

User Guide

HGST 4U102 ScaleMax[™] Hybrid Storage Platform

Regulatory Model: H4102-J

December 2017

Rev. 1.2

2079-810014-000

Long Live Data[™] | www.hgst.com

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Revision History

Date	Revision	Comment
November 2017	Revision 1.0	Initial Release
November 2017	Revision 1.1	<ul style="list-style-type: none">• The crossbar on the CMA was changed. See CMA Description on page 45.• Removed Lowline power specs from Detailed Power Specifications.• Changed required rack depth, see Required Rack Depth.• Changed typical power consumption, see Typical Power Consumption.• Updated LED Flash Patterns, see LEDs on page 16.
December 2017	Revision 1.2	<ul style="list-style-type: none">• Added active cable support• Added firmware upgrade section. See Firmware Upgrade on page 28.• Added a note regarding single IOMs in SATA TLAs. See the list of features.• Updated the Non-Op altitude specification. See Non-Operational Altitude.

Points of Contact

For further assistance with an HGST product, contact Platform Engineering technical support. Please be prepared to provide the following information: Serial Number (S/N), product name, model number, and a brief description of the issue.

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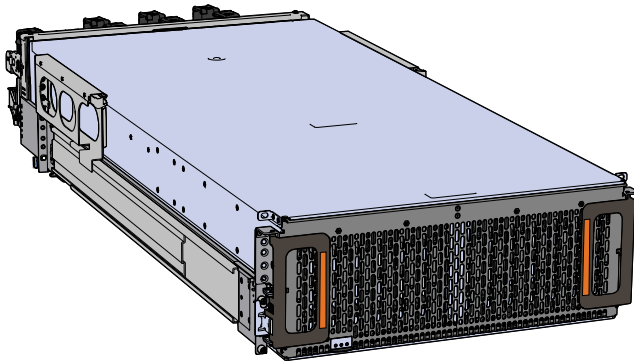
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1 Overview

This section provides a high level overview of the features of the HGST 4U102.

1.1 HGST 4U102 ScaleMax™ Hybrid Storage Platform Description

Figure 1: HGST 4U102



The HGST 4U102 is a 4U form factor, high availability, high density, rack-mounted storage enclosure that is capable of hosting up to 102 SAS or SATA drives. The maximum data storage capacity of the HGST 4U102 is 1.224 PB using 12TB HGST Ultrastar® He12 drives. (For a full list of compatible drives and total storage capacities, see the [List of Compatible Drives](#) on page 24.) The enclosure runs on an input voltage of 200 - 240 VAC and consumes ~1300W of power under typical conditions. It requires a maximum of ~1600W at full load.

Note: Max and Typical Power Consumption values represent the output power to the system. Input power will vary depending on the PSU efficiency and load sharing between PSUs

It is designed to fit within a 4U rack space and requires 1181-1197 mm (46.5in. - 47.13in.) of usable rack space, frame to frame. A fully loaded system will add 118.8 kg/262 lbs. of static load when fully loaded with drives.

- 4U Storage Enclosure
- Supports up to 102 Drives
- Can support 3.5" drives
- Up to 12W per slot (Cannot exceed 85A on the 5V rail)
- House and control four (4) N+1 redundant 80mm fans
- House and control a dual rotor 40mm IOM Fan
- Controlled by two (2) redundant I/O Modules
- Powered by two (2) redundant 1600W PSUs
- Full high availability with independent dual paths to all HDDs
- Tool-less replacement of all Customer Replaceable Units (CRUs)

¹ SATA based models will only include 1 IOM

- Fits within a standard EIA-310 rack including all necessary cable management
- Supports up to 4m passive SAS cables and also supports Active Cables
- Supports Highline Input Power

1.2 System Architecture Overview

The HGST 4U102 IOM uses a cascaded expander design to allow for connection to all 102 drives. A 48-port primary expander connects with the six host ports, has a x3 link to the other IOM for IOM-IOM communication and syncing, and also has a x10 SAS link to each secondary expander. Each secondary expander then connects with fifty-one (51) drives.

The out-of-band management microprocessor provides an Ethernet connection using a Redfish/RESTful API to access the various enclosure services. All the SES enclosure information can be obtained through the out-of-band management port. Major use cases for this feature include obtaining system health information, locating enclosure components using the IDENT LEDs, and updating firmware.

The system FPGAs control and report the states of the systems fans, enclosure LEDs, connector LEDs, drive LEDs, and T10 Pin 3 drive power enable signals. Each drive slot can support up to 12W.

The I²C architecture is designed to support only one single master on any given bus. The primary expander will be the master on each I²C bus. There are eight I²C buses used in the HGST 4U102 enclosure. The number of devices on each bus are balanced to allow communication to peripheral devices and not overload any one bus. The devices connected on the I²C buses include the enclosure VPDs, temp sensors, baseboard FPGAs, and SAS connectors.

1.3 HGST 4U102 Layout

Figure 2: Front and Rear Product Layout

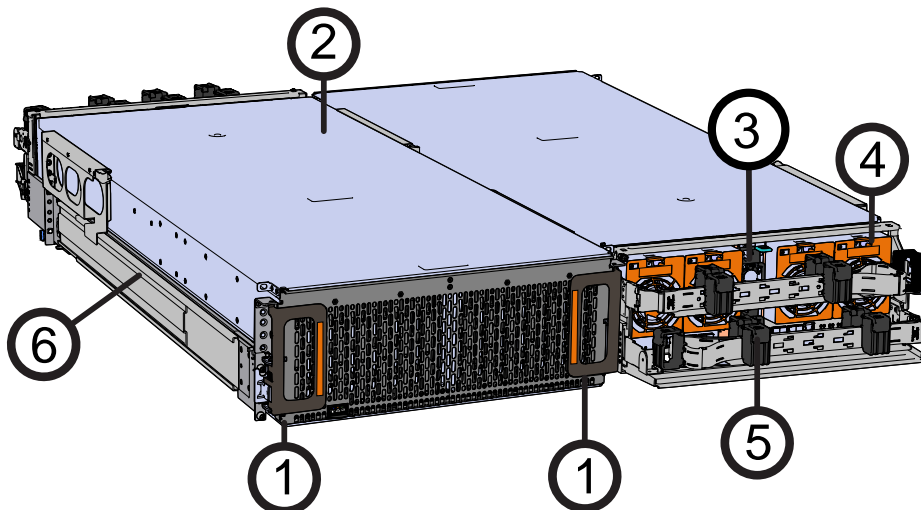


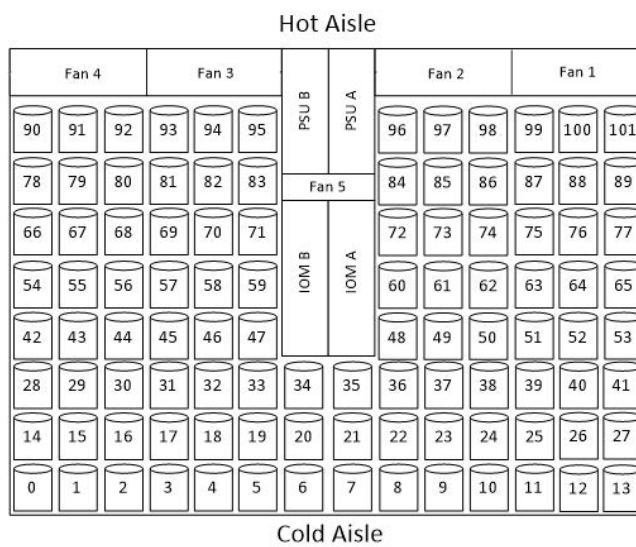
Table 1: Front and Rear Component Identification

Number	Component
1	Enclosure Handles

Number	Component
2	Chassis Cover
3	PSUs
4	Rear Fans
5	CMA
6	Rails

The following is an image of the layout of the layout of the major system components inside the HGST 4U102.

Figure 3: Component Layout



1.4 HGST 4U102 Specification Summary

Table 2: Environmental Specification

Specification	Non-Operational	Operational
Temperature	-40°C to 70°C	5°C to 35°C
Temperature Gradient	30°C per hour max	20°C per hour max
Temperature De-rating	1°C per 300m above 3000m	1°C per 125m above 950m
Relative Humidity	8-90% Non-Condensing	8-90% Non-Condensing
Relative Humidity Gradient	30% per hour maximum	30% per hour maximum

Specification	Non-Operational	Operational
Altitude	-300m to 12,000m / -984 ft. to 39,370 ft	-300m to 3048m / -984 ft. to 10,000 ft.

Table 3: Electrical Specifications

Specification	Value
Max Power Consumption	~1600W
Typical Power Consumption	~1300W
Note: Max and Typical Power Consumption values represent the output power to the system. Input power will vary depending on the PSU efficiency and load sharing between PSUs	
Input Voltage	200 - 240 VAC
PSU Connector Type	C14
Inrush Current Maximum (per PSU)	AC line inrush current shall not exceed 40A peak, for up to one-quarter of the AC cycle after which, the input current should be no more than the specified maximum input current.
PSU Efficiency	80 PLUS Platinum

Table 4: Mechanical Specifications

Specification	Non-Operational	Operational
Shock	10G, 0 - peak, 11ms half sine; 3 positive and 3 negative pulses in each axis Shock	5G, 0 - peak, 11ms half sine; 3 positive and 3 negative pulses in each axis- minimum 6 seconds between shocks to allow for write/read recovery
Vibration	0.75G, 0 - peak swept sine; 5 -500Hz; 1 complete sweep @ 1/2 octave per minute	0.10G, 0 - peak swept sine; 5 -500Hz; 1 complete sweep @ 1/2 octave per minute
Weight	118.8 kg / 262 lbs.	
Dimensions with CMA	W: 447mm x L: 1197 mm x H: 175mm / W: 17.6in. x L: 47.13in. x H: 6.89in.	
Length without CMA	1047 mm / 46.69in.	
Required Rack Width	450mm with (17.72in.) with 465mm (18.31in.) \pm 1.5mm nominal hole spacing. See EIA-310 Rack Standard	
Required Rack Depth	1181-1197 mm (46.5in. - 47.13in.) of usable rack space, frame to frame	
Rack Units (U)	4U	

Specification	Non-Operational	Operational
Vertical Rack Rail Spacing	32 in. - 36 in.	

Table 5: Performance Specifications

Specification	Value
Number of Drive Slots	102
Data Transfer Rates	12Gbps SAS / 6Gbps SATA
Max Raw Data Storage Capacity	1.224 PB using 12TB HGST Ultrastar® He12 drives
SAS Ports	12 x Mini-SAS HD (6 per IOM) 2 x 10/100/1G Ethernet

1.5 HGST 4U102 Rack Requirements

The HGST 4U102 is designed to be installed into a rack that meets the EIA-310 standard at a minimum 1181-1197 mm (46.5in. - 47.13in.) of usable rack space, frame to frame. The vertical rack rails must be set between 32 in. - 36 in. to support the enclosure. It requires 4U of rack space, and it should be installed into the rack at the lowest possible U height to keep the load on the rack balanced.

Table 6: Required Rack Specifications

Parameter	Requirement
Rack Depth	1181-1197 mm (46.5in. - 47.13in.) of usable rack space, frame to frame
Rack Width	450mm with (17.72in.) with 465mm (18.31in.) \pm 1.5mm nominal hole spacing. See EIA-310 Rack Standard
Rack Units (U)	4U
Vertical Rack Rail Spacing	32 in. - 36 in.
Static Load Rating	2500 lbs.
Dynamic Load Rating	3000 lbs.



Warning: When extended out of the rack on the rail system, the HGST 4U102 will be ~950 mm extended outward. This is a tipping hazard. Make sure that any rack supporting the enclosure **MUST BE BOLTED TO THE FLOOR** before servicing or extending out of the rack.

1.6 Power Requirements

The following table describes the A/C input power specification for the HGST 4U102.

Table 7: AC Power Specifications

Power	
Alternating Current (AC) Power Supply (2 per enclosure)	
Wattage (per power supply) Note: Max and Typical Power Consumption values represent the output power to the system. Input power will vary depending on the PSU efficiency and load sharing between PSUs	Supply Rating: 80 PLUS Platinum rated Max Power Consumption: ~1600W Typical Power Consumption: ~1300W
Voltage (per power supply)	200 - 240 VAC, auto-ranging, 50/60 Hz
Maximum inrush current (per power supply)	AC line inrush current shall not exceed 40A peak, for up to one-quarter of the AC cycle after which, the input current should be no more than the specified maximum input current.

Caution: The HGST 4U102 can only be plugged into highline. If the unit is plugged into lowline, the PSU will report a "Critical" state when status pages are queried using SES. In this case, the enclosure will power up, but the drives will not. The enclosure will remain in low-power mode.

1.7 Host Connectivity

The HGST 4U102 is limited to using passive SAS cables that are no longer than 4m.

The following table displays the power cable approved by HGST:

Table 8: Approved Power Cables

Type	Part Number	Dimension (overmold)
Standard C13 - C14 Power Cable	1EX0064	C13 to C14

Connect the HGST 4U102 to the host, using high quality HD MiniSAS cables.

The following table displays the SAS cable approved by HGST:

Table 9: Approved SAS Cables

Type	Part Number
Passive - HGST 3m, 12G SAS, MINISAS HD, 28 AWG	1EW0329

Type	Part Number
Active - Molex, 3M Active SAS cable.	106415-2103
Active - Molex, 10M Active SAS cable.	106415-2110

1.8 ESD

The enclosure is designed to dissipate all electrostatic discharge (ESD) to the chassis base. Ensure that there is sufficient electrical and mechanical connection from the chassis base to the rack rails, and that the rack itself is tied to earth ground. Precautions must be taken to ensure that the system is not exposed to ESD while handling components or servicing the unit.

The unit must be grounded in accordance with all local/regional and national electrical codes.

1.9 Enclosure Cooling

The HGST 4U102 has an advanced thermal algorithm running within the logical enclosure services process called the SEP that monitors all of the temperature sensors in the enclosure. The SEP makes adjustments to the fan speeds based upon the thermal sensors. The fan algorithm takes into account the component and the warning and critical threshold limits defaulted and managed by the SEP controller. If any temperature sensor exceeds the temperature threshold configured in the SES pages, the fan speed will increase to cool the enclosure. If the enclosure encounters low temperatures, the enclosure will reduce fan speed in an attempt to conserve power and not over-cool the enclosure. This algorithm is agnostic to effects of altitude and humidity. The algorithm works based on temperatures within the enclosure with emphasis on reducing power consumption. The rack that the HGST 4U102 is installed in must not restrict airflow to the enclosure. Racks with doors should be tested to ensure they do not constrict airflow to the enclosure. If the enclosure reaches critical temperature, it will go into low-power mode to avoid damage to the enclosure.

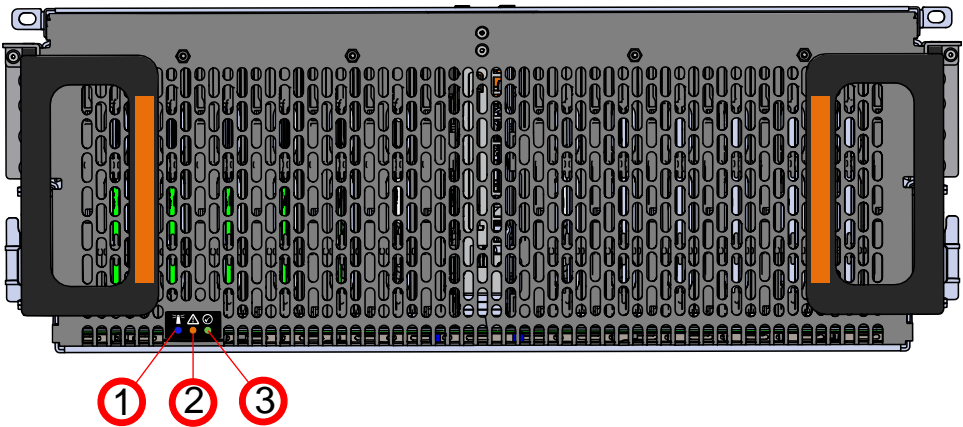
When the HGST 4U102 is extended out of the rack, the cover of the enclosure remains inside the rack which exposes the drives. This feature allows for easier access to drives and simplifies maintenance tasks related to internal components. However, there is a limit to the amount of time the enclosure can be extended out of the rack before the enclosure will begin to overheat. Limit the amount of time that the enclosure is extended out of the rack to only what is necessary to exchange a component or perform regular maintenance and should be limited to a maximum of 5 minutes total. Never extend the enclosure out for longer than 5 minutes to prevent overheating. Only extend the enclosure out of the rack as far as necessary to service components. The enclosure is equipped with a sensor that will be tripped when the enclosure's top cover has been opened resulting in the rear fans turning up to max speed.

1.10 LEDs

1.10.1 Front and Rear IO LEDs

The HGST 4U102 has a number of LEDs on the exterior of the enclosure that display various system statuses. There are three on the front and three on the rear that mirror each other and provide general status. This allows the status of the enclosure to be visible from either side of the rack.

Figure 4: Front LEDs



From the rear there are the three enclosure status LEDs and LEDs on the Ethernet and SAS ports.

Table 10: Front LED Identification

Number	LED Name	Color	Behavior
1	Identification	Blue	Blink @ 1 Hz – Blinks only when Identification has been activated. Will blink when any component is identified.
2	Fault	Amber	Blink @ 1 Hz –Enclosure has a fault Off – Enclosure has no fault

Number	LED Name	Color	Behavior
3	Power	Green	Solid - Powered On

Figure 5: Rear IO LEDs

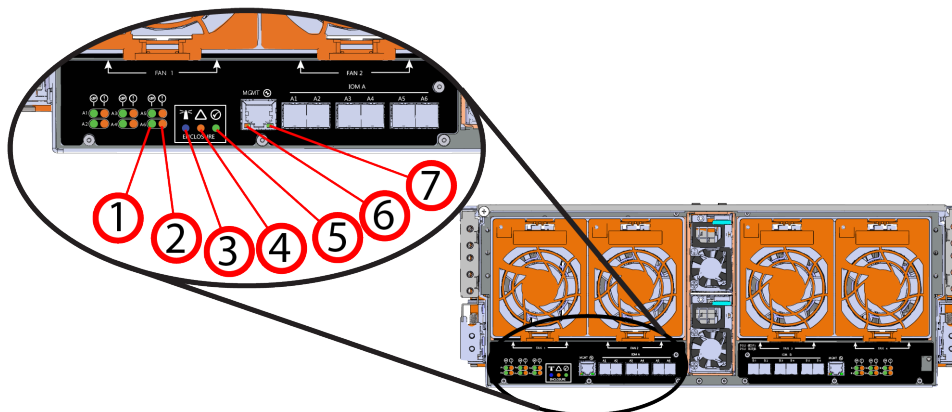


Table 11: Rear LED Identification

Number	LED Name	Color	Behavior
1	SAS Link Status	Green	Solid – SAS Cable Connected Off – SAS Cable Not Connected
2	SAS Fault Status	Fault	Blink @ 1 Hz – SAS connection fault Off – No SAS connection fault
3	Identification	Blue	Blink @ 1 Hz – Blinks only when Identification has been activated. Will blink when any component is identified.
4	Fault	Amber	Blink @ 1 Hz –Enclosure has a fault Off – Enclosure has no fault
5	Power	Green	Solid - Powered On
6	Ethernet Connectors Link/Activity	Green	Off - No Connection Solid - Connected Blink - Activity
7	Ethernet Connector Speed	Green/Amber	Off - Operating at 10 Mbps Green Solid - Operating at 100 Mbps Amber Solid - Operating at 1Gbps

1.10.2 IOM LEDs

The IOM has three LEDs, one each for power, fault, and identification.

Figure 6: IOM LEDs

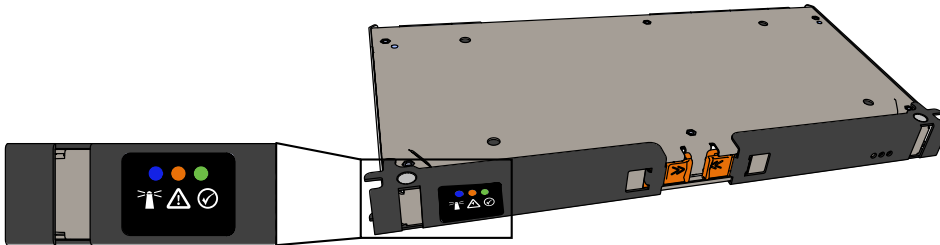


Table 12: IOM LED Identification

LED Name	Color	Behavior
IOM Power	Green	Solid - IOM is on Off - IOM is off
IOM Fault	Amber	Solid - IOM has Fault Off - IOM is functioning normally
IOM Identification	Blue	Blink @ 1 Hz – Blinks only when IOM Identification has been activated. Off - Not being identified

1.10.3 IOM Fan LED

The IOM Fan has a single LED that has three distinct states, one each for a fault condition, identification, and power off.

Figure 7: IOM Fan LED

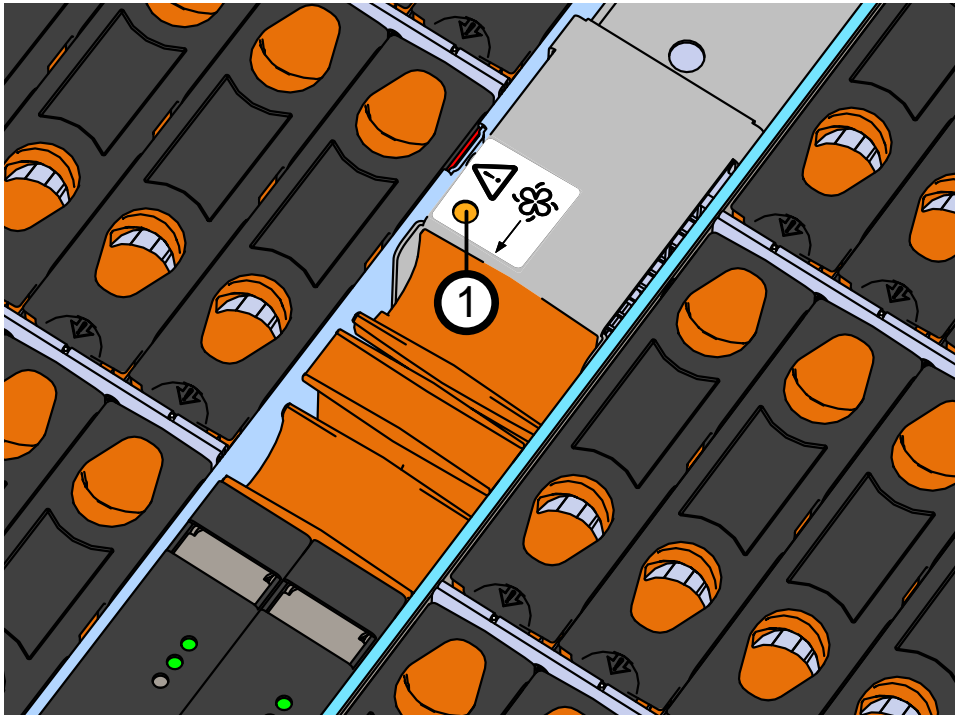


Table 13: IOM Fan LED Identification

LED Name	Color	Behavior
IOM Fan LED	Amber	Solid – IOM Fan is reporting faults Blinking @ 1 Hz – IOM Fan is being identified Off – IOM Fan is on and reporting no faults

1.10.4 PSU LED

The PSU has a single multi-function LED. See the table below for a detailed functional description.

Figure 8: PSU LEDs

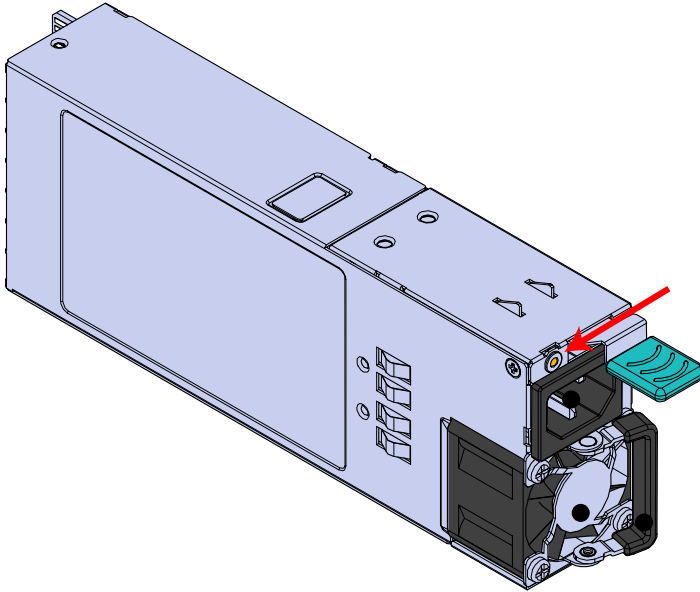


Table 14: PSU LED Identification

LED Name	Color	Behavior
PSU Multi-function LED	Green	Solid – PSU is on and reporting no faults Blinking @ 0.5Hz – PSU is functioning in Smart Redundant state Blinking @ 2Hz – PSU in firmware update mode Off – PSU is disconnected from power
	Amber	Solid – PSU is disconnected from power or critical fault causing a shutdown failure Blinking @ 0.5Hz – PSU reporting warnings Off – PSU is on and reporting no faults

1.10.5 Rear Fan LED

The Rear Fan has a single LED that has three distinct states, one for a fault condition, one for Identification, and off.

Figure 9: Fan LED

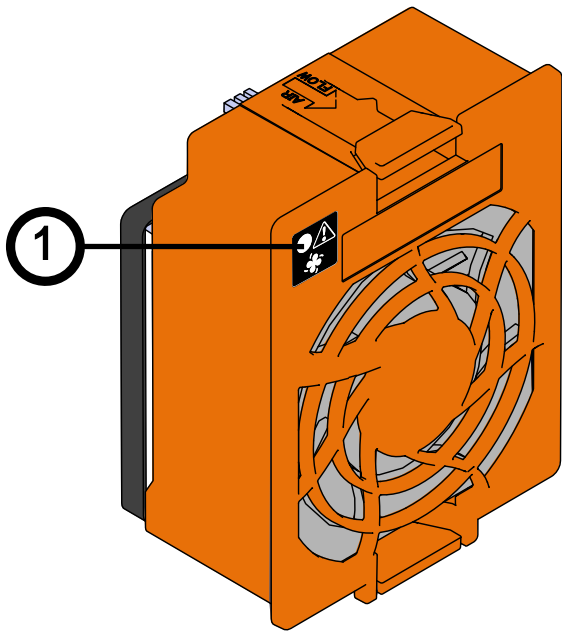


Table 15: Fan LED Identification

LED Name	Color	Behavior
Fan LED	Amber	Solid – Fan is reporting faults Blinking @ 1 Hz – Fan is being identified Off – Fan is on and reporting no faults

1.10.6 Drive Assembly LEDs

The HDD drive assemblies themselves do not contain an LED. However, there is an amber multi-function LED that has three distinct states, one for a fault condition, one for Identification, and off.

Figure 10: HDD Assembly LED

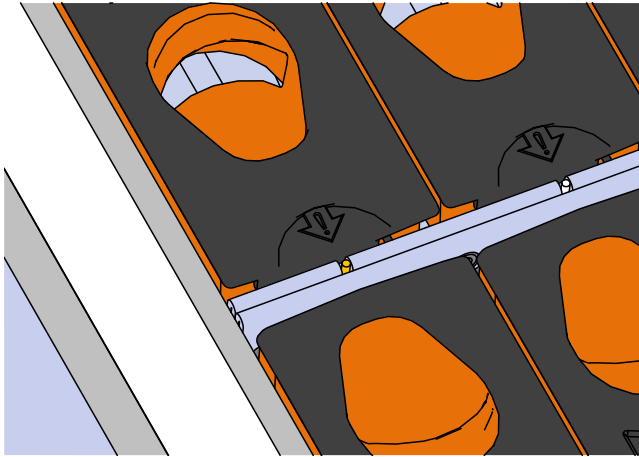


Table 16: HDD LED Identification

LED Name	Color	Behavior
Drive Multi-function LED	Amber	Solid – Drive Fault Blinking @ 1 Hz – Drive Identify Off – Drive has no faults

1.11 List of Customer Replaceable Units (CRUs)

The following table lists the replaceable components and their part numbers.

Table 17: List of Replaceable Components

Component	HGST Part Number
3.5 in. Drive Blank	1EX0429
HD Mini-SAS to HD Mini-SAS, 3m, Qty=2	1EX0329
IOM	1EX0430
IOM Blank	1EX0431
IOM Fan	1EX0432
Rear Fan	1EX0433
PSU	1EX0434
Rails	1EX0435
CMA	1EX0437

Component	HGST Part Number
CMA Cable Tray	1EX1119
Power Cable for PDU, C13-C14, 18AWG, 3m, Qty=1	1EX0064
3.5" Drive Carrier, Qty = 1	1EX0438
HGST 4U102 Chassis with Single IOM and PSU	1EX0440
HGST 4U102 Chassis with IOMs and PSUs	1EX0441

1.12 List of Available SKUs

The following table list the available SKUs that can be purchased in HGST 4U102 product.

Table 18: Available SKUs

SKU Number	SKU Name
1ES0255	HGST 4U102 - 102 8TB SAS 4Kn ISE HDD
1ES0245	HGST 4U102 - 102 8TB SAS 4Kn TCG HDD
1ES0246	HGST 4U102 - 102 8TB SAS 4Kn SE HDD
1ES0247	HGST 4U102 - 102 8TB SAS 512e ISE HDD
1ES0248	HGST 4U102 - 102 8TB SAS 512e TCG HDD
1ES0249	HGST 4U102 - 102 8TB SAS 512e SE HDD
1ES0294	HGST 4U102 - 102 10TB SAS 4Kn ISE HDD
1ES0295	HGST 4U102 - 102 10TB SAS 4Kn TCG HDD
1ES0296	HGST 4U102 - 102 10TB SAS 4Kn SE HDD
1ES0297	HGST 4U102 - 102 10TB SAS 512e ISE HDD
1ES0298	HGST 4U102 - 102 10TB SAS 512e TCG HDD
1ES0299	HGST 4U102 - 102 10TB SAS 512e SE HDD
1ES0300	HGST 4U102 - 102 10TB SATA 4Kn ISE HDD
1ES0301	HGST 4U102 - 102 10TB SATA 4Kn SED HDD
1ES0302	HGST 4U102 - 102 10TB SATA 4Kn SE HDD
1ES0303	HGST 4U102 - 102 10TB SATA 512e ISE HDD
1ES0304	HGST 4U102 - 102 10TB SATA 512e SED HDD
1ES0305	HGST 4U102 - 102 10TB SATA 512e SE HDD
1ES0306	HGST 4U102 - 102 12TB SAS 4Kn ISE HDD
1ES0307	HGST 4U102 - 102 12TB SAS 4Kn TCG HDD
1ES0308	HGST 4U102 - 102 12TB SAS 4Kn SE HDD

SKU Number	SKU Name
1ES0309	HGST 4U102 - 102 12TB SAS 512e ISE HDD
1ES0310	HGST 4U102 - 102 12TB SAS 512e TCG HDD
1ES0311	HGST 4U102 - 102 12TB SAS 512e SE HDD
1ES0312	HGST 4U102 - 102 12TB SATA 4Kn ISE HDD
1ES0313	HGST 4U102 - 102 12TB SATA 4Kn SED HDD
1ES0314	HGST 4U102 - 102 12TB SATA 4Kn SE HDD
1ES0315	HGST 4U102 - 102 12TB SATA 512e ISE HDD
1ES0316	HGST 4U102 - 102 12TB SATA 512e SED HDD
1ES0317	HGST 4U102 - 102 12TB SATA 512e SE HDD

1.13 List of Compatible Drives

Table 19: Compatible Drives

Drive	Volume	Part Number
HGST Ultrastar® He8 SAS 4Kn ISE, Qty=1	8TB	1EX0389
HGST Ultrastar® He8 SAS 4Kn TCG, Qty=1	8TB	1EX0390
HGST Ultrastar® He8 SAS 4Kn SE, Qty=1	8TB	1EX0391
HGST Ultrastar® He8 SAS 512e ISE, Qty=1	8TB	1EX0392
HGST Ultrastar® He8 SAS 512e TCG, Qty=1	8TB	1EX0393
HGST Ultrastar® He8 SAS 512e SE, Qty=1	8TB	1EX0394
HGST Ultrastar® He10 SAS 4Kn ISE, Qty=1	10TB	1EX0482
HGST Ultrastar® He10 SAS 4Kn TCG, Qty=1	10TB	1EX0483
HGST Ultrastar® He10 SAS 4Kn SE, Qty=1	10TB	1EX0484
HGST Ultrastar® He10 SAS 512e ISE, Qty=1	10TB	1EX0485
HGST Ultrastar® He10 SAS 512e TCG, Qty=1	10TB	1EX0486
HGST Ultrastar® He10 SAS 512e SE, Qty=1	10TB	1EX0487
HGST Ultrastar® He10 SATA 4Kn ISE, Qty=1	10TB	1EX0494
HGST Ultrastar® He10 SATA 4Kn SED, Qty=1	10TB	1EX0495
HGST Ultrastar® He10 SATA 4Kn SE, Qty=1	10TB	1EX0496
HGST Ultrastar® He10 SATA 512e ISE, Qty=1	10TB	1EX0497
HGST Ultrastar® He10 SATA 512e SED, Qty=1	10TB	1EX0498
HGST Ultrastar® He10 SATA 512e SE, Qty=1	10TB	1EX0499

Drive	Volume	Part Number
HGST Ultrastar® He12 SAS 4Kn ISE, Qty=1	12TB	1EX1004
HGST Ultrastar® He12 SAS 4Kn TCG, Qty=1	12TB	1EX1005
HGST Ultrastar® He12 SAS 4Kn SE, Qty=1	12TB	1EX1006
HGST Ultrastar® He12 SAS 512e ISE, Qty=1	12TB	1EX1007
HGST Ultrastar® He12 SAS 512e TCG, Qty=1	12TB	1EX1008
HGST Ultrastar® He12 SAS 512e SE, Qty=1	12TB	1EX1009
HGST Ultrastar® He12 SATA 4Kn ISE, Qty=1	12TB	1EX1010
HGST Ultrastar® He12 SATA 4Kn SED, Qty=1	12TB	1EX1011
HGST Ultrastar® He12 SATA 4Kn SE, Qty=1	12TB	1EX1012
HGST Ultrastar® He12 SATA 512e ISE, Qty=1	12TB	1EX1013
HGST Ultrastar® He12 SATA 512e SED, Qty=1	12TB	1EX1014
HGST Ultrastar® He12 SATA 512e SE, Qty=1	12TB	1EX1015

2 System Management Overview

This chapter provides an overview of the system management features available in the HGST 4U102 through the inband SAS connections using SG3_utils software, and out-of-band using a REST interface over HTTPS to access HGST's implementation of the DMTF Redfish API. There is also an out-of-band interface to the BMC integrated into the system. The interface is a GUI that is accessible via the BMC management port on the rear of the enclosure. For more information visit the Insyde website for BMC documentation.

2.1 Firmware Features Overview

The enclosure services functionality is compatible with the SES-3 standard. The enclosure implements the Standalone Enclosure Services Process model described in the SES standard. The logical enclosure services process is called the SEP. The SEP operates in a dual IOM environment. To a host server, the SEP exists as a dual ported SAS device, one port on each IOM. The firmware on HGST 4U102 provides an Active/Active architecture for IOM redundancy. This allows each IOM to independently report the enclosure status information such as drive power, fan speed, and LED states. This allows the HGST 4U102 to maintain high availability and hot-swappability. Due to the active/active architecture, commands only need to be executed to one IOM because either IOM is fully capable of performing all enclosure management tasks. The information and enclosure status will be synchronized between the two IOMs via the internal SAS links.

The primary expander in each IOM is the only expander that presents a SCSI target, and it is the main device for gathering information from the system for presentation to hosts. The SEP services SES control page operations. All control operations follow a synchronous completion model, i.e. the SEP will send SCSI status only when the requested operation has completed, or to notify the host that the requested operation cannot be performed. Typical SES control operations include:

- Requesting LED flash patterns
- Recording predicted or known component failures
- Requesting power cycle of one or more drives
- Perform a code download. All firmware in programmable components in the enclosure may be updated via SES.

SES Status

The SEP services SES status page operations. All status operations follow a non-blocking completion model, i.e. the SEP returns the last known status, rather than blocking the completion of the SCSI operation while doing an immediate polling operation. Typical SES status operations include:

- FRU and drive presence, health information, and entity names
- SAS topology maps
- Report sensor readings: temperatures, fan speeds, voltages, currents, etc.

Autonomous Behavior

The SEP autonomously manages enclosure power and thermal characteristics. This is done dynamically as needed to stay within the allowed operational envelope of power consumption, thermal heating, and ambient temperature in the data center. This management can include the use of one or more mitigating actions:

- Raise and lower the cooling fans.
- Enable or disable activity safeguards which limit enclosure activity to reduce power consumption or heat generation.
- Enter a self-healing thermal offline state in which some or all enclosure components are powered off.
- Power off the enclosure (not self-healing).

The enclosure operates visual indicators. These indicators can be set or cleared via host request, or autonomously by the enclosure if it detects fault conditions. The enclosure provides non-volatile memory that records enclosure serialization and branding information. The SEP records event log entries to non-volatile memory. The SEP implements T10 defined SMP controlled “zoning on the fly”, and has the capability to save the host defined zoning parameters in non-volatile memory. The SEP also implements several predefined zoning configurations. These predefined configurations are selectable via SES control operations.

2.2 OOBM Management Overview

The HGST 4U102 uses an implementation of DMTF Redfish for out-of-band system management. All the SES enclosure information can be obtained through the out-of-band management port using RESTful API calls to the management port over HTTPS.

More information coming soon.

2.3 SCSI Enclosure Services Page 02

The SCSI `Send Diagnostic` and `Receive Diagnostic Results` commands can be addressed to a specific SES element in the enclosure. There are many different element codes, such as Page 02, defined to cover a wide range of devices. Page 02h refers to the control and status of the enclosures PSUs, HDDs, ESMs, and sensors.

Note: Refer to the SES Firmware Management Interface Specification for more information on SES Page 02.

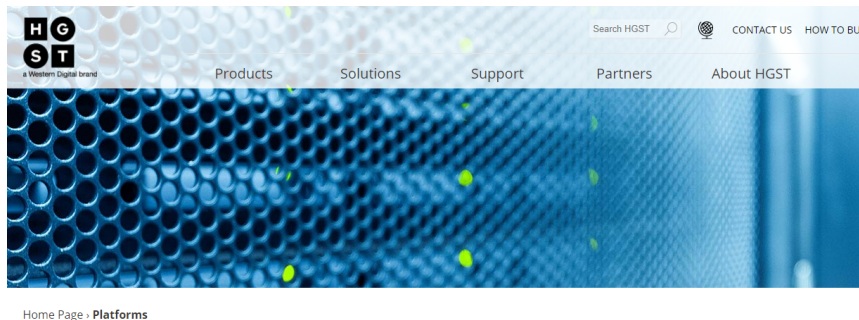
3 Firmware Upgrade

3.1 Downloading Firmware from the Support Portal

Note: The product must be registered in order to download firmware updates.

1. Open a web browser and navigate to: <http://www.hgst.com/>.
2. Navigate to the Platforms page by clicking **Products > Platforms**. The Platforms page will appear.

Figure 11: Platforms Page



Platforms

3. Locate the HGST 4U102 and click **Learn More**. The HGST 4U102 page will appear.
4. Access the Customer Technical Support and Downloads page by clicking the **Support** button. The Customer Technical Support and Downloads page will appear in a new tab.

Figure 12: Support Button



5. Log in to the Customer Technical Support and Downloads page using a username and password. To get a username and password click **Register Now** and fill out the form.

Note: If the product has not been registered, complete the registration first before continuing.

Figure 13: Customer Technical Support and Downloads

HGST
a Western Digital brand

HGST Home

Customer Technical Support and Downloads

Support at your fingertips

Platform customers can [contact technical support](#) or log in to create a case.
For support on other HGST products, visit our [Support page](#)

Sign in with your username and password and bring a wealth of useful support features to your fingertips. Don't have a support account yet? Just click the register button - the process is fast and easy.

Why Register

- Access latest downloads for your registered product
- Create and view support cases for registered products
- Support for products purchased from a partner
- Unique login for each person within a company

[Register Now](#)

Username *

Password *

[Register Now](#)
[Forgot Password](#)

[Log in](#)

6. Access the product Downloads by clicking **Downloads** in the Dashboard. The Downloads page will appear.

Figure 14: Dashboard

Downloads Product Activation Product Registration Support Cases

Home » Dashboard

Dashboard

Welcome to HGST's Enterprise Customer Technical Support and Downloads. Here you're able to:

- Register your product to take advantage of the full benefits offered here
- Access the latest software downloads customized to your registered products under the Downloads menu
- Access the latest hardware downloads customized to your registered product under the Downloads menu
- Easily submit a support case for service requests
- Activate your trial software
- View [Warranty Policy](#) for Hardware and Software
- View [Hardware Support Options](#)
- View [Warranty Policy, Support Options and Support Agreement](#) for the Active Archive and ActiveScale systems
- Click Downloads for SW and for Technical Documents Download

[Downloads](#) [Product Activation](#) [Product Registration](#) [Support Cases](#)

7. Select the HGST 4U102 from the Downloads list. The product downloads will appear.
8. View the firmware download options by clicking HGST 4U102 Chassis Firmware.
9. Download the firmware by clicking **Download** next the latest firmware .zip file.

