



SEAGATE

Exos[®] CORVAULT[™]

Hardware Installation and Maintenance Guide

Abstract

This guide describes initial hardware setup for a Seagate Exos CORVAULT enclosure. 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.

Part Number: 83-00007762-10-01
Revision: B
Published: August 2021

© 2021 Seagate Technology LLC or its affiliates. All rights reserved. Seagate, Seagate Technology, and the Spiral logo are registered trademarks of Seagate Technology LLC in the United States and/or other countries. CORVAULT and Exos are either trademarks or registered trademarks of Seagate Technology LLC or one of its affiliated companies in the United States and/or other countries. All other trademarks or registered trademarks are the property of their respective owners. When referring to disk capacity, one gigabyte (GB) equals one billion bytes, one terabyte (TB) equals one trillion bytes, and one petabyte (PB) equals one thousand terabytes. Your computer's operating system may use a different standard of measurement and report a lower capacity. In addition, some of the listed capacity is used for formatting and other functions, and thus will not be available for data storage. All coded instruction and program statements contained herein remain copyrighted works and confidential proprietary and trade secret information of Seagate Technology LLC or its affiliates. Any use, derivation, disassembly, reverse engineering, dissemination, reproduction, or any attempt to modify, prepare derivative works, reproduce, distribute, disclose copyrighted material of Seagate Technology LLC, for any reason, in any manner, medium, or form, in whole or in part, if not expressly authorized, is strictly prohibited. Seagate reserves the right to change, without notice, product offerings or specifications.

Regulatory and compliance information

For the latest regulatory and compliance information see www.seagate.com/support. Scroll down to the Compliance, Safety and Disposal Guide link.

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

1 Introduction	8
Intended audience	8
Knowledge prerequisites	8
Product documentation and support	8
Safety guidelines	9
2 System overview	10
Storage enclosure components	10
Storage enclosure chassis	10
Storage enclosure modules	11
Storage enclosure PCBAs	12
Optional components	13
3 Initial installation	14
Installation checklist	14
Complete installation prerequisites	15
Unpack and prepare the storage enclosure	16
Install the rackmount rail kit	18
Separate the inner rails from the outer and mid rails	19
Adjust the outer rails to the rack cabinet	22
Install the outer rails in the rack cabinet	25
Attach the inner rails to the storage enclosure	28
Install the storage enclosure	30
Mount the storage enclosure into the rack cabinet	30
Install the CMA and crossbar	33
Install disk drives in the storage enclosure	37
Test enclosure connections	40
4 Route power cords and data cables	41
Route power cords from the power supply units	41
Route data cables from the controller module	43
Route and connect power cords and data cables	45
5 Operation	48
Apply power to the storage enclosure	48
5 Interpret system LEDs	49
Interpret front panel LEDs	49
Interpret controller module LEDs	50
6 Hardware installation and configuration issues	52
Address initial start-up issues	52
Interpret FRU fault condition LEDs	53
Disk drive fault LED	53
SAS expander module fault LED	53
Controller fan fault LED	53
System fan fault LED	54
Power supply unit (PSU) status LED	55
Controller module fault LEDs	56
Identify fault conditions	57
Isolate hardware and connectivity faults	58
Isolate system application faults	59
Take corrective action	60
7 In-service field maintenance	63
Replace a disk drive	64
Replace a SAS expander module	66
Replace a controller fan module	67

Replace a system fan module	69
Replace a power supply unit	70
Replace a controller module	72
Replace a main bay cover	74
Replace an auxiliary bay cover	76
A Technical specifications	78
B Standards and regulations	80
International standards	80
Potential for radio frequency interference	80
WEEE recycling	80
Index	81

Figures

Figure 1	Storage enclosure with rails	11
Figure 2	Top view, hot-swappable FRUs	12
Figure 3	PCBAs cutaway with callouts	13
Figure 4	Default belt straps already around the storage enclosure	17
Figure 5	Optional lift handles attached to the storage enclosure	17
Figure 6	Left and right lift handles	18
Figure 7	Separated left rail assembly, inner sides facing	20
Figure 8	Extension of left inner rail beyond mid rail	21
Figure 9	Location of inner rail safety lock	21
Figure 10	Location of mid rail release switch lever	22
Figure 11	Distance measurement of rack inside post-to-post depth	23
Figure 12	Default location of outer rail adjustment setscrews	23
Figure 13	Measurement of rail from rear to front mount bracket	24
Figure 14	Sample adjusted distance for outer rail setscrews	24
Figure 15	Alignment of CMA B bracket to rear outer rail bracket holes alignment and attachment	25
Figure 16	Attach the rear of the outer right rail assembly	26
Figure 17	Right front post detail of the inserted outer right rail assembly	27
Figure 18	Location for cage nut near top of allocated 4U space	28
Figure 19	Left and right inner rail edge details	29
Figure 20	Left inner rail alignment to storage enclosure chassis	29
Figure 21	Lock of rail against T-pins, alignment of screw holes to chassis sidewall	29
Figure 22	Attachment of the CMA A bracket	30
Figure 23	Align inner rails with mid and outer rails, detail	31
Figure 24	Leaf spring latch engaged, extension of mid rail to fully forward and locked position	32
Figure 25	Release both safety lock latches	33
Figure 26	Attachment of the CMA bracket assembly to the CMA A bracket on the chassis	35
Figure 27	Insertion of CMA bracket assembly into CMA B bracket on the outer rail	35
Figure 28	Proper installation of the CMA bracket assembly	36
Figure 29	Direction to tighten crossbar thumbscrews	37
Figure 30	Front half of unpopulated main bay	38
Figure 31	Orient disk drive carrier handle to rear	38
Figure 32	Required installation of first complete row of disk drives	39
Figure 33	Rear half of unpopulated main bay	39
Figure 34	Auxiliary bay latch	40
Figure 35	Location of cable capture clip release screw	42
Figure 36	Power cord routing up to cable capture clip	42
Figure 37	Final power cord routing	43
Figure 38	Open cable capture arms on chassis	44
Figure 39	Proper order of data cables	44
Figure 40	Route for sample data cables on either side of the CMA cable capture arm	45
Figure 41	Close all CMA bracket clips	46
Figure 42	Sample HBA data and management connections	47
Figure 43	Route power cables to redundant PDUs	49
Figure 44	Front panel LEDs	50
Figure 45	Controller module LEDs	51
Figure 46	Disk drive fault LED on top panel	53
Figure 47	SAS expander module LEDs, component side	53
Figure 48	Controller fan fault LED, rotated orientation	54
Figure 49	System fan module fault LED	55
Figure 50	PSU Fault LED	56
Figure 51	Controller module LEDs to examine for fault conditions	56
Figure 52	Removal of disk drive from the main bay (other disk drives removed for clarity)	65
Figure 53	Removal of a SAS expander module	67
Figure 54	Removal of a controller fan	68

Figure 55	Removal of a system fan	70
Figure 56	Removal of the PSU without power	71
Figure 57	Removed PSU	72
Figure 58	Controller module LEDs to examine for fault conditions	73
Figure 59	Release of the controller module latch handle	74
Figure 60	Access main bay cover's rear latch	75
Figure 61	Rear half of an unpopulated main bay	76
Figure 62	Main bay cover's front hinge pin	76
Figure 63	Access auxiliary bay cover's latch	77

Tables

Table 1	Installation checklist tasks	14
Table 2	Fault LED prioritization	49
Table 3	Host port link LED status types	51
Table 4	Non-fault conditions	57
Table 5	Status of disk drive or array, based on front panel Fault-Application LED	59
Table 6	Status of CM, based on the green Cache LED and reboot	59
Table 7	Corrective action for fault conditions	60
Table 8	Time limits for FRU replacement	63
Table 9	Storage enclosure dimensions	78
Table 10	Storage enclosure FRU weights	78
Table 11	Storage enclosure total weights	78
Table 12	Environmental specifications	78
Table 13	Power specifications	79
Table 14	Safety compliance	80

1 Introduction

The Exos CORVAULT storage enclosure product is a high-capacity 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 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*	
Installation of the rail kit and enclosure into a rack	Rackmount Guide*	
	Online installation video	
Initial installation of hardware and component replacement	Hardware Installation and Maintenance Guide	Installation video
Configuration, management with web browser interface	Storage Management Guide	
Configuration, management with command-line interface	CLI Reference Guide	
Event codes and recommended actions	Event Descriptions Reference Guide	
Regulatory compliance, safety, and disposal information	Compliance, Safety, and Disposal Guide	Documentation, Support
* 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 CORVAULT storage enclosure mounts to a rack cabinet, occupying four EIA rack space units (4U) and contains up to 106 hot-swappable disk drives.

 **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

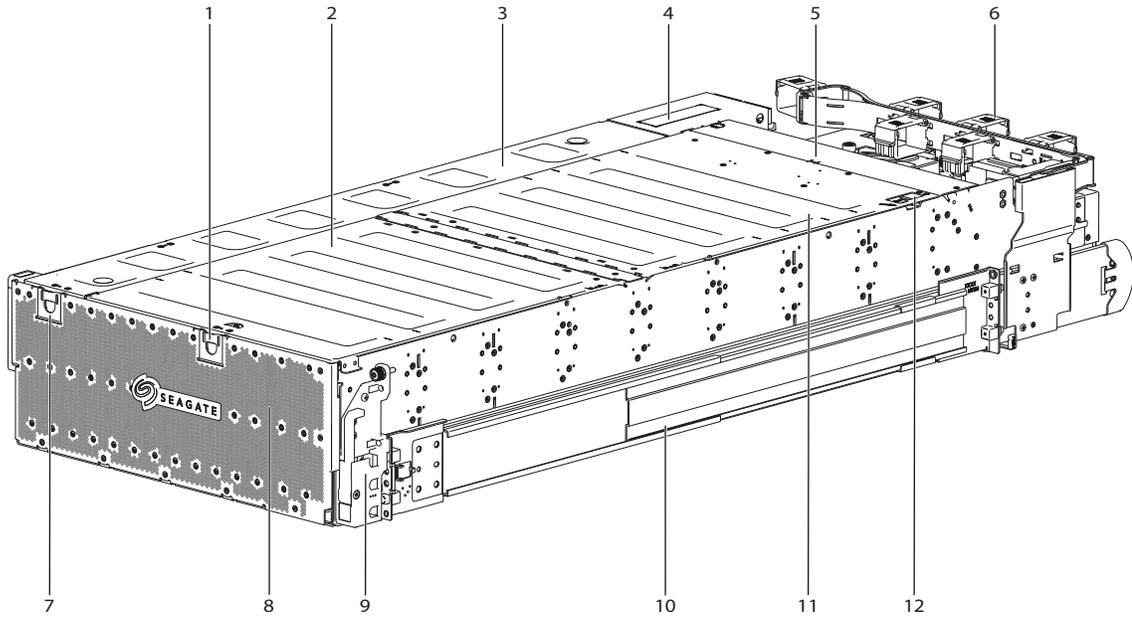
The typical CORVAULT storage enclosure comes equipped with several core components.

- 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 disk drives and an expander module for each of the eight (8) rows.
- The auxiliary bay contains slots for 10 more disk drives, 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 disk drives, 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.



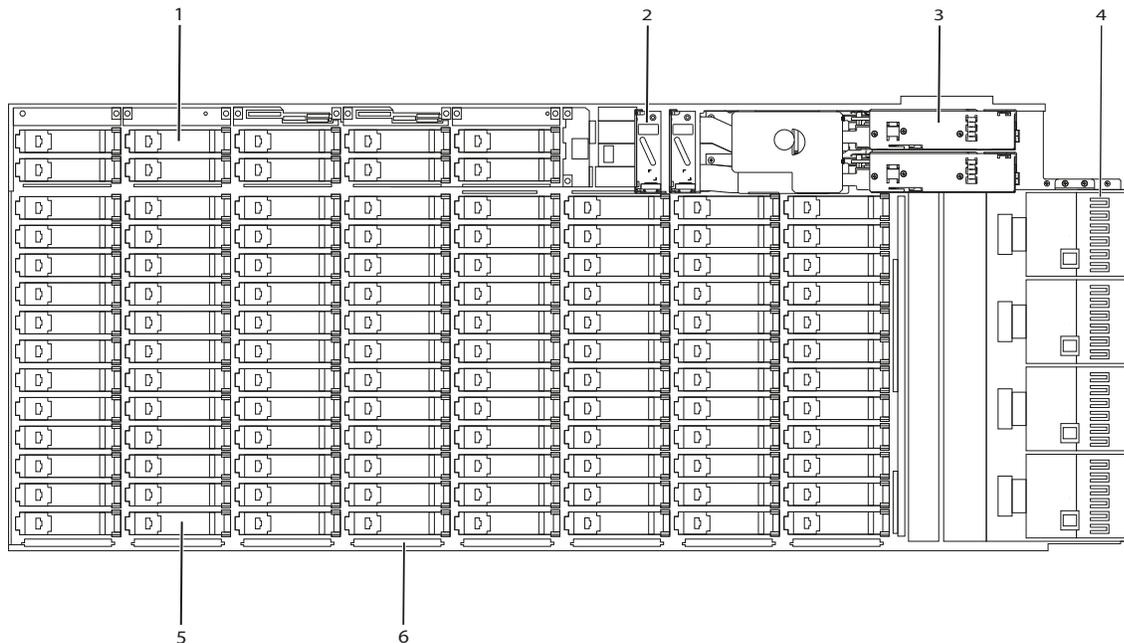
Item	Description	Item	Description
1	Main bay cover front latch	7	Auxiliary bay cover latch
2	Main bay front cover	8	Front panel
3	Auxiliary bay cover	9	Pull handle
4	Fixed controller cover	10	Right rail assembly with CMA B bracket
5	Fixed midplane cover	11	Main bay rear cover
6	Cable management arm (CMA)	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) that are hot-swappable, meaning you can perform in-service maintenance without powering down the storage enclosure. Modules or components that are cold-swap and require trained service 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.

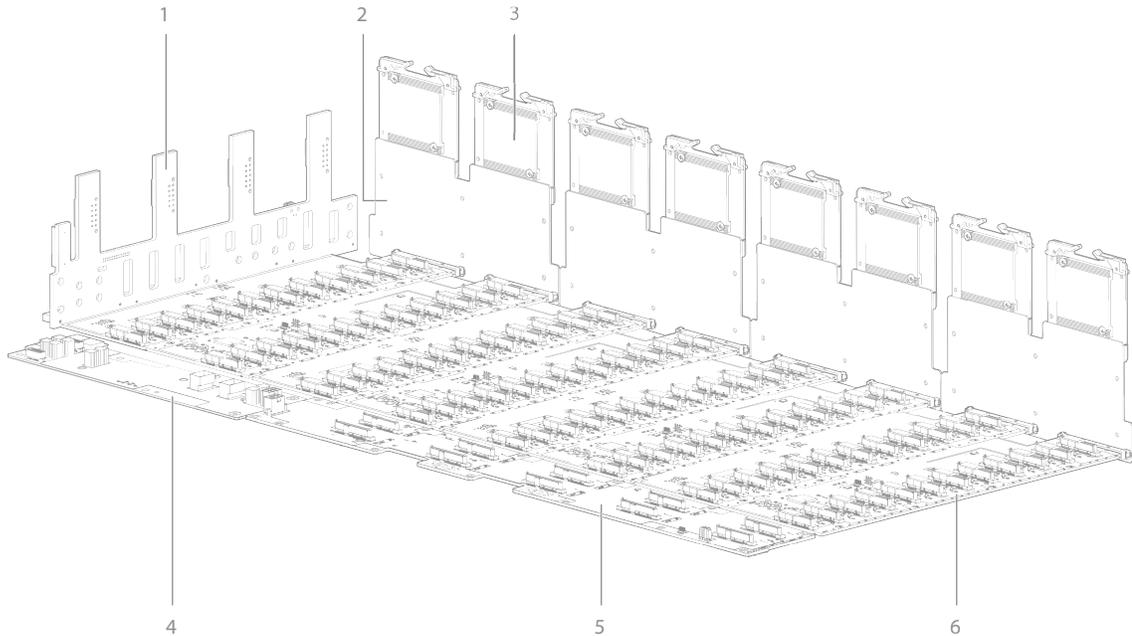


Item	Description	Function
1	Auxiliary bay disk drive (10)	Exchanges data on the controller channel
2	Controller fan module (2)	Provides redundant cooling for auxiliary bay components
3	Controller module (2)	Manages enclosure, fans, and LEDs; provides host connectivity
4	System fan module (4)	Provides redundant cooling for main bay components
5	Main bay disk drive (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
N/A	Cable management arm (CMA) and hardware; crossbar	Manages interconnection cables, providing full rail extension for service access; provides stability
N/A	Rack rail (left and right) and hardware	Provides support for a fully populated storage enclosure mounted within a rack cabinet

Figure 2 Top view, hot-swappable FRUs

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 cold-swap assemblies that require replacement by trained personnel, other than the SAS expander modules and the controller PCB that is part of the controller module.



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 and controller channels
2	SAS riser sideplane (4)	Passively balances drive paths between both SAS expander modules, one per main baseplane
3	SAS expander module (8), hot-swap	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 disk drives and signal connection to the dual controller channel; does not support single-port disk drives
6	24-HDD baseplane (4)	Provides power via a high-speed harness to each disk drive on the 24-HDD baseplane and signal connection to the dual drive channel; supports single-port disk drives

Figure 3 PCBAs cutaway with callouts

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.
- **Disk carriers:** In some situations, you can request optional disk drive carriers to surround a disk drive for installation in a disk drive 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; Complete installation prerequisites
2	Unpack the storage enclosure.	Installation checklist; Unpack and prepare the storage enclosure
3	Prepare the site for installation of the storage enclosure into the rack cabinet.	Installation checklist; Unpack and prepare the storage enclosure
4	For rackmount installation, temporarily place all disk drives in a static-protected area.	Installation checklist
5	Install the rackmount kit in the rack cabinet.	Install the rackmount rail kit
6	Mount the storage enclosure into the rack cabinet.	Install the storage enclosure
7	Install disk drives in the storage enclosure.	Install disk drives in the storage enclosure
8	Connect all power cords and data cables.	Route power cords and data cables
9	Route storage enclosure cables to a compatible host.	Route and connect power cords and data cables
10	Test the enclosure to verify full functionality.	Test enclosure connections

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 disk drives into a static-protected area, regardless of how your storage enclosure or disk drives 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 disk drive installation**

1. Prior to handling and replacing the disk drives, make sure you are static-compliant.
2. Make sure you can easily reach the slots in the enclosure safely while maintaining your balance.

