Exos® E 4U106 Hardware Installation and Maintenance Guide

Abstract

This guide describes initial hardware setup for Seagate Exos 4U106 controller enclosures and disk enclosures. It also describes removal and installation of customer-replaceable components. The guide is intended for use by storage system administrators familiar with servers and computer networks, network administration, storage system administration and configurations, storage area network management, and relevant protocols.

Open Source Third Party Licenses and Code

Seagate storage products use open source software components. To view information about open source software licenses and open source code used in Seagate storage products, see www.seagate.com/support.

Contents

Figures

Tables

1 Introduction

The Exos E 4U106 storage enclosure product is a high-capacity expansion enclosure designed for cloud and enterprise environments, using ADAPT software features. It supports high-demand storage applications that require high data availability, capacity, and performance. Each storage enclosure can be used either as a server-attached Just a Bunch of Disks (JBOD), or cabled to a RAID bunch of disks (RBOD) as an Expanded Bunch of Disks (EBOD) for added storage. Each rail-mounted storage enclosure fits within four (4) EIA rack space units in a 1.2 m rack. The integral cable management arm (CMA) allows you to service individual, hot-swappable components within the storage enclosure, while retaining connection and power.

Intended audience

This guide is for software integration providers, storage installation professionals, and system administration personnel.

Knowledge prerequisites

Make sure you have the appropriate knowledge base prior to product installation or service.

- Server system administration
- Storage system configuration
- Storage area network (SAN) management
- Serial Attached SCSI (SAS) protocol
- Ethernet protocol
- RAID technology

Product documentation and support

To obtain the following documents, videos, and other product information, visit www.seagate.com/support.

Content description	Document	Seagate QR codes
Enhancements, known issues, and updates	Release Notes	
Overview of product shipkit contents and setup support	Getting Started*	Documentation, Support
Initial installation of hardware and component replacement	Hardware Installation and Maintenance Guide	
Regulatory compliance, safety, and disposal information	Compliance, Safety, and Disposal Guide	
* Printed document included in the shipkit.		

Safety guidelines

You must adhere to all safety requirements in this document. Some relate to the entire system, some to the rack, some to the storage enclosure, and others to the FRUs within it.

2 System overview

The Exos 4U106 storage enclosure mounts to a rack cabinet, occupying four EIA rack space units (4U) and contains up to 106 hot-swappable drive modules.

⚠ **CAUTION**   Make sure you are not connected to power at any time during installation procedures.

⚠ **CAUTION**   Only operate the storage enclosure in a dust-free environment to meet temperature control and airflow requirements.

Storage enclosure components

The typical 4U106 storage enclosure comes equipped with several core components.

- The storage enclosure chassis exterior includes the front panel, top covers to access two internal bays, the rear panel, and the rear crossbar.
- The storage enclosure chassis interior contains baseplane, sideplane, and midplane PCBs and the remaining components they control.
- The main bay contains slots for 96 drive modules and an expander module for each of the eight (8) rows.
- The auxiliary bay contains slots for 10 more drive modules, two (2) controller fan modules, and two (2) SAS personality modules (PMs) interconnected with an inter-controller link (ICL) board.
- The rear panel area contains four (4) system fan modules, two (2) power supply units (PSUs), and two (2) controller modules (CMs).
- The rackmount rail kit consists of two (2) rails that connect the storage enclosure to the rack cabinet.
- The cable management arm (CMA) includes brackets on a flexible arm that routes and protects cables during in-rack maintenance procedures.

Storage enclosure chassis

The storage enclosure sheet metal is bonded together and free from non-conductive coatings. The top and rear panels provide access to plug-in drive modules, integrated PCBs, and other FRUs.

NOTE   You can order and attach optional lift handles to storage enclosure sidewalls to position it onto the lift. You must remove the lift handles after positioning the storage enclosure and prior to its installation into the rack. Lift handles are not part of the standard package, so you must order and install them separately.
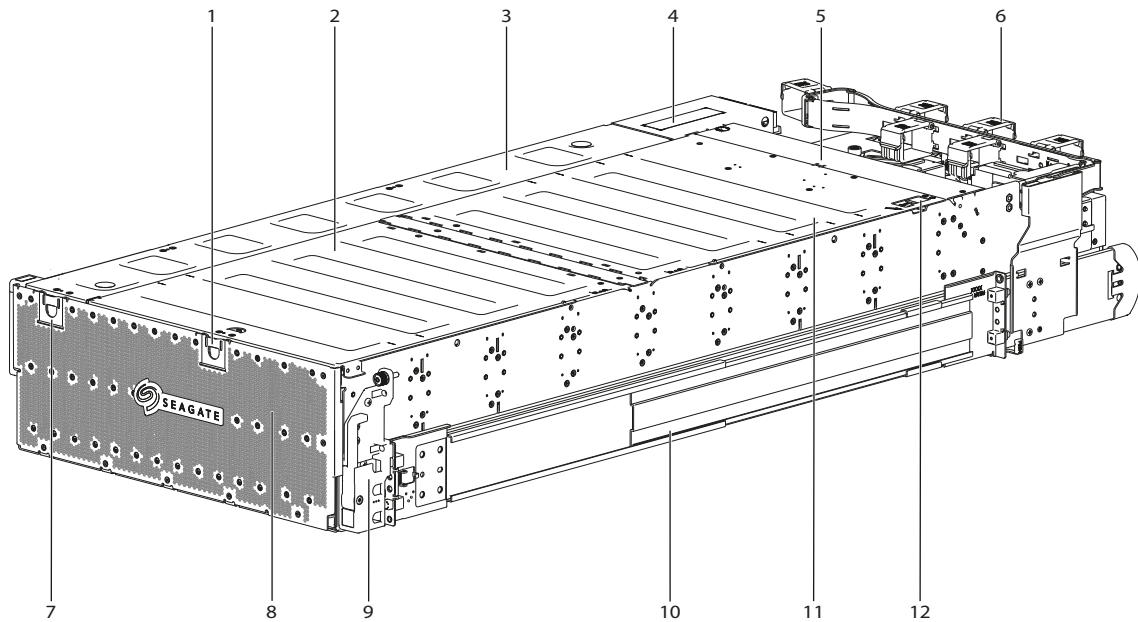
Item	Description	Item	Description
1	Main bay cover front latch	7	Auxiliary bay cover latch
2	Main bay front cover	8	Front panel
3	Auxiliary bay cover	9	Pull handle
4	Fixed controller cover	10	Right rail assembly with CMA B bracket
5	Fixed midplane cover	11	Main bay rear cover
6	Cable management arm (CMA)	12	Main bay cover rear latch

Figure 1   Storage enclosure with rails

Storage enclosure modules

The storage enclosure contains a number of field-replaceable units (FRUs). Modules or components that require Seagate-authorized warranty and repair personnel to replace them are not identified.

⚠ **CAUTION**   If you partially populate the storage enclosure with disk drives, you must populate from front to back, filling an entire lateral bay before populating the next bay.

Figure 2   Customer-replaceable FRUs, top view
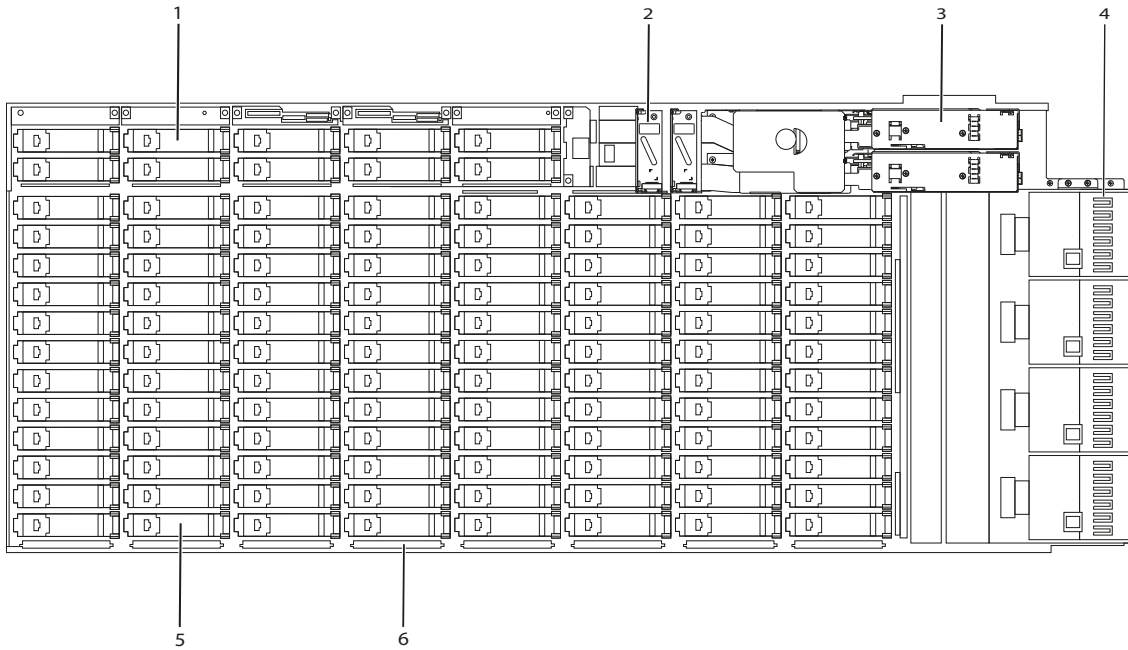
Item	Description	Function
1	Auxiliary bay drive module (10)	Exchanges data on the controller channel
2	Controller fan module (2)	Provides redundant cooling for auxiliary bay components
3	Controller module (2)	Manages enclosure, fans, and LEDs; provides host connectivity
4	System fan module (4)	Provides redundant cooling for main bay components
5	Main bay drive module (96)	Exchanges data on the main bay channel
6	SAS expander module (8)	Provides power and high-speed signal connection
N/A	Power supply unit (2)	Provides redundant power to storage enclosure
	Cable management arm (CMA) and hardware; crossbar	Manages interconnection cables, providing full rail extension for service access; provides stability
	Rack rail (left and right) and hardware	Provides support for a fully populated storage enclosure mounted within a rack cabinet

Storage enclosure PCBAs

The storage enclosure provides separate access to two bays: the main bay and the auxiliary bay. The PCBAs identified in this section are all assemblies that require replacement by Seagate-authorized warranty and repair personnel, other than the SAS expander modules.
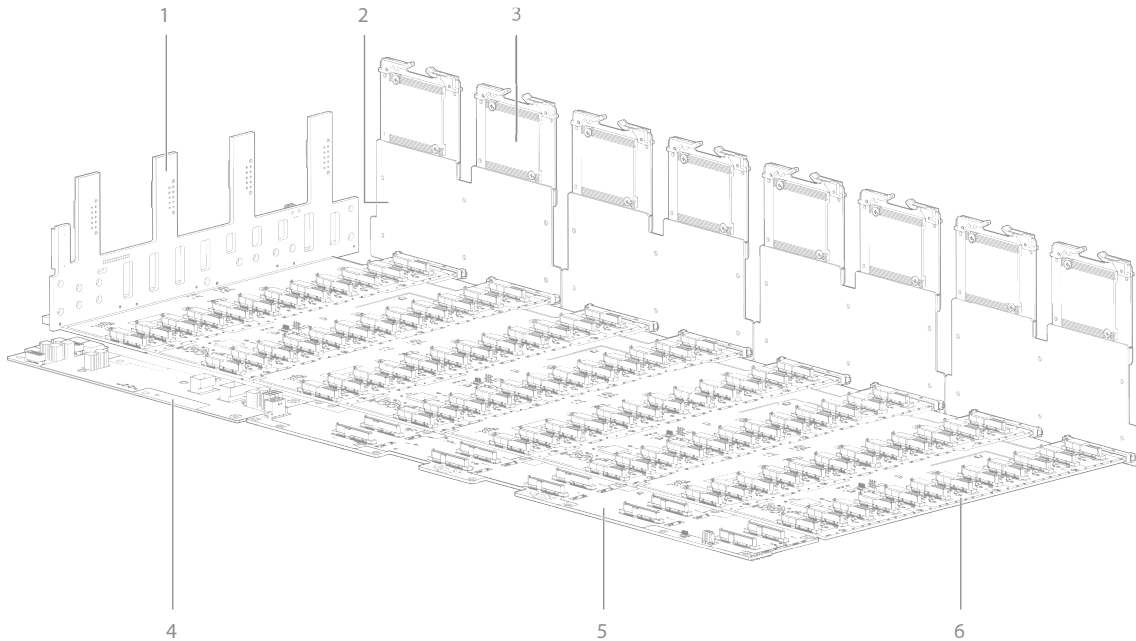
Item	Description	Function
1	Power midplane (1)	Distributes power from the power supply units to each fan module and the main baseplane, sends signals to the controller module, and provides busbar connection for both drive module and controller channels
2	SAS riser sideplane (4)	Passively balances drive module paths between both SAS expander modules, one per main baseplane
3	SAS expander module (8), customer-replaceable	Provides power and high-speed signal connection to the main baseplane via the riser sideplanes, two per main baseplane
4	Fan baseplane (1)	Distributes power to system fans and the controller baseplane
5	10-HDD baseplane (1)	Provides power to the 10 auxiliary bay drive modules and signal connection to the dual controller channel; does not support single-port drive modules
6	24-HDD baseplane (4)	Provides power via a high-speed harness to each drive module on the 24-HDD baseplane and signal connection to the dual drive channel; supports single-port drive modules

Figure 3   Storage enclosure PCBAs

Optional components

- **Optional lift handles**: The storage enclosure ships with three belt straps for lifting the enclosure to the mechanical lift. You can also request optional lift handles to attach to the storage enclosure sidewalls. If you install lift handles to assist you in positioning the enclosure on the lift, you must also remove them before you begin installation procedures.

- **Drive carriers**: In some situations, you can request optional drive carriers to surround a drive module for installation in a drive carrier slot.

3 Initial installation

Each storage enclosure installation requires the same amount of preparation to successfully mount it into your 1.2m industry-standard rack cabinet.

⚠ **WARNING!** Heed all warnings and cautions on labeling and throughout this guide to reduce risk of personal injury or damage to equipment.

⚠ **CAUTION** Use only power cords supplied in the installation kit or those that meet product specifications.

ⓘ **IMPORTANT** Only a qualified service technician should perform the installation.

Installation checklist

Use this checklist, performing each task only in the sequence presented after successful completion of the prior step.

Table 1 Installation checklist tasks

Step	Task	Reference
1	Complete all installation prerequisites.	"Installation checklist" above; "Complete installation prerequisites" on the next page
2	Unpack the storage enclosure.	"Installation checklist" above; "Unpack and prepare the storage enclosure" on page 15
3	Prepare the site for installation of the storage enclosure into the rack cabinet.	"Installation checklist" above; "Unpack and prepare the storage enclosure" on page 15
4	For rackmount installation, temporarily place all drive modules in a static-protected area.	"Installation checklist" above
5	Install the rackmount kit in the rack cabinet.	"Install the rackmount rail kit" on page 17
6	Mount the storage enclosure into the rack cabinet.	"Install the storage enclosure" on page 29
7	Install drive modules in the storage enclosure.	"Install drive carriers in the storage enclosure" on page 36
8	Connect all power cords and data cables.	"Route power cords and data cables" on page 39
9	Route storage enclosure cables to a compatible host.	"Route and connect power cords and data cables " on page 47
10	Test the enclosure to verify full functionality.	"Test enclosure connections" on page 39
11	Configure connection to management host.	"Configure the management host for serial communication" on page 53

You must adhere to all related safety requirements prior to and during installation of a new storage enclosure and during FRU replacement.

⚠ **WARNING!** Do not attempt to install the storage enclosure into the rack cabinet with drive modules preloaded in the slots. Serious injury and damage could result. Unload any drive modules in storage enclosure slots to an static-protected area. Do not further lighten the storage enclosure by removing other components.

⚠ **CAUTION** You must use a mechanical lift for mounting the storage enclosure into the rack cabinet. Do not use a vacuum lift because it might damage the storage enclosure.

To adhere to installation safety precautions:

- **Site preparation**
    1. Use the installation checklist.
    2. Clear the site for installation and secure a static-protected area.
- **Before storage enclosure installation**
    1. Unpack the storage enclosure in a clear area, using appropriate safety precautions.
    2. Temporarily set aside all drive modules into a static-protected area, regardless of how your storage enclosure or drive modules ship.
    3. Review all related warnings before mounting the storage enclosure into the rack.
- **Storage enclosure installation**
    1. Use the provided belt straps or optional lift handles to move the storage enclosure onto a suitable mechanical lift.
    2. Use a mechanical lift for positioning the storage enclosure and mounting it into the rack cabinet. Do not use a vacuum lift. To maintain personal and equipment safety, do not use any other method to support the weight of the storage enclosure during installation or maintenance.
    3. Make sure the storage enclosure slides smoothly on its rails from full insertion to the service position. Do not force insertion, which could damage the rails.
- **Before drive carrier installation**
    1. Prior to handling and replacing the drive modules, make sure you are static-compliant.
    2. Make sure you can easily reach the slots in the enclosure safely while maintaining your balance.
- **Drive carrier installation**
    1. Only after you securely mount the storage enclosure in the rack can you install the drive modules into the proper module slots as part of the system setup.
    2. (Optional) As an extra safety precaution, you may choose to continue supporting the weight of the storage enclosure with the lift during drive module installation, then remove the lift when you are ready to fully insert the storage enclosure into the rack cabinet.

△ **CAUTION** If you partially populate the storage enclosure with disk drives, you must populate from front to back, filling an entire lateral bay before populating the next bay.

Complete installation prerequisites

The rackmount rails are designed to bear the maximum weight of the storage enclosure when it is properly mounted in a standard rack cabinet. You can install multiple storage enclosures in a single rack cabinet.

△ **CAUTION** You must use only the supplied rail kit and related mounting hardware.

To complete installation prerequisites:

1. Prepare the host system for the installation by obtaining access to the following items:
    a. A functioning host bus adapter
    b. Known good cables for host connection that meet storage enclosure requirements
    c. The provided right-angle power cords that meet power supply unit specifications

2. Familiarize yourself with system configuration requirements and the layout of storage enclosure modules.

3. Obtain the following:

    a. An anti-static wrist or ankle strap for handling static-sensitive components

    b. A static-protected environment for temporary storage of the storage enclosure and the drive modules

    c. A T10 screwdriver, 6-in length, and #2 Phillips-head magnetic screwdrivers, 6- and 12-in length

    d. A retractable tape measure

    e. A mechanical lift with sufficient clearance and capable of safely lifting the storage enclosure without drive modules

4. Ensure the rack cabinet is suitable for use with the storage enclosure.

    a. A rack cabinet capable of holding 4U form factors, leveled in all planes with respect to each other

    b. A maximum depth of 43.35 inches (1101mm) from back of front post to maximum extremity, excluding cabling and door closure considerations

    c. A rack cabinet that causes a maximum back air pressure of 5 pascals (0.5mm water gauge)

    d. Weight capacity for the total number of storage enclosures installed, using a maximum of 310 lb (140kg) per storage enclosure

    NOTE Allocate and maintain a 1.7m or 5.58 ft safe distance to mount or remove a storage enclosure into a rack.

5. Secure sufficient staff to assist with the installation. Minimum staff:

    a. One qualified service technician for the complete installation procedure

    b. One spotter to assist with the lift and to observe the installation from the rear of the rack cabinet

    c. A total of two to four people to unpack the storage enclosure and move it onto the mechanical lift

Unpack and prepare the storage enclosure

⚠ **CAUTION** Do not operate a storage enclosure outside the manufacturer's intended use.

*   Storage enclosures are suitable for connection to intra-building or non-exposed wiring or cabling only.

*   Storage enclosures are suitable for installation in locations where the National Electrical Code (NEC) applies, but are not suitable for Outside Plant (OSP) installations.

*   Customer facilities must provide for voltages with not more than ± 5 percent fluctuation. Customer facilities must also provide suitable surge protection.

⚠ **CAUTION** The storage enclosure ships in a partially-populated state. All PCBAs and FRUs ship in the storage enclosure, but the disk drives do not. It is very heavy, so handle with care and adhere to Seagate recommendations.

There are two primary packing configurations: a three-piece or a regular slotted container. Neither configuration includes the drive modules, which ship separately, based on system configuration: Single drive modules, 10-packs, or 24-packs. Set drive modules aside until after installation of the storage enclosure in the rack cabinet.

Both containers come strapped to a pallet and have edge protector reinforcements on all four corners. Each storage enclosure ships inside a plastic bag with three belt straps around the chassis. Both configurations require the same site preparation and vigilance during handling.

To unpack the enclosure:

1. Prepare the site for the storage enclosure installation. This includes meeting all product specifications and providing a clean, clear, static-protected environment prior to unpacking the storage enclosure.
2. Examine packaging for damage. This includes cuts, water damage, or evidence of mishandling during shipment.
3. If there is damage, photograph and document it, but do not proceed. You must retain all original packaging for product returns.
4. Remove pallet strapping, the cardboard base, and all protective foam above the storage enclosure to access container contents.
5. Slide the plastic bag to remove it from surrounding the storage enclosure.
6. Prepare to remove the storage enclosure from the container, using one of two options, depending on the shipment:
   a. **Default provided belt straps**: Locate three to four people to assist in moving the storage enclosure onto the mechanical lift, using an appropriate safe lifting technique and following the steps for default belt straps.
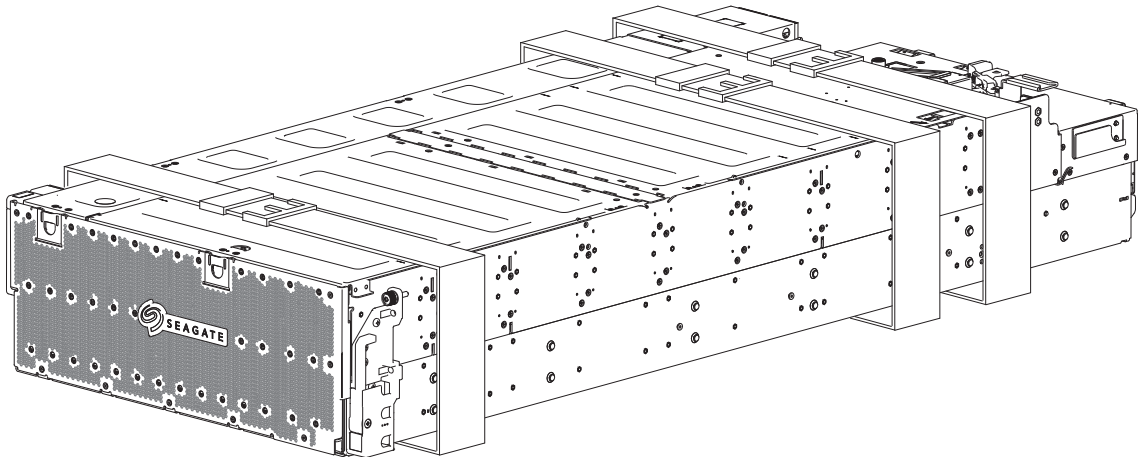
Figure 4   Default belt straps already around the storage enclosure

   b. **Optional lift handles**: Locate two to four people to assist in moving the storage enclosure onto the mechanical lift, using an appropriate safe lifting technique and following the steps for the optional lift handles.
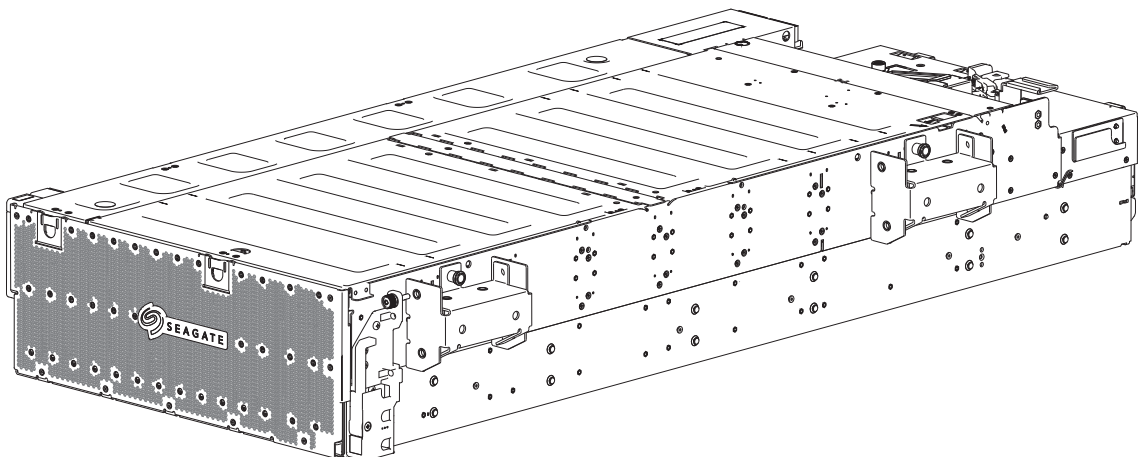
Figure 5   Optional lift handles attached to the storage enclosure

7. To use the default belt straps, perform the following actions:
    a. Position one person at the front to grip the front belt strap securely by both loops.
    b. Position one person at each rear corner to grip both rear belt straps by the loops on that side.
    c. Simultaneously lift the storage enclosure, using appropriate safe lifting technique while moving it to a static-protected location, and then to the mechanical lift for mounting to the rack cabinet.
    d. Skip the optional lift handle step.
8. For the optional lift handle procedure, perform the following actions:
    a. Skip the default belt strap step.
    b. Separate the left lift handles from the right lift handles. The left ones have a locking edge mid-point on the bracket, while the right ones have a locking edge toward the bottom of the bracket.
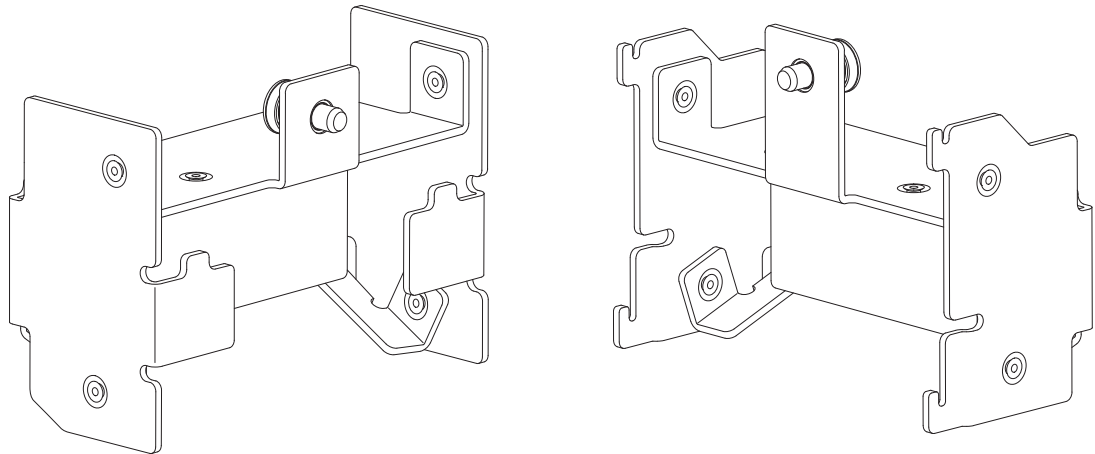
Figure 6   Left and right lift handles

    c. Align a left lift handle to the left sidewall of the storage enclosure chassis.
    d. Holding a lift handle flat against the front-most portion of the left chassis sidewall, slide it upward until its push-pull pin engages the push-pull pin hole to secure it.
    e. Repeat for the back-most left position.
    f. Verify you securely fastened both handles, since the lift handles will bear the full weight of the enclosure while moving it to a static-protected location, then the mechanical lift.
    g. Repeat the same procedure for the mirror positions on the right sidewall for the right lift handles.
    h. Position one person at each side of the storage enclosure. If you are not comfortable lifting the weight of the enclosure with two people, position two people on each side of the storage enclosure.
    i. Securely grasp one or both handles on the same side of the chassis, depending on the number of people involved, and lift the storage enclosure.
9. Place the storage enclosure in a static-protected area until you are ready to move it to the mechanical lift for mounting in the rack cabinet.

Install the rackmount rail kit

The storage enclosure requires rackmount hardware for installation into a standard 1.2m rack and occupies four EIA units of rack space (17.78 cm or 7 inches) per unit. The rail kit contains a left and right rail. Product function and user safety hinge on their proper installation.

NOTE Allocate and maintain a 1.7m or 5.58 ft safe distance to mount or remove a storage enclosure into a rack.

You must take all appropriate rack cabinet safety precautions before mounting a storage enclosure into a rack.

⚠ **CAUTION** Observe all of the following directives:

- Always place the rack cabinet on a flat, leveled surface. Do not install a storage enclosure into a rack cabinet until you verify the rack cabinet is level.
- Follow prescribed leveling procedures from the rack cabinet manufacturer.
- Never install or remove from the rack cabinet more than one storage enclosure at a time. This helps prevent the rack cabinet from tipping or falling.
- Verify the rack cabinet meets all safety requirements when configured with storage enclosures.
- Verify connections comply with all electrical requirements.
- Verify the system complies with all temperature and exhaust requirements.