The product firmware will download.

10. Extract the file by extracting the downloaded file to the file path that will be used for installation.

3.2 Linux Upgrade Preparation

To prepare the firmware package for download, do the following:

1. Connect the HGST 4U102 to a standard SAS HBA or a RAID SAS HBA hosted on the Linux Server that presents the Enclosure Services Processor to the Linux operating system. The Enclosure Services Processor in the HGST 4U102 will be referred to as an IOM.
2. Launch a terminal.
3. Type the **sg_scan -i** command to verify that the enclosure has been found by the server.

Note: If the HGST 4U102 is connected to an HBA that does not present the Enclosure Services Processor to the host for management purposes, HGST recommends attaching the HGST 4U102 to a host that does expose the Enclosure Services Processor so that the upgrade may be performed.

3.3 Linux Upgrade to New Firmware

To download the new firmware package, do the following:

1. Locate the **/dev/sgX** in the resulting code for the SES device handle.
2. In the terminal, type `sg_ses_microcode --mode=14 --bpw=4096 --in=/mnt/releases-fw/mt_madonna/hgst_firmware_00XX-00X_downloadable.bin /dev/sgX.`

Note: Change the bolded text to the the name of the .bin for the new version of firmware. Refer to the current set of release notes to verify the correct firmware release.

3. Press **Enter**.
The code begins downloading. The upgrade can take up to 10 minutes to complete.
4. Once the download is complete activate the firmware by issuing the following command:`sg_ses_microcode --mode=15 /dev/sgX.`
5. Press **Enter**.
The code is activated.

Note: An IOM fault LED will illuminate after upgrading the first IOM. This is expected behavior and is due to the FW mismatch between IOMs. Once both IOMs have been upgraded the fault LEDs should turn off.

6. Verify the installation is correct by repeating the **sg_scan** again.

Note: The firmware update is downloaded to both IOMs at the same time.

3.4 Windows Upgrade Preparation

To upgrade firmware using a windows server, do the following:

1. Make sure that **sg3_utils** is installed on the system and that the **MPIO** software is configured and enabled on the host to be able to handle an online upgrade.
2. Connect the HGST 4U102 to a standard SAS HBA or a RAID SAS HBA hosted on the Windows Server that presents the Enclosure Services Processor to the operating system. The Enclosure Services Processor in the HGST 4U102 will be referred to as an IOM.
3. Log on to the Windows server and launch a command prompt.
4. Input the **sg_scan -s** command to find the IOM devices to ensure that they can be accessed.

Note: If the HGST 4U102 is connected to an HBA that does not present the Enclosure Services Processor to the host for management purposes, HGST recommends attaching the HGST 4U102 to a host that does expose the Enclosure Services Processor so that the upgrade may be performed.

5. To determine which IOM is which, use the **SCSIX: X.X.X** string with the **sg_ses** command.

3.5 Windows Upgrade to New Firmware

To download the new firmware package, do the following:

1. Locate the **SCSIX: X.X.X** in the resulting code for the SES device handle.
2. In the terminal, type **sg_ses_microcode --mode=14 --bpw=4096 --in=/mnt/releases-fw/mt_madonna/hgst_firmware_00XX-00X_downloadable.bin SCSIX: X.X.X.**

Note: Change the bolded text to the the name of the .bin for the new version of firmware.

3. Press **Enter**.
The code begins downloading. The upgrade can take up to 10 minutes to complete.
4. Once the download is complete, type **sg_ses_microcode --mode=15 SCSIX: X.X.X.**
5. Press **Enter**.
The code is activated.

3.6 Upgrading Firmware with OOBM

The following procedure should be followed to upgrade the firmware of the HGST 4U102 using the OOBM API.

1. Visit the HGST Support portal at <http://www.hgst.com/support/platforms-support> and download the firmware package for the HGST 4U102.
2. Extract the downloaded zip file and place bin file in a location that is accessible to the HGST 4U102.

3. Make a POST call to the UpdateService object using the SimpleUpdate action. In the body of the POST the ImageURI as the data parameter and set the value of this parameter to the file location of the bin file.

```
POST /redfish/v1/UpdateService/Actions/UpdateService.SimpleUpdate HTTP/1.1
Content-Type: application/json;charset=utf-8
Content-Length: <computed length>
OData-Version: 4.0
Authorization: Basic userid:password
{
  "ImageURI": "tftp://10.0.0.2/hgst_firmware_0001-001.bin"
}
```

Note: TFTP or HTTPS are supported.

4. To activate the firmware, send a POST to the UpdateService object using the FWActivate command.

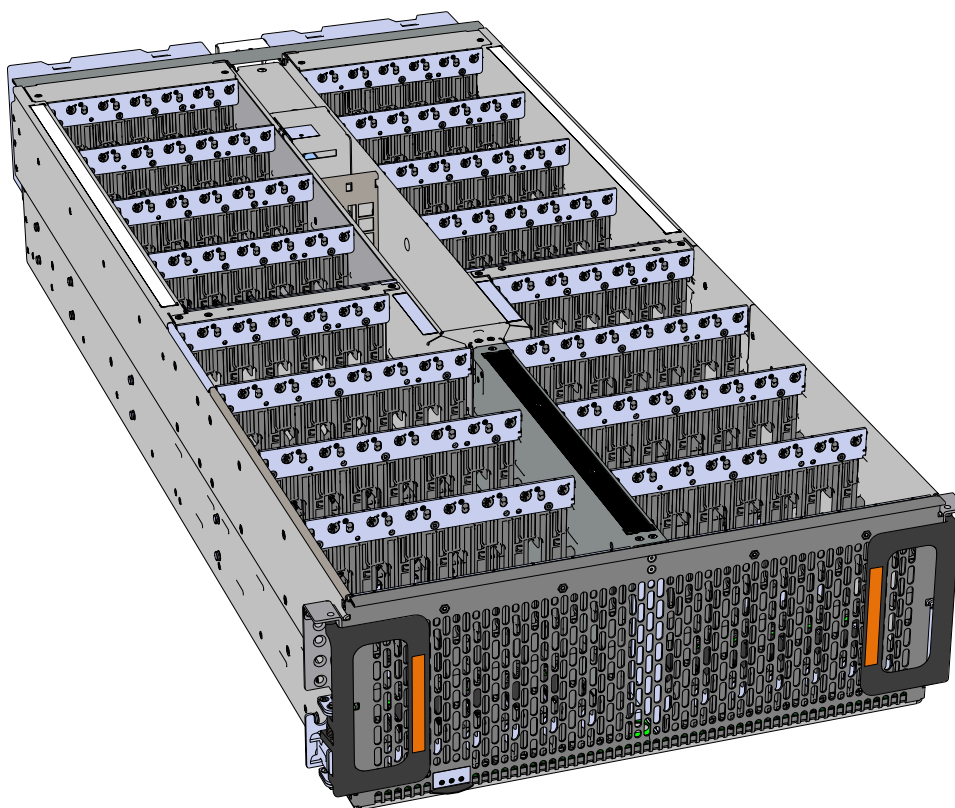
```
/redfish/v1/UpdateService/Actions/UpdateService.FWActivate
```

4 Component Overviews

This section is intended to give an overview of all of the major components contained within the HGST 4U102. Each section includes specifications, descriptions, and images that explain the features of each component.

4.1 Chassis Description

Figure 15: Overview Image



The chassis is the primary housing that contains and connects all of the system components that comprise the HGST 4U102. The chassis is comprised of the drive bay that contains all of the system data storage drives and a number of other bays that contain the major system components such as the PSUs and IOMs. Other system components are attached to the exterior of the chassis, such as the rear fans and rails to provide system cooling and rackmounting capability. The chassis also houses the baseboard which is mounted in the bottom of the chassis' tub and is the primary data pathway that connects all of the enclosure's system components. The chassis has internal backflow preventers to prevent hot air from re-entering the enclosure.

4.1.1 Chassis Specifications

Table 20: Specification Summary

Specification	Value
Dimensions	W: 447 mm x L: 1047 mm x H: 172.7 mm / W: 17.6 in. x L: 46.69in. x H: 6.8 in.
Part Number	1EX0441 or 1EX0440 for single IOM chassis versions
Hot Swappable?	No
Weight	32.34 kg / 71.3 lbs

4.1.2 Chassis Layout

Figure 16: Layout

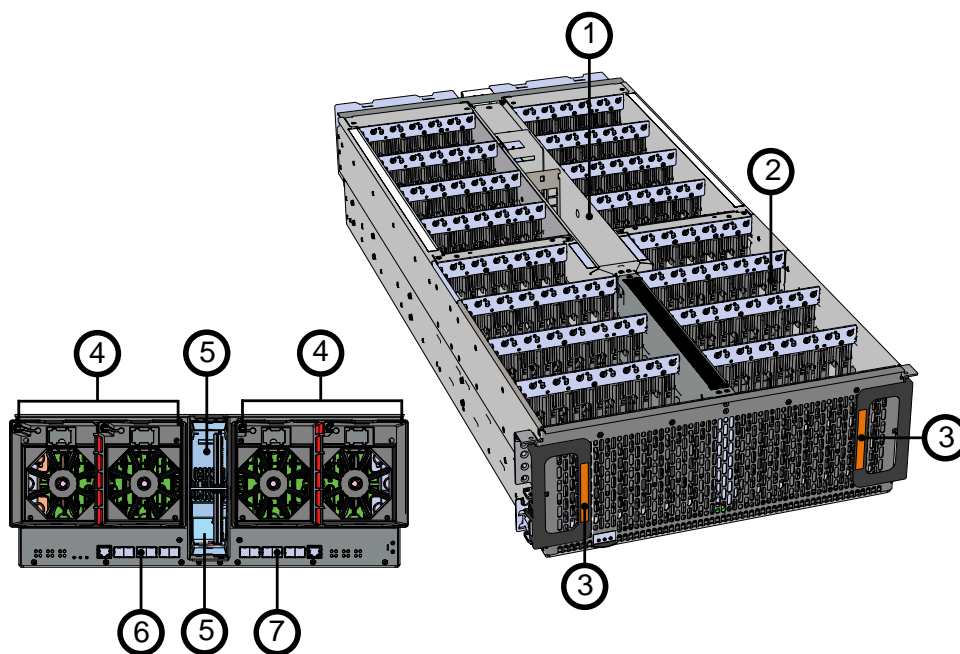



Table 21: Exterior Components

Number	Feature
1	IOM and IOM Fan Bay
2	Drive Bay
3	Chassis Handles
4	Rear Fans Ports
5	PSU Bays
6	IOM A Dual HD-Mini SAS Ports (x6) 1GB Ethernet Port (x1)

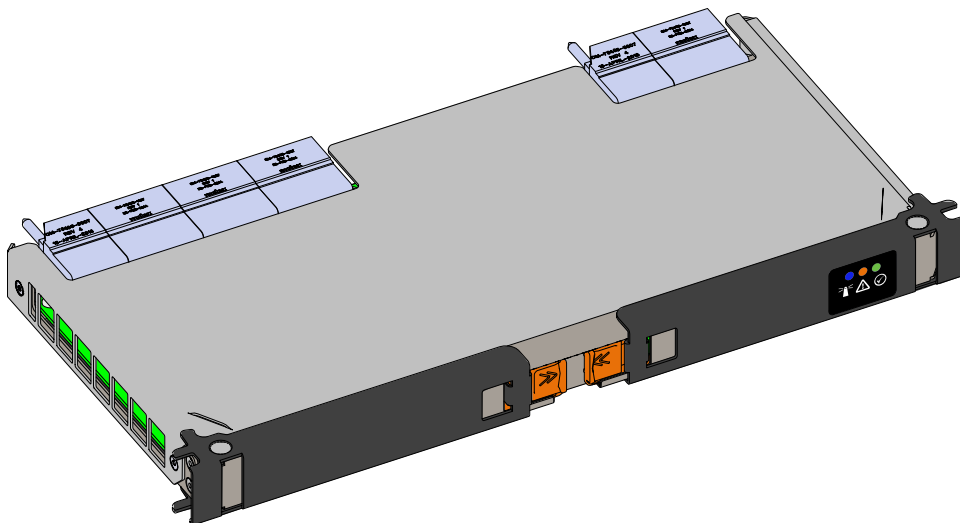
Number	Feature
7	IOM B Dual HD-Mini SAS Ports (x6) 1GB Ethernet Port (x1)

The chassis has a removable lid that encloses the internal system components and ensures proper airflow. The drive bays are comprised of 16 sections that isolate the data storage drives from transmitting vibration to one another. There is a long central bay that contains the enclosure's IOMs and the IOM fan. The front of the chassis has a metal mesh cover and two handles that swing out from the chassis that are used to extend the enclosure out of the rack when pulled. There are two rack ears at the front of the enclosure that are used to secure the enclosure to the rack for shipping purposes. The rear of the chassis has two housings to shroud and connect the four rear fans to the enclosure, and a center bay that houses the PSU modules.

Warning:  The handles on the front of the chassis are not intended to be used to support the weight of the HGST 4U102. Lifting the unit by the chassis handles or trying to support the unit on the handles can cause them to fail. This can cause serious damage to the unit or serious bodily harm to those handling the unit. Always team lift the chassis by gripping the underside of the unit, and never try to lift a chassis that is filled with drives.

4.2 IOM Description

Figure 17: Overview Image



Each IOM provides system data connectivity through 6 Mini-SAS HD ports capable of four 12Gbps SAS connections each. The IOMs are N+1 redundant, hot-swappable components. The IOMs install into the central bay from the top of the Chassis and connect to the drive board. The baseboard completes the connection to the 6 Mini-SAS HD ports that extend out of the rear of the enclosure.

The IOM contains a primary and two secondary expander chips, and an out-of-band (OOB) management chip that connects to the management port on the drive board.

4.2.1 IOM Specifications

Table 22: Specification Summary

Specification	Value
Connector Type	x6 HD Mini-SAS (connected externally at the rear of the enclosure)
Number per Enclosure	2
Part Number	1EX0430
Hot Swappable?	Yes
FRU or CRU?	CRU
Weight	1.27 kg / 2.8 lbs

4.2.2 IOM Layout

Figure 18: Layout

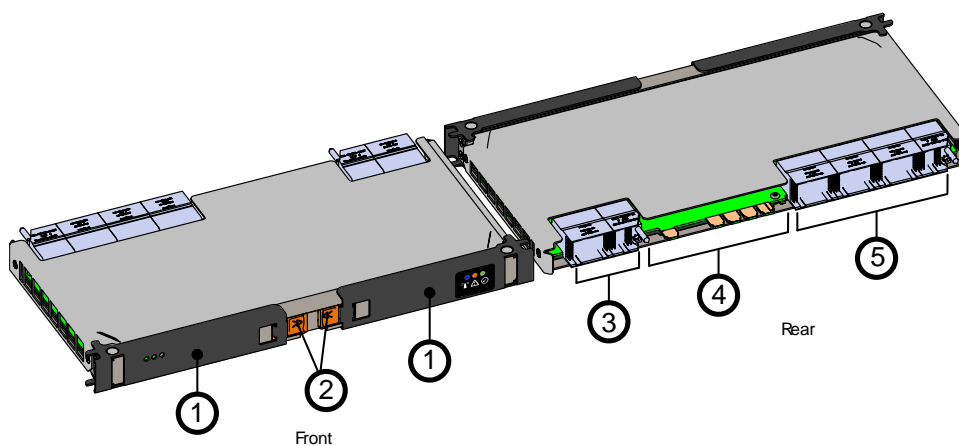
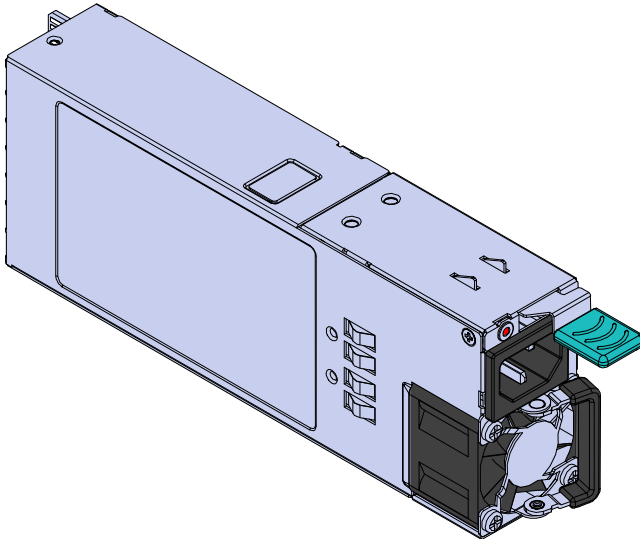


Table 23: Exterior Components

Number	Feature
1	IOM Handle
2	Latch Release
3	Internal IO Connector
4	Cardedge Power Receptacle
5	Internal IO Connector

4.3 PSU Description

Figure 19: Overview Image



HGST 4U102 contains redundant 1600W Power Supply Units (PSU). Each PSU requires an input voltage of between 200 - 240 VAC. The PSUs are 80 PLUS Platinum certified, and utilize C14 power cable receptacles.

4.3.1 PSU Specifications

Table 24: Specification Summary

Specification	Value
Power Output	1600W
80 PLUS Standard	Platinum
Input Voltage	200 - 240 VAC
Connector Type	C14
Number per Enclosure	2
Part Number	1EX0434
Hot Swappable?	Yes
FRU or CRU?	CRU
Weight	1 kg / 2.2 lbs.

4.3.2 PSU Layout

Figure 20: Layout

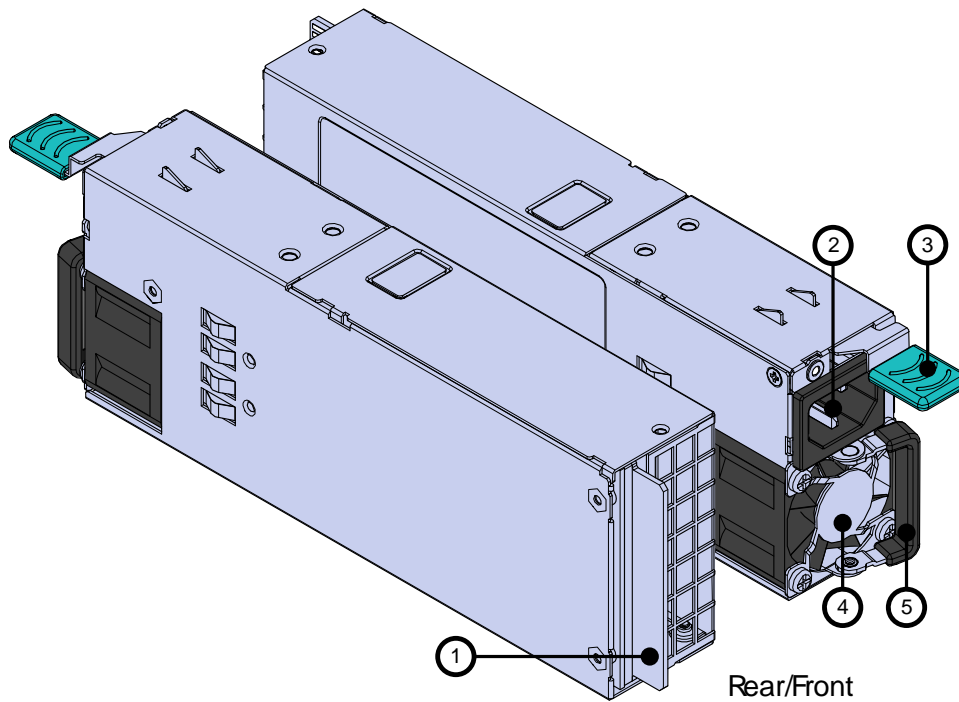
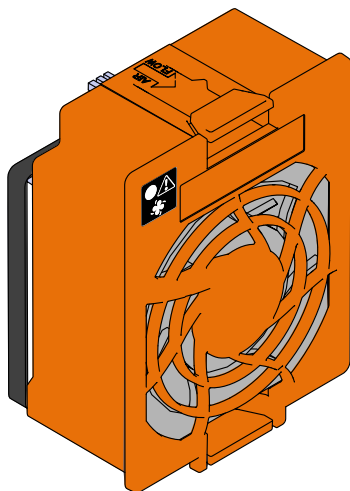


Table 25: Exterior Components

Number	Feature
1	Internal Connector
2	C14 Power Receptacle
3	Latch Release Lever
4	Fan
5	Handle

4.4 Rear Fan Description

Figure 21: Overview Image



The Rear Fans are toolless fan modules that provide the primary system cooling for the HGST 4U102. They are attached to the rear of the chassis in the fan housing by a 6 pin connector and two latches, that also provides power and control signals to the modules.

4.4.1 Rear Fan Specifications

Table 26: Specification Summary

Specification	Value
Number per Enclosure	4
Part Number	1EX0433
Hot Swappable?	Yes
FRU or CRU?	CRU
Weight	318 g / .7 lbs

4.4.2 Rear Fan Layout

Figure 22: Layout

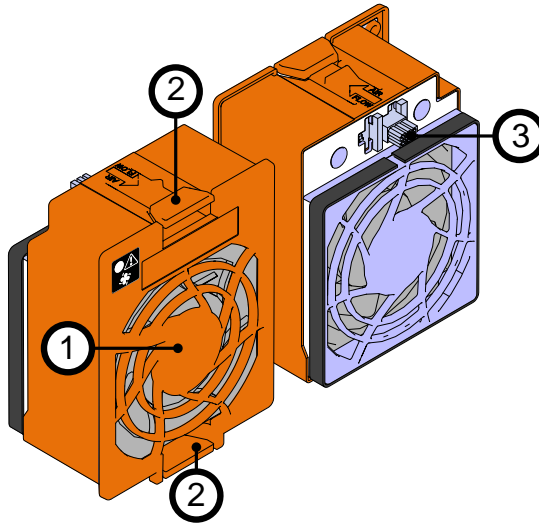
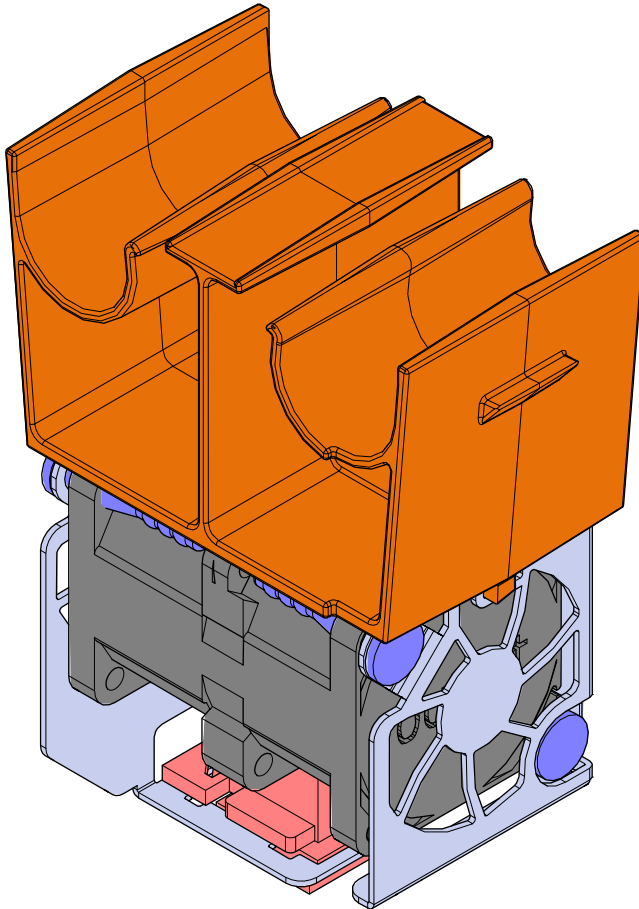


Table 27: Exterior Components

Number	Feature
1	Fan
2	Latch Releases
3	Internal Power and IO Connector

4.5 IOM Fan Description

Figure 23: Overview Image



The IOM Fan is designed to focus cooling on the enclosure's IOMs. It is installed in the central chassis bay and is accessed from the top of the enclosure underneath the lid. It is attached to the chassis toolless release mechanism that allows for easy replacement.

4.5.1 IOM Fan Specifications

Table 28: Specification Summary

Specification	Value
Number per Enclosure	1
Part Number	1EX0432
Hot Swappable?	Yes
FRU or CRU?	CRU
Weight	181.4 g / .4 lbs

4.5.2 IOM Fan Layout

Figure 24: Layout

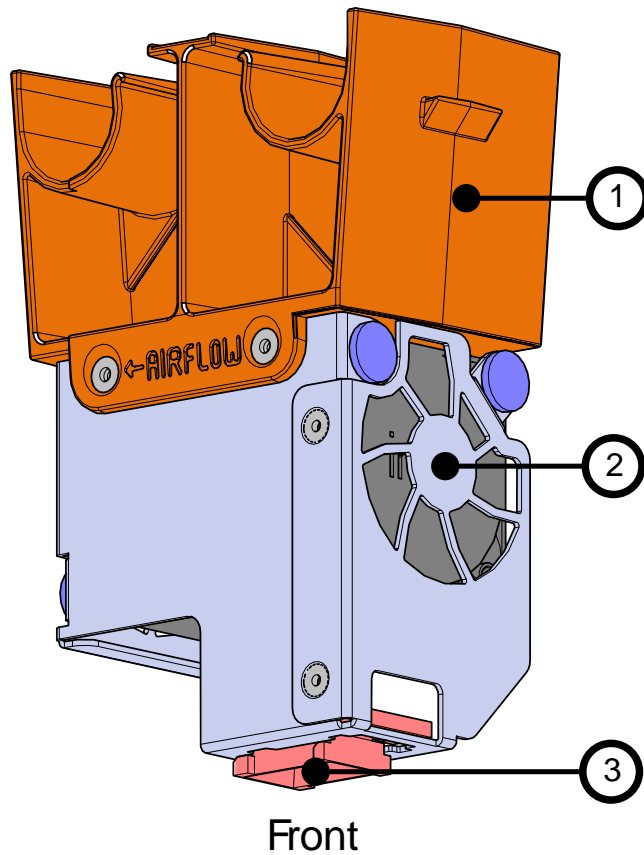
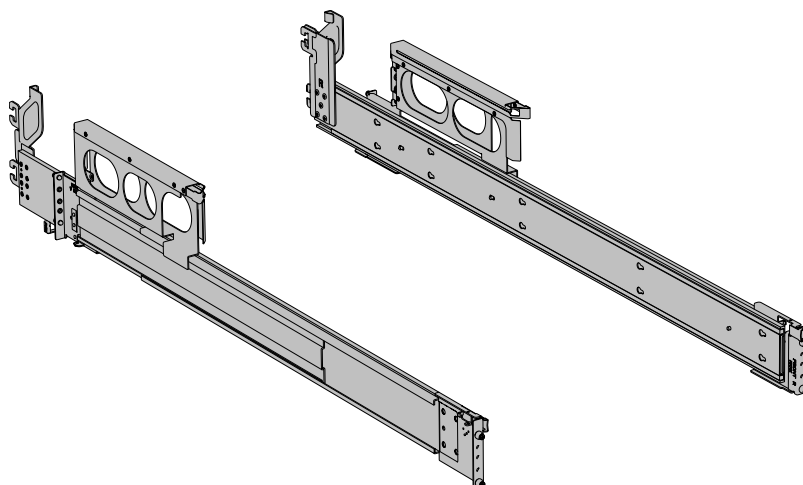


Table 29: Exterior Components

Number	Feature
1	Latch Mechanism
2	Fan Module
3	Internal Connector

4.6 Rails Description

Figure 25: Overview Image



The HGST 4U102 is attached to a rack using a toolless- attach rail system. They are a two piece system with one rail that attaches directly to the chassis called the inner rail. The inner rail comes nested inside the outer rail and can be accessed by sliding it out of the outer rail. The outer rails attach to the rack and receive the chassis to support it inside the rack. The outer rails attach to vertical rack rails that should be set between 32 in.-36 in. The toolless design means that an installer can attach these rails to a rack without any tools which simplifies installation. Once they are attached, they can be secured with the included M5 screws and washers.

4.6.1 Rails Specifications

Table 30: Specification Summary

Specification	Value
Length	1028.7 mm/40.5 in.
Part Number	1EX0435
Hot Swappable?	No
FRU or CRU?	CRU
Weight	7.89 kg total, 3.95 kg/rail / 17.4 lbs. total, 8.7/rail

4.6.2 Rails Layout

Figure 26: Layout

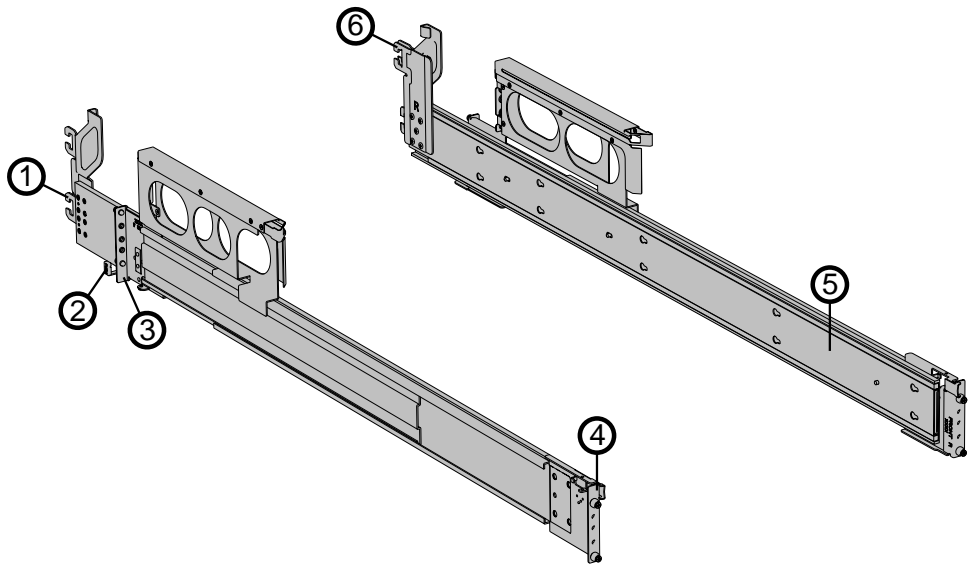
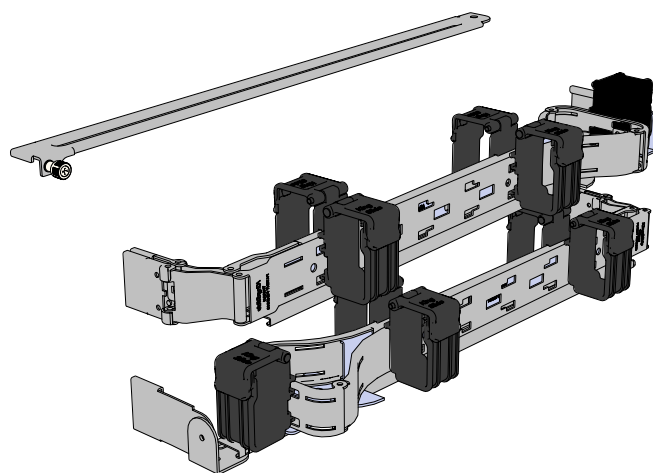


Table 31: Exterior Components

Number	Features
1	Lower CMA Connectors
2	Rear Latch Release
3	Rear Rack Mounting Bracket
4	Front Rack Mounting Bracket and Latch Release
5	Inner Rail
6	Upper CMA Connectors

4.7 CMA Description

Figure 27: Overview Image



The cable management assembly (CMA) provides a number of benefits to protect and manage the cables connected to the PSU ports, SAS ports, and Ethernet ports. It prevents damage to the port connectors and the cables throughout the full travel of the enclosure as it is pulled out of the rack for servicing. This motion ensures that the cables contained by the CMA arm do not snag or get pulled out of the ports as the enclosure moves.

The design of the HGST 4U102 CMA is a two-arm design that separates the connections to the two sides of the enclosure. The lower arm supports the cables that connect to the dual SAS ports and Ethernet on the right hand side of the unit as viewed from the rear, as well as the lower PSU power cord. The upper arm supports the left hand ports and the upper PSU power cord. Each arm is attached to the HGST 4U102 by one clip at the elbow and two at the other end. The cables are secured to the arms by plastic clips called baskets that can be opened at the top to adjust, add, or remove cables. The arms can also be moved into a service position by unclipping them from the elbow end of the arm and swinging them away from the enclosure when the enclosure is fully inserted in a rack. This provides access to connections and components at the rear of the system without having to remove the CMA or disconnect any of the cabling.

4.7.1 CMA Specifications

Table 32: Specification Summary

Specification	Value
Extension Range	0 - 36 in.
Number per Enclosure	1 assembly (2 arms)
Part Number	1EX0437

Specification	Value
Hot Swappable?	No
FRU or CRU?	CRU
Weight	1.54 kg, 0.77/arm / 3.4 lbs., 1.7/arm

4.7.2 CMA Layout

Figure 28: Layout

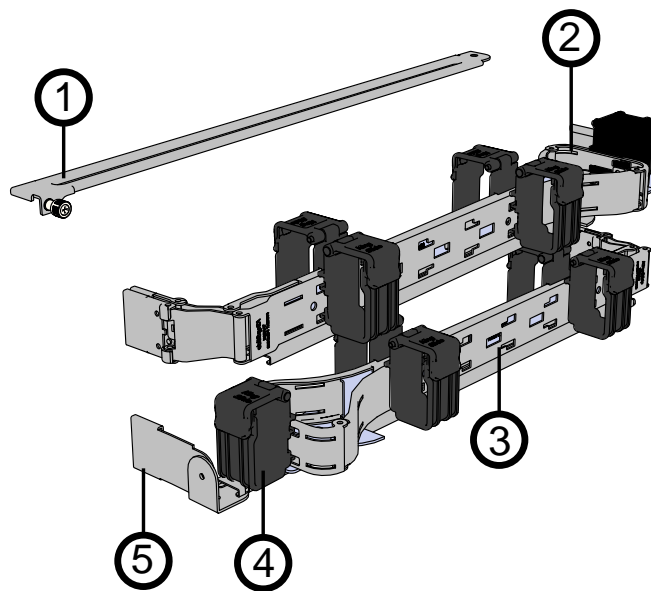
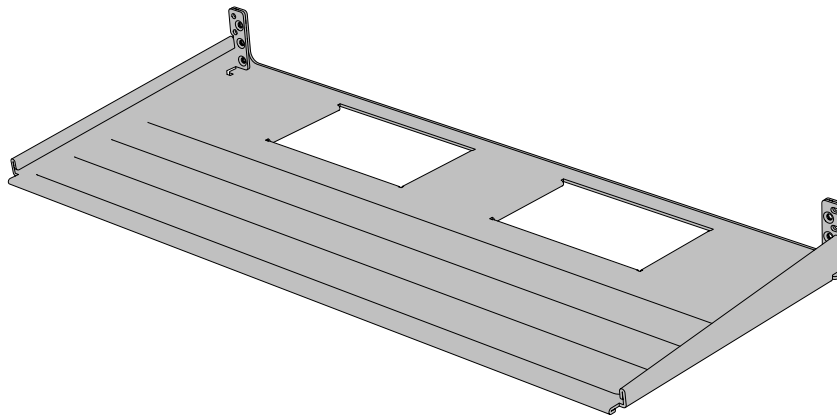


Table 33: Exterior Components

Number	Feature
1	Crossbar
2	Rail and Rack Connectors
3	Arm
4	Baskets (retains cables)
5	Elbow Connector

4.7.3 CMA Cable Tray

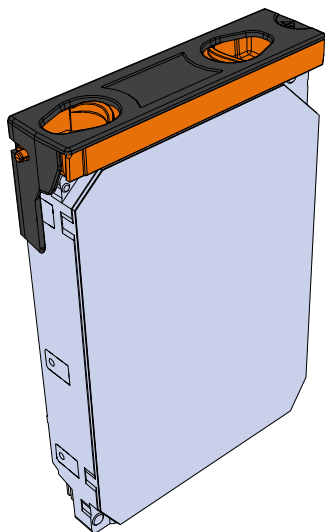
Figure 29: Overview Image



The cable management assembly (CMA) comes with an **optional** CMA tray that is used to support cable loads greater than ten (five per arm). This tray is mounted at the bottom of the chassis using four M3 x 8mm T10 Torx screws (two per side). Use this cable tray in cases where cables might interfere with the lower U space beneath the chassis.

4.8 Drive Assembly Description

Figure 30: Overview Image



The Drive Assembly is comprised of two parts: the storage drive and the drive carrier. The carrier attaches to the exterior of the data storage drive and caddies the drive into the enclosure. It stabilizes the motion of the drive into the drive bay so that the drive properly mounts onto the drive board.

4.8.1 Drive Assembly Specifications

Table 34: Specification Summary

Specification	Value
Number per Enclosure	102
Part Number	See the List of Compatible Drives on page 24 to find the specific part number required.
Hot Swappable?	Yes
Weight	.68 kg / 1.5 lbs.

4.8.2 Drive Assembly Layout

Figure 31: Layout

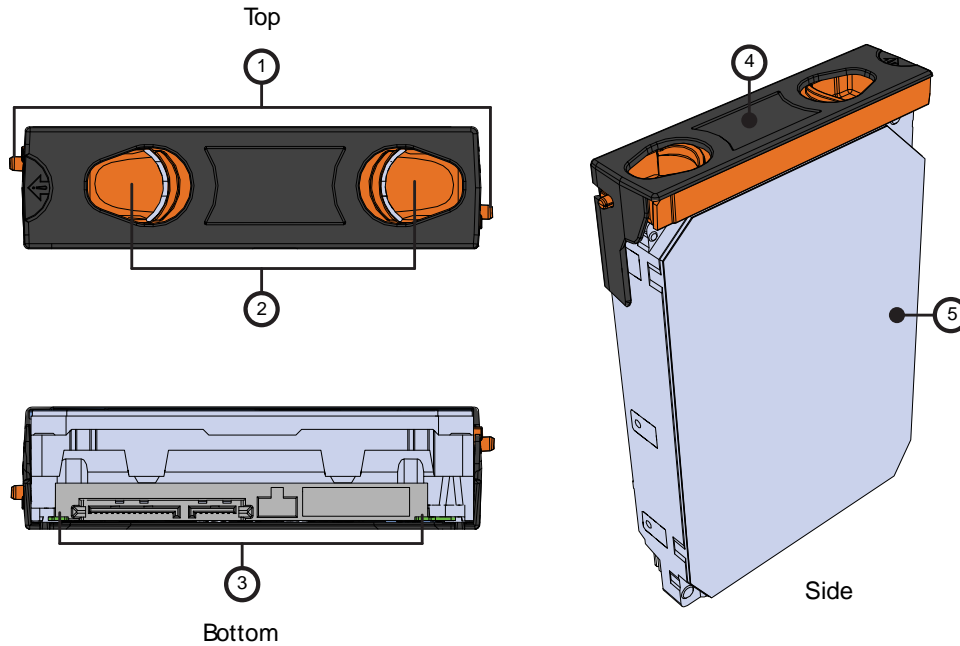


Table 35: Exterior Components

Number	Feature
1	Latches
2	Latch Release
3	IO and Power Connectors
4	Drive Carrier
5	Disk Drive

5 Part Replacement

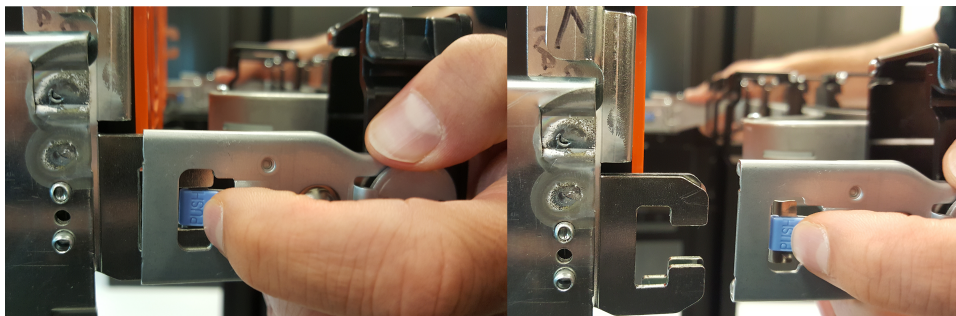
5.1 Chassis Replacement

Table 36: Procedure Info

Required Tools	Required Parts	# of People Required	Time Required
<ul style="list-style-type: none">• T15 Torx Screwdriver• # 2 Philips Screwdriver• Long T10 Torx Screwdriver• Cable Ties (for configurations with greater than 10 total cables)• Tape Measure• Level	<ul style="list-style-type: none">• M5 x 12mm T15 Torx Screws• Included Washers• Low-Profile M4 x 3.2mm Philips Screws (included with rail assembly)• Optional (if using CMA Tray): M3 x 8mm T10 Torx Screws	3	45m

1. Place both CMAs into service position.
 - a) Unlatch the upper CMA at the elbow connector by pressing the blue release button to unlatch the connector from the rail.

