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User Guide

Ultrastar® Data60

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Revision History

Date	Revision	Comment
November 2017	1.0	Initial release
November 2017	1.1	• The crossbar on the CMA was changed. See CMA *(page 60)*. • Removed Lowline power specs from Power Requirements *(page 18)*. • Changed required rack depth, see Mechanical Specifications *(page 5)*. • Changed typical power consumption, see Electrical Specifications *(page 5)*. • Updated LED Flash Patterns, see LEDs *(page 10)*.
December 2017	1.2	• Added active cable support • Added firmware upgrade section. See Firmware Upgrade *(page 184)*. • Updated the Non-Op altitude specification. See Environmental Specifications *(page 4)*.
January 2018	1.2.1	Updated the product name
January 2018	1.3	• Updated information on the 2.5" drive carrier option. • 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 69)*. • Updated the drive assembly installation instructions to clarify the orientation of the drive assemblies. 3.5in HDD Assembly Replacement *(page 83)*.
April 2018	1.4	• Updated Compatible Drives List. See Compatible Drives *(page 21)*. • Updated the Rack Requirements. See Ultrastar Data60 Rack Requirements *(page 16)*. • Updated the Firmware Upgrades. See: Firmware Upgrade *(page 184)*
May 2018	1.5	Added the Part Replacement Service Window. See: Part Replacement Service Window *(page 67)*

Date	Revision	Comment
June 2018	1.6	• Updated Compatible Drives List. See Compatible Drives *(page 21)* • Updated the Firmware Upgrade section. See Firmware Upgrade *(page 184)* • Updated the Firmware Download section. See Downloading Firmware from the Support Portal *(page 184)* • Updated the System Architecture Overview section. See System Architecture Overview *(page 2)* • Updated the Daisy Chaining section. See Daisy Chaining *(page 249)* • Added the Rear Cover Alignment Bracket Description. See Top Cover Alignment Bracket *(page 59)*
November 2018	1.7	• Updated the images in the Daisy Chaining section. See Daisy Chaining *(page 249)* • Updated List of CRUs. See List of Customer Replaceable Units (CRUs) *(page 8)* • Updated Compatible Drives List. See Compatible Drives *(page 21)* • Updated the Host Connectivity section. See: SAS Cabling *(page 19)*
May 2019	1.8	• Changed senddiag commands from images to codeblocks. See sg_senddiag Command *(page 218)*. • Updated daisy-chaining tables to match diagrams. See Two Host Cable Configurations *(page 256)*. • Corrected OOBM zoning configuration instructions. See Predefined Zoning Configurations *(page 211)*. • Added Configuring OOBM Network Settings Using SES *(page 206)*.
May 2019	1.9	• Corrected the system architecture overview. See System Architecture Overview *(page 2)*. • Corrected explanation of SATA configuration in Firmware Upgrade *(page 184)* section.
June 2019	1.10	• Updated the Host Connectivity section. See: SAS Cabling *(page 19)* • Added Windows syntax examples and reorganized the Upgrading Firmware with OOBM section
June 2019	1.11	Updated the Host Connectivity section. See: SAS Cabling *(page 19)*

Date	Revision	Comment
July 2019	1.12	Moved the following topics to the Ultrastar Data60Description *(page 2)* section: • Ultrastar Data60 Rack Requirements *(page 16)* • Power Requirements *(page 18)* • ESD *(page 19)* • Enclosure Cooling *(page 19)* • SAS Cabling *(page 19)* Moved the Supported Operating Systems *(page 9)* topic to the Management *(page 183)* section. Corrected LED identification tables for IOMs, PSUs, and drives in the LEDs *(page 10)* section. Updated servicing image to correct length values and rail servicing extension in Ultrastar Data60 Rack Requirements *(page 16)* section. Added a note about OOBM ports configured for DHCP by default to the OOBM Management Overview *(page 205)* section.
September 2019	1.13	• Replaced references to He12 drives with Ultrastrar DC HC520 in Compatible Drives *(page 21)* • Changed device references from OS-specific (`/dev/sgX` for Linux and `scsix:x,x,x` for Windows) to generic (`<dev>`) throughout. • Updated table for Approved SAS Cables in SAS Cabling *(page 19)* • Added Subenclosure Nickname *(page 240)* section • Updated Supported Operating Systems *(page 9)*
November 2019	1.14	• Added drive assembly LED pointer orientation image in 3.5in HDD Assembly Replacement *(page 83)* section • Updated images of captive chassis-cover screws throughout • Updated table for Approved SAS Cables in SAS Cabling *(page 19)* • Updated the Daisy Chaining configurations in Daisy Chaining *(page 249)*

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Date	Revision	Comment
April 2020	1.15	• Corrected explanation of expanders in System Architecture Overview *(page 2)* • Added note about using non-automatic firmware activation for RAID adpaters in Firmware Upgrade *(page 184)* • Added note about performing zoning offline in Zoning *(page 211)* • Added note and step for configuring zoning on an IOM after replacement in IOM Replacement *(page 69)* • Added RHEL 8.0 to Supported Operating Systems *(page 9)* • Added note about LED behavior during proper drive insertion in Drive Assembly LED *(page 16)* • Corrected part number for rail kit in List of Customer Replaceable Units (CRUs) *(page 8)* and Rails Specifications *(page 57)* • Added note about minimum time between removing and reapplying power in Power Connections *(page 269)*
August 2020	1.16	• Updated Supported Operating Systems *(page 9)* • Updated SAS Cabling *(page 19)* • Updated Compatible Drives *(page 21)* • Added File-Based Zoning *(page 230)* section • Updated note in IOM Replacement *(page 69)* about standard vs. file-based zoning configuration after IOM replacement
October 2020	1.17	• Fixed typo in Rails Layout *(page 58)* • Updated text and color-coded images in Predefined Zoning Configurations *(page 211)* • Updated images in LEDs *(page 10)* and Components *(page 39)* • Added note about not unzipping tar.gz file prior to firmware upgrade in Downloading Firmware from the Support Portal *(page 184)*, Linux Upgrade to New Firmware, Non-Automatic Firmware Activation in Linux, Windows Upgrade to New Firmware, and Non-automatic Firmware Activation in Windows • Added Ubuntu 20.04 to Supported Operating Systems *(page 9)* • Updated table of approved SAS cables in SAS Cabling *(page 19)* • Updated FW activation step in Upgrading Firmware with OOBM *(page 209)*
December 2020	1.18	• Added UK Import Representation Contact • Removed Formerica cables from SAS Cabling *(page 19)*

Date	Revision	Comment
February 2021	1.19	• Added Ultrastar DC HC650 drives to Compatible Drives *(page 21)* • Added content for Artesyn PSU *(page 49)* • Added Firmware Auto-Sync *(page 203)* section and updated IOM Replacement *(page 69)* to reference this feature • Updated Rails Replacement *(page 109)* to include instructions for toolless screwplate • Updated Rear Fan Replacement *(page 77)* with requirement to replace all four fans
March 2021	1.20	• Added Appendices *(page 287)* section to contain *SKUs for Fully-Populated Configurations*, *SKUs for Partially-Populated Configurations*, and *SKUs for Scale-Up Modules* • Updated List of Customer Replaceable Units (CRUs) *(page 8)*
August 2021	1.21	• Removed Mexico from Country Certifications *(page 273)* • Updated Rear Fan Replacement *(page 77)* with notes about replacing all four fans • Added Multiple CRU Replacements *(page 67)* to Part Replacement Service Window *(page 67)* • Added Verifying OOBMs before Firmware Upgrade in Linux to Firmware Upgrade *(page 184)*
September 2021	01	Changed document number from 1ET1101 to D018-000227-000
January 2022	02	• Added drive model numbers to Compatible Drives *(page 21)* • Added footnote to Mechanical Specifications *(page 5)* and Components *(page 39)* that listed weights do not include accessories or packaging/shipping materials • Reorganized tables in *SKUs for Fully-Populated Configurations*, *SKUs for Partially-Populated Configurations*, and *SKUs for Scale-Up Modules* • Added Configuring OOBM Static IP Address Using cURL *(page 208)* • Removed Top Cover Alignment Bracket content from Rails *(page 57)*; added Top Cover Alignment Bracket *(page 59)* • Updated component image in 2.5in SSD Assembly • Removed Amphenol ICC (FCI) passive cables 10112041-2010LF, -2020LF, and -2030LF from SAS Cabling *(page 19)* • Added 1EX2490 and 1EX2485 to *SKUs for Scale-Up Modules*

Date	Revision	Comment
March 2022	03	• Reorganized SAS Cabling *(page 19)* section and added note about compatibility between AOCs and 9300-, 9302-, and 9305-series HBAs • Updated drive installation instructions in 3.5in HDD Assembly Replacement *(page 83)* • Updated logo for detachable power cord in Safety Warnings and Cautions *(page 271)* • Added Debian 10, 11, and RHEL 8.4 to Supported Operating Systems *(page 9)* • Updated component images and tables in Delta PSU Layout *(page 48)* and Artesyn PSU Layout *(page 50)*
May 2022	04	• Updated Performance Specifications *(page 6)* to put management port specs on separate row • Added PSU 2-Pack and removed Arteysn PSU from List of Customer Replaceable Units (CRUs) *(page 8)* • Removed CRU part number from Artesyn PSU Specifications *(page 49)* • Updated PSU Replacement *(page 73)* with instructions for replacing both PSUs • Removed content related to 2.5in SSDs (no longer supported) • Added South Korea Warning Label Statement, Class A ITE *(page 279)* to Regulatory *(page 272)*
September 2022	05	• Added Taiwan Safety Warnings *(page 281)* and Taiwan RoHS Information *(page 286)* to Regulatory *(page 272)* • Removed smp command steps from Enabling Zoning using Windows *(page 225)* and Disabling Zoning using Windows *(page 227)* • Replaced *SKUs for Fully-Populated Configurations*, *SKUs for Partially-Populated Configurations*, and *SKUs for Scale-Up Modules* with nTAA SKUs for Fully Populated Configurations *(page 288)*, nTAA SKUs for Partially Populated Configurations *(page 289)*, TAA SKUs for Fully Populated Configurations *(page 290)*, and nTAA SKUs for Scale-Up Modules *(page 291)* • Reorganized tables in Compatible Drives *(page 21)* • Added Ultrastar HC560 20TB and HC570 22TB drives to Compatible Drives *(page 21)* and associated SKUs to nTAA SKUs for Fully Populated Configurations *(page 288)*, nTAA SKUs for Partially Populated Configurations *(page 289)*, TAA SKUs for Fully Populated Configurations *(page 290)*, and nTAA SKUs for Scale-Up Modules *(page 291)* • Added Verifying OOBMs before Firmware Upgrade in Windows • Updated document to new branding

Date	Revision	Comment
September 2022	05	• Updated table of recommended IOM ports to be based on number of cables used in SAS Cabling *(page 19)* • Updated note about TFTP and HTTPS services in Upgrading Firmware with OOBM *(page 209)*
March 2023	06	• Added legal warning about modifying the enclosure to List of Customer Replaceable Units (CRUs) *(page 8)* • Added the GosPower PSU to the List of Customer Replaceable Units (CRUs) *(page 8)* • Added JPC cables to the SAS Cabling *(page 19)* • Added Ultrastar DC670 to Compatible Drives *(page 21)* and associated SKUs to nTAA SKUs for Scale-Up Modules *(page 291)* • Added GosPower PSU to Components *(page 39)* • Updated the Firmware Upgrade and Downgrade procedures in Management *(page 183)* • Added the Rack Configurations *(page 291)* section to the Appendix
June 2023	07	Updated the Compatible Third-Party Drives *(page 38)*
March 2024	10	• Compatible Drives *(page 21)* • nTAA SKUs for Fully Populated Configurations *(page 288)* • nTAA SKUs for Partially Populated Configurations *(page 289)* • TAA SKUs for Fully Populated Configurations *(page 290)* • nTAA SKUs for Scale-Up Modules *(page 291)*

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Overview

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

In This Chapter:

1.1 Ultrastar Data60 Description

Figure 1: Ultrastar Data60

TheUltrastar Data60 is a 4U form factor, high availability, high density, rack-mounted storage enclosure. It is capable of hosting up to 60 HDD drives (SAS or SATA). The maximum data storage capacity of the Ultrastar Data60 is 1.56PB using 26TB Ultrastar HC570 drives (For a full list of compatible drives, see Compatible Drives *(page 21)*). 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
- Supports 3.5in. drives 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[1]
- Powered by two (2) redundant 1600W or 1800W PSUs
- Supports High Line (220-240 VAC) Input Power
- 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 291)*)
- Supports up to 3m passive SAS cables (limited to 3m or less) or active cables (any length) (see SAS Cabling *(page 19)*)

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1.   SATA based models will only include 1 IOM

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. One secondary expander then connects with fifty-one (51) drives, while the other connects with nine (9) drives.

The out-of-band management microprocessor provides an Ethernet connection using a Redfish/RESTful API to access the various enclosure services. All the SES enclosure information can be obtained through the out-of-band management port. Major use cases for this feature include obtaining 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 I^2C architecture is designed to support only one single master on any given bus. The primary expander will be the master on each I^2C bus. There are eight I^2C 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 I^2C 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 2: System Block Diagram
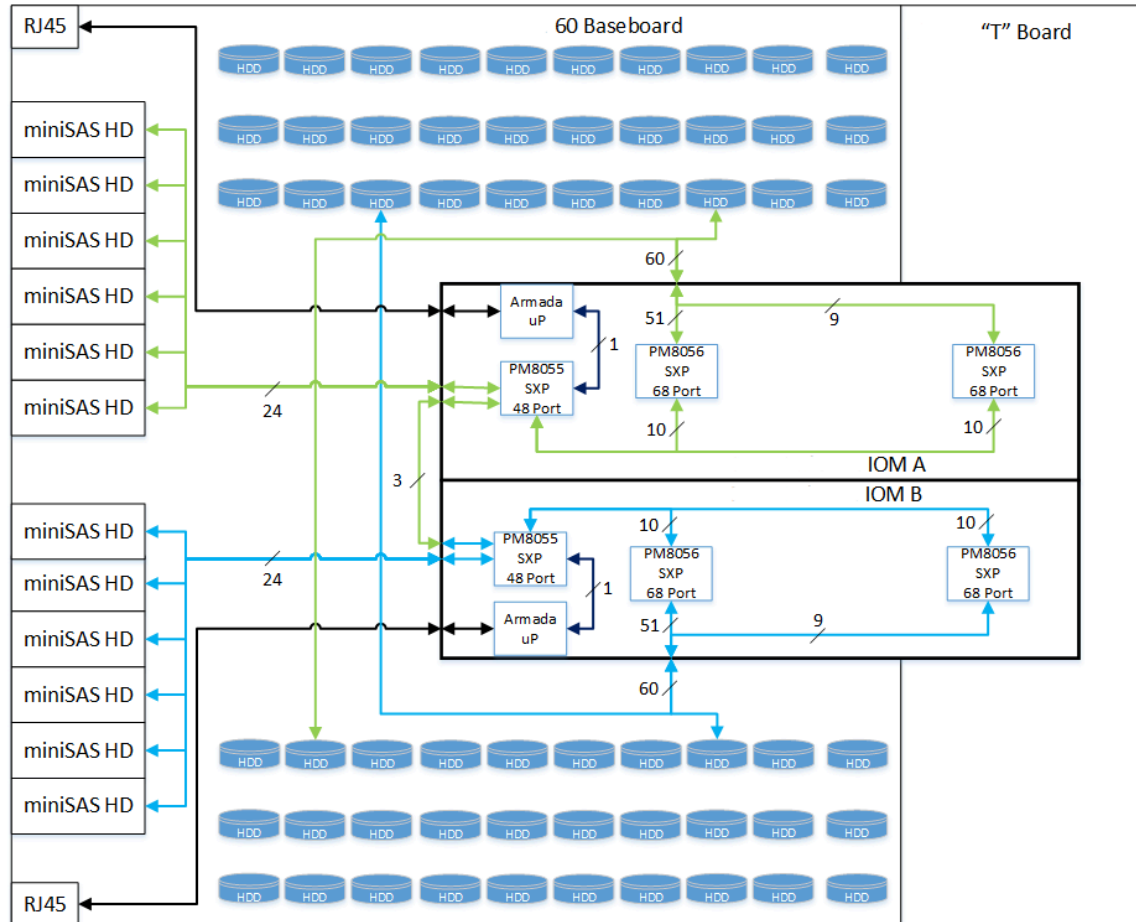
1.4 Environmental Specifications

Table 2: Environmental Specification

Specification	Non-Operational	Operational
Temperature	-40°C to 70°C	5°C to 35°C
Temperature Gradient	30°C per hour max	20°C per hour max
Temperature De-rating	1°C per 300m above 3000m	1°C per 300m above 900m
Relative Humidity	8-90% Non-Condensing	8-90% Non-Condensing
Relative Humidity Gradient	30% per hour maximum	30% per hour maximum

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

1.5 Electrical Specifications

Table 3: Electrical Specifications

Specification	Value
Max Power Consumption	1250W
Typical Power Consumption[2]	~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 high line (200-240 VAC) power. 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.