To adhere to safety precautions when mounting a storage enclosure into a rack cabinet:

1. Read and observe all warning and caution labels on the storage enclosure.
2. Verify the rack cabinet is on a flat, leveled surface because any incline or unevenness stresses the rack cabinet and the storage enclosure. A storage enclosure in an uneven rack cabinet resists smooth movement on the rails, eventually damaging the rails and possibly distorting the storage enclosure.
3. Verify the rack cabinet design supports the total weight of storage enclosures and has stabilizing features to prevent the rack cabinet from tipping or being pushed over during installation or normal use.
4. Do not lift the storage enclosure without a mechanical lift. No single person should ever lift a storage enclosure without assistance.
5. Mount storage enclosures into the rack cabinet from the bottom to the top during installation.
6. Locate lighter storage enclosures above heavier ones to maximize stability.
7. Remove storage enclosures from the top of the rack cabinet to the bottom when emptying it.

Separate the inner rails from the outer and mid rails

The rails ship with an inner rail inside each of the outer and mid rail sub-assemblies. You must separate them before attaching outer and mid rail sub-assemblies to the rack cabinet and inner rails to the storage enclosure.
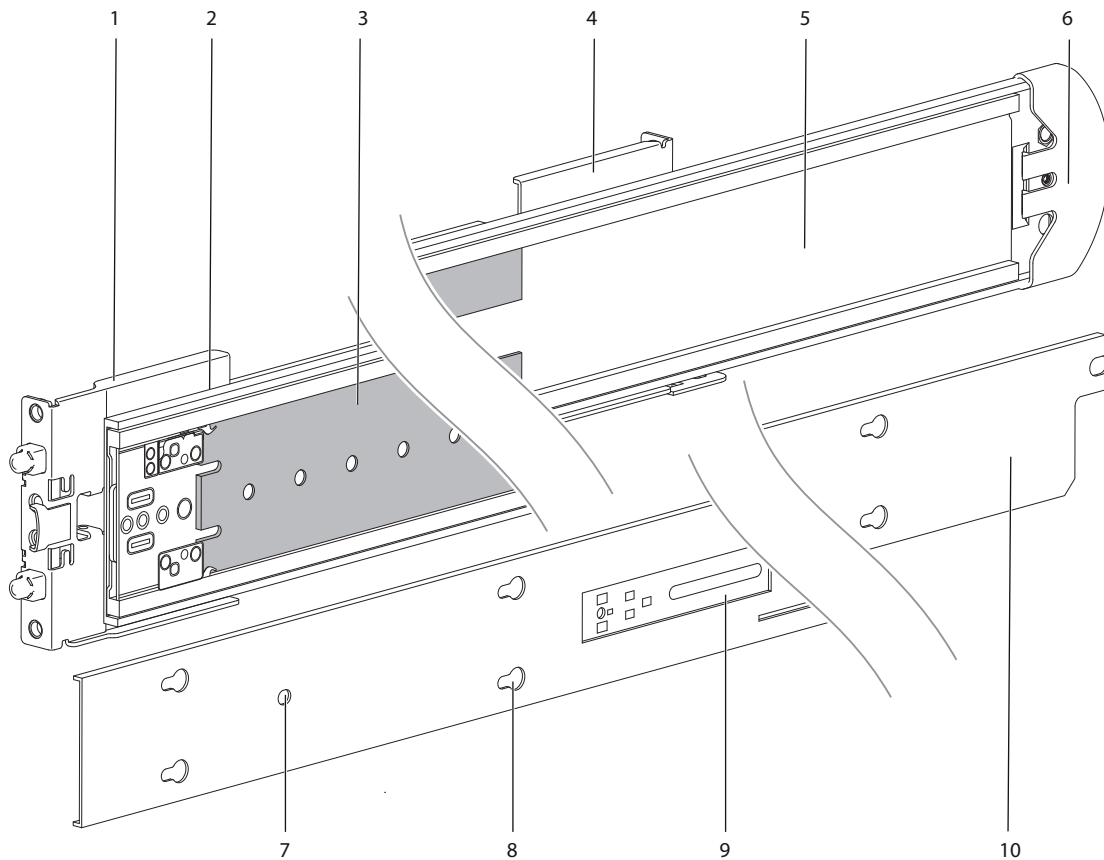
Item	Description	Item	Description
1	Front mount bracket	6	End cap
2	Outer rail	7	Slotted screw holes
3	Ball bearing retainer	8	T-pin keyholes
4	Rear mount bracket	9	Safety lock
5	Mid rail, slides within outer rail	10	Inner rail

Figure 7   Separated left rail assembly, inner sides facing

To separate the inner rails from the outer and mid rail sub-assemblies:

1. After removing each rail assembly from its packaging, orient the one with the L embossed on it to your left, the rail assembly with the R embossed on it to your right, and embossed arrows for both pointing up.

2. Examine the rails to distinguish each component, particularly the ball bearing retainer and mid rail.

⚠ **WARNING!**   Carefully inspect the rails. Do not use damaged or warped rails. Return them. Rail failure can allow the storage enclosure to fall and result in serious injury since the load on them can exceed 300 lb (136 kg).

3. (Optional) Clip an end cap into the slots at the rear outer side of each rail, locking it in place.

4. Extend the mid and inner rail on the outer rail of the left rail assembly until the safety lock engages with a click.
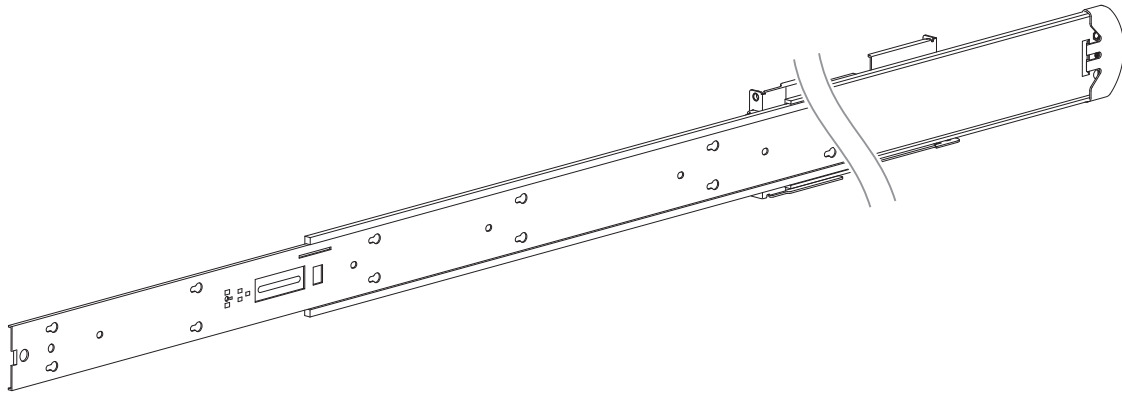
Figure 8   Extension of left inner rail beyond mid rail

5. Turn the left rail assembly over, then press the safety lock to disengage the inner rail.
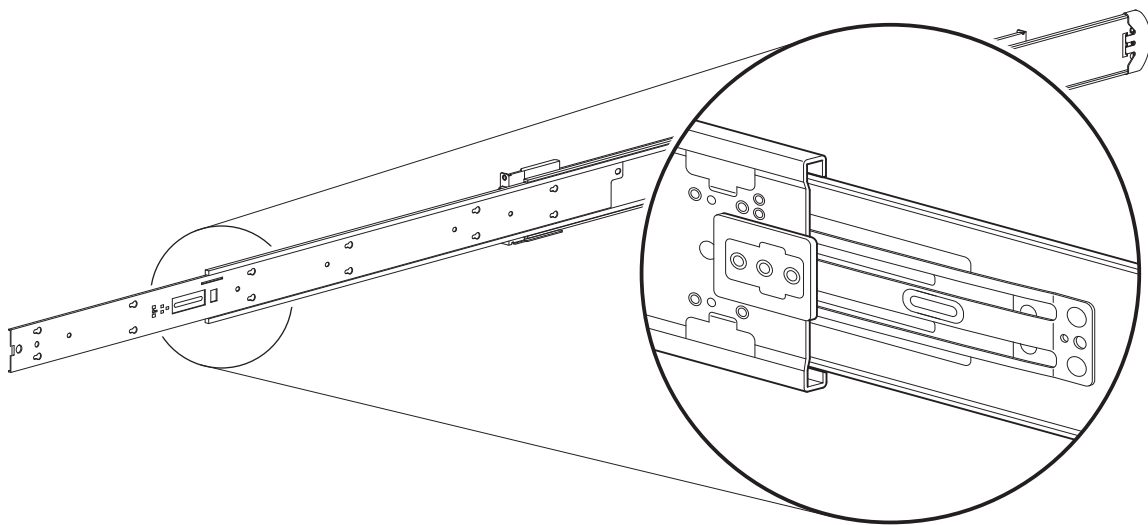
Figure 9   Location of inner rail safety lock

6. Slide out the left inner rail until it separates from the outer rail subassembly, setting it aside.

7. Turn the left outer rail subassembly back over, then locate the mid rail release switch.
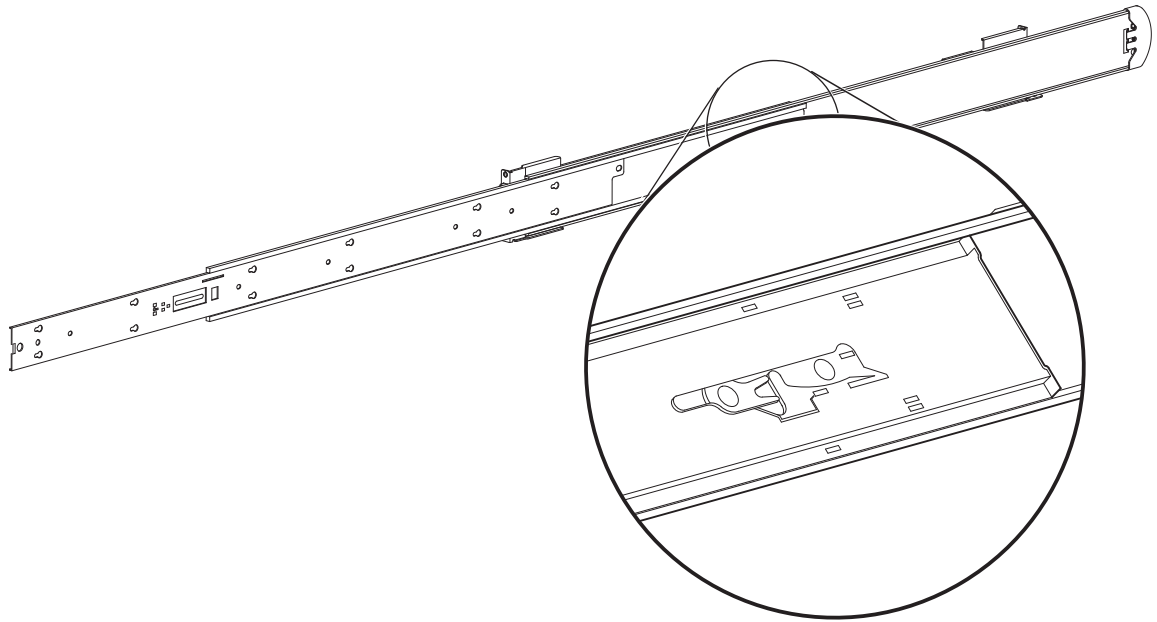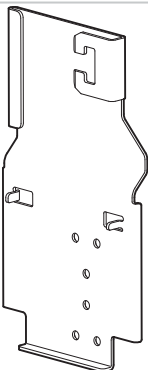
Figure 10   Location of mid rail release switch lever

8. Rotate the mid rail release switch lever to release it, then slide the left mid rail back until fully retracted onto the outer rail.

9. Set aside the left outer rail subassembly near the left inner rail.

10. Separate the right rail using the same process, keeping the separated right rails in an alternate location as the mirror image of the separated left rails.

11. Inspect the rails once again for any damage or warping. If you locate either, return them in their shipping carton.

Adjust the outer rails to the rack cabinet

You must correctly attach the outer rails to the rack cabinet. After successful installation, the storage enclosure must slide smoothly on the rails from fully inserted, out to the service position, and back again.

Required equipment	Qty	Identification
Outer rails, properly oriented	2	N/A
A retractable tape measure	1	N/A
#2 Phillips-head screwdriver, 6-in length	1	N/A
Panhead screw, M4x4mm length	4	
CMA B bracket	1	

To adjust the outer rails to the rack cabinet:

1. Facing the left side of the rack cabinet, measure the distance of the post-to-post depth between the inner side of the rear and front rack posts.
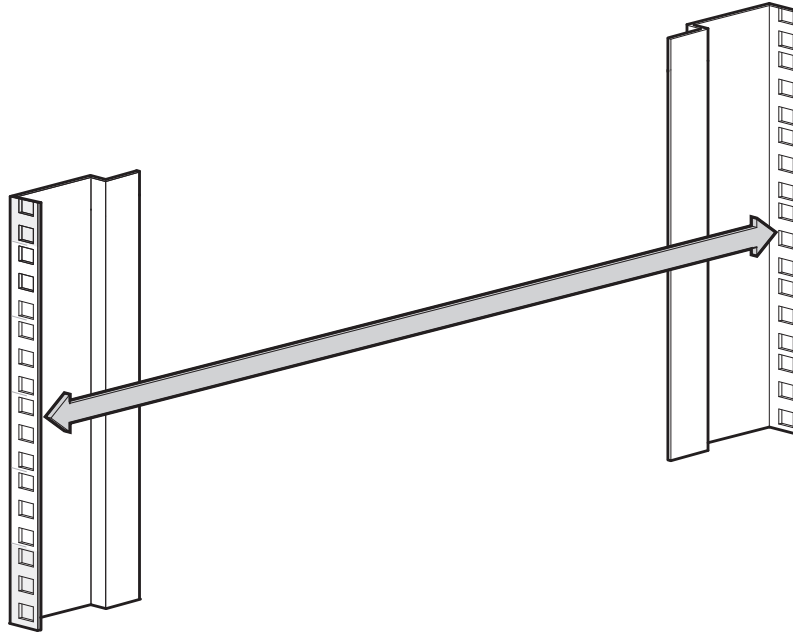
Figure 11   Distance measurement of rack inside post-to-post depth

2. Select the left outer rail assembly, rotating it so you face the mid rail and the outer rail is facing away from you.
3. Rotate the mid rail release switch lever, then extend the mid rail until it locks.
4. If the distance you measured is not between the default 34 and 35 inches, use a #2 Phillips-head screwdriver to remove and set aside all four rear mount bracket setscrews.
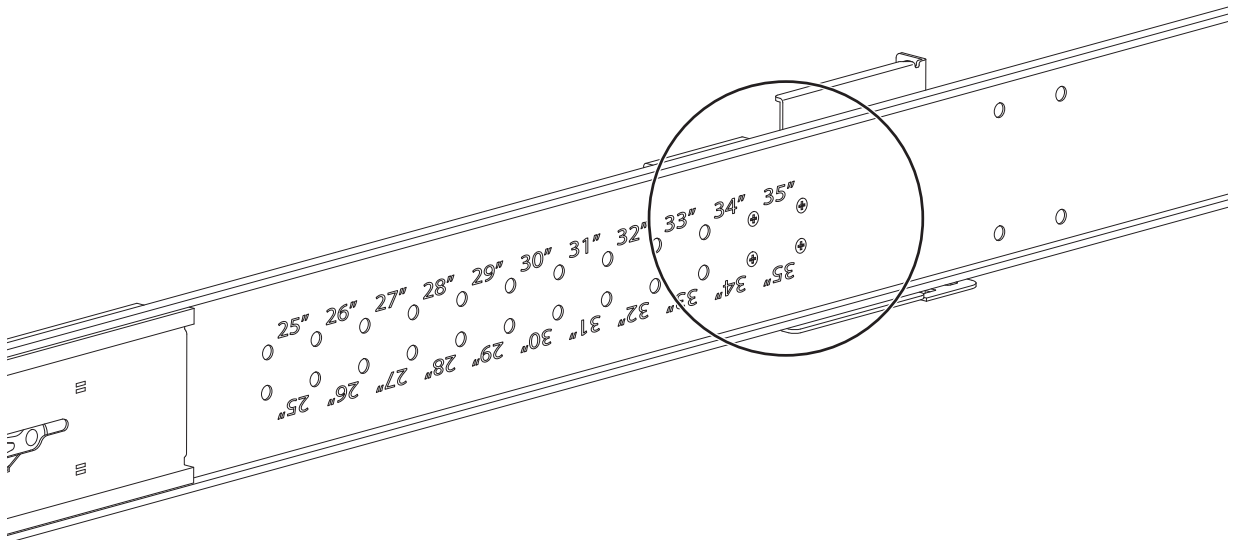
Figure 12   Default location of outer rail adjustment setscrews

5. Measure the rail distance from the inside of the front mount bracket to inside of the back mount bracket to determine if it matches the distance between rack posts.
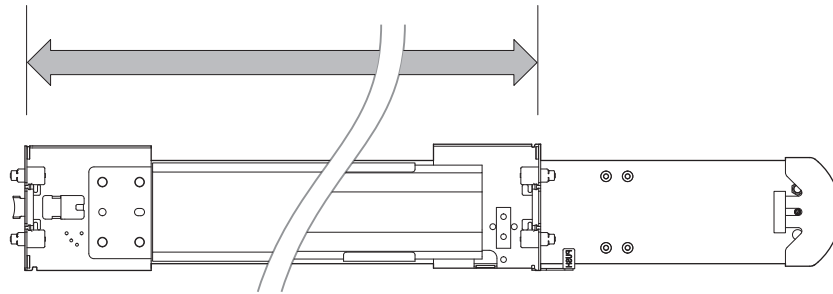
Figure 13   Measurement of rail from rear to front mount bracket

6. If the distance does not match, relocate the rear mount bracket to within an inch of the post-to-post depth distance you recorded and align the rear mount bracket holes to the demarked holes on the outer rail. For example, if you recorded 27.5 inches, you would use the 27- and 28-inch holes marked on the rails.
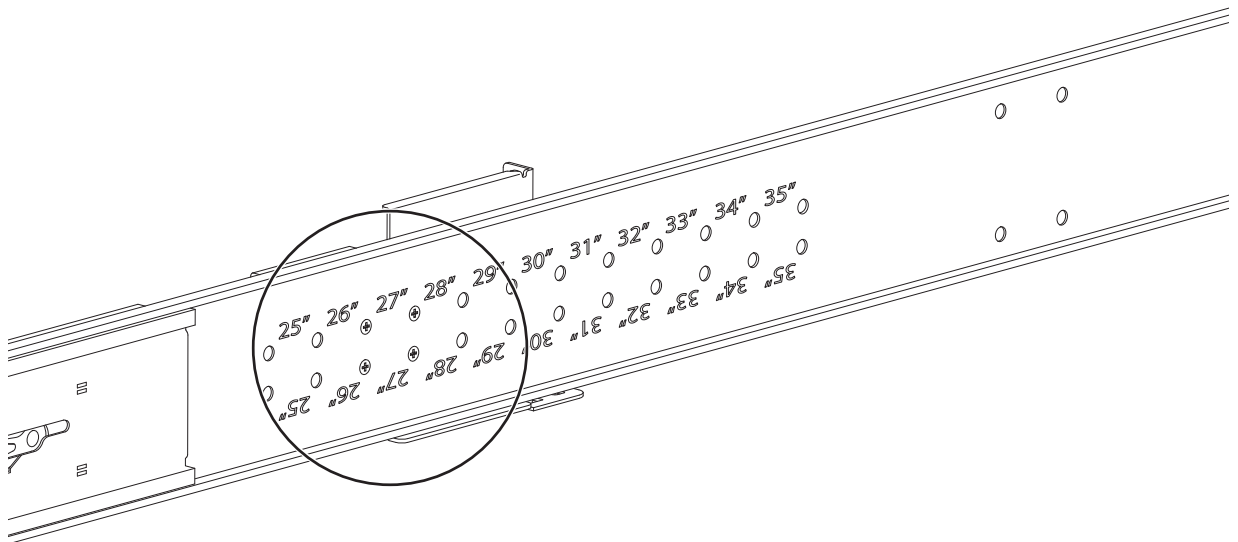
Figure 14   Sample adjusted distance for outer rail setscrews

7. Insert and tighten each setscrew with a #2 Phillips-head screwdriver to a torque of 12 lbf-in (1.36 N-m), then perform a fit check to validate the correct rail length.

8. Repeat the process for the right outer rail, using the proper orientation for the rack cabinet and rail.

9. Turn over the right outer rail assembly to access the inner side of the rear outer rail, then locate the CMA B bracket attachment holes.

> ⓘ **IMPORTANT**   Orient the rail with the bracket front to your right, the rounded rear of the bracket to your left, and the outer rail away from you.

10. Select the CMA B bracket from the CMA box.

11. Attach the CMA B bracket with the proper orientation to the right outer rail using four (4) M4 Panhead screws, tightening with a #2 Phillips-head screwdriver to a torque of 18 lbf-in (2.0 N-m).
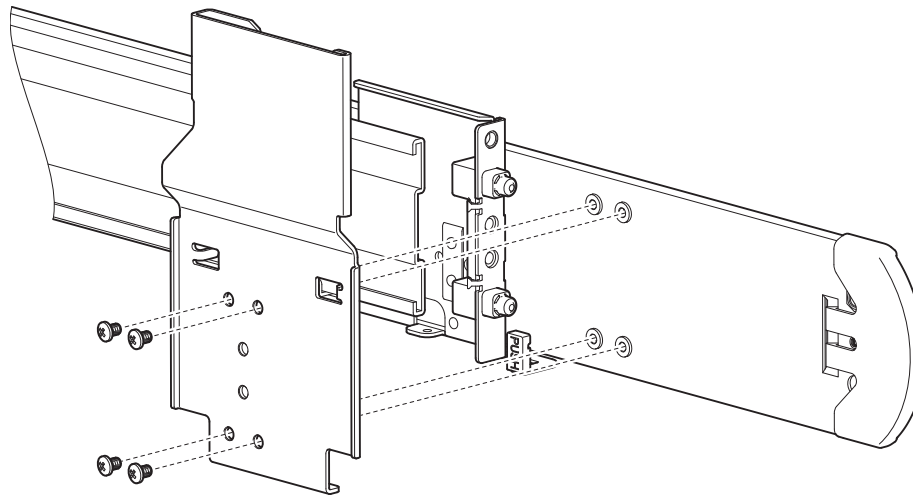
Figure 15 Alignment of CMA B bracket to rear outer rail bracket holes alignment and attachment
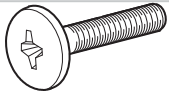
Install the outer rails in the rack cabinet

> ⚠ **WARNING!**   If you do not properly install and securely fasten the rack rails according to this procedure, you risk serious personal injury and could damage the storage enclosure.

Attach the outer rack rails in 4U increments. Select the location for the outer rails based on the following factors:

- Rack system safety precautions
- Position in the rack
- Population of the storage enclosure, full or partial

Once you determine the appropriate position in the rack cabinet, reread the rack system safety precautions, then proceed to install the outer rails. The following task assumes your rack posts have square mounting holes.

Required equipment	Qty	Identification
Outer rails, properly oriented	2	N/A
#2 Phillips-head screwdriver, 12-in length	1	N/A
Truss head screws, 10-32x3/4 in length	10	
Cage nut, 10-32 for rack posts with square mounting holes	2:4	

To install the outer rails in the rack cabinet:

1. Verify that you assembled the rack rails according to prior tasks, orienting it with embossed arrows pointing upward.

2. Complete the following actions to insert the right outer rail assembly as shown to attach it to the rear post on the right side of the rack cabinet:

   a. Insert the right outer rail assembly, adjusting the rear mount bracket to the bottom of the allotted 4U space.

   b. Clip the rear mount bracket spring onto the rear rack post, then confirm that the rear mount bracket seats fully in the rear rack post mounting holes.

   c. Secure the rear rack rail flange to the rack column with two (2) Truss head screws, then tighten each screw with a #2 Phillips-head screwdriver to a torque of 35 lbf-in (3.95 N-m).
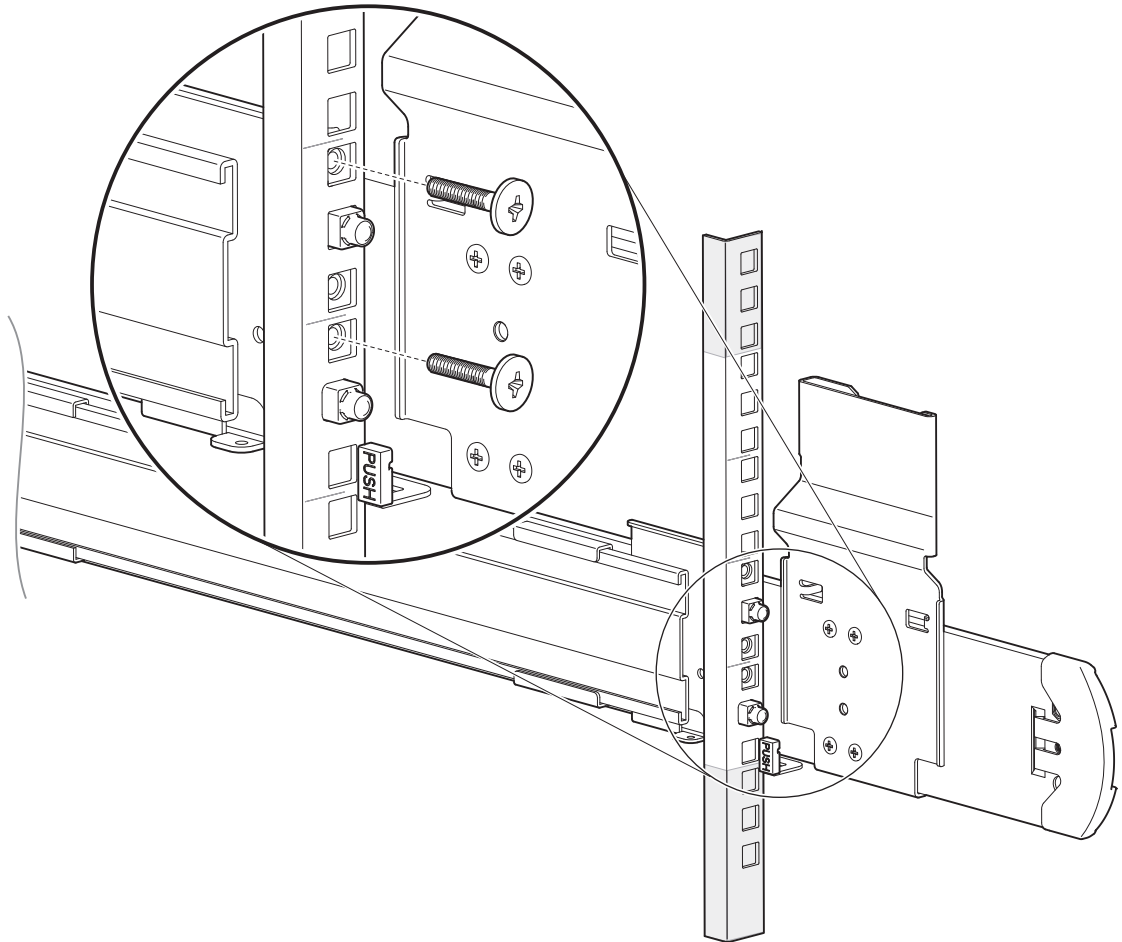
Figure 16   Attach the rear of the outer right rail assembly

   d. (Optional) To release the rear mount bracket, press the release lever with the PUSH label and realign the rail.

