



S E A G A T E

Exos E 4U106 Hardware Installation and Maintenance Guide

Abstract

This document describes initial hardware setup for Seagate Exos E 4U106 enclosures. It also describes removal and installation of customer-replaceable units for these enclosures. The document 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.

Firmware Version: GEM R2018.10.0

P/N 83-00007495-01-01, A
Revision A

October 2019

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About this guide

Introduction

This guide provides information about initial hardware installation and setup, as well as removal and installation of customer-replaceable units (FRUs) for the Seagate Exos E 4U106 enclosure. The Exos E 4U106 is a high-capacity expansion enclosure designed for use in cloud and enterprise environments. The Exos E 4U106 measures 4 EAI units of rack height (7") and fits a 1.2 m rack. It conforms to Common Form Factor (CFF) for canister bay support, and it integrates with Seagate controller enclosures for storage management. The integral cable management arm (CMA) allows the enclosure to be withdrawn from the rack for servicing, while remaining connected and powered in this mode.

The Exos E 4U106 is designed for use as an expansion enclosure. This 4U106 enclosure can either be used as a server-attached Just a Bunch of Disks (JBOD), or it can be cabled to an RBOD (RAID Bunch of Disks) as an Expanded Bunch Of Disks (EBOD) for adding storage.

Intended audience

This guide is intended for system administrators and storage administrators.

Prerequisites

Prerequisites for using this product include knowledge of:

- Server system administration
- Linux and Microsoft Windows servers
- Storage system configuration
- Server-attached storage
- Serial Attached SCSI (SAS) protocol

Document conventions and symbols

Table 1 Document conventions

Convention	Element
Green text	Cross-reference links
<u>Black, underlined</u> text	Email addresses
<u>Colored, underlined</u> text	Website addresses
Bold text	<ul style="list-style-type: none">• Keys that are pressed• Text entered into a GUI element, such as a text box• GUI elements that are clicked or selected, such as menu and list items, buttons, and check boxes
<i>Italic</i> text	Text emphasis
Monospace text	<ul style="list-style-type: none">• File and directory names• System output• Code• Commands, their arguments, and argument values
<i>Monospace, italic</i> text	<ul style="list-style-type: none">• Code variables• Command parameters
Monospace, bold text	Emphasis of file and directory names, system output, code, and text entered at the command line

⚠ WARNING! Warning messages alert the reader to a specific procedure or practice which, if not followed correctly, could cause personal injury or catastrophic loss of data or equipment.

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

ⓘ IMPORTANT: Provides clarifying information or specific instructions.

NOTE: Provides additional information.

💡 TIP: Provides helpful hints and shortcuts.

1 Safety guidelines

Safe handling

△ CAUTION: Use this equipment in a manner specified by the manufacturer: failure to do this may cancel the protection provided by the equipment.

- For new enclosures, prepare the site for installation per “[Installation checklist](#)” (page 35), and follow safe-handling instructions provided in “[Unpacking the enclosure](#)” (page 37).
 - Unplug the enclosure before you move it, or if you think that it has become damaged in any way.
 - A safe lifting height without a mechanical lift is 20U (~35”).
 - The 4U106 ships with all FRUs other than the discs installed; however, the DISCs must be installed as part of the system setup, *after* the enclosure is securely mounted in the rack.
 - Before installing the enclosure into a rack, see the **WARNING** on [page 44](#).
 - After installing the enclosure, and *before* installing the DISCs, see “[ESD precautions](#)” (page 73).
 - To install DISC drive modules into a rack-mounted enclosure, face the front panel, and pull the enclosure outward on its rails. Remove the top cover(s) to provide access to the DISC module slots. See [Figure 9](#) (page 22) for removable lids, and see [Figure 10](#) (page 23) and [Figure 11](#) (page 23) for DISC slots and FRU module slot indexing. See also “[Installing an LFF drive carrier module](#)” (page 84).
 - The belt straps and optional lift handles are designed to support the weight of the enclosure as shipped. Neither safely supports a fully populated enclosure. See also “[Unpacking the enclosure](#)” (page 37).
-

△ CAUTION: Use a suitable mechanical lift for hoisting the enclosure for installation into the rack:

- Fully configured Exos E 4U106 enclosures can weigh up to ~131 kg (289 lb). Do not install DISCs until after the enclosure is secured into the rack.
 - When positioning the enclosure into its rack space, use the belt straps (quantity three) or the optional enclosure lift handles (two handles per side). See also “[Requirements for rackmount installation](#)” (page 43) for additional information.
 - Observe the lifting hazard label affixed to the storage enclosure.
 - Do not use vacuum lift because it can potentially damage the 4U106 enclosure.
-

Operation

① IMPORTANT: It is essential that all FRU slots hold modules or module blanks to use the enclosure for more than the allowed service times for a FRU module.

- Observe the caution label affixed to the module being replaced.
- Replace a defective FRU with a fully operational FRU as soon as possible. Do not remove a defective FRU module unless you have a replacement model of the correct type ready for insertion.
- Before removal/replacement of a PSU, disconnect supply power from the PSU to be replaced. Refer to “[Replacing a PSU module](#)” (page 74).
- Observe the hazardous voltage warning label affixed to power supply modules.

Electrical safety

- The enclosure must only be operated from a power supply input voltage range of 200–240 VAC, 50/60Hz.
- Provide a suitable power source with electrical overload protection to meet the requirements in the technical specification.
- The power cord must have a safe electrical earth connection. Check the connection to earth of the enclosure before you switch on the power supply.
- The system requires voltages within minimum fluctuation. The customer-supplied facilities' voltage must maintain a voltage with not more than ± 5 percent fluctuation. The customer facilities must also provide suitable surge protection.

ⓘ **IMPORTANT:** The enclosure must be grounded before applying power.

- The plug on the power supply cord is used as the main disconnect device. Ensure that the socket outlets are located near the equipment and are easily accessible.
- 4U106 enclosures are intended to operate with two PSUs, four system fans accessed from the rear panel, and two controller channel fan modules which can be accessed from the top of the enclosure.
- Observe the power-supply disconnection caution label affixed to PSU modules.

⚠ **CAUTION:** Do not remove covers from the PSU or any other FRU module. There is a danger of electric shock inside. Return the plug-in module to your supplier for repair.

ⓘ **IMPORTANT:** The RJ-45 socket on IOMs (Input Output module) is for the Ethernet connection only and must not be connected to a telecommunications network.

-
- Exos E 4U106 storage enclosures are suitable for connection to intra-building or non-exposed wiring or cabling only.
 - Exos E 4U106 storage enclosures are suitable for installation in locations where the NEC (National Electrical Code) applies. These enclosures are not suitable for Outside Plant (OSP) installations.

Rack system safety precautions

The following safety requirements must be considered before mounting the enclosure in a rack.

- Before installing a 4U106 enclosure into the rack, see the **CAUTION** on [page 12](#) and the **WARNING** on [page 44](#).
- The rack construction must be capable of supporting the total weight of the installed enclosures. The design should incorporate stabilizing features suitable to prevent the rack from tipping or being pushed over during installation or in normal use.
- When loading a rack with enclosures, fill the rack from the bottom up. Empty the rack from the top down. Heavier enclosures should be located beneath lighter enclosures for optimal stability.
- One person alone should not try to lift the enclosure.

△ **CAUTION:** To avoid danger of the rack falling over, under no circumstances should more than one enclosure be moved out of the cabinet at any one time.

- The system must be operated with low pressure rear exhaust installation. The back pressure created by rack doors and obstacles is not to exceed 5 pascals (0.5 mm water gauge).
 - The rack design should take into consideration the maximum operating ambient temperature for the enclosure, which is 35°C (95°F) for JBODS/EBODs. Above an altitude of 900 meters, derating applies as per ASHRAE Class A2.
 - The rack should have a safe electrical distribution system. It must provide over-current protection for the enclosure and must not be overloaded by the total number of enclosures installed in the rack. When addressing these concerns, consideration should be given to the electrical power consumption rating shown on the nameplate.
 - The electrical distribution system must provide a reliable earth connection for each enclosure in the rack.
 - Each power supply line cord will have an earth leakage current of 1mA. The design of the electrical distribution system must take into consideration the total earth leakage current from all the PSUs in all the enclosures. The rack will require labeling with “High Leakage Current. Earth connection essential before connecting supply.”
 - The rack—when configured with the enclosures—must meet the safety requirements of UL2416, UL60950-1, and IEC 60950-1.
-

Leveling an enclosure rack

The rack should be installed on a flat, leveled surface. It should not rest inclined under any circumstances as this could cause uneven stress on the rack structure, and also on the ground. Enclosures placed in such uneven racks resist smooth movement in the racks while pushing them in or pulling them out. This can eventually damage the enclosure rails. For safe operation, follow the leveling instructions as prescribed by the rack manufacturer in the rack documentation.

△ **CAUTION:** Do not install any enclosures into a rack until and unless racks are leveled.

2 System overview

Enclosure configuration

The Exos E 4U106 storage system fits within four rack space units. See [Figure 1](#) and [Figure 2](#). It holds up to 106 low profile (1-inch high) 3.5" form factor drive modules vertically in 4U of rack space (hence, the term '4U106'). Alternatively, each drive slot can hold a low profile (5/8-inch high) 2.5" form factor drive with an adapter within the large form factor carrier.

Each individual drive is hot pluggable and replaceable on site. Drive modules must be installed during system setup after the enclosure is mounted on rails in the rack.

NOTE: Throughout this guide—and the management interface documents used with this guide—I/O module (IOM) is a general term denoting an IOM (expansion canister).

The enclosure configurations—including chassis and FRUs—are described on the following pages. Refer to [“Enclosure Configuration”](#) (page 17) for details about various enclosure options.

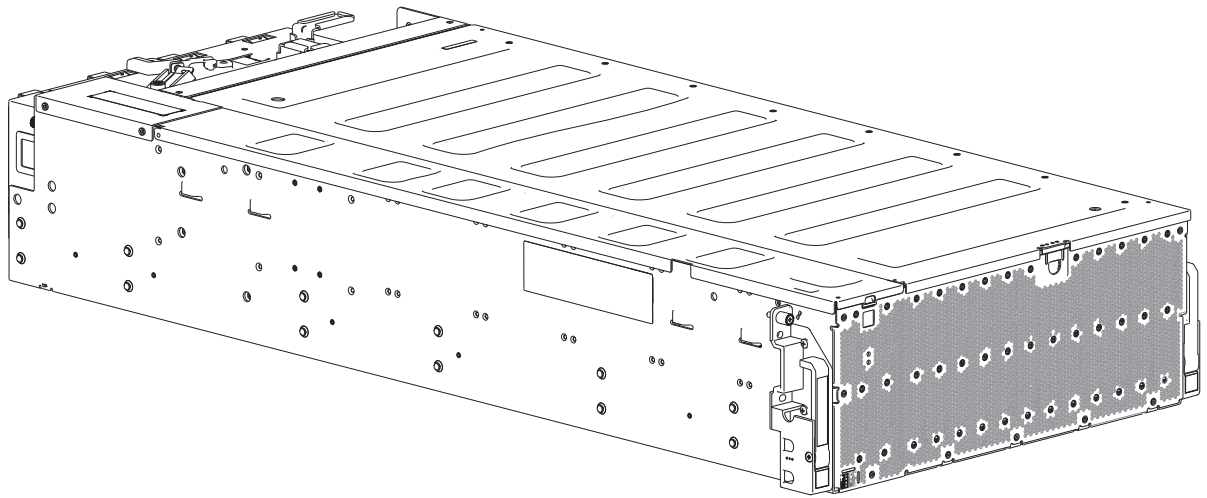


Figure 1 4U106 enclosure system – dimetric front orientation

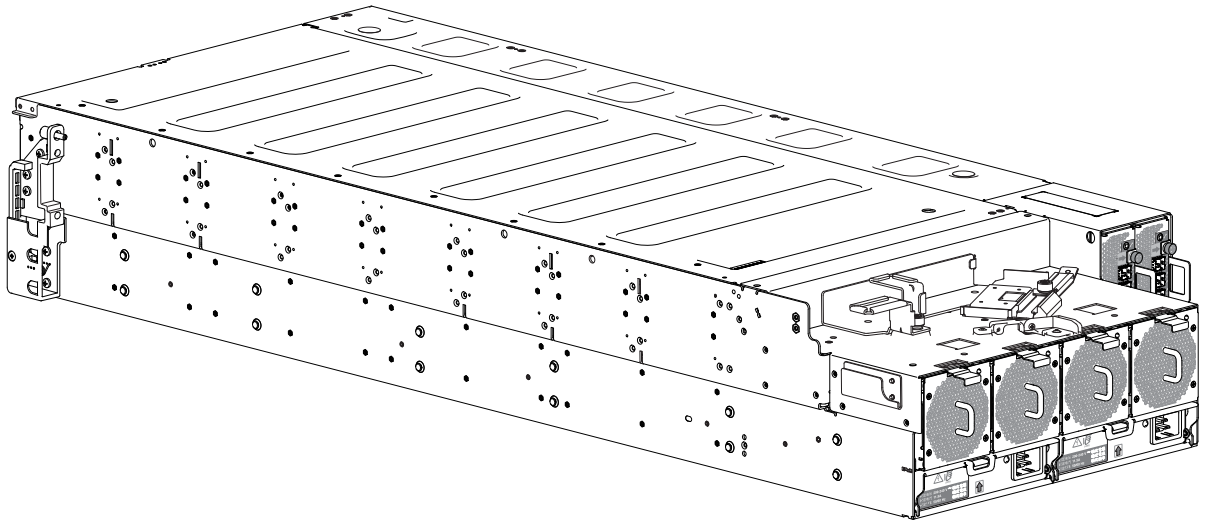


Figure 2 4U106 enclosure system – dimetric rear orientation

Enclosure Configuration

The 4U106 chassis is configured as an expansion enclosure, as shown in [Table 2](#). The enclosure supports 106 qualified drive modules installed via the top panel.

- Hot-swappable (HS) expanders support 96 disc drives attached to four 24 HDD baseplanes (12 drives x 8 rows).

The 24 HDD baseplane continues to operate while the high-availability card is replaced when the enclosure:

- Uses SAS drives
- Does not use split-chassis shared-nothing firmware
- Has a host connected to both IOMs
- The 10 HDD baseplane PCBA supports 10 drives (2 drives x 5 rows).

Table 2 4U106 enclosure configuration

Product	Description of configuration	PSUs ¹	System fans ²	IOMs ³	IOM fans ²	Drives ⁴	HS Expanders ⁵
4U106	12Gb/s direct dock Large Form Factor (LFF)	2	4	2	2	106	8
	Enclosure location of FRU variant	Rear	Rear	Rear	Top	Top	Top

1-Redundant PSUs must be compatible modules of the same type (both AC).

2-For adequate cooling, four rear-panel system fans are required, and two IOM fans provide cooling for the IOMs (accessed via the top panel).

3-The IOM is used to connect the 4U106 to a host, or to connect to a host and additional storage enclosures.

4-LFF drives are supported using the 3.5" tool-less carrier; SFF drives are supported using the 2.5" tool-less carriers.

5-Hot-swappable expanders support 24 drive slots per drive row (8 rows total).

Enclosure core product

The design concept is based on an enclosure subsystem together with a set of plug-in Customer Replaceable Units (FRUs). A typical enclosure System includes the following:

- An enclosure chassis equipped with several PCBAs, including a midplane, sideplane, and baseplane PCBAs, and a cluster of enclosure status LED indicators located at the lower left area of the enclosure front panel
- Two PSU modules rated at 2,000W 200–240VAC
- Four rear fan modules for enclosure cooling
- One or two IOMs with four mini-SAS HD (SFF-8644) ports, a single serial port, and dual RJ-45 Ethernet management ports (the Ethernet ports are not enabled). A single IOM must have IOM blank installed.
- Two fan controller modules for IOM cooling
- Up to 106 Disc Drive in Carriers (DDICs). 3.5" Large form factor (LFF) & 2.5" small form factor carrier are available
- Eight removable hot-swappable expander cards, two per 24 HDD baseplane
- A rail kit for rack mounting.
- A cable management arm (CMA) for managing cables, and enabling in-rack servicing of the enclosure.

NOTE: About enclosure modules

- The drive modules are not installed when the enclosure ships. Do not insert drives into the enclosure until after it has been secured in the rack. See also "[Populating drive slots](#)" ([page 23](#)).
 - The following figures show component locations relative to the enclosure front, rear, and top panels.
 - Refer to FRU Replacement Time Limit ([Table 12](#)) for maximum allowable time to replace FRUs.
-

Enclosure front panel

This enclosure front panel view intentionally omits the optional lift handles that attach to the enclosure sides and that must be removed before pushing the enclosure mounted on the rails into the rack. It also does not show the rails holding the enclosure when mounted in a rack because the rails are behind the pull handles.

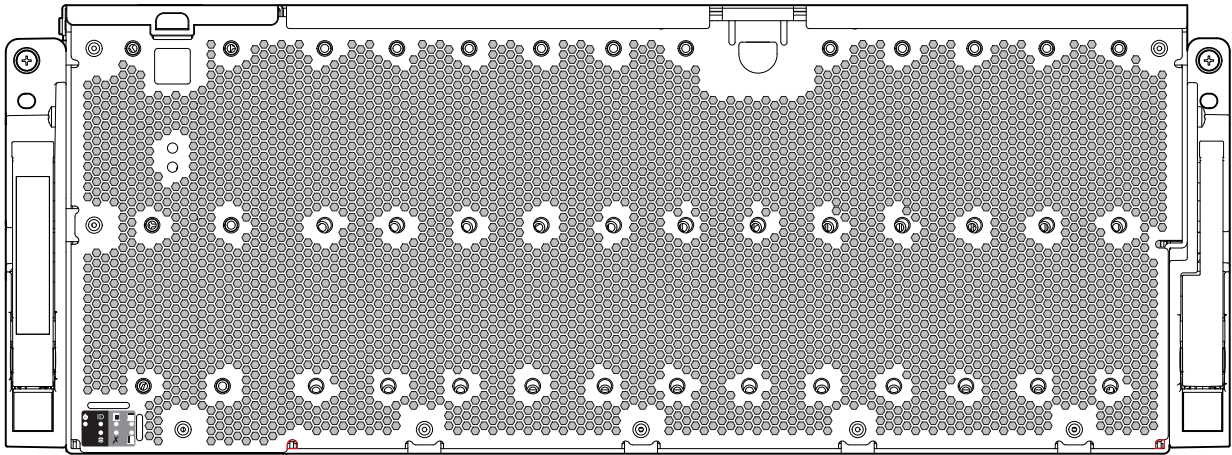
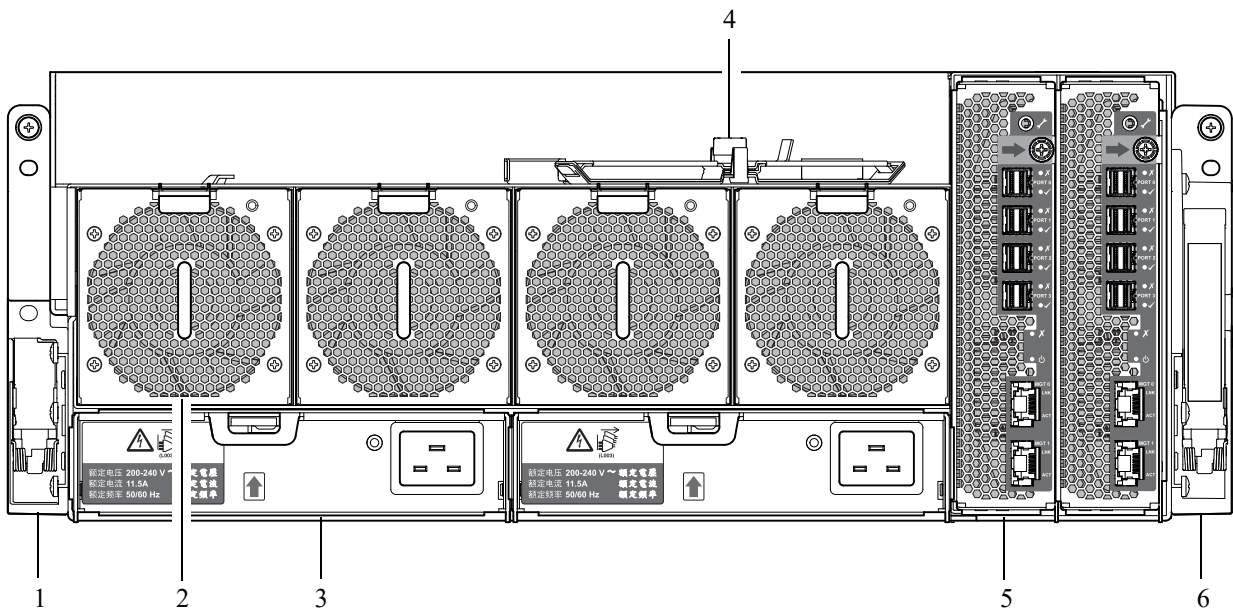


Figure 3 4U106 enclosure system – front panel components

The enclosure front panel has seven system LEDs located in the lower left corner. See also [Figure 3 \(page 25\)](#). The two enclosure pull handles used to slide the enclosure forward on its rails for in-rack servicing tasks are on the right- and left-hand sides of the front panel.

Enclosure rear panel

This enclosure rear panel view intentionally omits the optional lift handles that attach to the enclosure sides and that must be removed before pushing the enclosure mounted on the rails into the rack. It also does not show the rails holding the enclosure when mounted in a rack because the rails are behind the pull handles.



No.	Description	No.	Description
1	Right ear assembly (as viewed from back)	4	Cable shelf and CMA bracket for coiled cables
2	System fan module (quantity-4)	5	IOM (quantity-2)
3	Power supply unit (quantity-2)	6	Left ear assembly (as viewed from back)

Figure 4 4U106 enclosure system – rear panel components

See [Figure 5 \(page 19\)](#) for a conceptual diagram showing the numbering for each module bay that can be accessed from the rear panel.

Rear panel components

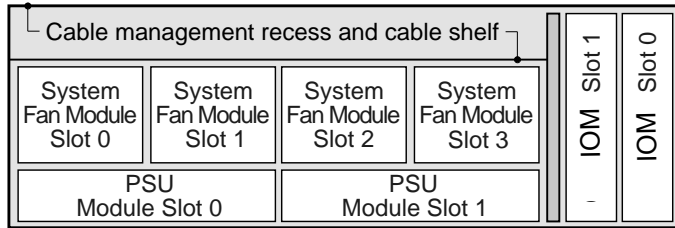


Figure 5 4U106 enclosure – rear panel module slot index diagram

Expansion module

Figure 6 shows the IOM used in either IOM slot located on the enclosure rear panel. The module is shown resting vertically in the install position.

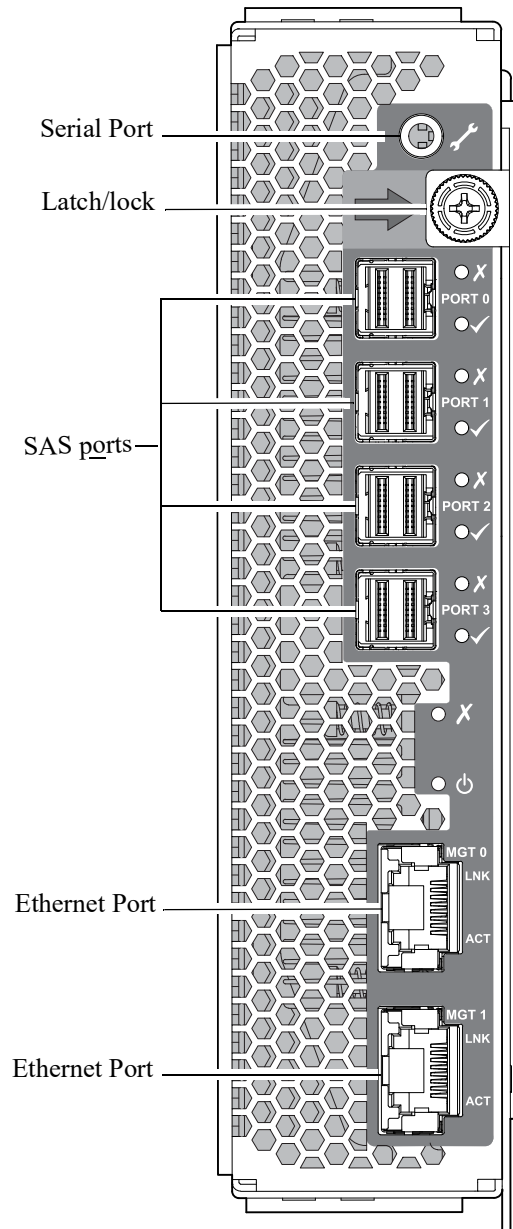


Figure 6 IOM detail

Power supply unit (PSU)

Figure 7 shows the PSU used in a 4U106 enclosure. The example shows a PSU oriented for use in either PSU slot located on the enclosure rear panel.

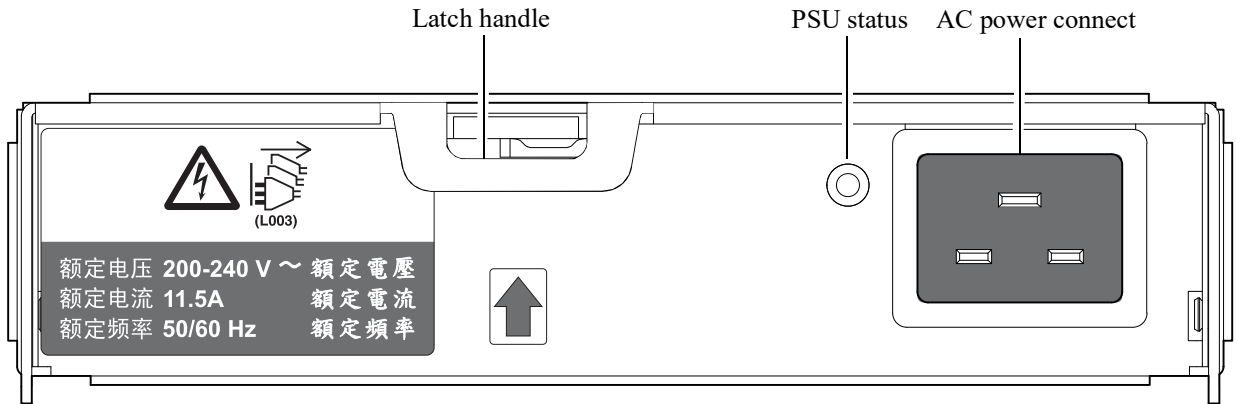


Figure 7 Power supply unit (PSU) module detail

System fan module

Figure 8 shows a system fan used in a 4U106 enclosure. The example shows a system fan module oriented for use in any of the system fan slots located on the enclosure rear panel.

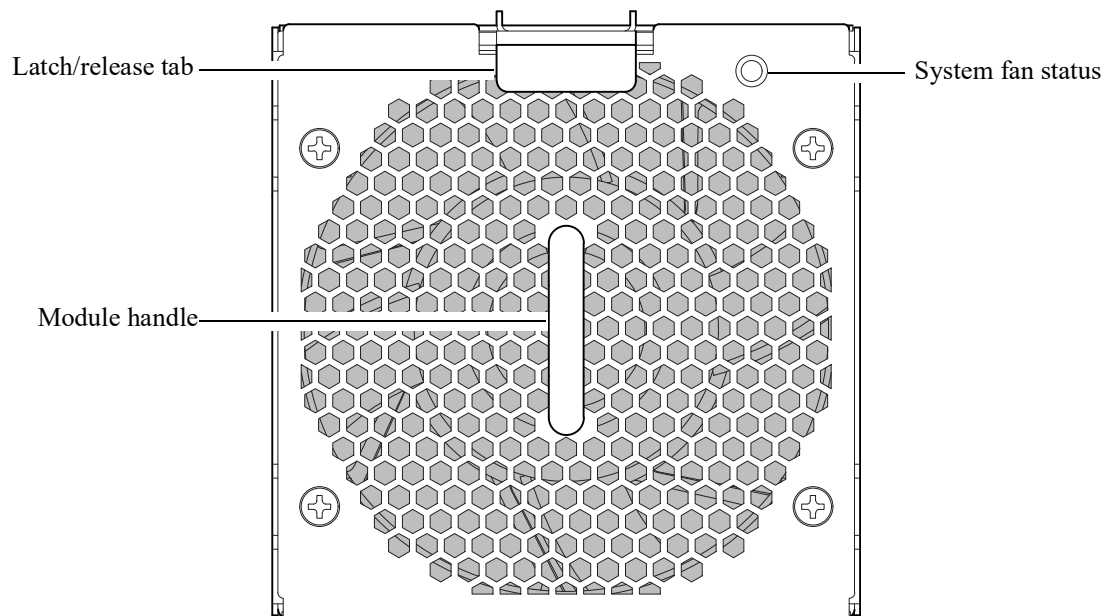


Figure 8 System fan module detail

Enclosure top panel

The enclosure top panel has two covers that can be removed for access to the internal components. The illustration shows three parts of the top panel labeled as A, B, and C. See Figure 9 for more details.

- A: The removable main bay cover that provides access to the hot-swap expanders and 96 drive slots.
- B: The removable controller bay cover that provides access to 10 drive slots and the two internal fan modules.
- C: A fixed part of the enclosure chassis that cannot be removed.