- **Disk drive installation**

1. Only after you securely mount the storage enclosure in the rack can you install the disk drives 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 disk drive 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 disk drives
 - 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 disk drives
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
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 disk drives, which ship separately, based on system configuration: Single disk drives, 10-packs, or 24-packs. Set disk drives 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.

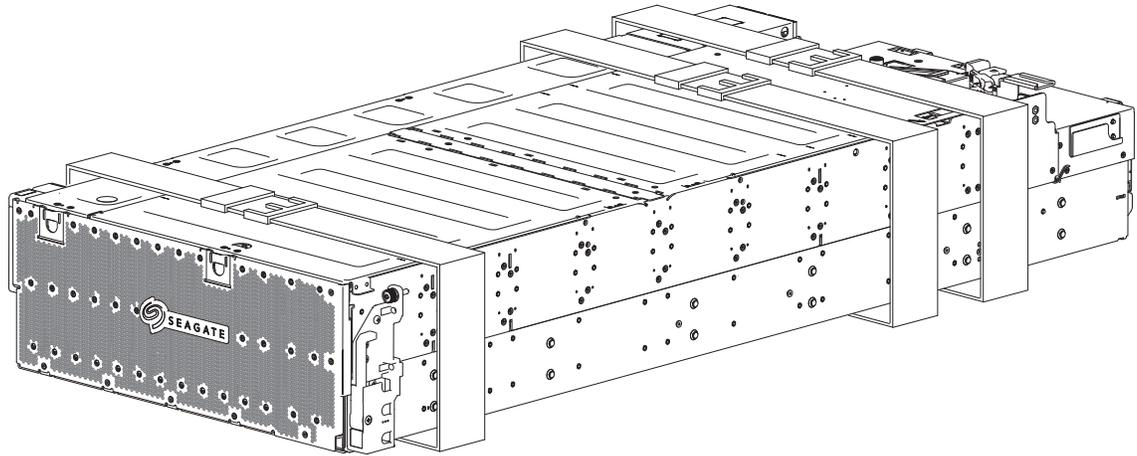


Figure 4 Default belt straps already around the storage enclosure

- 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.

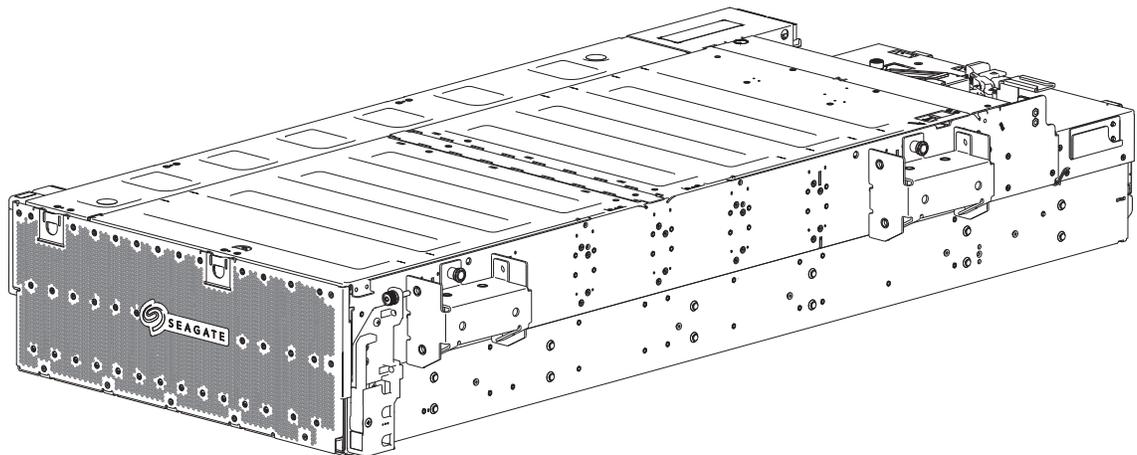


Figure 5 Optional lift handles attached to the storage enclosure

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.

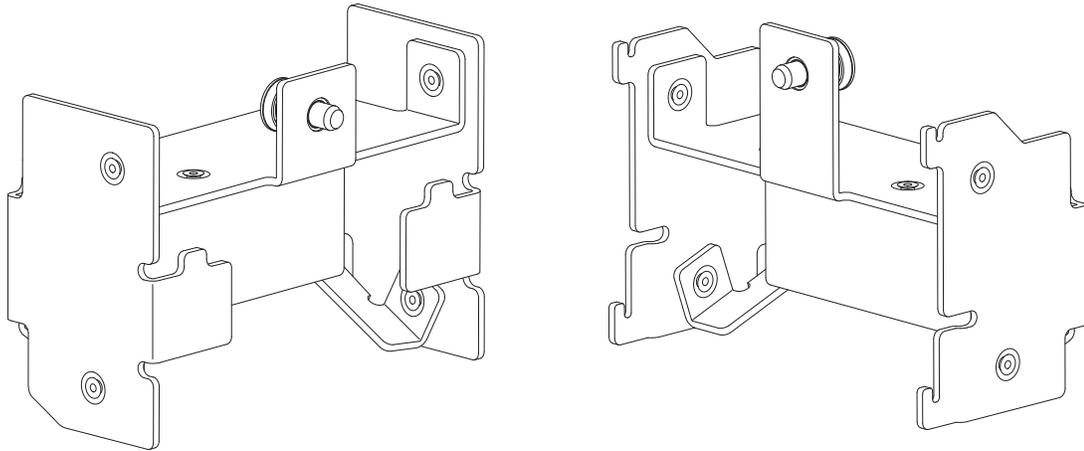


Figure 6 Left and right lift handles

- 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.

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:

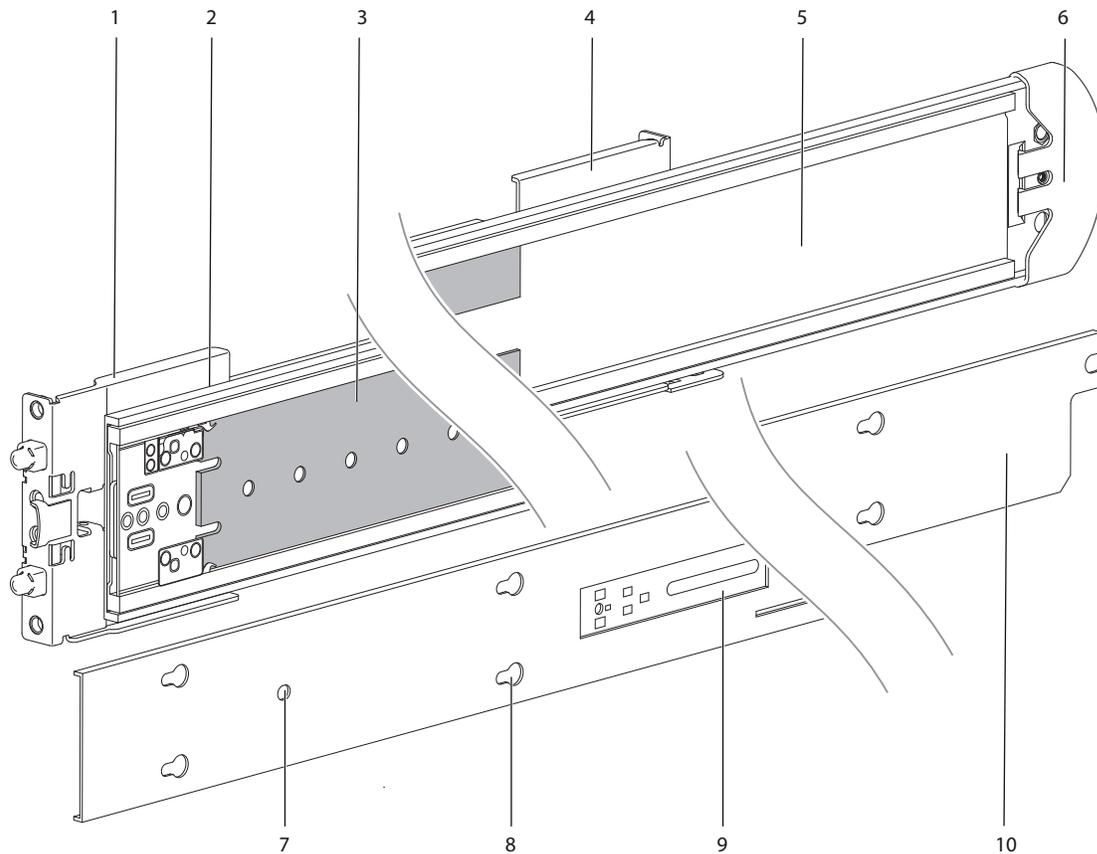
1. Read and observe all warning and caution labels on the storage enclosure.
2. Verify the rack cabinet is on a flat, leveled surface because any incline or unevenness stresses the rack cabinet and the storage enclosure. A storage enclosure in an uneven rack cabinet resists smooth movement on the rails, 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.

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.



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

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.

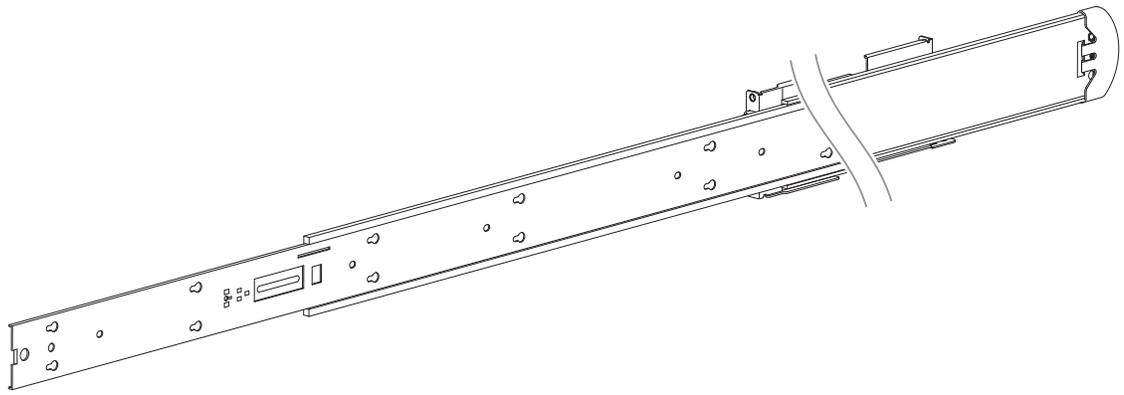


Figure 8 Extension of left inner rail beyond mid rail

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

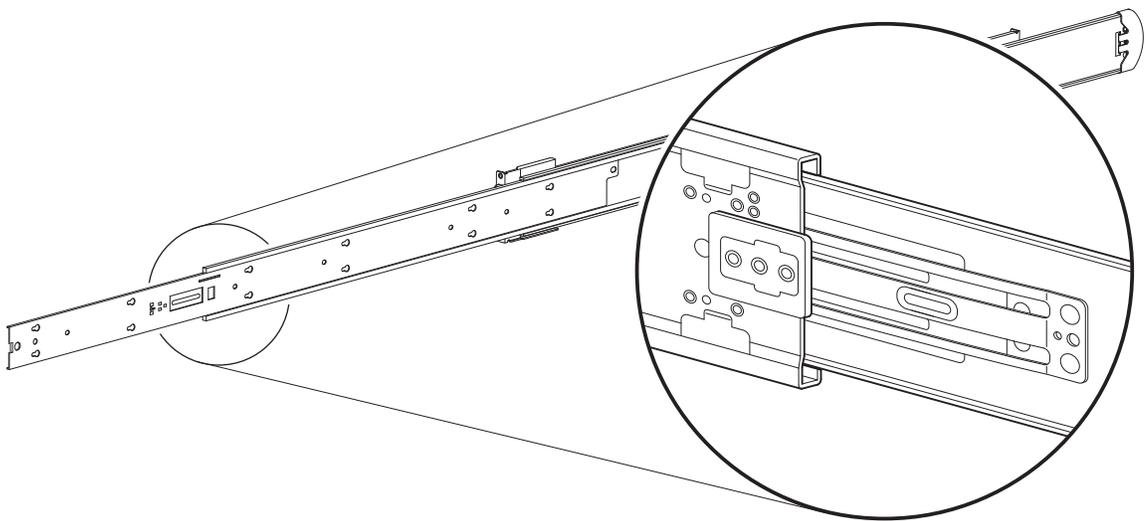


Figure 9 Location of inner rail safety lock

6. Slide out the left inner rail until it separates from the outer and mid rail subassembly, setting it aside.
7. Turn the left outer and mid rail subassembly back over, then locate the mid rail release switch.

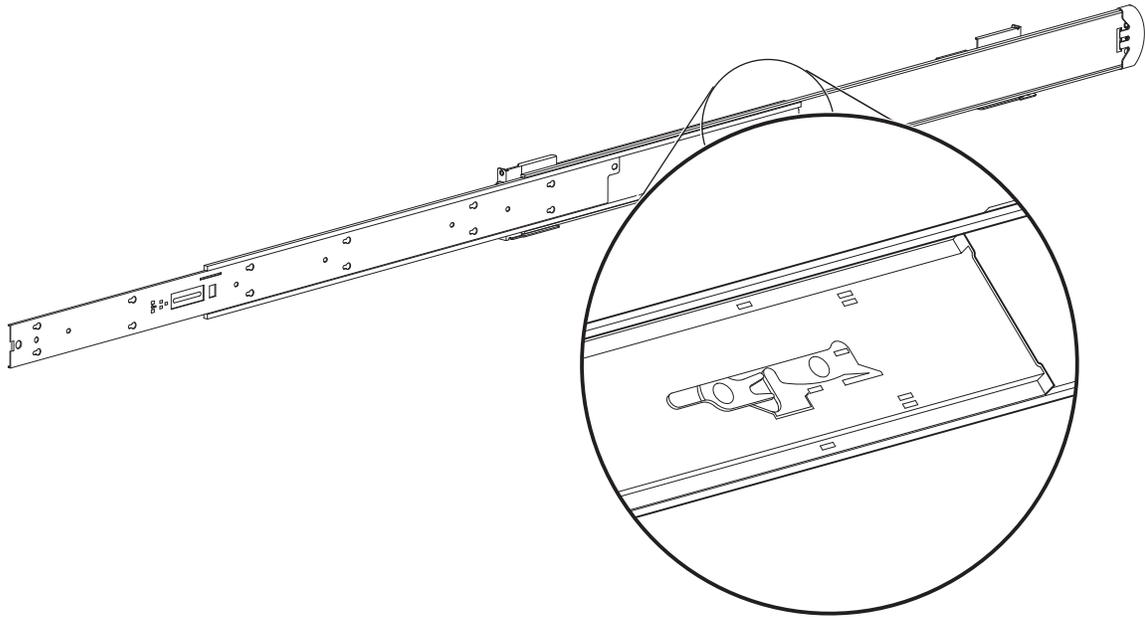
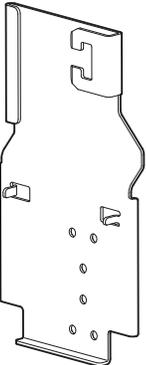


Figure 10 Location of mid rail release switch lever

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 and mid 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.

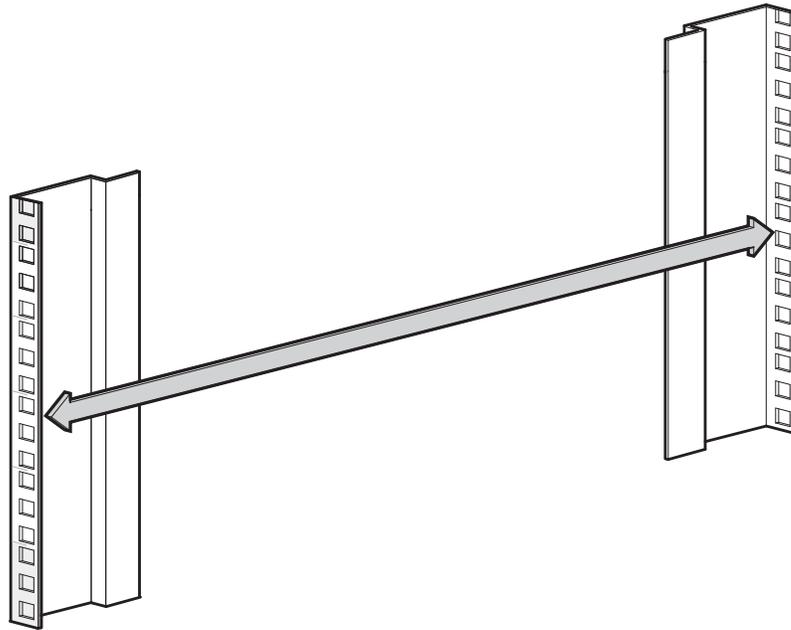


Figure 11 Distance measurement of rack inside post-to-post depth

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.

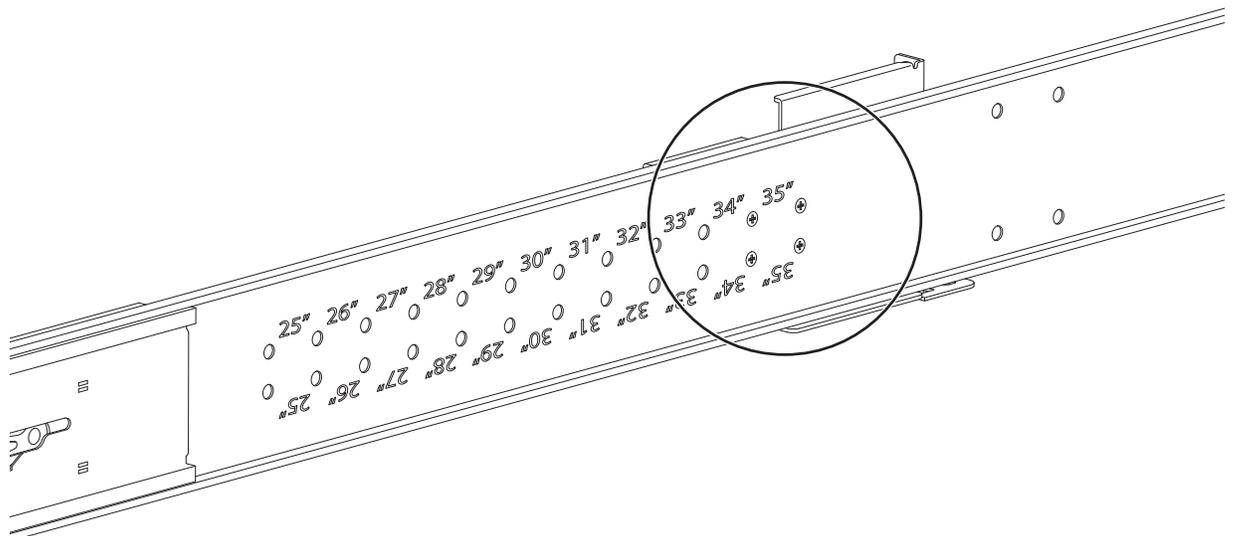


Figure 12 Default location of outer rail adjustment setscrews

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.