3. Complete the following actions to attach the front of the right outer rail assembly to the right front post of the rack cabinet:

   a. Slide the front mount bracket into the front rack post so that it occupies the bottom of the allotted 4U space and it aligns with the rear mount bracket.

b. Clip the front mount bracket spring onto the front rack post so that the outer sleeve, which mates to either a round or square mounting hole, snaps fully into place.

c. Confirm that the mounting bracket fully seats in the mounting holes by verifying that the outer sleeve fully extends and is flush with the fixed inner pin.

d. Confirm that the keyed latch on the front mount bracket snaps onto the front rack post.

e. (Optional) To release the front mount bracket, press the keyed latch outward and realign the rail.

f. Insert a Truss head screw in the hole just below the bottom rail pin seated in the rack post.
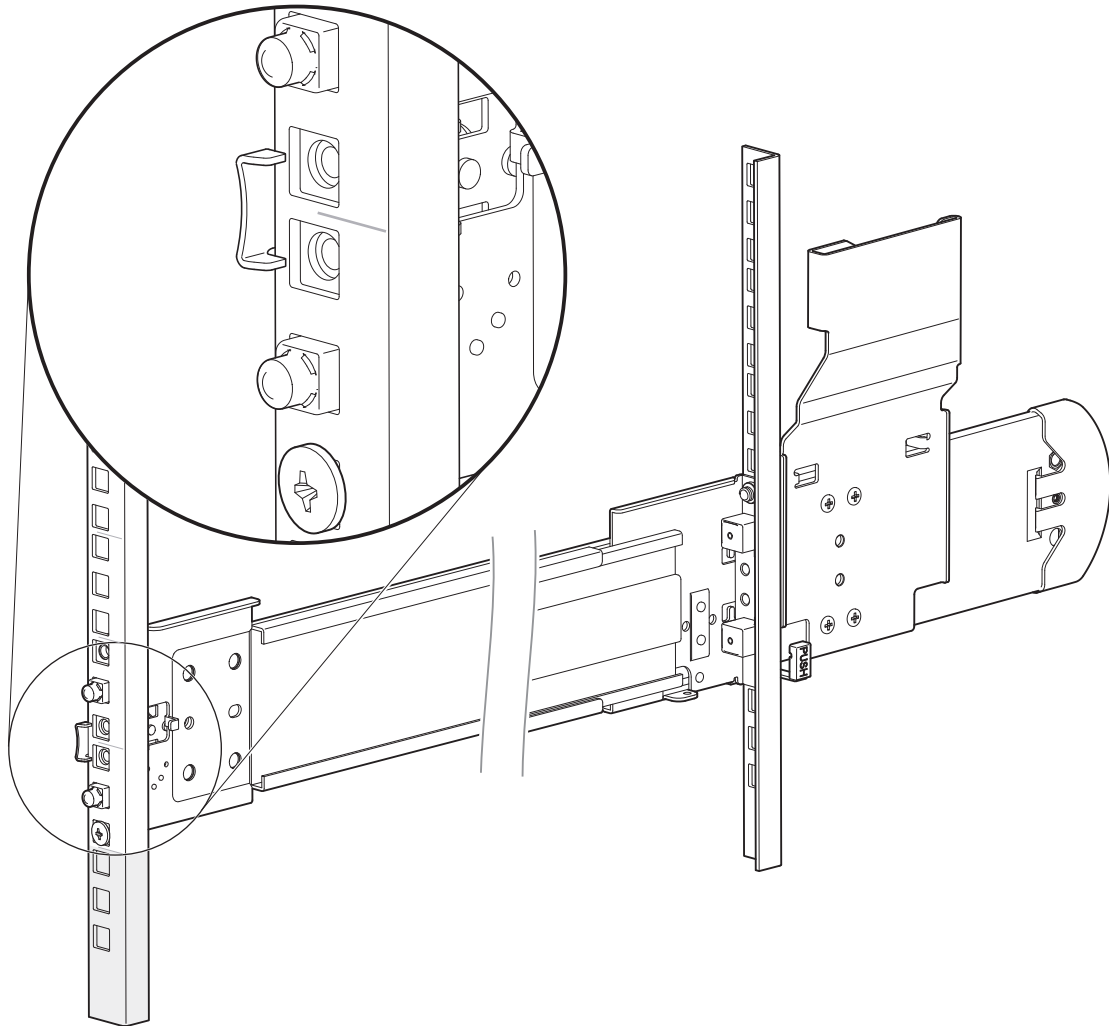
Figure 17 Right front post detail of the inserted outer right rail assembly

g. Secure the front mount bracket by tightening the screw with a #2 Phillips-head screwdriver to a torque of 35 lbf-in (3.95 N-m).

4. Complete the following actions to insert cage nuts in the right front rack post:

a. Insert a cage nut in each front rack post at the second-from-the-top hole in the allocated 4U space, then make sure the nut spring is fully engaged in the post hole.

b. (Optional) Insert a cage nut in the front rack post just below it in the allocated 4U space, then make sure the nut spring is fully engaged in the post hole. Reserve this cage nut for use during non-operating transport of the storage enclosure.
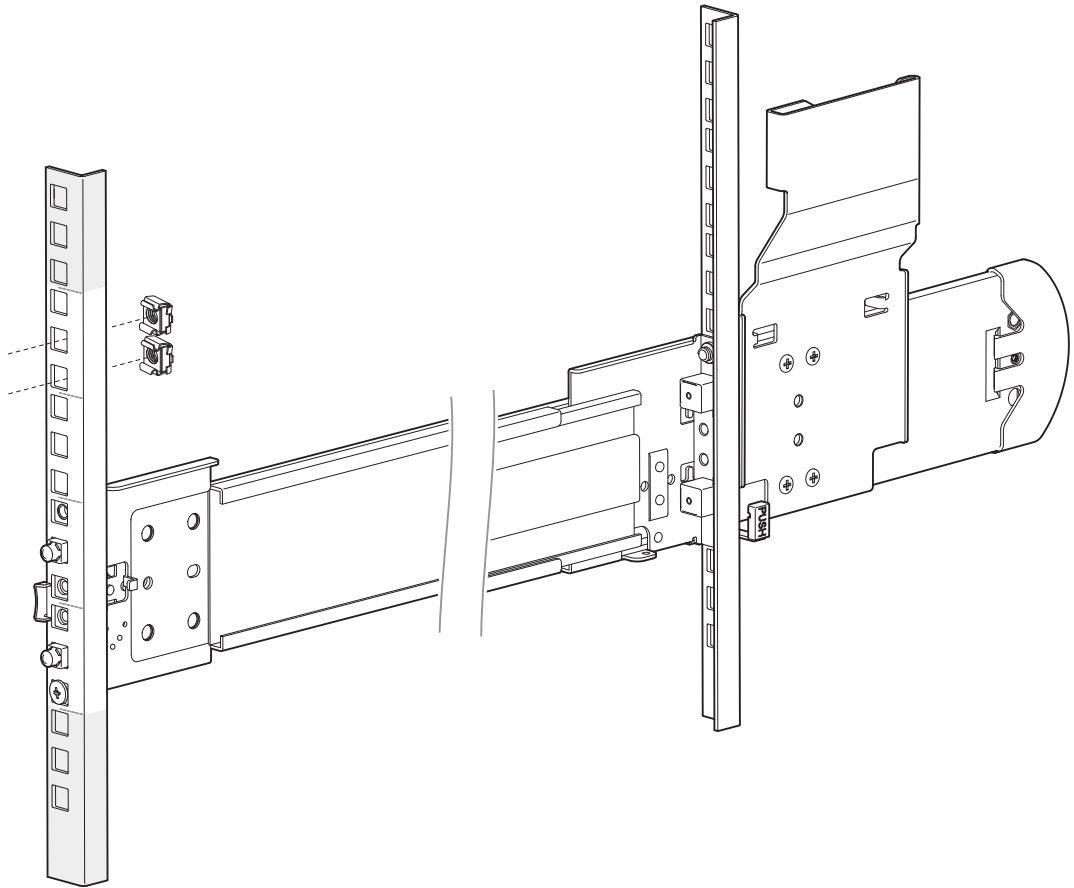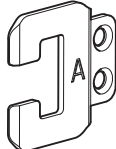
Figure 18   Location for cage nut near top of allocated 4U space

5. Repeat the entire procedure for the left outer rail assembly and the perform a fit check to validate each rail's correct length and location within the rack cabinet.

Attach the inner rails to the storage enclosure

You must correctly attach the inner rails to the storage enclosure to bear the weight of its contents.

Required equipment	Qty	Identification
Inner rails, properly oriented	2	N/A
T10 Torx screwdriver, 6-in length	1	N/A
M3 low profile screws, 5x2.75-in length	10	
#2 Phillips-head screwdriver, 6-in length	1	N/A
Panhead screw, M4x4mm length	2	
CMA A bracket	1	

To attach the inner rails to the storage enclosure:

1. Examine the inner rails, locating the smooth inner edge of the rail, the flanged outer edge, and the rear top notch.
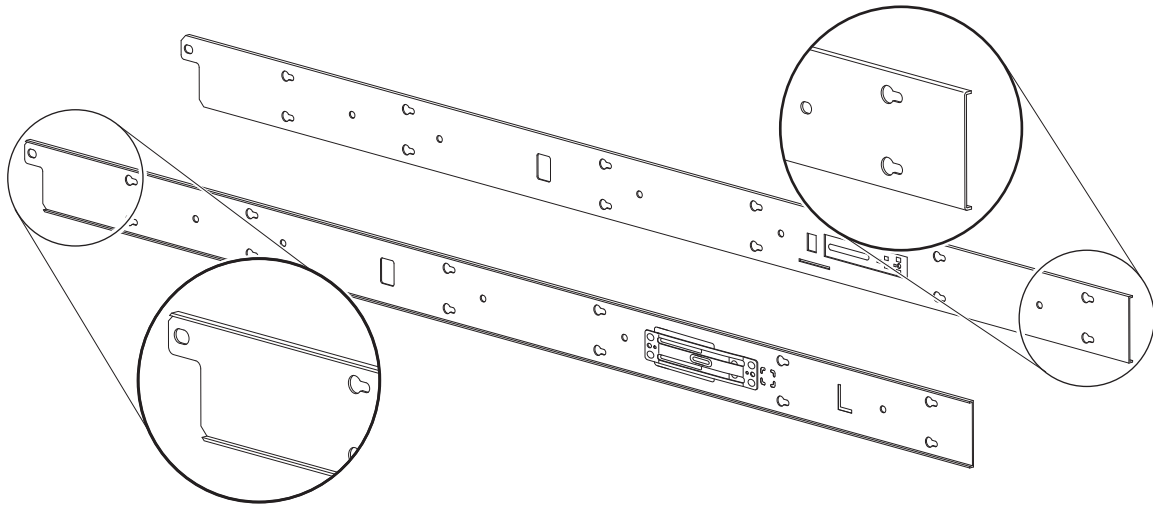
Figure 19   Left and right inner rail edge details

2. Orient the left inner rail so that the flat face at the front of the rail is to your right, the top notch is to your left, and the smooth inner edge is away from you.

3. Face the left storage enclosure sidewall, then align the left inner rail's key holes to the six (6) pairs of sidewall T-pins.
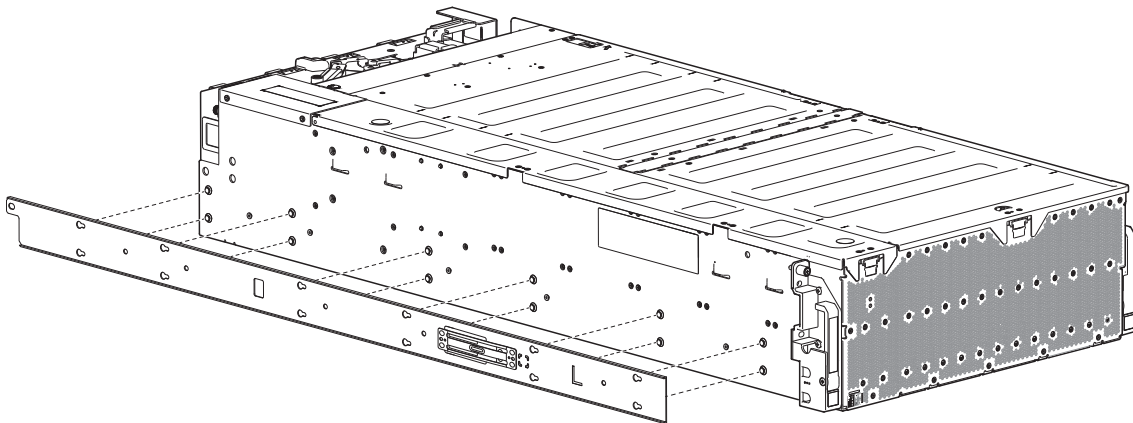
Figure 20   Left inner rail alignment to storage enclosure chassis

4. Slide the inner rail toward the rear until it locks against the T-pins and the screw holes align.
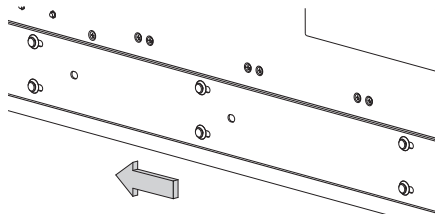
Figure 21   Lock of rail against T-pins, alignment of screw holes to chassis sidewall

5. Secure the rail by inserting and tightening five (5) M3 screws with the T10 Torx to a torque of 12 lbf-in (1.36 N-m).

6. Repeat the process for the right inner rail, using the proper orientation.

7. Locate the CMA A bracket in the CMA shipping box, then orient it so you can see the part number etched on it.

8. Facing the rear of the storage enclosure, locate the two holes on the right side of the chassis, above the CMA shelf.

9. Attach the CMA A bracket so that the face of the bracket is flush against the mounting flange of the chassis.

10. Insert and tighten two (2) M4 Panhead screws with a #2 Phillips-head screwdriver to a torque of 12 lbf-in (1.36 N-m).
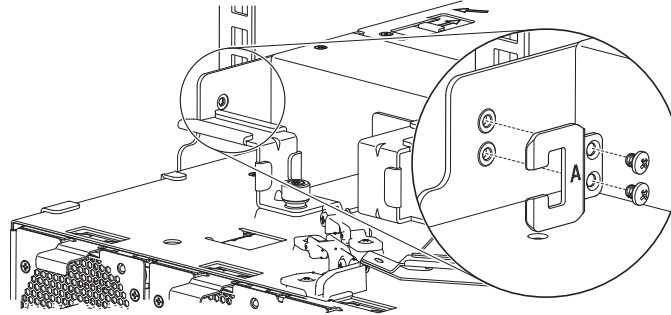
Figure 22   Attachment of the CMA A bracket

Install the storage enclosure

After you successfully complete the installation of the rackmount rail kit, you can mount the storage enclosure into the rack cabinet.

⚠ **WARNING!**   Do not attempt to install the storage enclosure into the rack cabinet with drive modules preloaded in the slots. Serious injury and damage could result. Unload any drive modules in storage enclosure slots to an static-protected area. Do not further lighten the storage enclosure by removing other components.

Mount the storage enclosure into the rack cabinet

⚠ **WARNING!**   Serious injury and mechanical failure can result if you do not adhere to rack cabinet safety precautions.

- To avoid risk of death or injury from tipping the rack, follow all rack installation guidelines, securing the rack cabinet to the floor with a concrete anchor kit.
- To avoid catastrophic failure of the rack assembly, never exceed rack cabinet weight limits.
- Entirely support the storage enclosure with the mechanical lift until the storage enclosure is in the storage position.
- Follow local occupational health and safety guidelines and meet all requirements for manual material handling.

Mounting the storage enclosure into the rack cabinet is the most critical of the installation procedures and requires your full attention. Safety and hardware longevity depend on the smooth function of the rails and correct implementation of this task.

- Make sure there is sufficient clearance for the storage enclosure when fully extended in the service position and for a technician or system administrator.
- Observe rack cabinet weight limits.
- Fill the rack cabinet from the bottom to the top, with the heaviest equipment at the bottom.

- Make your approach with the mechanical lift level, straight, and parallel to the rack cabinet. Any skew, warp, or tilt prevents the inner rails attached to the storage enclosure from properly engaging the outer rails in the rack cabinet.

Required equipment	Qty
Retractable tape measure	1
Mechanical lift	1
Storage enclosure with attached inner rails	1
Rack cabinet with installed outer and mid rails	1

To mount the storage enclosure into the rack cabinet:

1. Confirm that the rack rails are properly assembled and securely installed correctly in the rack cabinet.

2. Confirm that the storage enclosure does not contain any drive modules.

3. Complete the following actions to position the lift and the storage enclosure:

   a. Using proper safety precautions, position the storage enclosure on the lift perpendicular to the lift wheels.

   b. Move the lift into position perpendicular to the rack cabinet so that the storage enclosure is parallel to the opening and is a minimum of 5 to 7 inches (12.7cm to 17.78cm) away from the rack cabinet.

   c. Adjust the lift height to be as close as possible to the allocated 4U location.

   d. Moving only the storage enclosure, position it so the attached inner rails align with the mid rails in the rack.
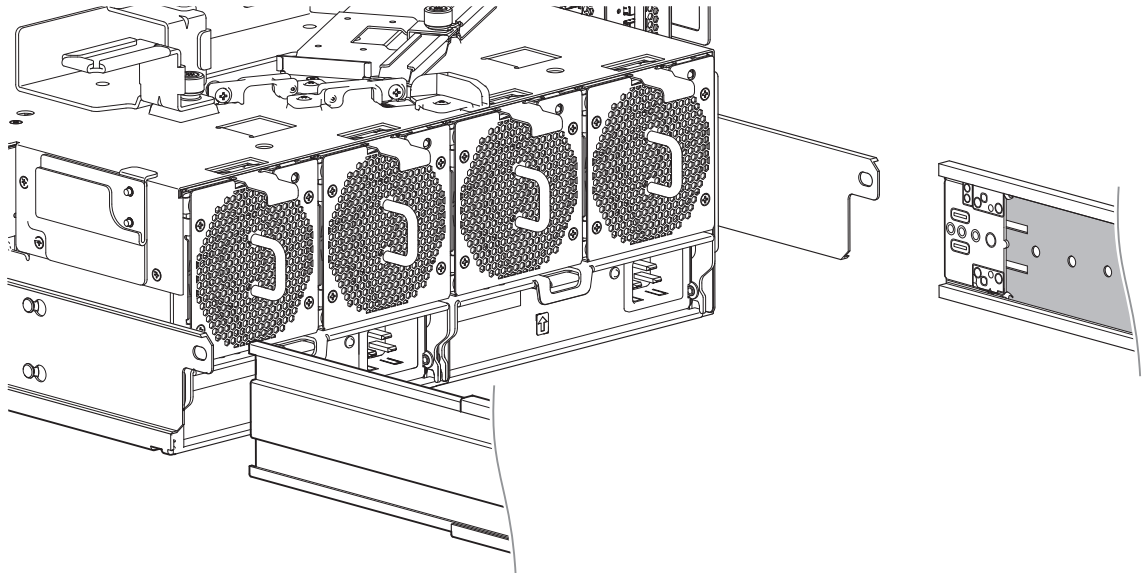
Figure 23   Align inner rails with mid and outer rails, detail

4. Complete the following actions to prepare the rails to receive the storage enclosure:

⚠ **WARNING!**   Failure to properly seat the inner rail on the ball bearing retainers can cause integration failure and immediate or gradual mechanical failure. Serious injury could result.

   a. Facing the cabinet, verify that both the top and bottom ball bearing retainers are fully seated.

   b. Slide both mid rail slides smoothly on the ball bearing retainers until they are fully forward and engage the inner leaf spring on the mid rail nearest the front mount bracket.

(!) IMPORTANT   Retention against the inner leaf spring is essential for proper rail sequencing and full engagement of the mid rail on the inner rail.
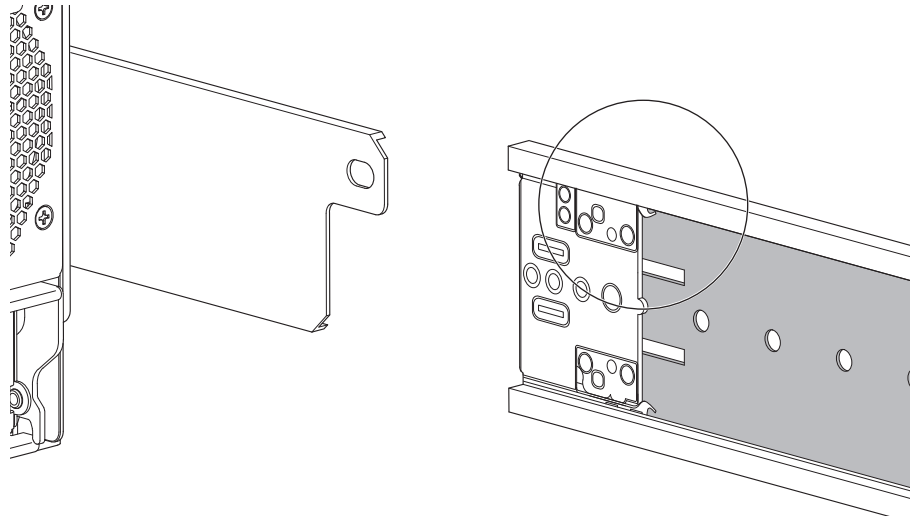
Figure 24   Leaf spring latch engaged, extension of mid rail to fully forward and locked position

c. After releasing the safety lock on the outer rails, extend both left and right mid rails roughly 3 to 5 inches (7.62cm to 12.7cm) beyond the rack cabinet opening.

d. Verify that both mid rails are the same distance from the rack cabinet face.

⚠ **WARNING!**   To fine-tune any alignment adjustments, move only the storage enclosure or the mechanical lift. Do not move the mid rails or the rack cabinet.

e. Fine-tune the alignment between the storage enclosure and the rails, only moving the storage enclosure.

5. Complete the following actions to properly secure the storage enclosure on the rails:

a. Keep the storage enclosure stationary on the lift.

b. Verify that both rails are as far forward as possible and that each engages the leaf spring at the front of the rail.

c. Grasp the right ball bearing retainer, then continuously press it against the right mid rail to make sure it continues to engage the leaf spring at the very front of the mid rail.

d. Continuously maintain pressure on the ball bearing retainer as you slide the mid rail onto the inner rail, beginning with the top of the inner rail, then the bottom of the inner rail for the right side.

e. Continue maintaining pressure on ball bearing retainer while feeding the remainder of the mid rail onto the storage enclosure inner rail until it reaches the maximum extension of the right rail.

f. Repeat for the left side.

g. Verify full engagement, top and bottom, of the inner rails with the top and bottom ball bearing retainers.

h. Verify the mid rails slide freely and smoothly on the inner rails. If they do not, this indicates misalignment and requires correction.

i. Slide both mid rails until they are fully extended in the service position and engage the safety lock.

6. Complete the following actions to begin insertion of the storage enclosure into the rack cabinet:
   a. Facing the front of the enclosure, carefully exert even pressure on both sides of the storage enclosure front, inserting the storage enclosure until it locks into the service position with an audible click.
   b. Carefully lower the mechanical lift just enough so that the weight of the storage enclosure fully rests on the rails.
   c. Thoroughly examine the rack rails for issues such as bowing, scraping, resistance, or indicators of misalignment.
   d. Locate and depress both safety lock latches to release the rails.
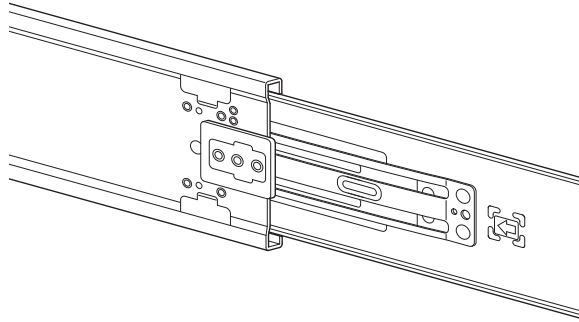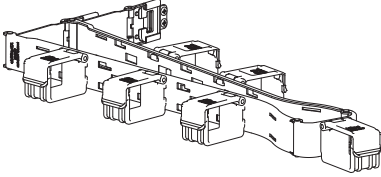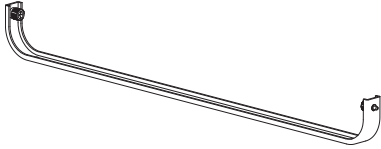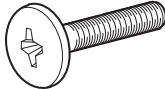
Figure 25   Release both safety lock latches

   e. Continue depressing the safety lock latch springs while inserting the storage enclosure into the rack just far enough to bypass the service position locks.
   f. Carefully exert even pressure on both sides of the storage enclosure front.
   g. Continue insertion all the way into the rack until the rack mounting flange is flush with the rack ears, locking the storage enclosure into the storage position. Do not force insertion, because this action could damage the rails.
7. Complete the following actions to confirm the proper installation of the storage enclosure into the rack cabinet:
   a. Gently pull the storage enclosure outward to make sure the storage enclosure slides smoothly on its rails out to service position and returns smoothly to the storage position.
   b. Feel for the smooth, even function of the ball bearings in the ball bearing retainer. Any grinding indicates misalignment and requires correction, up to obtaining a new rail kit if you identify damaged bearings.
8. Secure the storage enclosure flanges to the rack, fastening the top captive thumbscrew on each side until tight.

Install the CMA and crossbar

The cable management arm (CMA) is essential to the storage enclosure and allows for full extension to the service position. It also ensures efficient and effective storage enclosure connectivity. The crossbar stabilizes the rear rails, keeps them parallel to each other, and protects them from inadvertent sideways forces that could damage their function.

Required equipment	Qty	Identification
CMA bracket assembly	1	
Crossbar	1	
#2 Phillips-head screwdriver, 12-in length	1	N/A
(Optional) Panhead screw, M5 0.8x4mm length	2	
(Optional) Truss head screws, 10-32x3/4 in length	2	

To install the CMA and crossbar:

1. Facing the rear of the rack cabinet, grasp the CMA bracket assembly so that arrows by embossed letters point upward and are visible to you, then fully extend the CMA bracket with the front end in your right hand.

2. Route the front end of the CMA bracket assembly in your right hand along the chassis guide bracket until it clips to the CMA A bracket you previously attached to the storage enclosure chassis.
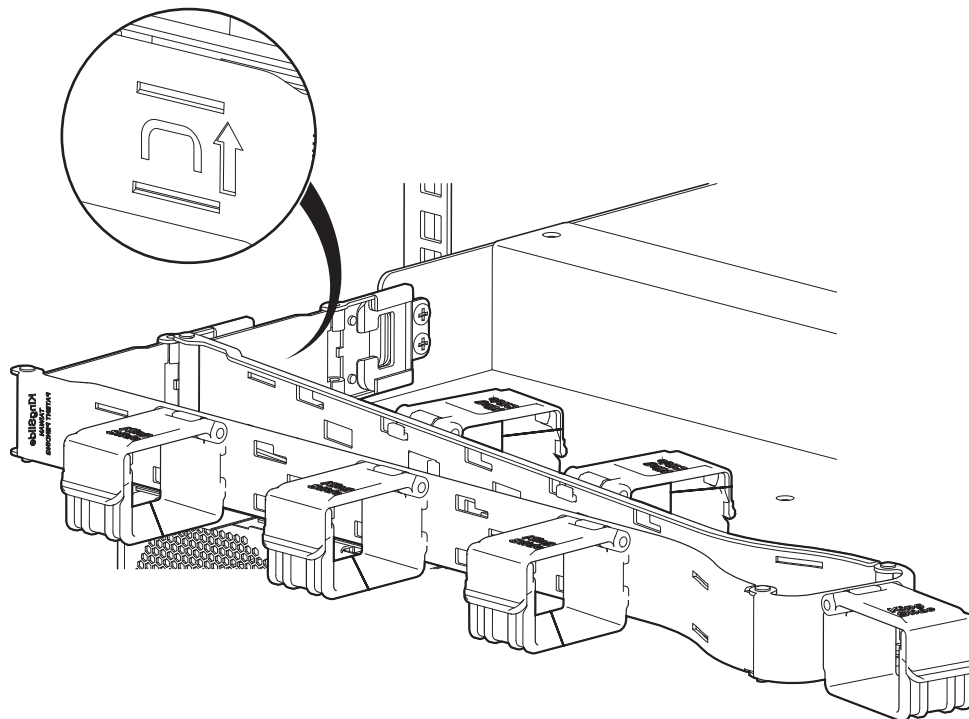
Figure 26   Attachment of the CMA bracket assembly to the CMA A bracket on the chassis

3. Using your right hand, push the storage enclosure slightly forward to gain better access to the CMA B bracket.

4. Route the portion of the CMA bracket assembly in your left hand inward until it clips to the CMA B bracket that you previously installed on the outer rail.
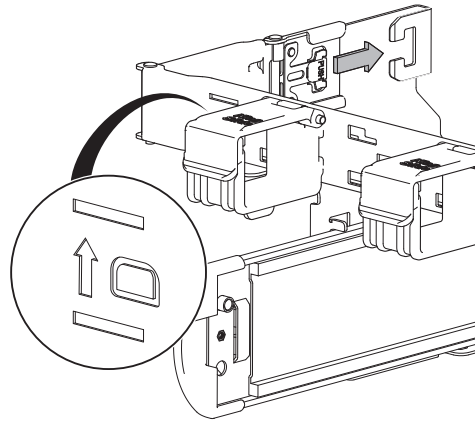
Figure 27   Insertion of CMA bracket assembly into CMA B bracket on the outer rail

5. Complete the following actions to verify the CMA bracket installation:
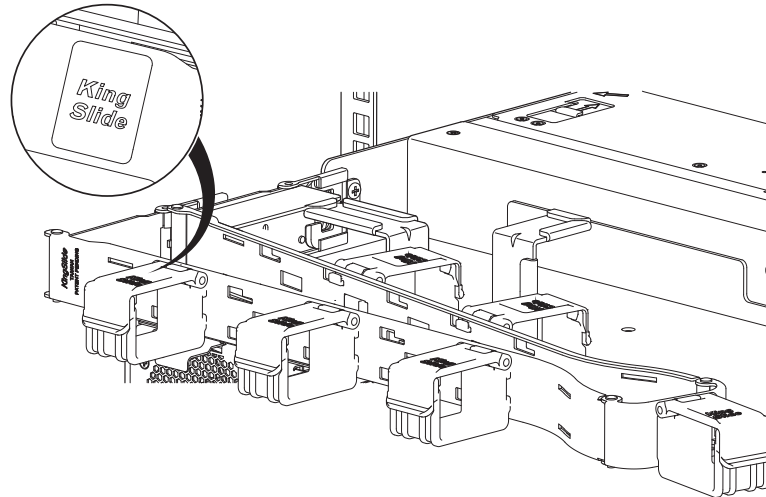
Figure 28   Proper installation of the CMA bracket assembly

   a. Verify the outer blue spring of the CMA bracket assembly securely clips to the CMA B bracket on the outer rail and that the inner blue spring securely clips to the CMA A bracket.
   b. Verify that all cable holders open upward and that you can read the embossed name King Slide when examining the top of each cable retainer.
6. After fully retracting the chassis, tug on the CMA bracket to make sure you properly and securely installed it.
7. Install the crossbar by snapping each captive thumbscrew into the lower of the two available holes, twisting to the right to tighten them and stabilize the rails.
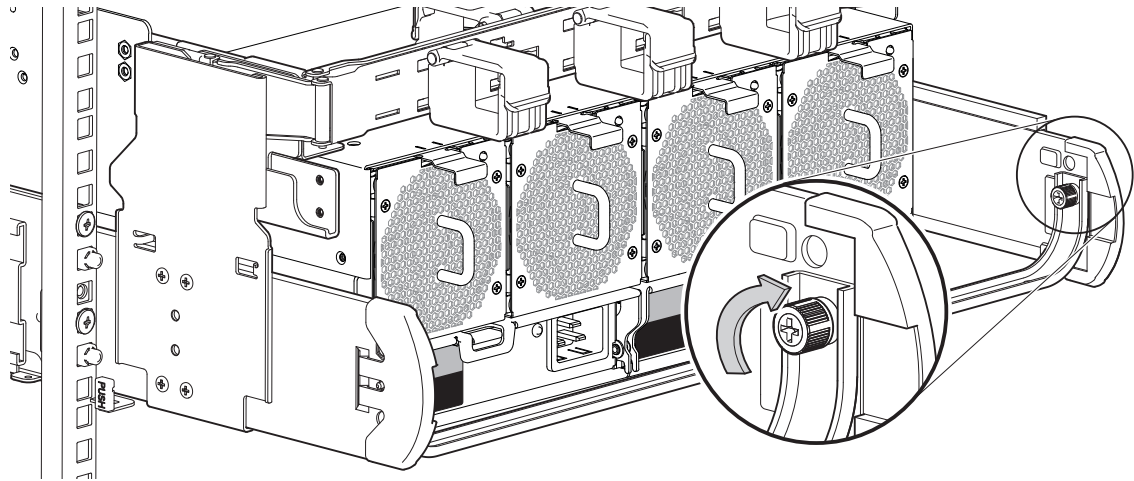
Figure 29 Direction to tighten crossbar thumbscrews

