconstruction manually, replace each failed disk and designate each replacement disk as a spare. If you have configured the dynamic spares feature through the CLI, reconstruction will automatically start for linear disk groups. With dynamic spares enabled, if a disk fails and you replace it with a compatible disk, the storage system rescans the bus, finds a new disk, automatically designates it a spare, and starts reconstructing the disk group.

For virtual storage only, reconstruction of all disk groups uses a quick-rebuild feature.

Before You Begin

⚠️ **Caution:** Removing a drive module impacts the airflow and cooling ability of the chassis. If the internal temperature exceeds acceptable limits, the chassis may overheat and automatically shut down or restart. To avoid potential overheating, wait 20 seconds to allow the internal drives to stop spinning (HDDs), then insert the new drive module.

For more information, see Preventing Electrostatic Discharge on page 37 and Grounding Methods to Prevent Electrostatic Discharge on page 38.

Verify Component Failure

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

⚠️ **Caution:** Failure to identify the correct drive module could result in data loss if the wrong drive is removed from the chassis. If your chassis has a bezel installed, remove it to view drive LEDs. Alternatively, you can observe drive component health via Disk Management Utility.

Drive Fault

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

ℹ️ **Note:** Newer product models use an chassis 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 Partial assembly showing bezel alignment (2U24) on page 13 for 2U24 chassis bezel alignment.
- See Partial assembly showing bezel alignment (2U12) on page 11 for 2U12 chassis bezel alignment.

Using management interfaces

Alternatively, you can observe drive component health using management interfaces to verify component failure or component operation (see Using management interfaces on page 135 for more information).

Using Disk Management Utility V3

1. Sign in to the disk management utility (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. Click the **System** topic. The System panel opens.

3. 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 Health Recommendations.

Using Disk Management Utility V2

1. Sign in to Disk Management Utility (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. View the System Overview panel to determine whether the health of the new drive is OK.

   - If the health is OK, then the drive module installation process is complete.

   - If the health is not OK, then in the Configuration View panel, select the chassis that the new drive is in to display the Enclosure Overview panel, and select the drive to view details about it, such as Status and Health Recommendations.

Using the CLI

You can set a CLI preference to use v3 or v2 terminology in command output and system messages.

> **Note:** The following CLI commands enable you to set the management mode to V3 or V2:
> -Use **set protocols** to change the default management mode.
> -Use **set cli-parameters** to change the current management mode for the CLI session.
> The system defaults to V3 for new customers and V2 for existing users. See the CLI Reference Guide for more information).

1. Log in to the CLI (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. To view information about drives, run the following command:

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

Drives are specified by enclosure ID and slot number. Enclosure IDs increment from 0. Drive IDs increment from 0 in each enclosure (e.g., show disks 0.7). Entering the command shown above will display the drive health for the drive residing in slot number 7 of enclosure number 0 (i.e., the controller enclosure). If health is not OK, the command output will also display recommended actions.

Remove the 12- or 24-Drive Module

1. Follow one of two sub-steps below, according to your product drive module type (see Figure 45 on the next page):

   a. SFF drive (stands on edge) used in 24-drive chassis— Squeeze the latch release flanges together to disengage the drive module, and swing the pivoting portion of the latch upwards by 45° (see Figure 45 on the next page and Figure 46 on page 58).

   b. LFF drive (lays on side) used in 12-drive chassis — Slide the release latch to the left to disengage the drive module (see Figure 45 on the next page).

Moving the latch to the left will provide a clicking sound and cause the spring to move its position inside the chassis, partially ejecting the drive from its installed position within the drive slot.

Figure 45: Disengaging a drive module
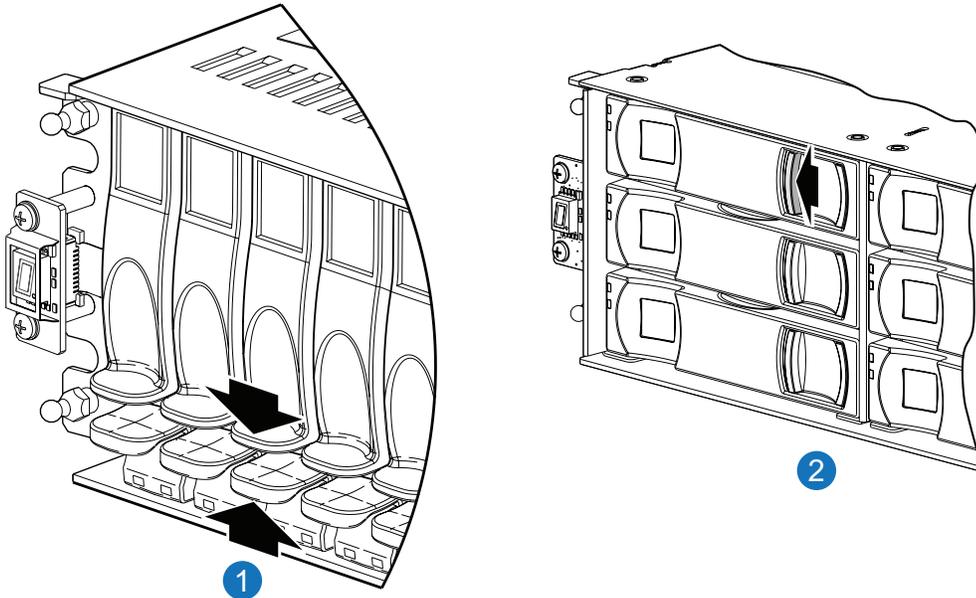
1. **24-drive chassis: SFF 2.5" drive or blank**   2. **12-drive chassis: LFF 3.5" drive or blank**

2. Wait 20 seconds for the internal drives to stop spinning (HDDs).

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

   a. SFF drive used in 24-drive chassis — Firmly grasp the front of the plastic sled, and pull the drive module straight out of the chassis, taking care not to drop the module.

   b. LFF drive used in 12-drive chassis — Once the drive module partially ejects from the slot, grasp the module firmly, and carefully pull it straight out of the chassis slot. Take care not to drop the module.

Figure 46: Removing a drive module
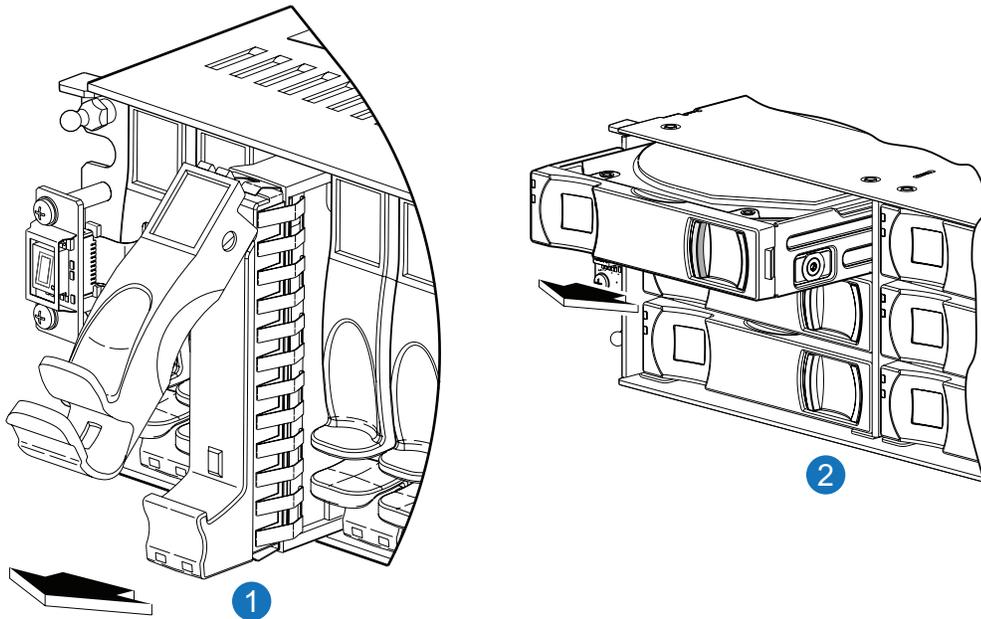
1.	**Extract SFF drive or blank**	2.	**Extract LFF drive or blank**

Install the 12- or 24-Drive Module

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

   a. SFF drive used in 24-drive chassis — Squeeze the latch release flanges together, and then pull the latch, rotating it upward until it is fully open (see Figure 45 on the previous page and Figure 46 above).

   b. LFF drive used in 12-drive chassis — No action required.

   Proceed to step 2 below.

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

   a. SFF drive used in 24-drive chassis — With the LEDs oriented to the bottom, slide the drive module into the drive slot as far as it will go (see left illustration in Figure 47 on the next page).

   b. LFF drive used in 12-drive chassis — With the LEDs oriented to the left, slide the drive module into the drive slot as far as it will go (see right illustration in Figure 47 on the next page).

Figure 47: Installing a drive module
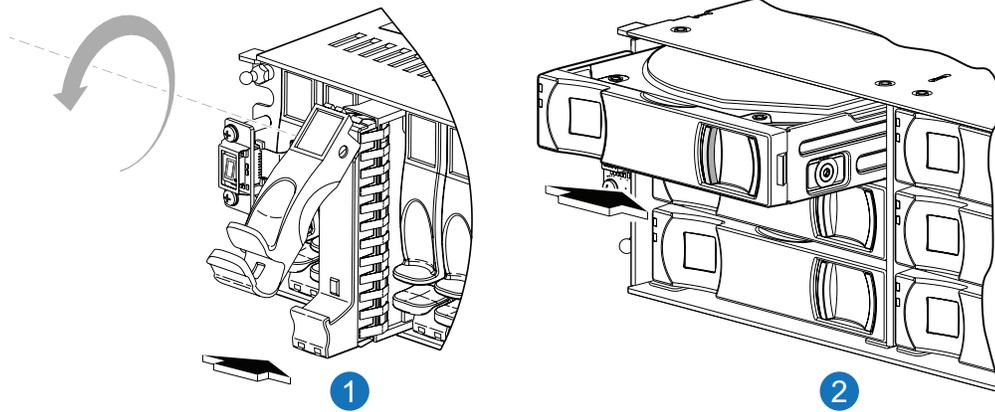
1. **24-drive chassis: Insert SFF drive or blank**
2. **12-drive chassis: Insert LFF drive or blank**

3. Follow *one* of the two sub-steps below, according to your product's drive type:

   a. SFF drive used in 24-drive chassi — Rotate the latch downward until it clicks closed to firmly seat the drive module in the chassis midplane.

   b. LFF drive used in 12-drive chassi — Verify that you have inserted the drive module into the slot as far as it will go, to ensure that the module is firmly seated in the chassis midplane.

   The installed drive module should now appear as shown in .

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

   Use Disk Management Utility V3, Disk Management Utility V3, or the CLI to complete this procedure.

Using Disk Management Utility V3

1. Sign in to the disk management utility (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. Click the **System** topic. The System panel opens.

3. 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 Health Recommendations.

Using Disk Management Utility V2

1. Sign in to Disk Management Utility (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. View the System Overview panel to determine whether the health of the new drive is OK.

   - If the health is OK, then the drive module installation process is complete.

   - If the health is not OK, then in the Configuration View panel, select the chassis that the new drive is in to display the Enclosure Overview panel, and select the drive to view details about it, such as Status and Health Recommendations.

Setting CLI Preferences

You can set a CLI preference to use v3 or v2 terminology in command output and system messages.

> **ⓘ Note:** The following CLI commands enable you to set the management mode to V3 or V2:
> -Use **set protocols** to change the default management mode.
> -Use **set cli-parameters** to change the current management mode for the CLI session.
> The system defaults to V3 for new customers and V2 for existing users. See the CLI Reference Guide for more information).

1. Log in to the CLI (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. To view information about drives, run the following command:

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

   Drives are specified by enclosure ID and slot number. Enclosure IDs increment from 0. Drive IDs increment from 0 in each enclosure (e.g., show disks 0.7). Entering the command shown above will display the drive health for the drive residing in slot number 7 of enclosure number 0 (i.e., the RAID chassis). If health is not OK, the command output will also display recommended actions.

Determine if a Drive is Missing

You can determine whether a drive is missing by using disk management utility V2, disk management utility V3, or the CLI.

Using Disk Management Utility V3

1. Sign-in to the 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 chassis/enclosure ears to see metadata for specific chassis/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 Disk Management Utility V2

1. Sign-in to Disk Management Utility 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 Configuration View panel, right-click the appropriate chassis/enclosure under **Physical**.

   - Select the **Front Graphical** tab to display a pictorial representation of drives within slots, and the supporting chassis/enclosure table showing properties and values.

   - Select the **Front Tabular** tab to display the Enclosure's Front View data table and supporting chassis/enclosure table showing properties and values.

3. Using the graphical and tabular views, look for gaps in the drive location sequence to determine if a drive is missing.

Setting CLI Preferences

You can set a CLI preference to use v3 or v2 terminology in command output and system messages.

> **ℹ Note:** The following CLI commands enable you to set the management mode to V3 or V2:
> -Use **set protocols** to change the default management mode.
> -Use **set cli-parameters** to change the current management mode for the CLI session.
> The system defaults to V3 for new customers and V2 for existing users. See the CLI Reference Guide for more information).

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 drives' properties by location. Review the information, and look for gaps in the drive location sequence to determine whether any drives are missing.

Verify Component Operation

Verify that the Power/Activity LED—located on the front face of the drive escutcheon—is illuminated green. On LFF drives, this is the bottom LED. On SFF drives, this is the left LED. Both sets of LEDs are shown in

> ℹ **Note:** See the *QX and QXS Setup Guide* for descriptions of drive LEDs and other front panel LEDs pertaining to 2U12 and 2U24 RAID chassis.

Also see Using management interfaces on page 135 as an alternative to physically observing LEDs to verify component operation.

Remove or Install a 48-Drive Chassis Bezel

Before accessing front panel LEDs, and components, you must first remove the chassis bezel.

Figure 48: Partial assembly showing bezel alignment (2U48)
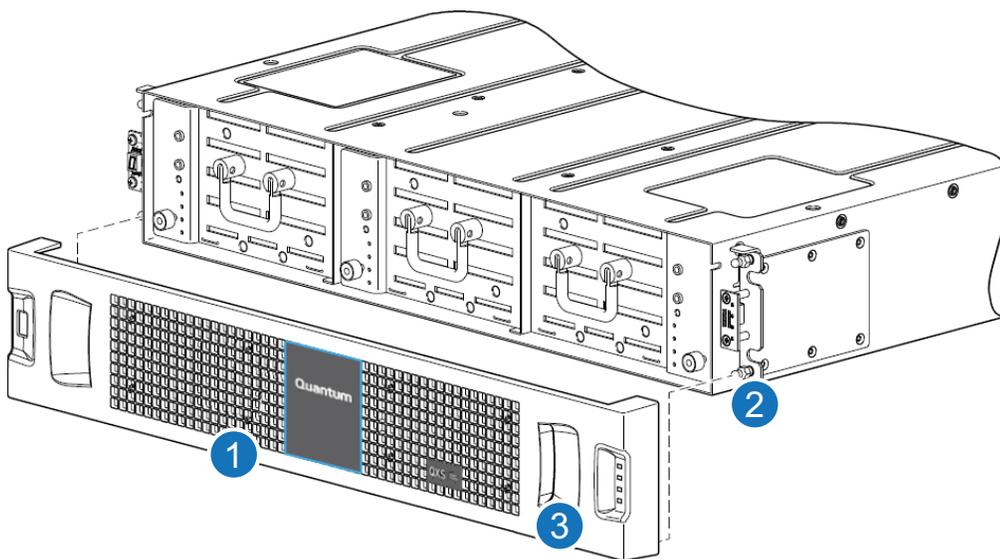
1. **Chassis bezel (includes EMI shield for drives)**
2. **Ball stud on chassis ear (typical 4 places on chassis)**
3. **Pocket opening (typical 2 places on bezel)**

Attach the Chassis Bezel

1. Orient the bezel to align its back side with the front face of the chassis as shown in the figures above.

2. Face the front of the chassis, and while supporting the base of the bezel, position it such that the mounting sleeves within the integrated ear caps align with the ball studs.

3. Gently push-fit the bezel onto the ball studs to attach the bezel to the front of the chassis.

Remove the Chassis Bezel

1. While facing the front of the chassis, insert the index finger of each hand into the top of the respective (left or right) pocket opening shown in the figures above.

2. Insert the middle finger of each hand into the bottom of the respective opening, with thumbs on the bottom of the bezel face.

3. Gently pull the top of the bezel while applying slight inward pressure below, to release the bezel from the ball studs.

Accessing a 48-Drive Drawer

The 48-drive chassis includes three different drawers; one for the left (Drawer 0) and middle (Drawer 1) drawers, and one for the right (Drawer 2) drawer.

Opening and Closing a Drawer

You can open a drawer for visual inspection of drives while the drawer is in operation. Before accessing the drawer via its handle, you must first remove the chassis bezel (see narrative instructions beneath Figure 48 on the previous page). Given that the chassis bezel is required to provide EMI protection, you should re-attach the bezel to the chassis after examining the drawer.

1. Using a Torx T15 or straight blade screwdriver, loosen the drawer stop screw on the front face of the drawer (see Loosen the drawer stop screw below).

   Once the screw is loosened, use the outer thumb wheel to unlock the drawer. Do not remove the screw.

Figure 49: Loosen the drawer stop screw
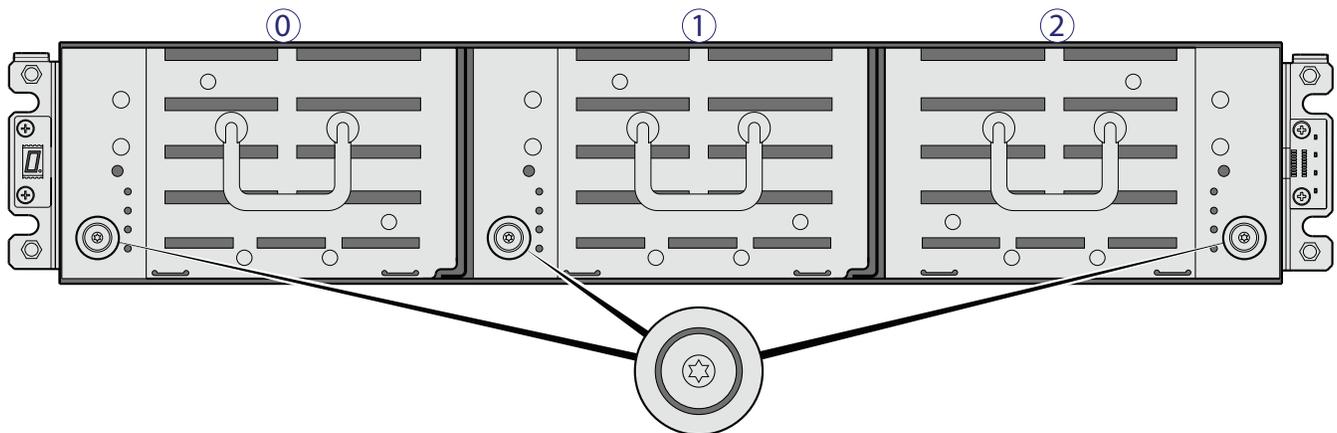
2. Revolve the drawer handle upwards by 90° to enable pulling the drawer outward for viewing drives (see Revolve the handle to drawer-pull position on the next page).

Figure 50: Revolve the handle to drawer-pull position
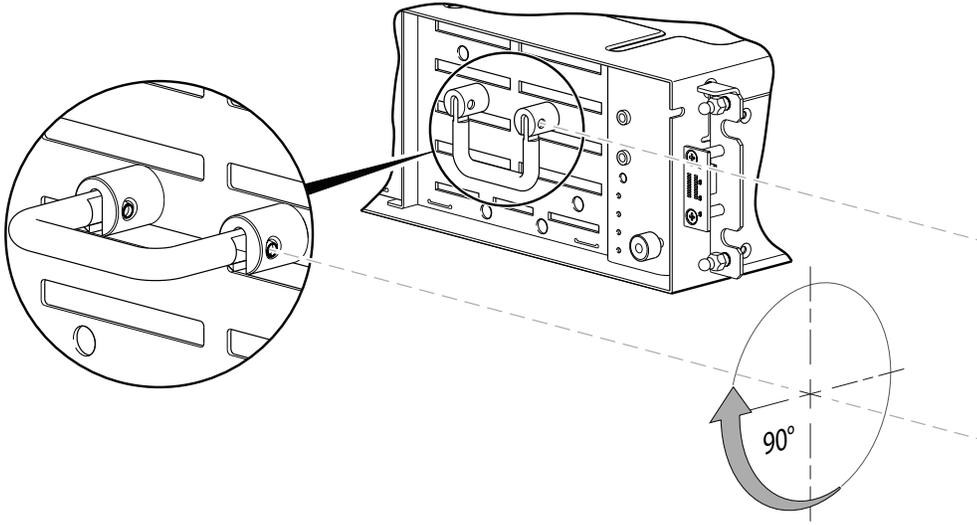
3. Face the front of the drawer—and using the handle—pull the drawer outward along the drawer slide until it meets the drawer stop.