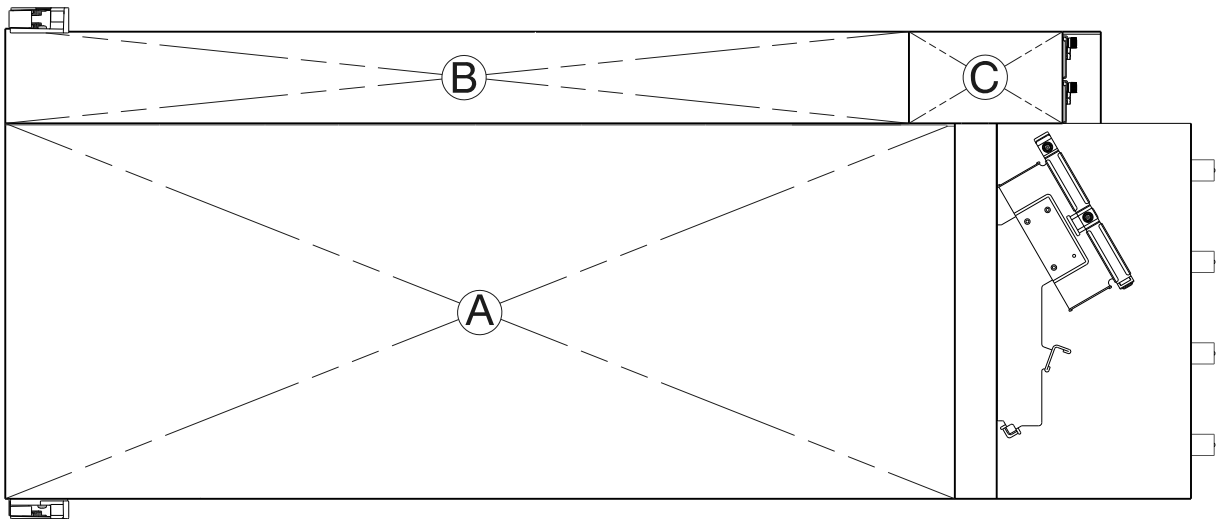


Figure 9 4U106 enclosure – top panel with covers installed

Figure 9 shows a top view of the enclosure with simplified covers. The illustration is oriented such that the front of the enclosure is on left, and the rear of the enclosure is on the right. The rail kit and most of the cable management arm geometry are omitted for clarity.

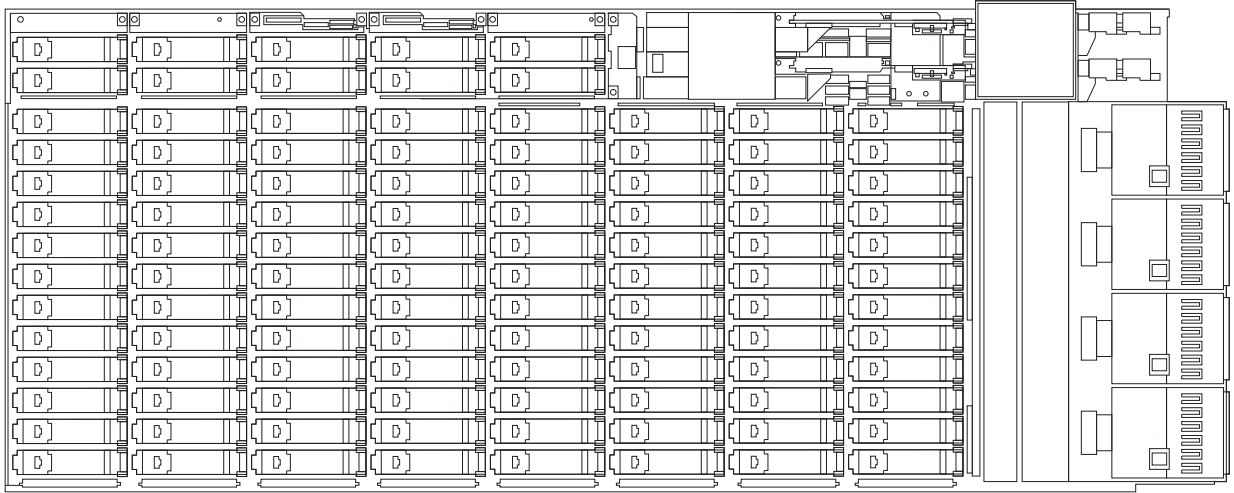


Figure 10 4U106 enclosure – top panel with covers not shown

Figure 11 provides a conceptual diagram of module slot-index numbering as viewed from the top of a 4U106 enclosure with all covers removed. To view the arrangement of PSU module slots—beneath the system fan slots—see Figure 5 (page 19).

	Drive 96	Drive 98	Drive 100	Drive 102	Drive 104		IOM Fan 5	IOM Fan 4	IOM 0
	Drive 97	Drive 99	Drive 101	Drive 103	Drive 105				IOM 1
Enclosure Front	Drive 0	Drive 12	Drive 24	Drive 36	Drive 48	Drive 60	Drive 72	Drive 84	Fan Module 3
	Drive 1	Drive 13	Drive 25	Drive 37	Drive 49	Drive 61	Drive 73	Drive 85	
	Drive 2	Drive 14	Drive 26	Drive 38	Drive 50	Drive 62	Drive 74	Drive 86	
	Drive 3	Drive 15	Drive 27	Drive 39	Drive 51	Drive 63	Drive 75	Drive 87	Fan Module 2
	Drive 4	Drive 16	Drive 28	Drive 40	Drive 52	Drive 64	Drive 76	Drive 88	
	Drive 5	Drive 17	Drive 29	Drive 41	Drive 53	Drive 65	Drive 77	Drive 89	
	Drive 6	Drive 18	Drive 30	Drive 42	Drive 54	Drive 66	Drive 78	Drive 90	Fan Module 1
	Drive 7	Drive 19	Drive 31	Drive 43	Drive 55	Drive 67	Drive 79	Drive 91	
	Drive 8	Drive 20	Drive 32	Drive 44	Drive 56	Drive 68	Drive 80	Drive 92	
	Drive 9	Drive 21	Drive 33	Drive 45	Drive 57	Drive 69	Drive 81	Drive 93	Fan Module 0
	Drive 10	Drive 22	Drive 34	Drive 46	Drive 58	Drive 70	Drive 82	Drive 94	
	Drive 11	Drive 23	Drive 35	Drive 47	Drive 59	Drive 71	Drive 83	Drive 95	
		Sideplane 0	Sideplane 1	Sideplane 2	Sideplane 3	Sideplane 4	Sideplane 5	Sideplane 6	Sideplane 7

Figure 11 4U106 enclosure – top panel module slot index diagram

The 4U106 is designed for use with a full load of drives; however, it may also be partially populated. Gray-colored drive slots above indicate *minimum* drive module placement for power and cooling reasons. These slots should be populated in all cases.

Populating drive slots

The Exos E 4U106 does not ship with pre-installed drive modules. When installing drive modules, be mindful of the slot numbering shown in Figure 11. The following rules apply when populating the 4U106 with drives possessing 12 watts maximum drive operating power per slot.

- Populate the minimum drive slot arrangement indicated by gray-colored drive slots in Figure 11.

- Populate the remaining drive slots from enclosure from front to back – filling an entire lateral row (e.g., drives 0-11) - before populating the next row (e.g., drives 12-23, drives 24-34), and so on.

NOTE: A row can be skipped during loading, except the first row (Drive slot 0 to Drive slot 11). However, once you start to fill a row ensure that you fill it completely.

- When rack-mounting a 4U106 enclosure, install the drives after the enclosure is installed in the rack.
- Populate drive slots 96–105 at any time during the sequence, as they are cooled separately within the enclosure.

Enclosure chassis

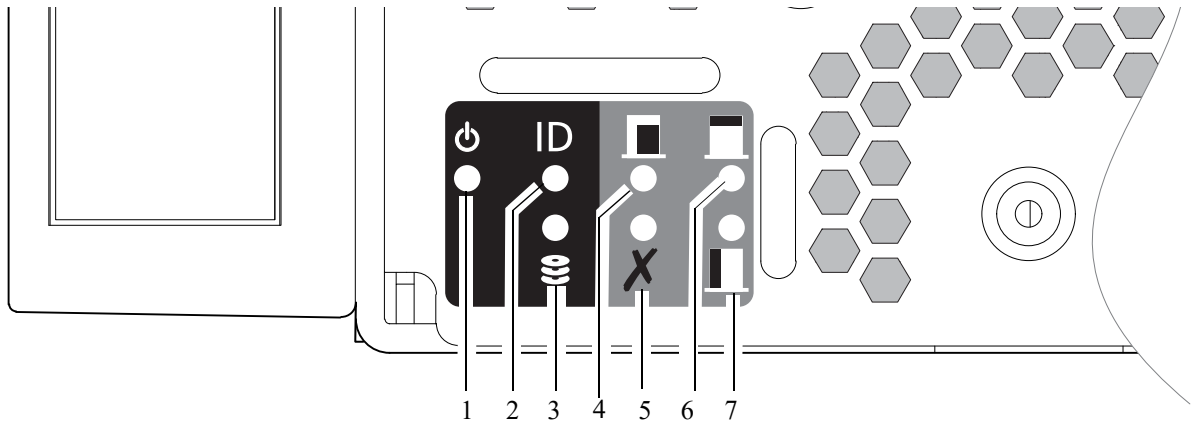
The 4U106 chassis consists of a sheet metal enclosure with integrated PCBAs. The enclosure is divided into a main bay and a controller bay. Each bay has a removable cover to provide access to plug-in modules known as field-replaceable units (FRUs). The metal surfaces are free from non-conductive coatings and paint

- The chassis has a 1.2 m rack mounting that enables it to be installed onto standard 1.2 m racks, and uses four EIA units of rack space (7") for a 4U enclosure. Optional lift handles on the chassis side walls facilitate hoisting and installation. See also [Figure 24 \(page 42\)](#).
- The cable management arm (CMA) routes cables from the controller channel and external connections and secures them for in-rack servicing of the installed enclosure.
- The drive channel bus-bar distributes power from the power midplane to 24 HDD baseplanes.
- The four 24 HDD baseplane PCBAs support 96 drive connections in the drive channel.
- The 10 HDD baseplane PCBs supports 10 drive connections in the controller channel.
- The enclosure top panel provides access to 106 low profile 3.5" LFF or 2.5" SFF (with adapter) drives, held vertically. Out of these 106 drives, 96 drives are present below cover A (main bay cover), and 10 drives (and two controller channel fans) are present below the cover B (controller bay). See [Figure 9](#) for more details. Each drive slot holds a plug-in drive carrier module. The top panel also provides access to the HS expander and controller fan FRUs.
- Each 24 HDD base plane has a pair of hot-swappable expander cards (eight individual hot-swappable expander cards). Each expander card plugs into a riser card that in turn connects to a baseplane.
- Within the controller bay, fans provide additional cooling for IOMs.
- In the rear, the chassis holds two PSUs, four system fans, two CFF-compliant IOMs and a cable management arm to manage data & power cables.
- The main bay cover A, provides access to 96 low profile 3.5" LFF or 2.5" SFF with adapter drives, held vertically. It also provides access to eight High Speed expander FRUs.
- The controller bay cover (cover B) provides access to 10 low profile 3.5" LFF or 2.5" SFF with adapter drives, held vertically. It also provides access to two controller fan FRUs.

① **IMPORTANT:** If the Exos E 4U106 enclosure is configured with a single IOM, it must be installed in IOM0 (as shown in [Figure 11](#)). An IOM blank must be installed in the adjacent slot to ensure sufficient air flow through the enclosure during operation.

Overview of front panel LEDs

The enclosure front panel displays several LEDs. The front panel displays the functions shown in the illustration below and listed in the table. See also [Figure 3 \(page 18\)](#).



Front panel – lower left corner (partial view)

LED	Front panel functions (lower left corner of panel)	LEDs as displayed in the output of the GEM CLI command 'report_faults'.
1	System Power (green)	Not reported
2	System ID (blue)	Unit Identifier LED
3	Host Connectivity (green)	Port Link Status Ops LED
4	Fault - Main Bay (amber)	Module Fault LED
5	Fault - Application (amber)	Logic Fault LED
6	Fault - Rear Module (amber)	Module Fault Rear LED
7	Fault - Controller Bay (amber)	Module Fault Side LED

Table 3 LEDs: 4U106 enclosure front panel

Front Panel LED Descriptions

- LED 1 System Power**
 This LED illuminates green when the system power is applied. If this LED is off, either the system is powered off or there is a power failure in the system. Troubleshoot to identify the cause.
- LED 2 System ID**
 This LED illuminates blue when activated and is used to identify the storage system among the other systems installed in the rack. This LED is normally off and illuminates only during the identification process initiated by the application.
- LED 3 Host Connectivity**
 This LED illuminates green when a host port is linked up with either IOM.
- LED 4 Fault - Main Bay**
 This LED illuminates amber when experiencing a system hardware fault. The hardware fault can be initiated by GEM for a component or FRU that is accessible through the main bay cover. This LED is normally off. Pull the chassis forward from its installed position within the rack, remove the main bay cover and look for amber colored LED on any disc drives or HS expander modules. Replace the faulty component. If no LED is illuminated in the Main Bay then contact Seagate support.
- LED 5 Fault - Application**
 This LED illuminates amber when experiencing a system fault that is initiated by the Application (Host). This LED is normally off.

- **LED 6 Fault - Rear Module**

This LED illuminates amber when experiencing a system hardware fault with an FRU accessible through the rear of the enclosure (IOMs, PSUs, System Fans). This LED is normally off. If no LED is illuminated in the Rear Module then contact Seagate support.

- **LED 7 Fault - Controller Bay**

This LED illuminates amber when experiencing a system hardware fault initiated by GEM, for an FRU that is accessible through the controller bay cover. This LED is normally off. Pull the chassis forward from its installed position within the rack, remove the controller bay cover and look for amber colored LED on disc drives or controller fans. Replace the faulty component. If no LED is illuminated in the Main Bay then contact Seagate support.

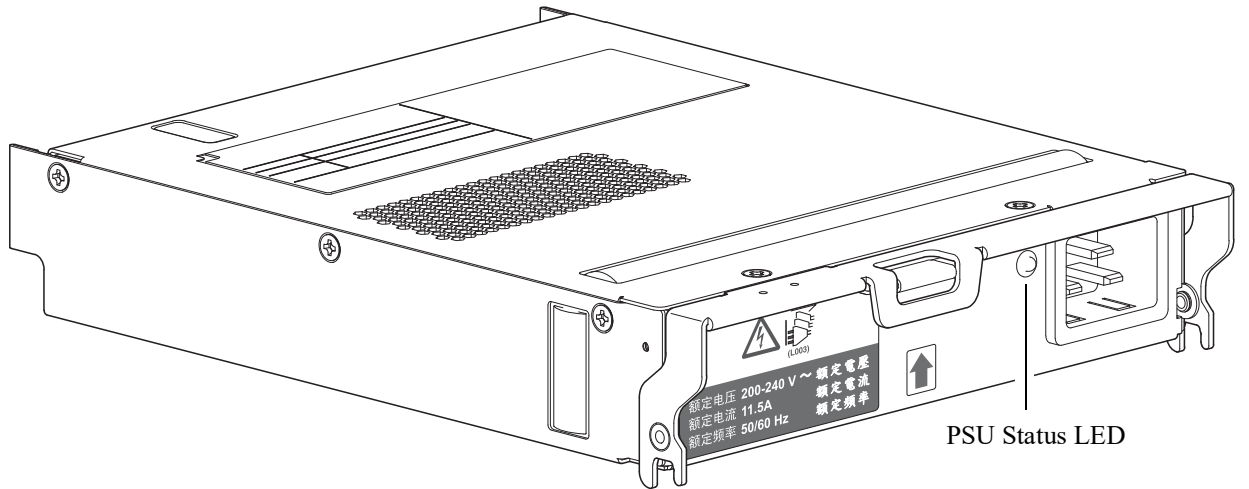
Overview of rear panel LEDs

Power supply unit

AC-DC power is provided by up to two auto-ranging power supply modules (PSUs). Cooling is provided by four separate cooling fans and two controller module fans. The IOM provides power and LED control. Also see [“System airflow” \(page 28\)](#) for optimal cooling within the enclosure(s).

2,000W PSU

The 2,000W PSU voltage operating range is nominally 200V-240VAC, and the input frequency operating range is 50-60 Hz. The dimetric rear orientation in [Figure 12](#) shows the PSU aligned for insertion into either PSU slot located on the enclosure rear panel. Also remove the stabilizer bar before inserting or removing a PSU.



PSU oriented for use in rear panel slot

Module LED	LED behavior states		
PSU Status LED (bitonal):	PSU OK (green)	PSU fault/failure (amber/blinking amber)	Power off (Off)

Figure 12 LEDs: 2,000W PSU – rear panel

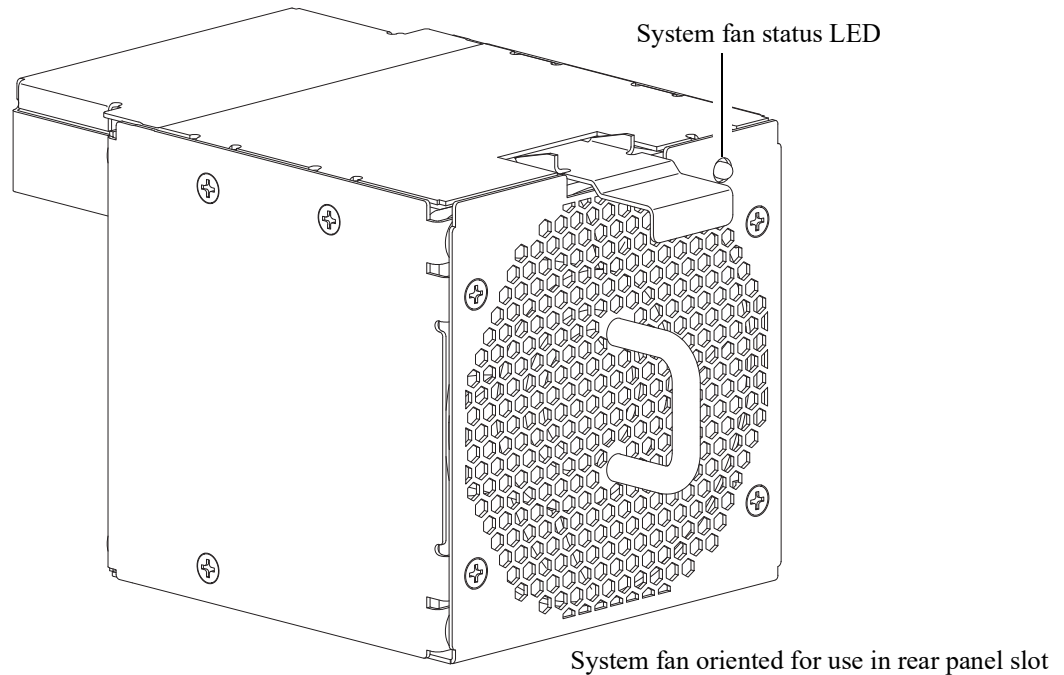
Multiple power supply unit modules

The 4U storage system includes two hot-swappable PSUs that provide redundant power control for the system so that if one module fails, the other maintains the power and enclosure operation is not affected while the faulty PSU is being replaced. See FRU Replacement Time Limit ([Table 12](#)) for maximum allowable time to replace FRUs. See section [“Removing a PSU module”](#) ([page 75](#)) for replacement instructions. Note the slide-rail crossbar needs to be removed to get access to PSUs.

-
- ⓘ **IMPORTANT:** Operation of the enclosure with any modules missing will disrupt the airflow, and the drives will not receive sufficient cooling. It is essential that all slots are fitted with PSUs prior to powering on the enclosure.
-

System fan module

Enclosure cooling is provided by four system fan modules used in combination with two controller channel fan modules. The IOM provides fan and LED control. This section describes system fan modules. See also “[Controller channel fan module](#)” (page 33).



Module LED	LED behavior states		
System Fan Status LED:	System Fan OK (Off)	Fan fault/ID (amber/blinking amber)	Power off (Off)

Figure 13 LEDs: System fan module – rear panel

Multiple system fan modules

The 4U106 enclosure includes four system fan FRUs which provide redundant cooling for the system, so that if one module fails, the others maintain airflow circulation, and enclosure operation is not affected while you replace the faulty module. Within this FRU module, if one of the two internal rotors fails, then a fault occurs, indicating module failure. A dual rotor failure is reported as a dual-fault. Refer to FRU Replacement Time Limit ([Table 12](#)) for maximum allowable time to replace FRUs. See section “[Replacing a system fan module](#)” (page 77) and “[Replacing a controller fan module](#)” (page 79) for replacement instructions.

-
- ① **IMPORTANT:** Operation of the enclosure with any modules missing disrupts the airflow, and the drives do not receive sufficient cooling. It is essential that all slots are fitted with system fans prior to powering on the enclosure.
-

System airflow

The system must be operated with low pressure rear exhaust installation. Back pressure created by rack doors and obstacles is not to exceed 5 pascals (0.5mm water gauge). The cooling system provides sufficient capacity to ensure that maximum temperatures are not exceeded.

-
- ① **IMPORTANT:** The environment in which the enclosure operates must be dust-free to ensure adequate airflow.
-

IOM module

This section describes the IOM used in Exos E 4U106 12Gb/s storage enclosures.

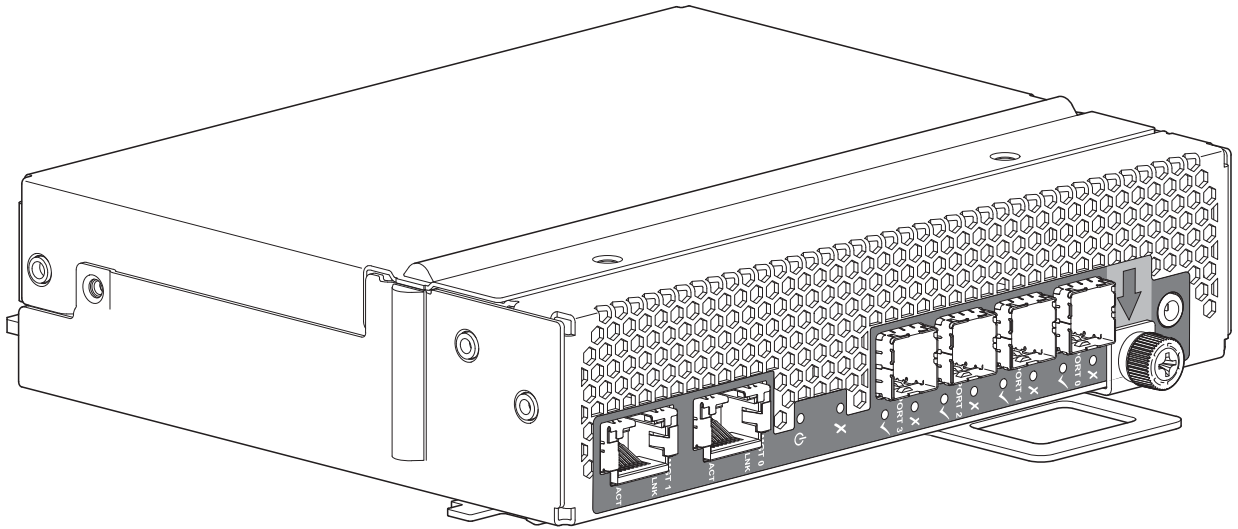


Figure 14 IOM

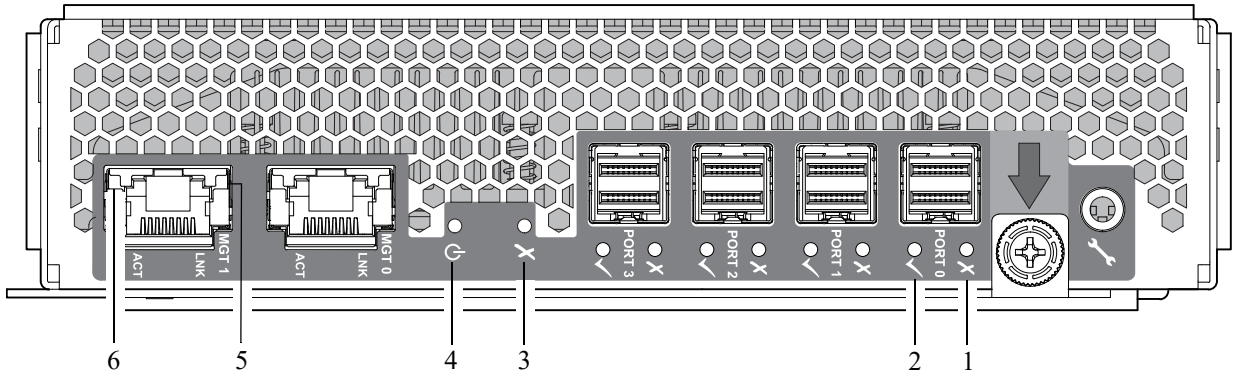
Each IOM maintains Vital Product Data (VPD) in EEPROM device and are interconnected by I2C buses on the midplane creating an interlink between the two modules. An enclosure system fault occurs when incompatible configurations are detected.

Refer to FRU Replacement Time Limit ([Table 12](#)) for maximum allowable time to replace FRUs. See section [“Replacing an IOM” \(page 85\)](#) for replacement instructions.

NOTE: For a description of IOM LEDs, see [“12Gb/s IOM LEDs” \(page 30\)](#).

12Gb/s IOM LEDs

Insert IOM into a slot as shown in [Figure 6 \(page 20\)](#).



LED	Description	Definition
1	12Gb SAS Fault ¹	Off — No fault detected. Amber — A fault has been detected on the port.
2	12Gb SAS Link Status and Activity ¹	Off — No link detected. Green — The port is connected and the link is up. Blinking green — The link has I/O activity.
3	Fault	Off — The IOM is operating normally. Amber — A fault has been detected or a service action is required.
4	Power OK	Green — The IOM is operating normally. Blinking green — System is booting. Off — The IOM is powered off.
5	Ethernet Port Link Speed ²	Not Applicable (Port Disabled).
6	Ethernet Port Link/Active Status ²	Not Applicable (Port Disabled).

1—This LED description applies to all 12Gb SAS ports (Port 0 through 3)

2—This LED description applies to both management ports (Port 0 and Port 1)

Figure 15 LEDs: IOM – rear panel

Overview of top panel LEDs

To view LEDs of components that are accessible from the Main Bay & Controller Bay covers, you must first remove the lid for the compartment in which the component is installed. The enclosure top panel is shown in [Figure 9 \(page 22\)](#).

Drive carrier module

The drive carrier module comprises a hard drive held by a carrier.

- Each 4U106 drive slot can hold a single low profile (1.0-inch) 3.5-inch form factor drive in its carrier.
- Each 4U106 drive slot can hold a single low profile (5/8-inch) 2.5-inch form factor drive with adapter in its carrier.
- The drive modules are inserted into vertically aligned slots that are accessible from the top of the enclosure. While facing the front of the enclosure, properly orient the drive module for insertion into the slot:
 - Hold the module so that the front is facing you (latch tab on left, and drive PCB facing up).
 - Revolve the module -90° about the horizontal axis (latch is facing up, module is standing on end)
 - Revolve the module 90° about the vertical axis (latch is facing up, drive PCB is facing left).

The carriers have mounting locations for:

- Qualified SAS drives (LFF/SFF).
- Qualified SATA drives (LFF/SFF).
- Qualified SSDs (SFF).

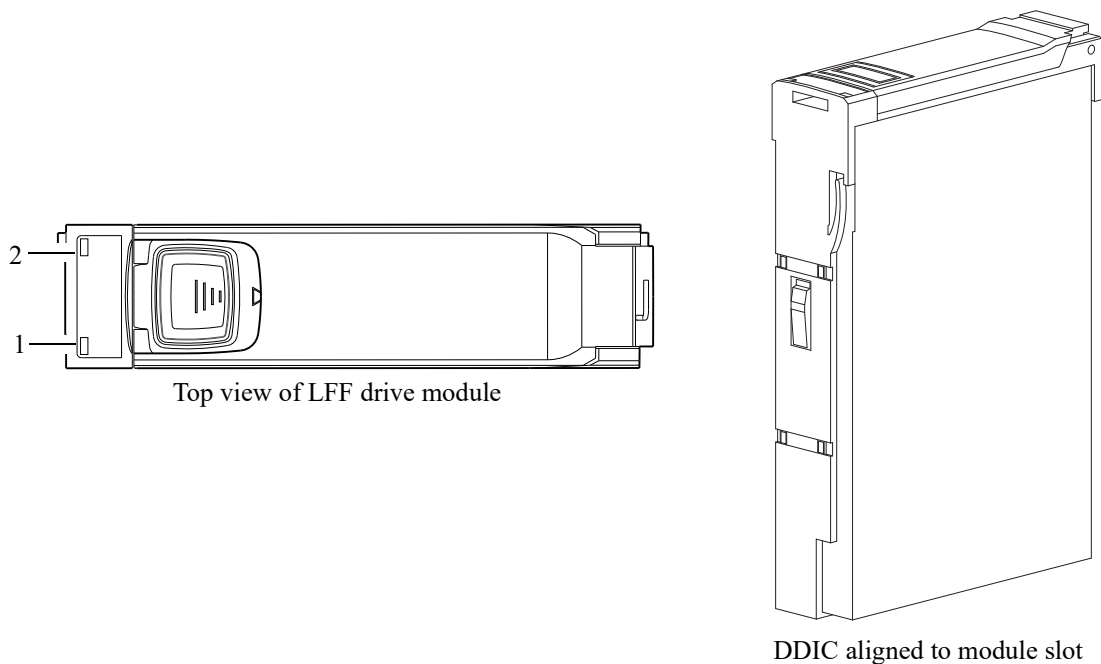
A plastic casing holds and provides protection for each drive. The drive with protective casing is known as a drive module. The front cap also has an ergonomic handle that gives the following functions:

- Secure location of the carrier into and out of drive slots.
- Positive spring-loading of the drive/midplane connector.

The carrier can use this interface:

- Dual path direct dock SAS.

NOTE: Pictorial views of the supported DDIC with LFF drive are provided below. Modules are shown oriented for insertion into drive slots located on the enclosure top panel.

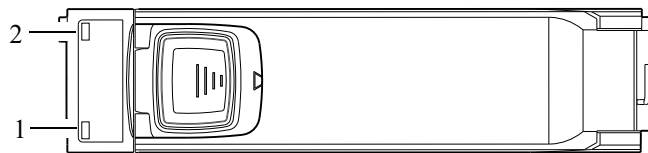


LED	Description	Definition
1	Not used	Not applicable.
2	Fault or Identify	Off – the Disc Drive in Carrier is operating normally. Amber – A fault has been detected or a service action is required. Amber 1s on / 1s off – application requested identification. Amber - 3s on / 1s off - see log for fault conditions.