1.6 Mechanical Specifications

Table 4: Mechanical Specifications

Specification	Non-Operational	Operational
Shock	10G, 0 - peak,11ms half sine; 3 positive and 3 negative pulses in each axis Shock	5G, 0 - peak, 11ms half sine; 3 positive and 3 negative pulses in each axis- minimum 6 seconds between shocks to allow for write/read recovery
Vibration	0.75G, 0 - peak swept sine; 5 -500Hz; 1 complete sweep @ 1/2 octave per minute	0.10G, 0 - peak swept sine; 5 -500Hz; 1 complete sweep @ 1/2 octave per minute
Weight	79.4 kg. / 175 lbs. [3]	

2. 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.

3. Listed weight is for a dual-IOM enclosure, fully populated with 60 drives. It does not include the CMA, cable tray, accessories, or packaging/shipping materials.

Specification	Non-Operational	Operational
Enclosure Dimensions	W: 447 mm x L: 890 mm x H: 175 mm / W: 17.67 in. x L: 35.04 in. x H: 6.89 in.	
Length of Enclosure w/o CMA	712 mm / 28.03in.	
Required Rack Width	450 mm (17.72 in.) minimum width, with 465 mm (18.31 in.) ± 1.5 mm 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	609.6 - 812.8 mm / 24 - 32 in.	

1.7 Performance Specifications

Table 5: Performance Specifications

Specification	Value
Number of Drive Slots	60
Data Transfer Rates	12Gbps SAS / 6Gbps SATA
Max Raw Data Storage Capacity	1.56PB using 26TB Ultrastar HC570 drives
SAS Ports	12 x Mini-SAS HD (6 per IOM)
Management Ports	2 x 10/100/1G Ethernet

1.8 Ultrastar Data60 Layout

Figure 3: Front and Rear Product Layout
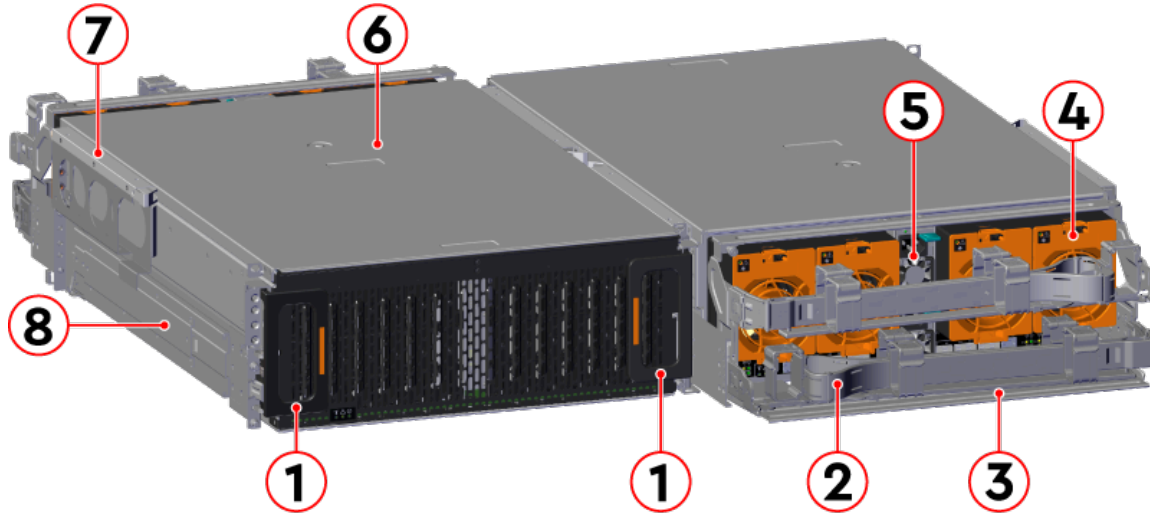
Table 6: Front and Rear Component Identification

Number	Component
1	Enclosure Handles
2	CMAs
3	CMA Tray
4	Rear Fans
5	PSUs (Delta PSUs shown)
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 4: Component Layout
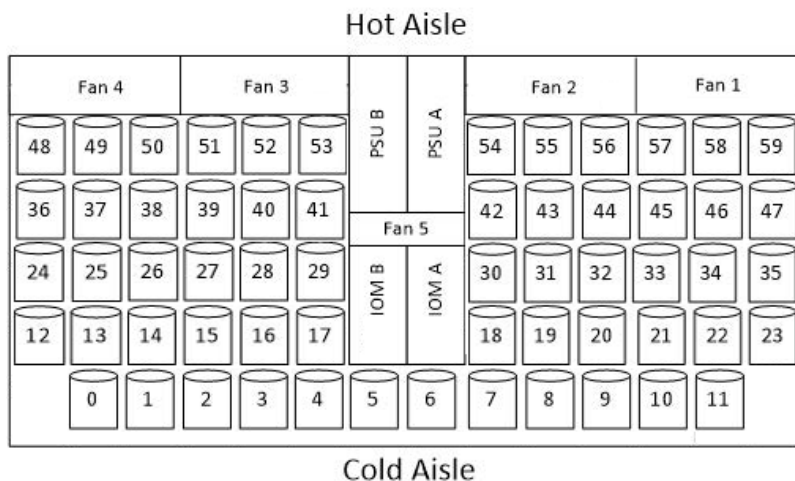
1.9 List of Customer Replaceable Units (CRUs)

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

Table 7: List of Replaceable Components

Component	Part Number
Ultrastar Data60 Chassis (one IOM, two PSUs)	1EX0442
Ultrastar Data60 Chassis (two IOMs, two PSUs)	1EX0443
Delta PSU 1600W 2-Pack	1EX2937
GosPower PSU 1600W	1EX3028
IOM	1EX2201
IOM Blank	1EX0431
IOM Fan	1EX0432
Rear Fans	1EX2814
Top Cover Alignment Brackets	1EX2288
Rails Kit (CMA Standard)	1EX0436
CMA Standard Arms (dual)	1EX0437
CMA Standard Arm (single)	1EX1174
CMA Cable Tray	1EX1119
3.5 in. Drive Carrier	1EX0438
3.5 in. Drive Blank	1EX0429
Power Cable for PDU, C13-C14, 18AWG, 3m	1EX1158
HD Mini-SAS to HD Mini-SAS, Passive, 2m	1EX1531
HD Mini-SAS to HD Mini-SAS, Passive, 3m	1EX1533

Component	Part Number
HD Mini-SAS to HD Mini-SAS, Active Optical, 3m	1EX2316
HD Mini-SAS to HD Mini-SAS, Active Optical, 4m	1EX2315
Accessory Kit	1EX2755
Packaging Kit	1EX0582

Warning: Modifying your product or using it contrary to specifications may void the limited warranty. Consult Western Digital's *Limited Warranty for Platform Products* for details.

1.10 Supported Operating Systems

Table 8: Compatible Operating Systems

OS Support	
Microsoft® Windows	**2012** R2 x64 Server
	2016 R1 x64 Server
	2019 R1 x64 Server
	2022 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) Kernel: 3.10.0-957
	8.0 (x86_64) Kernel: 4.18.0-80
	8.2 (x86_64) Kernel: 4.18.0-193
	8.3 (x86_64) Kernel: 4.18.0-240
	8.4 (x86_64) Kernel: 4.18.0-305
	8.6 (x86_64) Kernel: 4.18.0-372
	9 (x86_64) Kernel: 5.14.0-70
FreeBSD®	13.2
Ubuntu® Server	**14.04** Kernel: 3.13
	16.04 Kernel: 4.4
	18.04 Kernel: 4.15
	20.04 Kernel: 5.4
	22.04 Kernel: 5.15
Debian GNU/Linux	**8.10** Kernel: 3.16
	9.6 Kernel: 4.9
	9.8 Kernel: 4.9

OS Support	
	10 Kernel: 4.19
	11 Kernel: 5.10
SUSE® Linux Enterprise Server (SLES)	**12** SP3
	15 SP1

1.11 LEDs

1.11.1 Front and Rear IO LEDs

The Ultrastar Data60 has a number of LEDs on the exterior of the enclosure that display various system statuses. The three LEDs on the front mirror three on the rear, allowing the general status of the enclosure to be determined from either side of the rack.

Figure 5: Front LEDs Location
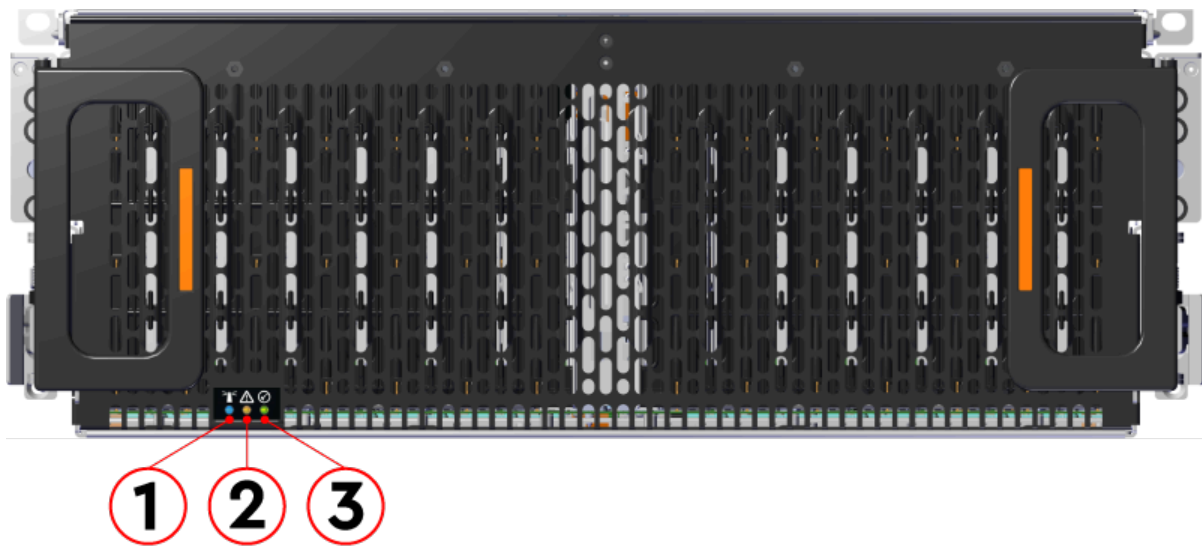
Table 9: Front LEDs Identification

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	**Off** – Enclosure has no fault **Blink** @ 1 Hz (50% duty cycle) – Enclosure has a fault
3	Power	Green	**Solid** – Powered On

In addition to the three enclosure status LEDs, the rear provides LEDs for the Ethernet and SAS ports.

Figure 6: Rear LEDs Location
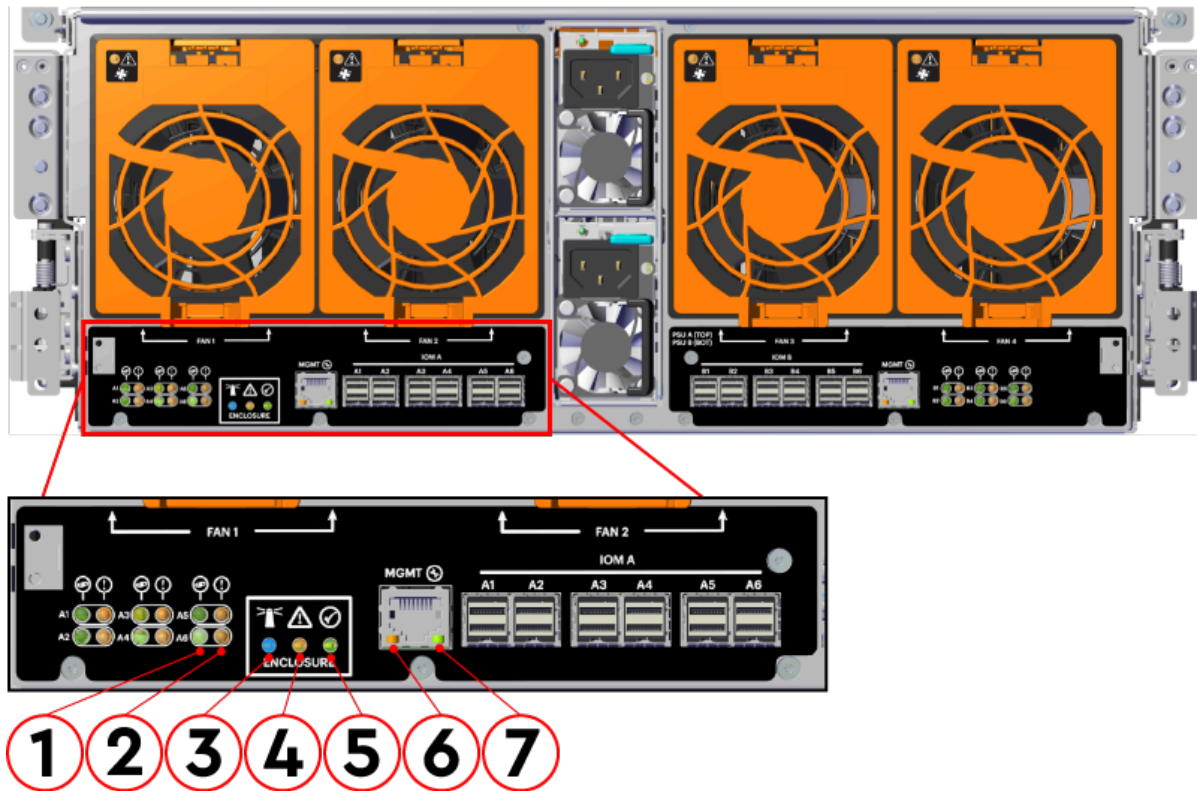
Table 10: Rear LEDs Identification

Number	LED Name	Color	Behavior
1	SAS Link Status	Green	**Off** – SAS cable not connected **Solid** – SAS cable connected
2	SAS Fault Status	Amber	**Off** – No SAS connection fault **Blink** @ 1 Hz (50% duty cycle) – SAS connection fault
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	**Off** – Enclosure has no fault **Blink** @ 1 Hz (50% duty cycle) – Enclosure has a fault
5	Power	Green	**Solid** – Powered On
6	Ethernet Connector Speed	Green/ Amber	**Off** – Operating at 10 Mbps **Green Solid** – Operating at 100 Mbps **Amber Solid** – Operating at 1Gbps
7	Ethernet Connectors Link/Activity	Green	**Off** – No Connection **Blink** – Activity **Solid** – Connected

1.11.2 IOM LEDs

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

Figure 7: IOM LEDs Location
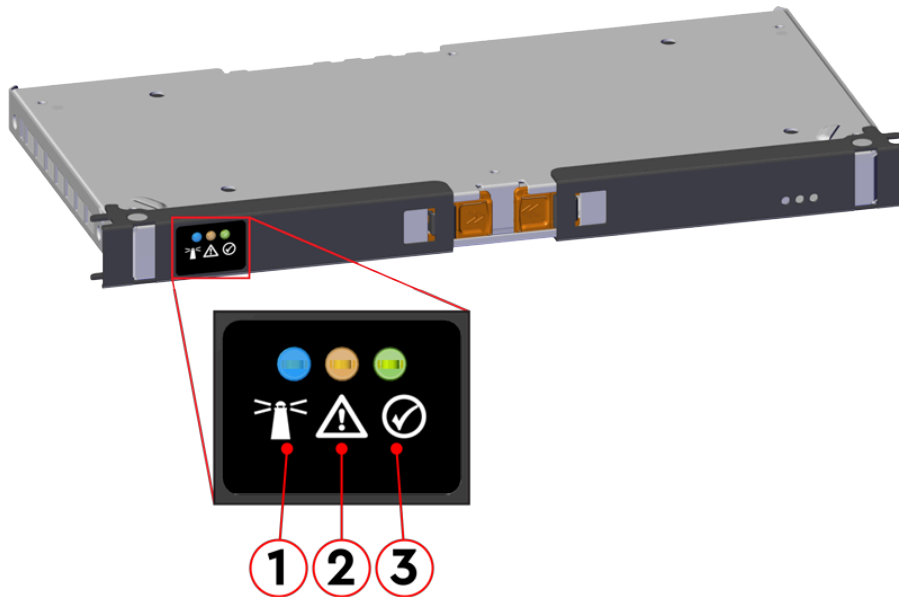
Table 11: IOM LEDs Identification

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

1.11.3 IOM Fan LED

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

Figure 8: IOM Fan LED Location
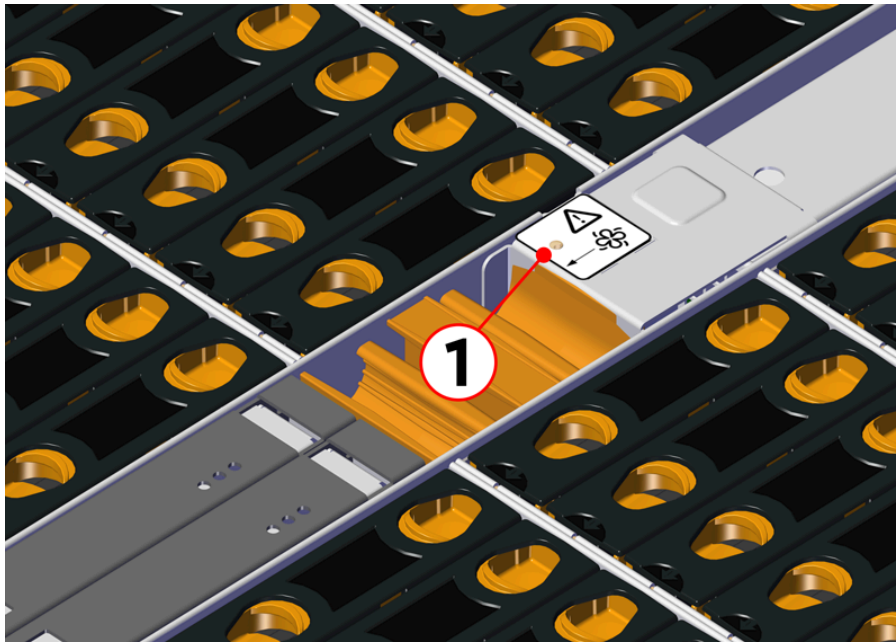
Table 12: IOM Fan LED Identification

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

1.11.4 PSU LED

The PSU has a single, multi-function LED. See the following tables for a detailed functional description.