8. (Optional) For non-operating transport of the rack cabinet, complete the following steps:

    a. Return to the front of the rack cabinet.

    b. Lower the pull handle, and then insert and tighten two (2) Truss-head screws per side in the available screwholes on the rack ear to a torque of 35 lbf-in (3.95 N-m). The screws secure the storage enclosure against shock and vibration.
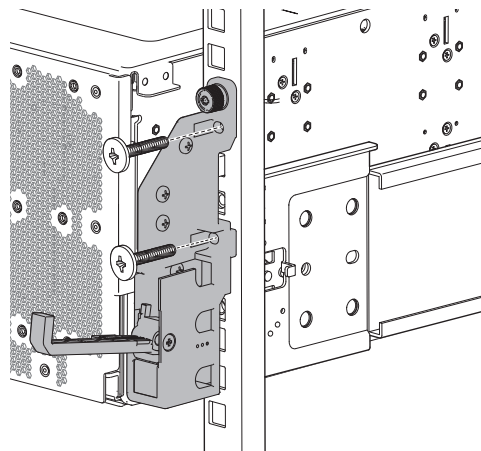
Figure 30 Location for insertion of rack ear transport screws

    c. Facing the rear of the rack cabinet, secure the rails by inserting and tightening an M5 screw just above each crossbar thumbscrew to a torque of 12 lbf-in (1.36N-m) to stabilize the rails against shock and vibration.
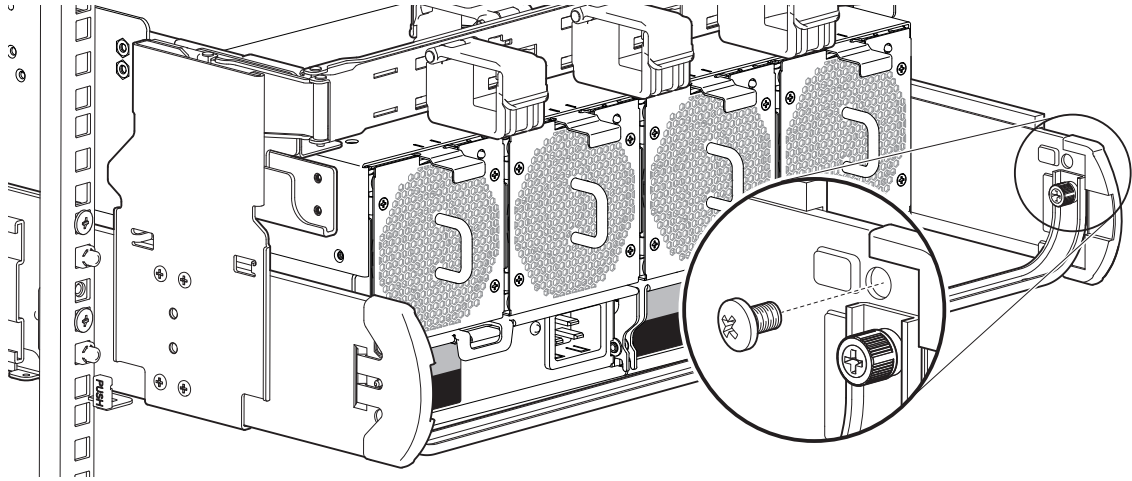
Figure 31 Location for insertion of crossbar transport screws

9. Continue your initial installation by following instructions in the related Hardware Installation and Maintenance Guide.

☼ **TIP**   Use the QR code on the included Getting Started sheet to access related storage enclosure documentation online.

Install drive carriers in the storage enclosure

Seagate provides drive carriers to protect each drive module and connect each drive module to the baseplane after vertical insertion into a slot.

⚠ **WARNING!**   Do not attempt to install the storage enclosure into the rack cabinet with drive modules preloaded in the slots. Serious injury and damage could result. Unload any drive modules in storage enclosure slots to an static-protected area. Do not further lighten the storage enclosure by removing other components.

⚠ **CAUTION**   Make sure you are not connected to power at any time during installation procedures.

To install drive carriers in the storage enclosure:

1. Facing the front of the enclosure, lower both pull handles and steadily pull the storage enclosure out on its rails until it locks in the service position.

2. (Optional) As an extra safety measure while installing drive carriers, continue to support the storage enclosure with a mechanical lift to avoid any potential issues caused by downward forces.

3. Locate the main bay cover's front latch, then release it by pressing the latch away from the front panel and toward the hinge, resting the open half of the cover on the closed half.
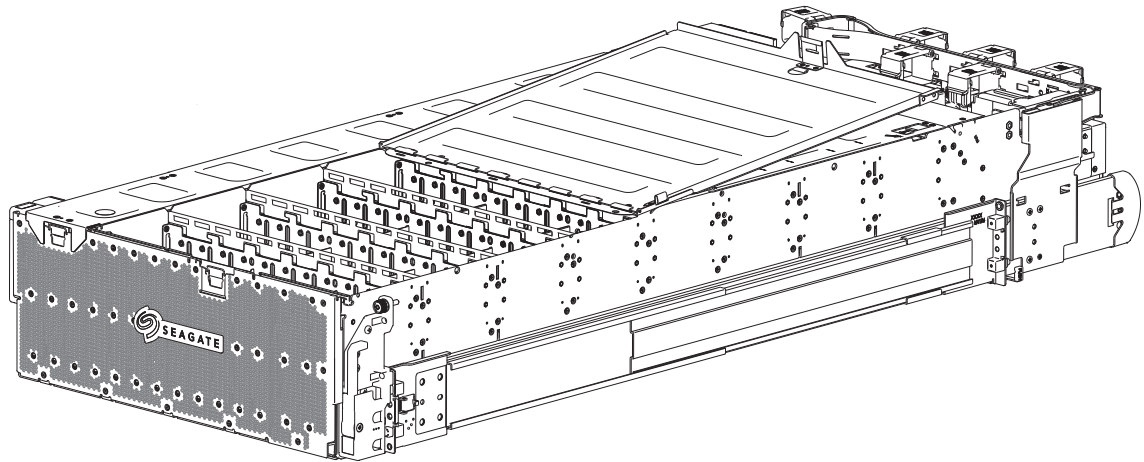
Figure 32   Front half of unpopulated main bay

4. Select the first drive carrier from the static-protected area you used when unpacking the storage enclosure.

5. Go to the right side of the open storage enclosure, so that the auxiliary bay is to the top of your workspace.

6. Prepare to fill the main bay from top to bottom for each lateral bay, progressing from front to back.

7. Release the drive carrier latch to open the carrier, then hold the handle so it is toward the rear of the slot.
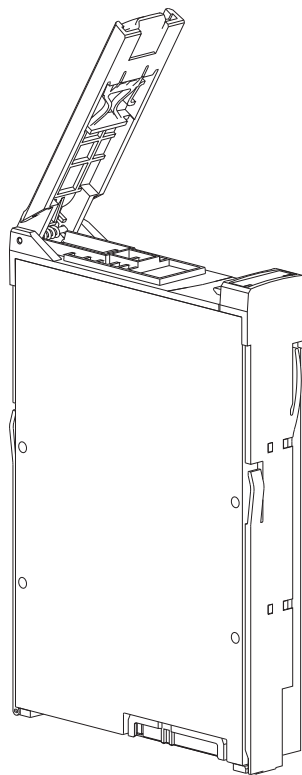
Figure 33   Orient drive carrier handle to rear

8. Insert the first drive carrier in the leftmost top slot closest to the auxiliary bay.
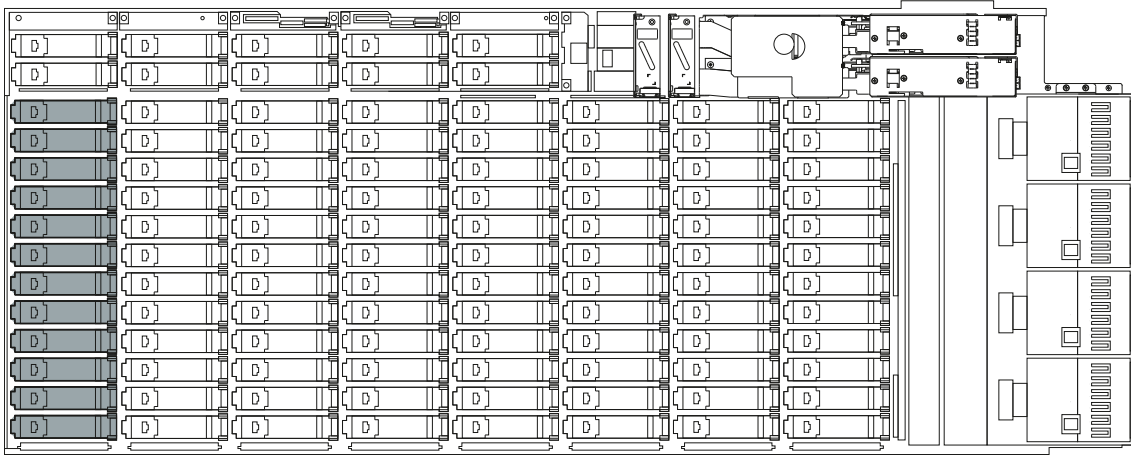
Figure 34   Required installation of first complete row of drive carriers

9. Firmly press the drive carrier into the mating connector on the baseplane.

10. Close and press down on the drive carrier handle until you engage the locking mechanism.

11. Repeat the procedure, inserting each drive carrier below the former one, until you complete the first lateral bay.

⚠ **CAUTION**   If you partially populate the storage enclosure with disk drives, you must populate from front to back, filling an entire lateral bay before populating the next bay.

12. (Optional) To completely populate the storage enclosure, take the following actions:

   a. Continue insertion of drive carriers for each of the next three sets of twelve to complete the insertion of 48 drives.

   b. Close the front half of the main bay cover, latching it firmly in place.

   c. Using the rear latch of the main bay cover, lift the rear half, resting it on the front half.
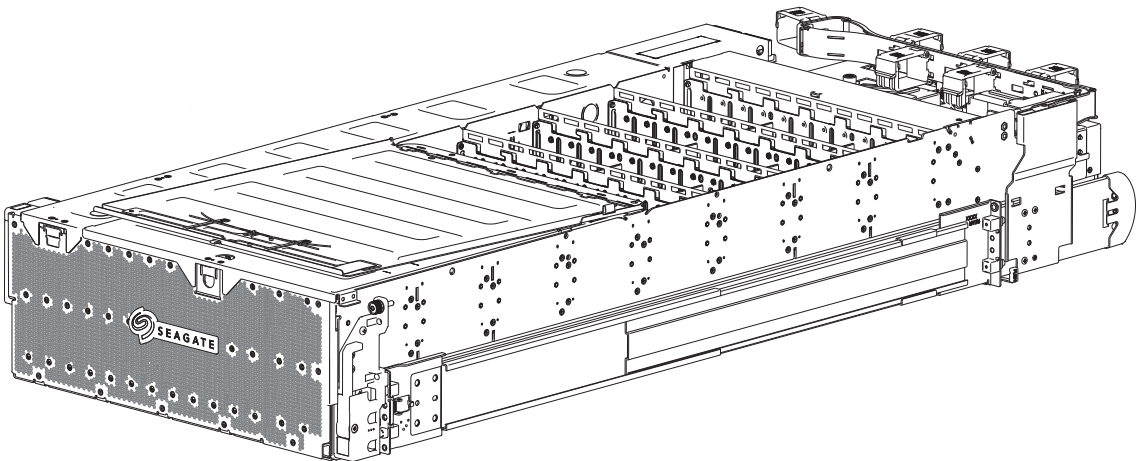
Figure 35   Rear half of unpopulated main bay

   d. Continue insertion of the next 48 drives to complete population of the main bay, again filling the slots from top to bottom, progressing from front to back.

   e. Close the rear half of the main bay cover, latching it firmly in place.

   f. Using the front latch of the auxiliary bay cover, remove it and set aside to access the auxiliary bay.
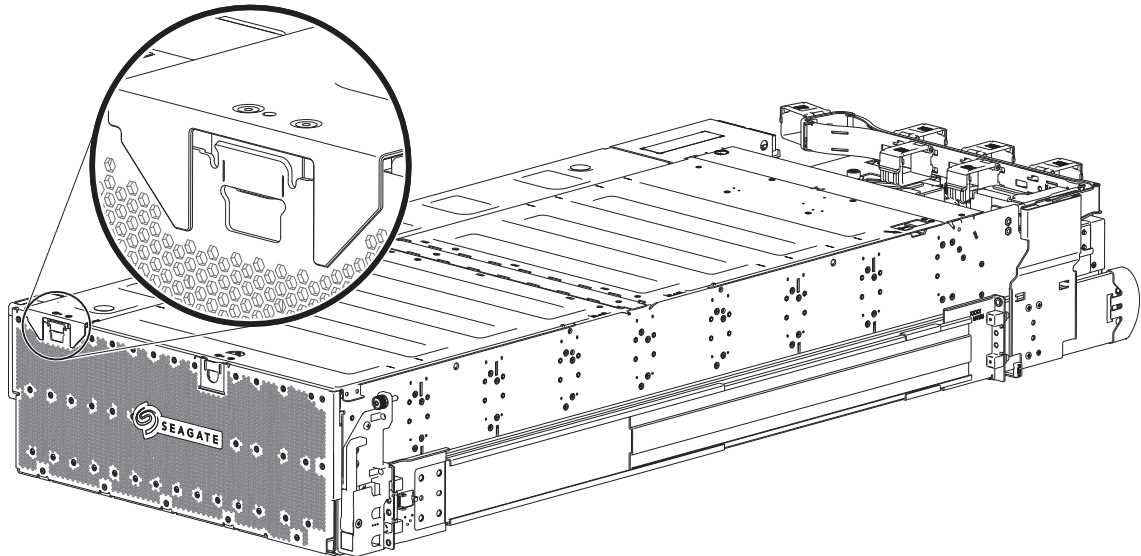
Figure 36 Auxiliary bay latch

    g. Continue insertion of the final 10 drives to complete population of the auxiliary bay using the same progression from top to bottom and from front to back.

    h. Replace the auxiliary bay cover, latching it firmly in place.

13. (Optional) Lower and remove the mechanical lift.

Test enclosure connections

After completion of all installation procedures, the storage enclosure is ready for connection to power. You can only connect the storage enclosure to a power source that has a safety electrical earth connection. Have a qualified electrical engineer confirm the earth connection meets the product specifications.

△ **CAUTION** If you install multiple storage enclosures in a rack cabinet, the importance of the earth connection increases, since each storage enclosure increases earth leakage current.

ⓘ **IMPORTANT** Only a qualified electrical engineer who meets local and national standards should perform the inspection.

Route power cords and data cables

Power cords and data cables enable efficient operation of the storage enclosure. You must properly route them through the cable management arm (CMA) assembly and brackets to facilitate in-rack service of storage enclosure modules.

△ **CAUTION** You must ground the storage enclosure before applying power. Install the equipment close to the tested socket outlets and make sure the outlets are easily accessible because the plug on the power supply cord is the primary disconnect device.

To adhere to electrical safety precautions:

1. Observe the power supply disconnection caution label affixed to power supply units (PSUs).
2. Confirm the power supply input voltage range is 200-240VAC at 50 to 60Hz, then only operate the storage enclosure in that range.
3. You must provide a suitable power source with electrical overload protection to meet technical specification requirements.
4. You must use a provided power cord that has a tested, safe electrical earth connection for each storage enclosure power supply.
5. Confirm the storage enclosure connection to earth before applying power to it.
6. Do not operate a storage enclosure with less than the provided two PSUs, four system fans, and two controller channel fan modules, other than to provide in-service maintenance in the required time allotment.

(!) **IMPORTANT**   Use only Seagate or OEM-qualified fibre channel or HD mini-SAS (SFF-8644) x4 data cables that are at least 3m (9.83 ft) in length and do not exceed 5m (16.4 ft) in length to connect to the SAS ports on each controller module.

Route power cords from the power supply units

This basic task connects the supplied power cords to the redundant power supply units.

⚠ **CAUTION**   Use only power cords supplied in the installation kit or those that meet product specifications.

⚠ **CAUTION**   Adhere to the following electrical safety guidelines:

- During installation, never connect a power cord to a power supply unit (PSU) before installing it in the appropriate storage enclosure slot.
- Only connect the power cord to power that complies with the product specifications within a range of 200 to 240VAC, per the hazardous voltage warning label on the PSU.
- During service, always remove the PSU from power by disconnecting the power connector before removal of the PSU.

Required equipment	Qty	Identification
CMA bracket assembly, properly installed	1	N/A
#2 Phillips-head screwdriver, 12-in length	1	N/A
T10 Torx driver, 6-in length	1	N/A
Power cords	2	N/A
M3 low-profile screw, 5x2.75-in length	1	

To route power cords from the power supply units:

1. Select both power cords from the packaging, remove the cable ties, and connect a right-angle power cord connector to each PSU.
2. Move the CMA bracket assembly aside to access the cable capture clip on the chassis.
3. Use a #2 Phillips-head screwdriver to loosen the captive screw on cable capture clip and then raise the clip on its hinge.
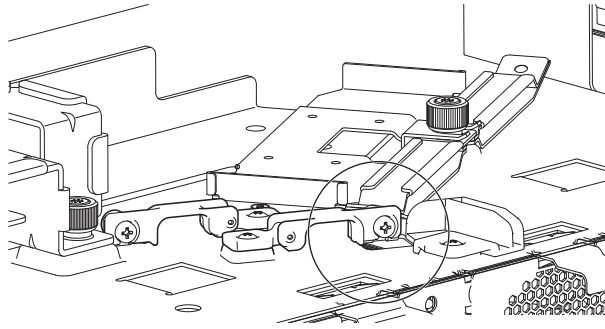
Figure 37 Location of cable capture clip release screw

4. Route the outer power cord just inside the outer fan and up to the clip, allowing a minimum of slack.

5. Route the inner power cord just inside the third fan and up to the clip, allowing a minimum of slack.
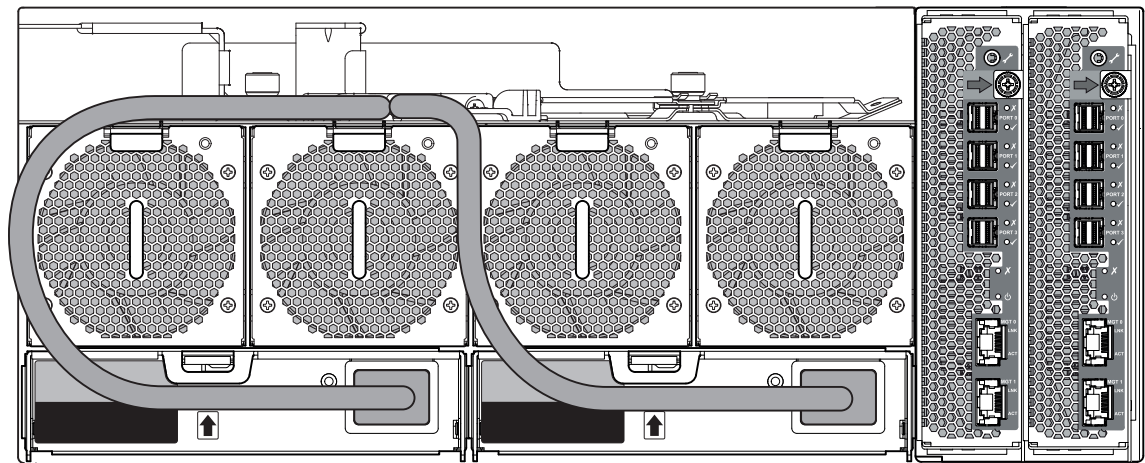
Figure 38 Power cord routing up to cable capture clip

6. Ensure both cords lie smooth and flat against the chassis as you route them through the cable capture clip.

7. Lower the clip hinge, then tighten the captive screw to a torque of 5 lbf-in (.54 N-m).
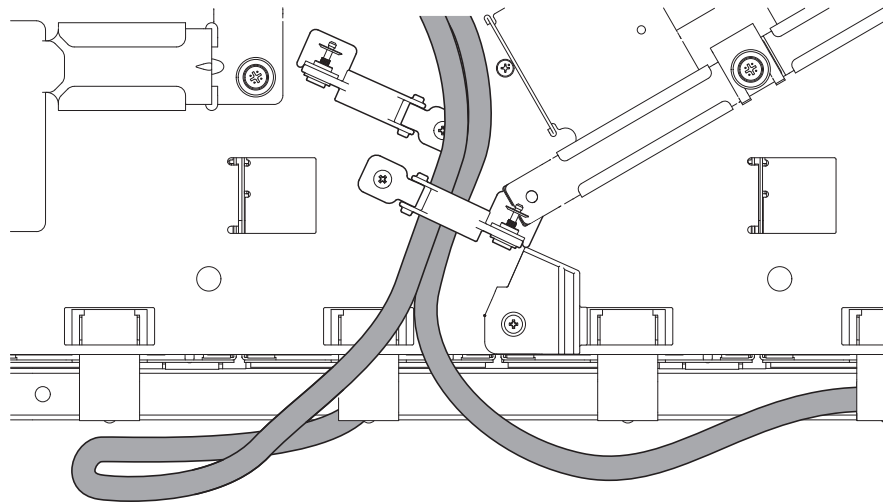
Figure 39   Final power cord routing

8. Proceed with routing data cables in the next tasks, leaving the power cord plugs for future connection when you complete all other cabling tasks and are fully ready to test your connections.

Route data cables from the controller module

The storage enclosure chassis retains cable capture mechanisms for securing data cables to the chassis. You must first secure data cables to the chassis, then route them through the CMA bracket. The CMA bracket protects data cables during extension of the storage enclosure to the service position.

To route data cables from the controller modules:

1. Complete the following actions to number the data cables you selected for this installation:

    a. Sequentially label eight mini-SAS cable pairs, starting with numbers 1 to 4 and 5 to 8.

    b. Sequentially label two Ethernet cables with RJ-45 connectors, numbers 9 and 10.

2. Move the CMA bracket out of the way.

3. Loosen the thumbscrew on the center post of the cable capture arms, then rotate them away from the center post.
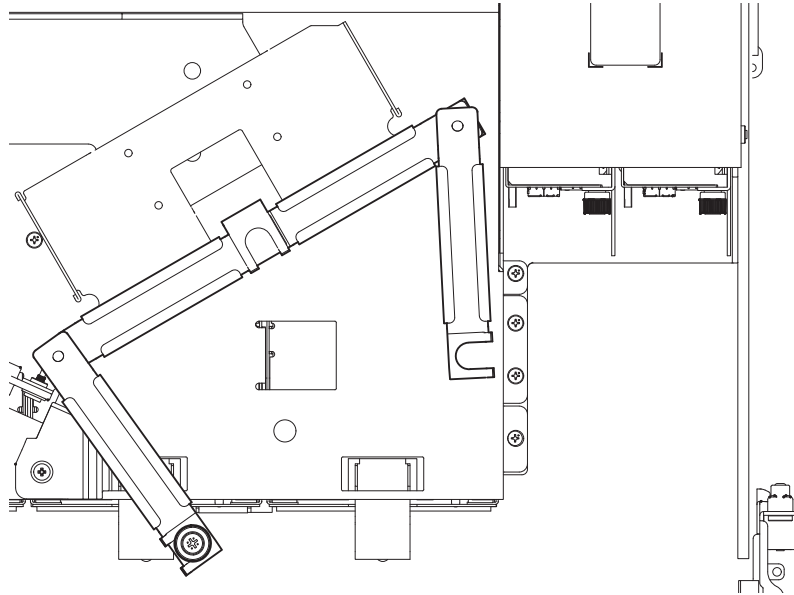
Figure 40 Open cable capture arms on chassis

4. Complete the following actions to route four mini-SAS data cable pairs to each of the controller modules:

    a. Route the first four data cable pairs, numbered 1 through 4, to the 12Gb SAS ports on the outer controller module, labeled data ports DP0, DP1, DP2, and DP3, respectively.

    b. Route the second four data cable pairs, numbered 5 through 8, to the 12Gb SAS ports on the inner controller module, labeled data ports DP0, DP1, DP2, and DP3, respectively.
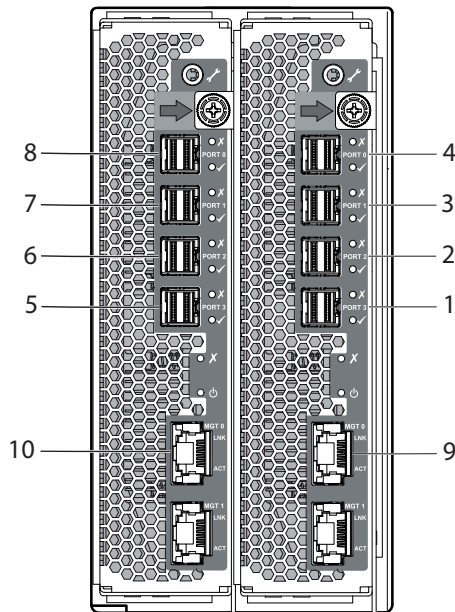
Figure 41 Proper order of data cables

5. (Optional, when enabled) Complete the following actions to route an Ethernet cable to each of the controller modules:

    a. Route the first Ethernet cable, numbered 9, to the Ethernet port on the outer controller module.

    b. Route the second Ethernet cable, numbered 10, to the Ethernet port on the inner controller module.
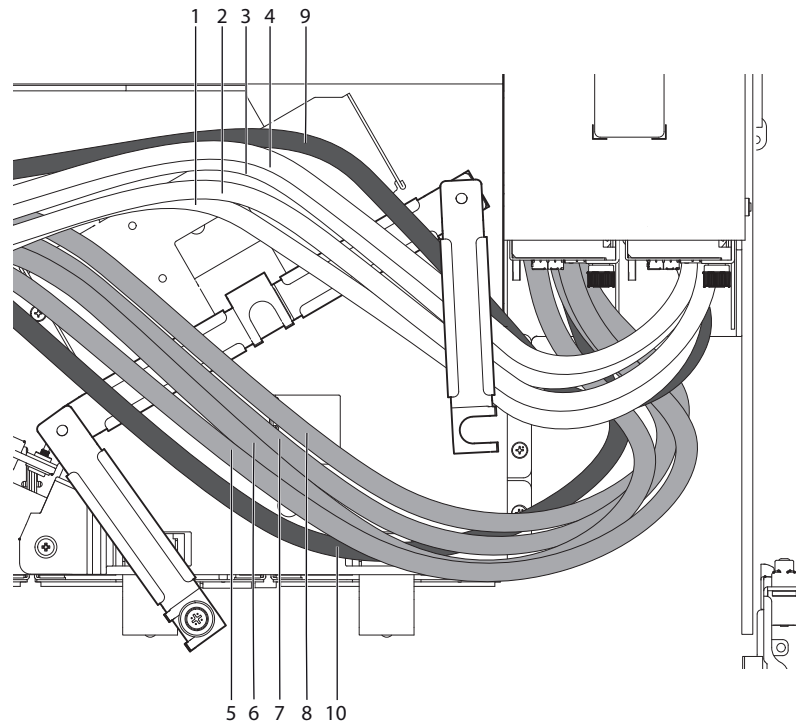
Figure 42   Route for sample data cables on either side of the CMA cable capture arm

6. Complete the following actions to route cable groups through the cable capture arm:

    a. Route the first group of five cables, numbered 1 to 4 and 9, so they lie flat as shown on the base of the open cable capture arm.

    b. Route the second group of five cables, numbered 5 to 8 and 10, so they lie flat as shown on the opposite side.

    c. Make sure each cable meets the bend radius for that cable type as you properly and smoothly route all cables.

    d. Rotate both cable capture arms to secure each cable group on its appropriate side. If the cables are SAS data cables, you may need to press them downward to properly seat the cable capture arms.