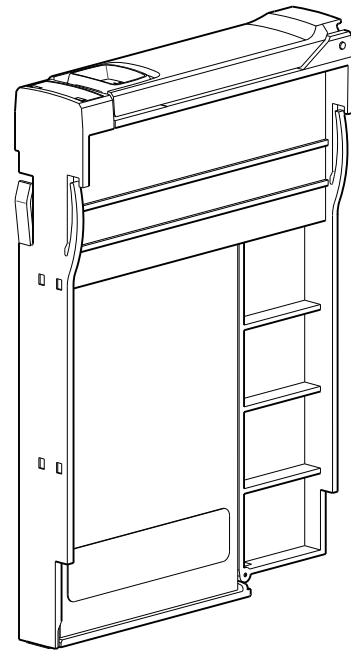
Figure 16 LEDs: Dual path LFF 3.5" drive carrier modules – top panel

If you need to replace this module, see FRU Replacement Time Limit ([Table 12](#)) for more details. For additional information about LFF drive LED behavior, see “[LEDs](#)” ([page 66](#)).

NOTE: Pictorial views of the supported DDIC with SFF drive and adapter are provided below. Modules are shown oriented for insertion into drive slots located on the enclosure top panel.



Top view of SFF drive module



DDIC aligned to module slot

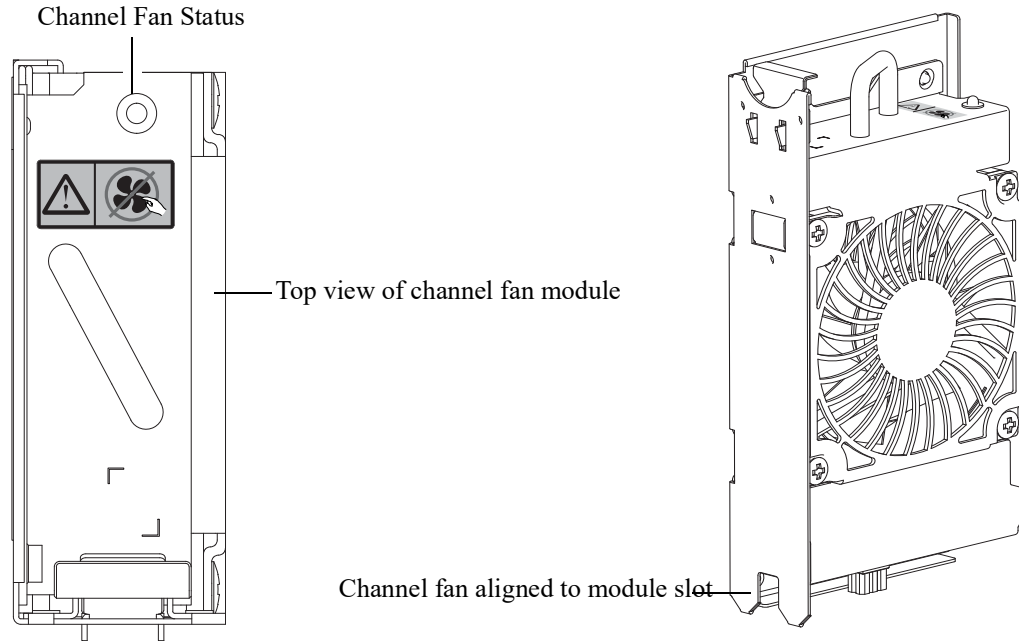
LED	Description	Definition
1	Not used	Not applicable.
2	Fault or Identify	Off – the Disc Drive in Carrier is operating normally. Amber – A fault has been detected or a service action is required. Amber 1s on / 1s off – application requested identification. Amber - 3s on / 1s off - see log for fault conditions.

Figure 17 LEDs: Dual path SFF 2.5" drive carrier modules – top panel

If you need to replace this module, see FRU Replacement Time Limit ([Table 12](#)) for more details. For additional information about SFF drive LED behavior, see [“LEDs” \(page 66\)](#).

Controller channel fan module

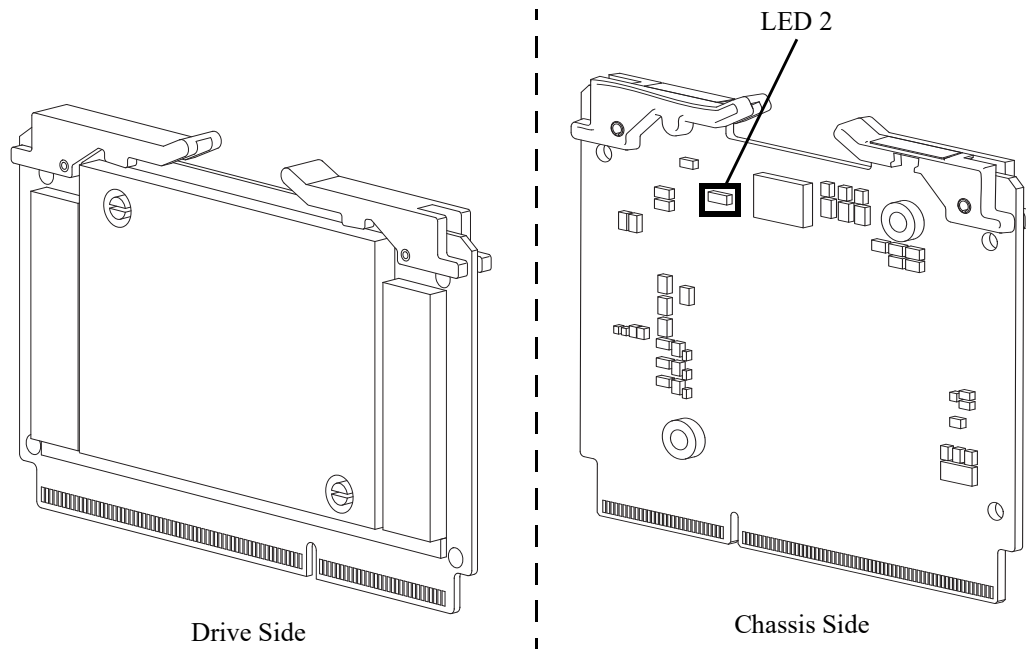
The controller channel fan module supplements the system fans by circulating airflow within the enclosure controller channel, and providing cooling for the IOMs. If you need to replace this module, see FRU Replacement Time Limit (Table 12) for more details.



Module LED	LED behavior states		
Channel Fan Status LED:	Channel Fan OK (Off)	Fan fault ID (amber/blinking amber)	Power off (Off)

Figure 18 LEDs: Controller channel fan module – top panel

HS Expander module



Module LED	LED behavior states		
HS Expander Status LED:	Expander OK (Off)	Expander fault ID (amber/blinking amber)	Power off (Off)

Figure 19 LEDs: HS Expander module – top panel

If you need to replace this module, see FRU Replacement Time Limit ([Table 12](#)) for more details.

Enclosure management

IOMs actively manage the enclosure. Each module has a SAS expander with its own storage enclosure processor (SEP) that provides a SCSI Enclosure Services (SES) target for a host to interface to through the ANSI SES Standard. If one of these modules fails, the other module will continue to operate.

Refer to a module's specification or the SES Interface specification for definitions of the module's functions and its SES control.

The storage system also provides a command-line interface (CLI).

Command-line interface

The command-line interface can be accessed in the following ways:

- Serial port connection
- Ethernet Telnet connection
- Ethernet WBCLI utility
- SESCLI utility

The CLI utilities and capabilities are described in the GEM Command-line Interface document. Contact your account manager for additional information.

3 Installation

Installation checklist

This chapter shows how to plan for and successfully install your enclosure system into an industry standard 1.2 m rack cabinet.

△ **CAUTION:** To install the system, use only the power cords supplied, or power cables that match the specification quoted in “AC power cords/universal jumper cords” (page 93).

The following table outlines the steps required to install the enclosure. To ensure successful installation, perform the tasks in the order presented. For rackmount installation, temporarily place all drive modules in a static-protected area, and then install them after the 4U106 is installed in the rack.

Table 4 Installation checklist

Step	Task	Where to find procedure
1	Unpack the enclosure	See “Unpacking the enclosure” (page 37).
2	Plan and prepare for installing the 4U106 into the rack ¹	See “Required tools” (page 42). See “Requirements for rackmount installation” (page 43).
3	For rackmount installation, defer installing drives until the 4U106 is rack-mounted ²	See “Populating drive slots” (page 23). See “ESD precautions” (page 73).
4	Install the 4U106 into the rack space	See “Installing the 4U106 enclosure” (page 43).
5	Cable the 4U106 to the compatible server HBA or RBOD	See Figure 56 and Figure 57 (page 63).
6	Cable the 4U106 to any compatible EBODs	See Figure 56 and Figure 57 (page 63).
7	Connect power cords	See “Power cord connection” (page 63).
8	Test enclosure connectivity	See “Testing enclosure connections” (page 64).

1-The environment in which the enclosure operates must be dust-free to ensure adequate airflow.

2-Locate the drive modules and temporarily place them in a static-protected environment for population of the drive rows once the enclosure is installed and secured into the rack.

Planning for installation

Before beginning the enclosure installation, familiarize yourself with the system configuration requirements. The figures listed below show the locations for each plug-in module:

- 4U106 enclosure front panel: see Figure 3 (page 18)
- 4U106 enclosure rear panel: see Figure 4 (page 19)
- 4U106 enclosure top panel: see Figure 9 (page 22), Figure 10 (page 23), and Figure 11 (page 23)

ⓘ **IMPORTANT:** Installation work should be performed by qualified service personnel.

Table 5 Storage system configuration

Module type	Location	Description
Power supply unit	Rear panel	Two PSUs provide full power redundancy, allowing the system to continue to operate while a faulty PSU is replaced.
System fan	Rear panel	Four system fans provide cooling, allowing the system to continue to operate while a faulty system fan is replaced.
I/O module	Rear panel	Up to two IOMs of the same model type are supported. In single-IOM configurations, the IOM must be installed in IOM slot No.0 and an IOM blank must be installed in IOM slot No.1.
Drive module	Top panel	See “Populating drive slots” (page 23) .
Channel fan	Top panel	Up to two channel fan modules of the same model type are supported.
HS Expander	Top panel	Eight removable hot swap expanders are supported: one per 12-drive row.

Preparing for installation

△ **CAUTION:** The enclosure—together with all its component parts—is too heavy to manually lift and install into the rack cabinet. A minimum of three people and a suitable mechanical lift are required to hoist the enclosure and install it into the rail kit assembly within the rack.

Make sure you wear an effective anti-static wrist or ankle strap and obey conventional ESD precautions when touching modules and components. Do not touch midplane, motherboard, or module connectors. See also [“ESD precautions” \(page 73\)](#).

This section provides important preparation requirements and handling procedures for use during product installation.

Preparing the site and host server

Before beginning the enclosure installation, verify that the site where you will install your storage system has the following:

- A mechanical lift that can safely hoist a ~100 lb high-density enclosure for installation into a 1.2 m rack.
- A proper redundant AC power source or a rack power distribution unit (PDU) with an Uninterruptible Power Supply (UPS).
- A host computer configured with the appropriate software, BIOS, and drives. Contact your supplier for the correct software configurations.
- A static-protected environment for temporarily storing drive modules if the enclosure is intended for rack-mount use. See the **CAUTION** on [page 12](#) before unpacking the enclosure and installing it in the rack.

Before installing the enclosure, verify the existence of the following:

- SAS HBA
- Qualified cable options for host connection and EBOD cascades
- One suitable C20 to C19 power cord per PSU
- Rail kit and cable management arm (for rack installation)
- Drive modules for use in populating the drive slots after the enclosure is secured into the rack.

Refer to your supplier for a list of qualified accessories for use with the enclosure. The accessories box contains the power cords and other accessories.

Unpacking the enclosure

Before unpacking the enclosure, familiarize yourself with the exploded view of packaging components that pertain to your enclosure product. See “[Enclosure packaging](#)” (page 95).

1. Examine the packaging for FRUshes, cuts, water damage, or any other evidence of mishandling during transit. If you suspect that damage has happened, photograph the package before opening for possible future reference. Retain original packaging materials for use with returns.
2. Follow the unpacking sequence pertaining to 4U106 enclosures as shown in the [Figure 77](#) (page 96) and [Figure 78](#) (page 97). Removing packaging materials like lids, inerts, and side walls improve accessibility of the lifting personnels as they don't need to bed over a lot over packaging and to lift the enclosure as high up.

△ CAUTION: The enclosure does not ship with drive modules installed, but all rear panel FRU modules are installed. This partially populated enclosure is quite heavy: 44.9 kg (99 lb).

You can remove the enclosure from its shipping box using the standard belt-style lifting straps. If the optional lift handles are available, you can use them instead of the straps to remove the enclosure from its box.

- a. Default method: remove the enclosure from its box using the straps.

See [Figure 20](#) and the CAUTION above and below the illustration. The illustration shows buckled belt-straps secured longitudinally on the 4U106 enclosure. Only the straps and plastic bag are shown. They are isolated from the remainder of the packaging. For more information about the packaging materials, see “[Enclosure packaging](#)” (page 95).

△ CAUTION: Verify that each belt strap is securely wrapped and buckled before performing the lift.

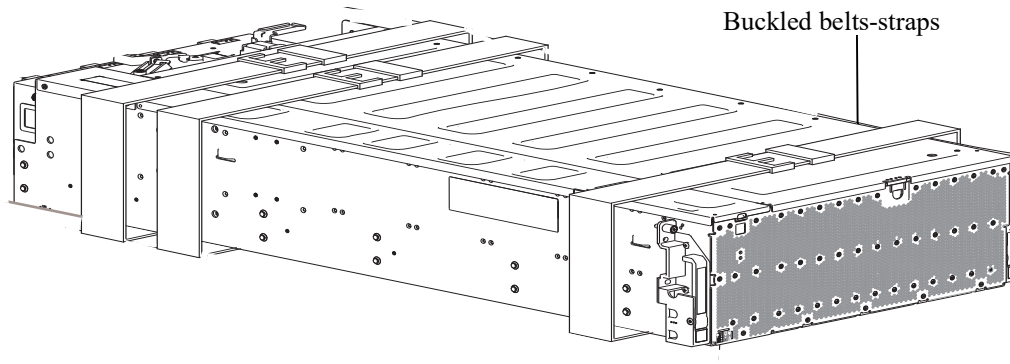


Figure 20 Unpacking the 4U106 enclosure using straps

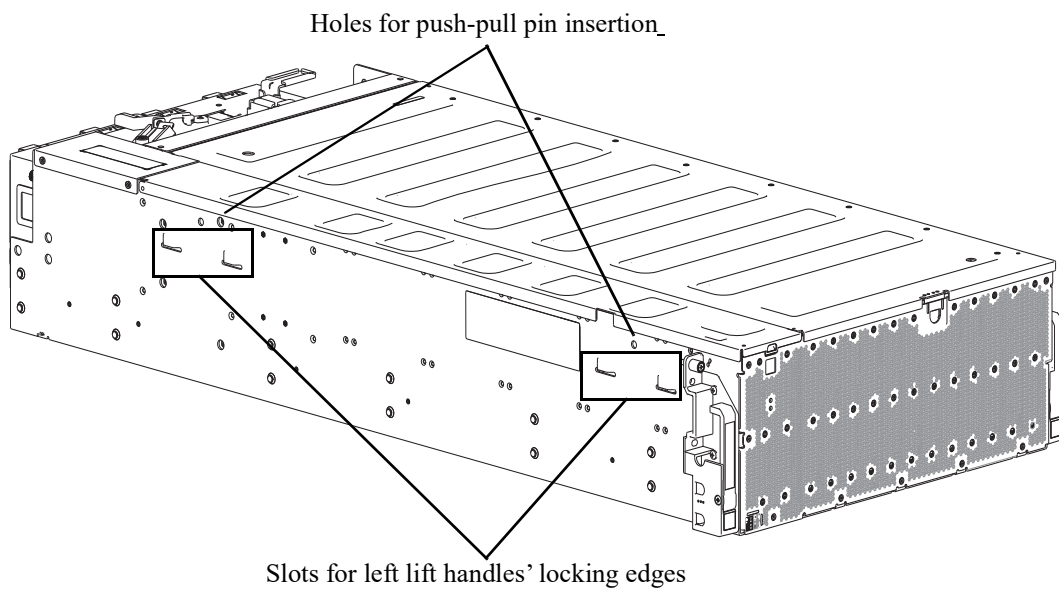
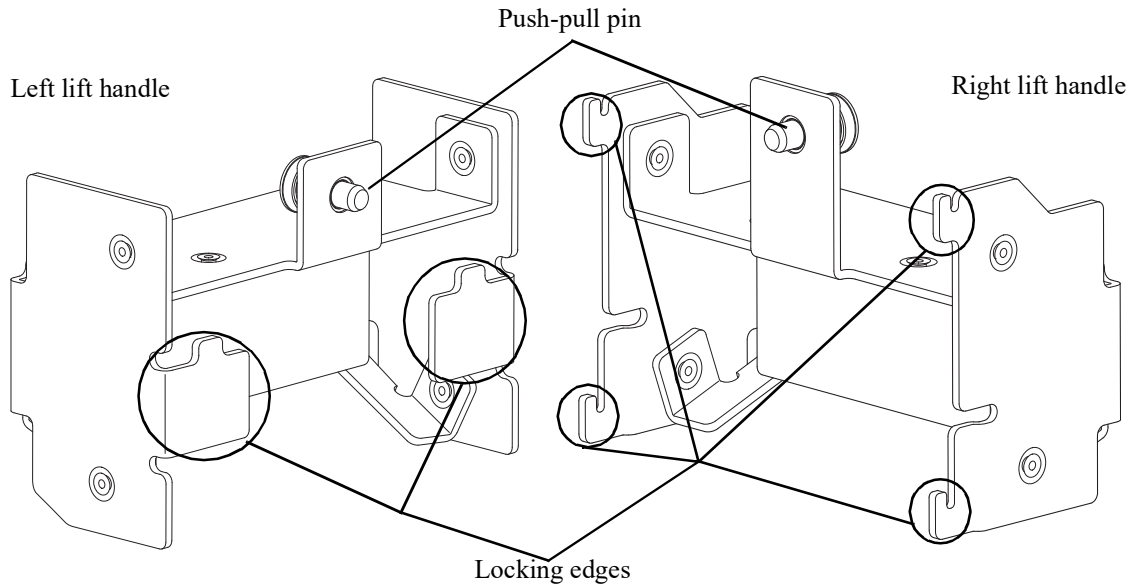
△ CAUTION: With three persons—positioned one at each rear corner, and one at the front of the enclosure—grip the straps securely by the loops, and lift the enclosure out of the box using appropriate lifting technique. Place the enclosure in a static-protected area.

Except for the drive modules, enclosures are supplied with all integrated PCBAs and all plug-in modules installed. For information about plug-in module replacement, see “[Module removal and replacement](#)” (page 73). Drive modules are installed separately *after* the enclosure is mounted in the rack.

Upon completion of this step, go to [step 6](#) on [page 42](#).

b. Alternative method: remove the enclosure from its box using the optional lift handles.

Figure 24 shows left, and right lift handles along with the slots present on the enclosure sidewalls. Each 4U106 enclosure supports four lift handles (two identical lift handles on the left side, and two identical lift handles on the right side). Carefully mark the difference between the left and right lift handles, and their slots present on the enclosure.



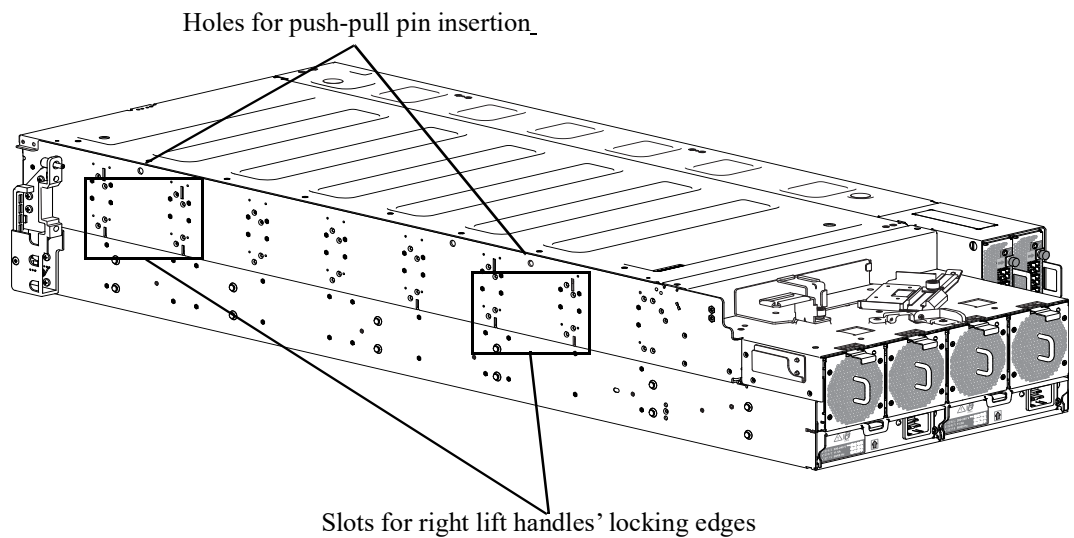


Figure 21 Lift handles and their slots present on the enclosure

See [Figure 24](#) and the **CAUTION** above and below the illustration. Illustrations are isolated from the remainder of the packaging. As a visual aid for the unpacking task, see “[Enclosure packaging](#)” (page 117). The illustration shows lift handles slots present at the front of the enclosure. Similar slots are present at the rear of the enclosure. The bottom illustration shows two steel lift handles installed on the left side of the chassis just below the enclosure cover.

To attach the left lift handles to the enclosure chassis follow the steps below.

CAUTION: Remove the plastic bag present on the enclosure and keep it out of the way before attaching the lift handles.

1. Identify the left lift handles (see [Figure 24](#)) and remove them from the packaging box.

2. To attach the front left lift handle, align it in below the front left lift handle slots present on the left sidewall of the enclosure as shown in [Figure 22](#).

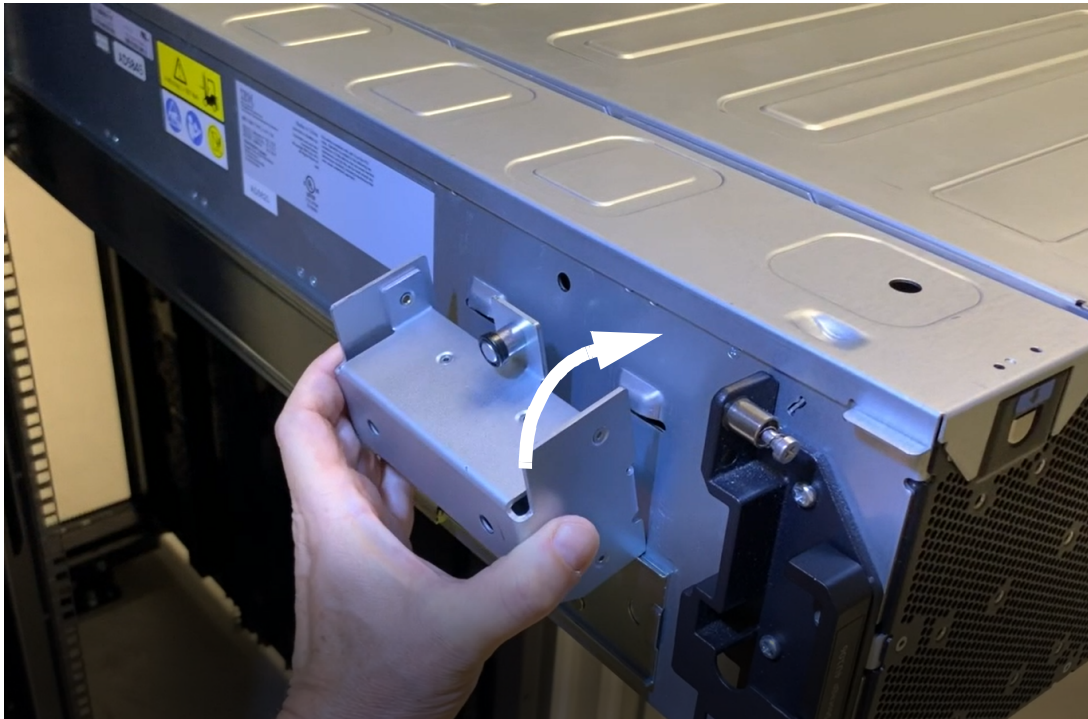


Figure 22 Aligning front left lift handle to the enclosure slots

3. Hold the lift handle flat against the enclosure sidewall and slide it upward till the push-pull pin gets engaged into the push-pull pin hole. This push-pull pin along with the lift handle locking edges, locks the lift handle

firmly against the enclosure sidewall.

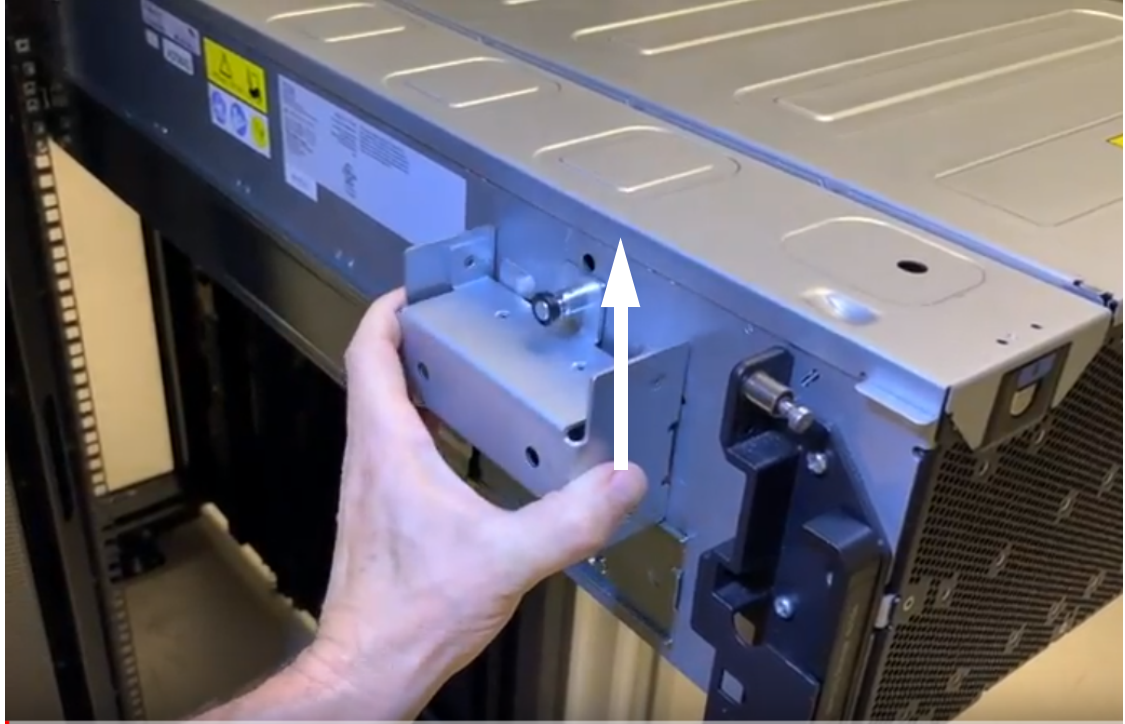


Figure 23 Sliding the front left lift handle upward

4. Follow the [step 1](#) to [step 3](#) and attach the second left lift handle to the another slot present on the left sidewall of the enclosure.
5. Follow [step 1](#) through [step 4](#) to attach the right lift handles on the right sidewall of the enclosure.

Two additional lift handles are attached on the right side of the enclosure (hidden in the bottom illustration).

CAUTION: Verify that each of the four lift handles is securely fastened to the enclosure sidewalls (sheet metal) before performing the lift.

These handles are designed to support the weight of a partially populated enclosure: chassis and FRUs only (as shipped). The handles are not designed to hold the weight of a fully populated enclosure which includes the drives.

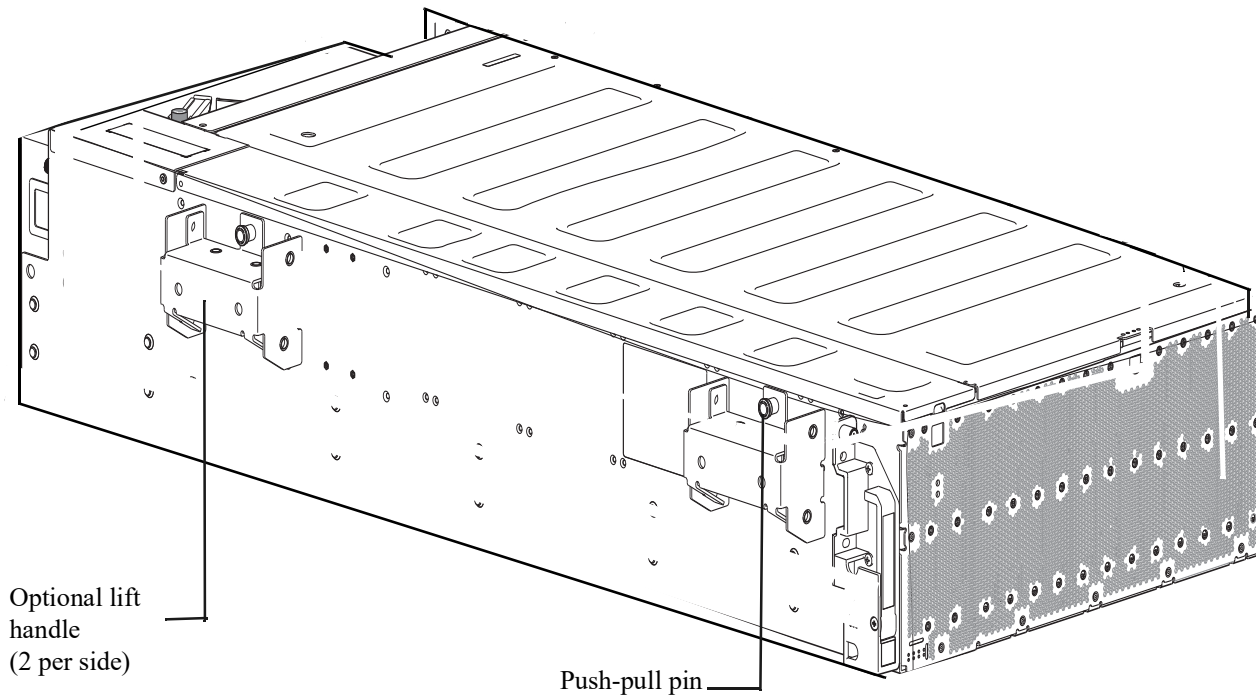


Figure 24 Unpacking the 4U106 using lift handles

△ **CAUTION:** With four persons—positioned one at each corner of the enclosure—grip the handles securely, and lift the enclosure out of the box using appropriate lifting technique. Place the enclosure in a ESD-protected area.