Figure 9: PSU LED Location (Delta PSU shown)
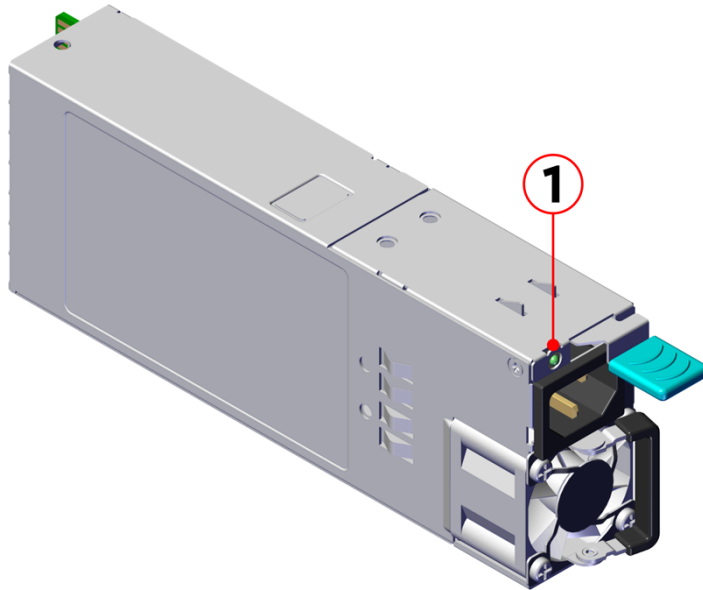
Table 13: PSU LED Identification

#	LED Name	Color	Delta Behavior	Artesyn Behavior
1	PSU Multi-Function LED	Green/ Amber	**Off** – PSU disconnected from power	**Off** – PSU disconnected from power
		Green	**Blink** @ 0.5Hz (50% duty cycle) – AC present and 12VSB on **Blink** @ 2Hz (50% duty cycle) – PSU in firmware update mode **Solid** – PSU on and reporting no faults	**Blink** @ 1Hz (50% duty cycle) – AC present and 12VSB on **Blink** @ 2Hz (50% duty cycle) – PSU in firmware update mode **Solid** – PSU on and reporting no faults
		Amber	**Blink** @ 0.5Hz (50% duty cycle) – PSU reporting warnings **Solid** – PSU disconnected from power, or critical fault causing a shutdown failure	**Blink** @ 1Hz (50% duty cycle) – PSU reporting warnings **Solid** – PSU disconnected from power while second PSU is connected to power, or critical fault causing a shutdown failure, or compatibility fault

1.11.5 Rear Fan LED

The Rear Fan has a single LED with three distinct states for indicating a fault condition, identification, or normal operation.

Figure 10: Fan LED Location
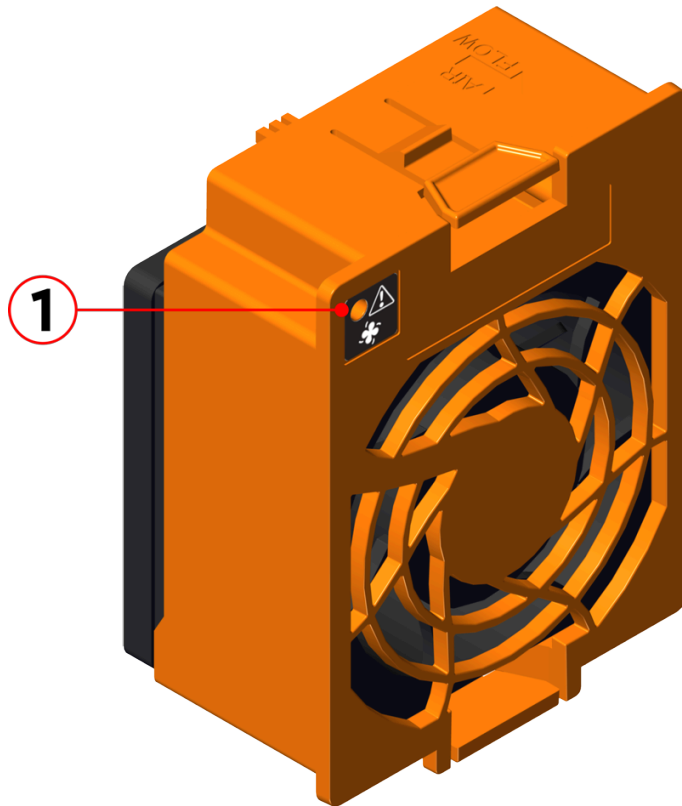
Table 14: Fan LED Identification

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

1.11.6 Drive Assembly LED

The HDD drive assembly itself does not contain an LED, but it instead the multi-function LED is located on the drive slot. This amber LED has three distinct states for indicating a fault condition, identification, or normal operation.

Figure 11: HDD Assembly LED Location
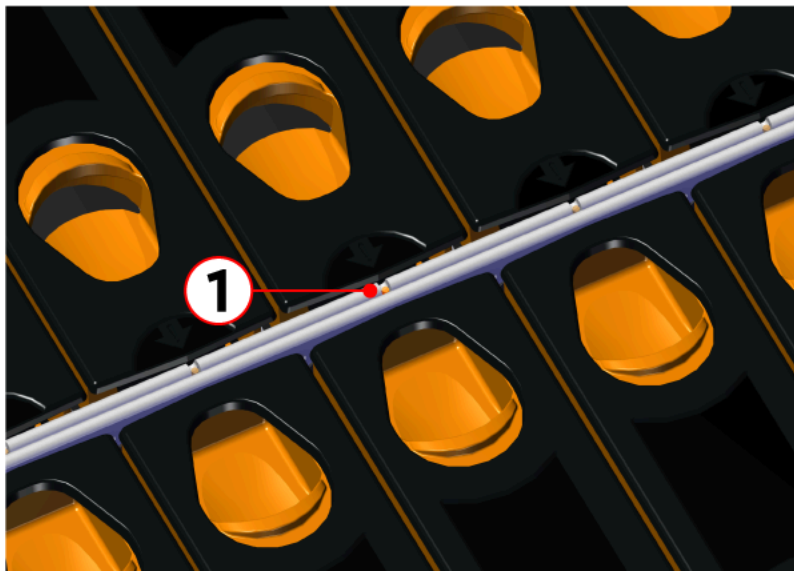
Table 15: HDD Assembly LED Identification

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

Note: During service events—when a drive is hot plugged or replaced and the drive installed properly—the LED state of that drive slot will change to solid ON. This is to provide the user with visual feedback that the drive has been successfully connected and has been discovered by the expander. Once the enclosure has been slid back into the rack and the OPEN bit on the door sensor element is 0, the LED will return to the previously set state (Ident, Fault, or Off).

For example: A drive in slot 0 needs to be replaced. The fault bit on Array Slot descriptor 0 is set to indicate to the service technician which drive slot to replace. This will cause the LED to blink at 1Hz (50% duty cycle). When the service technician pulls out the enclosure, inserts a new drive, and successfully installs the drive, the slot LED state will change to solid ON to indicate that the drive was properly installed. When the service technician pushes the enclosure back into the rack and the OPEN bit of the door sensor element changes from 1 to 0, the LED state of drive slot 0 will change back to the fault indication blink rate (1 Hz 50% duty cycle).

1.12 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 609.6 - 812.8 mm / 24 - 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 16: Required Rack Specifications

Parameter	Requirement
Rack Depth	900mm (35.43in.) usable rack space, frame to frame
Rack Width	450 mm (17.72 in.) minimum width, with 465 mm (18.31 in.) ± 1.5 mm nominal hole spacing. See EIA-310 Rack Standard.
Rack Units (U)	4U
Vertical Rack Rail Spacing	609.6 - 812.8 mm / 24 - 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 12: Installation, Servicing, and Removal
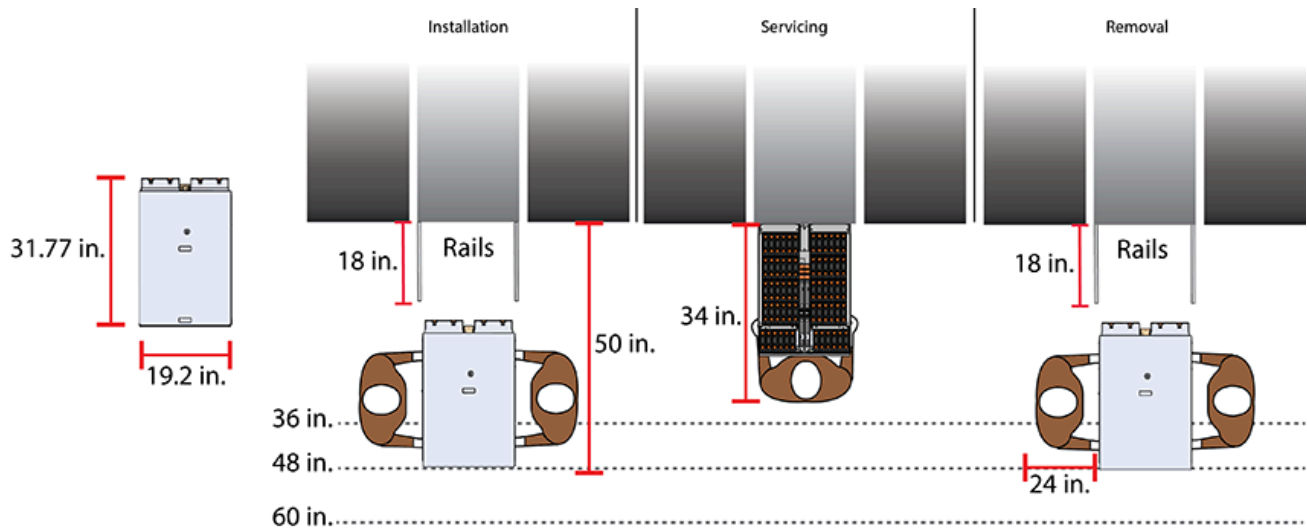
> **(i)** **Attention:** **Do not** install or remove the enclosure while it is populated with drives. The fully populated enclosure exceeds the amount of weight that a team of two should lift.

For more information related to Ultrastar Data60 Rack Configurations see: Rack Configurations *(page 291)*

1.13 Power Requirements

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

Table 17: AC Power Specifications

Power	
Alternating Current (AC) Power Supply (2 per enclosure)	
Wattage (per power supply)[4]	**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.

4.   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.

1.14 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.

1.15 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.

ℹ️ **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.

1.16 SAS Cabling

The Ultrastar Data60 can use passive cables up to 3m in length, or active cables up to 10m, for SAS connections to the host. All approved passive and active SAS cables are listed in the following tables.

Active Cabling

Active cables can be used for both direct (host-to-enclosure) and daisy-chain (enclosure-to-enclosure) connections. When daisy-chaining multiple Ultrastar Data60 enclosures together, active cables must be used between enclosures for improved signal integrity.

> **(i) Important:** Active Optical SAS cable support is limited to Broadcom 9300-, 9302-, 9305-, 9400-, 9500-series HBAs.

> **📄 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 18: Approved Active Optical HD Mini-SAS to HD Mini-SAS Cables

Length	Manufacturer	Vendor Part Number
2m	JPC Connectivity (Jess-Link)	P5388FC3002M-1[5]
3m	Amphenol ICC (FCI)	FOHHB23P00003[6]
3m	JPC Connectivity (Jess-Link)	P5388FC3003M-1
3m	Molex	106415-2103
4m	Amphenol ICC (FCI)	FOHHB23P00004
4m	JPC Connectivity (Jess-Link)	P5388FC3004M-1
4m	JPC Connectivity (Jess-Link)	P5388FC3004M-3
5m	Amphenol ICC (FCI)	FOHHB23P00005
5m	Molex	106415-2105
6m	Amphenol ICC (FCI)	FOHHB23P00006
6m	JPC Connectivity (Jess-Link)	P5388FC3006M-1
10m	Molex	106415-2110

Passive Cabling

Passive cables should only be used for direct (host-to-enclosure) connections.

Table 19: Approved Passive HD Mini-SAS to HD Mini-SAS Cables

Length	Manufacturer	Vendor Part Number
1m	Amphenol ICC (FCI)	10112041-2010LF
2m	Amphenol ICC (FCI)	601760006
2m	Amphenol ICC (FCI)	10117949-2020LF
2m	Amphenol ICC (FCI)	10112041-2020LF
2m	CS Electronics	12G-HD-4444/2M

5.   Listed JPC P5388FC300xxx cables are compatible, beginning with firmware version 4008-020 and later.

6.   Listed FOHHB23P00xxx cables are compatible, beginning with firmware version 2052-020 and later.

Length	Manufacturer	Vendor Part Number
	Data Storage Cables (DSC)	C5555-2M
	Molex	1110751002
	The Mate Company (TMC)	C5555-2M
3m	Amphenol ICC (FCI)	601760008
		10117949-4030LF
		10112041-2030LF
	CS Electronics	12G-HD-4444/3M
	Molex	1110751003

IOM Ports Based on Number of Cables

As a best practice, Western Digital recommends connecting cables to specific SAS connector ports based on the number of cables being used. Please refer to the following table for the recommended ports.

# of Cables	IOM A Port(s)	IOM B Port(s)
1	6	1
2	4, 6	1, 3
3	2, 4, 6	1, 3, 5
4	1, 3, 5, 6	1, 2, 4, 6
5	1, 3, 4, 5, 6	1, 2, 3, 4, 6
6	1, 2, 3, 4, 5, 6	1, 2, 3, 4, 5, 6

Edge Buffering

Edge buffering is an enclosure feature that increases the overall performance when a 6Gb/s 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 6Gb/s targets to utilize the 12Gb/s link from the expander to the initiator in a more efficient manner.

