

User Guide

Ultrastar® Data60

Regulatory Model: H4060-J

December 2019

Rev. 1.14

1ET1101

Western Digital®

Table of Contents

Revision History.....	v
Copyright.....	viii
Points of Contact.....	ix
Product Label Information.....	ix
Chapter 1. Overview.....	1
® Data60 Description.....	2
System Architecture Overview.....	2
System Level Block Diagram.....	3
Ultrastar Data60 Specification Summary.....	3
Ultrastar Data60 Layout.....	5
List of Customer Replaceable Units (CRUs).....	6
LEDs.....	7
Front and Rear IO LEDs.....	7
IOM LEDs.....	9
IOM Fan LED.....	9
PSU LED.....	10
Rear Fan LED.....	11
Drive Assembly LED.....	12
Ultrastar Data60 Rack Requirements.....	13
Compatible Rack Hardware Configuration.....	14
Power Requirements.....	16
ESD.....	17
Enclosure Cooling.....	17
Host Connectivity.....	17
Supported SKUs.....	19
List of Compatible Drives.....	19
Chapter 2. System Management Overview.....	34
Firmware Features Overview.....	35
Supported Operating Systems.....	36
OOBM Management Overview.....	36
SCSI Enclosure Services Page 02.....	36
Chapter 3. Component Overviews.....	38
Chassis Description.....	39

Chassis Specifications.....	39
Chassis Layout.....	40
IOM Description.....	41
IOM Specifications.....	41
IOM Layout.....	42
IOM Blank Description.....	42
PSU Description.....	43
PSU Specifications.....	43
PSU Layout.....	44
Rear Fan Description.....	44
Rear Fan Specifications.....	45
Rear Fan Layout.....	45
IOM Fan Description.....	46
IOM Fan Specifications.....	47
IOM Fan Layout.....	47
Rails Description.....	48
Rails Specifications.....	49
Rails Layout.....	49
Rear Cover Alignment Bracket Description.....	50
CMA Description.....	51
CMA Specifications.....	52
CMA Layout.....	52
CMA Cable Tray.....	53
Drive Assembly Description.....	54
Drive Assembly Specifications.....	54
Drive Assembly Layout.....	55
2.5" Drive Carrier Description.....	55
Drive Blank Description.....	58
Chapter 4. Part Replacement.....	60
Part Replacement Service Window.....	61
IOM Replacement.....	61
PSU Replacement.....	64
Rear Fan Replacement.....	67
IOM Fan Replacement.....	70

Drive Assembly Replacement.....	71
CMA Replacement.....	76
Rails Replacement.....	93
Chassis Replacement.....	122
Special Considerations for Cable Routing.....	157
Cabling for CMA.....	159
Before You Begin.....	159
Cabling CMA.....	160
Chapter 5. System Management.....	162
Firmware Upgrade.....	163
Downloading Firmware from the Support Portal.....	163
Linux Upgrade Preparation.....	165
Linux Upgrade to New Firmware.....	167
Non-Automatic Firmware Activation in Linux.....	169
Windows Upgrade Preparation.....	170
Windows Upgrade to New Firmware.....	172
Non-Automatic Firmware Activation in Windows.....	175
Upgrading Firmware with OOBM.....	178
Configuring OOBM Network Settings.....	179
Configuring OOBM Network Settings Using SES.....	179
Zoning.....	181
Before Zoning.....	182
Predefined Zoning Configurations.....	182
sg_senddiag Command.....	188
Enabling Zoning using Linux.....	189
Disabling Zoning using Linux.....	192
Enabling Zoning using Windows.....	195
Disabling Zoning using Windows.....	199
Subenclosure Nickname.....	202
Setting the Subenclosure Nickname.....	202
Partially Populated Enclosures.....	204
Partial Population Configurations.....	204
Installing Drives.....	207
Daisy Chaining.....	210
Daisy Chaining Configurations.....	211

One Host Cable Configurations.....	212
Two Host Cable Configurations.....	217
Cabling for Daisy Chaining.....	222
Chapter 6. Safety.....	229
Electrostatic Discharge.....	230
Optimizing Location.....	230
Power Connections.....	230
Power Cords.....	230
Rackmountable Systems.....	231
Safety and Service.....	231
Safety Warnings and Cautions.....	232
Chapter 7. Disclaimers.....	233
Restricted Access Location.....	234
Safety Compliance.....	234
Electromagnetic Compatibility (EMC) Class A Compliance.....	234
Country Certifications.....	235
Chapter 8. Regulatory Statements.....	236
Europe (CE Declaration of Conformity).....	237
FCC Class A Notice.....	237
ICES-003 Class A Notice—Avis NMB-003, Classe A.....	237
Japanese Compliance Statement, Class A ITE.....	237
Taiwan Warning Label Statement, Class A ITE.....	237

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 (page 51). Removed Lowline power specs from Power Requirements (page 16). Changed required rack depth, see Required Rack Depth (page 5). Changed typical power consumption, see Typical Power Consumption (page 4). Updated LED Flash Patterns, see LEDs (page 7).
December 2017	Revision 1.2	<ul style="list-style-type: none"> Added active cable support Added firmware upgrade section. See Firmware Upgrade (page 163). Updated the Non-Op altitude specification. See Non-Operational Altitude (page 4).
January 2018	Revision 1.21	Updated the product name
January 2018	Revision 1.3	<ul style="list-style-type: none"> Updated information on the 2.5" drive carrier option. See 2.5" Drive Carrier Description (page 55). Added torque requirements for all screws used in the enclosure. Updated the IOM replacement section to account for the possibility of a firmware mismatch. See IOM Replacement (page 61). Updated the drive assembly installation instructions to clarify the orientation of the drive assemblies. Drive Assembly Replacement (page 71).
April 2018	Revision 1.4	<ul style="list-style-type: none"> Updated Compatible Drives List. See List of Compatible Drives (page 19). Updated the Rack Requirements. See Ultrastar Data60 Rack Requirements (page 13). Updated the Firmware Upgrades. See: Firmware Upgrade (page 163)
May 2018	Revision 1.5	Added the Part Replacement Service Window. See: Part Replacement Service Window (page 61)
June 2018	Revision 1.6	<ul style="list-style-type: none"> Updated Compatible Drives List. See List of Compatible Drives (page 19)

Date	Revision	Comment
		<ul style="list-style-type: none"> Updated the Firmware Upgrade section. See Firmware Upgrade (page 163) Updated the Firmware Download section. See Downloading Firmware from the Support Portal (page 163) Updated the System Architecture Overview section. See System Architecture Overview (page 2) Updated the Daisy Chaining section. See Daisy Chaining (page 210) Added the Rear Cover Alignment Bracket Description. See Rear Cover Alignment Bracket Description (page 50)
November 2018	Revision 1.7	<ul style="list-style-type: none"> Updated the images in the Daisy Chaining section. See Daisy Chaining (page 210) Updated List of CRUs. See List of Customer Replaceable Units (CRUs) (page 6) Updated Compatible Drives List. See List of Compatible Drives (page 19) Updated the Host Connectivity section. See: Host Connectivity (page 17)
May 2019	Revision 1.8	<ul style="list-style-type: none"> Changed senddiag commands from images to codeblocks. See sg_senddiag Command (page 188). Updated daisy-chaining tables to match diagrams. See Two Host Cable Configurations (page 217). Corrected OOBM zoning configuration instructions. See Predefined Zoning Configurations (page 182). Added Configuring OOBM Network Settings (page 179).
May 2019	Revision 1.9	<ul style="list-style-type: none"> Corrected the system architecture overview. See System Architecture Overview (page 2). Corrected explanation of SATA configuration in Firmware Upgrade (page 163) section.
June 2019	Revision 1.10	<ul style="list-style-type: none"> Updated the Host Connectivity section. See: Host Connectivity (page 17) Added Windows syntax examples and reorganized the Upgrading Firmware with OOBM (page 178) section
June 2019	Revision 1.11	Updated the Host Connectivity section. See: Host Connectivity (page 17)
July 2019	Revision 1.12	<p>Moved the following topics to the Overview (page 1) section:</p> <ul style="list-style-type: none"> Ultrastar Data60 Rack Requirements (page 13) Power Requirements (page 16) ESD (page 17)

Date	Revision	Comment
		<ul style="list-style-type: none"> • Enclosure Cooling (page 17) • Host Connectivity (page 17) <p>Moved the Supported Operating Systems (page 36) topic to the System Management Overview (page 34) section.</p> <p>Corrected LED identification tables for IOMs, PSUs, and drives in the LEDs (page 7) section.</p> <p>Updated servicing image to correct length values and rail servicing extension in UltraStar Data60 Rack Requirements (page 13) section.</p> <p>Added a note about OOBM ports configured for DHCP by default to the OOBM Management Overview (page 36) section.</p>
November 2019	Revision 1.13	<ul style="list-style-type: none"> • Replaced references to He12 drives with UltraStar DC HC520 in List of Compatible Drives (page 19) • Changed device references from OS-specific (<code>/dev/sgX</code> for Linux and <code>SCSI:x,x,x</code> for Windows) to generic (<code><dev></code>) throughout. • Updated table for Approved SAS Cables in Host Connectivity (page 17) • Added Subenclosure Nickname (page 202) section • Updated Supported Operating Systems (page 36) • Added drive assembly LED pointer orientation image in Drive Assembly Replacement (page 71) section • Updated images of captive chassis-cover screws throughout • Updated the Daisy Chaining configurations in Daisy Chaining (page 210)
December 2019	1.14	<ul style="list-style-type: none"> • Rebranded document to WD design • Updated the List of Compatible Drives (page 19)

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<https://portal.wdc.com/Support/s/>

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The following product information is required for technical support requests:

- Part Number (P/N)
- Serial Number (S/N)
- Product Name and/or Model Number (MODEL)

This information may be found on the product label, which is affixed to an exterior, non-removable surface of the chassis. The following is an example label with the applicable information fields highlighted:

<p>P/N: 1ESXXXX REV: XX</p> <p>S/N: CCMM0WYYPXXXX</p> <p>###-###v~ ##A ###/## Hz (2x)</p> <p>MODEL: XXXXX-X</p>		<p>This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.</p> <p>CAN ICES-3 (A)/NMB-3(A)</p> <p>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</p> <p>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。</p>
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<p>MANUFACTURED BY: HGST</p>	<p>R-41042056</p>	<p>Laite on liitettävä suojamaadoituskoskettimilla varustettuun pistorasiaan Apparatet må tilkoples jordet stikkontakt Apparaten skall anslutas till jordat uttag</p>  <p>DATE CODE: MMDDYYYY COO</p>

Overview

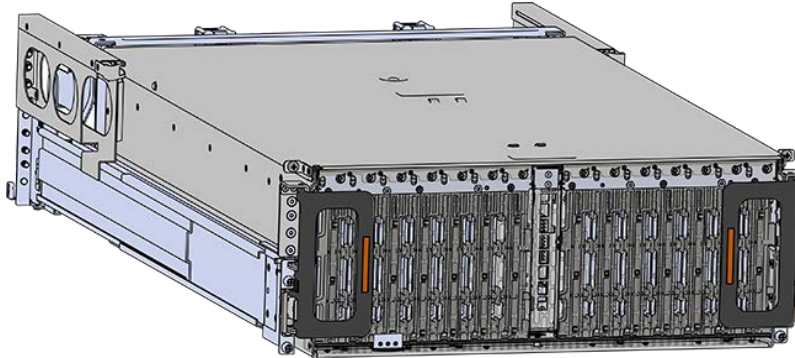
This section provides a high level overview of the features of the Ultrastar Data60.

In This Chapter:

- Ultrastar Data60 Description..... 2
- System Architecture Overview..... 2
- System Level Block Diagram..... 3
- Ultrastar Data60 Specification
Summary..... 3
- Ultrastar Data60 Layout..... 5
- List of Customer Replaceable Units
(CRUs)..... 6
- LEDs..... 7
- Ultrastar Data60 Rack Requirements..... 13
- Power Requirements..... 16
- ESD..... 17

1.1 Ultrastar® Data60 Description

Figure 2: Ultrastar Data60



The Ultrastar® Data60 is a 4U form factor, high availability, high density, rack-mounted storage enclosure that is capable of hosting up to 60 SAS or SATA drives. The maximum data storage capacity of the Ultrastar Data60 is 840 TB using 14TB Ultrastar® HC530 drives . (For a full list of compatible drives and total storage capacities, see the [hg \(page 19\)](#).) The enclosure runs on an input voltage of 200 - 240 VAC and consumes ~1000W of power under typical conditions. It requires a maximum of ~1250W at full load.

It is designed to fit within a 4U rack space and requires 900mm (35.43in.) usable rack space, frame to frame. A fully loaded system will add 79.4 kg. / 175 lbs. of static load when fully loaded with drives.

- 4U Storage Enclosure
- Supports up to 60 Drives
- Can support 3.5" drives and 2.5" SSD drives (2.5" requires an adapter) in the 60 available drive bays.
- Up to 12W per drive slot for the 60 data storage drives (Cannot exceed 85A on the 5V rail)
- House and control four (4) N+1 redundant 80mm rear fans
- House and control a dual rotor 40mm internal 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
- Toolless replacement of all Customer Replaceable Units (CRUs)
- Fits within a standard EIA-310 rack including all necessary cable management (see: [Compatible Rack Hardware Configuration \(page 14\)](#))
- Supports up to 3m passive SAS cables (limited to 3m or less) or active cables (any length)
- Supports High line (220-240 VAC) Input Power

1.2 System Architecture Overview

The Ultrastar Data60 IOM uses a cascaded expander design to allow for connection to all 60 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 thirty (30) drives.

* SATA based models will only include 1 IOM

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 storage subsystem health information, locating enclosure components using the IDENT LEDs, and updating firmware.

The system FPGAs control and report the states of the system fans, enclosure LEDs, connector LEDs, drive LEDs, and T10 drive power disable signals on the 60 data storage drives.



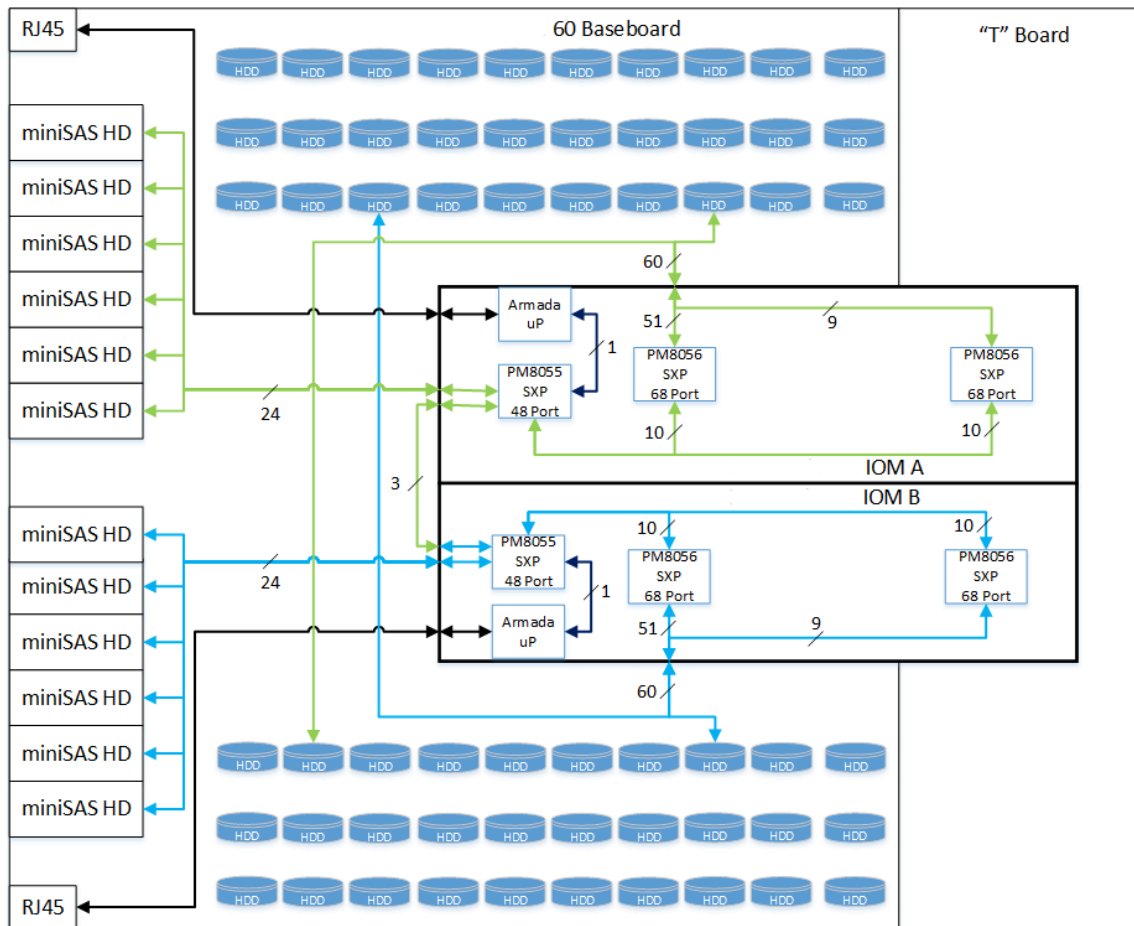
Note: To use T10 power disable, the drives installed must also support this feature.

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 Ultrastar Data60 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 among others.

1.3 System Level Block Diagram

The following image shows the system block diagram for the Ultrastar Data60.

Figure 3: System Block Diagram



1.4 Ultrastar Data60 Specification Summary

Table 1: Environmental Specification Summary

Specification	Non-Operational	Operational
Temperature	-40°C to 70°C	5°C to 35°C
Temperature Gradient	30°C / Hr	20°C per hour maximum
Temperature De-rating	1°C per 300m above 3000m	1°C per 300m above 900m
Relative Humidity	8-90% Non-Condensing	8-90% Non-Condensing
Relative Humidity Gradient	30% per hour maximum	30% per hour maximum
Altitude	-300m to 12,000m / -984 ft. to 39,370 ft	-300m to 3048m / -984 ft. to 10,000 ft.

Table 2: Electrical Specifications

Specification	Value
Max Power Consumption	~1250W
Typical Power Consumption*	~1000W
Input Voltage	200 - 240 VAC
PSU Connector Type	C14
PSU Efficiency	80 PLUS Platinum
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.



Caution: The Ultrastar Data60 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.

Table 3: 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

* 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.

Specification	Non-Operational	Operational
Weight	79.4 kg. / 175 lbs.	
Dimensions	447mm x 890mm x 175mm / 17.67in. x 35.04in. x 6.89in.	
Length without CMA	712 mm / 28.03in.	
Required Rack Width	450mm (17.72in.) with 465mm (18.31in.) ± 1.5mm nominal hole spacing. See EIA-310 Rack Standard	
Required Rack Depth	900mm (35.43in.) usable rack space, frame to frame	
Rack Units (U)	4U	
Vertical Rack Rail Spacing	24 in. - 32 in.	

Table 4: Performance Specifications

Specification	Value
Number of Drive Slots	60
Data Transfer Rates	12Gbps SAS / 6Gbps SATA
Max Raw Data Storage Capacity	840 TB using 14TB Ultrastar® HC530 drives
SAS Ports	12 x Mini-SAS HD (6 per IOM) 2 x 10/100/1G Ethernet

1.5 Ultrastar Data60 Layout

Figure 4: Front and Rear Product Layout

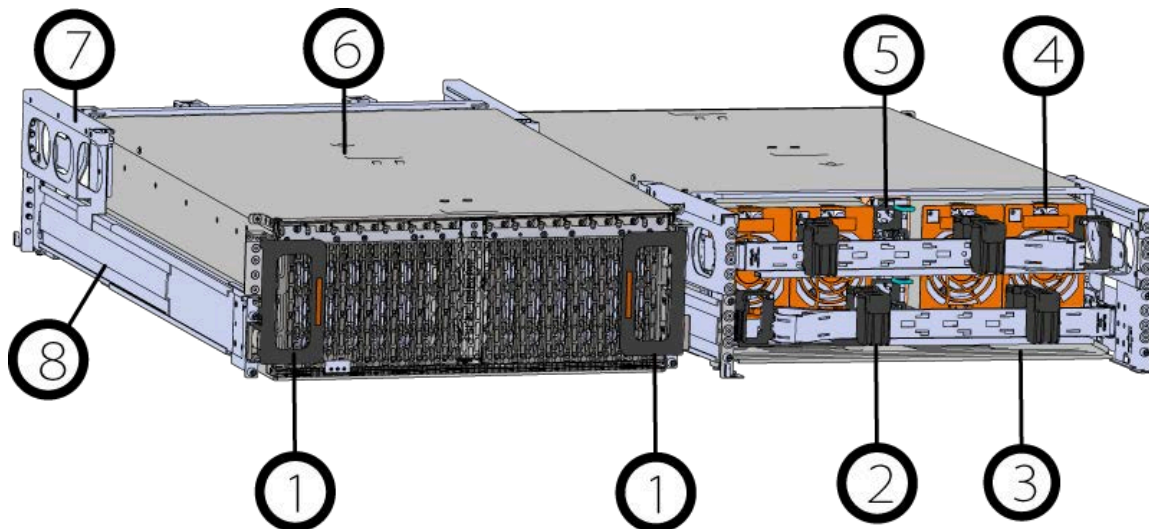
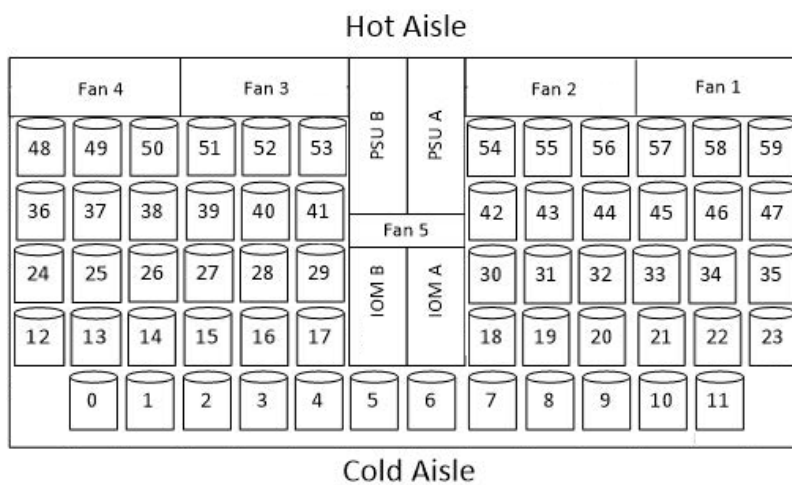


Table 5: Front and Rear Component Identification

Number	Component
1	Enclosure Handles
2	CMAs
3	CMA Tray
4	Rear Fans
5	PSUs
6	Chassis Cover
7	Rear Cover Alignment Brackets
8	Rails

The following is an image of the layout of the major system components inside the Ultrastar Data60.

Figure 5: Component Layout



1.6 List of Customer Replaceable Units (CRUs)

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

Table 6: List of Replaceable Components

Component	Part Number
Ultrastar Data60 Chassis with a single IOM and PSU	1EX0442
Ultrastar Data60 Chassis with IOMs and PSUs	1EX0443
IOM	1EX0430
IOM Blank	1EX0431
PSU 1600W	1EX0434

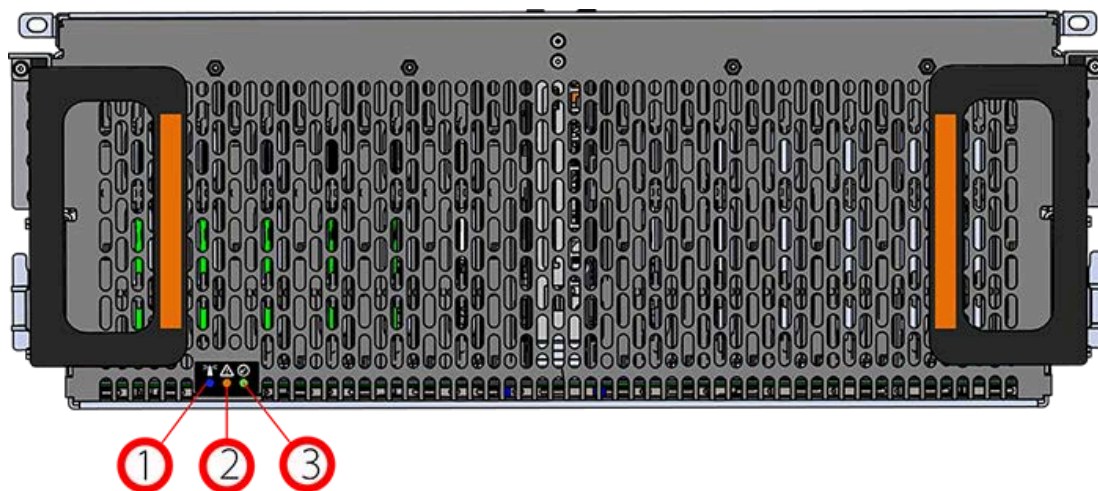
Component	Part Number
Rear Fan	1EX0433
IOM Fan	1EX0432
Rails (CMA Standard)	1EX0435
Rear Cover Alignment Bracket	1EX2288
CMA Standard Arms	1EX0437
CMA Cable Tray	1EX1119
3.5 in. Drive Carrier, Qty=1	1EX0438
3.5 in. to 2.5 in. conversion Drive Carrier, Qty=1	1EX0439
3.5 in. Drive Blank, Qty=1	1EX0429
Power Cable for PDU, C13-C14, 18AWG, 3m, Qty=1	1EX1158
HD Mini-SAS to HD Mini-SAS, 3m, Qty=2	1EX1533

1.7 LEDs

1.7.1 Front and Rear IO LEDs

The Ultrastar Data60 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 6: Front LEDs



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

Table 7: Front LED Identification

Number	LED Name	Color	Behavior
1	Identify	Blue	Blink @ 1 Hz (50% duty cycle) – Blinks only when Identification has been activated. Will blink when any component is identified.
2	Fault	Amber	Blink @ 1 Hz (50% duty cycle) – Enclosure has a fault Off – Enclosure has no fault Note: LEDs have a 50% duty cycle (On for 2 seconds, off for less than a second).
3	Power	Green	Solid - Powered On

Figure 7: Rear IO LEDs

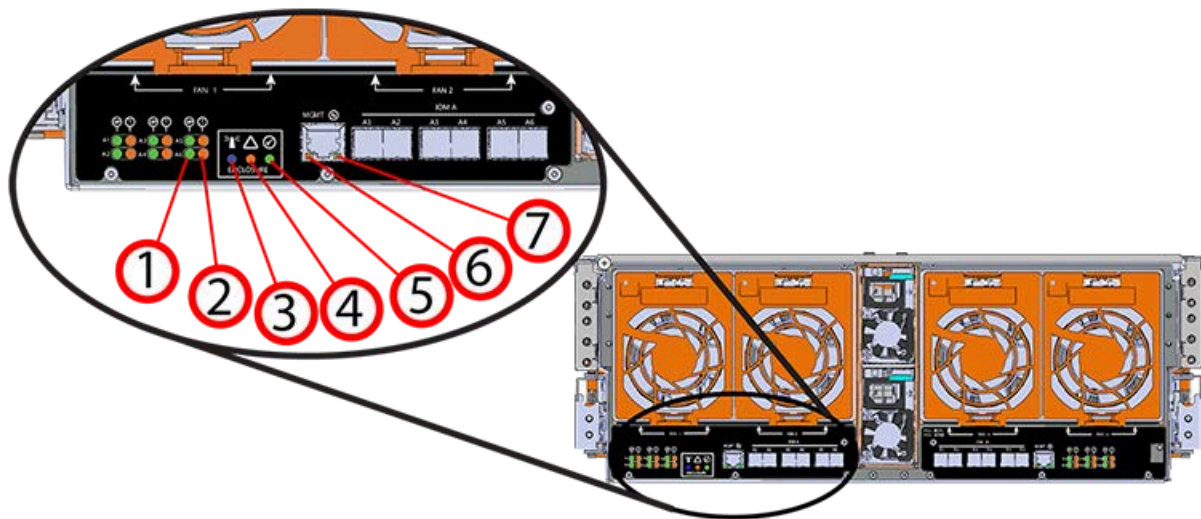


Table 8: Rear LED Identification

Number	LED Name	Color	Behavior
1	SAS Link Status	Green	Solid – SAS Cable Connected Off – SAS Cable Not Connected
2	SAS Fault Status	Amber	Blink @ 1 Hz (50% duty cycle) – SAS connection fault Off – No SAS connection fault Note: LEDs have a 50% duty cycle (On for 2 seconds, off for less than a second).

Number	LED Name	Color	Behavior
3	Identification	Blue	Blink @ 1 Hz (50% duty cycle) – Blinks only when Identification has been activated. Will blink when any component is identified.
4	Fault	Amber	Blink @ 1 Hz (50% duty cycle) – Enclosure has a fault Off – Enclosure has no fault Note: LEDs have a 50% duty cycle (On for 2 seconds, off for less than a second).
5	Power	Green	Solid - Powered On
6	Ethernet Connectors Link/Activity	Green/Amber	Off - Operating at 10 Mbps Green Solid - Operating at 100 Mbps Amber Solid - Operating at 1Gpbs
7	Ethernet Connector Speed	Green	Off - No Connection Solid - Connected Blink - Activity

1.7.2 IOM LEDs

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

Figure 8: IOM LEDs

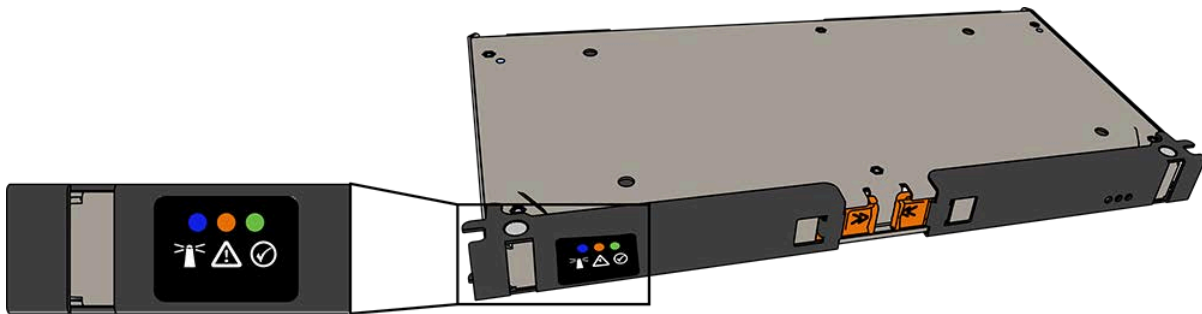


Table 9: IOM LED Identification

LED Name	Color	Behavior
IOM Identification	Blue	Blink @ 0.5 Hz (75% duty cycle) – Blinks only when IOM Identification has been activated. Off - Not being identified
IOM Fault	Amber	Blink @ 0.5 Hz (75% duty cycle) – IOM has Fault Off - IOM is functioning normally
IOM Power	Green	Solid - IOM is on Off - IOM is off

1.7.3 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 9: IOM Fan LED

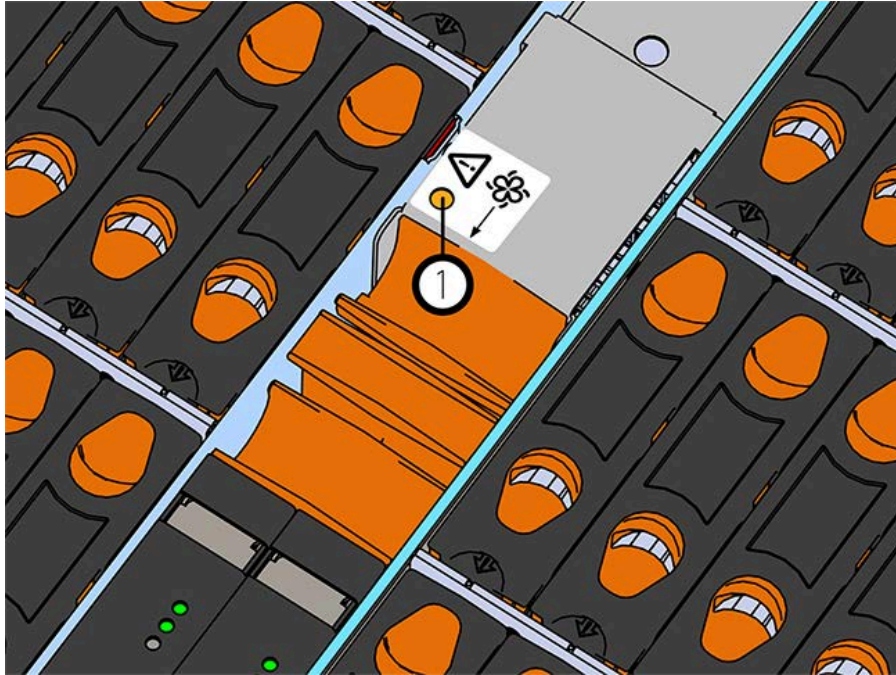


Table 10: IOM Fan LED Identification

LED Name	Color	Behavior
IOM Fan LED	Amber	Blink @ 2 Hz (50% duty cycle) – IOM Fan is being identified Blink @ 1 Hz (50% duty cycle) – IOM Fan is reporting faults Off – IOM Fan is on and reporting no faults

Note: LEDs have a 50% duty cycle (On for 2 seconds, off for less than a second).

1.7.4 PSU LED

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

Figure 10: PSU LEDs

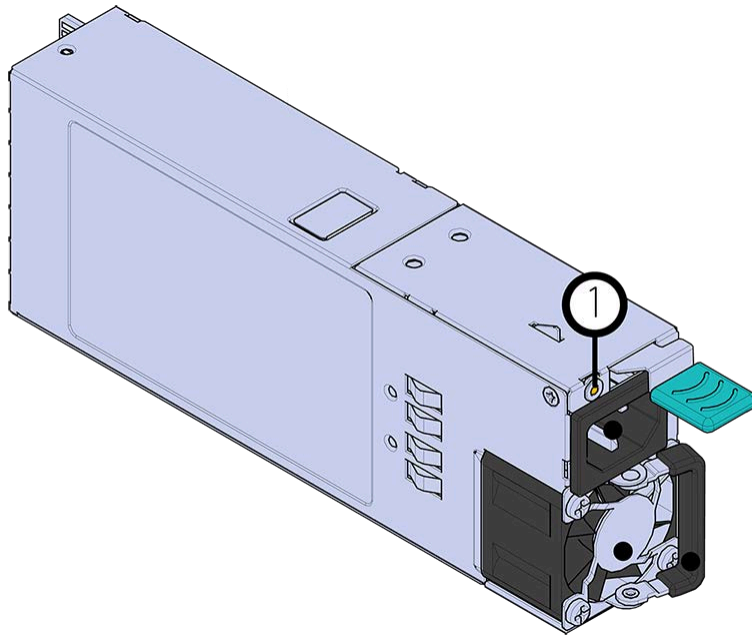



Table 11: PSU LED Identification

LED Name	Color	Behavior
PSU Multi-function LED	Green	Solid – PSU is on and reporting no faults Blink @ 2Hz (50% duty cycle) – 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 Blink @ 0.5Hz (50% duty cycle) – PSU reporting warnings Off – PSU is reporting no faults

 **Note:** LEDs have a 50% duty cycle (On for 2 seconds, off for less than a second).

1.7.5 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 11: Fan LED

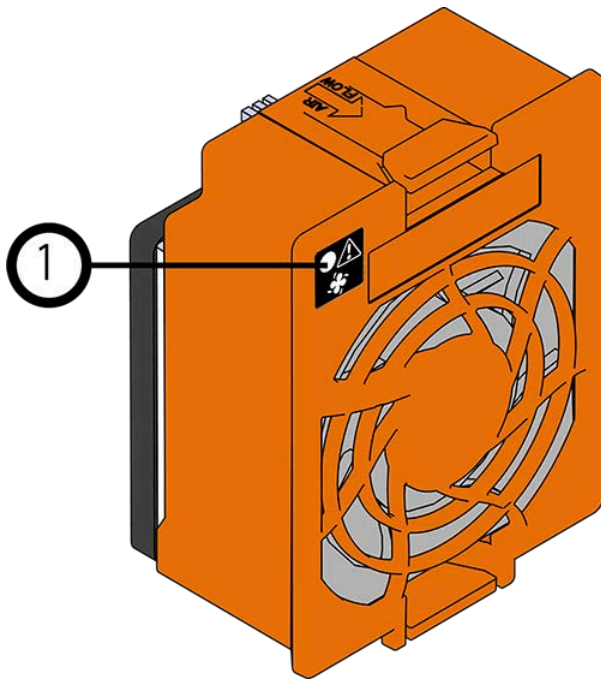


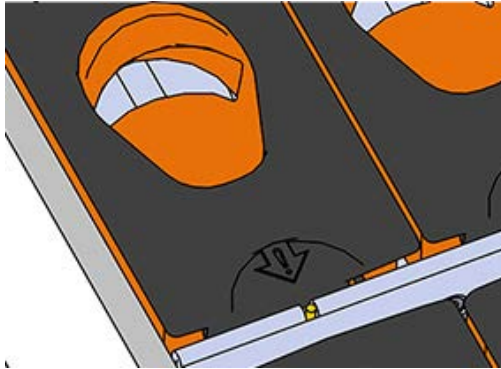
Table 12: Fan LED Identification

LED Name	Color	Behavior
Fan LED	Amber	Blink @ 1 Hz (50% duty cycle) – Fan is reporting faults Blink @ 2 Hz (50% duty cycle) – Fan is being identified Off – Fan is on and reporting no faults


Note: LEDs have a 50% duty cycle (On for 2 seconds, off for less than a second).

1.7.6 Drive Assembly LED

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

Figure 12: HDD Assembly LED**Table 13:** HDD LED Identification

LED Name	Color	Behavior
Drive Multi-function LED	Amber	Blink @ 2 Hz (50% duty cycle) – Drive identify Blink @ 1 Hz (50% duty cycle) – Drive fault Off – Drive has no faults


Note: LEDs have a 50% duty cycle (On for 2 seconds, off for less than a second).

1.8 Ultrastar Data60 Rack Requirements

The Ultrastar Data60 is designed to be installed into a rack that meets the EIA-310 standard at a minimum 900mm (35.43in.) usable rack space, frame to frame. The vertical rack rails must be set between 24 in. - 32 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 14: Required Rack Specifications

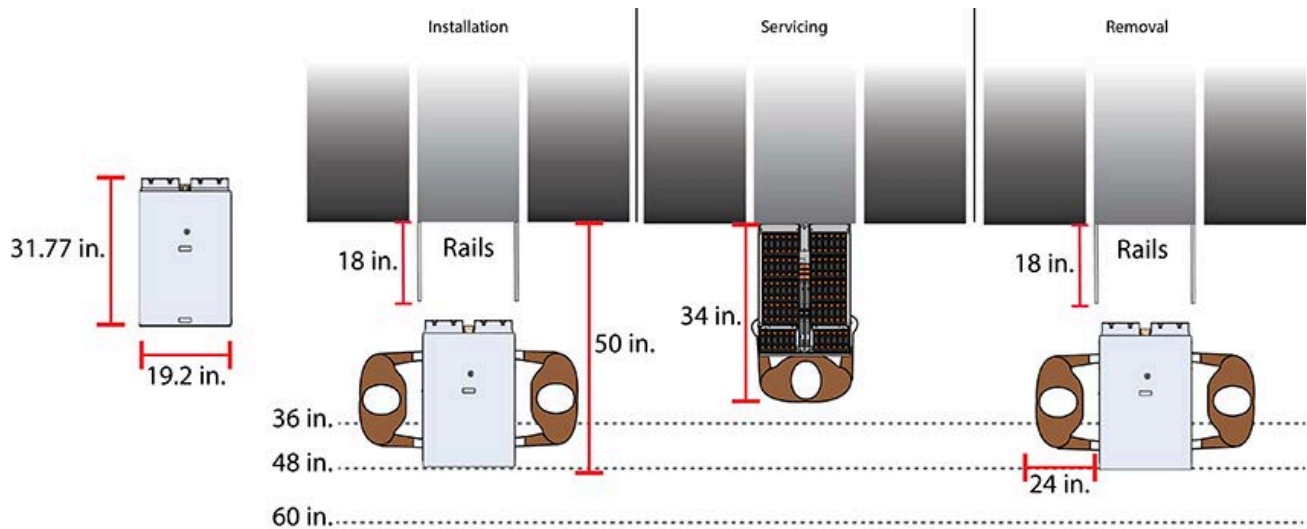
Parameter	Requirement
Rack Depth	900mm (35.43in.) usable rack space, frame to frame
Rack Width	450mm (17.72in.) with 465mm (18.31in.) ± 1.5mm nominal hole spacing. See EIA-310 Rack Standard
Rack Units (U)	4U
Vertical Rack Rail Spacing	24 in. - 32 in.
Static Load Rating	1360.7 kg. / 3000 lbs.
Dynamic Load Rating	1020.5 kg. / 2250 lbs.

Warning: When extended out of the rack on the rail system, the Ultrastar Data60 will be ~630mm / 24.8in. extended outward. This may be a potential tipping hazard depending on the configuration of the rack. Ensure that leveling feet, anti-tilt, and any other safety features recommended by the specific rack manufacturers have been deployed before servicing.

The following section provides specific information necessary to install, service, and remove the Ultrastar Data60. The installation of the Ultrastar Data60 requires two people and a space of 1270mm / 50in. in front of the installation space. The servicing of the enclosure requires one person and a minimum of 863.6mm / 34in. of space in front of the installation space. The removal of the enclosure requires two people, 914.4mm / 36in. of space in front of the installation space, and 24in. on either side of the enclosure for two people to remove the enclosure.

Warning: The handles on the front of the chassis are not intended to be used to support the weight of the Ultrastar Data60. 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.

Figure 13: Installation, Servicing, and Removal



Attention: Do not install or remove the enclosure while it is populated with drives. The fully populated enclosure exceeds the amount of weight that a team of two should lift.

1.8.1 Compatible Rack Hardware Configuration

The following table(s) list the approved rack hardware configurations for the Ultrastar Data60:

Table 15: Compatible Hardware Configuration 1

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
Vendor	CRENLO/EMCOR	Server Technology	Server Technology	Various

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
Part Number	AS-160099-03 (Drawing Number EMCOR 526121 Rev 5)	412-0761-11_STV-4501	KIT-MBVPT-1B (one kit per PDU)	4 x M6 x 16 Hex Cap Screws
		412-0761-20_STV-4502		8 x M6 Fender Washers
		412-0761-23_STV-4503		4 x M6 Hex Nut with Nylon Lock
Quantity	1	2	2	Varies

Table 16: Compatible Hardware Configuration 2

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
Vendor	AFCO/Legrand	Server Technology	Server Technology	Various
Part Number	Options:	412-0761-11_STV-4501	KIT-MB-40	None
	42RU – WEDIT605	412-0761-20_STV-4502		
	45RU – WEDIT604	412-0761-23_STV-4503		
	48RU – WEDIT603			
	51RU – WEDIT606			
Quantity	1 rack	2	1	N/A

Table 17: Compatible Hardware Configuration 3

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
Vendor	TRIPP LITE	Server Technology	Server Technology	Various
Part Number	Options:	412-0761-11_STV-4501	KIT-MBVPT-1B	None
	SR42UBDP (Rack)	412-0761-20_STV-4502		
	SREXTENDER 25U (Rack Extension)	412-0761-23_STV-4503		
	SREXTENDER 42U (Rack Extension)			

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
	SREXTENDER 48U (Rack Extension)			
Quantity	1 rack	2	1	N/A

Table 18: Compatible Hardware Configuration 4

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
Vendor	APC/Schneider	Server Technology	Server Technology	Various
Part Number	AR3300W	412-0761-11_STV-4501 412-0761-20_STV-4502 412-0761-23_STV-4503	KIT-MBVPT-1B (one kit per PDU)	4 x M6 x 16 Hex Cap Screws 8 x M6 Fender Washers 4 x M6 Hex Nut with Nylon Lock
Quantity	1 rack	2	2	Varies

1.9 Power Requirements

The following table describes the A/C input power specification for the Ultrastar Data60.

Table 19: AC Power Specifications

Power	
Alternating Current (AC) Power Supply (2 per enclosure)	
Wattage (per power supply) *	Supply Rating: 80 PLUS Platinum rated Max Power Consumption: ~1250W Typical Power Consumption: ~1000W
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.

* 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.



Caution: The Ultrastar Data60 can only be plugged into high line (220-240 VAC). If the unit is plugged into low line (110-127 VAC), 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.

1.10 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.

1.11 Enclosure Cooling

The Ultrastar Data60 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 Ultrastar Data60 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 Ultrastar Data60 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.



Attention: 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 increasing to max speed. In the event that a fan has failed, it must be replaced before any other CRUs and should be removed from the enclosure within 30 seconds of removing the enclosure cover.

1.12 Host Connectivity

The Ultrastar Data60 can use passive cables that are limited to 3m or less, or active cables of any length for SAS connections to the host. Active cables must be used for Ultrastar Data60 to Ultrastar Data60 daisy chaining connections. All approved passive and active SAS cables are listed in the following table.



Note: MegaRAID adapters do not support the use of active SAS cables. If your configuration requires the use of MegaRAID adapters, passive cables must be used.

Table 20: Approved SAS Cables

Type	Length	Part Number	Vendor Part Number
Active HD Mini-SAS to HD Mini-SAS	Variable	N/A	Molex: 106415-21xx*
Passive HD Mini-SAS to HD Mini-SAS	2m	1EX1531	Amphenol: 601760006 601760006-02
			CS Electronics: 12G-HD-4444/2M
			DSC: C5555-2M
			FCI: 10117949-2020LF
Passive HD Mini-SAS to HD Mini-SAS	3m	N/A	Molex: 1110751002
			TMC: C5555-2M
			Amphenol: 601760008
Passive HD Mini-SAS to HD Mini-SAS	1m, 2m, 3m	N/A	CS Electronics: 12G-HD-4444-3M
			FCI: 10117949-3030LF
			Molex: 1110751003
Passive HD Mini-SAS to HD Mini-SAS	1m, 2m, 3m	N/A	FCI: 10112041-2010LF (1m) 10112041-2020LF (2m) 10112041-2030LF (3m)

Active Cables

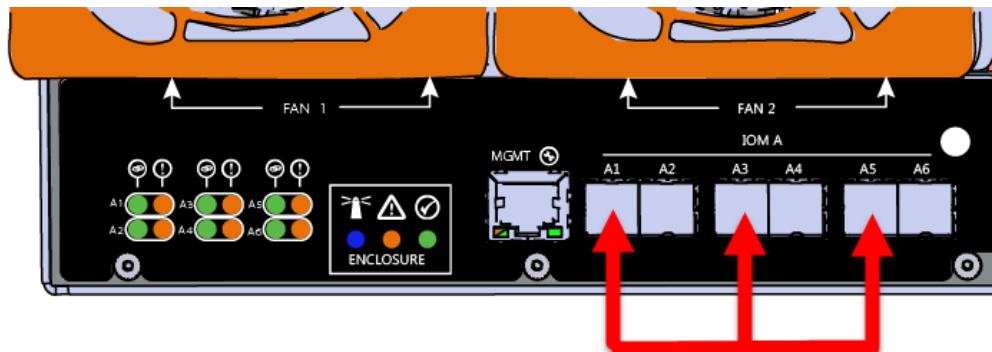
During the process of Daisy Chaining the Ultrastar

Data60 enclosures, active cables must be used when connecting between enclosures. The use of active cables provides improved signal integrity between the enclosures.

Passive Cabling

If you are connecting more than one host port per I/O, you must connect cables to every other port per IOM and do not need all six ports, Western Digital recommends connecting the cables to every other port as a best practice. The recommended connection order on IOM A ports A6, A4, and A2 for subsystems with three or fewer connected hosts. If more than three hosts are required, the recommended connection order on IOM A ports A5, A3, and A1 to be connected next. The recommended connection order on IOM B ports B1, B3, and B5 for subsystems with three or fewer connected hosts. If more than three hosts are required, the recommended connection order on IOM A ports B2, B4, and B6 to be connected next.

* Active Cables can be used for both direct and daisy-chain connections. xx represents the length of the cable and can be replaced by length of cable in meters; preceding numbers are the qualified cable family.

Figure 14: Passive Cable Rear I/O Connection**Edge Buffering**

Edge buffering is an enclosure feature that increases the overall enclosure performance when a 6 Gbps target is connected. With edge buffering disabled, primitives that can be deleted from the initiator are added to slow the effective logical rate to the slowest target device connected between the initiator and the target device. With edge buffering enabled, the expanders buffer data from slower 6 Gbps targets to utilize the 12 Gbps link from the expander to the initiator in a more efficient manner.

1.13 Supported SKUs

The following table lists the versions of this Western Digital product that are supported by this document.

Table 21: List of Supported SKUs

SKUs					
1ES1157	1ES1158	1ES1159	1ES1160	1ES1161	1ES1162
1ES1163	1ES1164	1ES1234	1ES1235	1ES1236	1ES1237
1ES1238	1ES1239	1ES1240	1ES1241	1ES0347	1ES0348
1ES0349	1ES0350	1ES0351	1ES0352	1ES0353	1ES0354
1ES0355	1ES0356	1ES0357	1ES0358	1ES0359	1ES0360
1ES0361	1ES0362	1ES0363	1ES0364	1ES0365	1ES0366
1ES0367	1ES0368	1ES0369	1ES0370	1ES1461	1ES1462
1ES1463	1ES1464	1ES1465	1ES1466	1ES1467	

1.14 List of Compatible Drives

Compatible Drives

Table 22: HDD w/ 3.5 in drive carrier

Drive	Type	Interface	Sector Size	Encryption	Volume	Part Number
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	SE	4TB	1EX1993
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG	4TB	1EX2177
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG-FIPS	4TB	1EX2178
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE	4TB	1EX2179
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG	4TB	1EX2180
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG-FIPS	4TB	1EX2181
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	SE	6TB	1EX1183
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG	6TB	1EX1182
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG-FIPS	6TB	1EX1852
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE	6TB	1EX1185
Western Digital® Ultrastar® DC HC310	HDD	SAS 12Gb/s	512e	TCG	6TB	1EX1184

Drive	Type	Interface	Sector Size	Encryption	Volume	Part Number
w/ 3.5 in. drive carrier						
Western Digital® Ultrastar® DC HC310	HDD	SAS 12Gb/s	512e	TCG-FIPS	6TB	1EX1853
w/ 3.5 in. drive carrier						
Western Digital® Ultrastar® DC HC310	HDD	SATA 6Gb/s	4Kn	SE	6TB	1EX1187
w/ 3.5 in. drive carrier						
Western Digital® Ultrastar® DC HC310	HDD	SATA 6Gb/s	4Kn	TCG	6TB	1EX1186
w/ 3.5 in. drive carrier						
Western Digital® Ultrastar® DC HC310	HDD	SATA 6Gb/s	512e	SE	6TB	1EX1189
w/ 3.5 in. drive carrier						
Western Digital® Ultrastar® DC HC310	HDD	SATA 6Gb/s	512e	TCG	6TB	1EX1188
w/ 3.5 in. drive carrier						
Western Digital® Ultrastar® DC HC320	HDD	SAS 12Gb/s	4Kn	SE	8TB	1EX1221
w/ 3.5 in. drive carrier						
Western Digital® Ultrastar® DC HC320	HDD	SAS 12Gb/s	4Kn	TCG	8TB	1EX1220
w/ 3.5 in. drive carrier						
Western Digital® Ultrastar® DC HC320	HDD	SAS 12Gb/s	4Kn	TCG-FIPS	8TB	1EX1342
w/ 3.5 in. drive carrier						
Western Digital® Ultrastar® DC HC320	HDD	SAS 12Gb/s	512e	SE	8TB	1EX1223
w/ 3.5 in. drive carrier						
Western Digital® Ultrastar® DC HC320	HDD	SAS 12Gb/s	512e	TCG	8TB	1EX1222
w/ 3.5 in. drive carrier						
Western Digital® Ultrastar® DC HC320	HDD	SAS 12Gb/s	512e	TCG-FIPS	8TB	1EX1343
w/ 3.5 in. drive carrier						

Drive	Type	Interface	Sector Size	Encryption	Volume	Part Number
Western Digital® Ultrastar® DC HC320 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SE	8TB	1EX1225
Western Digital® Ultrastar® DC HC320 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	TCG	8TB	1EX1224
Western Digital® Ultrastar® DC HC320 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SE	8TB	1EX1227
Western Digital® Ultrastar® DC HC320 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SED	8TB	1EX1226
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	SE	10TB	1EX2432
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG	10TB	1EX2433
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG-FIPS	10TB	1EX2434
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE	10TB	1EX2435
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG	10TB	1EX2436
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG-FIPS	10TB	1EX2437
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SE	10TB	1EX2438

Drive	Type	Interface	Sector Size	Encryption	Volume	Part Number
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SED	10TB	1EX2439
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SE	10TB	1EX2440
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SED	10TB	1EX2441
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	ISE	10TB	1EX0482
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	SE	10TB	1EX0484
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG	10TB	1EX0483
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG-FIPS	10TB	1EX1340
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	ISE	10TB	1EX0485
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE	10TB	1EX0487
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG	10TB	1EX0486
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG-FIPS	10TB	1EX1341

Drive	Type	Interface	Sector Size	Encryption	Volume	Part Number
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	ISE	10TB	1EX0494
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SE	10TB	1EX0496
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SED	10TB	1EX0495
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	ISE	10TB	1EX0497
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SE	10TB	1EX0499
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SED	10TB	1EX0498
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	ISE	12TB	1EX1004
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	SE	12TB	1EX1006
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG	12TB	1EX1005
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG-FIPS	12TB	1EX1339
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	ISE	12TB	1EX1007

Drive	Type	Interface	Sector Size	Encryption	Volume	Part Number
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE	12TB	1EX1009
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG	12TB	1EX1008
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG-FIPS	12TB	1EX1338
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	ISE	12TB	1EX1010
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SE	12TB	1EX1012
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SED	12TB	1EX1011
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	ISE	12TB	1EX1013
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SE	12TB	1EX1015
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SED	12TB	1EX1014
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	SE	14TB	1EX1788
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG	14TB	1EX1789

Drive	Type	Interface	Sector Size	Encryption	Volume	Part Number
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG-FIPS	14TB	1EX1854
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE	14TB	1EX1791
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	ISE	14TB	1EX1583
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG	14TB	1EX1792
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG-FIPS	14TB	1EX1855
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SE	14TB	1EX1790
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SE	14TB	1EX1793
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SED	14TB	1EX1794
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	ISE SMR-HM	14TB	1EX1604
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	SE SMR-HM	14TB	1EX1884
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	ISE SMR-HM	14TB	1EX1885

Drive	Type	Interface	Sector Size	Encryption	Volume	Part Number
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE SMR-HM	14TB	1EX1886
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	ISE SMR-HM	14TB	1EX1887
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	ISE SMR-HM	15TB	1EX1857
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE SMR-HM	15TB	1EX2152
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE SMR-HM	15TB	1EX2153
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	ISE SMR-HM	15TB	1EX2154

Table 23: SSD w/ 3.5 in to 2.5 in drive carrier

Drive	Type	Interface	Drive Writes	Encryption	Volume	Part Number
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	400GB	1EX1291
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	400GB	1EX1293
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	400GB	1EX1315
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG-FIPS	400GB	1EX1481
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	ISE	400GB	1EX1287
Western Digital®	SSD	SAS 12Gb/s	ME-10DW/D	SE	400GB	1EX1289

Drive	Type	Interface	Drive Writes	Encryption	Volume	Part Number
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	TCG	400GB	1EX1312
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	TCG-FIPS	400GB	1EX1479
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	400GB	1EX1296
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	400GB	1EX1298
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	400GB	1EX1309
Sandisk® Cloudspeed Ultra Gen. II w/ 3.5 in to 2.5 in drive carrier	SSD	SATA 6Gb/s	RI-1.8DW/D	SE	400GB	1EX1294
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	400GB	1EX2020
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	400GB	1EX2021
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	400GB	1EX2087
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	SE	400GB	1EX2012
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	ISE	400GB	1EX2013
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	TCG	400GB	1EX2083
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	TCG	480GB	1EX1318
Western Digital® Ultrastar® SS530	SSD	SAS 12Gb/s	RI-1DW/D	SE	480GB	1EX2030

Drive	Type	Interface	Drive Writes	Encryption	Volume	Part Number
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS530	SSD	SAS 12Gb/s	RI-1DW/D	ISE	480GB	1EX2031
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS530	SSD	SAS 12Gb/s	RI-1DW/D	TCG	480GB	1EX2092
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS200	SSD	SAS 12Gb/s	RI-3DW/D	ISE	800GB	1EX1290
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS200	SSD	SAS 12Gb/s	RI-3DW/D	SE	800GB	1EX1292
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS200	SSD	SAS 12Gb/s	RI-3DW/D	TCG	800GB	1EX1314
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS300	SSD	SAS 12Gb/s	RI-3DW/D	ISE	800GB	1EX1295
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS300	SSD	SAS 12Gb/s	RI-3DW/D	SE	800GB	1EX1297
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS300	SSD	SAS 12Gb/s	RI-3DW/D	TCG	800GB	1EX1308
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS300	SSD	SAS 12Gb/s	RI-3DW/D	TCG-FIPS	800GB	1EX1480
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS300	SSD	SAS 12Gb/s	ME-10DW/D	ISE	800GB	1EX1286
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS300	SSD	SAS 12Gb/s	ME-10DW/D	SE	800GB	1EX1288
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS300	SSD	SAS 12Gb/s	ME-10DW/D	TCG	800GB	1EX1311
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS300	SSD	SAS 12Gb/s	ME-10DW/D	TCG-FIPS	800GB	1EX1478
w/ 3.5 in to 2.5 in drive carrier						
Sandisk® Cloudspeed Ultra Gen. II	SSD	SATA 6Gb/s	RI-1.8DW/D	SE	800GB	1EX1305
w/ 3.5 in to 2.5 in drive carrier						

Drive	Type	Interface	Drive Writes	Encryption	Volume	Part Number
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	800GB	1EX2022
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	800GB	1EX2023
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	800GB	1EX2088
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	SE	800GB	1EX2014
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	ISE	800GB	1EX2015
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	TCG	800GB	1EX2084
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	TCG	960GB	1EX1317
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	SE	960GB	1EX2032
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	ISE	960GB	1EX2033
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	TCG	960GB	1EX2093
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	1.6TB	1EX1303
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	1.6TB	1EX1304
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	1.6TB	1EX1313
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	1.6TB	1EX1299
Western Digital®	SSD	SAS 12Gb/s	RI-3DW/D	SE	1.6TB	1EX1300

Drive	Type	Interface	Drive Writes	Encryption	Volume	Part Number
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	1.6TB	1EX1307
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG-FIPS	1.6TB	1EX1787
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-10DW/D	ISE	1.6TB	1EX1301
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-10DW/D	SE	1.6TB	1EX1302
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-10DW/D	TCG	1.6TB	1EX1310
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	TCG-FIPS	1.6TB	1EX1786
Sandisk® Cloudspeed Ultra Gen. II w/ 3.5 in to 2.5 in drive carrier	SSD	SATA 6Gb/s	RI-1.8DW/D	SE	1.6TB	1EX1319
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	1.6TB	1EX2024
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	1.6TB	1EX2025
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	1.6TB	1EX2089
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	SE	1.6TB	1EX2016
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	ISE	1.6TB	1EX2017
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	TCG	1.6TB	1EX2085
Western Digital® Ultrastar® SS200	SSD	SAS 12Gb/s	RI-1DW/D	TCG	1.92TB	1EX1316

Drive	Type	Interface	Drive Writes	Encryption	Volume	Part Number
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS530	SSD	SAS 12Gb/s	RI-1DW/D	SE	1.92TB	1EX2034
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS530	SSD	SAS 12Gb/s	RI-1DW/D	ISE	1.92TB	1EX2035
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS530	SSD	SAS 12Gb/s	RI-1DW/D	TCG	1.92TB	1EX2094
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS200	SSD	SAS 12Gb/s	RI-3DW/D	ISE	3.2TB	1EX0578
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS300	SSD	SAS 12Gb/s	RI-3DW/D	ISE	3.2TB	1EX1285
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS300	SSD	SAS 12Gb/s	RI-3DW/D	SE	3.2TB	1EX1306
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS530	SSD	SAS 12Gb/s	RI-3DW/D	SE	3.2TB	1EX2026
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS530	SSD	SAS 12Gb/s	RI-3DW/D	ISE	3.2TB	1EX2027
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS530	SSD	SAS 12Gb/s	RI-3DW/D	TCG	3.2TB	1EX2090
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS530	SSD	SAS 12Gb/s	ME-10DW/D	SE	3.2TB	1EX2018
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS530	SSD	SAS 12Gb/s	ME-10DW/D	ISE	3.2TB	1EX2019
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS530	SSD	SAS 12Gb/s	ME-10DW/D	TCG	3.2TB	1EX2086
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS200	SSD	SAS 12Gb/s	RI-1DW/D	ISE	3.84TB	1EX0579
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS200	SSD	SAS 12Gb/s	RI-1DW/D	ISE	3.84TB	1EX0579
w/ 3.5 in to 2.5 in drive carrier						

Drive	Type	Interface	Drive Writes	Encryption	Volume	Part Number
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	SE	3.84TB	1EX2036
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	ISE	3.84TB	1EX2037
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	TCG	3.84TB	1EX2095
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	6.4TB	1EX2028
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	6.4TB	1EX2029
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	6.4TB	1EX2091
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	SE	7.68TB	1EX0580
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	SE	7.68TB	1EX2038
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	ISE	7.68TB	1EX2039
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	TCG	7.68TB	1EX2096
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	SE	15.36TB	1EX2040
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	ISE	15.36TB	1EX2041
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	TCG	15.36TB	1EX2097

System Management Overview

This chapter provides an overview of the system management features available in the Ultrastar Data60 through the in-band SAS connections using SG3_utils software, and out-of-band using a REST interface over HTTPS to access Western Digital's implementation of the DMTF Redfish API.

In This Chapter:

- Firmware Features Overview..... 35
- Supported Operating Systems..... 36
- OOBM Management Overview.....36
- SCSI Enclosure Services Page 02.....36

2.1 Firmware Features Overview

The enclosure services functionality is compatible with the SES-3 (SES3r14) 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 Ultrastar Data60 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 Ultrastar Data60 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 storage subsystem may be updated via SES.

SES Status

The SEP services SES status pages. 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. The SES status is updated every 0.5s. 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 Supported Operating Systems

Table 24: Compatible Operating Systems

OS Support	
Microsoft® Windows	2012 R2 x64 Server
	2016 R1 x64 Server
	2019 R1 x64 Server
CentOS/RedHat® Enterprise Linux (RHEL)	7.2 (x86_64) Kernel: 3.10.0-327
	7.3 (x86_64) Kernel: 3.10.0-514
	7.4 (x86_64) Kernel: 3.10.0-693
	7.6 (x86_64)
Ubuntu® Server	14.04 Kernel: 3.13
	16.04 Kernel: 4.4
Debian	8.10
	9.6

2.3 OOBM Management Overview

The Ultrastar Data60 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. The OOBM ports are configured for DHCP by default.

2.4 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 02 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.

Component Overviews

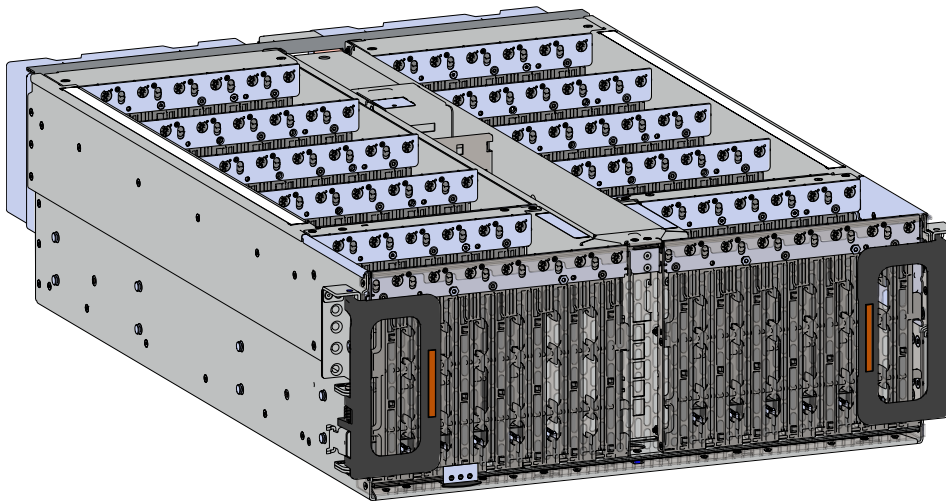
This section is intended to give an overview of all of the major components contained within the Ultrastar Data60. Each section includes specifications, descriptions, and images that explain the features of each component.

In This Chapter:

- Chassis Description.....	39
- IOM Description.....	41
- PSU Description.....	43
- Rear Fan Description.....	44
- IOM Fan Description.....	46
- Rails Description.....	48
- CMA Description.....	51
- Drive Assembly Description.....	54

3.1 Chassis Description

Figure 15: Overview Image



The chassis is the primary housing that contains and connects all of the system components that comprise the Ultrastar Data60. 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 . 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.