   See Opening and closing a drawer: pull or push drawer along slide below.

   The open drawer that shown in the example is empty.

Figure 51: Opening and closing a drawer: pull or push drawer along slide
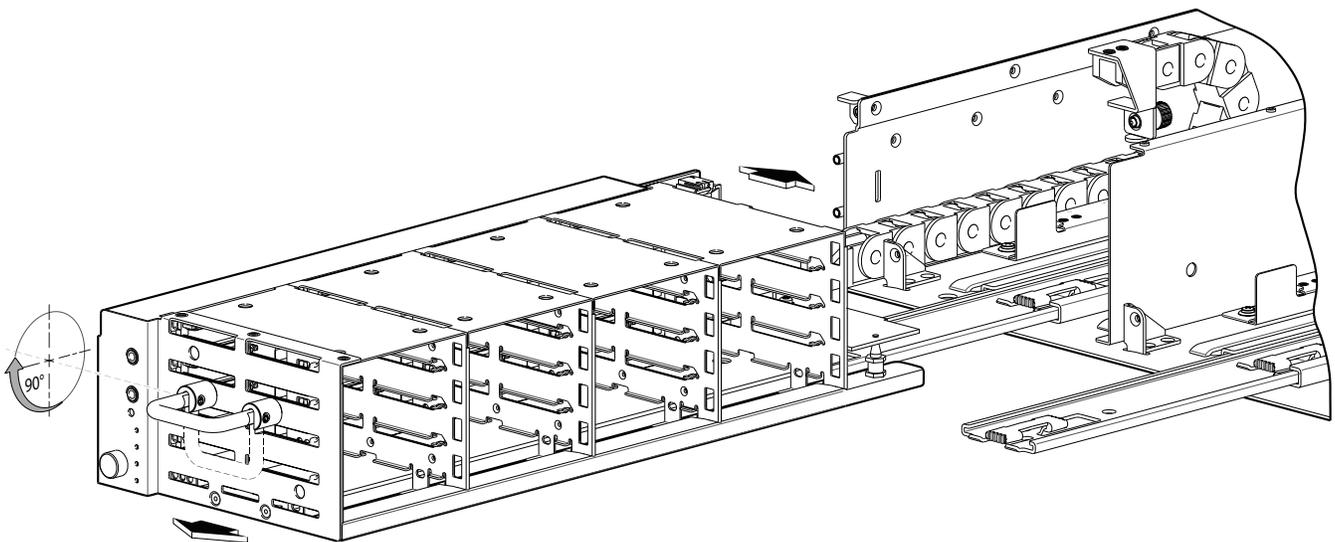
shows example alignment of a sledded drive module or AMS insert for installation into the drawer. Please see the "Populating drawers" topic within the *QX and QXS Setup Guide* for instructions to install drive modules and AMS inserts into 2U48 drawers.

Figure 52: Align AMS or drive module for installation into the drawer
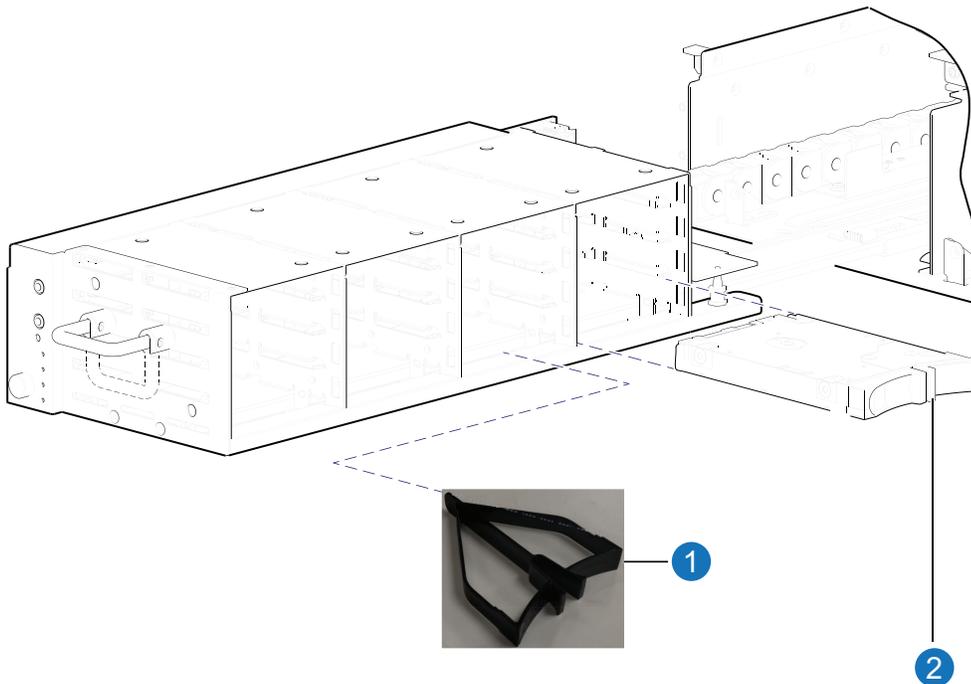
1. **AMS**
2. **Drive**

> ⚠ **Caution:** Each drive bay must be populated with four AMS inserts or a full complement of drive modules (four SFF 2.5" drives).

Replace a 48-Drive Module

A drive module consists of a drive in a sled. Drive modules are hot-swappable, which means they can be replaced without halting I/O to the disk groups, or powering off the chassis. The new drive module must be of the same type, and possess capacity equal to or greater than the one being replaced. Otherwise, the storage system cannot use the new drive to reconstruct the disk group.

> ⓘ **Note:** These are important notes when installing drives within a 2U48 chassis.

- You must populate the 2U48 chassis in four (4 each) drive increments and populate a vertical slot group in the drawer.

- Always install drives in the 2U48 chassis in slot 0-3 first (drawer 0).

- Quantum recommends that you distribute additional drives among the three drawers to mitigate potential

performance bottlenecks.

- Populate any empty drive slots with an AMS insert to allow proper cooling of the chassis.

Air Management Solution Insert

An air management solution (AMS) insert—also known as a *blank*—is a plastic insert that is used in lieu of a drive module within a drive bay, to maintain optimal air flow for proper cooling within the chassis. Four blanks are installed in drive bays missing all four drive modules. If you must remove a malfunctioning drive module, but cannot immediately replace it, you must either leave the faulty module in place, or arrange to replace the drive in the bay with a blank.

> **ⓘ Note:** The blank is used to manage air flow for each slot in the drive bay. Insert blanks in all empty drive bay slots within the chassis.

Familiarize yourself with the drive module replacement procedures in this subsection before replacing a faulty drive with another drive module, or replacing a drive malfunctioning module in a given bay with a blank (proceed to Before You Begin on page 68).

To access drive slots in the drawer bays, you must first do the following:

- Remove the chassis bezel (see Remove or Install a 48-Drive Chassis Bezel on page 62).
- Pull the drawer outward as described in Opening and Closing a Drawer on page 63.

Installing an Air Management Insert

Refer to Figure 53 below when orienting an AMS for insertion into the target drawer. If you are installing into the left or middle drawer, refer to the illustrations on the left when performing this step-procedure. If you are installing into the right drawer, refer to the illustrations on the right when performing this step-procedure.

Figure 53: Orient the AMS for installation

1. Squeeze the latch release flanges together—so that the locking-nib will clear the sheet metal bay wall— and insert the AMS into the target drive bay.

2. Verify that the AMS is firmly seated in place.

The installed AMS insert should now appear as shown in the sectioned cutaway views of the respective drawers in Figure 54 below.

Figure 54: Secure the AMS into the drive bay

Removing an Air Management Insert

Refer to Figure 55 below when removing an AMS from the target drawer. If you are extracting from the left or middle drawer, refer to the illustration on the left when performing the step procedure. If you are extracting from the right drawer, refer to the illustration on the right when performing this step-procedure.
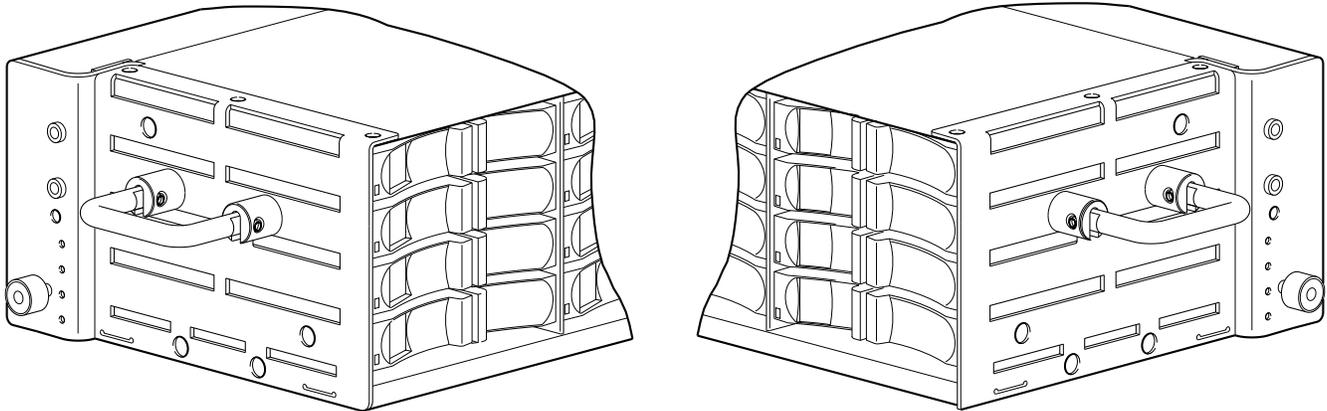
Figure 55: Remove an AMS from the drive bay
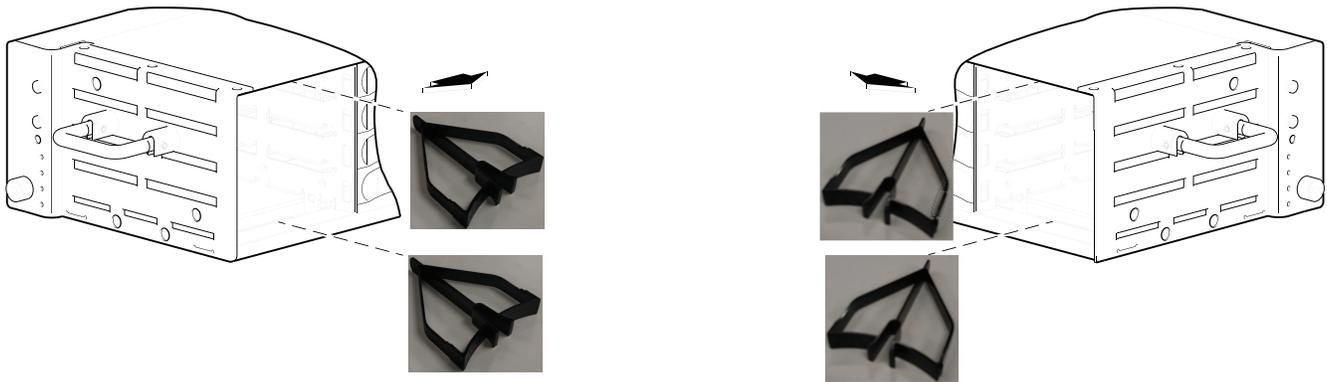
1. Squeeze the latch release flanges together—so that the locking-nib will clear the sheet metal bay wall— and extract the AMS from the target drive bay.

2. Pull the AMS insert straight out of the drive bay as show in Figure 55 above.

Before You Begin

⚠️ **Caution:** Removing a drive module impacts the airflow and cooling ability of the chassis. If the internal temperature exceeds acceptable limits, the chassis may overheat and automatically shut down or restart. To avoid potential overheating, wait 20 seconds to allow the internal drives to stop spinning (HDDs only), then insert the new drive module.

See CAUTION bullets regarding "electrostatic discharge" and "anti-static protection" on page 17.

Verify Component Failure

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

⚠️ **Caution:** Failure to identify the correct drive module could result in data loss if the wrong drive is removed from the chassis.

For line-of-sight viewing of individual drive LEDs, you must remove the chassis bezel and open the drawer to view its installed drives and blanks (if used). When a drive fails or a fault occurs, the drive LED illuminates with a 4Hz (4:1) blue blink behavior (see the *QX and QXS Setup Guide* for a description of LEDs and drive slot numbering for your chassis. Also see Appendix A — Drawer description for a summary). You can determine from visual inspection which drive in the drawer is experiencing a fault/failure.

Alternatively, you can observe drive component health using management interfaces to verify component failure or component operation (see Using management interfaces on page 53 for more information).

Remove a Drive Module

To access drive slots in the drawer bays, you must first do the following:

- Remove the chassis bezel (see Remove or Install a 48-Drive Chassis Bezel on page 62).
- Pull the drawer outward as described in Opening and Closing a Drawer on page 63.

⚠️ **Caution:** Drawer and drive slot numbering are described pictorially on the adhesive label laminated to the top side of each drawer. Drive slot numbering for drawers 0 (left) and 1 (middle) begins at the front of the drawer and moves inward (column-by-column) along the z-axis; whereas drive slot numbering for drawer 2 (right) begins at the rear of the drawer and moves outward (column-by-column).

⚠️ **Caution:** Familiarize yourself with FDE considerations on page 31 *before* performing this step-procedure.

If you are removing a drive module from the left drawer or middle drawer, refer to the illustrations on the left when performing this step-procedure. If you are removing a drive module from the right drawer, refer to the illustrations on the right when performing this step-procedure.

⚠️ **Caution:** Be sure to follow these drive module removal guidelines:

- Stop I/O to the drive (see Stopping I/O on page 22).

- Remove only **one** drive module at a time: concurrent/multiple drive module removal is not allowed.

- Remove the drive module (per step procedure)—wait 30 seconds—before removing another drive.

1. Squeeze the latch release flanges together to release the locking-nib on the right side of the sled from the drawer cage wall, and disengage the drive module from its connector on the drawer PCBA (see illustration for appropriate drawer in Figure 56 below).

Figure 56: Disengaging a drive module

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

3. Firmly grasp the front of the plastic sled, and pull the drive module straight out of the chassis, taking care not to drop the module (see illustration for appropriate drawer in Figure 57 below).

Figure 57: Removing a drive module
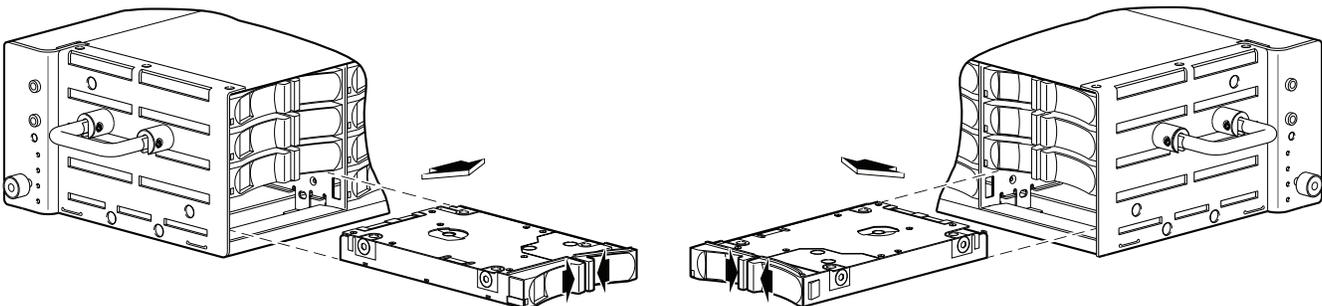
Install the Drive Module

To access drive slots in the drawer bays, you must first do the following:

- Remove the chassis bezel (see Remove or Install a 48-Drive Chassis Bezel on page 62).

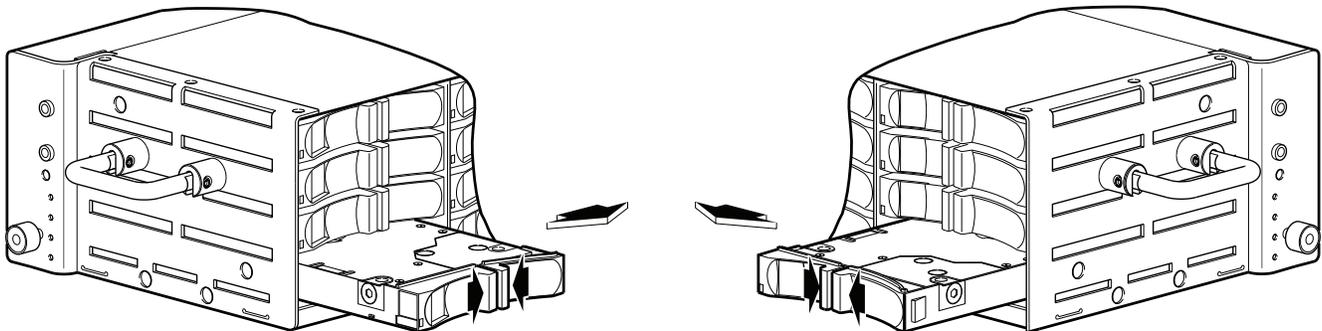- Pull the drawer outward as described in Opening and Closing a Drawer on page 63.

⚠️ **Caution:** Familiarize yourself with FDE considerations on page 31 before performing this step-procedure to mitigate the potential for unusable installed drives.

⚠️ **Caution:** Be sure to follow drive module installation guidelines :

- Install only **one** drive module at a time: concurrent/multiple drive module insertions are not allowed.

- Install the drive module (per step procedure)—wait 45 seconds—before installing another drive module.

The chassis uses an SFF sledded drive positioned to lay on its side—with the drive PCBA facing up—for insertion into the drive slot within the drawer. Each drive is mated to a connector on the drawer PCBA.

If you are installing a drive module in the left drawer or middle drawer, refer to illustrations on the left when performing the step-procedure. If you are installing a drive module in the right drawer, refer to illustrations on the right when performing this step-procedure.

1. While supporting the bottom of the drive module with one hand (drive PCBA should be facing up and latch release flanges should be facing out)—align the drive module for insertion into the target drive slot (see illustration for appropriate drawer in Figure 58 below).

2. Using your other hand, squeeze the latch release flanges together—so that the locking-nib will clear the sheet metal bay wall—and insert the drive module into the target slot (see illustration for appropriate drawer in Figure 58 below).

Figure 58: Aligning the drive module
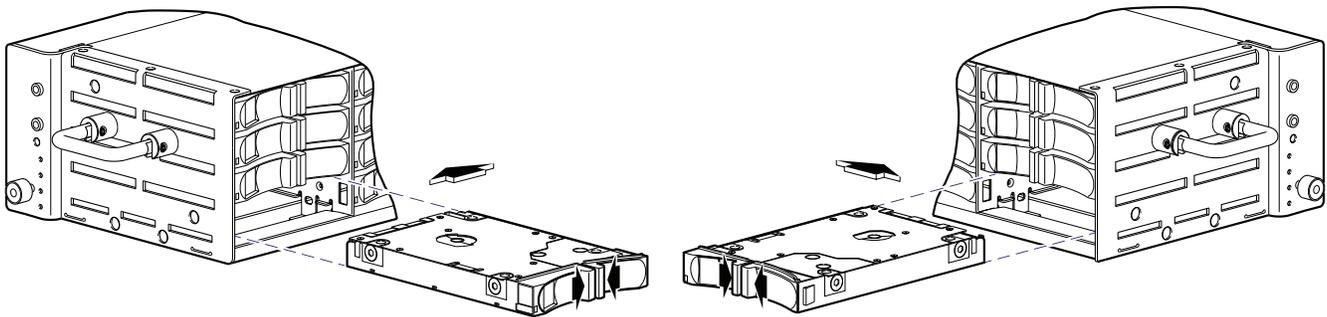
3. Firmly push the drive module into the slot until the locking nib, on the drive, latches into the drive chassis.

ℹ️ **Note:** You will hear a distinct click when the locking nib engages into its chassis drive slot.

⚠️ **Caution:** Verify that the drive module locks securely within the chassis. If the drive module is not locked securely within the chassis, the drive module might not power on and might not be assessable by the controller and/or host.