1.17 Compatible Drives

Ultrastar DC HC310 CMR, 6TB HDD with 3.5" Drive Carrier

Table 21: DC HC310 Part / Model Numbers

Sector Size	SATA		SAS		
	SE	TCG	SE	TCG	TCG-FIPS
512e	1EX1189 / HUS726T6TAL-E604	1EX1188 / HUS726T6TAL-E601	1EX1185 / HUS726T6TAL-5204	1EX1184 / HUS726T6TAL-5201	1EX1853 / HUS726T6TAL-5205
4Kn	1EX1187 / HUS726T6TAL-N604	1EX1186 / HUS726T6TAL-N601	1EX1183 / HUS726T6TAL-4204	1EX1182 / HUS726T6TAL-4201	1EX1852 / HUS726T6TAL-4205

Ultrastar DC HC310 drives are only compatible with the OSs and HBAs listed in the following table:

OS	Kernel	HBA	HBA FW	HBA Driver
Ubuntu 18.04	4.15.0-76-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 20.04	5.4.0-47-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		
CentOS/RedHat Enterprise Linux (RHEL)	5.14.0.70.13.1	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		

Ultrastar DC HC320 CMR, 8TB HDD with 3.5" Drive Carrier

Table 23: DC HC320 Part / Model Numbers

Sector Size	SATA			SAS		
	SE	SED	TCG	SE	TCG	TCG-FIPS
512e	1EX1227 / HUS728T8TAL-E604	1EX1226 / HUS728T8TAL-E601		1EX1223 / HUS728T8TAL-5204	1EX1222 / HUS728T8TAL-5201	1EX1343 / HUS728T8TAL-5205
4Kn	1EX1225 / HUS728T8TAL-N604		1EX1224 / HUS728T8TAL-N601	1EX1221 / HUS728T8TAL-4204	1EX1220 / HUS728T8TAL-4201	1EX1342 / HUS728T8TAL-4205

Ultrastar DC HC320 drives are only compatible with the OSs and HBAs listed in the following table:

OS	Kernel	HBA	HBA FW	HBA Driver
Ubuntu 18.04	4.15.0-76-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 20.04	5.4.0-47-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		
CentOS/RedHat Enterprise Linux (RHEL)	5.14.0.70.13.1	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	

OS	Kernel	HBA	HBA FW	HBA Driver
		9500-16e		

Ultrastar DC HC330 CMR, 10TB HDD with 3.5" Drive Carrier

Table 25: DC HC330 Part / Model Numbers

| Sector Size | SATA | | SAS | | |
	SE	SED	SE	TCG	TCG-FIPS
512e	1EX2440 / WUS721010AL-E604	1EX2441 / WUS721010AL-E601	1EX2435 / WUS721010AL-5204	1EX2436 / WUS721010AL-5201	1EX2437 / WUS721010AL-5205
4Kn	1EX2438 / WUS721010AL-N604	1EX2439 / WUS721010AL-N601	1EX2432 / WUS721010AL-4204	1EX2433 / WUS721010AL-4201	1EX2434 / WUS721010AL-4205

Ultrastar DC HC330 drives are only compatible with the OSs and HBAs listed in the following table:

OS	Kernel	HBA	HBA FW	HBA Driver
Ubuntu 18.04	4.15.0-76-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 20.04	5.4.0-47-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		

OS	Kernel	HBA	HBA FW	HBA Driver
CentOS/RedHat Enterprise Linux (RHEL)	5.14.0.70.13.1	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		

Ultrastar DC HC510 CMR, 10TB HDD with 3.5" Drive Carrier

Table 27: DC HC510 Part / Model Numbers

Sector Size	SATA			SAS			
	SE	ISE	SED	SE	ISE	TCG	TCG-FIPS
512e	1EX0499 / HUH721010AL-E604	1EX0497 / HUH721010AL-E600	1EX0498 / HUH721010AL-E601	1EX0487 / HUH721010AL-5204	1EX0485 / HUH721010AL-5200	1EX0486 / HUH721010AL-5201	1EX1341 / HUH721010AL-5205
4Kn	1EX0496 / HUH721010AL-N604	1EX0494 / HUH721010AL-N600	1EX0495 / HUH721010AL-N601	1EX0484 / HUH721010AL-4204	1EX0482 / HUH721010AL-4200	1EX0483 / HUH721010AL-4201	1EX1340 / HUH721010AL-4205

Ultrastar DC HC510 drives are only compatible with the OSs and HBAs listed in the following table:

OS	Kernel	HBA	HBA FW	HBA Driver
Ubuntu 18.04	4.15.0-76-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 20.04	5.4.0-47-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		

OS	Kernel	HBA	HBA FW	HBA Driver
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		
CentOS/RedHat Enterprise Linux (RHEL)	5.14.0.70.13.1	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		

Ultrastar DC HC520 CMR, 12TB HDD with 3.5" Drive Carrier

Table 29: DC HC520 Part / Model Numbers

Sector Size	SATA			SAS			
	SE	ISE	SED	SE	ISE	TCG	TCG-FIPS
512e	1EX1015 / HUH721212AL-E604	1EX1013 / HUH721212AL-E600	1EX1014 / HUH721212AL-E601	1EX1009 / HUH721212AL-5204	1EX1007 / HUH721212AL-5200	1EX1008 / HUH721212AL-5201	1EX1338 / HUH721212AL-5205
4Kn	1EX1012 / HUH721212AL-N604	1EX1010 / HUH721212AL-N600	1EX1011 / HUH721212AL-N601	1EX1006 / HUH721212AL-4204	1EX1004 / HUH721212AL-4200	1EX1005 / HUH721212AL-4201	1EX1339 / HUH721212AL-4205

Ultrastar DC HC520 drives are only compatible with the OSs and HBAs listed in the following table:

OS	Kernel	HBA	HBA FW	HBA Driver
Ubuntu 18.04	4.15.0-76-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 20.04	5.4.0-47-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		

Western Digital.

OS	Kernel	HBA	HBA FW	HBA Driver
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		
CentOS/RedHat Enterprise Linux (RHEL)	5.14.0.70.13.1	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		

Ultrastar DC HC530 CMR, 14TB HDD with 3.5" Drive Carrier

> **ⓘ** **Attention:** Lower performance observed for multiple (2, 4, and 8) write streams when using I/O Queue Depths of less than 4 on Ultrastar DC HC530 14TB SAS drives.

Table 31: DC HC530 Part / Model Numbers

Sector Size	SATA		SAS			
	SE	SED	SE	ISE	TCG	TCG-FIPS
512e	1EX1793* / WUH721414AL-E604 1EX3046 / WUH721814AL-E6L4	1EX1794* / WUH721414AL-E6L1	1EX1791* / WUH721414AL-5204 1EX3045 / WUH721814AL-520	1EX1583 / WUH721414AL-5200	1EX1792* / WUH721414AL-5201	1EX1855 / WUH721414AL-5205
4Kn	1EX1790* / WUH721414AL-N604		1EX1788* / WUH721414AL-4204		1EX1789* / WUH721414AL-4201	1EX1854 / WUH721414AL-4205

* This part number is no longer available.

Ultrastar DC HC530 drives are only compatible with the OSs and HBAs listed in the following table:

OS	Kernel	HBA	HBA FW	HBA Driver
Ubuntu 18.04	4.15.0-76-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 20.04	5.4.0-47-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		
CentOS/RedHat Enterprise Linux (RHEL)	5.14.0.70.13.1	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		

Ultrastar DC HC550 CMR, 16TB HDD with 3.5" Drive Carrier

Table 33: DC HC550 Part / Model Numbers

Sector Size	SATA		SAS		
	SE	SED	SE	TCG	TCG-FIPS
512e	1EX2476 / WUH721816AL-E604	1EX2477 / WUH721816AL-E601	1EX2473 / WUH721816AL-5204	1EX2474 / WUH721816AL-5201	1EX2475 / WUH721816AL-5205

Ultrastar DC HC550 drives are only compatible with the OSs and HBAs listed in the following table:

OS	Kernel	HBA	HBA FW	HBA Driver
Ubuntu 18.04	4.15.0-76-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 20.04	5.4.0-47-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		
CentOS/RedHat Enterprise Linux (RHEL)	5.14.0.70.13.1	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		

Ultrastar DC HC550 CMR, 18TB HDD with 3.5" Drive Carrier

Table 35: DC HC550 Part / Model Numbers

Sector Size	SATA		SAS		
	SE	SED	SE	TCG	TCG-FIPS
512e	1EX2481 / WUH721818AL-E604	1EX2482 / WUH721818AL-E601	1EX2478 / WUH721818AL-5204	1EX2479 / WUH721818AL-5201	1EX2480 / WUH721818AL-5205

Ultrastar DC HC550 drives are only compatible with the OSs and HBAs listed in the following table:

OS	Kernel	HBA	HBA FW	HBA Driver
Ubuntu 18.04	4.15.0-76-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 20.04	5.4.0-47-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		
CentOS/RedHat Enterprise Linux (RHEL)	5.14.0.70.13.1	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		

OS	Kernel	HBA	HBA FW	HBA Driver
		9500-8e	24.00.00.00	
		9500-16e		

Ultrastar DC HC560 CMR, 20TB HDD with 3.5" Drive Carrier

Table 37: DC HC560 Part / Model Numbers

Sector Size	SATA		SAS	
	SE	SED	SE	TCG
512e	1EX2909 / WUH722020BL-E604	1EX2910 / WUH722020BL-E601	1EX2906 / WUH722020BL-5204	1EX2907 / WUH722020BL-5201

Ultrastar DC HC560 drives are only compatible with the OSs and HBAs listed in the following table:

OS	Kernel	HBA	HBA FW	HBA Driver
Ubuntu 18.04	4.15.0-76-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 20.04	5.4.0-47-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		

OS	Kernel	HBA	HBA FW	HBA Driver
CentOS/RedHat Enterprise Linux (RHEL)	5.14.0.70.13.1	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		

Ultrastar DC HC570 CMR, 22TB HDD with 3.5" Drive Carrier

Table 39: DC HC570 Part / Model Numbers

Sector Size	SATA		SAS	
	SE	SED	SE	TCG
512e	1EX2966/ WUH722222AL-E604	1EX2967/ WUH722222AL-E601	1EX2963/ WUH722222AL-5204	1EX2964/ WUH722222AL-5201

Ultrastar DC HC570 drives are only compatible with the OSs and HBAs listed in the following table:

OS	Kernel	HBA	HBA FW	HBA Driver
Ubuntu 18.04	4.15.0-76-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 20.04	5.4.0-47-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		

OS	Kernel	HBA	HBA FW	HBA Driver
CentOS/RedHat Enterprise Linux (RHEL)	5.14.0.70.13.1	9400-16e	24.00.00.00	43.00.00.00
		9500-8e		
		9500-16e		
		9300-8e	22.00.00.00	
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		

Ultrastar DC HC580 CMR, 22TB HDD with 3.5" Drive Carrier

Table 41: DC HC580 Part / Model Numbers

Sector Size	SATA	
	SE	
512e	1EX3169/ WUH722422AL-E6L4	

Ultrastar DC HC570 drives are only compatible with the OSs and HBAs listed in the following table:

OS	Kernel	HBA	HBA FW	HBA Driver
Ubuntu 18.04	4.15.0-76-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 20.04	5.4.0-47-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00

OS	Kernel	HBA	HBA FW	HBA Driver
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		
CentOS/RedHat Enterprise Linux (RHEL)	5.14.0.70.13.1	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		

Ultrastar DC HC580 CMR, 24TB HDD with 3.5" Drive Carrier

Table 43: DC HC580 Part / Model Numbers

Sector Size	SATA	
	SE	
512e	1EX3171/ WUH722424AL-E6L4	

Ultrastar DC HC580 drives are only compatible with the OSs and HBAs listed in the following table:

OS	Kernel	HBA	HBA FW	HBA Driver
Ubuntu 18.04	4.15.0-76-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 20.04	5.4.0-47-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		

OS	Kernel	HBA	HBA FW	HBA Driver
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		
CentOS/RedHat Enterprise Linux (RHEL)	5.14.0.70.13.1	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		

Ultrastar DC HC650 SMR, 20TB HDD with 3.5" Drive Carrier

Table 45: DC HC650 Part / Model Numbers

Sector Size	SATA		SAS	
	SE	SED	SE	TCG
4Kn	1EX2719 / WSH722020AL-N604	1EX2720 / WSH722020AL-N601	1EX2716 / WSH722020AL-4204	1EX2717 / WSH722020AL-4201

Ultrastar DC HC650 drives are only compatible with the OSs and HBAs listed in the following table:

Caution: Known Issue

- The host or application is required to send an explicit write pointer reset before rewriting zones.
- This issue will only occur with SATA SMR drives when a zone is full. The application is required to add a check and apply the write pointer reset command that is appropriate for the zone state.
- The sg_rep_zones command will report the following zone state information: empty, partially filled, or full.

OS	Kernel	HBA	HBA FW	HBA Driver
Ubuntu 18.04	4.15.0-76-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 20.04	5.4.0-47-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		

OS	Kernel	HBA	HBA FW	HBA Driver
		9500-8e	24.00.00.00	
		9500-16e		
CentOS/RedHat Enterprise Linux (RHEL)	5.14.0.70.13.1	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		

Ultrastar DC HC670 SMR, 26TB HDD with 3.5" Drive Carrier

Table 47: DC HC670 Part / Model Numbers

Sector Size	SATA		SAS	
	SE	SED	SE	TCG
4Kn	1EX3013 / WSH722626ALN604	1EX3014 / WSH722626ALN601	1EX3010 / WSH722626AL4204	1EX3011 / WSH722626AL4201

Ultrastar DC HC670 drives are only compatible with the OSs and HBAs listed in the following table:

Caution: Known Issue

- The host or application is required to send an explicit write pointer reset before rewriting zones.
- This issue will only occur with SATA SMR drives when a zone is full. The application is required to add a check and apply the write pointer reset command that is appropriate for the zone state.
- The sg_rep_zones command will report the following zone state information: empty, partially filled, or full.

OS	Kernel	HBA	HBA FW	HBA Driver
Ubuntu 18.04	4.15.0-76-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 20.04	5.4.0-47-generic	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		

OS	Kernel	HBA	HBA FW	HBA Driver
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	24.00.00.00	
		9500-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		
CentOS/RedHat Enterprise Linux (RHEL)	5.14.0.70.13.1	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e		
		9500-8e	24.00.00.00	
		9500-16e		

1.18 Compatible Third-Party Drives

Attention: All drives have been tested with version 4008-020 enclosure firmware.

Device	Volume	Encryption	Drive Firmware	Manufacturer Part Number
Kioxia SAS PM7-M/V/R Series SSD	Up to 3.84TB	SE	0101	KPM7XRUG3T84
Samsung SAS PM1653A SSD	Up to 3.84TB	SE	GXG3	MZILG3T8HCLS-00A07

Note: Ultrastar Data60 supports third-party device features that are within SAS specification as mandatory. Any third-party drive features that are vendor specific are not guaranteed to function.

Components

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:

2.1 Chassis

Figure 13: Ultrastar Data60 Chassis

The chassis is the primary housing that contains and connects all of the system components of the Ultrastar Data60 . The chassis is comprised of the drive bays that contains all of the system data storage drives and a number of other bays that contain the major system components, such as the PSUs and IOMs. Other system components are attached to the exterior of the chassis, such as the rear fans and rails, to provide system cooling and rackmounting capability. The chassis also houses the baseboard, which is mounted inside the bottom of the chassis 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.

2.1.1 Chassis Specifications

Specification	Value
Dimensions	W: 447 mm x L: 890 mm x H: 175 mm / W: 17.67 in. x L: 35.04 in. x H: 6.89 in.
Part Number	1EX0442 (single IOM) / 1EX0443 (dual IOMs)
Hot Swappable?	No
Weight	20 kg / 44 lbs [7]

7.   Listed weight does not include packaging/shipping materials.

2.1.2 Chassis Layout

Figure 14: Chassis Component Locations
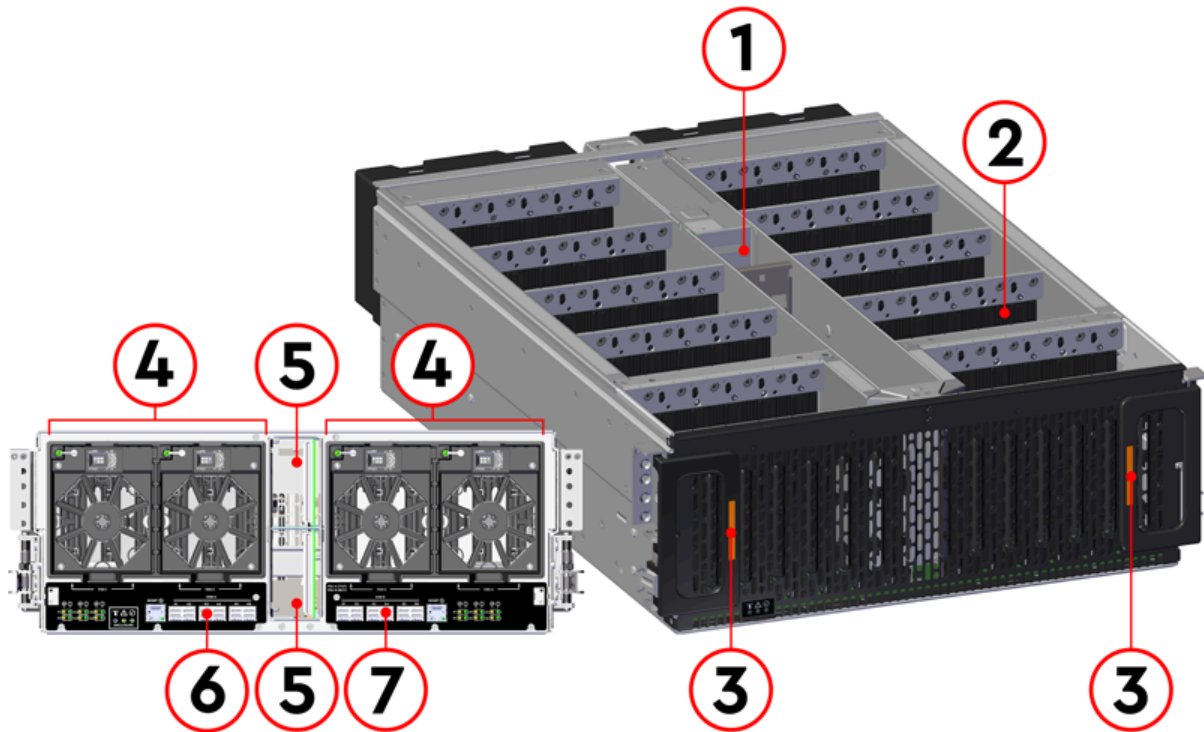
Table 51: Chassis Component Descriptions

Number	Feature
1	IOM and IOM Fan Bay
2	Drive Bays
3	Chassis Handles
4	Rear Fans Bays
5	PSU Bays
6	IOM A Dual HD-Mini SAS Ports (x6) 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. A long central bay 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, which are used to pull the enclosure out of the rack. Two rack ears at the front of the enclosure 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.