Except for the drive modules, enclosures are supplied with all integrated PCBAs and all plug-in modules installed. For information about plug-in module replacement, see [“Module removal and replacement” \(page 73\)](#). Drive modules are installed separately *after* the enclosure is mounted in the rack.

6. Prepare to install and set up the enclosure.
 - a. Before installing the enclosure into a rack, see the **CAUTION** on [page 12](#) and the **WARNING** on [page 44](#).
 - b. For rackmount installation, do not install the drive modules until after the enclosure is mounted in the rack.

Required tools

- #2 Phillips screw driver
- #10 Torx Driver

Requirements for rackmount installation

The enclosure can be installed in an industry standard 1.2 m cabinet capable of holding 4U form factors.

- Minimum depth: 1,206.5 mm (47.5") from rack posts to maximum extremity of enclosure (includes rear panel cabling and cable bend radii).
- Weight: Up to 140 kg (310 lb), dependent upon configuration, per enclosure.
- The rack should cause a maximum back pressure of 5 pascals (0.5 mm water gauge).
- Before you begin, ensure that you have adequate clearance in front of the rack for installing the rails and the CMA.
- Follow the sequence of tasks provided in the [“Installation checklist” \(page 35\)](#).

△ CAUTION: Enclosure rackmount precautions

- The mechanical lift and the rack must be level in all planes, and with respect to each other. Failure to comply could result in mechanical failure of the rail kit.
- Use a “spotter” to observe installation from the rear of the rack. The spotter should ensure the inner rail is fully mated with the middle rail track throughout installation.

Rackmount rail kit


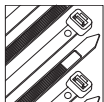

Rack mounting rails are developed for use with the 4U106 enclosure that fits into 1.2 m rack cabinets. These rails have been designed and tested for the maximum enclosure weight, and to ensure that multiple enclosures may be installed without loss of space within the rack. Use only the Seagate supplied rail kit and mounting hardware.

Installing the 4U106 enclosure

Enclosure installation involves interrelated steps and product-kit sub assemblies.

The cable management arm (CMA) comprises subassemblies that attach to the 4U106 enclosure, rails, and rack.

Table 6 CMA kit package contents

Item no.		Quantity	Description	Required tool
1		6	Screws, M4x4mm length, panhead Phillips (Screws for periscope bracket, and C bracket)	#2 Phillips screwdriver (6" length)
2		1	Zip ties	None
3		4	Velcro strips	None

Each enclosure is supplied with two types of rail kits. One is an outer rail kit, and the other is an inner rail kit. Each rail kit comprises left and right rail subassemblies that attach to the 4U106 enclosure and the rack. The inner rails are shipped inside the outer rails and need to be removed for installation on the chassis. See [Table 7](#) and [Table 8](#).

Table 7 Outer rail kit package fasteners

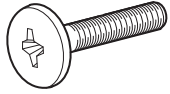

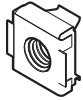

Item no.		Quantity	Description	Required tool
4		10	Screws, 10-32x3/4" length, Truss head (Screws to attach outer rails to the rack posts)	#2 Phillips screwdriver (12" length)
5		2	Screws, M5 0.8x4mm length (Screws to lock a chassis to rack posts when transporting the rack with the chassis installed)	#2 Phillips screwdriver (6" length)
6		4	10-32, Cage nut, Retainers (Nuts to retain quantity 4 of Item 4 screws)	None

Table 8 Inner rail kit package fasteners

Item no.		Quantity	Description	Required tool
7		10	Screw, M3-05x2.75" length, Torx head, Low Profile (Screws to attach inner rails to the chassis)	T10 screwdriver (6" length)

⚠ WARNING! Do not attempt to install the enclosure into the rack with drives preloaded into drive slots. The enclosure should be installed without drives during rackmount installation. Unload drives (if installed) to an ESD-protected area and label them. Failure to observe this Warning and the following guidelines could result in serious injury. Although you can further lighten the enclosure by removing FRUs, it is not necessary to do so.

This procedure describes adjustment and installation of left and right rail subassemblies, followed by installation of the 4U106 enclosure into the rack.

Enclosure installation involves interrelated steps and product-kit subassemblies. The rail kit comprises left and right rail subassemblies that attach to the 4U106 enclosure and the rack. The cable management arm (CMA) comprises subassemblies that attach to the 4U106 enclosure, rails, and rack.

Removing the inner rails from the rail kits

1. Remove a rail kit from the packaging box and keep it as shown in [Figure 25](#) below.

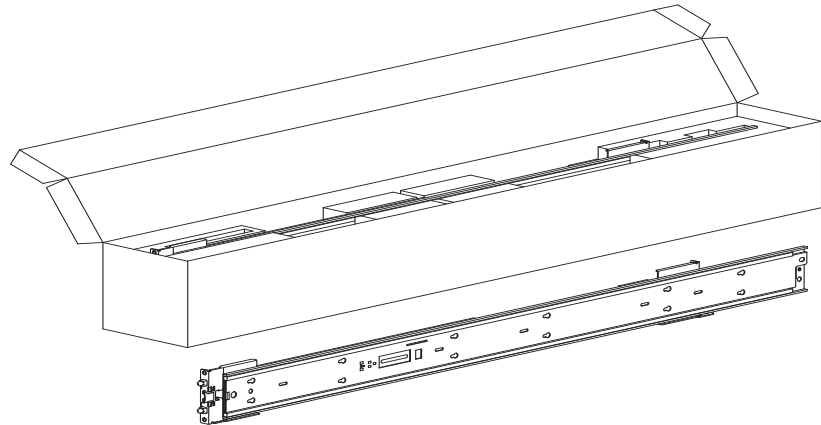


Figure 25 Removing a rail kit from the packaging box

2. Slide the mid and inner rail out until it stops at mid-point. Continue to slide the inner rail until clicks indicating the Safety lock is engaged.

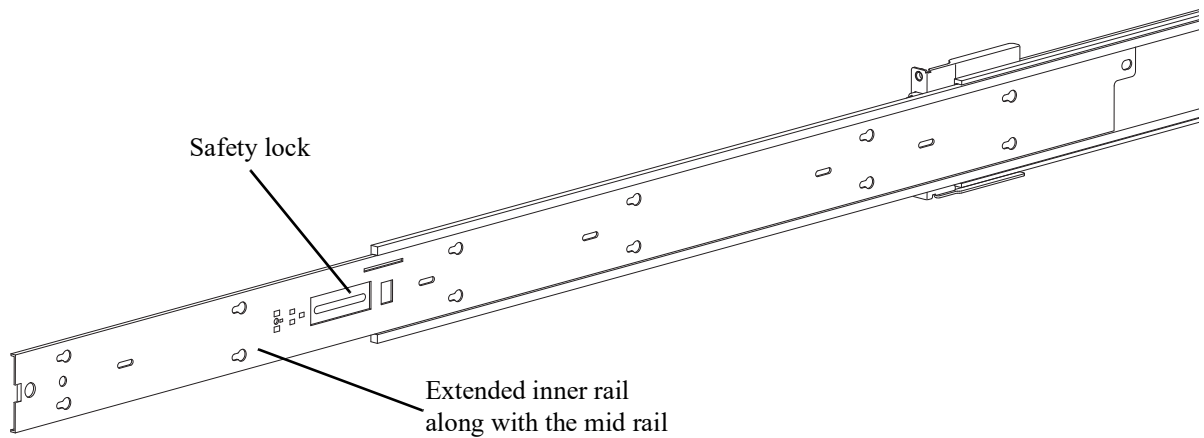


Figure 26 Extending the inner rail

3. Flip the rail kit, press the Safety lock (Figure 27) to unlock the inner rail, and slide it out from the mid rail.

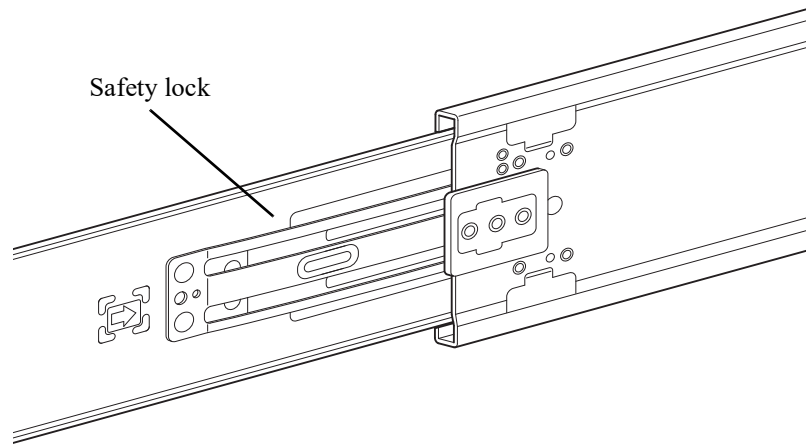


Figure 27 Pressing the safety lock

4. Flip the rail kit back to its original position, and locate the actuator switch.

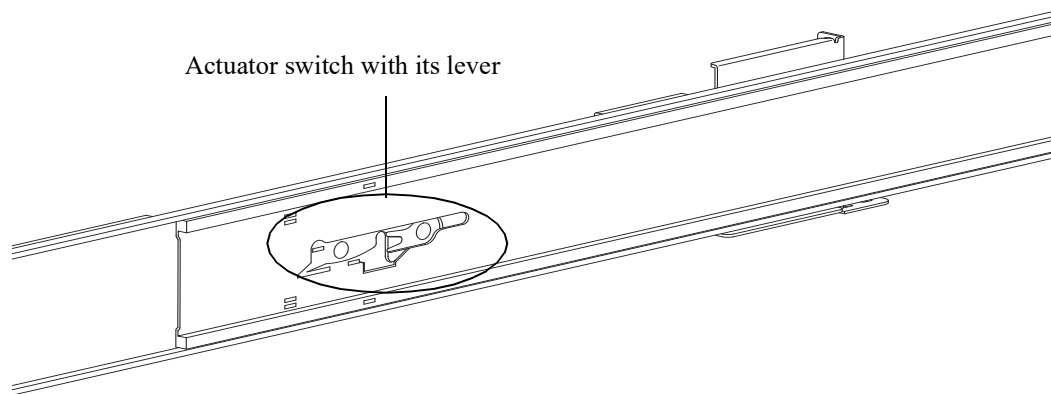


Figure 28 Locating the lever present on the Actuator switch

5. Rotate actuator switch lever in the direction marked by the arrow (Figure 29), and slide the mid rail back to its original position.

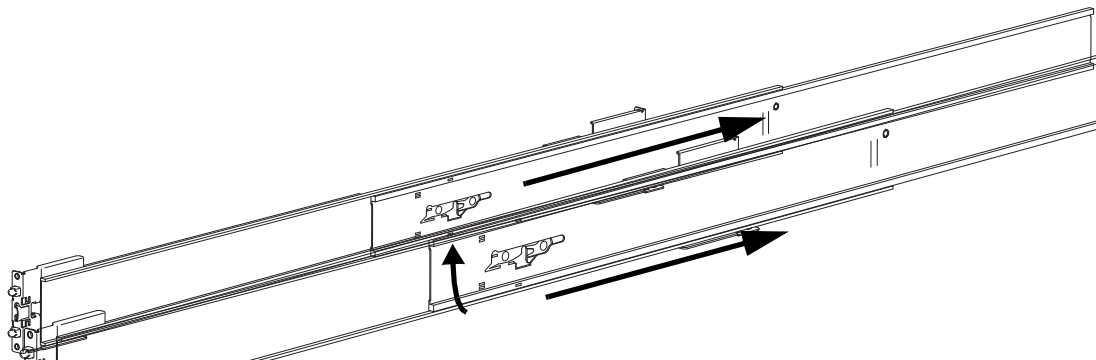


Figure 29 Rotating the lever on the actuator switch and sliding back the mid rail

Figure 30 shows the separated inner rail from its rail kit.

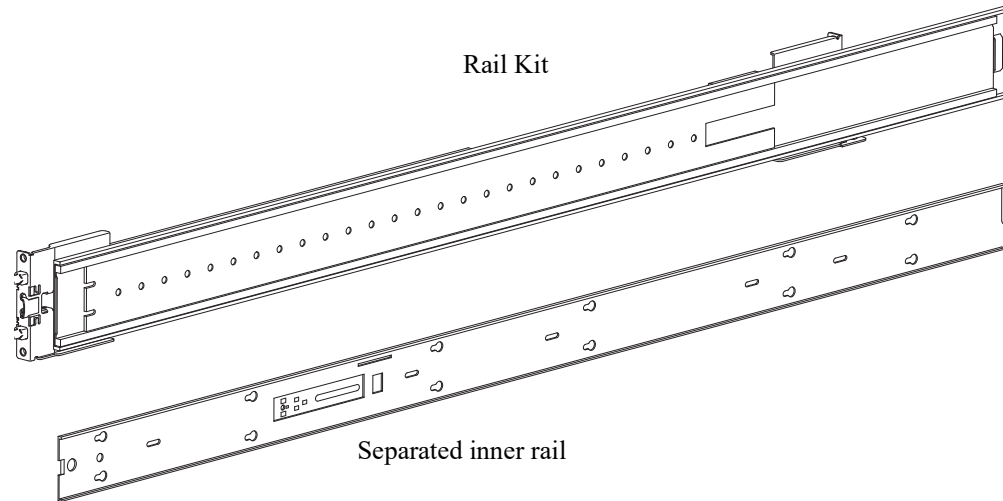


Figure 30 Separated an inner rail from the rail kit

6. Follow [step 1](#) through [step 5](#) to remove the other inner rail from its rail kit.

Attaching the inner rack rails to the physical enclosure

Correctly attaching the left and right inner rack rail subassemblies to the physical enclosure allows for proper seating of the inner rack rails within the middle rack rails. This ensures that the enclosure will slide smoothly into and out of the rack.

Before attaching the inner rails to the physical enclosure, make sure you have separated the inner rails from its rail kits as described in [“Removing the inner rails from the rail kits”](#) (page 45).

Attaching the left inner rail to the physical enclosure

1. Locate inner and outer edge on rail (P/N: 727648700) as in [Figure 31](#).

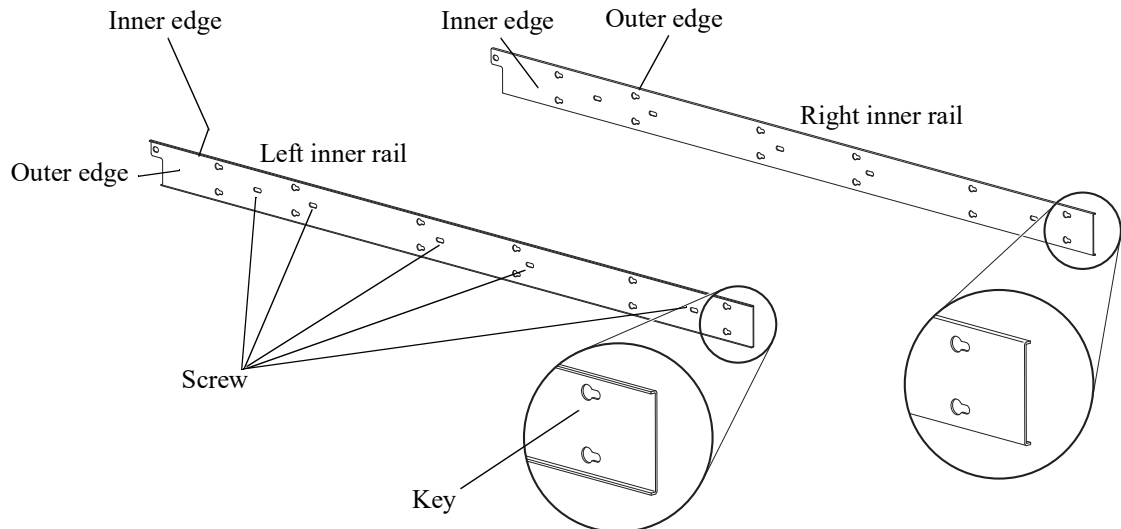
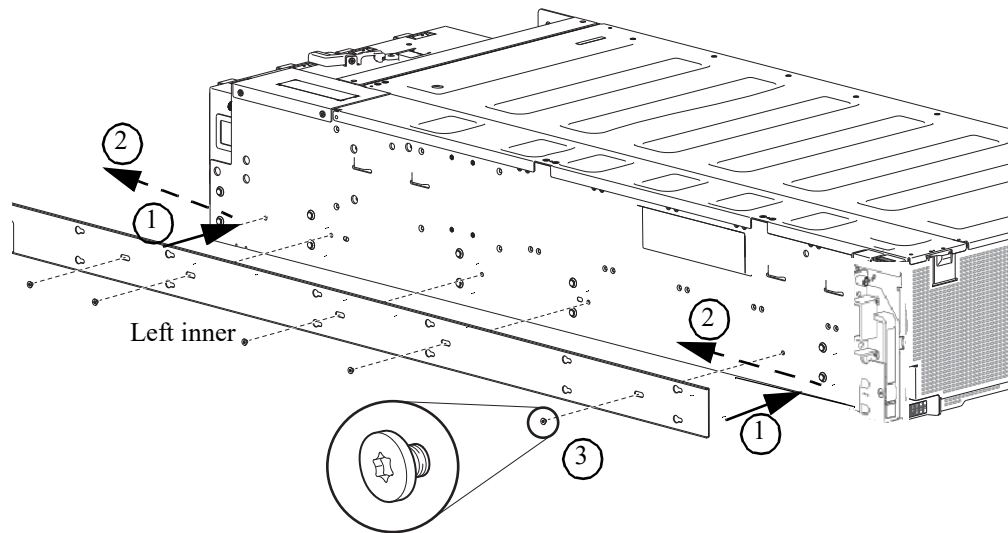


Figure 31 Right and left inner rails

2. While facing the left side of the physical enclosure, align the left inner rail key holes (see [Figure 31](#)) to the 12 T-pins present on the left sidewall of the enclosure (see [Figure 32](#)).



1. Aligning the left inner rail to the enclosure sidewall
2. Sliding back the inner rail through the key holes to lock it against the T-pins (see [Figure 33](#))
3. Securing the rails using M3 screws

Figure 32 Attaching left inner rail to the left sidewall of the physical enclosure

3. Insert the key holes present on the left inner rail into the T-pins present on the left sidewall of the enclosure, and slide the left inner rail towards the enclosure back until it locks itself into the slots (see [Figure 33](#)).

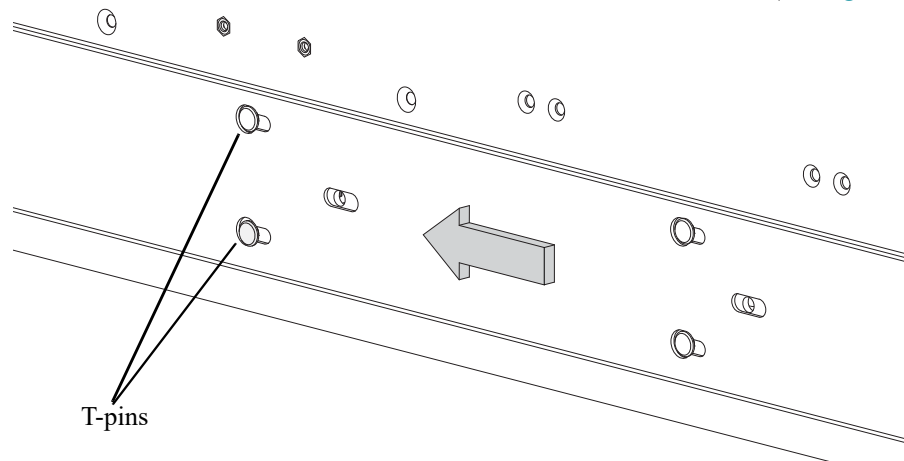


Figure 33 Locking inner rail over the T-pins

4. Make sure that the screw holes (quantity 5) on the left inner rack rail are aligned to the respective screw holes present on the left side of the physical enclosure.
5. Using the quantity-5 M3 screws provided, secure the left inner rack rail to the left side of the physical enclosure. Torque each screw to 1.36 N-m (12 lbf-in).

Attaching the right inner rail to the physical enclosure

1. Locate inner and outer edge on rail (P/N: 727648700) as in [Figure 31](#).
2. While facing the right side of the physical enclosure, align the right inner rail key holes (see [Figure 31](#)) to the 12 T-pins present on the left sidewall of the enclosure.

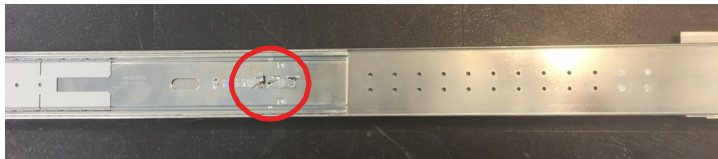
3. Insert the key holes present on the right inner rail into the T-pins present on the right sidewall of the enclosure, and slide the right inner rail towards the enclosure back until it locks itself into the slots (see [Figure 33](#)).
4. Make sure that the screw holes (quantity 5) on the left inner rack rail are aligned to the respective screw holes present on the left side of the physical enclosure.
5. Using the quantity-5 M3 screws provided, secure the right inner rack rail to the right side of the physical enclosure. Torque each screw to 1.36 N-m (12 lbf-in).

Adjusting the rack rails

1. Measure the rail-span depth distance from rear rack post to front rack post, and record this dimension.



2. Take the left outer rail subassembly (P/N: 727648200) in hand; then rotate the middle slide release, and fully extend the middle slide.



Middle slide – fully extended
(Slide release latch identified above)



Middle slide release detail

3. Unscrew and remove the quantity-4 rail kit rear-mounting bracket screws to adjust the rack post-to-post distance for the left rail subassembly.

Adjust the rail for the rack post-to-post distance



Attachment holes for Step No.3 are identified above



Rail-mounting bracket adjusted at 35", by default

Figure 34 Unscrewing rear-mounting bracket screws

4. Relocate the left rail mounting bracket to approximately match the rack post-to-post distance recorded in [step 1](#) on [page 49](#).

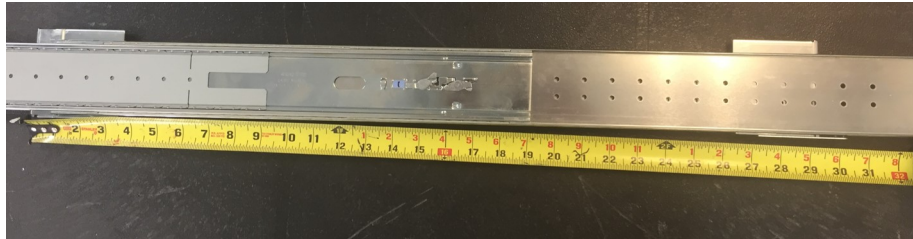


Figure 35 Figure showing screws tightened at 25"

This bracket has ~1.5" of available adjustment after the screws are secured. After torquing the quantity-4 screws removed in [step 3](#) on [page 49](#), verify that the bracket can be adjusted to the exact rack post-to-post distance determined in [step 1](#) on [page 49](#). Torque to 1.36 N-m (12 lbf-in).

5. Repeat [step 1](#) through [step 4](#) for the right outer rail subassembly (P/N: 727654200).



Figure 36 Right rail after adjustment

6. Take the right outer rail subassembly in hand, and flip it over (rotate it 180° along its longitudinal axis).



Attachment holes for Step No.7 are identified above

Figure 37 Attachment holes

- Using the quantity-4 panhead screws (P/N: 727666900) provided with the CMA kit, attach the CMA B bracket (P/N: 735166500) to the rear end of the outer slide. The images below show the progression of steps from left to right. Torque each screw to 2.0 N-m (18 in-lbf).



CMA "B" bracket (inner side)



panhead screws

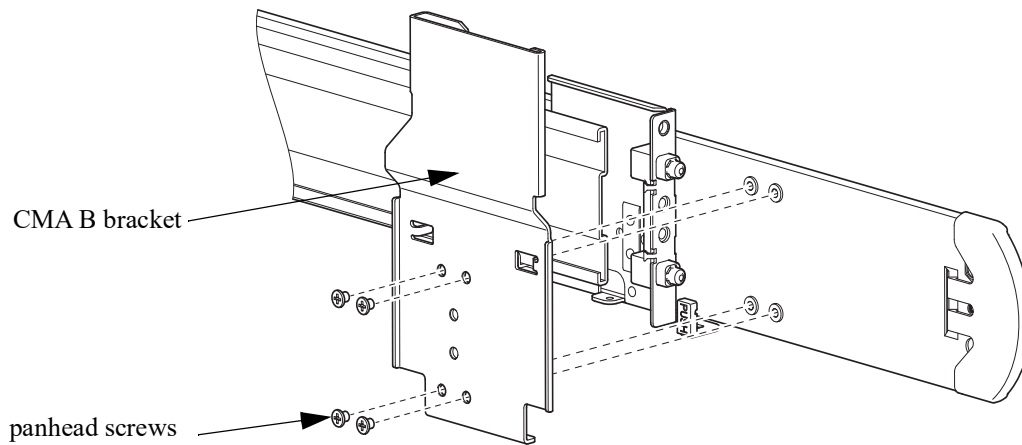


Figure 38 Attaching CMA "B" bracket to the right rail

Installing the rack rails into the rack

- Insert the right rail subassembly into the rack. Attach the adjustable rear mounting bracket to the rail first, ensuring that the rail subassembly occupies the lower 2U portion of the allotted 4U space. The rear mounting bracket spring will clip onto the rail. Ensure that the quantity-2 all-in-one rail kit mounting hardware fully seats into the rack post mounting hole.



Location detail



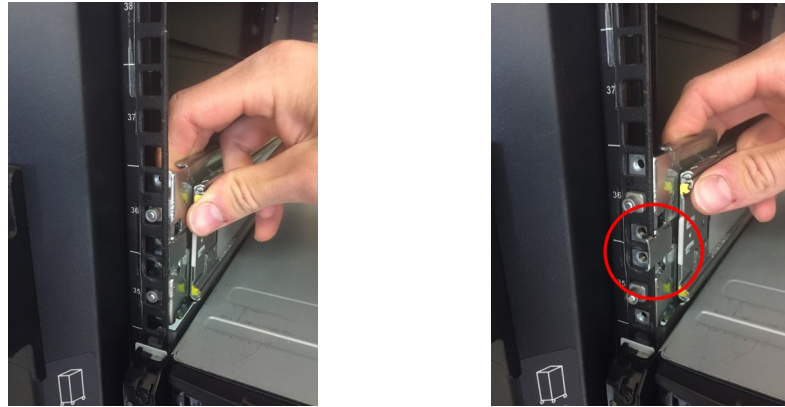
Fastener detail



Attachment spring detail

Figure 39 Installing rack rail into the rack

2. Attach the front mounting bracket to the rack post, ensuring that the rail subassembly occupies the lower 2U portion of the allotted 4U space. The front mounting bracket spring will clip onto the post. Ensure that the quantity-2 all-in-one rail kit mounting hardware fully seats into the rack post mounting hole.



Front rack post attachment details

Figure 40 Attaching front mounting bracket to the rack

3. Secure the front and back rail kit mounting brackets with four (two at the front, and two at the back) of the item 4 (10-32 panhead screws, see [Table 7](#)) (P/N: 01-00000264-00-01) provided, on the top and bottom fastener locations present on the front and the rear mounting brackets. Torque each screw to 3.95 N-m (35 lbf-in).



Figure 41 Securing rails using panhead screws

4. Repeat [step 1](#) on [page 51](#) through [step 3](#) for the left rail subassembly.
5. Insert the quantity-4 (quantity-2 per side) cage nuts (P/N: 01-00000279-00-04) provided into the rack in the second-to-top and third-to-top square holes in the 4U space (mates to thumbscrew and panhead screw in [step 8](#) on [page 55](#)).

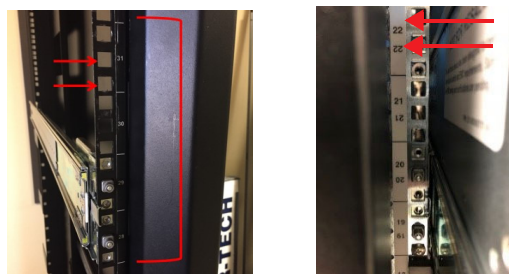
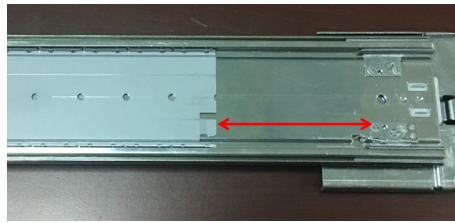
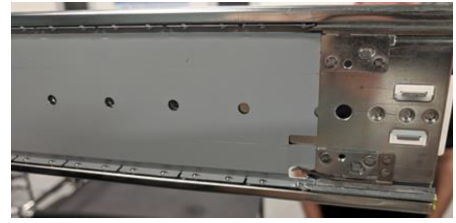


Figure 42 Rack post square hole location detail

6. While heeding the following safe handling precautions, ensure the middle slide ball bearing track is fully seated to the front of the middle slide. This step is critical for proper rail sequencing and full engagement of the inner rail on the middle rail. In the example on the left (below), the ball bearing track is not fully seated to the front of the middle slide.