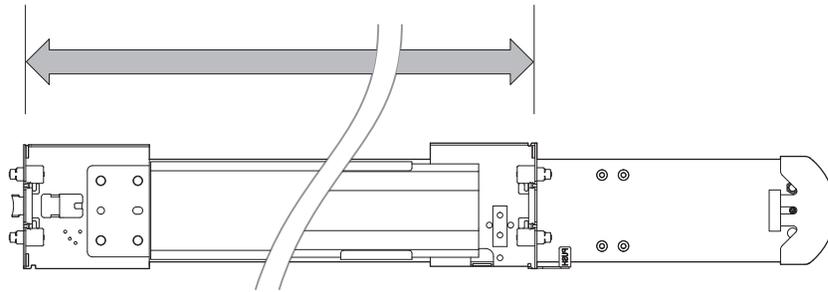


Figure 13 Measurement of rail from rear to front mount bracket

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.

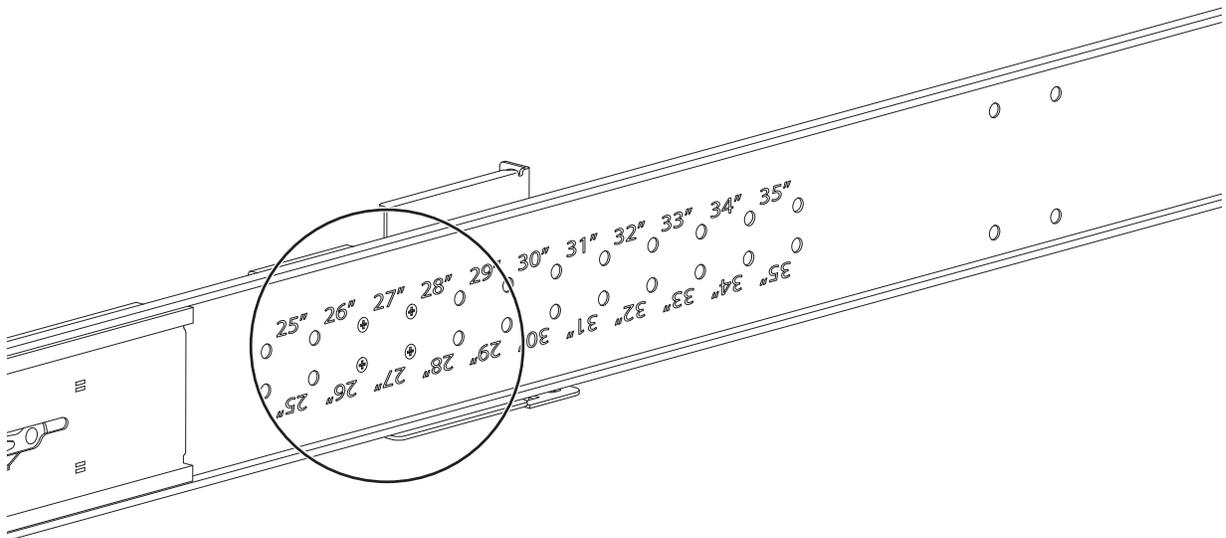


Figure 14 Sample adjusted distance for outer rail setscrews

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.

- 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).

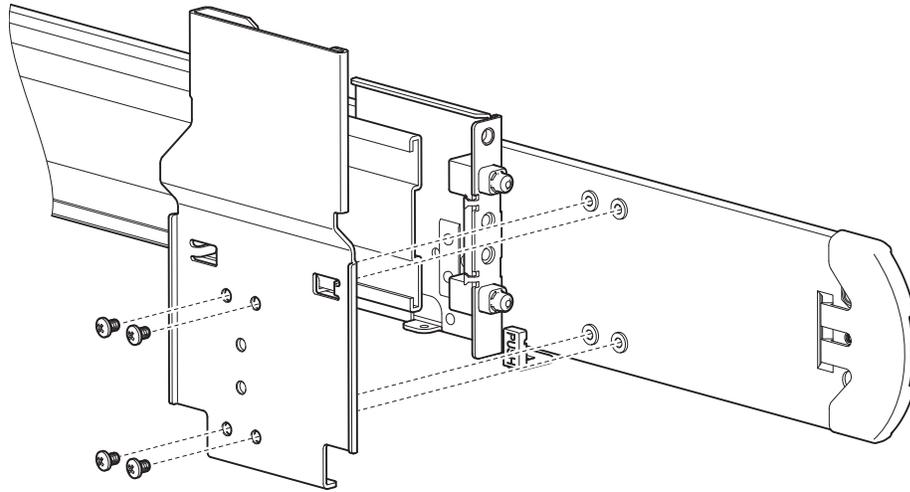


Figure 15 Alignment of CMA B bracket to rear outer rail bracket holes alignment and attachment

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).

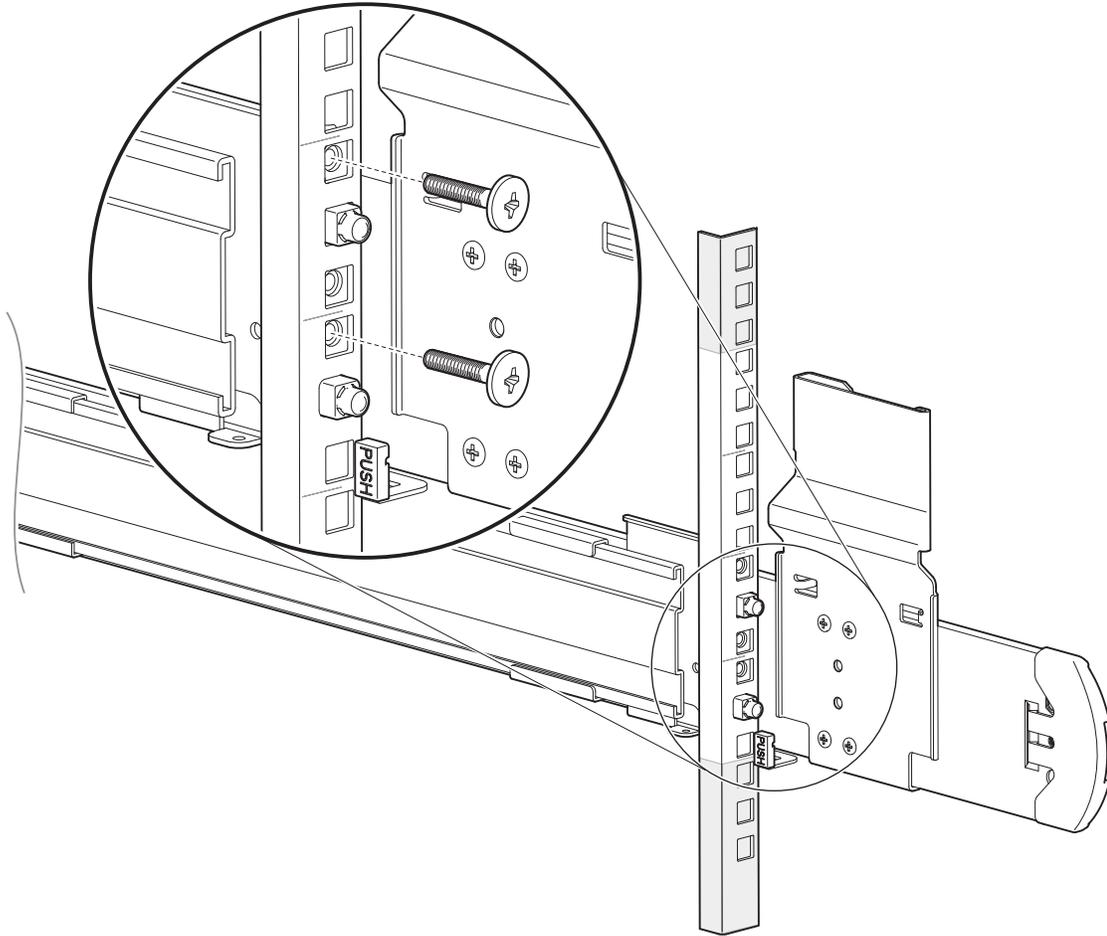


Figure 16 Attach the rear of the outer right rail assembly

- 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.

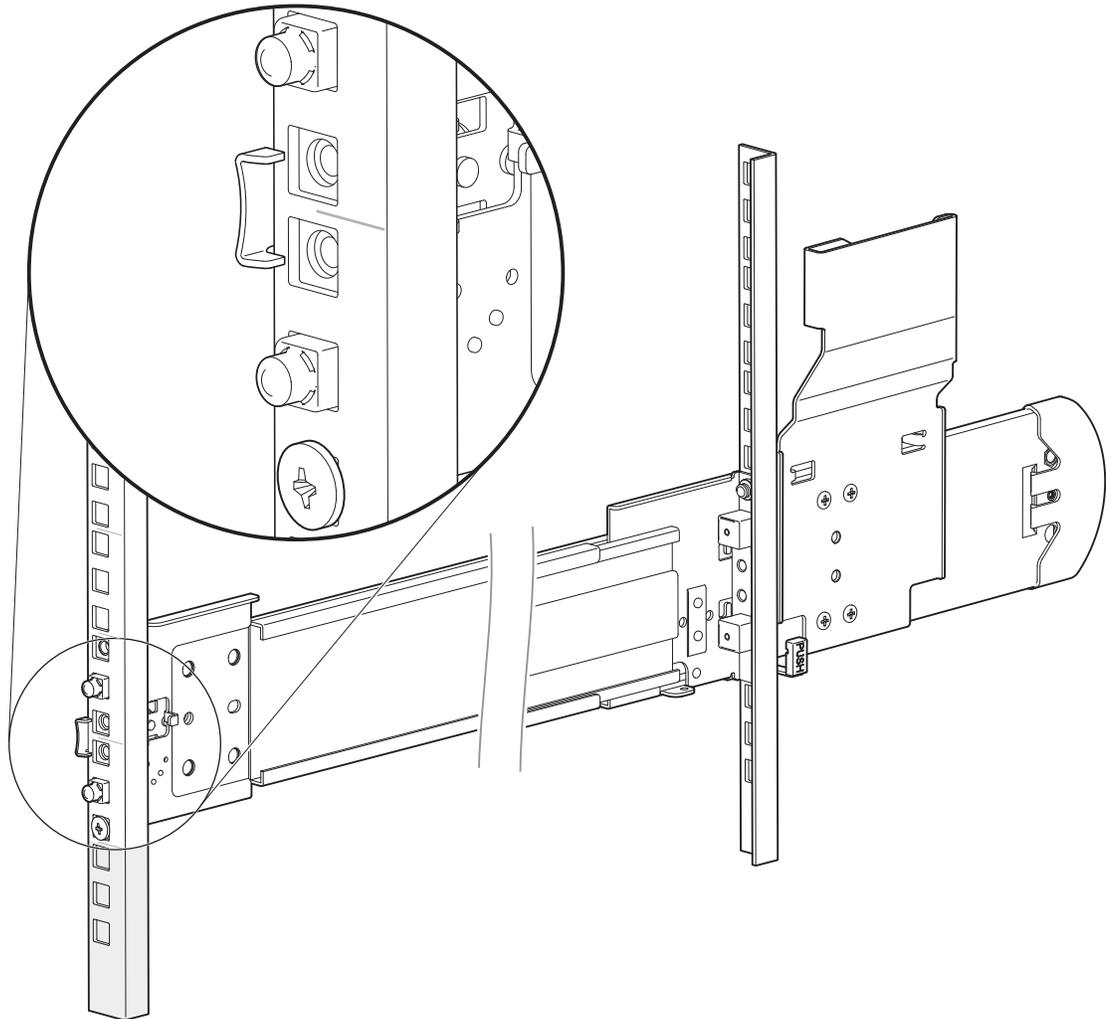


Figure 17 Right front post detail of the inserted outer right rail assembly

- 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. 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.

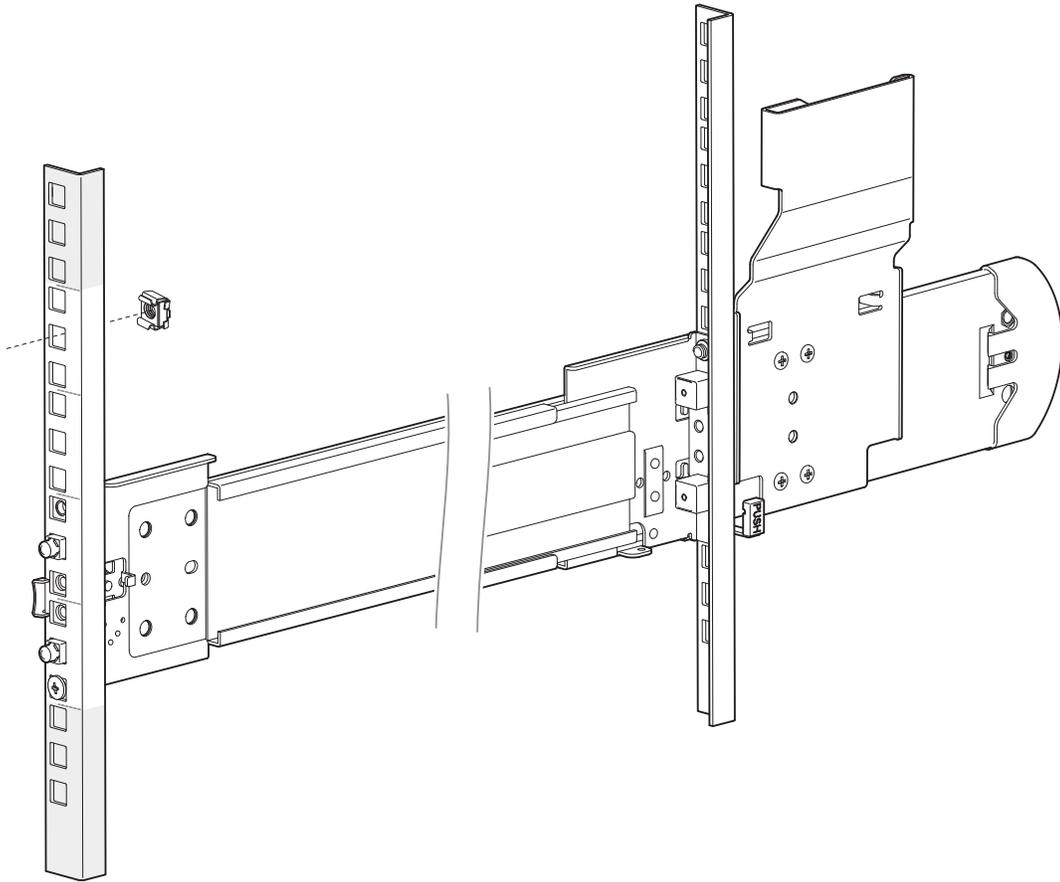


Figure 18 Location for cage nut near top of allocated 4U space

5. Repeat the entire procedure for the left outer rail assembly.

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.

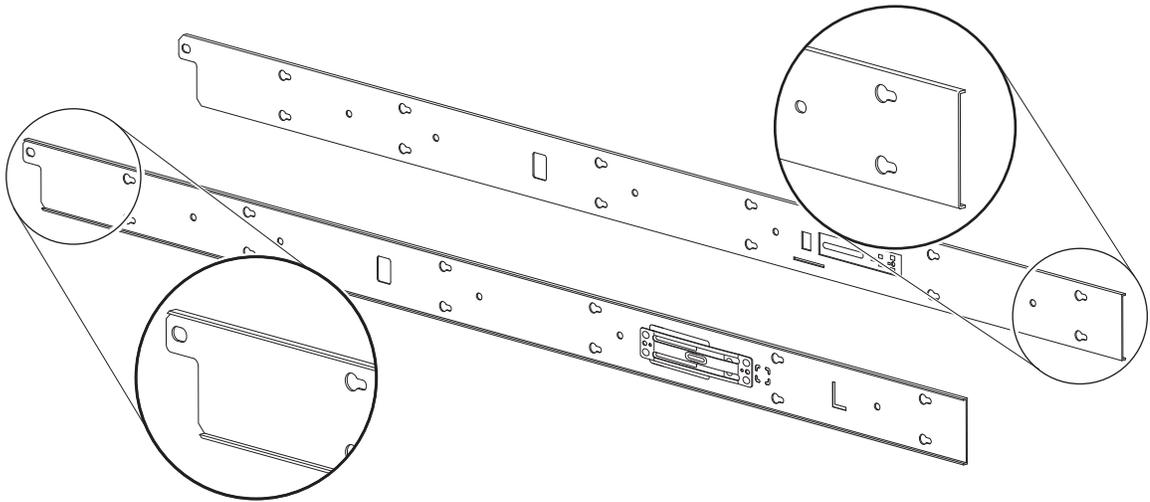


Figure 19 Left and right inner rail edge details

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.