Figure 59: Drive module and locking nib
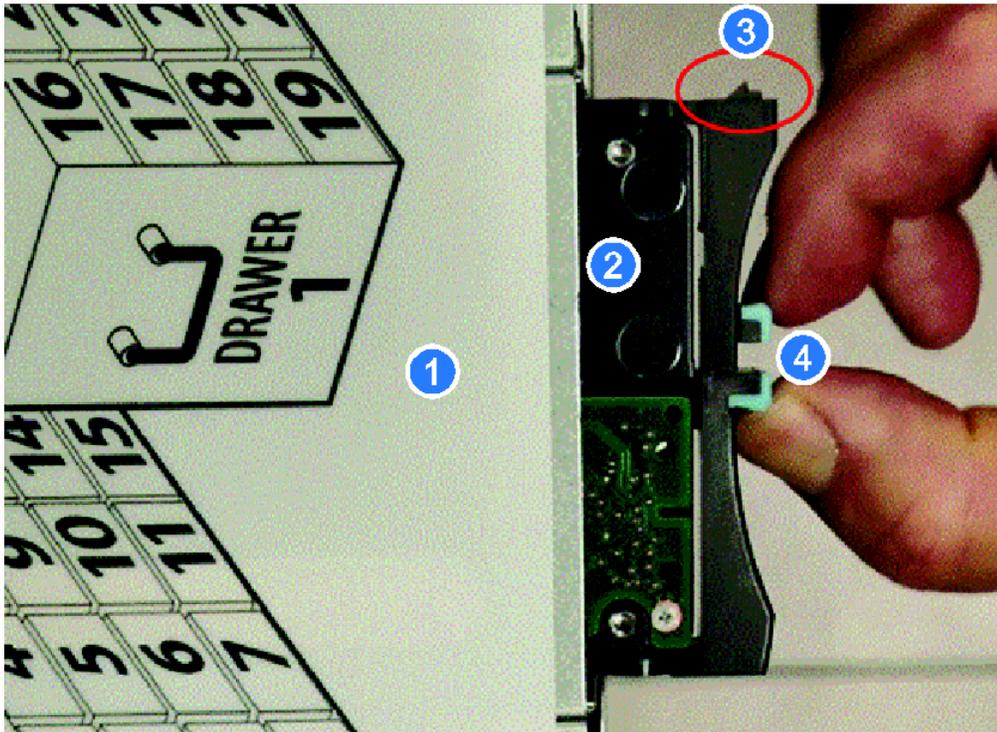
1. Chassis drawer   2. Drive module

3. Locking nib   4. Latch release flanges

> **Note:** Refer to the following link (Training tab) for a video on drive installation:
> http://www.quantum.com/qxshybriddocs

The installed drive module should now appear as shown (see illustration for appropriate drawer in Figure 60 on the next page). Wait 45 seconds before installing another drive.

Figure 60: Installing a drive module
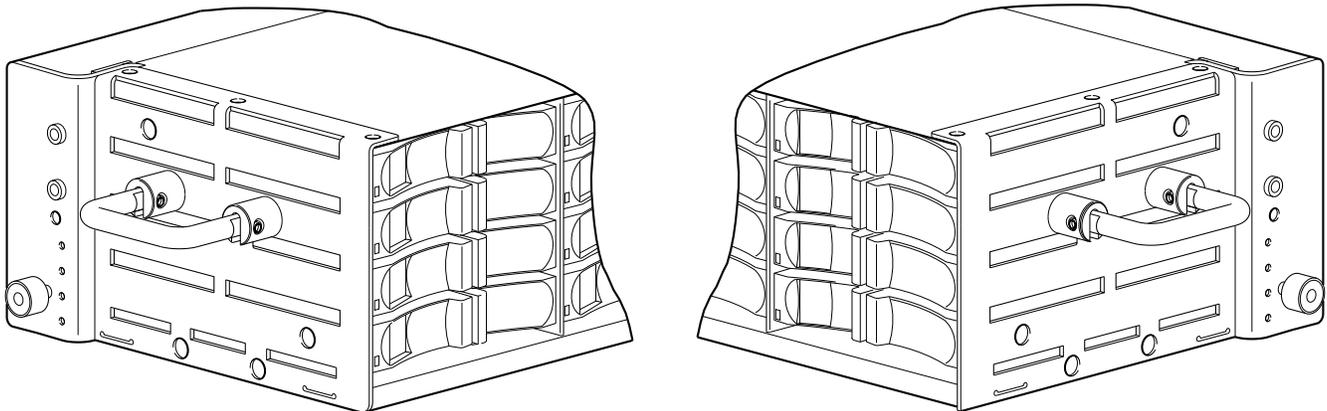
> ℹ **Note:** Allow at least 30 seconds to elapse when jointly completing the "Removing a drive module" and "Installing a drive module" procedures.

Use Disk Management Utility V3, Disk Management Utility V2 or the CLI to complete this procedure.

Using Disk Management Utility V3

1. Sign in to the disk management utility (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. Click the **System** topic. The System panel opens.

3. 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 Health Recommendations.

Using Disk Management Utility V2

1. Sign in to Disk Management Utility (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. View the System Overview panel to determine whether the health of the new drive is OK.

   - If the health is OK, then the drive module installation process is complete.

   - If the health is not OK, then in the Configuration View panel, select the chassis that the new drive is in to display the Enclosure Overview panel, and select the drive to view details about it, such as Status and Health Recommendations.

Using the CLI

You can set a CLI preference to use v3 or v2 terminology in command output and system messages.

ℹ **Note:** The following CLI commands enable you to set the management mode to V3 or V2:
-Use **set protocols** to change the default management mode.
-Use **set cli-parameters** to change the current management mode for the CLI session.
The system defaults to V3 for new customers and V2 for existing users. See the CLI Reference Guide for more information).

1. Log in to the CLI (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. To view information about drives, run the following command:

`show disks <disk-ID>`

Drives are specified by chassis/enclosure ID and slot number. Enclosure IDs increment from 0. Drive IDs increment from 0 in each chassis/enclosure (e.g., `show disks 0.7`). Entering the command shown above will display the drive health for the drive residing in slot number 7 of chassis/enclosure number 0 (i.e., the RAID chassis). If health is not OK, the command output will also display recommended actions.

Remove or Install a 56-Drive Chassis Bezel

Before accessing front panel LEDs, and components, you must first remove the chassis bezel.

Figure 61: Partial assembly showing bezel alignment (4U56)
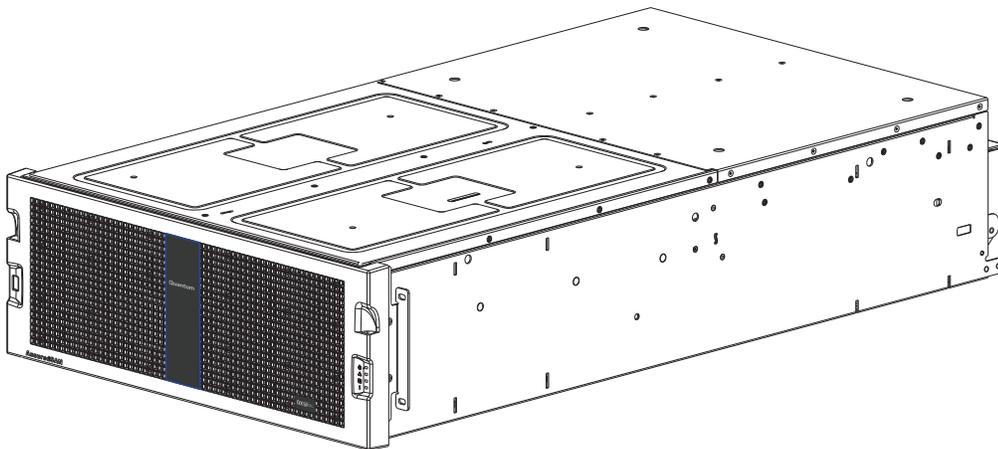
Remove the Chassis Bezel

1. While facing the front of the chassis, insert the index finger of each hand into the top of the respective

(left or right) pocket opening.

Figure 62: Removing Chassis Bezel
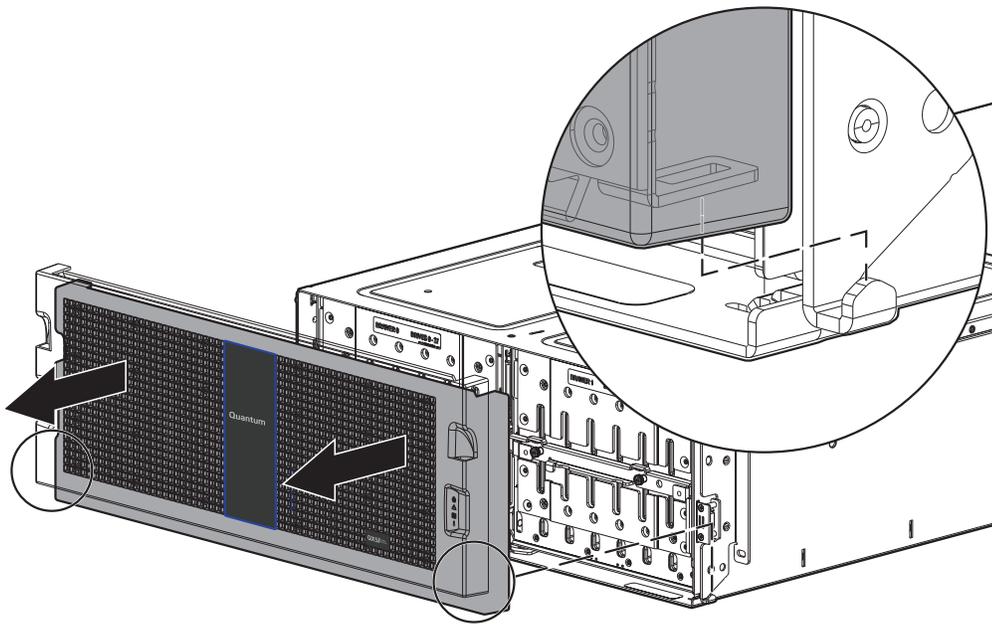
2. Gently pull the top of the bezel while applying slight inward pressure below to release the top sleeves from the ball studs.

3. Lift the bezel upwards to allow the angle-bracket slots to clear the upturned mounting flanges on the chassis.

Install the Chassis Bezel

1. Orient the bezel to align its back side with the front face of the chassis.

Figure 63: Installing Chassis Bezel
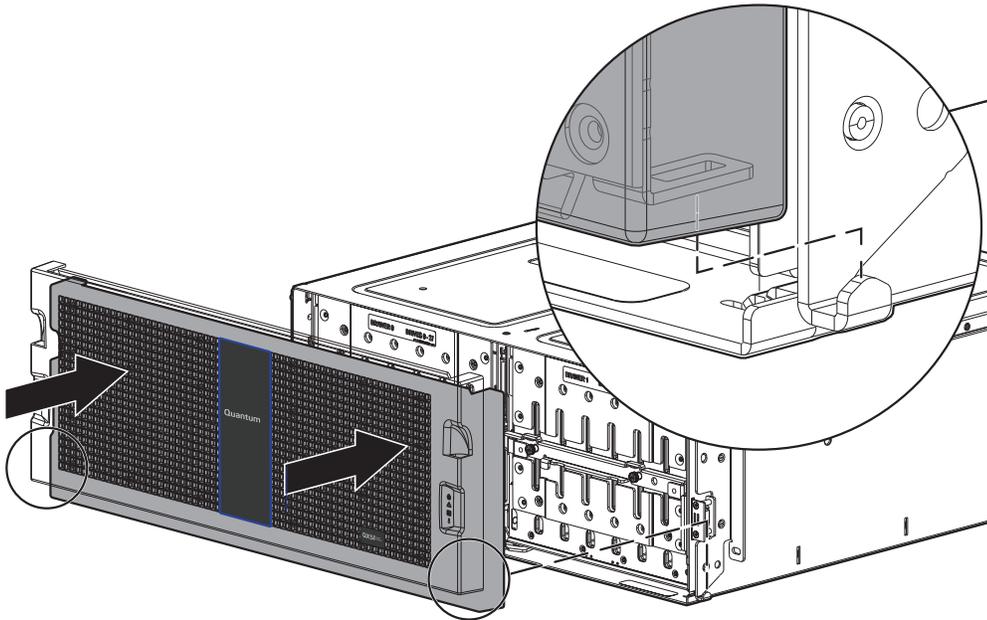
2. Tilt the bezel forward, and guide the two angle-bracket slots on the backside of the bezel onto the two upturned flanges located on sidemount brackets near the front of the chassis (on the exterior left and right chassis walls).

3. Gently push-fit the bezel onto the ball studs to attach the bezel to the front of the chassis.

Access a 56-Drive Drawer

The 56-Drive chassis includes two different drawers; one for the left (Drawer 0) and right (Drawer 1) drawers.

Open a Drawer

You can open a drawer for visual inspection of drives while the drawer is in operation. Before accessing the drawer via its handle, you must first remove the chassis bezel (refer to Bezel Assembly on page 32). Given that the chassis bezel is required to provide EMI protection for drives, you should re-attach the bezel to the chassis after examining the drawer.

Figure 64: Loosen the drawer stop screw

Enclosure front panel featuring
drawer access components

Loosen screws on target drawer

DRAWER 0   DRIVES 0 – 27

DRAWER 1   DRIVES 28 – 55
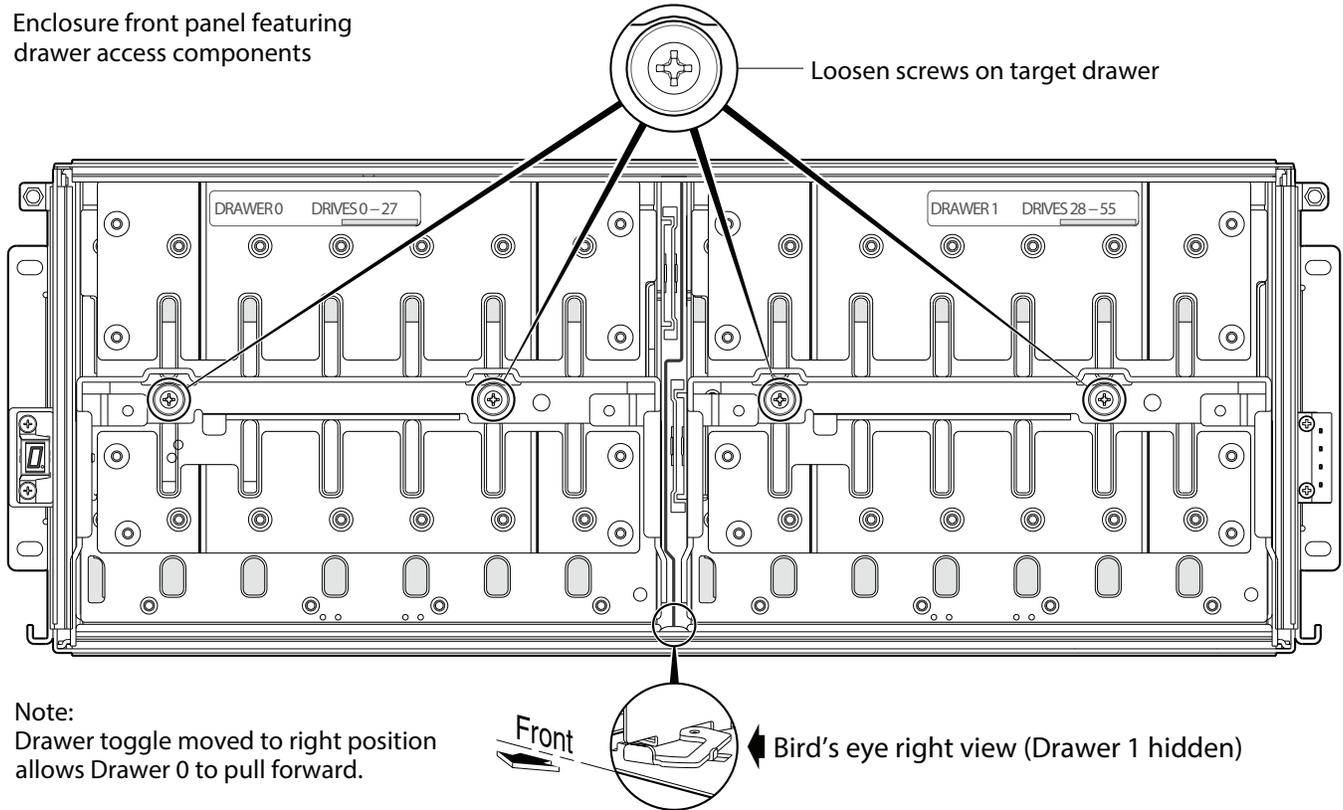
Note:
Drawer toggle moved to right position
allows Drawer 0 to pull forward.

Front

Bird's eye right view (Drawer 1 hidden)
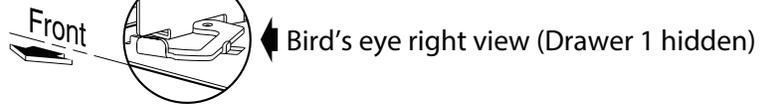
1. Using a No. 2 Phillips screwdriver, loosen the two screws securing the handle to the front face of the drawer (Figure 64 above.

   Once the two screws on the target drawer are loosened, turn the thumb wheel counter-clockwise to disengage the handle from its upright stowed position.

2. Move the drawer toggle to enable the target drawer to travel along the slide.

   Move the toggle to the right to open Drawer 0 (left drawer); or move the toggle to the left to open Drawer 1 (right drawer).

3. Revolve the drawer handle downwards by 90° to enable pulling the drawer outward for viewing drive slots (Figure 65 on the next page).

4. Face the front of the drawer—and using the handle—pull the drawer outward along the drawer slide until it meets the first drawer stop.

   The second stop is met by using your index fingers to pull the blue clips (located on both sides of the drawer) towards the front of the drawer. Pull the drawer outward until it meets the next drawer stop.

ⓘ **Note:** Do not pull out a drawer that is fully loaded with drives to the second stop.

Figure 65: Loosen the drawer stop screw
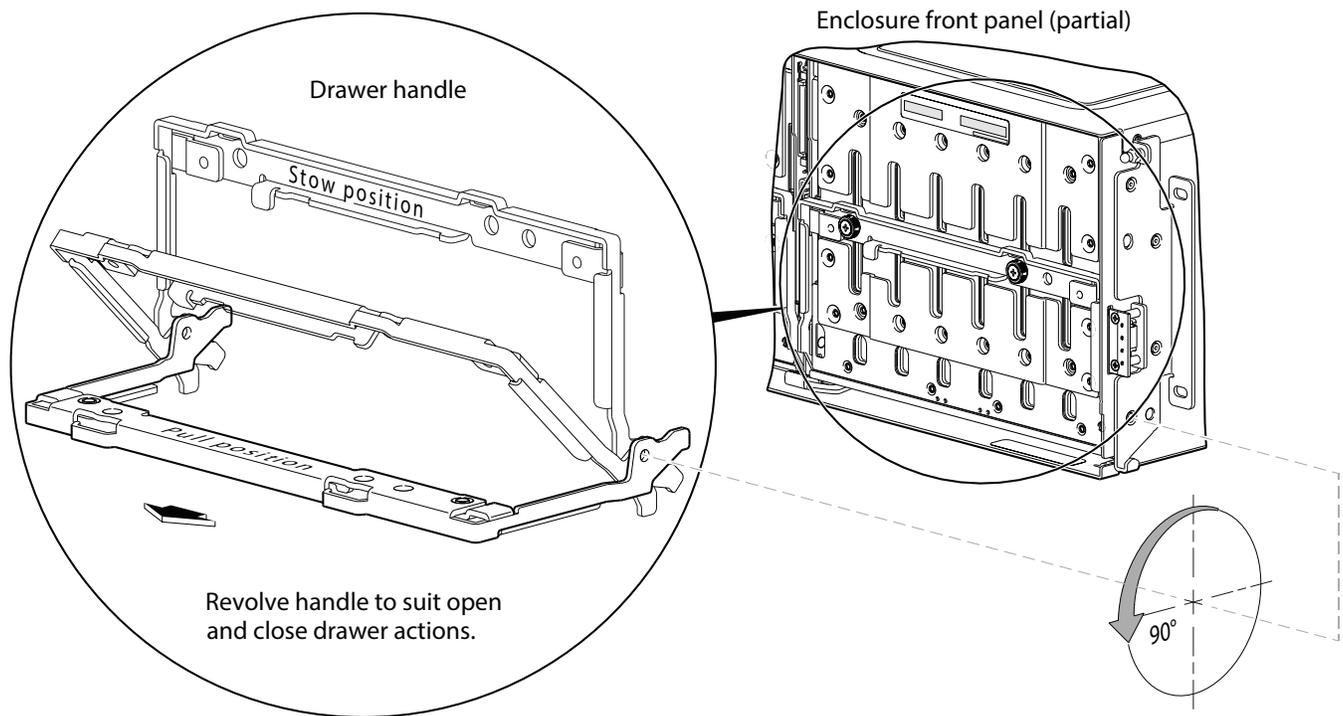
Close a Drawer

To close the drawer, simply slide the drawer into the chassis along the drawer slide until it properly seats in the drawer bay. Take care to ensure that no loose cable wires protrude beyond the limits of the igus chainflex cable. Note that the drawer will lock at the second stop.