3.1.1 Chassis Specifications

Table 25: Specification Summary

Specification	Value
Dimensions	447 mm x 807 mm x 172.7 mm / 17.6 in. x 31.77 in. x 6.8 in.

Specification	Value
Part Number	1EX0443 / 1EX0442 for single IOM chassis replacement
Hot Swappable?	No
Weight	20 kg / 44 lbs

3.1.2 Chassis Layout

Figure 16: Layout

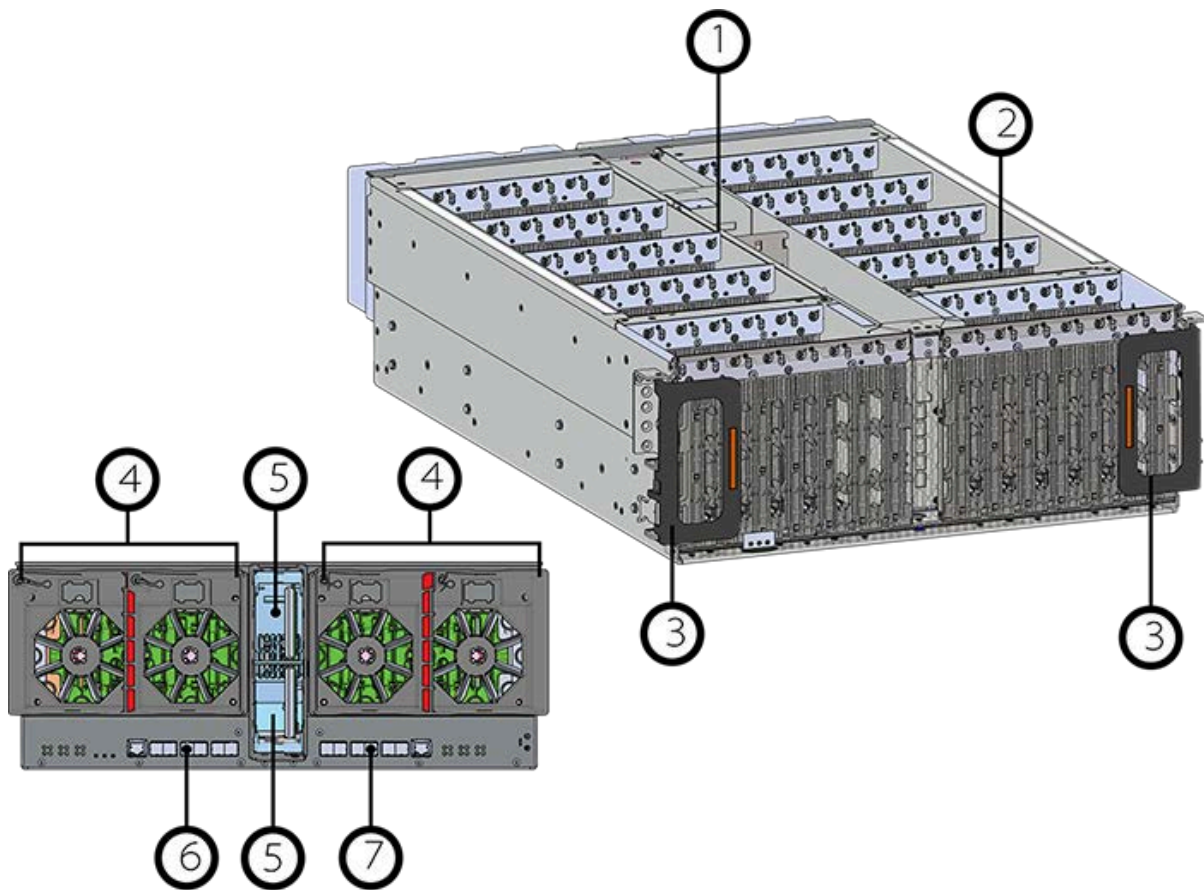



Table 26: Exterior Components

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

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

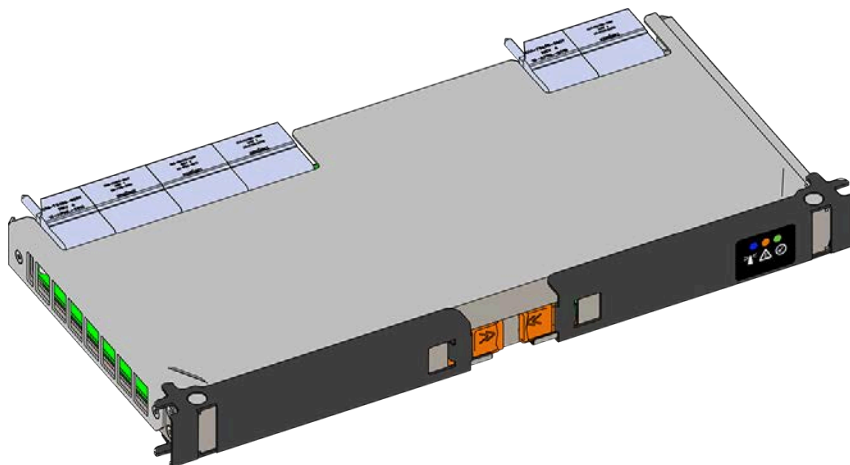
The chassis has a removable lid that encloses the internal system components and ensures proper airflow. The drive bays are comprised of 16 sections that isolate the data storage drives from transmitting vibration to one another. There is a long central bay that contains the enclosure's IOMs and the 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 Ultrastar Data60. 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.

3.2 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 are installed into the central bay from the top of the Chassis and connect to the drive board. The baseboard completes the connection to the Mini-SAS HD ports that extend out of the rear of the enclosure.

The IOM contains a primary and two SAS expander chips, and an out-of-band management (OOBM) chip that connects to the management port on the rear of the enclosure.

3.2.1 IOM Specifications

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

3.2.2 IOM Layout

Figure 18: Layout

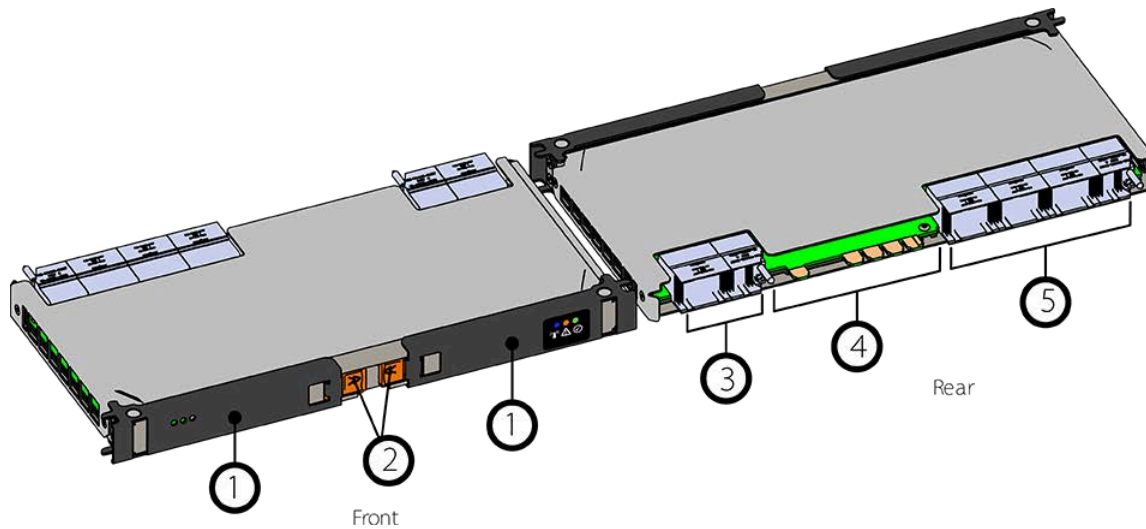
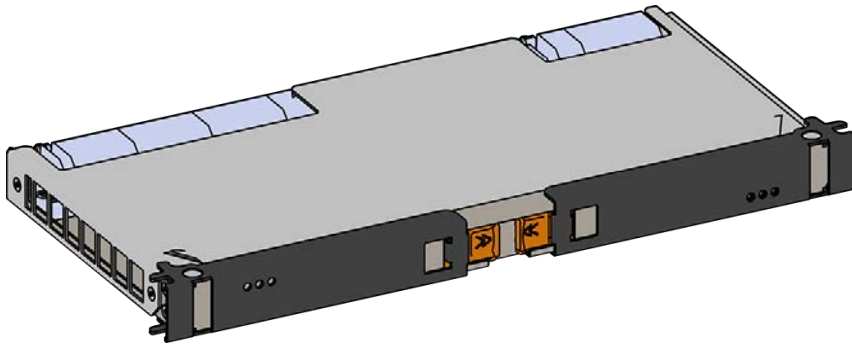


Table 27: Exterior Components

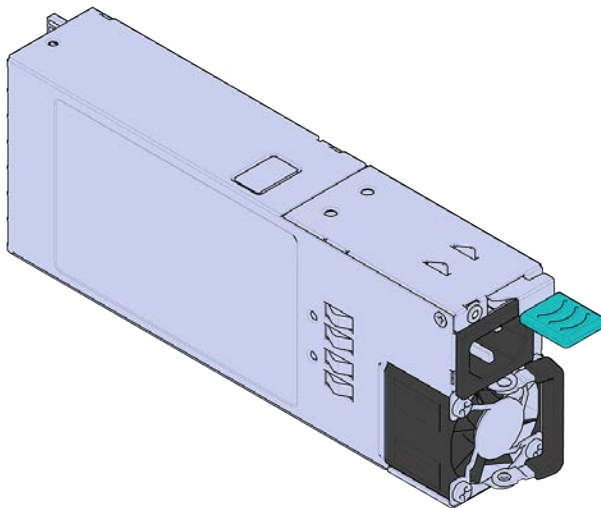
Number	Feature
1	IOM Handle
2	Latch Release
3	Internal IO Connector
4	Card Edge Power Receptacle
5	Internal IO Connector

3.2.3 IOM Blank Description

Figure 19: Overview Image

The IOM Blank is a placeholder component that is used to fill the unused IOM slot, in versions of the Ultrastar Data60 that do not leverage redundant IOMs. The IOM Blank may only be installed into IOM slot B under all circumstances. When at the front of the enclosure, Slot B is the left-hand slot. It is necessary to have a blank installed in this unused slot in order to ensure the proper airflow dynamics that are within operational parameters designed for the enclosure, but has no functional component beyond this feature.

3.3 PSU Description

Figure 20: Overview Image

Ultrastar Data60 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.

3.3.1 PSU Specifications

Specification	Value
Power Output	1600W
80 PLUS Standard	Platinum

Specification	Value
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.

3.3.2 PSU Layout

Figure 21: Layout

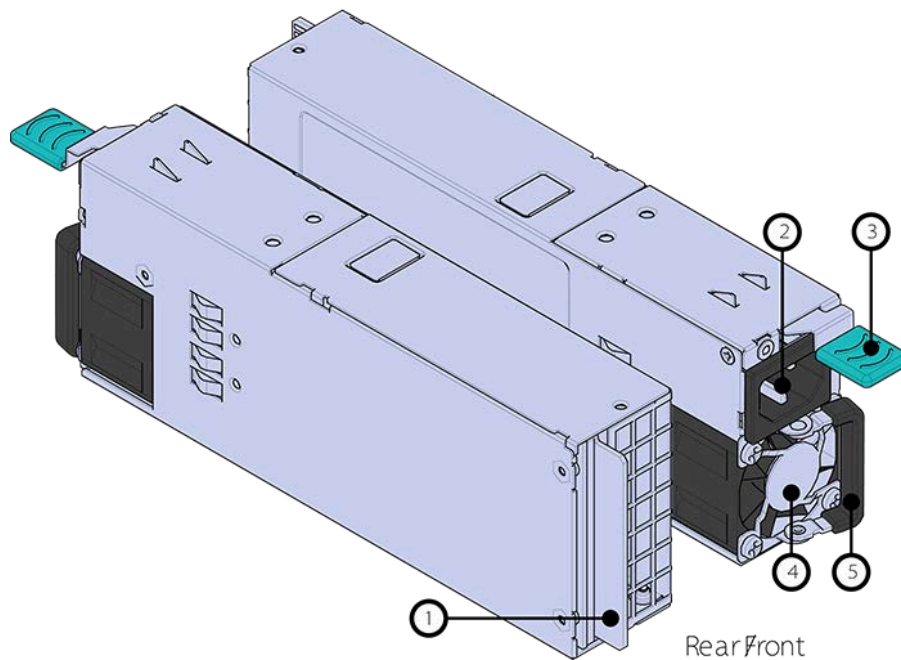
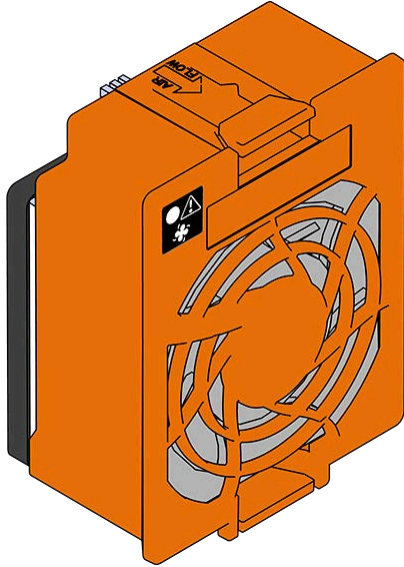


Table 28: Exterior Components

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

3.4 Rear Fan Description

Figure 22: Overview Image



The Rear Fans are toolless fan modules that provide the primary system cooling for the Ultrastar Data60. 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.

3.4.1 Rear Fan Specifications

Table 29: Specification Summary

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

3.4.2 Rear Fan Layout

Figure 23: Layout

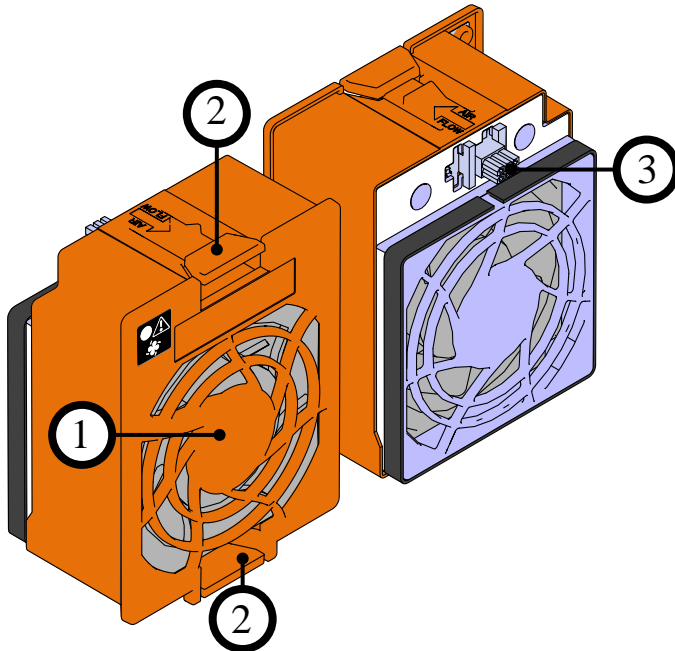
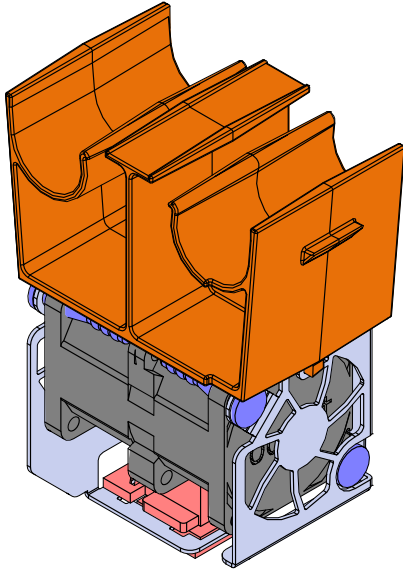


Table 30: Exterior Components

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

3.5 IOM Fan Description

Figure 24: 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.

3.5.1 IOM Fan Specifications

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

3.5.2 IOM Fan Layout

Figure 25: Layout

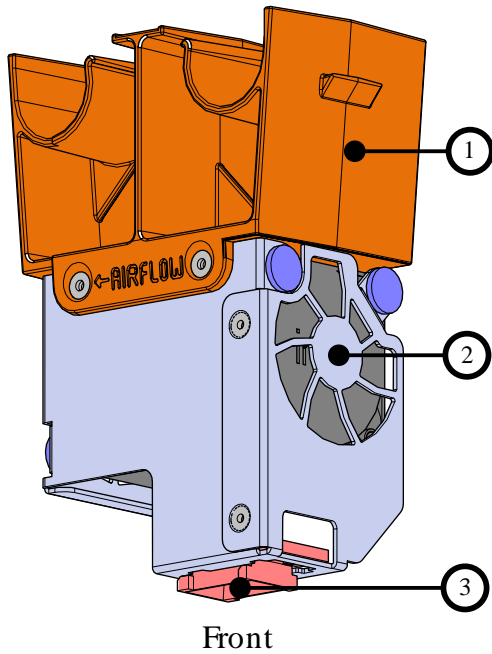
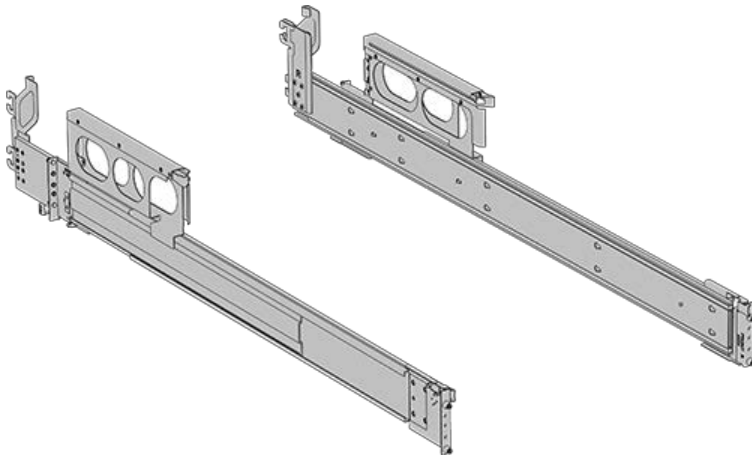


Table 31: Exterior Components

Number	Feature
1	Latch Mechanism
2	Fan Module
3	Internal Connector

3.6 Rails Description

Figure 26: Overview Image

The Ultrastar Data60 is installed into a rack using a toolless-attach rail system. The rails are a two-piece system with one rail that attaches directly to the chassis called the inner rail and the other that attaches to the rack. 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 24"-32". 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.

3.6.1 Rails Specifications

Specification	Value
Length	1028.7 mm/40.5 in.
Part Number	1EX0435
Hot Swappable?	No
FRU or CRU?	CRU
Weight	6.07 kg total, 3.03 kg/rail / 13.4 lbs. total, 6.7/rail

3.6.2 Rails Layout

Figure 27: Layout

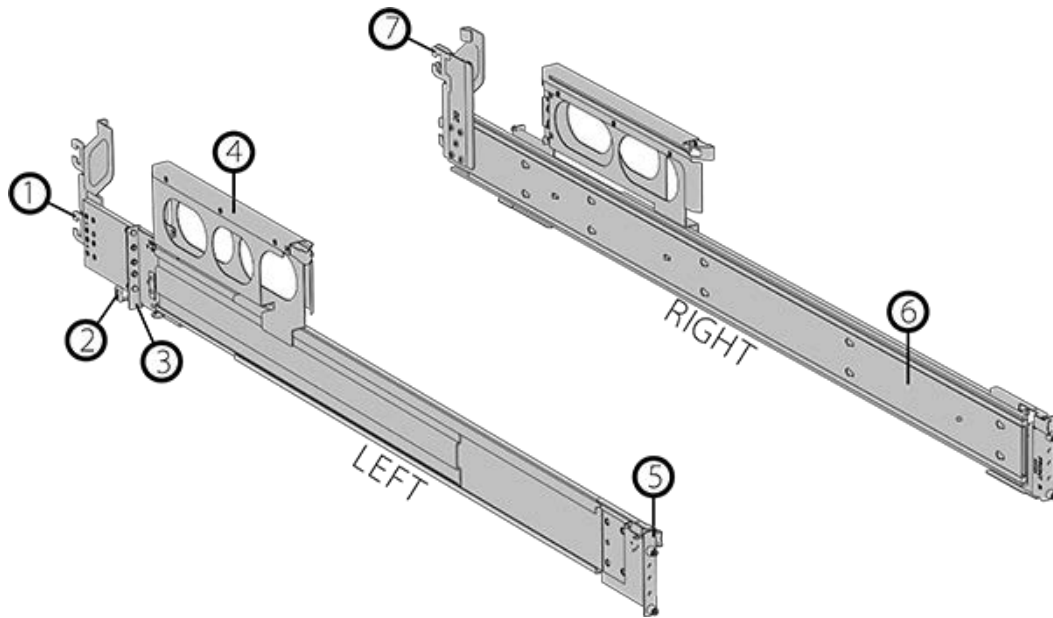
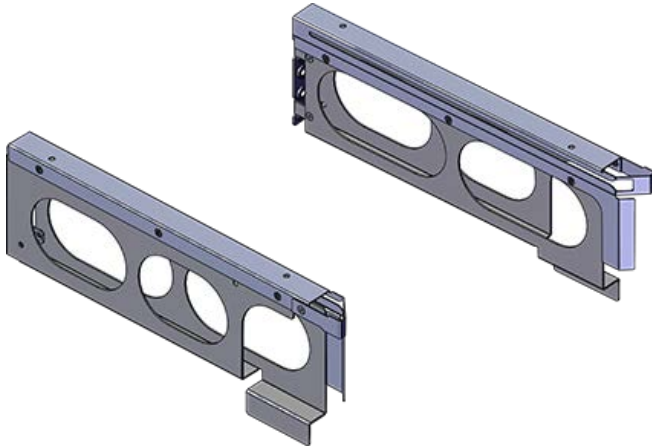


Table 32: Exterior Components

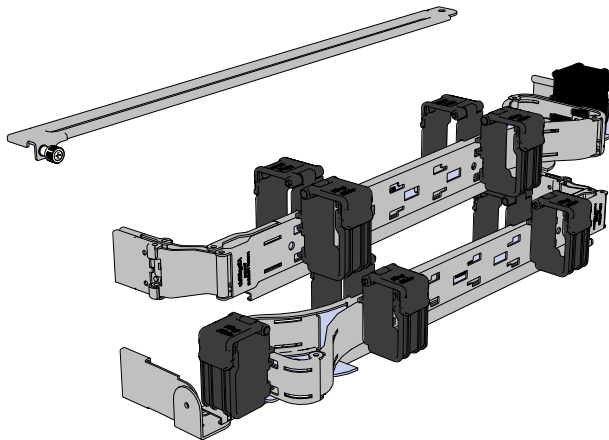
Number	Features
1	Lower CMA Connectors
2	Rear Latch Release
3	Rear Rack Mounting Bracket
4	Rear Cover Alignment Bracket
5	Front Rack Mounting Bracket and Latch Release
6	Inner Rail
7	Upper CMA Connectors

3.6.3 Rear Cover Alignment Bracket Description

Figure 28: Overview Image

The rear cover alignment brackets are designed to keep the top cover of the chassis in the rack while extending the Ultrastar Data60 out of the rack for servicing. The rear cover alignment brackets will attach to the rear vertical rack rails and rest on top of the toolless rail system.

3.7 CMA Description

Figure 29: 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 Ultrastar Data60 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 Ultrastar Data60 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.

3.7.1 CMA Specifications

Specification	Value
Extension Range	0 - 36 in.
Number per Enclosure	1 assembly (2 arms)
Part Number	1EX0437
Hot Swappable?	No
Maximum Number of Cables	12 SAS Cables
	2 Power Cords
	2 Ethernet
FRU or CRU?	CRU
Weight	1.54 kg, 0.77/arm / 3.4 lbs., 1.7/arm

3.7.2 CMA Layout

Figure 30: Layout

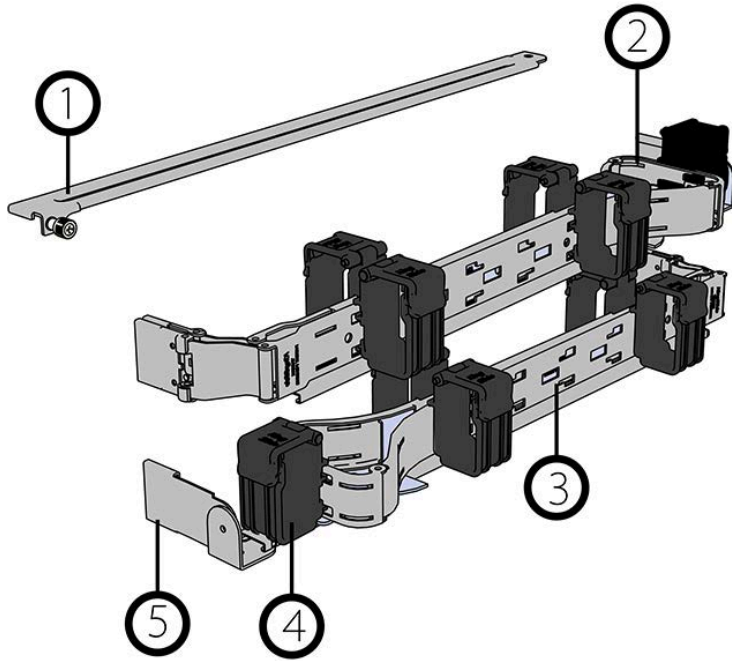
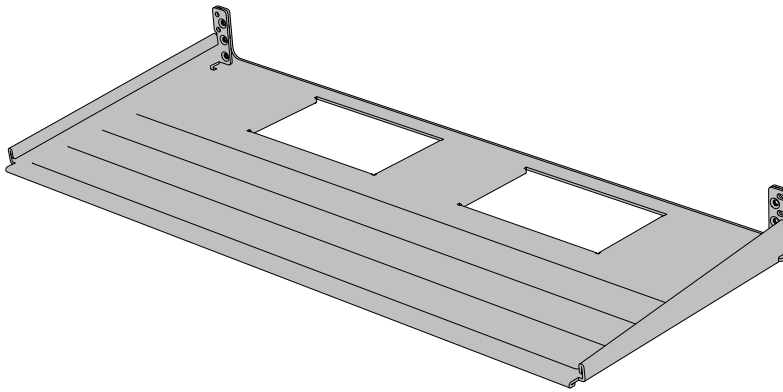


Table 33: Exterior Components

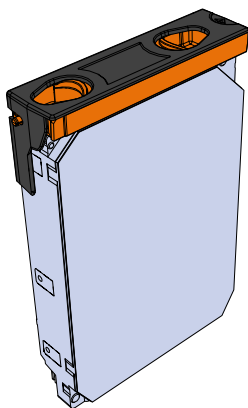
Number	Feature
1	Crossbar
2	Rail and Rack Connectors
3	Baskets (retains cables)
4	Arm
5	Elbow Connector

3.7.3 CMA Cable Tray

Figure 31: 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.

3.8 Drive Assembly Description

Figure 32: 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.

3.8.1 Drive Assembly Specifications

Specification	Value
Number per Enclosure	up to 60 drives
Part Number	See the List of Compatible Drives (page 19) to find the specific part number required.
Hot Swappable?	Yes
Weight	.68 kg / 1.5 lbs.

3.8.2 Drive Assembly Layout

Figure 33: Layout

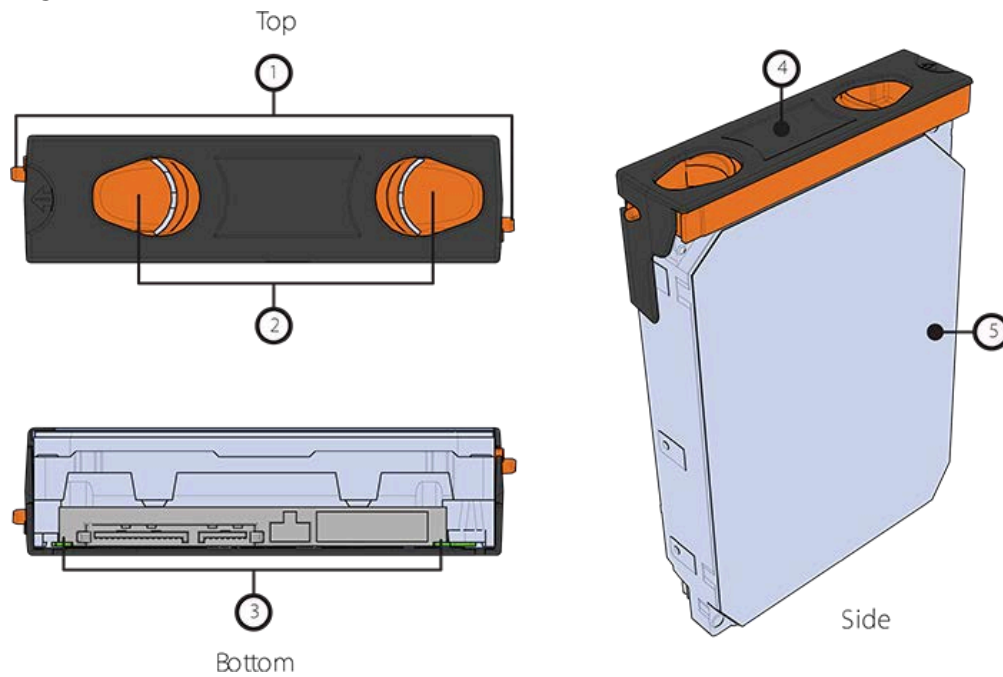
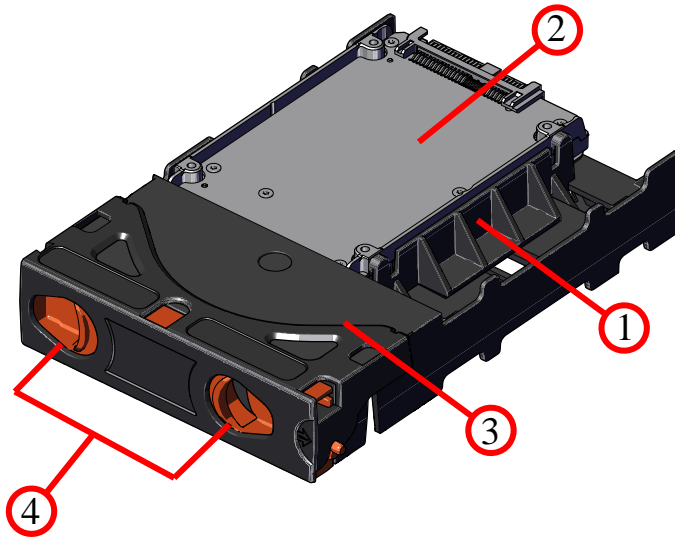


Table 34: Exterior Components

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

3.8.3 2.5" Drive Carrier Description

Figure 34: Overview Image



The 2.5" carrier assembly is used to adapt a 2.5" form factor data storage drive to the 3.5" drive slots in the Ultrastar Data60 drive bays. This allows the enclosure to accommodate high speed SSD drives as its primary data storage medium. The carrier operates by utilizing an innovative clamping mechanism. The 2.5" drive is seated in the orientation shown the overview image. Then the clamp is inserted to apply pressure to the SSD and secure it in place.

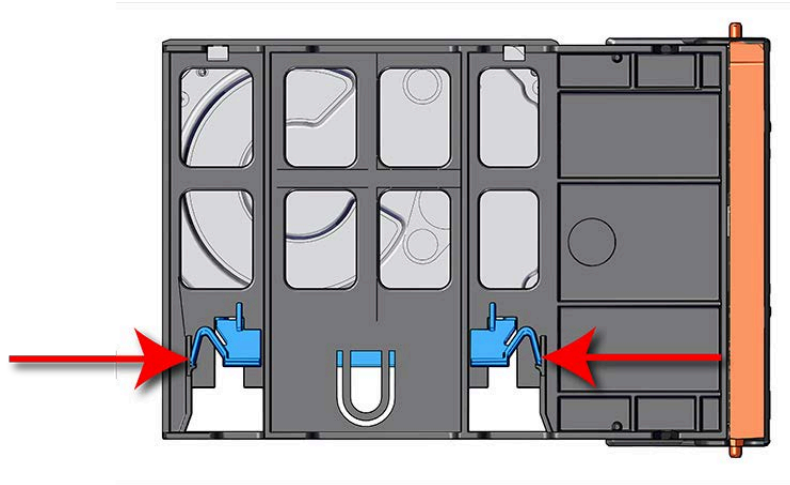
Table 35: SSD Features

Number	Feature
1	Drive Holder Clamp
2	SSD
3	Carrier Shell
4	Drive Latch Release

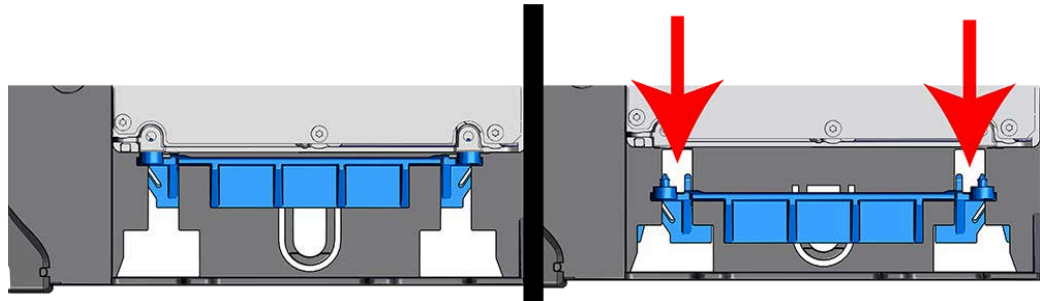
3.8.3.1 Operating the 2.5" Drive Carrier

Follow these steps to operate the clamping mechanism and install a 2.5" drive in the carrier.

Step 1: Locate the release clips on the rear and press them inward to release the clamp.

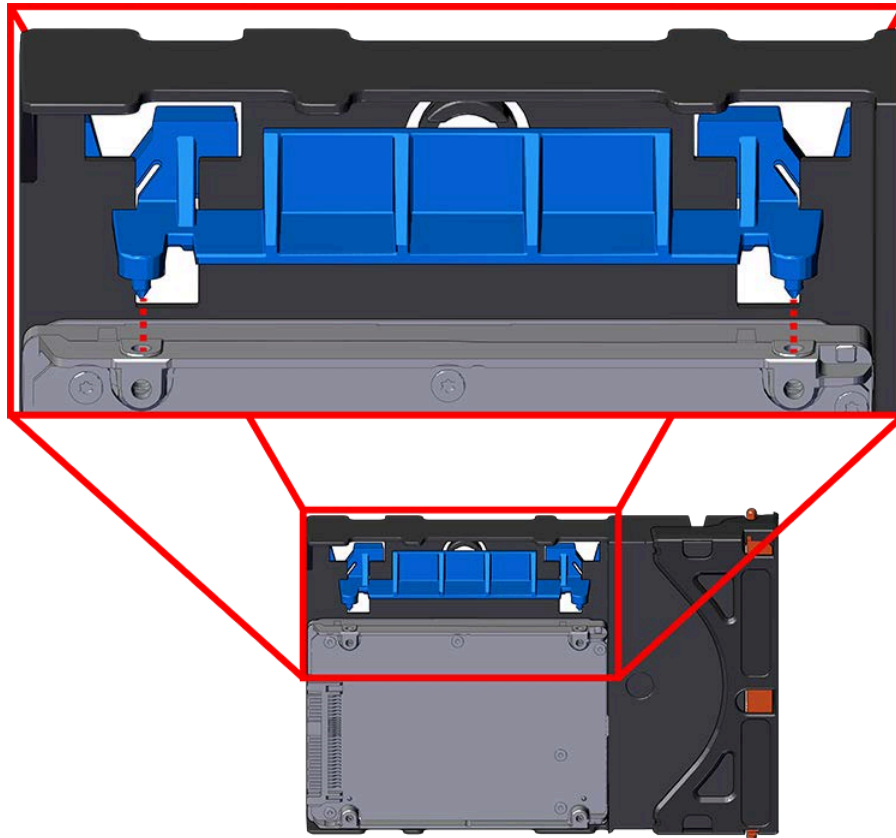
Figure 35: Clamp Release (clamp shown in blue for visual clarity)

Step 2: Slide the clamp in the direction shown in the following image to loosen it from the drive. Be sure not to slide too far as this will allow the clamp to fall from the carrier body and it will have to be reinstalled.

Figure 36: Clamp Slide (clamp shown in blue for visual clarity)

Step 3: Insert the 2.5" drive into the drive slot so that it is snug into the corner.

Step 4: Slide the clamp back toward the drive making sure that the two plastic pins on the side of the drive properly install into the drive screwholes. If these pins are not seated properly, unlatch the clamp and retry.

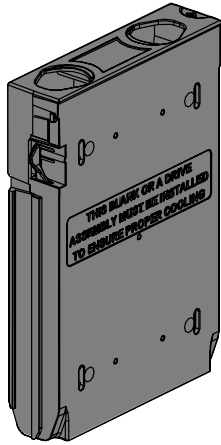
Figure 37: Clamp Pins (clamp shown in blue for visual clarity)

3.8.4 Drive Blank Description

The drive blank is a placeholder component that is used to fill empty drive slots in the chassis when a Ultrastar Data60 enclosure is partially populated with drives. The purpose of the drive blank is to maintain proper airflow and cooling of the enclosure and the components within the enclosure. For more information on requirements for a partially populated enclosure, see: [Partially Populated Enclosures \(page 204\)](#).

When the number of drives that are used in a row is less than the total that are necessary to fill that row, the drive blank is used to fill out the row in place of actual drives.

Figure 38: 3.5" Drive Blank Overview Image



Part Replacement

In This Chapter:

- Part Replacement Service Window..... 61
- IOM Replacement.....61
- PSU Replacement..... 64
- Rear Fan Replacement..... 67
- IOM Fan Replacement.....70
- Drive Assembly Replacement..... 71
- CMA Replacement.....76
- Rails Replacement..... 93
- Chassis Replacement..... 122
- Special Considerations for Cable Routing..... 157

4.1 Part Replacement Service Window

The following table contains a time required and a replacement window related to each hot swappable replacement part within the enclosure. The time required for replacement is the expected amount of time it requires to replace the part. The replacement window is the amount of time that the enclosure can be open for servicing. If the enclosure cover is open for a period lasting longer than the replacement window, the enclosure may reduce access to drives and other components to reduce the occurrence of thermal issues.

Table 36: Replacement Service Window

Part	Time Required	Replacement Window
IOM	60s	5 Minutes
PSU	60s	5 Minutes
Rear Fan	60s	5 Minutes
IOM Fan	60s	5 Minutes
Drive Assembly	60s	5 Minutes



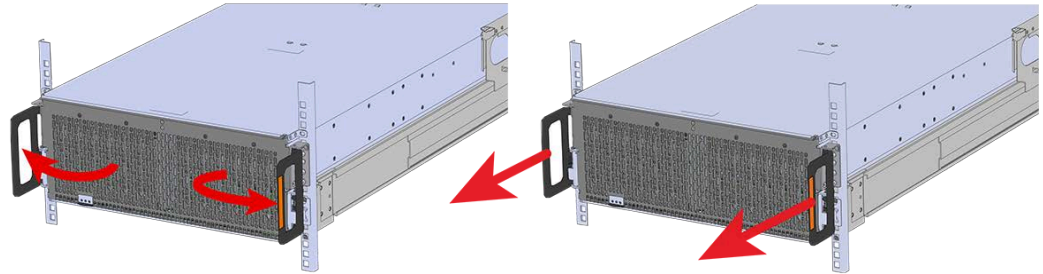
Attention: In the case of multiple part failures, a failed fan should **always** be replaced before any other part is replaced. Once the enclosure cover is open, the failed fan **must** be removed within a minute. The remainder of the replacement of a failed fan should be completed within the 5 minute replacement window.

4.2 IOM Replacement

Table 37: Replacement Procedure Info

Required Tools	# of People Required	Time Required	Replacement Window
None	1	60s	5 Minutes

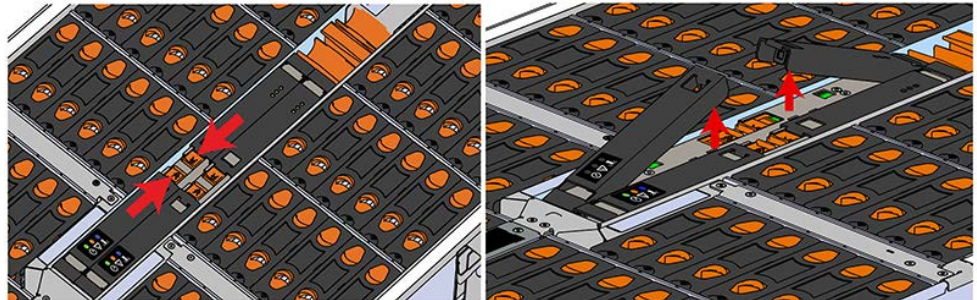
Step 1: Grasp both handles at the front of the enclosure and pull with even pressure to extend the chassis out of the rack until it is stopped by the safety latches. The safety latches will prevent the enclosure from coming out of the rack completely and the cover will remain in the rack attached to the rear alignment brackets.

Figure 39: Chassis Handle Operation

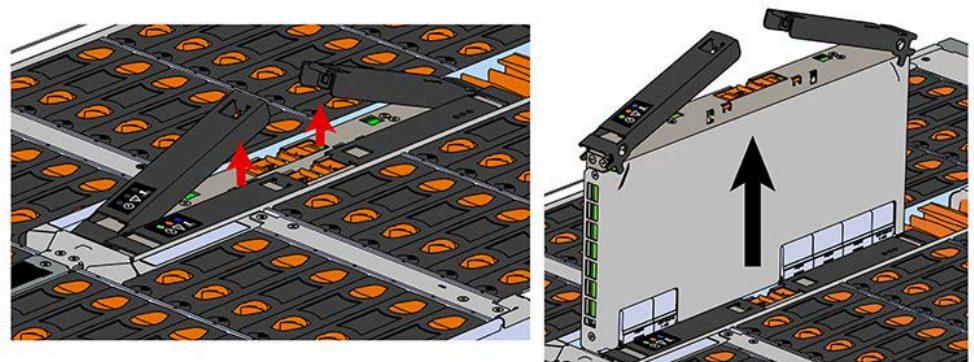
Step 2: Locate the faulty IOM by the amber LED that will be lit on top if there is a fault or by activating the identify LED on the IOM being replaced.

Step 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 40: 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 41: Removing IOM

Step 4: Remove the new IOM from its packaging.

Step 5: Install the IOM.


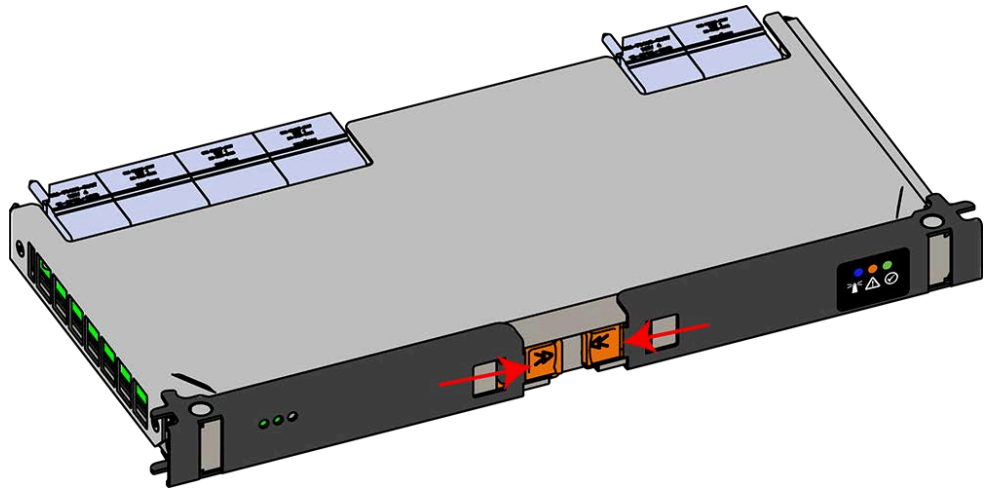
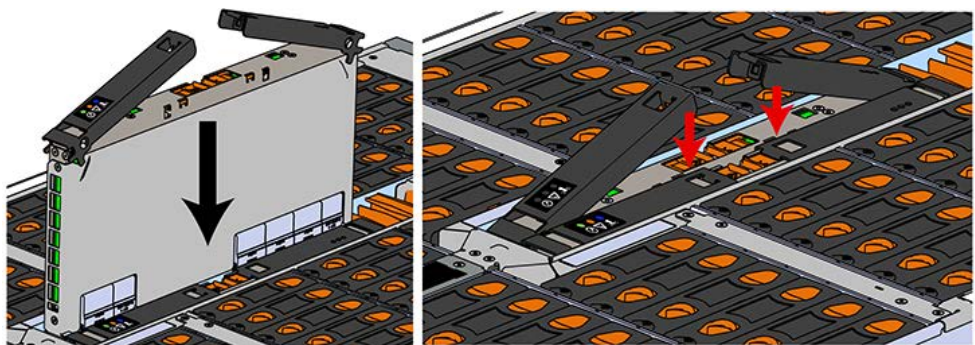
- a.  **Caution:** If a pin on the IOM's internal connectors is bent or damaged, the IOM will have to be replaced. For this reason it is imperative that the IOM is not forced into position, that it is inserted straight, and that the directions for installing the IOM are followed exactly.
- b. Ensure 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 42: 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 43: 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.

Step 6: Push the chassis back into the rack. Verify that the fans have slowed to their regular RPM. This ensures that the enclosure is back to its proper cooling settings.

Step 7: Check the fault LEDs on the IOM or on the enclosure's front and rear LED panels to determine if there is a firmware mismatch between the replacement IOM and the IOM that was not replaced.

a. If the fault LED is illuminated, open a command prompt on the host server and issue the following command using SG3_utils.

```
sg_ses <dev> -p 3
```

Remember to replace the <dev> field with the appropriate value related to the IOM in slot A.

b. Scan the output for the ESCE element status descriptor. If it is critical, then there is a firmware mismatch.

c. To fix the firmware mismatch perform an upgrade to the current firmware revision by following the upgrade instructions here: [Firmware Upgrade \(page 163\)](#)

4.3 PSU Replacement

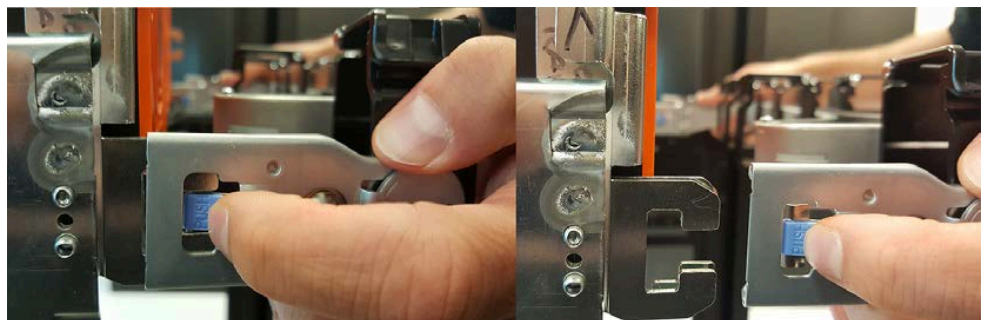
Table 38: Replacement Procedure Info

Required Tools	# of People Required	Time Required	Replacement Window
None	1	60s	5 Minutes

Step 1: Place the CMA(s) into service position.

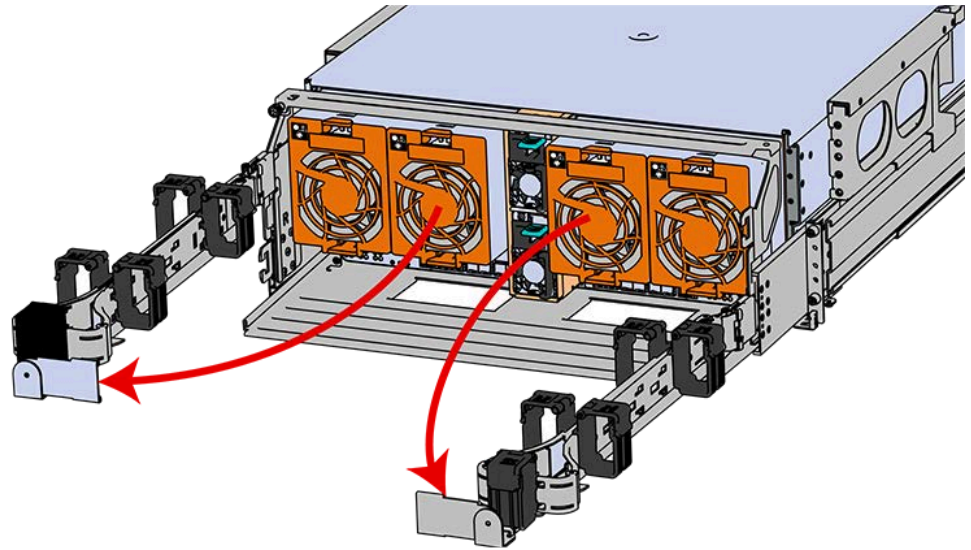
a. Unlatch the CMA(s) from the rail at the elbow connector by pressing the blue release button.

Figure 44: Unlatching a CMA Connector



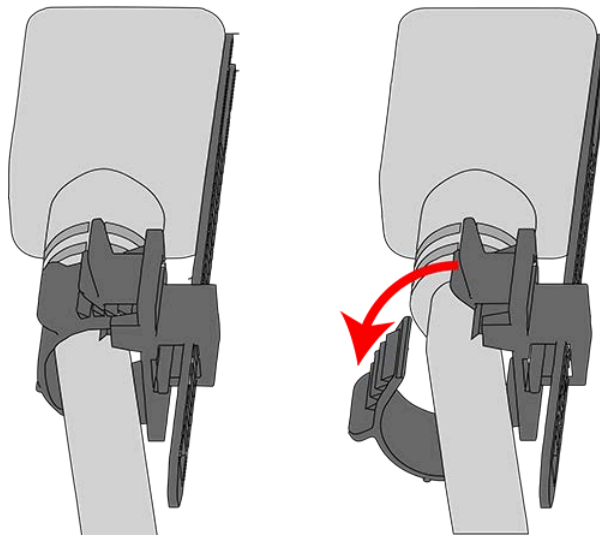
b. Swing the CMA(s) away from the enclosure.

c. The arm(s) should be extended away from the enclosure as shown in the following example.

Figure 45: CMA(s) in service position (Cables not shown)

Step 2: Locate the faulty PSU by finding the amber LED lit at the rear of the enclosure.

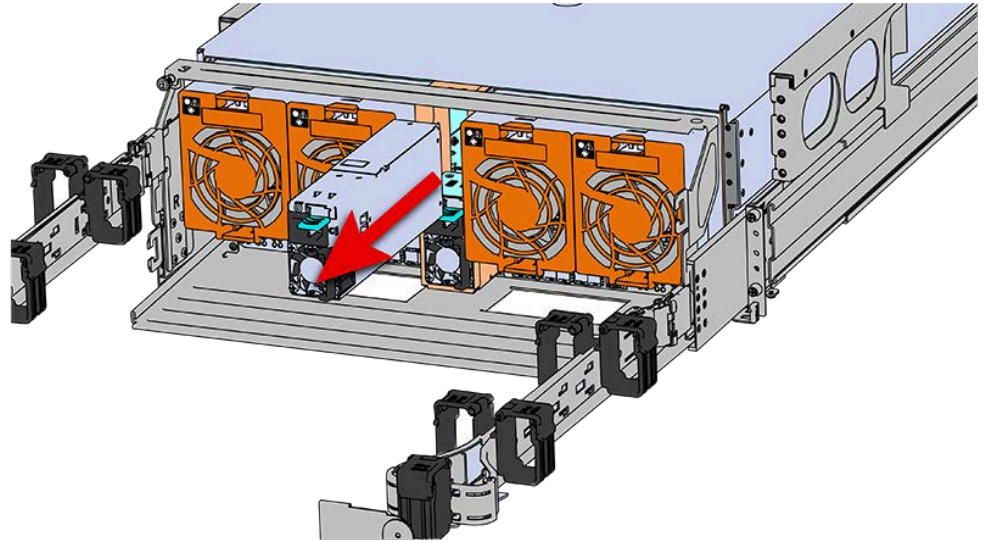
Step 3: Detach the retention clip from the PSU cable.

Figure 46: Cable Retention Mechanism

Step 4: Remove the power cable from the faulty PSU.

Step 5: Uninstall the PSU.

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

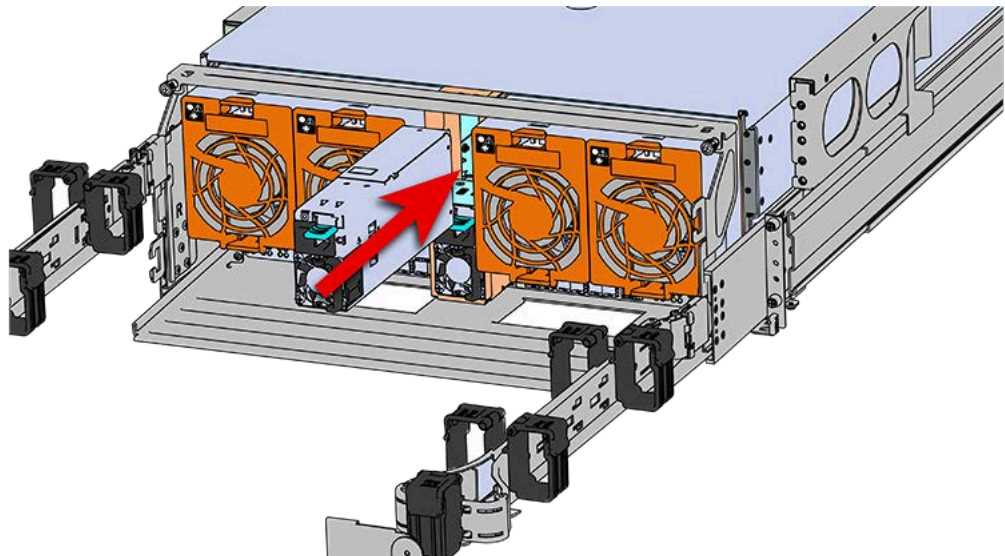
Figure 47: Uninstalling PSU

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

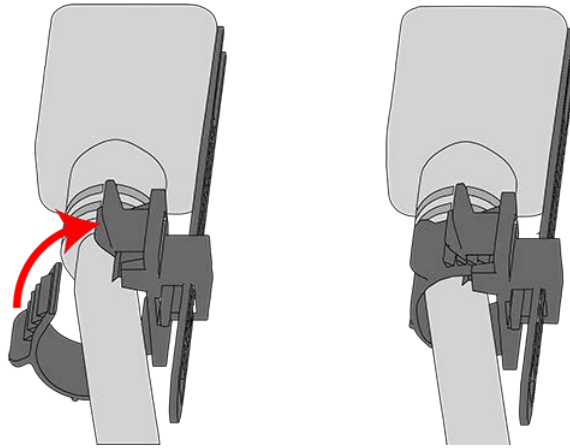
Step 6: Remove the new PSU from its packaging.

Step 7: Install the PSU.

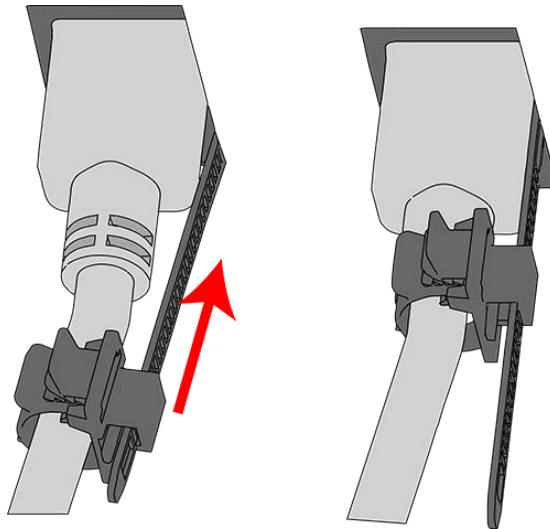
- a. Align the PSU in the orientation shown in the following image.
- b. Slide the PSU into the slot until it seats fully into the chassis.

Figure 48: 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 49: 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 50: Cinching Cable Retention Clip

- Step 8:** Make sure the CMA(s) is in operational position by folding the arm(s) in toward the enclosure and attaching the elbow end(s) to the connector(s) attached to the rail. Verify that all of the cabling is in functional order and does not bind or catch.

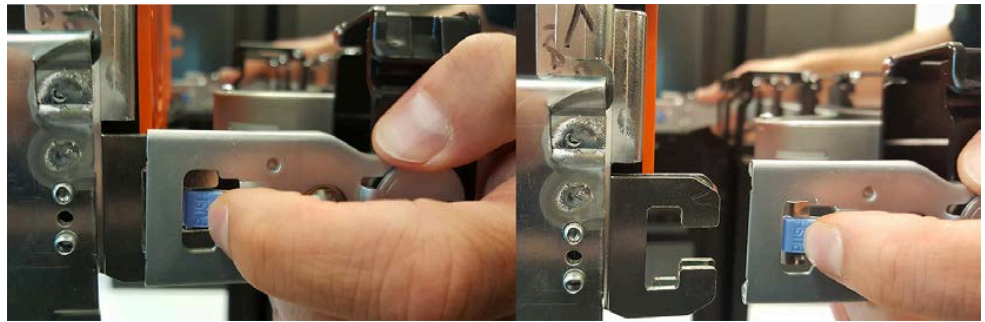
4.4 Rear Fan Replacement

Table 39: Replacement Procedure Info

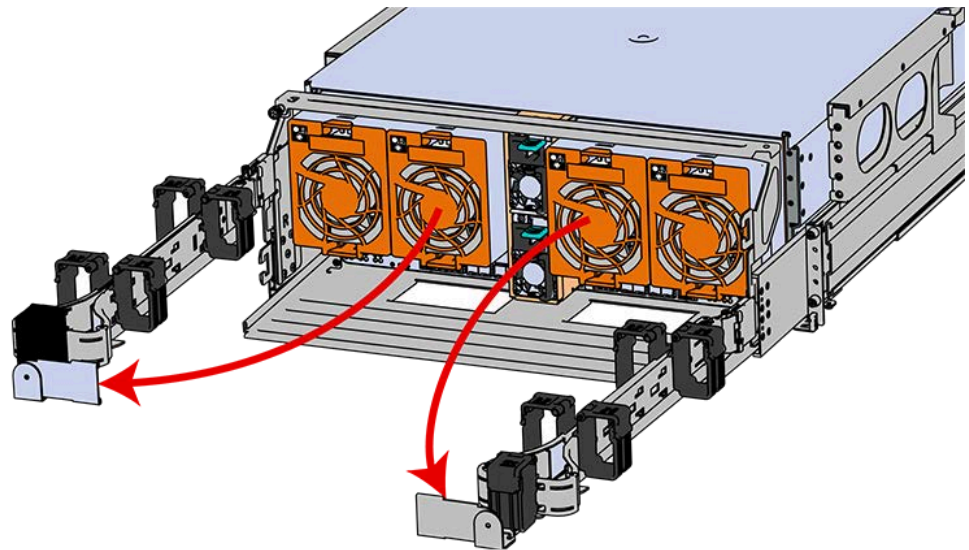
Required Tools	# of People Required	Time Required	Replacement Window
None	1	60s	5 Minutes

Step 1: Place the CMA(s) into service position.

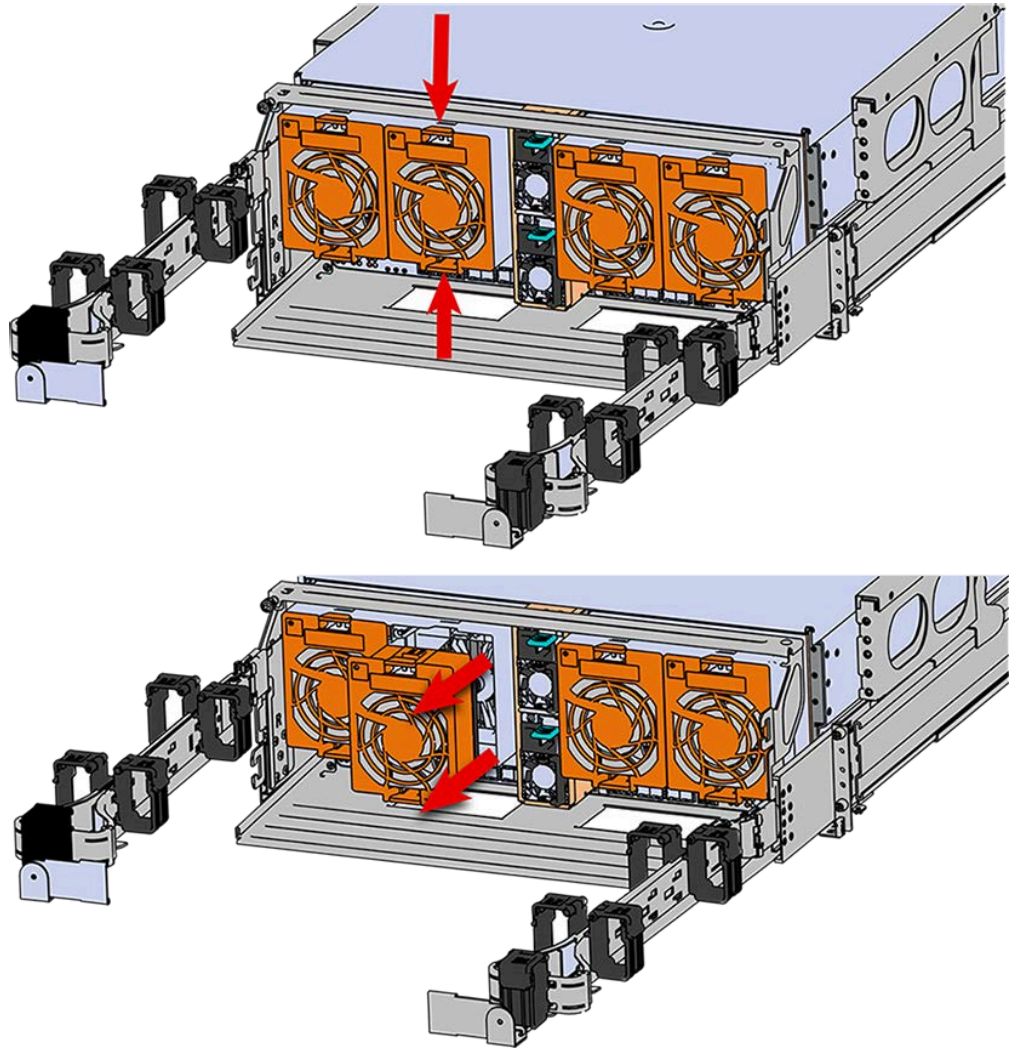
- a. Unlatch the CMA(s) from the rail at the elbow connector by pressing the blue release button.

Figure 51: Unlatching a CMA Connector

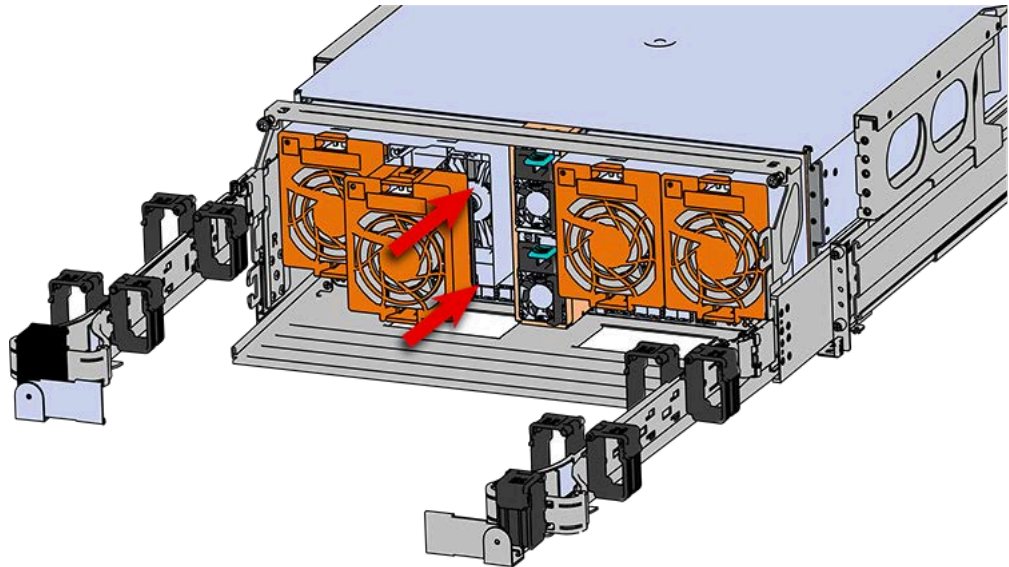
- b. Swing the CMA(s) away from the enclosure.
- c. The arm(s) should be extended away from the enclosure as shown in the following example.