2.2 IOM

Figure 15: Ultrastar Data60 IOM
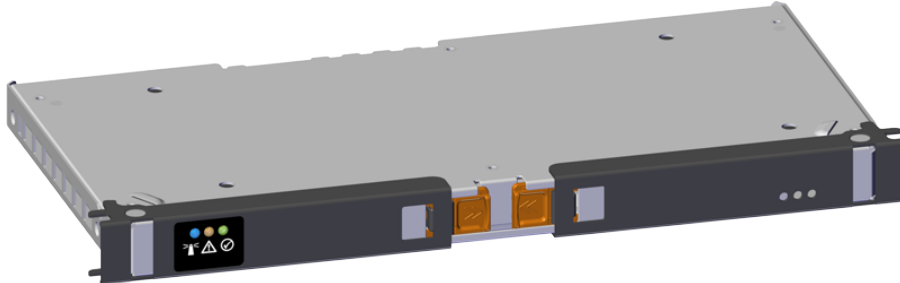
Each IOM provides system data connectivity through 6 Mini-SAS HD ports, capable of four 12Gbps SAS connections each. The IOMs are N+1 redundant, hot-swappable components. The IOMs are installed into the central bay from the top of the Chassis and connect to the drive board. The baseboard completes the connection to the Mini-SAS HD ports, which extend out the rear of the enclosure. Each 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.

2.2.1 IOM Specifications

Specification	Value
Connector Type	x6 HD Mini-SAS (connected externally at the rear of the enclosure)
Number per Enclosure	2 (SAS) / 1 (SATA)
Part Number	1EX2201
Hot Swappable?	Yes
FRU or CRU?	CRU
Weight	1.27 kg / 2.8 lbs [8]

8.   Listed weight does not include packaging/shipping materials.

2.2.2 IOM Layout

Figure 16: IOM Component Locations
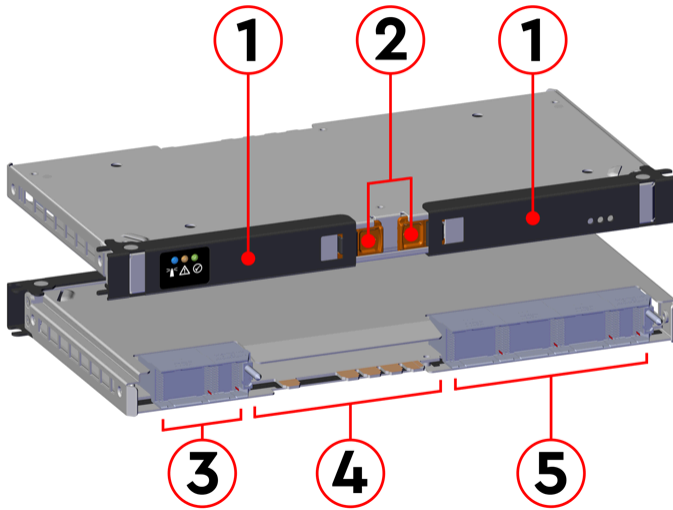
Table 53: IOM Component Descriptions

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

2.2.3 IOM Blank

Figure 17: Ultrastar Data60 IOM Blank
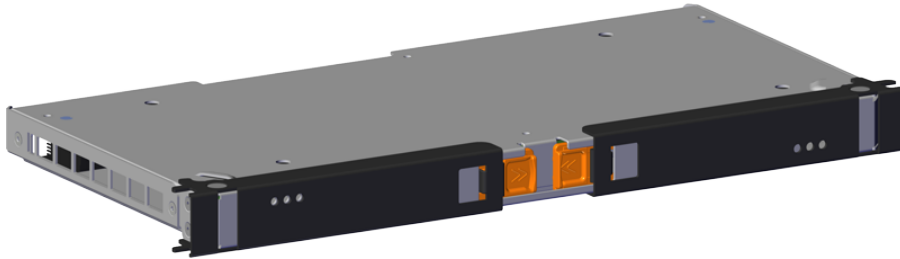
The IOM Blank is a placeholder component for filling the unused IOM slot in versions of the Ultrastar Data60 that do not leverage redundant IOMs. The IOM Blank must be installed into IOM slot B under all such circumstances. From the front of the enclosure, slot B is the left-hand slot. It is necessary to have a blank installed in this unused slot in order to ensure the airflow remains within the operational parameters designed for the enclosure; the IOM Blank has no function beyond this.

2.3 PSU

Your system may contain PSUs from one of two models. Please see the following sections for details on each model:

- Delta PSU *(page 47)*
- Artesyn PSU *(page 49)*
- GosPower PSU *(page 50)*

2.3.1 Delta PSU

Figure 18: Ultrastar Data60   Delta PSU

The Ultrastar Data60 contains redundant 1600W power supply units (PSUs). Each PSU requires an input voltage between 200 - 240 VAC, is 80 PLUS Platinum certified, and utilizes a C14 power cable receptacle.

2.3.1.1 Delta PSU   Specifications

Specification	Value
Power Output	1600W
80 PLUS Standard	Platinum
Input Voltage	200 - 240 VAC
Connector Type	C14
Number per Enclosure	2
Part Number	1EX2937
Hot Swappable?	Yes
FRU or CRU?	CRU
Weight	1 kg / 2.2 lbs. [9]

9.   Listed weight does not include packaging/shipping materials.

2.3.1.2 Delta PSU Layout

Figure 19: PSU Component Locations
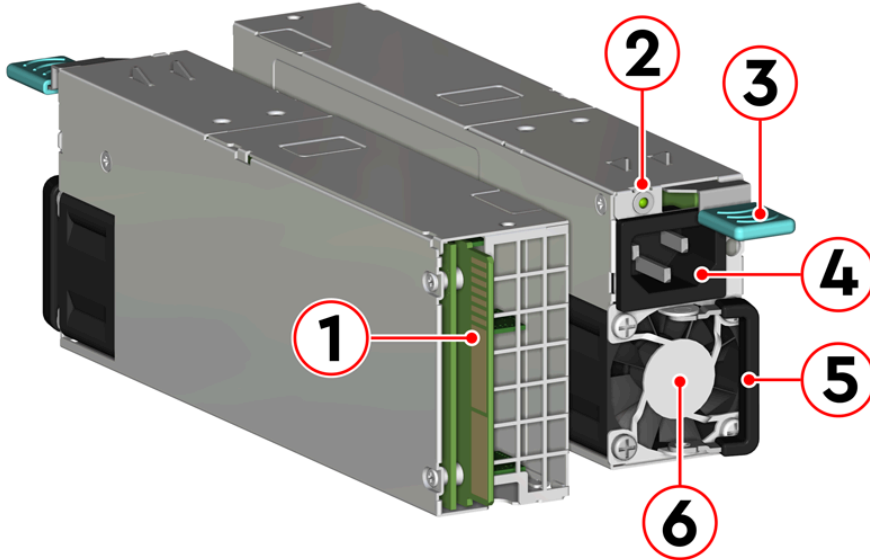
Table 55: PSU Component Descriptions

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

2.3.2 Artesyn PSU

Figure 20: Ultrastar Data60 Artesyn PSU

The Ultrastar Data60 contains redundant 1800W power supply units (PSUs). Each PSU requires an input voltage between 200 - 240 VAC, is 80 PLUS Platinum certified, and utilizes a C14 power cable receptacle.

Note: The Artesyn PSU requires 3000 series firmware or later.

2.3.2.1 Artesyn PSU Specifications

Specification	Value
Power Output	1800W
80 PLUS Standard	Platinum
Input Voltage	200 - 240 VAC
Connector Type	C14
Number per Enclosure	2
Hot Swappable?	Yes
Weight	1 kg / 2.2 lbs. [10]

10.   Listed weight does not include packaging/shipping materials.

2.3.2.2 Artesyn PSU Layout

Figure 21: Artesyn PSU Component Locations
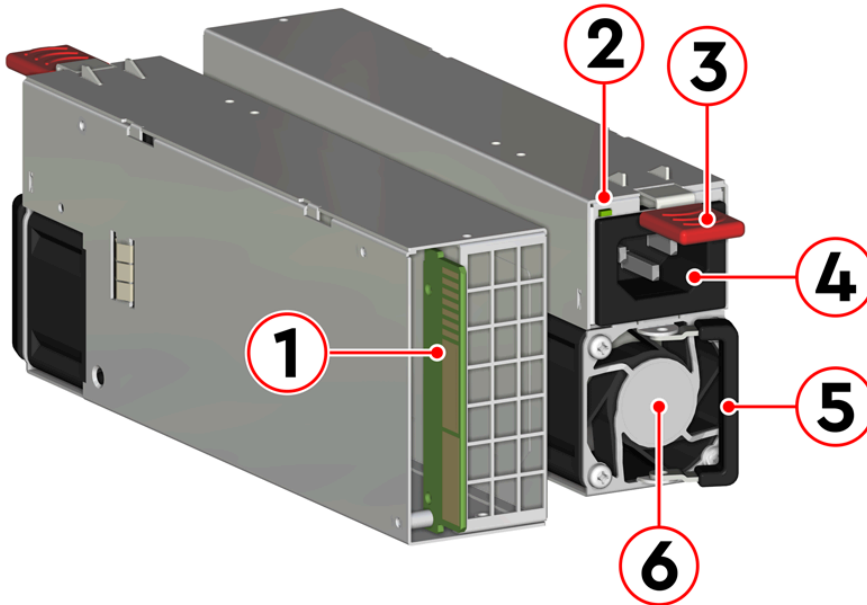
Table 57: Artesyn PSU Component Descriptions

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

2.3.3   GosPower PSU

Figure 22:   GosPower PSU
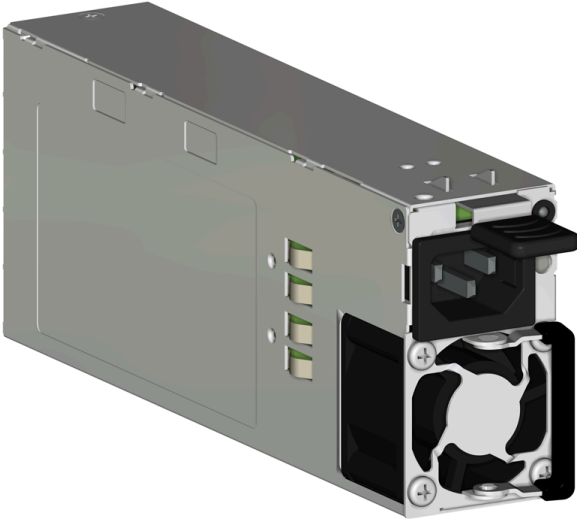
The Ultrastar Data60 contains redundant Power Supply Units (PSUs). Each PSU requires an input voltage between 200 - 240 VAC. The PSUs are 80 PLUS Titanium certified and utilize C14 power cable receptacles.

> **Note:** The GosPower PSU requires version 4008-020 of firmware due to being qualified as 80 PLUS Titanium.

2.3.3.1   GosPower PSU Specifications

Specification	Value
Power Output	1600W
80 PLUS Standard	Titanium
Input Voltage	200 - 240 VAC
Connector Type	C14
Number per Enclosure	2
Hot Swappable?	Yes
Weight	1 kg / 2.2 lbs. [11]

11.   Listed weight does not include packaging/shipping materials.

2.3.3.2 GosPower PSU Layout

Figure 23:   GosPower PSU Component Locations
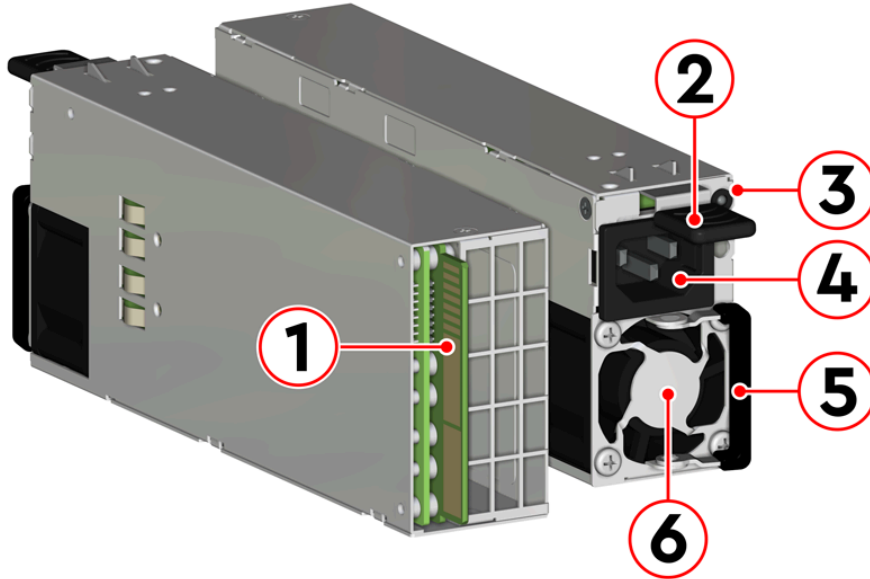
Table 59:   GosPower PSU Component Descriptions

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

2.4 Rear Fan

Figure 24: Ultrastar Data60 Rear Fan

The Rear Fans are toolless modules that provide the primary system cooling for the Ultrastar Data60 . They are attached inside the fan housing at the rear of the chassis by two latches and a 6-pin connector, which also provides power and control signals to the modules.