7. Tighten the thumbscrew down on both cable capture arms.

8. Take the following actions to route data and management cables from the appropriate server's host bus adapter (HBA) or appropriate management network switch to the best available controller module port for your environment:

💡 **TIP**   Use the cabling sample below as a recommended method for creating redundancy.

---

    a. Connect the data cables numbered 1 and 2 to the top two ports in one HBA or switch.

    b. Connect the data cables numbered 3 and 4 to the lower two ports in a second HBA or switch.

    c. Connect the data cables numbered 5 and 6 to the available top two ports in the second HBA or switch.

    d. Connect the data cables numbered 7 and 8 to the available lower two ports the first HBA or switch.
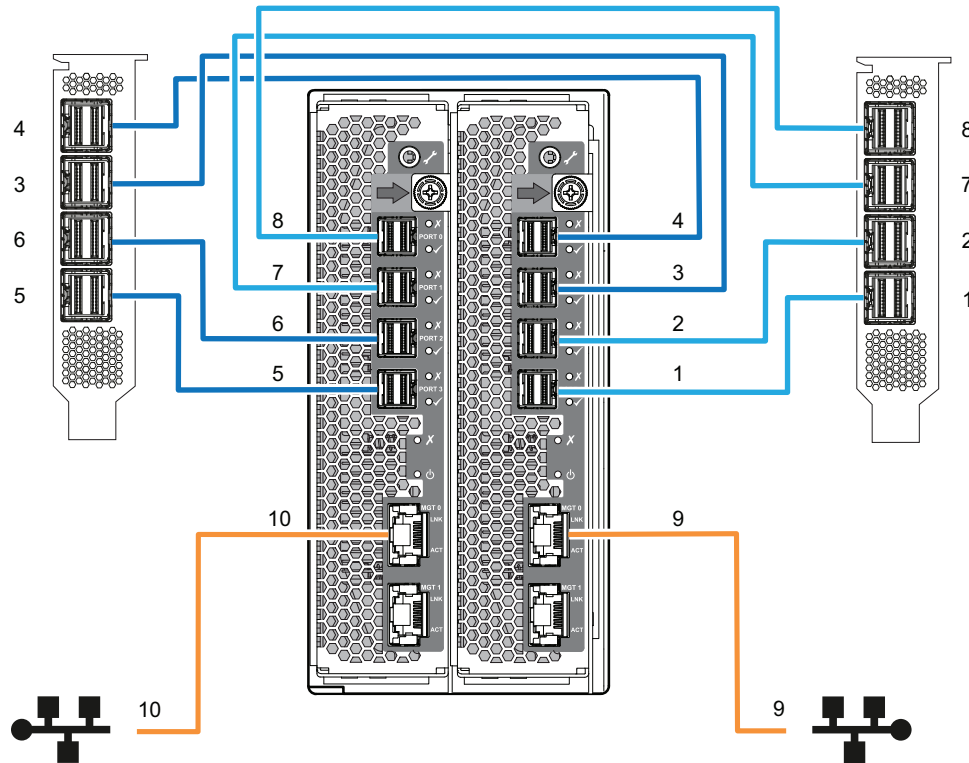
Figure 43 Sample HBA data and management connections

9. (Optional, when enabled) Connect the Ethernet cables numbered 9 and 10 to the host system or management network.

Route enclosure and expansion data cables

The storage enclosure supports up to three (3) expansion enclosures and several methods for connectivity to a switch or the host system. Fault tolerance and performance are key factors in determining how to best optimize your particular system and cabling configuration. This topic assumes a fault-tolerant *reverse* cabling method, since it provides a method of maintaining access to all enclosures in the chain, even if one of the enclosures fails or requires removal. If you use a *straight-through* cabling method, a failed enclosure in the chain prevents access to any enclosures that follow it in the chain until you repair or replace the failed enclosure. If you use a star cabling method, it reduces delays in the communication path, and can readily combine with a daisy chain method.

You must comply with all cabling requirements and you must verify they meet all related standards.

- The maximum length of any data cable for any configuration is 2 m (6.56-ft).

- If you install SAS cables to expansion modules, only use mini-SAS HD cables with SFF-8644 connectors.

To route enclosure and expansion data cables:

1. (Optional) Take the following actions to connect the first host switch to its related expansion modules. This example has three expansion enclosures directly below the storage enclosure.

    a. Connect an approved mini-SAS data cable to the first host switch as the first output.

    b. Connect the cable's other end to SAS port A in the first expansion enclosure, 1A, as the first input and using each additional SAS port A thereafter as the input side.

c. Connect an approved mini-SAS data cable from SAS port C in the first expansion enclosure, 1A, as the second output and using each additional SAS port C as the output side.

d. Connect the cable's other end to SAS port A in the second expansion enclosure, 2A.

e. Connect an approved mini-SAS data cable from SAS port C in the second expansion enclosure, 2A.

f. Connect the cable's other end to SAS port A in the third expansion enclosure, 3A.

2. (Optional) Take the following actions to connect the second host switch to its related expansion modules.

a. Connect an approved mini-SAS data cable to the second host switch as the first output.

b. Connect the cable's other end to SAS port A in the third expansion enclosure, 3B, as the first input and using each additional SAS port A thereafter as the input side.

c. Connect an approved mini-SAS data cable from SAS port C in the third expansion enclosure, 3B, as the second output and using each additional SAS port C as the output side.

d. Connect the cable's other end to SAS port A in the second expansion enclosure, 2B.

e. Connect an approved mini-SAS data cable from SAS port C in the second expansion enclosure, 2B.

f. Connect the cable's other end to SAS port A in the first expansion enclosure, 1B.
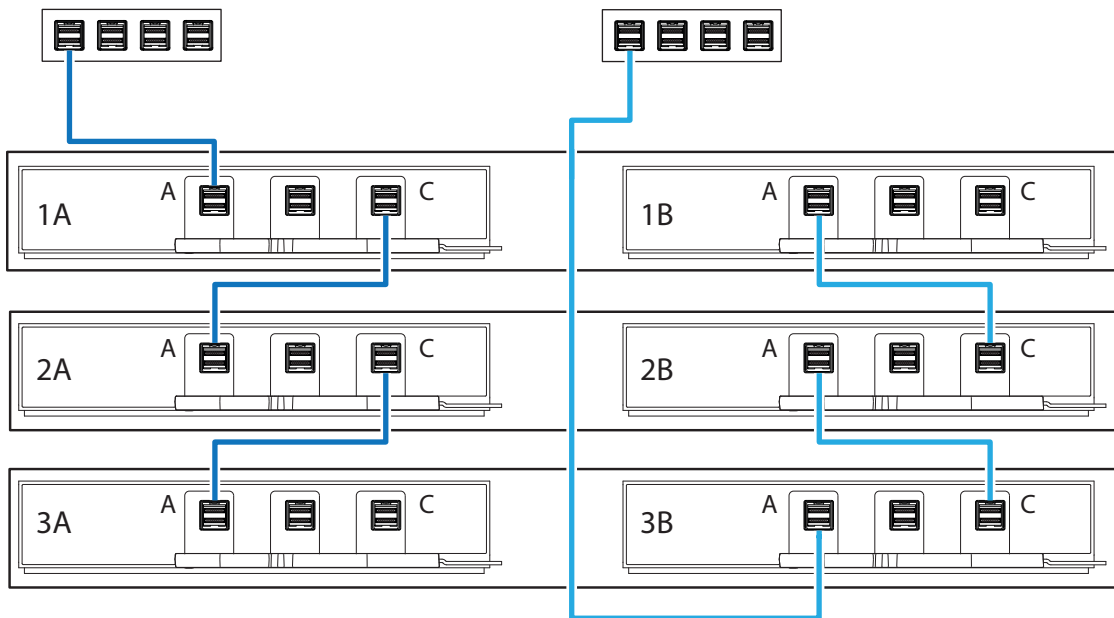
Figure 44 Sample reverse cabling method among host switches and expansion modules
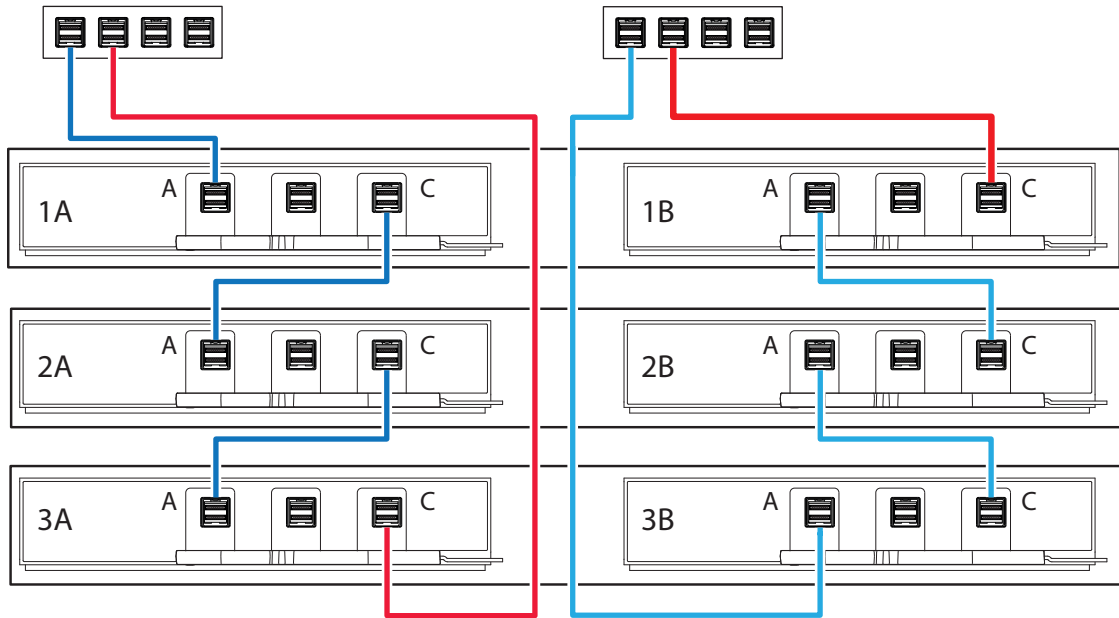
Figure 45   Sample invalid loop (in red) among host switches and expansion modules

Route and connect power cords and data cables

This task will maximize space, provide for minimal cable crossover, and enable in-service maintenance.

NOTE   The following cable configuration is only a sample configuration and changes, based on individual system requirements.

To route and connect power cords and data cables:

1. Route the power cords straight toward and then behind the first L-shaped bracket.
2. Continue routing and flattening the power cords around the second L-shaped bracket to the far right, then drape them down the left face of the rear panel. They temporarily cover the first system fan, awaiting power connection.
3. Open the CMA bracket assembly clips, each embossed with *King Slide* on the top.
4. Holding the CMA bracket assembly away from the chassis, route the data cables from the CMA cable capture arm through the first two CMA L-shaped bracket clips.
5. Make sure the data cables lie as flat as possible and fit best in the space.
6. Release the CMA bracket assembly, then continue to route data cables beyond the bend and through the next four CMA bracket clips.
7. Keep cables as flat as possible, so that all data cables meet the bend radius for that cable type.
8. Gently snap closed all bracket clips around the routed data cables.
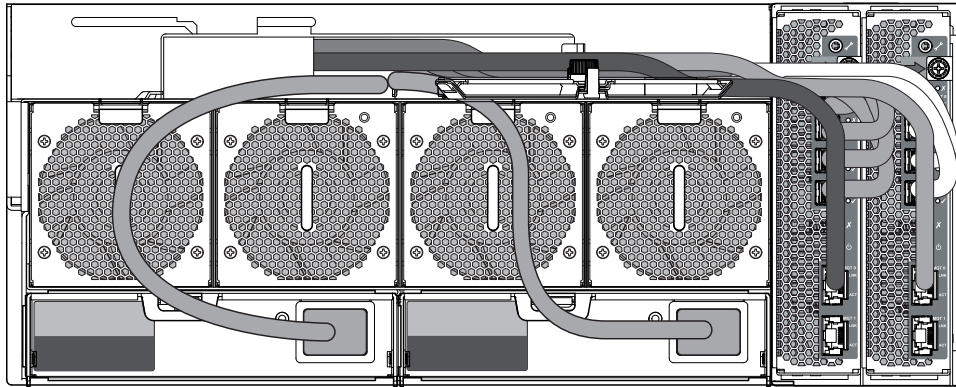
Figure 46   Close all CMA bracket clips

9. Connect the Ethernet cables numbered 9 and 10 to the host system or management network.

10. Facing the front panel, press both safety lock switches to release the rails.

11. Carefully exert even pressure on both sides of the storage enclosure front and continue insertion all the way into the rack until it locks in the storage position. Do not force insertion, which could damage the rails.

12. Secure the storage enclosure chassis flanges to the rack cabinet, fastening the top captive thumbscrew on each side until tight.

4 Operation

The storage enclosure management interface allows for provisioning, monitoring, and managing the storage enclosure. It uses the storage enclosure processor (SEP) and associated monitoring and control logic, such as the SCSI Enclosure Services (SES) service, to identify, assess, and diagnose storage enclosure hardware systems.

⚠ **CAUTION** Never attempt to power on or operate the storage enclosure until it reaches the proper operating temperature and humidity requirements identified in the Environmental Requirements of the product specification. This applies to first-time installation and service replacements, particularly disk drive replacements.

⚠ **CAUTION** Only operate the storage enclosure in a dust-free environment to meet temperature control and airflow requirements.

Before you power on the storage enclosure, you must take the following actions:

- Review the "Installation checklist" on page 13, confirming the successful completion of the entire sequence.
- Verify that all drive modules are in their correct slots and that you properly engaged them by pressing down firmly until each one locks into place on its baseplane.
- Confirm you have met ambient temperature requirements identified in the "Technical specifications" on page 87 section.
- Confirm that airflow paths at the front and rear of the enclosure are clear and remain clear.
- Proceed to the power on task.
- Access the software management interface to complete your system setup. You can use SES to identify or set the storage enclosure unit identification number (UID).

Apply power to the storage enclosure

The storage enclosure relies on main power provided through separate, independent power distribution. If you lose main power for any reason, the storage enclosure automatically restarts after power restoration.

⚠ **CAUTION** Adhere to the following electrical safety guidelines:

- During installation, never connect a power cord to a power supply unit (PSU) before installing it in the appropriate storage enclosure slot.
- Only connect the power cord to power that complies with the product specifications within a range of 200 to 240VAC, per the hazardous voltage warning label on the PSU.
- During service, always remove the PSU from power by disconnecting the power connector before removal of the PSU.

ⓘ **IMPORTANT** Only after you successfully complete the installation checklist can you complete system setup and begin operation of the storage enclosure.

To apply power to the storage enclosure:

1. Facing the rear of the rack cabinet, connect the plug for each of the power cords you routed through the cable clip during installation to an independent power distribution unit (PDU). The second power supply unit (PSU) provides the first PSU

with redundant power.

> **(!) IMPORTANT**   The storage enclosure design requires two redundant power supply units (PSUs). You must plug each power cord into an independent power distribution unit (PDU) that connects to an uninterruptible power system.
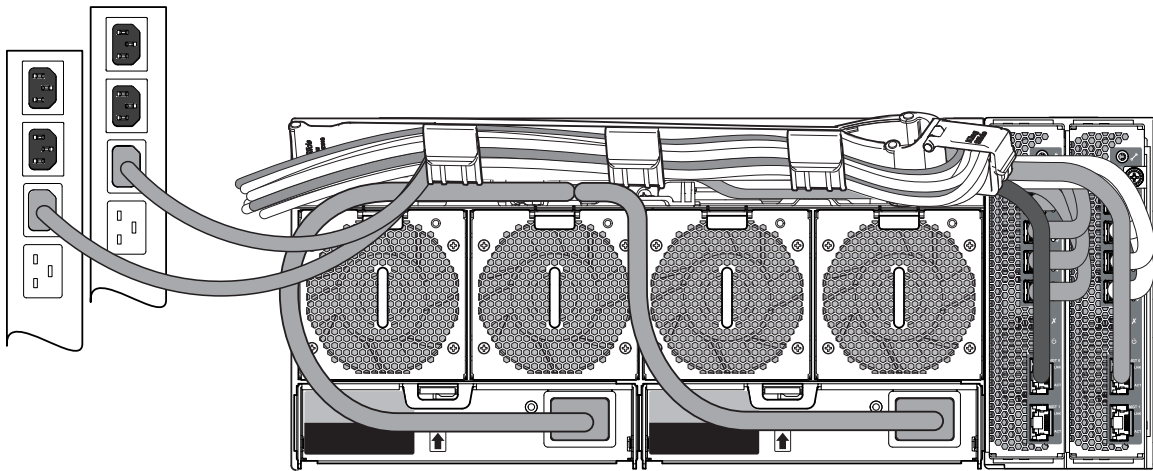
Figure 47   Route power cables to redundant PDUs

2. Facing the front, observe the LEDs on the front panel and confirm the *System power* LED is in a steady green state.

3. When you are ready to power down the storage enclosure, disconnect the right-angle power connector from both PSUs.

Interpret system LEDs

Visual cues provide you with the means to monitor the storage enclosure and its components and reinforce software messages about system health. Use LEDs throughout the storage enclosure as a means to determine if there is a critical fault.

The storage enclosure registers the following states using the identified LED colors.

1. **Green or unlit LED**: Indicates a module is functioning normally

2. **Flashing green or amber LED**: Indicates a non-critical condition

3. **Amber LED**: Indicates a critical fault

4. **Blue LED**: Indicates system component identification, so is not a fault or critical condition

Since an amber fault LED uses fast or slow flashes to cover multiple conditions, this is the priority for simultaneous indications:

Table 2   Fault LED prioritization

Priority	Flash rate	Indication	Description
Top priority	Fast flash (1s: 1s)	Identify	Locate the enclosure or module
Priority 2	On	Fault	Fault condition detected
Priority 3	Slow flash (3s: 1s)	Logical or non-critical fault	Logical fault or non-critical notification
Lowest priority	Off	No indication	System functioning normally

The front panel area, controller module, and expansion module LEDs require further elaboration.

Interpret front panel LEDs

The storage enclosure front panel contains a series of LEDs to reflect system status. You can monitor the front panel LEDs to determine system status in combination with the user interface content.

In the case of a system fault condition, identified in the state column with an asterisk (*), troubleshoot the fault.
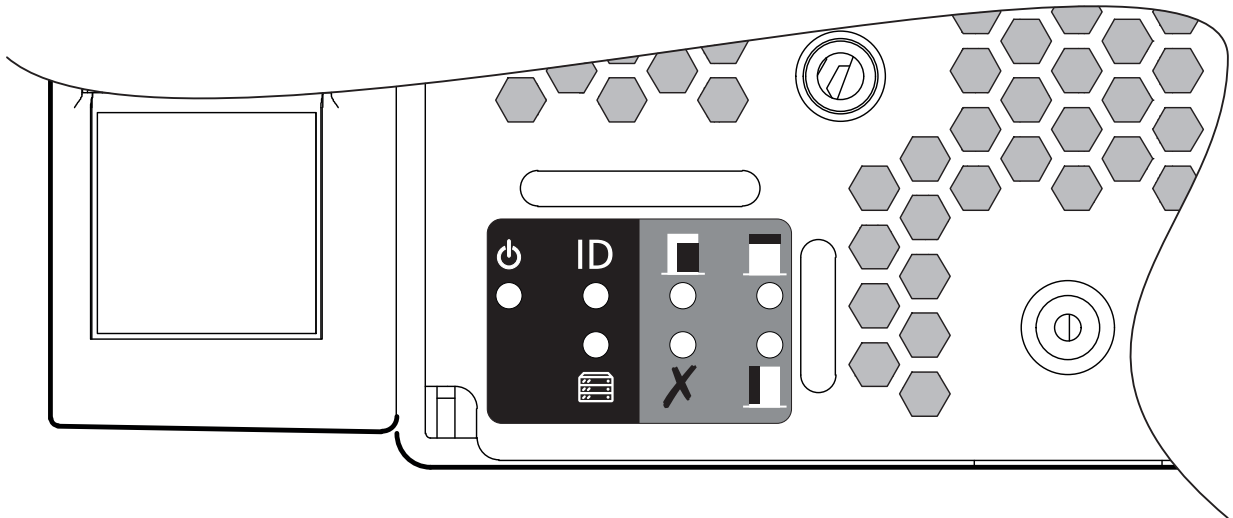
LED	LED number: Name	Color	State	Status
⏻	1: System power	Green	On	System powered on
			Off	System powered off
ID	2: System ID	Blue	Flashing	System unit identification (UID) active
			Off	Normal state, no query for UID active
▦	3: Host connectivity	Green	Flashing	Host successfully linked to controller module (CM)
			Off	No connection to CM
▮	4: Fault-Main bay	Amber	**On***	System hardware fault in the main bay
			Off	System hardware in the main bay is functioning normally
✗	5: Fault-Application	Amber	**On***	System application logic fault, initiated by the CM
			Off	System application logic initiated by the CM is functioning normally
▯	6: Fault-Rear panel	Amber	**On*** **Flashing***	System hardware fault in the rear panel area
			Off	System hardware in the rear panel area is functioning normally
▌	7: Fault-Auxiliary bay	Amber	**On***	System hardware fault in the auxiliary bay
			Off	System hardware in the auxiliary bay is functioning normally

Figure 48   Front panel LEDs

Interpret input/output module LEDs

There are two redundant input/output modules (IOMs) that use a series of LEDs to reflect host connectivity status. You can monitor the LEDs from the rear panel to determine system status in combination with the user interface content.

In the case of a fault condition, identified in the state column with an asterisk (*), troubleshoot the fault and take the appropriate corrective action.
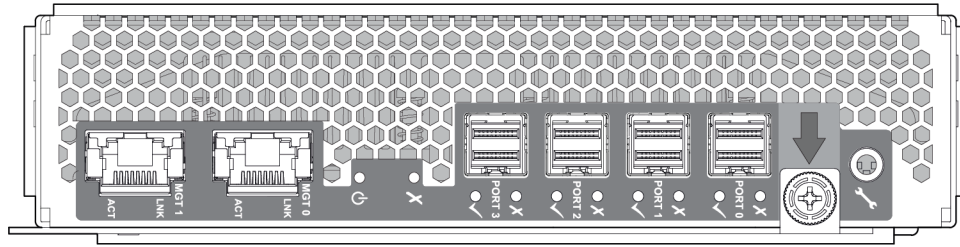
IOM LEDs	Type	Color	State	Status
![X]	Hardware fault	Amber	**On***	IOM hardware fault
			Off	IOM hardware is functioning properly
![power]	Hardware normal	Green	On	IOM is functioning properly
			Flashing	Part of sequence as IOM comes online
			Off	IOM power is off

Figure 49   Input/output module LEDs

Additional LEDs on the IOM relate to host connectivity. Only one LED per port is active at any given time. Each LED functions as an indicator for both host link status and host link activity.

Table 3   Host port link LED status types

LEDs	Type	Color	State	Status
![X]	SAS host port fault	Amber	On	SAS connected; one or more SAS lanes inactive; partial link up results in lower and inconsistent speed
			Flashing	SAS connected; one or more SAS lanes inactive; active lanes register input or output activity
			Off	No fault detected
![check]	SAS host port link status/ activity	Green	On	SAS connected; all four active SAS lanes functioning at same negotiated speed
			Flashing	SAS connected; all four active SAS lanes register input or output activity
			Off	No host link detected
LNK ACT	Ethernet port link speed, status/activity[1]	Green	On[1]	When enabled, connected and active
			Flashing[1]	When enabled, connected and registering input or output activity
			Off[1]	When enabled, no host link detected

[1] Default: Disabled insecure Telnet protocol. Refer to the CLI Reference Guide for how to enable the port and initiate a Telnet session.

Storage enclosure management

Select an interface that best fits your requirements to directly or remotely monitor and manage storage enclosure activity.

Table 4   Interface options

Method	Description
Command-line interface (CLI)*	Supports interactive and scripted commands
Storage Management Console (SMC)*	Provides web-based GUI
JSON-based API	Provides means to conduct JSON-based operations
Redfish/Swordfish-based API	Provides means to conduct Redfish/Swordfish operations
XML-based Application Programming Interface (API)	Provides means to conduct XML-based operations
*Access method discussed in the following content	

💡 **TIP**   Use the QR code on the included Getting Started sheet to access related storage enclosure documentation online.

Command-line interface usage

One of the simplest methods of monitoring and managing activities performed by the storage enclosure system is to use the command-line interface (CLI) embedded in each controller module. There are two primary access methods:

- Direct connection to a controller module's serial USB port using a terminal emulator installed on a management host
- Remote connection to a secure LAN using either SSH or HTTPS
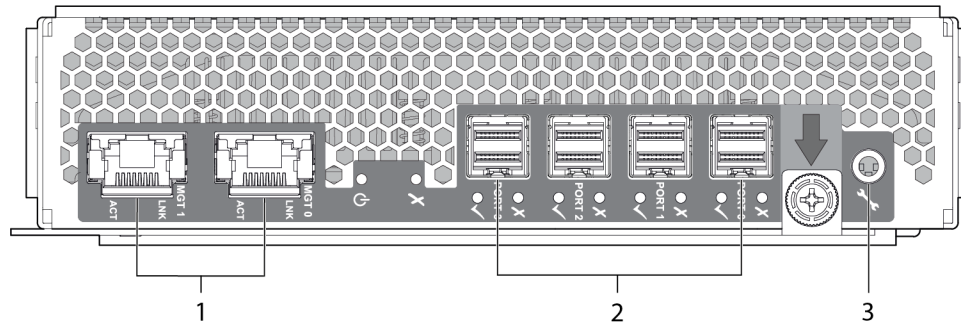
Item	Description
1	Ethernet port for connection to management host[1]
2	SAS data ports for data exchange
3	Service port for diagnostic connection to management host[1]
[1] Refer to the CLI Reference Guide for usage information.	

Figure 50   Ports on sample controller module

NOTE   If the management host does not recognize the new controller or the connection, it cannot communicate with it.

All setup and configuration tasks identified in this section assume you have a direct connection between the management host and the controller using the supplied or a known good serial cable. The connection you establish is an out-of-band connection, since it does not use a data path to transfer information between the controller and the management host.

The host computer or server can be either Linux- or Windows-based. Certain operating systems require a special mode of operation or the installation of a device driver.

Install a device driver

Some operating systems, such as a Windows OS that predates Windows 10/Server 2016, require download and installation of a device driver before the OS recognizes the USB device and can connect to a controller module.

To install a device driver:

1. Navigate to https://www.seagate.com/support/systems/general-support/ and locate the device driver for download.
2. Download the zip file to the management computer.
3. Unzip the file, then click `Setup.exe`.
4. Follow all install instruction dialogs, clicking the prompts to run, accept, and install the device driver.
5. After successful completion of the install, close the dialog.
6. (Optional) Reset the management computer if required to complete installation and recognize the device driver.

Configure the management host for serial communication

After you successfully connect the supplied serial cable to the controller module, the management host should detect a new USB device. The next step is to establish communication between the management host and the controller module.

Once you successfully install and run a supported terminal emulator, the controller presents a single serial port that uses the related USB vendor identification (ID) and product ID hex codes.

Table 5 Supported terminal emulator applications

Operating system	Supported application
Microsoft Windows (all versions)	HyperTerminal, TeraTerm, PuTTY
Linux (all versions)	Minicom

Table 6 Terminal emulator serial port hex codes

USB vendor identification code type	Hex code
USB vendor identification code	0x210C
USB product identification code	0xA4A7

Configure Linux for serial communication

If you do not have a terminal emulator, such as Minicom, you must obtain one prior to completion of this task.

To configure Linux for serial communication:

> (!) **IMPORTANT**   While Linux systems do not require installation of a device driver, it might require USB parameters as you load the device driver to enable controller recognition.
>
> `modprobe usbserial vendor=0x210c product=0xa4a7 use_acm=1`
>
> You may also choose to incorporate the same information into the `/etc/modules.conf` file.

1. Determine if the operating system recognizes the USB (ACM) device by entering a command:

   `cat /proc/devices |grep -i "ttyACM"`

   If the OS discovers a device driver, it responds with the device number followed by `ttyACM`, for example:

   `116 ttyACM`

2. To query the system about USB buses and the devices connected to them, use the list USB command:

   `lsusb`

   If the OS discovers a USB device driver, it responds with the single serial port, using the USB parameter hex codes:

   `ID 210c:a4a7`

   This confirms that the appropriate USB (ACM) device is visible to the management computer.

3. Invoke Minicom to configure it.

   `minicom -s`

4. Select `Serial Port Setup` from the menu.

5. Select the parameter setting you want to change at the prompt by typing the related setting letter (A-G).

   Table 7 Sample Linux Minicom serial port parameter settings

Setting	Description	Parameter settings
A	Serial device	/dev/ttyACM0
B	Lockfile location	/var/lock
C	Callin program	
D	Callout program	
E	Bps/Par/Bits	11520 8N1
F	Hardware flow control	No
G	Software flow control	No

6. Press the ESC key to shift from the parameters to the configuration menu.

7. Select `Save setup as dfl` to save the parameter settings to default.

8. Select `Exit from Minicom`.

Configure Windows for serial communication

Use the terminal emulator to launch the device driver window and directly communicate with each controller module, after meeting the following prerequisites:

- An installed and tested terminal emulator.
- An installed and tested Windows USB device driver to connect to the controller module USB port, by using the native USB serial driver for Windows 10/Server 2016 or higher, or by downloading and installing the Seagate device driver.