Figure 52: CMA(s) in service position (Cables not shown)

Step 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 53: Uninstalling the Rear Fan**Step 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 54: Installing the Rear Fan

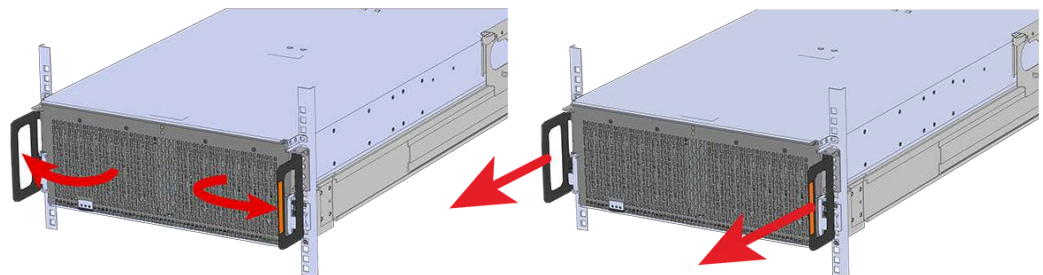
Step 4: Make sure the CMA(s) is in operational position by folding the arm(s) in toward the enclosure and attaching the elbow end(s) to the connector(s) attached to the rail. Verify that all of the cabling is in functional order and does not bind or catch.

4.5 IOM Fan Replacement

Table 40: Replacement Procedure Info

Required Tools	# of People Required	Time Required	Replacement Window
None	1	60s	5 Minutes

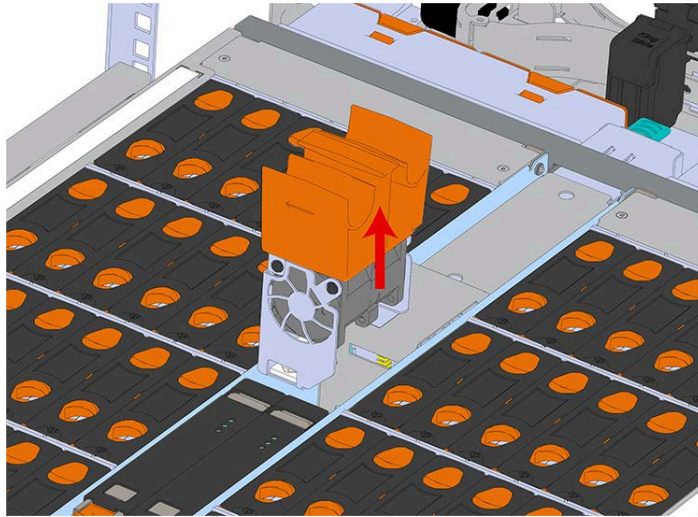
Step 1: Grasp both handles at the front of the enclosure and pull with even pressure to extend the chassis out of the rack until it is stopped by the safety latches. The safety latches will prevent the enclosure from coming out of the rack completely and the cover will remain in the rack attached to the rear alignment brackets.

Figure 55: Chassis Handle Operation

Step 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.

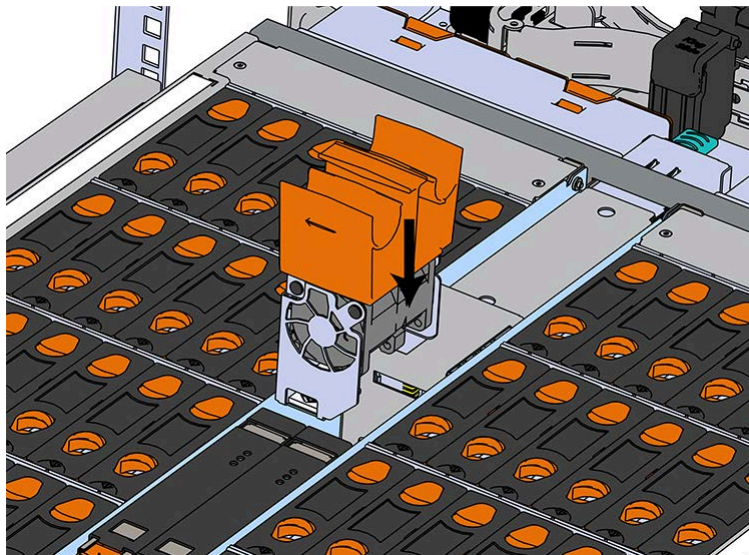
Figure 56: Removing IOM Fan



Step 3: Install the IOM Fan.

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

Figure 57: Installing the IOM Fan



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

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

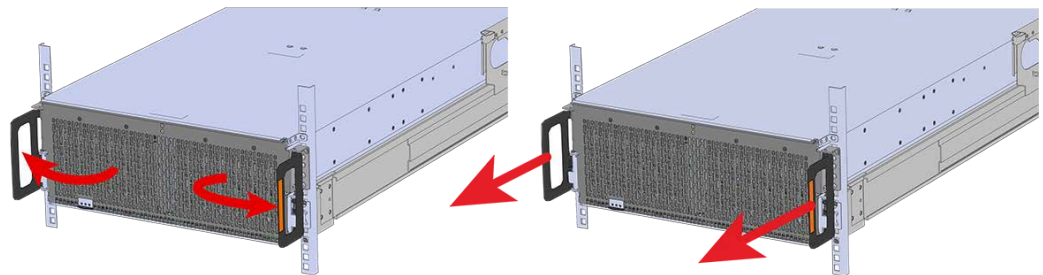
4.6 Drive Assembly Replacement

Table 41: Replacement Procedure Info

Required Tools	# of People Required	Time Required	Replacement Window
None	1	60s	5 Minutes

Step 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 and the cover will remain in the rack attached to the rear alignment brackets.

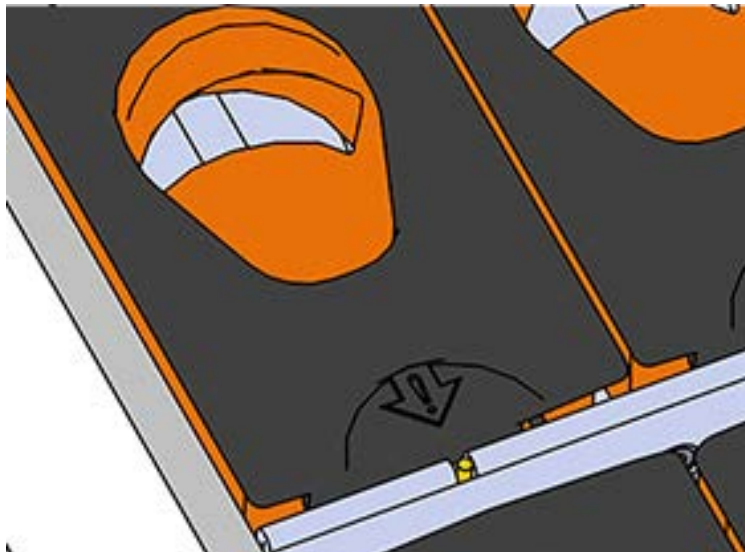
Figure 58: Chassis Handle Operation



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

Step 2: Locate the faulty Drive Assembly by finding the illuminated amber LED or by activating the identification LED for the drive to be replaced.

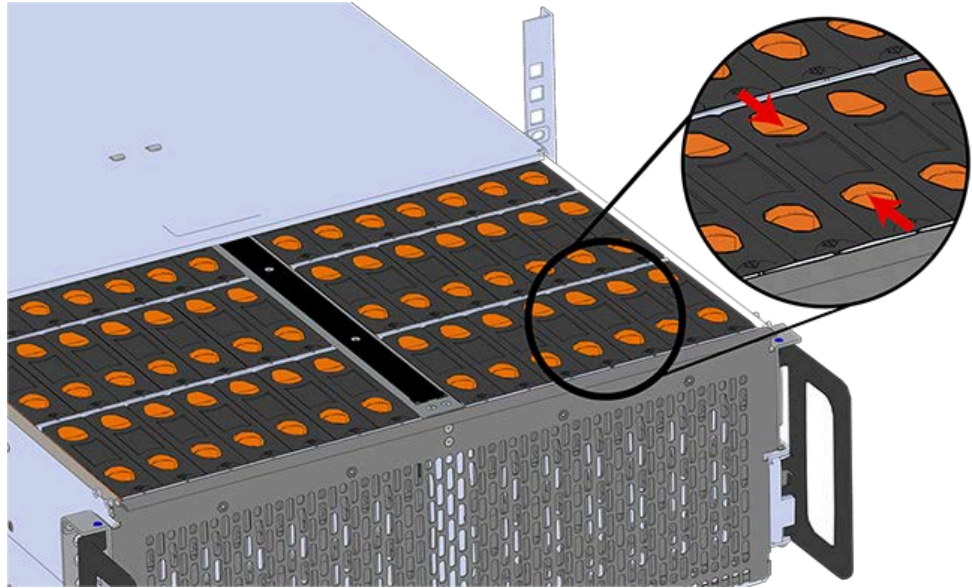
Figure 59: HDD Assembly LED



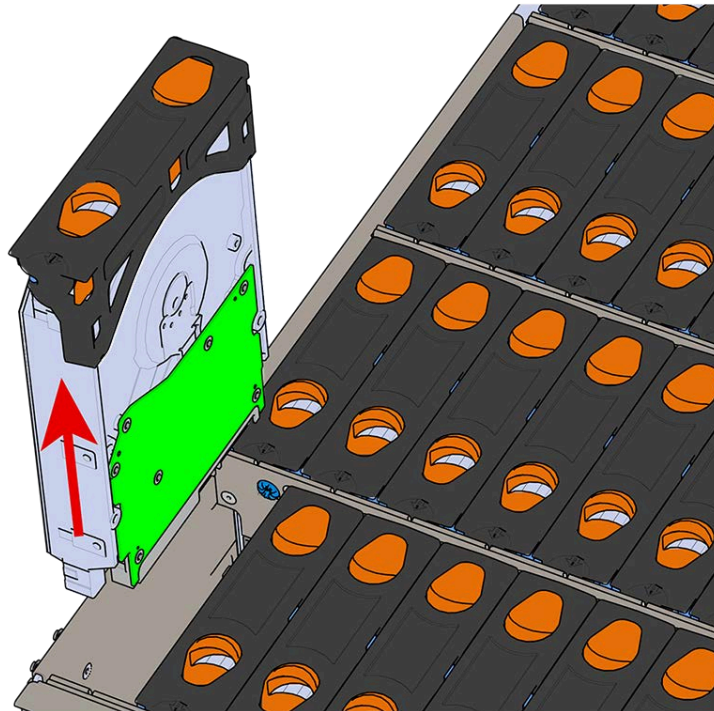
Step 3: Follow these steps to remove a Drive Assembly.

- 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 60: Unlatch Drive Carrier (IOM Not Shown)



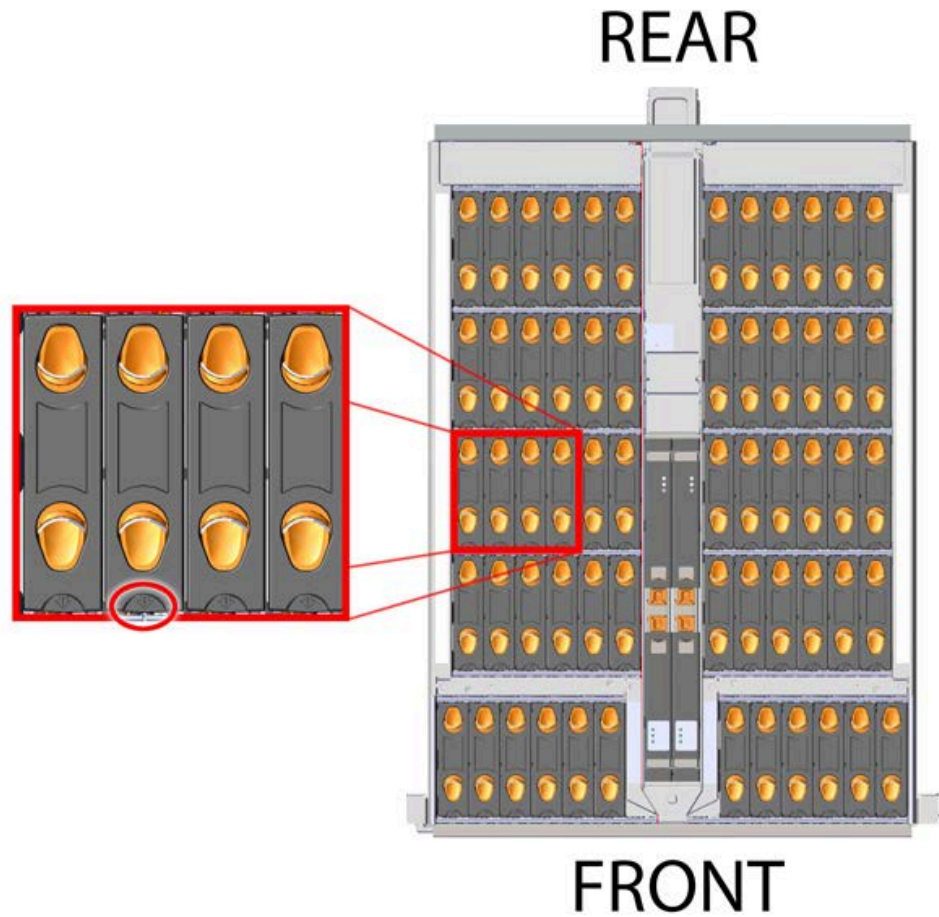
- c. Lift the Drive Assembly free from the enclosure.

Figure 61: Removing Drive Assembly

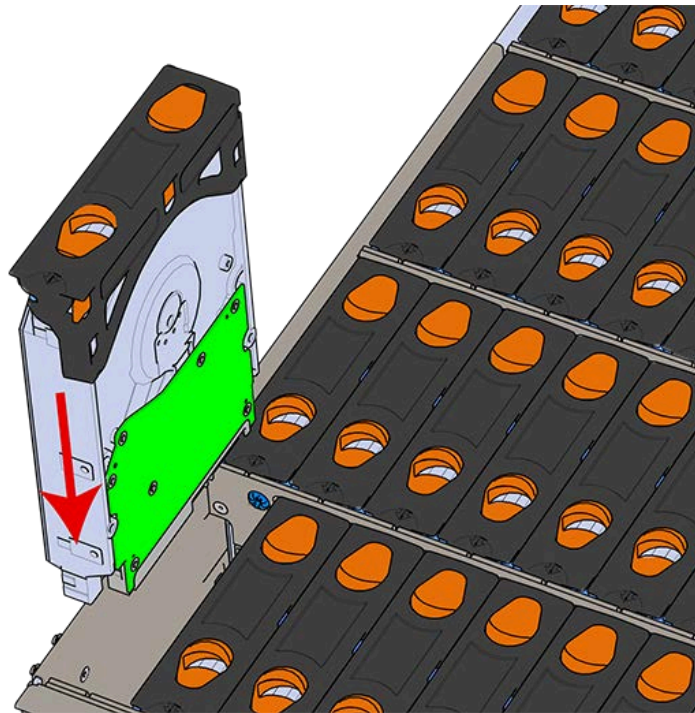
Step 4: Remove the new Drive Assembly from its packaging.

Step 5: Install the Drive Assembly.

- a. Ensure that the enclosure has been pulled out of the rack until the rail latches engage.
- b. Find the LED pointer on the top of the drive carrier. This pointer should point toward the front of the unit as shown in the following image.

Figure 62: LED Pointer Orientation

- c. Align the drive with the empty slot that will receive it. Lower it into the slot, making sure it stays level and does not snag.

Figure 63: Installing a Drive Assembly

- d. Pinch the latch release and carefully press downward to seat the Drive Assembly the rest of the way.

Step 6: Push the enclosure back into the rack to ensure proper cooling.

4.7 CMA Replacement

i **Attention:** The CMA Lite replacement package includes a CMA arm and spacer brackets. Replacing the CMA arm can be done with the enclosure in place in the rack. To replace the spacer brackets, the enclosure must be removed from the rack. For the replacement of a CMA arm alone, anything pertaining to the spacer brackets may be skipped.

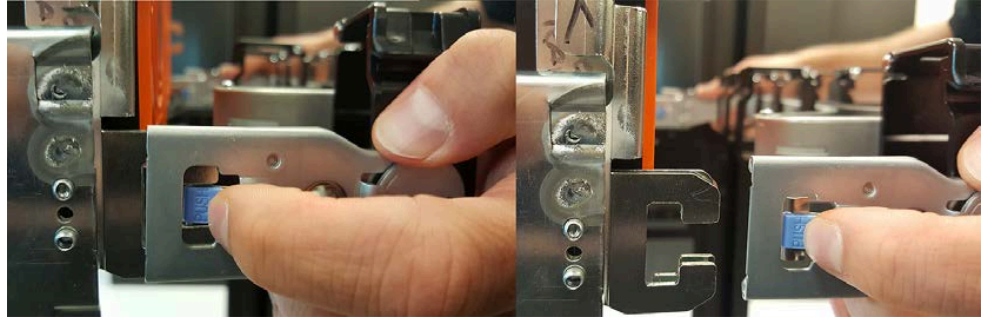
Table 42: Replacement Procedure Info

Required Tools	Required Parts	# of People Required	Time Required
<ul style="list-style-type: none"> # 2 Philips Screwdriver Cable Ties (for configurations with greater than 10 total cables) Tape Measure 	<ul style="list-style-type: none"> Low-Profile M4 x 3.2mm Philips screws 	1	15m

Step 1: Place the CMA(s) into the service position.

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

Figure 64: Unlatching a CMA Connector

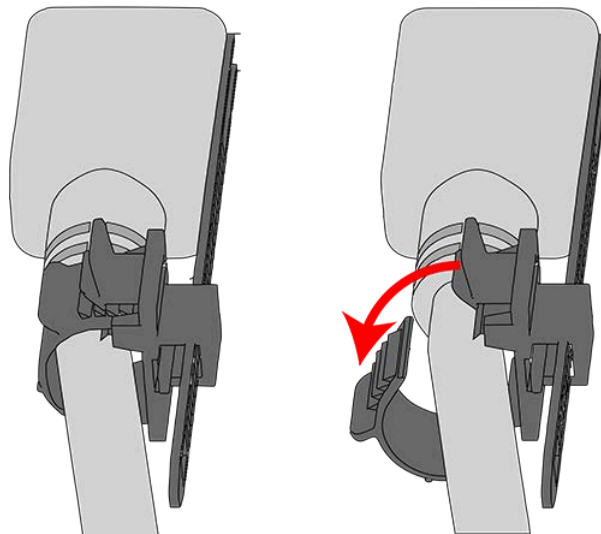


- b. Swing the CMA(s) away from the enclosure.
- c. The CMA arm(s) should be extended away from the enclosure.

Step 2: Disconnect the Enclosure from power.

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

Figure 65: Cable Retention Mechanism



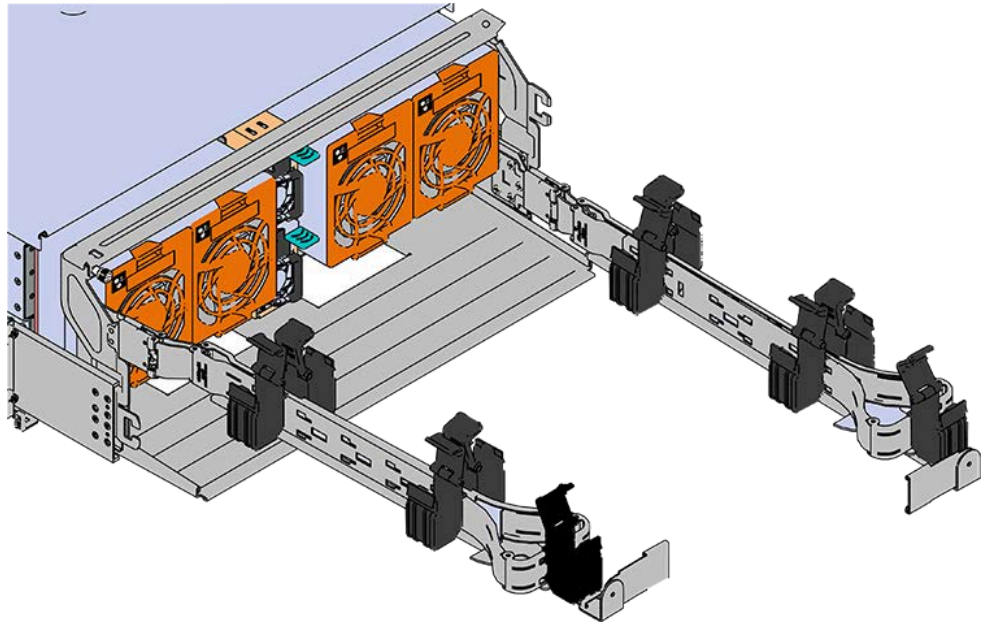
- c. Power down the enclosure by disconnecting both power cables, one from each PSU.

Step 3: Disconnect the remaining cables from the enclosure.

Step 4: Uncable the CMA(s).

CMA Standard:

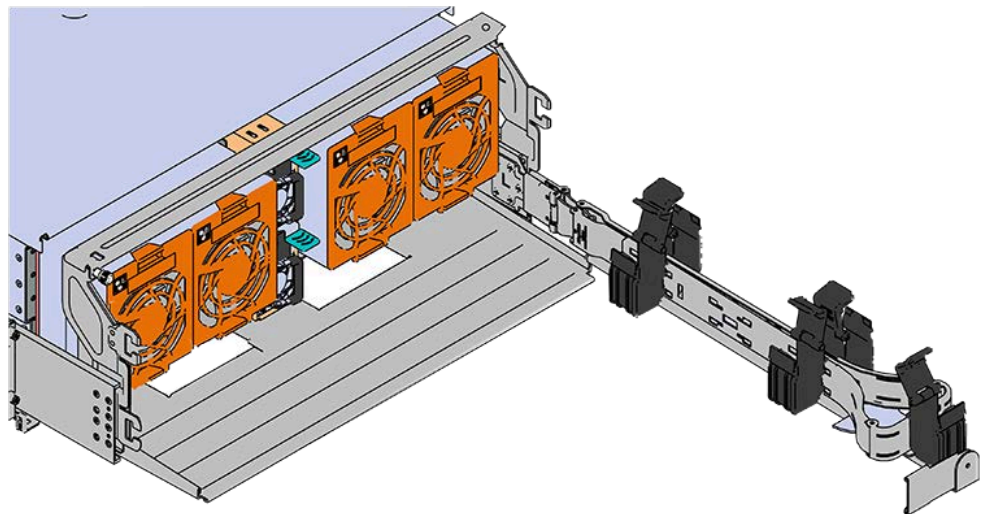
- a. Open all of the baskets on the CMA.

Figure 66: Open Baskets

- b.** Remove one cable from the CMA at a time making sure not to put too much strain on the arm.
- c.** Repeat these steps to remove the cables from the second arm.

CMA Lite:

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

Figure 67: Open Baskets

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

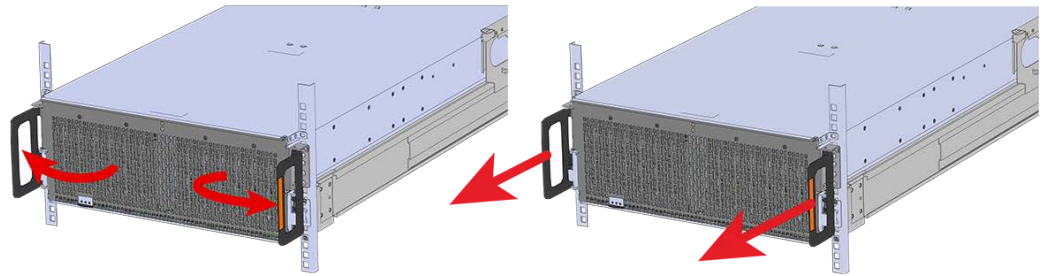
Step 5: Unlatch all of the connectors that attach the CMA(s) to the enclosure and the rail by locating the latch release button and pressing it from either side of the latch. There are three total connections that need to be removed, one at the elbow and two at the opposite end.

Figure 68: Unlatching a CMA Connector



Step 6: 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 and the cover will remain in the rack attached to the rear alignment brackets.

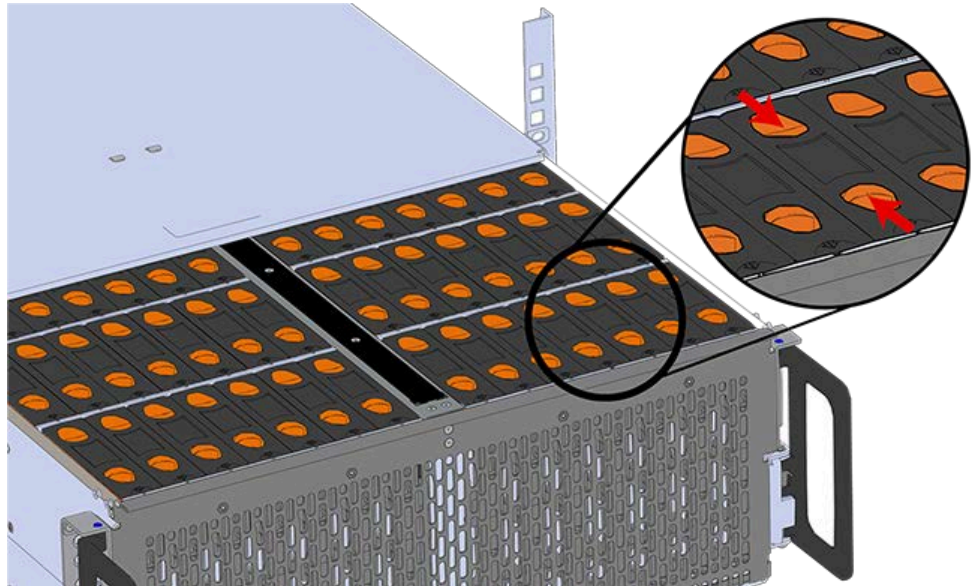
Figure 69: Chassis Handle Operation



Step 7: Follow these steps to remove a Drive Assembly.

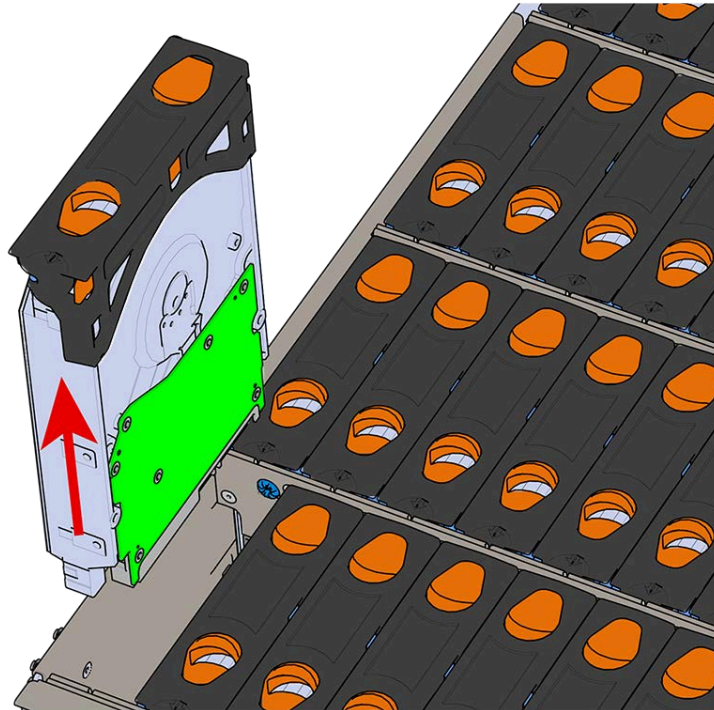
- a. Find the latch release mechanism on the Drive Assembly being removed.
- b. Insert a finger and a thumb into the latch release and pinch to unlatch the Drive Assembly.

Figure 70: Unlatch Drive Carrier (IOM Not Shown)



- c. Lift the Drive Assembly free from the enclosure.

Figure 71: Removing Drive Assembly




- Step 8:** 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.
- Step 9:** Release the safety latch on the inner rails on each side of the chassis as shown in the following image.

Figure 72: Inner Rail Safety Latch Release



- Step 10:** Remove the chassis from the rack.
- 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
 - 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 Ultrastar Data60. 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.

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

Figure 73: 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.



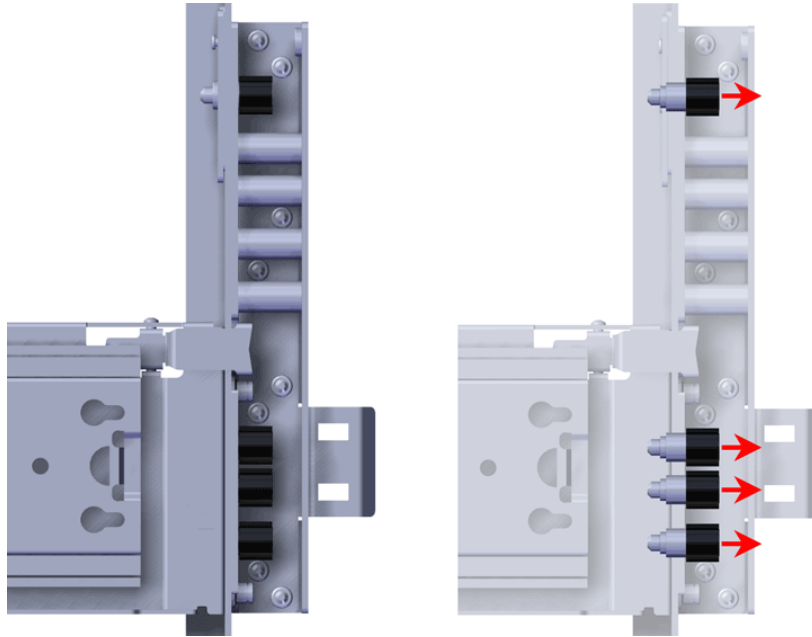
Warning: Do not lift the chassis by the Cable Tray while removing the chassis from the rack OR while installing it into a rack. This can cause serious damage to the unit or serious bodily harm to those handling the unit. Always team lift the chassis by gripping the underside of the unit, and never try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

- f. Slide the chassis forward to free it from the rails. Place the chassis in a safe location to avoid damage.

Step 11: CMA Lite: Uninstall the spacer brackets.

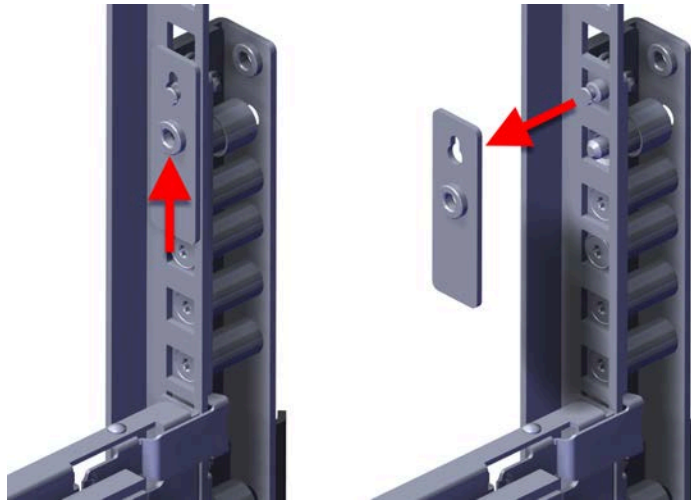
- a. Using a T15 Torx screwdriver, remove all four of the captive screws from the spacer bracket.

Figure 74: Captive Screws Removal



- b. Remove the nut plate from the mounting pin on the back of the spacer bracket.

Figure 75: Rack Spacer Nut Plate Removal



- c. Remove the spacer brackets from the rack.


Figure 76: Spacer Bracket Removal



Step 12: CMA Lite: Install the new spacer brackets.


Step 13: Install the chassis into the rails.

- a. Extend the bearing plates on the inside of the mid-rails until they are fully forward (detent has engaged). This prevents potential damage due to improper mating of the rails.

Figure 77: Bearing Plate

- b.  **Caution:** This step in the installation requires a minimum of 3 individuals to install safely, two to lift and one to guide the others who 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.** The only case in which the system may be installed or removed with the drives populated is if the facility has a lift that is rated to handle the maximum weight of the fully loaded system.

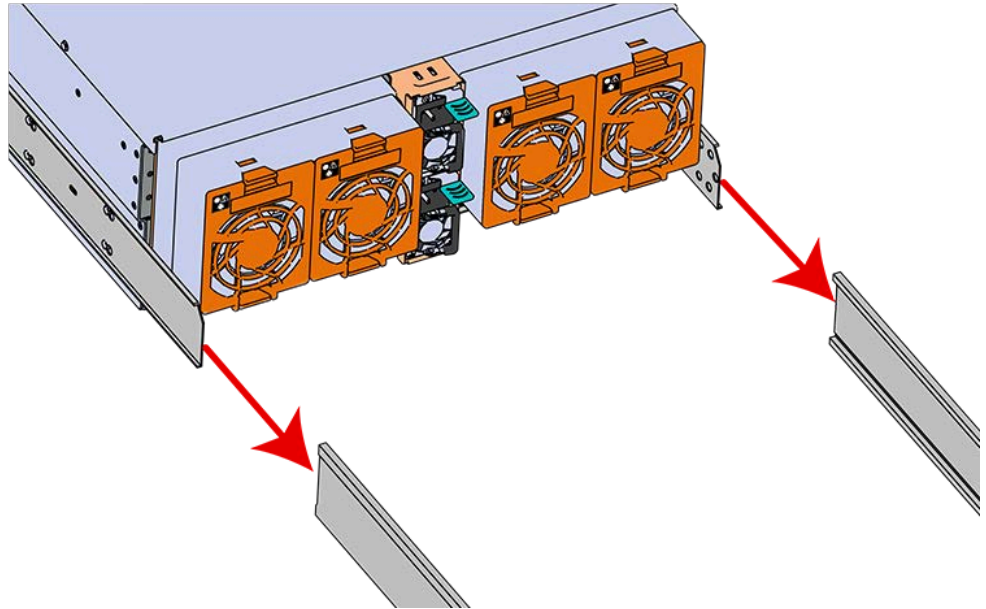
-  **Warning:**  The handles on the front of the chassis are not intended to be used to support the weight of the Ultrastar Data60. Lifting the unit by the chassis handles or trying to support the unit on the handles can cause them to fail. This can cause serious damage to the unit or serious bodily 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.

In preparation to perform a team lift, position one individual on each side of the enclosure (to lift) and a third individual standing at the protruding rack rails (to guide the chassis to mate with rack rails).

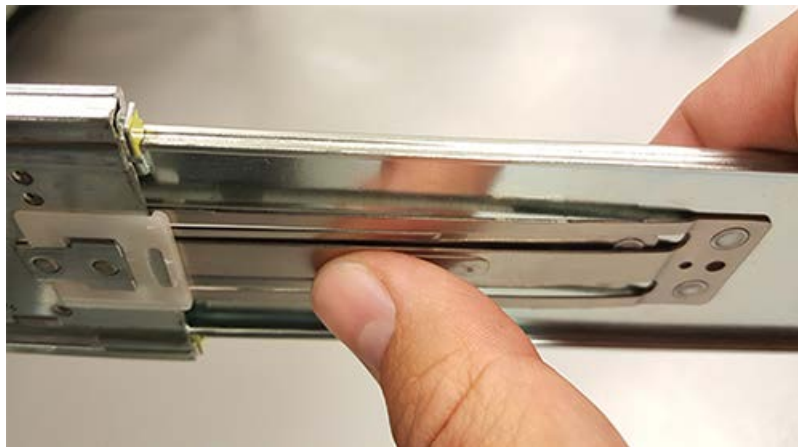
- c. Team-lift the enclosure until the inner rails (which are attached to the chassis) align with the extended mid-rails (which are attached to the rack), and guide the inner rails on the chasis to mate with the rack rails.

Figure 78: Installing the Chassis



- 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 each of the rails), and push the enclosure the rest of the way into the rack.

Figure 79: Safety Latch Release

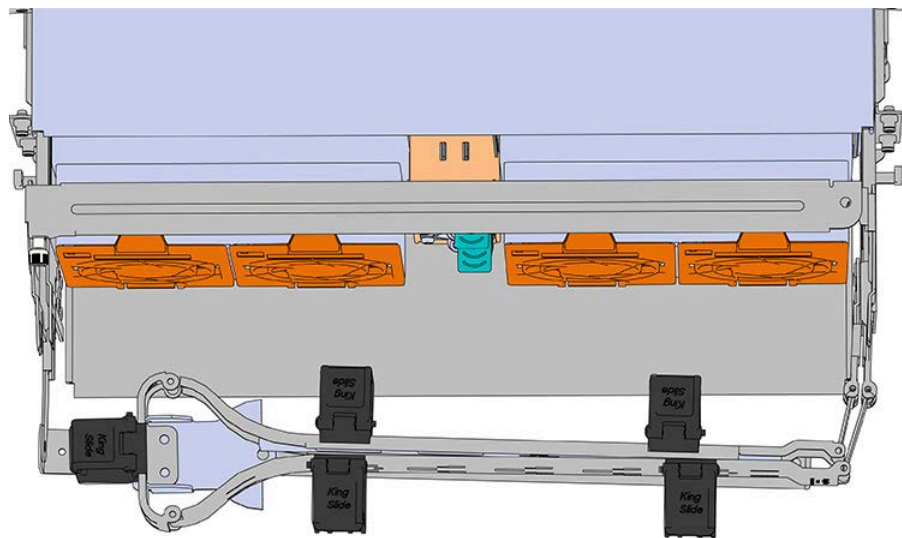


- e. As the chassis is slid into the rack, position one installer at the rear of the rack to ensure that the pegs on the sides of the cover will slide correctly into the rear cover alignment brackets on both sides of the rack. If the chassis does not install smoothly or snags, check that the rear cover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

Step 14: Install the CMA(s).

Note: The CMA has two arms, labeled "upper" and "lower." The lower arm should have the elbow on the left side and be installed first; the upper arm should have the elbow on the right side and be installed last.

- a. Orient the CMA so that the elbow is on the left hand side.
- b. Attach all three of the connectors to the brackets on the rails. There should be one at the elbow side and two at the other end.

Figure 80: Lower CMA Orientation

- c. Slowly slide the enclosure forward to ensure the arm is operating properly, then slide it back into the rack.
- a. Repeat these steps to install the upper arm with the elbow facing to the right.

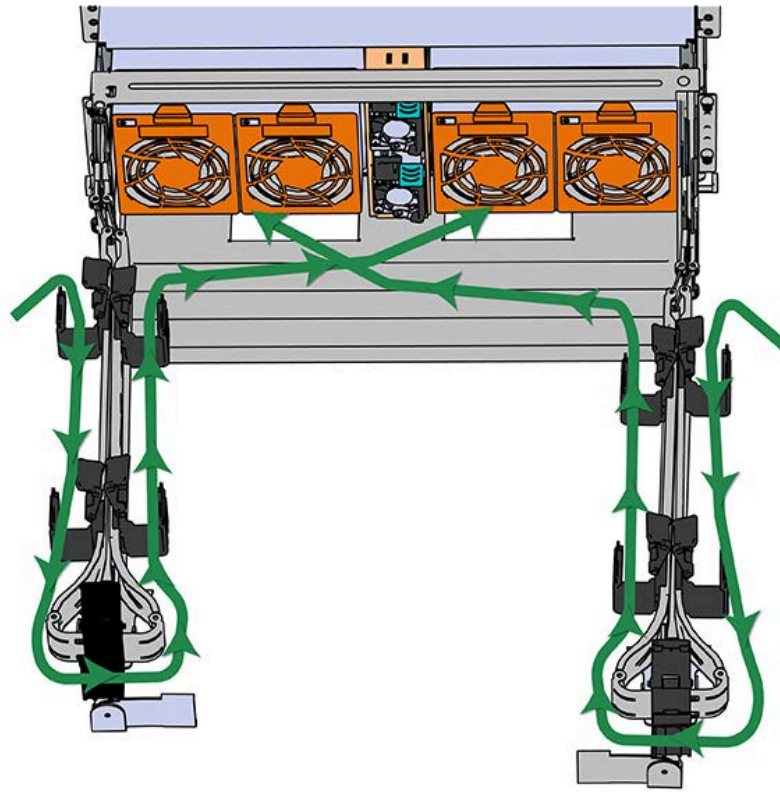
Step 15: Cable the CMA(s).

- a. Unlatch the elbow side of the arm(s) by pressing the blue button labeled "push," and then swing the arm(s) open.
- b. Gather the SAS, power, and Ethernet cables for installation. Before cabling, note the following routing patterns for best results:



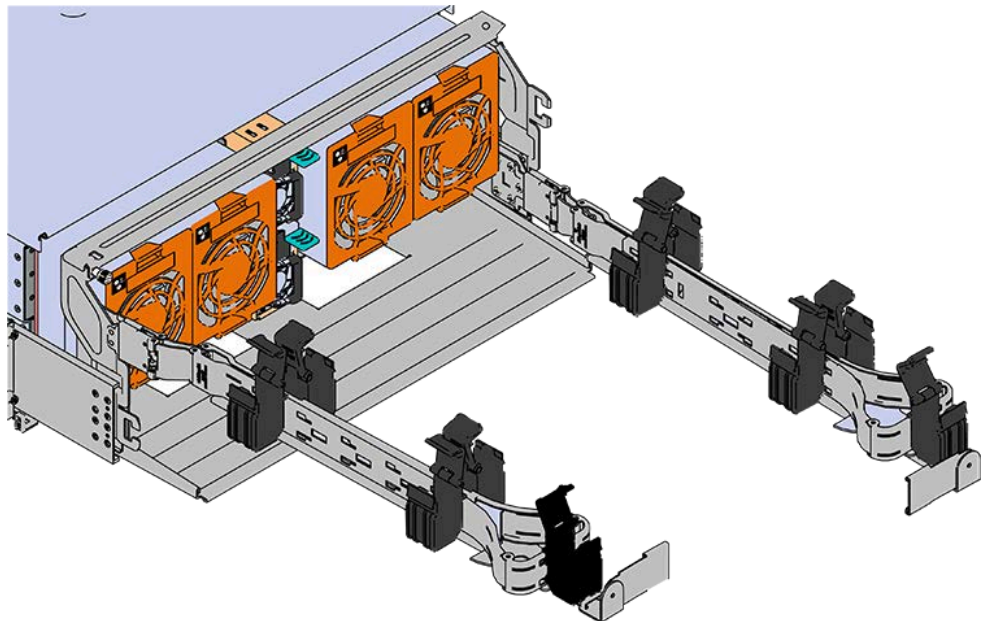
Note: Route the cables supported by the lower arm to IOM A (left hand side looking at the rear). Second, route the cables supported by the upper arm to IOM B (right hand side looking at the rear) in a "criss-cross" pattern. See the [Special Considerations for Cable Routing](#) (page 157) for more information.

Figure 81: CMA Cable Routing



- c. Open all of the baskets.

Figure 82: Open Baskets



- d. Connect the Ethernet cable to the Ethernet port, and route the cable through each of the baskets on the arm.
- e. Connect the SAS cables to the SAS ports, and route them through the baskets one at a time. Make sure to follow the labels to ensure they are connected to the proper ports.
- f. Connect the power cable to the PSU and route it through each basket.



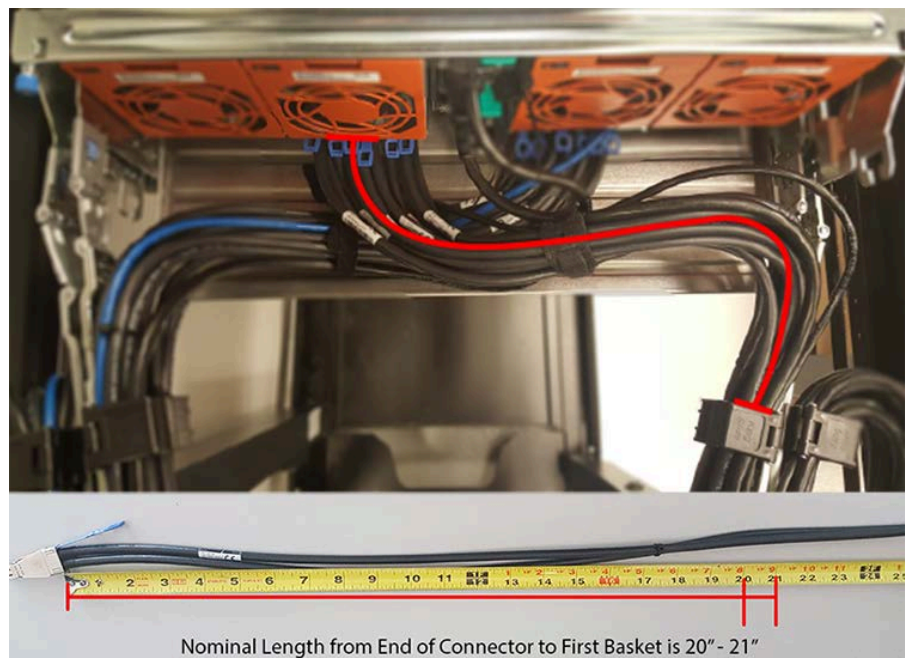
Attention: Make sure the power cable is not connected to a PDU. If it is, the system will power up when the cable is connected to a PSU. This is not intended at this stage of installation.

- g. If the installation includes more than 10 total cables, follow the recommendations in [Special Considerations for Cable Routing \(page 157\)](#), before proceeding.



Note: Each cable must be given enough slack at the connector end to operate smoothly. Allow 20 - 21 in. (508 - 533.4 mm) between the connector and the first basket.

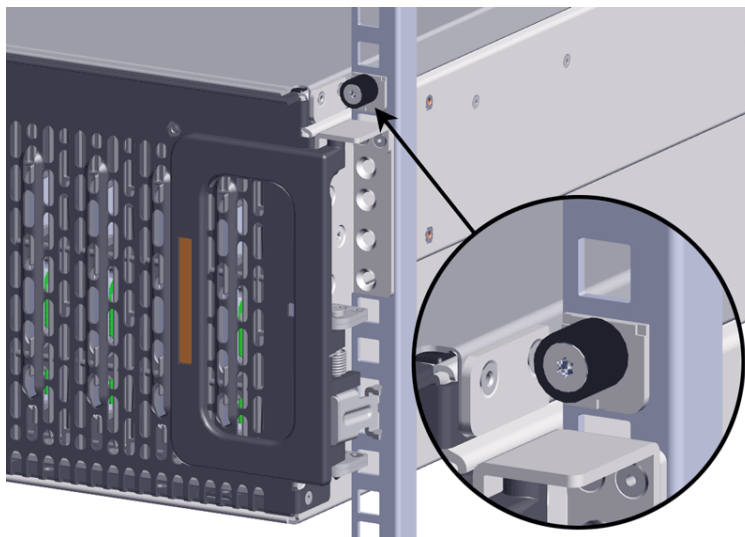
Figure 83: Nominal Cable Length at Connectors



- h. Close all of the baskets.
- i. If the Ultrastar Data60 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 Ultrastar Data60 is instead being installed where it will be operated, skip this step. Remember to remove the cable ties after the enclosure has reached its final operational location.
- j. Reconnect the arm at the elbow to the connectors on the rail.

- Step 16:** Make sure the CMA(s) is in operational position by folding the arm(s) in toward the enclosure and attaching the elbow end(s) to the connector(s) attached to the rail. Verify that all of the cabling is in functional order and does not bind or catch.
- Step 17:** Test for binding in the extension of the arm by gently pulling the enclosure out of the rack, ensuring 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 arm to ensure that they are all functioning properly.
- Step 18:** Secure the chassis top cover to the rack using the captive M5 thumb-screws as shown in the following image. Use a T15 Torx screwdriver, and tighten the screws to 3.38-3.61 Nm / 30-32 in-lbf.

Figure 84: Cover Retention Screws

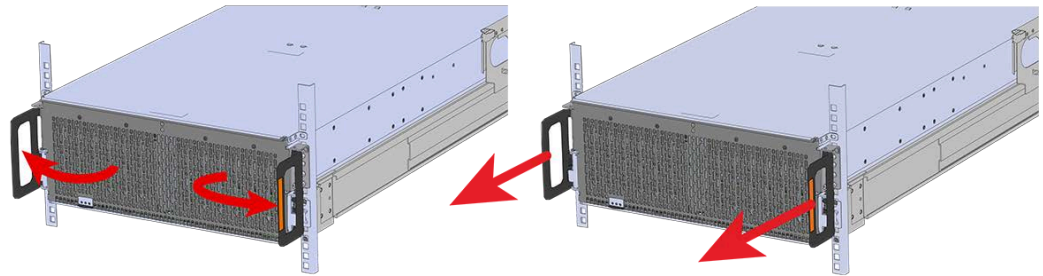


- Step 19:** Now that the chassis is installed, test the installation by sliding the enclosure in and out of the rack a minimum of three times. If the enclosure binds, catches, or displays any incorrect motion or behavior repeat the installation.



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

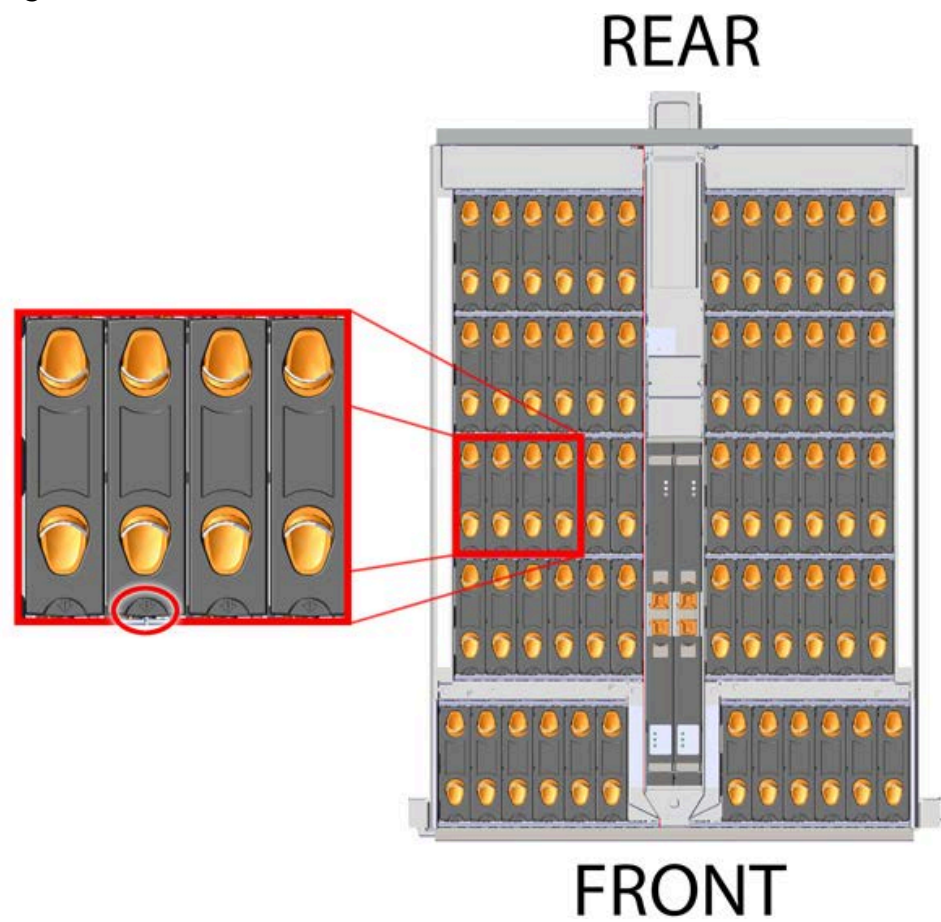
- Step 20:** Grasp both handles at the front of the enclosure and pull with even pressure to extend the chassis out of the rack until it is stopped by the safety latches. The safety latches will prevent the enclosure from coming out of the rack completely and the cover will remain in the rack attached to the rear alignment brackets.

Figure 85: Chassis Handle Operation

Step 21: Perform this same action two more times without the drives loaded to make sure the rail kits are installed properly.

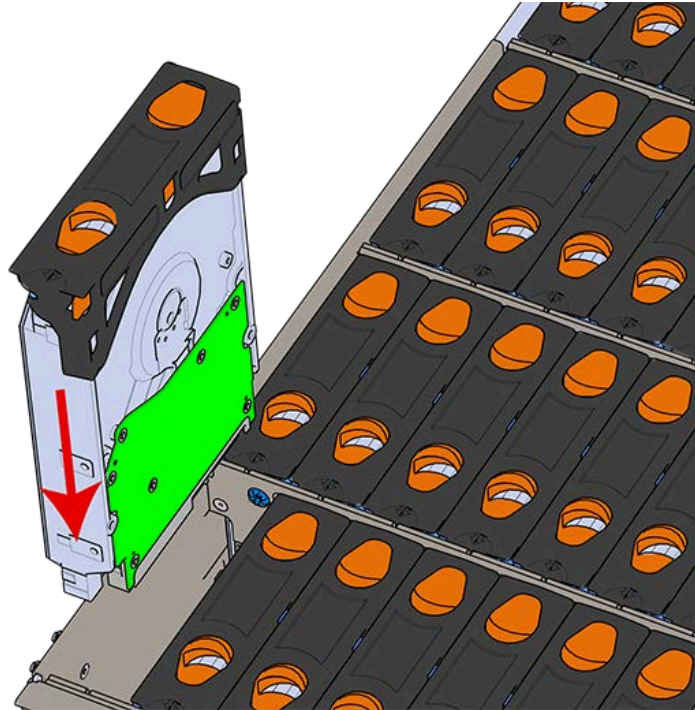
Step 22: Install the Drive Assembly.

- Ensure that the enclosure has been pulled out of the rack until the rail latches engage.
- Find the LED pointer on the top of the drive carrier. This pointer should point toward the front of the unit as shown in the following image.

Figure 86: LED Pointer Orientation

- c. Align the drive with the empty slot that will receive it. Lower it into the slot, making sure it stays level and does not snag.

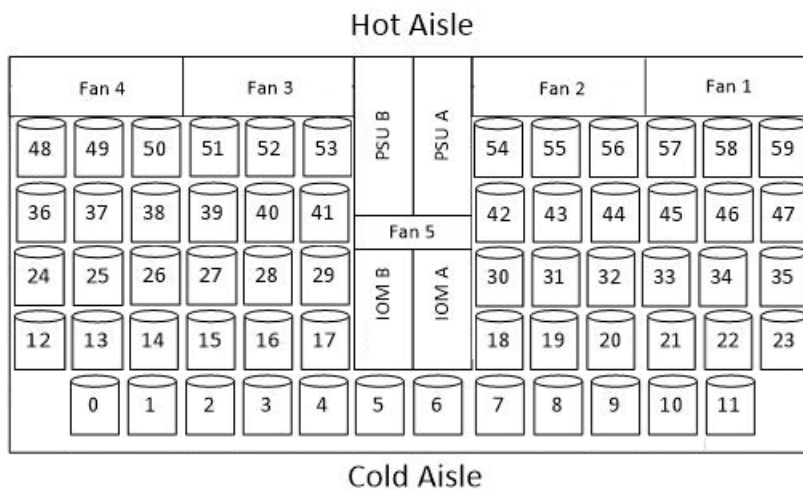
Figure 87: Installing a Drive Assembly



- d. Pinch the latch release and carefully press downward to seat the Drive Assembly the rest of the way.

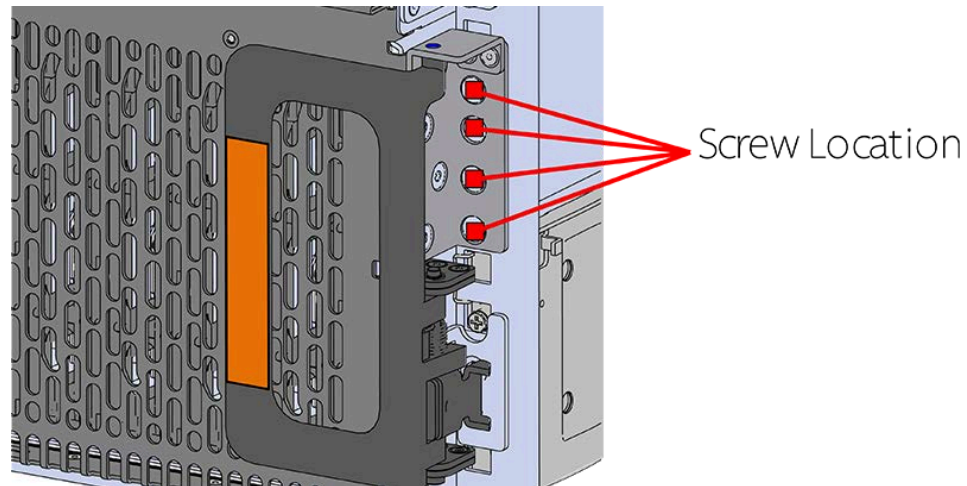
Step 23: Install each drive in the same way the first was installed. Make sure to follow the drive layout in numerical sequence as shown in the following image.

Figure 88: Drive Layout



- Step 24:** Now that the drives are installed into the chassis, 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 of the drives and chassis.
- Step 25:** 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 Flat Head Torx screws into the two brackets at the front of the chassis in the following locations. These screws should be tightened to 3.38-3.61 Nm / 30-32 in-lbf using a Long T15 Torx Screwdriver. If this chassis will not be installed into a rack for shipping purposes, skip this step and move on to the next one.

Figure 89: Shipping Bracket Screw Locations



Step 26: Plug the enclosure power cords into a PDU to power the enclosure.

Step 27: Double check the power indicators and other LEDs to ensure that the system is booting.

4.8 Rails Replacement

Table 43: Procedure Info

Required Tools	Required Parts	# of People Required	Time Required
<ul style="list-style-type: none"> Long 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 Flat Head 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)	~1h

Step 1: Place the CMA(s) into service position.

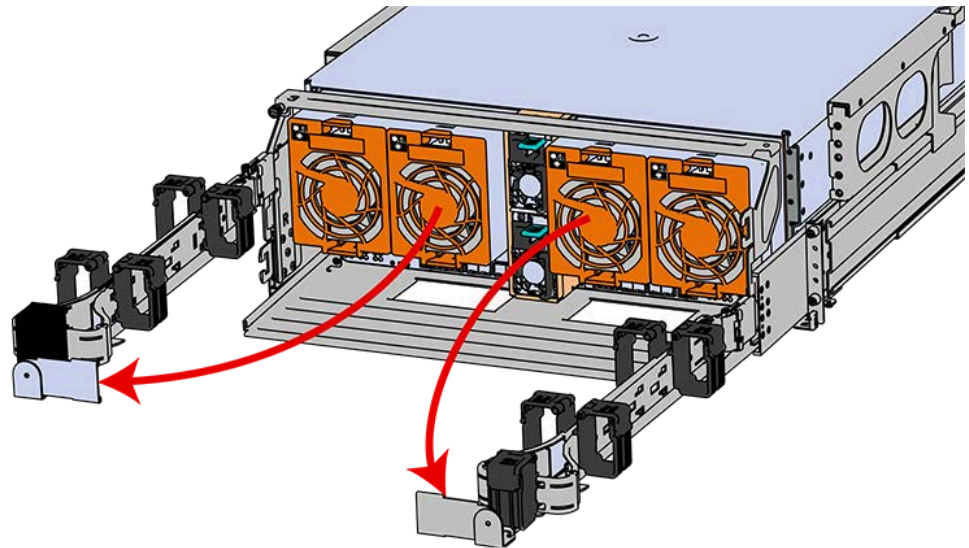
- a. Unlatch the CMA(s) from the rail at the elbow connector by pressing the blue release button.

Figure 90: Unlatching a CMA Connector



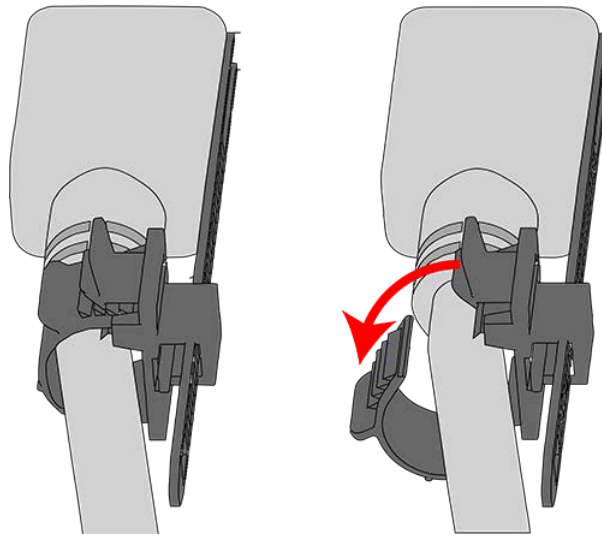
- b. Swing the CMA(s) away from the enclosure.
- c. The arm(s) should be extended away from the enclosure as shown in the following example.

Figure 91: CMA(s) in service position (Cables not shown)



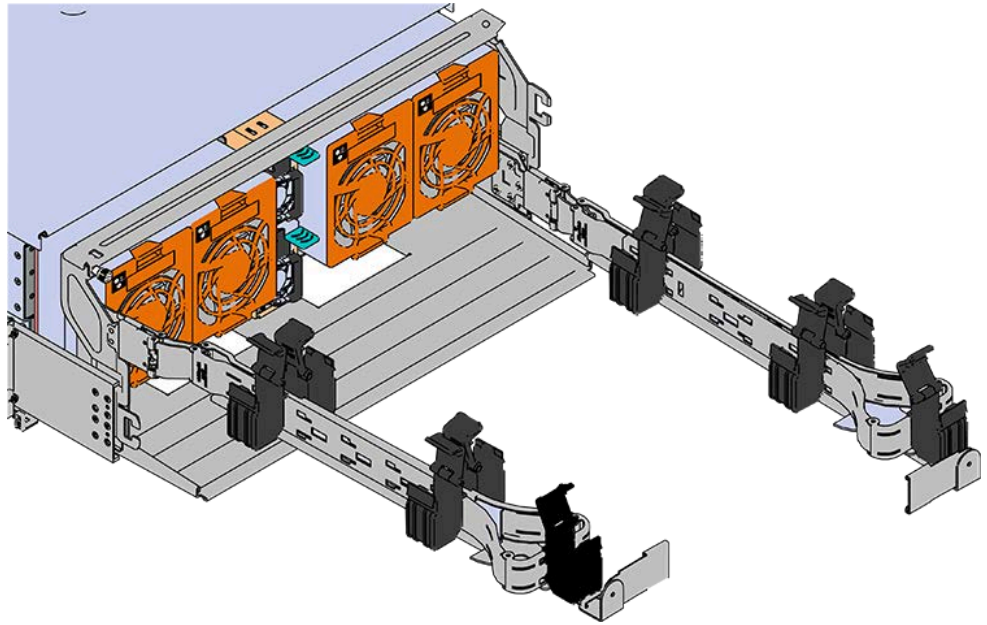
Step 2: Disconnect the Enclosure from power.

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

Figure 92: Cable Retention Mechanism

- c.** Power down the enclosure by disconnecting both power cables, one from each PSU.

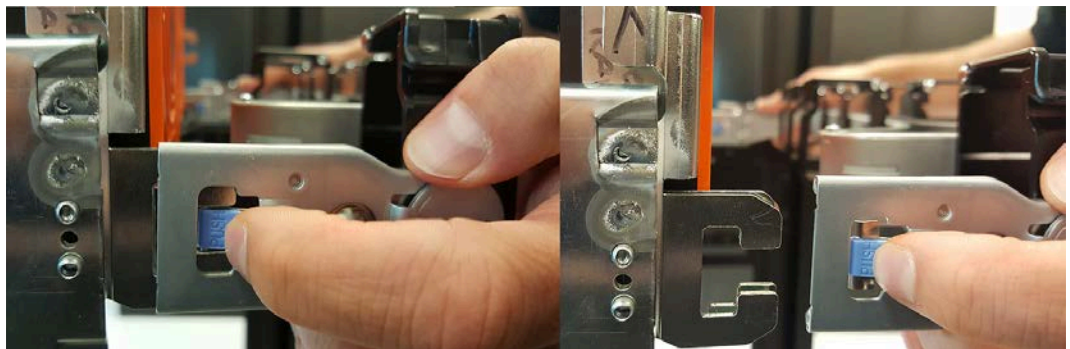
- Step 3:** Disconnect the HD Mini-SAS cables from the rear of the enclosure by pulling (don't jerk) on the blue tab that is extending outward from the connector. This will free the cable from the port. Make sure each cable is labeled or label them yourself to ensure that they will be plugged back into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

Figure 93: Open Baskets

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

Step 6: Remove the CMA(s).

- a. Release all of the connectors that attach the CMA(s) to the enclosure and the rail.
There are three total connections that need to be released, one at the elbow and two at the opposite end.
- b. To release a connector, press the blue latch release button and pull the connector free.