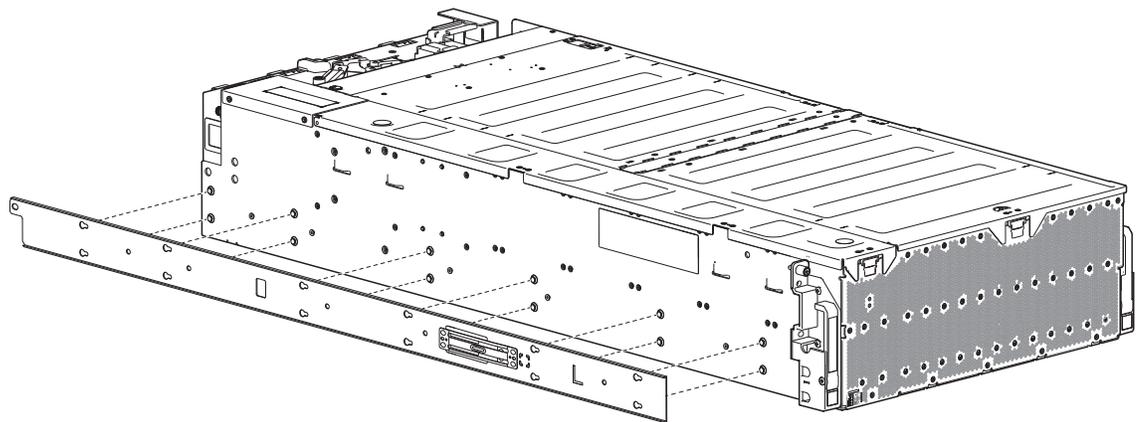


Figure 20 Left inner rail alignment to storage enclosure chassis

4. Slide the inner rail toward the rear until it locks against the T-pins and the screw holes align.

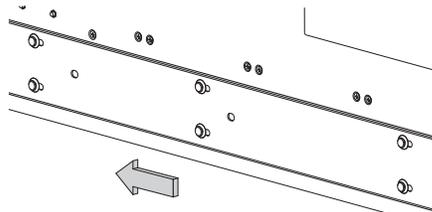


Figure 21 Lock of rail against T-pins, alignment of screw holes to chassis sidewall

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).

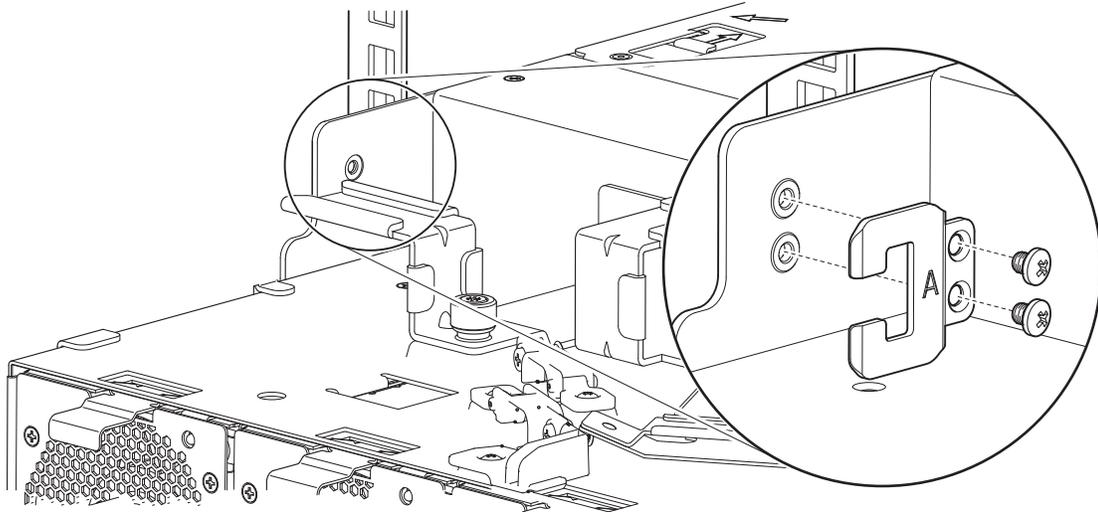


Figure 22 Attachment of the CMA A bracket

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 disk drives.
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.

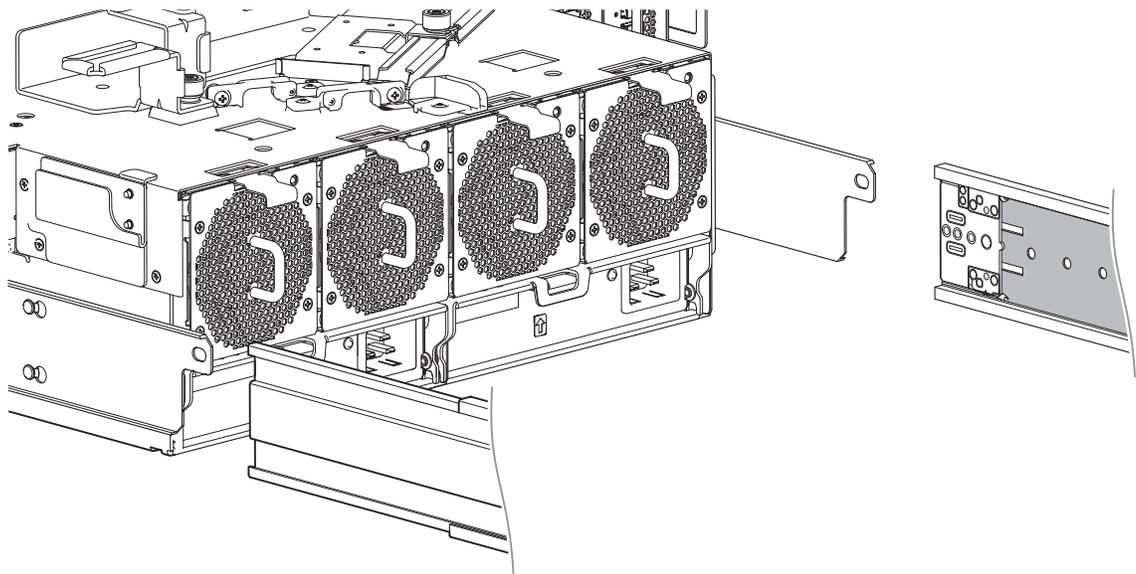


Figure 23 Align inner rails with mid and outer rails, detail

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.

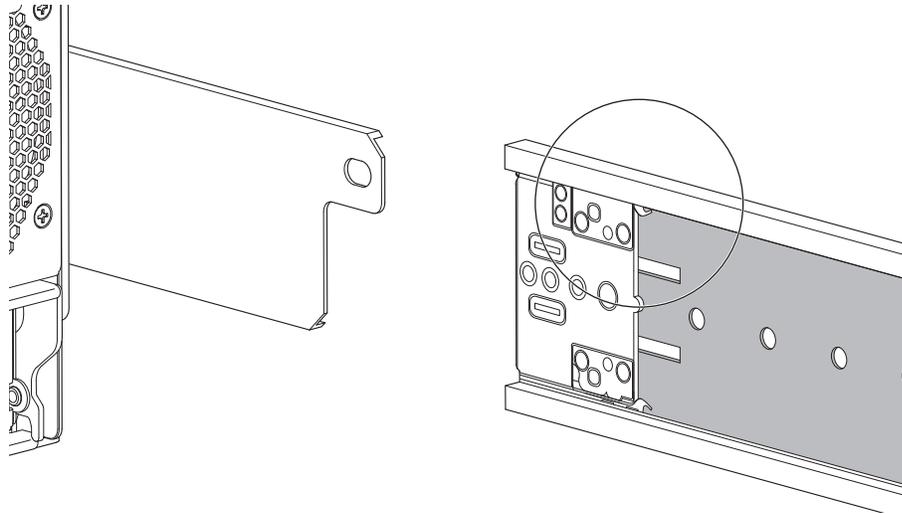


Figure 24 Leaf spring latch engaged, extension of mid rail to fully forward and locked position

- 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.

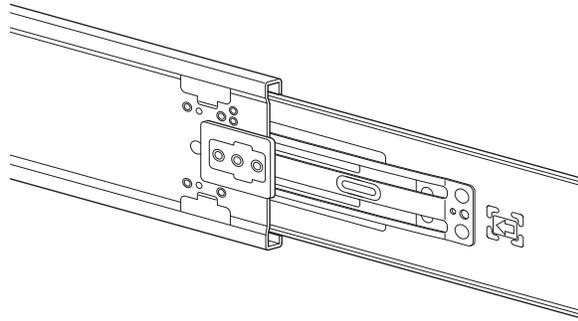
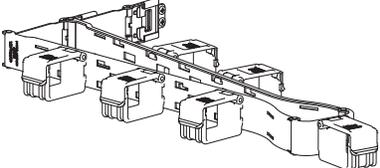
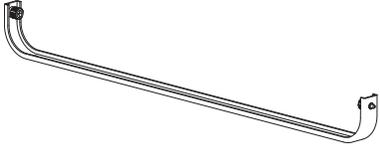
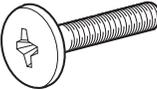


Figure 25 Release both safety lock latches

- 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, 6-in length	1	N/A
(Optional) Panhead screw, M5 0.8x4mm length	2	
(Optional) Truss head screws, 10-32x3/4 in length	2	
(Optional) Cage nut, 10-32 for rack posts with square mounting holes	2:4	

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.

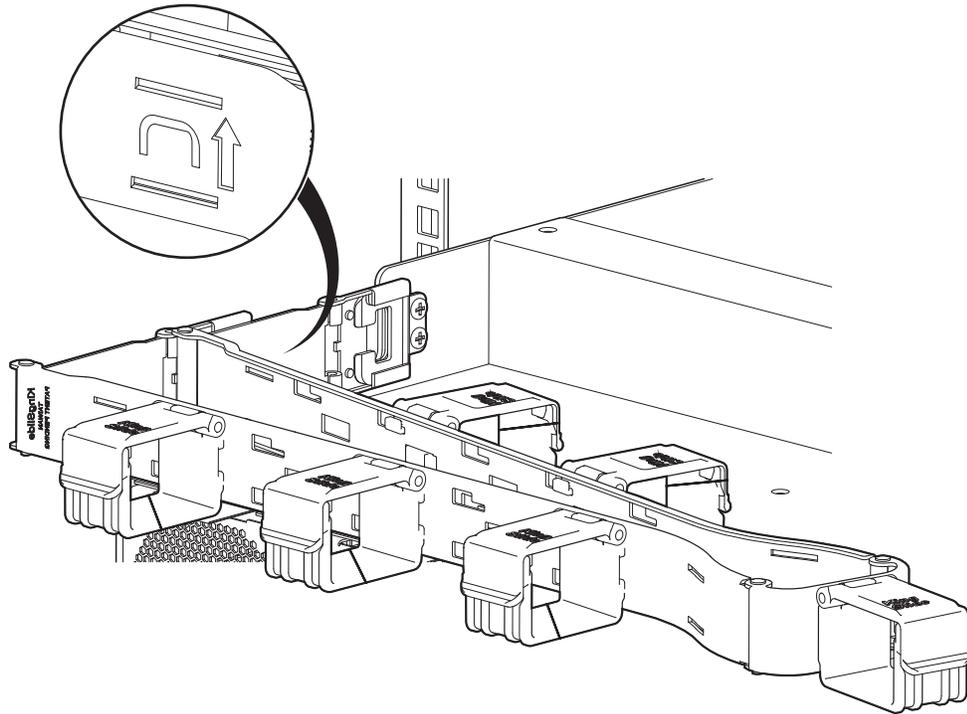


Figure 26 Attachment of the CMA bracket assembly to the CMA A bracket on the chassis

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.

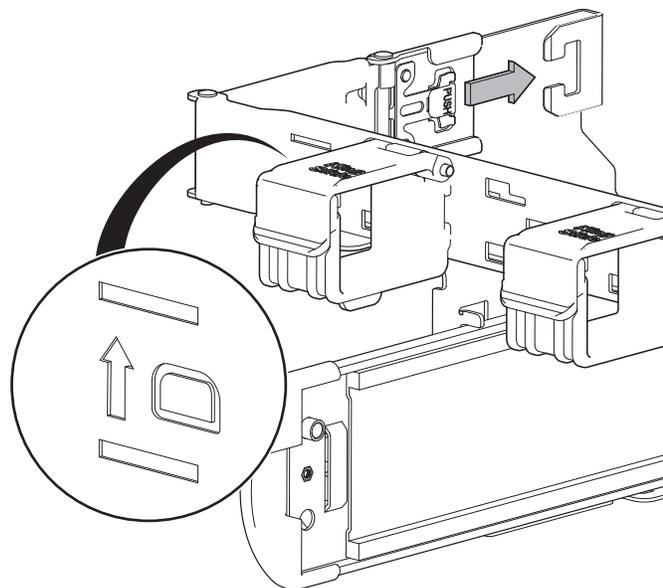


Figure 27 Insertion of CMA bracket assembly into CMA B bracket on the outer rail

5. Complete the following actions to verify the CMA bracket installation:

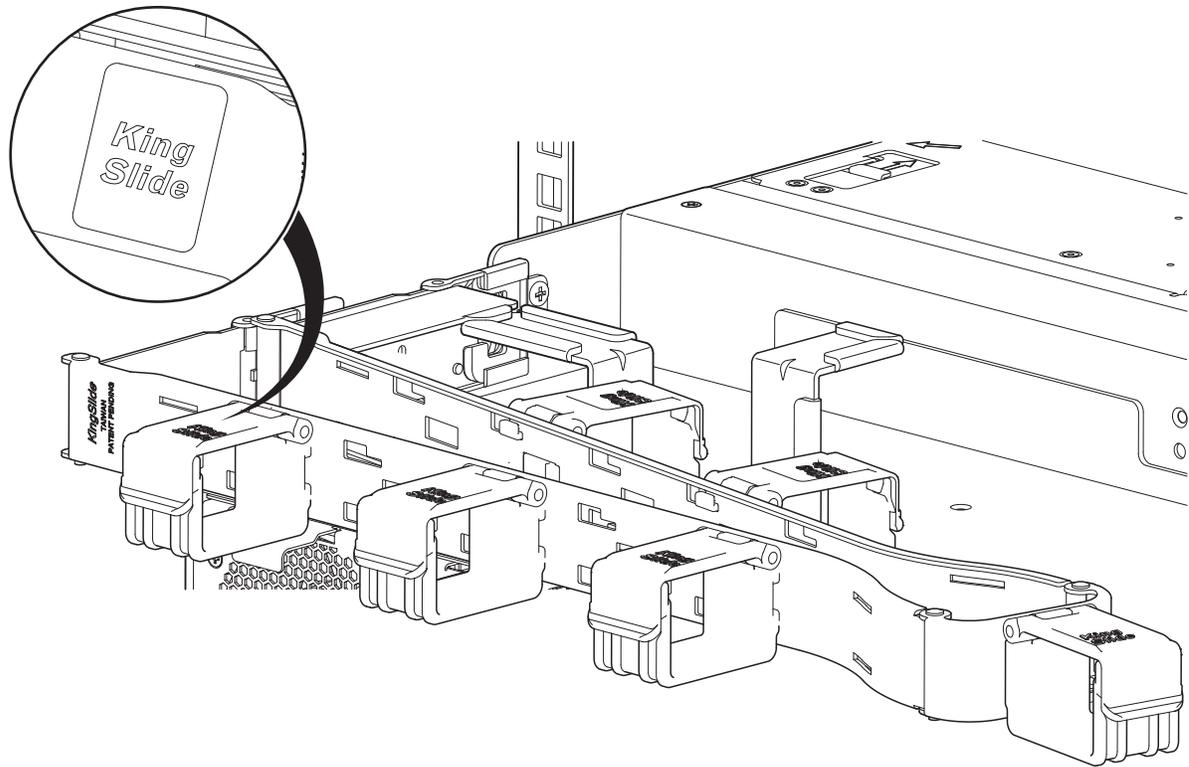


Figure 28 Proper installation of the CMA bracket assembly

- 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.

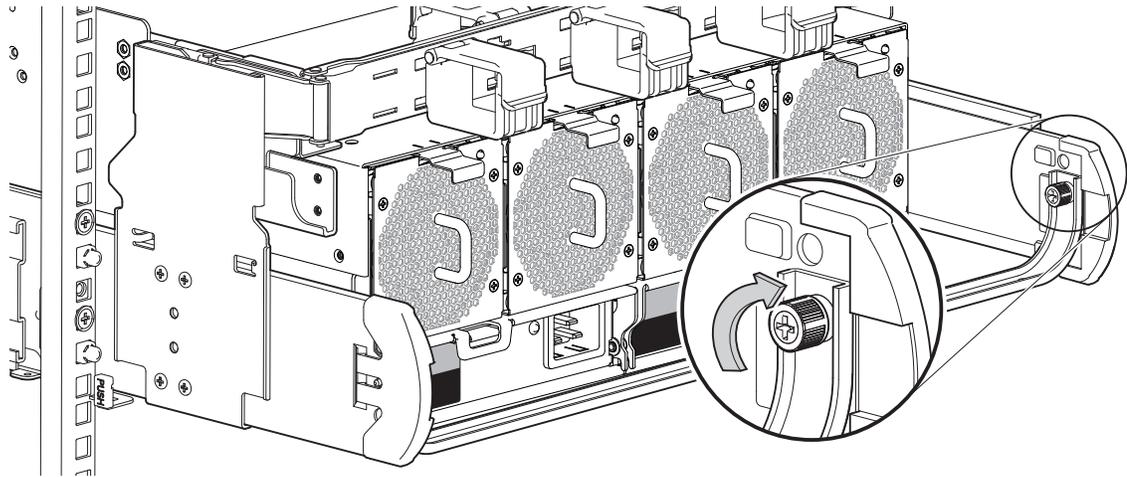


Figure 29 Direction to tighten crossbar thumbscrews

8. (Optional) For non-operating transport of the rack cabinet, complete the following steps:
 - a. Secure the crossbar 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.
 - b. Return to the front of the rack cabinet.
 - c. Add an additional cage nut just below the former cage nut.
 - d. Insert and tighten two (2) Truss-head screws per side in the available screwholes within the 4U space just above the top front mount bracket post to a torque of 12 lbf-in (1.36N-m). The screws secure the storage enclosure against shock and vibration.

NOTE The crossbar screws you must use for non-operating transport prevent the enclosure from extension for service, so only use them for their intended purpose, then remove them.

Install disk drives in the storage enclosure

Seagate provides carriers to protect each disk drive and connect each disk drive 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 disk drives 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 disk drives, 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.