To release the lock, use your index fingers to pull the blue clips towards the front of the drawer and slide the drawer into the chassis. After closing the drawer, revolve the handle upwards such that it is flush with the drawer front panel—in stowed position—and tighten the two handle screws. Re-attach the bezel to the front of the chassis.

Replace a 56-Drive Module

A drive module consists of a drive in a sled. Drive modules are hot-swappable, which means they can be replaced without halting I/O to the vdisks, or powering off the chassis. The new drive module must be of the same type, and possess capacity equal to or greater than the one being replaced. Otherwise, the storage system cannot use the new drive to reconstruct the vdisk (see "About vdisks" and "About drive failure and vdisk reconstruction" topics in the *WBI User Guide*).

ⓘ **Note:** If replacing a drive within a QXS-5600, you must configure the spare drive as a global hot spare for the new drive to rebuild into the system (LUN). After adding this drive as a global hot spare, the rebuild starts right away. See QXS-5600 Global Hot Spare Instructions on page 83 for more information.

Before You Begin

⚠ **Caution:** Removing a drive module impacts the airflow and cooling ability of the chassis. If the internal temperature exceeds acceptable limits, the chassis may overheat and automatically shut down or restart. To avoid potential overheating, wait 20 seconds to allow the internal drives to stop spinning (HDDs), then insert the new drive module.

For more information, see Preventing Electrostatic Discharge on page 37 and Grounding Methods to Prevent Electrostatic Discharge on page 38.

Verify Component Failure

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

⚠ **Caution:** Failure to identify the correct drive module could result in data loss if the wrong drive is removed from the chassis. If your chassis has a bezel installed, remove it to view drive LEDs. Alternatively, you can observe drive component health via Disk Management Utility.

56-Drive Modules

For line-of-sight viewing of individual drive LEDs, you must remove the chassis bezel and open the drawer to view its installed drives and blanks (if used). When a drive fails or a fault occurs, the drive LED illuminates with a 4Hz (4:1) blue blink behavior (refer to *QX and QXS: Setup Guide* for additional information on LEDs). You can determine from visual inspection which drive in the drawer is experiencing a fault/failure.

Using management interfaces

Alternatively, you can observe drive component health using management interfaces to verify component failure or component operation (see Using management interfaces on page 135 for more information).

Using Disk Management Utility V3

1. Sign in to the disk management utility (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. Click the **System** topic. The System panel opens.

3. 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 Health Recommendations.

Using Disk Management Utility V2

1. Sign in to Disk Management Utility (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. View the System Overview panel to determine whether the health of the new drive is OK.

   - If the health is OK, then the drive module installation process is complete.

   - If the health is not OK, then in the Configuration View panel, select the chassis that the new drive is in to display the Enclosure Overview panel, and select the drive to view details about it, such as Status and Health Recommendations.

Using the CLI

You can set a CLI preference to use v3 or v2 terminology in command output and system messages.

> ℹ **Note:** The following CLI commands enable you to set the management mode to V3 or V2:
> -Use **set protocols** to change the default management mode.
> -Use **set cli-parameters** to change the current management mode for the CLI session.
> The system defaults to V3 for new customers and V2 for existing users. See the CLI Reference Guide for more information).

1. Log in to the CLI (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. To view information about drives, run the following command:

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

   Drives are specified by chassis/enclosure ID and slot number. Enclosure IDs increment from 0. Drive IDs increment from 0 in each chassis/enclosure (e.g., show disks 0.7). Entering the command shown above will display the drive health for the drive residing in slot number 7 of chassis/enclosure number 0 (i.e., the RAID chassis). If health is not OK, the command output will also display recommended actions.

Remove the 56-Drive Module

To access drive slots in the drawer bays, you must first do the following:

- Remove the chassis bezel (see narrative instructions following <u>Assembly with bezel removed (4U56) on page 31</u>).

- Pull the drawer outward as described in <u>Open a Drawer on page 75</u>.

⚠️ **Caution:** Drawer and drive slot numbering are described pictorially on the adhesive label laminated to the exterior wall of each drawer. Drive slot numbering for drawers 0 (left) and 1 (right) begins at the front of the drawer and moves inward (row-by-row) along the x-axis.

⚠️ **Caution:** Drive module removal guidelines:

- Stop I/O to the drive (see Stop I/O on page 42)

- Remove only one drive module at a time: concurrent/multiple drive module removal is not allowed.

- Remove the drive module (per step procedure)—wait 30 seconds—before removing another drive.

1. Refer to Figure 66 below for an illustration of the QXS-5600 system.

2. Using your index finger, slide the release latch—located in the upper pocket on the face of the drive module—forward to disengage the drive module (see detail inset view in Figure 15).

   Moving the latch forward will provide a clicking sound and cause the spring to move its position inside the drawer cage, partially ejecting the drive from its installed position within the drive slot.

Figure 66: Remove a drive from a drawer slot

3. Wait 20 seconds for the internal drives to stop spinning (HDDs).

4. Once the drive module partially ejects from the slot, grasp the module firmly, and carefully pull it straight out of the drawer slot. Take care not to drop the module.

Install a 56-Drive Module

To access drive slots in the drawer bays, you must first do the following:

- Remove the chassis bezel (see narrative instructions following Assembly with bezel removed (4U56) on page 31).
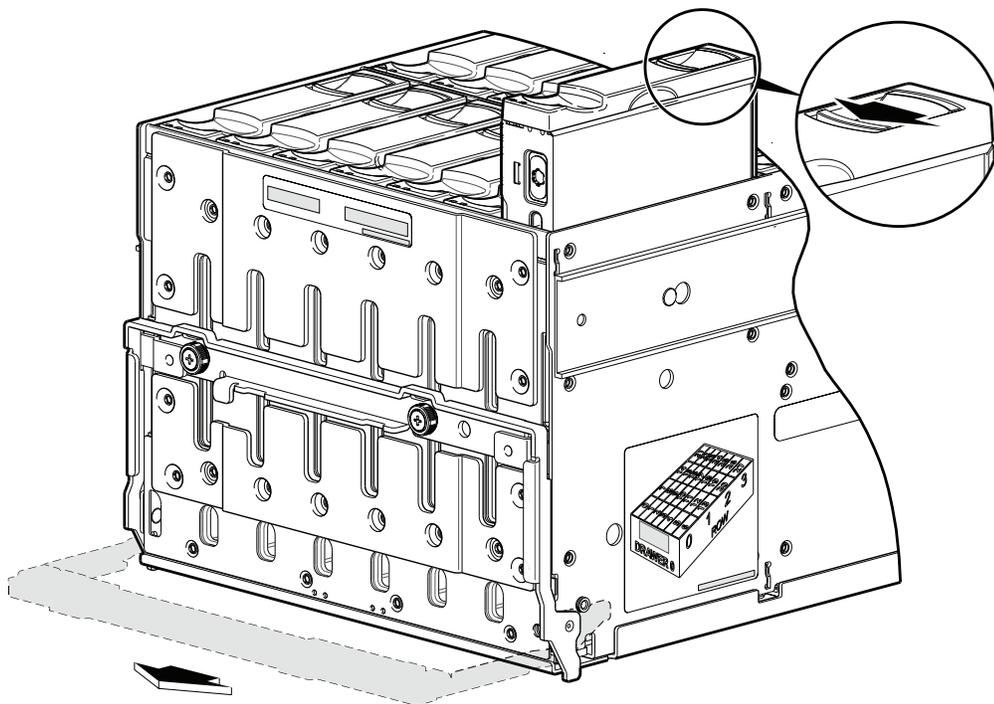- Pull the drawer outward as described in Open a Drawer on page 75.

⚠️ **Caution:** Drive module installation guidelines:

- Install only one drive module at a time: concurrent/multiple drive module insertions are not allowed.
- Install the drive module (per step procedure)—wait 45 seconds—before installing another drive module.

⚠️ **Caution:** As you install multiple drives into the drawer, populate from back row to front row, while installing drives into the slots. Provide adequate support for the weight of the extended drawer as you install the drives.

An exception to this statement occurs if you are installing drive modules to partially fill a drawer, in which case you must install a minimum of 14 drive modules, and they must be placed in contiguous slots closest to the front of the drawer.

Installing a Drive

The chassis uses an LFF sledded drive positioned to stand on end (Figure 67 below), for insertion into the drive slot within the drawer FRU. Each drive is mated to a connector on the drawer PCBA.

Figure 67: Install a drive into a drawer slot
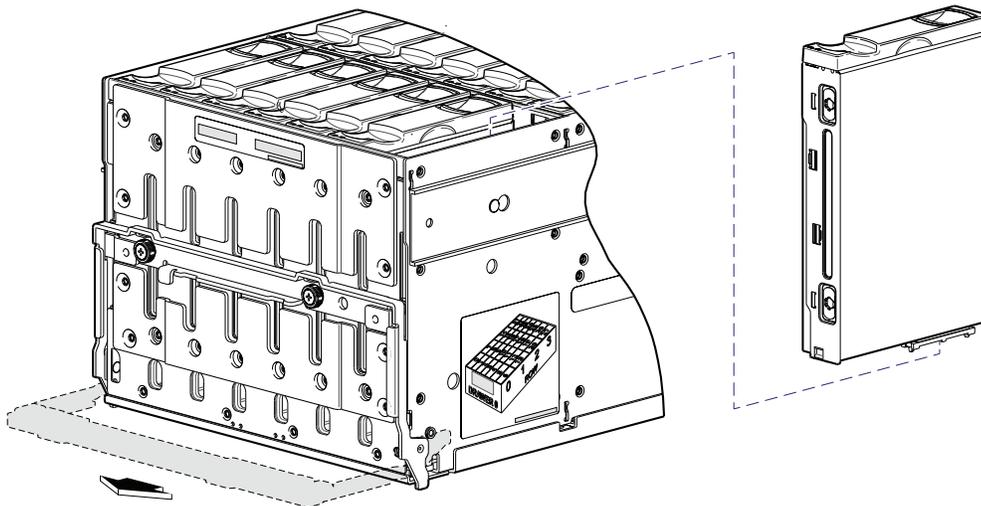
1. With the drive module standing on end—and the LEDs oriented to the left—insert the drive module into the vertically-aligned drive slot. Notches on the inside of the drawer will help guide the drive to the correct position and seat the drive into the connector on the drawer PCBA.

2. Verify that you have inserted the drive module into the slot as far as it will go. A spring in the drawer slot will provide a resistive force when mating the drive to the connector. This will ensure that the module is firmly seated in the drawer PCBA.

ⓘ **Note:** Allow at least 30 seconds to elapse when jointly completing a removal and installation of a drive.

⚠ **Caution:** If you install an empty drive and intend to use it as a spare, the drive must be enabled as a spare in order for this procedure to be complete. Spares can be managed using the Disk Management Utility or the CLI.

Using Disk Management Utility V3

1. Sign in to the disk management utility (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. Click the **System** topic. The System panel opens.

3. 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 Health Recommendations.

Using Disk Management Utility V2

1. Sign in to Disk Management Utility (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. View the System Overview panel to determine whether the health of the new drive is OK.

   - If the health is OK, then the drive module installation process is complete.

   - If the health is not OK, then in the Configuration View panel, select the chassis that the new drive is in to display the Enclosure Overview panel, and select the drive to view details about it, such as Status and Health Recommendations.

Using the CLI

You can set a CLI preference to use v3 or v2 terminology in command output and system messages.

> ℹ **Note:** The following CLI commands enable you to set the management mode to V3 or V2:
> -Use **set protocols** to change the default management mode.
> -Use **set cli-parameters** to change the current management mode for the CLI session.
> The system defaults to V3 for new customers and V2 for existing users. See the CLI Reference Guide for more information).

1. Log in to the CLI (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. To view information about drives, run the following command:

show disks <disk-ID>

Drives are specified by chassis/enclosure ID and slot number. Enclosure IDs increment from 0. Drive IDs increment from 0 in each chassis/enclosure (e.g., show disks 0.7). Entering the command shown above will display the drive health for the drive residing in slot number 7 of chassis/enclosure number 0 (i.e., the RAID chassis). If health is not OK, the command output will also display recommended actions.

QXS-5600 Global Hot Spare Instructions

This section provides information on configuring drives as a global hot spare:

- Using Disk Management Utility V2/Global Hot Spare below
- Using Disk Management Utility V3/Global Hot Spare on page 85

> ℹ **Note:** If replacing a drive within a QXS-5600, you must configure the spare drive as a global hot spare for the new drive to rebuild into the system (LUN). After adding this drive as a global hot spare, the rebuild starts right away.

Using Disk Management Utility V2/Global Hot Spare

1. Using the Disk Management Utility, go to the Provisioning section and select Manage Global Hot Spares (Figure 68 on the next page).

Figure 68: Manage Global Spares
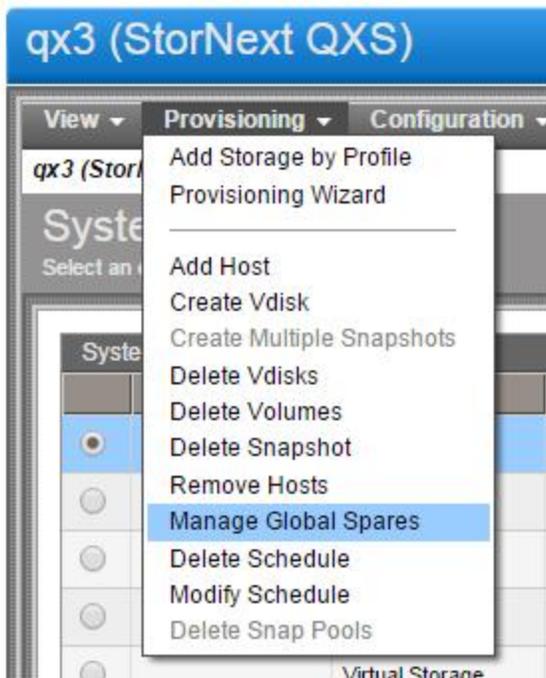
2. Select the new replacement drive and click on Modify Spares ().

Figure 69: Modify Spares

3. As soon as the drive is added to the Global Hot Spare group, the LUN rebuild process initiates automatically.

Using Disk Management Utility V3/Global Hot Spare

1. Using the Disk Management Utility, go to the Action tab and select Change Global Spares (Figure 68 on the previous page).

Figure 70: Change Global Spares

2. Select the new replacement drive(s) and click on the "Change" button (Figure 69 on the previous page).

Figure 71: Select Spares

3. Verify that the "Processing the request" screen appears.

Figure 72: Processing the request screen
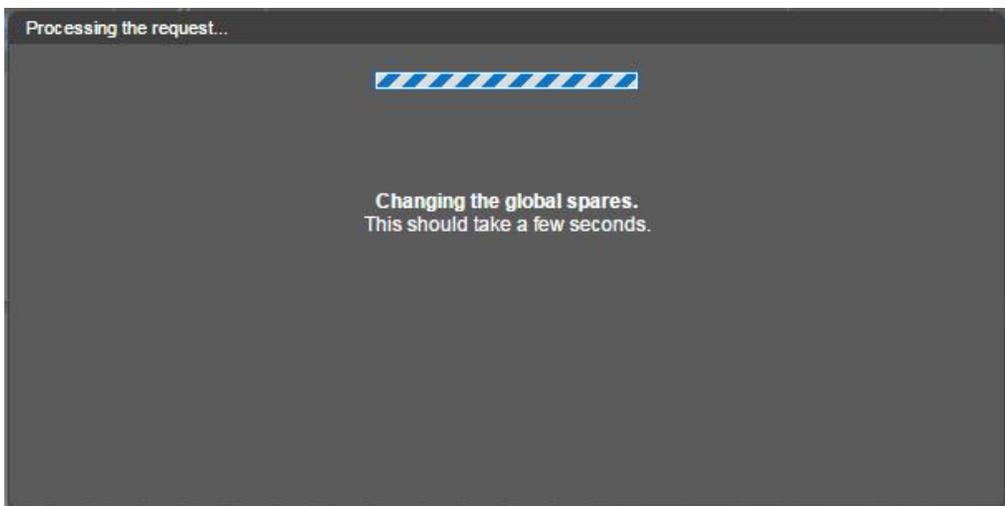
4. Verify that the "Success" screen appears after the process is complete.

Figure 73: Success screen
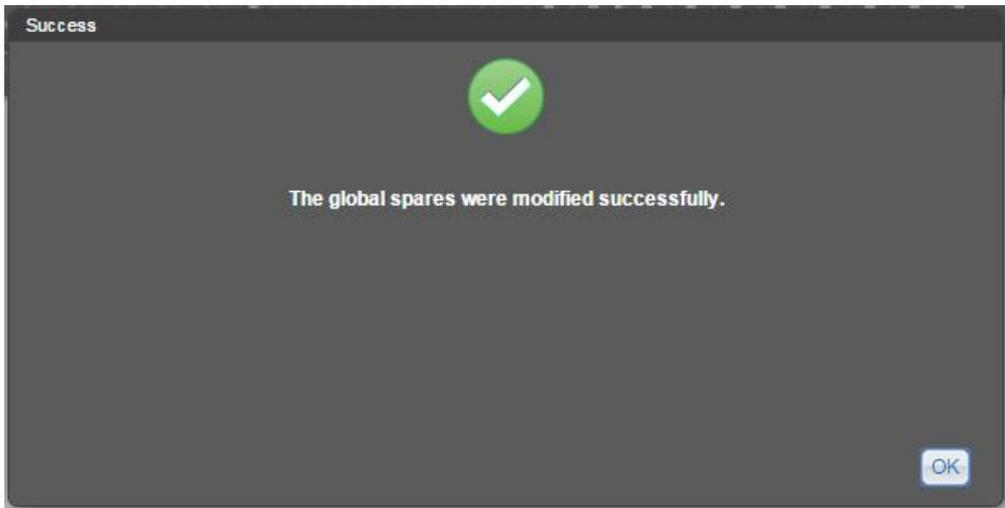
5. Click on the System icon to view the status of the global spare(s).
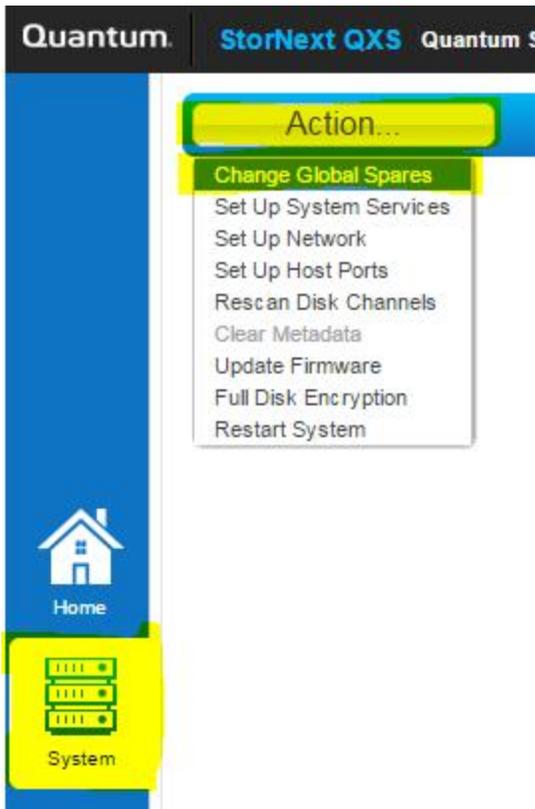
Figure 74: Processing the request screen

6. As soon as the drive is added to the Global Hot Spare group, the LUN rebuild process initiates automatically.

Using Disk Management Utility V3

1. Sign in to the disk management utility (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. Click the **System** topic. The System panel opens.

3. 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 Health Recommendations.