Incorrect – example



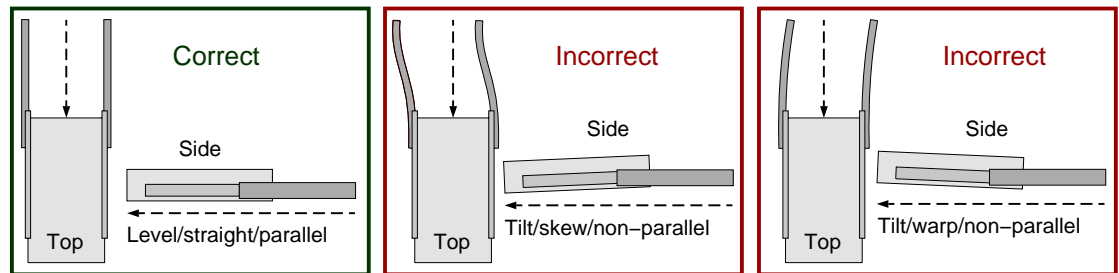
Correct – example

Figure 43 Adjusting middle slide ball bearing track

Installing chassis to the rack

⚠ WARNING! Safe handling precautions:

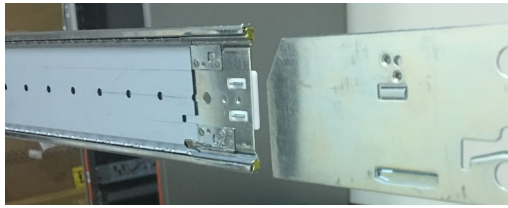
- Do not drop or lift the chassis using a mechanical lift while inner rails are engaged with middle rails. The middle and inner rails should be properly aligned before engagement, so they glide smoothly during the entire insertion.
- The 4U106 chassis must be entirely supported by the mechanical lift until the rails are locked in the service position. Failure to do so can cause mechanical failure and serious personal injury.
- Do not push the chassis into the rack using the mechanical lift. The insertion force must be manual, and unassisted by mechanical force or additional mass. Using the lift for this purpose could damage rails.
- Do not push the chassis into the rack using enclosure front panel as this may misalign or damage the front panel. It is recommended to use the enclosure ears to push the enclosure back into the rack.
- Do not bend the middle rail in order to force alignment with the inner rail. Alignment should be adequately established with the lift.
- If fine-tuning of alignment adjustments are required, do not adjust using the mechanical lift. Adjustments should be made by shifting the chassis itself; not the lift, and not the middle rail.
- Lower the lift only after the service position is reached, and the rail is locked in place. Lower the lift by no more than 2"– 3" while the chassis is inserted from the service position into the rack.
- The inner rails/chassis and the middle rails must be kept level, straight, and fully parallel during the entire installation. Failure to comply can cause inadequate rail engagement, and possible damage to the rails.



Safe-handling thumbnails: inserting the chassis with rails into the rack

1. Extend the middle rail of both the left and right rail kit subassemblies roughly 3" beyond the face of the rack.

- Position the chassis with the lift such that the inner rails are lined up perfectly with the middle rails. The end of both inner rails should be equidistant from the rack face. To make adjustments to the alignment, shift the chassis on the left until alignment of both sides is adequate.



Rail slide alignment detail

Figure 44 Rail slide alignment detail

- Keeping the chassis stationary, pull the middle rails forward onto the inner rails, ensuring full engagement of the inner rails onto the middle slide track. Middle slides should slide freely and smoothly onto inner rails. Difficult middle slide movement during this step typically indicates misalignment.
- Middle rails will eventually “click” into place as the service position locks engage. Ensure both sides engage at the same time, and both inner rails are fully engaged on their respective middle slide tracks.
- Carefully and slowly lower the mechanical lift 2"– 3" so that the weight of the chassis now fully rests on the rail kit. Keep the lift elevation 2"– 3" below the chassis elevation until the enclosure is fully installed in the rack. This is a safety measure in case the rails are not seated properly, or another mechanical/integration failure occurs.
- Locate the inner slide lock springs on both the left and right rail kits, and depress both to disengage the service protection lock. Continue depressing springs while inserting the chassis far enough to bypass the locks on both sides.



Inner view – example

Rail slide assembly details



Outer view– example

Figure 45 Disengaging service protection lock of rails (Only left rail shown above)

- Continue inserting the chassis all the way into the rack, ensuring the chassis ears are coincident with the rack mounting flanges.

- Secure the 4U chassis ears to the rack/rail kit with embedded thumbscrews (quantity-2, 1 per side). For shipping and transport, secure the 10-32 panhead screws provided (P/N: 01-00000264-00-01), and torque to 3.96 N-m (35 lbf-in) (quantity-4, 2 per side).

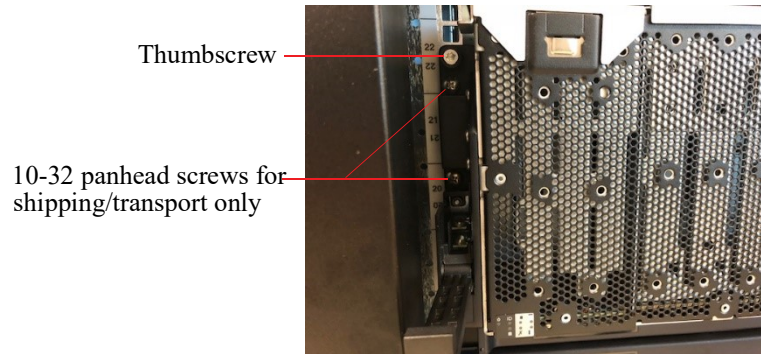


Figure 46 Attaching panhead screws to the rack

- Using the quantity-2 panhead screws provided (P/N: 727666900), attach the CMA “A” chassis attachment bracket (P/N: 727666600) to the chassis above the CMA shelf, on its inner surface. Torque screws to 1.36 N-m (12 lbf-in). The images below show the progression of steps from left to right.

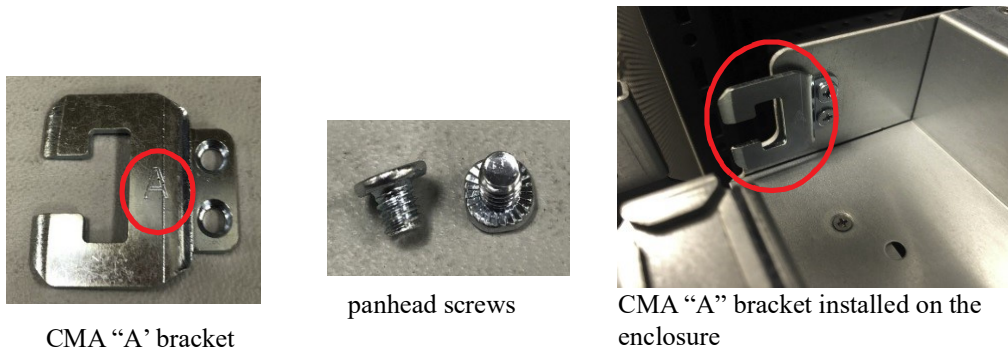
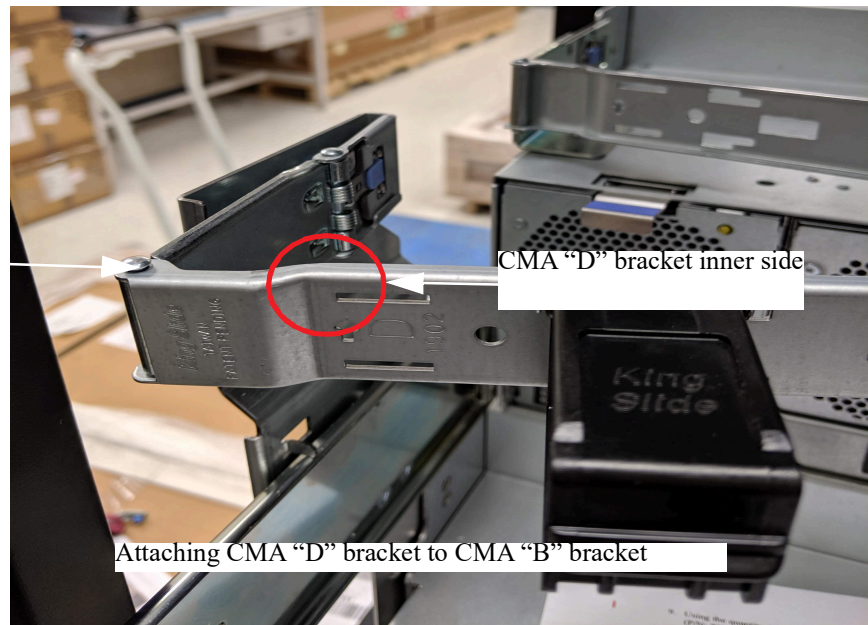


Figure 47 Attaching CMA bracket to the chassis

- Clip the CMA “D” bracket onto the CMA “B” bracket (as shown in [step 7](#) on [page 51](#)). Ensure that:
 - The blue spring clips onto the C-shaped CMA attachment bracket present on the CMA “B” bracket securely.
 - On the CMA “D” bracket, the arrow next to the “D” point upward.

CMA "D" bracket
arrow pointing
upward



CMA
"B" bracket

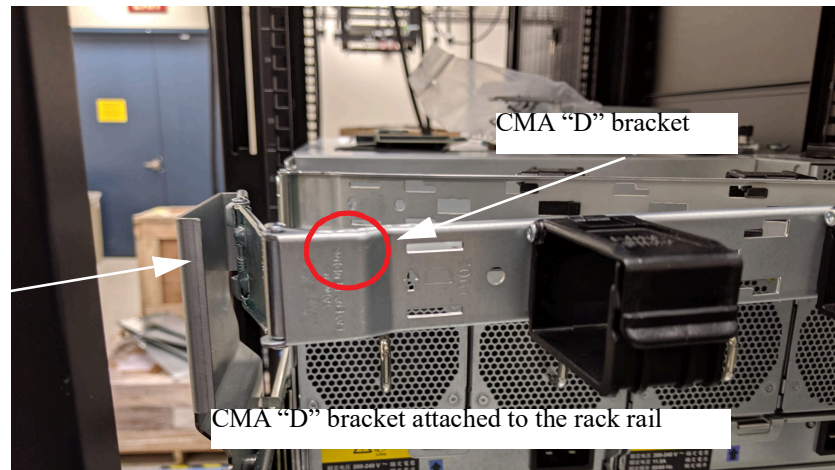


Figure 48 Attaching CMA "D" bracket to the CMA "B" bracket

11. Clip the CMA "A" bracket (as shown in [step 9](#) on [page 55](#)) onto the chassis CMA "C" bracket. Ensure that:
 - o The "C" bracket slides into the CMA ramp "lip" as shown in Figure 39: A.
 - o The blue spring clips onto the CMA "A" bracket securely, as shown in Figure 39: B.

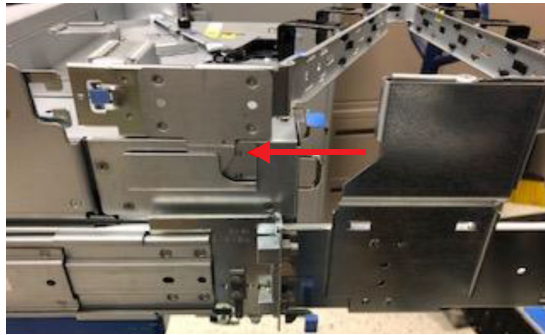
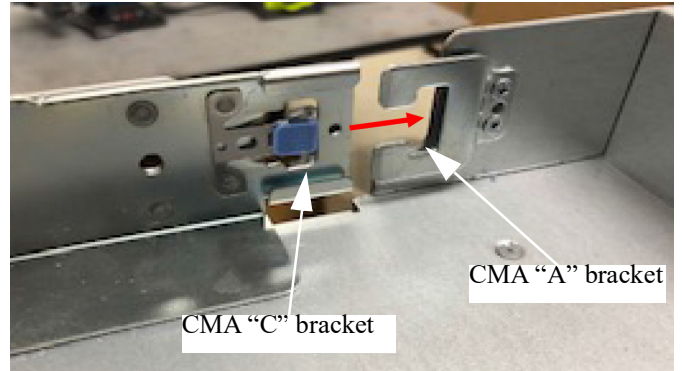
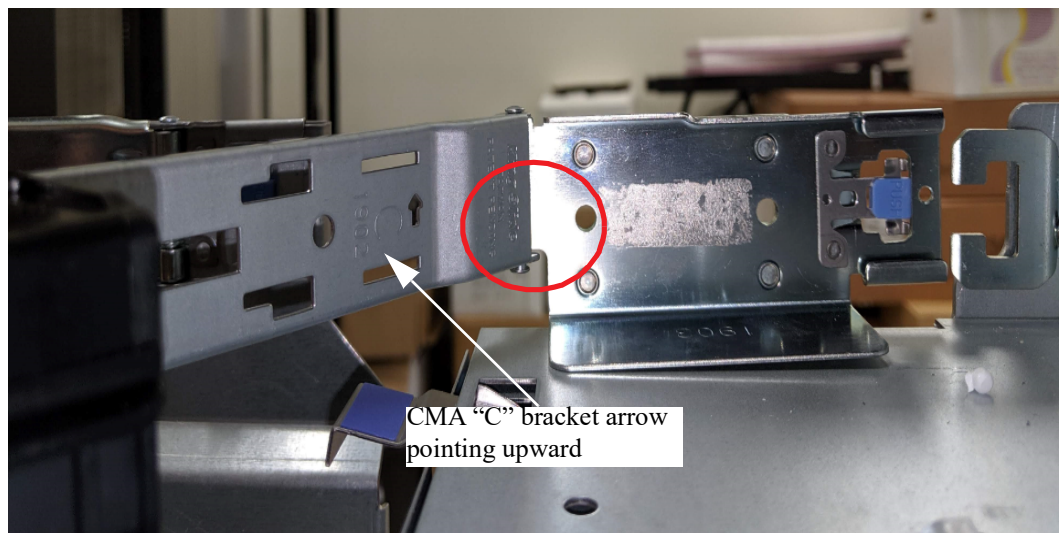


Figure 39:A CMA ramp lip



CMA "C" bracket being attached to the CMA "A" bracket

Figure 39:B



CMA "C" bracket seated atop enclosure cable shelf with "C" arrow pointing upward

Figure 39:C

Figure 49 Attaching CMA "C" bracket

12. Verify that your completed installation looks similar to the following example photo, where:

- The "D" bracket in the foreground is attached to a rail, behind the enclosure (which is slid forward on the rails)
- The "C" bracket is attached to the enclosure cable shelf
- The cable holders extend downward from the arm, with the caps marked "King Slide" on top

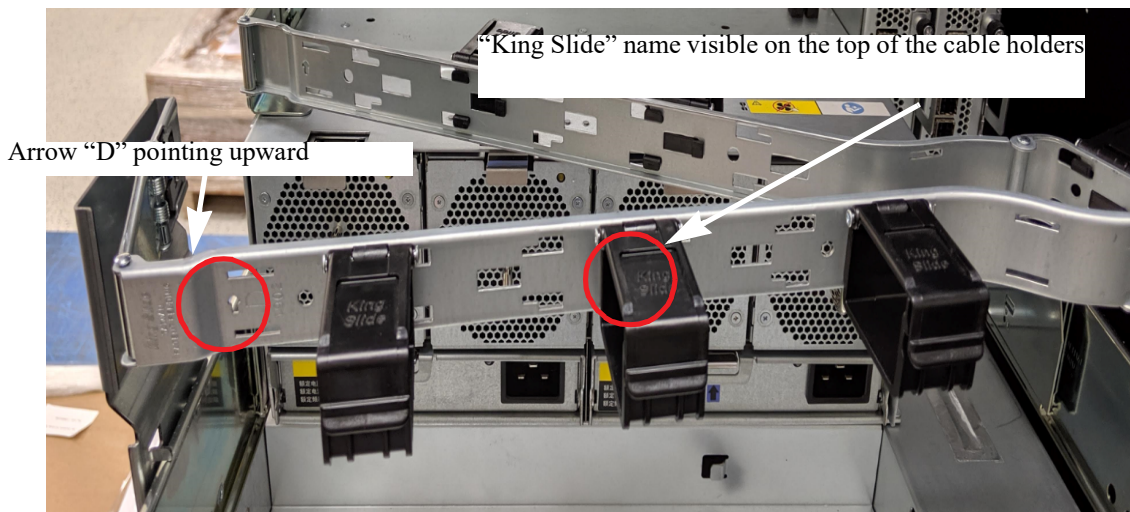


Figure 50 Rear view: CMA installed correctly

13. Insert IOMs as described in “Installing an IOM” (page 87)”.
14. Install the crossbar (bar with a blue thumbscrew at each end), which helps to stabilize the rails.



Figure 51 Crossbar installed on the 4U106 enclosure between 2 rails

15. Install the shipping screws (optional step required only for preventing non-operating transportation shock/vibration)



Figure 52 Shipping screw installed

The figure above identifies an installed shipping screw using a red arrow. A shipping screw installs above each of the crossbar thumbscrews as shown in the enclosure rear panel view included above this step.

NOTE: After the enclosure is secured in the rack, install the drives.

Routing cables using the CMA

Routing of power and data cables for the 4U106 is integral to successful rail kit installation and rackmount installation of the enclosure. Cables must be correctly installed and routed to facilitate efficient operation and in-rack servicing of the enclosure.

This section provides instructions for routing cables through the CMA, to include using the CMA baskets and the CMA storage shelf located at the rear of the enclosure.

1. Install the data cables and route them through the CMA brackets.
 - Rotate the CMA cable capture arms so they are out of the way of the data cable routing.
 - Route data cables 1–5 onto the CMA shelf and through the CMA brackets in the order and configuration shown below.
 - Secure the routed cables with one hand, while installing additional cables until data cables 1–5 are installed.
 - Rotate the outer cable capture arm close over data cables 1–5, ensuring it seats in the C-flange in between the two cable capture arms.
 - Route data cables 6–10 onto the CMA shelf and through the CMA brackets in the order and configuration shown below.

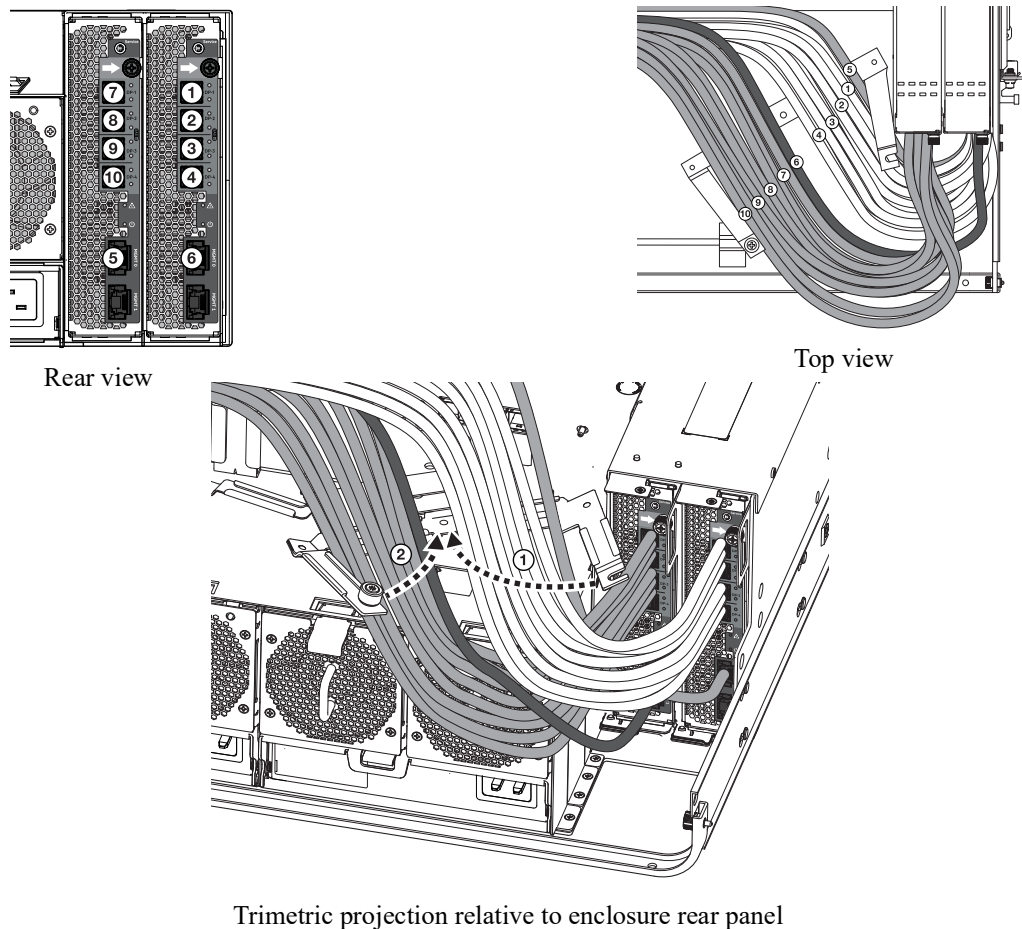


Figure 53 Routing data cables through the CMA brackets

2. Rotate the inner CMA cable capture arm into the C bracket to secure the rest of the data cables. The outer CMA cable capture arm may need to be pushed down in the C bracket to allow the inner cable capture arm to seat properly. The CMA bracket may need to be shifted slightly in order for the thumbscrew to find the PEM thread in the CMA shelf. Secure the thumbscrew.
3. Install the PSU cables.

Refer to the details provided beneath the sub-steps, noting that the top view details represent the CMA shelf.

 - a. Remove the M3 panhead screw from the PSU cable clip assembly, and set it aside for re-installation.
 - b. Install the right-angle C19 connectors into the PSUs.
 - c. Route the cables as shown, ensuring they lay flat on the CMA shelf and through the PSU cable-clip assembly.
 - d. Reinstall the M3 panhead screw from [step 3a](#), while torquing the screw to 0.56 N-m (5 lbf-in).

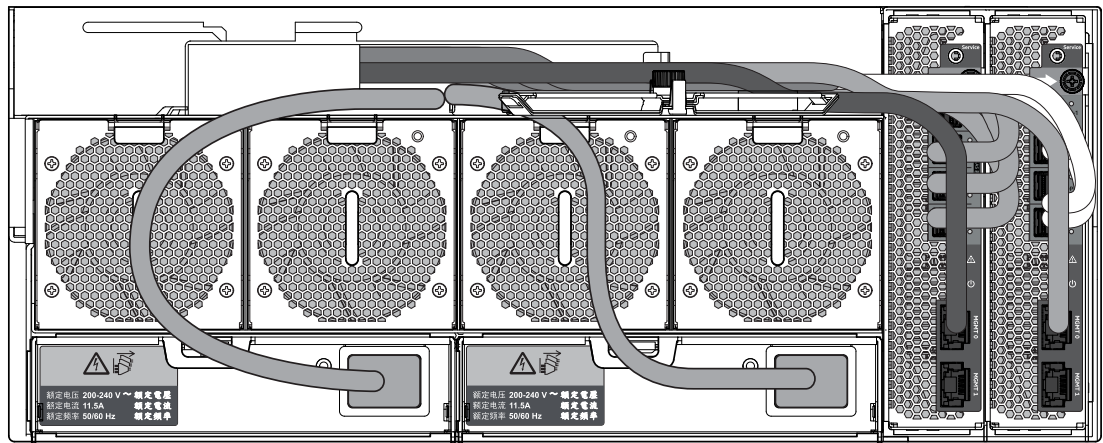
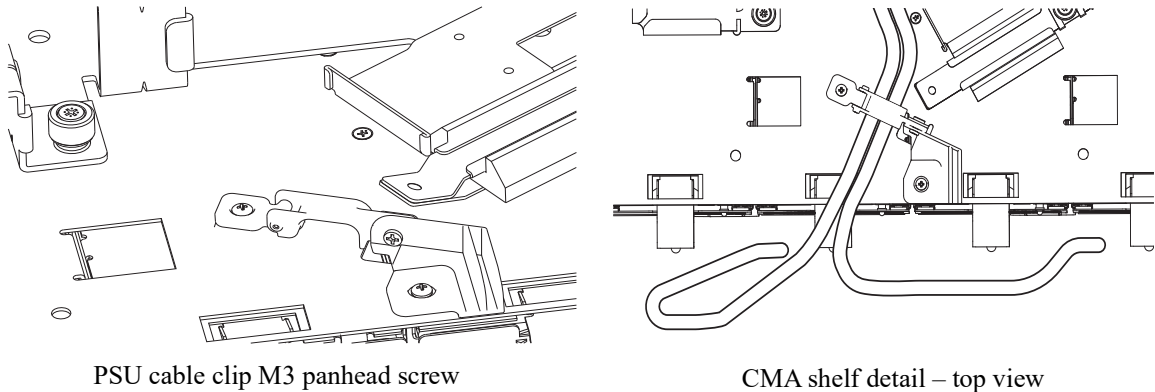


Figure 54 Securing PSU Cables through CMA bracket

4. Route cables through CMA baskets.
 - o Route cables through the first two baskets, ensuring minimal cable crossover to maximize space.
 - o Use all available space on the CMA shelf to make the first 180° bend into the first CMA basket.
 - o Keep pairs of dual SAS cables parallel and close together.

- After all cables (including PSU cables) are routed through the first two CMA baskets, route them around a 180° bend into the remaining four CMA baskets.



Figure 55 Enclosure Cables routed through CMA

Cable requirements for expansion enclosures

When adding storage, use only Seagate or OEM-qualified cables, and observe the following guidelines:

- When installing SAS cables to expansion modules, use only supported HD mini-SAS (SFF-8644) x4 cables.
- Qualified HD mini-SAS cables, not to exceed 5 m (16.40'), are used to connect cascaded enclosures in the rack.
- The maximum expansion cable length allowed in any configuration is 5 m (16.40').
- The minimum cable length through the CMA is 3 m (9.83')
- When adding more than two expansion enclosures, you may need to purchase additional cables, depending upon number of enclosures and cabling method used.
- You may need to order additional or longer cables when cabling a fault-tolerant configuration.

SAS topology

It is possible to support different topologies of SAS with the 4U106 enclosure. There are two basic forms of expansion topology as shown in [Figure 56 \(page 62\)](#). One is a simple daisy chain of enclosures one after another in a chain (left illustration). The other topology is a star configuration (right illustration) that has each expansion enclosure connected from the host (server attached JBOD configuration) or controller enclosure (EBOD configuration).

A third example provided in [Figure 57 \(page 63\)](#), shows use of all SAS ports via the daisy chain cabling method.

SAS Expansion

As you face the rear panel of the 4U106 enclosure, the left IOM slot is 1 and the right IOM slot is 0. See also [Figure 5 \(page 19\)](#) for FRU slot index numbering for the enclosure rear panel. Green is used to show IOM 0 paths and blue is used to show IOM 1 paths for cabling the expansion enclosures shown in each cascade.