Figure 94: Unlatching a CMA Connector

- Step 7:** Complete the previous step for the second CMA.

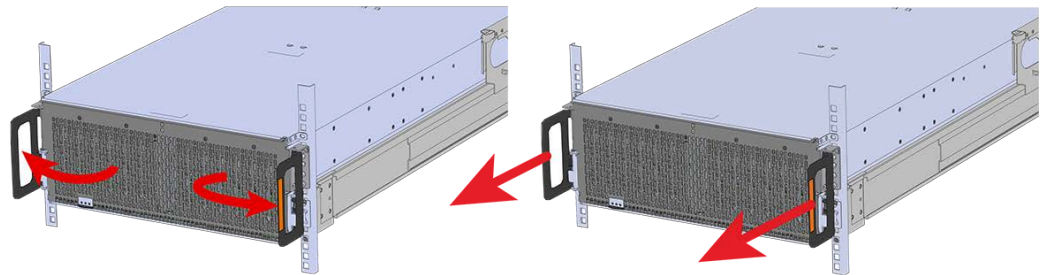


Warning: The following steps regarding uninstalling drives from the enclosure should be followed in order to reduce the weight enough to remove the chassis during the rails replacement process. However, if there is proper lift/support equipment rated to support the full weight of the enclosure, 79.4 kg. / 175 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.

Step 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 and the cover will remain in the rack attached to the rear alignment brackets.

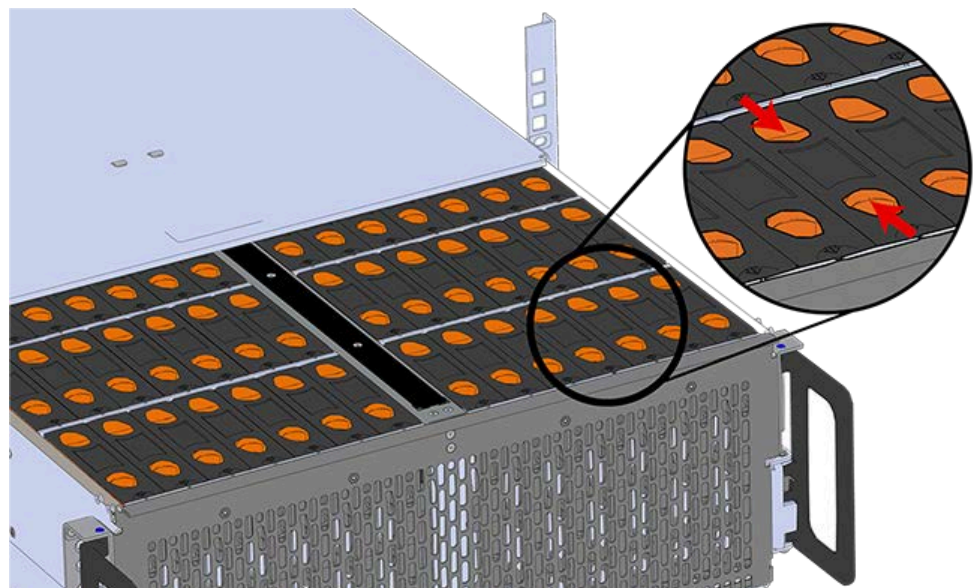
Figure 95: Chassis Handle Operation



Step 9: Follow these steps to remove a Drive Assembly.

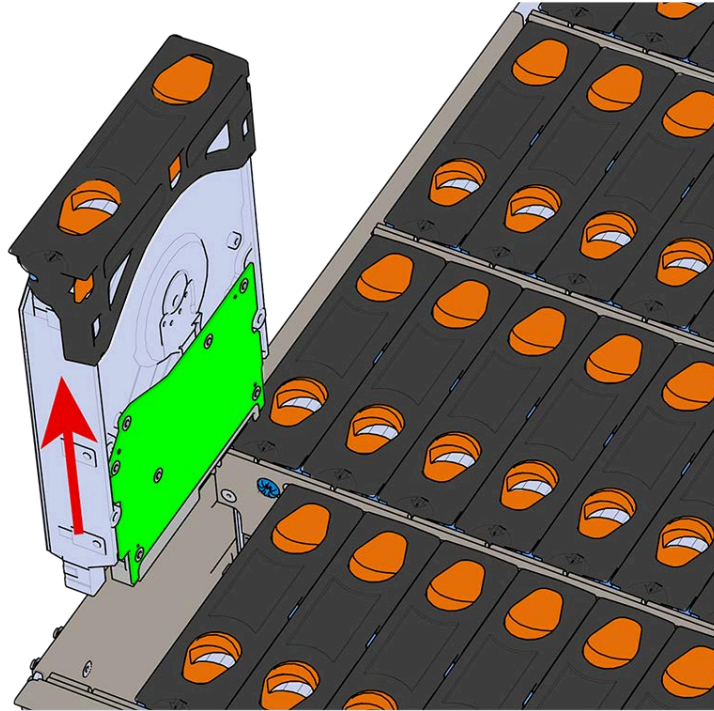
- a. Find the latch release mechanism on the Drive Assembly being removed.
- b. Insert a finger and a thumb into the latch release and pinch to unlatch the Drive Assembly.

Figure 96: Unlatch Drive Carrier (IOM Not Shown)



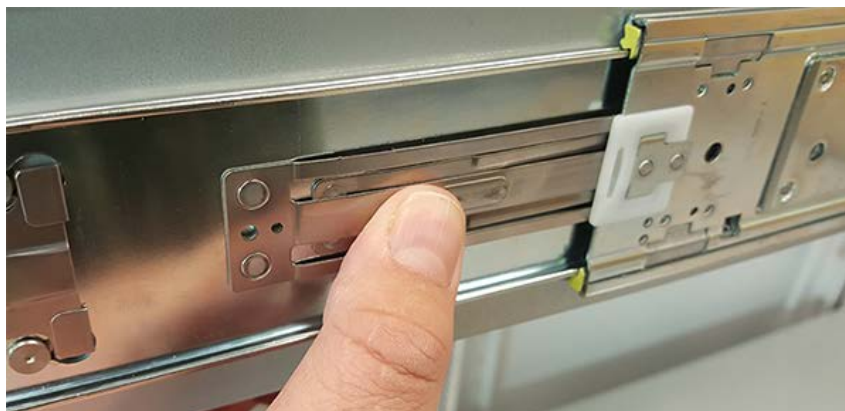
- c. Lift the Drive Assembly free from the enclosure.

Figure 97: Removing Drive Assembly



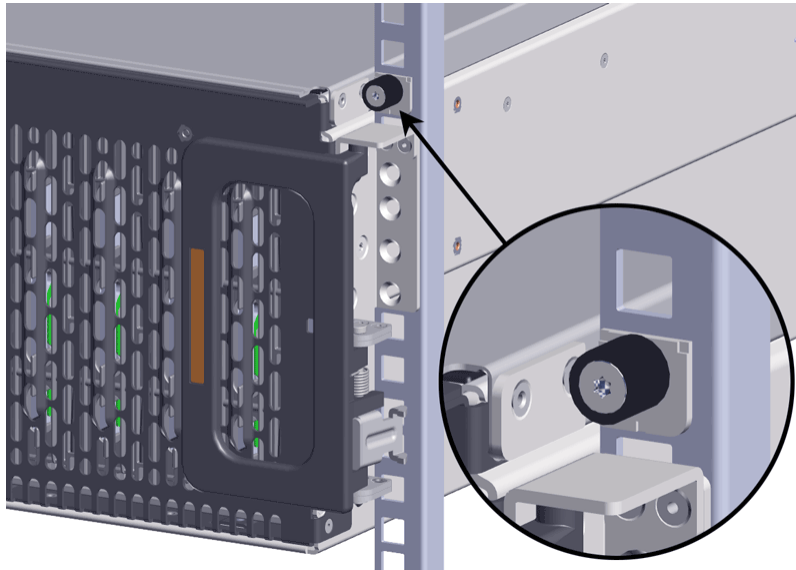
- Step 10:** Follow the previous step for each drive in the enclosure. Attach a label or mark the drives with the drive slot they were removed from in order to add them to the same slot in the future. Store the drives in an ESD safe location until the drives are ready to be installed back into an enclosure.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

Figure 98: Inner Rail Safety Latch Release



- Step 12:** Push the chassis back into the rack.


Step 13: Locate the M5 thumb-screws on the top cover of the enclosure that keep it in place when the drawer is extended, and unscrew them using a T15 Torx screwdriver. This will allow the top cover to move freely with the enclosure when the enclosure is removed.



Step 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 Ultrastar Data60. 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 100: 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.

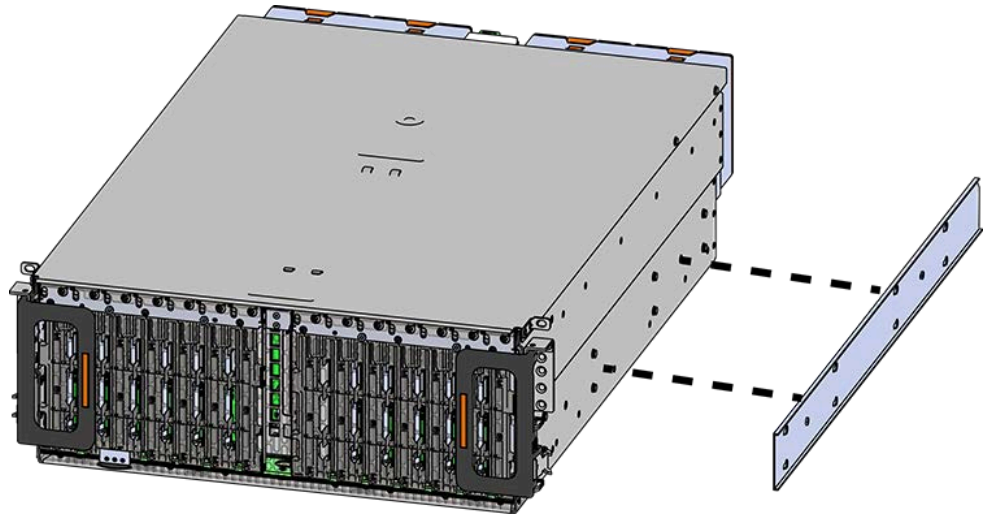


Warning: Do not lift the chassis by the Cable Tray while removing the chassis from the rack OR while installing it into a rack. This can cause serious damage to the unit or serious bodily harm to those handling the unit. Always team lift the chassis by gripping the underside of the unit, and never try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

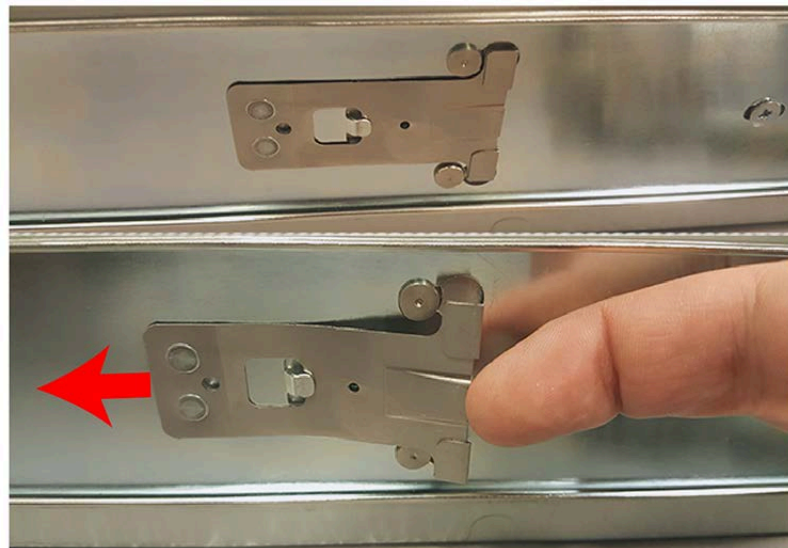
- f. Slide the chassis forward to free it from the rails. Place the chassis in a safe location to avoid damage.

Step 15: Uninstall the inner rails from the sides of the chassis.

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

Figure 101: Remove Inner Rail

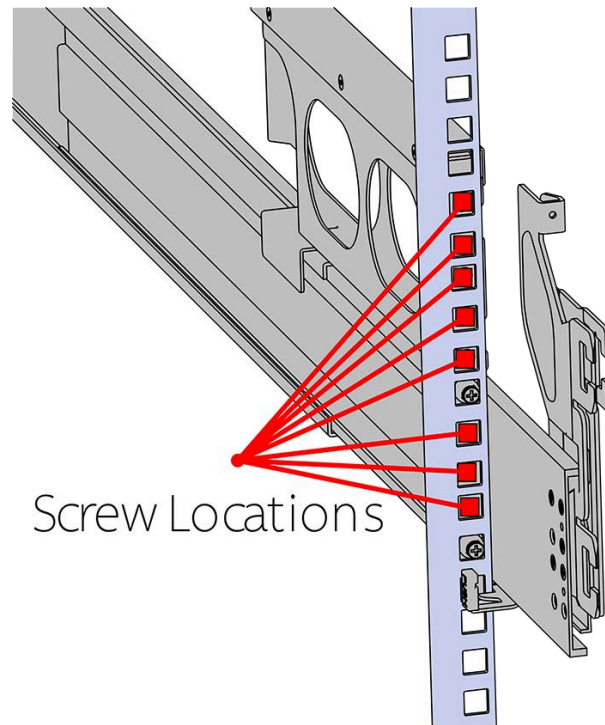
- b. Locate and unlatch the springlock on the side of the inner rail.

Figure 102: 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.

Step 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.

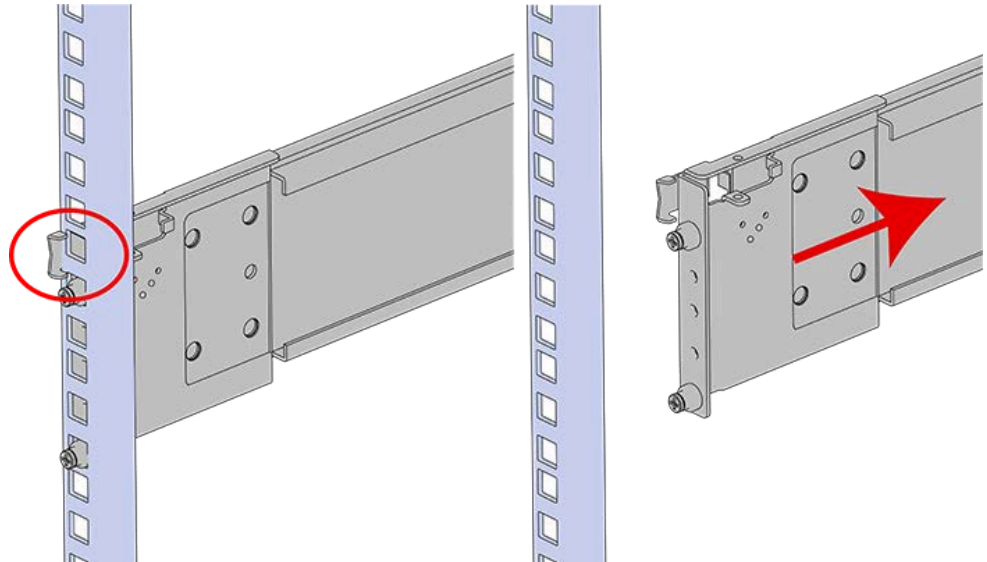
Figure 103: Rear Screw Locations

- 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.

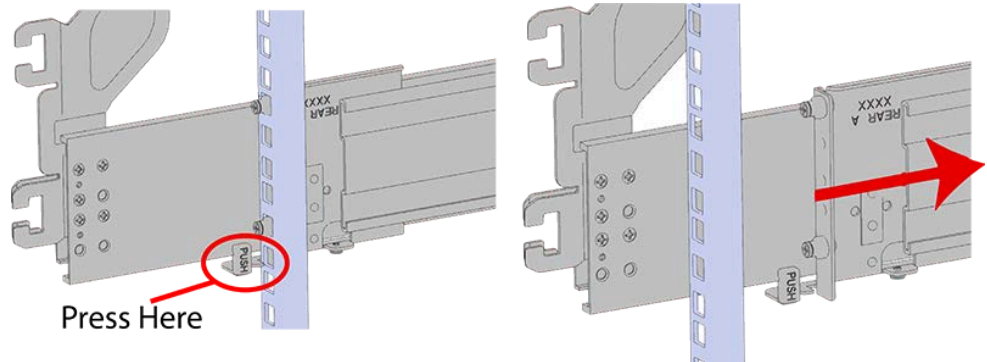
Figure 104: Rack Latch Bracket Installed

Step 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 105: 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 106: Rear Rail Latch Release Button

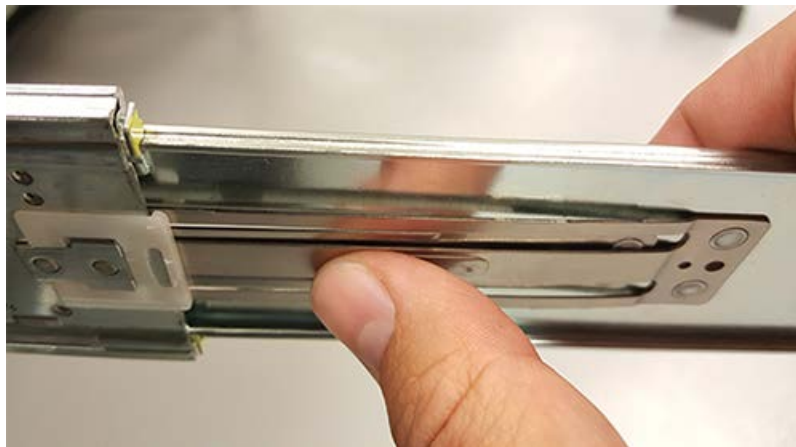
Step 18: Gather the replacement rails and prepare to install them.

Step 19: Remove the inner rail that is nested inside the rack rails.



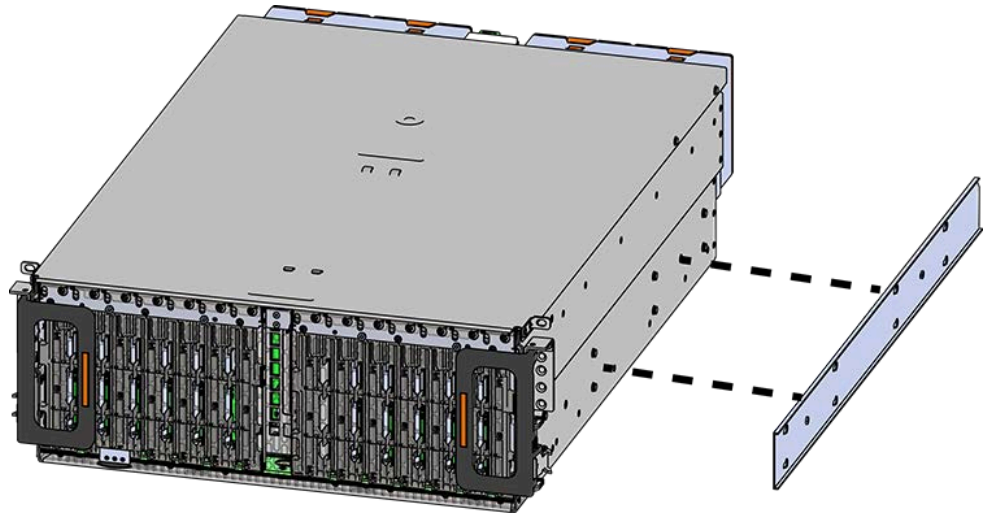
Note: There are Right and Left rails and they must be installed as a set. Each inner rail will read "R" for the right or "L" for the left embossed on the inside. Each outer rail will read "R-Front" for the right or "L-Front" for the left. Right and Left refer to when you are facing the front of the rack.

- 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 107: Rail Safety Latch

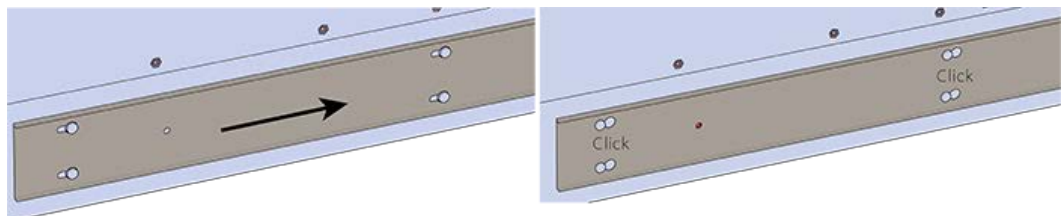
- Step 20:** Install the inner rail onto the chassis making sure they are installed on the correct side. Each inner rail will read "R" for the right or "L" for the left embossed on the side that faces away from the chassis. Right and Left are with reference to looking at the front of the enclosure.
- 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.
 - 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 108: Inner Rail Attachment



- 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 109: Slide Inner Rail



- 
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 should be tightened to .90-1.12 Nm / 8-10 in-lbf using a # 2 Philips Screwdriver. These screws are specially designed for this purpose. Using unapproved screws could cause damage to the slides inside the rail.

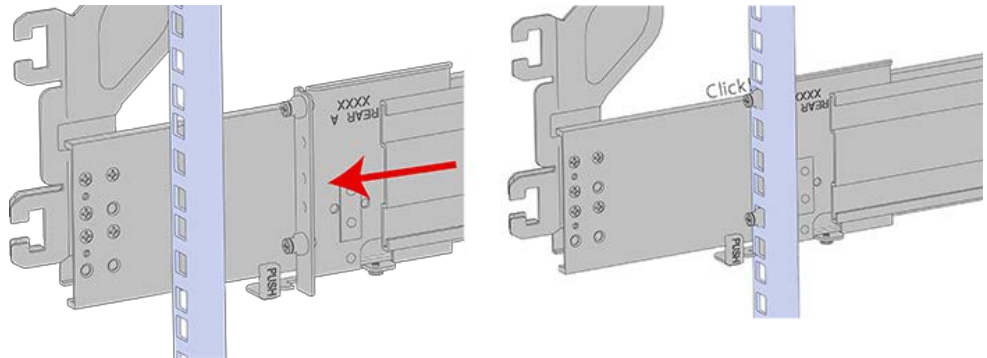
Install the two special low-profile M4 x 3.2mm Philips screws provided to secure the inner rail to the chassis.

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

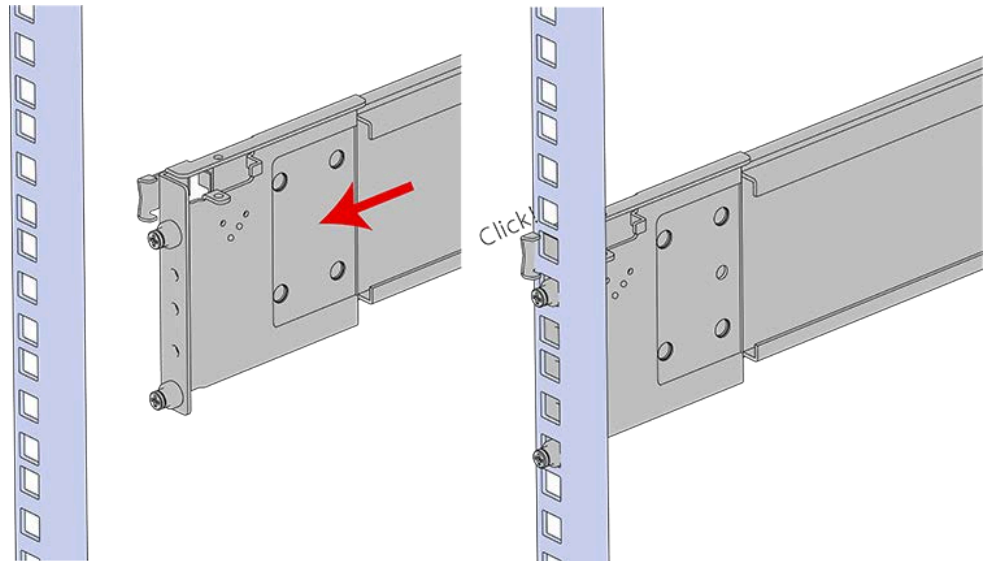
Step 21: Install the outer rails into the rack. Pay special attention to which side is being installed. The embossed R is for the right side and L is for the left side. Right and Left refer to when you are facing the front of the rack.

- 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 latch is facing the inside of the rack posts as shown in the following image.

Figure 110: Rear Rail Latch Release Latch



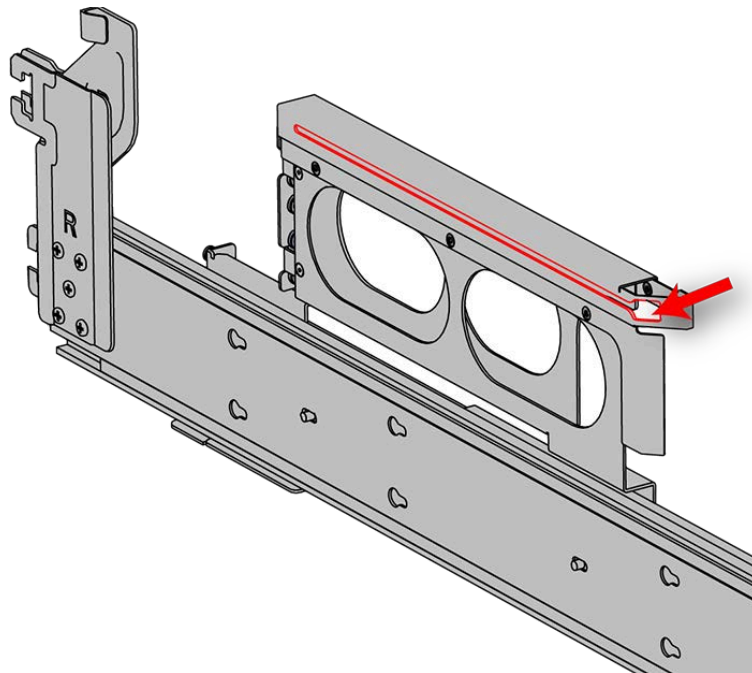
- c. Align the rail on the rack posts at the U-height desired for installation. The bottom of the rail will be the lower most U of the total 4U height.
- d. Pull the rail toward the rack post until the toolless latching mechanism engages the rack. The latching mechanism may need to be pulled open to 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 111: 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.

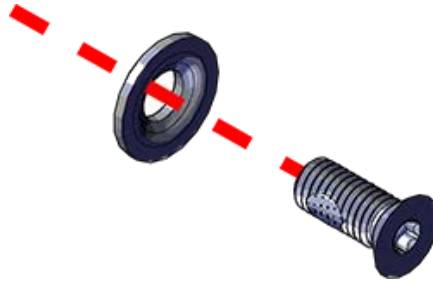
Step 22: Install the rear cover alignment brackets.

- a.** From the rear of the rack, orient the alignment brackets so that the groove that will catch the cover is facing the inside of the rack.

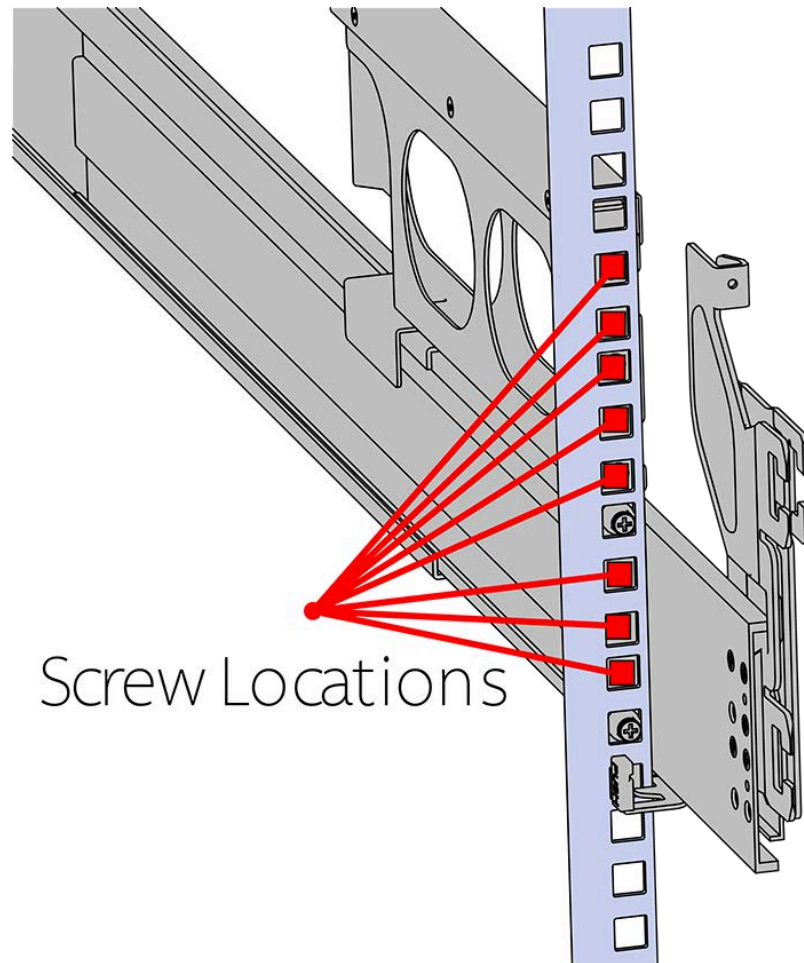
Figure 112: Alignment Bracket Groove (highlighted in red)

- b. Use five of the M5 x 12mm T15 Flat Head Torx screws and five of the included washers and attach the rear cover alignment bracket to the vertical rail with the Long T15 Torx Screwdriver. Add three M5 x 12mm T15 Flat Head Torx screws and three included washers to attach the rear rail (the three lower holes) to the rack posts as shown in the following image. These screws should be tightened to 3.38-3.61 Nm / 30-32 in-lbf using a Long T15 Torx Screwdriver.

Figure 113: Screw and Washer Order



Caution: Be careful to set the screws properly cover alignment bracket and rail to prevent crossthreading.

Figure 114: Screw Installation Location

Step 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 115: 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.


Step 24: Install the chassis into the rails.

- a.** Extend the bearing plates on the inside of the mid-rails until they are fully forward (detent has engaged). This prevents potential damage due to improper mating of the rails.

Figure 116: Bearing Plate

- b.  **Caution:** This step in the installation requires a minimum of 3 individuals to install safely, two to lift and one to guide the others who 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.** The only case in which the system may be installed or removed with the drives populated is if the facility has a lift that is rated to handle the maximum weight of the fully loaded system.

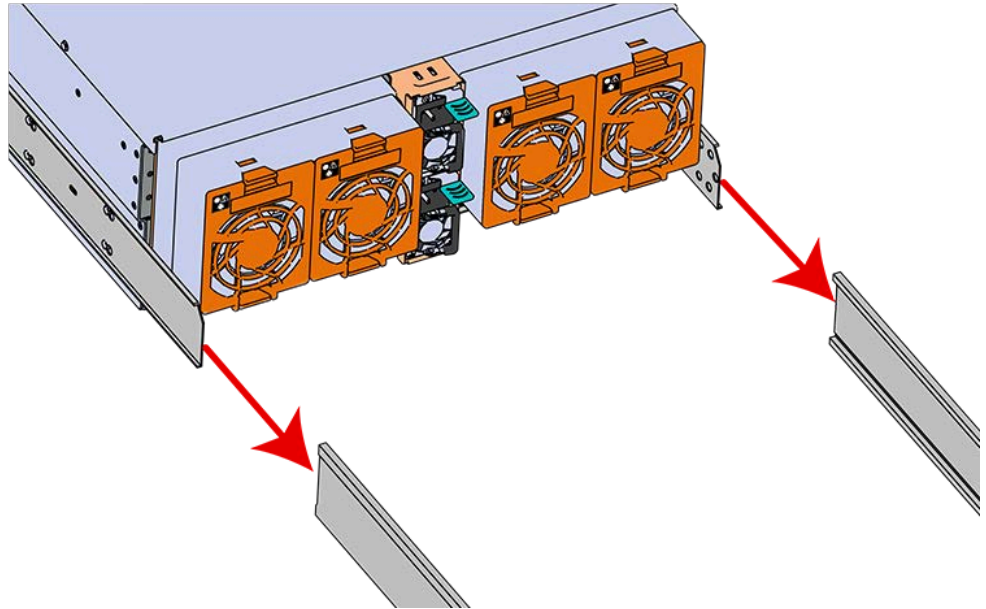
-  **Warning:**  The handles on the front of the chassis are not intended to be used to support the weight of the Ultrastar Data60. Lifting the unit by the chassis handles or trying to support the unit on the handles can cause them to fail. This can cause serious damage to the unit or serious bodily 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.

In preparation to perform a team lift, position one individual on each side of the enclosure (to lift) and a third individual standing at the protruding rack rails (to guide the chassis to mate with rack rails).

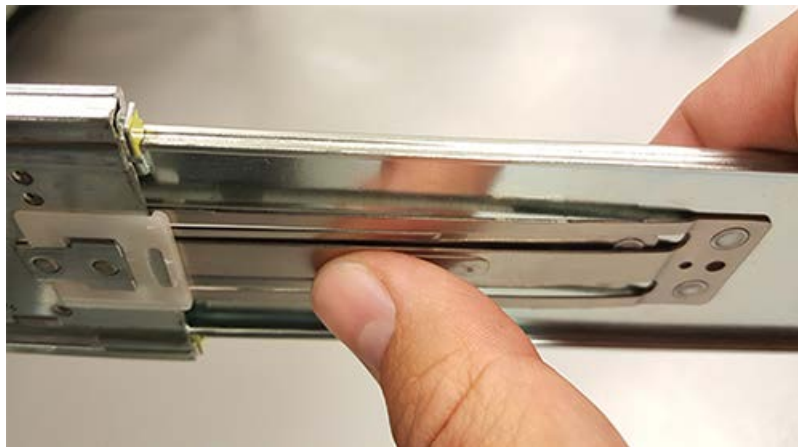
- c. Team-lift the enclosure until the inner rails (which are attached to the chassis) align with the extended mid-rails (which are attached to the rack), and guide the inner rails on the chassis to mate with the rack rails.

Figure 117: Installing the Chassis



- 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 each of the rails), and push the enclosure the rest of the way into the rack.

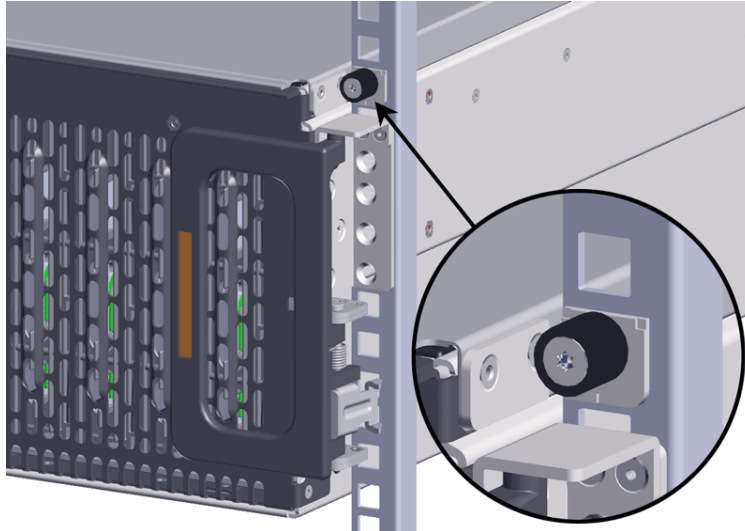
Figure 118: Safety Latch Release



- 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.

Step 25: Secure the chassis top cover to the rack using the captive M5 thumb-screws as shown in the following image. Use a T15 Torx screwdriver, and tighten the screws to 3.38-3.61 Nm / 30-32 in-lbf.

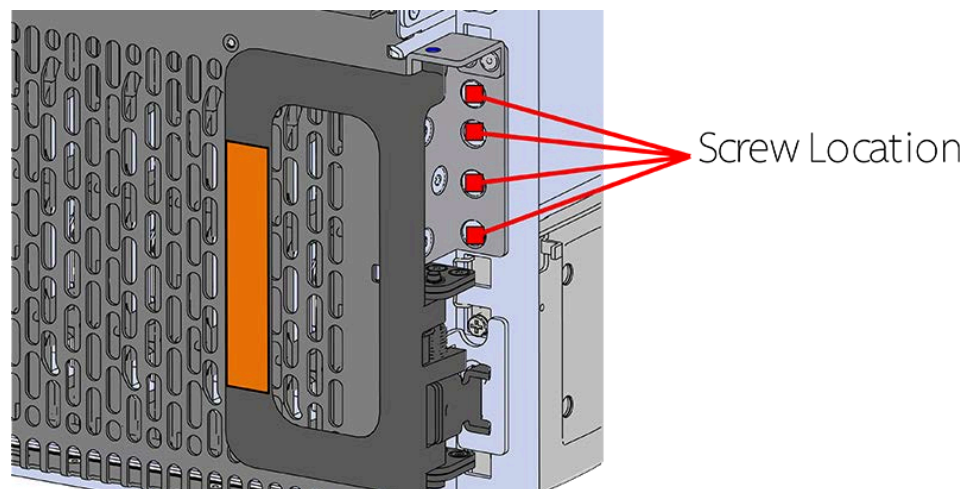
Figure 119: Cover Retention Screws



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.

Step 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 Flat Head Torx screws into the two brackets at the front of the chassis in the following locations. These screws should be tightened to 3.38-3.61 Nm / 30-32 in-lbf using a Long T15 Torx Screwdriver. If this chassis will not be installed into a rack for shipping purposes, skip this step and move on to the next one.

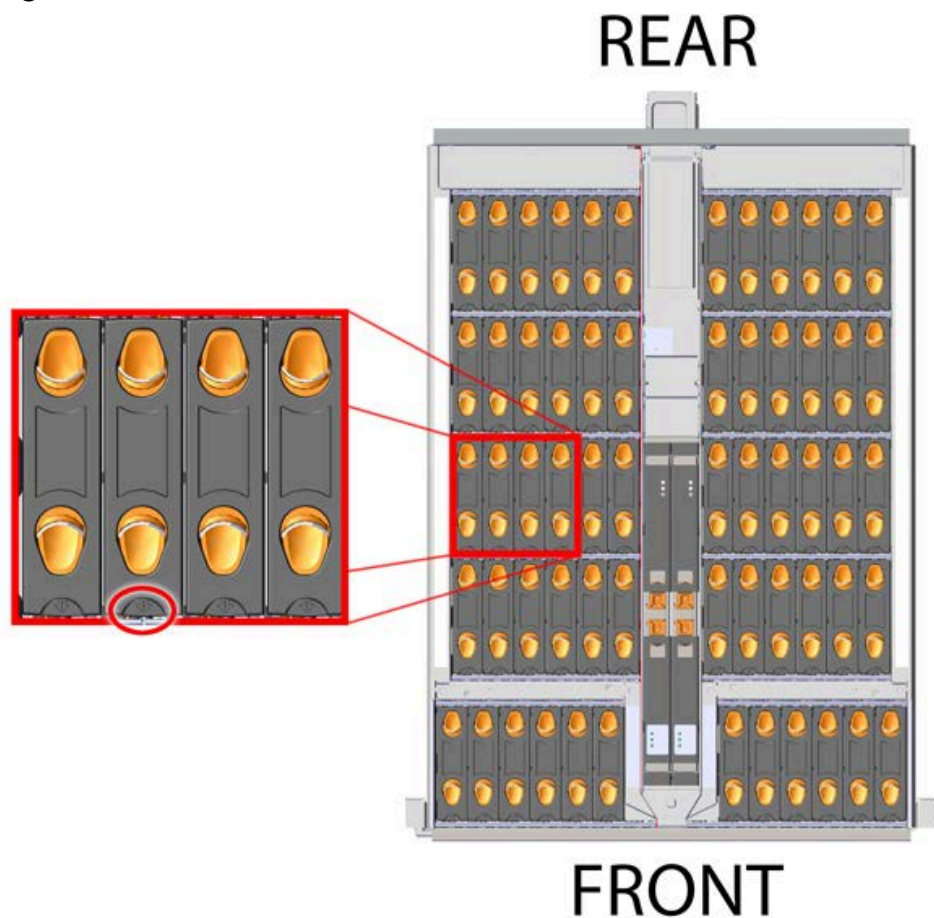
Figure 120: Shipping Bracket Screw Locations



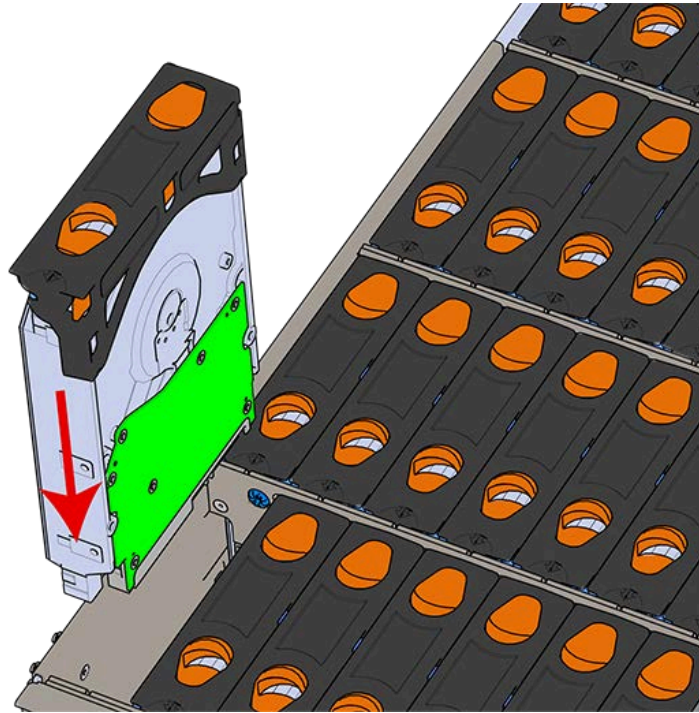
Step 27: Install the Drive Assembly.

- a. Ensure that the enclosure has been pulled out of the rack until the rail latches engage.
- b. Find the LED pointer on the top of the drive carrier. This pointer should point toward the front of the unit as shown in the following image.

Figure 121: LED Pointer Orientation



- c. Align the drive with the empty slot that will receive it. Lower it into the slot, making sure it stays level and does not snag.

Figure 122: Installing a Drive Assembly

- d. Pinch the latch release and carefully press downward to seat the Drive Assembly the rest of the way.

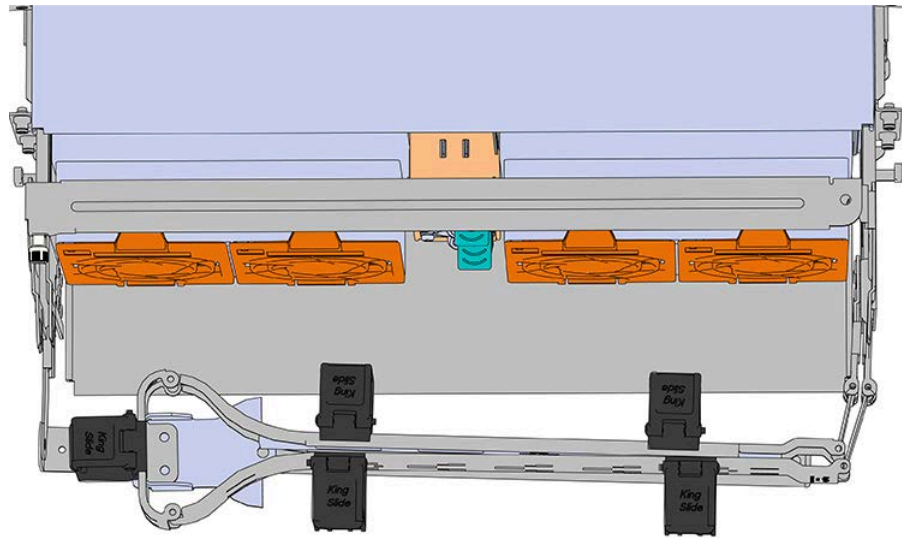
Step 28: Install each drive in the place it was removed from by following the labels or marks that were added earlier.

Step 29: Install the CMA(s).



Note: The CMA has two arms, labeled "upper" and "lower." The lower arm should have the elbow on the left side and be installed first; the upper arm should have the elbow on the right side and be installed last.

- a. Orient the CMA so that the elbow is on the left hand side.
- b. Attach all three of the connectors to the brackets on the rails. There should be one at the elbow side and two at the other end.

Figure 123: Lower CMA Orientation

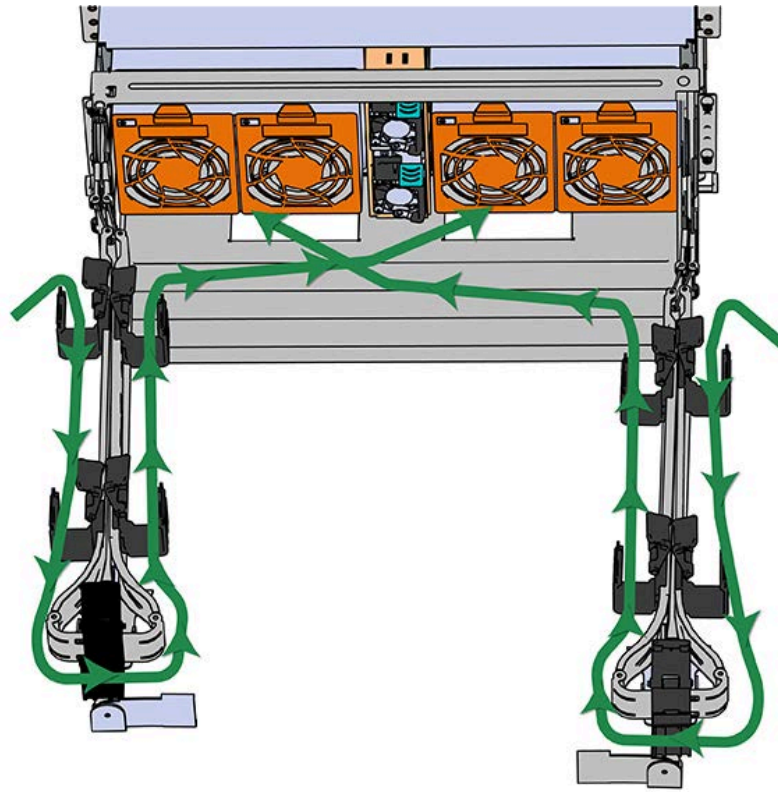
- c. Slowly slide the enclosure forward to ensure the arm is operating properly, then slide it back into the rack.
- a. Repeat these steps to install the upper arm with the elbow facing to the right.

Step 30: Cable the CMA(s).

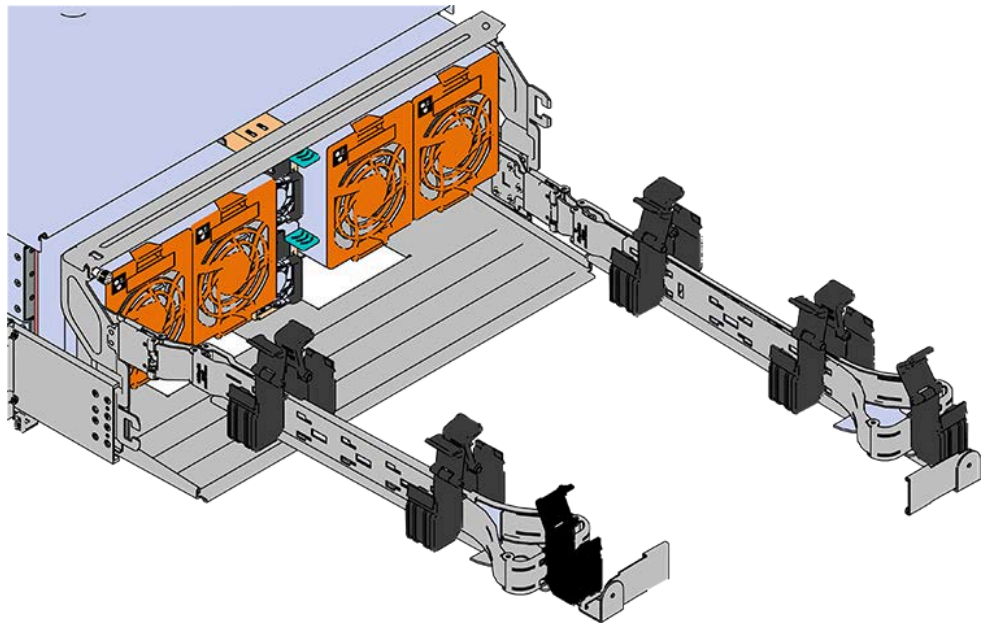
- a. Unlatch the elbow side of the arm(s) by pressing the blue button labeled "push," and then swing the arm(s) open.
- b. Gather the SAS, power, and Ethernet cables for installation. Before cabling, note the following routing patterns for best results:



Note: Route the cables supported by the lower arm to IOM A (left hand side looking at the rear). Second, route the cables supported by the upper arm to IOM B (right hand side looking at the rear) in a "criss-cross" pattern. See the [Special Considerations for Cable Routing \(page 157\)](#) for more information.

Figure 124: CMA Cable Routing

- c. Open all of the baskets.

Figure 125: Open Baskets

- d. Connect the Ethernet cable to the Ethernet port, and route the cable through each of the baskets on the arm.
- e. Connect the SAS cables to the SAS ports, and route them through the baskets one at a time. Make sure to follow the labels to ensure they are connected to the proper ports.
- f. Connect the power cable to the PSU and route it through each basket.



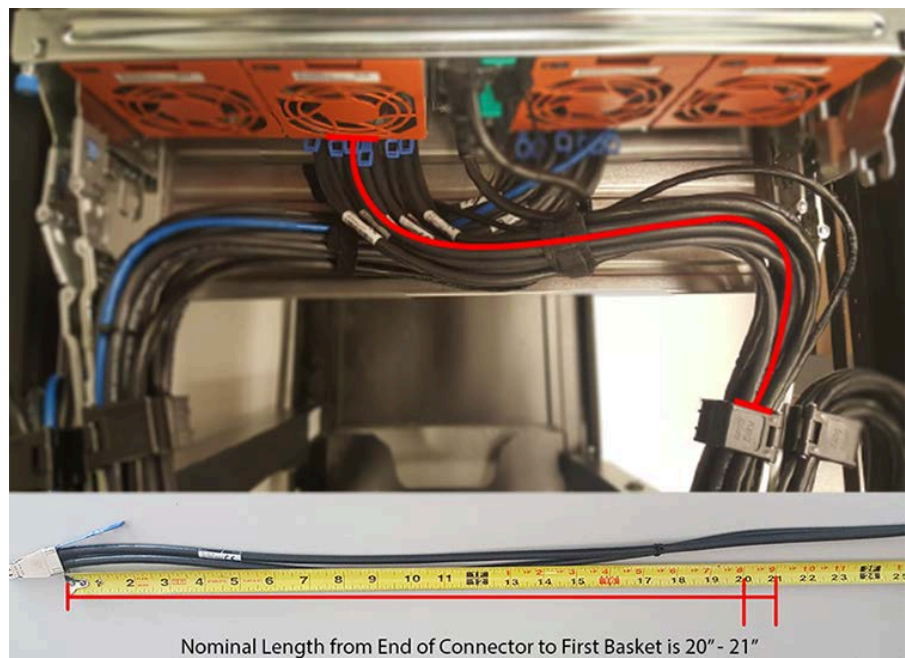
Attention: Make sure the power cable is not connected to a PDU. If it is, the system will power up when the cable is connected to a PSU. This is not intended at this stage of installation.

- g. If the installation includes more than 10 total cables, follow the recommendations in [Special Considerations for Cable Routing \(page 157\)](#), before proceeding.



Note: Each cable must be given enough slack at the connector end to operate smoothly. Allow 20 - 21 in. (508 - 533.4 mm) between the connector and the first basket.

Figure 126: Nominal Cable Length at Connectors

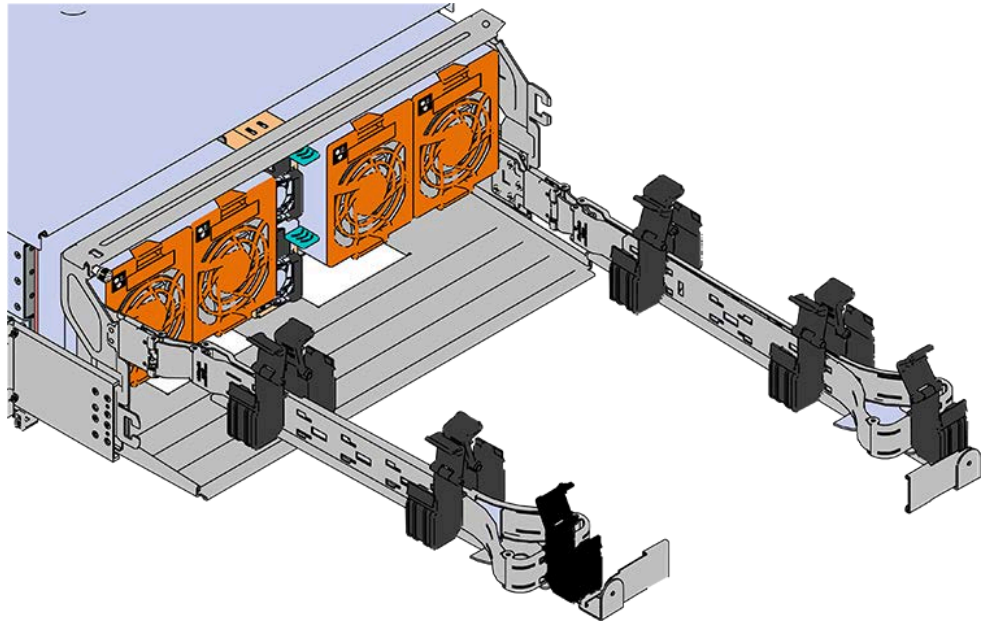


- h. Close all of the baskets.
- i. If the Ultrastar Data60 is being installed in a rack and will subsequently be transported inside that rack, it is important to use the included cable tie to wrap the CMA bundle to ensure it does not get damaged during transport. If the Ultrastar Data60 is instead being installed where it will be operated, skip this step. Remember to remove the cable ties after the enclosure has reached its final operational location.
- j. Reconnect the arm at the elbow to the connectors on the rail.

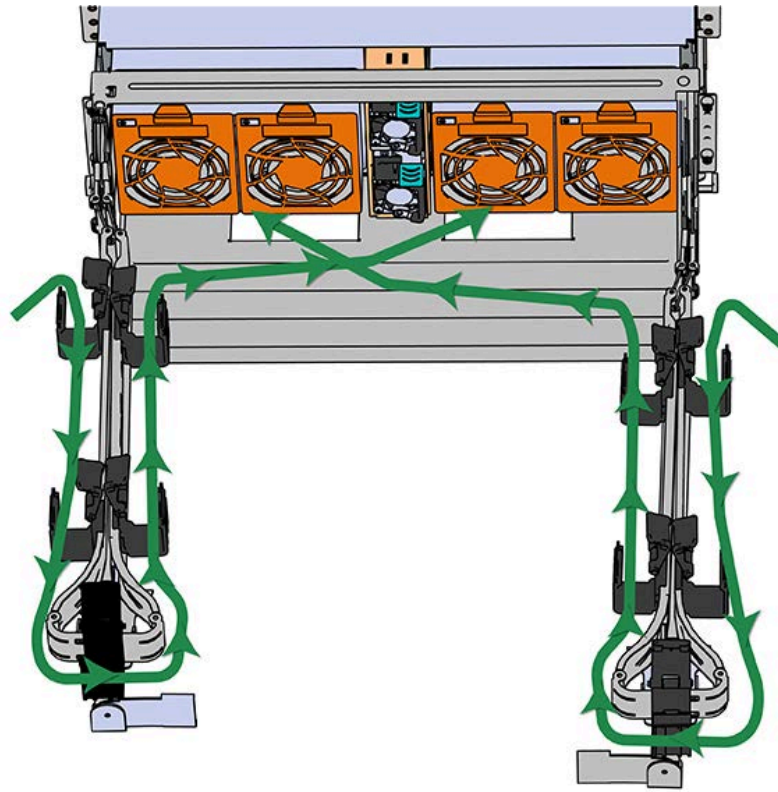
Step 31: Cable the upper CMA.

- 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 127: Open Baskets



- a. Connect the Ethernet cable to the Ethernet port on the right hand side of the Ultrastar Data60 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 upper PSU and route it through each basket. The following image shows the appropriate cable "criss-cross" pattern they should be installed in.

Figure 128: Connected Cable Routing

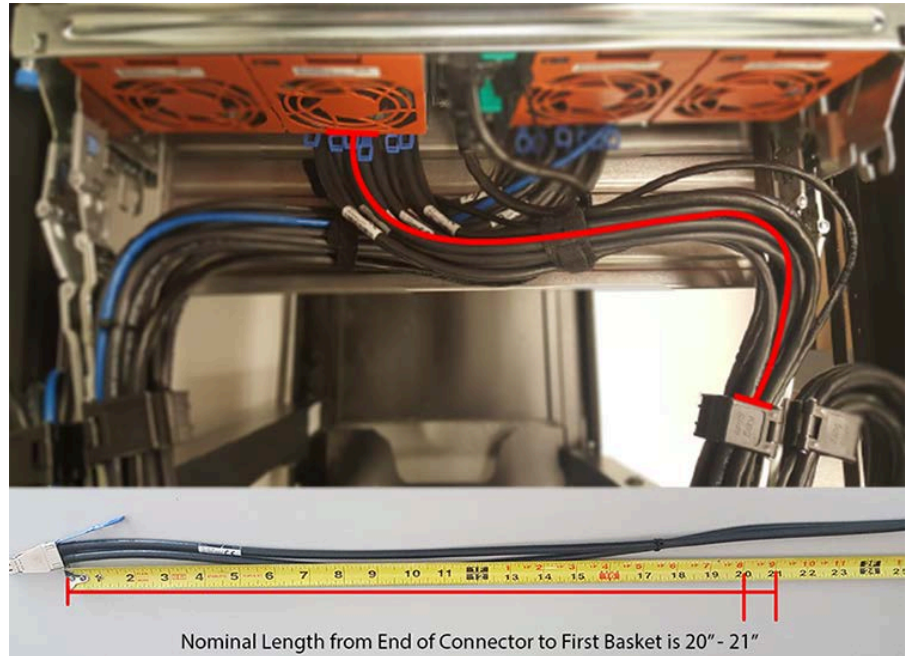
- d. Wrap cable tie around the installed cable bundle between the ports and the first basket of the CMA



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.

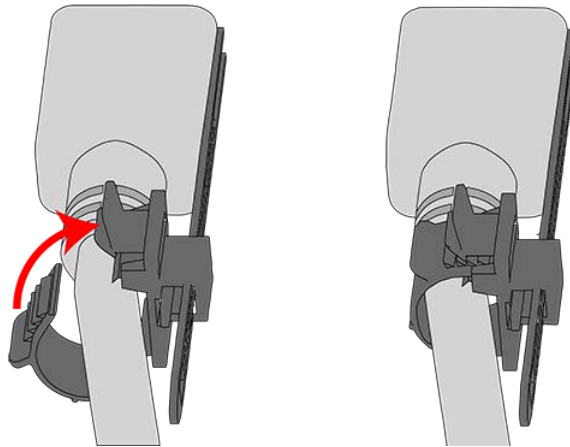


Figure 129: Nominal Cable Length at Connectors

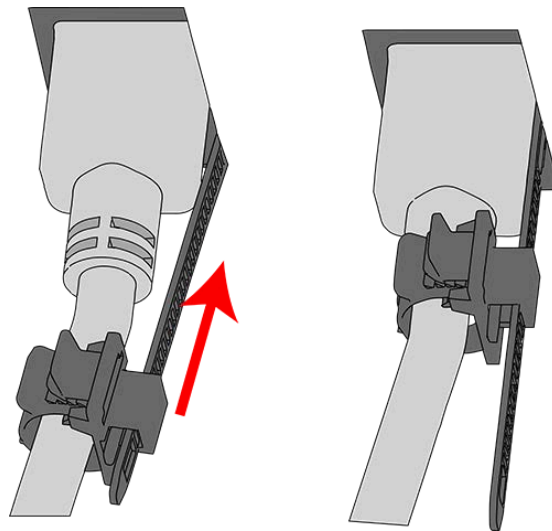


- e. Loop the retention clip on the PSU cables around the cable and pinch it until the clip catches and locks in place.

Figure 130: 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 131: Cinching Cable Retention Clip

- g. If the Ultrastar Data60 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 Ultrastar Data60 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.

Step 32: Test for binding in the extension of the arm by gently pulling the enclosure out of the rack, ensuring 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 arm to ensure that they are all functioning properly.

Step 33: Make sure the CMA(s) is in operational position by folding the arm(s) in toward the enclosure and attaching the elbow end(s) to the connector(s) attached to the rail. Verify that all of the cabling is in functional order and does not bind or catch.

4.9 Chassis Replacement

Table 44: Procedure Info

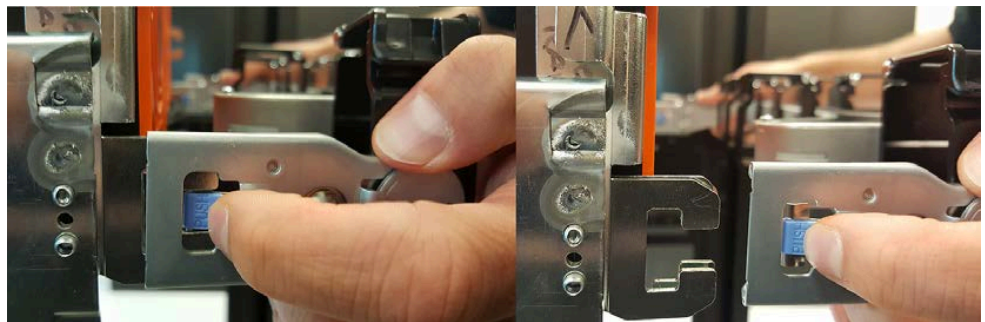
Required Tools	Required Parts	# of People Required	Time Required
<ul style="list-style-type: none"> • Long T15 Torx Screwdriver • # 2 Philips Screwdriver • T30 Torx Screwdriver • Long T10 Torx Screwdriver 	<ul style="list-style-type: none"> • M5 x 12mm T15 Flat Head Torx screws • Included Washers • Low-Profile M4 x 3.2mm Philips screws (included with rail assembly) 	3	~2h

Required Tools	Required Parts	# of People Required	Time Required
<ul style="list-style-type: none"> Cable Ties (for configurations with greater than 10 total cables) Tape Measure Level 	<ul style="list-style-type: none"> Optional (if using CMA Tray): M3 x 8mm T10 Torx screws 		

Step 1: Place the CMA(s) into service position.

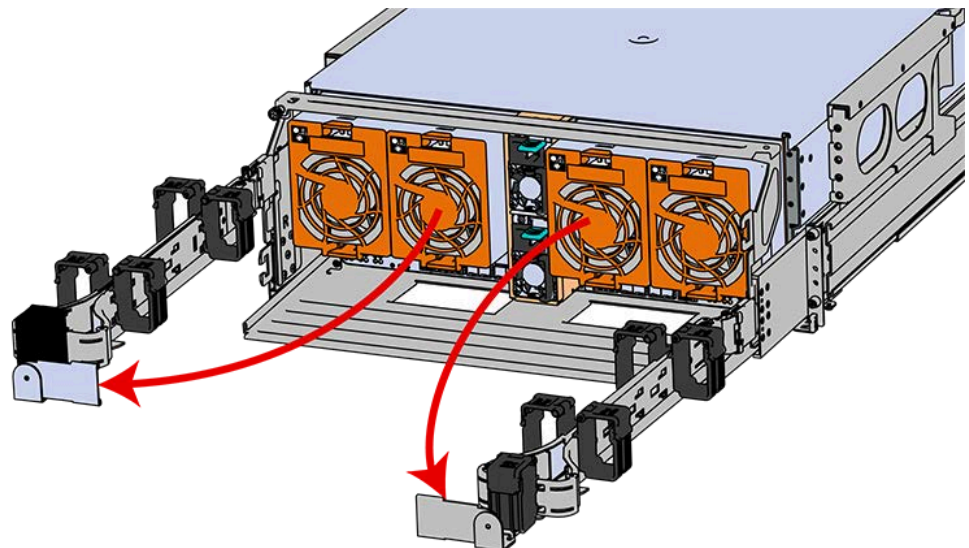
- Unlatch the CMA(s) from the rail at the elbow connector by pressing the blue release button.

Figure 132: Unlatching a CMA Connector



- Swing the CMA(s) away from the enclosure.
- The arm(s) should be extended away from the enclosure as shown in the following example.