Using Disk Management Utility V2

1. Sign in to Disk Management Utility (use default user manage and password !manage, or the appropriate username and password if they have been changed).
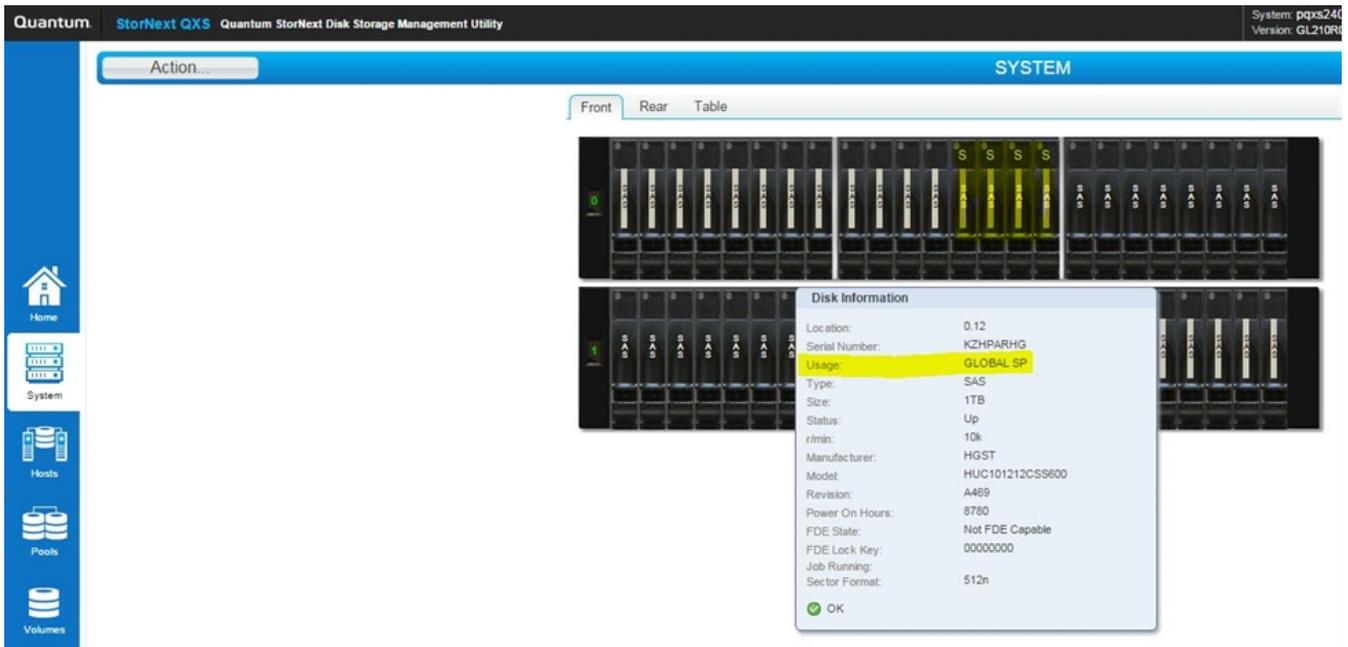
2. View the System Overview panel to determine whether the health of the new drive is OK.

    - If the health is OK, then the drive module installation process is complete.

    - If the health is not OK, then in the Configuration View panel, select the chassis/enclosure that the new drive is in to display the Enclosure Overview panel, and select the drive to view details about it, such as Status and Health Recommendations.

Setting CLI Preferences

You can set a CLI preference to use v3 or v2 terminology in command output and system messages.

ⓘ Note: The following CLI commands enable you to set the management mode to V3 or V2:
-Use **set protocols** to change the default management mode.
-Use **set cli-parameters** to change the current management mode for the CLI session.
The system defaults to V3 for new customers and V2 for existing users. See the CLI Reference Guide for more information).

1. Log in to the CLI (use default user manage and password !manage, or the appropriate username and password if they have been changed).

2. To view information about drives, run the following command:

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

Drives are specified by chassis/enclosure ID and slot number. Enclosure IDs increment from 0. Drive IDs increment from 0 in each chassis/enclosure (e.g., show disks 0.7). Entering the command shown above will display the drive health for the drive residing in slot number 7 of chassis/enclosure number 0 (i.e., the RAID chassis). If health is not OK, the command output will also display recommended actions.

Determine if a Drive is Missing

You can determine whether a drive is missing by using disk management utility V2, disk management utility

V3, or the CLI.

Using Disk Management Utility V3

1. Sign-in to the 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 chassis/enclosure ears to see metadata for specific chassis/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 Disk Management Utility V2

1. Sign-in to Disk Management Utility 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 Configuration View panel, right-click the appropriate chassis/enclosure under **Physical**.

   - Select the **Front Graphical** tab to display a pictorial representation of drives within slots, and the supporting chassis/enclosure table showing properties and values.

   - Select the **Front Tabular** tab to display the Enclosure's Front View data table and supporting chassis/enclosure table showing properties and values.

3. Using the graphical and tabular views, look for gaps in the drive location sequence to determine if a drive is missing.

Setting CLI Preferences

You can set a CLI preference to use v3 or v2 terminology in command output and system messages.

 Note: The following CLI commands enable you to set the management mode to V3 or V2:
   -Use **set protocols** to change the default management mode.
   -Use **set cli-parameters** to change the current management mode for the CLI session.
   The system defaults to V3 for new customers and V2 for existing users. See the CLI Reference Guide for more information).

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 drives' properties by location. Review the information, and look for gaps in the drive location sequence to determine whether any drives are missing.

Verify Component Operation

Verify that the Power/Activity LED—located on the front face of the drive escutcheon—is illuminated green.

> ℹ **Note:** See the *QX and QXS Setup Guide* for descriptions of drive LEDs and other front panel LEDs pertaining to RAID chassis.

Also see as an alternative to physically observing LEDs to verify component operation.

Replace a 12-, 24-, or 48-Drive Chassis PSU

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 chassis, and PSUs are properly aligned for insertion into the rear panel of the chassis.

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

> ⚠ **Caution:** Power supply module replacement activities can cause chassis cables to disconnect and drives to go offline. Be careful with cabling connections during module replacement.

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 module within the chassis. Be very careful if moving a cabled/operational chassis during the module replacement process.

> ℹ **Note:** See for additional information about power supply faults and recommended actions.

Before You Begin

⚠️ **Caution:** Removing a power supply unit significantly disrupts the chassis's airflow. Do not remove the PSU until you have received the replacement module.

For more information, see Preventing Electrostatic Discharge on page 37 and Grounding Methods to Prevent Electrostatic Discharge on page 38.

Verify Component Failure

When either a fan or power supply component fails, Disk Management Utility 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 551 or 168	• V3: Verify that all fans are working using the Disk Management Utility. 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. • V2: Verify that all fans are working using Disk Management Utility. In the Configuration View, expand **Physical**, right-click the chassis and select **View > Overview**. Select either **Rear Graphical** or **Rear Tabular** to view health attributes • 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 chassis. • 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 551 or 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 module if necessary.
AC Power Good LED is off	Same as above.

Problem	Recommended action
Voltage/Fan Fault/Service Required LED is illuminated	Replace the power supply module.

Alternatively, you can observe power supply component health (PSUs, fans) using management interfaces to verify component failure or component operation (see Using management interfaces on page 135 for more information).

Power Supply Units

⚠️ **Caution:** 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 module included with the chassis. For RAID and expansion chassis configured with AC PSUs that do not have power switches, refer to the procedure described under Power Off AC and DC PSUs below. For procedures pertaining to a) chassis configured with DC PSUs, or b) previously installed expansion chassis featuring power switches, see DC and AC PSUs with power switch on the next page.

ℹ️ **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 chassis, and are interchangeable, provided they are of the same form factor/physical size and power rating.
The 56-drive chassis (4U) uses an altogether different power supply unit than the model used for 12-, 24-, and 48-drive chassis (2U).

Power Off AC and DC PSUs

Chassis 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 75: AC PSU
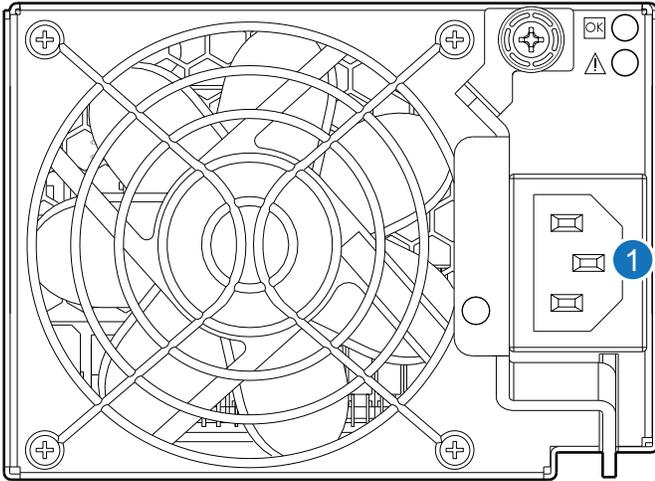
1. **Power cord connect**

Powering off the PSU

1. Stop all I/O from hosts to the chassis (see Stop I/O on page 42).

ℹ️ **Note:** This step is not required for hot-swapping; however, it is required when replacing both PSUs.

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.

ℹ️ **Note:** This step is not required for hot-swapping; however, it is required when replacing both PSUs.

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.

ℹ️ **Note:** See Connect a Power Cable on page 99 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.

Figure 76: DC power supply with power switch
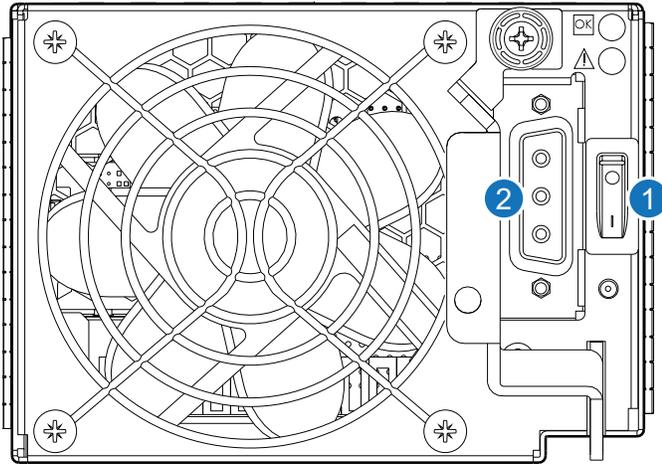
1. **DC power switch**
2. **DC power cable connect**

Figure 77: AC power supply with power switch
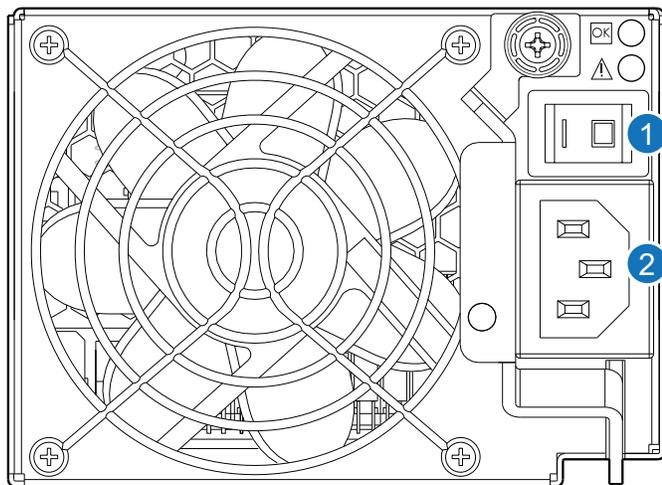
1. **AC power switch**
2. **AC power cord connect**

Powering off the PSU

1. Stop all I/O from hosts to the chassis (see).

> **ℹ Note:** This step is not required for hot-swapping; however, it is required when replacing both PSUs.

2. Use management software to shut down any other system components necessary.

> ℹ **Note:** This step is not required for hot-swapping; however, it is required when replacing both PSUs.

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.

> ℹ **Note:** See Connect a Power Cable on page 99 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 (Figure 83 on page 101 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.

Remove a 12-, 24-, or 48-Drive Chassis PSU

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 chassis 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 sufficient leverage to disconnect the module from the internal connector.

    See Figure 78 on the next page below.

Figure 78: Removing a power supply unit (2U)
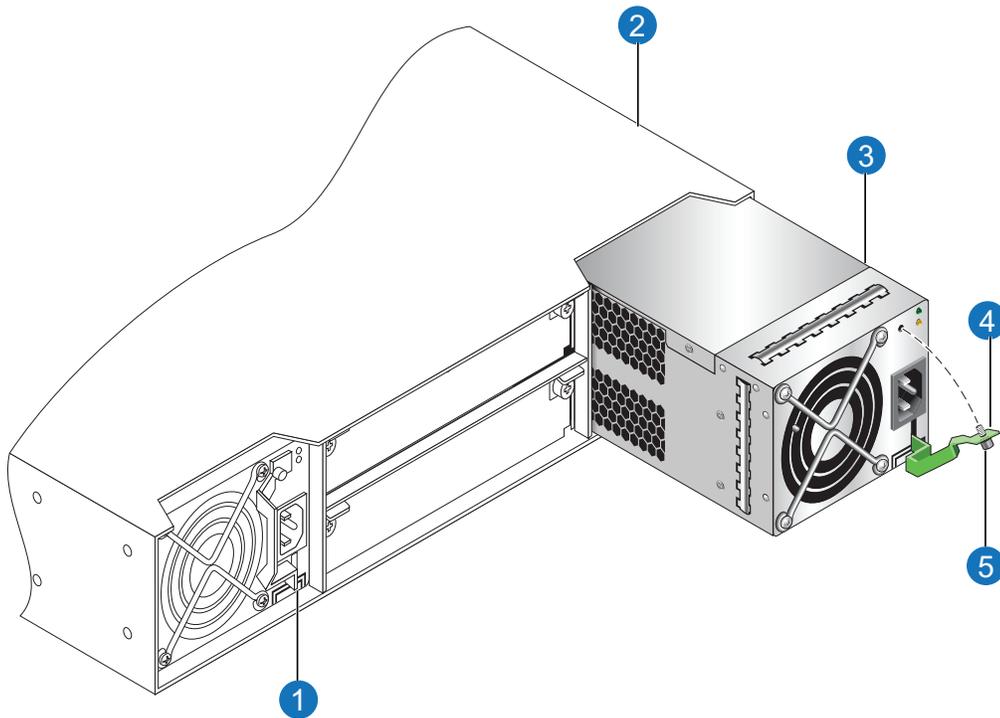
1.	**Power supply unit (installed position)**	4.	**Revolved latch**
2.	**RAID or expansion chassis (cover plates are shown in lieu of IOMs**	5.	**Thumbscrew**
3.	**Power supply unit (PSU) - switchless AC model**		

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 chassis.

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.

Install a 12-, 24-, or 48-Drive Chassis PSU

Figure 79: AC model without power switch
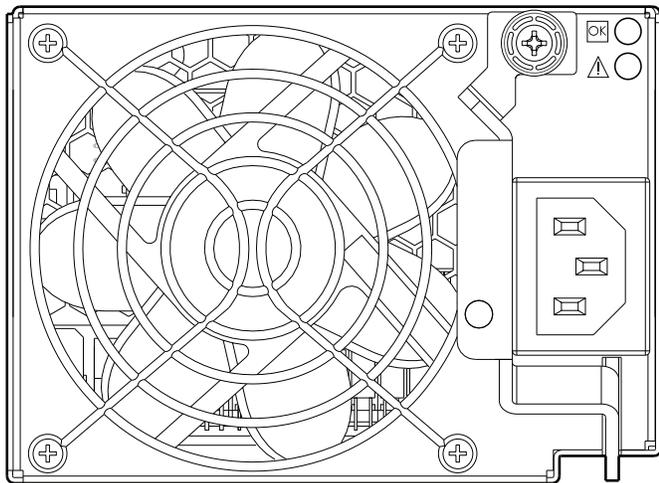
Figure 80: AC model with power switch

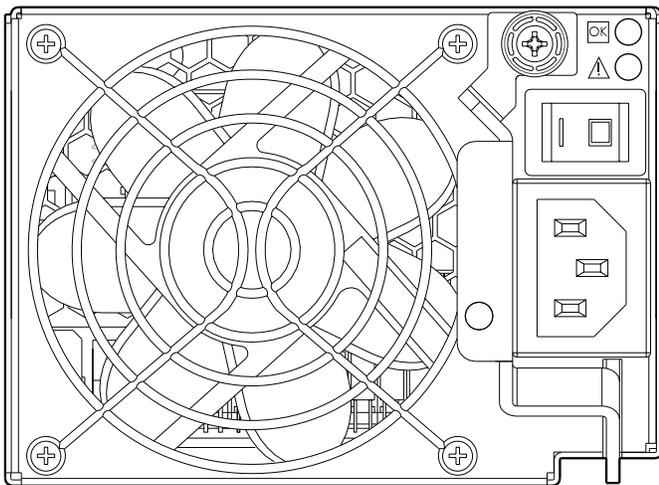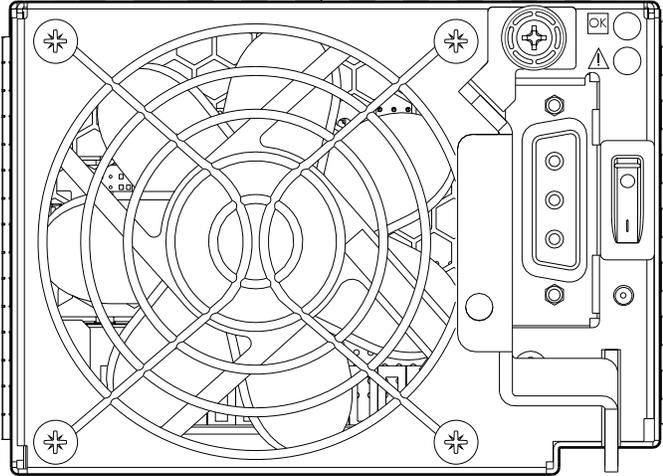**Figure 81:** Orienting a power supply unit (2U)

To install a power supply module

1. Orient the PSU with the AC or DC power cable connector toward the right as shown in Figure 78 on page 97 and Figure 81 above, 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 chassis.

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 chassis, and are interchangeable, provided they are of the same form factor/physical size and power rating.

6. See Connect a Power Cable below to attach the power cable(s).

Connect a Power Cable

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

Figure 82: AC power cord
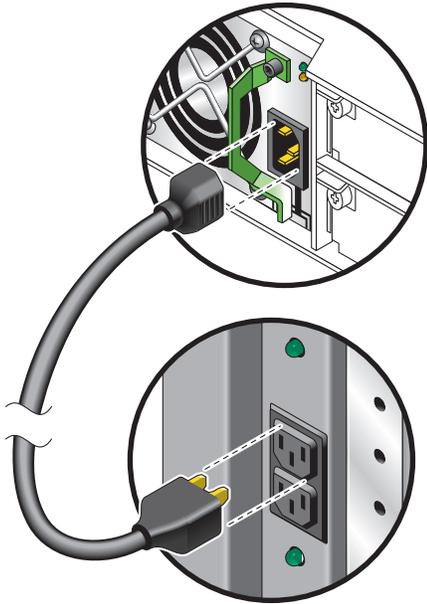
Connecting an AC power cord

The image in Figure 82 above 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 drives to spin up (HDDs).

   - For AC PSUs equipped with a power switch, press the power switch to the **On** position.

      Wait several seconds for the drives to spin up (HDDs).

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 chassis.

Figure 83: 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 83 on the previous page above).

2. If you did not perform a hot-swap, power-on storage system components in the order indicated:

Expansion chassis *first*; RAID chassis *next*; data host *last* (if powered down for maintenance).

Examine PSU module status as indicated in the Table 8 on the next page below.

Figure 84: Power supply for AC model
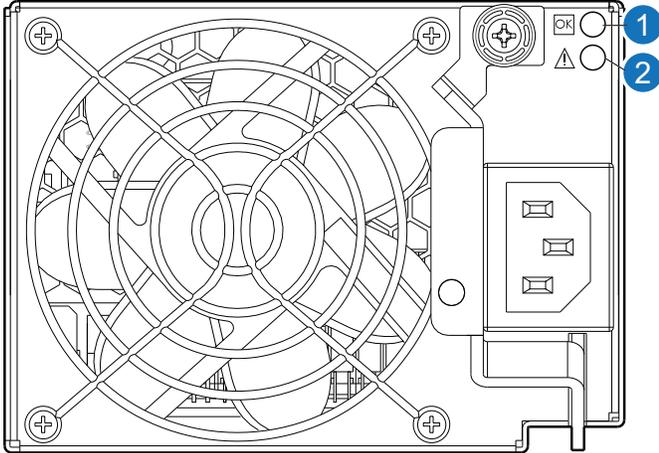
Figure 85: Power supply for DC model
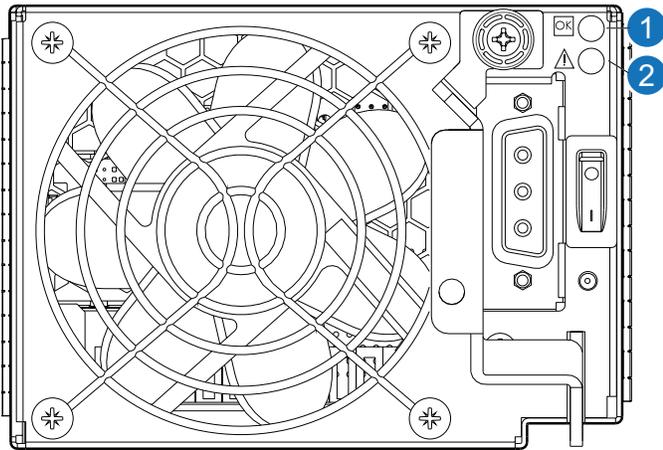
Table 8: Power supply unit LED descriptions

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.