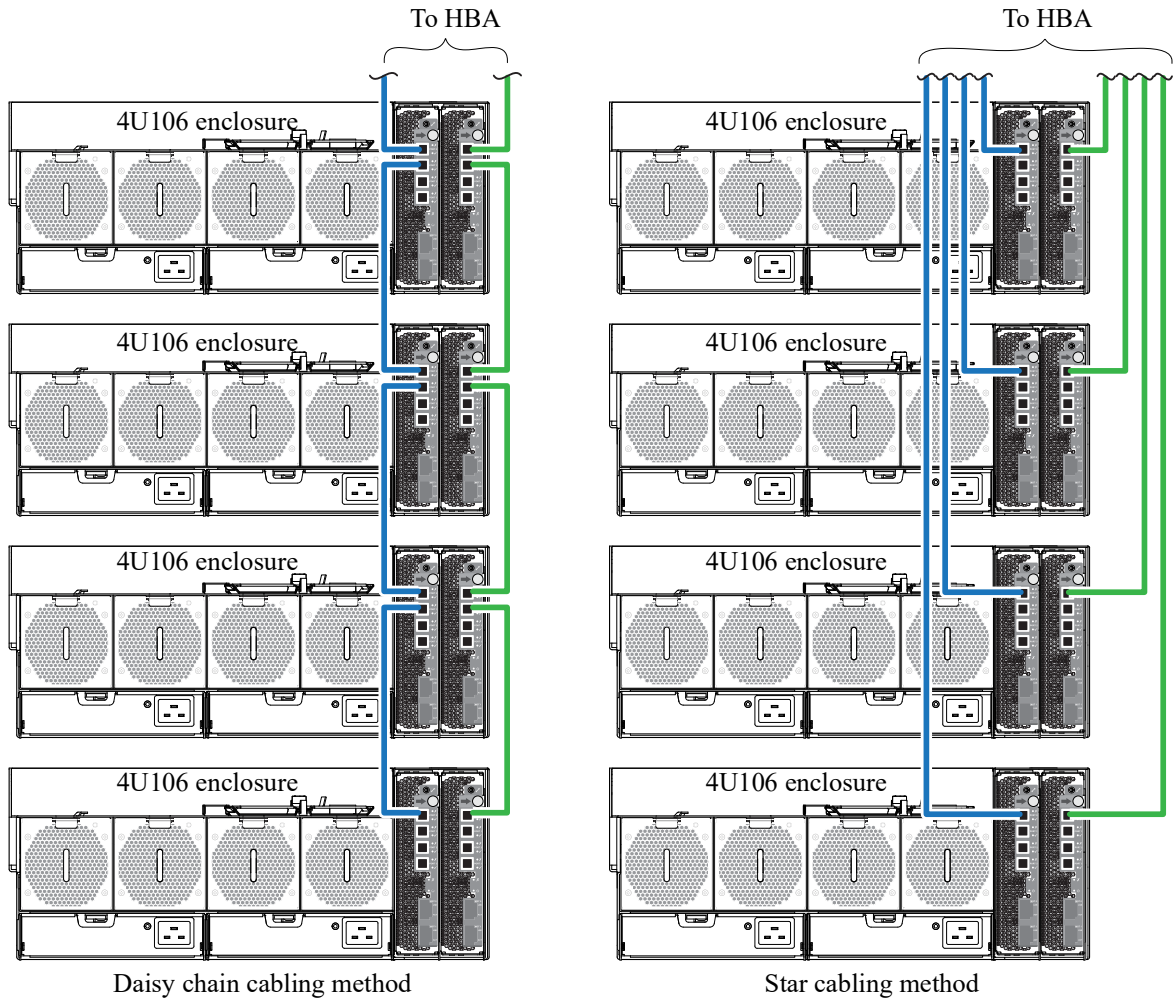
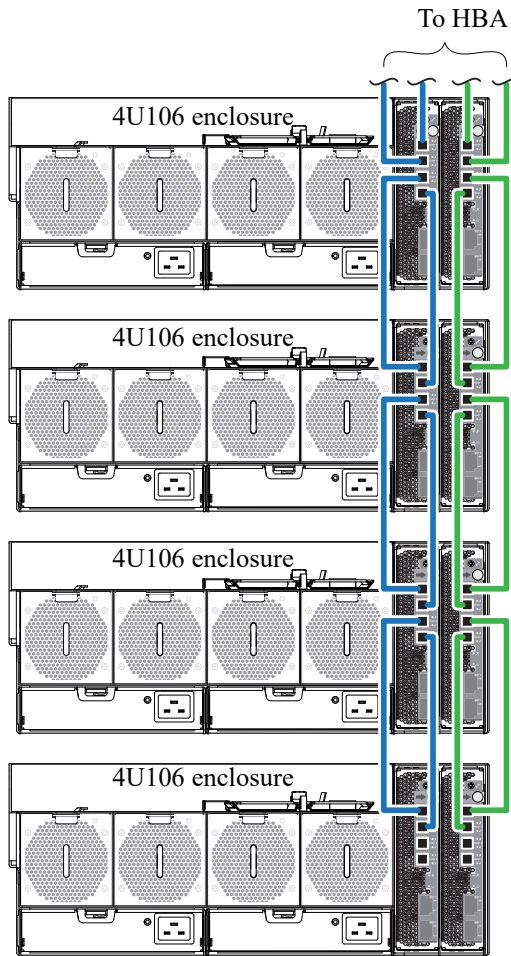


Figure 56 Cabling the 4U106 enclosures to the storage system (1 of 2)

The diagram on the left shows the daisy chain cabling method and the diagram on the right shows the star cabling method.

An advantage of the star configuration is that each expansion enclosure is only one additional expander or “hop” away from the initiator. This reduces delays in the SAS communication path. Those effects are small by measure. However, there are a limited number of expansion ports, so for larger topologies, some combination of the two approaches will be required. [Figure 57 \(page 63\)](#) provides another daisy chain cabling example with all 12Gb/s SAS ports connected.



Daisy chain cabling method - fully connected SAS ports

Figure 57 Cabling the 4U106 enclosure to the storage system (2 of 2)

Power cord connection

Connect a power cord from each PSU on the enclosure rear panel to the PDU (power distribution unit) as shown in the illustration below.

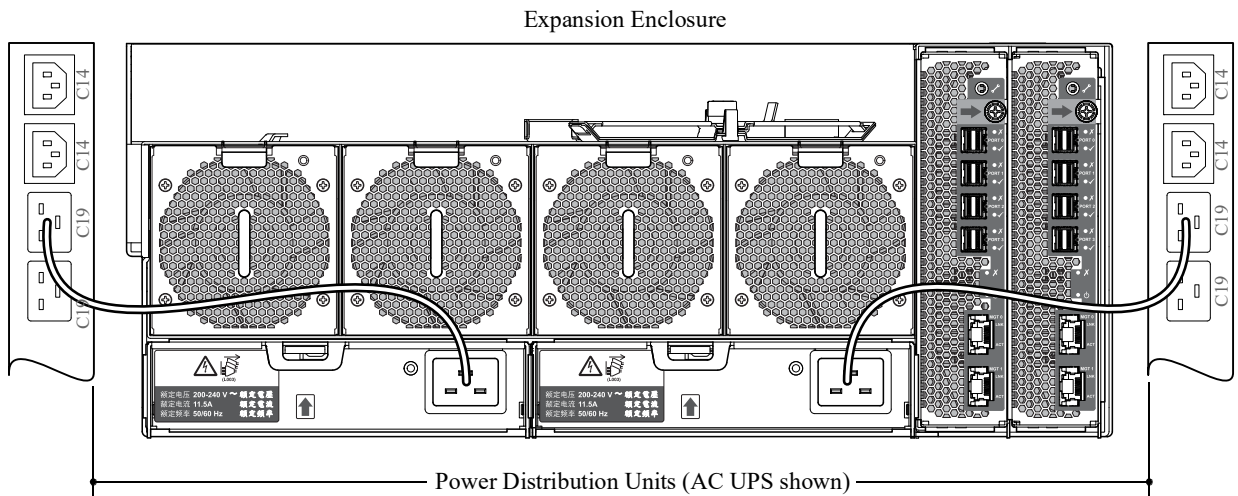


Figure 58 Typical AC power cord connection from PDU to PSU

① **IMPORTANT:** The 4U106 enclosure is fitted with two redundant PSUs. All power cords must be connected to at least two separate and independent power supplies to ensure redundancy.

- [Figure 58 \(page 63\)](#) shows power connection from a single-core PSU to a PDU using C19 connectors.
 - The C20 plug on the PSU connects to the C19 receptacle of the power cord. The C20 plug on the power cord connects to the C19 receptacle in the PDU.
-

△ **CAUTION:** Power connection concerns:

- Never connect the power cord to the PSU before installing the PSU in the system.
 - Always remove the power connections *before* you remove the PSU from the enclosure.
 - Whether standard (single-lead) or bifurcated (Y-lead), power cords must only be connected to a supply range of 200–240VAC as indicated on each PSU’s hazardous voltage warning label.
-

Testing enclosure connections

See “[Powering on/powering off](#)” ([page 65](#)). Once the power-on sequence succeeds, the storage system is ready to be connected.

Grounding checks

The product must only be connected to a power source that has a safety electrical earth connection.

△ **CAUTION:** If more than one enclosure goes in a rack, the importance of the earth connection to the rack increases because the rack will have a larger earth leakage current (touch current).

Examine the earth connection to the rack before power on. An electrical engineer who is qualified to the appropriate local and national standards must do the examination.

Updating the firmware

After installing the hardware and powering on the storage system components for the first time, verify that the system USM firmware (including controller modules, expansion modules, power supplies, and VPDs) as well as drives are using the current firmware release. Additionally, ensure that the system configuration (including SAS zoning) is correct per the solution requirements.

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

Periodically, you should ensure that the firmware versions used in enclosure modules are compatible. Product release notes describe the process for updating firmware. Contact your account manager for additional information.

4 Operation

Before you begin

Before powering on the enclosure system, make sure that all modules are firmly seated in their correct slots. Verify that you have successfully completed the sequential “Installation Checklist” instructions in [Table 4 \(page 35\)](#). Once you have completed these steps, you can access the management interfaces to complete the system setup.

Powering on/powering off

△ CAUTION: Do not operate the enclosure system until the ambient temperature is within the specified operating range described in “[Environmental requirements](#)” ([page 90](#)). If the drive modules have been recently installed, make sure they have had time to adjust to the environmental conditions before they are used with production data for I/O.

1. Power on the system by connecting the power cables from the PSU to the PDU. See [Figure 58 \(page 63\)](#).
The System Power LED on the front panel should be lit green when the enclosure power is activated.
2. Power the system down by disconnecting the power cord from the power supply module.

When powering up, make sure to power up the enclosures and associated data host in the following order:

- Expansion enclosures *first*.
This ensures that the DISCs in the drive enclosure have enough time to completely spin up before being scanned by the controller modules within the controller enclosure.
While enclosures power up, their LEDs blink. After the LEDs stop blinking—if no LEDs on the front, back and top of the enclosure are amber—the power-on sequence is complete, and no faults have been detected.
 - See “[Overview of front panel LEDs](#)” and [Figure 3 on page 25](#).
 - See “[Overview of rear panel LEDs](#)” ([page 26](#)) and figures/tables for rear panel FRUs.
 - See “[Overview of top panel LEDs](#)” ([page 30](#)) and figures/tables for top panel FRUs.
- Controller enclosure *next* if an RBOD is used. Not applicable to server attached JBOD configuration.
Depending upon the number and type of DISCs in the system, it may take several minutes for the system to become ready.
- Data host *last* (if powered down for maintenance purposes).

💡 TIP: When powering off, you will reverse the order of steps used for powering on.

ⓘ IMPORTANT: If main power is lost for any reason, upon restoration of power, the system will restart automatically.

NOTE: See “[LEDs](#)” ([page 66](#)) for details pertaining to front panel LEDs and related fault conditions.

Unit Identification Number

Software/SES

The enclosure UID number can be read and set through the management interfaces and SES.

5 Troubleshooting and problem solving

These procedures are intended to be used only during initial configuration, for the purpose of verifying that hardware setup is successful. They are not intended to be used as troubleshooting procedures for configured systems using production data and I/O.

NOTE: For further troubleshooting help—after setup and when data is present—see <https://seagate.com/support-home>.

Overview

The enclosure system includes a Storage Enclosure Processor (SEP) and associated monitoring and control logic to enable it to diagnose problems with the enclosure’s power, cooling, and drive systems. Management interfaces allow for provisioning, monitoring, and managing the storage system.

① **IMPORTANT:** See “[Fault isolation methodology](#)” (page 69) when conducting system diagnostics.

Initial start-up problems

Faulty power cords

Check that you have correctly cabled the system. Contact your supplier for replacements if:

- Power cables are missing or damaged.
- Plugs are incorrect.
- Power cables are too short.

Computer does not recognize the enclosure system

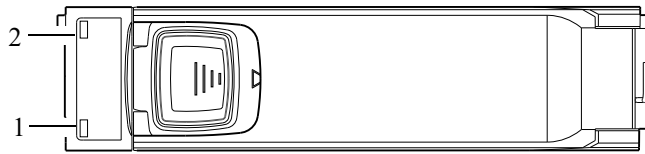
1. Verify that the interface cables from the enclosure to the host computer are fitted correctly.
2. Verify that the LEDs on all installed drive carrier modules do not show fault status.
3. Verify that the drive carrier modules have been correctly installed.
4. Check any visible SAS indicators (HBA, JBOD/EBOD, and RBOD if applicable).
5. Check HBA BIOS for SAS target visibility.
6. Verify that the operating system driver has been installed correctly.

NOTE: If the enclosure fails initialization, see “[If the enclosure does not initialize](#)” (page 70).

LEDs

LED colors are used consistently throughout the enclosure and its components for indicating status:

- Green: good or positive indication
- Blinking green/amber: non-critical condition
- Amber: critical fault
- Blue: identification



Top view of LFF drive module

Figure 59 LEDs: LFF/SFF Drive carrier LEDs

LED	Description	Definition
1	Not used	Not applicable.
2	Fault or Identify	Off – the Disc Drive in Carrier is operating normally. Amber – A fault has been detected or a service action is required. Amber 1s on / 1s off – application requested identification. Amber - 3s on / 1s off - see log for fault conditions.

IOM LEDs

Expansion IOM status is monitored by the LEDs located on the face plate. See also [Figure 15 \(page 30\)](#). LED behaviors for expansion enclosures are described in [Table 9](#). For actions pertaining to [Table 9](#), see **Actions** below.

Table 9 IOM LED states

FRU OK (green)	FRU Fault (amber)	SAS port (green)	Status
On	Off		IOM OK
Off	On		IOM fault – see “Replacing an IOM” (page 85)
		Off	No external port connection
		On	HD mini-SAS port connection – no activity
		Blinking	HD mini-SAS port connection – activity
Blinking			EBOD VPD error

Actions:

- If the Power OK LED is blinking, wait for the system to boot.
- If the Power OK LED is off, and the IOM is powered on, the module has failed.
 - Check that the IOM is fully inserted and latched in place, and that the enclosure is powered on.
 - Check for logs pertaining to the failure.
- If the Fault LED is on, a fault condition is detected.
 - Reseat the IOM in its slot.
 - Check for logs pertaining to the failure.
- If the above actions do not resolve the fault, contact your supplier for assistance.

Temperature sensors

Temperature sensors throughout the enclosure and its components monitor the thermal health of the storage system. Exceeding the limits of critical values will cause a notification to occur.

Troubleshooting

The following sections describe common problems that can occur with your enclosure system, and some possible solutions. For the problems listed in [Table 10](#), the pertinent fault LEDs on the enclosure front panel glow amber to indicate a fault. See also “[Overview of front panel LEDs](#)” ([page 25](#)).

Table 10 Alarm conditions

Status	Severity	Alarm
PSU alert - loss of DC power from a single PSU	Fault - loss of redundancy	S1 ¹
PSU fan fail	Fault - loss of redundancy	S1 ¹
CFF module detected PSU fault	Fault	S1 ¹
PSU removed	Configuration error	None ²
Enclosure configuration error (VPD)	Fault – critical	S1 ¹
Low temperature warning alert	Warning	S1 ¹
High temperature warning alert	Warning	S1 ¹
Over temperature alarm	Fault – critical	S4 ³
I ² C bus failure	Fault – loss of redundancy	S1 ¹
Front panel communication error (I ² C)	Critical fault	S1 ¹
RAID error	Fault – critical	S1 ¹
CFF interface module fault	Fault – critical	S1 ¹
CFF interface module removed	Warning	None ²
Drive power control fault	Fault – critical–loss of drive power	S1 ¹
Insufficient power available	Warning	None ²

1-The enclosure will continue operating, requiring an administrator to take appropriate action, such as replacing a PSU or reducing the room temperature. Alarm messages are signaled by the SES pages ([page 34](#)).

2-An alarm is not issued for this status and severity condition.

3-The enclosure will take action, such as shutting down in order to protect the enclosure’s data content. Alarm messages are signaled by the SES pages ([page 34](#)).

PSU and system fan faults

Symptom	Cause	Recommended action
Front panel Module Fault LED is amber ¹	Any power fault	Verify AC mains connections to the PSU are live
Amber LED is illuminated on fan module ²	Fan failure	Replace system fan module

1-See [Figure 3](#) ([page 25](#)) for visual reference of front panel LEDs.

2-See [Figure 12](#) ([page 27](#)) for visual reference of PSU LEDs. See [Figure 13](#) ([page 28](#)) visual reference of system fan module LEDs.

Thermal monitoring and control

The storage enclosure system uses extensive thermal monitoring and takes a number of actions to ensure component temperatures are kept low, and to also minimize acoustic noise. Air flow is from the front to back of the enclosure.

Symptom	Cause	Recommended action
<p>If the ambient air is below 25°C (77°F), and the fans are observed to increase in speed, then some restriction on airflow may be causing additional internal temperature rise.</p> <hr/> <p>NOTE: This is not a fault condition.</p>	<p>The first stage in the thermal control process is for the fans to automatically increase in speed when a thermal threshold is reached. This may be caused by higher ambient temperatures in the local environment, and may be perfectly normal.</p> <hr/> <p>NOTE: This threshold changes according to the number of drives and power supplies fitted.</p>	<ol style="list-style-type: none"> 1. Check the installation for any airflow restrictions at either the front or back of the enclosure. A minimum gap of 25 mm (1") at the front and 50 mm (2") at the rear is recommended. 2. Check for restrictions due to dust build-up. Clean as appropriate. 3. Check for excessive re-circulation of heated air from rear to front. Use of the enclosure in a fully enclosed rack is not recommended. 4. Verify that all blank modules are in place. 5. Reduce the ambient temperature.

Thermal alarm

Symptom	Cause	Recommended action
<ol style="list-style-type: none"> 1. Front panel Module Fault LED is amber. 2. Fan Fail LED is illuminated on one or more fans. 	<p>Internal temperature exceeds a preset threshold for the enclosure.</p>	<ol style="list-style-type: none"> 1. Verify that the local ambient environment temperature is within the acceptable range. See also “Environmental requirements” (page 90). 2. Check the installation for any airflow restrictions at either the front or back of the enclosure. A minimum gap of 25 mm (1") at the front and 50 mm (2") at the rear is recommended. 3. Check for restrictions due to dust build-up. Clean as appropriate. 4. Check for excessive re-circulation of heated air from rear to front. Use of the enclosure in a fully enclosed rack is not recommended. 5. If possible, shut down the enclosure and investigate the problem before continuing.

Fault isolation methodology

This section presents the basic methodology used to locate faults within a storage system, and to identify the pertinent FRUs affected.

Basic steps

- Gather fault information, including using system LEDs.
- Determine where in the system the fault is occurring.

- Review logs from the host application/operating system.
- Review Ddump output from both controllers:
 - The Ddump CLI command is described in the GEM Command-line Interface document.
 - Ddumps can be captured via the following interfaces: serial, Telnet, WCLI/SES.
 - Invoke `help Ddump` for additional information about capturing Ddump output.
 See also [“Command-line interface” \(page 34\)](#).
- If required, isolate the fault to a data path component or configuration as described in [“Isolate the fault” \(page 70\)](#).

Gather fault information

When a fault occurs, it is important to gather as much information as possible. Doing so will help you determine the correct action needed to remedy the fault.

Begin by reviewing the reported fault:

- *Is the fault related to an internal data path or an external data path?*
- *Is the fault related to a hardware component such as a drive module, controller module, or power supply unit?*

Determine where the fault is occurring

When a fault occurs, the Module Fault LED—located in the lower left corner of the enclosure front panel—illuminates. See also [“Overview of front panel LEDs” \(page 25\)](#). Check the status of the other front panel LEDs. Also check the LEDs on the back and top panels (must remove a cover) of the enclosure to narrow the fault to a FRU, connection, or both.

- See [“Overview of rear panel LEDs” \(page 26\)](#)
- See [“Overview of top panel LEDs” \(page 30\)](#)

The LEDs help you identify the location of a FRU reporting a fault.

Isolate the fault

Occasionally, it might become necessary to isolate a fault. This is particularly true with data paths, due to the number of components comprising the data path. For example, if a host-side data error occurs, it could be caused by any of the components in the data path: controller module, cable, or data host.

By isolating the fault to *one* of the components within the storage system, you can determine the necessary corrective action more quickly.

If the enclosure does not initialize

It may take up to two minutes for all enclosures to initialize. If an enclosure does not initialize:

- Power cycle the system
- Make sure the power cord is properly connected, and check the power source to which it is connected
- Check log for errors

Host I/O

When troubleshooting drive and connectivity faults, stop I/O to the affected drive groups from all hosts as a data protection precaution. As an additional data protection precaution, it is helpful to conduct regularly scheduled backups of your data. See also [“Stopping I/O” \(page 86\)](#).

Dealing with hardware faults

Ensure that you have obtained a replacement module of the same type before removing any faulty module as described in [“Module removal and replacement” \(page 73\)](#).

ⓘ **IMPORTANT:** If the enclosure system is powered up and you remove any module, replace it immediately. If the system is used with any modules missing for more than a few seconds, the enclosure(s) can overheat, causing power failure and potential data loss. Such action can invalidate the product warranty.

ⓘ **IMPORTANT:** Observe applicable/conventional ESD precautions when handling modules and components, as described in “[ESD precautions](#)” (page 73). Avoid contact with midplane components, module connectors, leads, pins, and exposed circuitry.

Continuous operation during replacement

Your hardware or software enclosure management application determines the capability for replacing a failed drive without the loss of access to any file system on the enclosure. Enclosure access and use during this period is uninterrupted. If an enclosure is equipped with redundant PSUs, sufficient power is provided to the system while the faulty module is replaced.

NOTE: Exos E 4U106 enclosures support hot-plug replacement of redundant expansion modules, power supplies, fan modules, and HS expanders. Hot-add replacement of expansion enclosures is also supported.

Customer-replaceable units (FRU)

FRUs addressing 4U106-drive chassis

Table 11 Exos E 4U106 product components for 4U106-drive chassis

Item	Enclosure FRU and related component description	Access ¹
1	Drive (LFF/SFF) module: DDIC (DISC in drive carrier)	Top
	a) DDIC 3.5" LFF (drives of differing type/speed and storage capacity: SAS/SATA/SSD)	
	b) DDIC 2.5" SFF with adapter (drives of differing type/speed and storage capacity: SAS/SATA/SSD)	
2	Chassis (sheet metal enclosure) with integrated PCBAs (included with chassis; not available separately)	Note 2
3	Power supply unit (PSU) module available as AC unit (chassis uses two PSUs of same model type)	Rear
4	IOM (EBOD canister) for storage expansion	Rear
5	System fan module	Rear
6	Controller fan module	Top
7	HS Expander module (PCBA card)	Top
8	Rail kit (variable attachment options)	Note 3
	a) Rackmount kit, shelf, long (1.2 m), HW	
	b) cable management arm (CMA) and brackets	
9	Cable kits [Cable package: standard HD mini-SAS (SFF-8644) to HD mini-SAS (SFF-8644)]	N/A
10	AC power cord compatible with AC PSU	N/A

1-The **Access** column lists the enclosure panel from which the FRU is observed and accessed. It does not apply to other components.

2-See “[Enclosure chassis](#)” (page 24) for a description of the chassis FRU.

3-See “[Rackmount rail kit](#)” (page 43) and “[Routing cables using the CMA](#)” (page 59) for descriptions of the rail kit and CMA.

💡 **TIP:** Enclosure panel access diagrams for locating FRUs:

- Front panel: see [Figure 3 \(page 18\)](#) and [Figure 3 \(page 25\)](#)
 - Rear panel: see [Figure 4 \(page 19\)](#)
 - Top panel: see [Figure 9 \(page 22\)](#), [Figure 10 \(page 23\)](#), and [Figure 11 \(page 23\)](#)
-

💡 **TIP:** Enclosure dimetric pictorial views:

- Projection from enclosure front panel: see [Figure \(page 15\)](#)
 - Projection from enclosure rear panel: see [Figure 2 \(page 16\)](#)
-

6 Module removal and replacement

Overview

This chapter provides procedures for replacing FRUs (customer-replaceable units), including precautions, removal instructions, installation instructions, and verification of successful installation. Each procedure addresses a specific task.

NOTE: Unless otherwise noted within a passage pertaining to a particular FRU, the replacement procedure should be completed within 3 minutes of the removal of a defective module. Do not remove a faulty module unless you have the replacement module available and ready for insertion into the slot.

ESD precautions

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

Preventing electrostatic discharge

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

△ CAUTION: Parts can be damaged by electrostatic discharge. Follow these precautions:

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

Grounding methods to prevent electrostatic discharge

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

△ CAUTION: Parts can be damaged by electrostatic discharge. Use proper anti-static protection:

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

- Use a portable field service kit with a folding static-dissipating work mat.
-

If you do not have any of the suggested equipment for proper grounding, have an authorized technician install the part. For more information about static electricity or assistance with product installation, see <https://seagate.com/support-home>.

System USM Firmware

When replacing an FRU, it is possible that the firmware loaded onto the new component does not match the USM release level of the other components within the system. To ensure optimal system operation, it is important that all components within the system are running revisions that are from the same USM release. After replacing any system FRUs, ensure that the system USM firmware and configuration (including SAS zoning) is appropriate for the solution. See “Updating the firmware” (page 64) for details.

FRU replacement time limits

Refer the subsequent table for information on time limits for each FRU.

Table 12 FRU Time limits

FRU	Time limit in minutes
Main Fan	2
IOM	8
Controller Fan	8
PSU	6
Main Bay cover	8
Controller Bay cover	8

Replacing a PSU module

This section provides procedures for replacing a failed power supply unit (PSU) module. Illustrations in PSU replacement procedures show rear panel views of the enclosure, with the PSU properly oriented for insertion into the rear panel of the enclosure.

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

⚠ CAUTION: Do not remove the cover from the PSU due to danger from electric shock inside. Return the PSU to your supplier for repair.

See CAUTION bullets regarding *electrostatic discharge* and *anti-static protection* on [page 73](#).

💡 TIP: The illustrations show PSU module replacement as you face the enclosure rear panel. See also [Figure 4 \(page 19\)](#) and [Figure 7 \(page 21\)](#).

Removing a PSU module

△ CAUTION: Removing a power supply unit significantly disrupts the enclosure's airflow. Do not remove the PSU until you have received the replacement module. It is important that all FRU slots are filled when the enclosure is in operation.

Before removing the PSU, disconnect the power from the PSU by physically removing the power source in order to ensure your system has warning of imminent power shutdown. A faulty PSU must be replaced by a fully operational PSU as soon as possible. Ensure that you correctly identify the faulty PSU before beginning the step procedure.

1. Stop all I/O from hosts to the enclosure. See also “[Stopping I/O](#)” (page 86).

💡 TIP: This step is not required for hot-swapping. However, it is required when replacing both PSUs at once.

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

💡 TIP: This step is not required for hot-swapping. However, it is required when replacing both PSUs at once.

3. Disconnect the power cable from the PSU power connector to power off the faulty PSU (it has no power switch).

NOTE: Power cables are typically routed to the PSU from the cable management arm (CMA). Verify that the 180° power cable bends lie flat in the CMA baskets. Ensure that the cable lays flat on the CMA shelf and through the cable clip assembly. See also [Figure 4](#) (page 19) and “[Routing cables using the CMA](#)” (page 59) for more details.

4. If replacing a single PSU via hot-swap, proceed to [step 6](#).
5. If replacing both PSUs, verify that the enclosure was shut down using management interfaces, and that the enclosure is powered off.
6. Verify that the power cord is disconnected.

7. Grasp the PSU handle latch between the thumb and forefinger and press the latch tab down to unlock the handle. Revolve the handle out and downward to lever the PSU out of the enclosure as shown in [Figure 60](#).

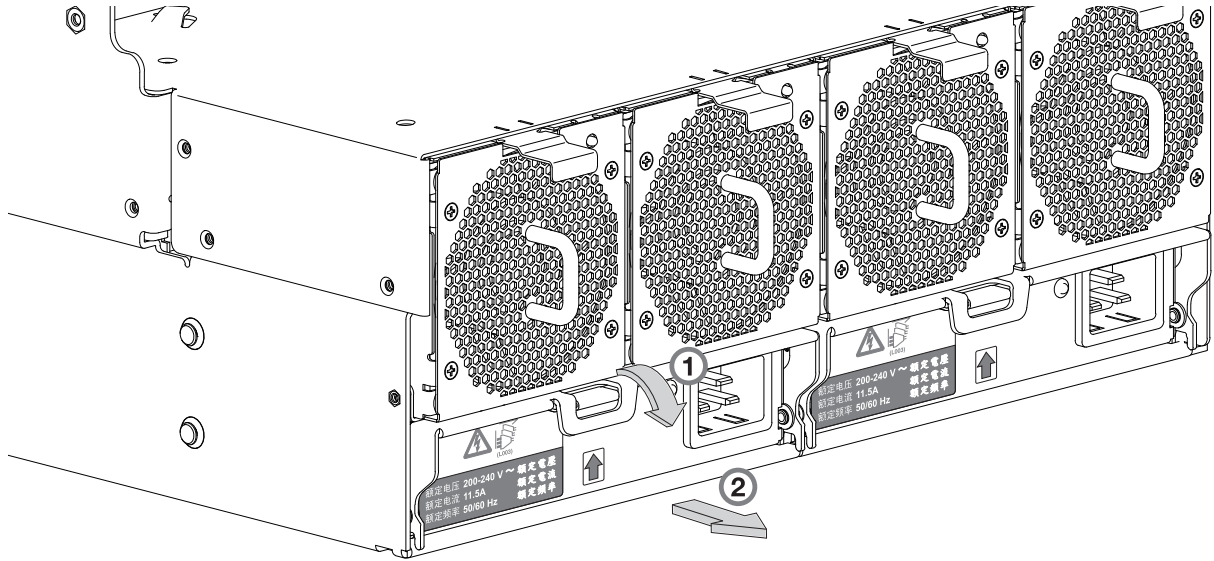


Figure 60 Removing a PSU (1 of 2)

8. Grip the handle and withdraw the PSU, taking care to support the base of the module with both hands as you remove it from the enclosure as shown in [Figure 61](#).

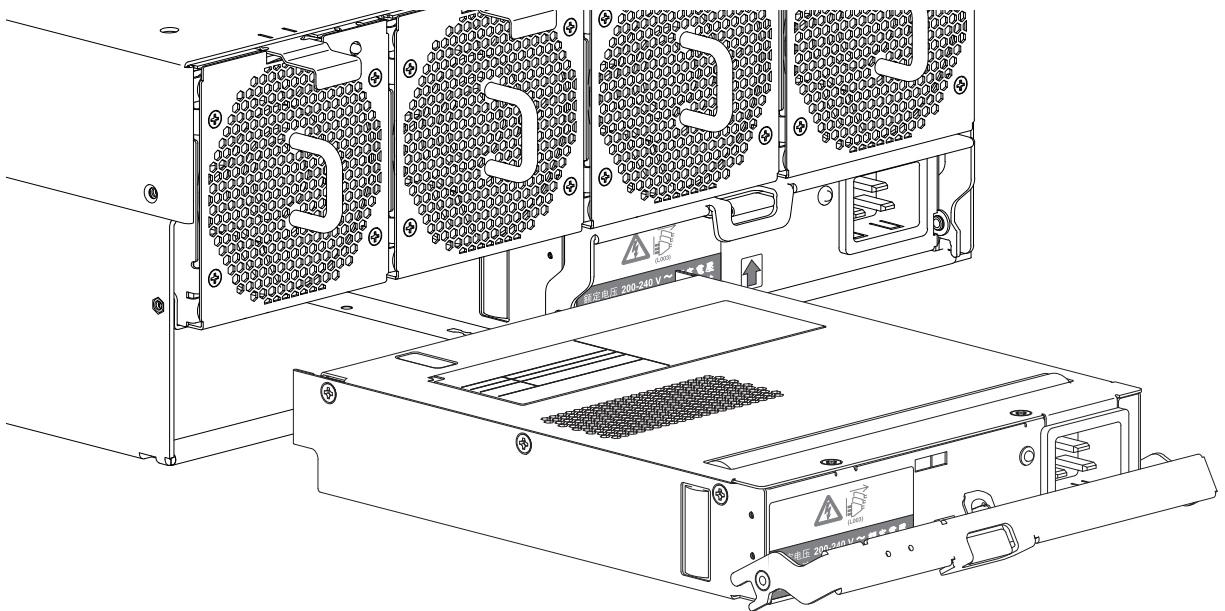


Figure 61 Removing a PSU (2 of 2)

NOTE: The remove PSU illustrations show a module with a single power connection. The procedure applies equally to single cord and dual cord PSU modules used in 4U enclosures.