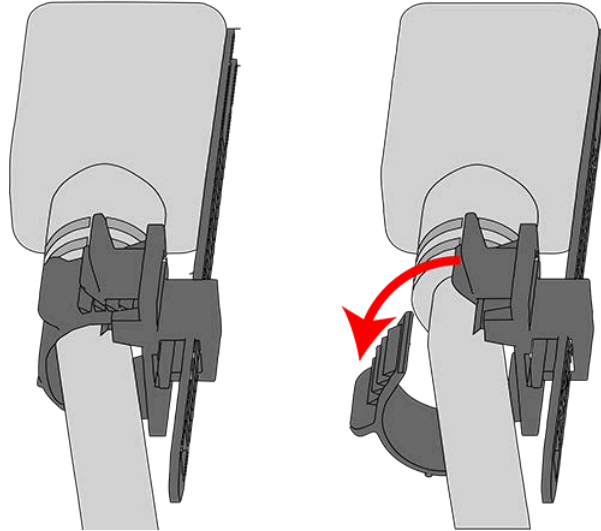
Figure 133: CMA(s) in service position (Cables not shown)



Step 2: Disconnect the Enclosure from power.

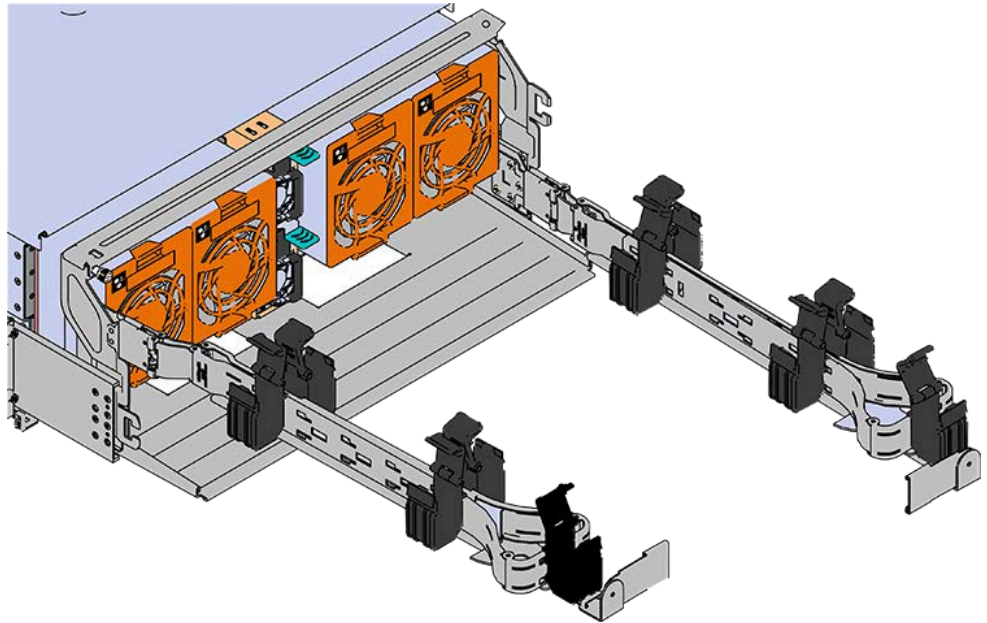
- a. Locate the redundant PSUs at the rear of the enclosure.
- b. Detach the cable retention clip from both power cords.

Figure 134: Cable Retention Mechanism



- c. Power down the enclosure by disconnecting both power cables, one from each PSU.

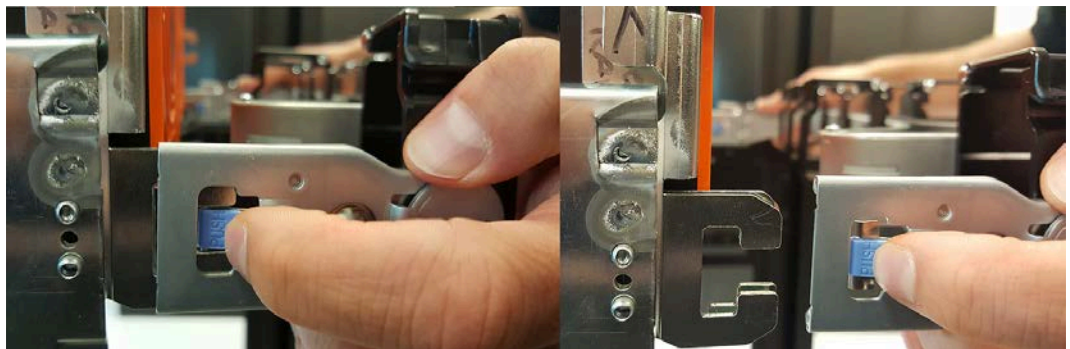
- Step 3:** Disconnect the HD Mini-SAS cables from the rear of the enclosure by pulling (don't jerk) on the blue tab that is extending outward from the connector. This will free the cable from the port. Make sure each cable is labeled or label them yourself to ensure that they will be plugged back into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

Figure 135: Open Baskets

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

Step 6: Remove the CMA(s).

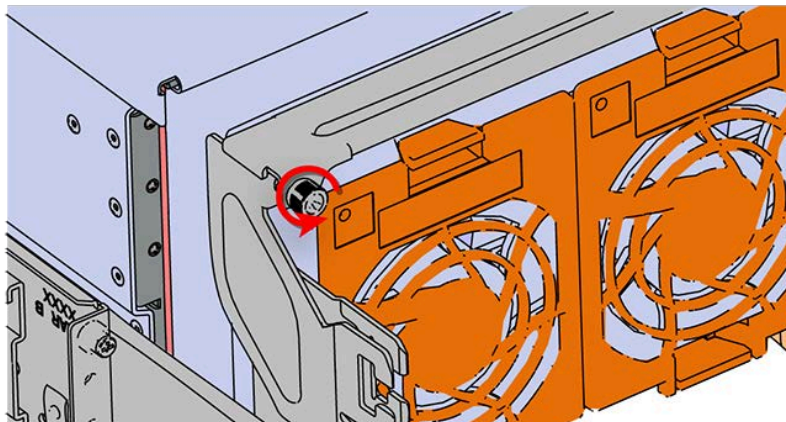
- a. Release all of the connectors that attach the CMA(s) to the enclosure and the rail.
 - There are three total connections that need to be released, one at the elbow and two at the opposite end.
- b. To release a connector, press the blue latch release button and pull the connector free.

Figure 136: Unlatching a CMA Connector

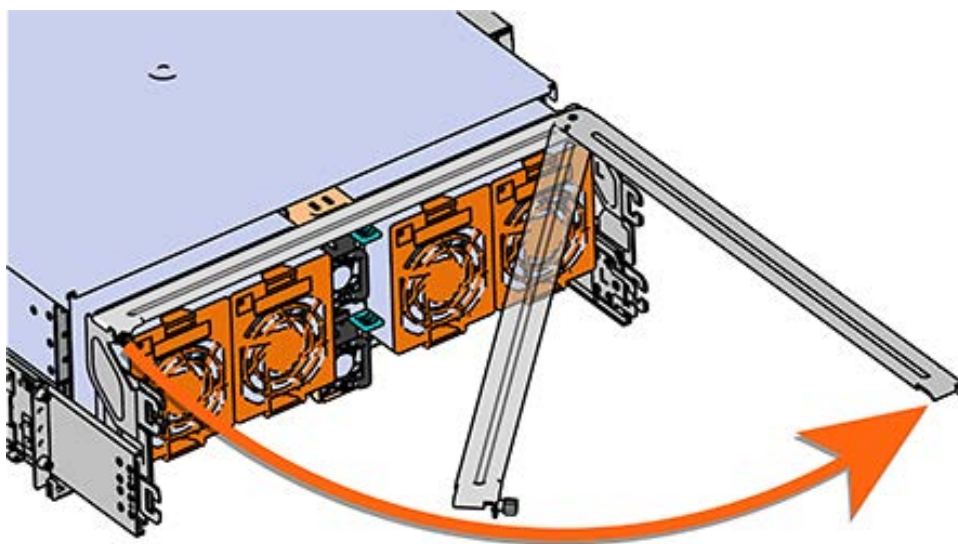
Step 7: Complete the previous step for the second CMA.

Step 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 137: Unscrew Thumbscrew

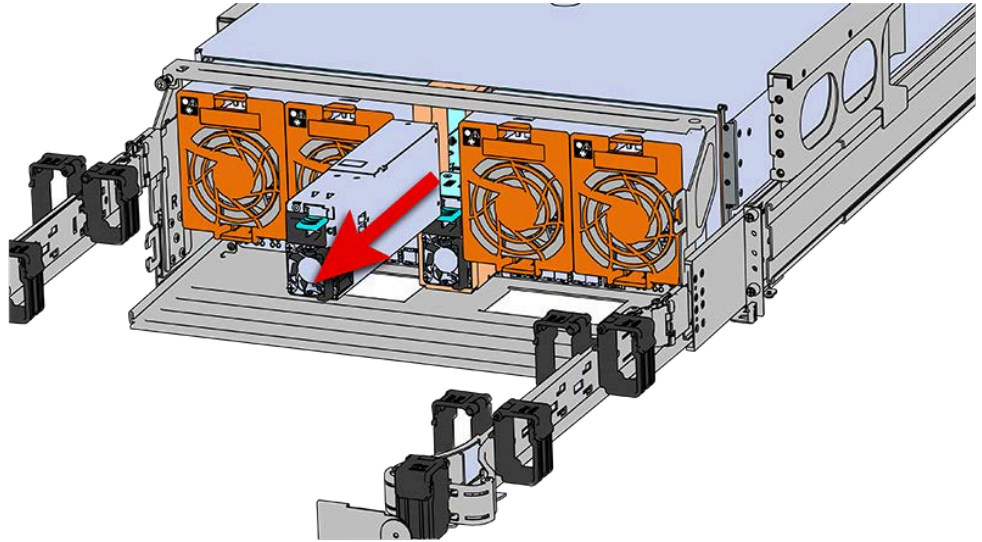
- b. Swing the crossbar away from the enclosure.

Figure 138: Crossbar Swinging Out

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

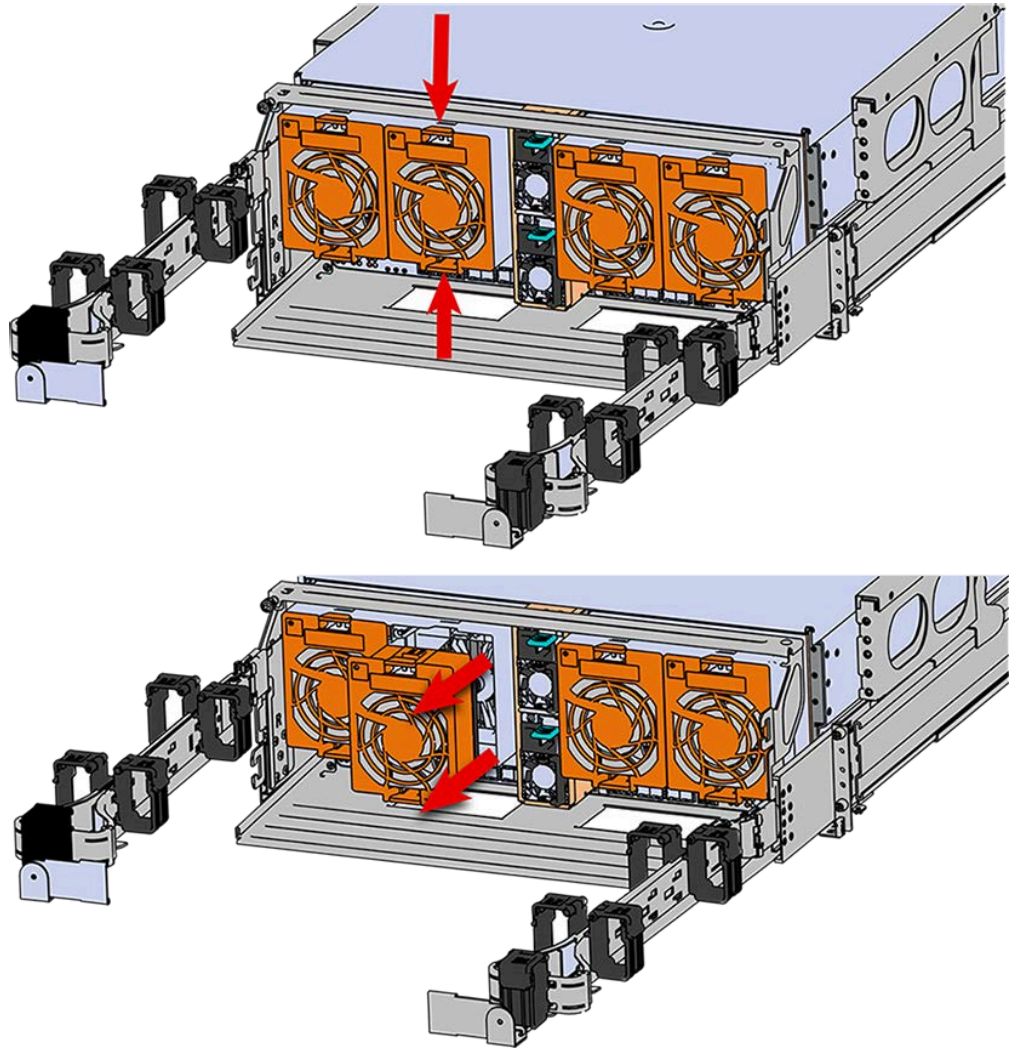
Step 9: Uninstall the PSU.

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

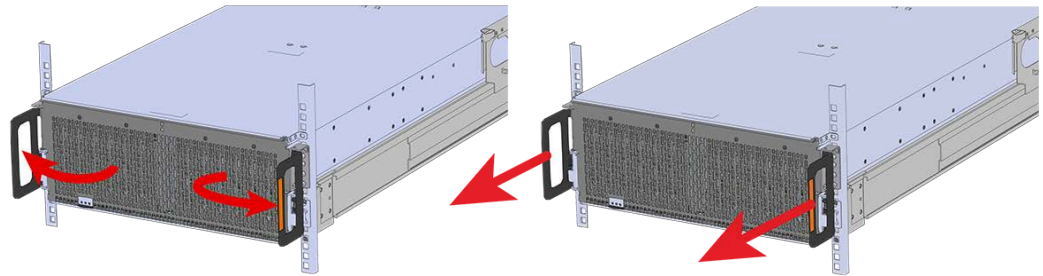
Figure 139: Uninstalling PSU

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

Step 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 140: Uninstalling the Rear Fan

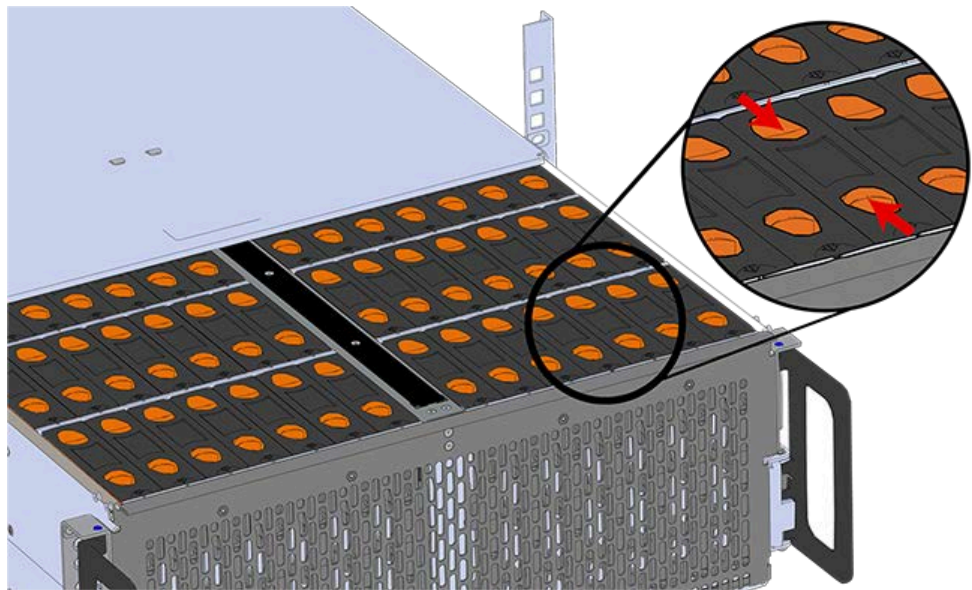
Step 11: Grasp both handles at the front of the enclosure and pull with even pressure to extend the chassis out of the rack until it is stopped by the safety latches. The safety latches will prevent the enclosure from coming out of the rack completely and the cover will remain in the rack attached to the rear alignment brackets.

Figure 141: Chassis Handle Operation

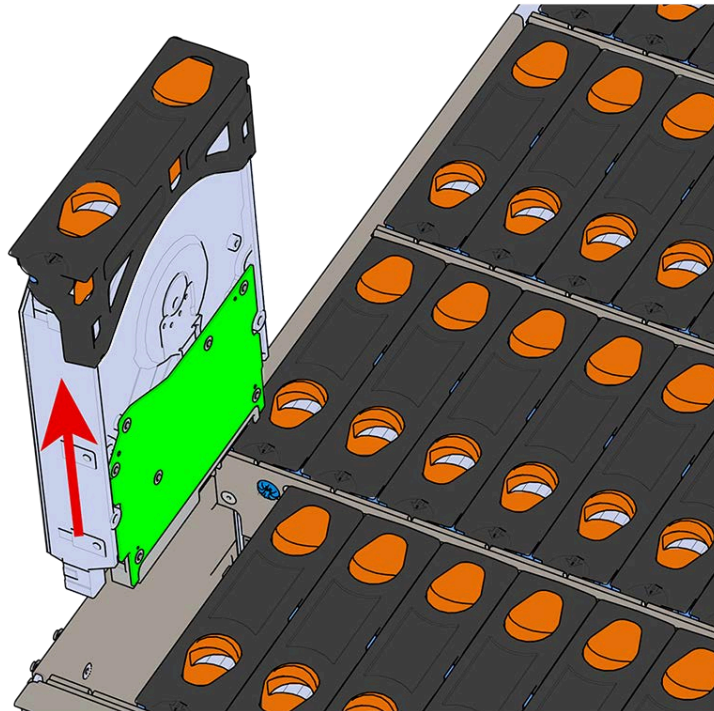
Step 12: Remove all of the drives from the chassis before uninstalling the chassis. Be prepared to label the drives as they are removed so they can be reinstalled in the same location in the new chassis.

Step 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 142: Unlatch Drive Carrier (IOM Not Shown)

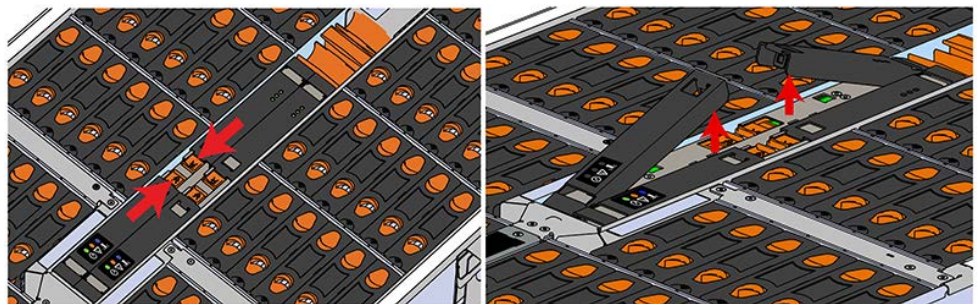
- c. Lift the Drive Assembly free from the enclosure.

Figure 143: Removing Drive Assembly

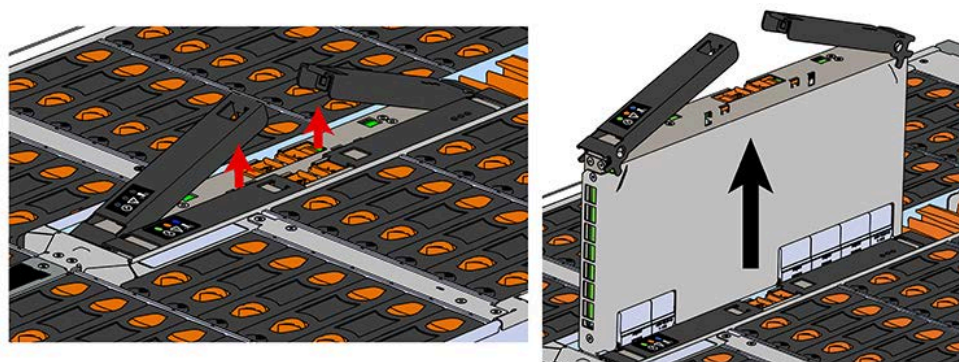
Step 14: Follow the previous step for each drive in the enclosure. Attach a label or mark the drives with the drive slot they were removed from in order to add them to the same slot in the future. Store the drives in an ESD safe location until the drives are ready to be installed back into an enclosure.

Step 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 144: Unlatching the IOM

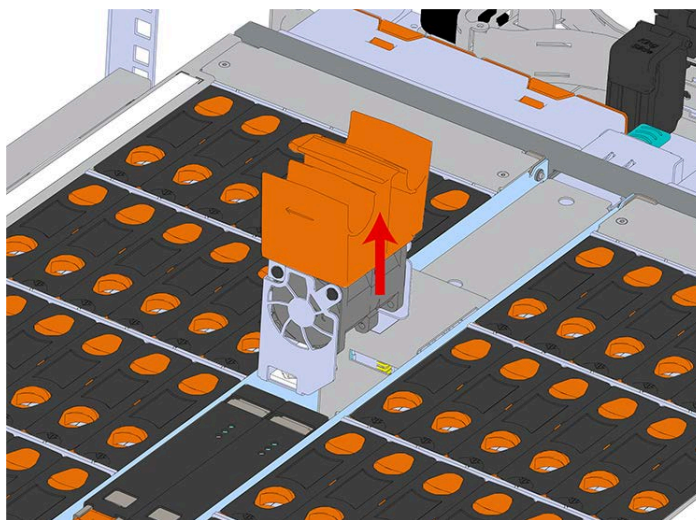
- b. Grasp both handles, one handle in each hand, and lift evenly with both hands to ensure the IOM comes out straight. This will prevent any damage to the pins on the internal connectors.

Figure 145: Removing IOM

Step 16: Remove the second IOM.

Step 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.

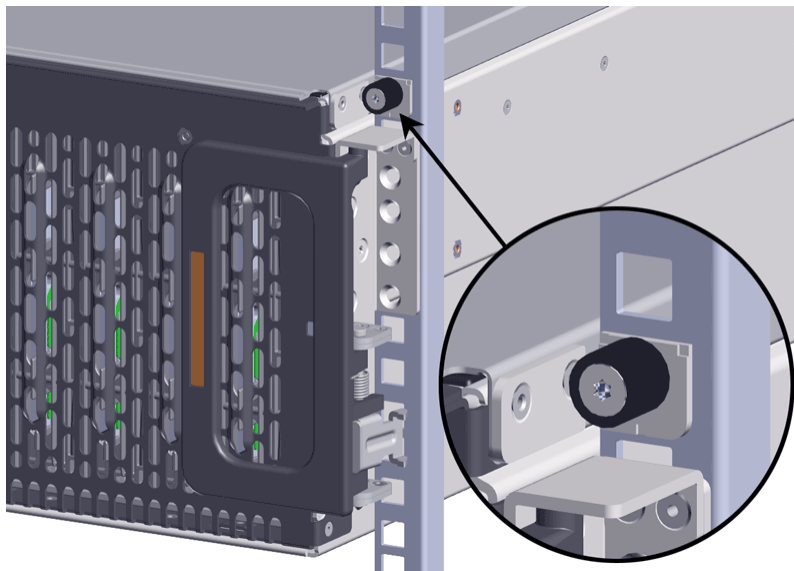
Figure 146: Removing IOM Fan

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

Figure 147: Inner Rail Safety Latch Release

Step 19: Push the chassis back into the rack.

Step 20: Locate the M5 thumb-screws on the top cover of the enclosure that keep it in place when the drawer is extended, and unscrew them using a T15 Torx screwdriver. This will allow the top cover to move freely with the enclosure when the enclosure is removed.




Step 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.

Step 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 Ultrastar Data60. 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 149: 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.

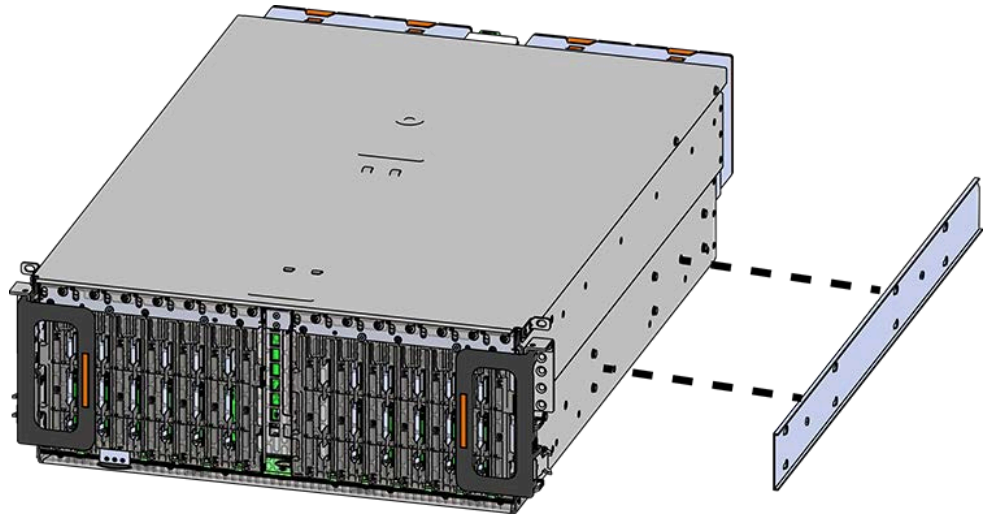


Warning: Do not lift the chassis by the Cable Tray while removing the chassis from the rack OR while installing it into a rack. This can cause serious damage to the unit or serious bodily harm to those handling the unit. Always team lift the chassis by gripping the underside of the unit, and never try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

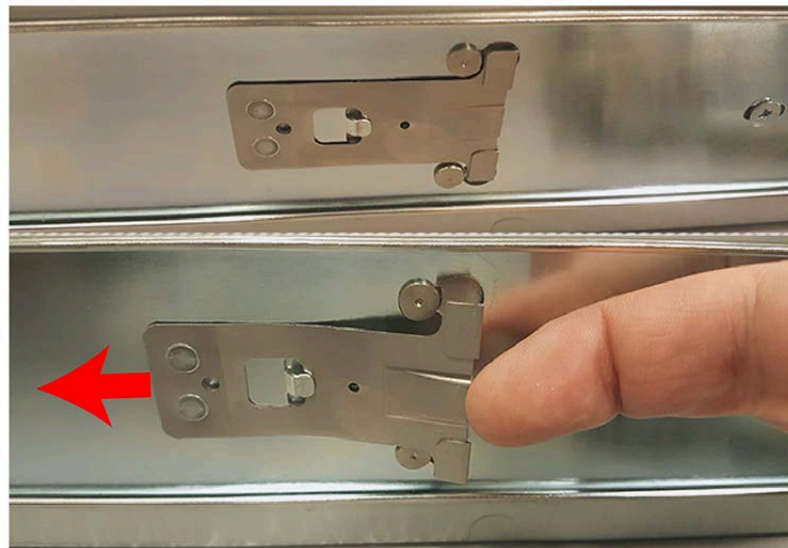
- f. Slide the chassis forward to free it from the rails. Place the chassis in a safe location to avoid damage.

Step 23: Uninstall the inner rails from the sides of the chassis.

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

Figure 150: Remove Inner Rail

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

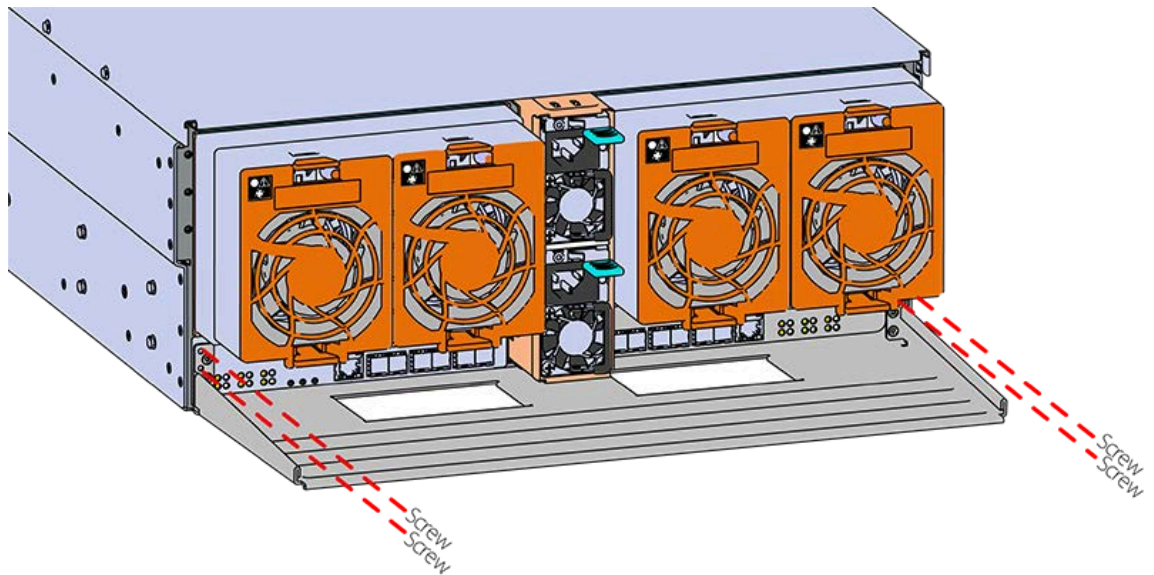
Figure 151: Inner Rail Spring Latch

- 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.

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

Figure 152: Uninstalling the Cable Tray

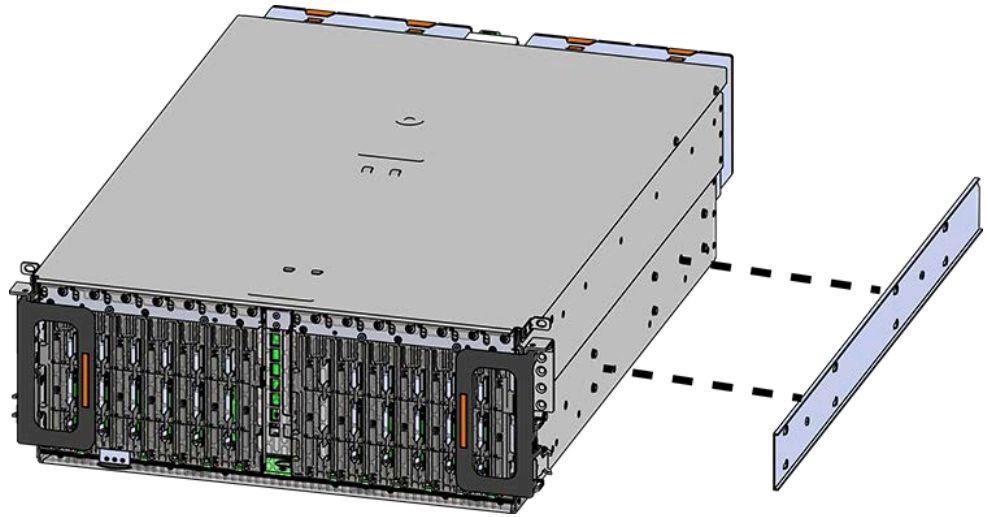
Caution: Always install the top cover onto the enclosure before installing the chassis into a rack. Not having the top cover installed may damage the alignment brackets.

Step 25: Ensure the top cover is installed.

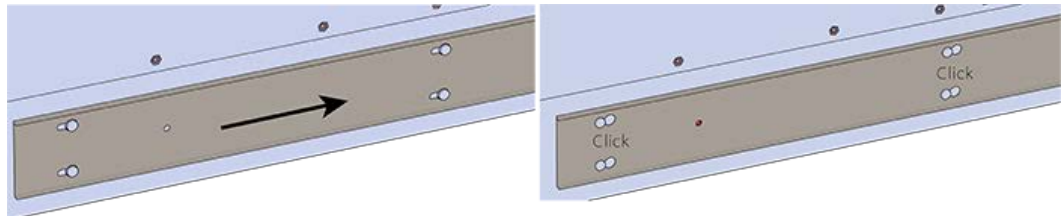
- a. From the rear of the enclosure, align the top cover with the grooves on the top of the chassis.
- b. Ensure that there is a good catch of the top cover by the chassis and slide it in all the way.


Step 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.

- 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 153: 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.

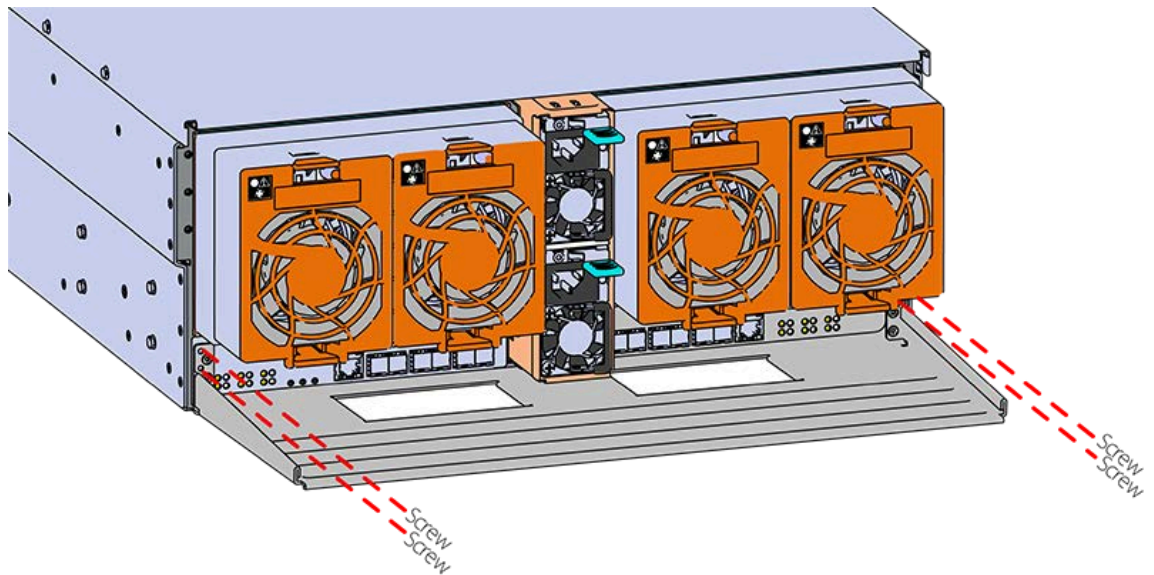
Figure 154: Slide Inner Rail

- 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 should be tightened to .90-1.12 Nm / 8-10 in-lbf using a # 2 Philips Screwdriver. These screws are specially designed for this purpose. Using unapproved screws could cause damage to the slides inside the rail.

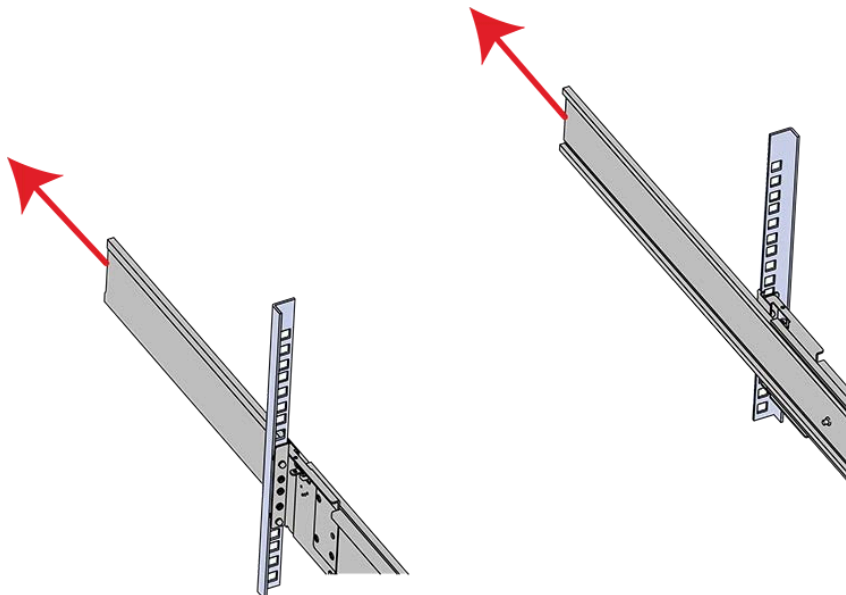
Install the two special low-profile M4 x 3.2mm Philips screws provided to secure the inner rail to the chassis.

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

Step 27: Secure the Cable Tray onto the enclosure using the included M3 x 8mm T10 Torx screws and the Long T10 Torx Screwdriver. These screws should be tightened to .33-.56 Nm / 3-5 in-lbf using a Long T10 Torx Screwdriver.

Figure 155: Installing the Cable Tray


Step 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 156: Extend Mid-Rails


Step 29: Install the chassis into the rails.

- a. Extend the bearing plates on the inside of the mid-rails until they are fully forward (detent has engaged). This prevents potential damage due to improper mating of the rails.

Figure 157: Bearing Plate

- b.  **Caution:** This step in the installation requires a minimum of 3 individuals to install safely, two to lift and one to guide the others who 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.** The only case in which the system may be installed or removed with the drives populated is if the facility has a lift that is rated to handle the maximum weight of the fully loaded system.

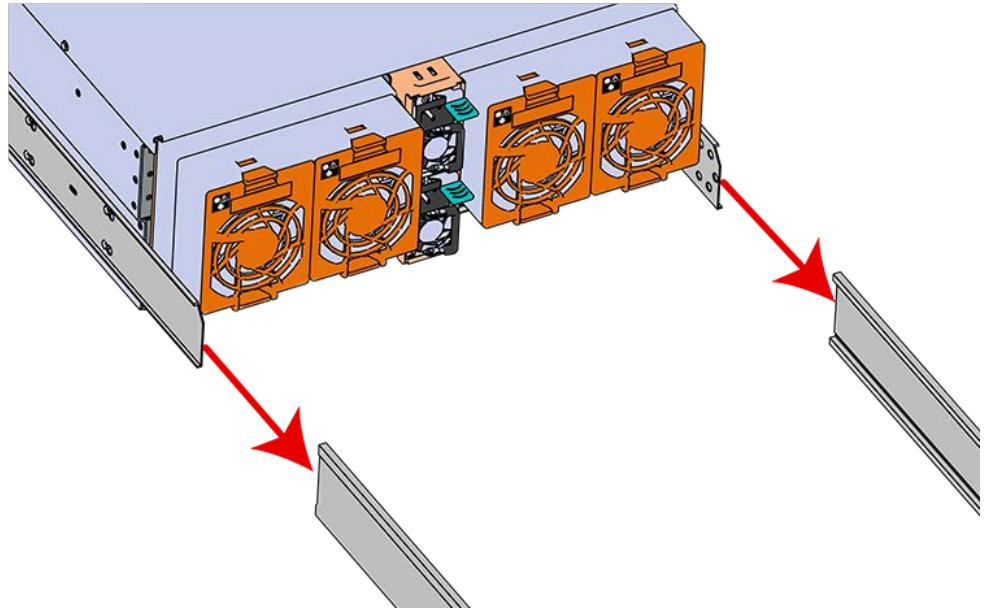
-  **Warning:**  The handles on the front of the chassis are not intended to be used to support the weight of the Ultrastar Data60. Lifting the unit by the chassis handles or trying to support the unit on the handles can cause them to fail. This can cause serious damage to the unit or serious bodily 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.

In preparation to perform a team lift, position one individual on each side of the enclosure (to lift) and a third individual standing at the protruding rack rails (to guide the chassis to mate with rack rails).

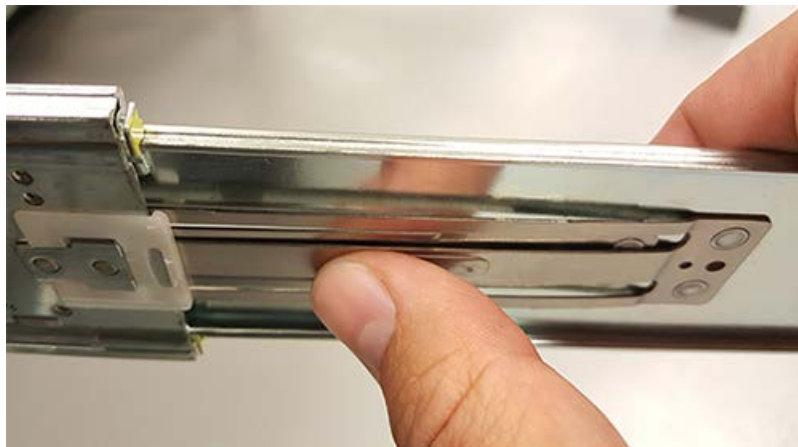
- c. Team-lift the enclosure until the inner rails (which are attached to the chassis) align with the extended mid-rails (which are attached to the rack), and guide the inner rails on the chassis to mate with the rack rails.

Figure 158: Installing the Chassis



- 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 each of the rails), and push the enclosure the rest of the way into the rack.

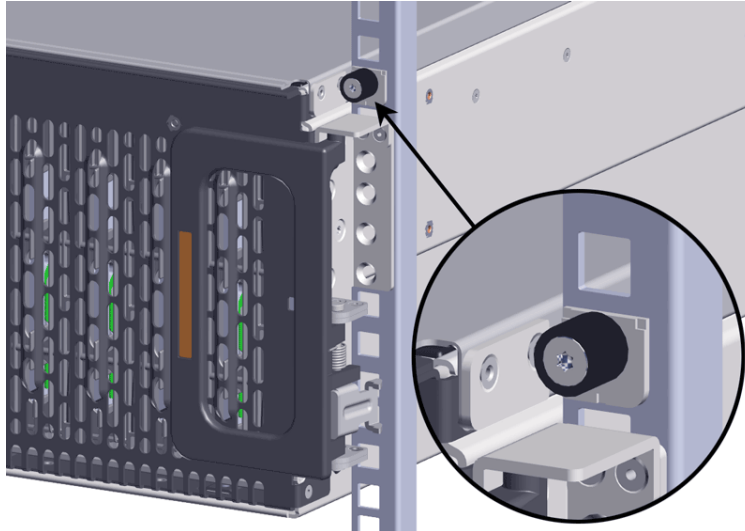
Figure 159: Safety Latch Release



- 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.

Step 30: Secure the chassis top cover to the rack using the captive M5 thumb-screws as shown in the following image. Use a T15 Torx screwdriver, and tighten the screws to 3.38-3.61 Nm / 30-32 in-lbf.

Figure 160: Cover Retention Screws



Step 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 repeat the installation.



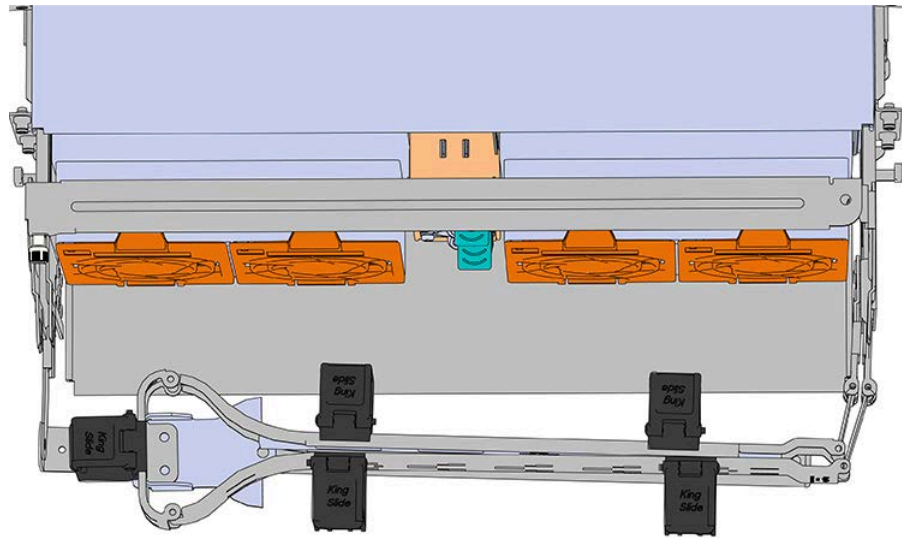
Note: Adjustments of the vertical rack rails may be required to fix any issues that may occur.

Step 32: Install the CMA(s).



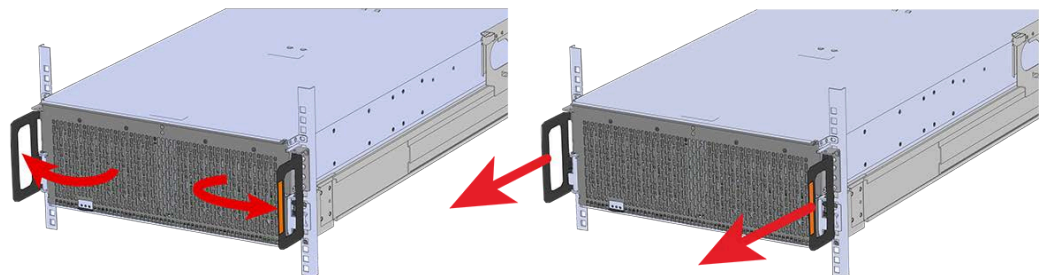
Note: The CMA has two arms, labeled "upper" and "lower." The lower arm should have the elbow on the left side and be installed first; the upper arm should have the elbow on the right side and be installed last.

- a. Orient the CMA so that the elbow is on the left hand side.
- b. Attach all three of the connectors to the brackets on the rails. There should be one at the elbow side and two at the other end.

Figure 161: Lower CMA Orientation

- c. Slowly slide the enclosure forward to ensure the arm is operating properly, then slide it back into the rack.
- a. Repeat these steps to install the upper arm with the elbow facing to the right.

Step 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 and the cover will remain in the rack attached to the rear alignment brackets.

Figure 162: Chassis Handle Operation

Step 34: Install the IOM.


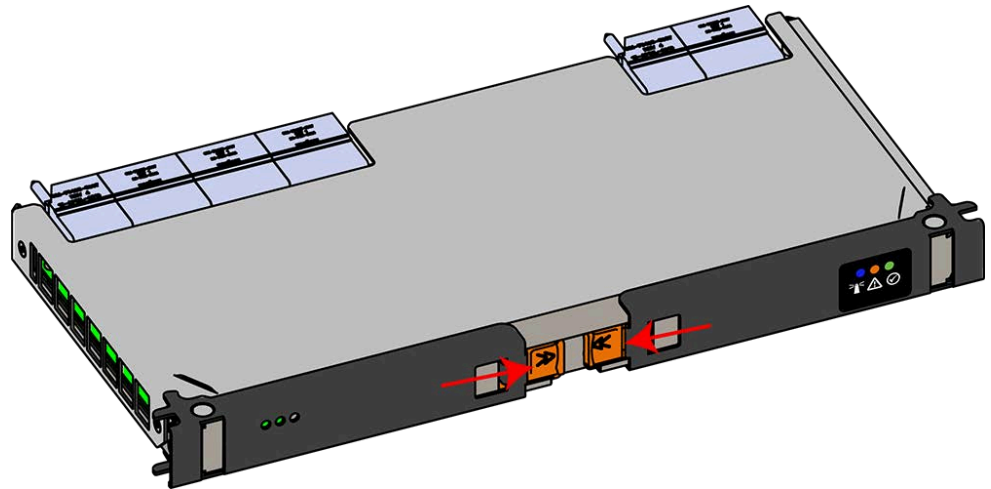
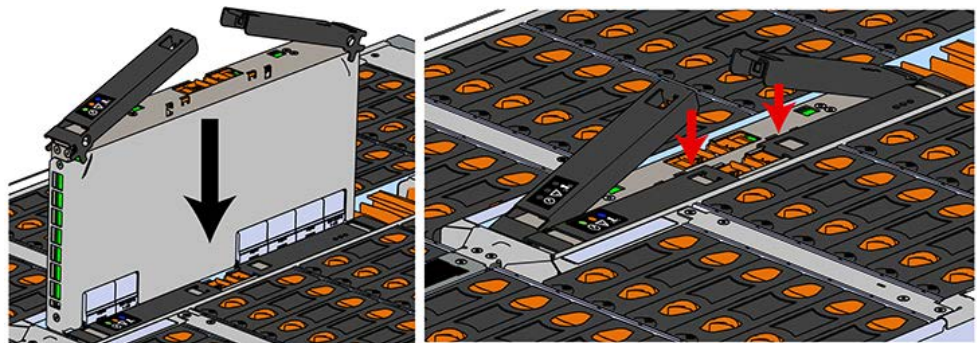
- a.  **Caution:** If a pin on the IOM's internal connectors is bent or damaged, the IOM will have to be replaced. For this reason it is imperative that the IOM is not forced into position, that it is inserted straight, and that the directions for installing the IOM are followed exactly.
- b. Ensure 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 163: 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.

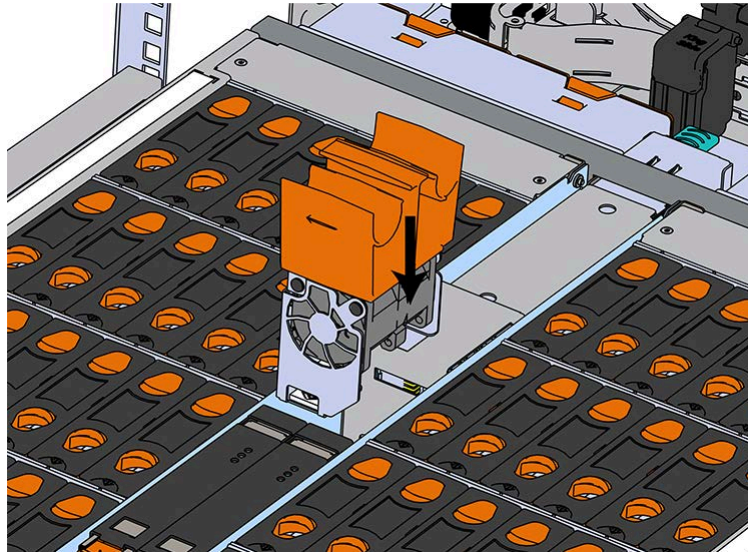
Figure 164: Installing the IOM

- 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.

Step 35: Install the second IOM using the same method as the first.

Step 36: Install the IOM Fan.

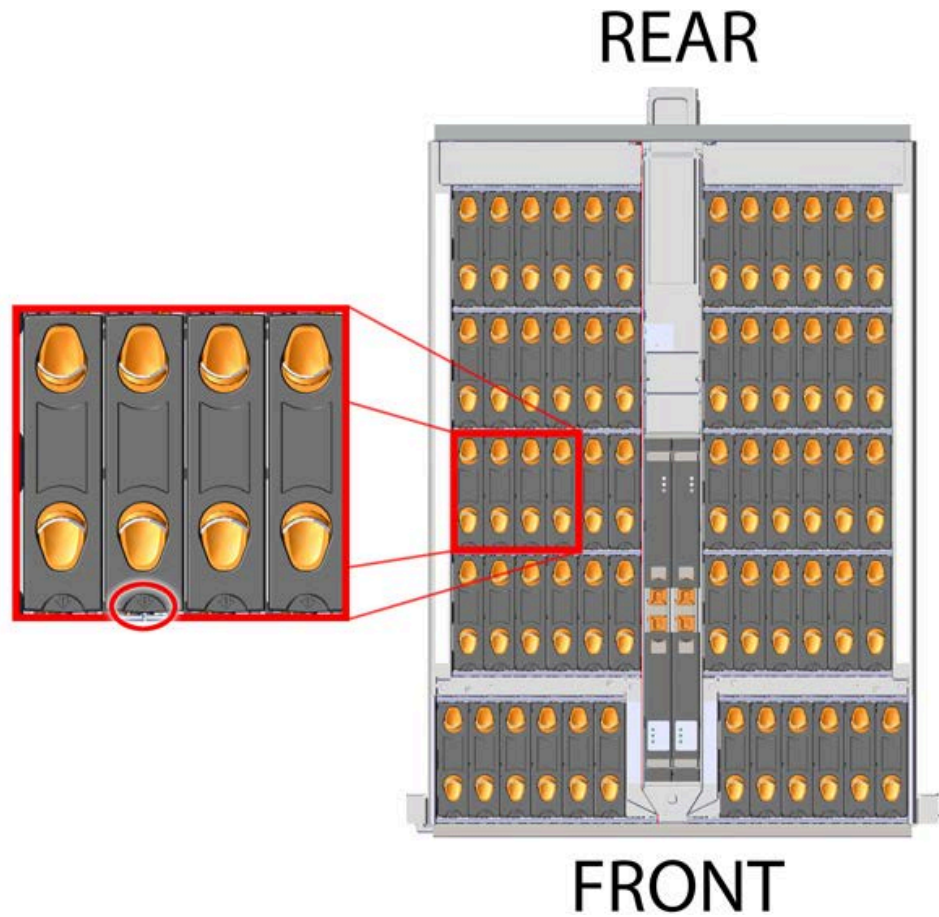
- a. Align the IOM Fan as shown in the following image.

Figure 165: Installing the IOM Fan

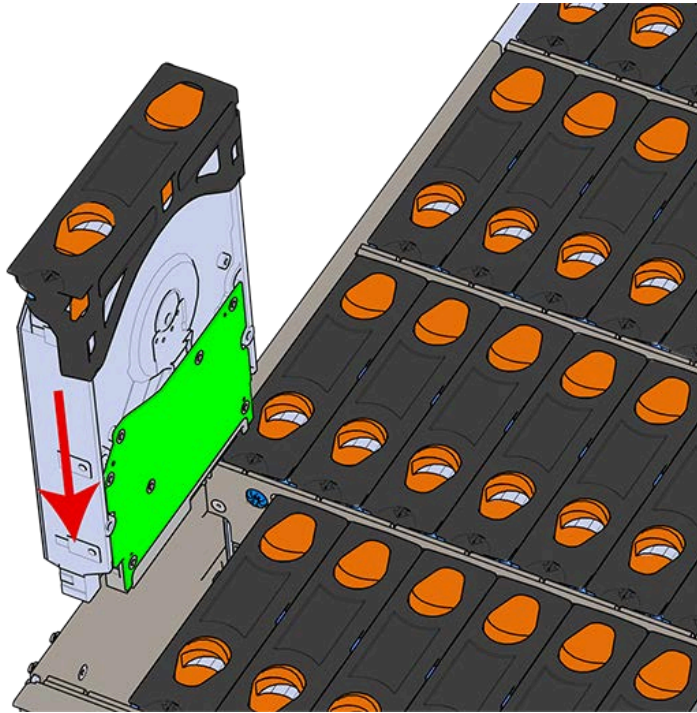
- b.** Pinch the latch release mechanism slightly and carefully lower the IOM Fan into the slot.

Step 37: Install the Drive Assembly.

- a.** Ensure that the enclosure has been pulled out of the rack until the rail latches engage.
- b.** Find the LED pointer on the top of the drive carrier. This pointer should point toward the front of the unit as shown in the following image.

Figure 166: LED Pointer Orientation

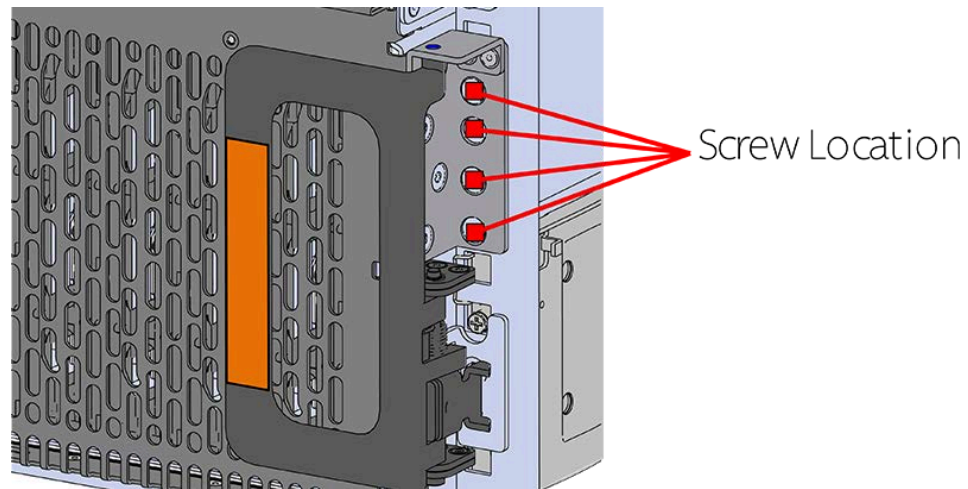
- c. Align the drive with the empty slot that will receive it. Lower it into the slot, making sure it stays level and does not snag.

Figure 167: Installing a Drive Assembly

- d. Pinch the latch release and carefully press downward to seat the Drive Assembly the rest of the way.

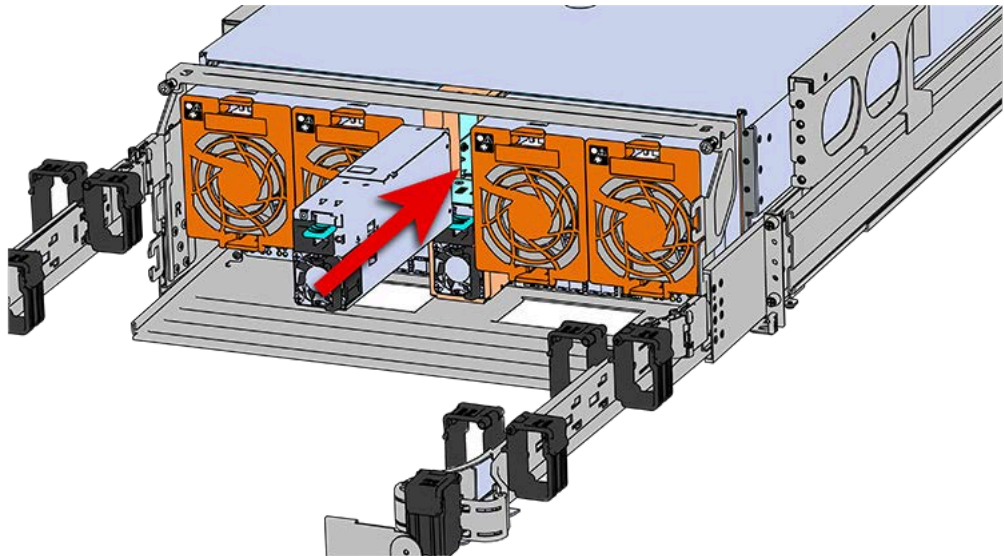
Step 38: Install each drive in the place it was removed from by following the labels or marks that were added earlier.

Step 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 Flat Head Torx screws into the two brackets at the front of the chassis in the following locations. These screws should be tightened to 3.38-3.61 Nm / 30-32 in-lbf using a Long T15 Torx Screwdriver. If this chassis will not be installed into a rack for shipping purposes, skip this step and move on to the next one.

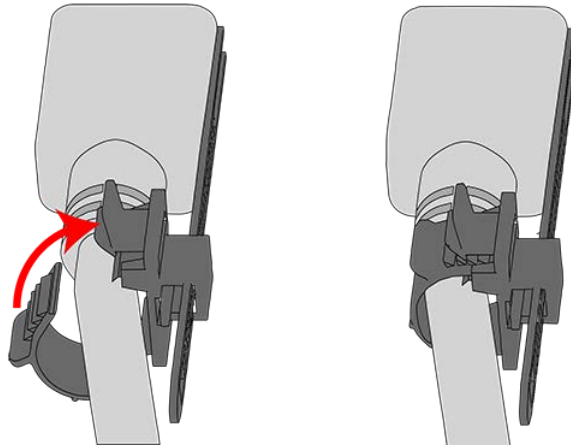
Figure 168: Shipping Bracket Screw Locations

Step 40: Install the PSU.

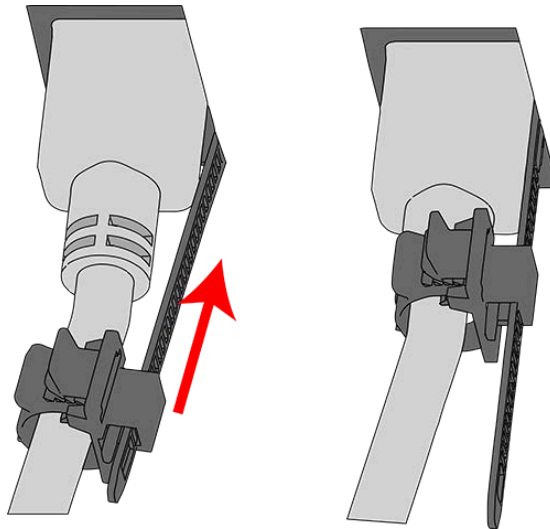
- a. Align the PSU in the orientation shown in the following image.
- b. Slide the PSU into the slot until it seats fully into the chassis.

Figure 169: 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 170: Cable Retention Mechanism

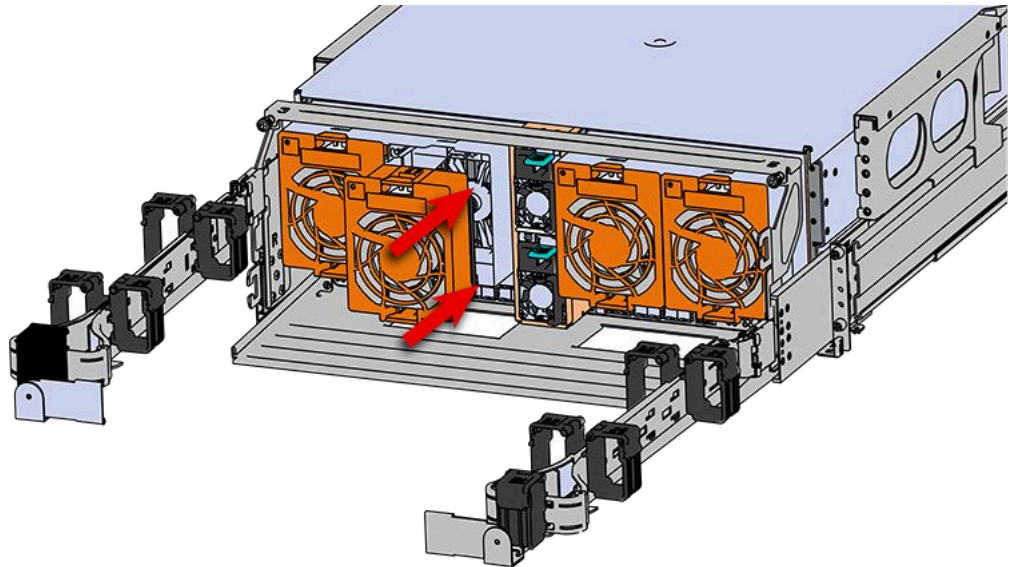
- e. Slide the retention clip forward until it stops near the cable connector. Doing this will ensure that the retention clip functions properly in the event the cable is pulled on for some reason.

Figure 171: Cinching Cable Retention Clip

Step 41: Install the second PSU.

Step 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 172: Installing the Rear Fan

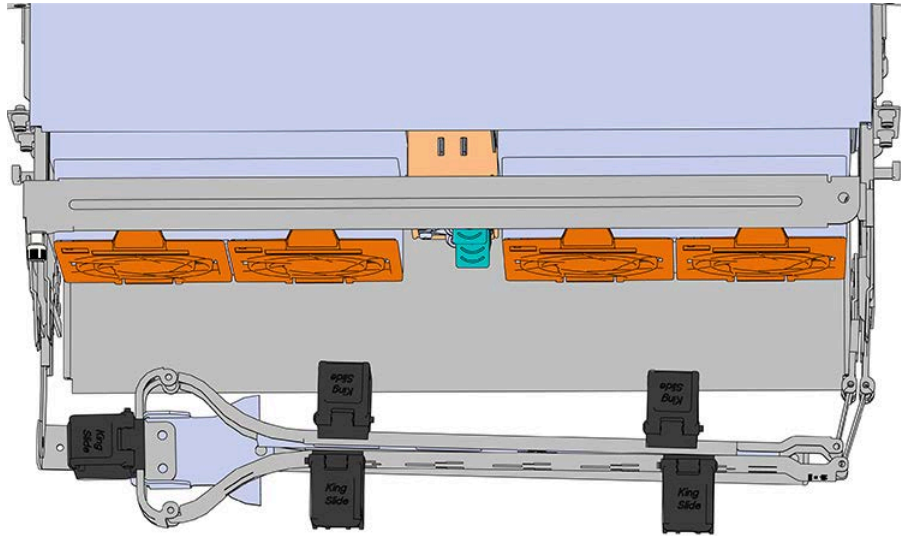
Step 43: Install the rest of the rear fans into the rear of the enclosure.

Step 44: Install the CMA(s).



Note: The CMA has two arms, labeled "upper" and "lower." The lower arm should have the elbow on the left side and be installed first; the upper arm should have the elbow on the right side and be installed last.