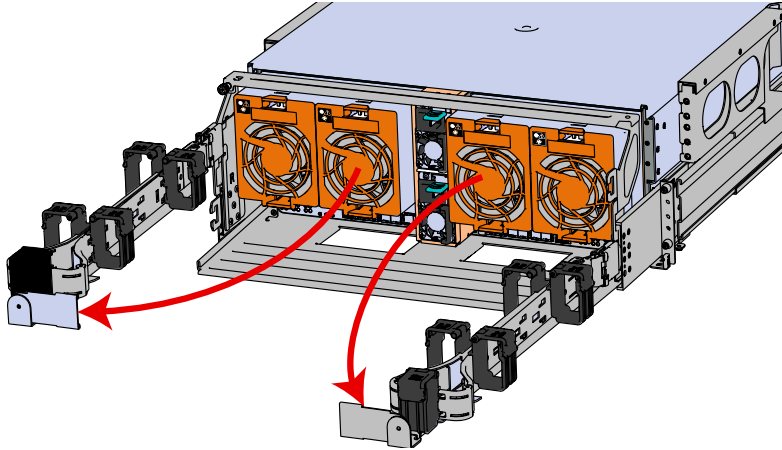
Figure 32: Unlatching a CMA Connector



- b) Swing the CMA away from the enclosure.
- c) Do the same for the lower CMA arm as what was done for the upper.

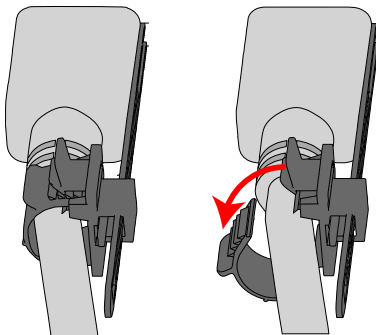
- d) Both arms should be extended away from the enclosure as shown in the following example.

Figure 33: CMAs in service position (Cables not shown)



2. Power down the Enclosure.
 - a) Locate the redundant PSUs at the rear of the enclosure.
 - b) Detach the cable retention clip from both power cords.

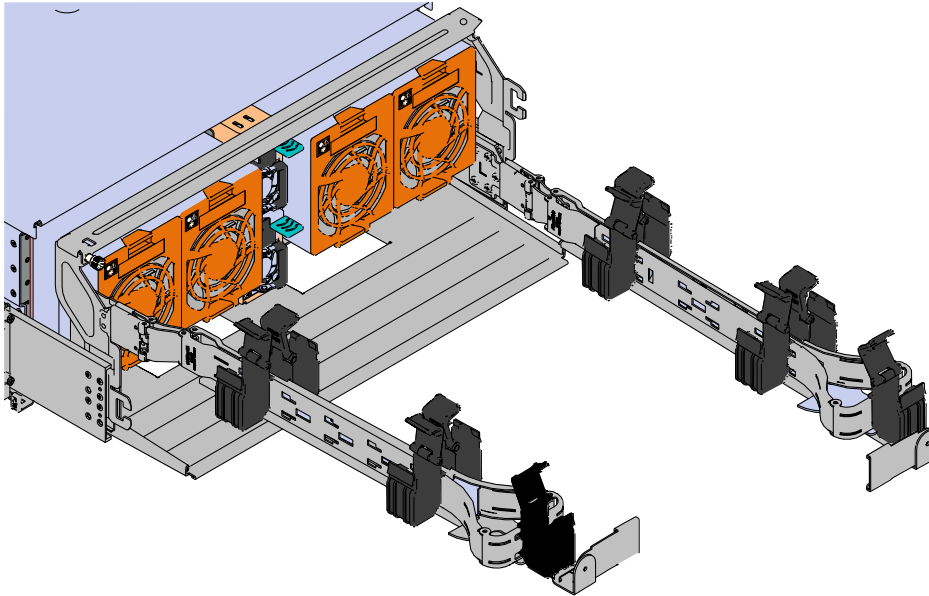
Figure 34: Cable Retention Mechanism



- c) Power down the enclosure by disconnecting both power cables, one from each PSU.
3. Disconnect the HD Mini-SAS cables from the rear of the enclosure by pulling (don't jerk) on the blue tab that is extending outward from the connector. This will free the cable from the port. Make sure each cable is labeled or label them yourself to ensure that they will be plugged back into the same location.
4. Unplug the Ethernet cables from the out-of-band management ports.
5. Uncable the CMA.

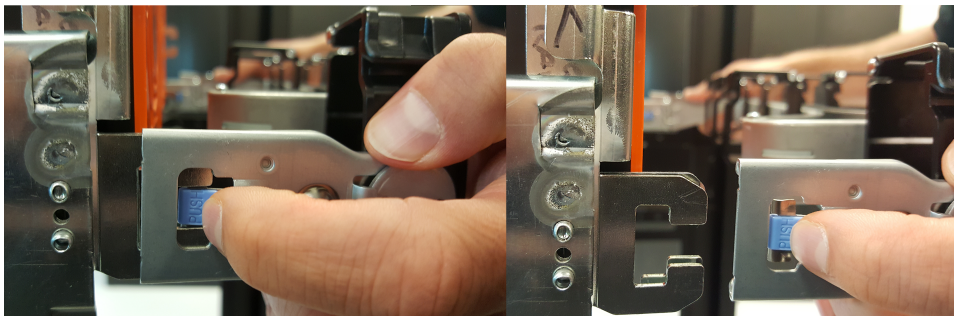
- a) Open all of the baskets on the CMA.

Figure 35: Open Baskets



- b) Remove one cable from the CMA at a time making sure not to put too much strain on the arm.
6. Unlatch all of the connectors that attach the CMA to the enclosure and the rail by locating the latch release button and pressing it from either side of the latch. There are three total connections that need to be removed, one at the elbow and two at the opposite end.

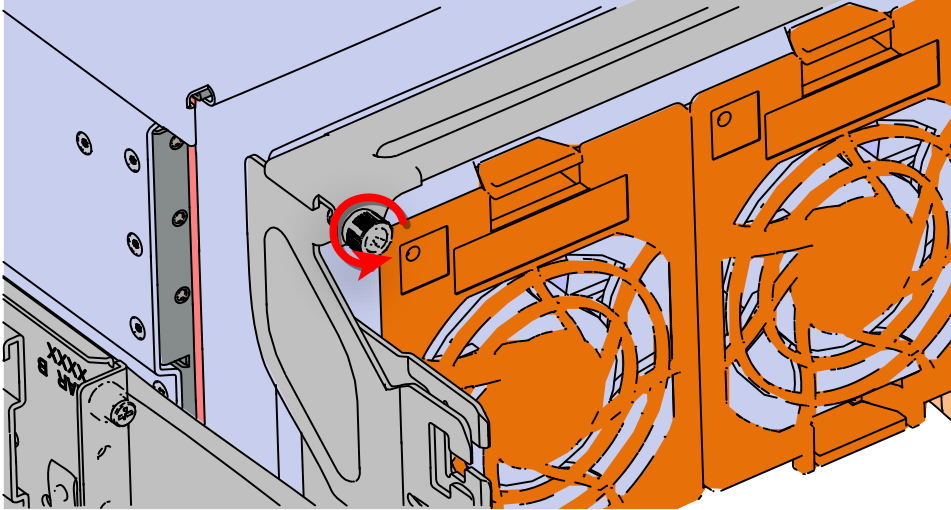
Figure 36: Unlatching a CMA Connector



7. Complete the previous step for the second CMA.
8. Uninstall the crossbar from the CMA mounting bracket.

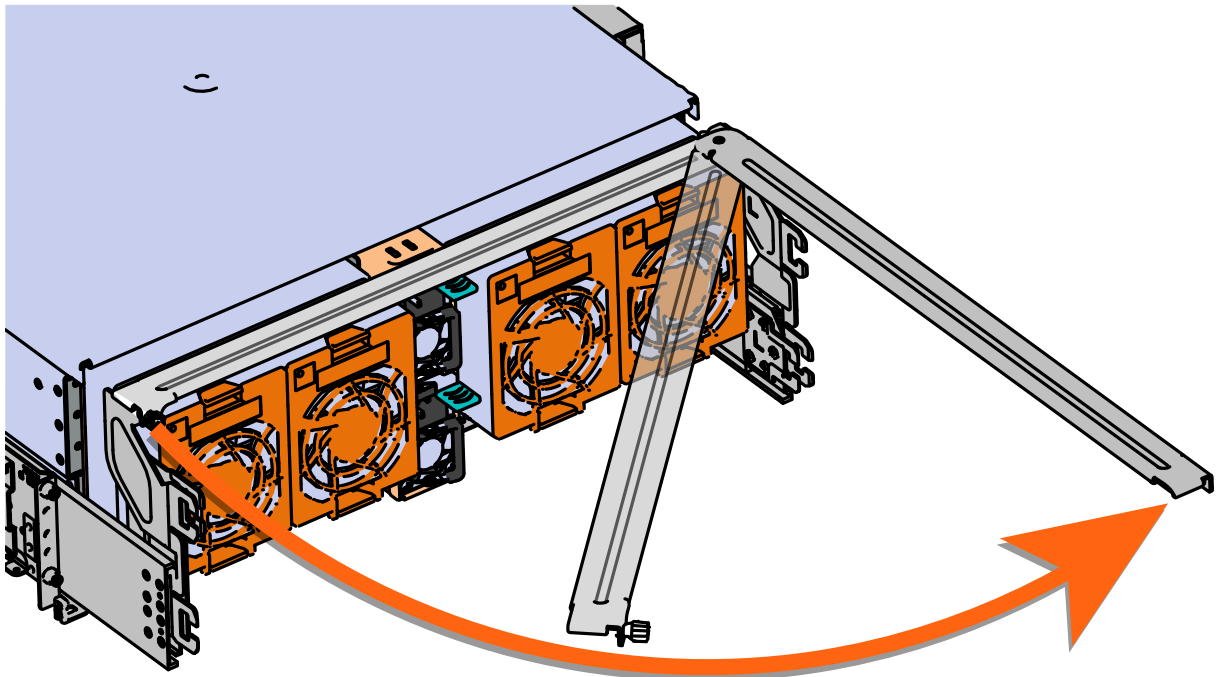
- a) Locate the crossbar thumbscrew that secures the crossbar to the CMA mounting brackets and unscrew it.

Figure 37: Unscrew Thumbscrew



- b) Swing the crossbar away from the enclosure.

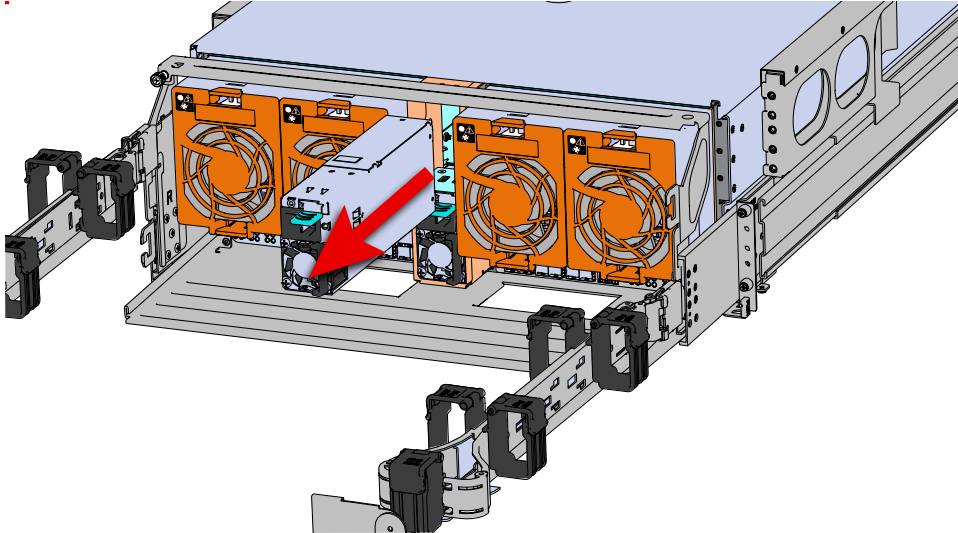
Figure 38: Crossbar Swinging Out



- c) Once the crossbar is straight it should easily come free from the mounting bracket.
9. Uninstall the PSU.

- a) Grasp the release lever and the metal handle in a downward pinching motion to release the latching mechanism.

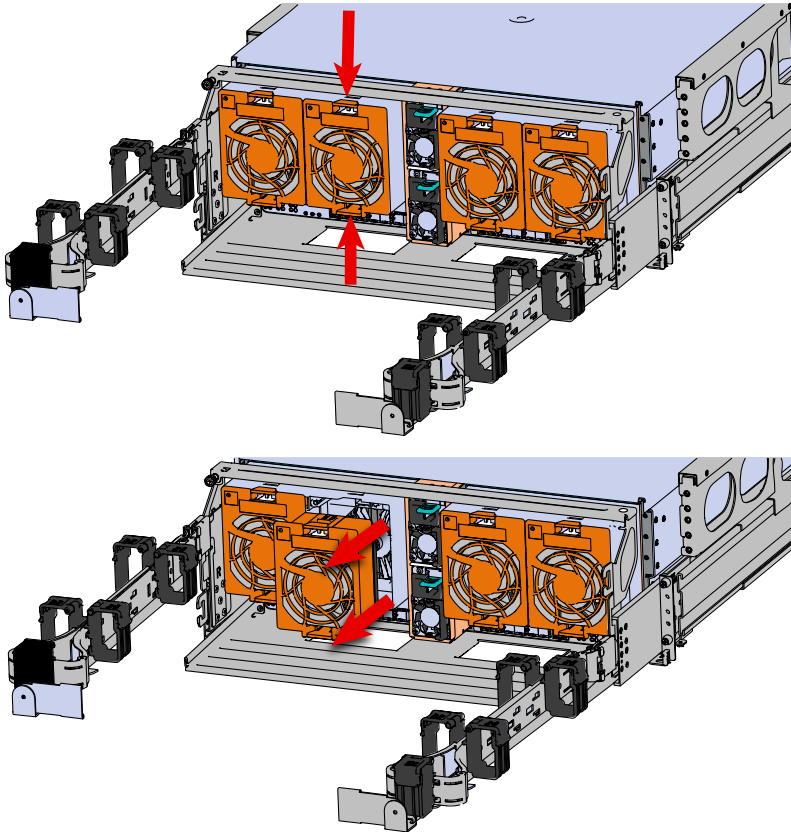
Figure 39: Uninstalling PSU



- b) Pull the PSU straight out with even pressure.

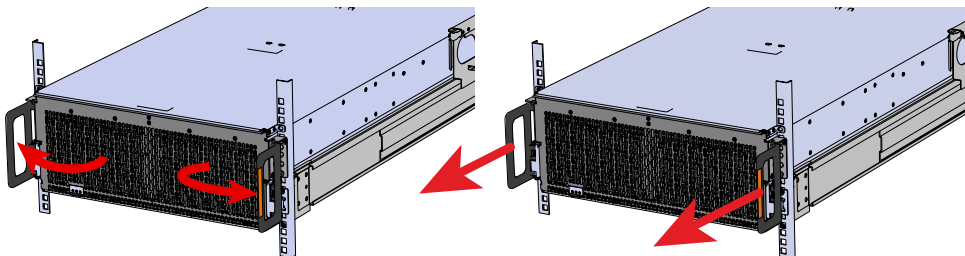
10. To unlatch the rear fan from the fan housing, use one hand to press the clip at the top and bottom of the fan and pull to free it from the chassis and remove it.

Figure 40: Uninstalling the Rear Fan



11. Grasp both handles at the front of the enclosure and pull with even pressure to extend the chassis out of the rack until it is stopped by the safety latches. The safety latches will prevent the enclosure from coming out of the rack completely.

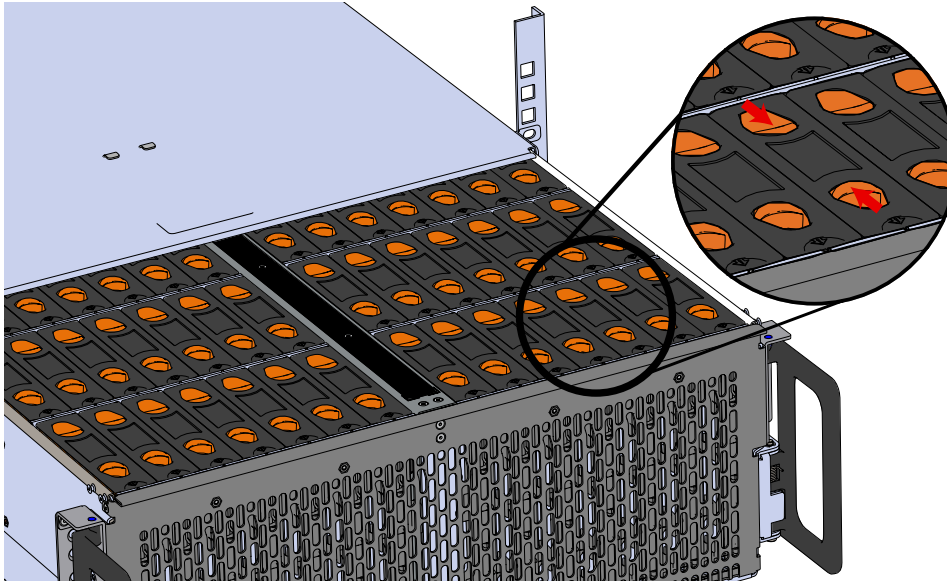
Figure 41: Chassis Handle Operation



12. Remove all of the drives from the chassis before uninstalling the chassis. Be prepared to label the drives as they are removed so they can be reinstalled in the same location in the new chassis.
13. Follow these steps to remove a drive assembly.
 - a) Find the latch release mechanism on the drive assembly being removed.

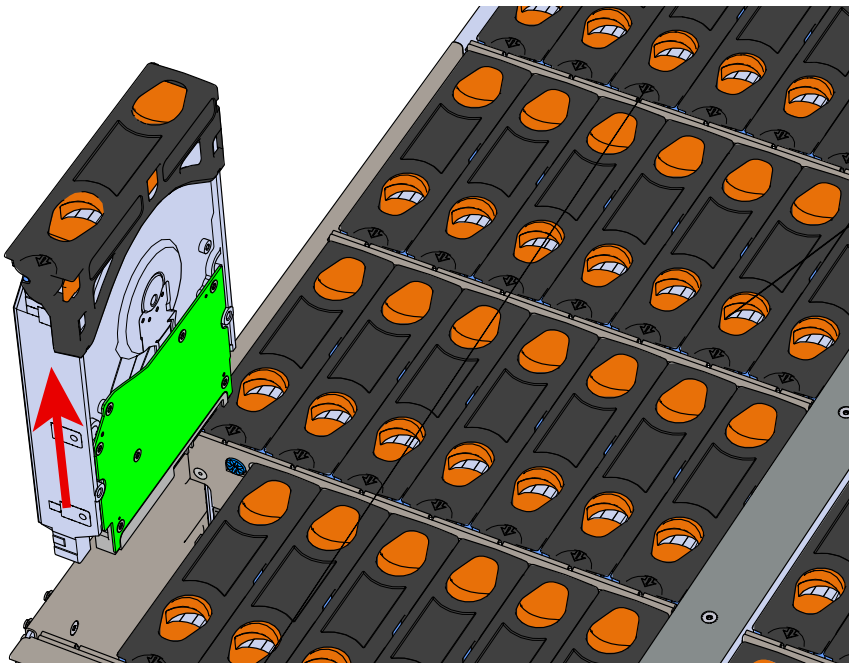
- b) Insert a finger and a thumb into the latch release and pinch to unlatch the drive assembly.

Figure 42: Unlatch Drive Carrier (IOM Not Shown)



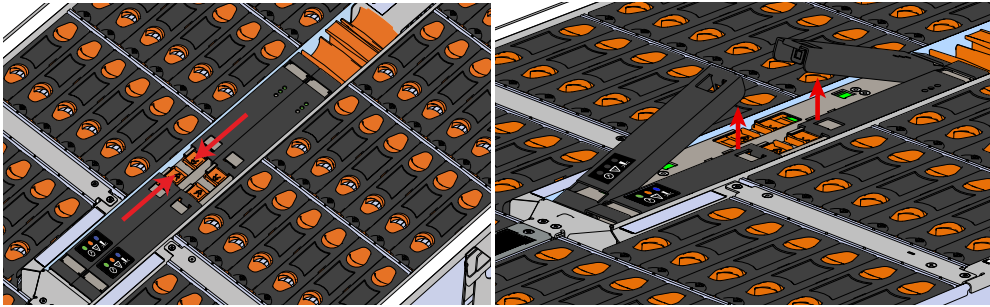
- c) Lift the drive assembly free from the enclosure.

Figure 43: Removing Drive Assembly



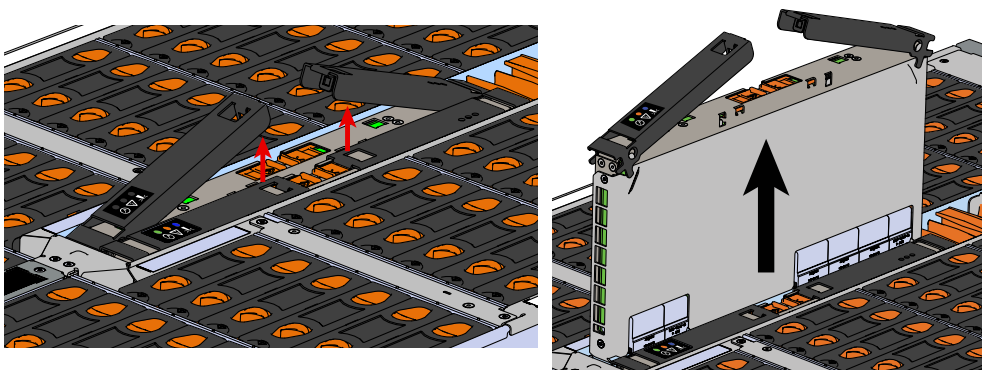
14. Follow the previous step for each drive in the enclosure. Attach a label or mark the drives with the drive slot they were removed from in order to add them to the same slot in the future. Store the drives in an ESD safe location until the drives are ready to be installed back into an enclosure.
15. Uninstall the IOM(s).
 - a) Locate the latch release on the IOM and press it in the direction shown in the following image.

Figure 44: Unlatching the IOM



- b) Grasp both handles, one handle in each hand, and lift evenly with both hands to ensure the IOM comes out straight. This will prevent any damage to the pins on the internal connectors.

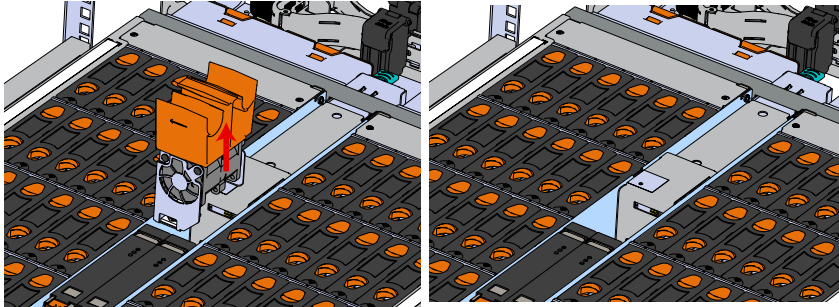
Figure 45: Removing IOM



16. Remove the second IOM.
17. Remove the IOM Fan.
 - a) With one hand, grasp around the center square of the fan housing as shown in the following image.

- b) Pinch the IOM fan housing to release the latching mechanism and pull it straight out from the chassis.

Figure 46: Removing IOM Fan



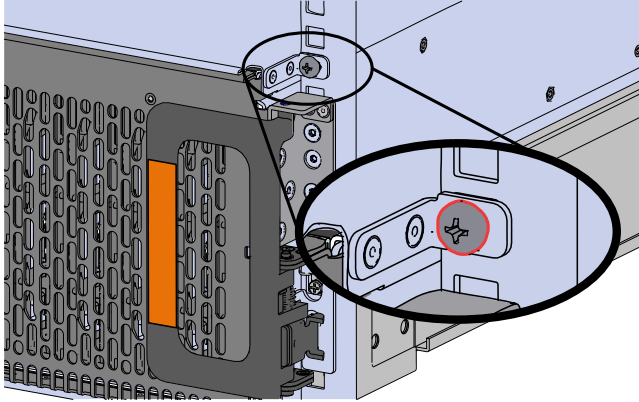
18. Release the safety latch on the inner rails on each side of the chassis as shown in the following image.

Figure 47: Inner Rail Safety Latch Release




19. Push the chassis back into the rack.

20. Locate the M5 x 12mm Philips Pan Head screws on the top cover of the enclosure that keep it in place when the drawer is extended and unscrew them using a #2 Philips head screwdriver. This will allow the top cover to move freely with the enclosure when the enclosure is removed.



21. Grasp both handles at the front of the enclosure and pull with even pressure to extend the chassis out of the rack until it is stopped by the safety latches. Make sure that the top cover comes with the chassis as it is extended out of the rack. The safety latches will prevent the enclosure from coming out of the rack completely.
22. Remove the chassis from the rack.
 - a) Be prepared to support the enclosure once it is free of the rails by having a second person or a lift to support the enclosure
 - b) Grasp both handles at the front of the enclosure and pull with even pressure until the enclosure will not extend further.


Warning:  The handles on the front of the chassis are not intended to be used to support the weight of the HGST 4U102. Lifting the unit by the chassis handles or trying to support the unit on the handles can cause them to fail. This can cause serious damage to the unit or serious bodily harm to those handling the unit. Always team lift the chassis by gripping the underside of the unit, and never try to lift a chassis that is filled with drives.

- c) Locate the safety catches on the inner rails attached to the enclosure.

Figure 48: Safety Latch Release



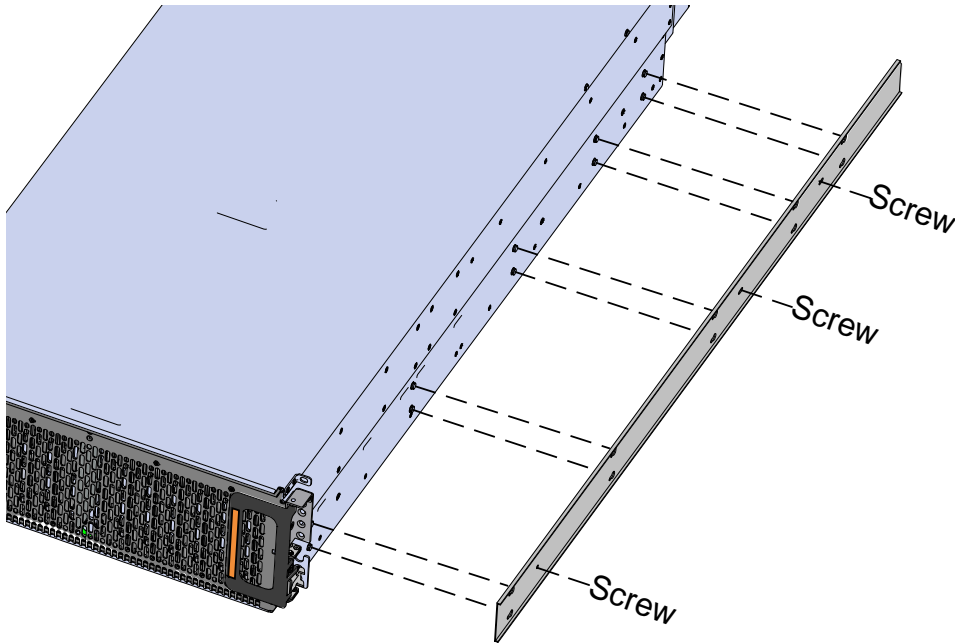
- d) Depress the latch release lever for the safety latches on the rail and push the chassis very slightly forward. The chassis is now unsecured from the rack.
- e) Ensure that you have the proper support mechanism to hold the chassis in position, whether that be a team lifting partner or an appropriate lift.

Warning:  Do not lift the chassis by the Cable Tray while removing the chassis from the rack OR while installing it into a rack. This can cause serious damage to the unit or serious bodily harm to those handling the unit. Always team lift the chassis by gripping the underside of the unit, and never try to lift a chassis that is filled with drives.

- f) Slide the chassis forward to free it from the rails. Store the chassis in a safe location to avoid damage.
- 23.** Uninstall the inner rails from the sides of the chassis.

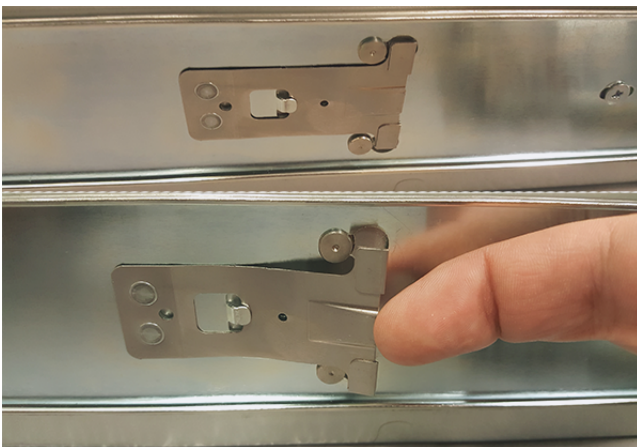
- a) Unscrew the three Low-Profile M4 x 3.2mm Philips screws that attach the inner rails to the chassis using a #2 Philips head screwdriver.

Figure 49: Remove Inner Rail



- b) Locate and unlatch the springlock on the side of the inner rail.

Figure 50: Inner Rail Spring Latch

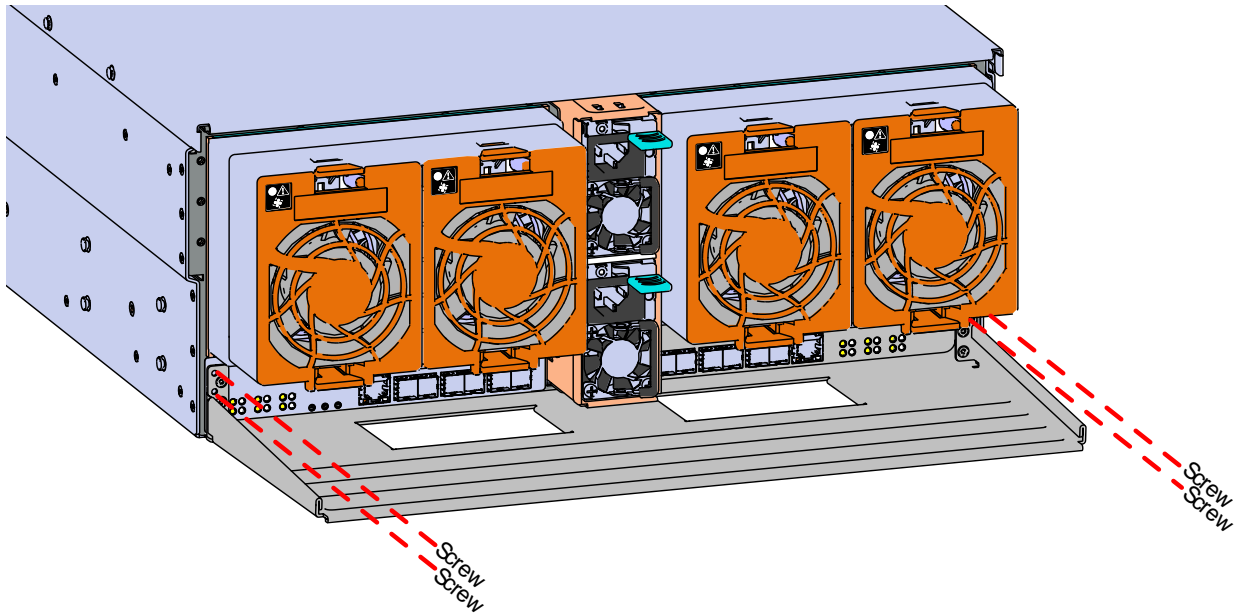



- c) Slide the inner rail toward the front of the enclosure to unlock it from the pegs that secure it to the sidewall and pull it free.

Note: Follow the next step if the cable tray was installed.

24. Uninstall the Cable Tray by removing the M3 x 8mm screws using the long T10 Torx head screwdriver.

Figure 51: Uninstalling the Cable Tray

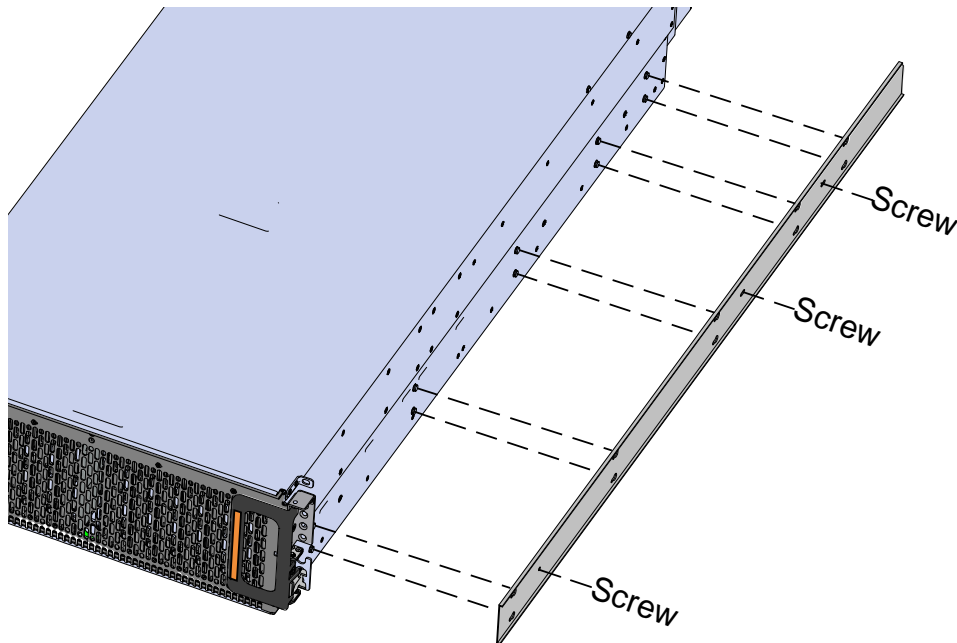


Caution:  Always install the top cover onto the enclosure before installing the chassis into a rack. Not having the top cover installed may damage the alignment brackets.

25. Ensure the top cover is installed.
- From the rear of the enclosure, align the top cover with the grooves on the top of the chassis.
 - Ensure that there is a good catch of the top cover by the chassis and slide it in all the way.
26. Install the inner rail onto the chassis making sure they are installed on the correct side. Each inner rail will read "R" for the right or "L" for the left embossed on the side that faces away from the chassis. Right and Left are with reference to looking at the front of the enclosure.
- Orient the inner rails so that the flat side is facing the enclosure and the side with the grooves is facing away from the enclosure.

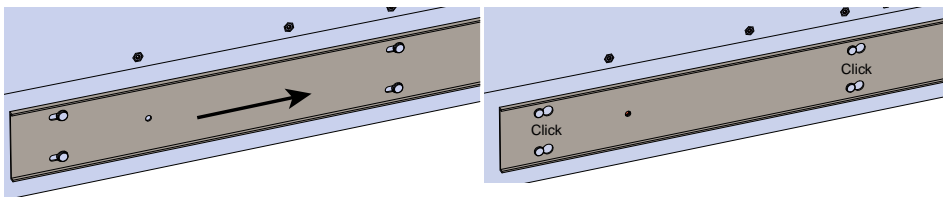
- b) Align the keyholes on the inner rail to the mounting pegs on the side of the enclosure and press the inner rail flush against the chassis. If the keyholes don't line up with the pegs, flip the rail length-wise to see if this will align them.

Figure 52: Inner Rail Attachment




- c) Slide the inner rail toward the rear of the chassis to lock it in place. There will be an audible click and the mounting pegs will cover the front part of the keyhole.

Figure 53: Slide Inner Rail



d)

Caution:  When installing the inner rail onto the chassis, make sure to only use the special low profile M4 x 3.2mm Philips screws provided in the accessory kit with the CMA. These screws are specially designed for this purpose. Using unapproved screws could cause damage to the slides inside the rail.

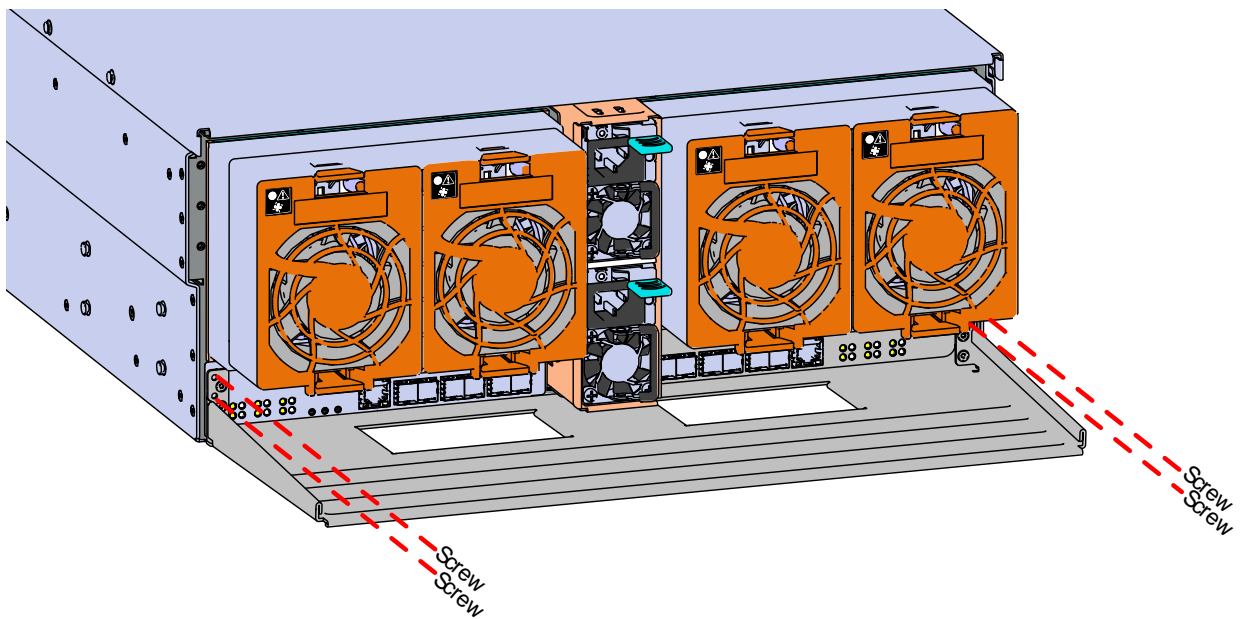
Install the three special low-profile M4 x 3.2mm Philips screws provided to secure the inner rail to the chassis.

- e) Follow these steps for the second inner rail on the opposite side of the enclosure.

Note: The cable tray only needs to be installed if the number of cables being installed into the CMA will be greater than 10. If not, this step is not necessary

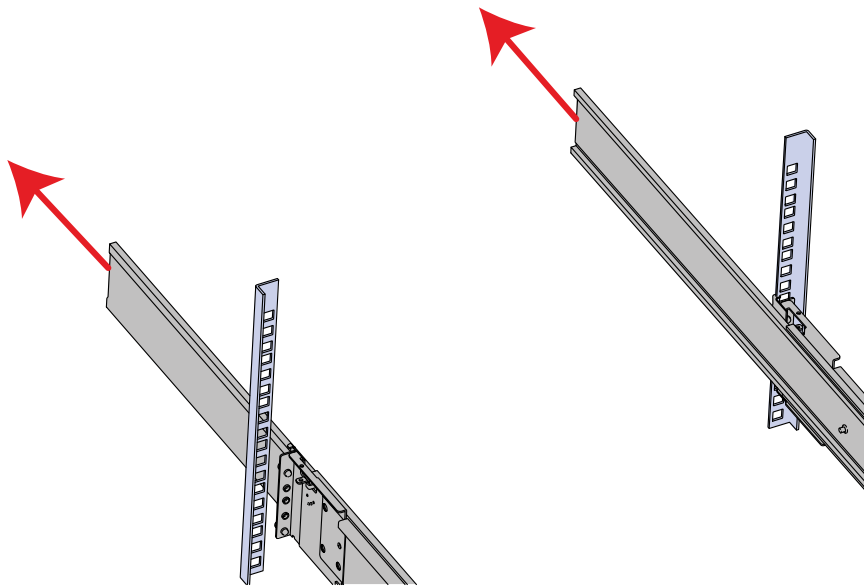
27. Secure the Cable Tray onto the enclosure using the included M3 x 8mm T10 Torx screws and the T10 Torx screwdriver.

Figure 54: Installing the Cable Tray




28. Extend the mid-rails out of the rack so that they are protruding from the front of the rack and the safety latches engage.


Figure 55: Extend Mid-Rails




29. Install the chassis into the rails.

a)

Caution:  This step in the installation requires a minimum of 3 individuals to install safely, two to lift and one to guide the others whom may have difficulty seeing because the enclosure is in the way. Ensure that the appropriate measures are taken to safely support the enclosure during installation. The enclosure **MUST** have no drives installed and requires a two person team lift to install. **Do not attempt to lift the system if it is fully populated with drives.**

Warning:  The handles on the front of the chassis are not intended to be used to support the weight of the HGST 4U102. Lifting the unit by the chassis handles or trying to support the unit on the handles can cause them to fail. This can cause serious damage to the unit or serious bodily harm to those handling the unit. Always team lift the chassis by gripping the underside of the unit, and never try to lift a chassis that is filled with drives.