2.4.1 Rear Fan Specifications

Specification	Value
Number per Enclosure	4
Part Number (4-pack)	1EX2814
Hot Swappable?	Yes
FRU or CRU?	CRU
Weight	318 g / 0.7 lbs [12]

12.   Listed weight does not include packaging/shipping materials.

2.4.2 Rear Fan Layout

Figure 25: Rear Fan Component Locations
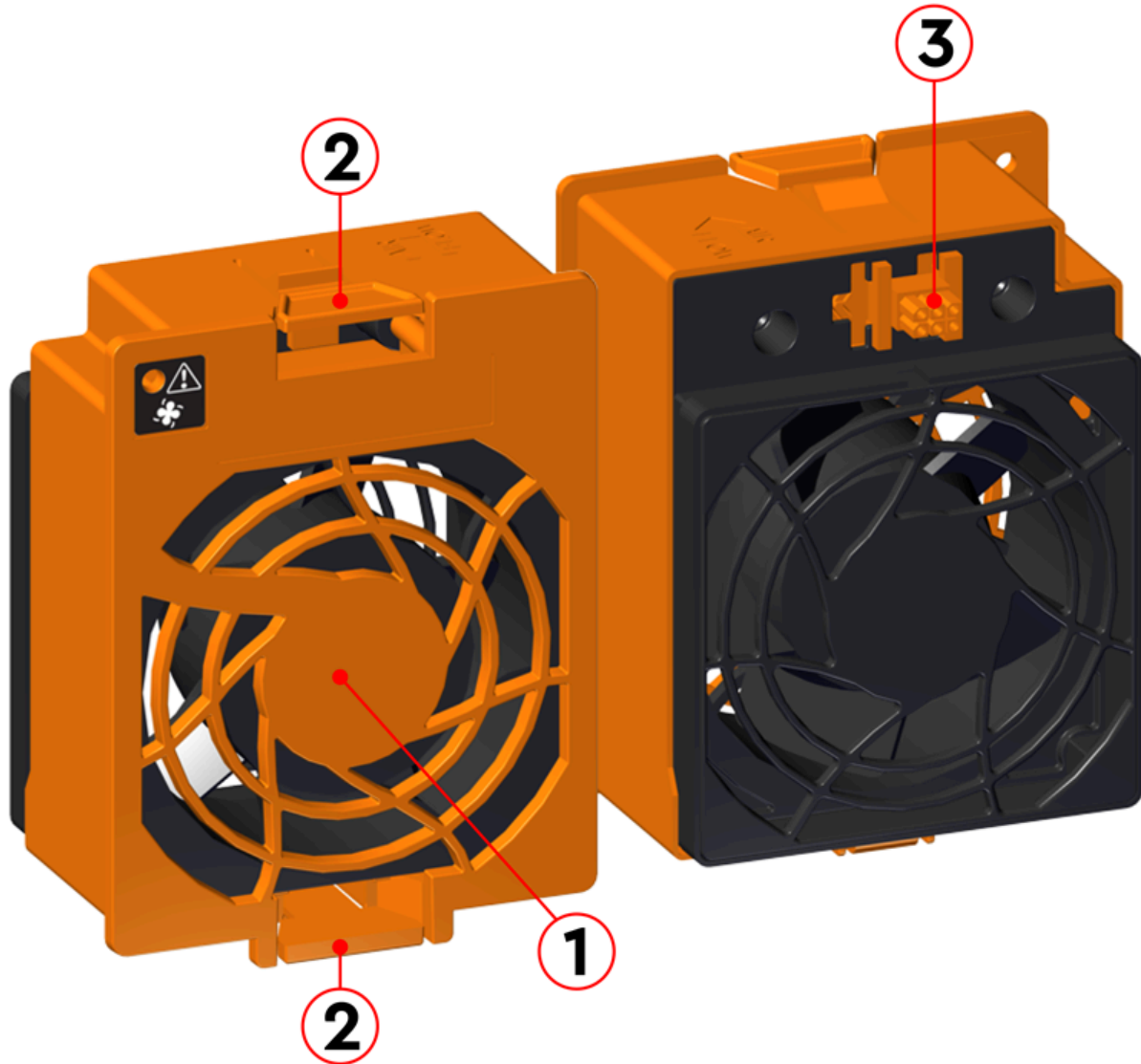
Table 61: Rear Fan Component Descriptions

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

2.5 IOM Fan

Figure 26: Ultrastar Data60 IOM Fan
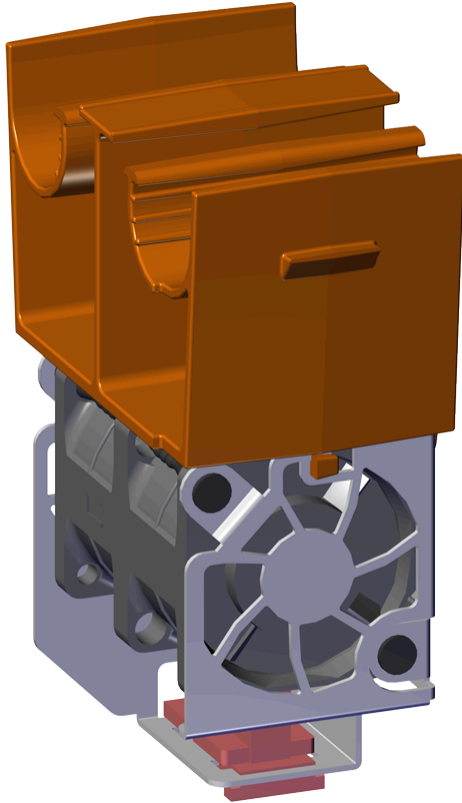
The IOM Fan is designed to focus cooling on the enclosure's IOMs. It is installed into the central bay of the chassis and is accessed from the top of the enclosure through the removable cover. It is attached to the chassis via a toolless release mechanism that allows for easy replacement.

2.5.1 IOM Fan Specifications

Specification	Value
Number per Enclosure	1
Part Number	1EX0432
Hot Swappable?	Yes
FRU or CRU?	CRU
Weight	181.4 g / 6.4 oz [13]

13.   Listed weight does not include packaging/shipping materials.

2.5.2 IOM Fan Layout

Figure 27: IOM Fan Component Locations
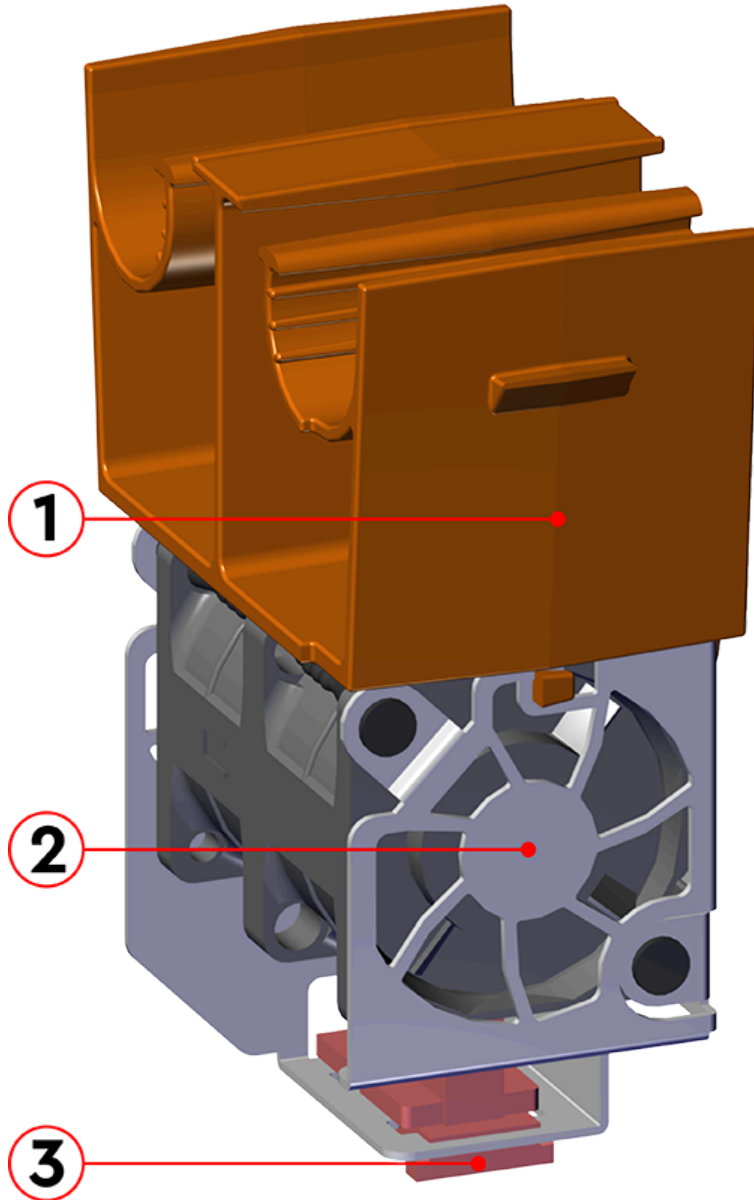
Table 63: IOM Fan Component Descriptions

Number	Feature
1	Latch Mechanism
2	Fan Module
3	Internal Connector

2.6 Rails

Figure 28: Ultrastar Data60 Rails

The Ultrastar Data60 is installed into a rack using a toolless-attach rail system. Each rail is a two-piece assembly, with one rail that attaches directly to the chassis (*inner rail*) and another (*outer rail*) 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, which should be set between 24 in.-32 in. . The toolless design allows an installer to attach the 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.

2.6.1 Rails Specifications

Specification	Value
Length	1028.7 mm / 40.5 in.
Rails Kit (CMA Standard) Part Number	1EX0436
Hot Swappable?	No
FRU or CRU?	CRU
Weight	6.07 kg total (3.03 kg per rail) / 13.4 lbs total (6.7 per rail) [14]

14.   Listed weight does not include packaging/shipping materials.

2.6.2 Rails Layout

Figure 29: Rails Component Locations
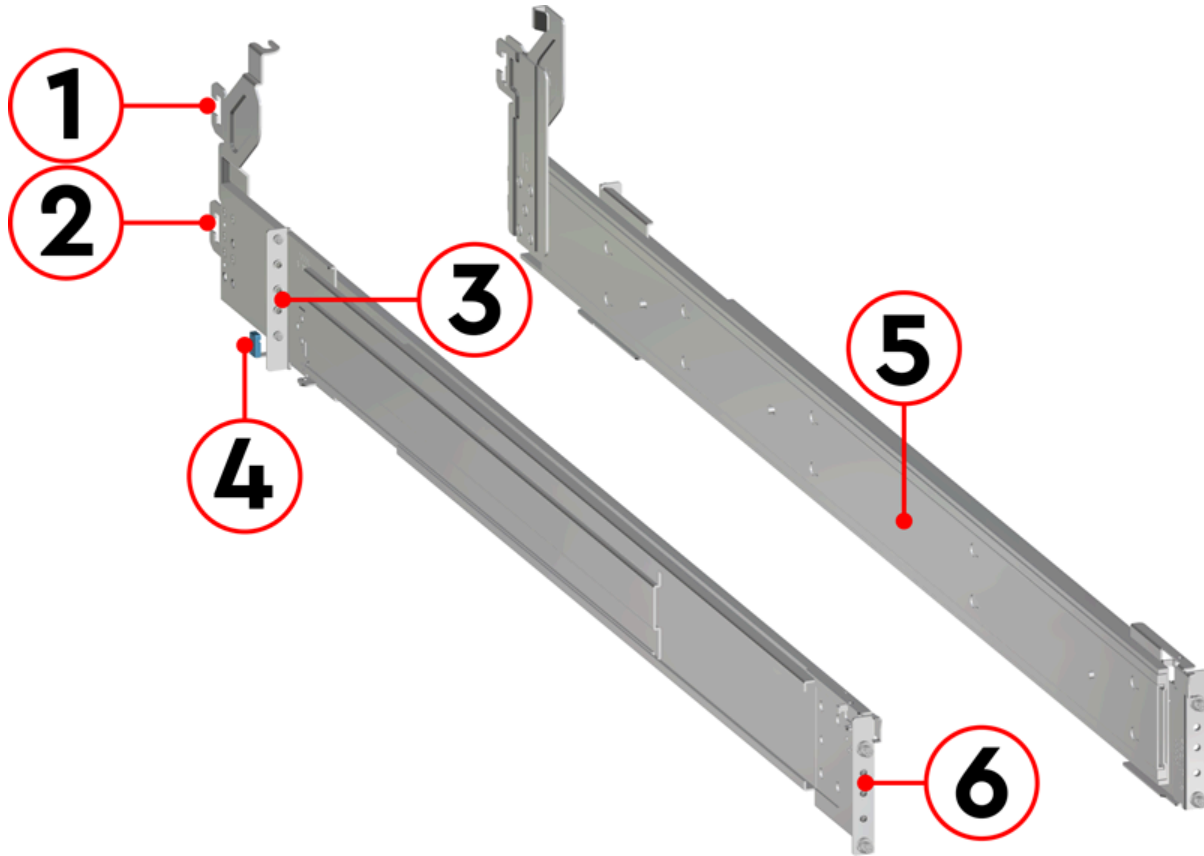
Table 65: Rails Component Descriptions

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

2.7 Top Cover Alignment Bracket

Figure 30: Ultrastar Data60 Top Cover Alignment Brackets
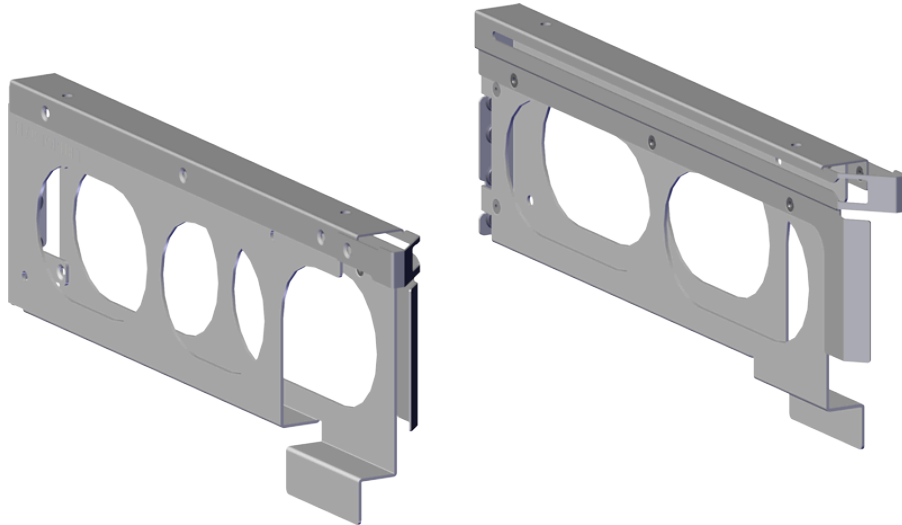
The Top Cover Alignment Brackets are designed to keep the top cover of the Chassis in the rack while extending the Ultrastar Data60 out of the rack for servicing. The Top Cover Alignment Brackets attach to the rear vertical rack rails and rest on top of the toolless rail system.

2.7.1 Top Cover Alignment Bracket Specifications

Specification	Value
Bracket Dimensions	W: 19.8 mm x L: 282.4 mm x H: 109.1 mm / W: 0.8 in. x L: 11.1 in. x H: 4.3 in.
Part Number	1EX2288
Hot Swappable?	Yes
FRU or CRU?	CRU

2.8 CMA

Figure 31: Ultrastar Data60 CMA
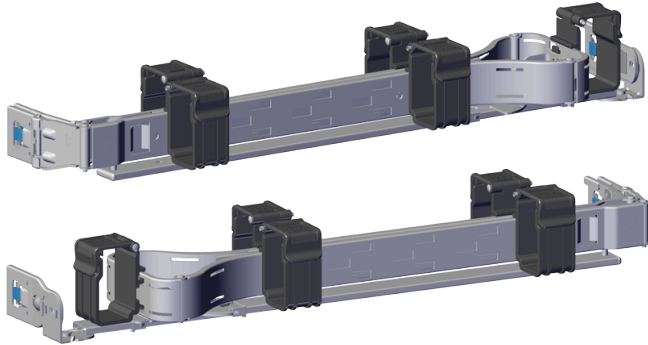
The cable management assembly (CMA) protects and manages the cables connected to the PSU ports, SAS ports, and Ethernet ports. It prevents damage to the port connectors and the cables throughout the full travel of the enclosure as it is pulled out of the rack for servicing. This motion ensures that the cables contained by the CMA arm do not snag or get pulled out of the ports as the enclosure moves.

The 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.

2.8.1 CMA Specifications

Specification	Value
Extension Range	0 - 36 in.
Number per Enclosure	1 assembly (2 arms)
CMA Arms (Dual) Part Number	1EX0437
CMA Arm (Single) Part Number	1EX1174
Cable Tray Part Number	1EX1119
Hot Swappable?	No
Maximum Number of Cables (with dual arms)	12 SAS Cables
	2 Power Cords
	2 Ethernet Cables
FRU or CRU?	CRU

Specification	Value
Weight	1.54 kg (0.77 per arm) / 3.4 lbs. (1.7 per arm) [15]

2.8.2 CMA Layout

Figure 32: CMA Component Locations
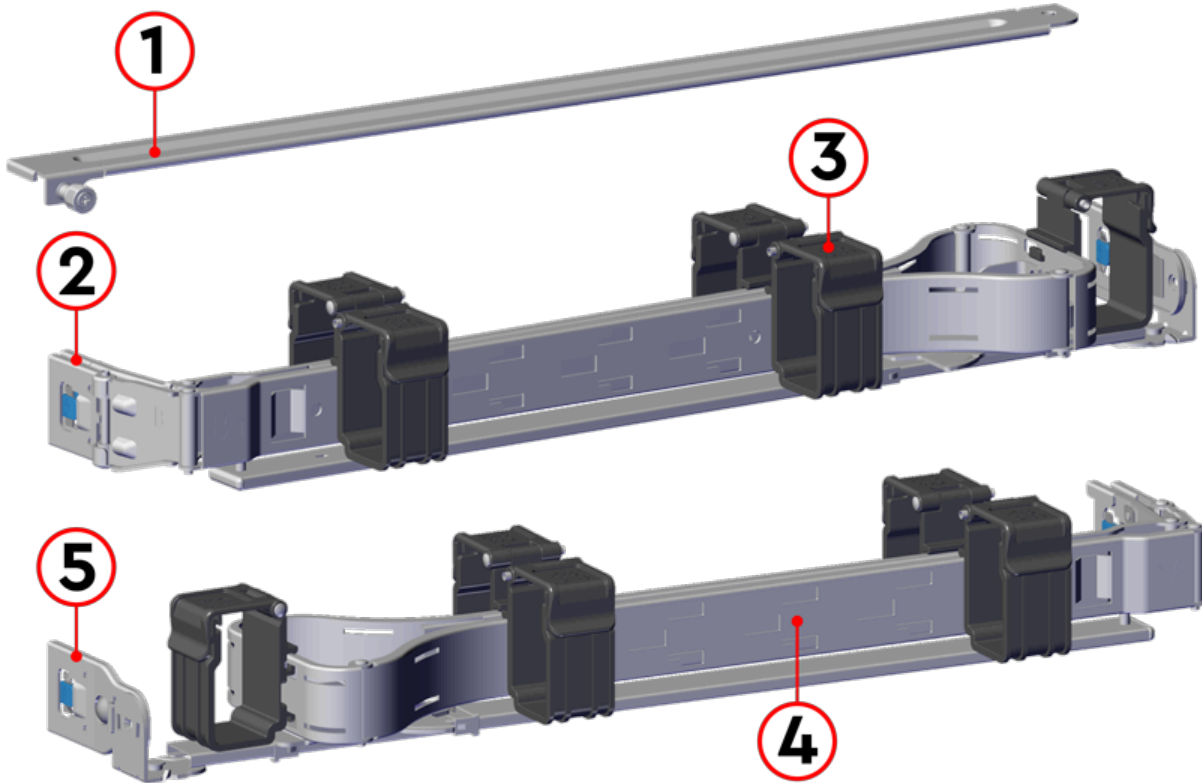
Table 68: CMA Component Descriptions

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

15.   Listed weight does not include cable tray or packaging/shipping materials.

2.8.3 CMA Cable Tray

Figure 33: Overview Image
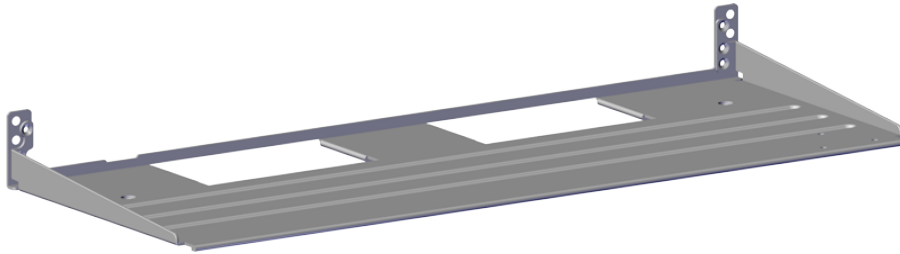
The cable management assembly (CMA) comes with an **optional** tray that is used to support cable loads greater than ten (five per arm). The CMA Cable Tray is mounted at the bottom-rear of the chassis using four M3 x 8mm T10 Torx screws (two per side). It is useful in situations where cables might interfere with the lower U space beneath the chassis.