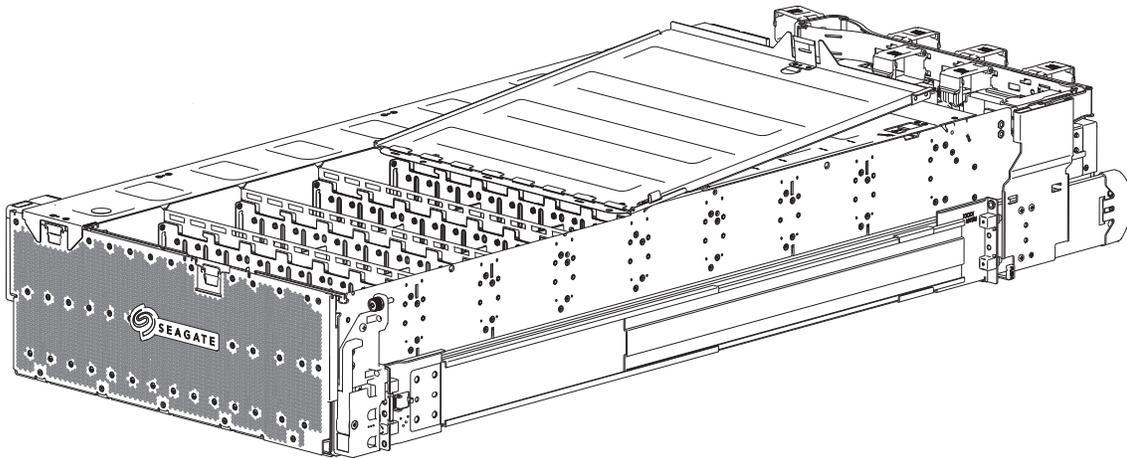


Figure 30 Front half of unpopulated main bay

4. Select the first disk drive 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 disk driver carrier latch to open the carrier, then hold the handle so it is toward the rear of the slot.

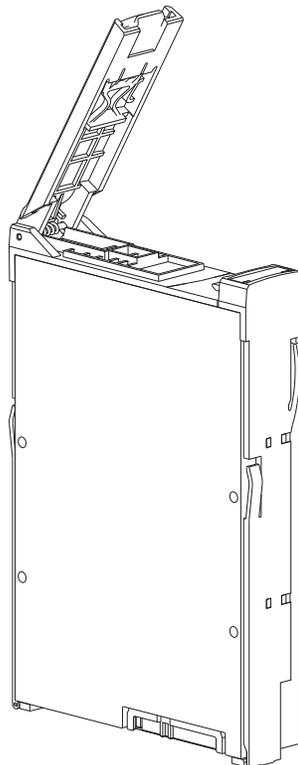


Figure 31 Orient disk drive carrier handle to rear

8. Insert the first disk drive in the leftmost top slot closest to the auxiliary bay.

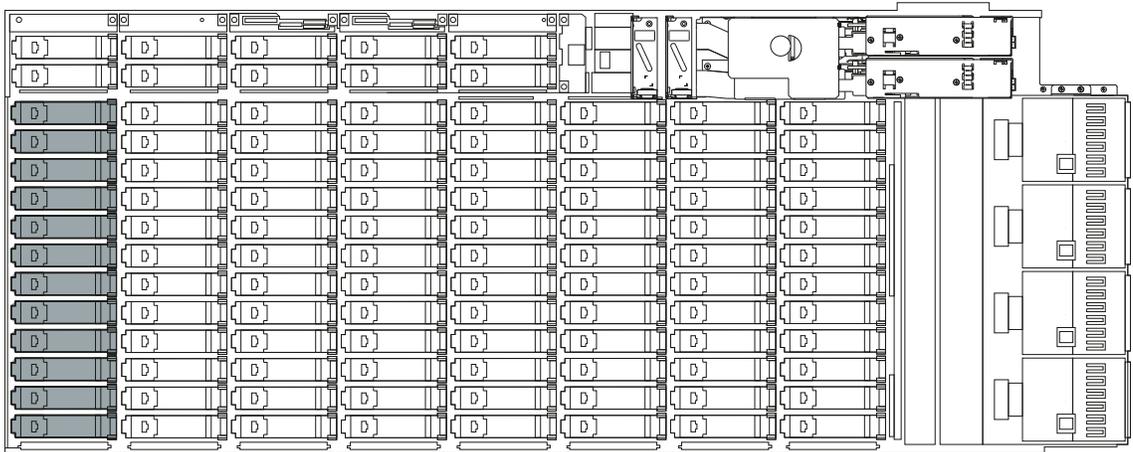


Figure 32 Required installation of first complete row of disk drives

9. Firmly press the disk drive into the mating connector on the baseplane.
10. Close and press down on the disk drive handle until you engage the locking mechanism.
11. Repeat the procedure, inserting each drive 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 drives for each of the next three sets of twelve to complete the insertion of 48 disk 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.

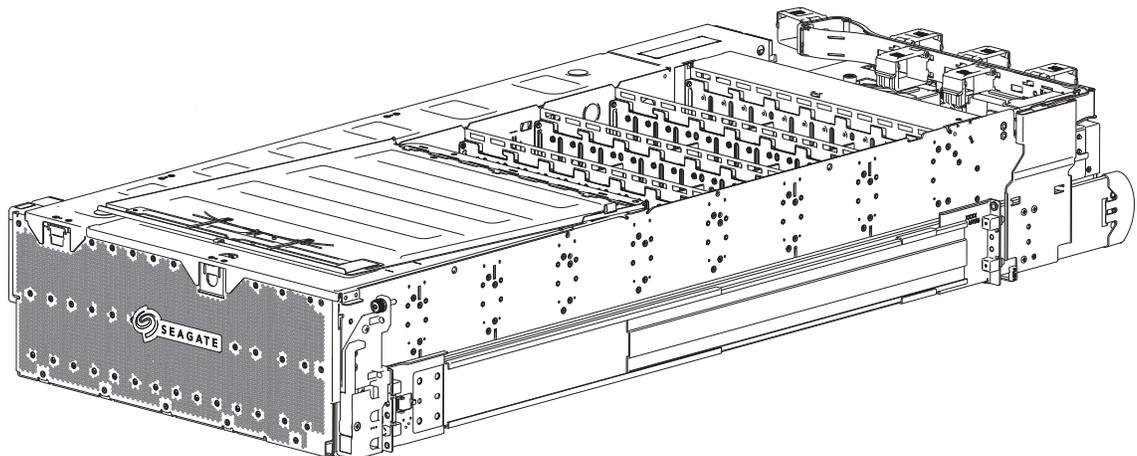


Figure 33 Rear half of unpopulated main bay

- d. Continue insertion of the next 48 disk 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 it aside to access the auxiliary bay.

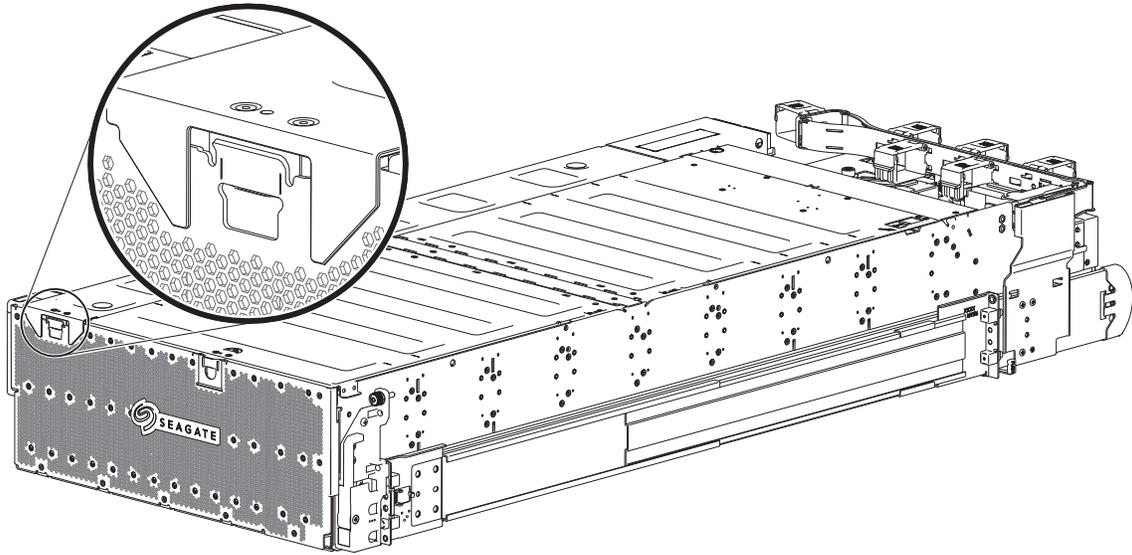


Figure 34 Auxiliary bay latch

- g. Continue insertion of the final 10 disk 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.

4 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 to 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
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. Loosen the captive screw on cable capture clip and then raise the clip on its hinge.

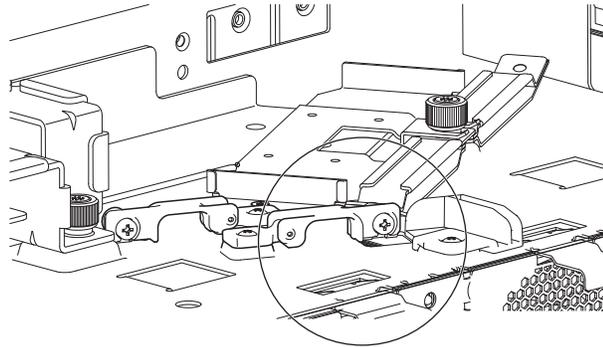


Figure 35 Location of cable capture clip release screw

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.

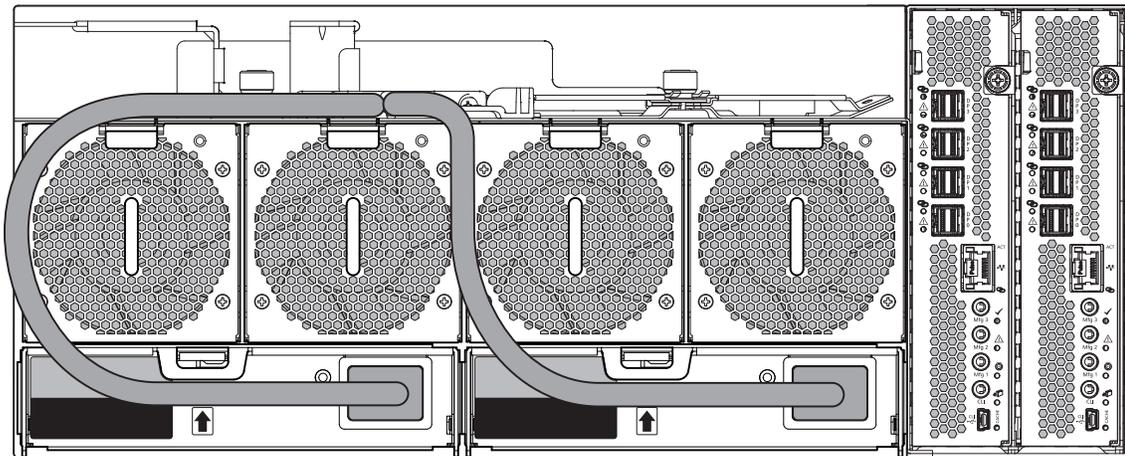


Figure 36 Power cord routing up to cable capture clip

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).

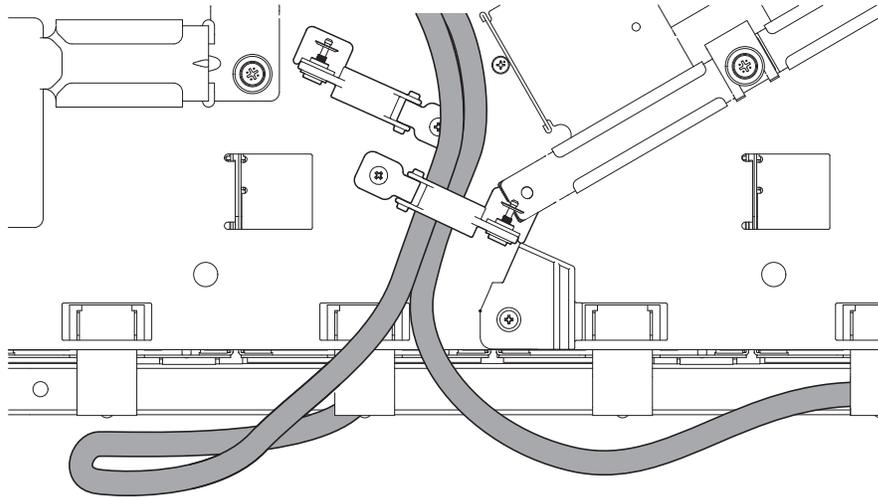


Figure 37 Final power cord routing

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.

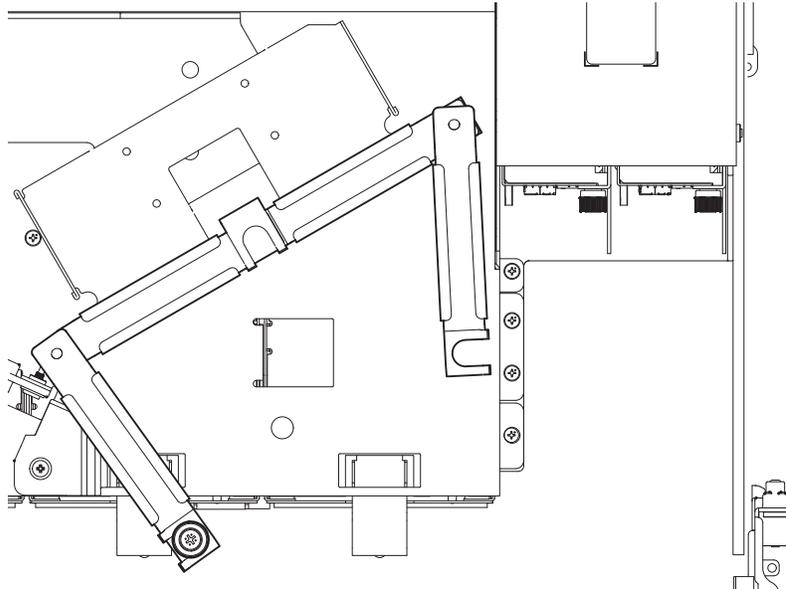


Figure 38 Open cable capture arms on chassis

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.

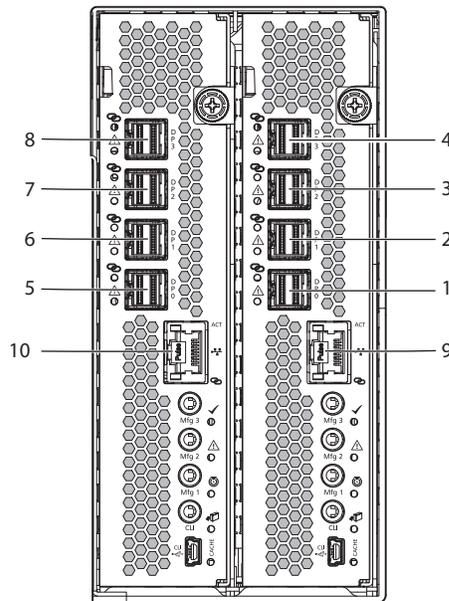


Figure 39 Proper order of data cables

5. 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.

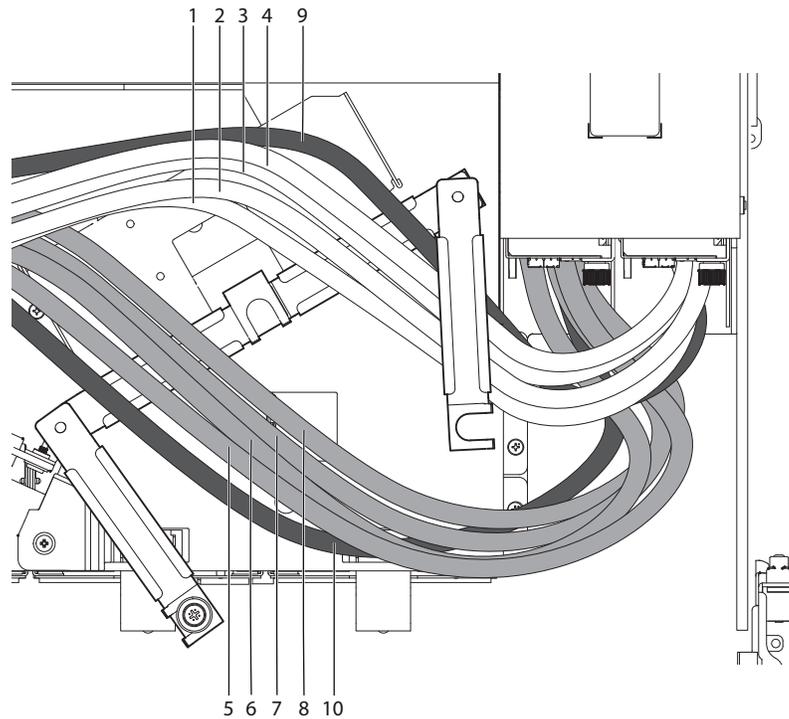


Figure 40 Route for sample data cables on either side of the CMA cable capture arm

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.

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.