Warning:  Do not lift the chassis by the Cable Tray while removing the chassis from the rack OR while installing it into a rack. This can cause serious damage to the unit or serious bodily harm to those handling the unit. Always team lift the chassis by gripping the underside of the unit, and never try to lift a chassis that is filled with drives.

Make sure the mid-rails are extended so they protrude and lock into position and that the bearing plate inside the rail is also fully forward and the detent is engaged.

Figure 56: Bearing Plate

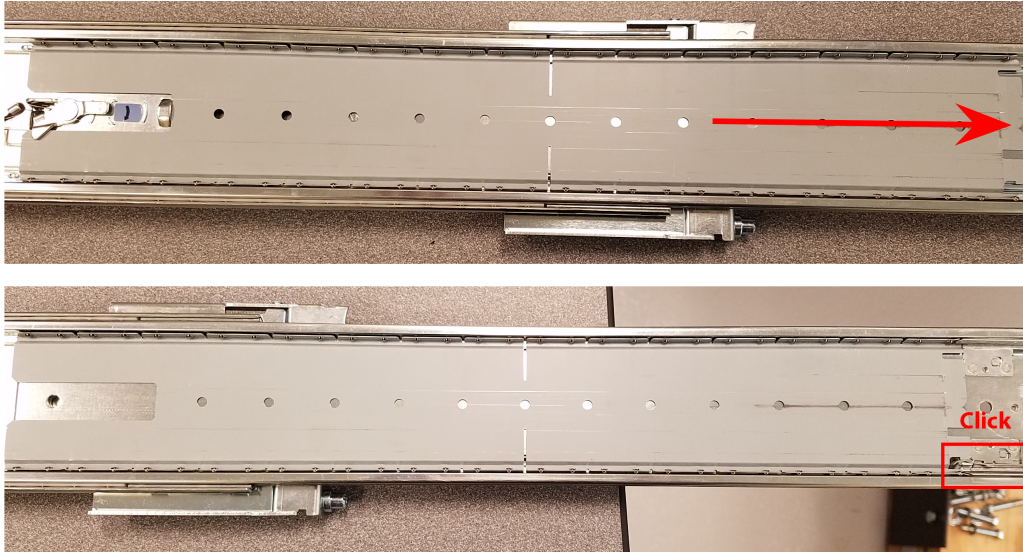
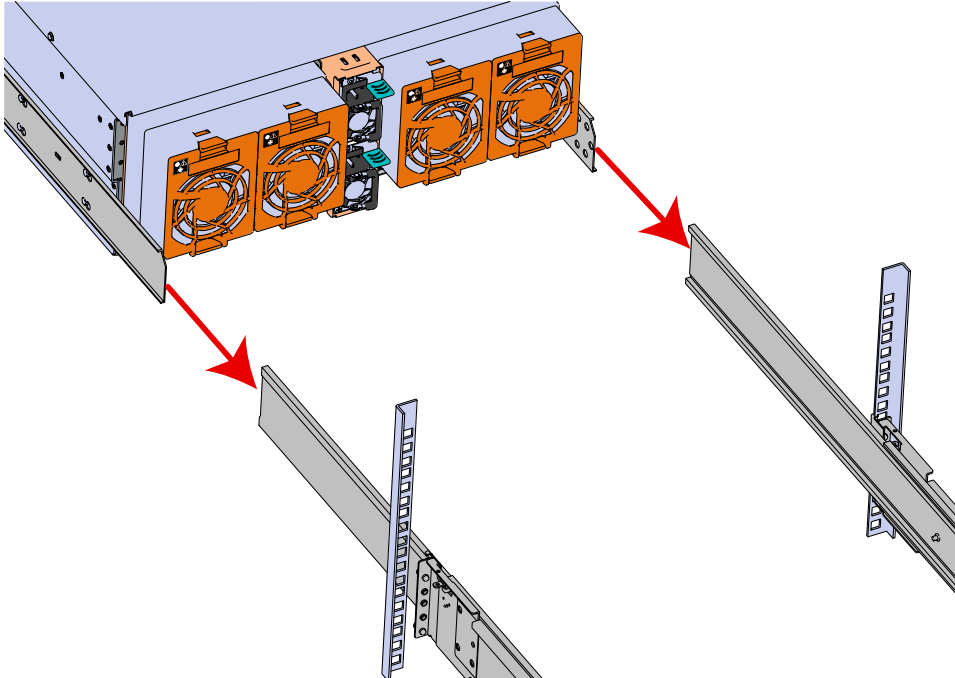



Figure 57: Installing the Chassis



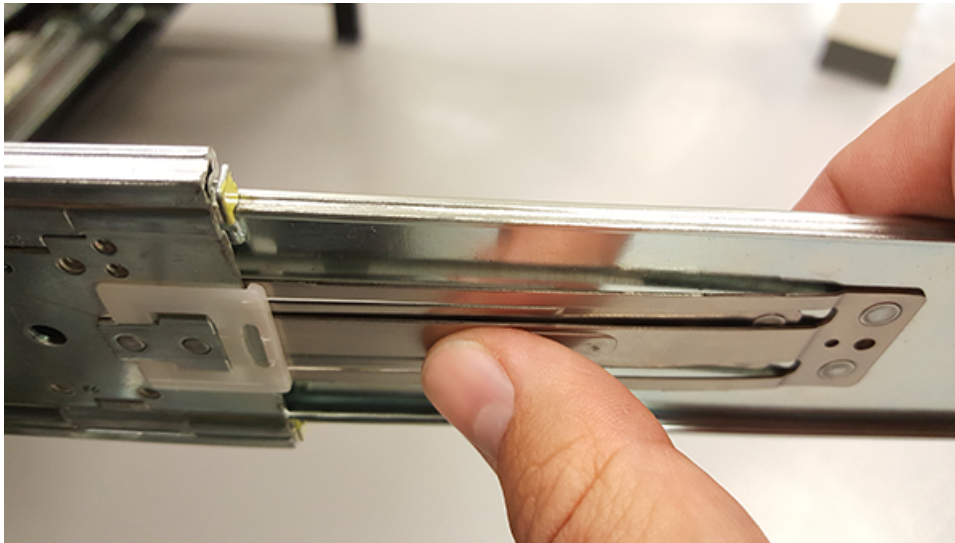
b)

Caution:  Make sure that the bearing plate on the inside of the mid-rails are fully forward and that the detent has engaged. This is to prevent potential damage due to improper mating of the rails.

Position one individual on each side of the enclosure to perform a team lift and have the third individual standing at the protruding rack rails to guide the chassis to mate with rack rails.

- c) Team-lift the enclosure until the inner rails that are attached to the chassis align with the extended mid-rails attached to the rack, and guide the inner rails on the chassis to mate with the rack rails.
- d) Once the rails are mated properly, slide the enclosure into the rack until it is stopped by the safety catch on the rails. Push the release lever on the safety latch located on the side of the rail and push the enclosure the rest of the way into the rack.

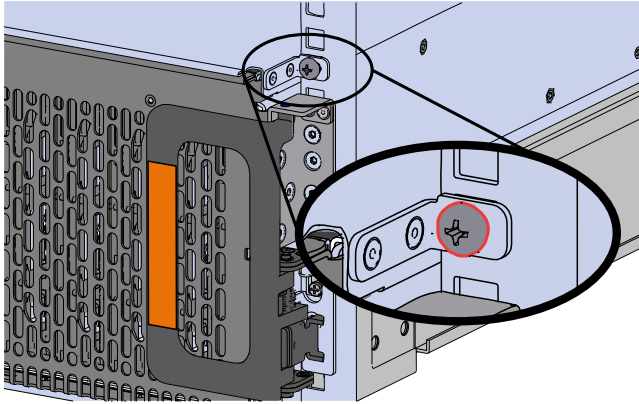
Figure 58: Safety Latch Release



- e) As the chassis is slid into the rack, position one installer at the rear of the rack to ensure that the pegs on the sides of the cover will slide correctly into the rear cover alignment brackets on both sides of the rack. If the chassis does not install smoothly or snags, check that the rear cover alignment brackets are not interfering with the chassis sidewalls, and try again.

30. Secure the chassis top cover to the rack using the included washers, the M5 x 12mm Philips Pan Head screws, and a Philips screwdriver as shown in the following image.

Figure 59: Cover Retention Screws



31. Now that the chassis is installed, test the installation by sliding the enclosure in and out of the rack a minimum of three times. If the enclosure binds, catches, or displays any incorrect motion or behavior retry the installation.

Note: Adjustments of the vertical rack rails may be required to fix any issues that may occur.

32. Install the lower CMA.

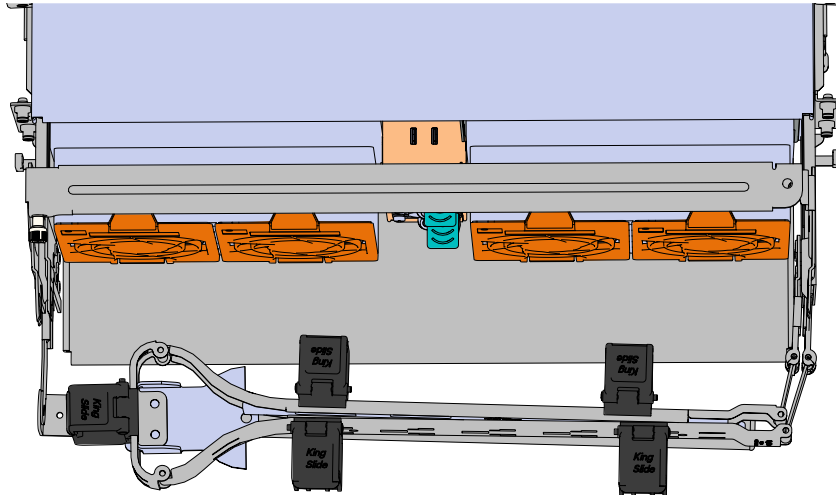
a)

Note: The CMA has two arms that are labeled upper and a lower. These arms are connected to the rails and the enclosure's chassis by four connectors. The first step in installing one of the arms for the CMA is to first determine what orientation the arm needs to be in. The lower arm should have the elbow on the right side, the upper arm should have the elbow on the left side.

Orient the CMA so that the elbow is on the left hand side.

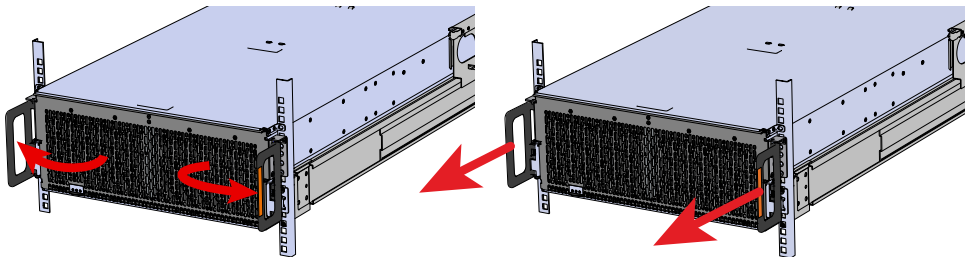
- b) Attach all of the connectors to the brackets on the rails and chassis. There should be one at the elbow side and two at the other end.

Figure 60: Lower CMA Orientation




- c) Slowly slide the enclosure forward to ensure the CMA arm is operating properly, then slide it back into the rack.
33. Grasp both handles at the front of the enclosure and pull with even pressure to extend the chassis out of the rack until it is stopped by the safety latches. The safety latches will prevent the enclosure from coming out of the rack completely.

Figure 61: Chassis Handle Operation



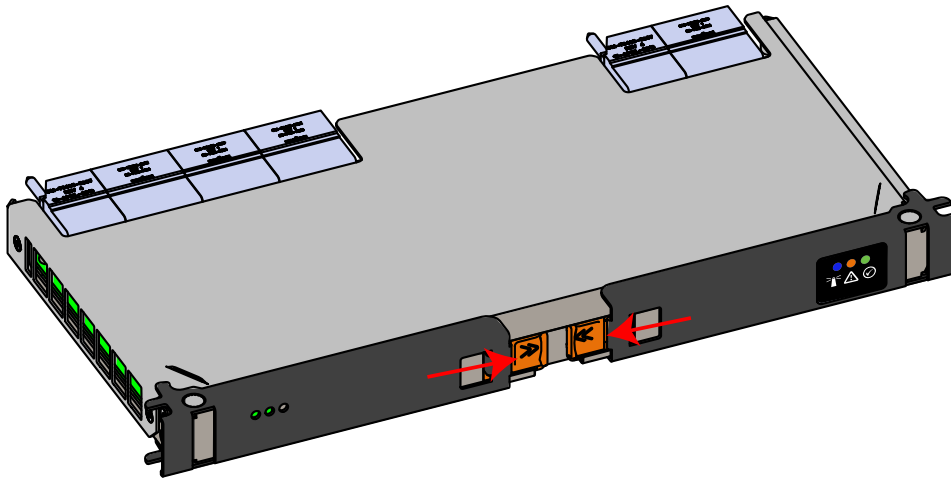
34. Install the IOM

a)

Caution:  If a pin on the IOM's internal connectors is bent or damaged, the IOM will have to be replaced. For this reason it is imperative that the IOM is not forced into position, that it is inserted straight, and that the directions for installing the IOM are followed exactly.

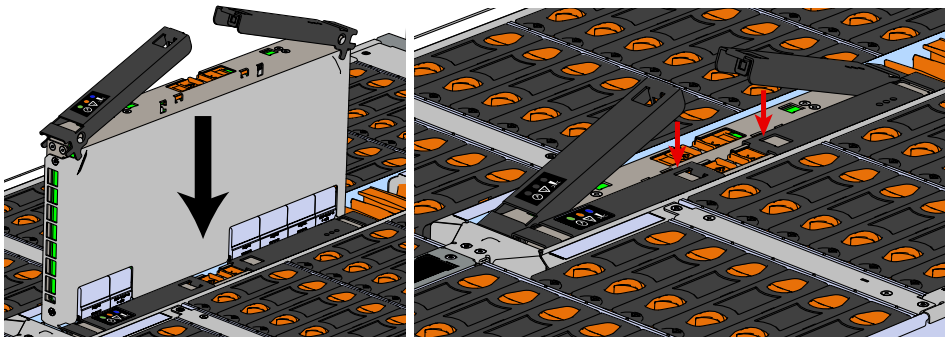
- b) Ensure that the handles on the IOM are not latched. To unlatch them, press the latch release in the direction shown in the following image.

Figure 62: Unlatching IOM Handles



- c) Align the IOM with the empty slot on the top of the chassis so that the arrow on the IOM latch release is facing toward the side shown in the following image.
d) Slowly lower the IOM into the empty slot while being careful to keep it level. Do not to force it.

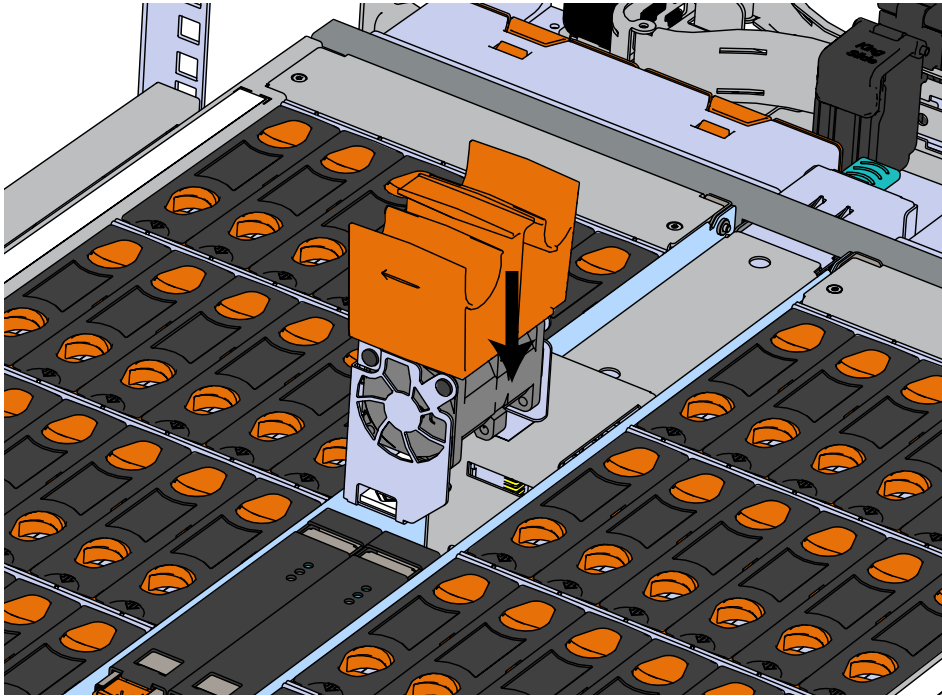
Figure 63: Installing the IOM



- e) When the IOM is lowered fully, apply light pressure with both hands evenly on the IOM body, not the handles, to seat the IOM in the connector. If the IOM won't seat correctly, **DO NOT FORCE IT**. Instead, back the IOM out, check the pins to make sure none are damaged, and try again.
f) Once the IOM is seated properly in the slot, close the handles until they latch closed.
35. Install the second IOM using the same method as the first.
36. Install the IOM Fan.

- a) Align the IOM Fan as shown in the following image.

Figure 64: Installing the IOM Fan

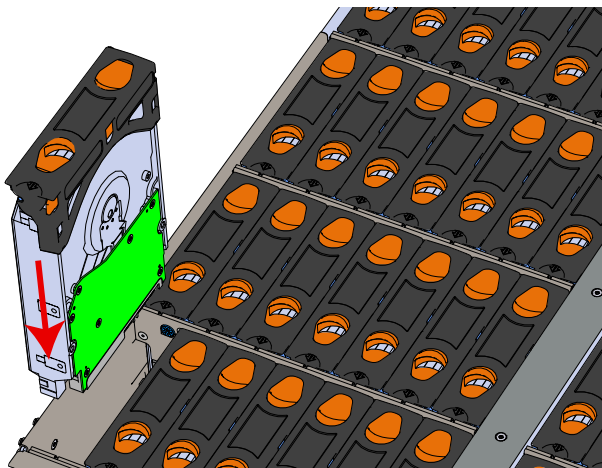


- b) Pinch the latch release mechanism slightly and carefully lower the IOM Fan into the slot.

37. Install the drive assembly.

- a) Align the drive with the empty slot that will receive it. Make sure the drive is oriented exactly as it is shown in the image below.

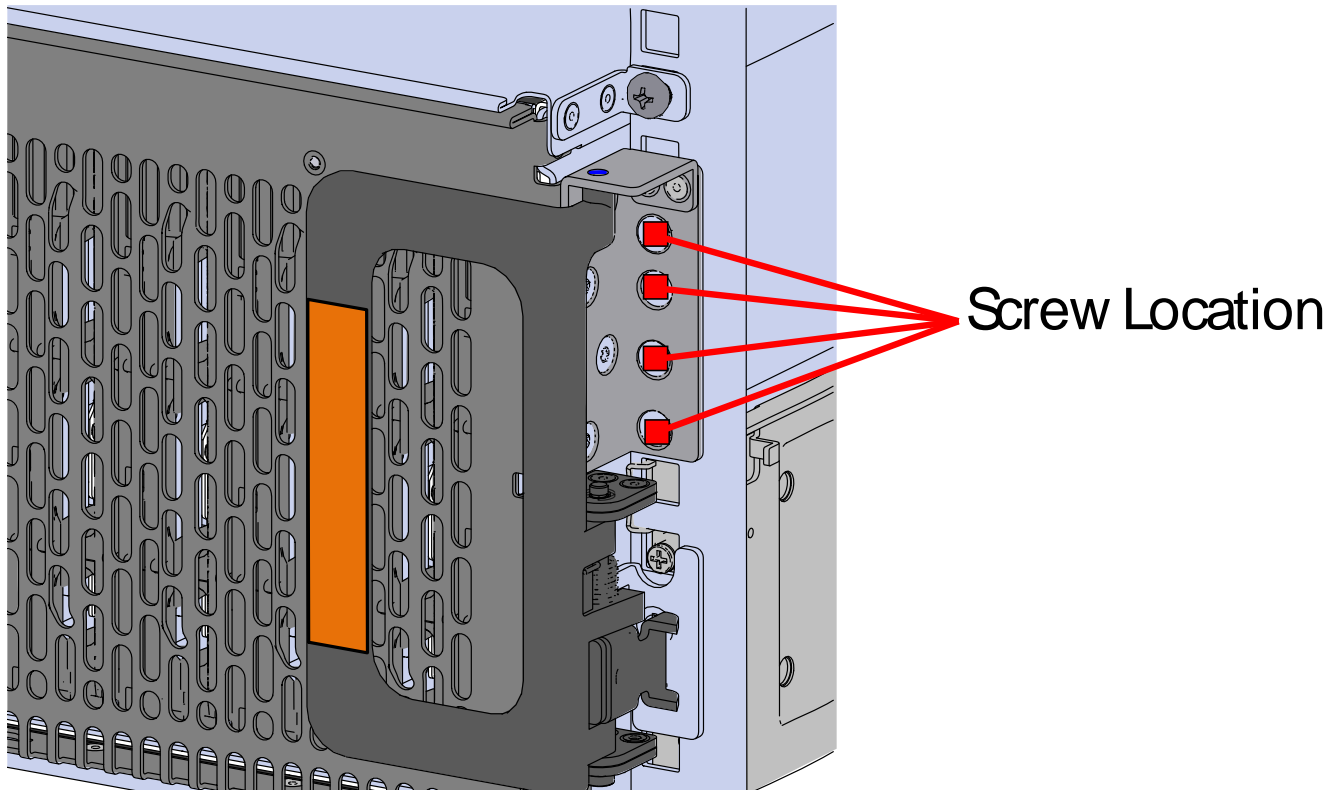
Figure 65: Installing a Drive Assembly



- b) Lower it into the slot, making sure it stays level and does not snag.

- c) Pinch the latch release and carefully press downward to seat the drive assembly the rest of the way.
38. Install each drive in the place it was removed from by following the labels or marks that were added earlier.
 39. If the chassis is being installed into a rack that will be shipped fully assembled, you **must** install eight (four per side) of the included M5 x 12mm T15 Torx screws into the two brackets at the front of the chassis in the following locations. If this chassis will not be installed into a rack for shipping purposes, skip this step and move on to the next one.

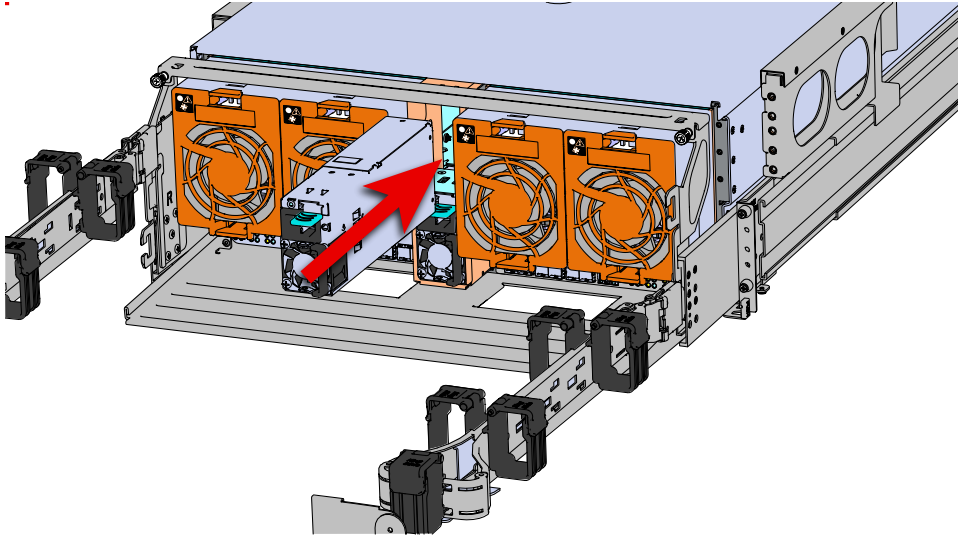
Figure 66: Shipping Bracket Screw Locations



40. Install the PSU.
 - a) Align the PSU in the orientation shown in the following image.

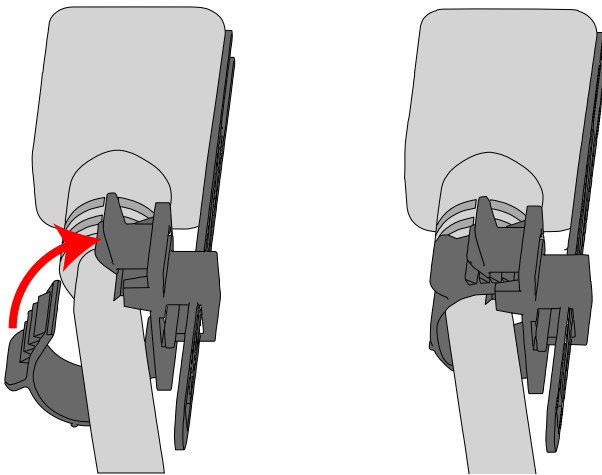
- b) Slide the PSU into the slot until it seats fully into the chassis.

Figure 67: Installing the PSU



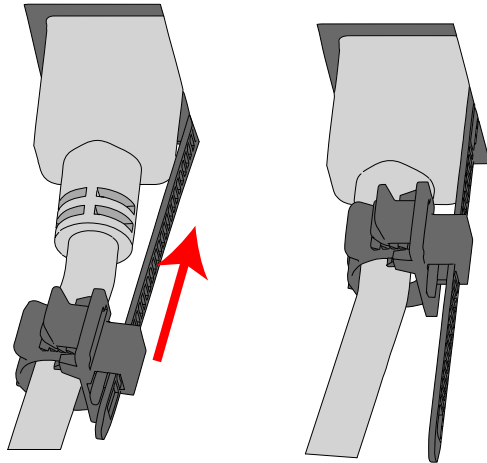
- c) Plug the power cable into the receptacle at the back of the PSU.
d) Loop the retention clip on the PSU cables around the cable and pinch it until the clip catches and locks in place.

Figure 68: Cable Retention Mechanism



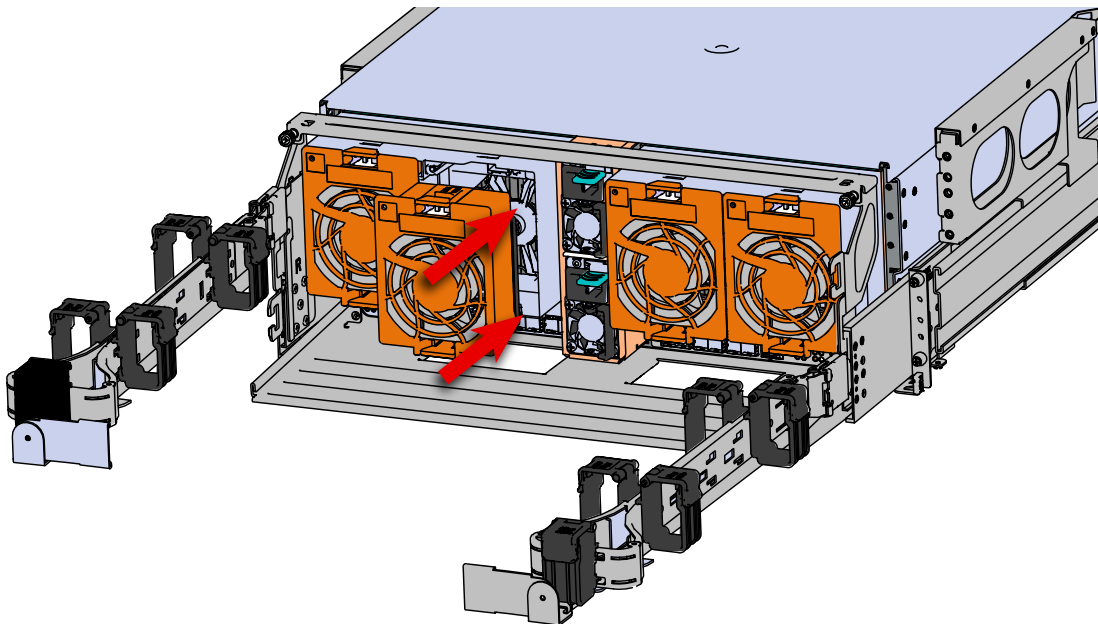
- e) Slide the retention clip forward until it stops near the cable connector. Doing this will ensure that the retention clip functions properly in the event the cable is pulled on for some reason.

Figure 69: Cinching Cable Retention Clip



41. Install the second PSU.
42. Install Rear Fan
 - a) Orient the rear fan as shown in the following image.
 - b) Insert the rear fan into the housing as shown in the following image.

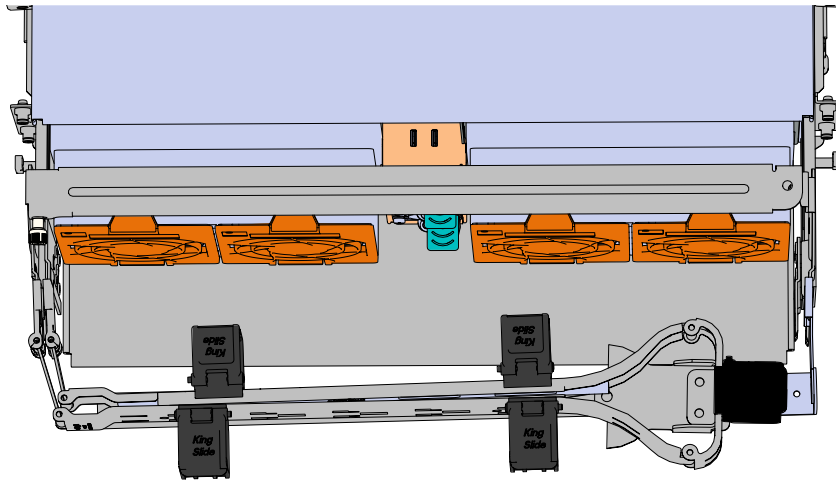
Figure 70: Installing the Rear Fan



43. Install the rest of the rear fans into the rear of the enclosure.
44. Install the upper CMA.

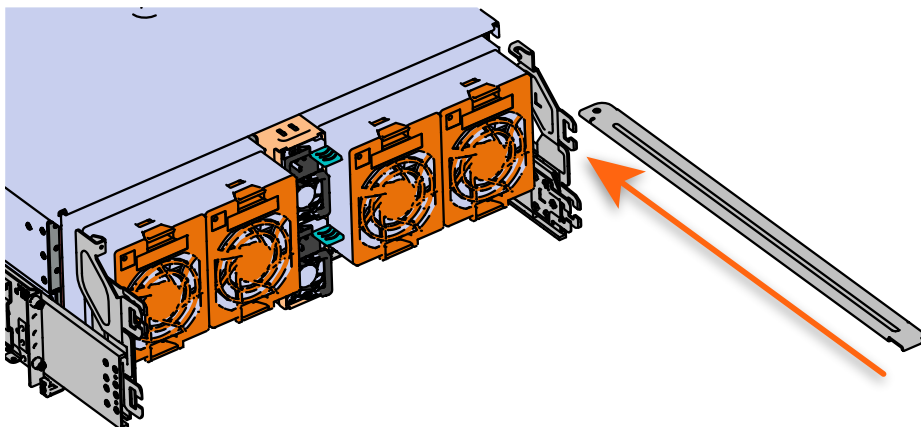
- a) Orient the CMA so that the elbow is on the right hand side as it is being installed.

Figure 71: Upper CMA Orientation



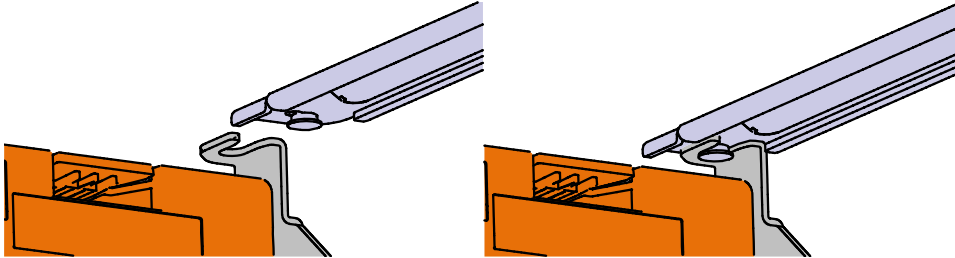
- b) Attach all of the connectors to the brackets on the rails and chassis. There should be one at the elbow side and two on the left hand side.
45. Install the crossbar onto the CMA mounting bracket.
- a) Align the crossbar with the mounting peg facing down and pointing toward the CMA mounting bracket.

Figure 72: Initial Alignment



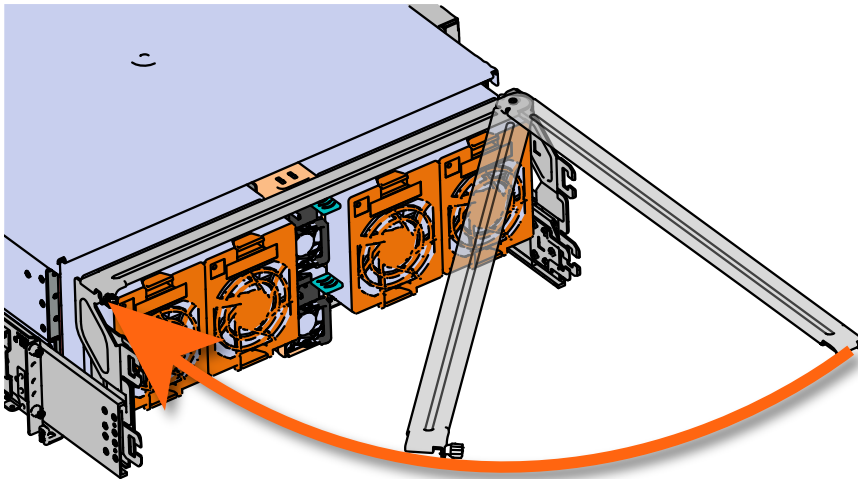
- b) Insert the peg on the underside of the crossbar into the slot on the CMA mounting bracket.

Figure 73: Crossbar Underside Peg



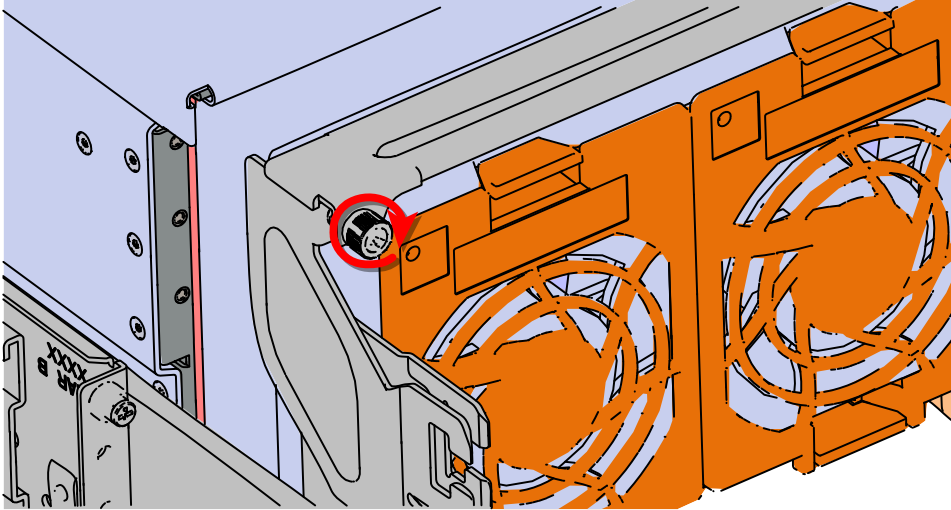
- c) Swing the crossbar so that the thumbscrew lines up with the mounting hole on the opposite side of the enclosure.

Figure 74: Swinging Motion of Crossbar to Locking Position



- d) Press the crossbar against the CMA mounting bracket and secure the crossbar in place by pressing and turning the thumbscrew clockwise until snug.

Figure 75: Tightening the Thumbscrew

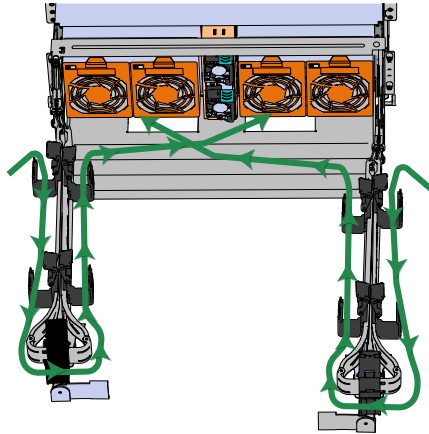


- a) Check that the crossbar is fully secured to the CMA mounting bracket by pulling on the bar to ensure it does not move.
- 46. Cable the lower CMA.**
- a) Unlatch the elbow side of the CMA arm and swing it forward by pressing the blue button that says “push” to unlatch it.
 - b) Gather the SAS cables, one power cable, and one Ethernet cable to install in the left hand side.

Note: Before cabling the lower CMA, note the following routing of the cables. For best results, the cables that are supported by the upper CMA are inserted into IOM B (right hand side looking at the rear) and the lower CMA cables are routed to IOM A (left hand side looking at the rear)

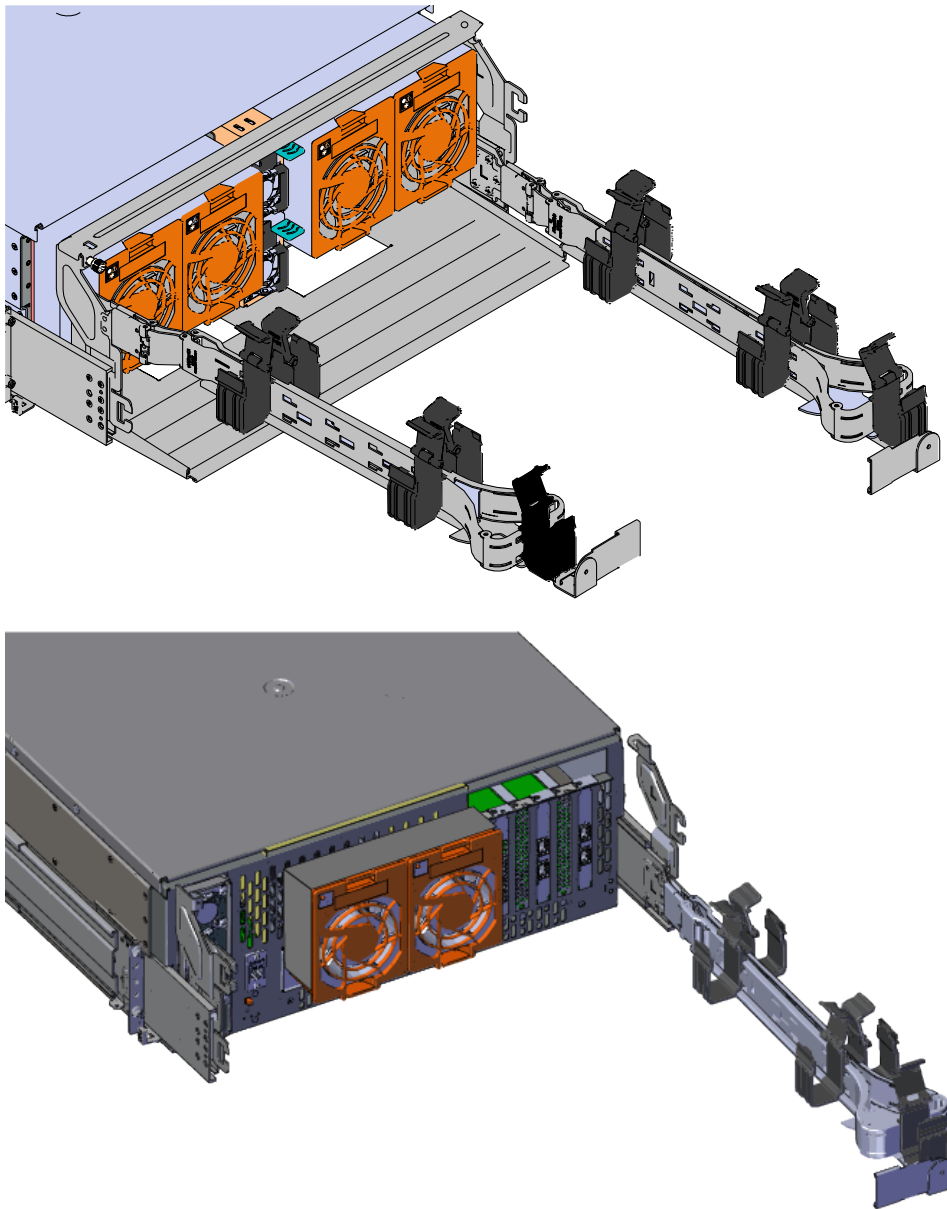
in a "criss-cross" pattern. See the [Special Considerations for Cable Routing](#) on page 135 for more information.