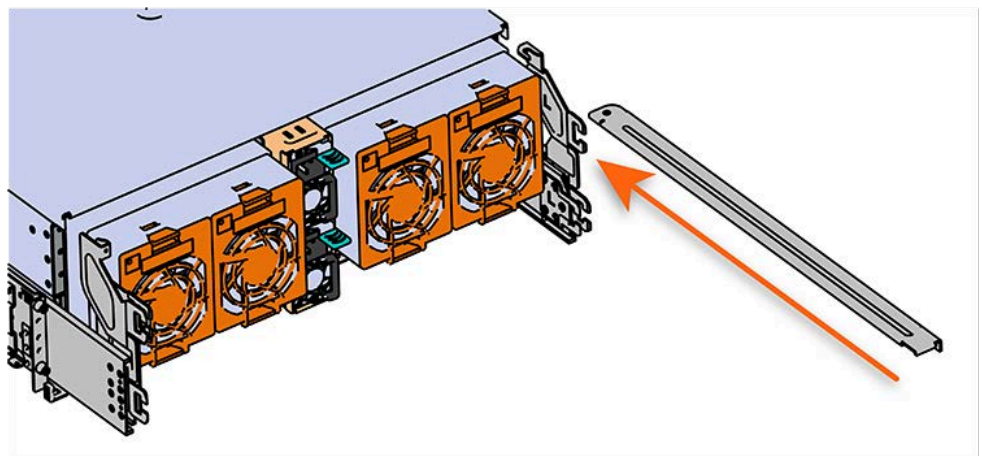
- a. Orient the CMA so that the elbow is on the left hand side.
- b. Attach all three of the connectors to the brackets on the rails. There should be one at the elbow side and two at the other end.

Figure 173: Lower CMA Orientation

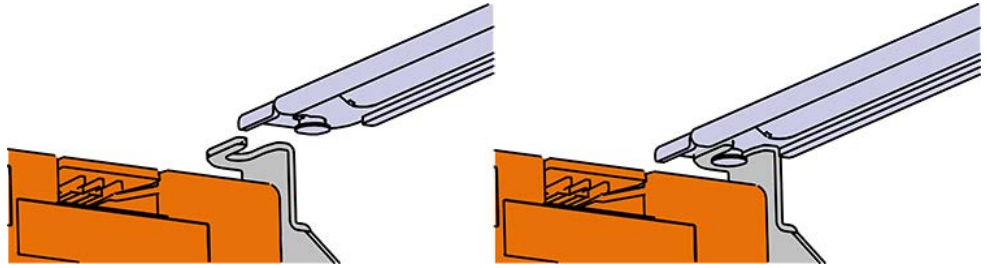
- c. Slowly slide the enclosure forward to ensure the arm is operating properly, then slide it back into the rack.
- a. Repeat these steps to install the upper arm with the elbow facing to the right.

Step 45: Install the crossbar onto the CMA mounting bracket.

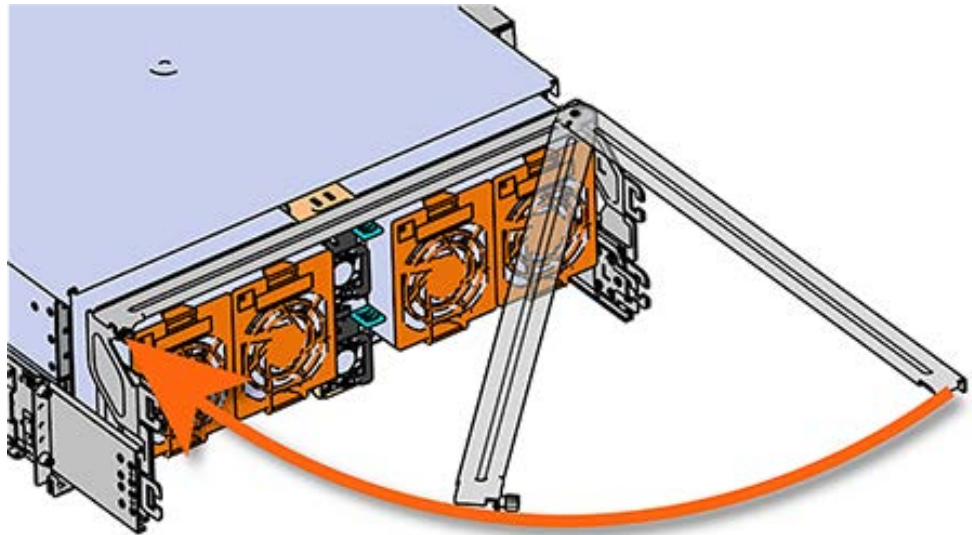
- a. Align the crossbar with the mounting peg facing down and pointing toward the CMA mounting bracket.

Figure 174: Initial Alignment

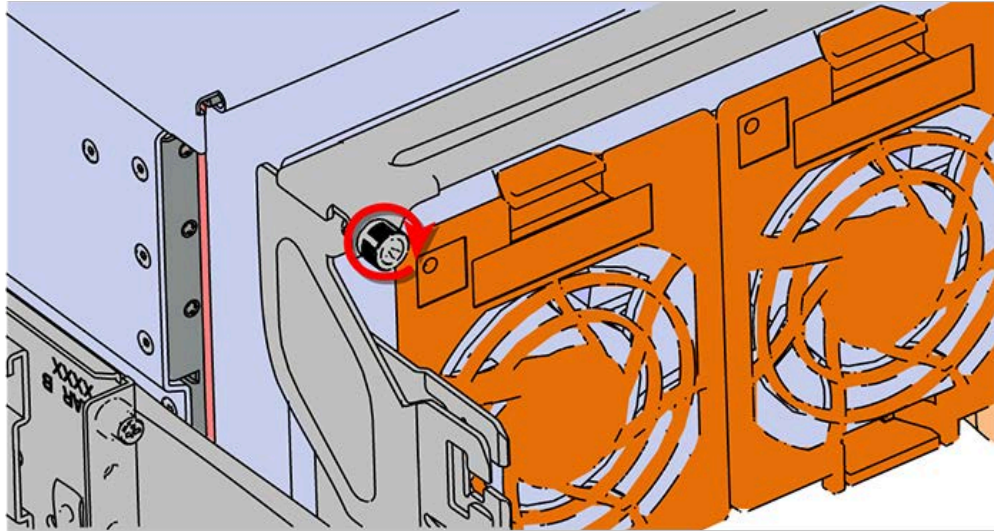
- b. Insert the peg on the underside of the crossbar into the slot on the CMA mounting bracket.

Figure 175: 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 176: 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 177: 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.

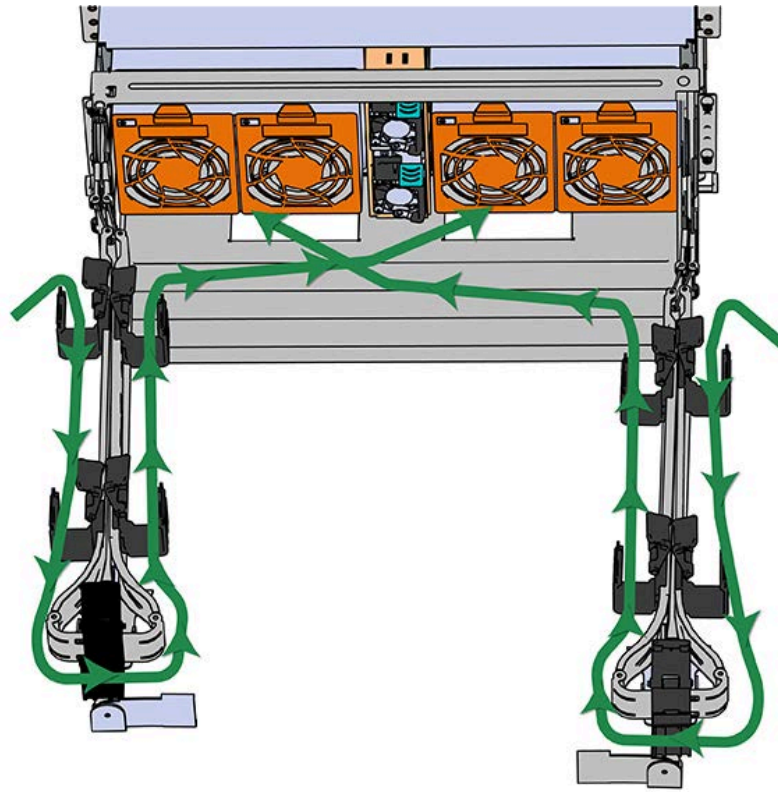
Step 46: Cable the CMA(s).

- a. Unlatch the elbow side of the arm(s) by pressing the blue button labeled "push," and then swing the arm(s) open.
- b. Gather the SAS, power, and Ethernet cables for installation. Before cabling, note the following routing patterns for best results:



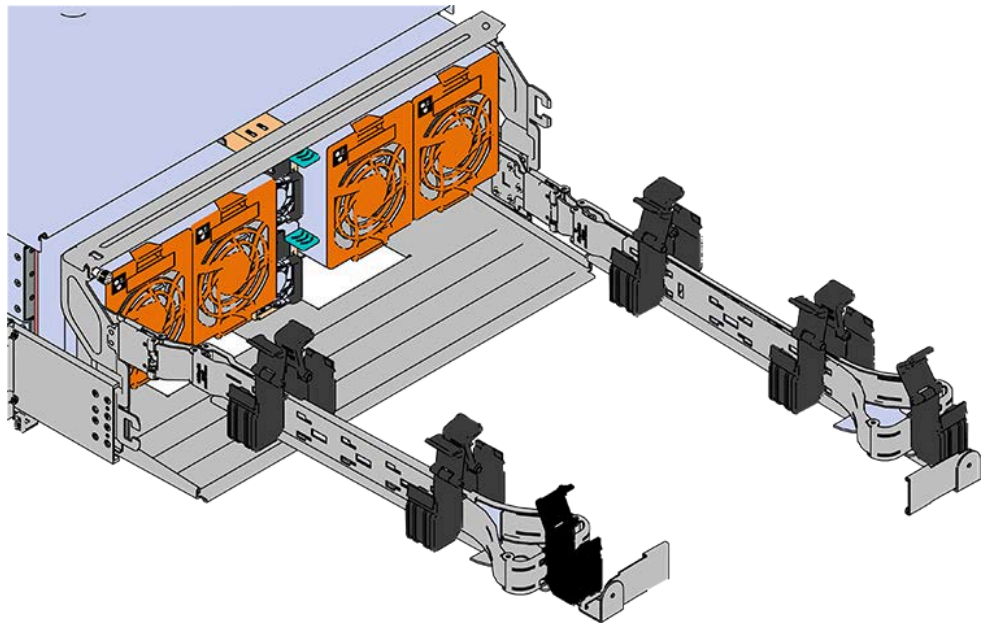
Note: Route the cables supported by the lower arm to IOM A (left hand side looking at the rear). Second, route the cables supported by the upper arm to IOM B (right hand side looking at the rear) in a "criss-cross" pattern. See the [Special Considerations for Cable Routing](#) (page 157) for more information.

Figure 178: CMA Cable Routing



- c. Open all of the baskets.

Figure 179: Open Baskets



- d. Connect the Ethernet cable to the Ethernet port, and route the cable through each of the baskets on the arm.
- e. Connect the SAS cables to the SAS ports, and route them through the baskets one at a time. Make sure to follow the labels to ensure they are connected to the proper ports.
- f. Connect the power cable to the PSU and route it through each basket.



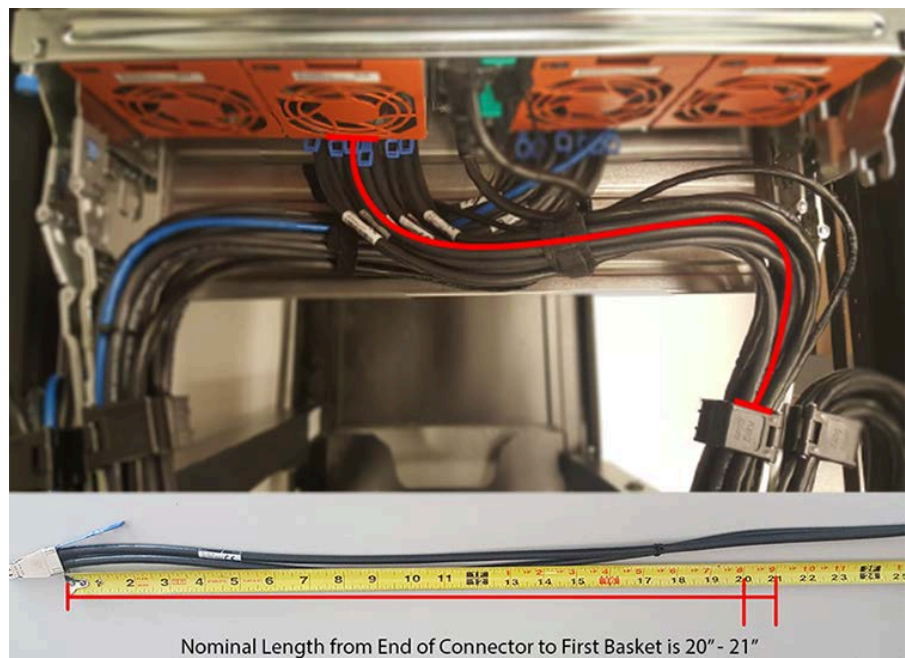
Attention: Make sure the power cable is not connected to a PDU. If it is, the system will power up when the cable is connected to a PSU. This is not intended at this stage of installation.

- g. If the installation includes more than 10 total cables, follow the recommendations in [Special Considerations for Cable Routing \(page 157\)](#), before proceeding.



Note: Each cable must be given enough slack at the connector end to operate smoothly. Allow 20 - 21 in. (508 - 533.4 mm) between the connector and the first basket.

Figure 180: Nominal Cable Length at Connectors

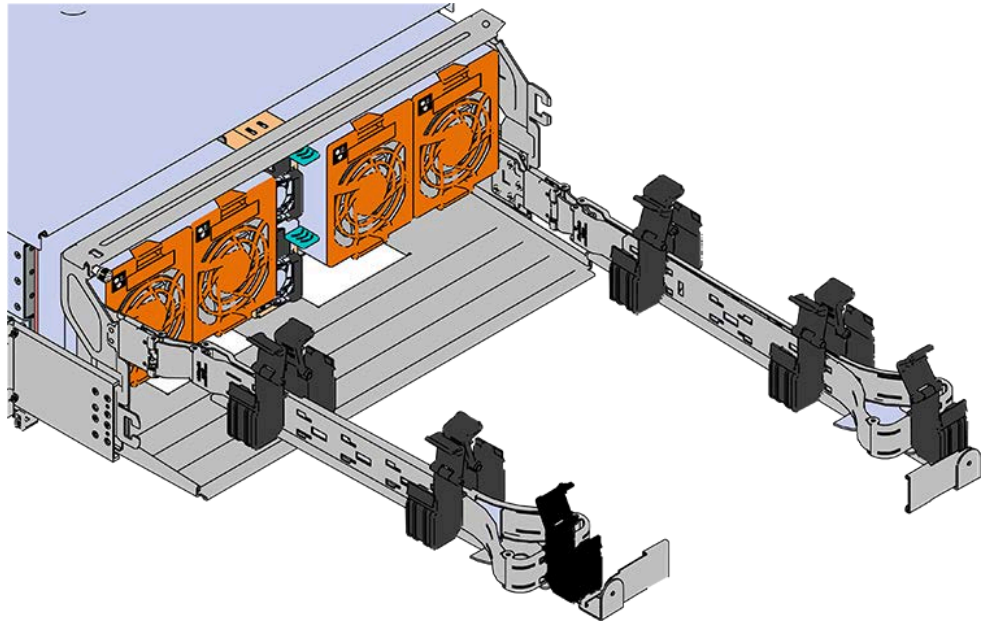


- h. Close all of the baskets.
- i. If the Ultrastar Data60 is being installed in a rack and will subsequently be transported inside that rack, it is important to use the included cable tie to wrap the CMA bundle to ensure it does not get damaged during transport. If the Ultrastar Data60 is instead being installed where it will be operated, skip this step. Remember to remove the cable ties after the enclosure has reached its final operational location.
- j. Reconnect the arm at the elbow to the connectors on the rail.

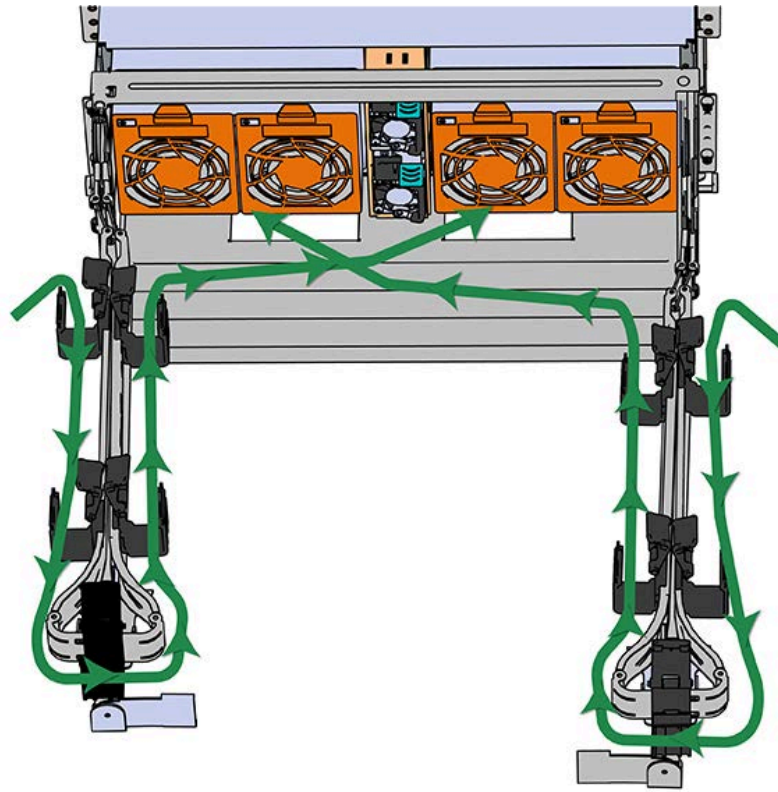
Step 47: Cable the upper CMA.

- 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 181: Open Baskets



- a. Connect the Ethernet cable to the Ethernet port on the right hand side of the Ultrastar Data60 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 upper PSU and route it through each basket. The following image shows the appropriate cable "criss-cross" pattern they should be installed in.

Figure 182: Connected Cable Routing

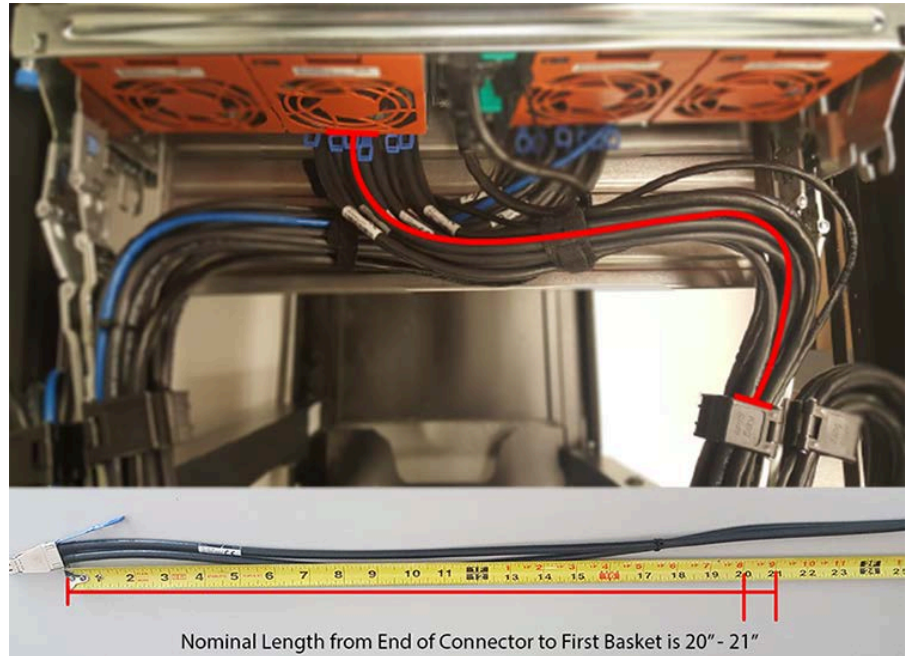
- d. Wrap cable tie around the installed cable bundle between the ports and the first basket of the CMA



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.

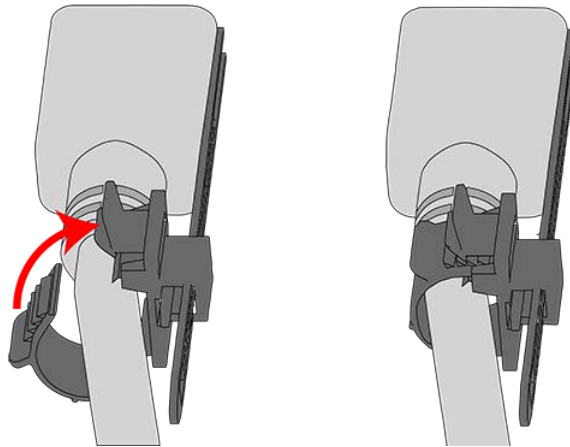


Figure 183: Nominal Cable Length at Connectors

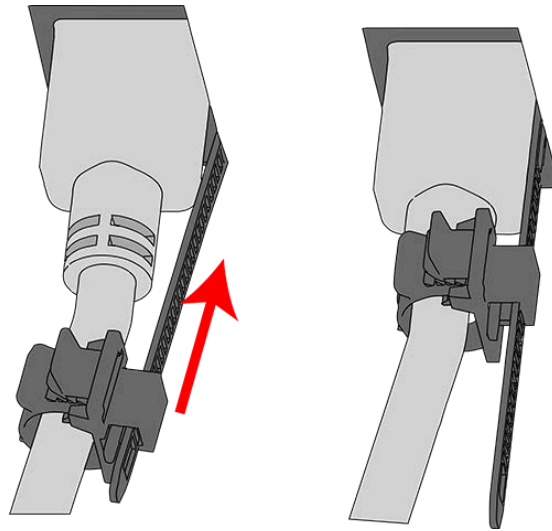


- e. Loop the retention clip on the PSU cables around the cable and pinch it until the clip catches and locks in place.

Figure 184: 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 185: Cinching Cable Retention Clip

- g. If the Ultrastar Data60 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 Ultrastar Data60 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.

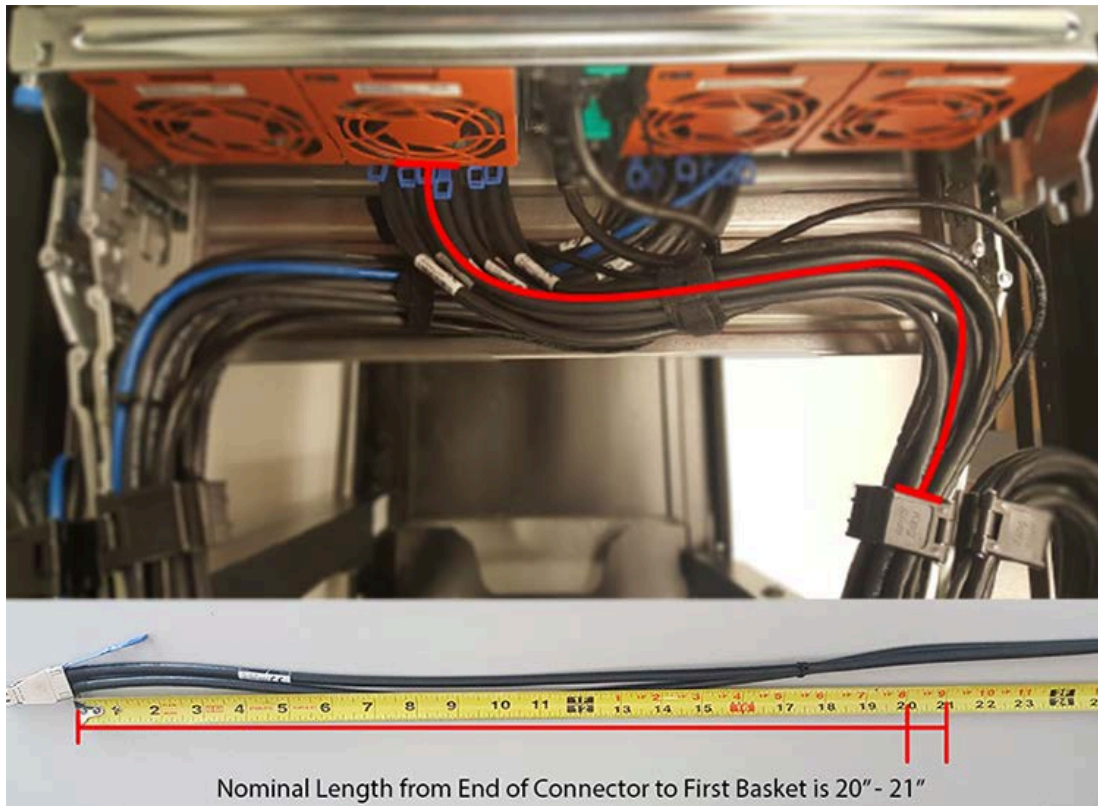
Step 48: Test for binding in the extension of the arm by gently pulling the enclosure out of the rack, ensuring the cables extend properly and that the system doesn't bind at all. If it does, examine the point at which the binding occurred and adjust the seating of cables in the baskets, check the connections to the rails, and examine the joints of the arm to ensure that they are all functioning properly.

Step 49: Make sure the CMA(s) is in operational position by folding the arm(s) in toward the enclosure and attaching the elbow end(s) to the connector(s) attached to the rail. Verify that all of the cabling is in functional order and does not bind or catch.

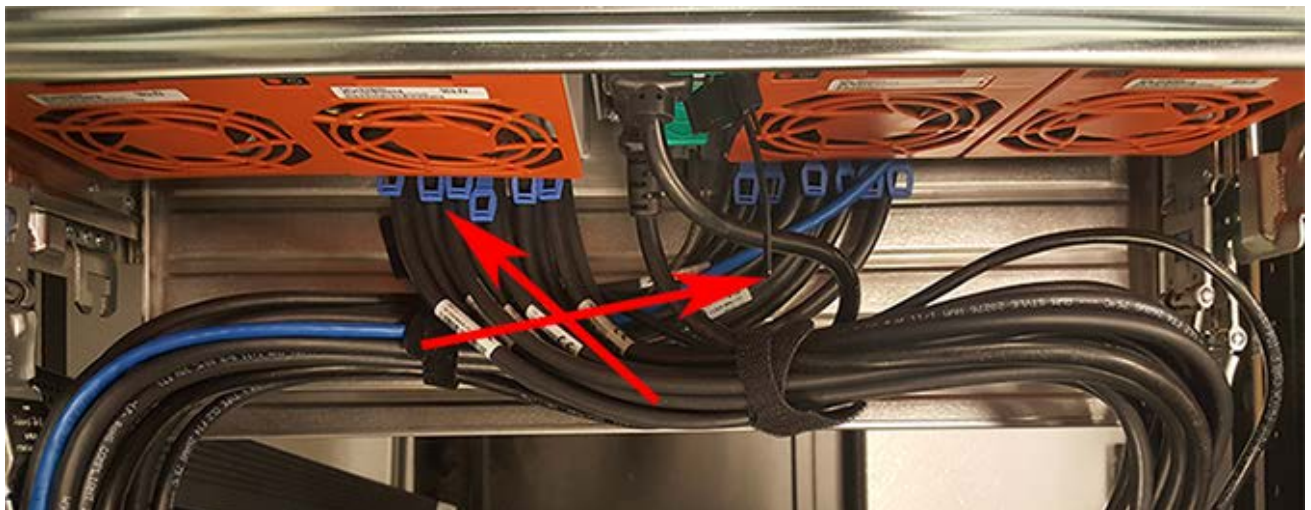
4.10 Special Considerations for Cable Routing

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 186: 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 187: Crisscross Cables

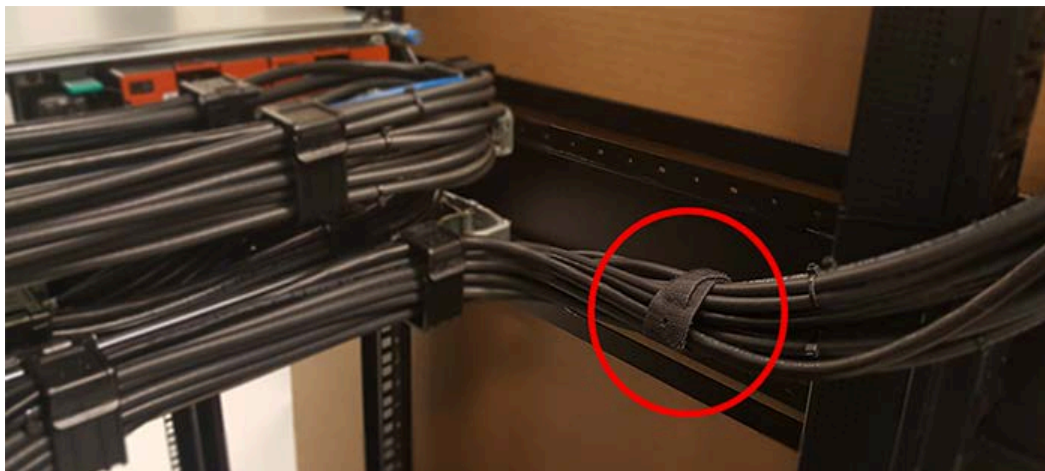
When the cables are routed into the CMA, make sure there is some slack given to the elbow joint of the CMA. It is recommended not to wrap the cables tightly around this joint because this can cause binding and prevent smooth operation. To ensure there is enough slack at the elbow, pull the enclosure 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 188: 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 189: Cable Tie at Exit of CMA



4.11 Cabling for CMA

4.11.1 Before You Begin

The cable configurations detailed in this section are intended to provide the optimal setup for your specific configuration. During the cabling of the CMA, the HD Mini-SAS and SFP+ cables should be installed into the CMA first, followed by Ethernet cables, and finally the power cables on top.

How to Use the Service Loop Dimension Figure and Table

This section uses the concept of service loops to inform the user on how to prepare HD mini-SAS cables for installation into the CMA. The power and Ethernet cables do not need to be added to the Service Loop bundle. This concept utilizes measurements that begin at the connector end of the cable and along the cable itself. The Service Loop Dimensions figure and the Service Loop Dimensions table are paired together to communicate the length in which connectors, velcro, and the CMA cage must be set at to avoid binding or snagging.



Note: The measurement provided in this section are only suggested values based on product testing. Your specific situation may vary. Adjust the measurement as necessary to avoid cable binding or sagging below the rear of the enclosure.

1. Identify the configuration that is needed for the particular setup and locate the Service Loop Dimension table related to that configuration.
2. Take the first measurement (letter A) and measure that length from the connector on the cable to the edge of where the first velcro strip will go. Apply the velcro strip.
3. Repeat this action for the B and C values until the table has been completed.

Here is an example of the Service Loop Dimension Figure and Table:

Figure 190: Service Loop Dimension Figure

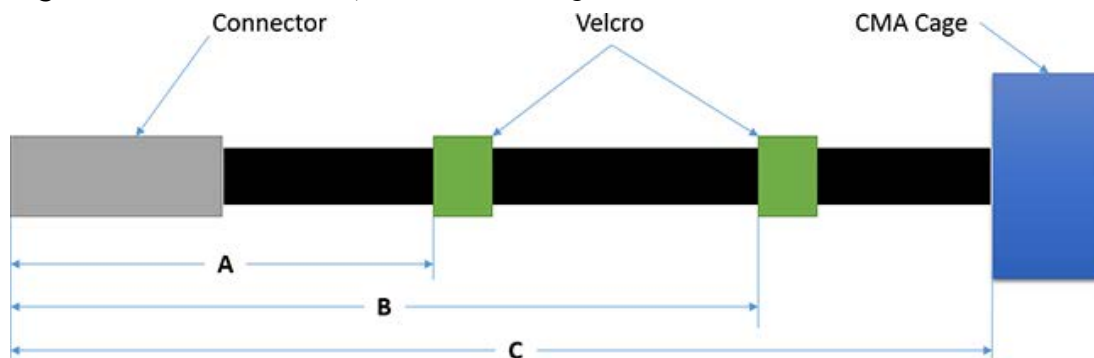


Table 45: Example Service Loop Dimension Table

A	B	C
6in.	N/A	12in.

In this case, the first measurement from the tip of the cable to the first velcro strip is 6in. Followed by a 12in. measurement to the CMA cage. There is no need for a B value due how short this configuration is.

4.11.2 Cabling CMA

4.11.2.1 SFP+ and HD Mini-SAS Cable Configuration

This configuration includes the use of up to **four** SFP+ and **two** HD Mini-SAS cables installed into a CMA arm.

Figure 191: Service Loop Dimension Figure

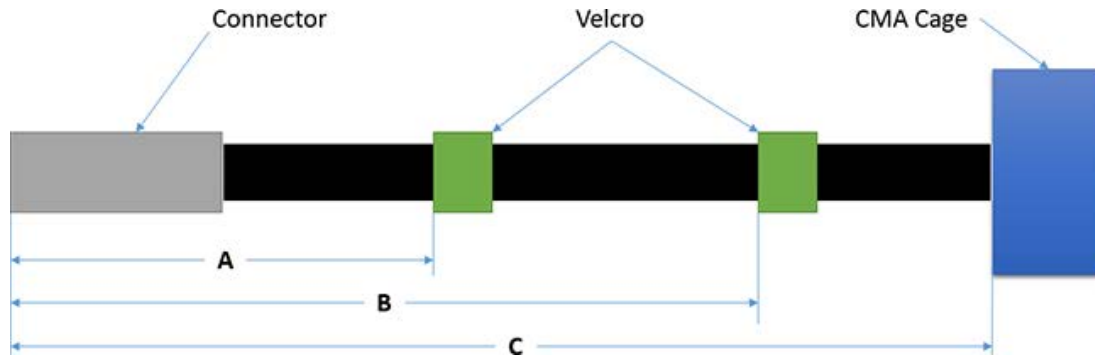


Table 46: Service Loop Dimension Table

A	B	C
6in.	12in.	16in.

System Management

In This Chapter:

- Firmware Upgrade..... 163
- Configuring OOBM Network Settings..... 179
- Zoning.....181
- Subenclosure Nickname.....202
- Partially Populated Enclosures..... 204
- Daisy Chaining..... 210



5.1 Firmware Upgrade

This section provides information on actions that should be taken before starting a firmware upgrade on the Ultrastar Data60.

The storage administrator should determine if the applications on the enclosure should be quiesced before the online upgrade is completed. Before upgrading enclosure firmware, review the following section to determine whether or not the enclosure should be taken offline before upgrading. As an alternative to the automatic firmware upgrade activation process, the storage administrator may opt to use a more controlled process by using the non-automatic firmware activation process detailed in [Linux Upgrade to New Firmware \(page 167\)](#) and [Windows Upgrade to New Firmware \(page 172\)](#).



Attention: It is strongly recommended that the user use the non-automatic firmware activation process for either Linux or Windows.

SAS Configuration: If the enclosure contains SAS drives and redundant IOMs, the enclosure firmware may be upgraded while online. This is due to the SAS configuration and host being able to manage the firmware upgrade using host multi-pathing software. The storage administrator should ensure that there are always two paths to each drive before starting an upgrade on either IOM. This will ensure that at least one path to each drive is available during the reset of the IOM that is being upgraded.

SATA Configuration: If the enclosure contains SATA drives, the enclosure firmware should not be upgraded while online. This is due to the SATA configuration having no redundancy with only a single IOM (the second slot contains an IOM Blank). When the IOM is rebooted, the single path to the drives to service I/O will be taken down.

Users should install all of the required downloads before beginning the firmware upgrade process.

Devices (<dev>)

In order to initiate a firmware upgrade on the enclosure, a target must be identified. Linux targets are referred to as sg (SCSI Generic) devices and appear as <dev> in the Linux Firmware Upgrade procedure. Windows targets are referred to as SCSI devices and appear as <dev> in the Windows Firmware Upgrade.

Required Downloads:

- **SG3 Utils:** download version 1.42 from the SG3 Utils website at: http://sg.danny.cz/sg/sg3_utils.html



Note: Firmware upgrades do not affect any zoning configurations that have been enabled on the enclosure.

5.1.1 Downloading Firmware from the Support Portal



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

Step 1: Open a web browser and go to: <https://portal.wdc.com/Support/s/>.

The Western Digital Enterprise Support Center will appear.

Step 2: Log in to the Western Digital enterprise support center using a Email and password.

You will be logged into the Western Digital Enterprise Support Center and several support options will appear on the page.

Figure 192: Logged into the Western Digital Enterprise Support Center

Sign in to
SUPPORT PORTAL

Step 3: Click the **Downloads** option.

The Western Digital downloads page will appear.

Step 4: Locate and download the firmware update for your product.

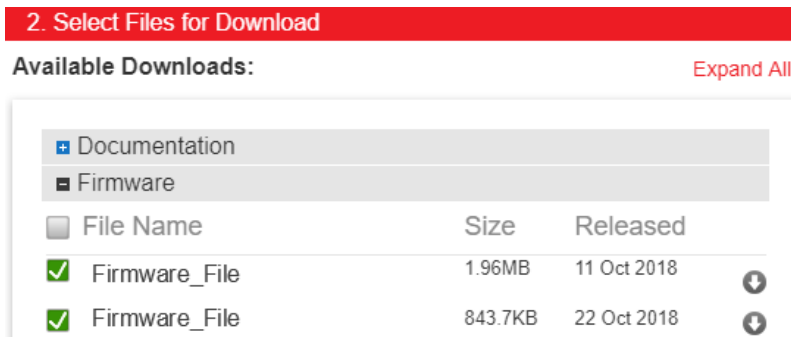
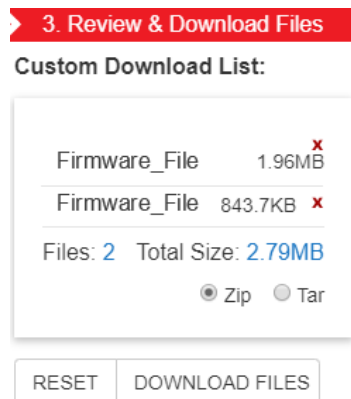
- a. From the Identify Product section, select the Product, Operating System / Type, and Release Version.

Figure 193: Identify Product section

- b. From the Select Files for Download section, expand the Firmware section and select the check box for the firmware file(s).

Figure 194: Select Files for Download section

- c. From the Review & Download Files section, review the selected files and click **DOWNLOAD FILES** to download the entire file selection from that section.

Figure 195: Review & Download Files section**Figure 196:** Download Files

Step 5: Extract the file by unzipping the downloaded file to the desktop.

5.1.2 Linux Upgrade Preparation

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

Step 1: Connect the Ultrastar Data60 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 Ultrastar Data60 will be referred to as an IOM.



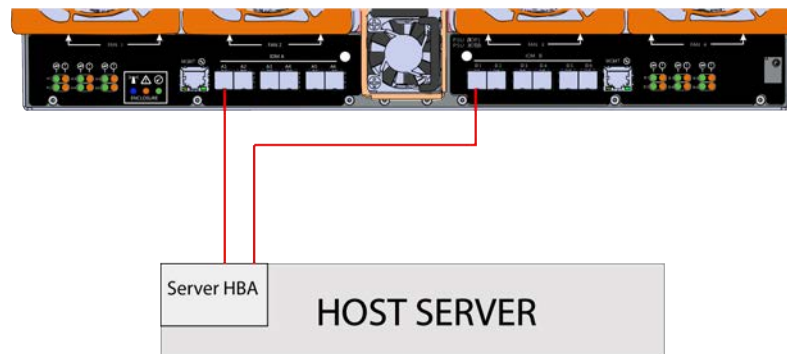
Note: To perform an online firmware upgrade, the Ultrastar Data60 must be configured with redundant data paths, meaning both IOMs must have a SAS Port populated and connected to the host server.

SAS Configurations: The server host must be configured with multi-pathing software that can handle the nature of the firmware upgrade. i.e. Once firmware is downloaded to the IOMs, each IOM will reset and boot the new code in a staggered fashion such that the host always has at least one path to the drives to service I/O.

SATA Configurations: A SATA configuration should not be considered for an online upgrade due to the single path nature of the topology.



Figure 197: Multipathing Configuration Minimum Requirement



Step 2: Type the `sg_scan -i` command to verify that the enclosure has been found by the server.

```
# sg_scan -i | grep -i 4060 -B 1
<dev>: scsi8 channel=0 id=50 lun=0
      HGST H4060-J 2020 [rmb=0 cmdq=1 pqual=0 pdev=0xd]
<dev>: scsi8 channel=0 id=204 lun=0
      HGST H4060-J 2020 [rmb=0 cmdq=1 pqual=0 pdev=0xd]
```



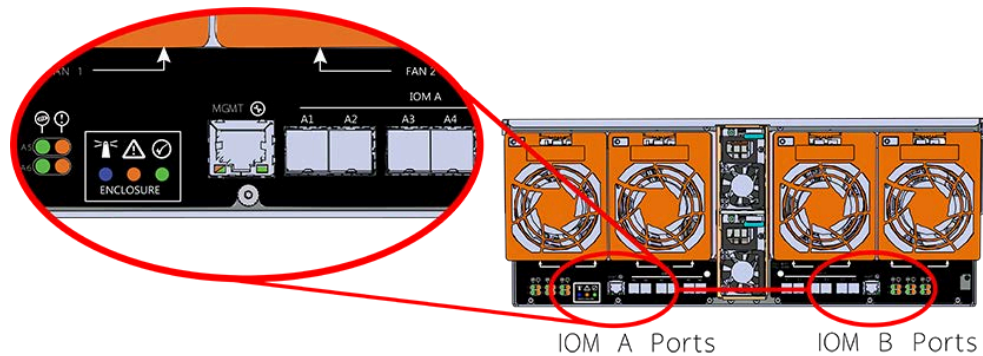
Note: If the Ultrastar Data60 is connected to an HBA that does not present the Enclosure Services Processor to the host for management purposes, Western Digital recommends attaching the Ultrastar Data60 to a host that does expose the Enclosure Services Processor so that the upgrade may be performed.



Attention: Beginning with firmware version 2000-073, the user may upgrade in-band via `sg_ses_microcode` without the requirement of having Ethernet interfaces actively configured with DHCP. Please proceed to the upgrade procedure.

Step 3: The following upgrade preparation steps apply only to firmware versions 01XX-XXX or if the user is upgrading via OOBM. If this does not apply, please proceed to the upgrade procedure.

- a. **IMPORTANT:** There is a firmware upgrade requirement which requires both Ethernet interfaces interface to be connected and obtain IP addresses via DHCP prior to starting the upgrade process. The Ethernet ports are shown in the following image:

Figure 198: Ethernet Ports (IOM A port magnified)

- b. After connecting both Ethernet interfaces and obtaining IP addresses via DHCP, locate the **<dev>** device name from the `sg_scan -i` output from step 2.
- c. Verify that both OOBMs have IP addresses by issuing the command `sg_ses <dev> -p0x7`
- d. Locate the IP addresses in the Enclosure Services Controller Electronics (ESCE) elements, indicated by the **XXX.XXX.XXX.XXX** in the results as shown in the following example:

```
Element type: Enclosure services controller electronics, subenclosure
id: 0 [ti=5]
Overall descriptor: <empty>
Element 0 descriptor: ESCE IOMA,IOM PART NUM ,IOM SERIAL
NUM,5000CCAB0500003C,XXX.XXX.XXX.XXX
Element 1 descriptor: ESCE IOMB,IOM PART NUM ,IOM SERIAL
NUM,5000CCAB0500007C,XXX.XXX.XXX.XXX
```

5.1.3 Linux Upgrade to New Firmware

To download the new firmware package, do the following:

Step 1: Ensure multi-pathing can see all of the expected drives.

- a. Execute the following command to verify that there are two paths to each drive:

```
multipath -ll | grep -i "active ready running" -c
```

Step 2: Locate the **<dev>** device name from the `sg_scan -i`.

Step 3: In the terminal, type:

```
sg_ses_microcode <dev> -m 0xe -N -b 4096 -I <filename> -vv
```

Step 4: Press **Enter**.

The firmware begins loading onto the IOMs. The upgrade can take up to 20 minutes to complete.

i **Important:** Due to the firmware image being a .tar.gz file, the enclosure has to unpack and load the firmware onto the respective ICs which may take up to 15 minutes. Once the `sg_ses_microcode` command is issued wait 20 minutes to ensure the enclosure has time to perform this process. To check the status of this process, use the Redfish out-of-band management to make a GET request to the following target:

```
curl -G -k -u admin:admin -H "Content-type: application/json" https://<ip address>/redfish/v1/UpdateService/Actions/UpdateService.SimpleUpdate/Status
```



Note: Execute the command until you see the following result:

```
{"ErrorCode":0,"StatusCode":2,"Description":"FW update completed. Waiting for activation.", "EstimatedRemainingMinutes":0}
```



Attention: If the OOBM is not being used, query Page Eh by executing the following command `sg_ses <device> -p 0xe`. The first time this command is issued, the output may be inaccurate, please ignore and issue the command again. The string to observe for download microcode status is "Complete, no error, start after hard reset or power cycle [0x11]" before proceeding to the activate step.

Example output:

```
sg_ses <dev> -p 0xe

HGST H4060-J 2040
Download microcode status diagnostic page:
number of secondary subenclosures: 0
generation code: 0x0
subenclosure identifier: 0 [primary]
download microcode status: Complete, no error, start after
hard reset or power cycle [0x11]
download microcode additional status: 0x0
download microcode maximum size: 1703914 bytes
download microcode expected buffer id: 0x0
download microcode expected buffer id offset: 0
```

Step 5: Once the download is complete, type:

```
sg_ses_microcode <dev> -m 0xf
```

Step 6: Press **Enter**.

The IOMs will reset. This process can take up to 5 minutes to activate.



Attention: The system will lose communication with the drives during this part of the upgrade. To avoid data loss, ensure that no data is being transferred during this process.

Step 7: Verify the installation is correct by repeating the `sg_scan -i` again.



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

Step 8: Ensure multi-pathing can see all of the expected drives.

- a. Execute the following command to verify that there are two paths to each drive:

```
multipath -ll | grep -i "active ready running" -c
```

5.1.4 Non-Automatic Firmware Activation in Linux

Step 1: Ensure multi-pathing can see all of the expected drives.

- a. Execute the following command to verify that there are two paths to each drive:

```
multipath -ll | grep -i "active ready running" -c
```

Step 2: Locate the <dev> device name from the `sg_scan -i`.

Step 3: Execute the following command to upgrade the enclosure firmware using `sg_ses_microcode`.

- a. Issue the following command:

```
sg_ses_microcode <dev> -m 0xe -N -b 4096 -I <filename> -vv
```

Step 4: Press **Enter**.

The firmware begins loading onto the IOMs. The upgrade can take up to 20 minutes to complete.



Important: Due to the firmware image being a .tar.gz file, the enclosure has to unpack and load the firmware onto the respective ICs which may take up to 15 minutes. Once the `sg_ses_microcode` command is issued wait 20 minutes to ensure the enclosure has time to perform this process. To check the status of this process, use the Redfish out-of-band management to make a GET request to the following target:

```
curl -G -k -u admin:admin -H "Content-type: application/json" https://<ip address>/redfish/v1/UpdateService/Actions/UpdateService.SimpleUpdate/Status
```



Note: Execute the command until you see the following result:

```
{"ErrorCode":0,"StatusCode":2,"Description":"FW update completed. Waiting for activation.", "EstimatedRemainingMinutes":0}
```



Attention: If the OOBM is not being used, query Page Eh by executing the following command `sg_ses <device> -p0xe`. The first time this command is issued, the output may be inaccurate, please ignore and issue the command again. The string to observe for download microcode status is "Complete, no error, start after hard reset or power cycle [0x11]" before proceeding to the activate step.

Example output:

```
sg_ses <dev> -p 0xe

HGST H4060-J 2033
Download microcode status diagnostic page:
number of secondary subenclosures: 0
generation code: 0x0
subenclosure identifier: 0 [primary]
download microcode status: Complete, no error, start after
hard reset or power cycle [0x11]
download microcode additional status: 0x0
download microcode maximum size: 1703914 bytes
download microcode expected buffer id: 0x0
download microcode expected buffer id offset: 0
```

Step 5: Issues the following command to activate IOM A:

```
sg_ses <dev> -p4 -c -d 02,00,01,00
```



Note: Activate only one IOM at a time to ensure there is always at least one path to the drives. The user will need to issue a reset to each IOM to activate the firmware using an `sg_ses` command to ensure this occurs properly.

Step 6: Ensure multi-pathing can see all of the expected drives after activating IOM A.

- a. Execute the following command to verify that there are two paths to each drive:

```
multipath -ll | grep -i "active ready running" -c
```

Step 7: Issues the following command to activate IOM B:

```
sg_ses <dev> -p4 -c -d 02,00,01,01
```

Step 8: Ensure multi-pathing can see all of the expected drives after activating IOM B.

- a. Execute the following command to verify that there are two paths to each drive:

```
multipath -ll | grep -i "active ready running" -c
```

- b. Verify that there are two paths to each drive.



Note: It could take the OS several minutes to rebuild all the paths to the drives depending on the workload on the drives and how busy the host is. Multipathing may have to be verified several times to ensure that all paths are in an optimal state following the reset of IOM B.

5.1.5 Windows Upgrade Preparation

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

- Step 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.
- Step 2:** Connect the Ultrastar Data60 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 Ultrastar Data60 will be referred to as an IOM.

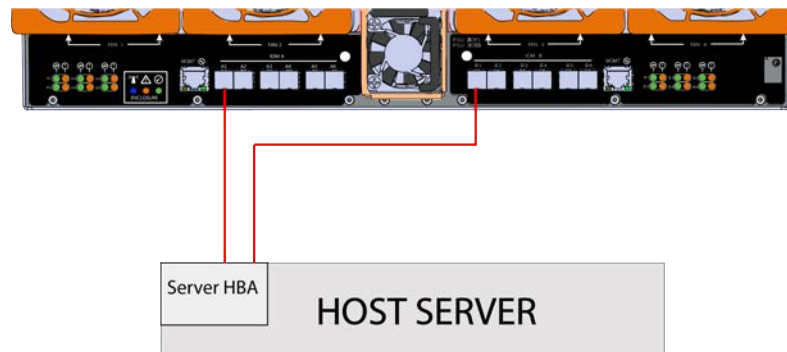


Note: To perform an online firmware upgrade, the Ultrastar Data60 must be configured with redundant data paths, meaning both IOMs must have a SAS Port populated and connected to the host server.

SAS Configurations: The server host must be configured with multi-pathing software that can handle the nature of the firmware upgrade. i.e. Once firmware is downloaded to the IOMs, each IOM will reset and boot the new code in a staggered fashion such that the host always has at least one path to the drives to service I/O.

SATA Configurations: A SATA configuration should not be considered for an online upgrade due to the single path nature of the topology.

Figure 199: Multipathing Configuration Minimum Requirement



Step 3: Log on to the Windows server and launch a command prompt.

Step 4: Input the **sg_scan -s** command to find the IOM devices to ensure that they can be accessed.



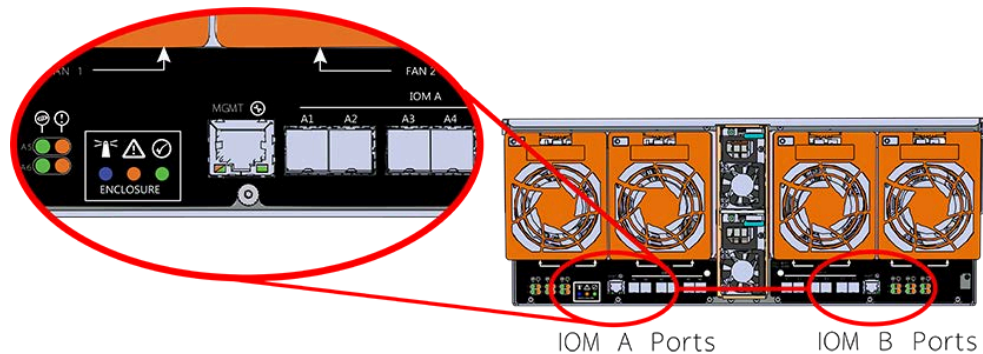
Note: If the Ultrastar Data60 is connected to an HBA that does not present the Enclosure Services Processor to the host for management purposes, Western Digital recommends attaching the Ultrastar Data60 to a host that does expose the Enclosure Services Processor so that the upgrade may be performed.

Step 5: To determine which IOM is which, use the **<dev>** string with the **sg_ses** command.

Step 6: **The following upgrade preparation steps apply only to firmware versions 01XX-XXX or if the user is upgrading via OOBM.** If this does not apply, please proceed to the upgrade procedure.

- a. **IMPORTANT:** There is a firmware upgrade requirement which requires both Ethernet interfaces interface to be connected and obtain IP addresses via DHCP prior to starting the upgrade process. The Ethernet ports are shown in the following image:

Figure 200: Ethernet Ports (IOM A port magnified)



- b. After connecting both Ethernet interfaces and obtaining IP addresses via DHCP, locate the **<dev>** device name from the `sg_scan -i` output from step 2.
- c. Verify that both OOBMs have IP addresses by issuing the command `sg_ses <dev> -p0x7`
- d. Locate the IP addresses in the Enclosure Services Controller Electronics (ESCE) elements, indicated by the **XXX.XXX.XXX.XXX** in the results as shown in the following example:

```
Element type: Enclosure services controller electronics, subenclosure
id: 0 [ti=5]
Overall descriptor: <empty>
Element 0 descriptor: ESCE IOMA,IOM PART NUM ,IOM SERIAL
NUM,5000CCAB0500003C,XXX.XXX.XXX.XXX
Element 1 descriptor: ESCE IOMB,IOM PART NUM ,IOM SERIAL
NUM,5000CCAB0500007C,XXX.XXX.XXX.XXX
```

5.1.6 Windows Upgrade to New Firmware

To download the new firmware package, do the following:

Step 1: Ensure Windows MPIO can see all paths to the drives.

- a. Execute the following command:

```
C:\mpclaim -v C:\Users\Administrator\Desktop\mpclaim_output.txt
```

- b. Verify that there are two paths to each drive by executing the following command:

```
C:\more C:\Users\Administrator\Desktop\mpclaim_output.txt
```

Step 2: Input the `sg_scan -s` command to find the IOM devices to ensure that they can be accessed.



Note: If the Ultrastar Data60 is connected to an HBA that does not present the Enclosure Services Processor to the host for management purposes, Western Digital recommends attaching the Ultrastar Data60 to a host that does expose the Enclosure Services Processor so that the upgrade may be performed.

Step 3: In the terminal, type:

```
sg_ses_microcode <dev> -m 0xe -N -b 4096 -I <filename> -vv
```

Step 4: Press **Enter**.

The firmware begins loading onto the IOMs. The upgrade can take up to **20 minutes** to complete.



Important: Due to the firmware image being a .tar.gz file, the enclosure has to unpack and load the firmware onto the respective ICs which may take up to 15 minutes. Once the `sg_ses_microcode` command is issued wait 20 minutes to ensure the enclosure has time to perform this process. To check the status of this process, use the Redfish out-of-band management to make a GET request to the following target:

```
curl -G -k -u admin:admin -H "Content-type: application/json" https://<ip address>/redfish/v1/UpdateService/Actions/UpdateService.SimpleUpdate/Status
```



Note: Execute the command until you see the following result:

```
{"ErrorCode":0,"StatusCode":2,"Description":"FW update completed. Waiting for activation.", "EstimatedRemainingMinutes":0}
```



Attention: If the OOBM is not being used, query Page Eh by executing the following command `sg_ses <device> -p 0xe`. The first time this command is issued, the output may be inaccurate, please ignore and issue the command again. The string to observe for download microcode status is "Complete, no error, start after hard reset or power cycle [0x11]" before proceeding to the activate step.

Example output:

```
sg_ses 0 -p 0xe

HGST H4060-J 2040
Download microcode status diagnostic page:
number of secondary subenclosures: 0
generation code: 0x0
subenclosure identifier: 0 [primary]
download microcode status: Complete, no error, start after
hard reset or power cycle [0x11]
download microcode additional status: 0x0
download microcode maximum size: 1703914 bytes
download microcode expected buffer id: 0x0
```



```
download microcode expected buffer id offset: 0
```

Step 5: Once the download is complete, type:

```
sg_ses_microcode <dev> -m 0xf
```

Step 6: Press **Enter**.

The IOMs will reset in a staggered manner. This process can take up to 5 minutes to activate.

Step 7: Ensure multi-pathing can see all of the expected drives.

- a. Execute the following command to verify that there are two paths to each drive:

```
multipath -ll | findstr -i "active ready running" -c
```

Step 8: Ensure Windows MPIO can see all paths to the drives after activating IOM A.

- a. Execute the following command:

```
C:\mpclaim.exe -v C:\Users\Administrator\Desktop\mpclaim_output.txt
```

- b. Verify there are two paths to each drive by issuing the following command:

```
C:\more C:\Users\Administrator\Desktop\mpclaim_output.txt
```



Note: It could take the OS several minutes to rebuild all the paths to the drives depending on the workload on the drives and how busy the host is. Multipathing may have to be verified several times to ensure that all paths are in an optimal state following the reset of IOM A.

- c. Verify that the output from the mpclaim_output.txt output appears similar to the following example.

```
0000000077010524 Active/Optimized 001|005|036|000 0 Adapter: Avago
Adapter, SAS3 3008 Fury -StorPo... (B|D|F:
134|000|000) Controller: 46616B65436F6E74726F6C6C6572 (State: Active)
0000000077000431 Active/Optimized 000|004|049|000 0 Adapter: Avago
Adapter, SAS3 3008 Fury -StorPo... (B|D|F:
132|000|000) Controller: 46616B65436F6E74726F6C6C6572 (State: Active)
MPIO Disk98: 02 Paths, Least Blocks, ALUA Not Supported SN:
5000CCA2532558CC
Supported Load Balance Policies: FOO RR RRWS LQD WP LB Path ID
State SCSI
Address Weight
-----
0000000077010523 Active/Optimized 001|005|035|000 0 Adapter: Avago
Adapter, SAS3 3008 Fury -StorPo... (B|D|F:
134|000|000) Controller: 46616B65436F6E74726F6C6C6572 (State: Active)
0000000077000430 Active/Optimized 000|004|048|000 0 Adapter: Avago
Adapter, SAS3 3008 Fury -StorPo... (B|D|F:
132|000|000) Controller: 46616B65436F6E74726F6C6C6572 (State: Active)
MPIO Disk97: 02 Paths, Least Blocks, ALUA Not Supported SN:
5000CCA253255E9C
Supported Load Balance Policies: FOO RR RRWS LQD WP LB Path ID
State SCSI
```

```
Address Weight
-----
...
```

5.1.7 Non-Automatic Firmware Activation in Windows

Step 1: Ensure Windows MPIO can see all paths to the drives.



Note: This should be completed before beginning the firmware upgrade procedure.

a. Execute the following command:

```
C:\mpclaim -v C:\Users\Administrator\Desktop\mpclaim_output.txt
```

b. Verify that there are two paths to each drive by executing the following command:

```
C:\more C:\Users\Administrator\Desktop\mpclaim_output.txt
```

Step 2: Upgrade the enclosure firmware using `sg_ses_microcode` by executing the following command:

```
sg_ses_microcode <dev> -m 0xe -N -b 4096 -I <filename> -vv
```



Attention: If the OOBM is not being used, query Page Eh by executing the following command `sg_ses <device> -p0xe`.

Step 3: Press **Enter**.

The firmware begins loading onto the IOMs. The upgrade can take up to **20 minutes** to complete.



Important: Due to the firmware image being a .tar.gz file, the enclosure has to unpack and load the firmware onto the respective ICs which may take up to 15 minutes. Once the `sg_ses_microcode` command is issued wait 20 minutes to ensure the enclosure has time to perform this process. To check the status of this process, use the Redfish out-of-band management to make a GET request to the following target:

```
curl -G -k -u admin:admin -H "Content-type: application/json" https://<ip address>/redfish/v1/UpdateService/Actions/UpdateService.SimpleUpdate/Status
```



Note: Execute the command until you see the following result:

```
{"ErrorCode":0,"StatusCode":2,"Description":"FW update completed. Waiting for activation.", "EstimatedRemainingMinutes":0}
```




Attention: If the OOBM is not being used, query Page Eh by executing the following command `sg_ses <device> -p0xe`. The first time this command is issued, the output may be inaccurate, please ignore and issue the command again. The string to observe for download microcode status is "Complete, no error, start after hard reset or power cycle [0x11]" before proceeding to the activate step.

Example output:

```
sg_ses <dev> -p 0xe

HGST H4060-J 2040
Download microcode status diagnostic page:
number of secondary subenclosures: 0
generation code: 0x0
subenclosure identifier: 0 [primary]
download microcode status: Complete, no error, start after
hard reset or power cycle [0x11]
download microcode additional status: 0x0
download microcode maximum size: 1703914 bytes
download microcode expected buffer id: 0x0
download microcode expected buffer id offset: 0
```

Step 4: Issue the following command to activate IOM A:

```
sg_ses <dev> -p4 -c -d 02,00,01,00
```



Note: Only activate one IOM at a time to ensure there is always at least one path to the drives to service I/O while an IOM is being reset. The user will need to issue a reset command to each IOM to activate the firmware using an `sg_ses` command to ensure this occurs properly.

Step 5: Ensure Windows MPIO can see all paths to the drives after activating IOM A.

- a. Execute the following command:

```
C:\mpclaim.exe -v C:\Users\Administrator\Desktop\mpclaim_output.txt
```

- b. Verify there are two paths to each drive by issuing the following command:

```
C:\more C:\Users\Administrator\Desktop\mpclaim_output.txt
```



Note: It could take the OS several minutes to rebuild all the paths to the drives depending on the workload on the drives and how busy the host is. Multipathing may have to be verified several times to ensure that all paths are in an optimal state following the reset of IOM A.

- c. Verify that the output from the `mpclaim_output.txt` output appears similar to the following example.

```
0000000077010524 Active/Optimized 001|005|036|000 0 Adapter: Avago
Adapter, SAS3 3008 Fury -StorPo... (B|D|F:
134|000|000) Controller: 46616B65436F6E74726F6C6C6572 (State: Active)
0000000077000431 Active/Optimized 000|004|049|000 0 Adapter: Avago
```

```

Adapter, SAS3 3008 Fury -StorPo... (B|D|F:
132|000|000) Controller: 46616B65436F6E74726F6C6C6572 (State: Active)
MPIO Disk98: 02 Paths, Least Blocks, ALUA Not Supported SN:
5000CCA2532558CC
Supported Load Balance Policies: FOO RR RRWS LQD WP LB Path ID
State SCSI
Address Weight
-----
0000000077010523 Active/Optimized 001|005|035|000 0 Adapter: Avago
Adapter, SAS3 3008 Fury -StorPo... (B|D|F:
134|000|000) Controller: 46616B65436F6E74726F6C6C6572 (State: Active)
0000000077000430 Active/Optimized 000|004|048|000 0 Adapter: Avago
Adapter, SAS3 3008 Fury -StorPo... (B|D|F:
132|000|000) Controller: 46616B65436F6E74726F6C6C6572 (State: Active)
MPIO Disk97: 02 Paths, Least Blocks, ALUA Not Supported SN:
5000CCA253255E9C
Supported Load Balance Policies: FOO RR RRWS LQD WP LB Path ID
State SCSI
Address Weight
-----
...

```

Step 6: Issue the following command to activate IOM B:

```
sg_ses <dev> -p4 -c -d 02,00,01,01
```

Step 7: Ensure Windows MPIO can see all paths to the drives after activating IOM B.

a. Execute the following command:

```
C:\mpclaim.exe -v C:\Desktop\mpclaim_output.txt
```

b. Verify there are two paths to each drive by issuing the following command:

```
C:\more C:\Users\Administrator\Desktop\mpclaim_output.txt
```



Note: It could take the OS several minutes to rebuild all the paths to the drives depending on the workload on the drives and how busy the host is. Multipathing may have to be verified several times to ensure that all paths are in an optimal state following the reset of IOM B.

c. Verify that the output from the mpclaim_output.txt output appears similar to the following example.

```

0000000077010524 Active/Optimized 001|005|036|000 0 Adapter: Avago
Adapter, SAS3 3008 Fury -StorPo... (B|D|F:
134|000|000) Controller: 46616B65436F6E74726F6C6C6572 (State: Active)
0000000077000431 Active/Optimized 000|004|049|000 0 Adapter: Avago
Adapter, SAS3 3008 Fury -StorPo... (B|D|F:
132|000|000) Controller: 46616B65436F6E74726F6C6C6572 (State: Active)
MPIO Disk98: 02 Paths, Least Blocks, ALUA Not Supported SN:
5000CCA2532558CC
Supported Load Balance Policies: FOO RR RRWS LQD WP LB Path ID
State SCSI
Address Weight
-----
0000000077010523 Active/Optimized 001|005|035|000 0 Adapter: Avago

```

```

Adapter, SAS3 3008 Fury -StorPo... (B|D|F:
134|000|000) Controller: 46616B65436F6E74726F6C6C6572 (State: Active)
0000000077000430 Active/Optimized 000|004|048|000 0 Adapter: Avago
Adapter, SAS3 3008 Fury -StorPo... (B|D|F:
132|000|000) Controller: 46616B65436F6E74726F6C6C6572 (State: Active)
MPIO Disk97: 02 Paths, Least Blocks, ALUA Not Supported SN:
5000CCA253255E9C
Supported Load Balance Policies: FOO RR RRWS LQD WP LB Path ID
State SCSI
Address Weight
-----
...