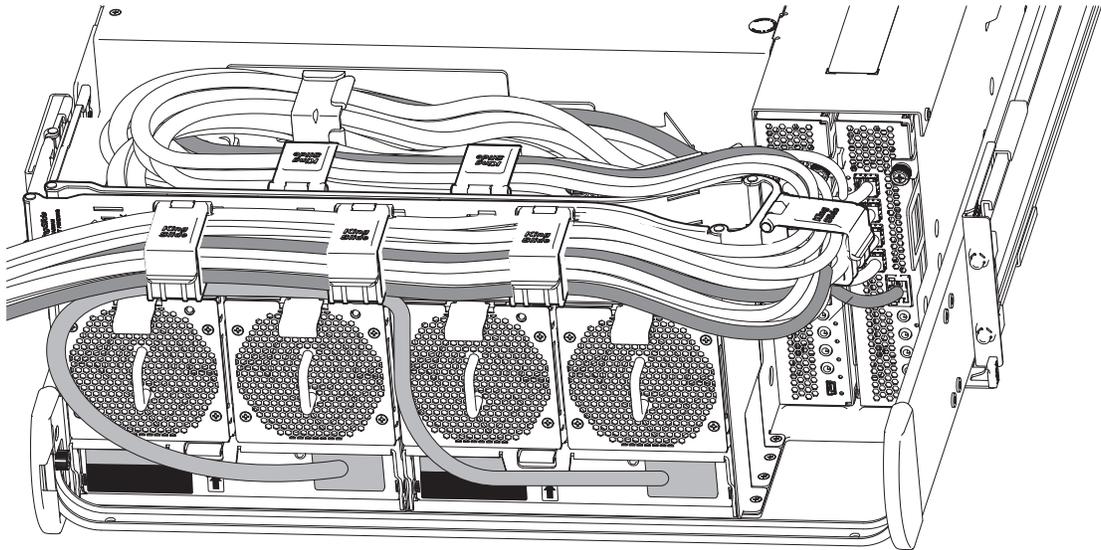


Figure 41 Close all CMA bracket clips

9. Take the following actions to connect the routed data cables to the appropriate server's host bus adapter (HBA) or appropriate management network switch:
 - a. Connect the data cables numbered 1 and 2 to the top two ports in one HBA.
 - b. Connect the data cables numbered 3 and 4 to the lower two ports in a second HBA.
 - c. Connect the data cables numbered 5 and 6 to the available top two ports in the second HBA.
 - d. Connect the data cables numbered 7 and 8 to the available lower two ports the first HBA.

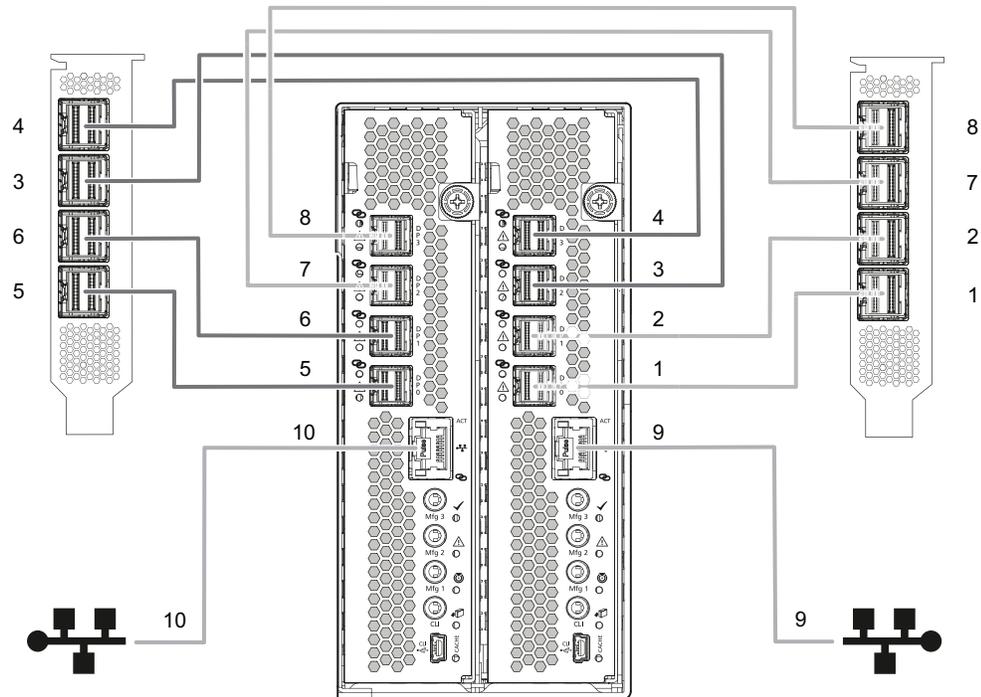


Figure 42 Sample HBA data and management connections

10. Connect the Ethernet cables numbered 9 and 10 to the host system or management network.
11. Facing the front panel, press both safety lock switches to release the rails.
12. 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.
13. Secure the storage enclosure chassis flanges to the rack cabinet, fastening the top captive thumbscrew on each side until tight.

5 Operation

⚠ 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](#), confirming the successful completion of the entire sequence.
- Verify that all disk drives 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 [Environmental Requirements](#) 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.

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.

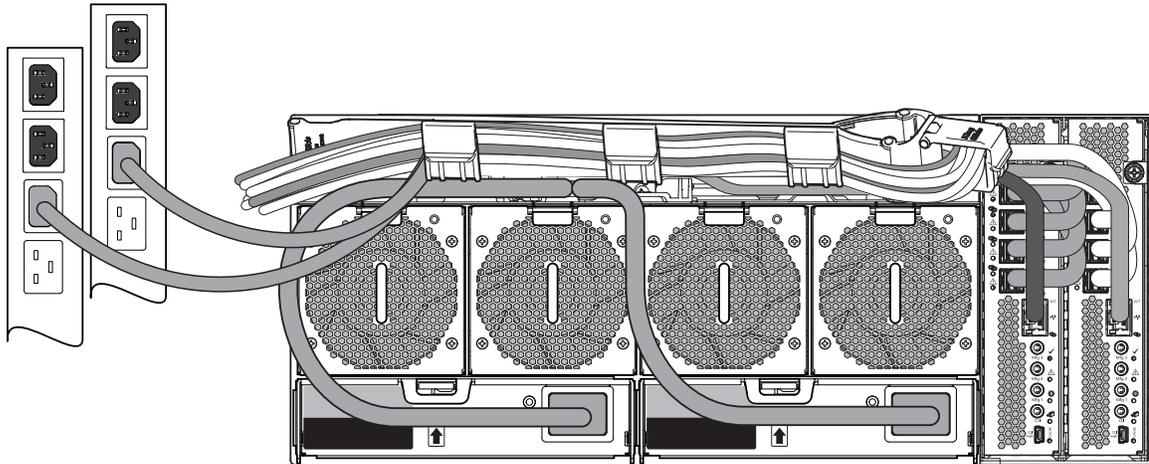


Figure 43 Route power cables to redundant PDUs

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.

5 Interpret system LEDs

Visual cues, such as the LEDs, 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 may have a fast or slow flash rate to cover multiple conditions, the priority for simultaneous indications is as follows:

Table 2 Fault LED prioritization

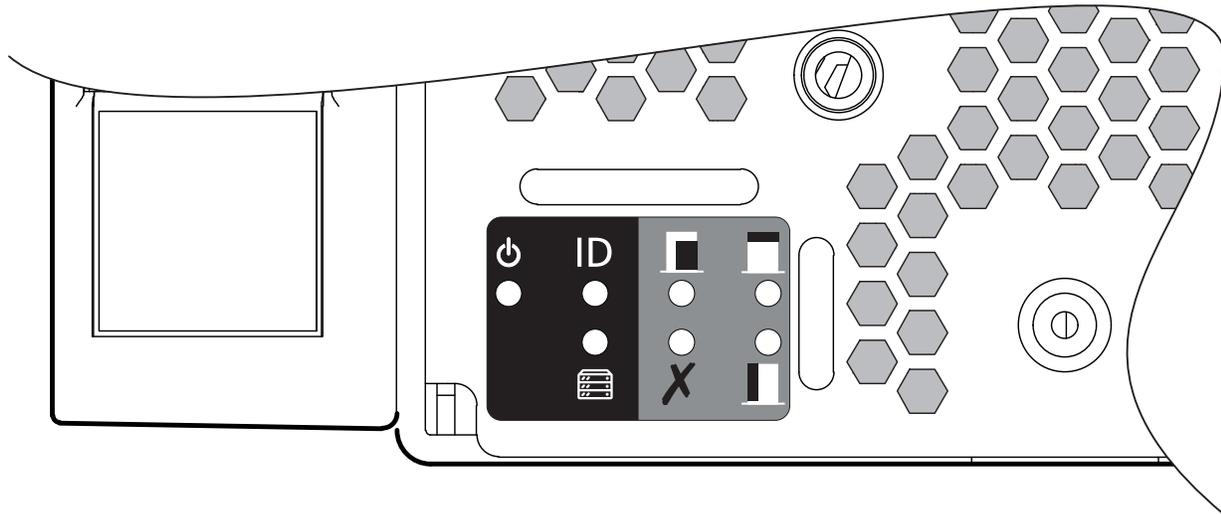
Priority	Flash rate	Indication	Description
Top priority	Fast flash (1s: 1s)	Identify	Locate the enclosure or module
Priority 2	On	Fault	Fault condition detected
Priority 3	Slow flash (3s: 1s)	Logical or non-critical fault	Logical fault or non-critical notification
Lowest priority	Off	No indication	System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

The front panel, 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.



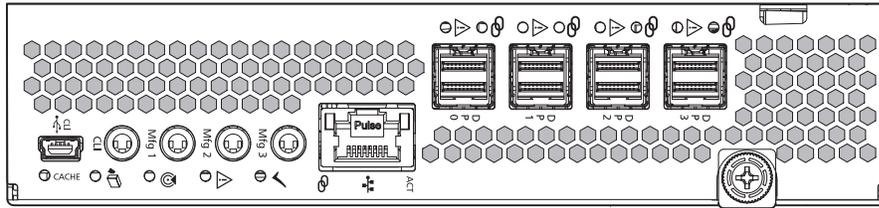
LED	LED number: Name	Color	State	Status
	1: System power	Green	On	System powered on
			Off	System powered off
	2: System ID	Blue	Flashing	System unit identification (UID) active
			Off	Normal state, no query for UID active
	3: Host connectivity	Green	Flashing	Host successfully linked to controller module (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*	System hardware fault in the rear panel area
			Flashing*	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 44 Front panel LEDs

Interpret controller module LEDs

There are two redundant controller modules (CMs) 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.



LED	Type	Color	State	Status
CACHE	Cache	Green	On	CM is functioning properly, no cache activity
			Flashing	Cache contains data and requires flush
			Off	Cache does not contain persistent data that requires flush
	OK to remove	White	On	CM is safe to remove after successful shutdown
			Off	Active, not safe to remove CM
	Controller ID	Blue	On	Controller unit identification (UID) active
			Off	Normal state, no query for UID active
	Hardware fault	Amber	On*	CM hardware fault
			Flashing	Part of sequence as CM comes online
			Off	CM hardware is functioning properly
	Hardware normal	Green	On	CM is functioning properly
			Flashing	Part of sequence as CM comes online
			Off	CM power is off

Figure 45 Controller module LEDs

Additional LEDs on the CM 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
	Ethernet port	Green	On	Connected and active
			Flashing	Connected and registering input or output activity
			Off	No host link detected
	SAS host port	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
		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

6 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 assess and diagnose power, disk drive, 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:

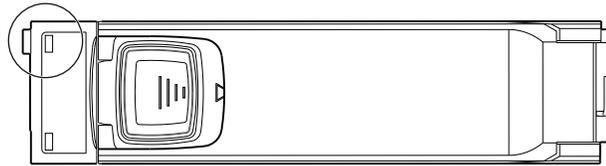
1. Complete the following actions to eliminate power cord issues during installation:
 - a. Request a replacement for damaged or missing power cords.
 - b. Request a replacement for cords with plugs that do not match your outlets or voltage requirements
 - c. Request a replacement for power cords that 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](#).
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 disk drives and they are all latched to the baseplane connectors.
 - b. Verify all installed disk drives display green LEDs, rather than an LED with a fault status. Follow the replacement procedure for disk drives displaying a fault status. Refer to [Disk drive fault LED](#).
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.

Disk drive fault LED

The disk drive uses an amber fault LED to identify various states. Those items in the state column with an asterisk (*) indicate a fault condition.

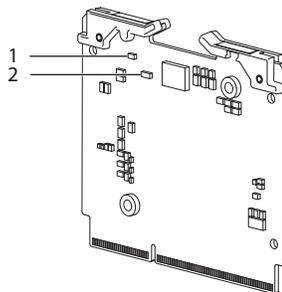


Color	State	Status
None	Off	No AC power is present or the disk drive is functioning normally.
Amber	On*	The disk drive has a hardware fault. Replace as soon as possible.
	Flashing*	<ul style="list-style-type: none"> Fast flash (1 s): The disk drive is identifying itself to the system software. Not a fault. Slow flash (3 s)*: See the system log for identified fault conditions.

Figure 46 Disk 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.

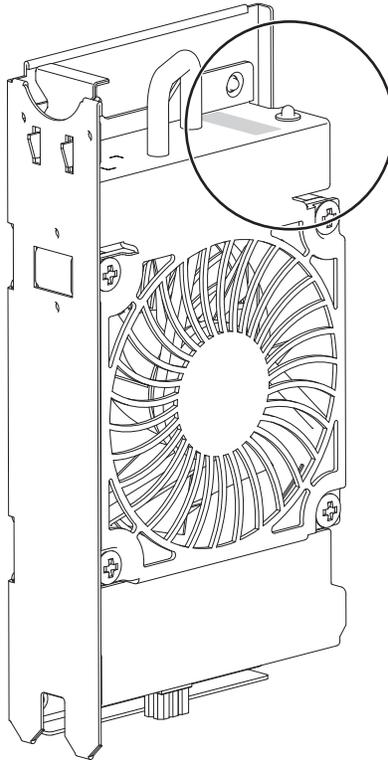


Item	LED number: Name	Color	State	Status
1	3: Activity	Green	Off	No AC power is present.
			Flashing	The firmware is active, the SAS expander module is functioning normally.
2	2: Fault condition	Amber	Off	The firmware has not set a hardware fault condition.
			On*	The firmware has set a hardware fault condition.

Figure 47 SAS expander module LEDs, component side

Controller fan fault LED

The controller fan has a single amber fault LED to identify various states. The asterisk (*) indicates a fault condition.

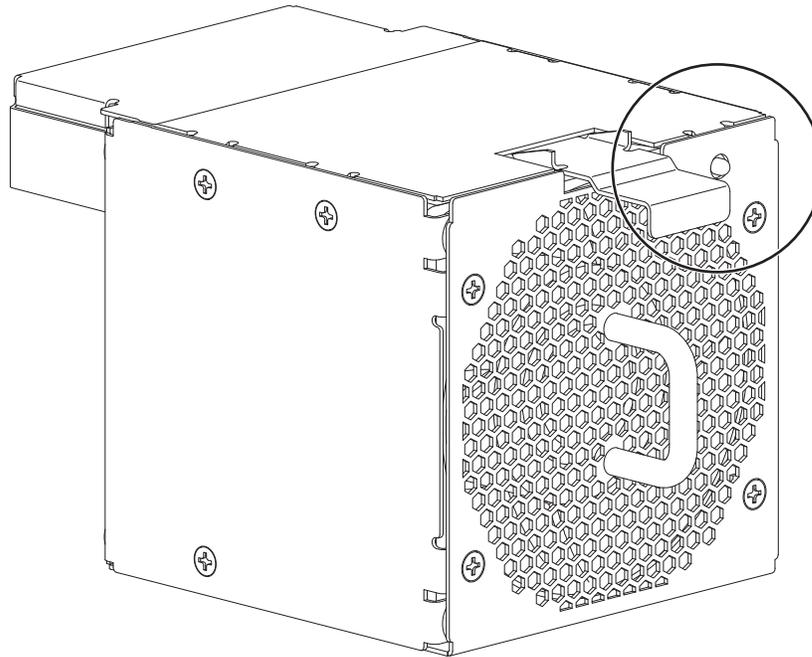


Color	State	Status
None	Off	No AC power is present or the controller fan module is functioning normally.
Amber	On*	The controller fan module has a hardware fault.

Figure 48 Controller fan fault LED, rotated orientation

System fan fault LED

Each system fan module has an amber fault LED. The asterisk (*) indicates a fault condition.

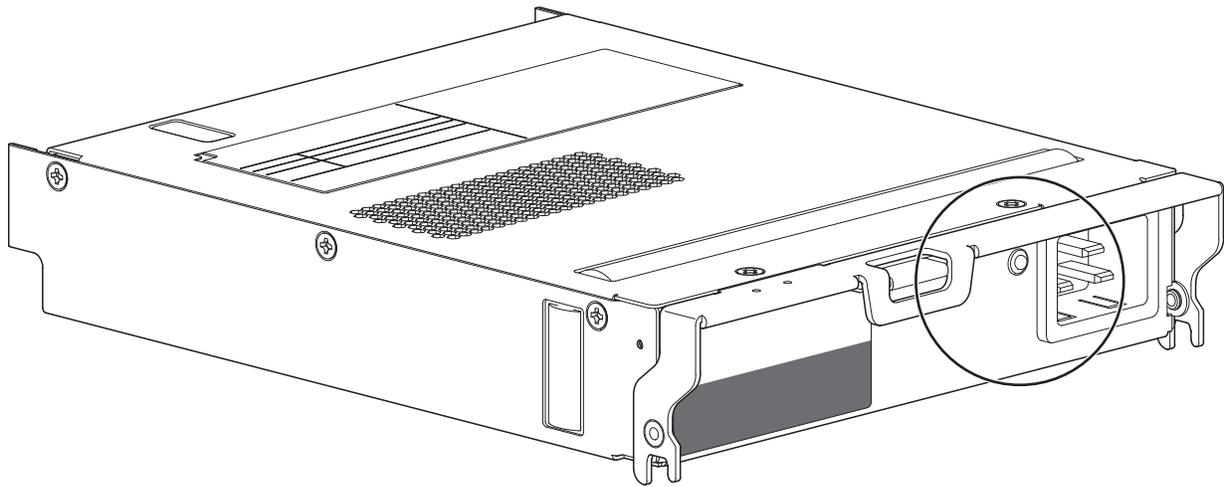


Color	State	Status
None	Off	No AC power is present or the system fan module is functioning normally. Fan activity indicates AC power is present.
Amber	On*	The system fan module has a hardware fault.
	Flashing	AC power is present and the system fan module is undergoing system identification.

Figure 49 System fan module fault LED

Power supply unit (PSU) status LED

Each PSU has a bitonal green or amber status LED. The asterisk (*) indicates a fault condition.