Figure 76: Connected Cable Routing



- c) Open all of the baskets

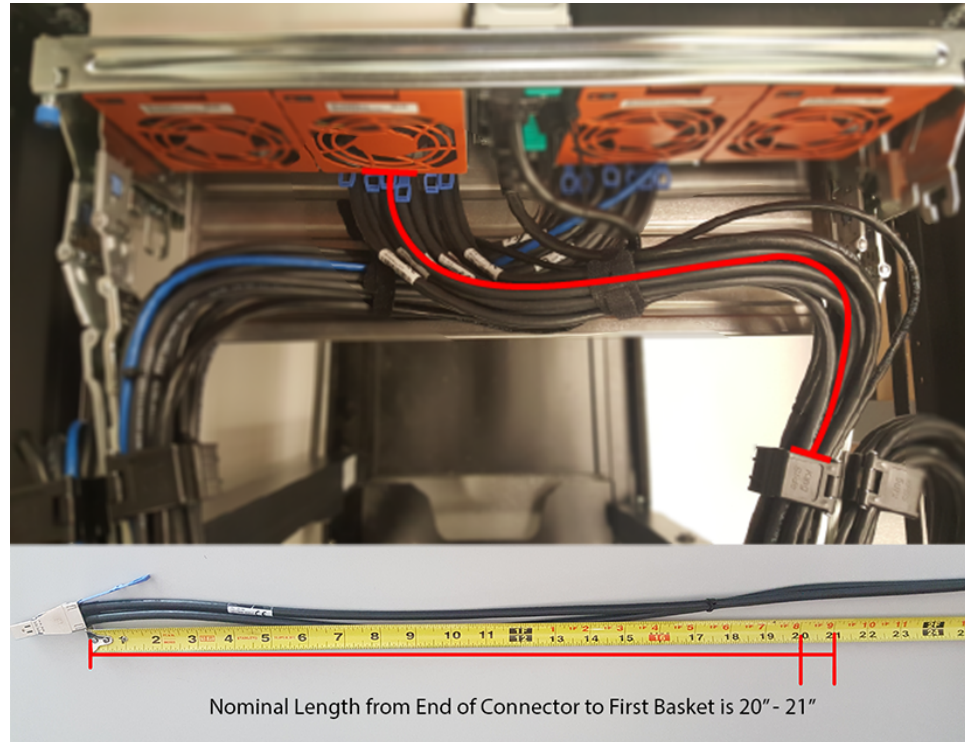
Figure 77: Open Baskets



- d) Connect the Ethernet cable to the Ethernet port on the right hand side of the HGST 4U102 and route the cable through each of the baskets on the CMA.
- e) Connect all of the SAS cables that will be used and route them through the baskets one at a time. Make sure to follow the labels to make sure they are connected to the proper port.
- f) **Make sure the power cable is not connected to a PDU.** Then connect the power cable to the lower PSU and route it through each basket. If the power cable is already connected to the PDU, the system will power up. This is not intended at this stage of installation.
- g) If the installation includes more than 10 total cables, follow the recommendations in [Special Considerations for Cable Routing](#) on page 135. Read this section before proceeding.

Note: Each cable must be given enough slack at the connector end to operate smoothly. For the lower CMA allow 20" - 21" (508 – 533.4mm) between the connector and the first basket.

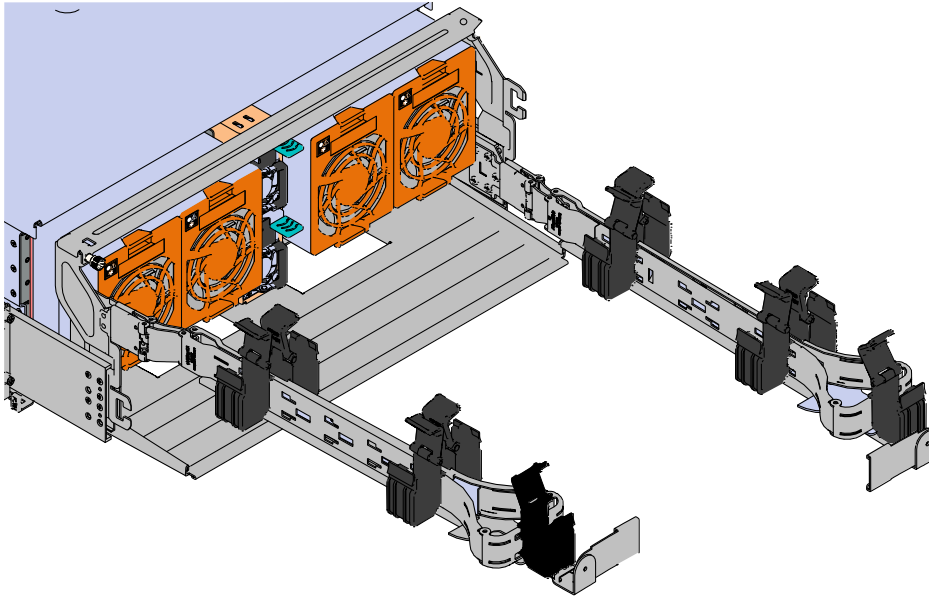
Figure 78: Nominal Cable Length at Connectors



- h) Close all of the baskets.
 - i) If the HGST 4U102 is being installed in a rack and will subsequently be transported inside that rack, it is important to use the included cable tie to wrap the CMA bundle to ensure it does not get damaged during transport. If the HGST 4U102 is instead being installed where it will operated, skip this step.
 - j) Reconnect the CMA at the elbow to the connectors on the rail.
- 47. Cable the upper CMA.**
- a) Unlatch the elbow side of the CMA arm and swing it forward by pressing the blue button that says "push" to unlatch it.
 - b) Gather the SAS cables, one power cable, and one Ethernet cable to install in the left hand side.

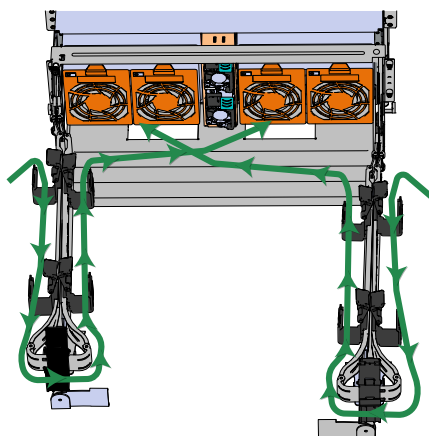
- c) Open all of the baskets

Figure 79: Open Baskets



- a) Connect the Ethernet cable to the Ethernet port on the right hand side of the HGST 4U102 and route the cable through each of the baskets on the CMA.
- b) Connect the SAS cables and route them through the baskets one at a time. Make sure to follow the labels to make sure they are connected to the proper port.
- c) Connect the power cable to the lower PSU and route it through each basket. The following image shows the appropriate cable "criss-cross" pattern they should be installed in.

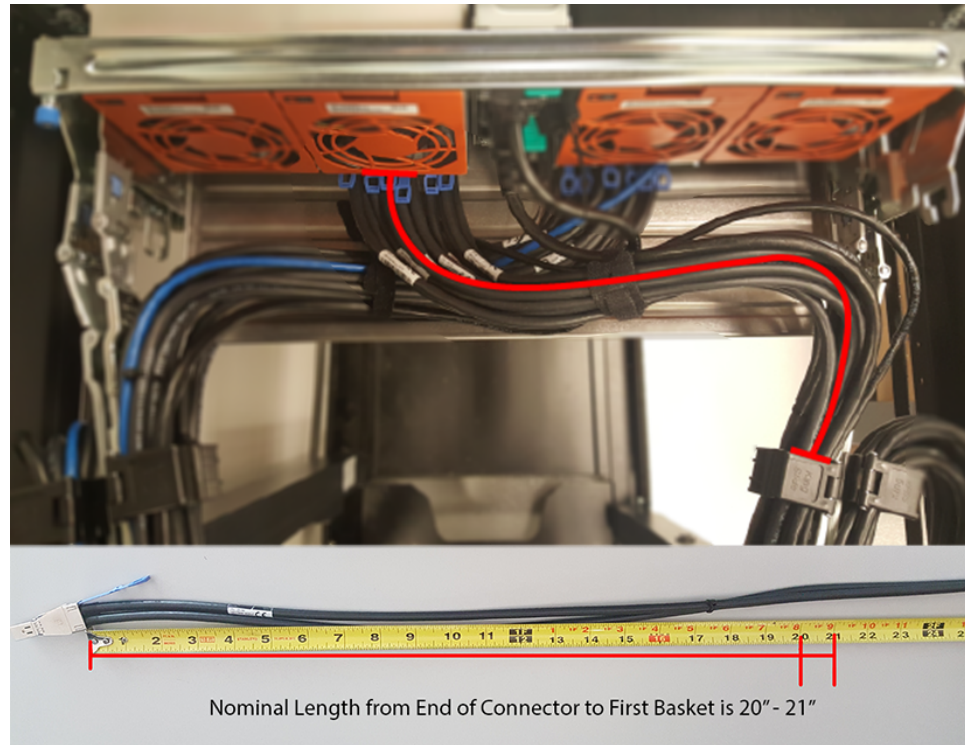
Figure 80: Connected Cable Routing



- d) Wrap cable tie around the installed cable bundle between the ports and the first basket of the CMA

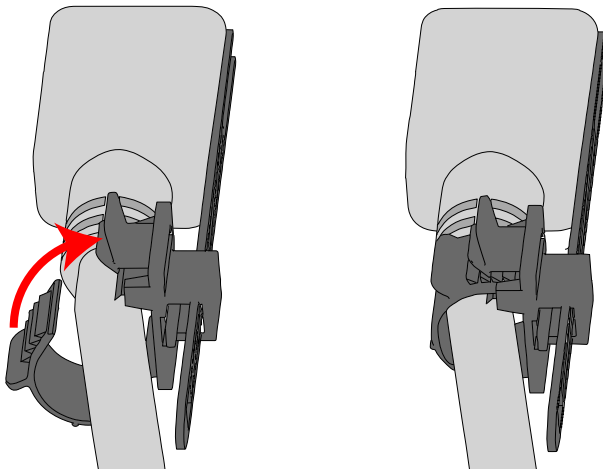
Note: Each cable must be given enough slack at the connector end to operate smoothly. For the upper CMA allow 20" - 21" (508 – 533.4mm) between the end of the connector and the first basket. Make sure to route all of the upper CMA cables **under** the lower CMA cables.

Figure 81: Nominal Cable Length at Connectors



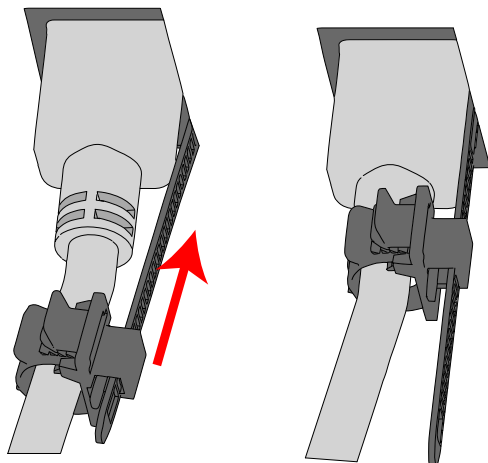
- e) Loop the retention clip on the PSU cables around the cable and pinch it until the clip catches and locks in place.

Figure 82: Cable Retention Mechanism



- f) Slide the retention clip forward until it stops near the cable connector. Doing this will ensure that the retention clip functions properly in the event the cable is pulled on for some reason.

Figure 83: Cinching Cable Retention Clip



- g) If the HGST 4U102 is being installed in a rack and will subsequently be transported inside that rack, it is important to use the included cable tie to wrap the CMA bundle to ensure it does not get damaged during transport. If the HGST 4U102 is instead being installed where it will operated, skip this step.
- h) Close all of the baskets.
- i) Reconnect the CMA at the elbow to connector A.
48. Test for binding in the extension of the CMA by gently pulling the enclosure out of the rack to ensure the cables extend properly and that the system doesn't bind at all. If it does, examine the point at which the binding occurred and adjust the seating of cables in the baskets, check the connections to the rails, and examine the joints of the CMA arm to ensure that they are all functioning properly.
49. Make sure the CMA is in operational position by folding the arm in toward the enclosure and attaching the elbow end of the CMA to the connector that is attached to the rail. Verify that all of the cabling is in functional order and does not bind or catch.

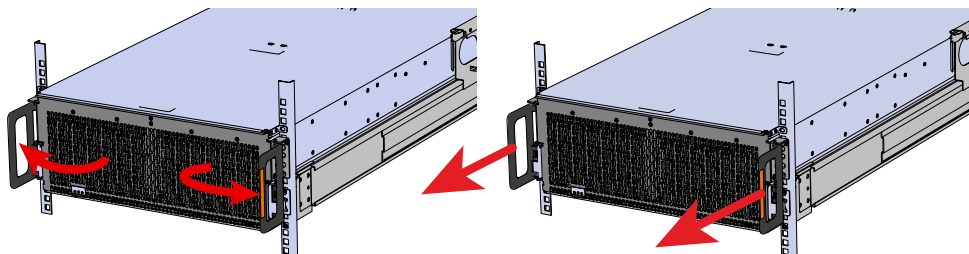
5.2 IOM Replacement

Table 37: Replacement Procedure Info

Required Tools	# of People Required	Time Required
None	1	60s

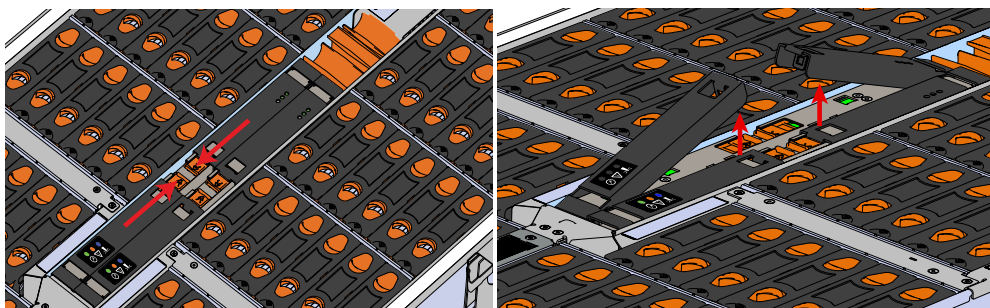
1. Grasp both handles at the front of the enclosure and pull with even pressure to extend the chassis out of the rack until it is stopped by the safety latches. The safety latches will prevent the enclosure from coming out of the rack completely.

Figure 84: Chassis Handle Operation



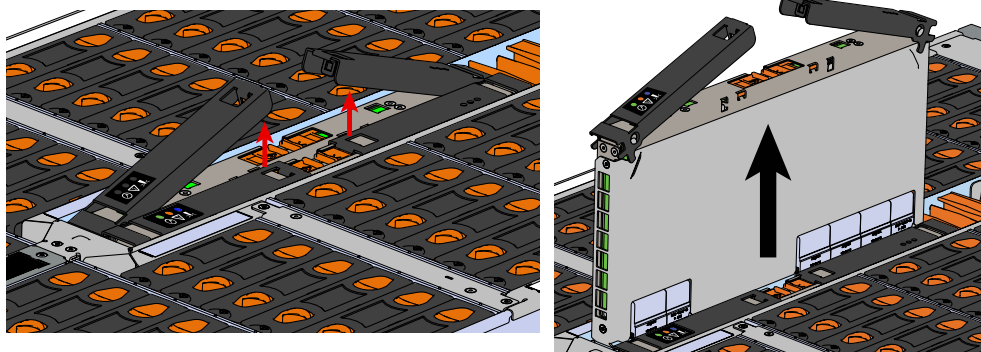
2. Locate the faulty IOM by the amber LED that will be lit on top if there is a fault or by activating the identify LED on the IOM being replaced.
3. Uninstall the IOM(s).
 - a) Locate the latch release on the IOM and press it in the direction shown in the following image.

Figure 85: Unlatching the IOM




- b) Grasp both handles, one handle in each hand, and lift evenly with both hands to ensure the IOM comes out straight. This will prevent any damage to the pins on the internal connectors.

Figure 86: Removing IOM



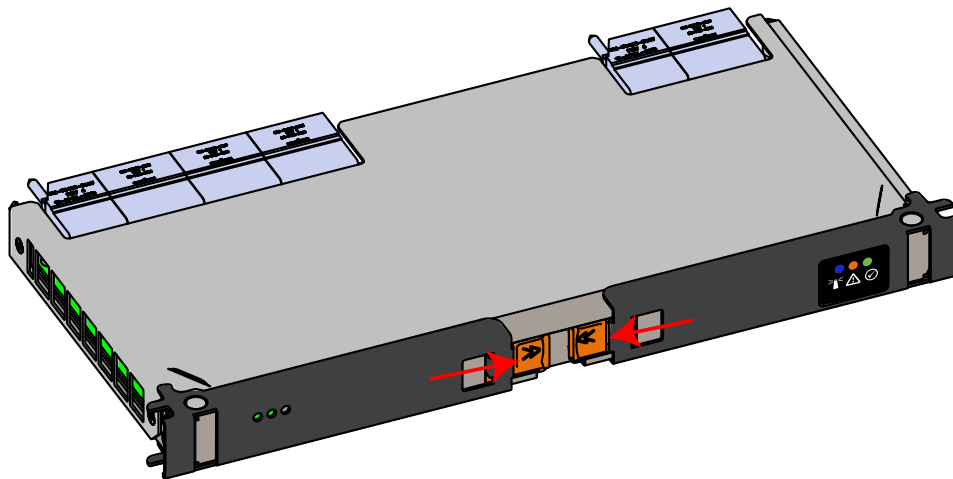
4. Install the IOM

a)

Caution:  If a pin on the IOM's internal connectors is bent or damaged, the IOM will have to be replaced. For this reason it is imperative that the IOM is not forced into position, that it is inserted straight, and that the directions for installing the IOM are followed exactly.

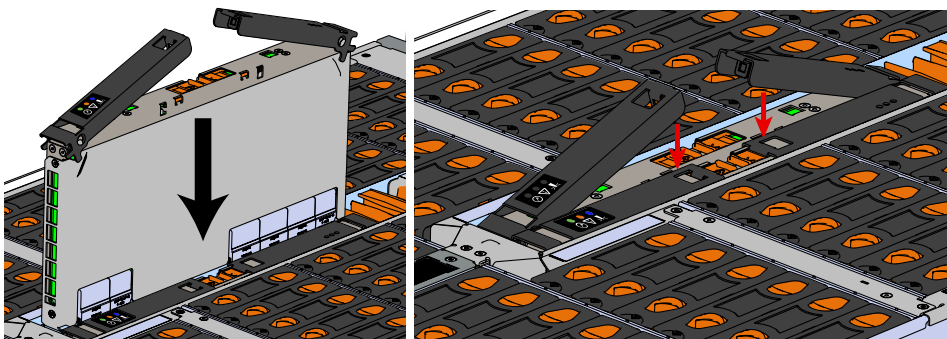
- b) Ensure that the handles on the IOM are not latched. To unlatch them, press the latch release in the direction shown in the following image.

Figure 87: Unlatching IOM Handles



- c) Align the IOM with the empty slot on the top of the chassis so that the arrow on the IOM latch release is facing toward the side shown in the following image.
d) Slowly lower the IOM into the empty slot while being careful to keep it level. Do not to force it.

Figure 88: Installing the IOM



- e) When the IOM is lowered fully, apply light pressure with both hands evenly on the IOM body, not the handles, to seat the IOM in the connector. If the IOM won't seat correctly, **DO NOT FORCE IT**. Instead, back the IOM out, check the pins to make sure none are damaged, and try again.
f) Once the IOM is seated properly in the slot, close the handles until they latch closed.

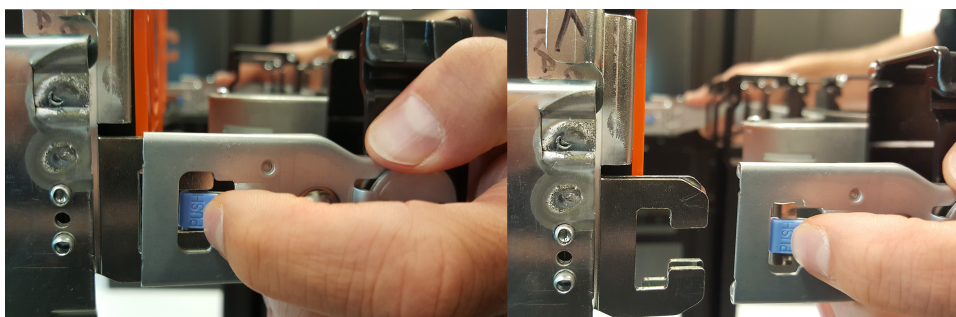
5.3 PSU Replacement

Table 38: Replacement Procedure Info

Required Tools	# of People Required	Time Required
None	1	60s

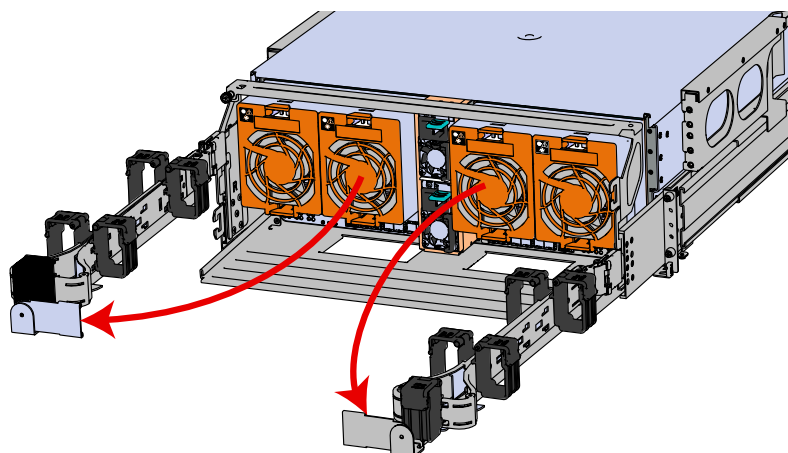
1. Place both CMAs into service position.
 - a) Unlatch the upper CMA at the elbow connector by pressing the blue release button to unlatch the connector from the rail.

Figure 89: Unlatching a CMA Connector



- b) Swing the CMA away from the enclosure.
 - c) Do the same for the lower CMA arm as what was done for the upper.
 - d) Both arms should be extended away from the enclosure as shown in the following example.

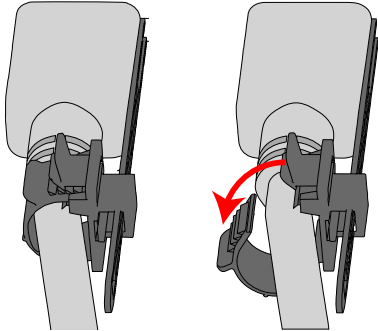
Figure 90: CMAs in service position (Cables not shown)



2. Locate the faulty PSU by finding the amber LED lit at the rear of the enclosure or by activating the identification LED.

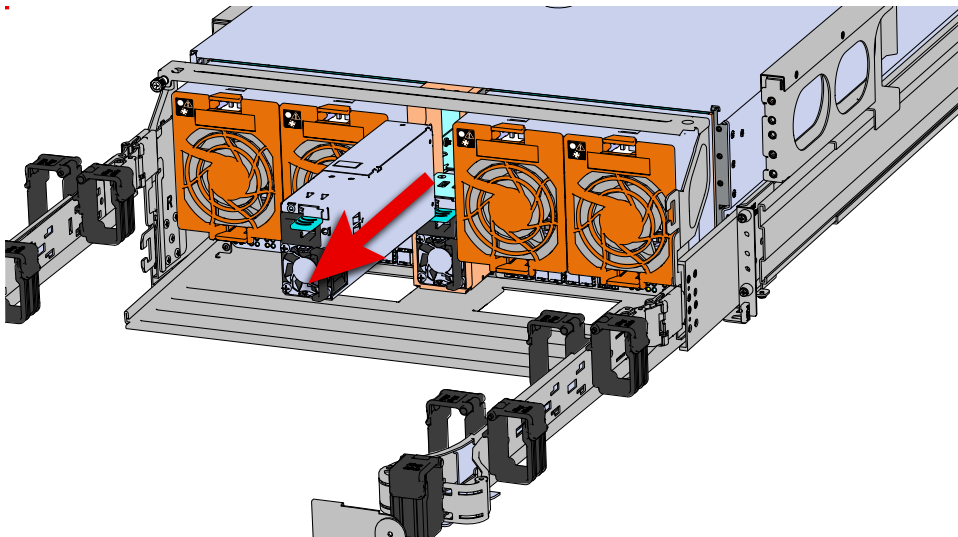
3. Detach the retention clip from the PSU cable.

Figure 91: Cable Retention Mechanism



4. Remove the power cable from the faulty PSU.
5. Uninstall the PSU.
 - a) Grasp the release lever and the metal handle in a downward pinching motion to release the latching mechanism.

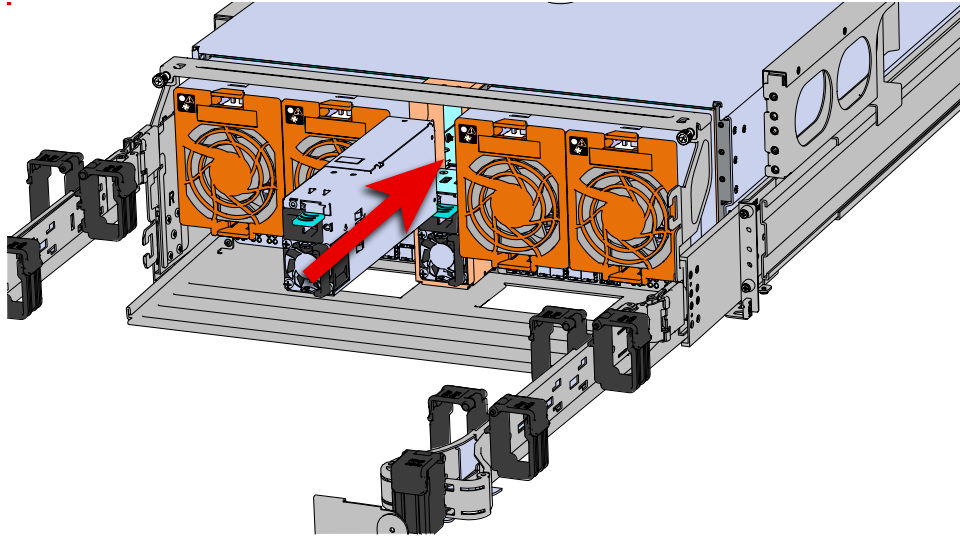
Figure 92: Uninstalling PSU



- b) Pull the PSU straight out with even pressure.
6. Install the PSU.
 - a) Align the PSU in the orientation shown in the following image.

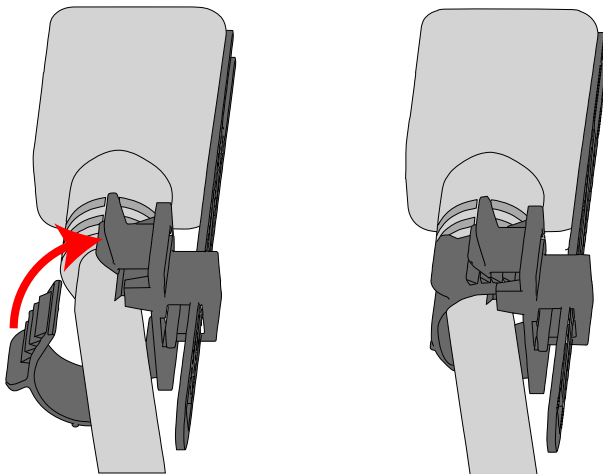
- b) Slide the PSU into the slot until it seats fully into the chassis.

Figure 93: Installing the PSU



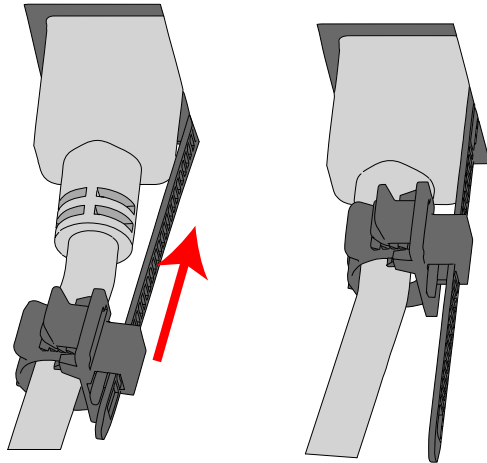
- c) Plug the power cable into the receptacle at the back of the PSU.
d) Loop the retention clip on the PSU cables around the cable and pinch it until the clip catches and locks in place.

Figure 94: Cable Retention Mechanism



- e) Slide the retention clip forward until it stops near the cable connector. Doing this will ensure that the retention clip functions properly in the event the cable is pulled on for some reason.

Figure 95: Cinching Cable Retention Clip



7. Make sure the CMA is in operational position by folding the arm in toward the enclosure and attaching the elbow end of the CMA to the connector that is attached to the rail. Verify that all of the cabling is in functional order and does not bind or catch.

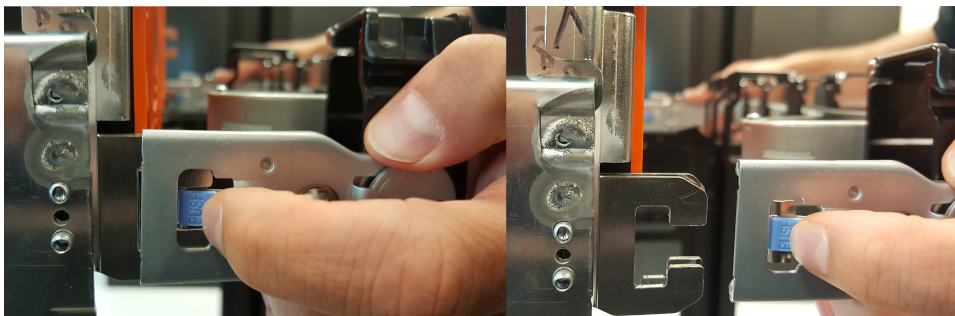
5.4 Rear Fan Replacement

Table 39: Replacement Procedure Info

Required Tools	# of People Required	Time Required
None	1	60s

1. Place both CMAs into service position.
 - a) Unlatch the upper CMA at the elbow connector by pressing the blue release button to unlatch the connector from the rail.

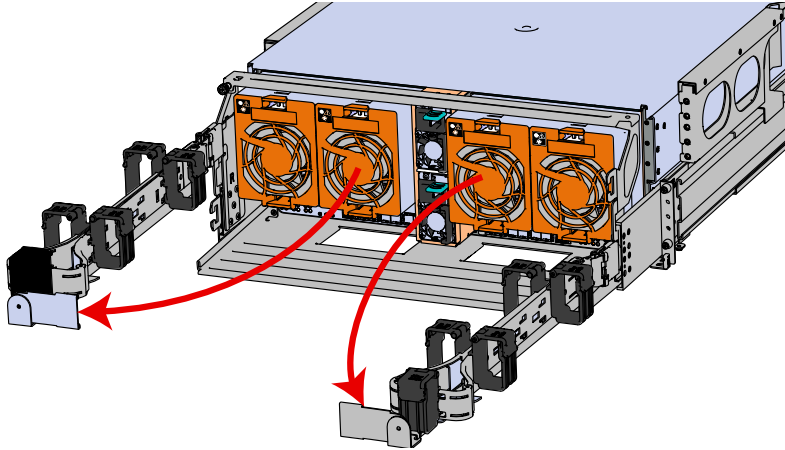
Figure 96: Unlatching a CMA Connector



- b) Swing the CMA away from the enclosure.
 - c) Do the same for the lower CMA arm as what was done for the upper.

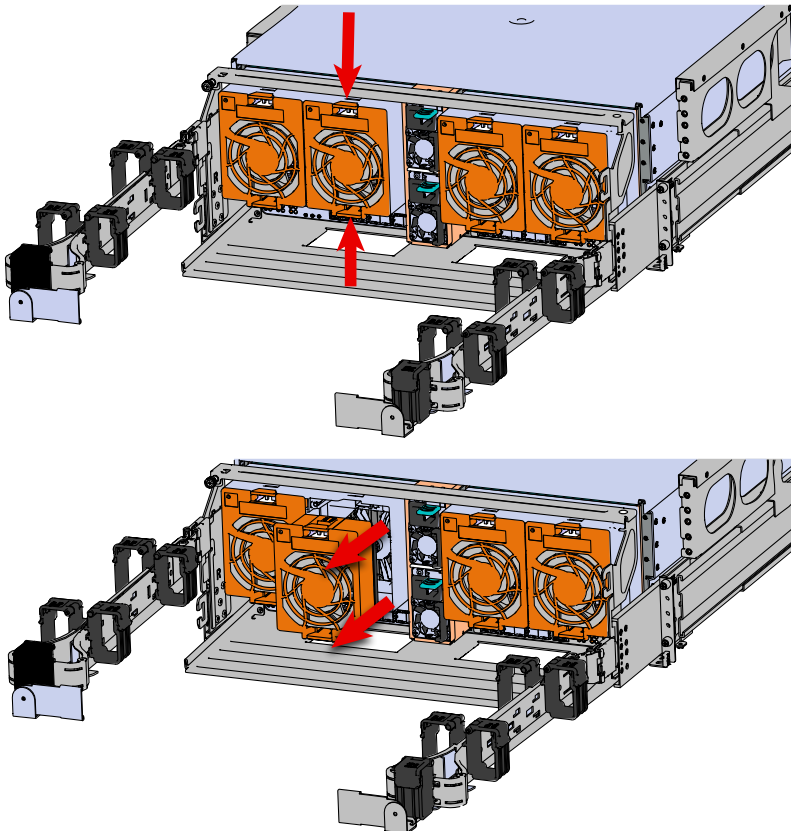
d) Both arms should be extended away from the enclosure as shown in the following example.

Figure 97: CMAs in service position (Cables not shown)



2. To unlatch the rear fan from the fan housing, use one hand to press the clip at the top and bottom of the fan and pull to free it from the chassis and remove it.

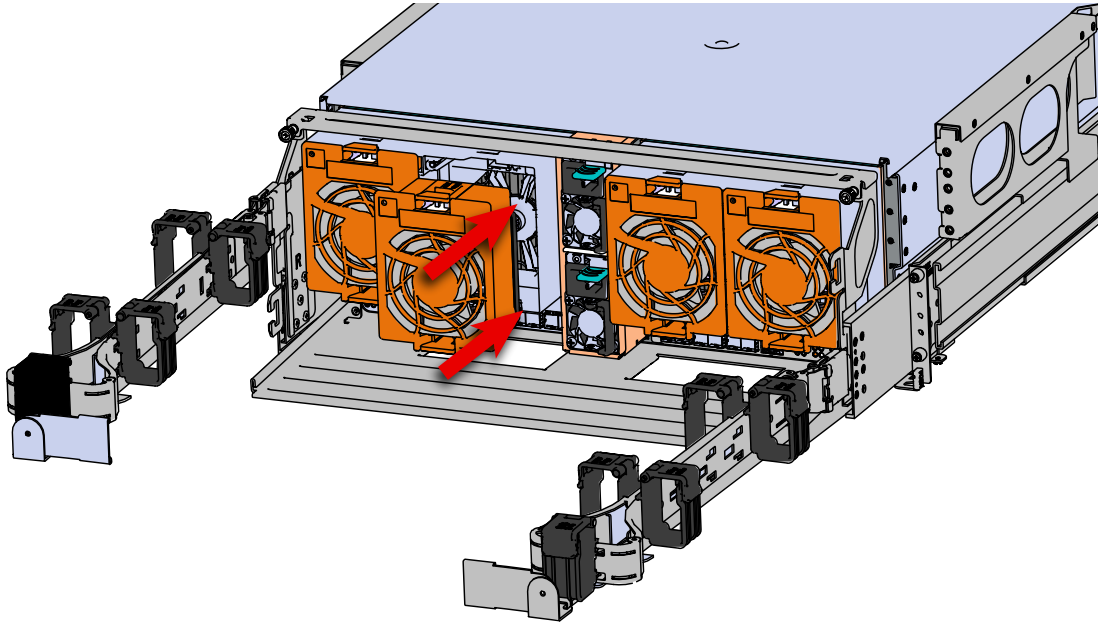
Figure 98: Uninstalling the Rear Fan



3. Install Rear Fan

- a) Orient the rear fan as shown in the following image.
- b) Insert the rear fan into the housing as shown in the following image.

Figure 99: Installing the Rear Fan



4. Make sure the CMA is in operational position by folding the arm in toward the enclosure and attaching the elbow end of the CMA to the connector that is attached to the rail. Verify that all of the cabling is in functional order and does not bind or catch.

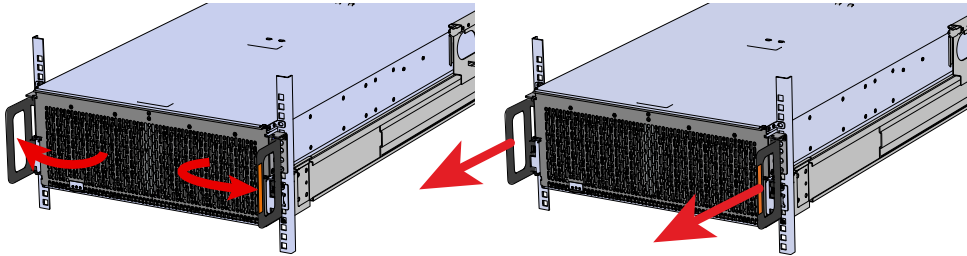
5.5 IOM Fan Replacement

Table 40: Replacement Procedure Info

Required Tools	# of People Required	Time Required
None	1	60s

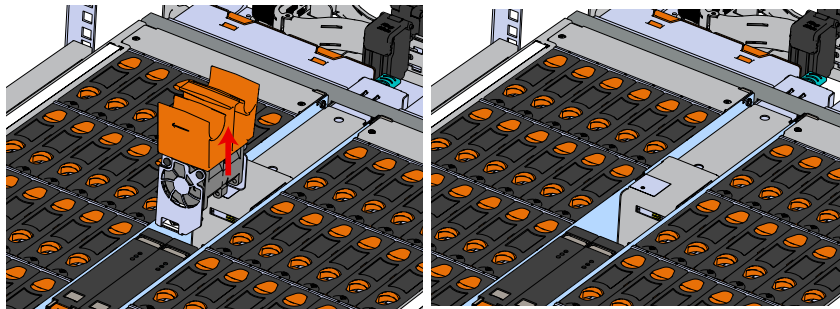
1. Grasp both handles at the front of the enclosure and pull with even pressure to extend the chassis out of the rack until it is stopped by the safety latches. The safety latches will prevent the enclosure from coming out of the rack completely.

Figure 100: Chassis Handle Operation



2. Remove the IOM Fan.
 - a) With one hand, grasp around the center square of the fan housing as shown in the following image.
 - b) Pinch the IOM fan housing to release the latching mechanism and pull it straight out from the chassis.

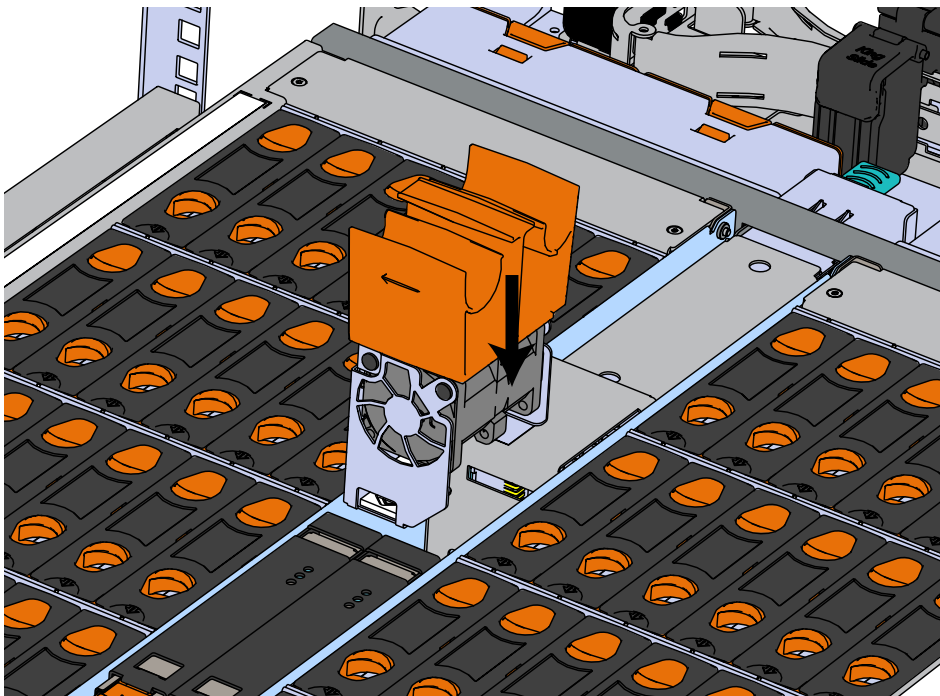
Figure 101: Removing IOM Fan



3. Install the IOM Fan.

a) Align the IOM Fan as shown in the following image.

Figure 102: Installing the IOM Fan



b) Pinch the latch release mechanism slightly and carefully lower the IOM Fan into the slot.