To configure Windows for serial communication:

1. Start and configure the terminal emulator, using the specified settings.

Table 8 Terminal emulator port connection settings

Parameter	Value	Parameter	Value
Connector	COM3[1]	Parity	None
Baud rate	115,200	Stop bits	1
Data bits	8	Flow control	None
[1] Your configuration determines the COM port used for USB connection. Verify you have the correct COM port.			

2. In the terminal emulator, right-click on the connected and identified COM port and select **Enable**.

NOTE You must disable XON/XOFF when using Windows 10/Server 2016 with PuTTy so you can open the COM port.

---

3. For any hung connection, take the following corrective actions:

   a. Validate the terminal emulator configuration is correct and you selected the correct COM port.

   b. Quit the terminal emulator program.

   c. In the Windows Device Manager window, right-click on the problem COM port and select **Disable**.

   d. Confirm the COM port disabled status.

   e. Right-click on COM port you just disabled and select **Enable** to re-enable it.

   f. Start the terminal emulator program again and connect to the COM port, then validate the port settings again.

Connect to a controller module for configuration

When you first install a storage enclosure, you must perform some initial tasks to connect to and configure the system, such as setting up a user, log in, and setting a valid IP address for each controller module (CM) serial COM port.

You have three options for setting up a network, each a viable approach to the same goal: connection to the CM.

- Use a direct connection to the serial COM port to access the Storage Management Console (SMC).
- Use a remotely connected network to access the SMC and connect to the CM through the identified factory default IP addresses.
- Use secure shell (SSH) to access the SMC at the identified factory default IP addresses.

  > ssh 10.0.0.2

If the CM default IP address is not compatible with your network, you must manually set a valid IP address for each network port, once you have a good serial port connection to the management host.

Table 9 Factory default network port IP addresses

IP version	Controller 0A addresses		Controller 0B addresses	
IPv4	IP address:	10.0.0.2	IP address:	10.0.0.3
	IP subnet mask:	255.255.255.0	IP subnet mask:	255.255.255.0
	Gateway IP address:	10.0.0.1	Gateway IP address:	10.0.0.1
IPv6	Autoconfig:	Enabled	Autoconfig:	Enabled
	Gateway:	::	Gateway:	::
	Link-Local Address:	fe80::2c0:ffff:fe44:952f	Link-Local Address:	fe80::2c0:ffff:fe44:7010
	Autoconfig IP:	6::2c0:ffff:fe44:952f	Autoconfig IP:	6::2c0:ffff:fe44:7017

To connect to a controller module for configuration:

1. Connect a serial cable from your management host to the CLI port on one of the CMs.

2. Launch the terminal emulator software and enable the CLI port for subsequent communication.

3. Press **Enter** to access the CLI prompt.

4. At the prompt, login with **setup**, press **Enter**, then press **Enter** again at the password prompt, for example:

   System Version: S100R009
   OS Version: SPM100R009-01
   MC Version: SXM100R009-01
   Serial Number: 00C0FF535A86
   SEAGATE00C0FF527EB8B login: **setup**
   Password:

5. For first time access to the SMC, enter **Y** at the prompt to continue.

6. To log in at the prompt, choose from one of the following actions:

   a. For first time access, create a user, such as **manage**, and follow the on-screen directions to create a user account. After doing so, the session will expire, and you can log in as the user you just created.

   b. For all subsequent log in activity, log in using valid system user credentials.

7. At the prompt, type the following command to set the IP address for each controller module or both controller modules:

   ```
   set network-parameters ip <address> netmask <netmask> gateway <gateway> controller a|b
   ```

   where:

       <address> is the IP address of the controller
       <netmask> is the subnet mask
       <gateway> is the IP address of the subnet router
       a|b specifies the controller whose network parameters you are setting

   For an ipV4 static example:

   ```
   # set network-parameters ip 192.168.0.10 netmask 255.255.255.0 gateway 192.168.0.1
   controller a
   # set network-parameters ip 192.168.0.11 netmask 255.255.255.0 gateway 192.168.0.1
   controller b
   ```

   For a DHCP example:

   ```
   # set network-parameters dhcp controller a
   # set network-parameters dhcp controller b
   ```

> **NOTE** See the CLI Reference Guide for information about IPv6, and the commands used to add IPv6 addresses and set IPv6 network parameters. The **ipv6** term is included within each relevant command name.

8. Choose one of the following actions to verify the new IP address:

   a. For IPv4, use the **show network-parameters** command.

   b. For IPv6, use the **show ipv6-network-parameters** command.

      The result for each controller includes the IP address, subnet mask, and gateway address.

9. In the host computer's command window, first ping controller 0A and then controller 0B to verify connectivity.

   ```
   ping <controller-IP-address>
   ```

10. When you are done using the CLI, exit the terminal emulator.

11. Retain the new IP addresses to access and manage the controllers by using either the SMC or the CLI.

    If you cannot access your system after changing the IP address and waiting up to two or three minutes, your network might require you to restart each affected Management Controller (MC) connected to the serial port. When you restart an MC, you temporarily lose communication with the MC until it successfully returns to a ready state.

12. (Optional) To restart the management controller on both controllers, type the following command :

    ```
    restart mc both
    ```

If you lose communication with the CLI while using an out-of-band cable connection, you can often restore communication by disconnecting and reattaching the serial cable.

After you initially set a controller IP address and have a functioning connection, you can change it later using the SMC.

> (!) **IMPORTANT** Changing IP settings can cause management hosts to lose access to the storage enclosure.

Storage Management Console usage

Seagate provides a user-friendly interface that provides the means to configure, monitor, and manage the storage system: the Storage Management Console (SMC). Access it through a supported browser, then use it to complete initial configuration of the management host, then monitor and manage the storage enclosure.

Table 10   Supported browsers

Browser	Version
Microsoft Internet Explorer	11
Mozilla Firefox	68 and newer
Google Chrome	70 and newer
Apple Safari (Mac)	11 and newer

For best results, use the following guidelines:

- Enable browser pop-up windows and set the browser to allow cookies for the related storage system IP addresses.

- For Internet Explorer, set the browser's local-intranet security option to medium or medium-low, and then add each controller's network IP address as a trusted site.

NOTE By default, your system is loaded with self-signed certificates. You should generate new self-signed certificates on each controller, using the `create certificate` CLI command. Expect browser warnings about security or privacy concerns related to self-signed or untrusted certificates or invalid certificate authorities. Bypass such warnings, if you are confident of a secure connection. Depending on the browser and its settings, you can create a security exception to inhibit future related warnings, despite the continued indication of an insecure connection in the browser address bar.

Access the web-based management interface

Once you successfully complete initial installation of the storage enclosure and initial configuration of the management host, you can access the controller module's web-based management interface, the Storage Management Console (SMC). It is a user-friendly interface that provides the means to configure, monitor, and manage the storage system.

To access the web-based management interface:

1. Launch a web browser on the computer connected to the controller module.

2. Enter the IP address of the controller module's network port, either the default address of 10.0.0.2/3 or the address you just configured, then press **Enter**.

3. To log in to the SMC, perform the following actions:

   a. In the web browser address field, type `https://<controller-network-port-IP-address>`, such as 10.1.4.33 without any leading zeros, and then press **Enter**. If a login prompt does not display, confirm you entered the correct IP address.

   b. At the prompt, enter the user name and password you just created. Refer to .

   c. Select **Log In**. If the user authentication fails, a message indicates if the system is unavailable or unable to authenticate the login.

4. Familiarize yourself with the SMC, consulting the online help topics or the Storage Management Guide.

5. To end your session, select **Log Out** from the banner, instead of simply closing the browser.

Complete the preboard and onboard process

During your initial connection, a wizard in the Storage Management Console (SMC) guides you through the first-time setup of your system: the preboard and onboard process. Follow the on-screen directions to complete your setup.

To complete the preboard and onboard process:

1. Complete the following actions to successfully complete the preboard process:

   a. Agree at the prompt to the end-user license agreement (EULA).

   b. Create your profile username and password for all future access.

   c. Update the controller firmware, as required.

2. Complete the following actions to successfully complete the onboard process:

   a. Configure your system settings: network settings, data and time, user definitions, and system notifications.

   b. Complete the storage system configuration, choosing the key features that pertain to the storage enclosure to ensure your storage enclosure achieves optimal capacity and performance.

   c. Provision the storage enclosure by creating hosts and host groups, then creating volumes and attaching them to hosts.

3. Continue to use the SMC to monitor and manage the storage enclosure by following instructions in the related Storage Management Guide, or use the online help.

☼ **TIP**   Use the QR code on the included Getting Started sheet to access related storage enclosure documentation online.

Update firmware

All modules within the storage and expansion enclosure system, such as drives, controllers, power supply units, and fans, must be compatible and must run on firmware revisions from the same Universal Storage Module™ (USM) firmware release. After installing the storage enclosure and applying power for the first time, verify that all modules and drives within the storage and expansion enclosures have the most current USM firmware.

Additionally, confirm the system configuration (including SAS zoning) is correct per solution requirements.

The JBOD Firmware Update utilities (both jbodupdate and UUT), are cross-platform tools that combine both the enclosure firmware content itself, and the logic required to detect and update any attached enclosures. These utilities provide support to discover available enclosures and display an inventory list of all enclosure firmware components and their versions. Refer to the utility user guide, firmware release notes and relevant solution documentation for instructions on safely using the firmware update utilities in a given solution.

5 Hardware installation and configuration issues

The storage enclosure management interface allows for provisioning, monitoring, and managing the storage enclosure. It uses the storage enclosure processor (SEP) and associated monitoring and control logic, such as the SCSI Enclosure Services (SES) service, to identify, assess, and diagnose power, drive module, and cooling systems. Temperature sensors throughout the enclosure and its components monitor the thermal health of the storage system. If a critical sensor value exceeds a threshold limit, you receive a system notification that requires your attention.

If you encounter any issues during installation or initial configuration, use the topics in this section to assist you in fault isolation and correction.

ⓘ **IMPORTANT**   Do not use this section for configured systems already interacting with production data. For the kind of assistance you need in such cases, contact Seagate for technical support.

Address initial start-up issues

You must successfully complete the installation tasks in the identified sequence. You must use the power cords provided with the system and install interface cables that meet system requirements.

To address initial start-up issues:

1. Complete the following actions to eliminate power cord issues during installation:
   a. Request a replacement for damaged or missing power cords.
   b. Request a replacement for cords with plugs that do not match your outlets or voltage requirements
   c. Request a replacement for power cords that are too short to reach a power distribution unit.
2. Use LEDs throughout the storage enclosure as a means to determine if there is a critical fault. Refer to "Interpret FRU fault condition LEDs" on the facing page.
3. Complete the following actions to verify your installation if the host system does not recognize the storage enclosure:
   a. Verify the interface cables you connected from the storage enclosure to each host bus adapter are not damaged, loose, or wired improperly.
   b. Look for any SAS Linkup indicators on both controller modules.
   c. Look for SAS target visibility on the host bus adapter BIOS.
   d. Verify you correctly installed the operating system software driver.
4. Complete the following actions if the storage enclosure does not report as much capacity as expected:
   a. Verify you correctly installed the drive modules and they are all latched to the baseplane connectors.
   b. Verify all installed drive modules display green LEDs, rather than an LED with a fault status. Follow the replacement procedure for drive modules displaying a fault status. Refer to "Interpret FRU fault condition LEDs" on the facing page.
5. Complete the following actions if the storage enclosure does not initialize:
   a. Verify each power cord is properly and securely connected on both ends.
   b. Reconfirm that the power source used to power the storage enclosure is viable and meets the installation criteria.
   c. Power cycle the storage enclosure by removing both right-angle power cord connectors from both PCMs.
   d. Examine the controller module system log for errors.

Interpret FRU fault condition LEDs

Throughout the storage enclosure, amber LEDs indicate a fault condition. Some FRUs are more complex than others, so have more than one fault condition. Those items in the state column with an asterisk (*) indicate a fault condition.

Drive module fault LED

The drive module uses an amber fault LED to identify various states. Those items in the state column with an asterisk (*) indicate a fault condition.
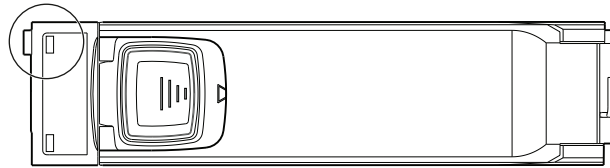
Color	State	Status
None	Off	No AC power is present or the disk drive is functioning normally.
	On*	The drive has a hardware fault. Replace as soon as possible.
Amber	**Fast flash***(1s)	The drive is identifying itself to the system software. Not a fault.
	Slow flash*(3s)	See the system log for identified fault conditions.

Figure 51   Drive fault LED on top panel

SAS expander module fault LED

The SAS expander module component side has a green activity LED, labeled LED 3 on the PCBA, and an amber fault condition LED, labeled LED 2 on the PCBA. Both LEDs can be difficult to view from the top, since the component side faces the chassis sidewall. Those items in the state column with an asterisk (*) indicate a fault condition.
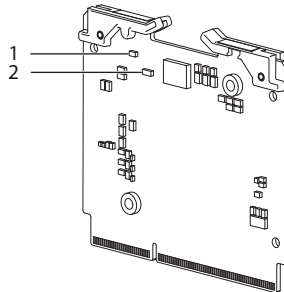
Item	LED number: Name	Color	State	Status
1	3: Activity	Green	Off	No AC power is present.
			Flashing	The firmware is active, the SAS expander module is functioning normally.
2	2: Fault condition	Amber	Off	The firmware has not set a hardware fault condition.
			On*	The firmware has set a hardware fault condition.

Figure 52   SAS expander module LEDs, component side

Controller fan module fault LED

The controller fan module has a single amber fault LED to identify various states. The asterisk (*) indicates a fault condition.
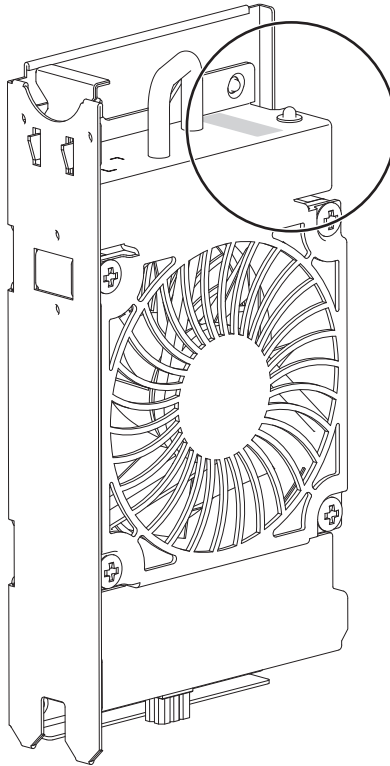
Color	State	Status
None	Off	No AC power is present or the controller fan module is functioning normally.
Amber	**On***	The controller fan module has a hardware fault.
	Flashing	AC power is present and the controller fan module is undergoing system identification.

Figure 53 Controller fan module fault LED, rotated orientation

System fan module fault LED

Each system fan module has an amber fault LED. The asterisk (*) indicates a fault condition.
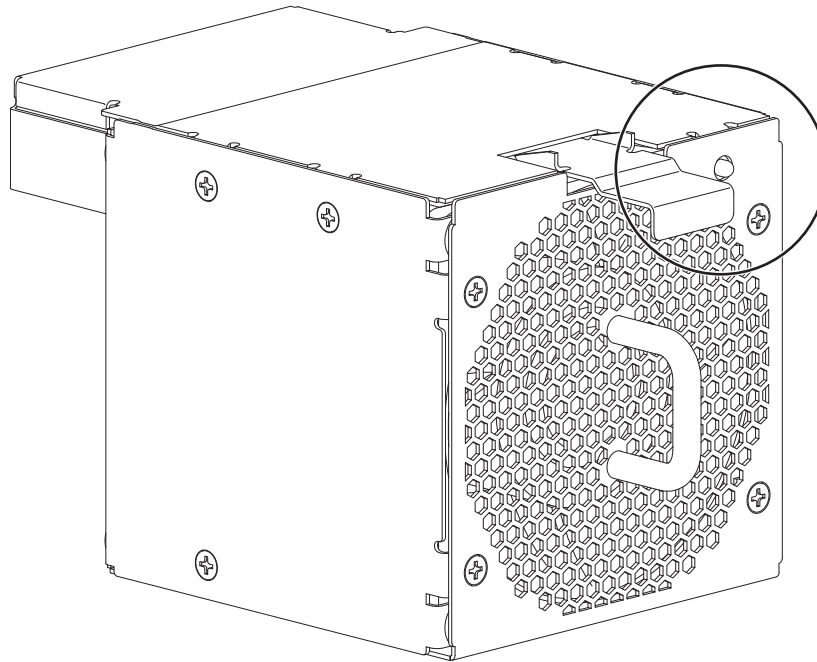
Color	State	Status
None	Off	No AC power is present or the system fan module is functioning normally. Fan activity indicates AC power is present.
Amber	**On***	The system fan module has a hardware fault.
	Flashing	AC power is present and the system fan module is undergoing system identification.

Figure 54   System fan module fault LED

Power supply unit status LED

Each power supply unit (PSU) has a bitonal status LED. The asterisk (*) indicates a fault condition.
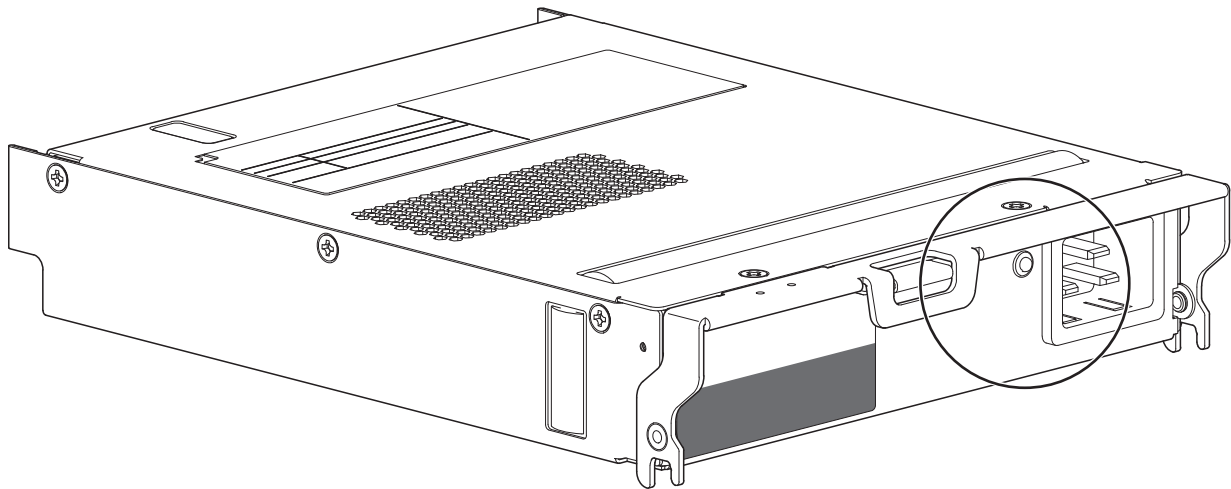
Color	State	Status
None	Off	No AC power is present.
Green	On	AC power is present and the PSU is functioning normally.
Amber	**On***	The PSU has a hardware fault: over temperature, over voltage, or over current.
	Flashing	A PSU firmware download is in progress.

Figure 55   Power supply unit fault LED

Input/output module fault LEDs

The input/output module (IOM) has a number of ports, each with independent status LEDs. The asterisk (*) indicates a fault condition.

Item	LED	Color	State	Status
1	SAS host port fault	Amber	**On***	SAS connected; one or more SAS lanes inactive; partial link up results in lower and inconsistent speed
			Flashing*	SAS connected; one or more SAS lanes inactive; active lanes register input or output activity
			Off	No host link connection, not a fault
2	Hardware fault	Amber	**On***	IOM hardware fault
			Off	IOM hardware is functioning properly

Figure 56   Input/output module LEDs to examine for fault conditions

Consult your solution service documentation for details on how to minimize system disruption during service replacement of a controller module. Fault conditions include the following:

- Logs or events indicate a fault condition for the IOM.
- The *OK to remove* LED on the IOM is off.
- The *Hardware fault* LED for one of the four 12Gb SAS ports on the IOM is steady or flashing amber.
- The *Fault-Rear panel* LED on the storage enclosure front panel is steady amber.
- Troubleshooting indicates a problem with the IOM. When you are isolating connectivity or disk drive fault conditions, stop the data flow to the affected disk groups from all hosts as a data protection precaution and perform a backup of your data.

When all of the prior LED fault conditions occur simultaneously, it is a clear indication of component failure.

Identify fault conditions

Fault conditions do not necessarily cause the storage enclosure to cease functioning. Fault conditions do require a system administrator to take an appropriate action to clear the fault condition.

The controller modules allow you to choose from multiple fault isolation methods. This section provides the basic methodology used to locate faults within a storage system, then identify the affected FRUs.

When performing fault isolation and troubleshooting steps, select the option or options that best suit your site environment. Use of any one of the following options is not mutually exclusive to the use of another option. The order for the options is based on frequency of use.

1. Monitor event and alert notifications through your host system interface.
   a. **Event notifications**: The system event logs record all system events and identifies the event type and its severity.
   b. **Alert notifications**: An alert reports a system fault, registers the type and severity, then tracks its resolution.
2. Alerts fall into three categories, listed in order of severity. Resolve them, from most severe to least severe.
   a. **Critical alerts**: Such alerts require immediate resolution, since they may cause a controller module to shut down or place data at risk.
   b. **Warnings**: Such alerts require immediate attention so you can evaluate the problem and correct it.
   c. **Informational alerts**: Such alerts neither require immediate attention nor immediate action.
3. Use the Storage Management Console. You can use the SMC to monitor the health icons or values for the system and its components, to make sure that everything is functioning properly, or to locate a problem component.
4. Use the command line interface (CLI). If you discover a problem, review both the SMC and the CLI for any recommended actions.
5. Visually inspect the front panel fault LEDs, then locate the component fault LEDs, based on general location identified through the front panel. If a hardware issue prevents access to the SMC or CLI, this is the only option available.

Table 11 Non-fault conditions

Symptom	Cause	Recommended action
Front panel LEDs, no fault conditions		
System power, system ID, and host connectivity LEDs with no fault condition LEDs	System functioning properly	No action required
Drive carrier LEDs, no fault conditions		
⚠ **CAUTION** Do not remove drive carriers during reconstruction, since that terminates the current operation and results in data loss.		

Table 11 Non-fault conditions (continued)

Symptom	Cause	Recommended action
Amber flashing LED: 1 second on, 1 second off	Drive module reconstruction	No action required
Amber flashing LED: 3 seconds on, 1 off		
Green LED flickers		
PSU LEDs, no fault conditions		
Green LED on	AC power is present, PSU functioning normally	No action required
Input/output module LEDs, no fault conditions		
LEDs other than Hardware fault LED	System likely functioning properly	Often, no action required. Refer to "Interpret input/output module LEDs" on page 51 or "Isolate system application faults" on the facing page.

Isolate hardware and connectivity faults

You may occasionally have to isolate a fault related to the storage enclosure hardware or related to data connections associated with the storage enclosure. This is particularly true with data paths because of the number of components involved along the data path and the complexity of the interactions. For example, if a host-side data error occurs, it could be caused by any of the involved hardware components: it could be a faulty host bus adapter (HBA) or a faulty controller module (CM), cable, connector, or switch. It also could be a failure involving more than one of these components.

Use this section to gather common installation hardware fault information and isolate the fault.

⚠ **CAUTION**   When you suspect a disk drive or connection is the fault, halt all input and output operations to the drive group or groups from all hosts as a data protection precaution. Make sure your regularly scheduled backup is good and that you conduct another backup at the time of failure as an additional data protection precaution.

To isolate hardware and connectivity faults associated with the storage enclosure:

1. Complete the following actions to gather fault information:
   a. Examine host application or operating system logs for fault identification.
   b. Examine system logs from both controller modules for errors, such as log and status output for fault identification.
   c. Use system alerts to help narrow the fault to an area of the storage enclosure.
   d. Visually inspect the front panel LEDs. A fault LED indicates there is a hardware issue and provides a general location: the main bay, the auxiliary bay, or the rear panel area.
   e. Access the identified location, then look for an amber fault LED to help identify a faulty module. The SAS expander module fault LED faces the sidewall, so look carefully along the sidewall for faults in the main bay.
   f. If you cannot find a fault in any of the listed areas, the fault most likely lies outside the storage enclosure.

2. Isolate the fault to one of the components in the storage enclosure. There can be a significant number of components interacting to create a viable data path, each potentially creating an issue. For example, if a host-side data error occurs, it could be hardware, such as the controller module or a faulty cable, or it could be the data host.

3. Proceed to the next section and take the recommended corrective action. This may mean obtaining a replacement FRU of the same type before replacing the faulty module.

Isolate system application faults

System application faults generally fall into two categories: drive module and array faults or input/output module (IOM)cache faults.

In the case of a faulty IOM or a power loss, the cache memory flushes to nonvolatile memory. During the process of writing the cache to nonvolatile memory, only those components used in the flush process receive super-capacitor power while the *Cache* LED momentarily flashes. The cache memory flush typically takes 60 seconds for each 1 Gb of cache. After the flush, the system uses the remaining super-capacitor power to refresh cache memory.

To troubleshoot system application errors:

1. If a drive module or array is at fault, determine the cause and take the related recommended action.

   Table 12   Status of drive module or array, based on front panel *Fault-Application* **LED**

LED state	Cause	Recommended action
Off	System application logic initiated by IOMfunctioning normally	None.
On	Drive module marked as leftover or failed	Clear metadata on the leftover drive module, then remove the drive module with the fault.
	Drive module in a critical array and not rebuilding	Add a spare drive module to alter the array state.
	Drive module in a failed array	Contact Technical Support.

2. If a IOM fault condition occurs, discover the status of the *Cache* LED and take the related recommended action. The asterisk (*) indicates a fault condition.

   Table 13   Status of IOM , based on the green Cache LED and reboot

CACHE LED state	IOM boots?	Cause	Recommended action
Off	Yes	System flushing data from cache	If this behavior persists, proceed to Step 3.
Fast flash every 0.1 seconds		System in self-refresh mode	
Slow flash every second		System flushing data to nonvolatile memory	
Off	No*	Hardware failure	Replace the IOM.
Fast flash every 0.1 seconds			
Slow flash every second			

3. Determine the cause of a SAS port host-side or IOM-side connection fault.

   a. Halt all input and output from the host to the storage enclosure.

   b. Verify there is no activity on the SAS host port activity LED for that data port. If there is, halt all applications that access the storage enclosure.

   c. Confirm the *Cache* LED is off, indicating there is no cached, unwritten data.

   d. Reseat the host cable after inspecting it for damage to the cable and connectors.

   e. After reconnection, if the fault condition persists, move the host cable to a port with a known good link status to isolate the issue to the external data path or the IOM data port.

   f. After reseating the host cable, if the fault condition persists, replace the host cable with a known good one.

   g. Verify that the host bus adapter (HBA) is fully seated and the PCI slot is powered on and functioning.

   h. If the fault condition persists, replace the IOM.

   i. If the fault condition persists, reseat the HBA.

   j. If the SAS host port activity LED still flashes amber, replace the HBA and reconnect the cable.

4. For still unaddressed issues, proceed to the next section and take the recommended corrective action, based on the symptom. This may mean obtaining a replacement FRU of the same type before replacing the faulty module.

Take corrective action

After you follow the process above and isolate the fault to an area of the storage enclosure or to a particular module, use the following chart to determine the type of corrective action you should take.

Table 14   Corrective action for fault conditions

Symptom	Cause	Recommended action
Front panel fault LEDs for system application faults		
Fault-Application LED is on	A fault condition related to the system application logic	1. Scan the enclosure event log for specific information for the fault. 2. For system application faults, refer to "Isolate system application faults" on the previous page. 3. If the above actions do not resolve the fault, isolate the fault to the failing component identified in the rear panel area and follow the instructions below.
Front panel fault LEDs for bays		
Fault-Main bay LED is on and a disk drive module or SAS expander module fault LED is on	A fault condition related to the hardware in the main bay	1. Inspect SAS expander modules for a fault amber LED that is on. If so, replace the SAS expander module as soon as you have a replacement. 2. Inspect the LEDs on the main bay drive modules for these conditions: • Both drive module LEDs are off. • A drive module fault amber LED is on, not flashing. 3. Select one of the following actions: • If both LEDs are off, verify that the drive module is fully inserted, the latch is fully engaged, and the storage enclosure is powered on. • If the fault LED is on, narrow the fault to the drive module, a connection, or both. 4. Scan the enclosure event log for specific fault information and follow recommended actions. 5. If the above actions do not resolve the fault, replace the faulty drive module or cable and connector as soon as you have a replacement.
Fault-Auxiliary bay LED is on and a drive or controller fan module fault LED is on	A fault condition related to the hardware in the auxiliary bay	1. Inspect controller fan modules for a fault amber LED that is on. If so, replace the controller fan module as soon as you have a replacement. 2. Inspect the LEDs on the four (4) drives. 3. Select one of the following actions: • If both LEDs are off, verify that the drive module is fully inserted, the latch is fully engaged, and the storage enclosure is powered on. • If the fault LED is on, not flashing, then narrow the fault to the drive module, a connection, or both. 4. Scan the enclosure event log for specific fault information and follow recommended actions. 5. If the above actions do not resolve the fault, isolate the fault, and then replace the drive module as soon as you have a replacement.
Front panel fault LEDs for rear panel area		
Fault-Rear panel LED is on	A fault condition related to the hardware in the rear panel area	1. Inspect the FRUs in the rear panel for fault condition LEDs: the controller modules (CMs), the system fan modules, and the power supply units (PSUs). 2. Scan the enclosure event log for specific fault information and follow recommended actions. 3. Narrow the fault to a FRU, a connection, or both, then follow the recommended actions for the related FRU.