Replace a 56-Drive Chassis PSU and Fan 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 chassis, and PSUs are properly aligned for insertion into the rear panel of the chassis.

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

⚠️ **Caution:** Power supply module replacement activities can cause chassis cables to disconnect and drives to go offline. Be careful with cabling connections during module replacement.

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 module within the chassis. Be very careful if moving a cabled/operational chassis during the module replacement process.

ℹ️ **Note:** See Table 9 on the next page for additional information about power supply faults and recommended actions.

Before You Begin

⚠️ **Caution:** Removing a power supply unit significantly disrupts the chassis's airflow. Do not remove the PSU until you have received the replacement module.

For more information, see Preventing Electrostatic Discharge on page 37 and Grounding Methods to Prevent Electrostatic Discharge on page 38.

Verify Component Failure

When either a fan or power supply component fails, Disk Management Utility 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 9: Power supply faults and recommended actions

Problem	Recommended action
Power supply fan warning or failure, or power supply warning or failure Event code 551 or 168	• V3: Verify that all fans are working using the Disk Management Utility. 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. • V2: Verify that all fans are working using Disk Management Utility. In the Configuration View, expand **Physical**, right-click the chassis and select **View > Overview**. Select either **Rear Graphical** or **Rear Tabular** to view health attributes • 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 chassis. • 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 551 or 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 module if necessary.
AC Power Good LED is off	Same as above.
Voltage/Fan Fault/Service Required LED is illuminated	Replace the power supply module.

Alternatively, you can observe power supply component health (PSUs, fans) using management interfaces to verify component failure or component operation (see Using management interfaces on page 135 for more information).

Power Supply Units

⚠ **Caution:** 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 module included with the chassis. For RAID and expansion chassis configured with AC PSUs that do not have power switches, refer to the procedure described under Replace a 56-Drive Chassis PSU and Fan Module on page 103. For procedures pertaining to a) chassis configured with DC PSUs, or b) previously installed expansion chassis featuring power switches, see Replace a 56-Drive Chassis PSU and Fan Module on page 103.

ℹ **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 chassis, and are interchangeable, provided they are of the same form factor/physical size and power rating.
The 56-drive chassis (4U) uses an altogether different power supply unit than the model used for 12-, 24-, and 48-drive chassis (2U).

AC and DC PSUs for 56-Drive Chassis

The AC and DC power supply are shown below as they appear when facing the rear panel of the chassis. For a midplane-facing view of the PSU, see Figure 86 below.

Figure 86: AC and DC PSUs
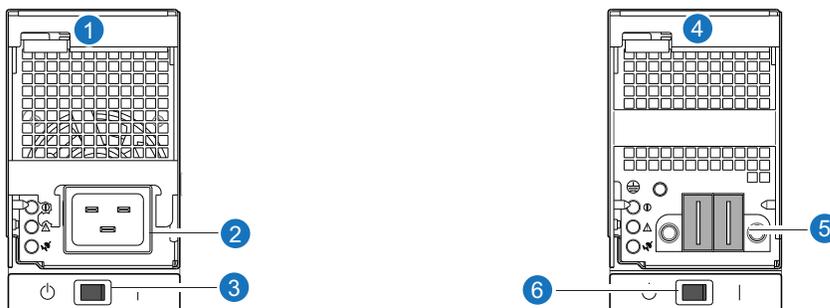
Table 10: AC and DC PSUs for 56-Drive Chassis

1. AC PSU	4. DC PSU
2. AC power connect	5. DC power connect
3. AC power supply switch	6. DC power supply switch

Power Off the PSU

1. Stop all I/O from hosts to the chassis (see Stop I/O on page 42).

ⓘ **Note:** This step is not required for hot-swapping; however, it is required when replacing both PSUs.

2. Use management software to shut down any other system components necessary.

ⓘ **Note:** This step is not required for hot-swapping; however, it is required when replacing both PSUs.

3. If applicable, turn off the power switch on the PSU being replaced and on the replacement PSU.

Disconnect 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.

Disconnect 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.

**Figure 87:** DC power cable featuring D-shell and lug connectors
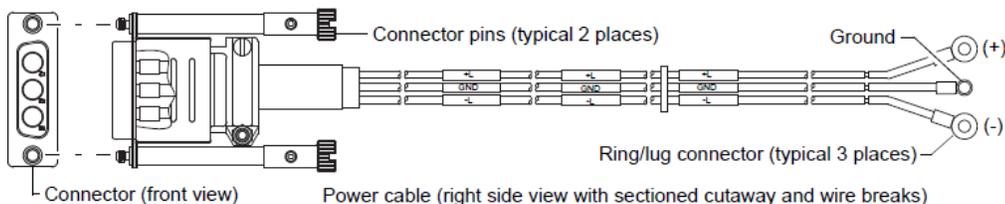
Remove 4U 56-Drive Chassis PSU

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 chassis is powered off.

   Verify that the power switch is set to the Standby position.

3. Verify that the power cords are both disconnected.

4. Using your index finger, move the red latch up to disconnect the module from the internal connector (Figure 88 below).

Figure 88: Removing a power supply unit (4U)
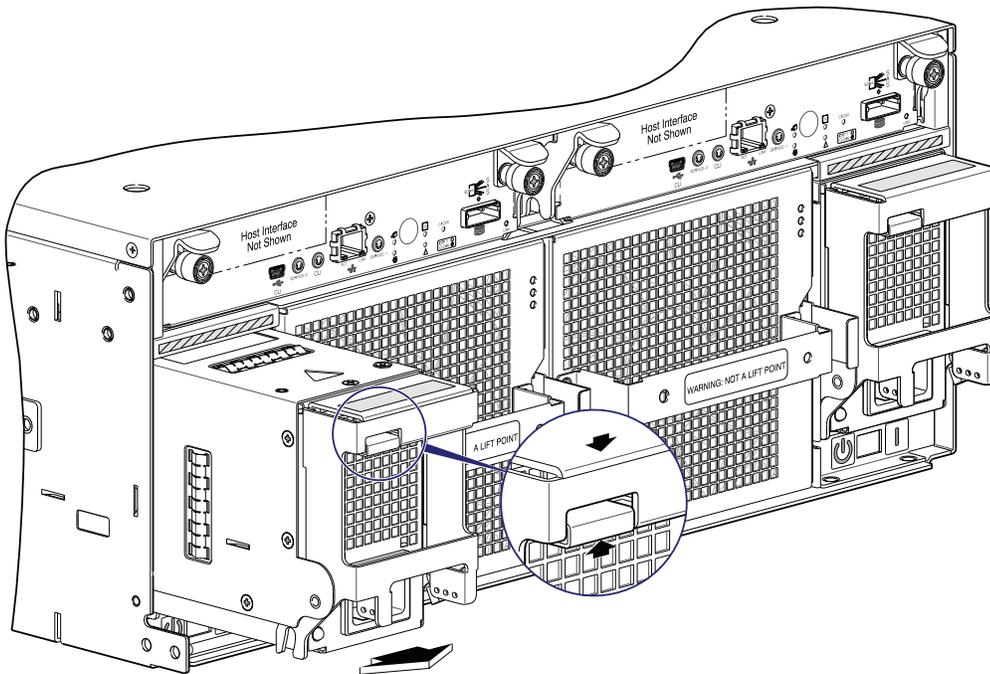
5. Pull the module straight out of the chassis slot, taking care to support the base of the PSU—with both hands—as you remove it from the chassis.

6. If replacing two power supply modules, repeat steps 3—5.

⚠ **Caution:** Do not lift the module by its plastic protective cover; doing so could damage the cover. Using both hands, lift and carry the module using its metal casing.

Install 4U 56-Drive Chassis PSU

1. Orient the PSU with the power cable connector on the bottom as shown above (Figure 89 on the next page).

2. With the handle 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. Using your index finger, move the red button up, ensuring that the connector on the PSU engages the connector inside the chassis.

4. If replacing two power supply modules, repeat steps 1—3.

Figure 89: Installing a power supply unit (4U)
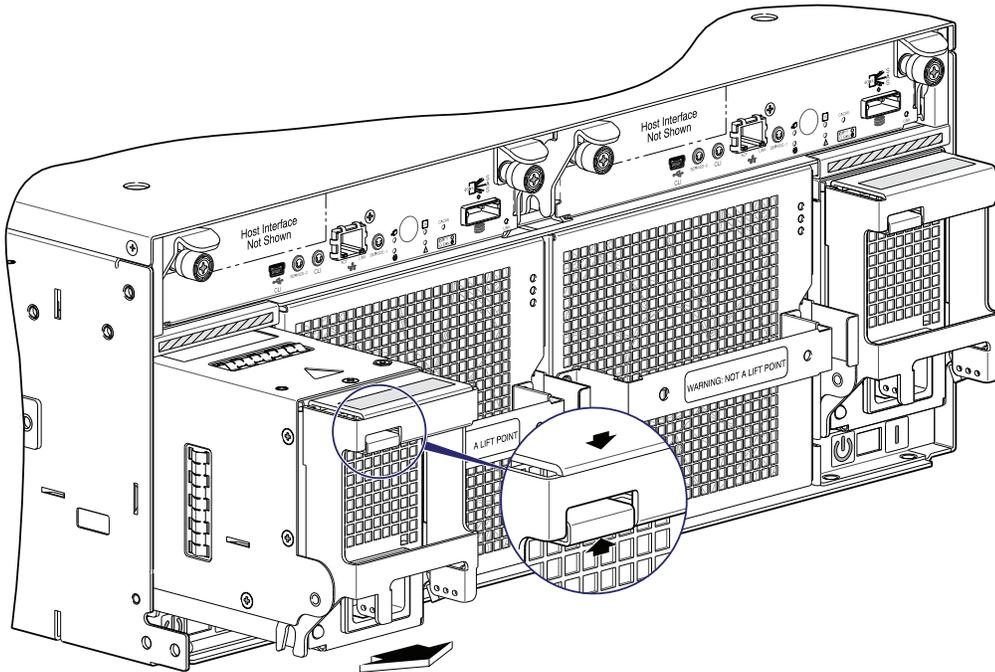
5. See Connect the Power Cable below to attach the power cable(s).

Connect the Power Cable

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

Figure 90: AC power cord

Connect an AC power cord

The image in 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 drives to spin up (HDDs).

   - For AC PSUs equipped with a power switch, press the power switch to the **On** position.

     Wait several seconds for the drives to spin up (HDDs).

3. If replacing two power supply modules, repeat step 1 and step 2.

Connect a DC power cable

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

Figure 91: DC power cable featuring D-shell and lug connectors
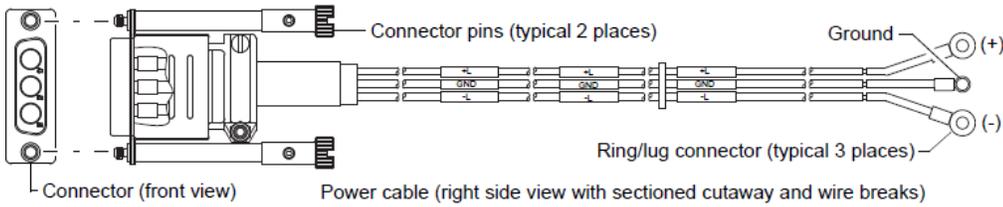
1. Install the appropriate DC power cable:

   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).
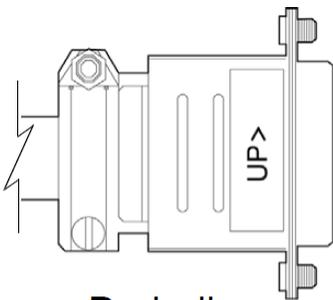
D-shell
(left side view)

   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 91 above above).

2. If you did not perform a hot-swap, power-on storage system components in the order indicated:

   Expansion chassis *first*; RAID chassis *next*; data host *last* (if powered down for maintenance).

Verify Component Operation

Examine PSU module status as indicated in the table below.

Figure 92: Power supply unit LED descriptions
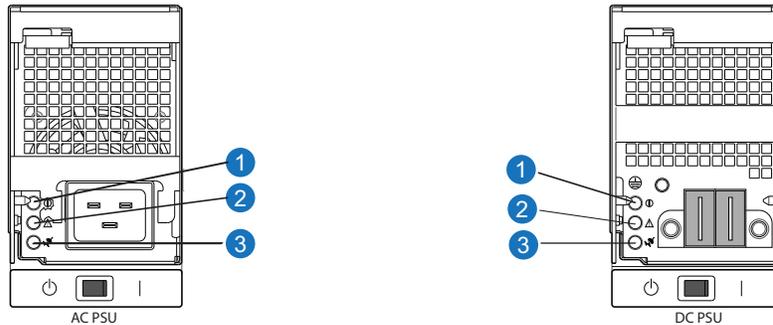
Table 11: Power supply unit LED descriptions

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.
3 — DC Power	Green	On	Main output power on.
		Off	Power is off; main output is off; or a fault is detected.

LEDs for a PSU are located in the top right corner of the module face, as shown in Figure 92 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 135 as an alternative to physically observing LEDs to verify component operation.

Replace 4U 56-Drive Chassis Fan Control Module

This section provides procedures for replacing a failed fan control module (FCM). Illustrations in fan control module replacement procedures show rear panel views of the chassis, and FCMs are properly aligned for insertion into the rear panel of the chassis.

A single FCM is sufficient to maintain operation of the chassis. You need not halt operations and completely power-off the chassis when replacing only one FCM; however, a complete orderly shutdown is required if replacing both fan control modules.

Before you begin

⚠️ **Caution:** Removing a fan control module significantly disrupts the chassis's airflow. Do not remove the FCM until you have received the replacement module.

For more information, see Preventing Electrostatic Discharge on page 37 and Grounding Methods to Prevent Electrostatic Discharge on page 38.

Verify component failure

You can observe fan module component health (PSUs, fans) using LEDs, management interfaces, or a combination thereof to verify component failure or component operation (see Using management interfaces on page 135 for more information).

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

Table 12: FCM faults and recommended actions

Problem	Recommended action
Power supply fan warning or failure, or fan module warning or failure Event code 552 or 558 (4U56)	• V3: Verify that all fans are working using Disk Management Utility. Click the **System** tab within the topics pane and from the System topic, select the **Rear** tab. Hover over each fan control module to view health attributes. You can also select the **Table** tab and view health status for fan control modules and other components in tabular form. • V2: Verify that all fans are working using Disk Management Utility. In the Configuration View, expand Physical, right-click the chassis and select **View** > **Overview**. Select either **Rear Graphical** or **Rear Tabular** to view health attributes. • 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 chassis. • Ensure that the power supply modules are properly seated and secured within their slots. • Ensure that the fan control 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.
AC Power Good LED is off	Same as above.
Voltage/Fan Fault/Service Required LED is illuminated	Replace the power supply module FRU.

Remove the Fan Control Module

1. Refer to [Figure 93 below](#) for an illustration of the fan control module.

2. If replacing a single fan control module via hot-swap, proceed to step 3.

3. If replacing both fan control modules, verify that the chassis is powered off.

4. Verify that the power cord is disconnected.

5. Using your index finger, move the latch (located on the right side of the handle) to the left.

Figure 93: Removing a fan control module (4U)
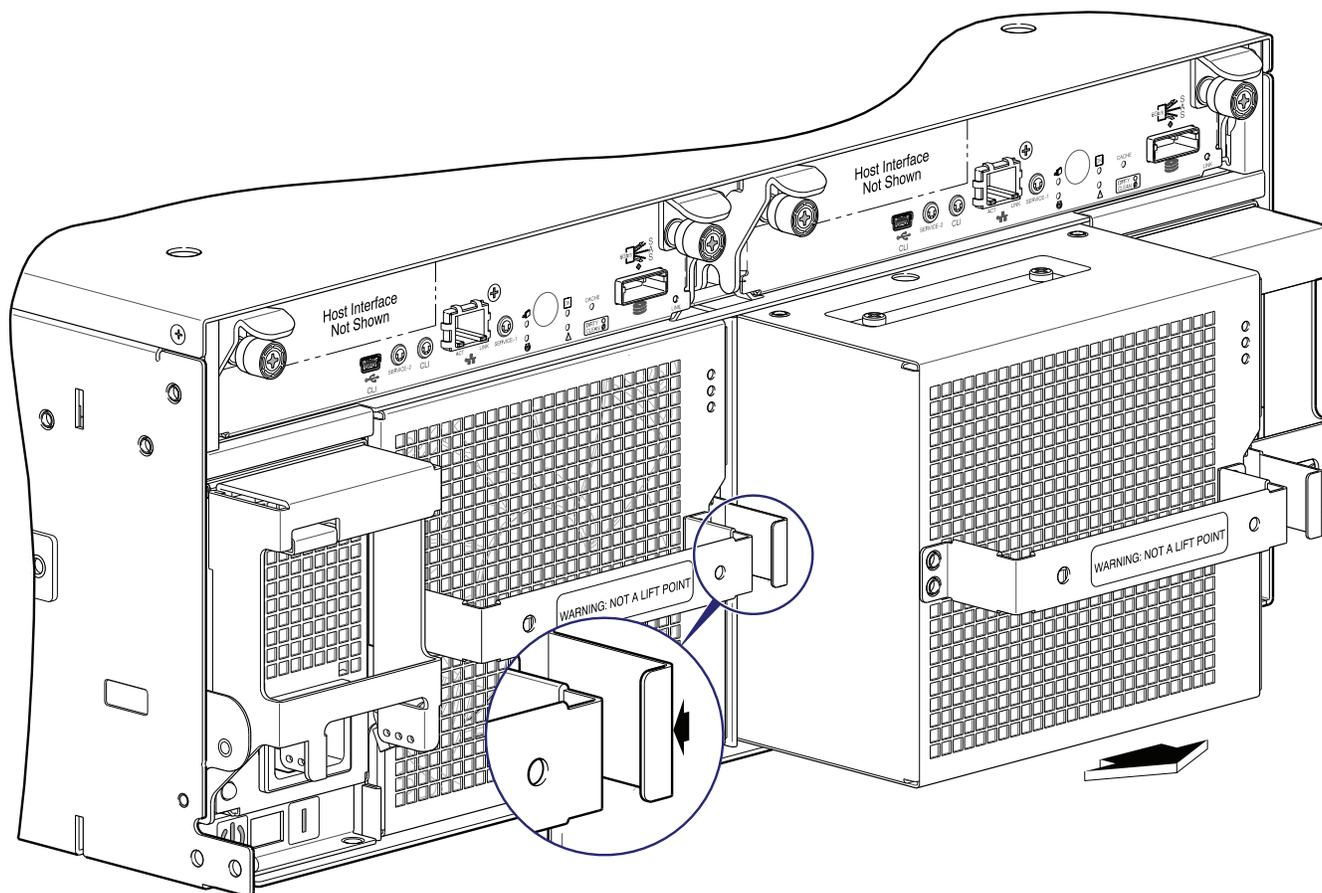
6. While holding the handle with the latch pinched, pull the module straight out of the chassis slot, taking care to support the base of the FCM—with both hands—as you remove it from the chassis.

7. If replacing two fan control modules, repeat steps 3—5.

⚠ **Caution:** The fan may continue to rotate after removing the FCM.

Install the Fan Control Module

1. Refer to Figure 94 below for an illustration of the fan control module.

2. Orient the fan control module with the power connector (located on the back of the FCM) on the top right.

   There is a stop pin to prevent insertion of the fan control module in the wrong orientation.

3. With the latch in the open position, ensure that the fan control module is level, and slide it into the appropriate fan control slot as far as it will go.

   When the fan control module has locked into position, you will hear a click from the latch.