4. Push the enclosure back into the rack to ensure proper cooling.

5.6 CMA Replacement

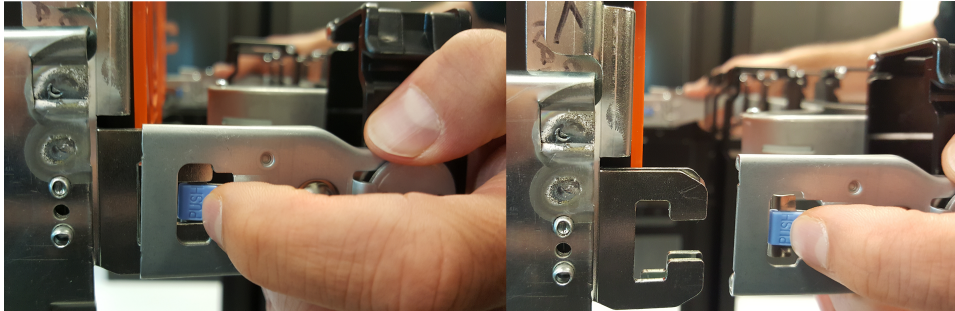
Table 41: Replacement Procedure Info

Required Tools	# of People Required	Time Required
<ul style="list-style-type: none">• Cable Ties (for configurations with greater than 10 total cables)• Tape Measure	1	15m

1. Place both CMAs into service position.

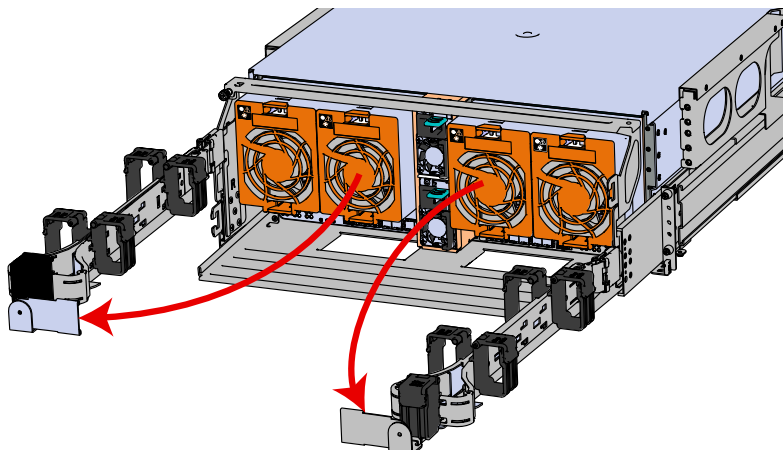
- a) Unlatch the upper CMA at the elbow connector by pressing the blue release button to unlatch the connector from the rail.

Figure 103: Unlatching a CMA Connector



- b) Swing the CMA away from the enclosure.
- c) Do the same for the lower CMA arm as what was done for the upper.
- d) Both arms should be extended away from the enclosure as shown in the following example.

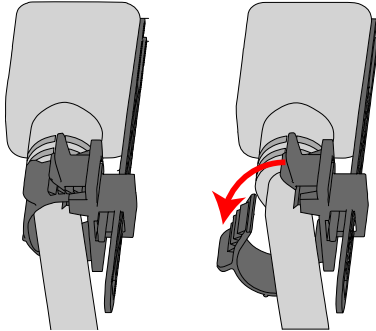
Figure 104: CMAs in service position (Cables not shown)



2. Power down the Enclosure.
 - a) Locate the redundant PSUs at the rear of the enclosure.

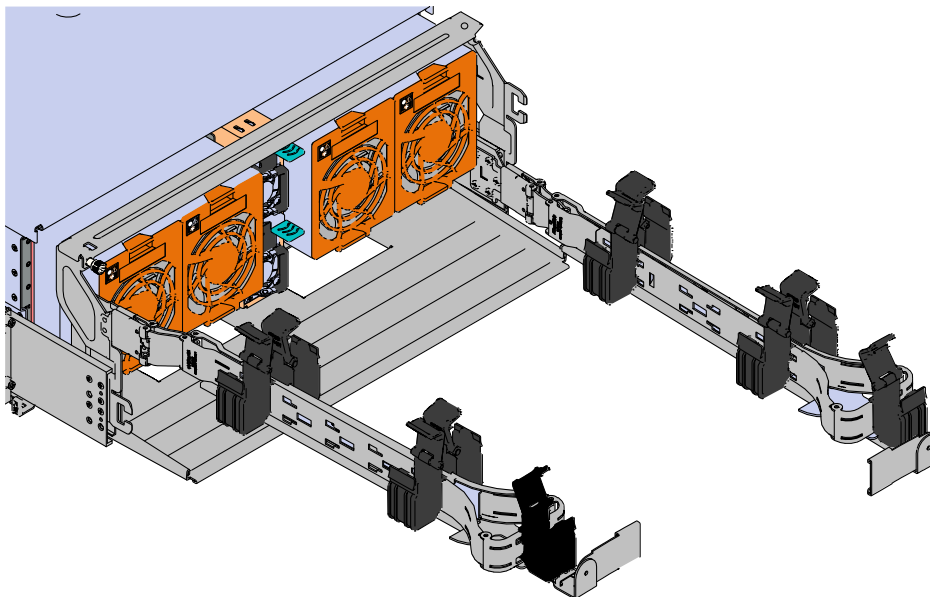
- b) Detach the cable retention clip from both power cords.

Figure 105: Cable Retention Mechanism



- c) Power down the enclosure by disconnecting both power cables, one from each PSU.
3. Disconnect the HD Mini-SAS cables from the rear of the enclosure by pulling (don't jerk) on the blue tab that is extending outward from the connector. This will free the cable from the port. Make sure each cable is labeled or label them yourself to ensure that they will be plugged back into the same location.
 4. Unplug the Ethernet cables from the out-of-band management ports.
 5. Uncable the CMA.
 - a) Open all of the baskets on the CMA.

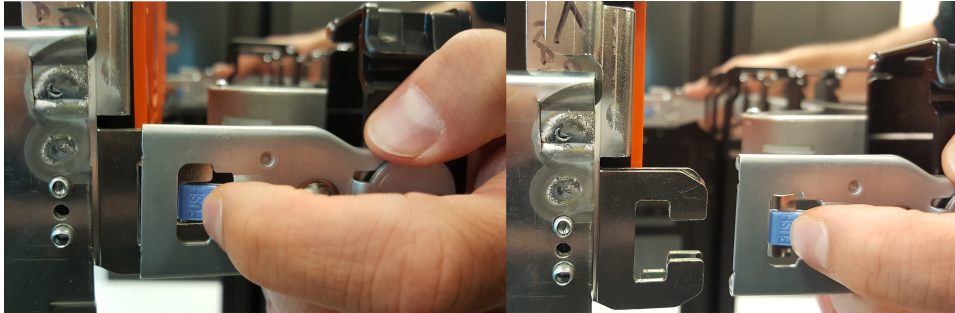
Figure 106: Open Baskets



- b) Remove one cable from the CMA at a time making sure not to put too much strain on the arm.

6. Unlatch all of the connectors that attach the CMA to the enclosure and the rail by locating the latch release button and pressing it from either side of the latch. There are three total connections that need to be removed, one at the elbow and two at the opposite end.

Figure 107: Unlatching a CMA Connector



7. Follow the previous step for the second CMA.
8. Install the lower CMA.

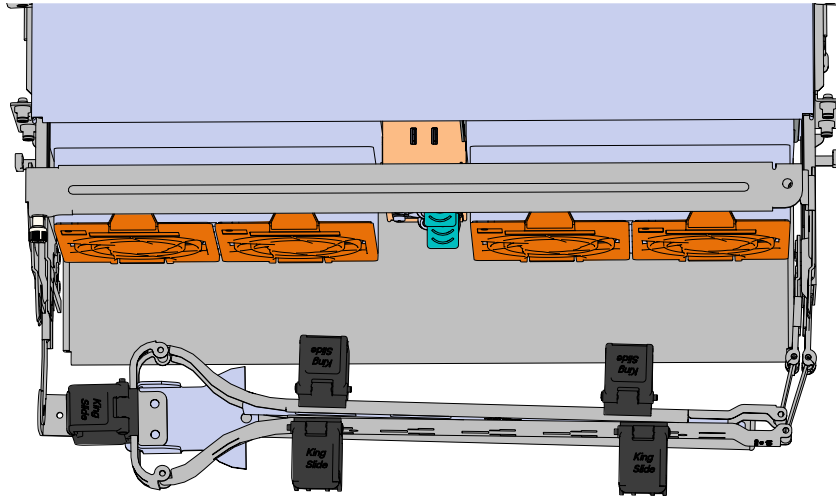
a)

Note: The CMA has two arms that are labeled upper and a lower. These arms are connected to the rails and the enclosure's chassis by four connectors. The first step in installing one of the arms for the CMA is to first determine what orientation the arm needs to be in. The lower arm should have the elbow on the right side, the upper arm should have the elbow on the left side.

Orient the CMA so that the elbow is on the left hand side.

- b) Attach all of the connectors to the brackets on the rails and chassis. There should be one at the elbow side and two at the other end.

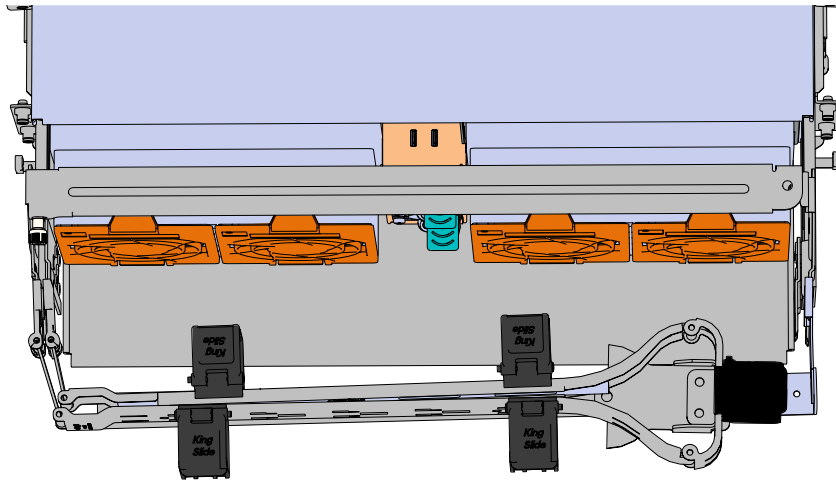
Figure 108: Lower CMA Orientation



- c) Slowly slide the enclosure forward to ensure the CMA arm is operating properly, then slide it back into the rack.
9. Install the upper CMA.

- a) Orient the CMA so that the elbow is on the right hand side as it is being installed.

Figure 109: Upper CMA Orientation

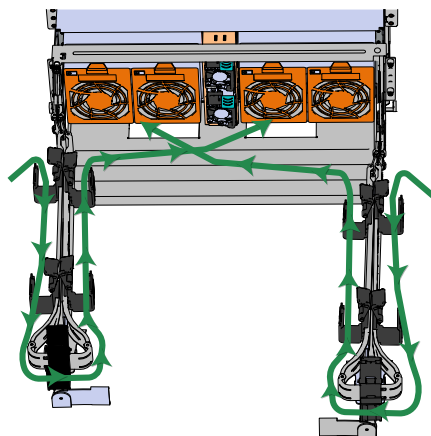


- b) Attach all of the connectors to the brackets on the rails and chassis. There should be one at the elbow side and two on the left hand side.
- 10. Cable the lower CMA.**
- a) Unlatch the elbow side of the CMA arm and swing it forward by pressing the blue button that says “push” to unlatch it.
 - b) Gather the SAS cables, one power cable, and one Ethernet cable to install in the left hand side.

Note: Before cabling the lower CMA, note the following routing of the cables. For best results, the cables that are supported by the upper CMA are inserted into IOM B (right hand side looking at the rear) and the lower CMA cables are routed to IOM A (left hand side looking at the rear)

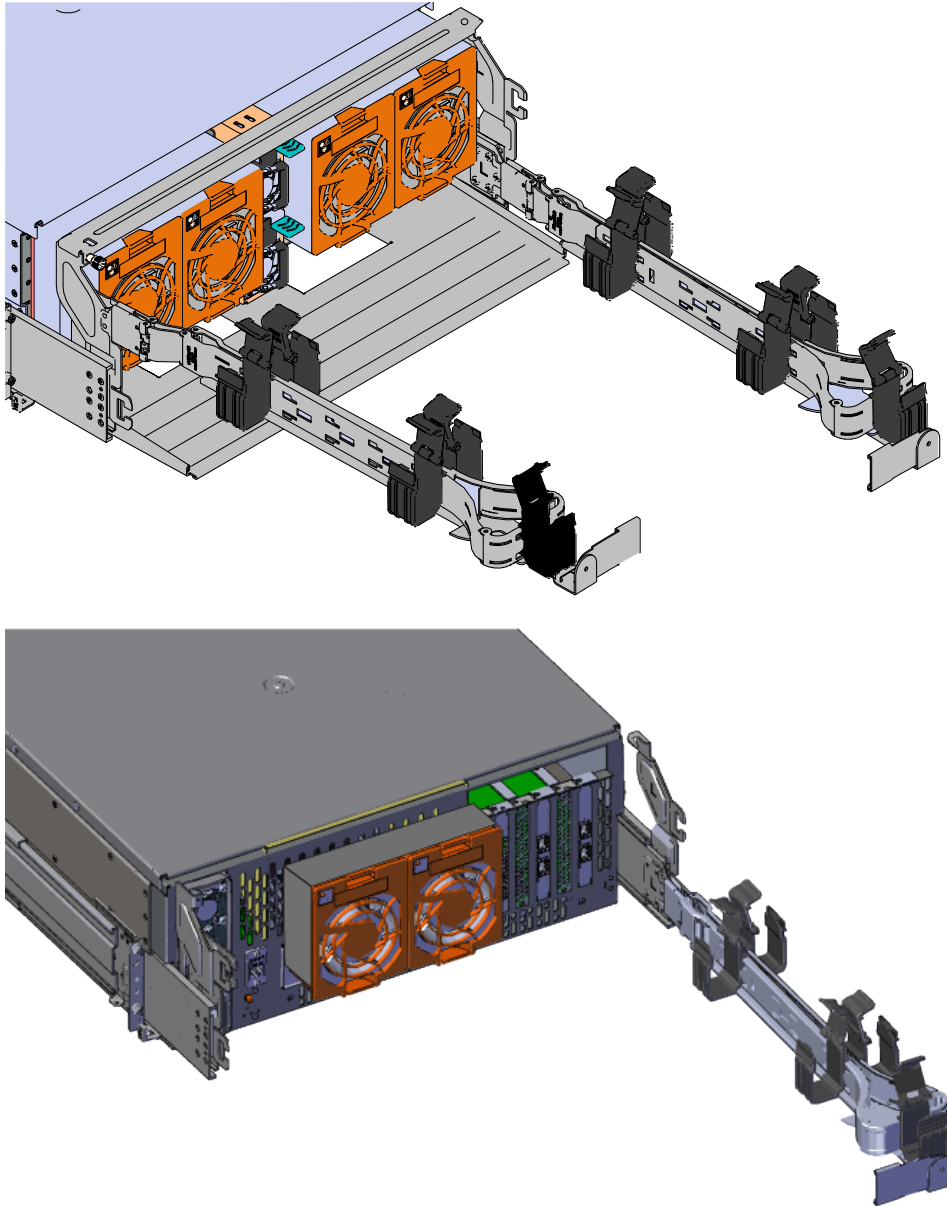
in a "criss-cross" pattern. See the [Special Considerations for Cable Routing](#) on page 135 for more information.

Figure 110: Connected Cable Routing



- c) Open all of the baskets

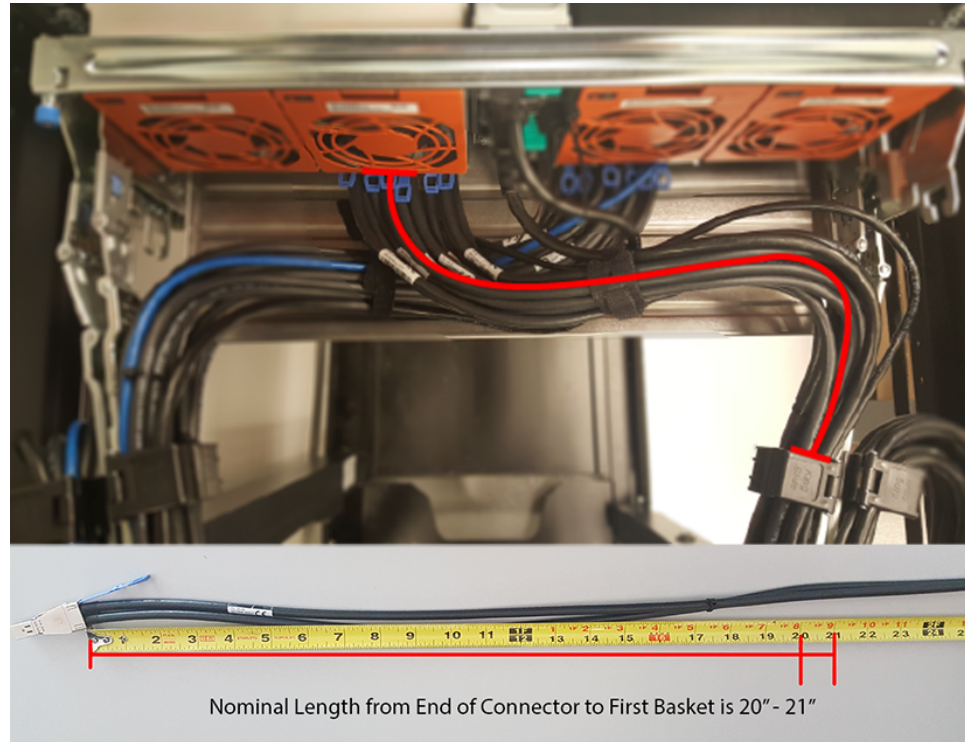
Figure 111: Open Baskets



- d) Connect the Ethernet cable to the Ethernet port on the right hand side of the HGST 4U102 and route the cable through each of the baskets on the CMA.
- e) Connect all of the SAS cables that will be used and route them through the baskets one at a time. Make sure to follow the labels to make sure they are connected to the proper port.
- f) **Make sure the power cable is not connected to a PDU.** Then connect the power cable to the lower PSU and route it through each basket. If the power cable is already connected to the PDU, the system will power up. This is not intended at this stage of installation.
- g) If the installation includes more than 10 total cables, follow the recommendations in [Special Considerations for Cable Routing](#) on page 135. Read this section before proceeding.

Note: Each cable must be given enough slack at the connector end to operate smoothly. For the lower CMA allow 20" - 21" (508 – 533.4mm) between the connector and the first basket.

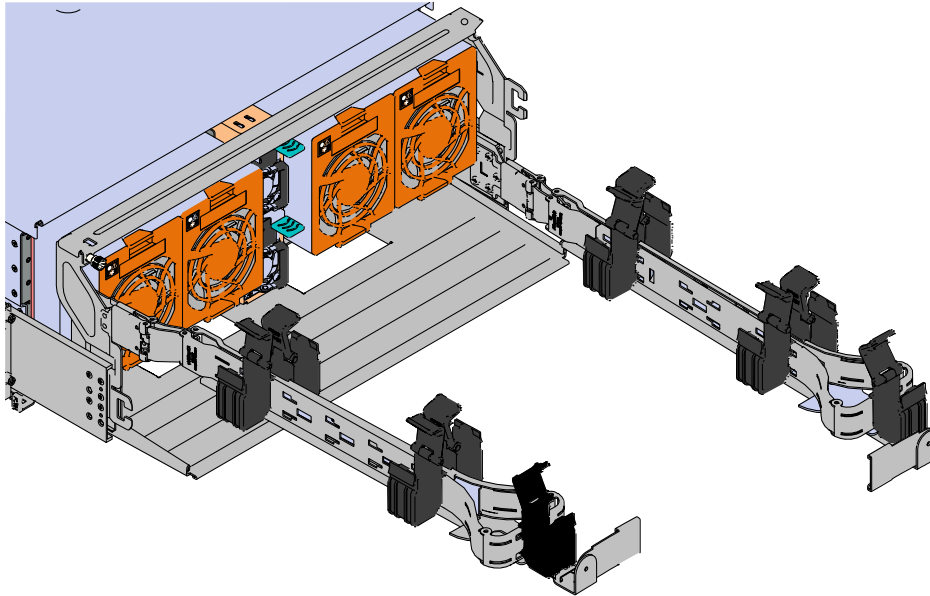
Figure 112: Nominal Cable Length at Connectors



- h) Close all of the baskets.
 - i) If the HGST 4U102 is being installed in a rack and will subsequently be transported inside that rack, it is important to use the included cable tie to wrap the CMA bundle to ensure it does not get damaged during transport. If the HGST 4U102 is instead being installed where it will operated, skip this step.
 - j) Reconnect the CMA at the elbow to the connectors on the rail.
11. Cable the upper CMA.
- a) Unlatch the elbow side of the CMA arm and swing it forward by pressing the blue button that says "push" to unlatch it.
 - b) Gather the SAS cables, one power cable, and one Ethernet cable to install in the left hand side.

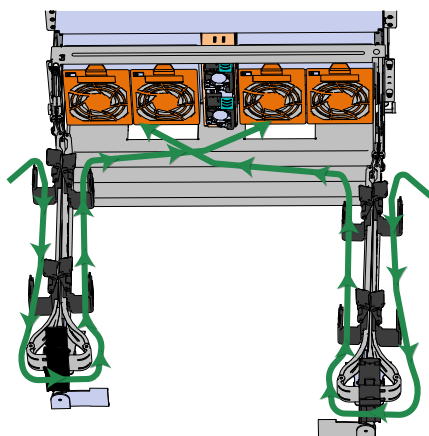
- c) Open all of the baskets

Figure 113: Open Baskets



- a) Connect the Ethernet cable to the Ethernet port on the right hand side of the HGST 4U102 and route the cable through each of the baskets on the CMA.
- b) Connect the SAS cables and route them through the baskets one at a time. Make sure to follow the labels to make sure they are connected to the proper port.
- c) Connect the power cable to the lower PSU and route it through each basket. The following image shows the appropriate cable "criss-cross" pattern they should be installed in.

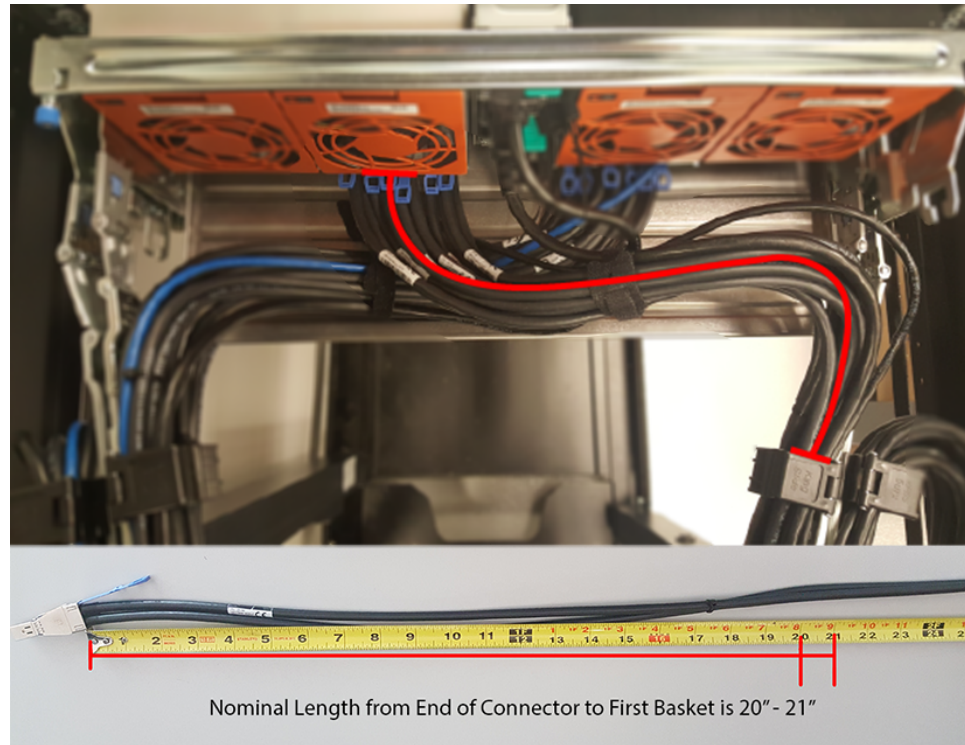
Figure 114: Connected Cable Routing



- d) Wrap cable tie around the installed cable bundle between the ports and the first basket of the CMA

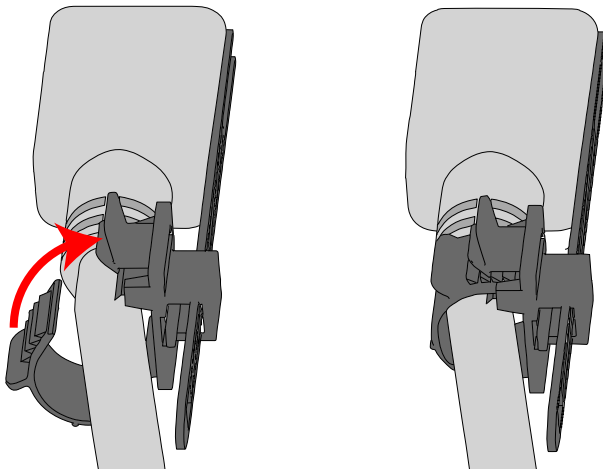
Note: Each cable must be given enough slack at the connector end to operate smoothly. For the upper CMA allow 20" - 21" (508 – 533.4mm) between the end of the connector and the first basket. Make sure to route all of the upper CMA cables **under** the lower CMA cables.

Figure 115: Nominal Cable Length at Connectors



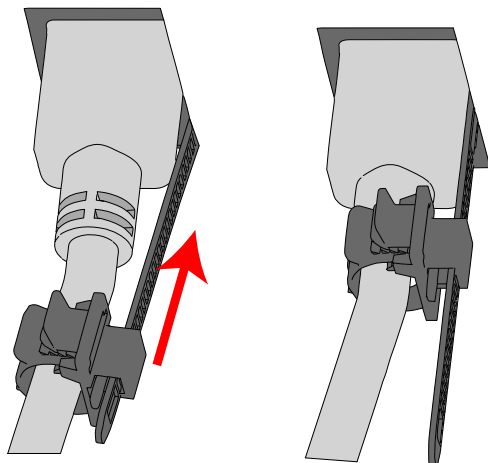
- e) Loop the retention clip on the PSU cables around the cable and pinch it until the clip catches and locks in place.

Figure 116: Cable Retention Mechanism



- f) Slide the retention clip forward until it stops near the cable connector. Doing this will ensure that the retention clip functions properly in the event the cable is pulled on for some reason.

Figure 117: Cinching Cable Retention Clip



- g) If the HGST 4U102 is being installed in a rack and will subsequently be transported inside that rack, it is important to use the included cable tie to wrap the CMA bundle to ensure it does not get damaged during transport. If the HGST 4U102 is instead being installed where it will operated, skip this step.
- h) Close all of the baskets.
- i) Reconnect the CMA at the elbow to connector A.
12. Test for binding in the extension of the CMA by gently pulling the enclosure out of the rack to ensure the cables extend properly and that the system doesn't bind at all. If it does, examine the point at which the binding occurred and adjust the seating of cables in the baskets, check the connections to the rails, and examine the joints of the CMA arm to ensure that they are all functioning properly.
13. Make sure the CMA is in operational position by folding the arm in toward the enclosure and attaching the elbow end of the CMA to the connector that is attached to the rail. Verify that all of the cabling is in functional order and does not bind or catch.

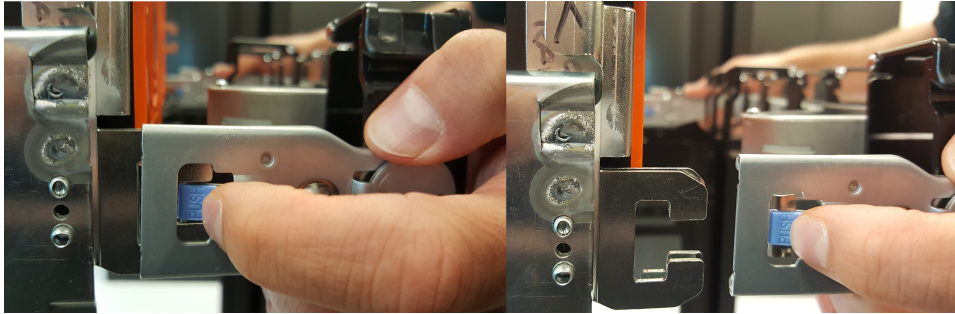
5.7 Rails Replacement

Table 42: Procedure Info

Required Tools	Required Parts	# of People Required	Time Required
<ul style="list-style-type: none"> T15 Torx Screwdriver # 2 Philips Screwdriver Long T10 Torx Screwdriver Cable Ties (for configurations with greater than 10 total cables) Tape Measure Level 	<ul style="list-style-type: none"> Reuse: M5 x 12mm T15 Torx Screws Reuse:Included Washers Low-Profile M4 x 3.2mm Philips Screws (included with rail assembly) Optional (if using CMA Tray):M3 x 8mm T10 Torx Screws 	3 Total (2 for Team Lifting Purposes and 1 to Guide and Spot)	45m

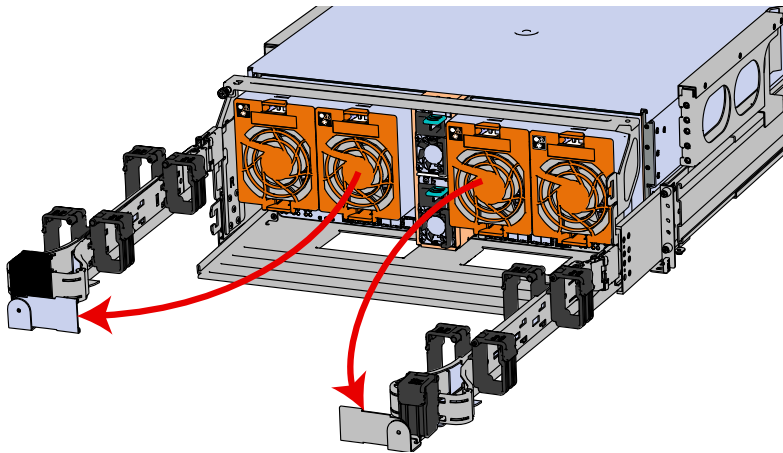
1. Place both CMAs into service position.
 - a) Unlatch the upper CMA at the elbow connector by pressing the blue release button to unlatch the connector from the rail.

Figure 118: Unlatching a CMA Connector



- b) Swing the CMA away from the enclosure.
 - c) Do the same for the lower CMA arm as what was done for the upper.
 - d) Both arms should be extended away from the enclosure as shown in the following example.

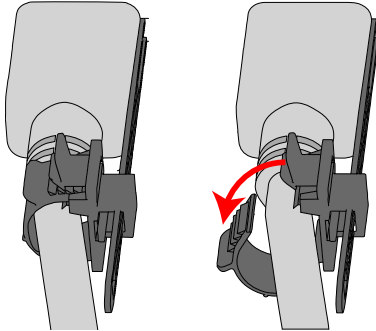
Figure 119: CMAs in service position (Cables not shown)



2. Power down the Enclosure.
 - a) Locate the redundant PSUs at the rear of the enclosure.

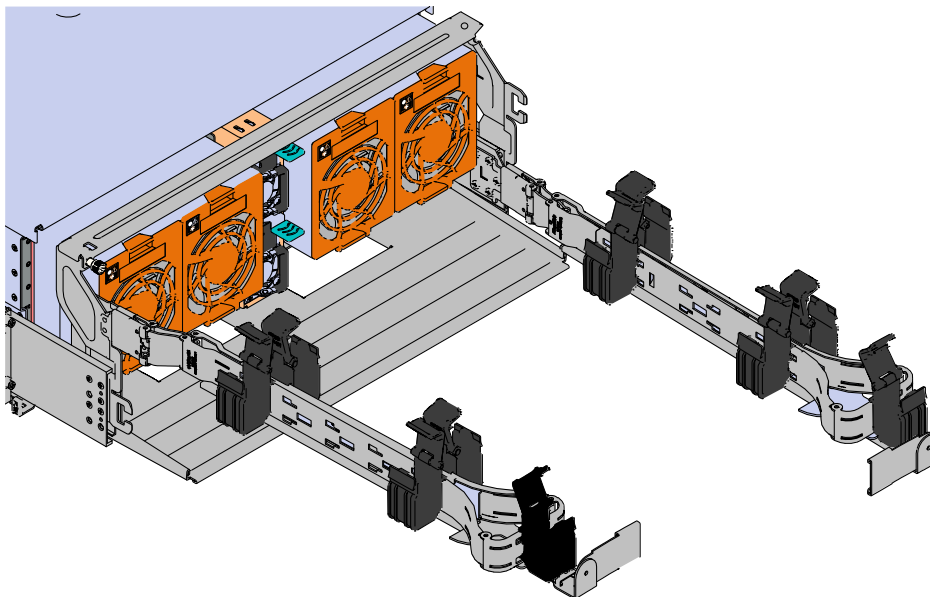
- b) Detach the cable retention clip from both power cords.

Figure 120: Cable Retention Mechanism



- c) Power down the enclosure by disconnecting both power cables, one from each PSU.
3. Disconnect the HD Mini-SAS cables from the rear of the enclosure by pulling (don't jerk) on the blue tab that is extending outward from the connector. This will free the cable from the port. Make sure each cable is labeled or label them yourself to ensure that they will be plugged back into the same location.
 4. Unplug the Ethernet cables from the out-of-band management ports.
 5. Uncable the CMA.
 - a) Open all of the baskets on the CMA.

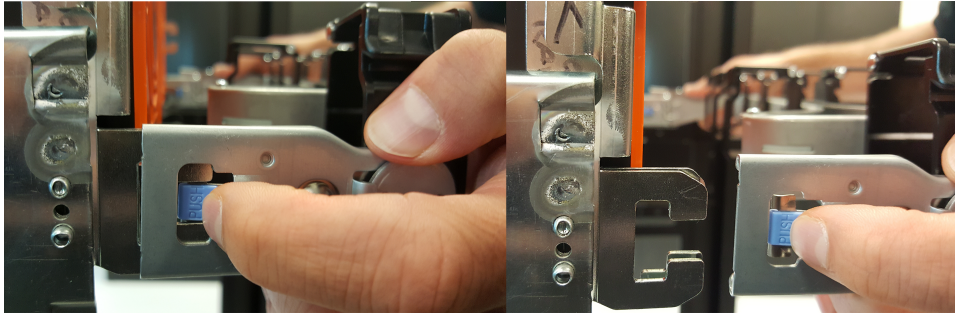
Figure 121: Open Baskets




- b) Remove one cable from the CMA at a time making sure not to put too much strain on the arm.

6. Unlatch all of the connectors that attach the CMA to the enclosure and the rail by locating the latch release button and pressing it from either side of the latch. There are three total connections that need to be removed, one at the elbow and two at the opposite end.

Figure 122: Unlatching a CMA Connector

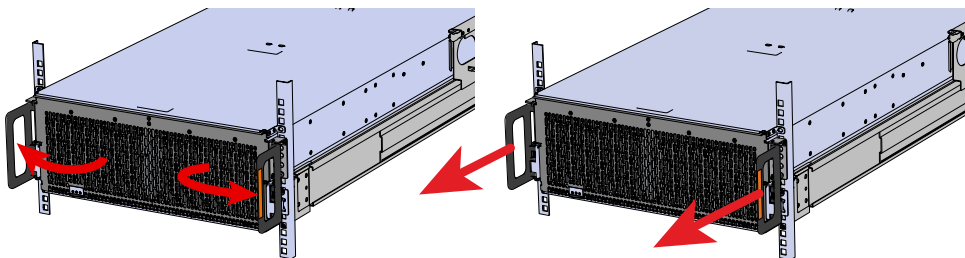


7. Complete the previous step for the second CMA.

Warning:  The following steps regarding uninstalling drives from the enclosure should be followed in order to reduce the weight enough to remove the chassis during the rails replacement process. However, if there is proper lift/support equipment rated to support the full weight of the enclosure, 118.8 kg / 262 lbs. , these steps can be skipped. If not, please follow these drive removal instructions to remove all of the drives and reduce the weight. **Never try to support the weight of the full system by hand.** Doing so could cause damage to the system or serious bodily harm.

8. Grasp both handles at the front of the enclosure and pull with even pressure to extend the chassis out of the rack until it is stopped by the safety latches. The safety latches will prevent the enclosure from coming out of the rack completely.

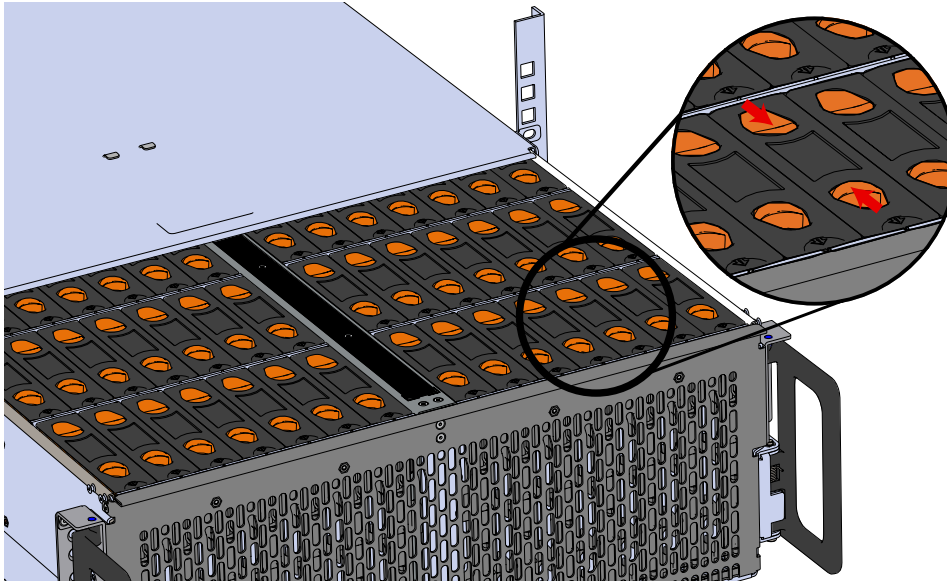
Figure 123: Chassis Handle Operation



9. Follow these steps to remove a drive assembly.
 - a) Find the latch release mechanism on the drive assembly being removed.

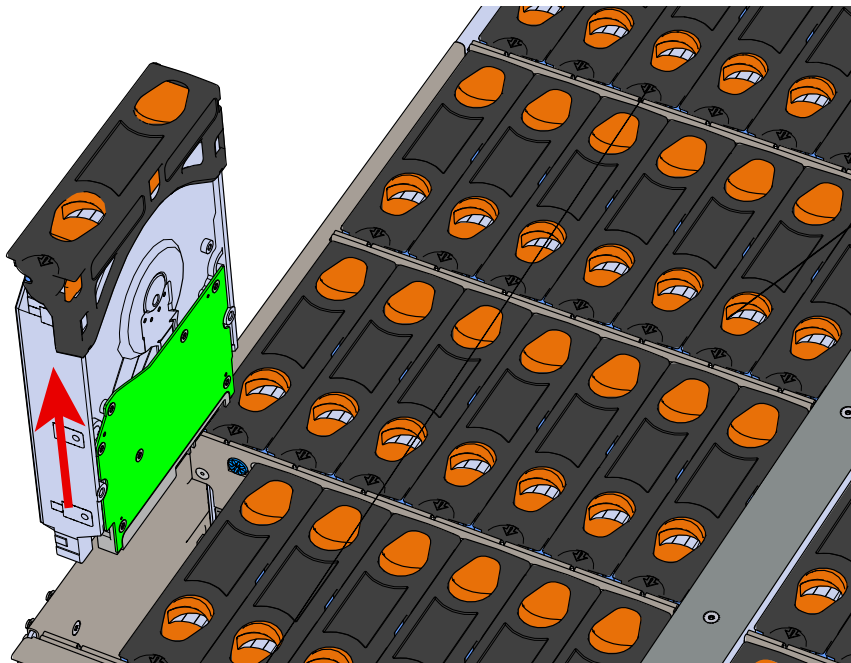
- b) Insert a finger and a thumb into the latch release and pinch to unlatch the drive assembly.

Figure 124: Unlatch Drive Carrier (IOM Not Shown)



- c) Lift the drive assembly free from the enclosure.

Figure 125: Removing Drive Assembly

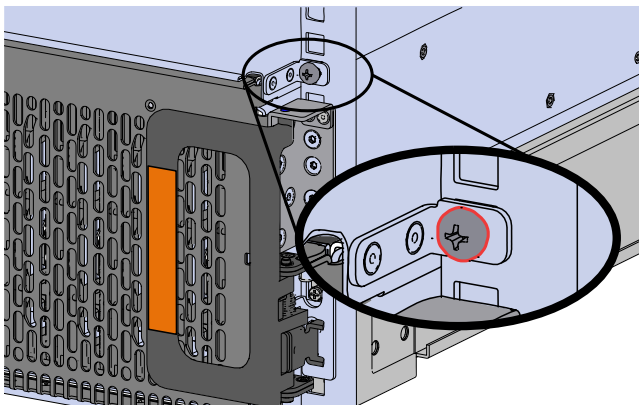


10. Follow the previous step for each drive in the enclosure. Attach a label or mark the drives with the drive slot they were removed from in order to add them to the same slot in the future. Store the drives in an ESD safe location until the drives are ready to be installed back into an enclosure.
11. Release the safety latch on the inner rails on each side of the chassis as shown in the following image.