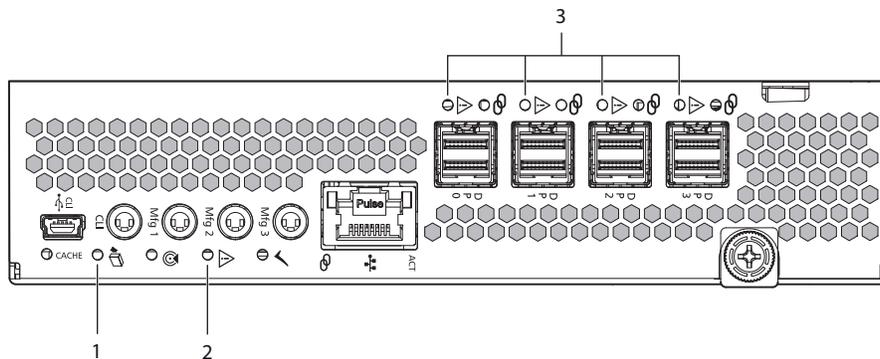


Color	State	Status
None	Off	No AC power is present.
Green	On	AC power is present and the PSU is functioning normally.
Amber	On*	The PSU has a hardware fault: over temperature, over voltage, or over current.
	Flashing	A PSU firmware download is in progress.

Figure 50 PSU Fault LED

Controller module fault LEDs

The controller module (CM) has a number of ports, each with independent status LEDs. The asterisk (*) indicates a fault condition.



Item	LED	Color	State	Status
1	OK to remove	White	On	CM is safe to remove after successful shutdown
			Off	Active, not safe to remove CM
2	Hardware fault	Amber	On*	CM hardware fault
			Off	CM hardware is functioning properly
3	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

Figure 51 Controller 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 CM.
- The *OK to remove* LED on the CM is off.
- The *Hardware fault* LED for one of the four 12Gb SAS ports on the CM 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 CM. 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, starting with most severe and moving 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 4 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.
Disk drive module LEDs, no fault conditions		

Table 4 Non-fault conditions (continued)

Symptom	Cause	Recommended Action
Amber flashing LED: 1 second on, 1 second off	Disk drive module reconstruction	No action required. CAUTION Do not remove a disk drive module during reconstruction, since that would terminate the current operation and result in data loss.
<ul style="list-style-type: none"> Amber flashing LED: 3 seconds on, 1 off Green LED flickers 	Disk drive module identification	No action required.
PSU LEDs, no fault conditions		
Green LED on	AC power is present, PSU functioning normally	No action required.
Controller module LEDs, no fault conditions		
LEDs other than Hardware fault LED	System likely functioning properly	Often, no action required. Refer to Interpret controller module LEDs or Isolate system application faults .

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:

- Complete the following actions to gather fault information:
 - Examine host application or operating system logs for fault identification.
 - Examine system logs from both controller modules for errors, such as log and status output for fault identification.
 - Use system alerts to help narrow the fault to an area of the storage enclosure.
 - 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.
 - 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.
 - If you cannot find a fault in any of the listed areas, the fault most likely lies outside the storage enclosure.
- 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.
- 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: disk drive and array faults or controller module cache faults.

In the case of a faulty CM 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 or array is at fault, determine the cause and take the related recommended action.

Table 5 Status of disk drive or array, based on front panel *Fault-Application* LED

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

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

Table 6 Status of CM, based on the green *Cache* LED and reboot

CACHE LED state	CM 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 CM.
Fast flash every 0.1 seconds			
Slow flash every second			

3. Determine the cause of a SAS port host-side or CM-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 CM 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 CM.
 - 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 7 Corrective action for fault conditions

Symptom	Cause	Recommended action
Front panel fault LEDs for system application faults		
<p><i>Fault-Application</i> LED is on</p> 	A fault condition related to the system application logic	<ol style="list-style-type: none"> 1. Scan the enclosure event log for specific information for the fault. 2. For system application faults, refer to Isolate system application faults. 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		
<p><i>Fault-Main bay</i> LED is on</p>  <p>and a disk drive or SAS expander module fault LED is on</p>	A fault condition related to the hardware in the main bay	<ol style="list-style-type: none"> 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 disk drive modules for these conditions: <ul style="list-style-type: none"> • Both disk drive module LEDs are off. • A disk drive module fault amber LED is on, not flashing. 3. Select one of the following actions: <ul style="list-style-type: none"> • If both LEDs are off, verify that the disk 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 disk 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 disk drive module or cable and connector as soon as you have a replacement.
<p><i>Fault-Auxiliary bay</i> LED is on</p>  <p>and a disk drive or controller fan module fault LED is on</p>	A fault condition related to the hardware in the auxiliary bay	<ol style="list-style-type: none"> 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) disk drives. 3. Select one of the following actions: <ul style="list-style-type: none"> • If both LEDs are off, verify that the disk 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 disk 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 disk drive module as soon as you have a replacement.
Front panel fault LEDs for rear panel area		
<p><i>Fault-Rear panel</i> LED is on</p> 	A fault condition related to the hardware in the rear panel area	<ol style="list-style-type: none"> 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 7 Corrective action for fault conditions (continued)

Symptom	Cause	Recommended action
<p><i>Fault-Rear panel LED is on</i></p>  <p>and a system fan fault LED is on</p>	A fault condition related to the system fan	<ol style="list-style-type: none"> Select one of the following actions: <ul style="list-style-type: none"> 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 reseal the system fan. If the system fan is still failing, replace it within the specified two (2) minutes.
<p><i>Fault-Rear panel LED is on</i></p>  <p>and a PSU fault LED is on</p>	A fault condition related to the PSU, such as a power fault condition	<ol style="list-style-type: none"> Verify AC mains connections to the PSU are live. Confirm the redundant PSU is properly functioning. Select one of the following actions: <ul style="list-style-type: none"> 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 reseal the power cord. If the PSU is still failing, remove it, wait one (1) minute, then reseal it. If the PSU is still failing, replace it within the specified six (6) minutes. If the power fault condition persists, contact Seagate for support.
<p><i>Fault-Rear panel LED is on</i></p>  <p>and an amber CM fault LED is on</p>	A fault condition related to the CM	<ol style="list-style-type: none"> Restart the CM with a CLI or WBI command. Confirm the redundant CM is properly functioning. Select one of the following actions: <ul style="list-style-type: none"> 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. 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. If the CM is still failing, remove the power cord, wait one (1) minute, then reseal the CM. If the CM is still failing, replace it within the specified eight (8) minutes with a new one. 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		
<p><i>Fault-Rear panel LED is on</i></p>  <p>and all system fan LEDs are on</p>	Internal temperature exceeds the present threshold for the storage enclosure	<ol style="list-style-type: none"> 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. Confirm you fully closed both main bay and auxiliary bay covers so latches fully engage. 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. Follow instructions related to increases in fan speed, identified below. Shut down the storage enclosure and investigate before continuing.

Table 7 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 drives, 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.	<ol style="list-style-type: none"> 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 contaminants, such as dust. Recommendation: Improve removal of contaminants 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. Recommendation: Reduce the ambient temperature in the room.

7 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 disk drives 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 8 Time limits for FRU replacement

Defective FRU	Replacement time limit
Main bay	
Disk drive, LFF or SFF	Eight (8) minutes, including main bay cover replacement
SAS expander module	Eight (8) minutes, including main bay cover replacement
Auxiliary bay	
Disk drive, 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 (\pm 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 disk drive

Each of the 96 drives in the main bay and each of the ten drives in the auxiliary bay stores and provides access to system data. Each drive slot can hold a single low-profile 3.5-in or 2.5-in form factor drive 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 disk drive 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 disk drive:

1. If you plan on removing all disk drives, properly shut down the storage enclosure.
2. Retrieve the new disk drive 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 disk 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 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 disk drive:
 - a. **For disk drives in the main bay:** After locating the main bay cover's front or rear latch, depending on the location of the disk drive 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 disk drives 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 disk drive you need to replace. The fault LED for each disk drive is a steady or blinking amber for a fault condition. Otherwise, it is off.

CAUTION You must replace the faulty disk drive with a disk drive 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 disk drive 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 disk drive from the baseplane.

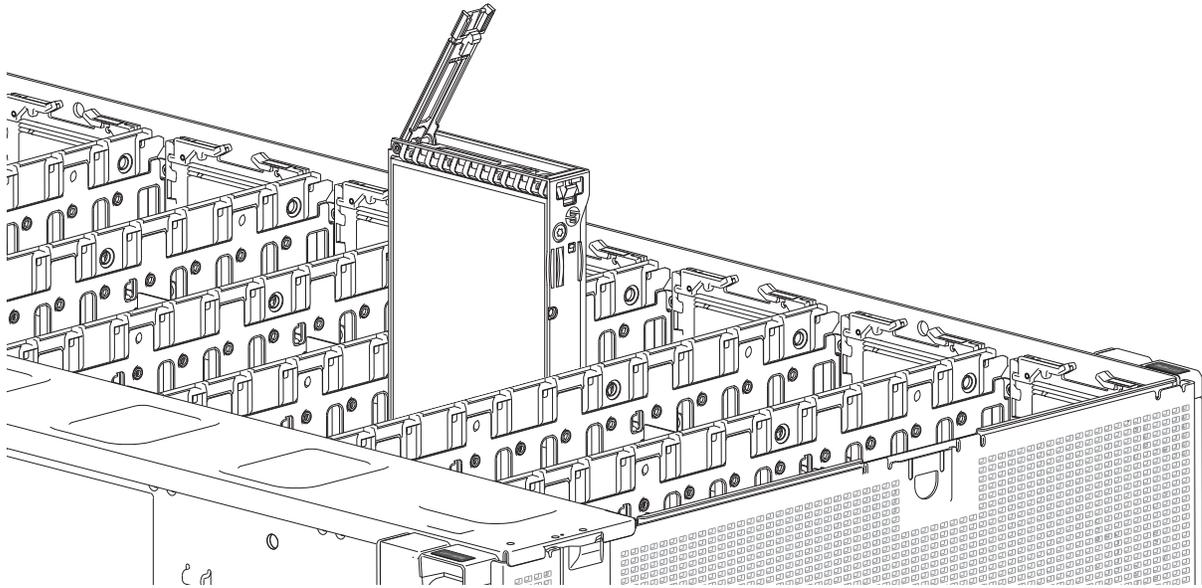


Figure 52 Removal of disk drive from the main bay (other disk drives removed for clarity)

9. Lift the disk drive carefully away from its slot and set it aside.
10. While maintaining proper static protection, remove the new disk drive 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 disk drive until you feel it connect to its baseplane.
12. Close and press down on the disk drive handle and engage the locking mechanism.
13. If you are replacing all disk drives, repeat the entire process for each of them.
14. Verify the disk drive 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 disk drive:
 - a. **For disk drives in the main bay:** Close the half of the main bay cover you opened, latching it firmly in place.
 - b. **For disk drives 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 disk drives. 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 disk 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 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.

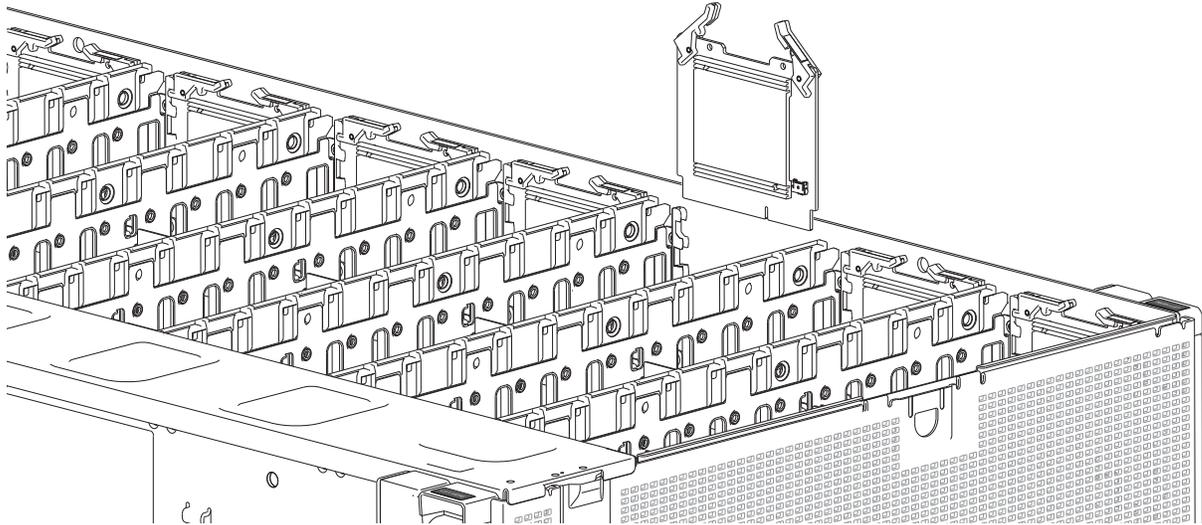


Figure 53 Removal of a SAS expander module

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 disk 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.

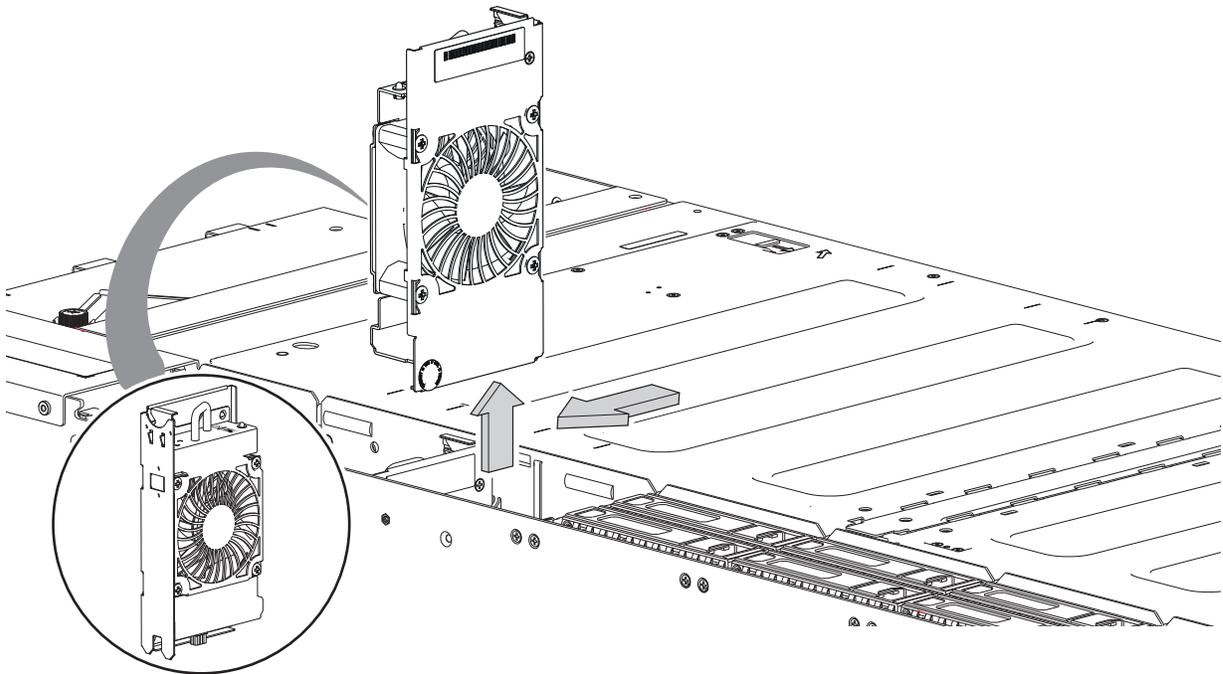


Figure 54 Removal of a controller fan

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.

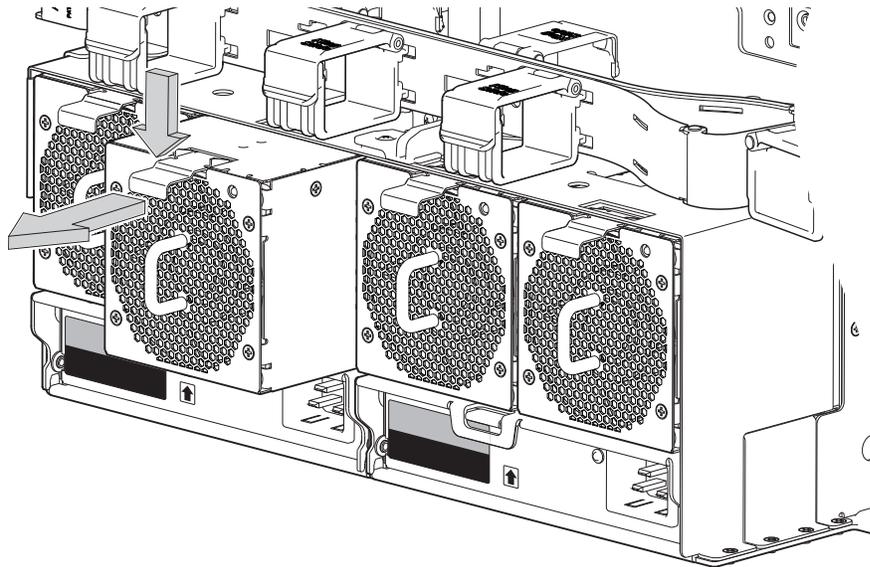


Figure 55 Removal of a system fan

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.

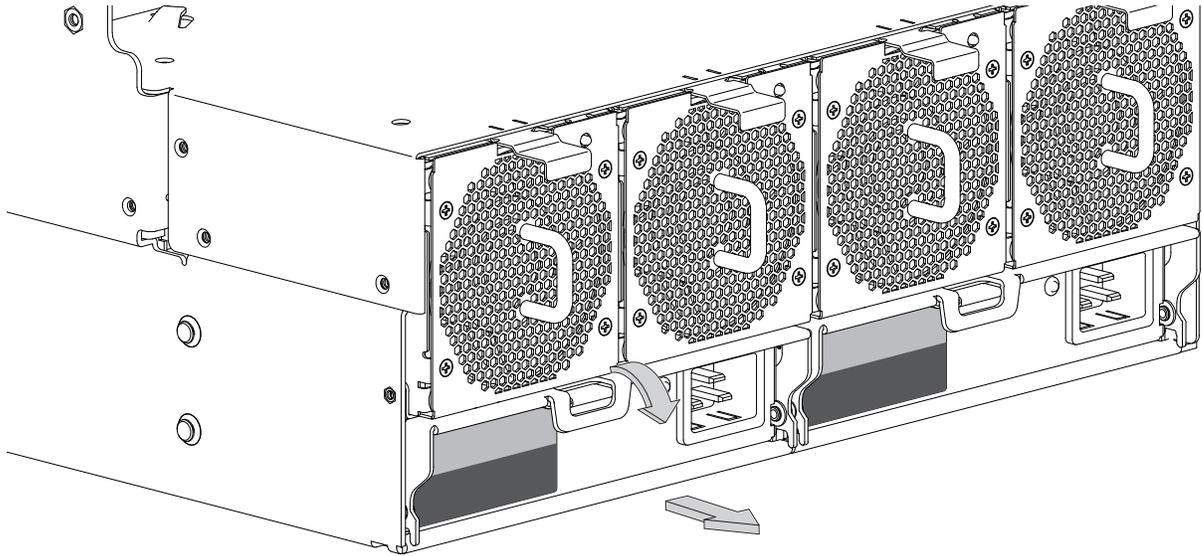


Figure 56 Removal of the PSU without power

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.