2.9 3.5in HDD Assembly

Figure 34: Ultrastar Data60 3.5in HDD Assembly

The 3.5in HDD 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.

2.9.1 3.5in HDD Assembly Specifications

Specification	Value
Number per Enclosure	Up to 60 drives
Part Number	See the Compatible Drives *(page 21)* to find the specific part number required.
Hot Swappable?	Yes
Weight	0.68 kg / 1.5 lbs. [16] [17]

16. Listed weight does not include packaging/shipping materials.

17. Actual weight may vary by drive model

2.9.2 3.5in HDD Assembly Layout

Figure 35: 3.5in HDD Assembly Component Locations
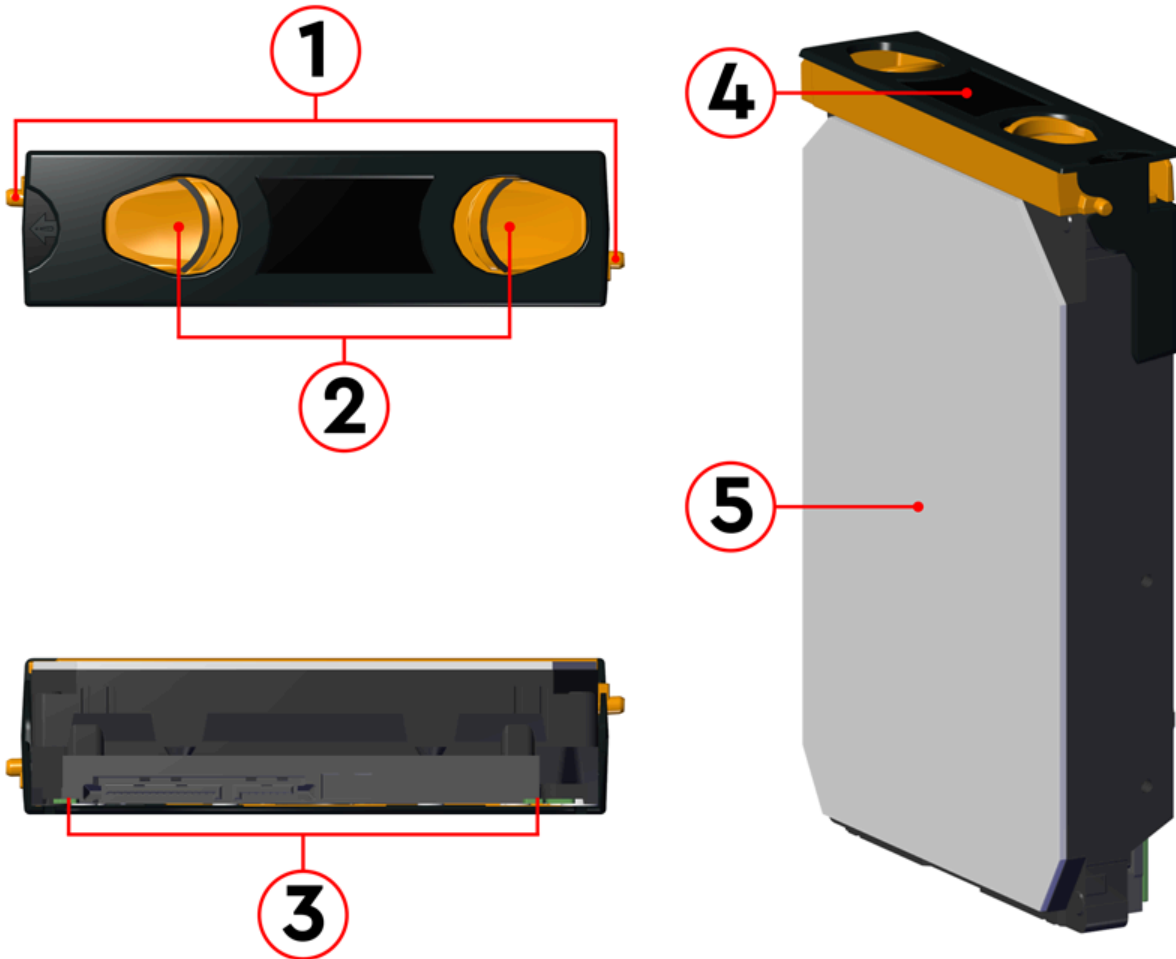
Table 70: 3.5in HDD Assembly Component Descriptions

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

2.9.3 3.5in Drive Blank

Figure 36: Ultrastar Data60 3.5in Drive Blank
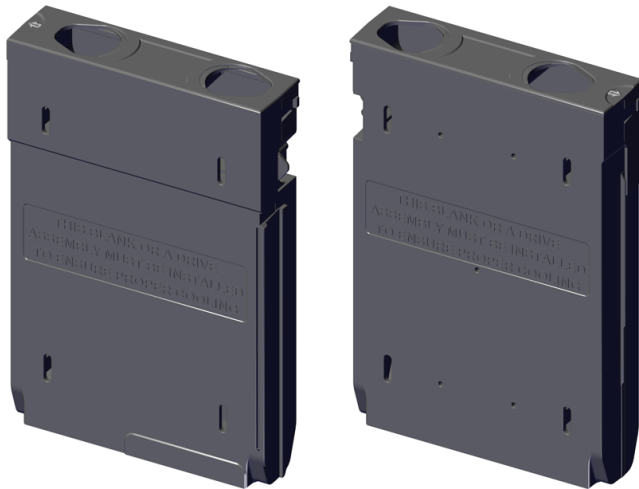
The 3.5in Drive Blank is a placeholder component used to fill empty drive slots in the chassis when an Ultrastar Data60 enclosure is partially populated with drives. When the number of drives in a row is less than the total necessary to fill that row, the 3.5in Drive Blank is used to fill out the row in place of actual drives. The purpose of the 3.5in 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 Partial Population Configurations *(page 242)*.

Support

In This Chapter:

3.1 Part Replacement Service Window

The following table contains a time required and a replacement window for each hot-swappable replacement part within the enclosure. The *Time Required* is the expected amount of time 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 71: Replacement Service Window

Part	Time Required	Replacement Window
IOM	1 min	5 min
PSU	1 min	5 min
Rear Fan	1 min	5 min
IOM Fan	1 min	5 min
Drive Assembly	1 min	5 min

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

3.1.1 Multiple CRU Replacements

This procedure provides information and instructions for replacing multiple CRUs in a single servicing window.

In order to maintain proper airflow for enclosure cooling, the Ultrastar Data60 can be opened for servicing of hot-swap components for a maximum of 5 minutes. If multiple CRUs must be replaced within that servicing window, it is critical to optimize servicing actions to make the best use of that time. The following procedure describes a scenario where an IOM Fan, an IOM , and a 3.5in HDD Assembly must be replaced. These instructions provide a strategy for optimizing the servicing window, the order in which CRUs should be replaced, and how to respond if the replacement time will exceed the overall enclosure servicing window.

Step 1 : Remotely determine which CRUs have faulted.

Step 2 : Review the appropriate CRU replacement procedures in Support *(page 66)* to familiarize yourself with the steps involved, the required parts and tools, and any safety precautions.

Step 3 : Gather all the replacement CRUs and required tools.

> 📄 **Note:** These preparation activities should be accomplished before servicing, to minimize the number of activities that must be performed while the enclosure is open. Staying within the enclosure servicing window is critical to maintaining its thermal operating requirements.

Step 4 : If the Rear Fans or PSUs require replacement, start with these CRUs as they are external and do not require opening the enclosure. Access the rear of the enclosure and follow the appropriate procedure for replacing these CRUs.

Step 5 : For replacement of internal CRUs, pull the enclosure out of the rack to allow access to the inside of the enclosure. The enclosure can stay in this position for a maximum of 5 minutes in an ambient temperature of 5°C to 35°C (de-rated for elevation).

Step 6 : If an IOM Fan has faulted, replace this CRU first. Remove the IOM Fan and install the replacement in **30 seconds** or less.

Step 7 : If an IOM has faulted, replace this CRU next. Remove the IOM and install the replacement in **1 minute** or less.

Step 8 : If any Drive Assemblies have faulted, replace each device in a sequential fashion. Pay close attention to proper orientation of the device within the enclosure. Replace each device in **1 minute** or less.

Step 9 : Perform a visual inspection of the enclousre to ensure that all CRUs are seated properly.

Step 10 : Before the 5-minute servicing window expires, push the enclosure back into the rack. If there are additional internal CRUs that require replacement, wait **10 minutes** before repeating this procedure, beginning with step 5 *(page 68)*.

Step 11 : After all CRUs have been replaced, verify remotely that the CRU replacements were successful and that enclosure function has returned to 100%.

3.2 IOM Replacement

Before you begin:

> ⓘ **Important:** Standard zoning methods (i.e. WDDCS Tool, OOBM, sg_senddiag, or SMP zoning commands) require each IOM to be configured individually. After replacing an IOM, zoning should be configured on it before the system is put back into production, otherwise, any host that is booted and has access to that IOM will see all drives. File-based zoning does not require individual IOM zoning configuration after replacement, as the zoning configuration is stored on the baseboard.

> 📄 **Note:** Enclosures running firmware version 3000-058 or later are equipped with Auto-Sync, a feature that automatically detects a mismatch of SEP and OOBM firmware between an enclosure's two IOMs and synchronizes the firmware versions. See Firmware Auto-Sync *(page 203)* for more details and instructions for enabling this feature.

Replacement Requirements	
Personnel Required	1
Avg. Replacement Time	1 min
Max Replacement Time	5 min

Tools	Qty. Needed	Required / Recommended
None	N/A	N/A

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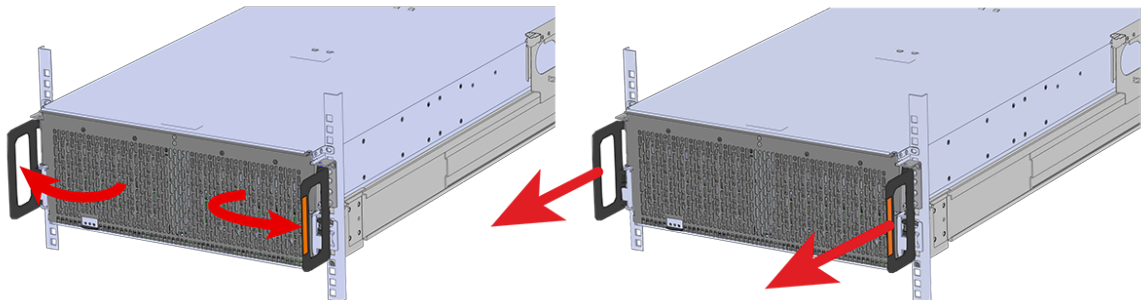
Step 2: Locate the faulty IOM by the amber LED that will be lit on top if there is a fault or by activating the identify LED on the IOM being replaced.

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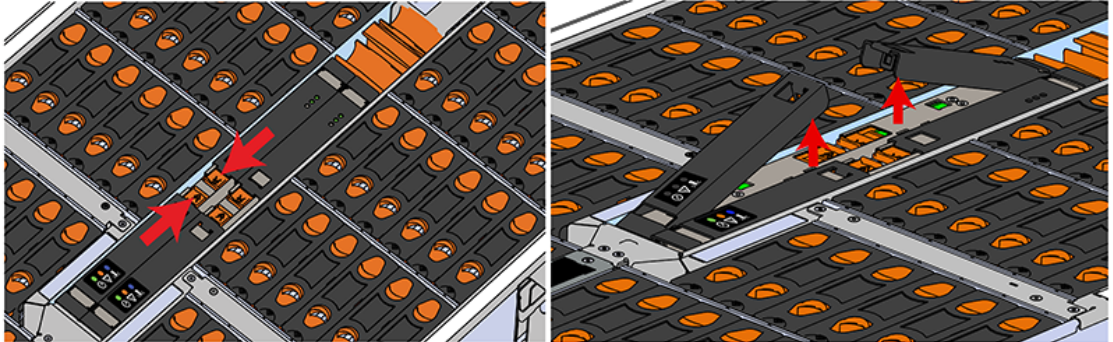
b. Grasp both handles, one handle in each hand, and lift evenly with both hands to ensure the IOM comes out straight. This will prevent any damage to the pins on the internal connectors.

Figure 39: Removing IOM
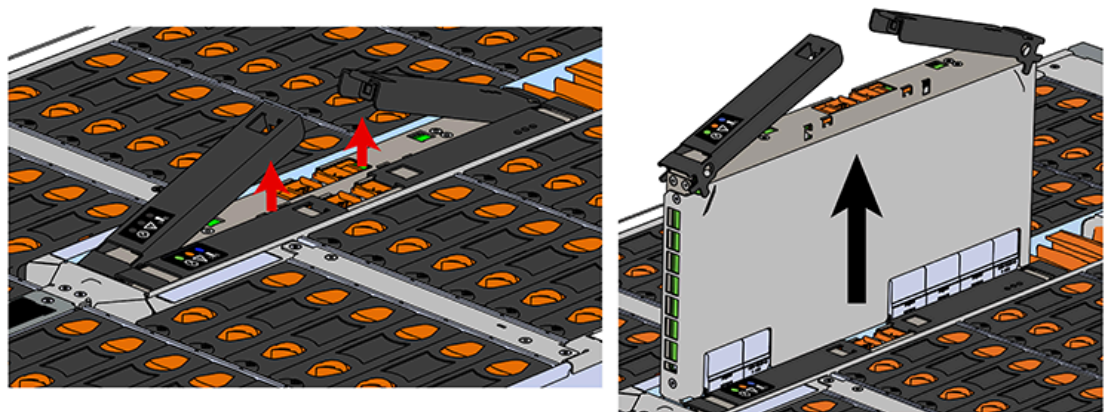
Step 4 : Remove the new IOM from its packaging.

Step 5 : Install the IOM.