Table 14 Corrective action for fault conditions (continued)

Symptom	Cause	Recommended action

Fault-Rear panel LED is on
 	
and a system fan fault LED is on
	A fault condition related to the system fan	1. Select one of the following actions:
		  • For instances where both PSU fault LEDs are on, see the Thermal Monitoring section of this table.
		  • If only one system fan is failing, remove the system fan, wait one (1) minute, then reseat the system fan.
		2. If the system fan is still failing, replace it within the specified two (2) minutes.

Fault-Rear panel LED is on
 	
and a PSU fault LED is on
	A fault condition related to the PSU, such as a power fault condition	1. Verify AC mains connections to the PSU are live.
		2. Confirm the redundant PSU is properly functioning.
		3. Select one of the following actions:
		  • If both are failing, follow shut down instructions and power off the system enclosure by removing power to both PSUs. Do not power on until after you successfully replace them both.
		  • If only one PSU is failing, remove the power cord, wait one (1) minute, then reseat the power cord.
		4. If the PSU is still failing, remove it, wait one (1) minute, then reseat it.
		5. If the PSU is still failing, replace it within the specified six (6) minutes.
		6. If the power fault condition persists, contact Seagate for support.

Fault-Rear panel LED is on
 	
and an amber CM fault LED is on
	A fault condition related to the CM	1. Restart the CM with a CLI or WBI command.
		2. Confirm the redundant CM is properly functioning.
		3. Select one of the following actions:
		  • If both are failing, follow shut down instructions and power off the system enclosure by removing power to both PSUs. Do not power on until after you successfully replace them both.
		  • If only one CM is failing, remove the power cord, wait one (1) minute, then reset the CM.
		4. If the CM is still failing, and the failure is related to a CM host port, follow the steps associated with system application faults below.
		5. If the CM is still failing, remove the power cord, wait one (1) minute, then reseat the CM.
		6. If the CM is still failing, replace it within the specified eight (8) minutes with a new one.
		7. If installing a new CM that is still failing, remove it, inspect connections for bent pins, reinstall it, then check the event log for errors.

Thermal monitoring and control		
Fault-Rear panel LED is on and all system fan LEDs are on	Internal temperature exceeds the present threshold for the storage enclosure	1. Confirm you have met ambient temperature requirements identified in the Environmental Requirements section and that the air flow moves from the front to the rear of the storage enclosure. 2. Confirm you fully closed both main bay and auxiliary bay covers so latches fully engage. 3. Determine if one of the fans failed or is in the process of failing. Verify all fans are running at a similar RPM. If the impellers of a fan turn more than 2K RPM slower than the other fans, replace the fan. 4. Follow instructions related to increases in fan speed, identified below. 5. Shut down the storage enclosure and investigate before continuing.

Table 14 Corrective action for fault conditions (continued)

Symptom	Cause	Recommended action
Thermal monitoring and control, continued		
Increased fan speed is greater than 12K RPM when the ambient temperature is below 23°C (73.4°F). Factors such as ambient temperature, number of installed drive modules, and altitude each influence fan speed.	Increases in fan speed are associated with reaching a thermal threshold as the first stage of the thermal control process. If you encounter fan speeds greater than 12K RPM when the ambient temperature is below 23°C (73.4°F), the likely cause is reduced airflow through the system.	1. Look for airflow restrictions at the front and rear of the storage enclosure. **Recommendation**: If a rack door blocks airflow by more than 60%, make sure it has a front minimum gap of 75mm (3 in) and a rear minimum gap of 152mm (6 in). 2. Confirm there are no restrictions based on contaminates, such as dust. **Recommendation**: Improve removal of contaminates and keep area clean. 3. Look for excessive re-circulation of heated air from the rear to the front of the storage enclosure. **Recommendation**: Avoid mounting in rack cabinets that are fully enclosed. 4. Verify temperature is within product specifications. Refer to "Standards and regulations" on page 89. **Recommendation**: Reduce the ambient temperature in the room.

6 In-service field maintenance

You may service the identified storage enclosure FRUs and still maintain continuous operation during the replacement, but with two very important qualifiers:

- You must determine whether your system allows for continuous operation during service replacement of the storage enclosure drive modules without interrupting access to enclosure file systems.
- You must complete the replacement in the allotted time, replacing only one FRU at a time. The storage enclosure design provides for redundancy, so the loss of a single FRU does not impact functionality for a limited time.

The tasks identified in this chapter first cover FRUs in the main bay, followed by FRUs in the auxiliary bay, and finally, FRUs in the rear panel area. It is absolutely essential you adhere to all safety precautions when servicing storage enclosure FRUs.

△ **CAUTION**   If you remove any FRU while the storage enclosure is powered up, you must replace it with a known good spare within the allotted time for that FRU. If you do not replace the FRU and, when applicable, close the related cover within the identified time limit, you void the product warranty and the storage enclosure might overheat, causing equipment failure and possible data loss.

△ **CAUTION**   When performing maintenance on the storage enclosure or its components:

- Observe the caution label affixed to each drive module or FRU prior to handling or replacing it.
- Do not remove a defective FRU until you have its functional replacement ready for insertion.

To adhere to safety precautions when replacing a FRU in a storage enclosure:

1. Replace any defective FRU with a fully operational one as soon as possible.
2. Replace any defective FRU within the identified replacement time to minimize air loss and maintain optimum cooling within the storage enclosure.

Table 15   Time limits for FRU replacement

Defective FRU	Replacement time limit
Main bay	
Drive modules, LFF or SFF	Eight (8) minutes, including main bay cover replacement
SAS expander module	Eight (8) minutes, including main bay cover replacement
Auxiliary bay	
Drive modules, LFF or SFF	Eight (8) minutes, including auxiliary bay cover replacement
Auxiliary bay fan module	Eight (8) minutes, including auxiliary bay cover replacement
Rear panel area	
System fan module	Two (2) minutes
Power supply unit	Six (6) minutes
Controller module	Eight (8) minutes
Attachments	
Rackmount rail kit	N/A
CMA and brackets	N/A
Cable kits: Standard HD mini-SAS to HD mini-SAS (SF-8644)	N/A
AC power cord, compatible	N/A

3. Prevent electrostatic discharge from damaging the storage enclosure or its components.

a. Keep a static-protected work surface clear of clutter, including plastic, vinyl, and foam.

b. Transport and store FRUs in static-safe containers.

c. Keep FRUs in their containers until reaching a clear, static-protected work surface.

d. Always wear a grounded ESD wrist strap that meets a minimum 1 megohm (± 10 percent) resistance standard and that is snug against your skin.

e. Use heel straps, toe straps, or boot straps on both feet to ground to your conductive floor or dissipating floor mat or use a portable field service kit with a grounded, static-dissipating work mat.

f. Use conductive field service tools.

g. When removing a FRU, immediately place it in anti-static packaging.

h. Avoid touching pins, leads, or circuitry.

Replace a drive carrier

Each of the 96 drive modules in the main bay and each of the ten drive modules in the auxiliary bay stores and provides access to system data. Each drive module slot can hold a single low-profile 3.5-in or 2.5-in form factor drive module in a carrier or a carrier with adapter, respectively.

An important feature of the storage enclosure design is redundancy. You can still maintain continuous operation during the replacement of a single drive module for up to eight (8) minutes.

⚠ **CAUTION**   If you remove any FRU while the storage enclosure is powered up, you must replace it with a known good spare within the allotted time for that FRU. If you do not replace the FRU and, when applicable, close the related cover within the identified time limit, you void the product warranty and the storage enclosure might overheat, causing equipment failure and possible data loss.

⚠ **CAUTION**   When you suspect a disk drive or connection is the fault, halt all input and output operations to the drive group or groups from all hosts as a data protection precaution. Make sure your regularly scheduled backup is good and that you conduct another backup at the time of failure as an additional data protection precaution.

To remove and replace a drive carrier:

1. If you plan on removing all drive carriers, properly shut down the storage enclosure.

2. Retrieve the new drive module in its static-protected container, ready to access and use it upon removal of the faulty one.

3. (Optional) As an extra safety measure while installing drive carriers, support the storage enclosure with a mechanical lift to avoid any potential issues caused by downward forces.

4. Facing the front of the rack cabinet, loosen the storage enclosure chassis flanges by twisting the top captive thumbscrew on each side of the storage enclosure to the left.

5. Lower the pull handles then gently and steadily pull the storage enclosure out on its rails until it locks in the service position.

6. Complete one of the following actions, based on the location of the drive module:

   a. **For drive carriers in the main bay**: After locating the main bay cover's front or rear latch, depending on the location of the drive carrier you need to replace, push on the tab, release it by pressing the latch away from the front or rear panel and toward the hinge, then resting the open half of the cover on the closed half.

b. **For drive carriers in the auxiliary bay**: After locating the auxiliary bay cover's front latch, release it by pressing the latch in to release the cover, then lift the cover away and set it aside.

7. Locate the drive carrier you need to replace. The fault LED for each drive carrier is a steady or blinking amber for a fault condition. Otherwise, it is off.

⚠ **CAUTION**   You must replace the faulty drive module with a drive module of the same type with a capacity equal to or greater than the one due for replacement. Otherwise, the storage enclosure cannot use the new drive module to reconstruct the disk group.

---

8. Press the release latch toward the rear to release the handle, then pull the handle upward until it disengages the drive carrier from the baseplane.
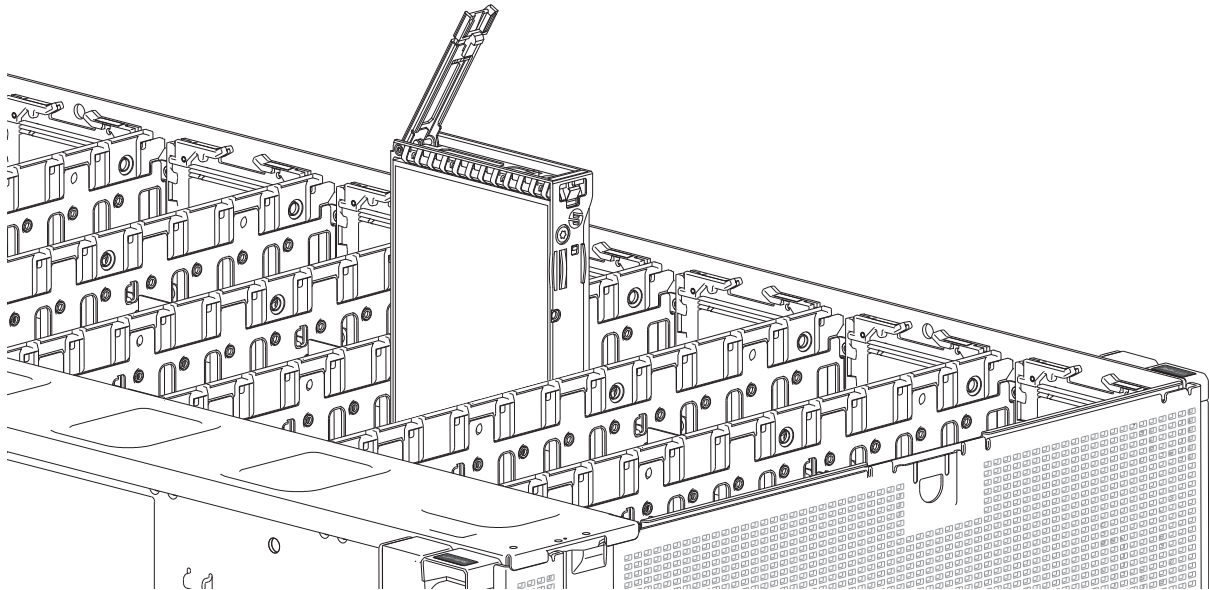

Figure 57   Removal of drive carrier from the main bay (other drive carriers removed for clarity)

9. Lift the drive carrier carefully away from its slot and set it aside.

10. While maintaining proper static protection, remove the new drive module in its carrier from its static-protected container.

11. Using the same orientation, open the latch so the hinge of the handle is toward the rear of the chassis, then slide it carefully into its empty slot and press downward on the drive carrier until you feel it connect to its baseplane.

12. Close and press down on the drive carrier handle and engage the locking mechanism.

13. If you are replacing all drive carriers, repeat the entire process for each of them.

14. Verify the drive carrier fault LED is off.

15. Return to the front panel of the storage enclosure and verify that neither the *Fault-Main bay* nor the *Fault-Auxiliary bay* LED is steady amber.

16. Complete one of the following actions, based on the location of the drive module:

    a. **For drive carriers in the main bay**: Close the half of the main bay cover you opened, latching it firmly in place.

    b. **For drive carriers in the auxiliary bay**: Replace the auxiliary bay cover, latching it firmly in place.

17. (Optional) Lower and remove the mechanical lift.

18. Facing the front panel, press both safety lock switches to release the rails.

19. Carefully exert even pressure on both sides of the storage enclosure front and continue insertion all the way into the rack until it locks in the storage position. Do not force insertion, which could damage the rails.

20. Secure the storage enclosure chassis flanges to the rack cabinet, fastening the top captive thumbscrew on each side until tight.

Replace a SAS expander module

Each of the eight (8) SAS expander modules provides power and high-speed signal connection to its associated 24-HDD baseplane through a SAS riser sideplane.

An important feature of the storage enclosure design is redundancy. The SAS expander modules provide an extra layer of fault tolerance for data paths to the main bay drive modules. You can still maintain continuous operation during the replacement of a single SAS expander module for up to eight (8) minutes.

⚠ **CAUTION**   If you remove any FRU while the storage enclosure is powered up, you must replace it with a known good spare within the allotted time for that FRU. If you do not replace the FRU and, when applicable, close the related cover within the identified time limit, you void the product warranty and the storage enclosure might overheat, causing equipment failure and possible data loss.

To remove and replace a SAS expander module:

1. If you plan on removing all SAS expander modules, properly shut down the storage enclosure.

2. Retrieve the new SAS expander module in its static-protected container, ready to access and use it upon removal of the faulty one.

3. (Optional) As an extra safety measure while installing drive modules, support the storage enclosure with a mechanical lift to avoid any potential issues caused by downward forces.

4. Facing the front of the rack cabinet, loosen the storage enclosure chassis flanges by twisting the top captive thumbscrew on each side of the storage enclosure to the left.

5. Lower the pull handles then gently and steadily pull the storage enclosure out on its rails until it locks in the service position.

6. After locating the main bay cover's front or rear latch, depending on the location of the SAS expander module you need to replace, push on the tab, release it by pressing the latch away from the front or rear panel and toward the hinge, then resting the open half of the cover on the closed half.

7. Locate the SAS expander module you need to replace from its location against the chassis sidewall and opposite the auxiliary bay.

   NOTE   The fault LED for each SAS expander module is on the component side of SAS expander module and has a steady or blinking amber LED if a fault condition exists. Otherwise, it is off to indicate the SAS expander module is functioning normally.

8. Grasping a release latch in either hand, simultaneously lift both release latches away from center until it disengages from the SAS riser sideplane.

9. Lift the SAS expander module carefully away from its slot and set it aside.
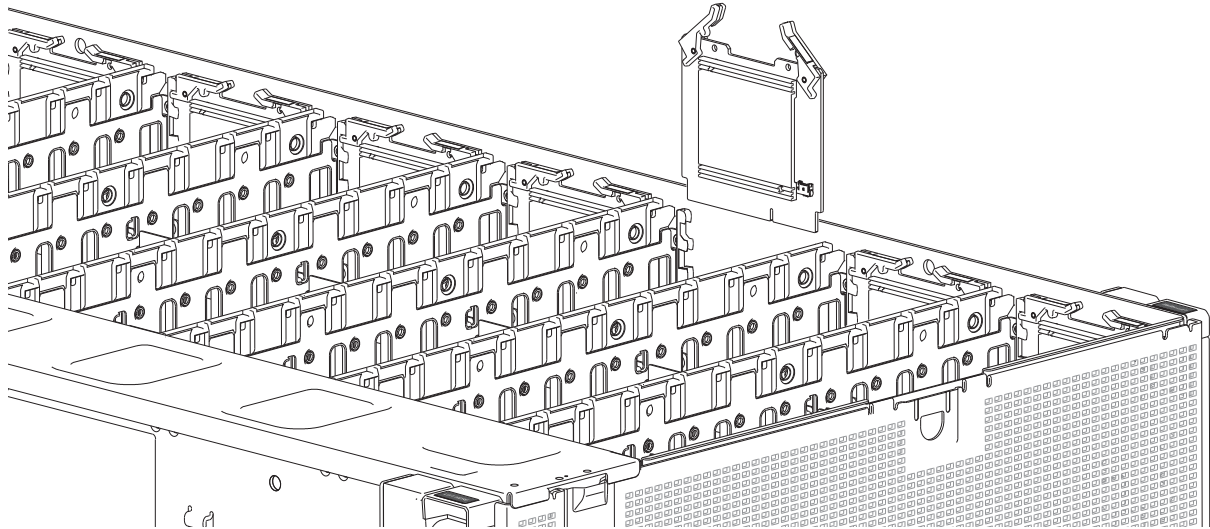
Figure 58 Removal of a SAS expander module

10. While maintaining proper static protection, remove the new SAS expander module from its static-protected container.

11. Inspect the SAS expander module carefully to make sure it is not damaged in any way, paying particular attention to the connectors.

12. Using the same orientation, make sure the SAS expander module has the smooth side to the main bay and the component side to the chassis, then press downward into its empty slot until you feel it connect to the SAS riser sideplane.

13. If you are replacing all SAS expander modules, repeat the entire process for each of them.

14. Verify the SAS expander module fault LED is off.

15. Return to the front panel of the storage enclosure and verify that the *Fault-Main bay* LED is not steady amber.

16. Close the half of the main bay cover you opened, latching it firmly in place.

17. (Optional) Lower and remove the mechanical lift.

18. Facing the front panel, press both safety lock switches to release the rails.

19. Carefully exert even pressure on both sides of the storage enclosure front and continue insertion all the way into the rack until it locks in the storage position. Do not force insertion, which could damage the rails.

20. Secure the storage enclosure chassis flanges to the rack cabinet, fastening the top captive thumbscrew on each side until tight.

Replace a controller fan module

The two (2) controller fan modules provide cooling to the auxiliary bay of the storage enclosure.

An important feature of the storage enclosure design is redundancy. The enclosure will maintain continuous operation during the replacement of a single controller fan module, as long as it is within the time limit of eight (8) minutes, since removal of a controller fan module significantly reduces airflow in the auxiliary bay.

△ **CAUTION**   If you remove any FRU while the storage enclosure is powered up, you must replace it with a known good spare within the allotted time for that FRU. If you do not replace the FRU and, when applicable, close the related cover within the identified time limit, you void the product warranty and the storage enclosure might overheat, causing equipment failure and possible data loss.

⚠ **CAUTION**   Do not remove covers from any FRU. There is a danger of electric shock inside. Return the FRU to your supplier for repair.

To remove and replace a controller fan module:

1. If you plan on removing all controller fan modules, properly shut down the storage enclosure.
2. Retrieve the new controller fan module in its static-protected container, ready to access and use the new controller fan module upon removal of the faulty one.
3. (Optional) As an extra safety measure while installing drives, support the storage enclosure with a mechanical lift to avoid any potential issues caused by downward forces.
4. Facing the front of the rack cabinet, loosen the storage enclosure chassis flanges by twisting the top captive thumbscrew on each side of the storage enclosure to the left.
5. Lower the pull handles, then steadily pull the storage enclosure out on its rails until it locks in the service position.
6. Locate the auxiliary bay cover's front latch, release it by pressing the latch in to release the cover, then lift the cover away and set it aside.
7. Locate the release latch of the failing controller fan module, which is toward the inside of the auxiliary bay.
8. Press the tab gently toward the chassis sidewall to release the latch, then pull steadily upward to disengage the fan from the baseplane.
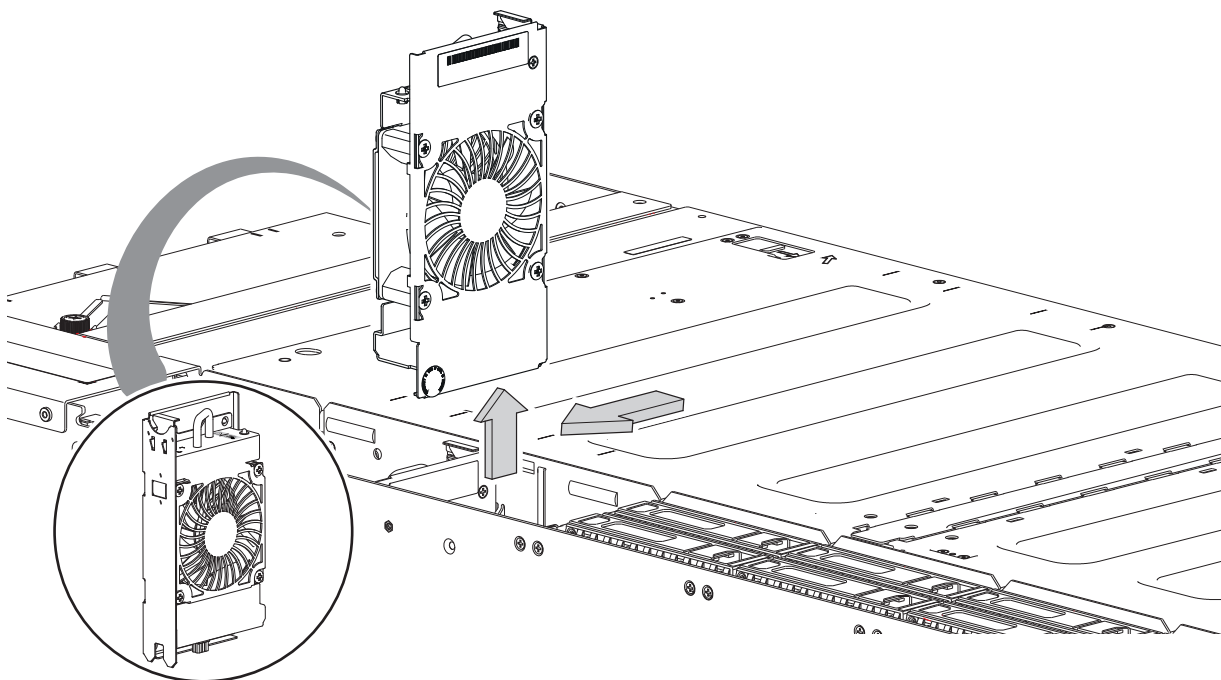9. Gently remove the controller fan module from the storage enclosure and set aside.

Figure 59   Removal of a controller fan

10. While maintaining proper static protection, remove the new controller fan module from its static-protected container.

11. Inspect the controller fan module carefully to make sure it is not damaged or bent in any way, paying particular attention to connector pins.

12. Properly orient the controller fan module so you can grasp the handle, then orient it to its empty slot.

13. Slide the controller fan module into its empty slot until it firmly connects to the baseplane.

14. If you are replacing both controller fan modules, repeat the entire process for the second one.

15. Verify the controller fan module status LED is off and the cooling fans began spinning.

16. Replace the auxiliary bay cover, latching it firmly in place.

17. Return to the front panel of the storage enclosure and verify that the *Fault-Auxiliary bay* LED is not steady amber.

18. (Optional) Lower and remove the mechanical lift.

19. Facing the front panel, press both safety lock switches to release the rails.

20. Carefully exert even pressure on both sides of the storage enclosure front and continue insertion all the way into the rack until it locks in the storage position. Do not force insertion, which could damage the rails.

21. Secure the storage enclosure chassis flanges to the rack cabinet, fastening the top captive thumbscrew on each side until tight.

Replace a system fan module

The four (4) system fan modules provide cooling to the main bay of the storage enclosure.

An important feature of the storage enclosure design is redundancy. The storage enclosure can maintain continuous operation during the replacement of a single system fan module, as long as it is within the time limit of two (2) minutes, since removal of a system fan module significantly reduces airflow in the main bay.

⚠ **CAUTION** If you remove any FRU while the storage enclosure is powered up, you must replace it with a known good spare within the allotted time for that FRU. If you do not replace the FRU and, when applicable, close the related cover within the identified time limit, you void the product warranty and the storage enclosure might overheat, causing equipment failure and possible data loss.

⚠ **CAUTION** Do not remove covers from any FRU. There is a danger of electric shock inside. Return the FRU to your supplier for repair.

To remove and replace a system fan module:

1. If you plan on removing all system fan modules, properly shut down the storage enclosure.

2. Retrieve the new system fan module in its static-protected container, ready to access and use it upon removal of the faulty one.

3. Press down on the release latch to disengage the system fan module from the locked position.

4. Using the handle, gently remove the system fan module using a steady pressure to pull it from the storage enclosure while supporting it with your other hand and set it aside.
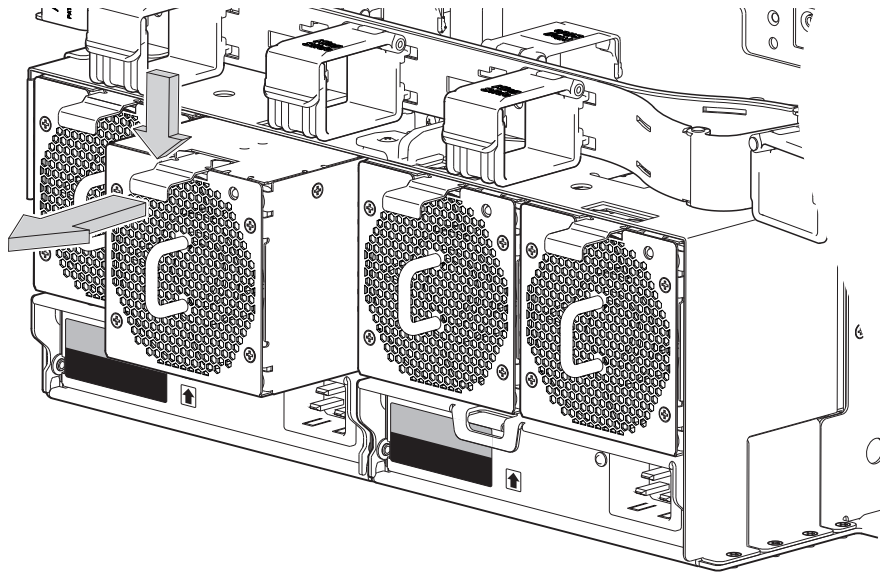
Figure 60 Removal of a system fan

5. While maintaining proper static protection, remove the new system fan module from its static-protected container.

6. Inspect the system fan module carefully to make sure it is not damaged or bent in any way, paying particular attention to connector pins.

7. Properly orient the system fan module so you can grasp the handle, then orient it to its empty slot.

8. Slide the system fan module into its empty slot until you feel it connect to the power midplane.

9. If you are replacing all system fan modules, repeat the entire process for each of them.

10. Verify the system fan module fault LED is steady amber when the cooling fans began spinning, then goes out when the cooling fans reach their optimal rotational speed.

11. Return to the front panel of the storage enclosure and verify that the *Fault-Rear panel* LED is not steady amber.

Replace a power supply unit

The two (2) power supply units (PSUs) provides power to the storage enclosure within the following specifications: 200-240VAC at 50- 60Hz.

An important feature of the storage enclosure design is redundancy. You can still maintain continuous operation during the replacement of a single PSU, as long as it is within the time limit of six (6) minutes.

⚠ **CAUTION**   If you remove any FRU while the storage enclosure is powered up, you must replace it with a known good spare within the allotted time for that FRU. If you do not replace the FRU and, when applicable, close the related cover within the identified time limit, you void the product warranty and the storage enclosure might overheat, causing equipment failure and possible data loss.

⚠ **CAUTION**   Do not remove covers from any FRU. There is a danger of electric shock inside. Return the FRU to your supplier for repair.