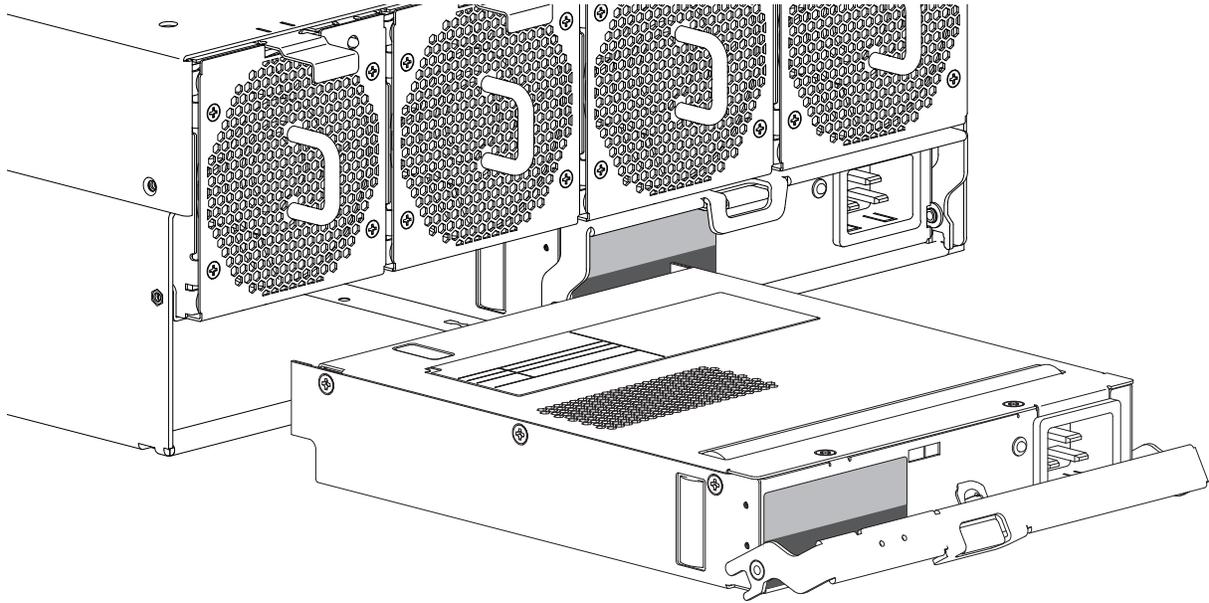


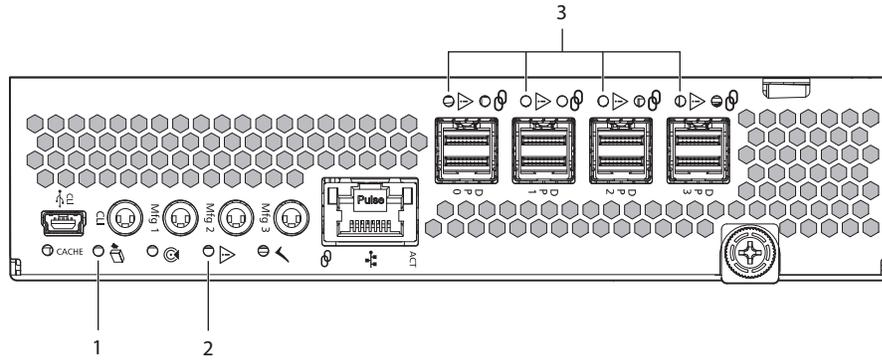
Figure 57 Removed PSU

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 a controller module

The two (2) controller modules (CMs) manage the flow of data to and from the storage enclosure. Each CM 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 CM 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 Type	Color	State	Status
1	OK to remove	White	On	CM is safe to remove after successful shutdown
			Off	Active, not safe to remove CM
2	Hardware fault	Amber	On*	CM hardware fault
			Off	CM hardware is functioning properly
3	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

Figure 58 Controller 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 CM.
- The *OK to remove* LED on the CM is off.
- The *Hardware fault* LED for one of the four 12Gb SAS ports on the CM 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 CM. 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.

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 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 CMs, properly shut down the storage enclosure.

3. Retrieve the new CM 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 CM.
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 CM away from the midplane.

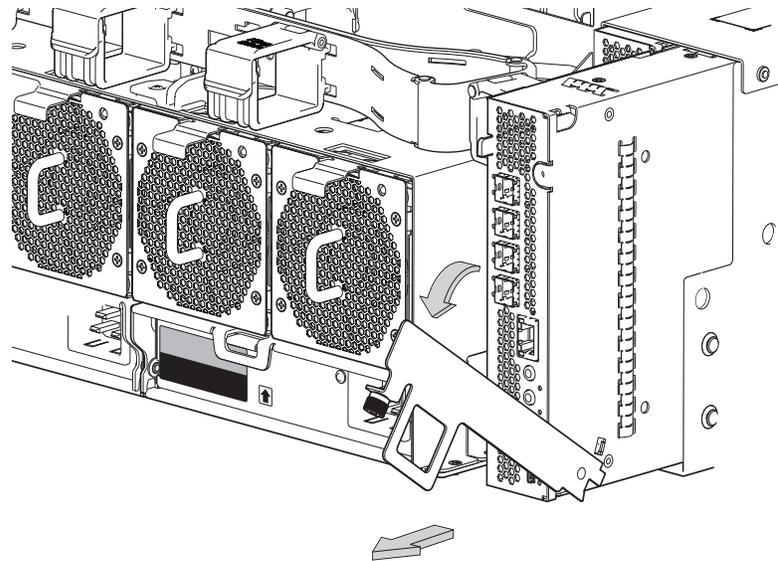


Figure 59 Release of the controller module latch handle

8. Gently pull the latch handle, easing the CM 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 CM from its static-protected container.
10. Inspect the CM to make sure it is not damaged or bent in any way, paying particular attention to connector pins.
11. Properly orient the CM so you can grasp the handle, then orient it to its empty slot.
12. Slide the CM 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 CMs, repeat the entire process for each of them.
18. Verify each CM 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.

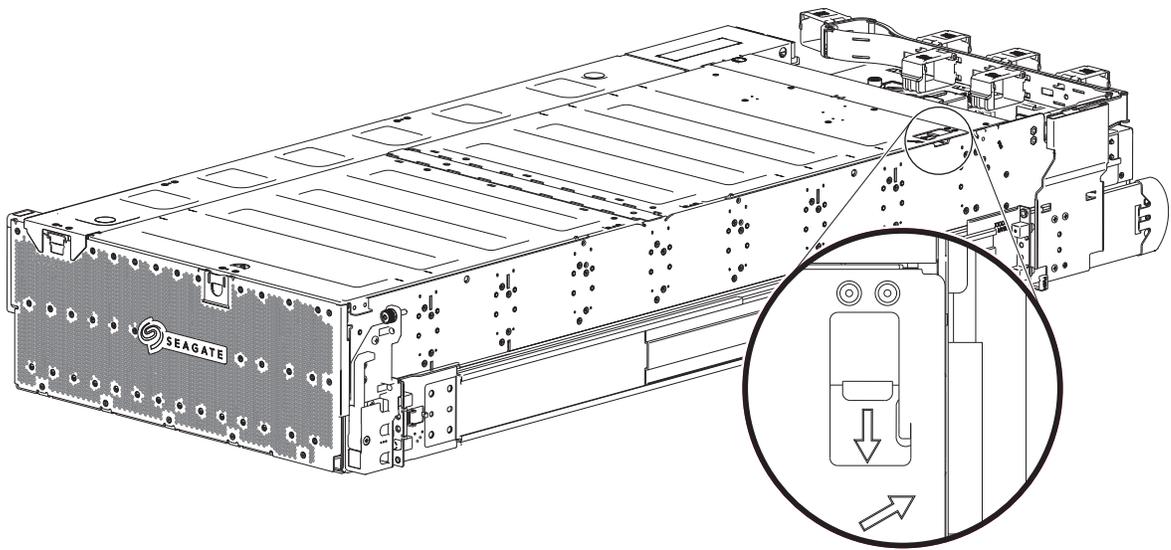


Figure 60 Access main bay cover's rear latch

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

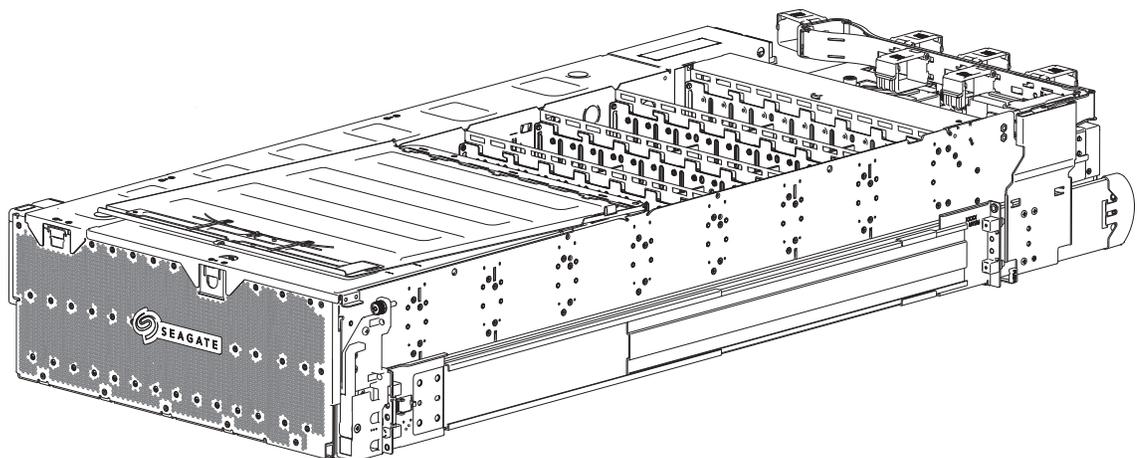


Figure 61 Rear half of an unpopulated main bay

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.

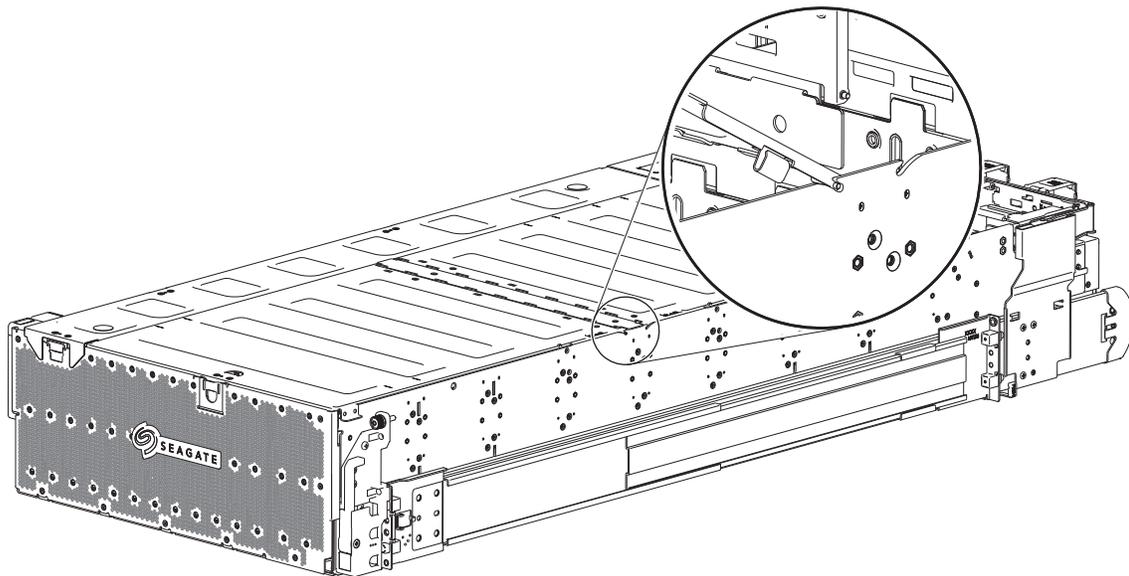


Figure 62 Main bay cover's front hinge pin

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.

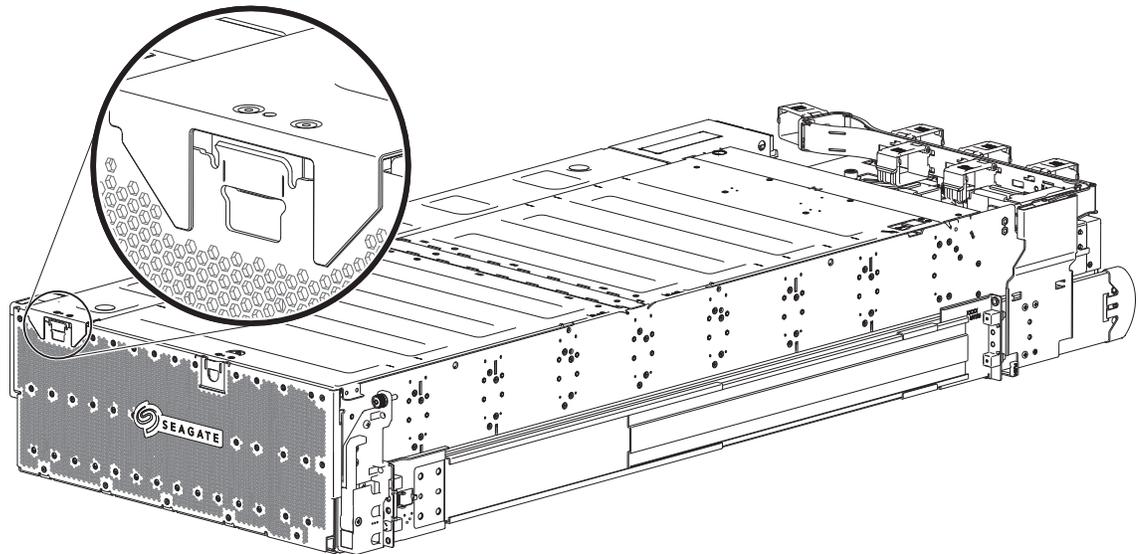


Figure 63 Access auxiliary bay cover's latch

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 9 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 10 Storage enclosure FRU weights

FRU or component	Metric units	Imperial units
Storage enclosure chassis plus midplane, no FRUs	36.00Kg	79.40 lb
Disk drive, either 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
Controller module (CM)	0.80Kg	1.80 lb
Controller fan	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

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

Table 11 Storage enclosure total weights

Variation	Metric units	Imperial units
Storage enclosure, populated with FRUS but no disk drives	44.90Kg	99.00 lb
Storage enclosure, populated with FRUS and 106 disk drives	131.50Kg	290.00 lb
Storage enclosure, populated with FRUS, 106 disk drives, CMA kit, and rack rails kit	140.60Kg	310.00 lb

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

Table 12 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 H2O)	
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	0.18Grms 5Hz to 500Hz, 30 min per axis	0.54Grms 6Hz to 200Hz (ISTA 3E Relocation: ISTA3H air ride for 60 min
Acoustics	8.5 Bels LWAd @ 23°C	N/A

Table 13 Power specifications

Type	Description
Power supply dimensions	38.1mm high x 169.9mm wide x 211.1mm long
Maximum output power	2000W
Voltage	<ul style="list-style-type: none">• 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 14 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

C

- cabling
 - cable management arm (CMA) 10-11, 33
 - power cords that meet product specifications 14, 41
 - route power cords 41
- controller module
 - LEDs 51
- corrective action 60
- cover
 - auxiliary bay 11, 40, 63-64
 - main bay 11, 38-39, 64
 - removal, replacement 38-40, 63-66, 68

D

- data path
 - components 58
 - fault tolerance 66

E

- electrostatic discharge 63
 - precautions 16, 18, 64-65, 70, 72, 74
 - proper protection 64, 67-68

F

- failure, hardware
 - cable, connector, or switch 58
 - fan or power 61
 - over temperature 61
- fault condition 50, 52-57, 72

H

- hardware
 - auxiliary bay 10-13, 39-40, 50, 63-65, 67
 - main bay 10-12, 38, 50, 63-66, 69
 - rear panel area 10, 50, 63
- host bus adapter (HBA) 46-47, 58

I

- installation
 - checklist 14, 48
 - lifting, default belt straps 17
 - lifting, optional lift handles 17-18
 - minimum staff requirements 16
 - prerequisites 15
 - required equipment 16, 22, 25, 28, 31, 34, 41

L

- LEDs
 - controller fan module fault LED 53
 - controller module LEDs 50, 56
 - drive fault LED 53

- front panel LEDs 49
- power supply unit fault LED 55
- SAS expander module fault LED 53
- system fan module fault LED 54

N

- notifications
 - alerts 57
 - events 57

P

- panels
 - front panel area 11
 - rear panel area 10, 69-70, 72
- power
 - prerequisites 79

R

- rack cabinet
 - leveling 19
 - prerequisites 16, 19
 - temperature and exhaust 78
- rackmount rail system
 - anatomy 20
 - ball bearing retainer 20
 - description 19
 - installation 18
 - leaf spring, mid rail 32
 - release latch, mid rail 22
 - safety guidelines 19
 - safety lock, inner rail 20-21
- replacement, in-service FRU
 - time limits 63

S

- safety precautions
 - electrical 41
 - equipment disposal 80
 - FRU replacement 63
 - installation 15
 - rack cabinet 19, 31
- SAS expander modules 12, 66
- specifications
 - environmental 78
 - power 79
- storage enclosure
 - proper rack cabinet door clearance 16, 62
 - shipping container 16
 - suitable rack cabinet 16
 - system airflow 10, 16, 48, 61-62, 67, 69, 78
 - temperature control 10, 48, 61, 67, 69, 78
 - total staff to install 16