```

5.1.8 Upgrading Firmware with OOBM

The following procedure should be followed to upgrade the firmware of the Ultrastar Data60 using the OOBM API.

- Step 1:** Open a web browser, go to: <https://portal.wdc.com/Support/s/>, and download the firmware package for the Ultrastar Data60.
- Step 2:** Extract the downloaded zip file and place file in a location that is accessible to the Ultrastar Data60.
- Step 3:** Make a POST call to the UpdateService object using the `SimpleUpdate` action.

```

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

```

- a. In the body of the POST, list the `ImageURI` as the data parameter, and set the value of this parameter to the file location of the bin file.



Note: TFTP and HTTPS are supported.

Linux Example:

```

{"ImageURI": "tftp://<tftp IP address>/HGST_Ultrastar-DATA60-
DATA102-Server60-8_SEP_bundle_2042-001_2.4.4.tar.gz"}

```

Windows Example:

```

{"ImageURI\\": "\\<https IP address>/HGST_Ultrastar-
DATA60-DATA102-Server60-8_SEP_bundle_2042-001_2.4.4.tar.gz\\"}

```

- Step 4:** To check the status of this process, make a GET request to the following target:



Note: This command may need to be issued multiple times until it reports a completed status. This should be done before completing the remainder of the procedure.

```
curl -G -k -u admin:admin -H "Content-type: application/json" https://<IP address>/redfish/v1/UpdateService/Actions/UpdateService.SimpleUpdate/Status
```

- a. Execute the command until you see the following result:

```
{
  "ErrorCode":0,
  "StatusCode":2,
  "Description":"FW update completed. Waiting for activation.",
  "EstimatedRemainingMinutes":0
}
```

Step 5: To activate the firmware, send a POST request:

- For an **automatic** activation, send the POST request to the UpdateService object using the `SimpleUpdate` command, and list the `ImageURI` as the data parameter:

```
curl -X POST -k -u admin:admin -H "Content-type: application/json" https://<OOBM IP address>/redfish/v1/UpdateService/Actions/UpdateService.SimpleUpdate -d
```

Linux Example:

```
{"ImageURI" : "tftp://<tftp IP address>/HGST_Ultrastar-DATA60-DATA102-Server60-8_SEP_bundle_2042-001_2.4.4.tar.gz" }
```

Windows Example:

```
{"ImageURI\" : \"https://<https IP address>/HGST_Ultrastar-DATA60-DATA102-Server60-8_SEP_bundle_2042-001_2.4.4.tar.gz\" }
```

- For a **non-automatic** activation, send the POST request to the UpdateService object using the `FWActivate` command:



Note: This command will perform a rolling reset of the IOMs.

```
curl -X POST -k -u admin:admin -H "Content-type: application/json" https://<IP address>/redfish/v1/UpdateService/Actions/UpdateService.FWActivate
```

- To manually reset the individual IOMs, send sequential POST requests to the Chassis object using the `Reset` command:

```
curl -X POST -k -u admin:admin -H "Content-type: application/json" https://<OOBM IOMA-IP Address>/redfish/v1/Chassis/IOModuleAFRU/Actions/Chassis.Reset
```

```
curl -X POST -k -u admin:admin -H "Content-type: application/json" https://<OOBM IOMB-IP Address>/redfish/v1/Chassis/IOModuleBFRU/Actions/Chassis.Reset
```

5.2 Configuring OOBM Network Settings

5.2.1 Configuring OOBM Network Settings Using SES

Changing the OOBM Network Configuration

Step 1: To change the OOBM network configuration, enter the following:

```
sg_wr_mode <dev> --dbd --page=0x23,0x01 --
contents=e3,01,00,1A,<IOM>,00,00,00,<setting>,00,00,00,<IPAddr>,
<netmask>,<gateway>,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
```

Where:

- <dev> = the device SEP sg handle
- <IOM> = 01 (IOMA) or 02 (IOMB)
- <setting> = 00 (static) or 01 (DHCP)
- <IPAddr> = The IP address in four pairs of two-digit hex codes
- <netmask> = The netmask, in four pairs of two-digit hex codes
- <gateway> = The gateway, in four pairs of two-digit hex codes

For example, to change the OOBM network configuration on IOM A to **static**:

```
sg_wr_mode /dev/sg3 --dbd --page=0x23,0x01 --
contents=e3,01,00,1A,01,00,00,00,00,00,00,00,C0,A8,00,0A,
FF,FF,FF,00,C0,A8,00,01,00,00,00,00,00,00,00,00,00,00,00,00,00
```

- Device = /dev/sg3
- IOM = 01 (IOM A)
- Setting = 00 (static)
- IP Address = 192.168.0.10
- Netmask = 255.255.255.0
- Gateway = 192.168.0.1

To change the OOBM network configuration on IOM B to **static**:

```
sg_wr_mode /dev/sg3 --dbd --page=0x23,0x01 --
contents=e3,01,00,1A,02,00,00,00,00,00,00,00,C0,A8,00,0B,
FF,FF,FF,00,C0,A8,00,01,00,00,00,00,00,00,00,00,00,00,00,00,00
```

- Device = /dev/sg3
- IOM = 02 (IOM B)
- Setting = static
- IP Address = 192.168.0.11
- Netmask = 255.255.255.0
- Gateway = 192.168.0.1

To change the OOBM network configuration on IOM A to **DHCP**:

```
sg_wr_mode /dev/sg3 --dbd --page=0x23,0x01 --
contents=e3,01,00,1A,01,00,00,00,01,00,00,00,00,00,00,00,
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
```

- Device = /dev/sg3
- IOM = 01 (IOM A)

- Setting = 01 (DHCP)
- IP Address = 0.0.0.0
- Netmask = 0.0.0.0
- Gateway = 0.0.0.0

To change the OOBM network configuration on IOM B to **DHCP**:

```
sg_wr_mode /dev/sg3 --dbd --page=0x23,0x01 --
contents=e3,01,00,1A,02,00,00,00,01,00,00,00,00,00,00,00,
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
```

- Device = /dev/sg3
- IOM = 02 (IOM B)
- Setting = 01 (DHCP)
- IP Address = 0.0.0.0
- Netmask = 0.0.0.0
- Gateway = 0.0.0.0

Viewing the OOBM Network Configuration

Step 2: To view the OOBM network configuration, enter the following:

```
sg_wr_mode <dev> --dbd --page=0x23,0x01
```

This returns:

```
e3,01,00,30,03,00,00,00,<IOM A Setting>,00,00,00,<IOM A IPAddr>,<IOM
A Netmask>,<IOM A Gateway>,00,00,00,<IOM B Setting>,00,00,00,<IOM B
IPAddr>,<IOM B Netmask>,<IOM B Gateway>
```

- <IOM> = 03 (IOMA & IOMB)
- <IOM A Setting> = 00 (static) or 01 (DHCP)
- <IOM A IPAddr> = The IP address in four pairs of two-digit hex codes
- <IOM A Netmask> = The netmask, in four pairs of two-digit hex codes
- <IOM A Gateway> = The gateway, in four pairs of two-digit hex codes
- <IOM B Setting> = 00 (static) or 01 (DHCP)
- <IOM B IPAddr> = The IP address in four pairs of two-digit hex codes
- <IOM B Netmask> = The netmask, in four pairs of two-digit hex codes
- <IOM B Gateway> = The gateway, in four pairs of two-digit hex codes

The result, after setting the two static addresses in [Changing the OOBM Network Configuration \(page 180\)](#):

```
e3,01,00,30,03,00,00,00,00,00,00,00,00,00,00,C0,A8,00,0A,FF,FF,FF,00,C0,A8,00,01,
00,00,00,00,C0,A8,00,0A,FF,FF,FF,00,C0,A8,00,01 <dev>
```

The result, when IOM B is not booting (no IP):

```
e3,01,00,30,03,00,00,00,00,00,00,00,00,00,00,C0,A8,00,0A,FF,FF,FF,00,C0,A8,00,01,
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00 <dev>
```



Note: Setting an invalid gateway will result in that field being zeroed-out.

5.3 Zoning

5.3.1 Before Zoning

This section provides information on actions that should be taken before starting zoning on the Ultrastar Data60.

Users should install all of the required downloads before beginning the zoning process.

Required Downloads:

- SMP Tools 0.98 for Linux: http://sg.danny.cz/sg/smp_utils.html
- SG3 Utils: http://sg.danny.cz/sg/sg3_utils.html
- CLI Tools: to download the latest version of CLI tools, see: [Downloading Firmware from the Support Portal \(page 163\)](#)

5.3.2 Predefined Zoning Configurations

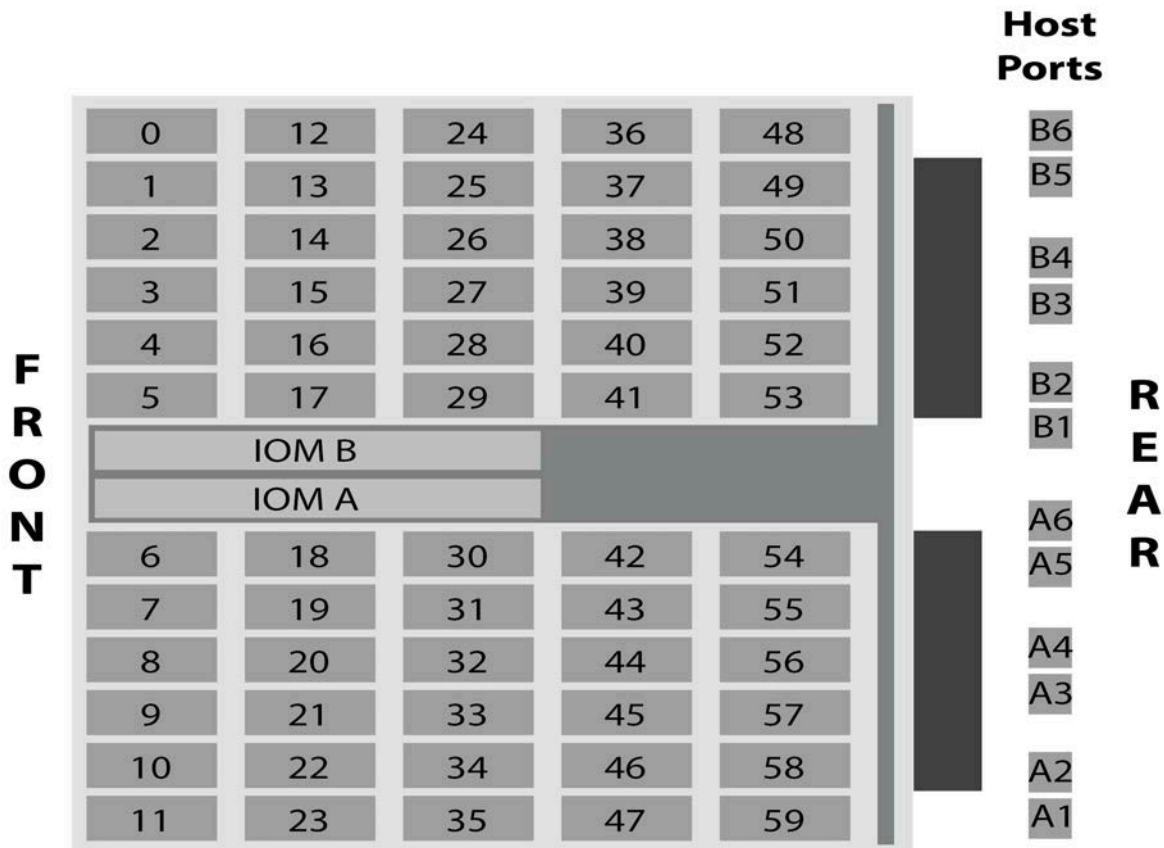
There are three predefined zoning configurations for the Ultrastar Data60. Each configuration connects a different number of hosts to a set number of drives. Each of these drives are part of a grouping called a zone group. This section displays the necessary information related to each of the predefined zoning configurations.

Configuration 0:

Configuration 0 allows all hosts to view all drive slots and the devices that are populated in those drive slots. In this Configuration, all of the drives belong to the same zone group as shown in the image below represented by one color. Each of the SAS ports on the rear IO of the enclosure are also represented by one color to display their connection to all of the drives within the enclosure.

- **In-band management:** Configuration 0 can be initiated to disable zoning in the `sg_senddiag` command in-band by using 00 in the Zoning Configuration option. See: [sg_senddiag Command \(page 188\)](#) for the actual senddiag commands.
- **Out-of-band management:** Configuration 0 (default configuration) can be initiated to disable zoning in the out-of-band management by using 0 in the ZoningConfig option. The following are example Redfish POST and cURL commands:

Figure 201: Configuration 0



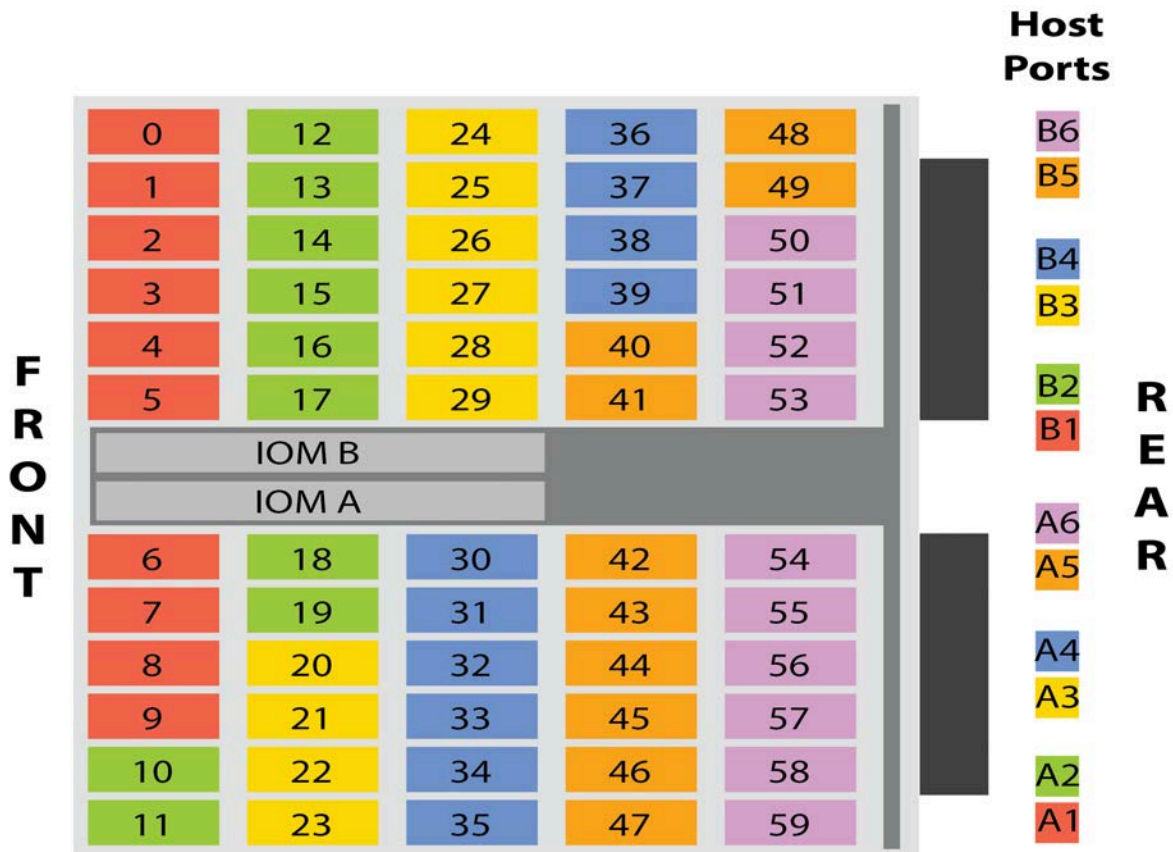
There is no SAS cable connection Configuration table for this Configuration. This is because the host servers do not rely on any order of connection to see the drives and drive slots.

Configuration 1:

Configuration 1 allows up to six redundantly configured hosts to view a specific zone group of drives. Each host will be able to view up to 10 drives that are mapped to both IOMs. Each zone group will display all of the devices that are contained within that zone. If a drive slot is not populated, it will still be part of that zone group, but it will not display any results in enclosure management until the drive slot has been populated. In this Configuration, the enclosure is divided into six zone groups as shown in the image below represented by six different colors. Each zone group matches to a single SAS port on each side of the rear IOM to allow for the connections to six different hosts.

- **In-band management:** Configuration 1 can be initiated in the `sg_senddiag` command in-band by using 01 in the Zoning Configuration option. See: [sg_senddiag Command \(page 188\)](#) for the actual senddiag commands.
- **Out-of-band management:** Configuration 1 can be initiated in the out-of-band management by using 1 in the ZoningConfig option. The following are example Redfish POST and cURL commands:

Figure 202: Configuration 1



Each SAS port in the following image matches the color of another set of drives in that specific zone group. Connect the host servers to the enclosure using SAS cables in the Configuration listed in the table below. The left side of the table displays the host connection and the right side displays the enclosure IOM SAS port connection.

Table 47: SAS Cable connections for Configuration 1

Host connection (SAS Port)	Enclosure IOM connection (SAS Port)
Host 1	A1
Host 1	B1
Host 2	A2
Host 2	B2
Host 3	A3
Host 3	B3
Host 4	A4
Host 4	B4
Host 5	A5

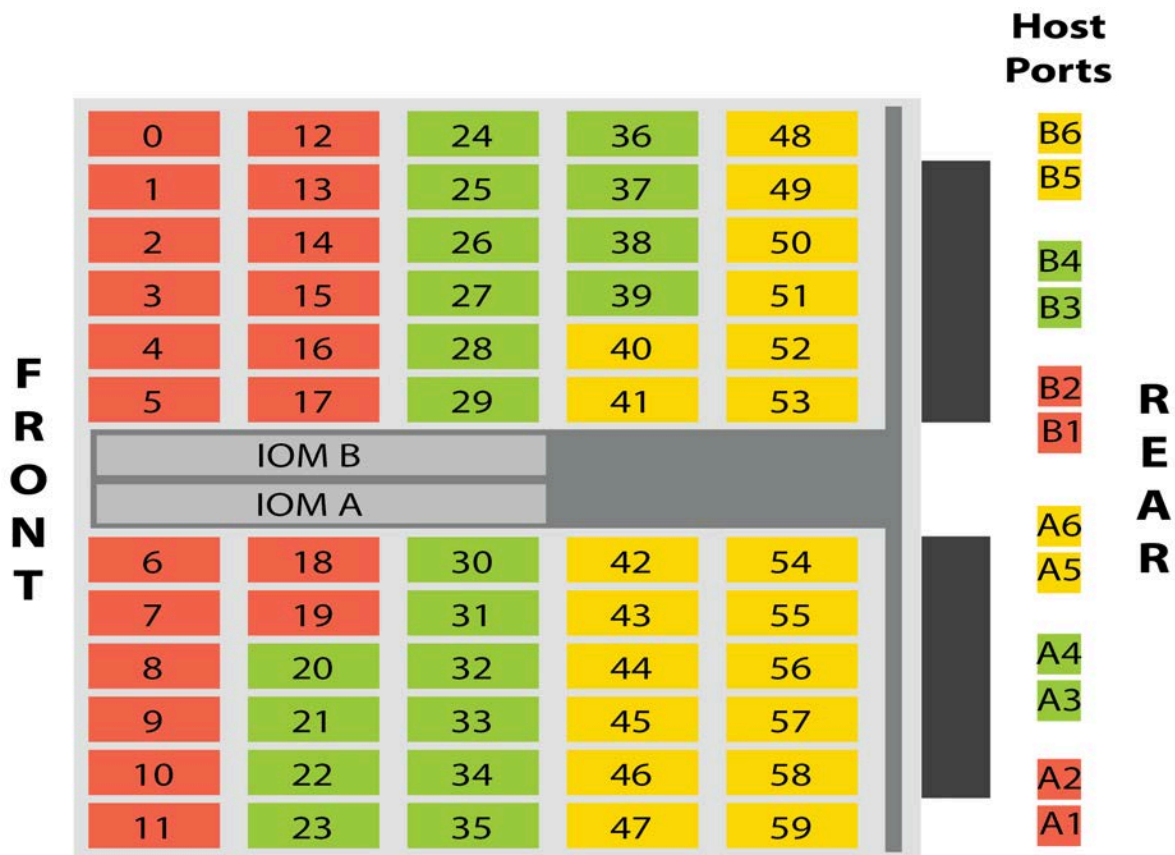
Host connection (SAS Port)	Enclosure IOM connection (SAS Port)
Host 5	B5
Host 6	A6
Host 6	B6

Configuration 2:

Configuration 2 allows up to three redundantly configured hosts to view a specific zone group of drives. Each host will be able to view up to 20 drives that are mapped to both IOMs. Each zone group will display all of the devices that are contained within that zone. If a drive slot is not populated, it will still be part of that zone group, but it will not display any results in enclosure management until the drive slot has been populated. In this Configuration, the enclosure is divided into three zone groups as shown in the image below represented by three different colors. Each zone group matches to a pair of SAS ports on each side of the rear IOM to allow for the connections to three different hosts.

- **In-band management:** Configuration 2 can be initiated in the `sg_senddiag` command in-band by using 02 in the Zoning Configuration option. See: [sg_senddiag Command \(page 188\)](#) for the actual senddiag commands.
- **Out-of-band management:** Configuration 2 can be initiated in the out-of-band management by using 2 in the ZoningConfig option. The following are example Redfish POST and cURL commands:

Figure 203: Configuration 2



Each SAS port in the following image matches the color of another set of drives in that specific zone group. Connect the host servers to the enclosure using SAS cables in the Configuration listed in the table below. The left side of the table displays the host connection and the right side displays the enclosure IOM SAS port connection.

Table 48: SAS Cable connections for Configuration 2

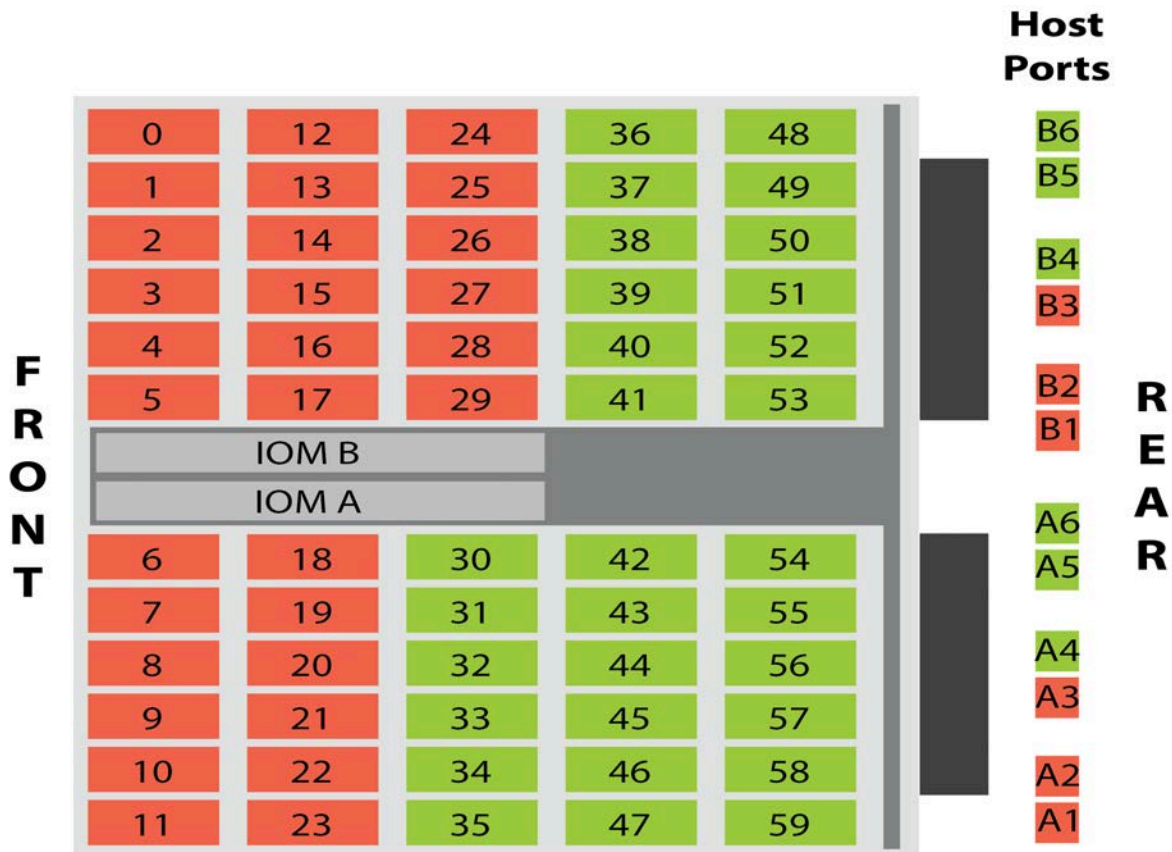
Host connection (SAS Port)	Enclosure IOM connection (SAS Port)
Host 1	A1
Host 1	A2
Host 1	B1
Host 1	B2
Host 2	A3
Host 2	A4
Host 2	B3
Host 2	B4
Host 3	A5
Host 3	A6
Host 3	B5
Host 3	B6

Configuration 3:

Configuration 3 allows up to two redundantly configured hosts to view a specific zone group of drives. Each host will be able to view up to 30 drives that are mapped to both IOMs. Each zone group will display all of the devices that are contained within that zone. If a drive slot is not populated, it will still be part of that zone group, but it will not display any results in enclosure management until the drive slot has been populated. In this Configuration, the enclosure is divided into two zone groups as shown in the image below represented by two different colors. Each zone group matches to three SAS ports on each side of the rear IOM to allow for the connections to two different hosts.

- **In-band management:** Configuration 3 can be initiated in the `sg_senddiag` command in-band by using 03 in the Zoning Configuration option. See: [sg_senddiag Command \(page 188\)](#) for the actual senddiag commands.
- **Out-of-band management:** Configuration 3 can be initiated in the out-of-band management by using 3 in the ZoningConfig option. The following are example Redfish POST and cURL commands:

Figure 204: Configuration 3



Each SAS port in the following image matches the color of another set of drives in that specific zone group. Connect the host servers to the enclosure using SAS cables in the Configuration listed in the table below. The left side of the table displays the host connection and the right side displays the enclosure IOM SAS port connection.

Table 49: SAS Cable connections for Configuration 3

Host connection (SAS Port)	Enclosure IOM connection (SAS Port)
Host 1	A1
Host 1	A2
Host 1	A3
Host 1	B1
Host 1	B2
Host 1	B3
Host 2	A4
Host 2	A5
Host 2	A6

Host connection (SAS Port)	Enclosure IOM connection (SAS Port)
Host 2	B4
Host 2	B5
Host 2	B6

5.3.3 sg_senddiag Command

The `sg_senddiag` command is used to configure zoning on Ultrastar Data60. This command contains several values that are important to enable and disable zoning through the use of the IOMs and expanders. The following section breaks down how to understand the necessary information to properly enable or disable zoning on the enclosure. Each important part of the command has been color coded to match up with the explanation of each part below. Understanding the function of the command will ensure that the proper information is collected to build the command in the following sections.

sg_senddiag Command

```
sg_senddiag <a> --pf --raw=04,00,00,90,<b>,<c>,00,00,<d>
```

Command Breakdown

```
sg_senddiag
```

is a utility that performs a SCSI send diagnostic command.

```
<a>
```

is the `sg` device (Linux) or SCSI device (Windows) that is assigned by the SEP. The information collected for the device will be input in any location that requests `<dev>`. There will be one `sg` or SCSI device handle for each of the two IOMs.

```
--pf
```

Page Format (`-pf`) is a bit and in this case is clear due to the lack of a `-list` option.

```
--raw
```

`raw` reads the sequence of bytes from the standard input.

```
<b>
```

is the value that enables or disables the zone configuration. Input one of the following values:

- **60** disables zoning configurations on the enclosure
- **61** enables zoning configurations on the enclosure

```
<c>
```

is the value that chooses the zoning configuration that will be applied to the enclosure. The following options display the preconfigured zones for the enclosure:

- **00** disables zoning in the enclosure
- **01** configures the zone groups into six sections containing 10 drives each
- **02** configures the zone groups into three sections containing 20 drives each
- **03** configures the zone groups into two sections containing 30 drives each



Note: For more information on zoning configurations, see: [Partial Population Configurations \(page 204\)](#).

<d>

is the value obtained from getting the SAS Address of each IOM. There will be one for each of the two IOMs on the enclosure. When the IOM SAS Address is applied to the string, each pair of characters should be offset by a comma.

5.3.4 Enabling Zoning using Linux

Step 1: From the host server, identify the sg devices that are associated with the Ultrastar Data60 IOMs.

- a. Issue the following command:

```
sg_scan -i | grep -i H4060-J -B 1
```

- b. Identify the sg devices from the output. The devices can be identified by the **<dev>**. The devices appear as **/dev/sg3** and **/dev/sg106** bolded in the example below.

```
/dev/sg3: scsi9 channel=0 id=43 lun=0
         HGST H460-J 0101 [rmb=0 cmdq=1 pqual=0 pdev=0xd]
'__
/dev/sg106: scsi9 channel=0 id=196 lun=0
          HGST H460-J 0101 [rmb=0 cmdq=1 pqual=0 pdev=0xd]
```

- c. Record the sg device numbers for use in a later step.

Step 2: Identify the IOM SAS Address for both IOMs `sg_ses` page 7h.

- a. Issue the following command:

```
sg_ses <dev> -p7 | grep -i esce
```

- b. Identify the IOM SAS address for both IOMs from the output. Each address appears before the IP Address as bolded in the example below.

```
Element 0 descriptor: ESCE IOMA,1EB0246-B2 ,THCLS03517EL0091
                    ,5000CCAB0300003C,10.202.238.225
Element 1 descriptor: ESCE IOMB,1EB0246 ,THCLS03517EL0052
                    ,5000CCAB0300007C,10.202.239.201
```

- c. Record the IOM SAS Addresses for use in a later step.

Step 3: Verify the IOM SAS Address that matches each `sg_device` that is linked to each IOM using `sg_vpd` page 83h.

- a. Issue the following command:

```
sg_vpd <dev> -p0x83
```

- b. Identify and match the IOM SAS address and sg device for both IOMs from the output. Each address appears bolded in the example below.

```
Addressed logical unit:
  designator type: NAA, code set: Binary
```

```

0x5000ccab0300003c
Target port:
designator type: NAA, code set: Binary
transport: Serial Attached SCSI Protocol (SPL-4)
0x5000ccab0300003c
designator type: Relative target port, code set: Binary
transport: Serial Attached SCSI Protocol (SPL-4)
Relative target port: 0x1
Target device that contains addressed lu:
designator type: NAA, code set: Binary
transport: Serial Attached SCSI Protocol (SPL-4)
0x5000ccab0300003c

```

Step 4: Build the `sg_senddiag` command using the information recorded in earlier steps.

- a. Use the example of the `sg_senddiag` command shown in the image above to complete the specific `sg_senddiag` command for IOM A. Replace letters **a** through **d** with the information recorded in previous steps.

sg_senddiag Command

```
sg_senddiag <a> --pf --raw=04,00,00,90,<b>,<c>,00,00,<d>
```

- a. **sg device (<dev>):** device associated with IOM A
- b. **Enable Zoning:** 61
- c. **Zoning Configuration:** configuration 01, 02, or 03



Note: For information on preconfigured zoning configurations, see: [Predefined Zoning Configurations \(page 182\)](#).

- d. **IOM SAS Address:** SAS Address associated with IOM A



Note: A comma should be placed after each bit of data in the IOM SAS Address that was recorded. For example, if the IOM SAS Address output was **5000CCAB0300003C**, the address that should be added to the `sg_senddiag` command should be **50,00,CC,AB,03,00,00,3C**.

- b. Use the example of the `sg_senddiag` command shown in the image above to complete the specific `sg_senddiag` command for IOM B. Replace letters **a** through **d** with the information recorded in previous steps.

sg_senddiag Command

```
sg_senddiag <a> --pf --raw=04,00,00,90,<b>,<c>,00,00,<d>
```

- a. **sg device (<dev>):** device associated with IOM B
- b. **Enable Zoning:** 61
- c. **Zoning Configuration:** configuration 01, 02, or 03



Note: For information on preconfigured zoning configurations, see: [Predefined Zoning Configurations \(page 182\)](#).

- d. **IOM SAS Address:** SAS Address associated with IOM B



Note: A comma should be placed after each bit of data in the IOM SAS Address that was recorded. For example, if the IOM SAS Address output was **5000CCAB0300007C**, the address that should be added to the `sg_senddiag` command should be **50,00,CC,AB,03,00,00,7C**.

c. The following are examples of completed `sg_senddiag` commands for IOM A and B.

- **IOM A:** `sg_senddiag <dev> -pf -raw=04,00,00,90,61,01,00,00,50,00,CC,AB,03,00,00,3C`
- **IOM B:** `sg_senddiag <dev> -pf -raw=04,00,00,90,61,01,00,00,50,00,CC,AB,03,00,00,7C`

Step 5: Enable zoning on IOM A using the `sg_senddiag` command.

- a. Issue the command for IOM A that was built in the previous step.
- b. Enabling a predefined zoning configuration will reset the SAS connector ports which may cause the `sg_senddiag` command to return a status of `DID_TIME_OUT` or `DID_SOFT_ERROR`. Despite the error, the zoning configuration will be enabled. The zoning configuration can be verified after both IOMs have been zoned.

```
send diagnostic: transport: Host_status=0x03 [DID_TIME_OUT]
Driver_status=0x00 [DRIVER_OK]
```

Step 6: Enable zoning on IOM B using the `sg_senddiag` command.

- a. Issue the command for IOM B that was built in the previous step.
- b. Enabling a predefined zoning configuration will reset the SAS connector ports which may cause the `sg_senddiag` command to return a status of `DID_TIME_OUT` or `DID_SOFT_ERROR`. Despite the error, the zoning configuration will be enabled. The zoning configuration can be verified after both IOMs have been zoned.

```
send diagnostic: transport: Host_status=0x03 [DID_TIME_OUT]
Driver_status=0x00 [DRIVER_OK]
```

Step 7: Verify the zone groups for each of the host using the `smp_discover_list` command.

- a. Issue the following command to locate the expander handles:

```
ls /dev/bsg
```

Example of the Expander Handles

```
0:2:0:0      9:0:1297:0  9:0:1378:0  9:0:1390:0
end_device-9:41:26 end_device-9:44:12 end_device-9:44:9
10:0:0:0     9:0:1298:0  9:0:1379:0  9:0:1391:0
end_device-9:41:27 end_device-9:44:13 expander-9:39
7:0:0:0      9:0:1299:0  9:0:1380:0  end_device-9:39:2
end_device-9:41:28 end_device-9:44:14 expander-9:40
9:0:1220:0   9:0:1300:0  9:0:1381:0  end_device-9:41:17
end_device-9:41:29 end_device-9:44:15 expander-9:41
9:0:1289:0   9:0:1301:0  9:0:1382:0  end_device-9:41:18
end_device-9:41:30 end_device-9:44:16 expander-9:42
```

```

9:0:1290:0 9:0:1302:0 9:0:1383:0 end_device-9:41:19
end_device-9:41:31 end_device-9:44:2 expander-9:43
9:0:1291:0 9:0:1303:0 9:0:1384:0 end_device-9:41:20
end_device-9:41:32 end_device-9:44:3 expander-9:44
9:0:1292:0 9:0:1304:0 9:0:1385:0 end_device-9:41:21
end_device-9:42:2 end_device-9:44:4 sas_host9
9:0:1293:0 9:0:1323:0 9:0:1386:0 end_device-9:41:22
end_device-9:44:0 end_device-9:44:5
9:0:1294:0 9:0:1375:0 9:0:1387:0 end_device-9:41:23
end_device-9:44:1 end_device-9:44:6
9:0:1295:0 9:0:1376:0 9:0:1388:0 end_device-9:41:24
end_device-9:44:10 end_device-9:44:7
9:0:1296:0 9:0:1377:0 9:0:1389:0 end_device-9:41:25
end_device-9:44:11 end_device-9:44:8

```

- b. Issue the following command to access a single host's SMP Discover output:

```
smp_discover_list /dev/bsg/expander-9:39
```

- c. Zone group 9 can be identified by the **zG:9** located at the end of each line in zone 9. The above example displays PHYs 0-13 as being in zone group 9. All other devices are labeled as **inaccessible** because the host is displaying the only devices it has access to. The step can be repeated on other hosts to see what zone group each host has access to.
- d. Issue the following command to access all hosts smp_discover_list:

```
smp_discover_list --ignore /dev/bsg/expander-9:39
```

- e. Zone group 9, 10, 11, 12, 13, and 14 can be identified by the **zG** located at the end of each group in each of their respective zones. The above example displays PHYs 0-13 as being in zone group 9, PHYs 14-27 as being in zone group 10, and so on.

5.3.5 Disabling Zoning using Linux

Step 1: From the host server, identify the sg devices that are associated with the Ultrastar Data60 IOMs.

- a. Issue the following command:

```
sg_scan -i | grep -i H4060-J -B 1
```

- b. Identify the sg devices from the output. The devices can be identified by the **<dev>**. The devices appear as **/dev/sg3** and **/dev/sg106** bolded in the example below.

```

/dev/sg3: scsi9 channel=0 id=43 lun=0
        HGST H460-J 0101 [rmb=0 cmdq=1 pqual=0 pdev=0xd]
'__
/dev/sg106: scsi9 channel=0 id=196 lun=0
        HGST H460-J 0101 [rmb=0 cmdq=1 pqual=0 pdev=0xd]

```

- c. Record the sg device numbers for use in a later step.

Step 2: Identify the IOM SAS Address for both IOMs sg_ses page 7h.

- a. Issue the following command:

```
sg_ses <dev> -p7 | grep -i esce
```

- b. Identify the IOM SAS address for both IOMs from the output. Each address appears before the IP Address as bolded in the example below.

```
Element 0 descriptor: ESCE IOMA,1EB0246-B2           ,THCLS03517EL0091
,5000CCAB0300003C,10.202.238.225
Element 1 descriptor: ESCE IOMB,1EB0246           ,THCLS03517EL0052
,5000CCAB0300007C,10.202.239.201
```

- c. Record the IOM SAS Addresses for use in a later step.

Step 3: Verify the IOM SAS Address that matches each sg_device that is linked to each IOM using sg_vpd page 83h.

- a. Issue the following command:

```
sg_vpd <dev> -p0x83
```

- b. Identify and match the IOM SAS address and sg device for both IOMs from the output. Each address appears bolded in the example below.

```
Addressed logical unit:
  designator type: NAA,   code set: Binary
    0x5000ccab0300003c
Target port:
  designator type: NAA,   code set: Binary
  transport: Serial Attached SCSI Protocol (SPL-4)
    0x5000ccab0300003c
  designator type: Relative target port,   code set: Binary
  transport: Serial Attached SCSI Protocol (SPL-4)
  Relative target port: 0x1
Target device that contains addressed lu:
  designator type: NAA,   code set: Binary
  transport: Serial Attached SCSI Protocol (SPL-4)
    0x5000ccab0300003c
```

Step 4: Build the sg_senddiag command using the information recorded in earlier steps.

- a. Use the example of the sg_senddiag command shown in the image above to complete the specific sg_senddiag command for IOM A. Replace letters **a** through **d** with the information recorded in previous steps.

sg_senddiag Command

```
sg_senddiag <a> --pf --raw=04,00,00,90,<b>,<c>,00,00,<d>
```

- a. **sg device (<dev>):** device associated with IOM A
b. **Disable Zoning:** 60
c. **Zoning Configuration:** configuration 00



Note: For information on preconfigured zoning configurations, see: [Predefined Zoning Configurations \(page 182\)](#).

- d. **IOM SAS Address:** SAS Address associated with IOM A



Note: A comma should be placed after each bit of data in the IOM SAS Address that was recorded. For example, if the IOM SAS Address output was **5000CCAB0300003C**, the address that should be added to the `sg_senddiag` command should be **50,00,CC,AB,03,00,00,3C**.

- b. Use the example of the `sg_senddiag` command shown in the image above to complete the specific `sg_senddiag` command for IOM B. Replace letters **a** through **d** with the information recorded in previous steps.

`sg_senddiag` Command

```
sg_senddiag <a> --pf --raw=04,00,00,90,<b>,<c>,00,00,<d>
```

- a. **sg device (<dev>):** device associated with IOM B
- b. **Disable Zoning:** 60
- c. **Zoning Configuration:** configuration 00



Note: For information on preconfigured zoning configurations, see: [Predefined Zoning Configurations \(page 182\)](#).

- d. **IOM SAS Address:** SAS Address associated with IOM B



Note: A comma should be placed after each bit of data in the IOM SAS Address that was recorded. For example, if the IOM SAS Address output was **5000CCAB0300007C**, the address that should be added to the `sg_senddiag` command should be **50,00,CC,AB,03,00,00,7C**.

- c. The following are examples of completed `sg_senddiag` commands for IOM A and B.

- **IOM A:** `sg_senddiag <dev> --pf --raw=04,00,00,90,60,00,00,00,50,00,CC,AB,03,00,00,3C`
- **IOM B:** `sg_senddiag <dev> --pf --raw=04,00,00,90,60,00,00,00,50,00,CC,AB,03,00,00,7C`

Step 5: Disable zoning on IOM A using the `sg_senddiag` command.

- a. Issue the command for IOM A that was built in the previous step.

Step 6: Disable zoning on IOM B using the `sg_senddiag` command.

- a. Issue the command for IOM B that was built in the previous step.

Step 7: Verify the zone groups for each of the host's has been disabled using the `smc_discover_list` command.

- a. Issue the following command to locate the expander handles:

```
ls /dev/bsg
```

Example of the Expander Handles

```

0:2:0:0      9:0:1297:0  9:0:1378:0  9:0:1390:0
end_device-9:41:26 end_device-9:44:12 end_device-9:44:9
10:0:0:0     9:0:1298:0  9:0:1379:0  9:0:1391:0
end_device-9:41:27 end_device-9:44:13 expander-9:39
7:0:0:0      9:0:1299:0  9:0:1380:0  end_device-9:39:2
end_device-9:41:28 end_device-9:44:14 expander-9:40
9:0:1220:0   9:0:1300:0  9:0:1381:0  end_device-9:41:17
end_device-9:41:29 end_device-9:44:15 expander-9:41
9:0:1289:0   9:0:1301:0  9:0:1382:0  end_device-9:41:18
end_device-9:41:30 end_device-9:44:16 expander-9:42
9:0:1290:0   9:0:1302:0  9:0:1383:0  end_device-9:41:19
end_device-9:41:31 end_device-9:44:2  expander-9:43
9:0:1291:0   9:0:1303:0  9:0:1384:0  end_device-9:41:20
end_device-9:41:32 end_device-9:44:3  expander-9:44
9:0:1292:0   9:0:1304:0  9:0:1385:0  end_device-9:41:21
end_device-9:42:2  end_device-9:44:4  sas_host9
9:0:1293:0   9:0:1323:0  9:0:1386:0  end_device-9:41:22
end_device-9:44:0  end_device-9:44:5
9:0:1294:0   9:0:1375:0  9:0:1387:0  end_device-9:41:23
end_device-9:44:1  end_device-9:44:6
9:0:1295:0   9:0:1376:0  9:0:1388:0  end_device-9:41:24
end_device-9:44:10 end_device-9:44:7
9:0:1296:0   9:0:1377:0  9:0:1389:0  end_device-9:41:25
end_device-9:44:11 end_device-9:44:8

```

- b. Issue the following command to access a single host's SMP Discover output:

```
smp_discover_list /dev/bsg/expander-9:39
```



Note: Repeat this substep for all expanders.

- c. Zone groups will not be visible due to zoning being disabled. All hosts will have access to all drives.
- d. Issue the following command to access all hosts smp_discover_list:

```
smp_discover_list --ignore /dev/bsg/expander-9:39
```



Note: Repeat this substep for all hosts.

5.3.6 Enabling Zoning using Windows

- Step 1:** From the host server, identify the SCSI devices that are associated with the Ultrastar Data60 IOMs.



Note: The operating system associates each SEP device as a SCSI device. The SCSI device of the SEP can be used to get status from or control elements within the enclosure.

- a. Issue the following command:


```
sg_scan -s | findstr /i H4060-J
```

- b. Identify the SCSI devices from the output. The device information follows **SCSI0**. The devices appear as **SCSI0:1,62,0** and **SCSI0:1,124,0** bolded in the example below.

```
SCSI0:1,62,0   claimed=0 pdt=dh           HGST           H460-J         0101
                0428
SCSI0:1,124,0 claimed=0 pdt=dh           HGST           H460-J
0101
                0428
```

Step 2: Locate the IP Address for each IOM using `sg_ses` page 7.

- a. Issue the following command:

```
sg_ses <dev> -p7 | finstr /i esce
```



Note: For `scsi<dev>`, type the number of the SCSI device recorded in the previous step.

- b. The IP Address for each IOM will appear at the end of each resulting line. Each IP Address is labeled for either IOM A or IOM B and occurs after the last comma as seen bolded in the following example.

Step 3: Verify the IOM SAS Address that matches each SCSI device that is linked to each IOM using `sg_vpd` page 83h.

- a. Issue the following command:

```
sg_vpd <dev> -p0x83
```

- b. Identify and match the IOM SAS address and sg device for both IOMs from the output. Each address appears bolded in the example below.

```
Addressed logical unit:
  designator type: NAA,   code set: Binary
    0x5000ccab0300003c
Target port:
  designator type: NAA,   code set: Binary
  transport: Serial Attached SCSI Protocol (SPL-4)
    0x5000ccab0300003c
  designator type: Relative target port, code set: Binary
  transport: Serial Attached SCSI Protocol (SPL-4)
  Relative target port: 0x1
Target device that contains addressed lu:
  designator type: NAA,   code set: Binary
  transport: Serial Attached SCSI Protocol (SPL-4)
    0x5000ccab0300003c
```

Step 4: Build the `sg_senddiag` command using the information recorded in earlier steps.

- a. Use the example of the `sg_senddiag` command shown in the image above to complete the specific `sg_senddiag` command for IOM A. Replace letters **a** through **d** with the information recorded in previous steps.

sg_senddiag Command

```
sg_senddiag <a> --pf --raw=04,00,00,90,<b>,<c>,00,00,<d>
```

- a. **SCSI device (<dev>):** device associated with IOM A
- b. **Enable Zoning:** 61
- c. **Zoning Configuration:** configuration 01, 02, or 03



Note: For information on preconfigured zoning configurations, see: [Predefined Zoning Configurations \(page 182\)](#).

- d. **IOM SAS Address:** SAS Address associated with IOM A



Note: A comma should be placed after each bit of data in the IOM SAS Address that was recorded. For example, if the IOM SAS Address output was **5000CCAB0300003C**, the address that should be added to the sg_senddiag command should be **50,00,CC,AB,03,00,00,3C**.

- b. Use the example of the sg_senddiag command shown in the image above to complete the specific sg_senddiag command for IOM B. Replace letters **a** through **d** with the information recorded in previous steps.

sg_senddiag Command

```
sg_senddiag <a> --pf --raw=04,00,00,90,<b>,<c>,00,00,<d>
```

- a. **SCSI device (<dev>):** device associated with IOM B
- b. **Enable Zoning:** 61
- c. **Zoning Configuration:** configuration 01, 02, or 03



Note: For information on preconfigured zoning configurations, see: [Predefined Zoning Configurations \(page 182\)](#).

- d. **IOM SAS Address:** SAS Address associated with IOM B



Note: A comma should be placed after each bit of data in the IOM SAS Address that was recorded. For example, if the IOM SAS Address output was **5000CCAB0300007C**, the address that should be added to the sg_senddiag command should be **50,00,CC,AB,03,00,00,7C**.

- c. The following are examples of completed sg_senddiag commands for IOM A and B.

- **IOM A:** sg_senddiag 3 --pf --raw=04,00,00,90,61,01,00,00,50,00,CC,AB,03,00,00,3C
- **IOM B:** sg_senddiag 106 --pf --raw=04,00,00,90,61,01,00,00,50,00,CC,AB,03,00,00,7C

Step 5: Enable zoning on IOM A using the sg_senddiag command.

- a. Issue the command for IOM A that was built in the previous step.

- b. Enabling a predefined zoning configuration will reset the SAS connector ports which may cause the `sg_senddiag` command to return a status of `DID_TIME_OUT` or `DID_SOFT_ERROR`. Despite the error, the zoning configuration will be enabled. The zoning configuration can be verified after both IOMs have been zoned.

```
send diagnostic: transport: Host_status=0x03 [DID_TIME_OUT]
Driver_status=0x00 [DRIVER_OK]
```

Step 6: Enable zoning on IOM B using the `sg_senddiag` command.

- a. Issue the command for IOM B that was built in the previous step.
- b. Enabling a predefined zoning configuration will reset the SAS connector ports which may cause the `sg_senddiag` command to return a status of `DID_TIME_OUT` or `DID_SOFT_ERROR`. Despite the error, the zoning configuration will be enabled. The zoning configuration can be verified after both IOMs have been zoned.

```
send diagnostic: transport: Host_status=0x03 [DID_TIME_OUT]
Driver_status=0x00 [DRIVER_OK]
```

Step 7: Verify the zone groups for each of the host using the `smp_discover_list` command.

- a. Issue the following command to locate the expander handles:

```
ls /dev/bsg
```

Example of the Expander Handles

```
0:2:0:0      9:0:1297:0  9:0:1378:0  9:0:1390:0
end_device-9:41:26 end_device-9:44:12 end_device-9:44:9
10:0:0:0     9:0:1298:0  9:0:1379:0  9:0:1391:0
end_device-9:41:27 end_device-9:44:13 expander-9:39
7:0:0:0      9:0:1299:0  9:0:1380:0  end_device-9:39:2
end_device-9:41:28 end_device-9:44:14 expander-9:40
9:0:1220:0   9:0:1300:0  9:0:1381:0  end_device-9:41:17
end_device-9:41:29 end_device-9:44:15 expander-9:41
9:0:1289:0   9:0:1301:0  9:0:1382:0  end_device-9:41:18
end_device-9:41:30 end_device-9:44:16 expander-9:42
9:0:1290:0   9:0:1302:0  9:0:1383:0  end_device-9:41:19
end_device-9:41:31 end_device-9:44:2  expander-9:43
9:0:1291:0   9:0:1303:0  9:0:1384:0  end_device-9:41:20
end_device-9:41:32 end_device-9:44:3  expander-9:44
9:0:1292:0   9:0:1304:0  9:0:1385:0  end_device-9:41:21
end_device-9:42:2  end_device-9:44:4  sas_host9
9:0:1293:0   9:0:1323:0  9:0:1386:0  end_device-9:41:22
end_device-9:44:0  end_device-9:44:5
9:0:1294:0   9:0:1375:0  9:0:1387:0  end_device-9:41:23
end_device-9:44:1  end_device-9:44:6
9:0:1295:0   9:0:1376:0  9:0:1388:0  end_device-9:41:24
end_device-9:44:10 end_device-9:44:7
9:0:1296:0   9:0:1377:0  9:0:1389:0  end_device-9:41:25
end_device-9:44:11 end_device-9:44:8
```

- b. Issue the following command to access a single host's SMP Discover output:

```
smp_discover_list /dev/bsg/expander-9:39
```

- c. Zone group 9 can be identified by the **zG:9** located at the end of each line in zone 9. The above example displays PHYs 0-13 as being in zone group 9. All other devices are labeled as **inaccessible** because the host is displaying the only devices it has access to. The step can be repeated on other hosts to see what zone group each host has access to.
- d. Issue the following command to access all hosts `smp_discover_list`:

```
smp_discover_list --ignore /dev/bsg/expander-9:39
```

- e. Zone group 9, 10, 11, 12, 13, and 14 can be identified by the **zG** located at the end of each group in each of their respective zones. The above example displays PHYs 0-13 as being in zone group 9, PHYs 14-27 as being in zone group 10, and so on.

5.3.7 Disabling Zoning using Windows

PENDING - Remove references to sg and replace with SCSI device handles.

- Step 1:** From the host server, identify the SCSI devices that are associated with the Ultrastar Data60 IOMs.



Note: The operating system associates each SEP device as a SCSI device. The SCSI device of the SEP can be used to get status from or control elements within the enclosure.

- a. Issue the following command:

```
sg_scan -s | findstr /i H4060-J
```

- b. Identify the SCSI devices from the output. The device information follows **SCSI0**. The devices appear as **SCSI0:1,62,0** and **SCSI0:1,124,0** bolded in the example below.

```
SCSI0:1,62,0   claimed=0 pdt=dh           HGST           H4060-J
0101
           0428
SCSI0:1,124,0 claimed=0 pdt=dh           HGST           H4060-J
0101
           0428
```

- Step 2:** Locate the IP Address for each IOM using `sg_ses` page 7.

- a. Issue the following command:

```
sg_ses <dev> -p7 | finstr /i esce
```



Note: For `scsi<dev>`, type the number of the SCSI device recorded in the previous step.

- b. The IP Address for each IOM will appear at the end of each resulting line. Each IP Address is labeled for either IOM A or IOM B and occurs after the last comma as seen bolded in the following example.

- Step 3:** Verify the IOM SAS Address that matches each SCSI device that is linked to each IOM using `sg_vpd` page 83h.

- a. Issue the following command:

```
sg_vpd <dev> -p0x83
```

- b. Identify and match the IOM SAS address and sg device for both IOMs from the output. Each address appears bolded in the example below.

```
Addressed logical unit:
  designator type: NAA, code set: Binary
  0x5000ccab0300003c
Target port:
  designator type: NAA, code set: Binary
  transport: Serial Attached SCSI Protocol (SPL-4)
  0x5000ccab0300003c
  designator type: Relative target port, code set: Binary
  transport: Serial Attached SCSI Protocol (SPL-4)
  Relative target port: 0x1
Target device that contains addressed lu:
  designator type: NAA, code set: Binary
  transport: Serial Attached SCSI Protocol (SPL-4)
  0x5000ccab0300003c
```

Step 4: Build the `sg_senddiag` command using the information recorded in earlier steps.

- a. Use the example of the `sg_senddiag` command shown in the image above to complete the specific `sg_senddiag` command for IOM A. Replace letters **a** through **d** with the information recorded in previous steps.

sg_senddiag Command

```
sg_senddiag <a> --pf --raw=04,00,00,90,<b>,<c>,00,00,<d>
```

- a. **SCSI device (<dev>):** device associated with IOM A
b. **Disable Zoning:** 60
c. **Zoning Configuration:** configuration 00



Note: For information on preconfigured zoning configurations, see: [Predefined Zoning Configurations \(page 182\)](#).

- d. **IOM SAS Address:** SAS Address associated with IOM A



Note: A comma should be placed after each bit of data in the IOM SAS Address that was recorded. For example, if the IOM SAS Address output was **5000CCAB0300003C**, the address that should be added to the `sg_senddiag` command should be **50,00,CC,AB,03,00,00,3C**.

- b. Use the example of the `sg_senddiag` command shown in the image above to complete the specific `sg_senddiag` command for IOM B. Replace letters **a** through **d** with the information recorded in previous steps.

sg_senddiag Command

```
sg_senddiag <a> --pf --raw=04,00,00,90,<b>,<c>,00,00,<d>
```


- a. **SCSI device (<dev>):** device associated with IOM B
- b. **Disable Zoning:** 60
- c. **Zoning Configuration:** configuration 00



Note: For information on preconfigured zoning configurations, see: [Predefined Zoning Configurations](#) (page 182).

- d. **IOM SAS Address:** SAS Address associated with IOM B



Note: A comma should be placed after each bit of data in the IOM SAS Address that was recorded. For example, if the IOM SAS Address output was **5000CCAB0300007C**, the address that should be added to the `sg_senddiag` command should be **50,00,CC,AB,03,00,00,7C**.

- c. The following are examples of completed `sg_senddiag` commands for IOM A and B.
 - **IOM A:** `sg_senddiag 3 --pf --raw=04,00,00,90,60,00,00,00,50,00,CC,AB,03,00,00,3C`
 - **IOM B:** `sg_senddiag 106 --pf --raw=04,00,00,90,60,00,00,00,50,00,CC,AB,03,00,00,7C`

Step 5: Disable zoning on IOM A using the `sg_senddiag` command.

- a. Issue the command for IOM A that was built in the previous step.
- b. Disabling a predefined zoning configuration will reset the SAS connector ports which may cause the `sg_senddiag` command to return a status of `DID_TIME_OUT` or `DID_SOFT_ERROR`. Despite the error, the zoning configuration will be enabled. The zoning configuration can be verified after both IOMs have been zoned.

```
send diagnostic: transport: Host_status=0x03 [DID_TIME_OUT]
Driver_status=0x00 [DRIVER_OK]
```

Step 6: Disable zoning on IOM B using the `sg_senddiag` command.

- a. Issue the command for IOM B that was built in the previous step.
- b. Disabling a predefined zoning configuration will reset the SAS connector ports which may cause the `sg_senddiag` command to return a status of `DID_TIME_OUT` or `DID_SOFT_ERROR`. Despite the error, the zoning configuration will be enabled. The zoning configuration can be verified after both IOMs have been zoned.

```
send diagnostic: transport: Host_status=0x03 [DID_TIME_OUT]
Driver_status=0x00 [DRIVER_OK]
```

Step 7: Reset the both IOMs by issuing the following command:

```
sg_ses <dev> -p4 -c -d 02,00,00,00
```

Step 8: Verify the zone groups for each of the host's has been disabled using the `smp_discover_list` command.

- a. Issue the following command to locate the expander handles:

```
ls /dev/bsg
```

Example of the Expander Handles

```
0:2:0:0      9:0:1297:0  9:0:1378:0  9:0:1390:0
  end_device-9:41:26  end_device-9:44:12  end_device-9:44:9
10:0:0:0     9:0:1298:0  9:0:1379:0  9:0:1391:0
  end_device-9:41:27  end_device-9:44:13  expander-9:39
7:0:0:0      9:0:1299:0  9:0:1380:0  end_device-9:39:2
  end_device-9:41:28  end_device-9:44:14  expander-9:40
9:0:1220:0   9:0:1300:0  9:0:1381:0  end_device-9:41:17
  end_device-9:41:29  end_device-9:44:15  expander-9:41
9:0:1289:0   9:0:1301:0  9:0:1382:0  end_device-9:41:18
  end_device-9:41:30  end_device-9:44:16  expander-9:42
9:0:1290:0   9:0:1302:0  9:0:1383:0  end_device-9:41:19
  end_device-9:41:31  end_device-9:44:2   expander-9:43
9:0:1291:0   9:0:1303:0  9:0:1384:0  end_device-9:41:20
  end_device-9:41:32  end_device-9:44:3   expander-9:44
9:0:1292:0   9:0:1304:0  9:0:1385:0  end_device-9:41:21
  end_device-9:42:2   end_device-9:44:4   sas_host9
9:0:1293:0   9:0:1323:0  9:0:1386:0  end_device-9:41:22
  end_device-9:44:0   end_device-9:44:5
9:0:1294:0   9:0:1375:0  9:0:1387:0  end_device-9:41:23
  end_device-9:44:1   end_device-9:44:6
9:0:1295:0   9:0:1376:0  9:0:1388:0  end_device-9:41:24
  end_device-9:44:10  end_device-9:44:7
9:0:1296:0   9:0:1377:0  9:0:1389:0  end_device-9:41:25
  end_device-9:44:11  end_device-9:44:8
```

- b. Issue the following command to access a single host's SMP Discover output:

```
smp_discover_list /dev/bsg/expander-9:39
```



Note: Repeat this substep for all expanders.

- c. Zone groups will not be visible due to zoning being disabled. All hosts will have access to all drives.
- d. Issue the following command to access all hosts smp_discover_list:

```
smp_discover_list --ignore /dev/bsg/expander-9:39
```

5.4 Subenclosure Nickname

5.4.1 Setting the Subenclosure Nickname

This task describes instructions for viewing and setting a subenclosure's nickname using `sg_ses` commands.

- In the following `sg_ses` examples, angle brackets surrounding a term (i.e. `<device>`) either indicate a generic reference to an expected output or a command phrase that should be replaced with the user's specific instance of that phrase (i.e. `/dev/sg2`).

- An enclosure consists of one or more subenclosures. If a single subenclosure is present, then that subenclosure is considered the primary subenclosure, and there are no secondary subenclosures. If multiple subenclosures are present, then:
 1. only one subenclosure is the primary subenclosure;
 2. the primary subenclosure is the subenclosure whose enclosure services process provides access to enclosure services information of all the subenclosures; and
 3. all other subenclosures are considered secondary subenclosures.

Verify Support for the Nickname Feature

Step 1: Verify the subenclosure's support for the nickname feature by using the `sg_ses <device> -p0x0` command to view the subenclosure's **Supported Diagnostic Pages**:

```
# sg_ses <device> -p0x0
  <manufacturer> <regulatorymodel> <firmwareversion>
Supported diagnostic pages:
Supported Diagnostic Pages [sdp] [0x0]
Configuration (SES) [cf] [0x1]
Enclosure Status/Control (SES) [ec,es] [0x2]
Help Text (SES) [ht] [0x3]
String In/Out (SES) [str] [0x4]
Threshold In/Out (SES) [th] [0x5]
Element Descriptor (SES) [ed] [0x7]
Additional Element Status (SES-2) [aes] [0xa]
Download Microcode (SES-2) [dm] [0xe]
Subenclosure Nickname (SES-2) [snic] [0xf]
<unknown> [0x10]
<unknown> [0x17]
```

If supported, the **Subenclosure Nickname** page will be included as one of the **Supported Diagnostic Pages**.

View the Nickname

Step 2: Use the `sg_ses <device> -p0xf` command to view the **Subenclosure Nickname** page:

```
# sg_ses <device> -p0xf
  <manufacturer> <regulatorymodel> <firmwareversion>
Subenclosure nickname status diagnostic page:
number of secondary subenclosures: 0
generation code: 0x0
subenclosure identifier: 0
nickname status: 0x0
nickname additional status: 0x0
nickname language code:
nickname:
```



Note: In the example above, the subenclosure's nickname is set to an empty string ("").

Set the Nickname

Step 3: Use the `sg_ses <device> -p0xf -c --nickname=<nickname>` command to set the subenclosure's nickname:

```
# sg_ses <device> -p0xf -c --nickname=<nickname>
  <manufacturer> <regulatorymodel> <firmwareversion>
```

```
No errors
```



Note: If the nickname contains one or more spaces, enclose the name in either single quotes (i.e. 'device nickname') or double quotes (i.e. "device nickname").

If the command was successful, **No errors** will be returned.

Step 4: Repeat the `sg_ses <device> -p0xf` command to view the **Subenclosure Nickname** page and verify that the nickname was set as intended:

```
# sg_ses <device> -p0xf
<manufacturer> <regulatorymodel> <firmwareversion>
Subenclosure nickname status diagnostic page:
number of secondary subenclosures: 0
generation code: 0x0
subenclosure identifier: 0
nickname status: 0x0
nickname additional status: 0x0
nickname language code:
nickname: <nickname>
```

Clear the Nickname

Step 5: If needed, use the `sg_ses <device> -p0xf -c --nickname=` command to clear the subenclosure's nickname (set it to an empty string):

```
# sg_ses <device> -p0xf -c --nickname=
<manufacturer> <regulatorymodel> <firmwareversion>
No errors
```

If the command was successful, **No errors** will be returned.