9. If replacing two PSUs, repeat steps 5 through 8, being mindful of the illustrations TIP on [page 74](#).

Installing a PSU module

Refer to [Figure 60 \(page 76\)](#) and [Figure 61 \(page 76\)](#) when performing this procedure, but ignore the directional arrows. You will insert the module into the slot rather than remove it.

ⓘ **IMPORTANT:** Handle the PSU carefully, and avoid damaging the connector pins. Do not install the PSU if any pins appear to be bent.

1. Check for damage, especially to all module connectors.
2. With the PSU handle in the open position, slide the module into the enclosure, taking care to support the base and weight of the module with both hands.
3. Lever the module home by manually closing the PSU handle. You should hear a click as the latch handle engages and secures the PSU to its connector on the back of the power midplane.
4. Connect the power cable to the power source and the PSU.
Power cables are typically routed to the PSU from the cable management arm (CMA). Verify that the 180° power cable bends lie flat in the CMA baskets. Route the cables as shown in [“Routing cables using the CMA” \(page 59\)](#), ensuring they lay flat on the CMA shelf and through the PSU cable clips assembly. See also [Figure 4 \(page 19\)](#).
5. Verify that the bitonal PSU Status LED is on/green. Verify that cooling fans are spinning with no fail states. Verify that the front panel LED states show no amber module faults.
6. If replacing two PSUs, repeat [step 1](#) through [step 5](#), being mindful of the illustrations TIP on [page 74](#).

Replacing a system fan module

This section provides procedures for replacing a failed system fan module. Within this FRU module, if one of the two internal rotors fails, then a fault occurs, indicating module failure. Illustrations in system fan replacement procedures show rear panel views of the enclosure, with the fan properly oriented for insertion into the rear panel of the enclosure.

If a system fan module fails, the remaining three fans are sufficient to maintain operation of the enclosure. You need not halt operations and completely power-off the enclosure when replacing only one system fan; however, a complete orderly shutdown is required if replacing multiple system fan modules simultaneously.

⚠ **CAUTION:** Do not remove the cover from the system fan module due to danger from electric shock inside. Return the module to your supplier for repair.

See CAUTION bullets regarding *electrostatic discharge* and *anti-static protection* on [page 73](#).

💡 **TIP:** The illustrations show system fan module replacement as you face the enclosure rear panel. See also [Figure 4 \(page 19\)](#) and [Figure 8 \(page 21\)](#).

Removing a system fan module

⚠ **CAUTION:** Removing a system fan module significantly disrupts the enclosure’s airflow. Do not remove the fan until you have received the replacement module. It is important that all fan module slots are filled when the enclosure is in operation.

1. Press down on the latch tab to release the fan from its locked position. See detail No.1 in [Figure 62 \(page 78\)](#).

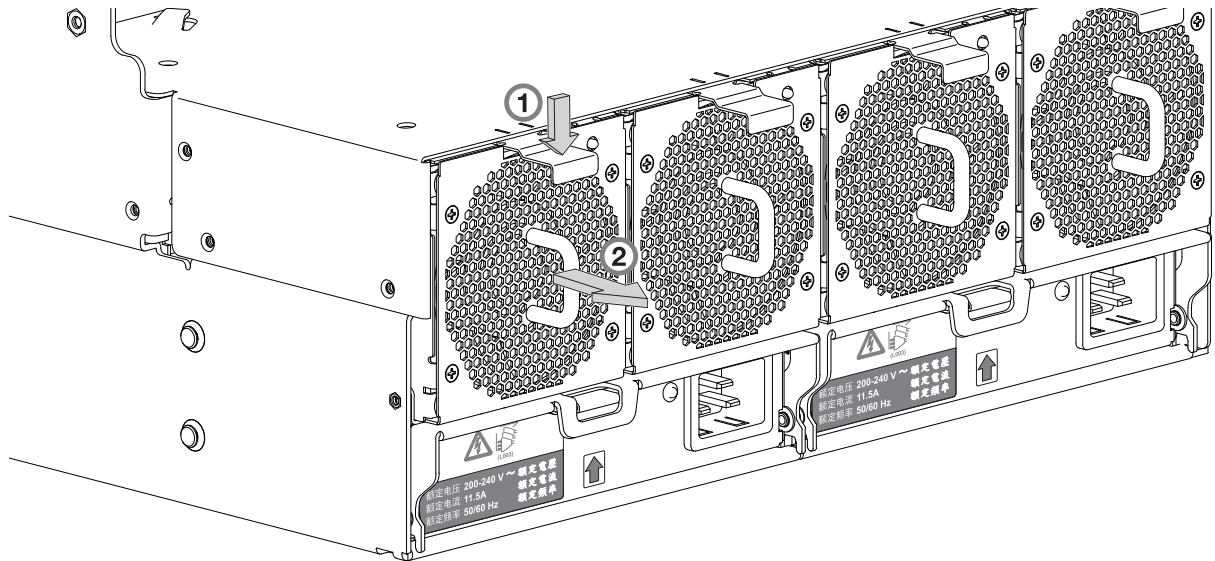


Figure 62 Removing a system fan (1 of 2)

2. Grasp the fan module handle and carefully pull the fan out of its slot. See also the detail in [Figure 63](#).

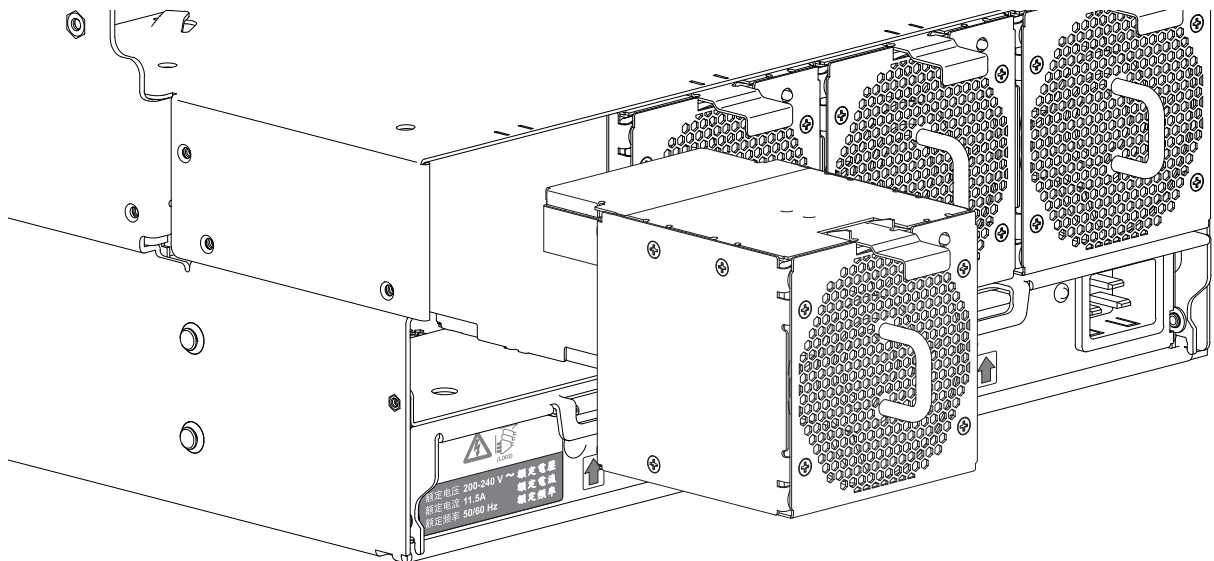


Figure 63 Removing a system fan (2 of 2)

Installing a system fan module

Refer to [Figure 62](#) and [Figure 63](#) when performing this procedure, but ignore the directional arrow. You will insert the module into the slot rather than remove it.

① **IMPORTANT:** Handle the system fan carefully, and avoid damaging connectors.

1. Check for damage, especially to all module connectors.
2. Align the system fan module for insertion into its slot, as shown in [Figure 63 \(page 78\)](#).
3. Insert the system fan, and slide the module into the enclosure, taking care to support the base and weight of the module with both hands.

Gently, but firmly, push the fan module into its fully seated position with its mating connector in the enclosure.

4. Verify that the System Fan Status LED is off. Verify that the cooling fans are spinning with no fail states. Verify that the front panel LED states show no amber module faults.
5. If replacing multiple fans, repeat [step 1](#) through [step 4](#). See FRU Replacement Time Limit ([Table 12](#)) for more details.

Replacing a controller fan module

This section provides procedures for replacing a failed controller fan module. Illustrations in controller fan replacement procedures show top panel views of the enclosure, with the fan properly oriented for insertion into the top panel of the enclosure, near the IOMs. Remove the controller bay cover B to access the controller module fan. See [Figure 9 \(page 22\)](#). Reattach controller bay cover B when you complete the procedure.

If a controller channel fan fails, the remaining fan is sufficient to maintain operation of the enclosure. You need not halt operations and completely power-off the enclosure when replacing only one controller module fan.

△ CAUTION: Do not remove the cover from the controller fan module due to danger from electric shock inside. Return the module to your supplier for repair.

See CAUTION bullets regarding *electrostatic discharge* and *anti-static protection* on [page 73](#).

💡 TIP: The illustrations show controller fan module replacement as you face the enclosure front and view the top panel. See also [Figure 11 \(page 23\)](#) and [Figure 18 \(page 33\)](#).

Removing a controller fan module

△ CAUTION: Removing a controller fan module disrupts the enclosure's airflow. Do not remove the fan until you have received the replacement module. It is important that all FRU module slots are filled when the enclosure is in operation.

1. Grasp the latch tab on the interior channel wall of the enclosure, and squeeze the tab against the wall to release the channel fan from its locked position as shown in [Figure 64](#).

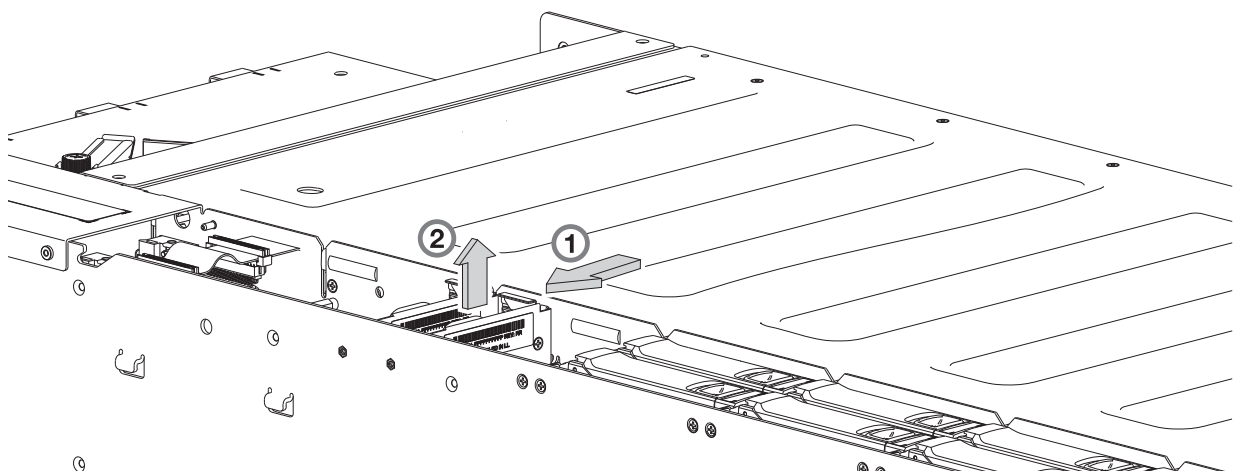


Figure 64 Removing a controller fan (1 of 2)

2. With your other hand, grasp the handle located on the top of the fan, and pull upwards to remove the fan from its slot as shown in [Figure 65](#).

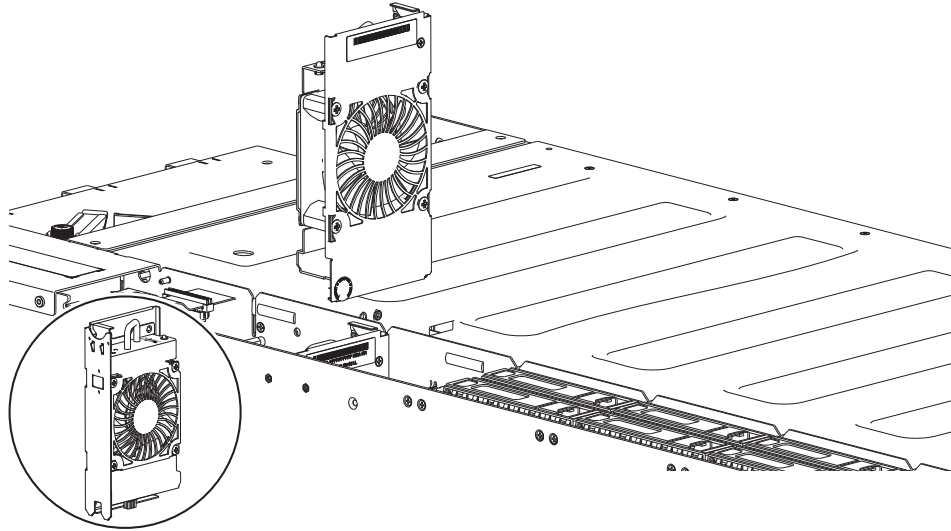


Figure 65 Removing a controller fan (2 of 2)

Installing a controller fan module

Refer to [Figure 64 \(page 79\)](#) and [Figure 65](#) when performing this procedure, but ignore the directional arrow. You will insert the module into the slot rather than remove it.

ⓘ **IMPORTANT:** Handle the controller fan carefully, and avoid damaging connectors.

1. Check for damage, especially to all module connectors.
2. Align the controller fan module for use in the fan slot that is accessible from the top panel.
3. Insert the controller fan module into the slot, and gently press down on the module until it seats firmly in its connector.
4. Verify that the Controller Fan Status LED is off. Verify that the front panel LED states show no amber module faults.
5. If replacing multiple fans, repeat [step 1](#) through [step 4](#).

Replacing an HS Expander module

This section provides procedures for replacing a failed HS Expander module. Illustrations in HS Expander replacement procedures show top panel views of the enclosure, with the module properly oriented for insertion into the top panel of the enclosure near the right wall.

If an HS Expander module fails, the remaining modules are sufficient to maintain operation of the enclosure. You need not halt operations and completely power-off the enclosure when replacing only one HS Expander module.

See CAUTION bullets regarding *electrostatic discharge* and *anti-static protection* on [page 73](#).

💡 **TIP:** The illustrations show HS Expander module replacement as you face the enclosure front and view the top panel. See also [Figure 9 \(page 22\)](#) and [Figure 11 \(page 23\)](#).

Removing an HS Expander module

△ CAUTION: Removing this hot-swappable PCBA disrupts the enclosure's airflow. Do not remove the PCBA until you have received the replacement. It is important that all FRU module slots are filled when the enclosure is in operation.

1. Remove the main bay cover A to access the HS Expander module. See [Figure 9 \(page 22\)](#).
2. On the faulty HS Expander, grasp each of the two plastic swing-arms between thumb and index finger as shown in [Figure 66](#).

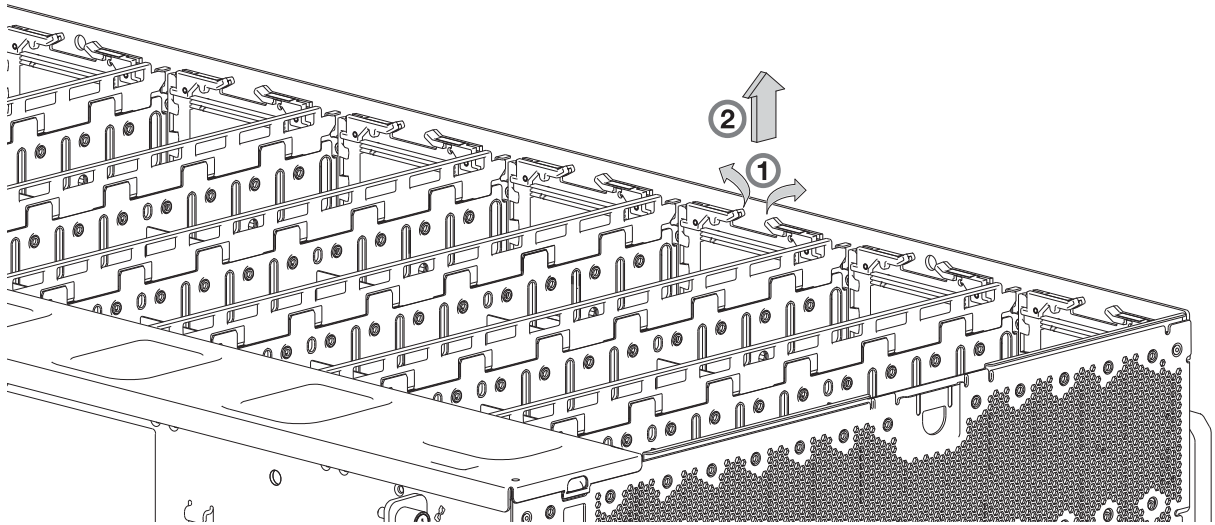


Figure 66 Removing a HS Expander (1 of 2)

3. Revolve each swing-arm upward to release the PCBA carrier from its slot as shown in [Figure 67](#).

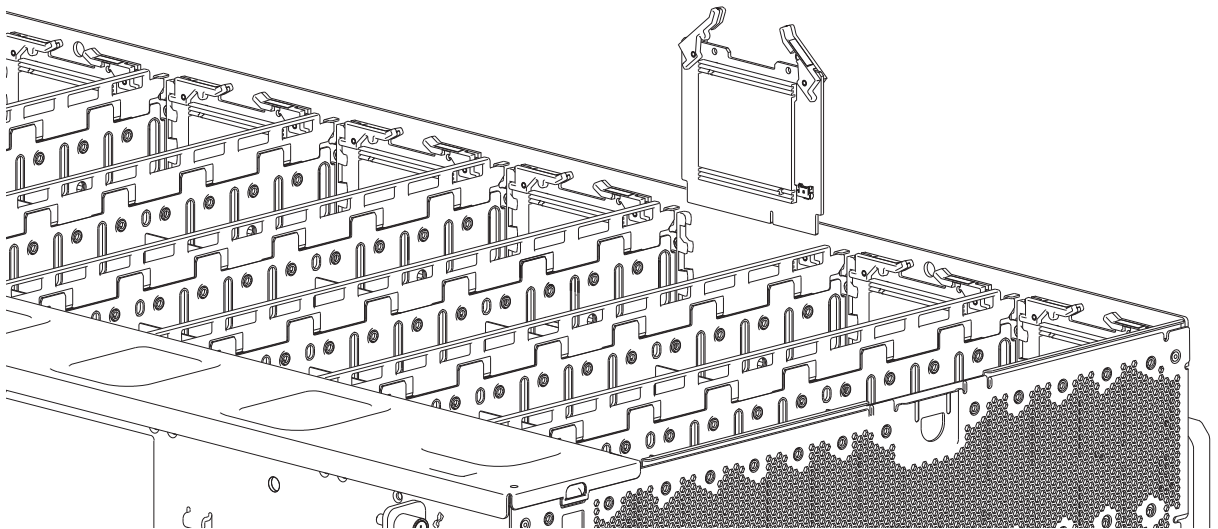


Figure 67 Removing a HS Expander (2 of 2)

4. While grasping the swing-arm handle, pull upwards to lift the HS Expander and remove it from its slot.

Installing an HS Expander module

Refer to [Figure 66](#) and [Figure 67](#) when performing this procedure, but ignore the directional arrow. You will insert the module into the slot rather than remove it.

① **IMPORTANT:** Handle the HS Expander module carefully to avoid damage to the connector and swing arms.

1. Check for damage, especially to all module connectors.
2. Align the HS Expander module for use in the module slot that is accessible from the top panel along the right wall of the enclosure.
3. Insert the HS Expander module into the slot, and gently press down on the module until it seats firmly in its connector.
4. Verify that the HS Expander Status LED is off. Verify that the front panel LED states show no amber module faults.
5. If replacing multiple HS Expanders, repeat [step 1](#) through [step 4](#).
6. Reattach top main bay cover A when you complete the procedure.

Replacing a drive carrier module

A DISC drive module consists of a DISC in a carrier. DISC Drive in Carrier (DDIC) modules are hot-swappable, which means they can be replaced without halting I/O to the DISC groups, or powering off the enclosure. The new DISC must be of the same type, and possess capacity equal to or greater than the one being replaced. Otherwise, the storage system cannot use the new DISC to reconstruct the DISC group. Remove the top main bay cover A to access DDICs. See [Figure 9 \(page 22\)](#) for enclosure cover locations and labeling. Reattach top main bay cover A when the procedure is completed. If accessing DDICs in DISC slots 96–105, remove top controller bay cover B, and reattach it when the procedure is completed. See also [Figure 11 \(page 23\)](#) for DISC slot indexing.

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

See CAUTION bullets regarding *electrostatic discharge* and *anti-static protection* on [page 73](#).

💡 **TIP:** The illustrations show DISC module replacement within the drive slots as you view the enclosure top panel. See also [Figure 11 \(page 23\)](#) for DISC drive slot numbering. Although the DDIC with LFF DISC is used in the illustrated procedures, the procedures also apply to the DDIC with SFF DISC and adapter.

Removing an LFF drive carrier module

1. Press the latch in the carrier handle towards the handle hinge to release the carrier handle as shown below.

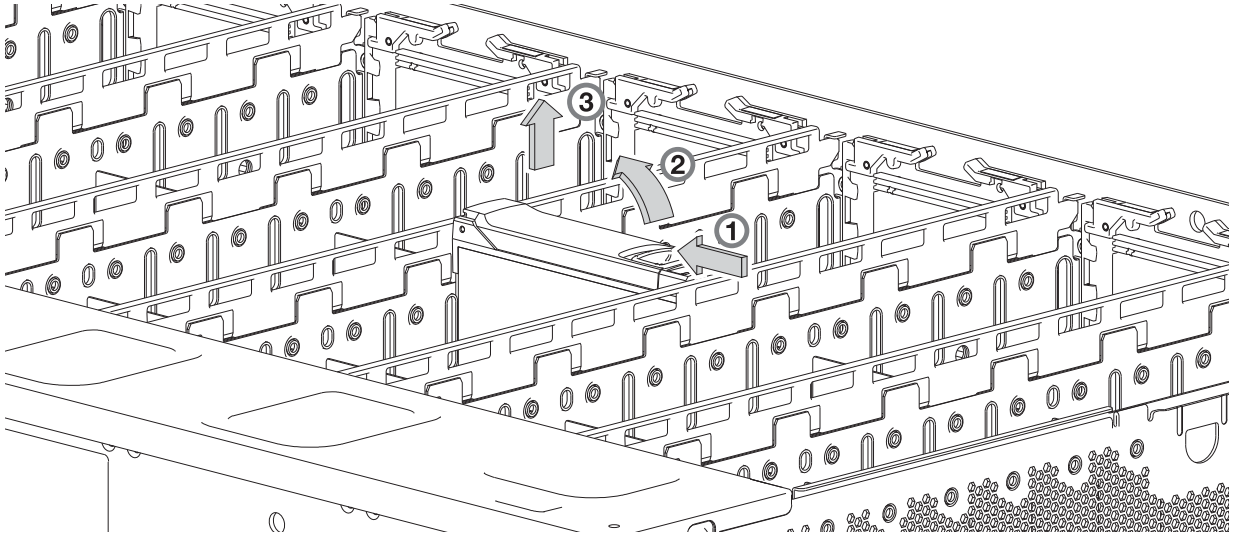


Figure 68 Removing an LFF DISC drive module (1 of 2)

2. Revolve the handle outward to lever the module out of its connector on the baseplane.

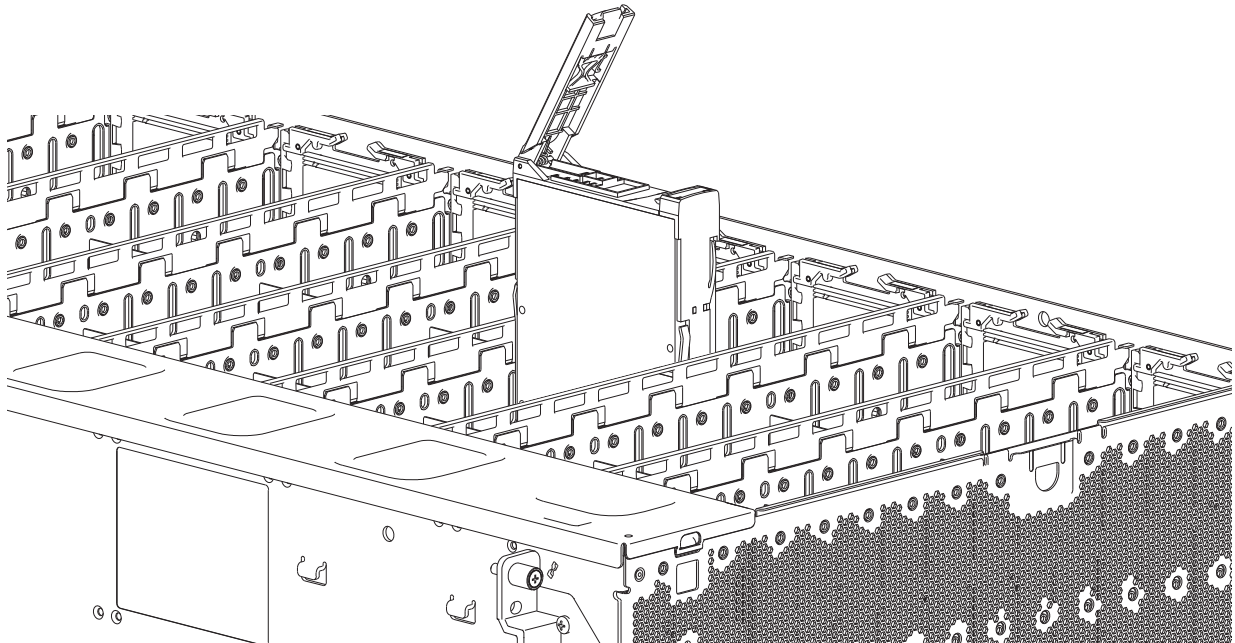


Figure 69 Removing an LFF DISC drive module (2 of 2)

3. Lift and remove the module fully from the drive slot.

Installing an LFF drive carrier module

1. Release the drive carrier handle by pressing the latch in the carrier handle towards the handle hinge to release the carrier handle as shown below.

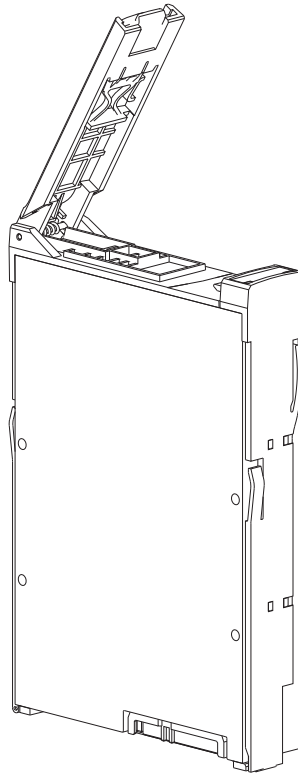


Figure 70 LFF drive carrier module in open position

2. Insert the drive carrier module into the enclosure. Make sure that the drive is held vertically with carrier latch positioned at the top, and the carrier hinge is present at the back of the enclosure as shown in [Figure 71](#).

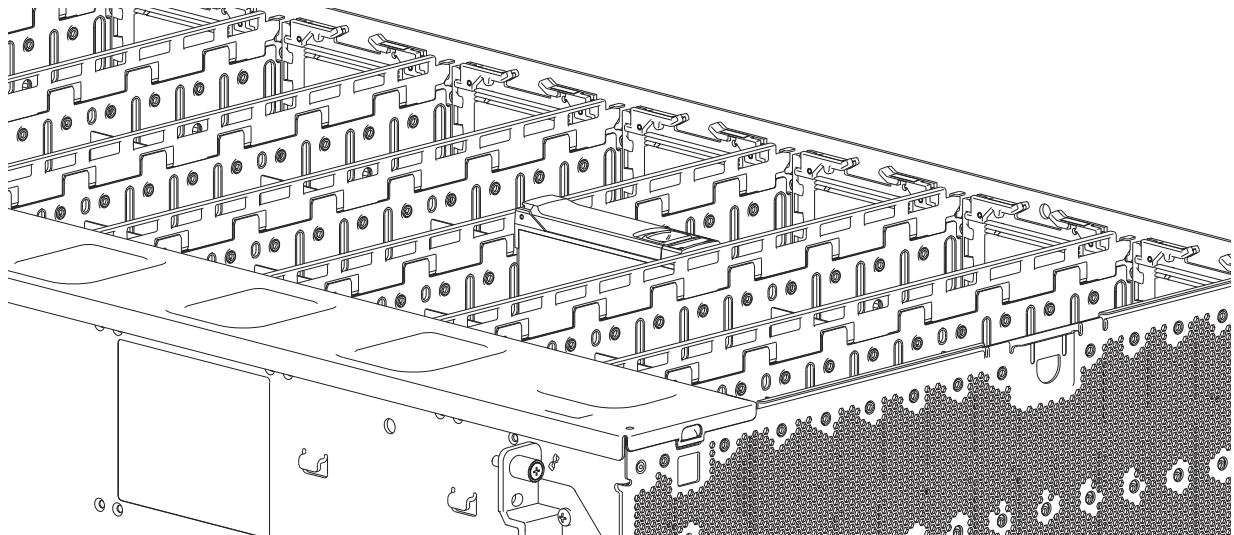


Figure 71 Installing an LFF drive carrier module (1 of 2)

3. Slide the drive carrier fully into the DISC slot within the enclosure.

4. Continue to push the DDIC (drive) firmly until the handle fully engages. The camming foot on the carrier will engage into a slot in the enclosure. You should hear a click as the latch handle engages and holds the handle closed.