To remove and replace a power supply unit:

1. Use your management interface to halt all data input and output operations to the storage enclosure.
2. If you plan on removing both PSUs, properly shut down the storage enclosure.
3. Retrieve the new PSU in its static-protected container, ready to access and use it upon removal of the faulty one.
4. Facing the rear of the enclosure, disconnect the provided right-angle power connector from the faulty PSU or both PSUs for complete removal of power from the power distribution unit (PDU).
5. Press the latch tab of the PSU handle down, then outward to access the PSU handle.
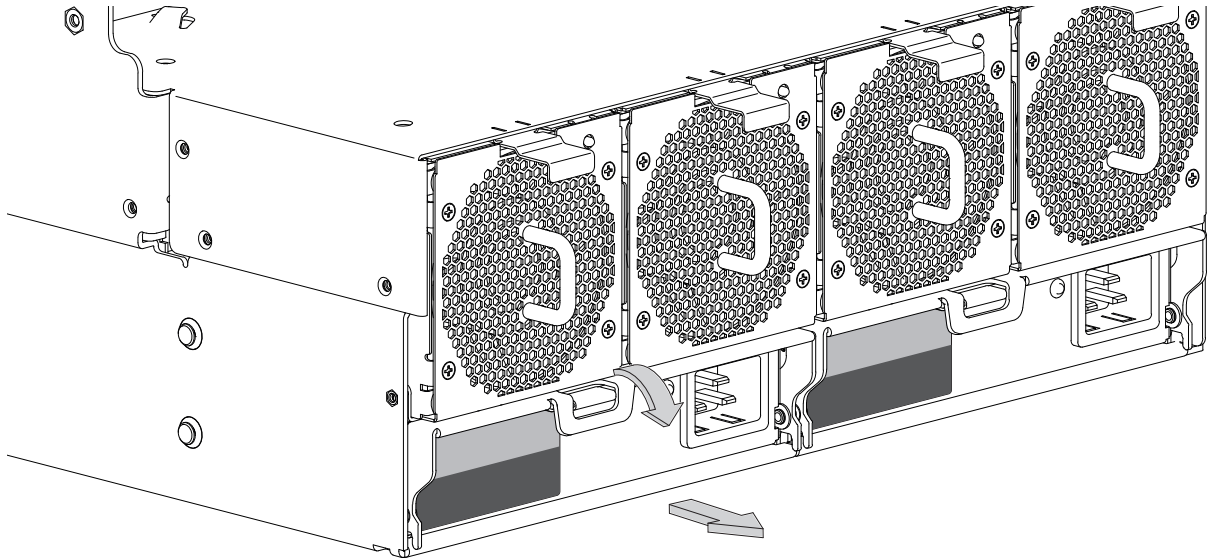

Figure 61 Removal of the PSU without power

6. Using the handle, gently remove the PSU using a steady pressure to pull it from the storage enclosure while supporting it with your other hand, and then set it aside.
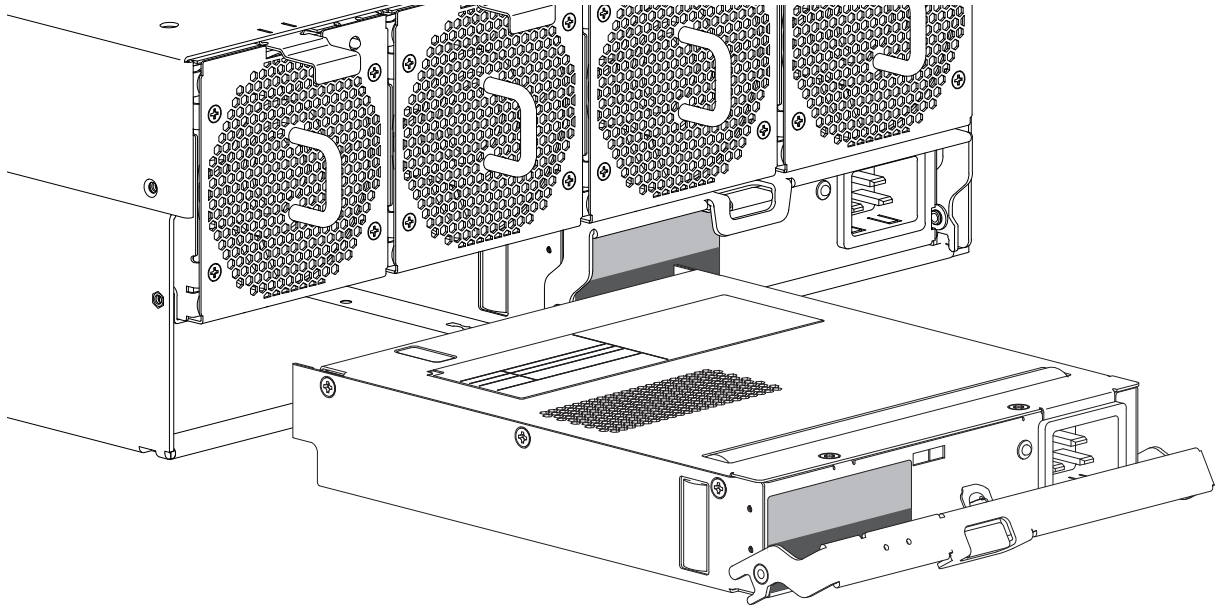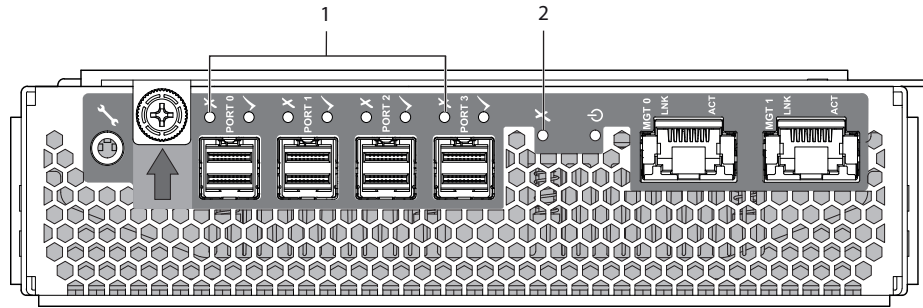
Figure 62   Removed PSU

7. While maintaining proper static protection, remove the new PSU from its static-protected container.

8. Inspect the PSU carefully to make sure it is not damaged or bent in any way, paying particular attention to connector pins.

9. Rotate the PSU handle to the open position, grasping it in one hand while using the other to support the PSU.

10. Slide the PSU into the empty PSU slot until you feel it connect to the power midplane.

11. Rotate the PSU handle to the closed position, listening for a slight click as the latch engages and secures the PSU.

12. If you are replacing both PSUs, repeat the entire process for the second PSU.

13. Verify all cables lie flat and smooth in the cable clip on the chassis, then connect the provided right-angle power connector to the PSU.

14. Verify the PSU status LED is steady green and the cooling fans are spinning.

15. Return to the front panel of the storage enclosure and verify that the *Fault-Rear panel* LED is not steady amber.

Replace an input/output module

The two (2) input/output modules (IOMs) manage the flow of data to and from the storage enclosure. Each IOM provides a very specialized, solutions-specific interaction that depends on your system configuration and software implementation, including SAS zoning, failover and failback procedures, and multi-path procedures.

The IOM has a number of ports, each with independent status LEDs. Those items in the state column with an asterisk (*) indicate a fault condition.

Item	LED	Color	State	Status
1	SAS host port fault	Amber	**On***	SAS connected; one or more SAS lanes inactive; partial link up results in lower and inconsistent speed
			Flashing*	SAS connected; one or more SAS lanes inactive; active lanes register input or output activity
			Off	No host link connection, not a fault
2	Hardware fault	Amber	**On***	IOM hardware fault
			Off	IOM hardware is functioning properly

Figure 63 Input/output module LEDs to examine for fault conditions

Consult your solution service documentation for details on how to minimize system disruption during service replacement of a controller module. Fault conditions include the following:

- Logs or events indicate a fault condition for the IOM.
- The *OK to remove* LED on the IOM is off.
- The *Hardware fault* LED for one of the four 12Gb SAS ports on the IOM is steady or flashing amber.
- The *Fault-Rear panel* LED on the storage enclosure front panel is steady amber.
- Troubleshooting indicates a problem with the IOM. When you are isolating connectivity or drive module fault conditions, stop the data flow to the affected disk groups from all hosts as a data protection precaution and perform a backup of your data.

When all of the prior LED fault conditions occur simultaneously, it is a clear indication of component failure.

⚠ **CAUTION** If you remove any FRU while the storage enclosure is powered up, you must replace it with a known good spare within the allotted time for that FRU. If you do not replace the FRU and, when applicable, close the related cover within the identified time limit, you void the product warranty and the storage enclosure might overheat, causing equipment failure and possible data loss.

⚠ **CAUTION** Do not remove covers from any FRU. There is a danger of electric shock inside. Return the FRU to your supplier for repair.

To remove and replace an input/output module:

1. Consider the implications of the replacement, reviewing all solution service documentation for pre- and post-replacement procedures to minimize system disruption.
2. (Optional) If you plan on removing all IOMs, properly shut down the storage enclosure.
3. Retrieve the new IOM in its static-protected container, ready to access and use it upon removal of the faulty one.
4. Facing the rear of the rack cabinet, locate the faulty IOM.

5. If each cable does not have a numbered label, label each as you disconnect it from its port.

6. Twist the thumbscrew counter-clockwise only far enough to loosen the latch handle.

7. Pull outward, then downward on the latch handle to leverage the IOM away from the midplane.
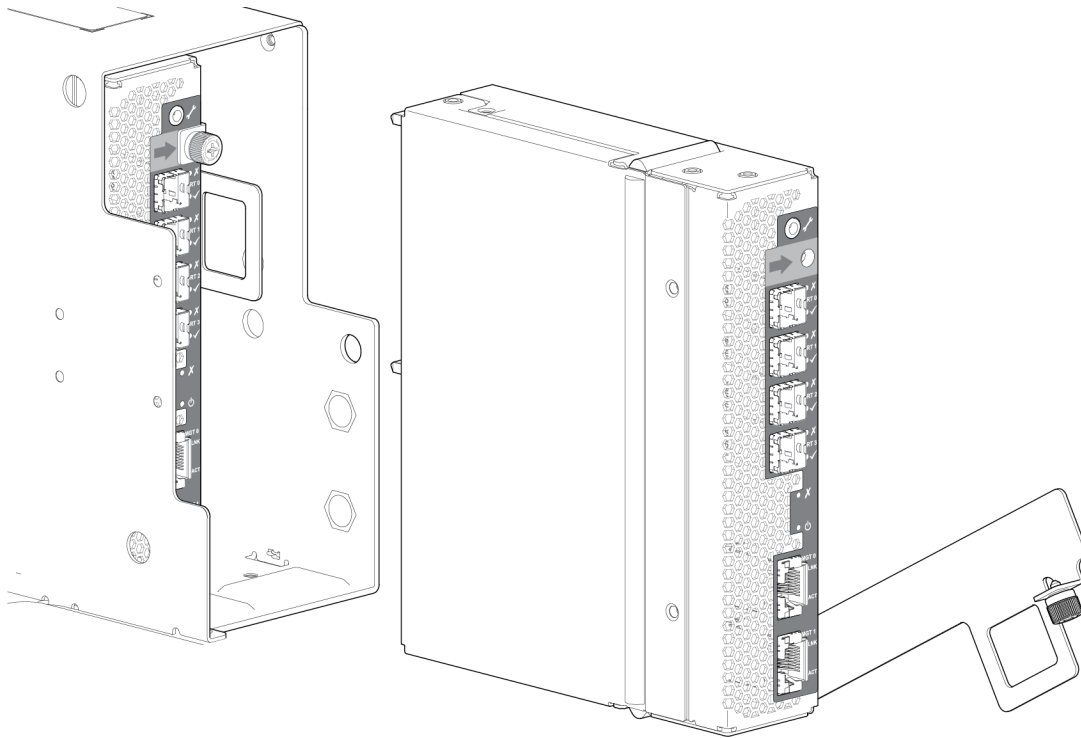

Figure 64   Release of the input/output module latch handle

8. Gently pull the latch handle, easing the IOM away from the rear panel and keeping it level with both hands during removal, then set aside.

9. While maintaining proper static protection, remove the new IOM from its static-protected container.

10. Inspect the IOM to make sure it is not damaged or bent in any way, paying particular attention to connector pins.

11. Properly orient the IOM so you can grasp the handle, then orient it to its empty slot.

12. Slide the IOM into its empty slot until you feel it fully connect to the midplane.

13. After pressing against it once more to make sure it is fully seated, close the latch until you hear a click as the latch handle engages into the locked position.

14. Tighten the thumbscrew to secure the latch, then reconnect each of the cables to its labeled location, again making sure all are fully seated.

15. Inspect all cables for any damage, especially the connectors. If you use passive copper cables, they cannot have any connection to common ground earth.

16. Reconnect all cables you removed according to the way you labeled them.

17. If you are replacing both IOMs, repeat the entire process for each of them.

18. Verify each IOM fault LED is off.

19. Return to the front panel of the storage enclosure and verify that the *Fault-Rear panel* LED is not steady amber.

Replace a main bay cover

The main bay cover protects the main bay components and assists with containing airflow to cool the main bay.

You can still maintain continuous operation during the replacement of the main bay cover, as long as it is within the time limit of eight (8) minutes, since the removal of the main bay cover impacts airflow in the main bay.

⚠ **CAUTION** If you remove any FRU while the storage enclosure is powered up, you must replace it with a known good spare within the allotted time for that FRU. If you do not replace the FRU and, when applicable, close the related cover within the identified time limit, you void the product warranty and the storage enclosure might overheat, causing equipment failure and possible data loss.

To remove and replace the main bay cover:

1. Facing the front of the rack cabinet, loosen the storage enclosure chassis flanges by twisting the top captive thumbscrew on each side of the storage enclosure to the left.
2. Lower the pull handles, then gently and steadily pull the storage enclosure out until it locks in the service position.
3. After locating the main bay cover's rear latch, closest to the rear panel, push down on the tab, then release it by pressing the latch away from the rear panel and toward the hinge.
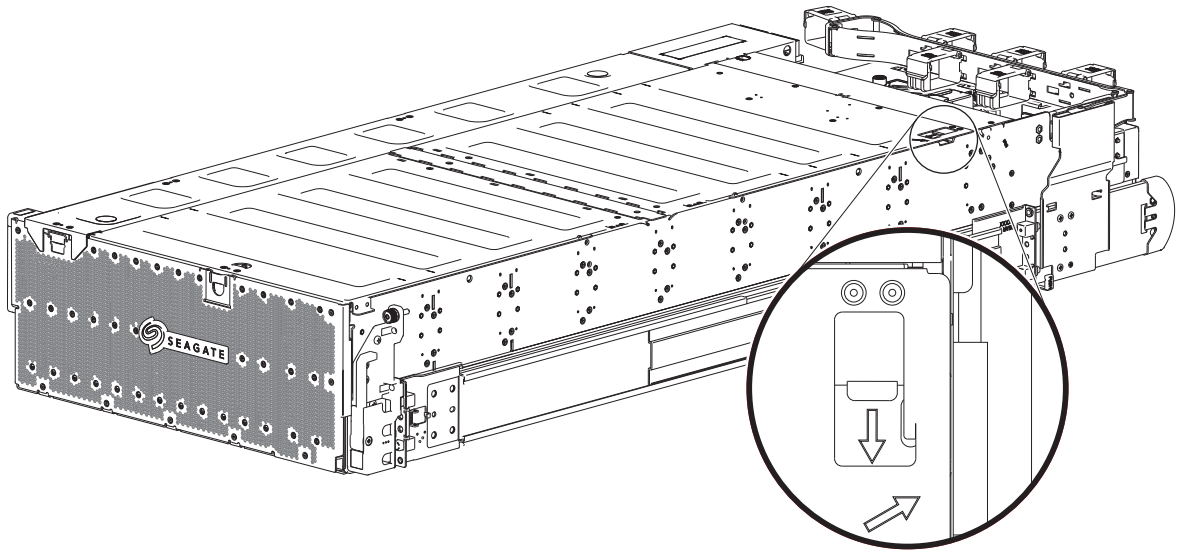

Figure 65 Access main bay cover's rear latch

4. Pull the rear half of the main bay cover up onto its hinge, then rest it against the unopened half.
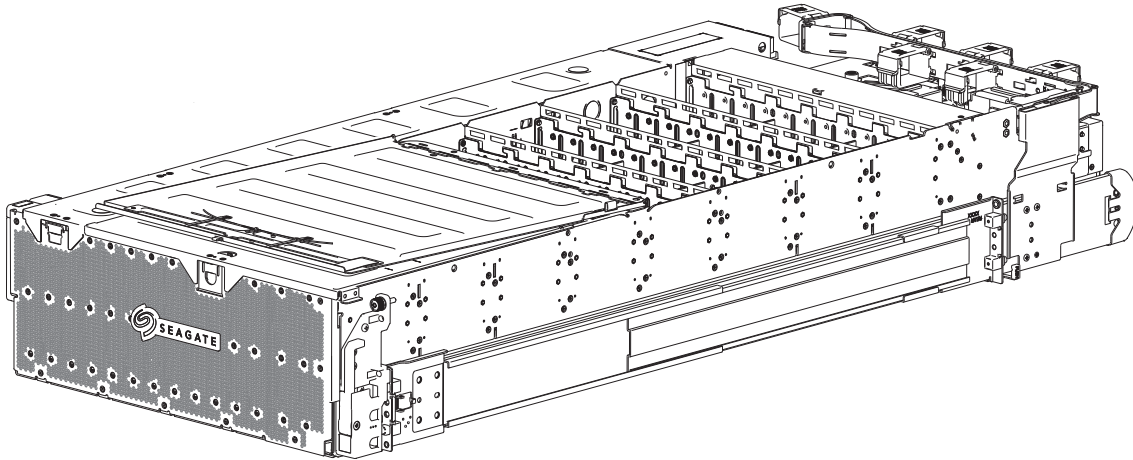
Figure 66   Rear half of an unpopulated main bay

5. After locating the main bay cover's front latch, closest to the front panel, push in on the latch to release it, then, grasping both halves, simultaneously lift them away from the hinge pin slot in an upward and outward angle toward the front panel.
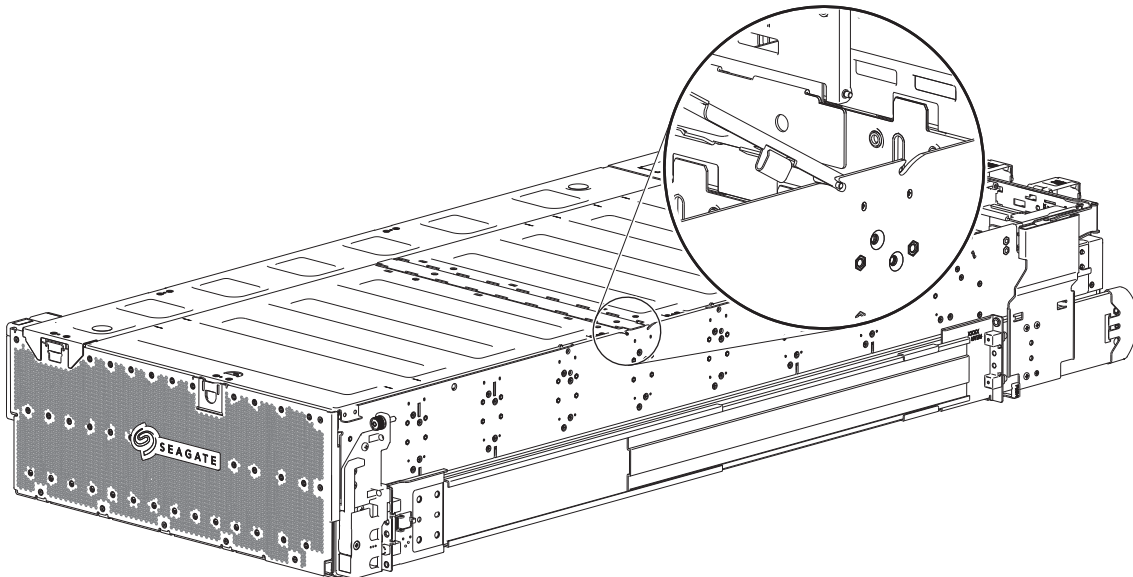

Figure 67   Main bay cover's front hinge pin

6. Set the main bay cover aside.

7. (Optional) If you need to replace the main bay cover with a new one, retrieve it from its container, inspect it for damage, and orient it so to match the final removal position of the damaged one.

8. Fold the main bay cover in half, with the front half under and matching the rear half.

9. Orient the main bay cover hinges to the hinge pin slot.

10. Gently slide the hinge pins along the chassis until the hinges sink down into the hinge pin slot.

11. Carefully lower both halves toward the front until the front half engages in the locked position.

12. Lift the back half away from the front half, still resting the hinged section on the chassis until engaging the rear half in the locked position.

> ⓘ **IMPORTANT**   Do not proceed until you perform a visual inspection to verify all main bay cover edges connect completely with supporting surfaces, both hinge mechanisms are at the bottom of the pin slots, and latches for both halves fully engage.

13. Facing the front panel, carefully exert even pressure on both sides of the storage enclosure front and continue insertion all the way into the rack until the mounting flange is flush with the rack ears, locking the storage enclosure into the storage position. Do not force insertion, which could damage the rails.

14. Secure storage enclosure chassis flanges to the rack, fastening both top captive thumbscrews until tight.

Replace an auxiliary bay cover

The auxiliary bay cover protects related components and assists with containing airflow to cool the auxiliary bay.

You can still maintain continuous operation during the replacement of the auxiliary bay cover, as long as it is within the time limit of eight (8) minutes, since removal of the auxiliary bay cover impacts airflow in the auxiliary bay.

> △ **CAUTION**   If you remove any FRU while the storage enclosure is powered up, you must replace it with a known good spare within the allotted time for that FRU. If you do not replace the FRU and, when applicable, close the related cover within the identified time limit, you void the product warranty and the storage enclosure might overheat, causing equipment failure and possible data loss.

To remove and replace the auxiliary bay cover:

1. Facing the front of the rack cabinet, loosen the storage enclosure chassis flanges by twisting the top captive thumbscrew on each side of the storage enclosure to the left.

2. Lower the pull handles, then gently and steadily pull the storage enclosure out until it locks in the service position.

3. After locating the auxiliary bay cover's front latch, closest to the front panel, push in on the latch to release it, then, grasping the auxiliary bay cover, lift it away from the rear until it is free.
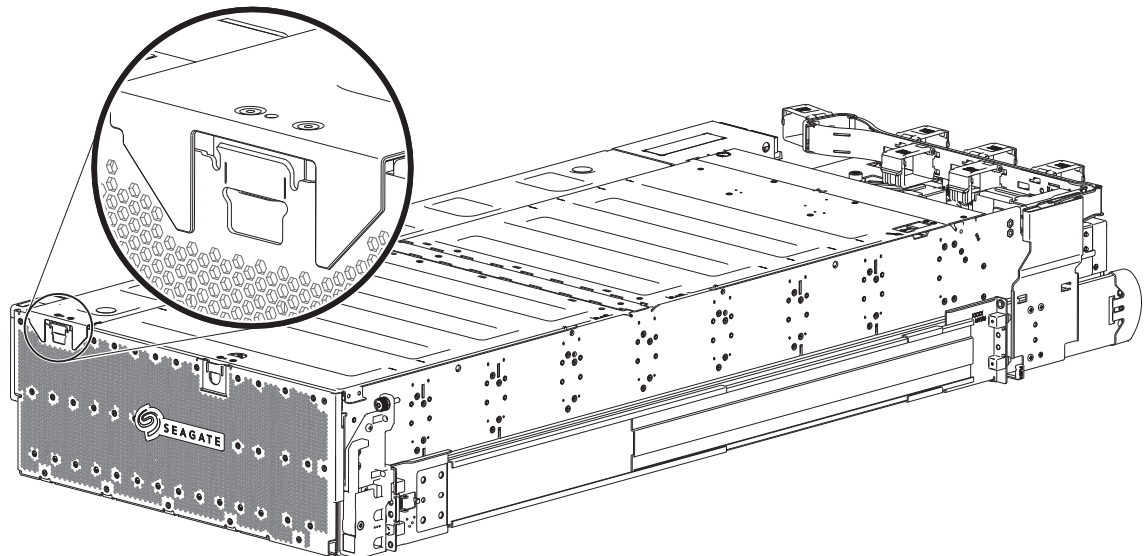

Figure 68   Access auxiliary bay cover's latch

4. Set the auxiliary bay cover aside so the top side is resting on a flat surface and the inside is facing up.

5. (Optional) If you need to replace the auxiliary bay cover with a new one, retrieve it from its container, inspect it for damage, and orient it so to match the final removal position of the damaged one.

6. Gently slide the auxiliary bay cover along the chassis until the rear of the cover slides under the rear retainer.

7. Carefully lower the auxiliary bay cover until the front engages in the locked position.

   ⓘ **IMPORTANT**   Do not proceed until you perform a visual inspection to verify all auxiliary bay cover edges connect completely with supporting surfaces and the front latch fully engages.

8. Facing the front panel, carefully exert even pressure on both sides of the storage enclosure front and continue insertion all the way into the rack until the mounting flange is flush with the rack ears, locking the storage enclosure into the storage position. Do not force insertion, which could damage the rails.

9. Secure storage enclosure chassis flanges to the rack, fastening both top captive thumbscrews until tight.

A Technical specifications

Table 16 Storage enclosure dimensions

Dimension type	Metric units	Imperial units
Height, including top covers	176.40mm	6.94 in
Width, excluding rails and rack ears	441.00mm	17.36 in
Depth, including handles, excluding cables	1139.00mm	44.84 in

Table 17 Storage enclosure FRU weights[1]

FRU or component	Metric units	Imperial units
Storage enclosure chassis plus midplane, no FRUs	36.00Kg	79.40 lb
Drive modules: 3.5 -in LFF in carrier or 2.5-in SFF with adapter in carrier	up to 0.80Kg	up to 1.80 lb
System fan module	0.70Kg	1.50 lb
Power supply unit (PSU)	1.45Kg	3.20 lb
Input/output module (IOM)	0.80Kg	1.80 lb
Controller fan module	0.70Kg	1.50 lb
SAS expander module	0.10Kg	0.20 lb
Cable management arm (CMA) and hardware kit	0.91Kg	2.00 lb
Rack rails and hardware kit	6.75Kg	14.90 lb

[1] All weights are nominal, can vary. Unit values for drives use the heaviest currently qualified drive. Scale calibration impacts measured weights.

Table 18 Storage enclosure total weights

Variation	Metric units	Imperial units
Storage enclosure, populated with FRUS but no drive modules[1]	44.90Kg	99.00 lb
Storage enclosure, populated with FRUS and 106 drive modules[1]	131.50Kg	290.00 lb
Storage enclosure, populated with FRUS, 106 drive modules, CMA kit, and rack rails kit[1]	140.60Kg	310.00 lb
UL-certified weight, fully populated, with typical cables, CMA kit, and rack rails kit	145.60Kg	321.00 lb

[1] All weights are nominal, can vary. Unit values for drives use the heaviest currently qualified drive. Weight totals do not include cables, which vary in length.

Table 19 Environmental specifications

Type	Operation	Storage, Non-operating
Temperature	5°C to 35°C (41°F to 95°F, derated by 1°C per 300m above 900m) ASHRAE A2 2015 thermal guidelines	-40°C to +70°C (-40°F to +158°F) Max temperature change in an hour: 20°C
Airflow	System must be operated with low pressure rear exhaust installation Back pressure created by rack doors and obstacles not to exceed 5 Pa (0.5mm H_2O)	
Altitude	-100 to 3,048 meters (-328 to 10,000 feet) Maximum operating temperature is de-rated by 1°C for each 300m above 900m (2952.76 ft)	-100 to 12,192m (-328 to 40,000 ft)
Relative humidity	-12°C dew point 10% to 80% max, non-condensing	-12°C dew point 5% to 100% max, non-condensing
Shock	3.0g, 11ms (per axis)	20.0g, 7ms, 10 shock pulses (2 shocks per axis X, Y in positive and negative direction, and 2 shocks in positive Z axis) OR ISTA 3H (mounted in a rack, horizontal impact on all sides, 4-in drop tests)
Vibration	$0.18G_{rms}$ 5Hz to 500Hz, 30 min per axis	$0.54G_{rms}$ 6Hz to 200Hz (ISTA 3E Relocation: ISTA3H air ride for 60 min
Acoustics	8.5 Bels LW_{Ad} @ 23°C	N/A

Table 20 Power specifications

Type	Qualifier	Description
Power supply dimensions		38.1mm (1.50 in) high x 169.9mm (6.69 in) wide x 211.1mm (8.30 in) long
Maximum output power		2000W
Voltage	Max output	2000W
	Range	200-240VAC, rated
	Range selection	90-264VAC, 47-63Hz, auto-ranging
	Frequency	50-60Hz
	Maximum inrush current	55A
Power conversion efficiency		≥ 94% @ 230VAC, 50% load
Harmonics		Meets EN61000-3-2 (EU), EN 31000-3-3 (EU), EN 55024 (EU), KN 24/KN 35
Output		+12V @ 164A
		+12V Standby Voltage @ 3.5A, 5V for circuit operation
Hot-swappable?		Yes

B Standards and regulations

International standards

The storage enclosure complies with the requirements of the following agencies and latest editions of these standards:

Table 21   Safety compliance

Type	Specification
System product type approval	UL/cUL/CE
Safety compliance	UL 60950-1; UL & cUL to UL 60950-1 CAN/CSA-C22.2 No. 60950-1-07 CE to EN 60950-1 IEC 60950-1; CB report to IEC 60950-1 CCC (China PRC - CCC Power Supplies) BIS (India - BIS PSU and system)

Potential for radio frequency interference

US Federal Communications Commission (FCC)

Notice:

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his or her expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. The supplier is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

European regulations

This equipment complies with European Regulations EN 55032 Class A: Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment and EN50082-1: Generic Immunity.

WEEE recycling

(!) **IMPORTANT**   Observe all applicable safety precautions detailed in the preceding chapters when dismantling and disposing of this equipment.

At the end of the product's life, all scrap or waste electrical and electronic equipment, recycle it in accordance with national regulations applicable to the handling of hazardous or toxic electrical and electronic waste materials.

Contact your supplier for a copy of the Recycling Procedures applicable to your country.

Index