Step 6: Repeat the `sg_ses <device> -p0xf` command to view the **Subenclosure Nickname** page and verify that the nickname was cleared:

```
# sg_ses <device> -p0xf
<manufacturer> <regulatorymodel> <firmwareversion>
Subenclosure nickname status diagnostic page:
number of secondary subenclosures: 0
generation code: 0x0
subenclosure identifier: 0
nickname status: 0x0
nickname additional status: 0x0
nickname language code:
nickname:
```

5.5 Partially Populated Enclosures

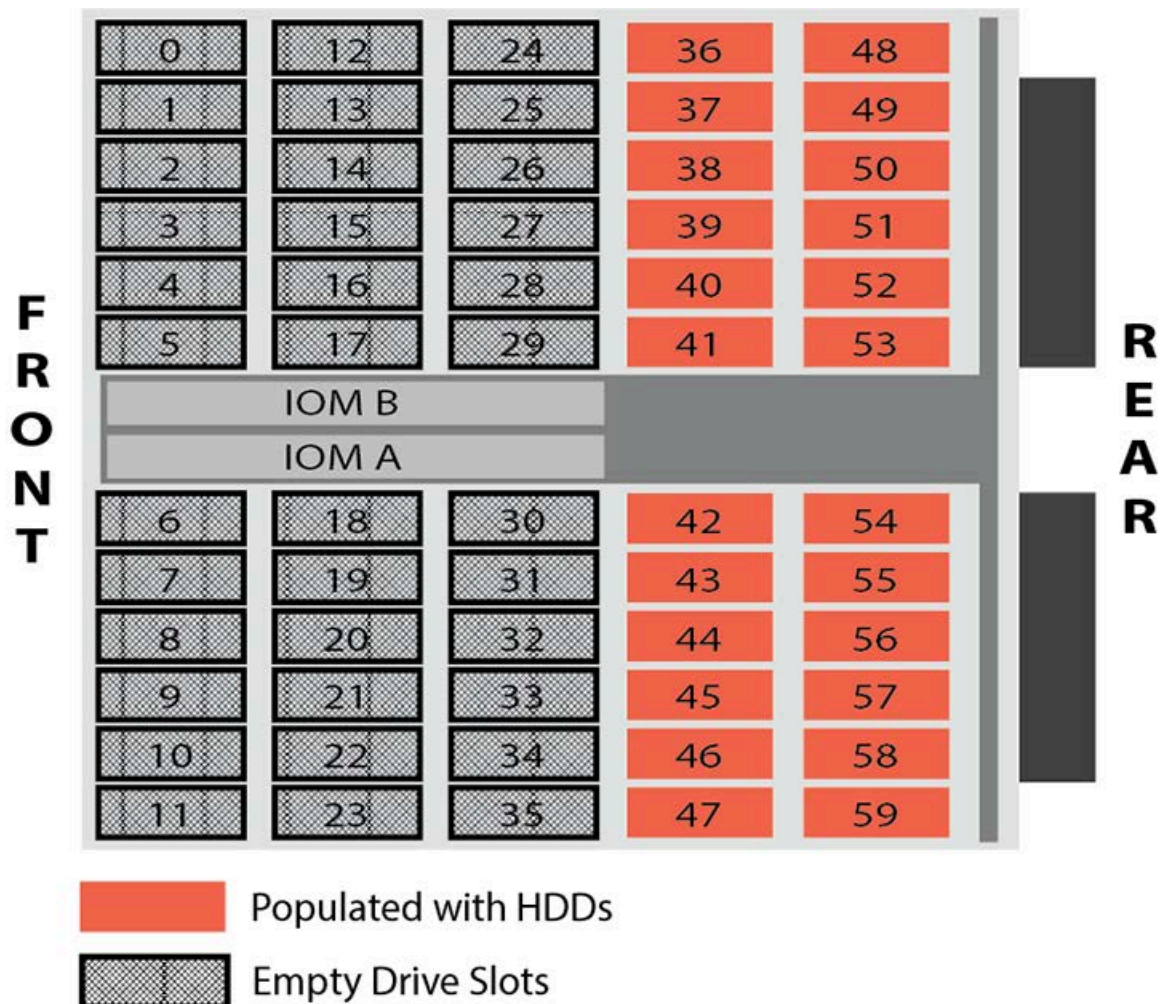
5.5.1 Partial Population Configurations

The Ultrastar Data60 supports partially-populated configurations that allow a user to increase the size of storage based on their needs. There are specific requirements that must be followed to ensure that the enclosure functions properly during operation. Partial population configurations that do not comply with the requirements listed in this section may result in enclosure performance issues. The following section details the requirements for HDD and HDD/SSD based configurations.

Minimum HDD Partial Population

The enclosure supports a minimum of 24 SAS or SATA HDDs for a partially-populated enclosure. The enclosure does not support a mix of SAS and SATA drives. The enclosure must be populated starting with the drives closest to the rear of the enclosure and work towards the front of the enclosure. If more drives are installed into the enclosure, any unfinished rows must be completed with drive blanks. The image below details the minimum required configuration for an HDD only configuration.

Figure 205: Minimum HDD Partial Population



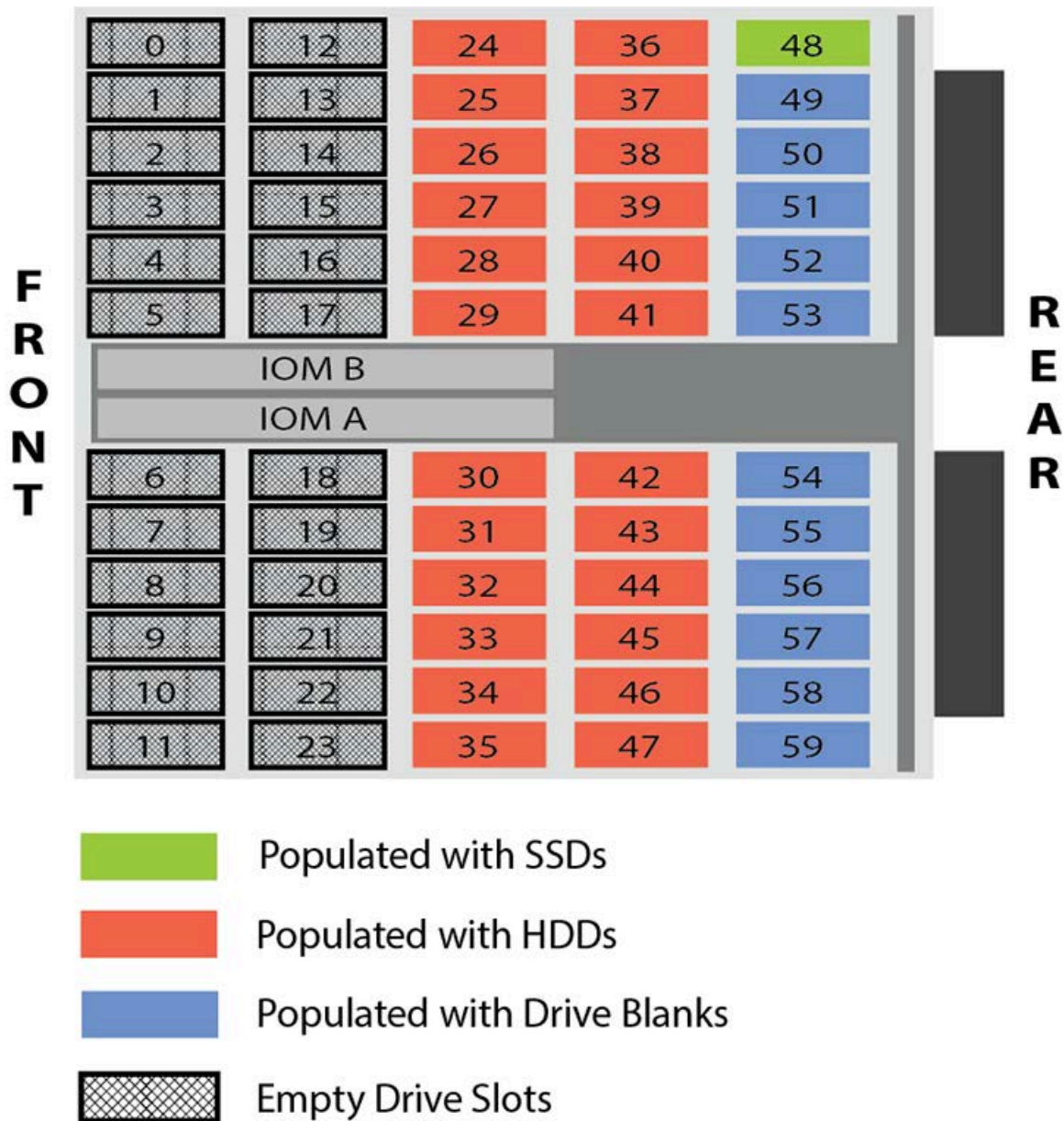
Minimum HDD and Minimum SSD Partial Population:

The enclosure supports a minimum of 24 HDDs and one SSD for a partially populated enclosure. The enclosure can support a minimum of one SSD with the remaining drive slots within that row being completed with drive blanks. The enclosure does not support a mix of SAS and SATA drives. The image below details the minimum required configuration for an HDD and SSD configuration.



Note: When installing SSDs for this configuration, the preinstalled HDDs will have to be moved one entire row to the next vacant row near the front of the enclosure.

Figure 206: Minimum HDD and Minimum SSD Partial Population



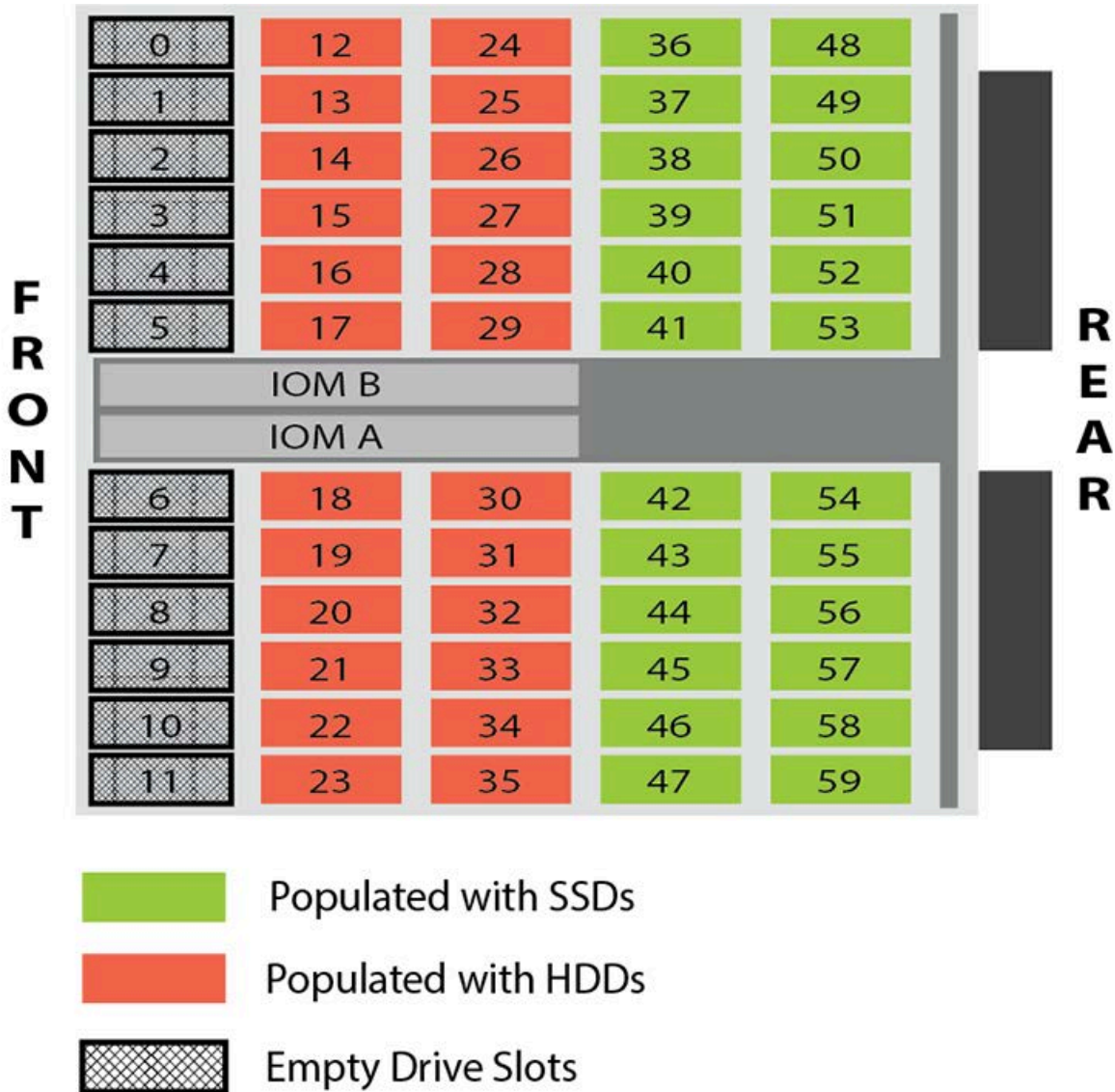
Minimum HDD and Maximum SSD Partial Population:

The enclosure supports a minimum of 24 HDDs and one SSD for a partially populated enclosure. The enclosure can support a maximum of up to 24 total SSDs in this configuration. The enclosure does not support a mix of SAS and SATA drives. The image below details the required configuration for minimum HDD and maximum SSD configuration.



Note: When installing SSDs for this configuration, the preinstalled HDDs will have to be moved two entire rows to the next vacant pair of rows near the front of the enclosure.

Figure 207: Minimum HDD and Maximum SSD Partial Population

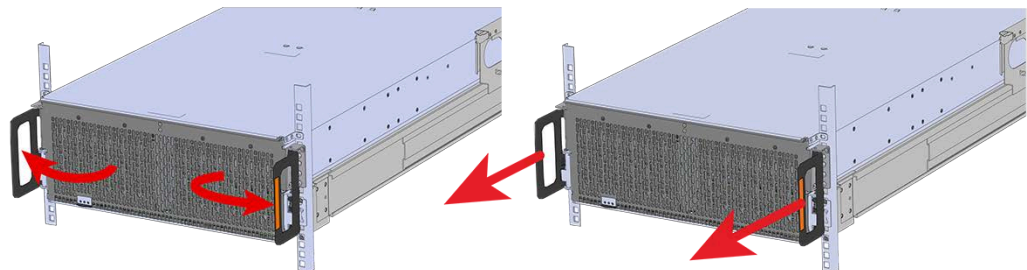


5.5.2 Installing Drives

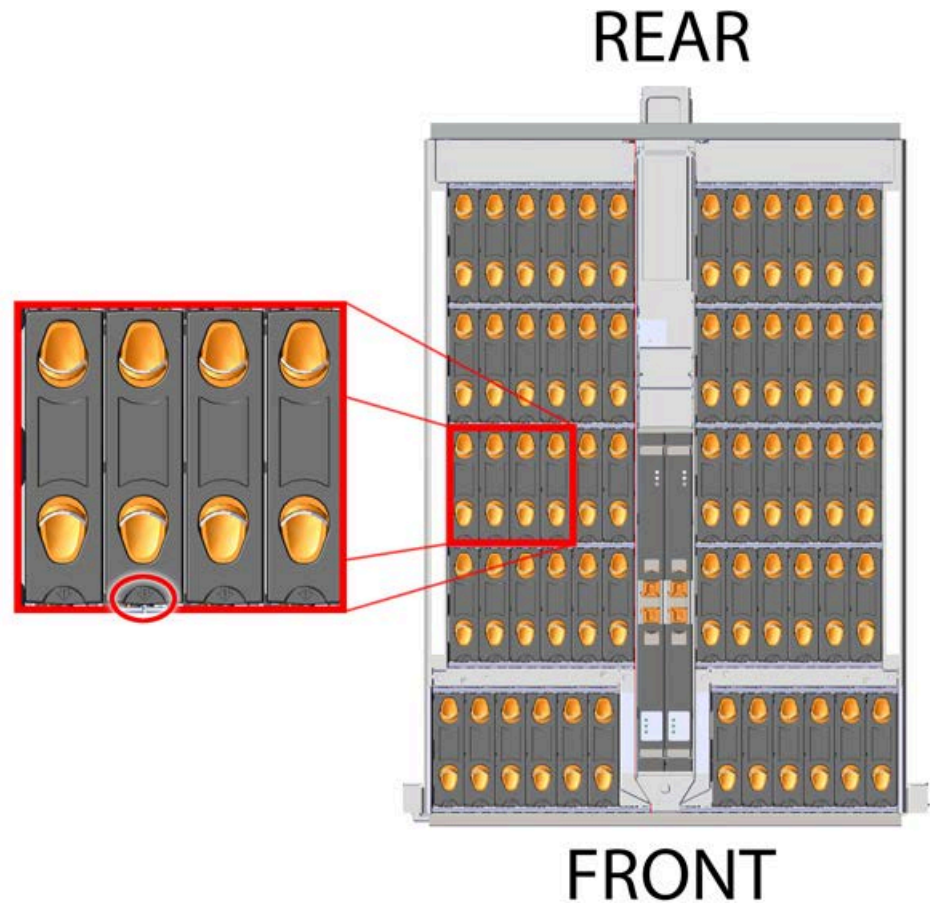
This section provides steps on how to install drives into the enclosure. The enclosure is shipped with a minimum of 24 HDDs and may require HDDs to be moved to other drives slots if SSDs are being installed. Before beginning the process of adding drives, refer to the [Partial Population Configurations \(page 204\)](#) section to determine what configuration will be used and what is required of that configuration.

- Step 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 and the cover will remain in the rack attached to the rear alignment brackets.

Figure 208: Chassis Handle Operation

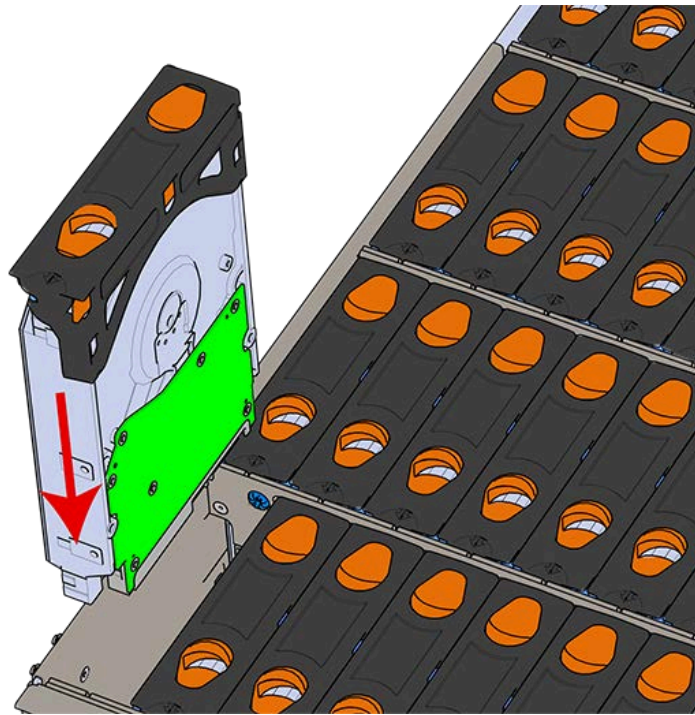


- Step 2:** Locate the area that the new drives will be installed into. When adding SSDs, the drives slots may already contain a drive. The drive will have to be removed and relocated before installing the HDD.
- Step 3:** Follow the requirements for partial populations listed in [Partial Population Configurations \(page 204\)](#).
- Step 4:** Install the Drive Assembly.
- Ensure that the enclosure has been pulled out of the rack until the rail latches engage.
 - Find the LED pointer on the top of the drive carrier. This pointer should point toward the front of the unit as shown in the following image.

Figure 209: LED Pointer Orientation

- c. Align the drive with the empty slot that will receive it. Lower it into the slot, making sure it stays level and does not snag.

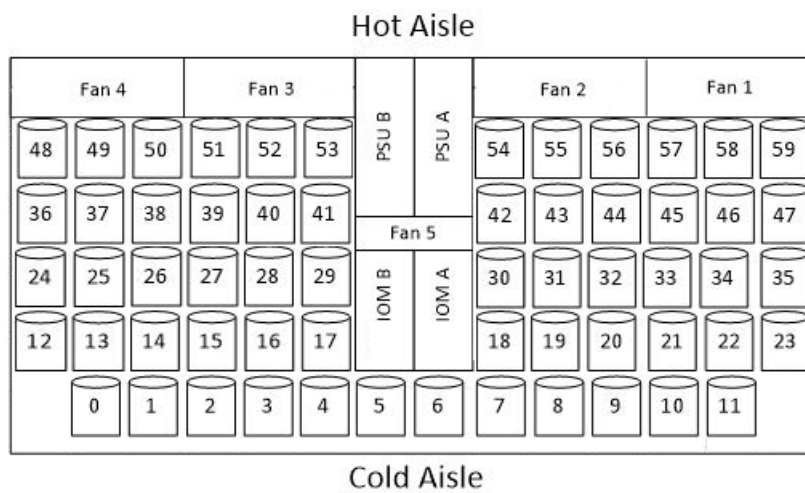
Figure 210: Installing a Drive Assembly



- d. Pinch the latch release and carefully press downward to seat the Drive Assembly the rest of the way.

Step 5: Install each drive in the same way the first was installed. Make sure to follow the drive layout shown in the following image.

Figure 211: Drive Layout



Step 6: Push the enclosure back into the rack to ensure proper cooling.

5.6 Daisy Chaining

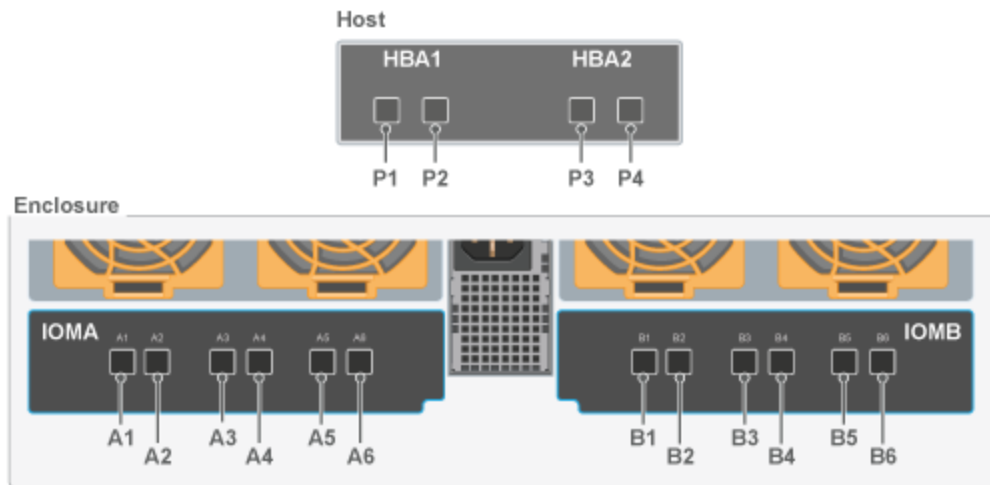
This chapter provides information related to predefined daisy chaining configurations and specific requirements.

5.6.1 Daisy Chaining Configurations

The Ultrastar Data60 supports configurations up to four enclosures daisy chained together using active cables. The Daisy Chaining Key identifies the specific information needed to use the cable maps in the following sections. The daisy chaining configurations are broken into two sections: one host configurations and two host configurations. Each of the sections provide a list of the configurations and an example diagram of how the enclosures can be connected using SAS cables.

The following diagram identifies the host, host ports, IOM configuration, and IO SAS connections.

Figure 212: Daisy Chaining Key



The following section identifies the different host configurations for daisy chaining multiple enclosures with either one or two hosts.

One Host Configurations: The following diagram is an example of how the enclosures will be connected via the IO SAS ports and what number each enclosure is. This information can be utilized with this cable map: [One Host Cable Configurations \(page 212\)](#).

Two Host Configurations: The following diagram is an example of how the enclosures will be connected via the IO SAS ports and what number each enclosure is. This information can be utilized with this cable map: [Two Host Cable Configurations \(page 217\)](#).

Table 50: Daisy Chaining Configurations

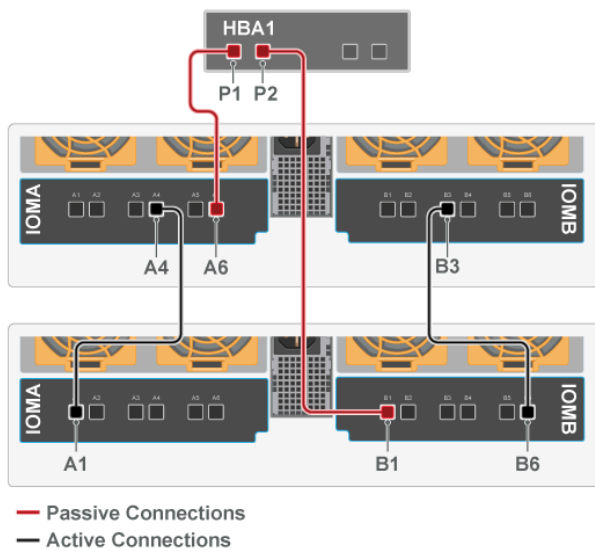
Type of Enclosure	Number of Hosts	Number of HBAs per Host	Number of Enclosures
SAS	1	1 HBA	2-4
	2		

Type of Enclosure	Number of Hosts	Number of HBAs per Host	Number of Enclosures
	1		
	2	2 HBAs	2-4
SATA	1	1 HBA	4

5.6.2 One Host Cable Configurations

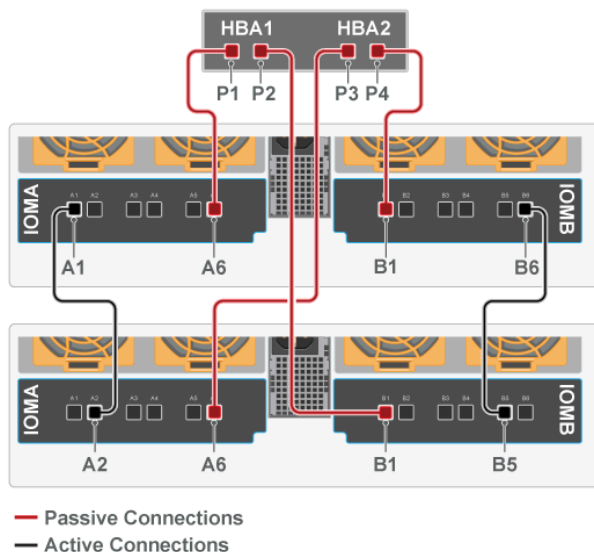
This section provides the information required to connect two or more enclosures to a single host via SAS connections. Choose the cable map that fits the preferred daisy chaining requirement.

Two Enclosures: One Host with a Single HBA



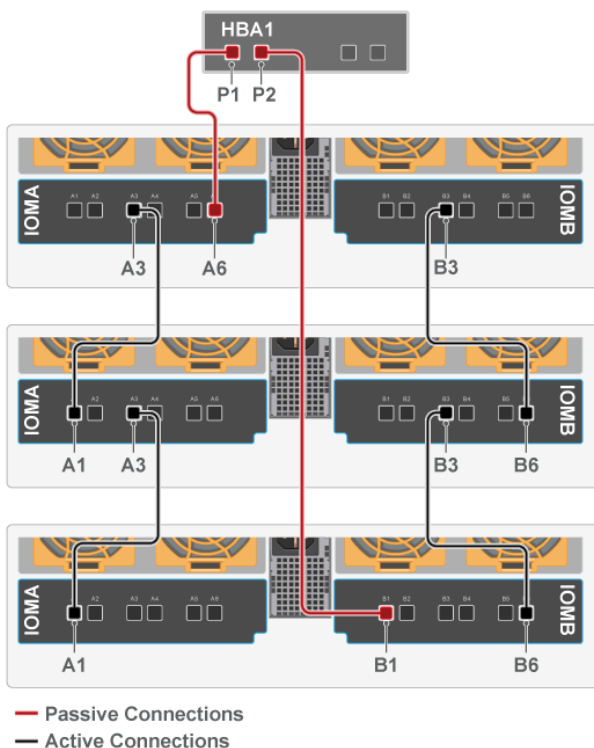
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure2: IOMB, B1
Enclosure1: IOMA, A4	Enclosure2: IOMA, A1
Enclosure1: IOMB, B3	Enclosure2: IOMB, B6

Two Enclosures: One Host with a Two HBAs



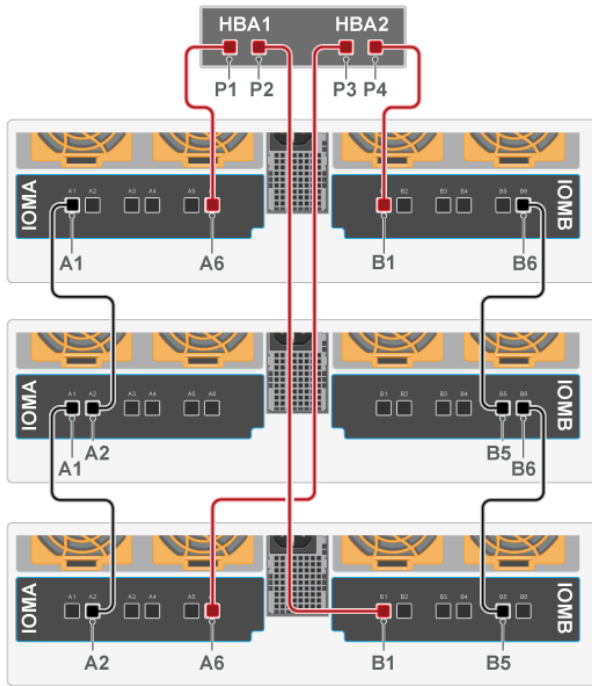
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure2: IOMB, B1
Host1: P3	Enclosure2: IOMA, A6
Host1: P4	Enclosure1: IOMB, B1
Enclosure1: IOMA, A1	Enclosure2: IOMA, A2
Enclosure1: IOMB, B6	Enclosure2: IOMB, B5

Three Enclosures: One Host with a Single HBA



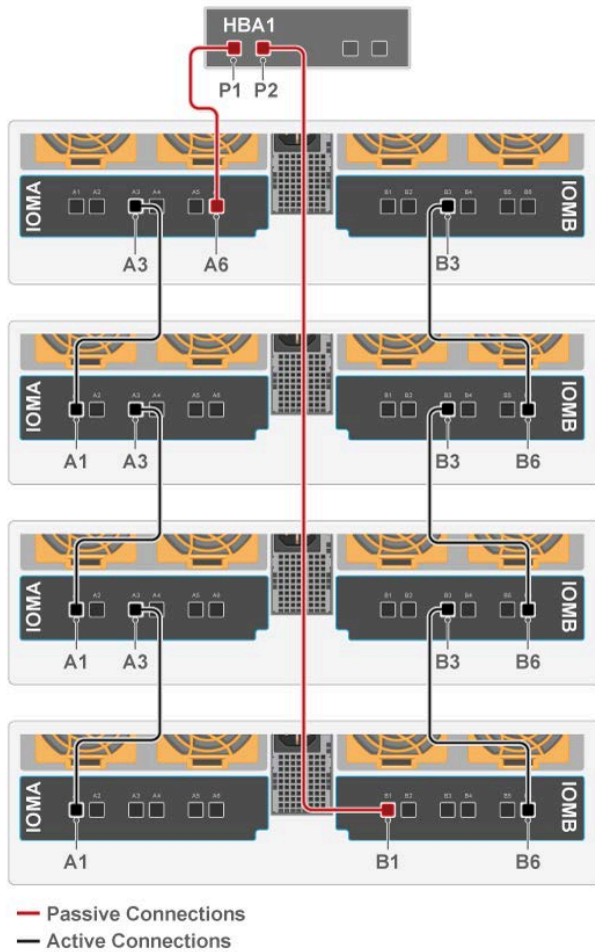
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure3: IOMB, B1
Enclosure1: IOMA, A3	Enclosure2: IOMA, A1
Enclosure1: IOMB, B3	Enclosure2: IOMB, B6
Enclosure2: IOMA, A3	Enclosure3: IOMA, A1
Enclosure2: IOMB, B3	Enclosure3: IOMB, B6

Three Enclosures: One Host with a Two HBAs



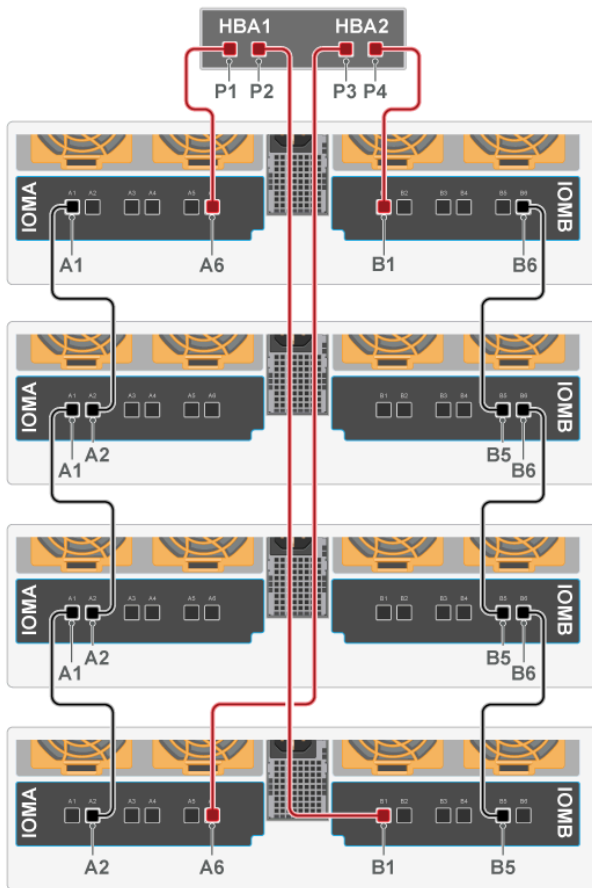
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure3: IOMB, B1
Host1: P3	Enclosure3: IOMA, A6
Host1: P4	Enclosure1: IOMB, B1
Enclosure1: IOMA, A1	Enclosure2: IOMA, A2
Enclosure1: IOMB, B6	Enclosure2: IOMB, B5
Enclosure2: IOMA, A1	Enclosure3: IOMA, A2
Enclosure2: IOMB, B6	Enclosure3: IOMB, B5

Four Enclosures: One Host with a Single HBA



Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure4: IOMB, B1
Enclosure1: IOMA, A3	Enclosure2: IOMA, A1
Enclosure1: IOMB, B3	Enclosure2: IOMB, B6
Enclosure2: IOMA, A3	Enclosure3: IOMA, A1
Enclosure2: IOMB, B3	Enclosure3: IOMB, B6
Enclosure3: IOMA, A3	Enclosure4: IOMA, A1
Enclosure3: IOMB, B3	Enclosure4: IOMB, B6

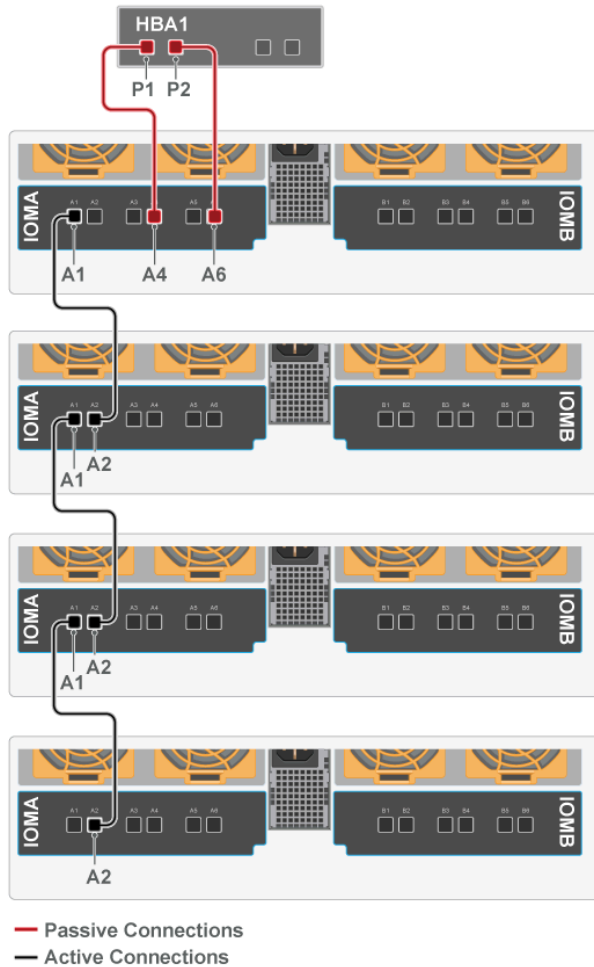
Four Enclosures: One Host with a Two HBAs



— Passive Connections
— Active Connections

Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure4: IOMB, B1
Host1: P3	Enclosure4: IOMA, A6
Host1: P4	Enclosure1: IOMB, B1
Enclosure1: IOMA, A1	Enclosure2: IOMA, A2
Enclosure1: IOMB, B6	Enclosure2: IOMB, B5
Enclosure2: IOMA, A1	Enclosure3: IOMA, A2
Enclosure2: IOMB, B6	Enclosure3: IOMB, B5
Enclosure3: IOMA, A1	Enclosure4: IOMA, A2
Enclosure3: IOMB, B6	Enclosure4: IOMB, B5

Four SATA Enclosure: One Host with a Single HBA

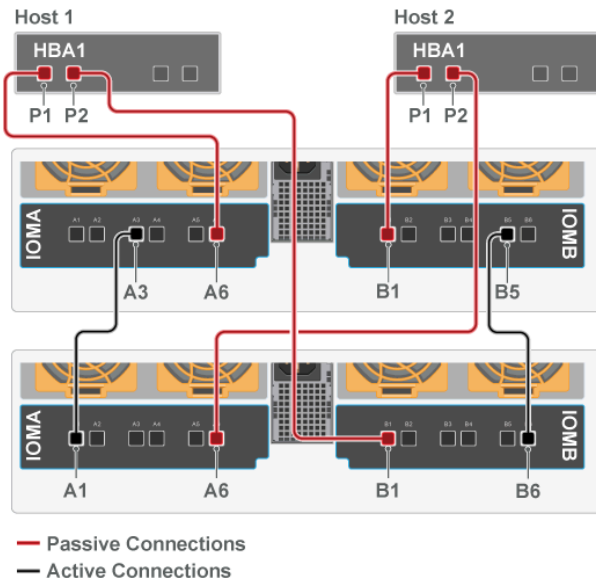


Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A4
Host1: P2	Enclosure1: IOMA, A6
Enclosure1: IOMA, A1	Enclosure2: IOMA, A2
Enclosure2: IOMA, A1	Enclosure3: IOMA, A2
Enclosure3: IOMA, A1	Enclosure4: IOMA, A2

5.6.3 Two Host Cable Configurations

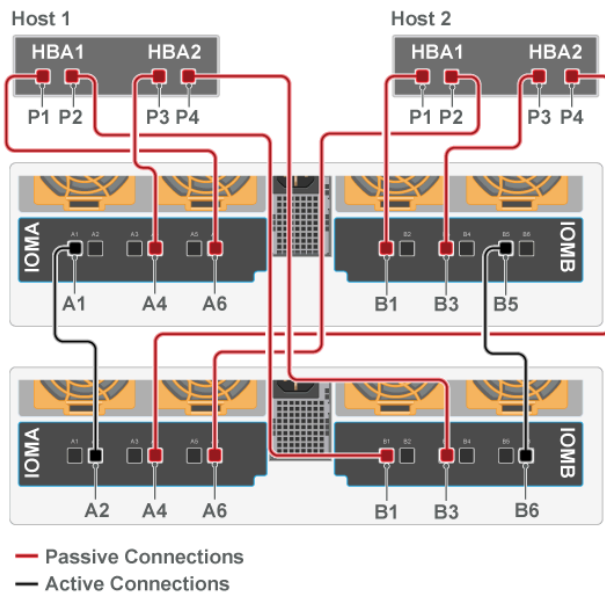
This section provides the information required to connect two or more enclosures to two hosts via SAS connections. Choose the cable map that fits the preferred daisy chaining requirement.

Two Enclosures: Two Hosts with One HBA



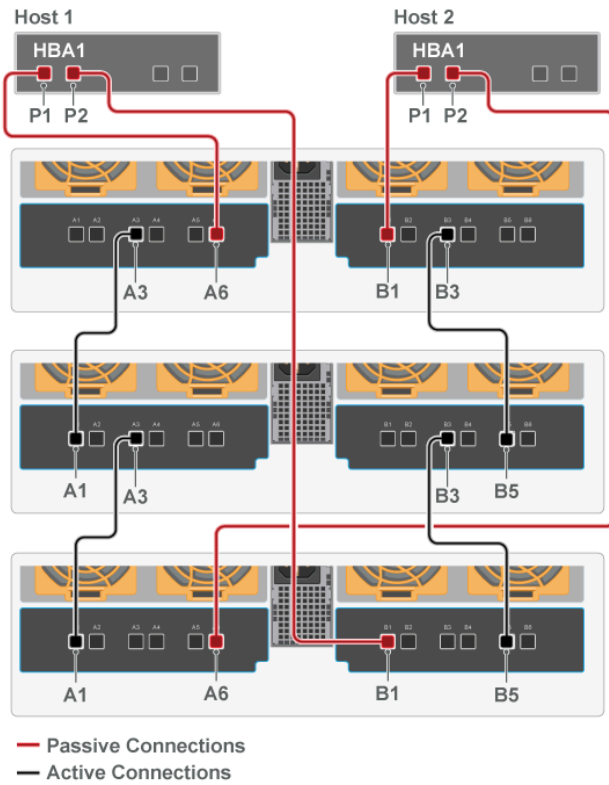
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure2: IOMB, B1
Host2: P1	Enclosure1: IOMB, B1
Host2: P2	Enclosure2: IOMA, A6
Enclosure1: IOMA, A3	Enclosure2: IOMA, A1
Enclosure1: IOMB, B5	Enclosure2: IOMB, B6

Two Enclosures: Two Hosts with Two HBAs



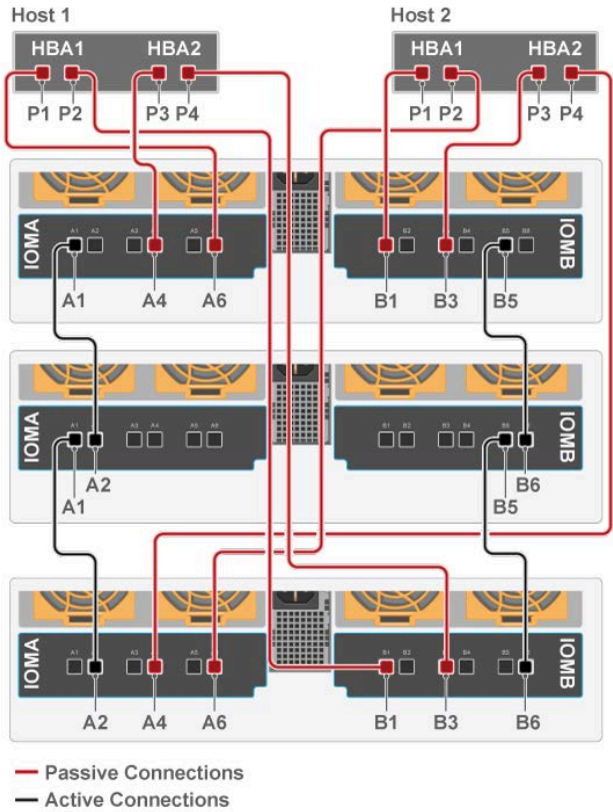
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure2: IOMB, B1
Host1: P3	Enclosure1: IOMA, A4
Host1: P4	Enclosure2: IOMB, B3
Host2: P1	Enclosure1: IOMB, B1
Host2: P2	Enclosure2: IOMA, A6
Host2: P3	Enclosure1: IOMB, B3
Host2: P4	Enclosure2: IOMA, A4
Enclosure1: IOMA, A1	Enclosure2: IOMA, A2
Enclosure1: IOMB, B5	Enclosure2: IOMB, B6

Three Enclosures: Two Hosts with One HBA



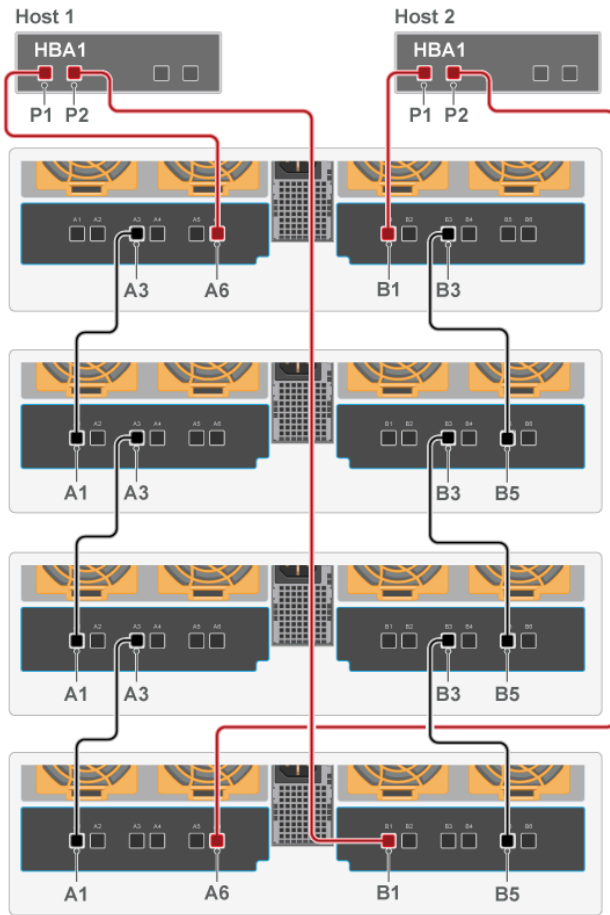
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure3: IOMB, B1
Host2: P1	Enclosure1: IOMB, B1
Host2: P2	Enclosure3: IOMA, A6
Enclosure1: IOMA, A3	Enclosure2: IOMA, A1
Enclosure2: IOMA, A3	Enclosure3: IOMA, A1
Enclosure1: IOMB, B3	Enclosure2: IOMB, B5
Enclosure2: IOMB, B3	Enclosure3: IOMB, B5

Three Enclosures: Two Hosts with Two HBAs



Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure3: IOMB, B1
Host1: P3	Enclosure1: IOMA, A4
Host1: P4	Enclosure3: IOMB, B3
Host2: P1	Enclosure1: IOMB, B1
Host2: P2	Enclosure3: IOMA, A6
Host2: P3	Enclosure1: IOMB, B3
Host2: P4	Enclosure3: IOMA, A4
Enclosure1: IOMA, A1	Enclosure2: IOMA, A2
Enclosure2: IOMA, A1	Enclosure3: IOMA, A2
Enclosure1: IOMB, B5	Enclosure2: IOMB, B6
Enclosure2: IOMB, B5	Enclosure3: IOMB, B6

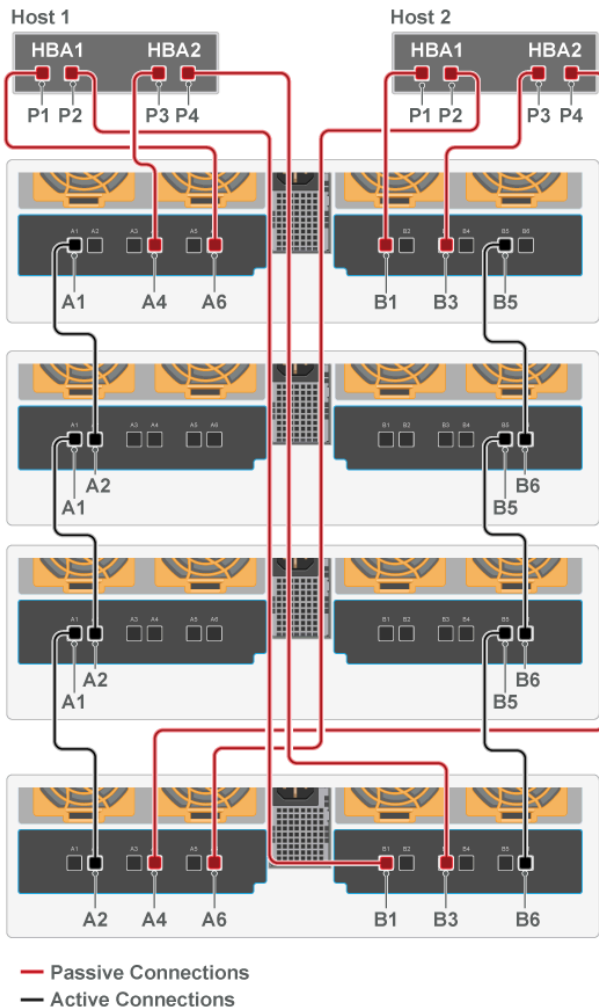
Four Enclosures: Two Hosts with One HBA



— Passive Connections
— Active Connections

Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure4: IOMB, B1
Host2: P1	Enclosure1: IOMB, B1
Host2: P2	Enclosure4: IOMA, A6
Enclosure1: IOMA, A3	Enclosure2: IOMA, A1
Enclosure2: IOMA, A3	Enclosure3: IOMA, A1
Enclosure3: IOMA, A3	Enclosure4: IOMA, A1
Enclosure1: IOMB, B3	Enclosure2: IOMB, B5
Enclosure2: IOMB, B3	Enclosure3: IOMB, B5
Enclosure3: IOMB, B3	Enclosure4: IOMB, B5

Four Enclosures: Two Hosts with Two HBAs



Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure4: IOMB, B1
Host1: P3	Enclosure1: IOMA, A4
Host1: P4	Enclosure4: IOMB, B3
Host2: P1	Enclosure1: IOMB, B1
Host2: P2	Enclosure4: IOMA, A6
Host2: P3	Enclosure1: IOMB, B3
Host2: P4	Enclosure4: IOMA, A4
Enclosure1: IOMA, A1	Enclosure2: IOMA, A2
Enclosure2: IOMA, A1	Enclosure3: IOMA, A2
Enclosure3: IOMA, A1	Enclosure4: IOMA, A2
Enclosure1: IOMB, B5	Enclosure2: IOMB, B6
Enclosure2: IOMB, B5	Enclosure3: IOMB, B6
Enclosure3: IOMB, B5	Enclosure4: IOMB, B6

5.6.4 Cabling for Daisy Chaining



Note: The CMA should be installed before installing cabling.

Step 1: Choose a configuration from the [One Host Cable Configurations \(page 212\)](#) section or [Two Host Cable Configurations \(page 217\)](#) sections. The configuration choice should be made based on the number of hosts being connected to the enclosure, the number of HBAs in each host, and how many enclosures will be daisy chained together.

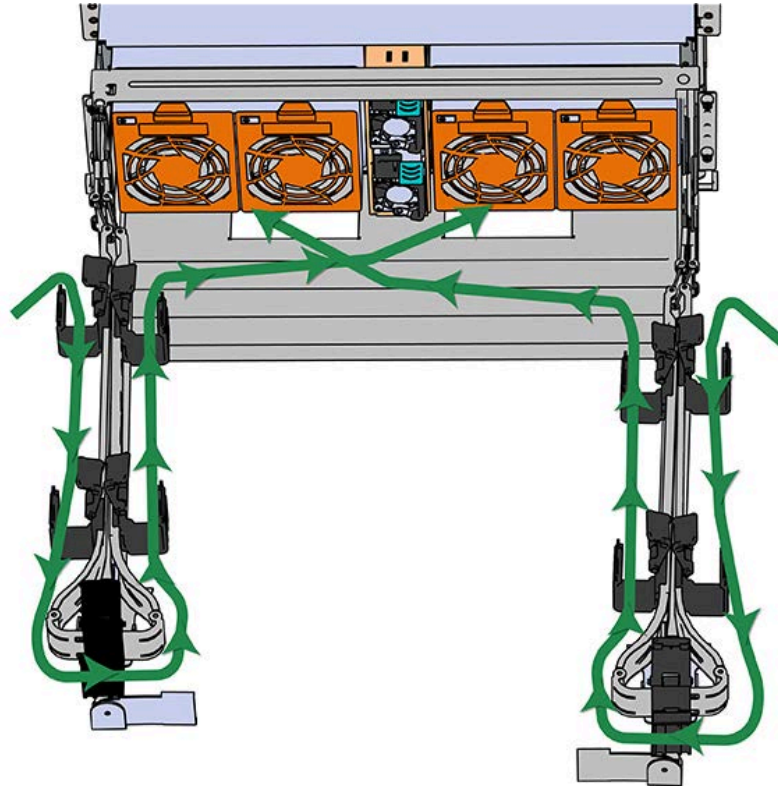
Step 2: Cable the lower CMA.

- 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.

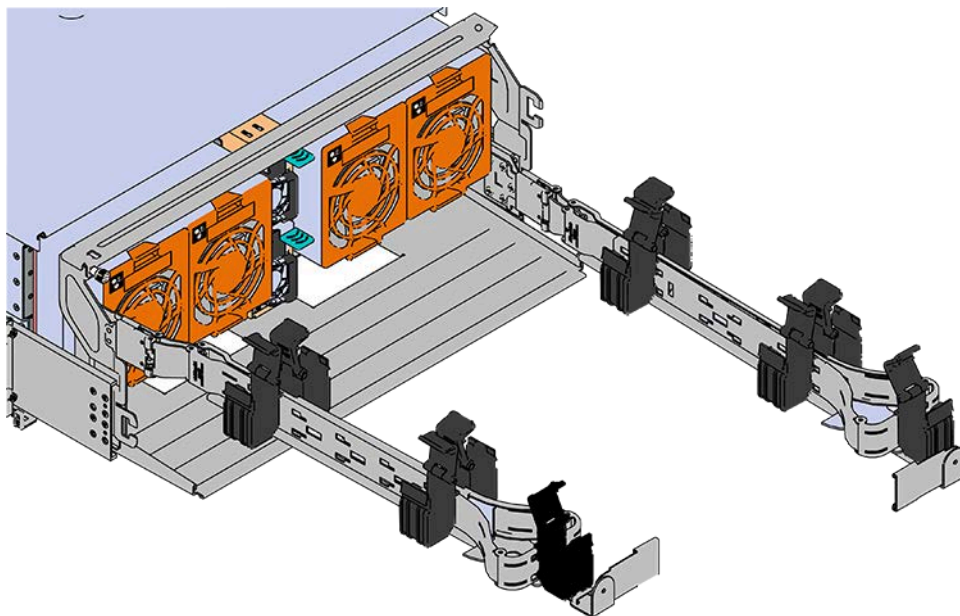


Note: Before cabling the lower CMA, note the following routing of the cables. For best results, the cables that are supported by the upper CMA are inserted into IOM B (right hand side looking at the rear) and the lower CMA cables are routed to IOM A (left hand side looking at the rear) in a "criss-cross" pattern. See the [Special Considerations for Cable Routing](#) (page 157) for more information.

Figure 226: Connected Cable Routing



- c. Open all of the baskets

Figure 227: Open Baskets

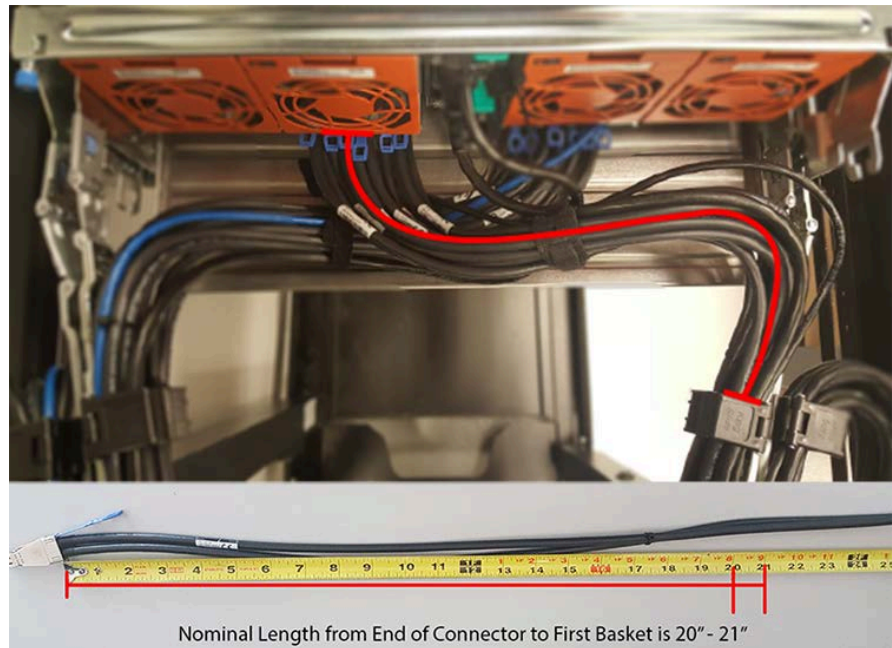
- d. Connect all of the SAS cables that will be used and route them through the baskets one at a time. Make sure to follow the labels to make sure they are connected to the proper port.
- e. If the installation includes more than 10 total cables, follow the recommendations in [Special Considerations for Cable Routing \(page 157\)](#). 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.



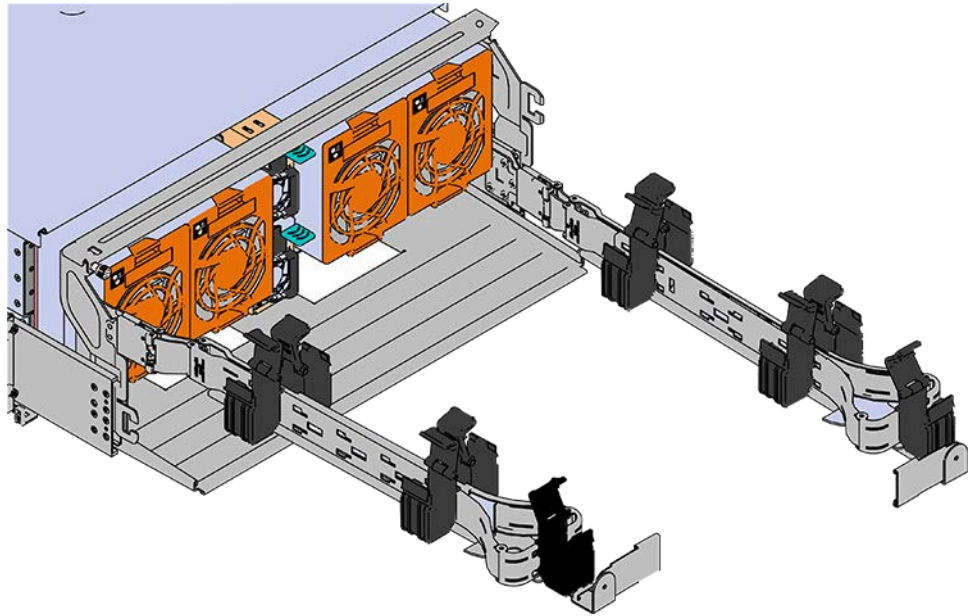
Figure 228: Nominal Cable Length at Connectors



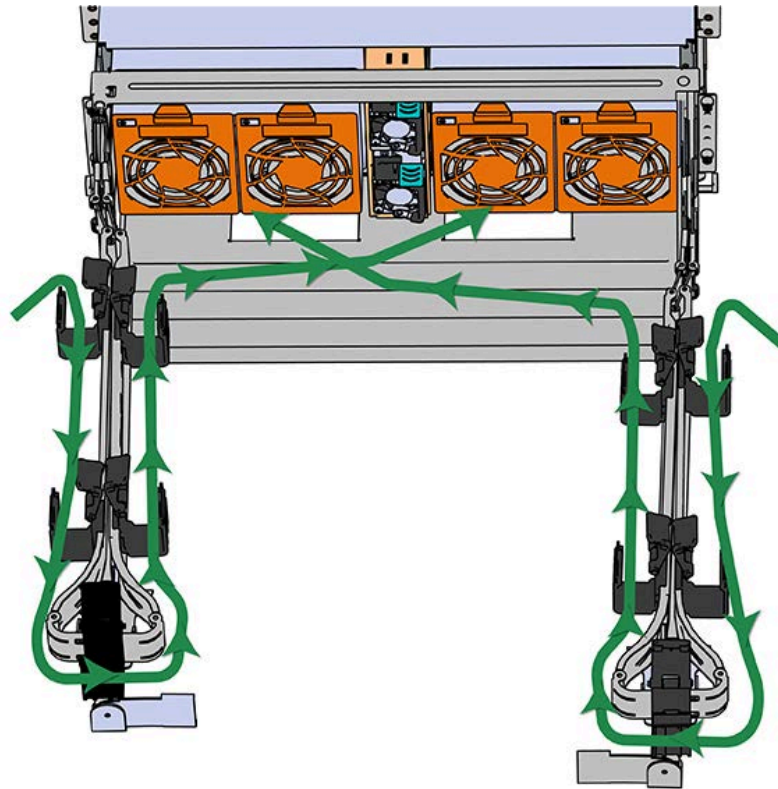
- f. Close all of the baskets.
- g. Reconnect the CMA at the elbow to the connectors on the rail.

Step 3: 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 229: Open Baskets

- a.** 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.
- b.** 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 230: Connected Cable Routing

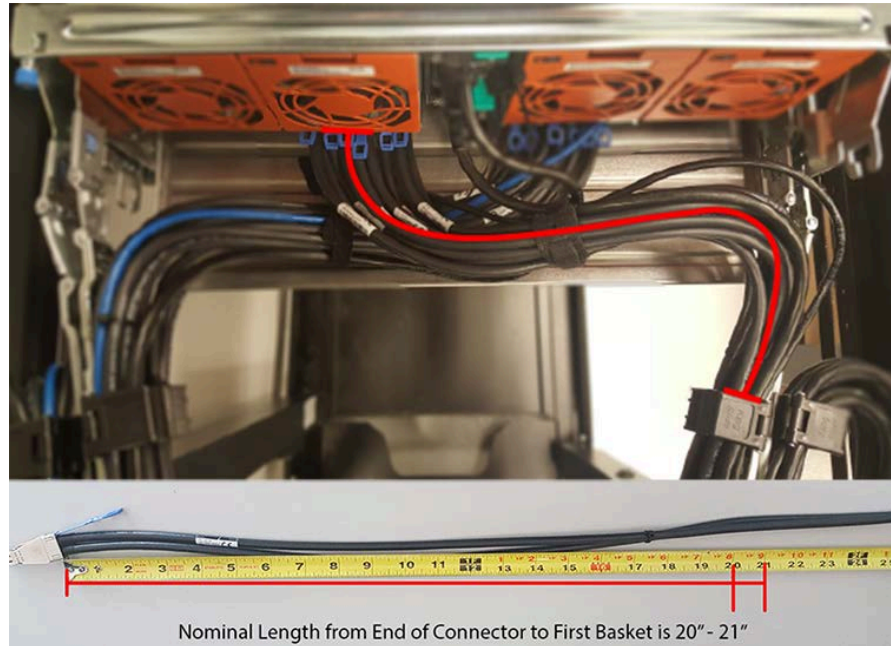
- c. Wrap cable tie around the installed cable bundle between the ports and the first basket of the CMA



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 231: Nominal Cable Length at Connectors



- d. Close all of the baskets.
- e. Reconnect the CMA at the elbow to connector A.

Step 4: Connect the SAS cables to the host server(s) according to the [One Host Cable Configurations \(page 212\)](#) and [Two Host Cable Configurations \(page 217\)](#).

Safety

The following chapter provides safety and regulatory information for the Ultrastar Data60.

In This Chapter:

- Electrostatic Discharge..... 230
- Optimizing Location..... 230
- Power Connections.....230
- Power Cords..... 230
- Rackmountable Systems..... 231
- Safety and Service.....231
- Safety Warnings and Cautions.....232

6.1 Electrostatic Discharge



Electrostatic discharge can harm delicate components inside Western Digital 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 Ultrastar Data60 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 Western Digital-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 Ultrastar Data60.



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.

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.

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 Ultrastar Data60.

In This Chapter:

- Restricted Access Location.....234
- Safety Compliance..... 234
- Electromagnetic Compatibility (EMC) Class A Compliance.....234
- Country Certifications..... 235

7.1 Restricted Access Location

The Ultrastar Data60 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.

7.2 Safety Compliance

Product Name: **Ultrastar
Data60**

Regulatory Model: **H4060-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.

7.3 Electromagnetic Compatibility (EMC) Class A Compliance

The **H4060-J** complies with and conforms to the latest international standards as applicable:

Emissions

- FCC CFR 47 Part 15, Subpart B
- ICES-003
- EN 55032
- CISPR 32
- CE – EMC Directive 2014/30/EU
- VCCI V-3
- BSMI CNS14338
- KN32
- AS/NZS CISPR 32
- TR CU 020/2011

Immunity

- EN 61000-3-2 Harmonic Current Emissions
- EN 61000-3-3 Voltage Fluctuations and Flicker
- EN 55024
- KN35

- EN 61000-4-2 ESD
- EN 61000-4-3 Radiated Immunity
- EN 61000-4-4 EFT
- EN 61000-4-5 Surge
- EN 61000-4-6 RF Common Mode
- EN 61000-4-8 Power Frequency Magnetic Field
- EN 61000-4-11 Voltage Dips and Interruptions

7.4 Country Certifications

Table 51: 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
South Africa	SABS
India	BIS

Regulatory Statements

The following chapter provides regulatory statements for the Ultrastar Data60, **H4060-J**.

Western Digital 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 Western Digital will void the warranty. In addition, changes or modifications to this equipment might cause it to create harmful interference.

In This Chapter:

- Europe (CE Declaration of Conformity)....237
- FCC Class A Notice..... 237
- ICES-003 Class A Notice—Avis NMB-003, Classe A..... 237
- Japanese Compliance Statement, Class A ITE..... 237
- Taiwan Warning Label Statement, Class A ITE..... 237

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 Western Digital 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 Western Digital 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機器です。この装置を住宅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.