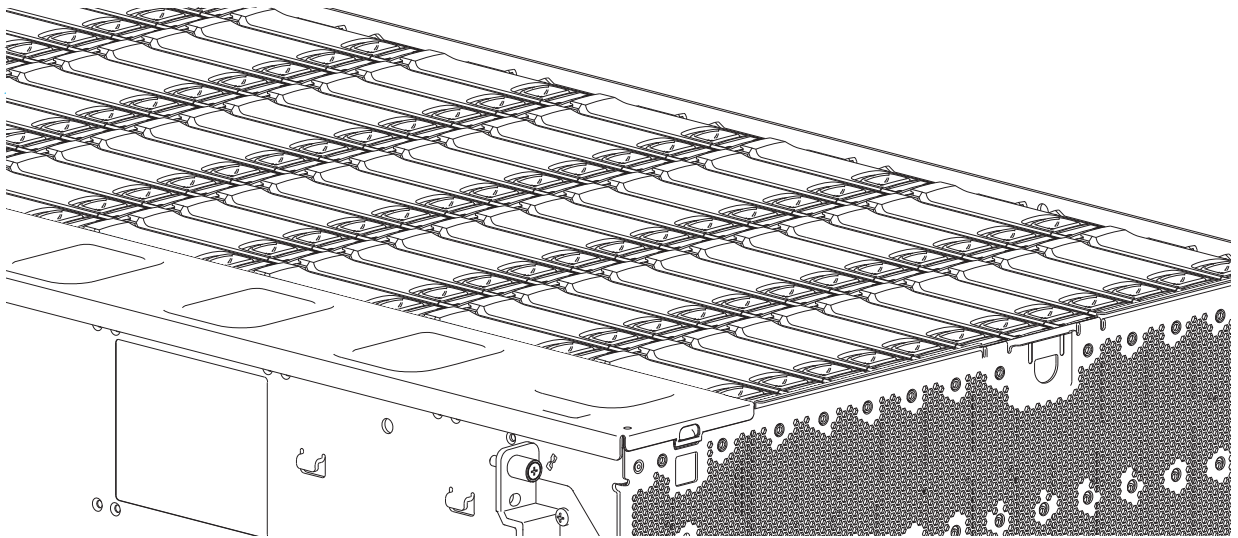


Figure 72 Installing an LFF drive carrier module (2 of 2)

5. Verify that the amber Fault LED on the DISC module handle is off. Verify that the front panel LED states show no amber module faults. The enclosure front panel Drive Activity LED will blink green to show DISC activity.

Replacing an IOM

-
- ⓘ **IMPORTANT:** If the Exos E 4U106 enclosure is configured with a single expansion module, it must be installed in IOM slot No.0. As you face the enclosure rear panel, this is the IOM slot located on the right. An IOM blank must be installed in the adjacent slot (No.1) as shown in [Figure 5 \(page 19\)](#). This configuration is required to ensure sufficient air flow through the enclosure during operation.
-

I/O module (IOM) denotes either a controller module (RAID canister) or an IOM (expansion canister). The I/O module replacement procedure is solution-specific and depends on system configuration and software implementation (including SAS zoning as well as multi-path and failover/failback procedures). Consult your solution service documentation for details on pre and post I/O module replacement procedures to minimize system disruption during replacement activities.

You may need to replace an IOM when:

- The Fault LED is illuminated
- Logs or events in the firmware indicate a problem with the module
- Troubleshooting indicates a problem with the module

Before you begin

Removing a controller or IOM from an operational enclosure significantly changes air flow within the enclosure. Openings must be populated for the enclosure to cool properly. Leave modules in the enclosure until ready to install a replacement. If replacing both IOMs in a dual-canister enclosure, record configuration settings before installing the new controller modules. See [“Removing an IOM” \(page 86\)](#), and [“Installing an IOM” \(page 87\)](#) for instructions about installing an additional controller module.

Verifying component failure

- Check Module Fault LED – rear (front of enclosure): Amber = Fault condition.
- Check Fault LED (back of enclosure on IOM face plate): Amber = Fault condition.
- Check that the OK LED (back of enclosure) is off.

Stopping I/O

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

① **IMPORTANT:** Stopping I/O to a DISC group is a host-side task, and falls outside the scope of this document.

When on-site, you can verify that there is no I/O activity by briefly monitoring the system LEDs; however, when accessing the storage system remotely, this is not possible.

Removing an IOM

① **IMPORTANT:** Considerations for removing IOMs:

- In a dual-controller environment, you may hot-swap a single controller module in an operational enclosure, provided you first shut down the faulty controller.
 - In a dual-controller environment—if replacing both controller modules—you must adhere to the instructions provided in “[Before you begin](#)” (page 85), and perform an orderly shutdown of the enclosure.
 - Do not remove a faulty module unless its replacement is on-hand. All FRU modules must be in place when the system is in operation.
-

See CAUTION bullets regarding *electrostatic discharge* and *anti-static protection* on [page 73](#).

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

1. Locate the enclosure whose ID LED (enclosure front panel – left side) is illuminated, and within the enclosure, locate the IOM to be replaced.
2. Disconnect any cables connected to the IOM.
Label each cable to facilitate re-connection to the replacement IOM.
3. Unlock the IOM latch handle by turning the thumbscrew counter-clockwise as shown in detail No.1 in [Figure 73](#).
Take care not to remove the thumbscrew from the IOM latch handle.
4. Grasp the IOM latch handle between the thumb and index finger and pull. Revolve the handle out and downward to lever the IOM out of the enclosure as shown in details No.2 and No.3 in [Figure 73 \(page 87\)](#).

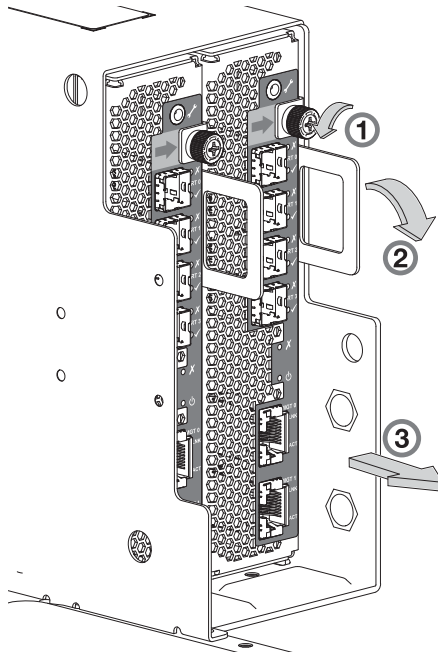


Figure 73 Removing an IOM (1 of 2)

5. Grip the latch handle and ease the IOM forward from the slot as shown within [Figure 74 \(page 87\)](#).
6. Place both hands on the IOM body, and pull it straight out of the enclosure such that the IOM remains level during removal.

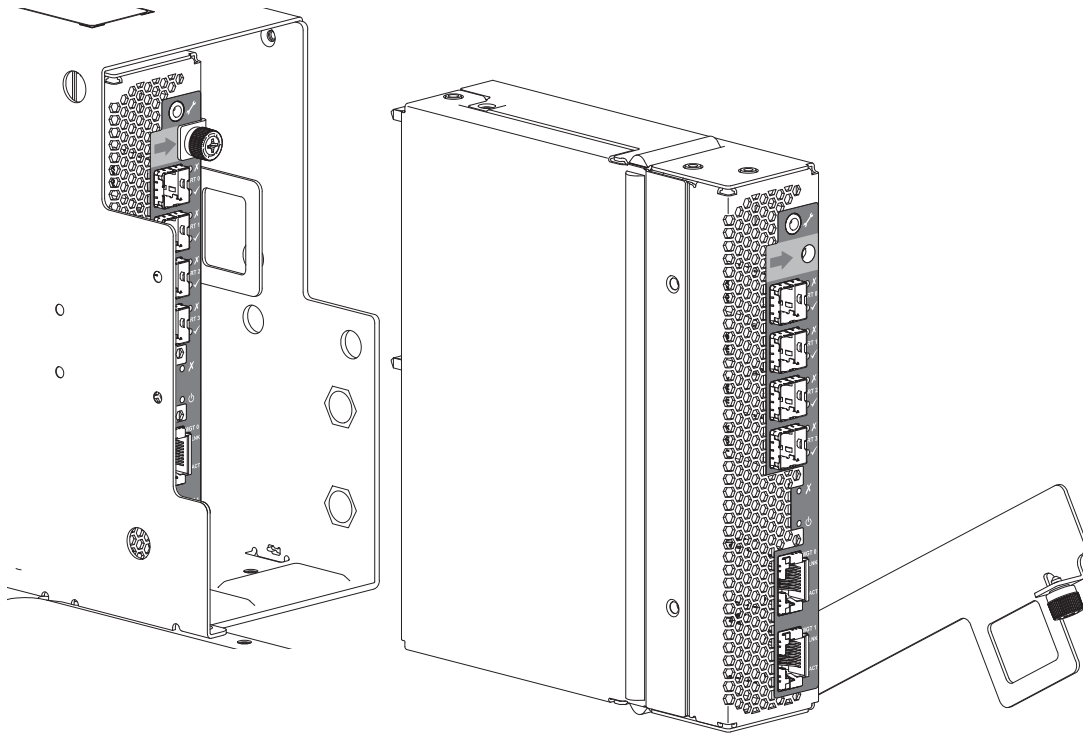


Figure 74 Removing an IOM (2 of 2)

Installing an IOM

See CAUTION bullets regarding *electrostatic discharge* and *anti-static protection* on [page 73](#).

△ CAUTION: If passive copper cables are connected, the cable must not have a connection to a common ground/earth point.

NOTE: When performing the following procedure, refer to [Figure 74](#) and [Figure 73 \(page 87\)](#) while ignoring the directional arrow. For installation, the IOM travels in the opposite direction relative to the arrow shown.

1. Examine the IOM for damage, and closely inspect the interface connector. Do not install if the pins are bent.
 2. Grasp the IOM using both hands, and with the latch in the open position, orient the module and align it for insertion into the target IOM slot.
 3. Ensuring the IOM is oriented as shown in the illustrations, slide it into the enclosure as far as it will go.
An IOM that is only partially seated will prevent optimal performance of the enclosure. Verify that the module is fully seated before continuing.
 4. Set the module in position by manually closing the latch.
You should hear a click as the latch handle engages and secures the IOM to its connector on the back of the midplane. Tighten the thumbscrew to secure the latch in place.
 5. Reconnect the cables.
-

NOTE: After replacement, ensure that the system USM firmware and configuration (including SAS zoning) is correct for the solution. Consult your solution service documentation for details on the correct procedures to verify and update system USM firmware.

Verifying component operation

Expansion module

If the storage system is configured with expansion enclosures, the replacement IOM may take up to one minute to initialize after the cables are connected. Verify that there are no illuminated Fault LEDs on the enclosure front panel or the IOM faceplate.

A Technical specifications

Enclosure dimensions

Table 13 4U enclosure dimensions

Specification	Metric units	Imperial units
Height (including top cover)	176.4 mm	6.94 in
Width (excluding ears and rails)	441 mm	17.36 in
Depth (including handles, excluding cables)	1,139 mm	44.84 in

Enclosure weights

Table 14 4U106 enclosure weights

FRU/component	Metric units (Kg)	Imperial units (lb)
Storage enclosure (enclosure plus midplane, but no FRU modules)	36	79.4
LFF DDIC module (3.5" LFF drive or 2.5" SFF drive with LFF adapter)	Up to 0.8	Up to 1.8
Power Supply Unit (PSU)	1.45	3.2
System fan module	0.7	1.5
IOM	0.8	1.8
IOM fan module	0.345	0.8
HS expander module	0.1	0.2
Cable Management Arm (CMA) and hardware kit	0.91	2.0
Rack rail (left/right) and hardware kit	6.75	14.9

NOTE:

Weights shown are nominal, and subject to variance.

DDIC weight varies depending on the drive model and capacity used. Value used is the heaviest DDIC currently qualified for the Exos E 4U106.

Scale calibration may affect measured weights.

Table 15 Exos E 4U106 total weights

FRU/component	Metric units (Kg)	Imperial units (lb)
Storage enclosure with FRUs, but no DDICs	44.9	99
Storage enclosure with FRUs and 106 DDICs	131.5	290
Storage enclosure with FRUs, 106 DDICs, CMA kit, and rack rail kit	140.6	310

NOTE:

Weight totals subject to variance in individual component weights.

Weight total changes depending on the number of DDIC modules installed. Weight totals with DDICs shown are for the maximum number of DDICs supported by Exos E 4U106.

Weight totals do not include power, SAS, or serial cables as those cables can have a range of lengths.

Environmental requirements

Table 16 Ambient temperature and humidity

Specification	Temperature range	Relative humidity
Operating	5°C to 35°C (41°F to 95°F, derated by 1°C per 300m above 900m) (ASHRAE A2 2015 thermal guidelines)	-12°C DP/10 to 80% (Max) (Non-condensing)
Non-operating	-40°C to +70°C (-40°F to +158°F) (Max rate of change: 20°C)	-12°C DP/5 to 100% (Max) (Non-condensing)

Specification	Measurement/description
Airflow	System must be operated with low pressure rear exhaust installation. Back pressure created by rack doors and obstacles not to exceed 5Pa (0.5 mm H ₂ O)
Altitude, operating	-100 to 3,048 meters (-328 to 10,000 feet). Maximum operating temperature is de-rated by 1°C for each 300 m above 900 m (2952.76 feet)
Altitude, non-operating	-100 to 12,192 m (-328 to 40,000 feet)
Shock, operating	3.0 g, 11 ms (per axis)
Shock, non-operating	20.0 g, 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, operating	0.18G _{rms} 5 Hz to 500 Hz, 30 min per axis
Vibration, non-operating	0.54 G _{rms} 6Hz to 200 Hz (ISTA 3E)
Vibration, relocation	ISTA3H air ride for 60 min
Acoustics	4U enclosures: Sound power operating ≤ 8.5 Bels LW _{Ad} @ 23°C
Orientation and mounting:	1.2 m rack mount (4 EIA units)
• Rack rails	To fit 1.2 m depth racks compliant with the SSI server rack specification
• Rack characteristics	Back pressure not exceeding 5Pa (~0.5 mm H ₂ O)

Power supply unit specifications

Table 17 Power cooling module specifications

Specification	Measurement/description
Dimensions (size)	38.1 mm high x 169.9 mm wide x 211.1 mm long: <ul style="list-style-type: none"> • X-axis length: 169.9 mm (6.69 in) • Y-axis length: 38.1 mm (1.5 in) • Z-axis length: 211.1 mm (8.3 in)
Maximum output power	2000 W
Voltage range	200–240 VAC rated

Table 17 Power cooling module specifications (continued)

Specification	Measurement/description
Frequency	50–60 Hz
Voltage range selection	Auto-ranging: 90–264 VAC, 47–63 Hz
Maximum inrush current	55A
Power conversion efficiency	≥ 94% @ 230 VAC (50% load)
Harmonics	Meets EN61000-3-2 (EU), EN 31000-3-3 (EU), EN 55024 (EU), KN 24/KN 35 (S. Korea)
Output	+12V @ 164A, +12V Standby Voltage @ 3.5A, 5V for circuit operation
Hot pluggable	Yes
Switches and LEDs	AC power cable connect and one bitonal status indicator LED

B Standards and regulations

International standards

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

- CE to EN 60950-1
- CB report to IEC 60950-1
- UL & cUL to UL 60950-1

Potential for radio frequency interference

USA 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.

Safety compliance

Table 18 Safety compliance specifications

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

EMC compliance

Table 19 EMC compliance specifications

Emissions	FCC CFR 47 Part 15 Subpart B Class A (USA)
	ICES/NMB-003 Class A (Canada)
	EN 55032:2012 Class A (EU)
	AS/NZS CISPR 22/CISPR 32 Class A (Australia/New Zealand)
	VCCI Class A (Japan)
	KN 22/KN 32 Class A (S. Korea)
	CNS 13438 Class A (Taiwan)
Harmonics	EN 61000-3-2 (EU)
Flicker	EN 61000-3-3 (EU)
Immunity	EN 55024 (EU)
	KN 24/KN 35 (S. Korea)

AC power cords/universal jumper cords

Table 20 AC power cord and universal jumper cord specifications

1	United States and Canada	
	Must be NRTL Listed (National Recognized Test Laboratory – e.g., UL)	
	Cord type	SVT or SJT, 14 AWG, 3 conductor, 2.5 M minimum length
	Plug	NEMA 6–15P grounding-type attachment plug rated 240V 15A
		<i>or</i>
		IEC 320, C-20, 250V, 15A or 16A
	Socket	IEC 320, C-19, 250V, 15A or 16A
2	General requirements: Europe and others	
	Cord type	Harmonized, H05-VVF, 15A or 16A, 250V, 14 AMG, 3*1.5sq mm
	Socket	IEC 320, C-19/C-20, 250V, 15A or 16A

ⓘ **IMPORTANT:** The plug and the complete power cable assembly must meet the standards appropriate to the country, and must have safety approvals acceptable in that country.

- Countries include the US, Canada, EU/NEMA, Mexico, Argentina, AUS/NZ, Japan, South Korea, Brazil, Vietnam, China, India, and EAC.
- Standards include RoHS, VDE, and low halogen.

Environmental Standards

- The RoHS Directive (2011/65/EU)
- The WEEE Directive (2012/19/EU)
- The REACH Directive (EC) No. 1907/2006

Recycling of Waste Electrical and Electronic Equipment (WEEE)

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

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

-
- ① **IMPORTANT:** Observe all applicable safety precautions detailed in the preceding chapters when dismantling and disposing of this equipment.
-

C Enclosure packaging

Supported packaging configurations are included for reference. Identify your packaging configuration from the palletized enclosure ship kit assemblies shown below. Read the documentation provided in your ship kit *before* unpacking, disposing of, or storing packing materials. See also “[Unpacking the enclosure](#)” (page 37).

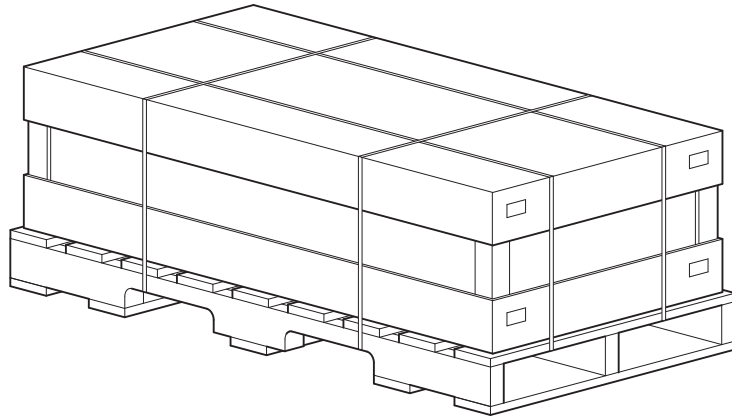


Figure 75 4U106 enclosure packed in 3-piece box

[Figure 77 \(page 96\)](#) shows an illustrated parts catalog (IPC) representation of the enclosure master container to complement the assembly view shown above.

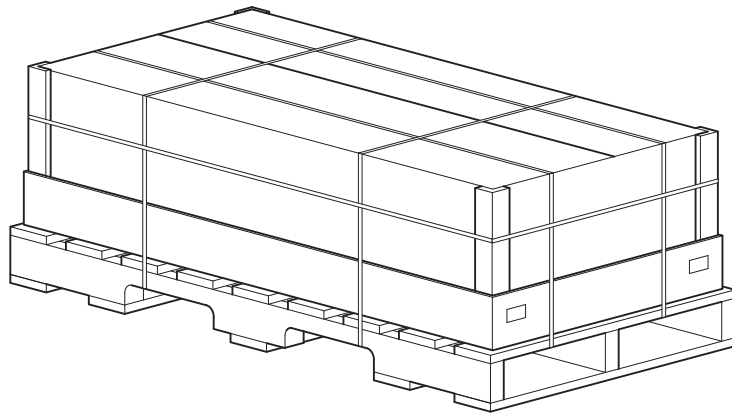
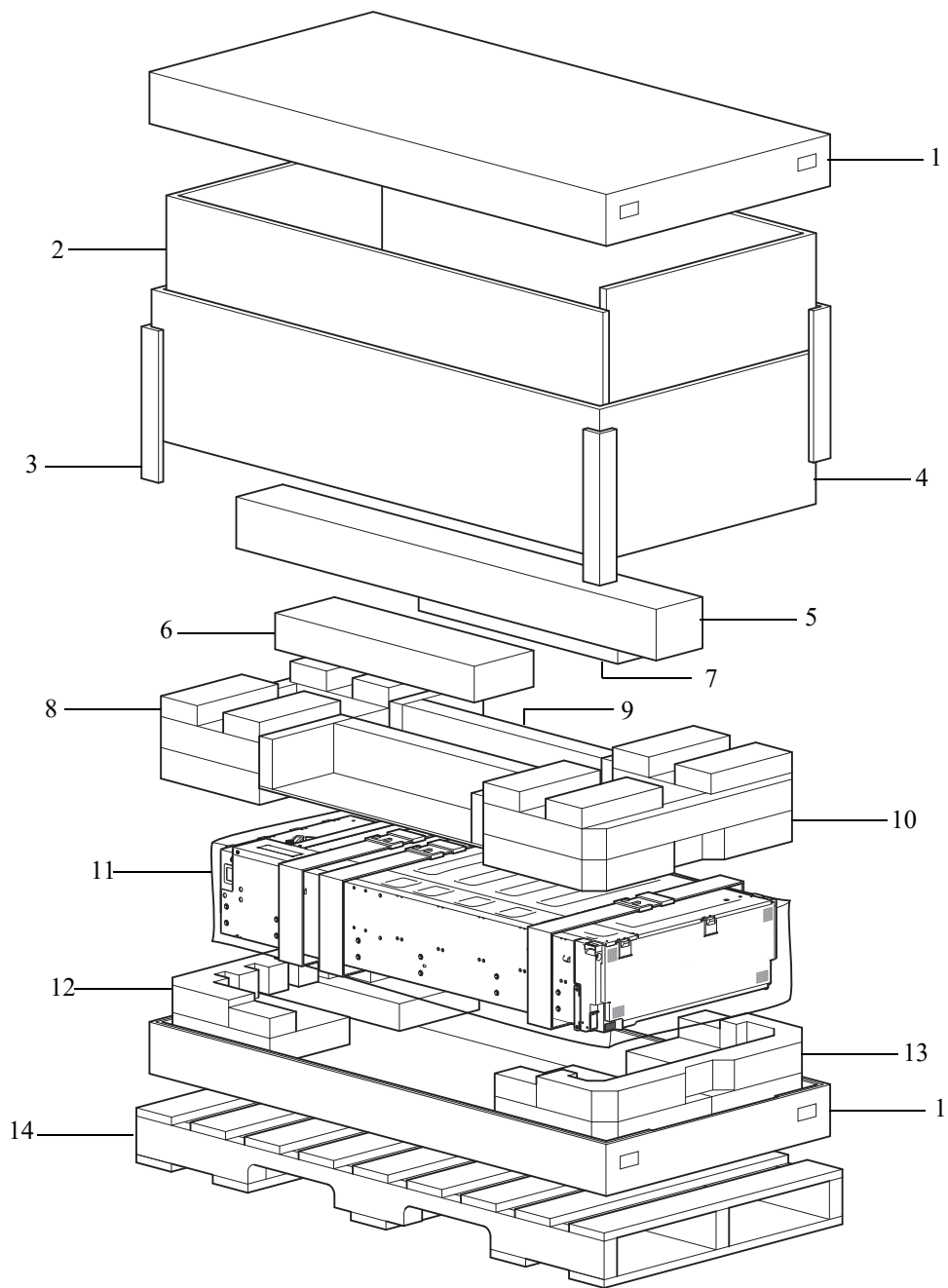


Figure 76 RSC box

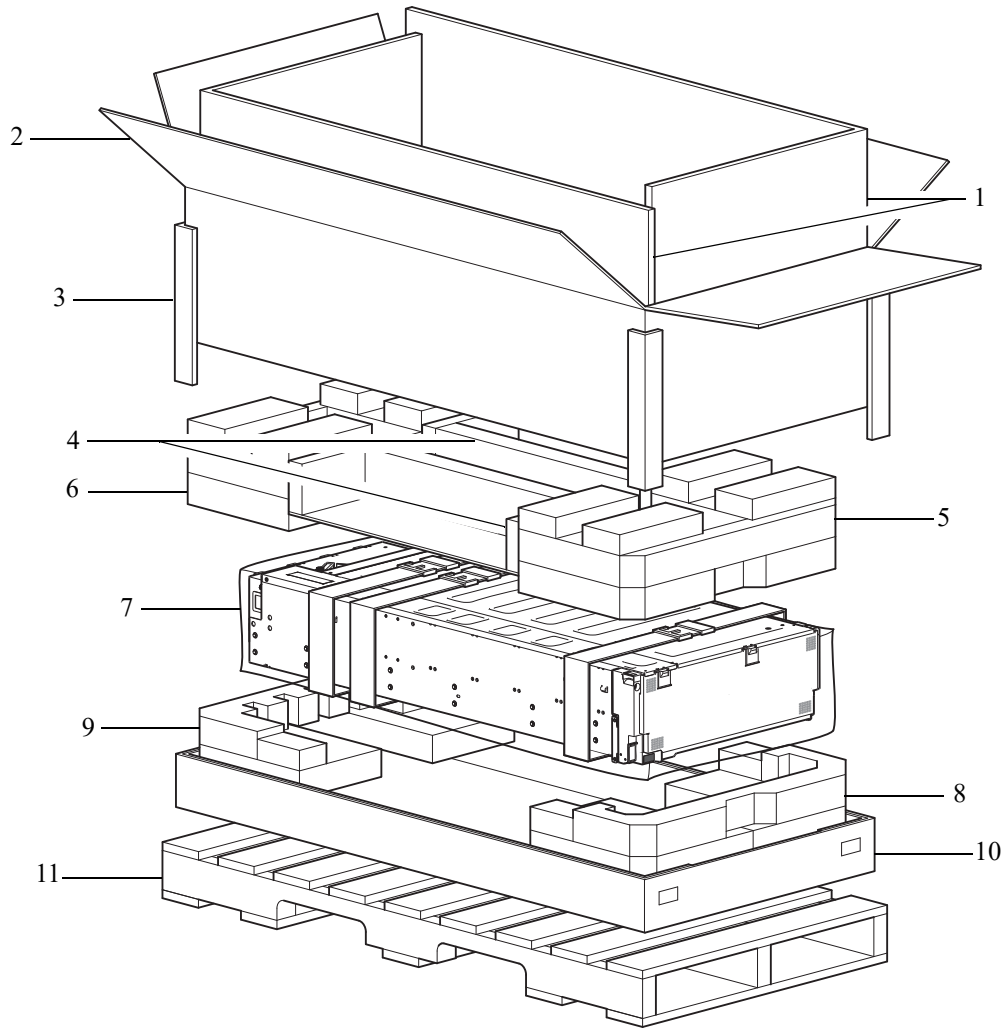
The Regular Slotted Container (RSC) box option is shown directly above. [Figure 78 \(page 97\)](#) shows an illustrated parts catalog representation of the RSC enclosure master container. This box uses a split flap-style, as opposed to the removable cover shown in [Figure 75 \(page 95\)](#). The RSC configuration differs from the 3-piece configuration: it does not include the rail kit box, CMA box, or accessory box. These items are provided separately for this configuration.

-
- ⓘ **IMPORTANT:** DISC drives in carriers (DDICs) are packaged separately from the 4U106 enclosure, and are available in different assortments (single, 12-pack, 24-pack). Do not populate DISC slots with DDICs until after the enclosure has been installed in the rack using a suitable mechanical lift. See also the **CAUTION** on [page 12](#) and “[Populating drive slots](#)” (page 23).
-



No.	Component description	Qty.	No.	Component description	Qty.
1	Base/cover, cardboard	2	8	Foam, inner, drawer rear, top	1
2	Insert, strength L, cardboard	2	9	Insert, CMA holder, cardboard	2
3	Edge protector, height, each corner	4	10	Foam, inner, drawer front, top	1
4	Insert, wall, cardboard	1	11	Plastic bag (with enclosure/belt straps)	1
5	Rail kit box	1	12	Foam, inner, drawer rear, bottom	1
6	Box, accessory kit	1	13	Foam, inner, drawer front, bottom	1
7	CMA box	1	14	Custom pallet, wood	1

Figure 77 Unpacking the enclosure: 3-piece box with packing



No.	Component description	Qty.	No.	Component description	Qty.
1	Insert, strength L, cardboard	2	7	Plastic bag (with enclosure/belt straps)	1
2	Cover, cardboard with AW	1	8	Foam, inner, drawer front, bottom	1
3	Edge protector, height, each corner	4	9	Foam, inner, drawer rear, bottom	1
4	Insert, CMA holder, cardboard	2	10	Base, cardboard	1
5	Foam, inner, drawer front, top	1	11	Custom pallet, wood	1
6	Foam, inner, drawer rear, top	1			

Figure 78 Unpacking the enclosure: RSC box with packing

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