Figure 126: Inner Rail Safety Latch Release



12. Push the chassis back into the rack.
13. Locate the M5 x 12mm Philips Pan Head screws on the top cover of the enclosure that keep it in place when the drawer is extended and unscrew them using a #2 Philips head screwdriver. This will allow the top cover to move freely with the enclosure when the enclosure is removed.



14. Remove the chassis from the rack.
 - a) Be prepared to support the enclosure once it is free of the rails by having a second person or a lift to support the enclosure
 - b) Grasp both handles at the front of the enclosure and pull with even pressure until the enclosure will not extend further.


Warning:  The handles on the front of the chassis are not intended to be used to support the weight of the HGST 4U102. Lifting the unit by the chassis handles or trying to support the unit on the handles can cause them to fail. This can cause serious damage to the unit or serious bodily harm to those handling the unit. Always team lift the chassis by gripping the underside of the unit, and never try to lift a chassis that is filled with drives.

- c) Locate the safety catches on the inner rails attached to the enclosure.

Figure 127: Safety Latch Release



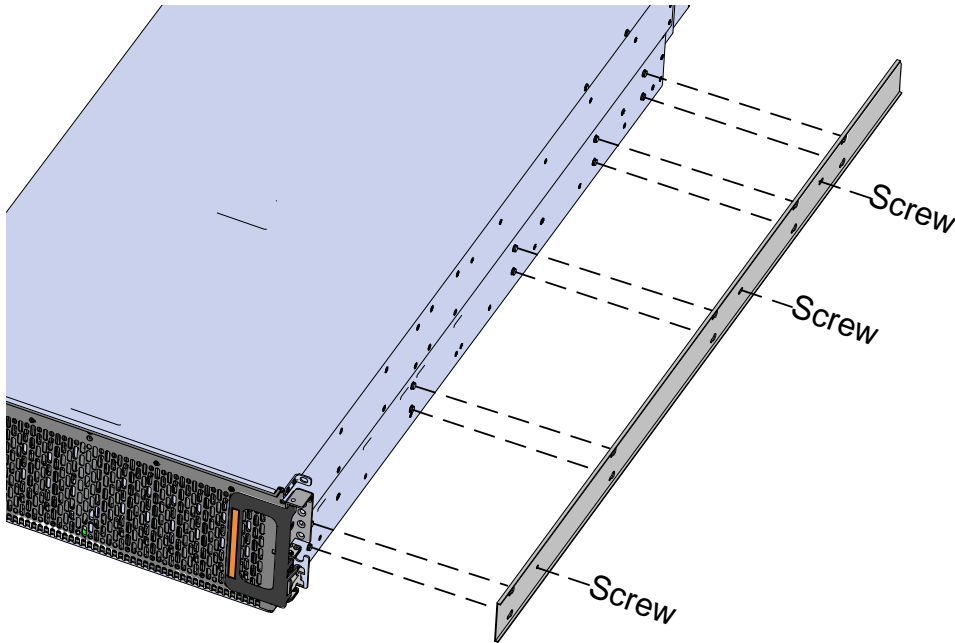
- d) Depress the latch release lever for the safety latches on the rail and push the chassis very slightly forward. The chassis is now unsecured from the rack.
- e) Ensure that you have the proper support mechanism to hold the chassis in position, whether that be a team lifting partner or an appropriate lift.

Warning:  Do not lift the chassis by the Cable Tray while removing the chassis from the rack OR while installing it into a rack. This can cause serious damage to the unit or serious bodily harm to those handling the unit. Always team lift the chassis by gripping the underside of the unit, and never try to lift a chassis that is filled with drives.

- f) Slide the chassis forward to free it from the rails. Store the chassis in a safe location to avoid damage.
15. Uninstall the inner rails from the sides of the chassis.

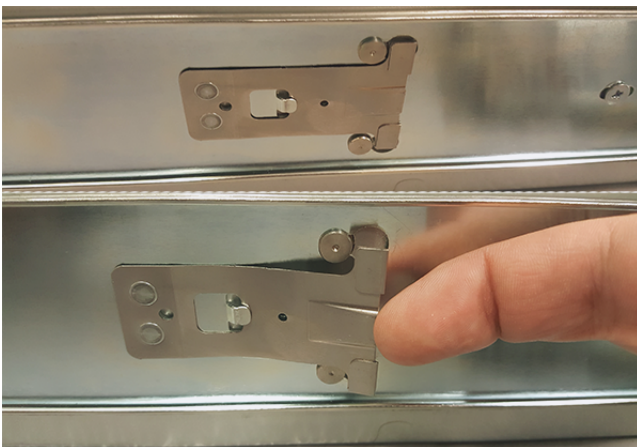
- a) Unscrew the three Low-Profile M4 x 3.2mm Philips screws that attach the inner rails to the chassis using a #2 Philips head screwdriver.

Figure 128: Remove Inner Rail



- b) Locate and unlatch the springlock on the side of the inner rail.

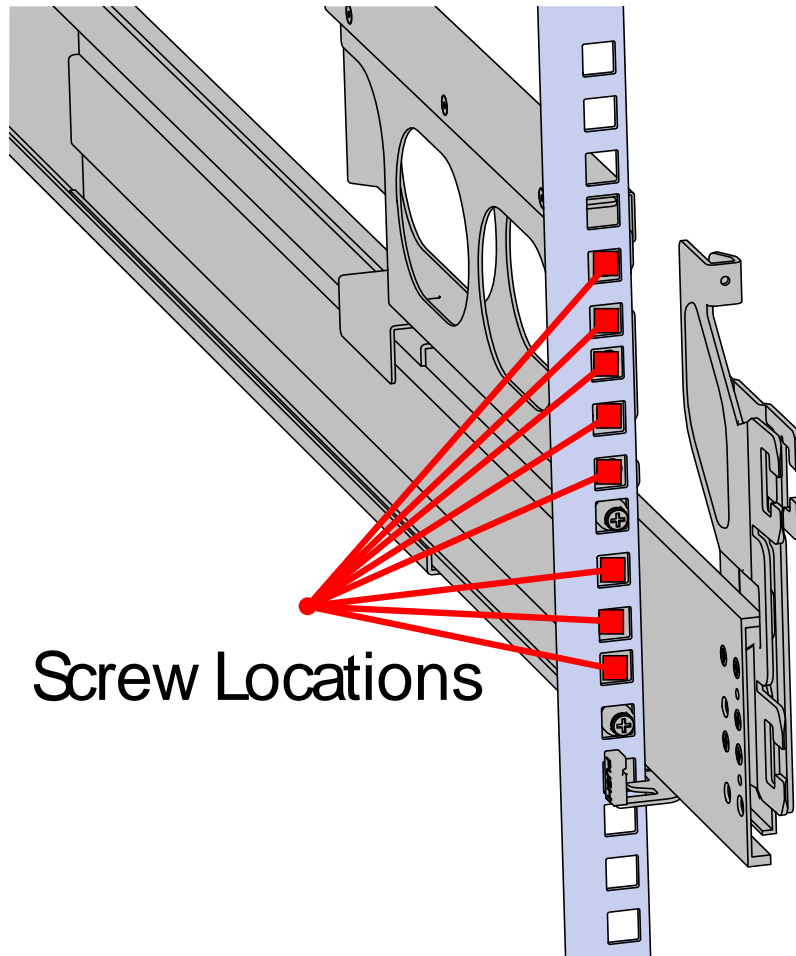
Figure 129: Inner Rail Spring Latch



- c) Slide the inner rail toward the front of the enclosure to unlock it from the pegs that secure it to the sidewall and pull it free.
16. Remove the screws that secure the rack rails to the rack.

- a) Uninstall the alignment bracket by removing the screws that secure it to the rack posts using the screw locations in the following image. Be careful, the alignment bracket will be free once the screws are removed. Make sure you have a solid grip on it before removing the final screw.

Figure 130: Rear Screw Locations



- b) Uninstall the rest of the screws in the rear rack rail.

- c) Move to the front of the rack and remove the three screws that hold the rack latch bracket to the front of the rack using a T15 Torx screwdriver. Be careful, the rack latch bracket will be free once the screws are removed. Make sure you have a solid grip on it before removing the final screw.

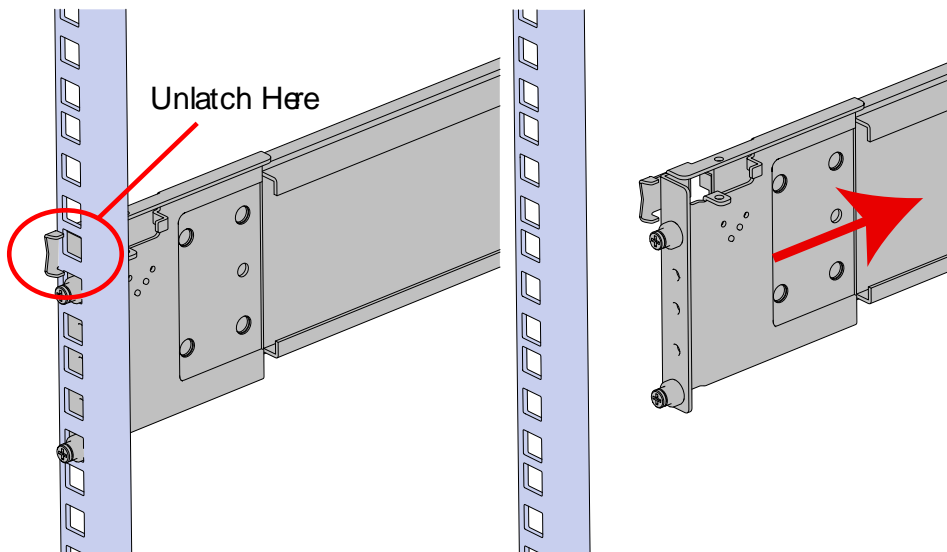
Figure 131: Rack Latch Bracket Installed



17. Uninstall the rack rails from the rack.

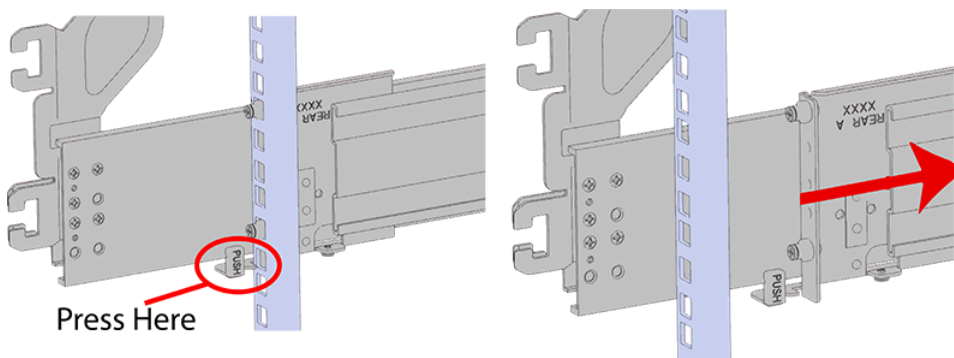
- a) From the front of the rack, locate the release clip as shown in the following image.

Figure 132: Front Rail Release Clip Operation



- b) Press the release clip and press lightly toward the rear of the rack to compress the rail clear of the rack post.
c) Let go of the rail and move to the rear of the rack.
d) Support the rail with one hand and press the release button with the other to free the rail from the rack and remove it.

Figure 133: Rear Rail Latch Release Button



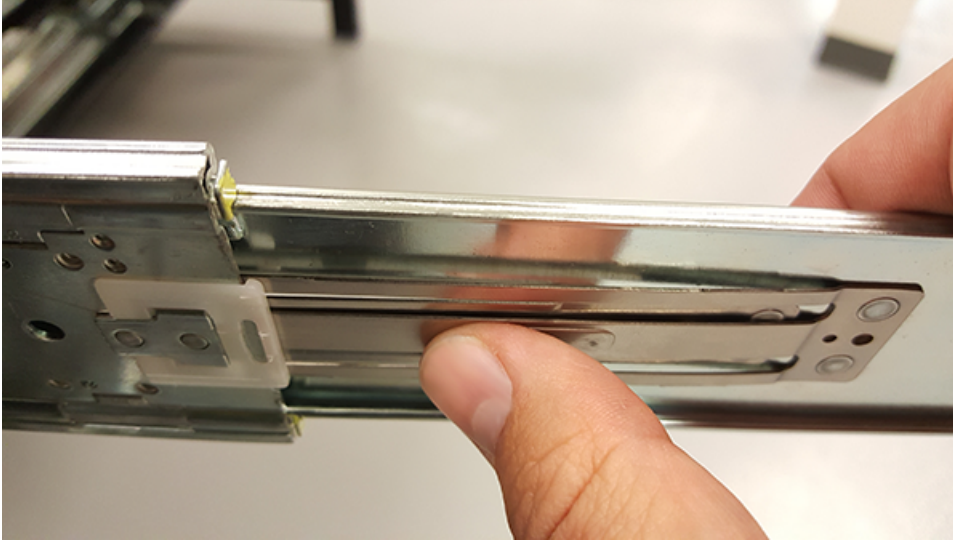
18. Gather the replacement rails and prepare to install them.
19. Remove the inner rail that is nested inside the rack rails.

Note: There are Right and Left rails and they must be installed as a set. Each inner rail will read "R" for the right or "L" for the left embossed on the inside. Each outer rail will read "R-Front" for the right or "L-Front" for the left. Right and Left refer to when you are facing the front of the rack.

- a) Start by sliding the inner rail out of the outer/rack rail until the safety latch engages and the inner rail will not extend further. It will only slide one way.

- b) Press on the safety latch release spring located on the side of the rail and slide the inner rail out the rest of the way.

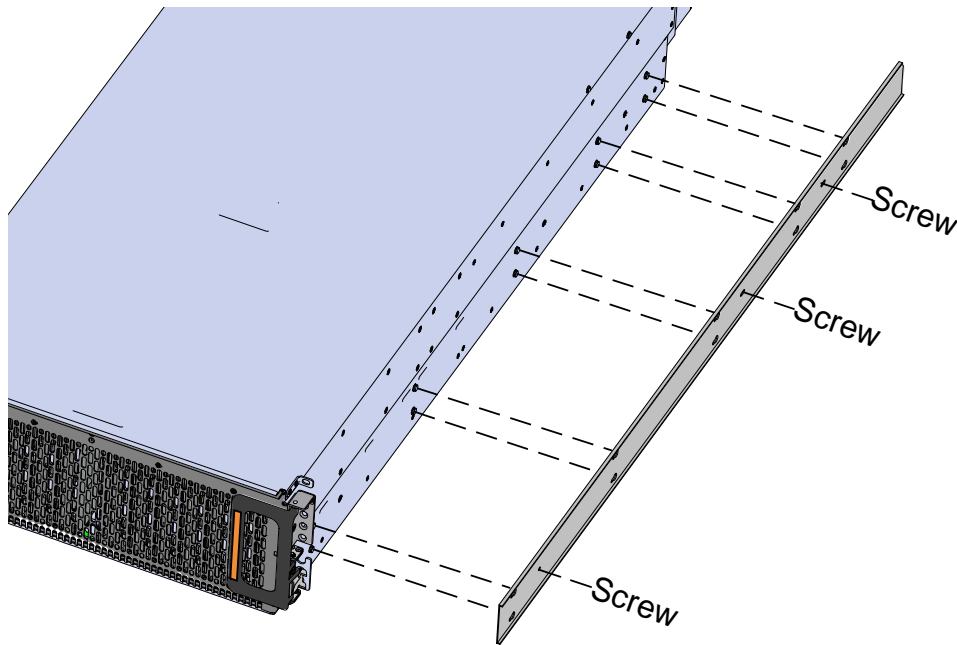
Figure 134: Rail Safety Latch



- 20. Install the inner rail onto the chassis making sure they are installed on the correct side. Each inner rail will read "R" for the right or "L" for the left embossed on the side that faces away from the chassis. Right and Left are with reference to looking at the front of the enclosure.
 - a) Orient the inner rails so that the flat side is facing the enclosure and the side with the grooves is facing away from the enclosure.

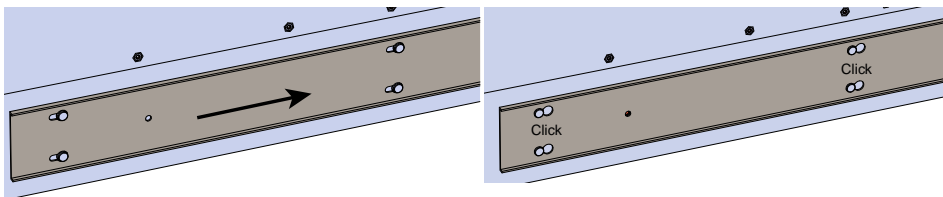
- b) Align the keyholes on the inner rail to the mounting pegs on the side of the enclosure and press the inner rail flush against the chassis. If the keyholes don't line up with the pegs, flip the rail length-wise to see if this will align them.

Figure 135: Inner Rail Attachment




- c) Slide the inner rail toward the rear of the chassis to lock it in place. There will be an audible click and the mounting pegs will cover the front part of the keyhole.

Figure 136: Slide Inner Rail

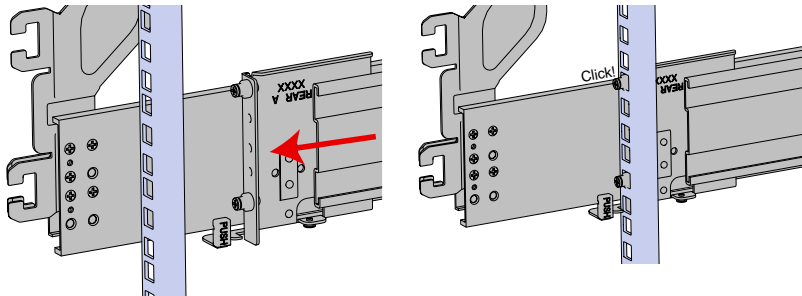


d)

Caution:  When installing the inner rail onto the chassis, make sure to only use the special low profile M4 x 3.2mm Philips screws provided in the accessory kit with the CMA. These screws are specially designed for this purpose. Using unapproved screws could cause damage to the slides inside the rail.

- Install the three special low-profile M4 x 3.2mm Philips screws provided to secure the inner rail to the chassis.
- e) Follow these steps for the second inner rail on the opposite side of the enclosure.
21. Install the outer rails into the rack. Pay special attention to which side is being installed. The embossed R is for the right side and L is for the left side. Right and Left refer to when you are facing the front of the rack.
- a) Move to the rear of the rack.
- b) Orient the rail so that the word "REAR" that is embossed into the metal of the rail is at the rear end of the rack, and the release button is facing the inside of the rack posts as shown in the following image.

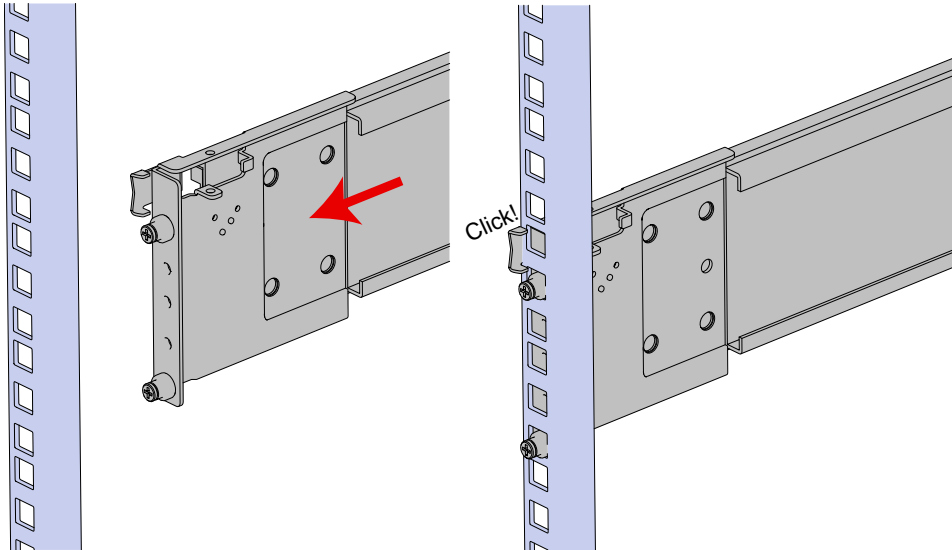
Figure 137: Rear Rail Latch Release Button



- c) Align the rail on the rack posts at the U-height desired for installation. The bottom of the rail will be the lower most U of the total 4U height.
- d) Pull the rail toward the rack post until the toolless latching mechanism engages the rack. The latching mechanism may need to be pulled open to get around the rack post.
- e) Move to the front of the rack.

- f) Align the front of the rail with the holes on the rack posts that will receive the rails and pull the rail toward the holes until the toolless latching mechanism engages the rack.

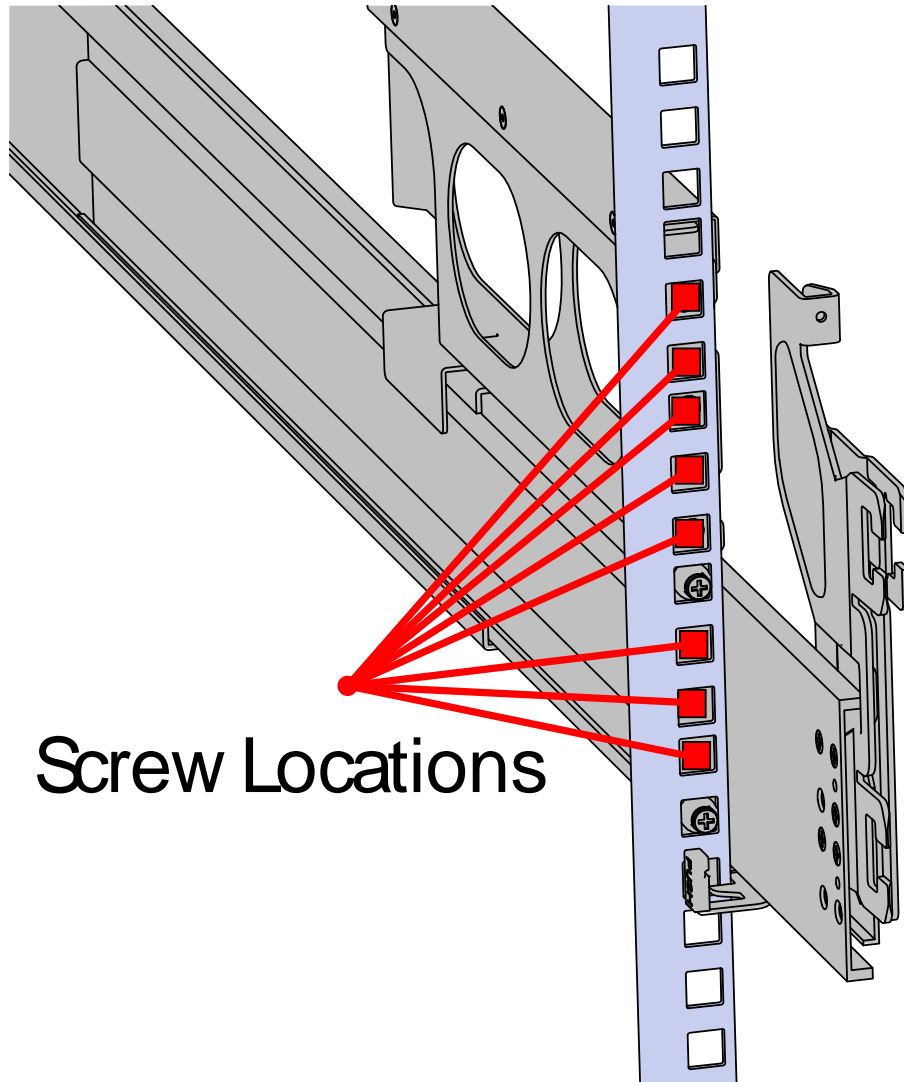
Figure 138: Front Rail Release Clip Operation



- g) Use a level to make sure that the rails are aligned properly.
 - h) Follow these steps for the other outer rail.
- 22. Install the rear cover alignment brackets.**
- a) From the rear of the rack, orient the alignment brackets so that the groove that will catch the lid is facing the inside of the rack.
 - b) Use five of the M5 x 12mm Torx screws and 5 of the included washers and attach the rear cover alignment bracket to the vertical rail with the long T15 torx screw driver. Add three M5 x 12mm Torx

screws and three included washers to attach the rear rail to the rack posts as shown in the following image.

Figure 139: Screw Installation Location




23. Install the two rack latch brackets at the front of the rack.
 - a) Orient the brackets so that the screw holes are between the two pins supporting the outer rails as shown in the following image. There is a left and a right. Use the image below as a guide for how to

orient this bracket and mirror it for the other side. Notice the increased distance between the top two screw holes and the lower screwholes and the flange being oriented on the outside.

Figure 140: Rack Latch Bracket Installed





- b) Use 6 of the included M5 x 12mm screws and the T15 Torx screwdriver to install each bracket, 3 screws per bracket.


Caution:  Always install the top cover onto the enclosure before installing the chassis into a rack. Not having the top cover installed may damage the alignment brackets.

24. Install the chassis into the rails.

a)

Caution:  This step in the installation requires a minimum of 3 individuals to install safely, two to lift and one to guide the others whom may have difficulty seeing because the enclosure is in the way. Ensure that the appropriate measures are taken to safely support the enclosure during installation. The enclosure **MUST** have no drives installed and requires a two person team lift to install. **Do not attempt to lift the system if it is fully populated with drives.**

Warning:  The handles on the front of the chassis are not intended to be used to support the weight of the HGST 4U102. Lifting the unit by the chassis handles or trying to support the unit on the handles can cause them to fail. This can cause serious damage to the unit or serious bodily harm to those handling the unit. Always team lift the chassis by gripping the underside of the unit, and never try to lift a chassis that is filled with drives.

Warning:  Do not lift the chassis by the Cable Tray while removing the chassis from the rack OR while installing it into a rack. This can cause serious damage to the unit or serious bodily harm to those handling the unit. Always team lift the chassis by gripping the underside of the unit, and never try to lift a chassis that is filled with drives.

Make sure the mid-rails are extended so they protrude and lock into position and that the bearing plate inside the rail is also fully forward and the detent is engaged.

Figure 141: Bearing Plate

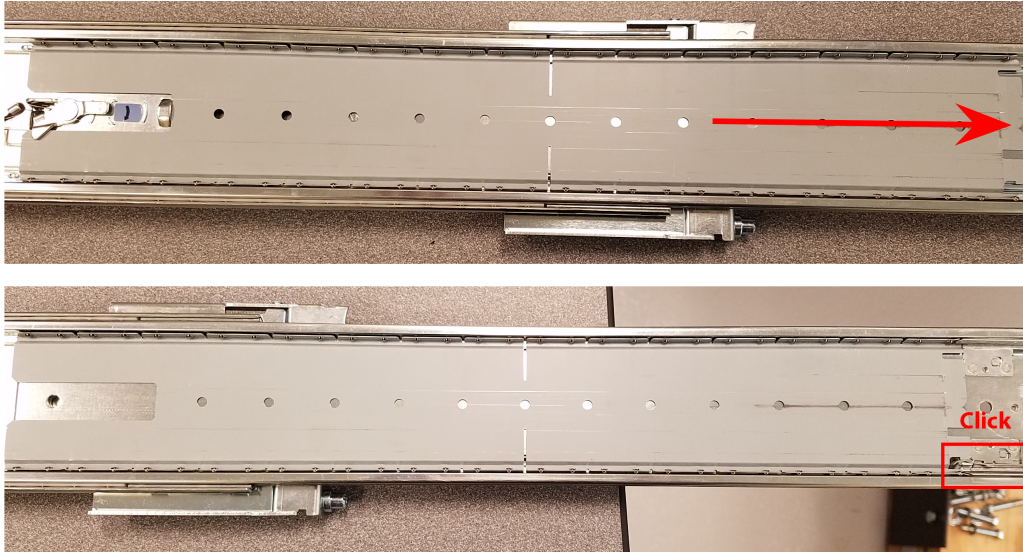
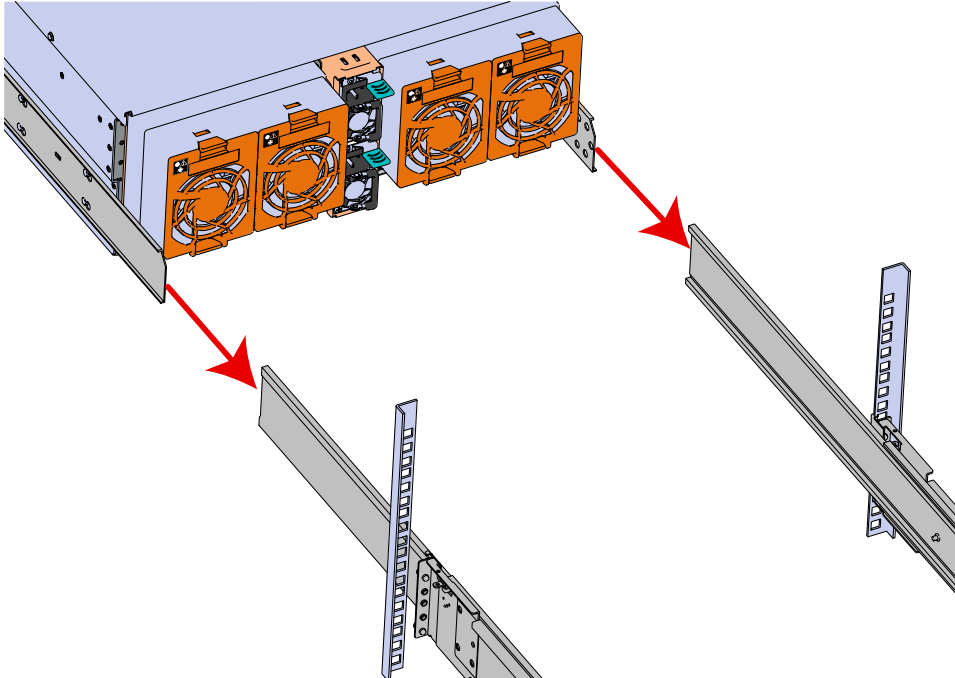



Figure 142: Installing the Chassis



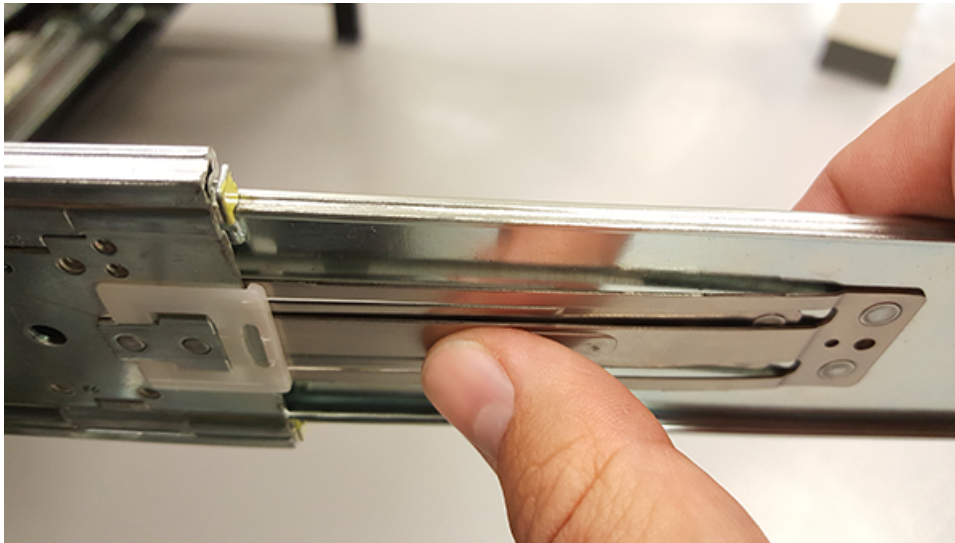
b)

Caution:  Make sure that the bearing plate on the inside of the mid-rails are fully forward and that the detent has engaged. This is to prevent potential damage due to improper mating of the rails.

Position one individual on each side of the enclosure to perform a team lift and have the third individual standing at the protruding rack rails to guide the chassis to mate with rack rails.

- c) Team-lift the enclosure until the inner rails that are attached to the chassis align with the extended mid-rails attached to the rack, and guide the inner rails on the chassis to mate with the rack rails.
- d) Once the rails are mated properly, slide the enclosure into the rack until it is stopped by the safety catch on the rails. Push the release lever on the safety latch located on the side of the rail and push the enclosure the rest of the way into the rack.

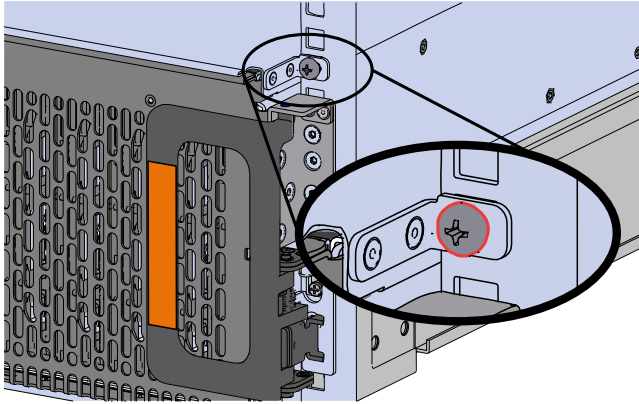
Figure 143: Safety Latch Release



- e) As the chassis is slid into the rack, position one installer at the rear of the rack to ensure that the pegs on the sides of the cover will slide correctly into the rear cover alignment brackets on both sides of the rack. If the chassis does not install smoothly or snags, check that the rear cover alignment brackets are not interfering with the chassis sidewalls, and try again.

25. Secure the chassis top cover to the rack using the included washers, the M5 x 12mm Philips Pan Head screws, and a Philips screwdriver as shown in the following image.

Figure 144: Cover Retention Screws

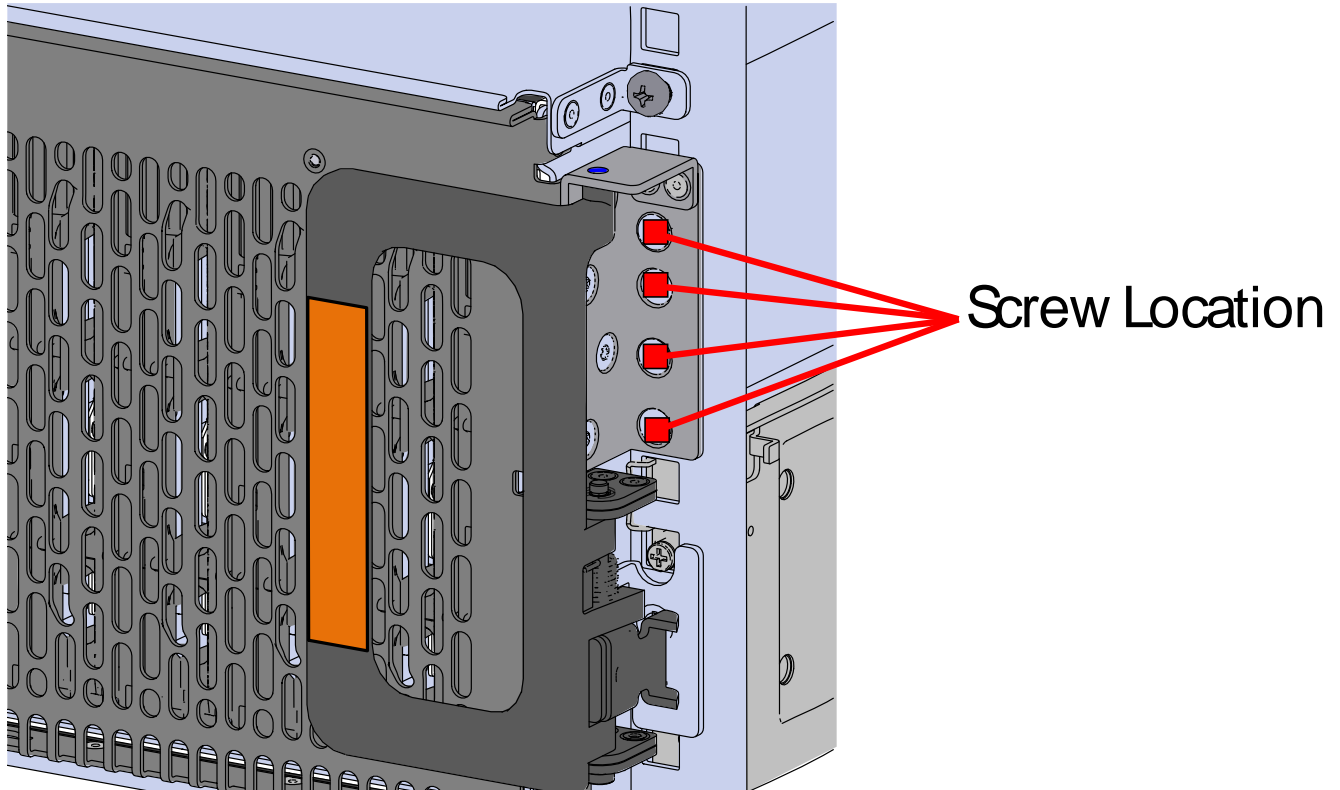


Note: If any drives were removed earlier to facilitate the removal of the chassis, follow the rest of the steps to reinstall the drives by following the labeling scheme noted earlier. If not, proceed to the cabling section.

26. If the chassis is being installed into a rack that will be shipped fully assembled, you **must** install eight (four per side) of the included M5 x 12mm T15 Torx screws into the two brackets at the front of the chassis

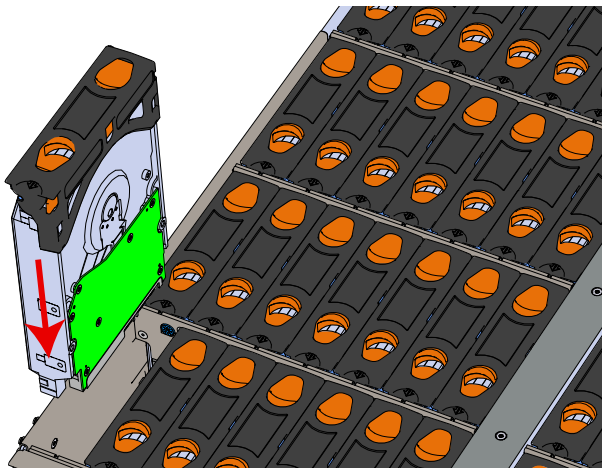
in the following locations. If this chassis will not be installed into a rack for shipping purposes, skip this step and move on to the next one.

Figure 145: Shipping Bracket Screw Locations



27. Install the drive assembly.
- Align the drive with the empty slot that will receive it. Make sure the drive is oriented exactly as it is shown in the image below.

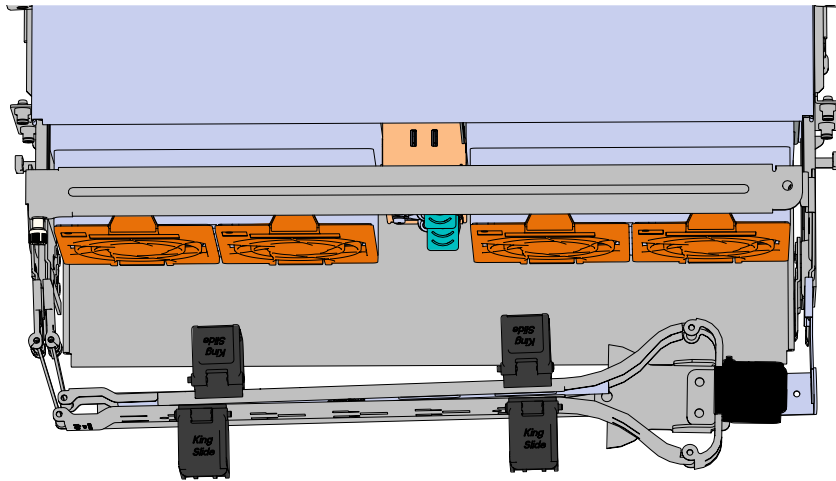
Figure 146: Installing a Drive Assembly



- Lower it into the slot, making sure it stays level and does not snag.

- c) Pinch the latch release and carefully press downward to seat the drive assembly the rest of the way.
- 28. Install each drive in the place it was removed from by following the labels or marks that were added earlier.
- 29. Install the upper CMA.
 - a) Orient the CMA so that the elbow is on the right hand side as it is being installed.

Figure 147: Upper CMA Orientation

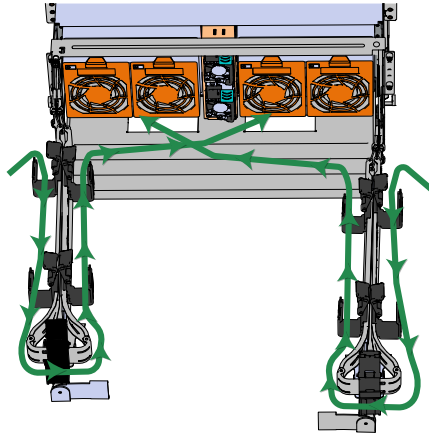


- b) Attach all of the connectors to the brackets on the rails and chassis. There should be one at the elbow side and two on the left hand side.
30. Cable the lower CMA.
- a) Unlatch the elbow side of the CMA arm and swing it forward by pressing the blue button that says “push” to unlatch it.
 - b) Gather the SAS cables, one power cable, and one Ethernet cable to install in the left hand side.