4. If replacing two fan control modules, repeat step 1 and step 2.

Figure 94: Installing a fan control module (4U)
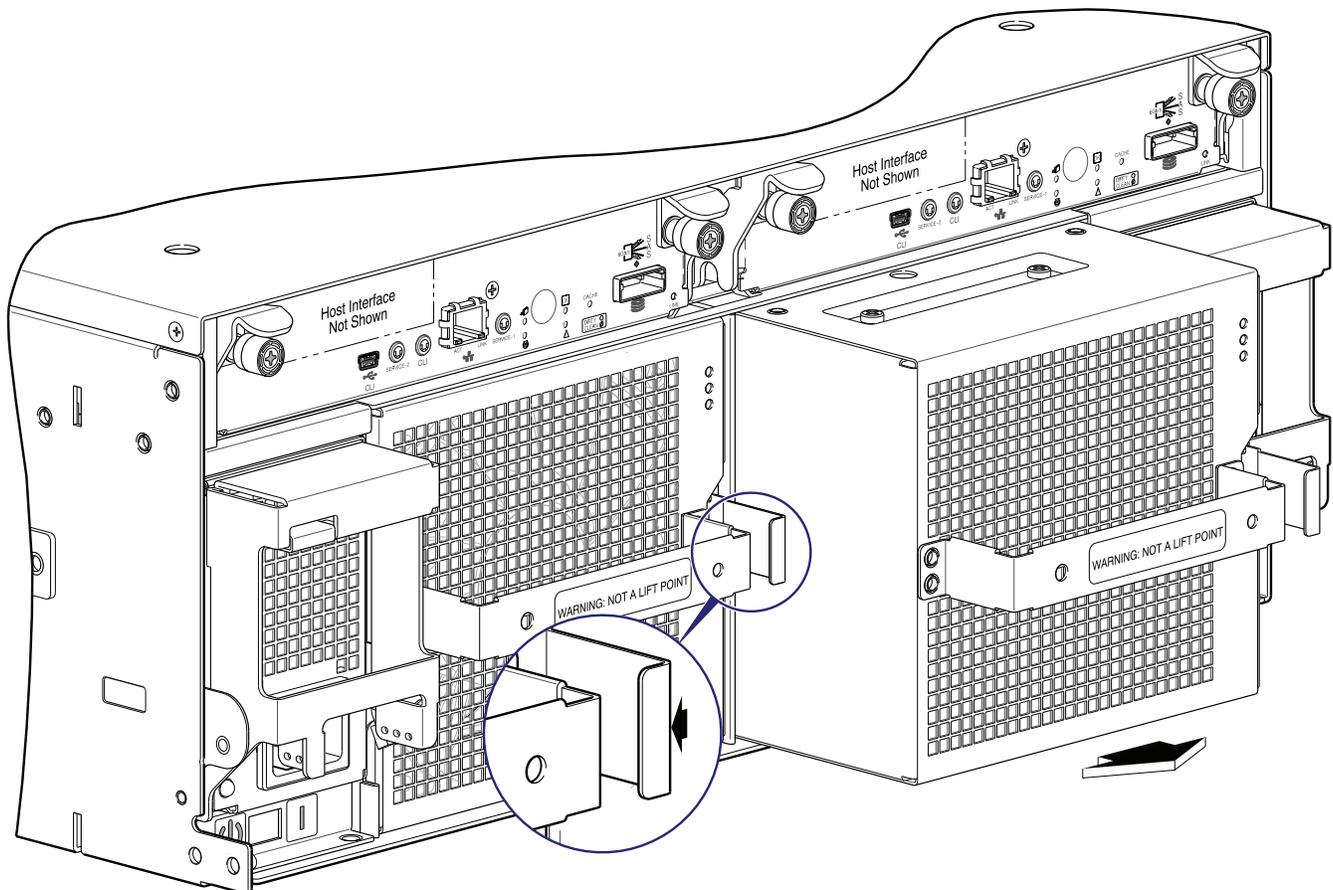
Verify Component Operation

Examine fan control module status as indicated in Figure 95 on the next page and Fan control module LED

Figure 95: Installing a fan control module (4U)
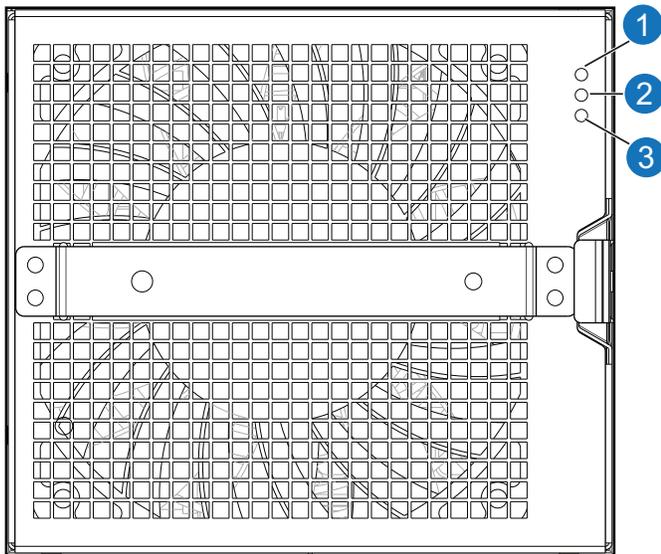
Table 13: Fan control module LED descriptions

LED No./Description	Color	State	Definition
1 — FRU OK	Green	On	Power is on with at least one fan operating normally.
		Off	Both fans are off; the system is powered off.
2 — Fault/Service Required	Amber	On	Fault detected; event has been acknowledged but the problem needs attention.
		Off	No fault condition exists.
3 — Unit locator	White	On	FRU is identified.
		Off	Normal operation.

Replace 12-, 24-, 48-, and 56-Drive Chassis Ear Components

This section provides the following information on replacing the ear components on the 12-, 24-, 48-, and 56-drive chassis.

Before You Begin

⚠️ **Caution:** Verify that you have the proper FRU kit (left or right) for the ear components being replaced.

For more information, see Preventing Electrostatic Discharge on page 37 and Grounding Methods to Prevent Electrostatic Discharge on page 38.

Chassis ear kit FRUs are available for the left and right ears of the chassis front panel. The following ear components replacement procedure applies to ear kits provided with the 12-, 24-, 48-, and 56-drive chassis models, respectively. Refer to the following illustrations pertaining to your product ear kit. Illustrations in ear kit replacement procedures show front panel views of each chassis, and ear bezel components are properly aligned for attachment to the ears on the front panel of the chassis.

12-Drive Chassis Ear Components

This section provides location of the ear components on the 12-drive chassis (2U).

Figure 96 below shows the left ear bezel of a 2U12 model with the LED circuit board installed. The chassis bezel is removed to reveal the left ear and LFF drives. See Figure 5 on page 11 and Newer Bezel Assemblies on page 12 for bezel attachment and removal details.

Figure 96: Replacing left ear bezel — 2U12 models (left ear with bezel removed)
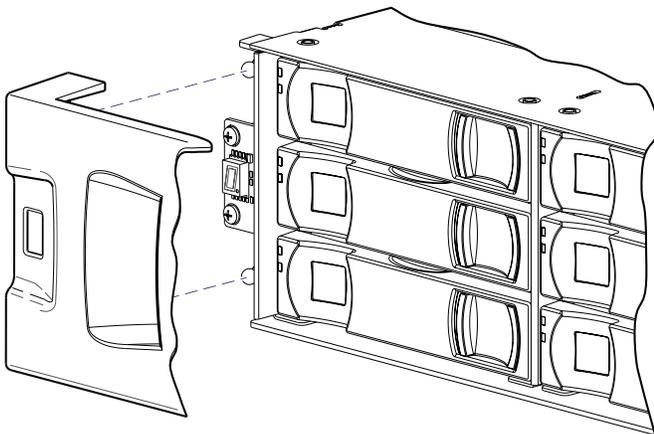
Figure 97 on the next page shows the right ear components of a 2U12 model. The chassis bezel is removed to reveal the right ear and LFF drives. The LED circuit board is shown exploded from its installed position, and aligned with the light pipes, which are integral to the chassis bezel. Individual light pipes are shown exploded from the front of the chassis bezel.

Figure 97: Replacing right ear bezels — 2012 models (right ear explosion)
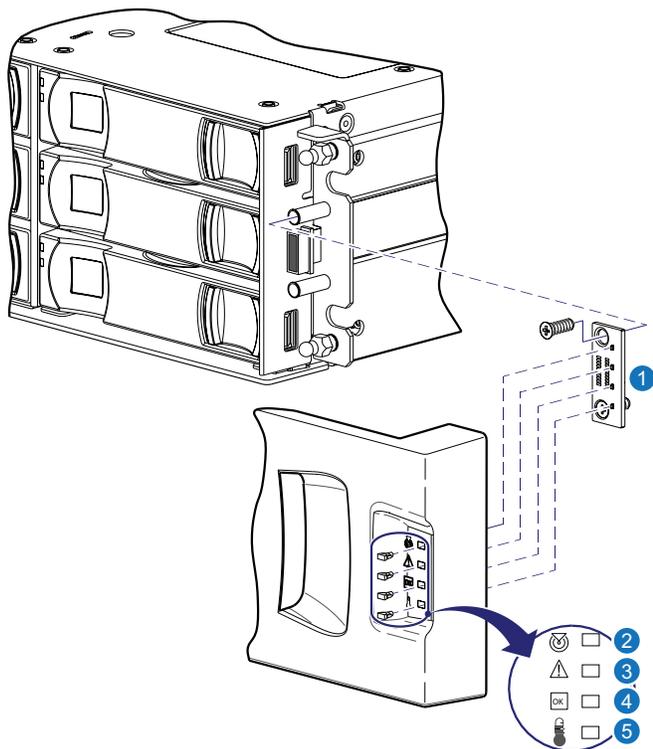
1. **LED circuit board**   4. **FRU OK**

2. **Unit locator**   5. **Temperature fault**

3. **Fault/Service required**

The chassis bezel attaches to four ball studs on the front of the chassis: each 2U12 ear flange hosts two ball studs. Relative to both left and right ear kits for 2U12 models, see Remove Ear Components on page 121 and Replace 12-, 24-, 48-, and 56-Drive Chassis Ear Components on page 115.

> ⓘ **Note:** If your 2U12 chassis is equipped with a bezel that employs an optional air filter, refer to the Bezel Kit Installation document—included in your product shipkit—for instructions on servicing the air filter.

24-Drive Chassis Ear Components

This section provides location of the ear components on the 24-drive chassis (2U).

Figure 98 on the next page shows the left ear components of a 2U24 model with the LED circuit board installed. The chassis bezel is removed to reveal the left ear and SFF drives. See Figure 9 on page 13 and Newer Bezel Assemblies on page 18 for bezel attachment and removal details.

Figure 98: Replacing left ear bezel — 2U24 models (left ear with bezels removed, drives shown)

shows the right ear components of a 2U24 model. The chassis bezel is removed to reveal the right ear. The example uses an empty chassis. The LED circuit board is shown exploded from its installed position, and aligned with the light pipe sub-assembly, which is integral to the chassis bezel.

Figure 99: Replacing right ear bezel — 2U24 models (empty chassis shown)

1. **LED circuit board**   4. **FRU OK**

2. **Unit locator**   5. **Temperature fault**

3. **Fault/Service required**

The chassis bezel attaches to four ball studs on the front of the chassis: each 2U24 ear flange hosts two ball studs. Relative to both left and right ear kits for 2U24 models, see Remove Ear Components on page 121 and Replace 12-, 24-, 48-, and 56-Drive Chassis Ear Components on page 115.
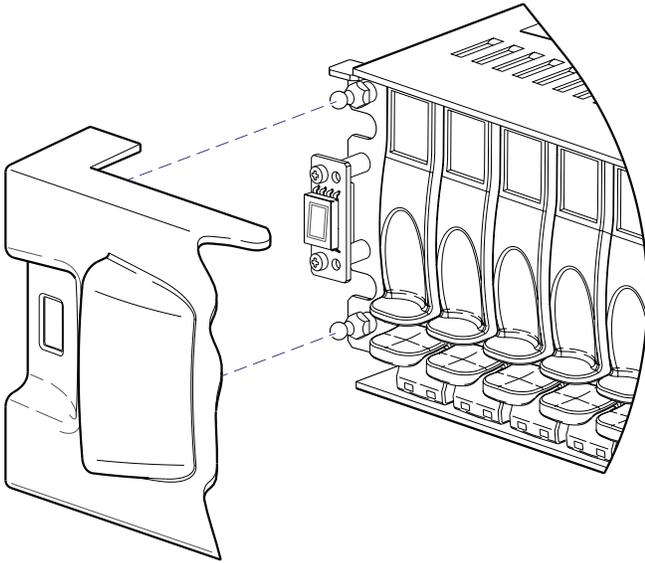
48-Drive Chassis Ear Components

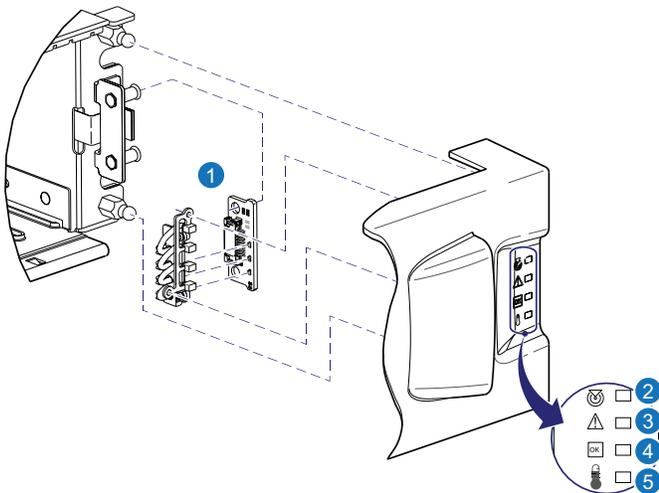This section provides location of the ear components on the 48-drive chassis (2U).

Figure 98 on the previous page shows the left ear components of a 2U48 model with the LED circuit board installed. The chassis bezel is removed to reveal the left ear and SFF drives. See Figure 9 on page 13 and Newer Bezel Assemblies on page 18 for bezel attachment and removal details.

Figure 100: Replacing left ear bezel — 2U48 models (left drawer shown)
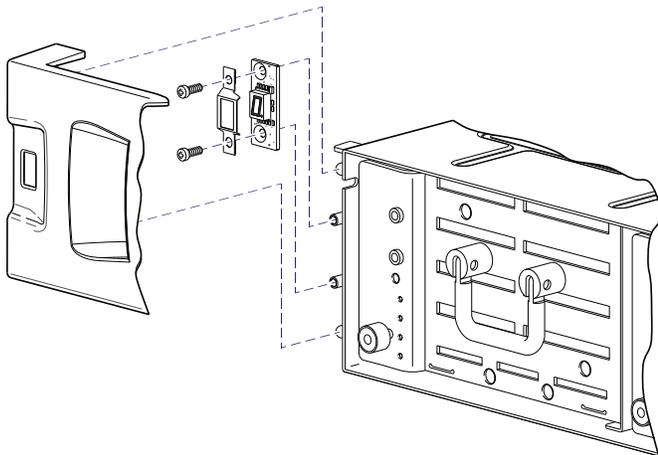
Figure 99 on the previous page shows the right ear components of a 2U48 model. The chassis bezel is removed to reveal the right ear flange and the right drawer in closed position. The LED circuit board is shown exploded from its installed position—and aligned with the light pipe sub-assembly—which is integral to the chassis bezel.

Figure 101: Replacing right ear bezel — 2U48 models (right drawer shown)
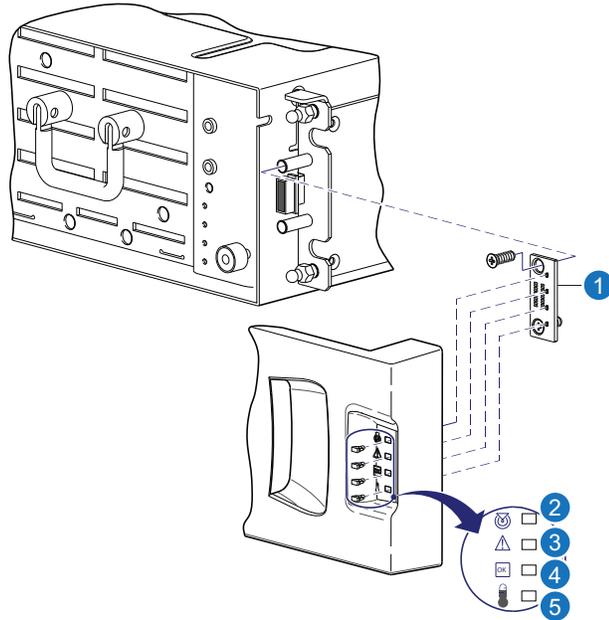
1. **LED circuit board**   4. **FRU OK**

2. **Unit locator**   5. **Temperature fault**

3. **Fault/Service required**

The chassis bezel attaches to four ball studs on the front of the chassis: each 2U48 ear flange hosts two ball studs. Relative to both left and right ear kits for 2U48 models, see Remove Ear Components on the next page and Replace 12-, 24-, 48-, and 56-Drive Chassis Ear Components on page 115.

56-Drive Chassis Ear Components

ⓘ **Note:** The chassis bezel attaches to two ball studs (top of chassis) and two upturned flanges (bottom of chassis) on the front of the chassis.

Figure 102 on the next page shows the left ear of a 4U56 model with the LED circuit board exploded from its installed position on the ear flange. The chassis bezel is removed to reveal the left ear flange and the left drawer in closed position.

Figure 102: Replacing left ear components
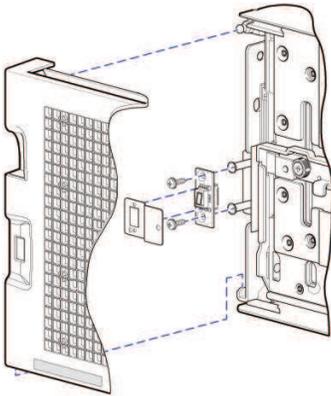
Figure 103 below shows the right ear of a 4U56 model. The chassis bezel is removed to reveal the right ear flange and the right drawer in closed position. The LED circuit board is shown exploded from its installed position—and aligned with the light pipe sub-assembly—which is integral to the chassis bezel.

Figure 103: Replacing right ear components
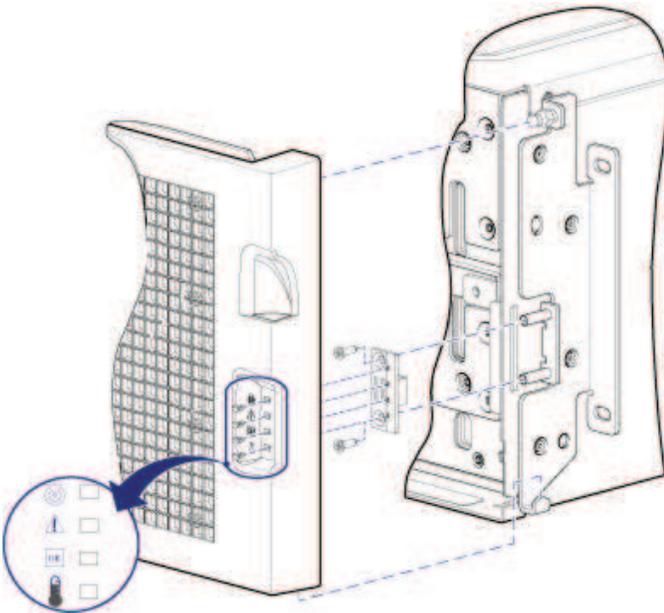
The chassis bezel attaches to two ball studs (top of chassis) and two upturned flanges (bottom of chassis) on the front of the chassis. Relative to both left and right ear kits for 2U48 models, see Remove Ear Components below and Replace 12-, 24-, 48-, and 56-Drive Chassis Ear Components on page 115.

Remove Ear Components

See the appropriate ear illustrations for your product model when removing the bezel and ear components:

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 chassis.

4. Remove the chassis bezel:

5. On the target ear, loosen the two screws that secure the LED circuit board to the mounting pins on the threaded mounting sleeves. Use a No.2 Phillips screw driver.

   > **ⓘ Note:** With the exception of the right ear on the 2U24 chassis, the mounting sleeves protrude forward from the ear flange. On 2U24 chassis, an angle bracket is affixed to the front of the right ear, with mounting sleeves protruding rightward from the base of the angle bracket.

   Remove the screws and retain them for use when installing the new LED circuit board.

6. Remove the ESD cage protecting the LED circuit board, and retain it for reinstallation.

   This step applies to the left ear kit replacement for the 2U12, 2U24, 2U48, and 4U56 chassis.

7. Disconnect the flexible ribbon cable from the back of the LED circuit board.

   a. Pull gently on the LED circuit board to stretch the ribbon cable attached to the back of the board.

   b. Reach behind the LED circuit board, and slightly pull outward on the locking mechanism of the connector to release the flexible ribbon cable from the circuit board.

8. Remove the LED circuit board.

   This step applies to the left and right ear circuit cards for the 2U12, 2U24, 2U48, and 4U56 chassis.

Install Ear Kit Components

Refer to the appropriate target ear illustration when installing ear kit components for your product:

1. Locate the replacement LED circuit board for the target ear.

2. Verify that the chassis is powered off. Remove both power cords.

3. Install the LED circuit board for the target ear:

   a. Properly orient the replacement LED circuit board, and align it for installation onto the ear flange as shown in the pertinent illustration (see bullet list above).

   b. Release the locking mechanism on the ribbon cable connector, located on the back of the LED circuit board, by pulling out on the locking mechanism.

   c. While holding the flexible ribbon cable steady, insert it into the connector on the back of the LED circuit board, and push in on the locking mechanism to secure the cable connection.

   d. Locate the ESD cage and align its through-holes with those on the LED circuit board (applies to left ear kit replacement only.

   e. Locate the LED circuit board fastener screws that you previously removed, and insert a screw through each of the board's two mounting holes, and into the threaded hole of the sleeve on the ear flange.

    f. Take care to ensure that the screw threads correctly mesh with the threads in the hole—in order to avoid cross-threading or stripping—and hand tighten them. If a calibrated torque driver is available, torque each screw to 3 in./lbs.

    g. Verify that the LED circuit board is securely installed and the flexible ribbon cable is fully-seated into the connector, and locked in place.