Note: Before cabling the lower CMA, note the following routing of the cables. For best results, the cables that are supported by the upper CMA are inserted into IOM B (right hand side looking at the rear) and the lower CMA cables are routed to IOM A (left hand side looking at the rear)

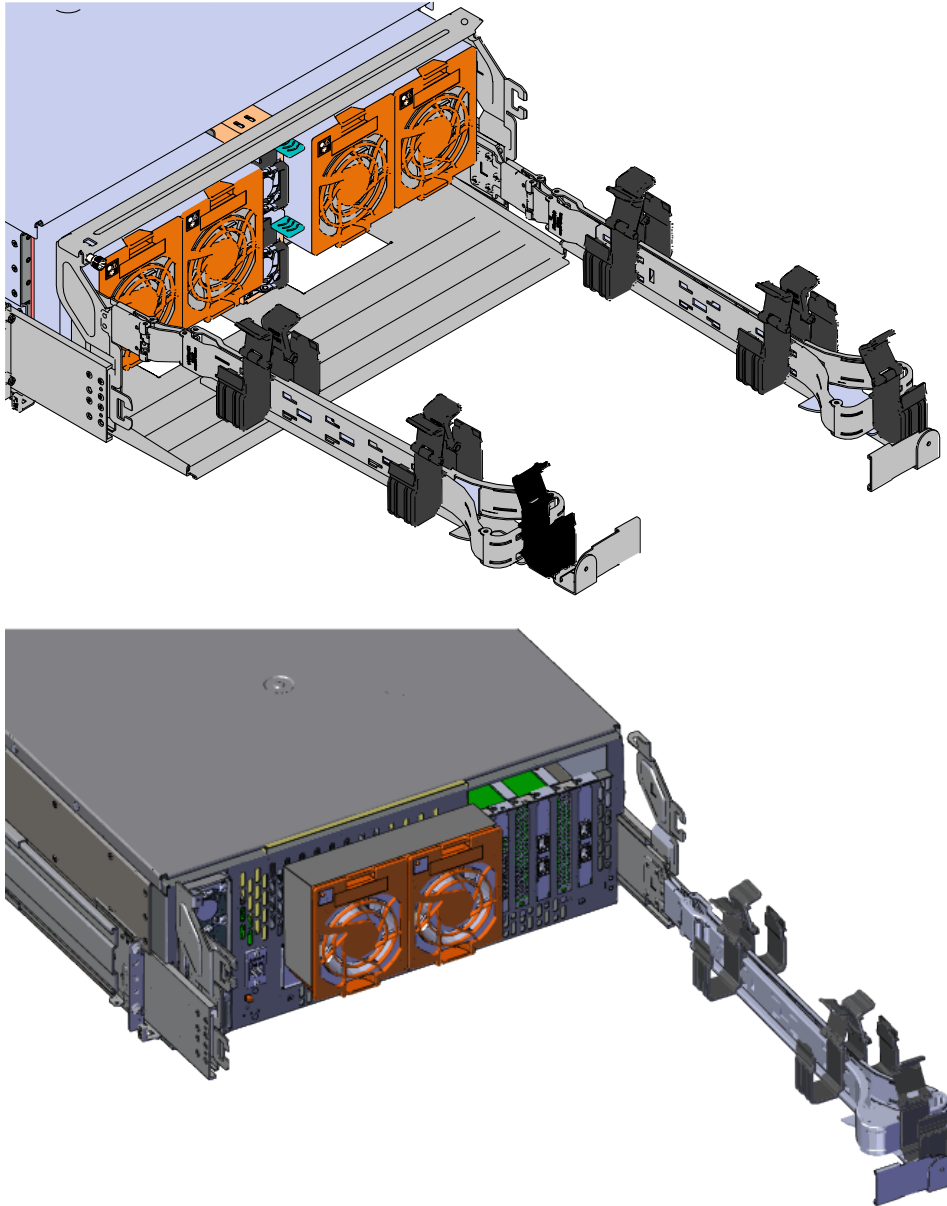
in a "criss-cross" pattern. See the [Special Considerations for Cable Routing](#) on page 135 for more information.

Figure 148: Connected Cable Routing



- c) Open all of the baskets

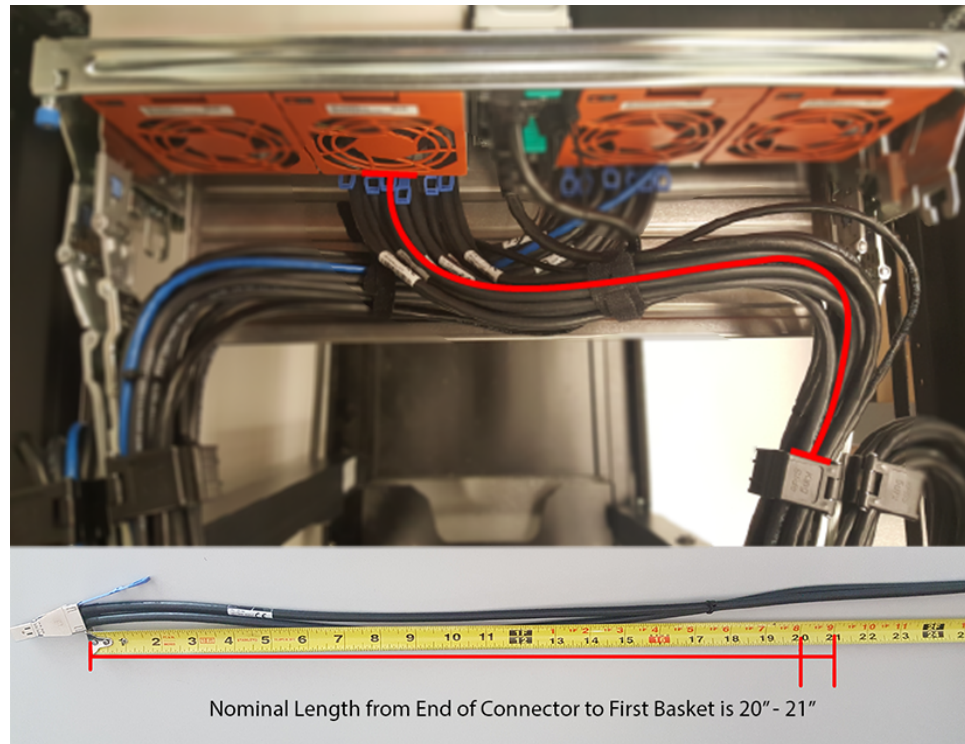
Figure 149: Open Baskets



- d) Connect the Ethernet cable to the Ethernet port on the right hand side of the HGST 4U102 and route the cable through each of the baskets on the CMA.
- e) Connect all of the SAS cables that will be used and route them through the baskets one at a time. Make sure to follow the labels to make sure they are connected to the proper port.
- f) **Make sure the power cable is not connected to a PDU.** Then connect the power cable to the lower PSU and route it through each basket. If the power cable is already connected to the PDU, the system will power up. This is not intended at this stage of installation.
- g) If the installation includes more than 10 total cables, follow the recommendations in [Special Considerations for Cable Routing](#) on page 135. Read this section before proceeding.

Note: Each cable must be given enough slack at the connector end to operate smoothly. For the lower CMA allow 20" - 21" (508 – 533.4mm) between the connector and the first basket.

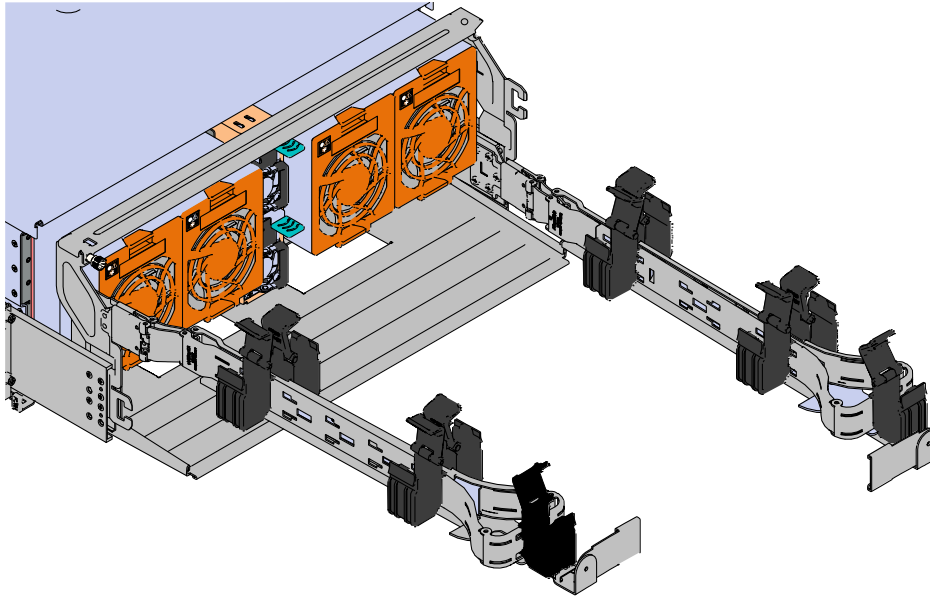
Figure 150: Nominal Cable Length at Connectors



- h) Close all of the baskets.
 - i) If the HGST 4U102 is being installed in a rack and will subsequently be transported inside that rack, it is important to use the included cable tie to wrap the CMA bundle to ensure it does not get damaged during transport. If the HGST 4U102 is instead being installed where it will operated, skip this step.
 - j) Reconnect the CMA at the elbow to the connectors on the rail.
- 31. Cable the upper CMA.**
- a) Unlatch the elbow side of the CMA arm and swing it forward by pressing the blue button that says "push" to unlatch it.
 - b) Gather the SAS cables, one power cable, and one Ethernet cable to install in the left hand side.

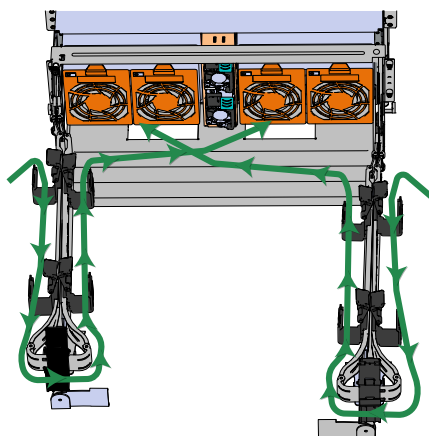
- c) Open all of the baskets

Figure 151: Open Baskets



- a) Connect the Ethernet cable to the Ethernet port on the right hand side of the HGST 4U102 and route the cable through each of the baskets on the CMA.
- b) Connect the SAS cables and route them through the baskets one at a time. Make sure to follow the labels to make sure they are connected to the proper port.
- c) Connect the power cable to the lower PSU and route it through each basket. The following image shows the appropriate cable "criss-cross" pattern they should be installed in.

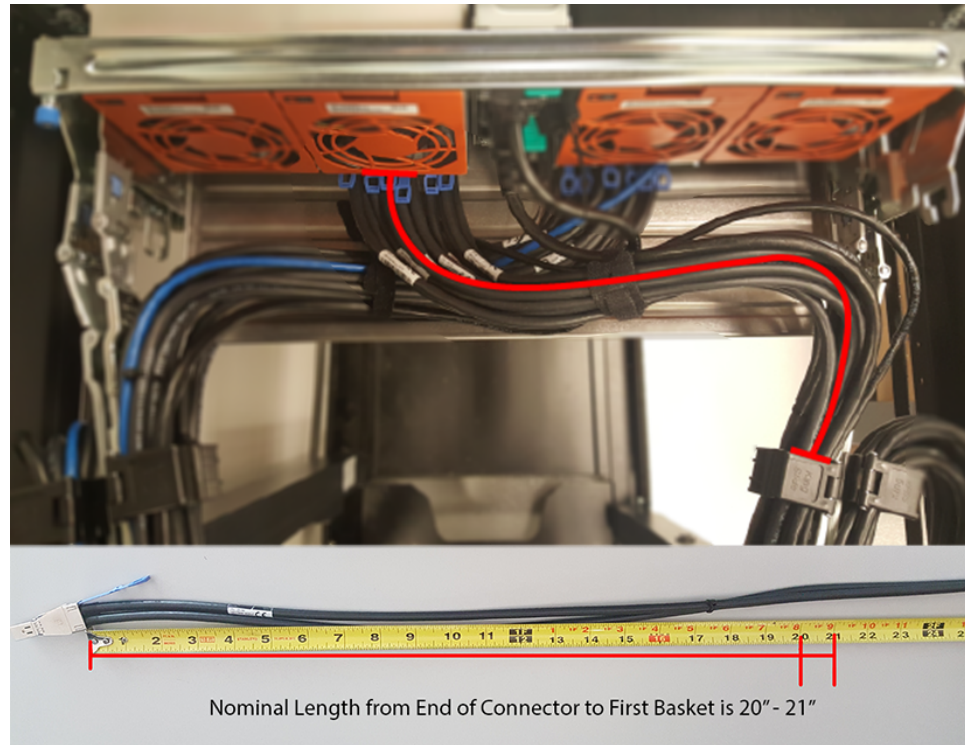
Figure 152: Connected Cable Routing



- d) Wrap cable tie around the installed cable bundle between the ports and the first basket of the CMA

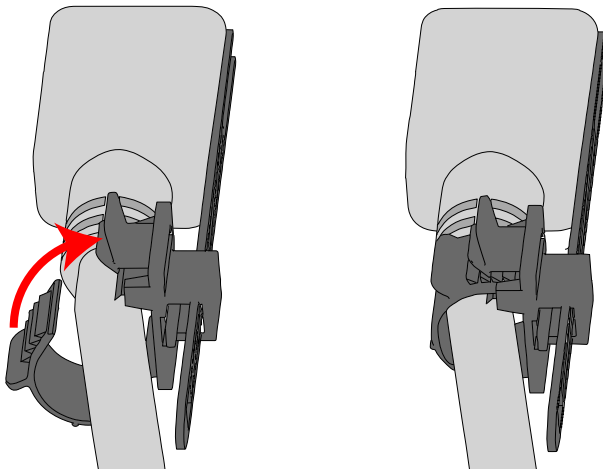
Note: Each cable must be given enough slack at the connector end to operate smoothly. For the upper CMA allow 20" - 21" (508 – 533.4mm) between the end of the connector and the first basket. Make sure to route all of the upper CMA cables **under** the lower CMA cables.

Figure 153: Nominal Cable Length at Connectors



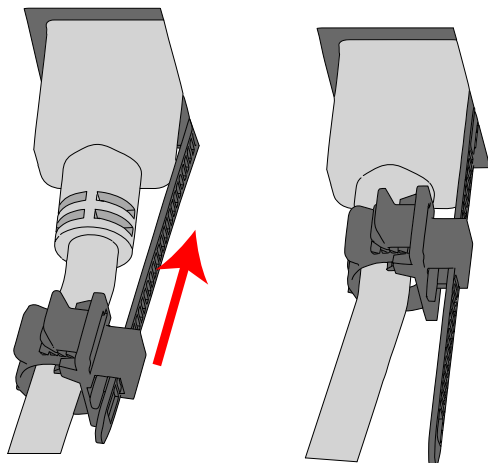
- e) Loop the retention clip on the PSU cables around the cable and pinch it until the clip catches and locks in place.

Figure 154: Cable Retention Mechanism



- f) Slide the retention clip forward until it stops near the cable connector. Doing this will ensure that the retention clip functions properly in the event the cable is pulled on for some reason.

Figure 155: Cinching Cable Retention Clip



- g) If the HGST 4U102 is being installed in a rack and will subsequently be transported inside that rack, it is important to use the included cable tie to wrap the CMA bundle to ensure it does not get damaged during transport. If the HGST 4U102 is instead being installed where it will operated, skip this step.
- h) Close all of the baskets.
- i) Reconnect the CMA at the elbow to connector A.
32. Test for binding in the extension of the CMA by gently pulling the enclosure out of the rack to ensure the cables extend properly and that the system doesn't bind at all. If it does, examine the point at which the binding occurred and adjust the seating of cables in the baskets, check the connections to the rails, and examine the joints of the CMA arm to ensure that they are all functioning properly.
33. Make sure the CMA is in operational position by folding the arm in toward the enclosure and attaching the elbow end of the CMA to the connector that is attached to the rail. Verify that all of the cabling is in functional order and does not bind or catch.

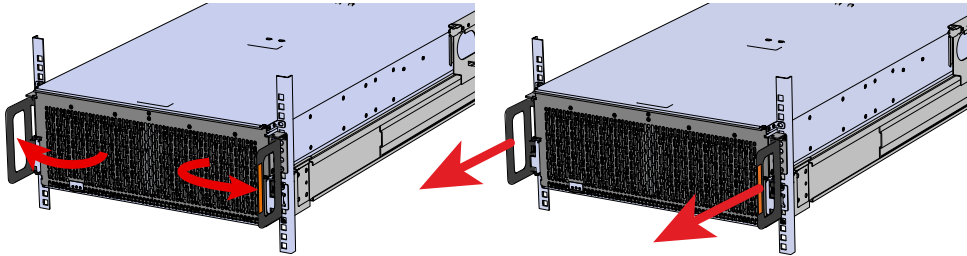
5.8 Drive Assembly Replacement

Table 43: Replacement Procedure Info

Required Tools	# of People Required	Time Required
None	1	60s

1. Grasp both handles at the front of the enclosure and pull with even pressure to extend the chassis out of the rack until it is stopped by the safety latches. The safety latches will prevent the enclosure from coming out of the rack completely.

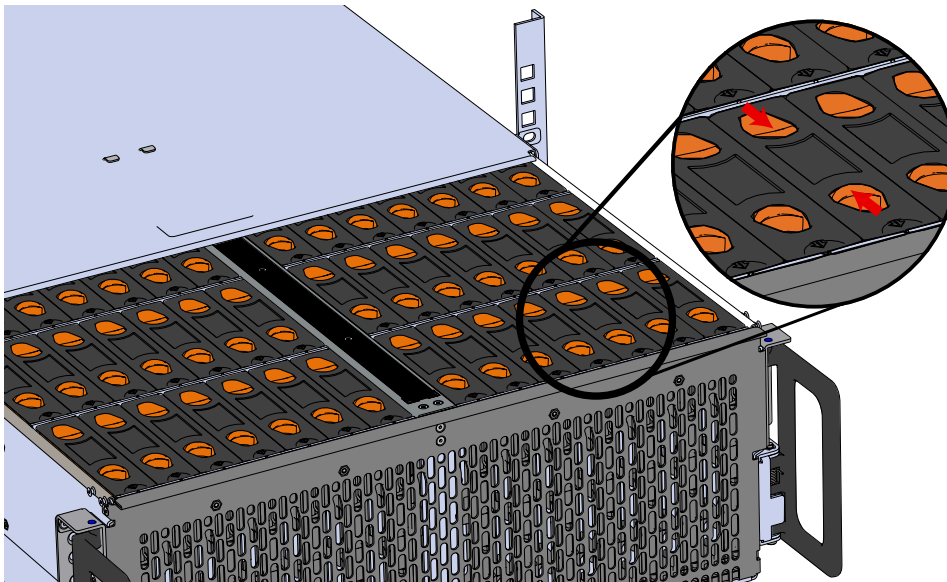
Figure 156: Chassis Handle Operation



Only extend the enclosure out of the rack as far as is needed to reach the drive being replaced.

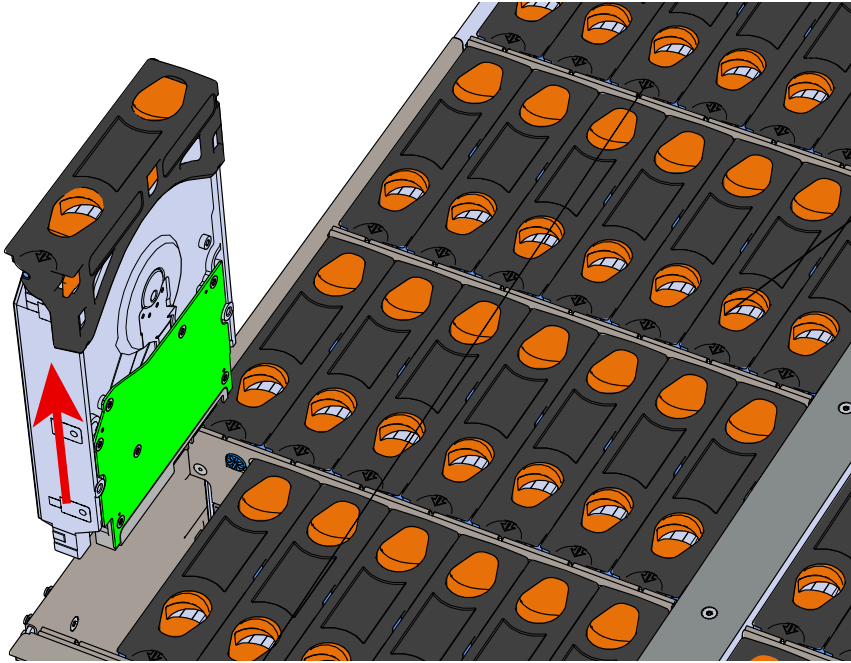
2. Locate the faulty drive assembly by finding the illuminated amber LED or by activating the identification LED for the drive to be replaced.
3. Follow these steps to remove a drive assembly.
 - a) Find the latch release mechanism on the drive assembly being removed.
 - b) Insert a finger and a thumb into the latch release and pinch to unlatch the drive assembly.

Figure 157: Unlatch Drive Carrier (IOM Not Shown)



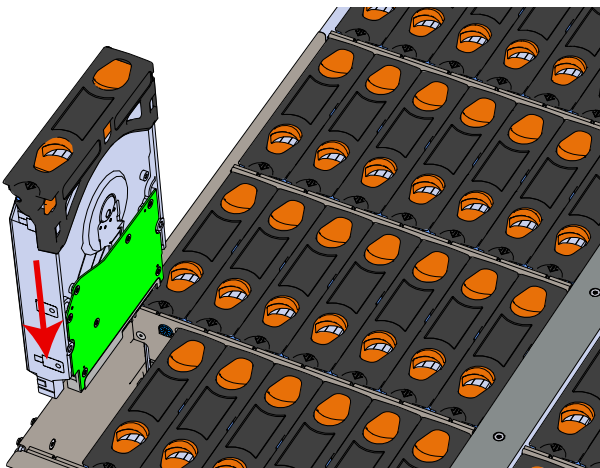
- c) Lift the drive assembly free from the enclosure.

Figure 158: Removing Drive Assembly



4. Install the drive assembly.
- a) Align the drive with the empty slot that will receive it. Make sure the drive is oriented exactly as it is shown in the image below.

Figure 159: Installing a Drive Assembly



- b) Lower it into the slot, making sure it stays level and does not snag.
- c) Pinch the latch release and carefully press downward to seat the drive assembly the rest of the way.

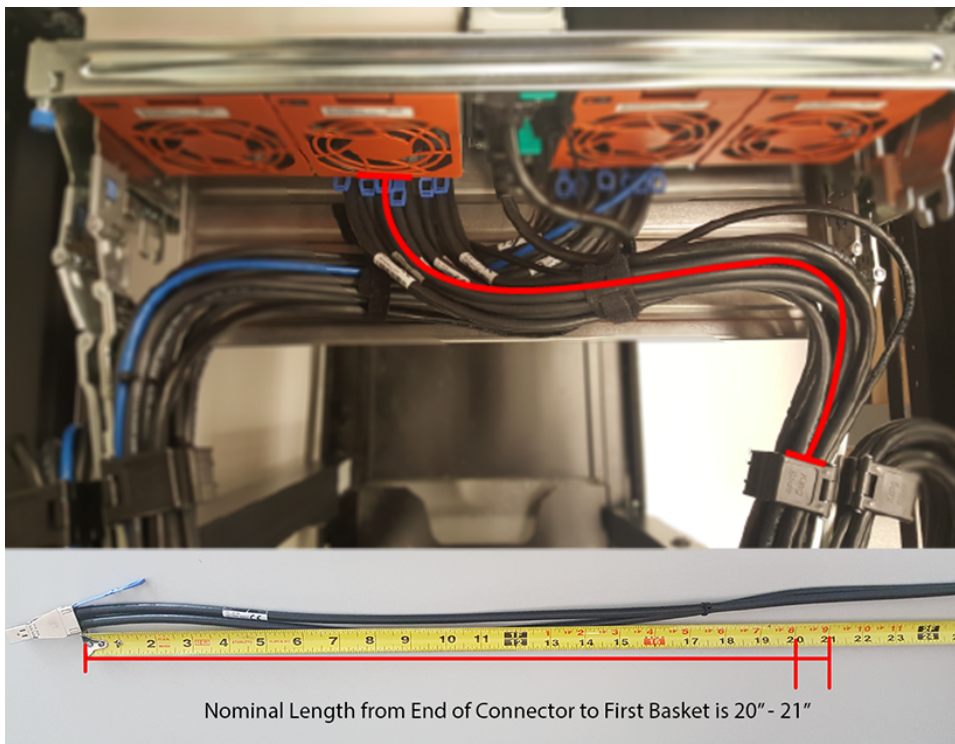
5. Push the enclosure back into the rack to ensure proper cooling.

5.9 Special Considerations for Cable Routing

There are a number of special considerations installers should take when routing cables through the CMA. This section outlines those considerations.

The distance from the end of the connector at the port to the first basket on the CMA should be 20" – 21" long. This will give the cables enough slack at this end to prevent stress on the port and binding during operation cycles.

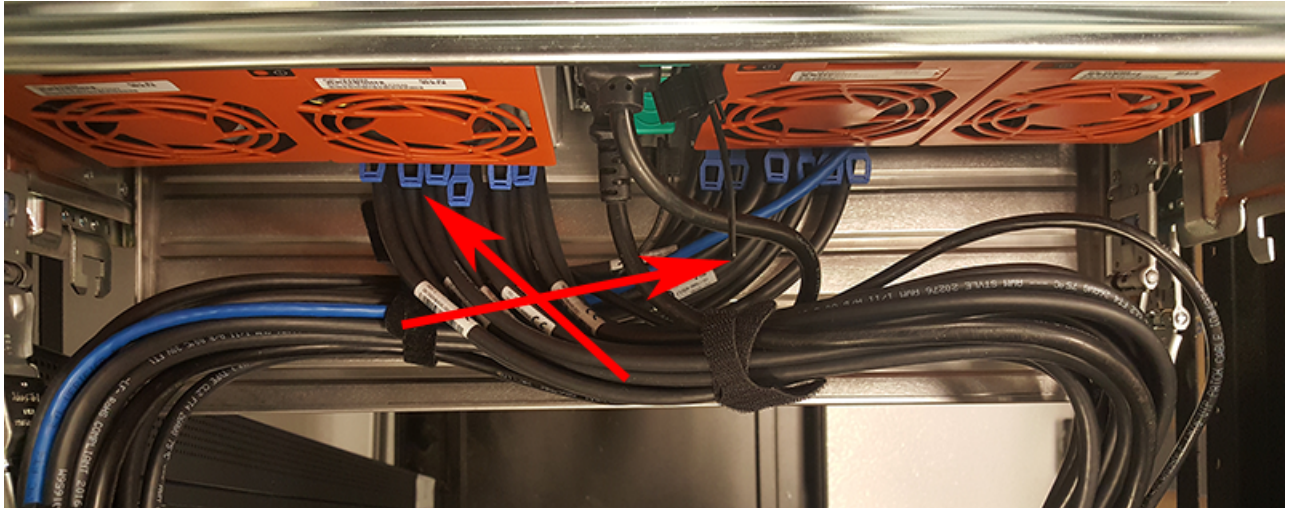
Figure 160: Nominal Cable Length at Connectors



The cables at the port side of the CMA should crisscross in front of the IOMs. To accomplish this, the cables connected to the ports for IOM B (right hand side when facing the rear) should be connected to the upper

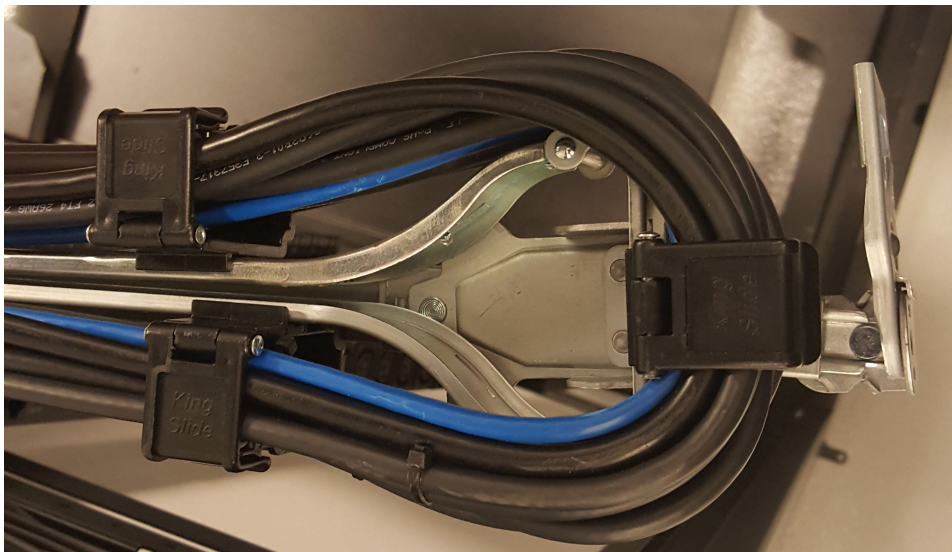
CMA, and the cables connected to the ports for IOM A (left hand side when facing the rear) should be connected to the lower CMA.

Figure 161: Crisscross Cables



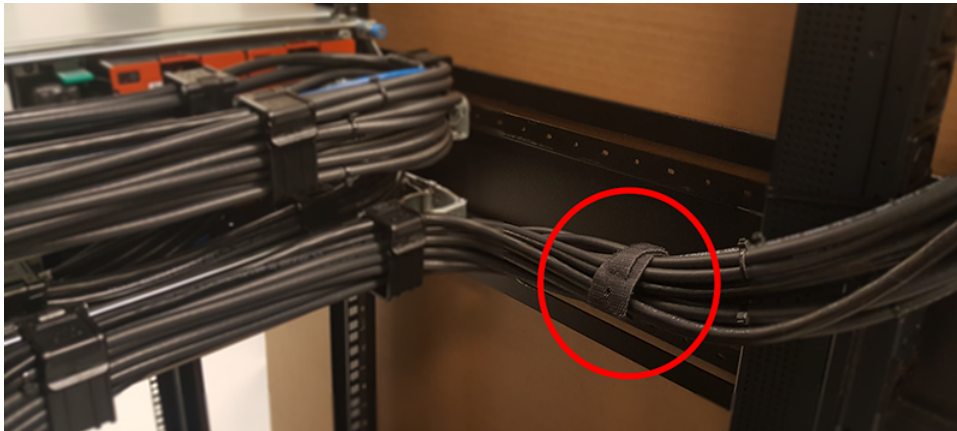
When the cables are routed into the CMA, make sure there is some slack given to the elbow joint of the CMA. It is recommended not to wrap the cables tightly around this joint because this can cause binding and prevent smooth operation. To ensure there is enough slack at the elbow, pull the enclosure in and out of the rack and have another installer check for binding in the elbow joint. Make sure the cables are bending and not twisting.

Figure 162: CMA Elbow with Full Cable Bundle



At the end of the CMA where the cables exit, use a cable tie to bundle the cables together. Make sure the cables are bending and not twisting.

Figure 163: Cable Tie at Exit of CMA



6 Safety

The following chapter provides safety and regulatory information for the HGST 4U102.

6.1 Electrostatic Discharge



CAUTION

Electrostatic discharge can harm delicate components inside HGST products.

Electrostatic discharge (ESD) is a discharge of stored static electricity that can damage equipment and impair electrical circuitry. It occurs when electronic components are improperly handled and can result in complete or intermittent failures.

Wear an ESD wrist strap for installation, service and maintenance to prevent damage to components in the product. Ensure the antistatic wrist strap is attached to a chassis ground (any unpainted metal surface). If possible, keep one hand on the frame when you install or remove an ESD-sensitive part.

Before moving ESD-sensitive parts place them in ESD static-protective bags until you are ready to install the part.

6.2 Optimizing Location

Failure to recognize the importance of optimally locating your product and failure to protect against electrostatic discharge (ESD) when handling your product can result in lowered system performance or system failure.

Do not position the unit in an environment that has extreme high temperatures or extreme low temperatures. Be aware of the proximity of the unit to heaters, radiators, and air conditioners.

Position the unit so that there is adequate space around it for proper cooling and ventilation. Consult the product documentation for spacing information.

Keep the unit away from direct strong magnetic fields, excessive dust, and electronic/electrical equipment that generate electrical noise.

6.3 Power Connections

Be aware of the ampere limit on any power supply or extension cables being used. The total ampere rating being pulled on a circuit by all devices combined should not exceed 80% of the maximum limit for the circuit.

CAUTION The power outlet must be easily accessible close to the unit.



Always use properly grounded, unmodified electrical outlets and cables. Ensure all outlets and cables are rated to supply the proper voltage and current.



This unit has more than one power supply connection; both power cords must be removed from the power supplies to completely remove power from the unit. There is no switch or other disconnect device.

6.4 Power Cords



Use only tested and approved power cords to connect to properly grounded power outlets or insulated sockets of the rack's internal power supply.

If an AC power cord was not provided with your product, purchase one that is approved for use in your country or region.

CAUTION To avoid electrical shock or fire, check the power cord(s) that will be used with the product as follows:

- The power cord must have an electrical rating that is greater than that of the electrical current rating marked on the product.
- Do not attempt to modify or use the AC power cord(s) if they are not the exact type required to fit into the grounded electrical outlets.
- The power supply cord(s) must be plugged into socket-outlet(s) that is / are provided with a suitable earth ground.
- The power supply cord(s) is / are the main disconnect device to AC power. The socket outlet(s) must be near the equipment and readily accessible for disconnection.

6.5 Rackmountable Systems

CAUTION

Always install rack rails and storage enclosure according to HGST 4U102 product documentation. Follow all cautions, warnings, labels, and instructions provided within the rackmount instructions.

Reliable grounding of rack-mounted equipment should be maintained.

If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (T_{ma}) specified by the manufacturer.

Observe the maximum rated ambient temperature, which is specified in the product documentation.

For safe operation of the equipment, installation of the equipment in a rack should be such that the amount of air flow is not impeded so that the safe operation of the equipment is not compromised.

6.6 Safety and Service



All maintenance and service actions appropriate to the end-users are described in the product documentation. All other servicing should be referred to an HGST-authorized service technician.



To avoid shock hazard, turn off power to the unit by unplugging both power cords before servicing the unit. Use extreme caution around the chassis because potentially harmful voltages are present.



When replacing a hot-plug power supply, unplug the power cord to the power supply being replaced before removing it from the HGST 4U102.



The power supply in this product contains no user-serviceable parts. Do not open the power supply. Hazardous voltage, current and energy levels are present inside the power supply. Return to manufacturer for servicing.



Use caution when accessing part of the product that are labeled as potential shock hazards, hazardous access to moving parts such as fan blades or caution labels.

6.7 Safety Warnings and Cautions

To avoid personal injury or property damage, before you begin installing the product, read, observe, and adhere to all of the following safety instructions and information. The following safety symbols may be used throughout the documentation and may be marked on the product and/or the product packaging.

CAUTION Indicates the presence of a hazard that may cause minor personal injury or property damage if the CAUTION is ignored.

WARNING Indicates the presence of a hazard that may result in serious personal injury if the WARNING is ignored.



Indicates potential hazard if indicated information is ignored.



Indicates shock hazards that result in serious injury or death if safety instructions are not followed.



Indicates do not touch fan blades, may result in injury.



Indicates disconnect all power sources before servicing.

7 Disclaimers

Learn about the Regulatory, Safety, and Electromagnetic standards for which this product is compliant.

The following chapter describes the Regulatory Statement of Compliance, Safety Compliance, and Electromagnetic Compatibility Agency Requirements for the HGST 4U102.

7.1 Safety Compliance

Product Name: **HGST 4U102**

Regulatory Model: **H4102-J**

Electromagnetic Compatibility Emissions: **Class A**

This product has been tested and evaluated as Information Technology Equipment (ITE) at accredited third-party laboratories for all safety, emissions and immunity testing required for the countries and regions where the product is marketed and sold. The product has been verified as compliant with the latest applicable standards, regulations and directives for those regions/countries. The suitability of this product for other product categories other than ITE may require further evaluation.

The product is labeled with a unique regulatory model that is printed on the label and affixed to every unit. The label will provide traceability to the regulatory approvals listed in this document. The document applies to any product that bears the regulatory model and type names including marketing names other than those listed in this document.

7.2 Restricted Access Location

The HGST 4U102 is intended for installation in a server room or computer room where at least one of the following conditions apply:

- access can only be gained by **service persons** or by **users** who have been instructed about the restrictions applied to the location and about any precautions that shall be taken and/or
- access is through the use of a **tool** or lock and key, or other means of security, and is controlled by the authority responsible for the location.

7.3 Regulatory Statement

Product Name: **HGST 4U102**

Regulatory Model: **H4102-J**

Electromagnetic Compatibility Emissions: **Class A**

This product has been tested and evaluated as Information Technology Equipment (ITE) at accredited third-party laboratories for all safety, emissions and immunity testing required for the countries and regions where the product is marketed and sold. The product has been verified as compliant with the latest applicable standards, regulations and directives for those regions/countries. The suitability of this product for other product categories other than ITE, may require further evaluation.

The product is labeled with a unique regulatory model that is printed on the label and affixed to every unit. The label will provide traceability to the regulatory approvals listed in this document. The document applies to any product that bears the regulatory model and type names including marketing names other than those listed in this document.

7.4 Electromagnetic Compatibility (EMC) Class A Compliance

The **H4102-J** complies with and conforms to the latest international standards as applicable:

Table 44: Emissions and Immunity Compliance Lists

Emissions	Immunity
FCC CFR 47 Part 15, Subpart B	EN 61000-3-2 Harmonic Current Emissions
ICES-003	EN 61000-3-3 Voltage Fluctuations and Flicker
EN 55032	EN 55024
CISPR 32	KN35
CE – EMC Directive 2014/30/EU	EN 61000-4-2 ESD
VCCI V-3	EN 61000-4-3 Radiated Immunity
BSMI CNS13438	EN 61000-4-4 EFT
KN32	EN 61000-4-5 Surge
AS/NZS CISPR 32	EN 61000-4-6 RF Common Mode
TR CU 020/2011	EN 61000-4-8 Power Frequency Magnetic Field
	EN 61000-4-11 Voltage Dips and Interruptions

7.5 Country Certifications

Table 45: Country Certifications

Country/Region	Authority or Mark
North America (Canada, USA)	Nemko
European Union	CE
Japan	VCCI
Korea	MSIP
Taiwan	BSMI
Australia/New Zealand	RCM
Russia, Kazakhstan, Belarus, Armenia	CU EAC
Ukraine	Ukrsepro
Mexico	NOM
Israel	SII

8 Regulatory Statements

The following chapter provides regulatory statements for the HGST 4U102, **H4102-J**.

HGST Storage Enclosures are marked to indicate compliance to various country and regional standards.

Note: *Potential equipment damage:* Operation of this equipment with cables that are not properly shielded and not correctly grounded may cause interference to other electronic equipment and result in violation of Class A legal requirements. Changes or modifications to this equipment that are not expressly approved in advance by HGST will void the warranty. In addition, changes or modifications to this equipment might cause it to create harmful interference.

8.1 Europe (CE Declaration of Conformity)

Marking by the symbol indicates compliance of this system to the applicable Council Directives of the European Union, including the Electromagnetic Compatibility Directive (2014/30/EU) and the Low Voltage Directive (2014/30/EU). A “Declaration of Conformity” in accordance with the applicable directives has been made and is on file at HGST Europe.

8.2 FCC Class A Notice

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.
2. This device must accept any interference received, including interference that may cause undesired operation.

Note: 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 it is not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Any modifications made to this device that are not approved by HGST may void the authority granted to the user by the FCC to operate equipment.

8.3 ICES-003 Class A Notice—Avis NMB-003, Classe A

This Class A digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

8.4 Japanese Compliance Statement, Class A ITE

The following Japanese compliance statement pertains to VCCI EMI regulations:

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用する
と電波妨害を引き起こすことがあります。この場合には使用者が適切な
対策を講ずるよう要求されることがあります。 VCCI-A

English translation:

This is a Class A product based on the Technical Requirement of the Voluntary Control Council for Interference by Information Technology (VCCI). In a domestic environment, this product may cause radio interference, in which case the user may be required to take corrective actions.

8.5 Taiwan Warning Label Statement, Class A ITE

警告使用者:

此為甲類資訊技術設備，於居住環境中使用時，
可能會造成射頻擾動，在此種情況下，使用者會
被要求採取某些適當的對策。

English translation:

This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take adequate measures.