4. Gently slip the chassis bezel cover onto the push-fit mounting ball studs, taking care to guide the LED indicators through the bezel's ear covers.

5. Power on the chassis.

Verify Component Operation

Chassis status LEDs are located on the front of the RAID chassis. During normal operation, the FRU OK and Temperature Fault LEDs are green, and the other status LEDs located on the right ear are off.

Transceivers Used in CNC Ports

The following systems use Converged Network Controller (CNC) technology:

- QXS-312 and QXS-324

- QXS-412, QXS-424, QXS-448, and QXS-456

- QXS-648 and QXS-656

This allows you to select the desired host interface protocol from available Fibre Channel (FC) or Internet SCSI (iSCSI) host interface protocols supported by the system. You can use the management interfaces to set all controller I/O module CNC ports to use one of these host interface protocols: 16 Gbit/s FC; 8 Gbit/s FC; 10GbE iSCSI; or 1 Gbit/s iSCSI.

Alternatively, you can use the management interfaces to set CNC ports to support a combination of host interface protocols. When configuring a combination of host interface protocols, host ports 0 and 1 must be set to FC (either both 16 Gbit/s or both 8 Gbit/s), and host ports 2 and 3 must be set to iSCSI (either both 10GbE or both 1 Gbit/s), provided the CNC ports use the qualified SFP connectors and cables required for supporting the selected host interface protocol. CNC ports can be used for host connection or remote replication, provided the optional AssuredRemote™ feature is licensed.

Replace an FC Transceiver

This section provides steps for replacing an SFP transceiver connector used in an FC controller host port. An example SFP connector is shown below.

Figure 104: Sample SFP connector
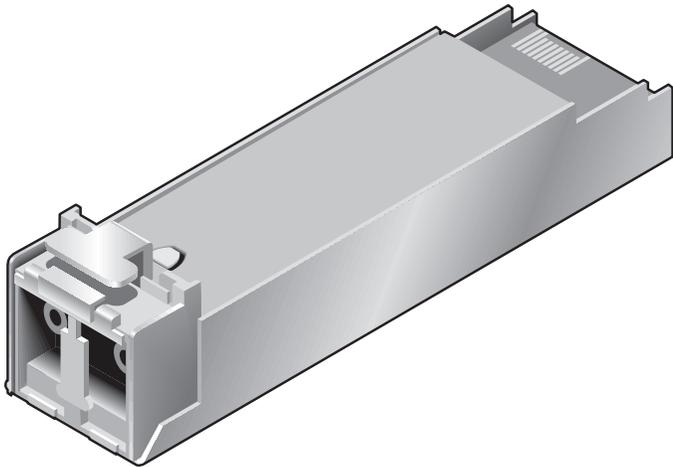
Before You Begin

Ensure you take proper precautions against static electricity. See Electrostatic Discharge on page 37.

⚠️ **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.

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

Verify Component Failure

Transceivers are part of a data path that includes multiple components, such as the transceiver, a cable, another SFP, and an HBA. 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 RAID chassis and server. Also, check the cable for kinks, crimping or other possible damage.

ℹ️ **Note:** See Using LEDs on page 134 for more information about LEDs.

Remove 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).

Figure 105: Disconnect fibre-optic interface cable from SFP - Fibre-optic cable attached to SFP
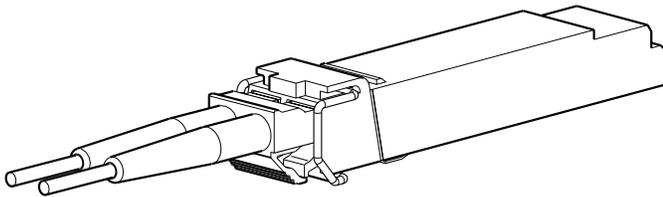
Figure 106: Disconnect fibre-optic interface cable from SFP - Fibre-optic cable disconnected
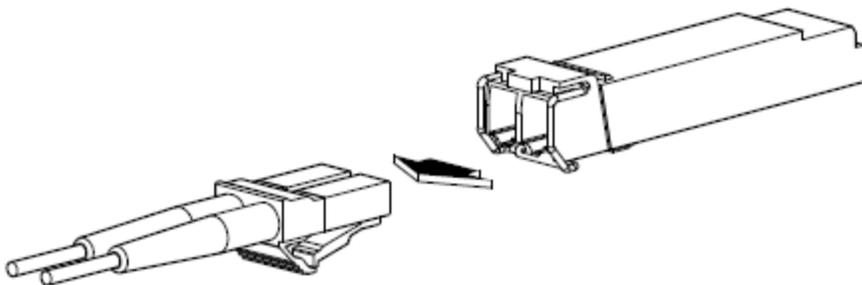
2. SFPs are commonly held in place by a small wire bail actuator. Flip the actuator up.

Figure 107: Flip SFP actuator upwards

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

Install an SFP Module

Perform the following procedure to install an SFP connector.

1. Locate the SFPs that will be used in the CNC ports.

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

    - If using different SFPs in combination, locate the appropriate SFP pertaining to each target CNC port, and note the port number (0 — 3) into which each SFP will install.

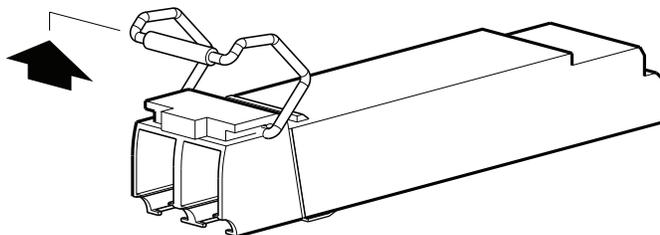   - See the *Disk Management Utility Users Guide* for information about configuring CNC ports for use with qualified FC or iSCSI SFP options.

2. Install the SFP and connect the host interface cable per Figure 108 below below:

    a. Flip the SFP actuator and revolve it downwards.

    b. Insert the SFP into the CNC port and ensure that it locks securely into place.

    c. Align the fibre-optic interface cable with the duplex jack at the end of installed SFP.

Figure 108: Install SFP into the CNC port
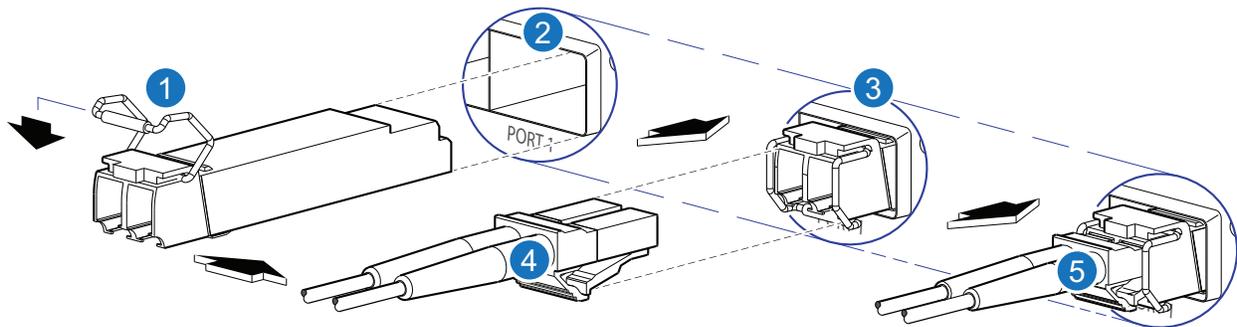
1.	**SFP Module**	**4.**	**Fibre-Optic Interface Cable**
2.	**Target CNC Port**	**5.**	**Installed FC Cable into SFP**
3.	**Installed SFP Module**		

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

4. Repeat steps 1—3 for each SFP requiring installation into a CNC port.

Verify Component Operation

View the Link Status and Link Activity LEDs on the controller I/O module face plate. A blinking LED indicates

that no link is detected. Also check the link status and link activity LEDs on the host.

Replace a Storage Chassis

The RAID chassis or expansion 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 into a replacement chassis.

⚠️ **Caution:** When replacing a chassis, several configuration parameters reset to default. Before replacing a chassis, ensure to record the QXS IP address, base information (system name, system contact information, system location), zoning and HBA configuration, Ethernet switch configuration, and iSCSI connection information (IQNs).

ℹ️ **Note:** QX and QXS storage using 2U12, 2U24, 2U48, or 4U56 chassis are described in the following sections:

- CRUs for 12-drive Chassis on page 8
- CRUs for 24-drive Chassis on page 13
- CRUs for 48-drive Chassis on page 18
- CRUs for 56-drive Chassis on page 26

Whether your product is a 2U12, 2U24, 2U48, or 4U56 model, a fully functional replacement chassis requires the successful removal and installation of the following components:

Table 14: 2U12, 2U24, 2U48, and 4U56 Components

2U12, 2U24, and 2U48 Models	4U56 Model
Chassis bezel (covers chassis front panel)	Chassis bezel (covers chassis front panel)
All drive modules	All drive modules
Ear components	Ear components
Two power supply/fan units of the same type (both AC or both DC)	Two power supply units of the same type (both AC)
N/A	Two fan control modules
Two I/O modules (of the same model type)	Two I/O modules (of the same model type)

CNC models require the successful removal and installation of qualified SFP options. This procedure makes extensive use of the FRU component procedures described elsewhere in Chapter 2.

Before You Begin

⚠️ **Caution:** Do not remove the chassis until you have received the replacement chassis.

For more information, see Preventing Electrostatic Discharge on page 37 and Grounding Methods to Prevent Electrostatic Discharge on page 38.

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 and label all cables.

4. Prepare a suitable static-protected work environment to accommodate chassis replacement.

Verify Component Failure

The chassis FRU includes the chassis's metal housing and the midplane that connects I/O modules, drive modules, and power supply modules. This FRU replaces a chassis 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 chassis.

Alternatively, you can observe chassis health (front panel and rear panel) using management interfaces to verify chassis/component failure or chassis/component operation (see Using management interfaces on page 135 for more information).

Prepare to Remove a Damaged Storage Chassis

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

1. Before replacing a RAID chassis, record the following parameters:

   a. QXS IP address

   b. Base information (system name, system contact information, system location)

   c. Zoning and HBA configuration

   d. Ethernet switch configuration

   e. iSCSI connection information (IQNs)

2. Stop all I/O from hosts to the system. See Stop I/O on page 42.

3. Shut down the controllers. See Shut Down the Controller I/O Module on page 43.

4. Power off the system (RAID chassis *first*; expansion chassis *next*). See Power Supply Units on page 104, and refer to the power cycling procedures for your particular power supply model.

> ⓘ **Note:** You must first remove the chassis bezel and ear components. You will also have to open the drawer on the 2U48 and 4U56 models to access the drives.

Table 15: Removing and replacing a storage chassis and its CRUs

To accomplish this sequential process	See the following procedures
1. Remove the chassis bezel to provide access to front panel components.	a. Replacing a 12- and 24-Drive Module on page 54 b. Replace a 48-Drive Module on page 65 c. Replace a 56-Drive Module on page 77
2. Remove disk modules from the damaged chassis.[1] (2U12/2U24 chassis: upon completion, proceed to step 5)	Replacing a 12- and 24-Drive Module on page 54
3. Remove disk modules from the damaged chassis.[1] (2U48 chassis: upon completion, proceed to step 5)	Replace a 48-Drive Module on page 65
4. Remove disk modules from the damaged chassis.[1] (4U56 chassis: upon completion, proceed to step 5)	Replace a 56-Drive Module on page 77
5. Remove the ear components from the damaged (2U12/2U24/2U48/4U56) chassis.	Replace 12-, 24-, 48-, and 56-Drive Chassis Ear Components on page 115
6. Remove power and data cables.	a. Replace a 12-, 24-, or 48-Drive Chassis PSU on page 91 b. Replace a 56-Drive Chassis PSU and Fan Module on page 103
7. Remove the damaged storage chassis from the rack.	Replace a Storage Chassis on page 127
8. Remove the power supply units from the damaged chassis, and install them in the replacement chassis.	a. Replace a 12-, 24-, or 48-Drive Chassis PSU on page 91 b. Replace a 56-Drive Chassis PSU and Fan Module on page 103
9. Remove the fan control modules from the damaged chassis, and install them in the replacement chassis (4U56 chassis only).	Replace a 56-Drive Chassis PSU and Fan Module on page 103
10. Remove each IOM from the damaged chassis, and install it in the replacement chassis.[2]	Replacing a Controller I/O Module or Expansion I/O Module on page 39

To accomplish this sequential process	See the following procedures
11. Remove each FC SFP from the damaged chassis, and install it in the replacement chassis (Fibre Channel models only).[3]	Replace an FC Transceiver on page 124
12. Remove each 10GbE SFP from the damaged chassis, and install it in the replacement chassis (10GbE iSCSI models only).[3]	Replace an FC Transceiver on page 124
13. Remove each 1 Gb SFP from the damaged chassis, and install it in the replacement chassis (1 Gb iSCSI models only).[3]	Replace an FC Transceiver on page 124
14. Install ear kit components on the replacement chassis ear.	Replace 12-, 24-, 48-, and 56-Drive Chassis Ear Components on page 115
15. Install the replacement storage chassis in the rack.	Replace a Storage Chassis on page 127
16. Install disk drive modules in the replacement chassis.[1] (2U48 and 4U56 chassis use drawers for disks)	a. Replacing a 12- and 24-Drive Module on page 54 b. Replace a 48-Drive Module on page 65 c. Replace a 56-Drive Module on page 77
17. Complete the installation process.	a. Replacing a 12- and 24-Drive Module on page 54 b. Replace a 48-Drive Module on page 65 c. Replace a 56-Drive Chassis PSU and Fan Module on page 103

To accomplish this sequential process	See the following procedures
18. Verify proper operation for all removed and installed FRU components.	Note 1: Complete "Verifying Component Operation" in each of the following sections.

ℹ **Note:** Refer to Reset QXS Configuration Parameters below to input configuration parameters.

Refer to Acquire New License after RAID Chassis Replacement to complete the chassis installation.

    a. Replacing a 12- and 24-Drive Module on page 54
    b. Replace a 48-Drive Module on page 65
    c. Replace a 56-Drive Module on page 77
    d. Replacing a Controller I/O Module or Expansion I/O Module on page 39
    e. Replace a 12-, 24-, or 48-Drive Chassis PSU on page 91
    f. Replace a 56-Drive Chassis PSU and Fan Module on page 103
    g. Replace an FC Transceiver on page 124

Note 2: Verify PFU is enabled (if applicable). See Updating Firmware on page 52.

[1]Within the replacement chassis, reinstall each drive or drive blank into the same drive slot from which it was removed from the damaged chassis.

[2]Within the replacement chassis, the IOM(s) and IOM blank—if applicable—must be reinstalled into the same IOM slots from which they were extracted from the damaged chassis.

[3]If your chassis model does not use CNC ports, ignore this step.

Reset QXS Configuration Parameters

ℹ **Note:** Since the QXS configuration information reset to default. Complete the following steps using the recorded information from the malfunctioning chassis.

1. Configure the QXS IP address.

2. Configure the base Information (System Name, System Contact information, System Location).

3. Check the Zoning and HBA configuration to adapt the changes in the WWN.

4. Check for potential required changes in Ethernet switch configuration because of the change mac address (firewall settings).

5. In case of ISCSI, look for the iSCSI connection with the changed IQN's.

Acquire New License after RAID Chassis Replacement

ℹ️ **Note:** GSC must use the COD License Manager in Oracle to add the new serial number into QuIL.

1. Service orders a replacement chassis from Choice Logistics.

2. Quantum Logistics receives the confirmation email from Choice with the new serial number being shipped.

3. Quantum Logistics enters the new serial number in Oracle IB (replaces original serial number).

4. Customer/Partner/Quantum contacts GSC for Auth Codes and provides the new Base/Array serial number.

5. GSC adds the new serial number to QuIL through Oracle "COD License Manager QTM" module.

    a. Select "COD License Manager QTM" module from Oracle Main Menu.

    b. Select "Adjust Licensable Product".

    c. Enter new serial number in "Serial Number" field.

6. GSC emails the new Auth Codes for the license set based on the original licenses in Oracle IB.

7. Customer/Partner/Quantum enters the Auth Codes in QuIL to retrieve licenses.

Remove a Damaged Storage Chassis From the Rack

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

⚠️ **Caution:**
-It is recommended that all drive modules be removed before removing the chassis. If this is not possible, two people are required to move the chassis.

1. Disconnect the power cables and data cables between devices as needed:

    a. Between the cascaded espansion chassis.

    b. Between the controller and peripheral SAN devices.

    c. Between the controller and the host.

2. Make sure the ear components are removed. See Remove Ear Components on page 121.

3. Remove the retaining screws that secure the front and rear of the chassis to the rack and rails.

4. Maintaining a level position, carefully slide the chassis from the rack.

5. Place the chassis on a work surface near the replacement chassis, the removed drive modules, ear bezel components, and screws.

6. Remove the side bracket from each side of the damaged chassis, and retain these rackmount items with the other components for future use.

Install Replacement Storage Chassis in Rack

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

> ⚠️ **Caution:**
> -It is recommended that all drive modules be removed before lifting the chassis. If this is not possible, two people are required to move the chassis.

> ℹ️ **Note:** Refer to the applicable rackmount install guide for the correct procedure and mounting hardware.

1. Attach side brackets (standard rackmount installation) or main brackets (2-post rackmount installation) on the replacement chassis.

2. Support the bottom of the chassis. Carefully lift/align the chassis and while maintaining a level position for the chassis, slide it into the rack.

3. Using the appropriate mounting hardware, secure the chassis to the rack.

4. Install the ear bezels. See Replace 12-, 24-, 48-, and 56-Drive Chassis Ear Components on page 115.

5. Using the applicable retaining screws, secure the front and rear or the chassis to the rack and rails.

6. Attach the chassis bezel to the front panel of the chassis. Refer to one of the following:

   - *QX and QXS Bezel Installation Guide*

   - Replace 12-, 24-, 48-, and 56-Drive Chassis Ear Components on page 115

Complete the Process

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

1. Reconnect data cables between devices, as needed, to return to the original cabling configuration:

   - Between cascaded chassis.

   - Between the controller and peripheral or SAN devices.

   - Between the RAID chassis and the host.

2. Reconnect power cables to the RAID chassis.

3. Turn on the power switch to power supply modules if they are equipped with power switches.

> ℹ️ **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 104.

Verify 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 chassis

  b. RAID chassis

  c. Host (if powered down for maintenance)

2. Perform a rescan to force a fresh discovery of all expansion chassis connected to the RAID chassis. This step clears the internal SAS layout information, reassigns chassis/enclosure IDs, and ensures that the chassis are displayed in the proper order. Use either the CLI or Disk Management Utility (V2 or V3) to perform the rescan:

Using CLI

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

```
rescan
```

Using Disk Management Utility V3

To perform a rescan using Disk Management Utility, follow the substeps below:

  a. Verify that the controllers are operating normally.

  b. In the Configuration View panel, right-click the system and select **Tools** > **Rescan Disk Channels**.

  c. Click **Rescan**.

See "Correcting chassis/enclosure IDs" in the Setup Guide for additional information.

Using Disk Management Utility V2

To perform a rescan using Disk Management Utility, follow the substeps below:

  a. Verify that both controllers are operating normally.

  b. In the Configuration View panel, right-click the system and select **Tools > Rescan Disk Channel**s.

  c. Click **Rescan**.

See "Correcting chassis/enclosure IDs" in the Setup Guide for additional information.

Using LEDs

View LEDs on the front and rear of the chassis (see "LED descriptions" within the *QX and QXS Storage 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 drives, verify that the Power/Activity LED (bottom LED on front of drive) is illuminated green or blinking green.

    Remove the chassis bezel to view drive LEDs. Attach the bezel when finished viewing drive LEDs.

- For SFF drives, verify that the Power/Activity LED (left LED on front of drive) is illuminated green or blinking green.

    Remove the chassis bezel to view drive LEDs. Attach the bezel when finished viewing drive 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, and enabled event notification (see "Getting Started" within the WBI or Disk Management Utility User Guide V3 for more information).

Select from the following methods to verify component operation:

- Use Disk Management Utility 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. Disk Management Utility 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 Disk Management Utility, 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 Disk Management Utility or the CLI. Using Disk Management Utility, 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 *QX and QXS CLI Reference Guide* for more information about command syntax and parameters).