> ⚠️ **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.

a. 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 40: Unlatching IOM Handles
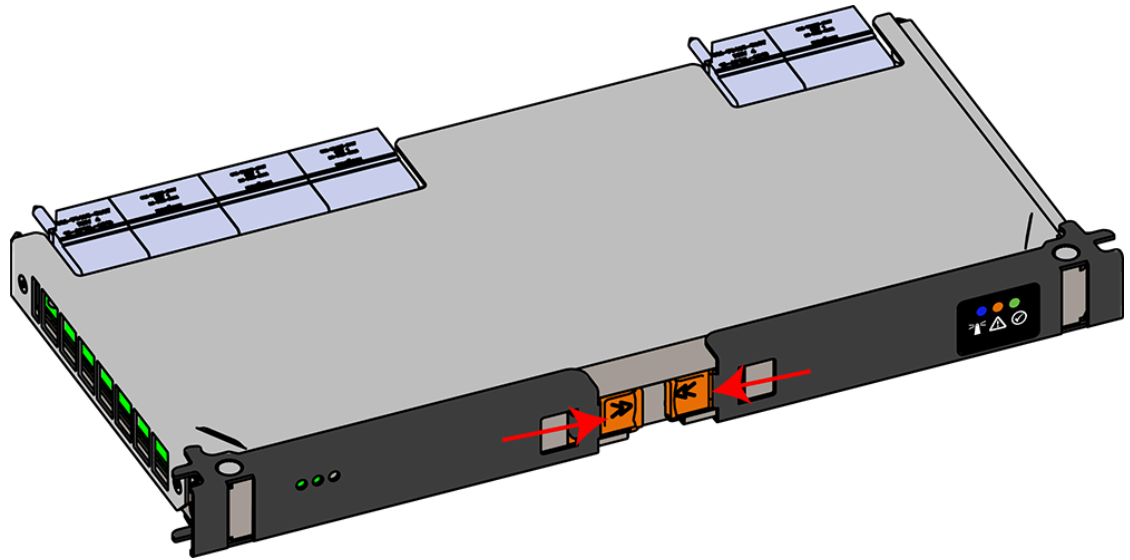
b. Align the IOM with the empty slot on the top of the chassis so that the arrow on the IOM latch release is facing toward the side shown in the following image.

c. Slowly lower the IOM into the empty slot while being careful to keep it level. Do not to force it.

Figure 41: Installing the IOM
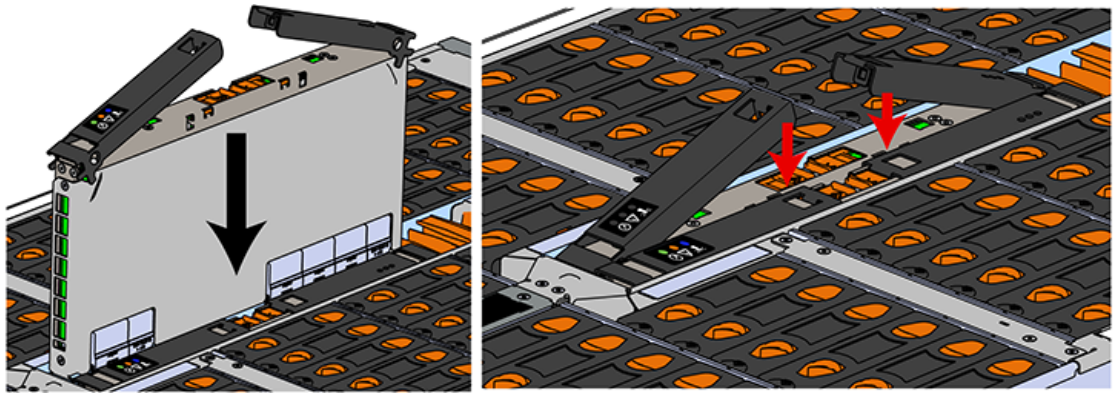
d. When the IOM is lowered fully, apply light pressure with both hands evenly on the IOM body, not the handles, to seat the IOM in the connector. If the IOM won't seat correctly, **DO NOT FORCE IT**. Instead, back the IOM out, check the pins to make sure none are damaged, and try again.

e. 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 : Enclosures running firmware version 3000-058 or later are equipped with Auto-Sync, a feature that automatically detects a mismatch of SEP and OOBM firmware between an enclosure's two IOMs and synchronizes the firmware versions. See Firmware Auto-Sync *(page 203)* for more details.

    a. For enclosures running earlier firmware versions, 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.

    b. 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.

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

    d. To fix the firmware mismatch, perform an upgrade to the current firmware revision by following the upgrade instructions here: Firmware Upgrade *(page 184)*

Step 8 : If zoning was configured via the WDDCS Tool, OOBM, sg_senddiag, or SMP zoning commands, these methods require each IOM to be configured individually. Configure zoning on the new IOM before the system is put back into production. For instructions on zoning, please see Zoning *(page 211)*.

3.3 PSU Replacement

This procedure provides instructions for replacing both PSUs.

Before you begin:

⚠️ **Caution:** Your system may contain different PSU models than those included in the CRU replacement package. To ensure proper enclosure functionality, both PSUs must be replaced with the PSUs included in the CRU replacement package.

Replacement Requirements	
Personnel Required	1
Avg. Replacement Time	1 min per PSU
Max Replacement Time	5 min per PSU

Tools	Qty. Needed	Required / Recommended
None	N/A	N/A

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 42: Unlatching a CMA Connector
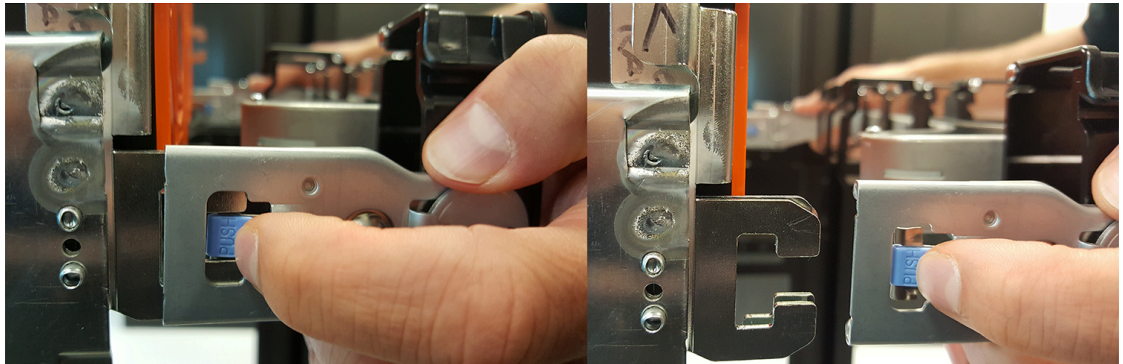

    b. Swing the CMA(s) away from the enclosure.

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

Figure 43: CMA(s) in service position (Cables not shown)
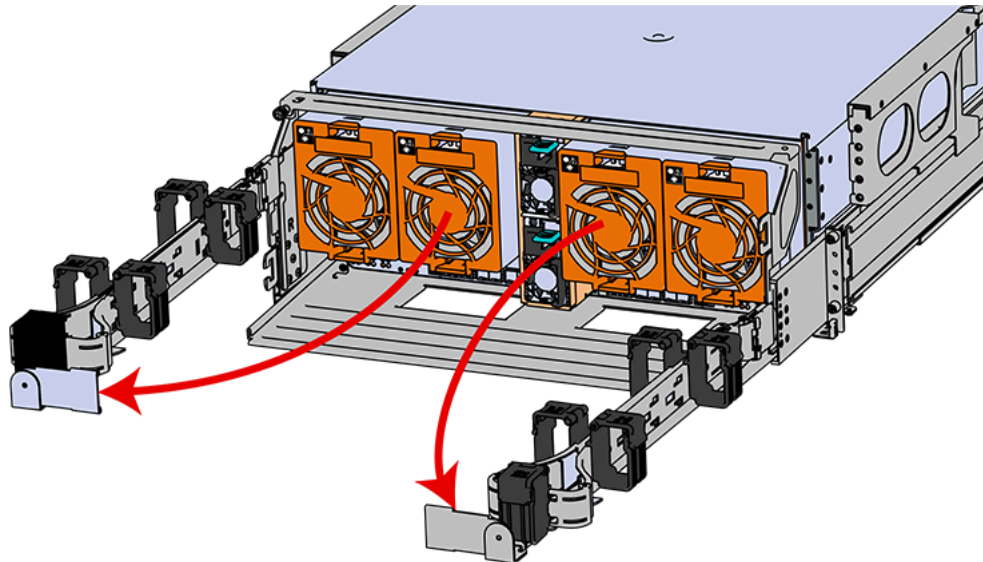
Step 2 : Locate the faulty PSU by finding the amber LED illuminated at the rear of the enclosure.

Step 3 : Detach the cable retention mechanism.

Figure 44: Clip-Style Cable Retention   *Figure 45: Strap-Style Cable Retention*
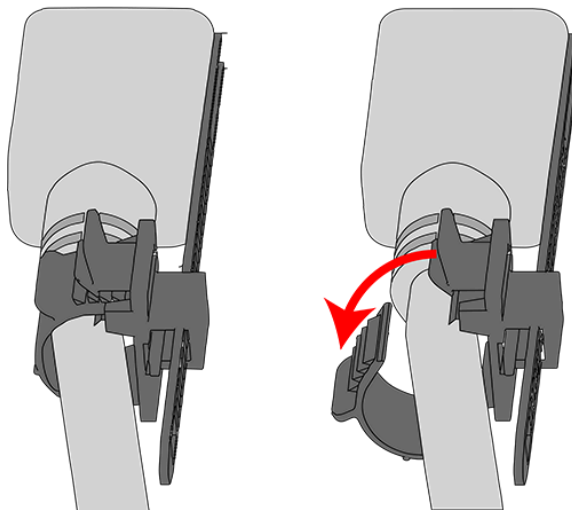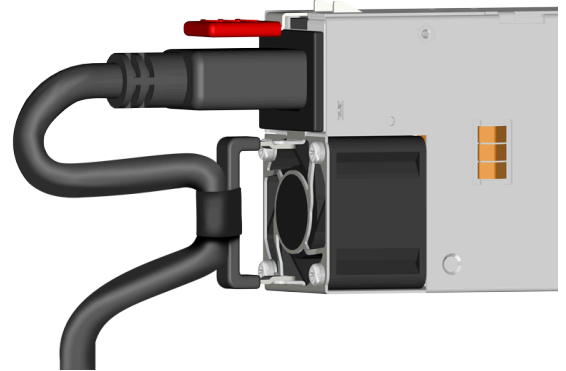
Step 4 : Remove the power cable from the faulty PSU.

Step 5 : Uninstall the PSU.

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

    b. Pull the PSU straight out with even pressure.

Figure 46: Uninstalling the PSU (Delta PSU shown)
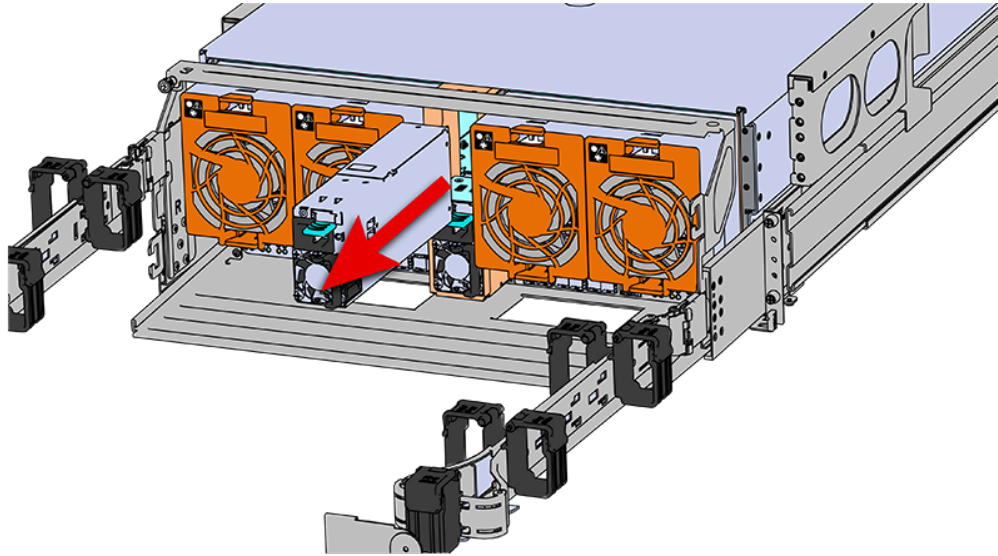
Step 6 : Remove the new PSU from its packaging.

Step 7 : Install the PSU.

    a. Align the PSU in the orientation shown in the following image, and slide the PSU into the slot until it seats fully into the chassis.

Figure 47: Installing the PSU
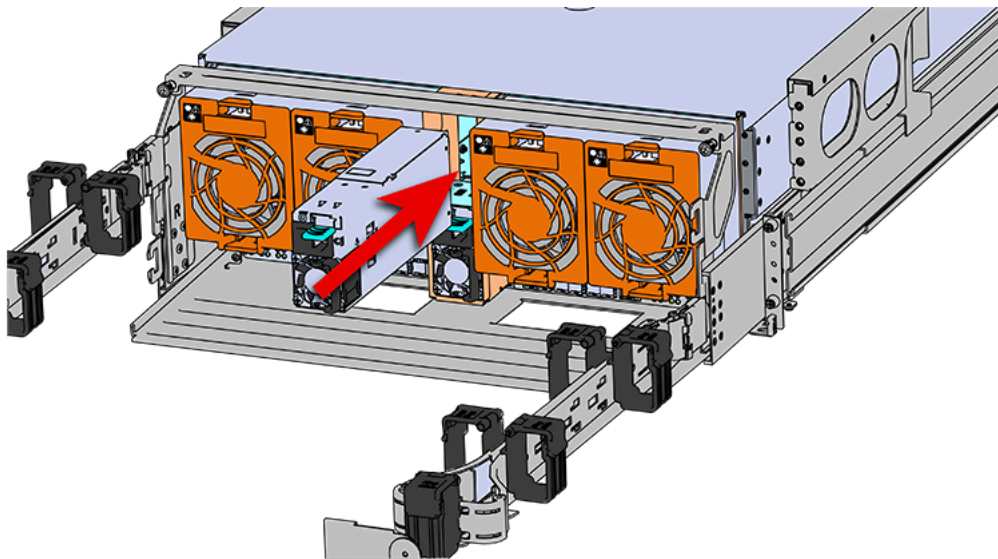
    b. Plug the power cable into the receptacle at the back of the PSU.

    c. Attach the cable retention mechanism.

        For PSUs with the clip-style retention mechanism, loop the clip around the power cable and pinch it until the clip catches and locks in place. Then slide the clip forward until it stops near the cable connector.

Figure 48: Clip-Style Cable Retention
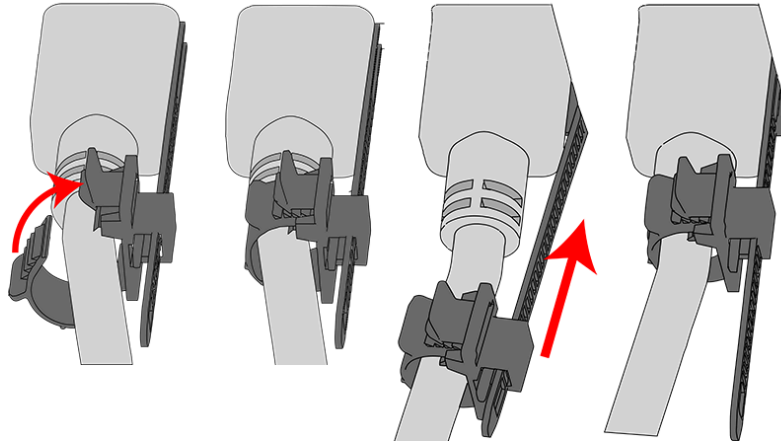
For PSUs with the strap-style retention mechanism, secure the power cable to the PSU handle with the hook-and-loop strap as shown in the following image.

Figure 49: Strap-Style Cable Retention
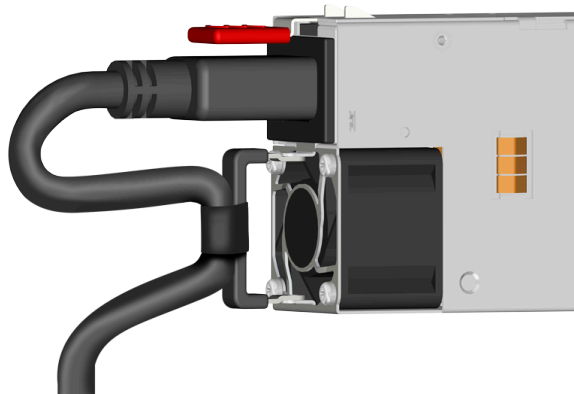
Step 8 : Ensure that the PSU's status LED is solid green, indicating the PSU is on and reporting no faults.

Step 9 : Repeat steps 3 *(page 74)* through 8 *(page 76)* to replace the second PSU.

Step 10 : 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.

Result: The PSUs are now replaced.

3.4 Rear Fan Replacement

Before you begin:

📄 **Note:** Mark or label the old fans prior to removing them, to ensure that all 4 are replaced.

⚠️ **Caution:** All four enclosure fans must be replaced with the fans included in the CRU replacement package. Failure to replace all 4 may result in false error messages.

🛑 **Warning:** For hot-plug replacement, the fans must be replaced one at a time and all four completed in a timely manner (5 minutes max.), to prevent exceeding thermal thresholds. An alternative is to replace the fans when the enclosure is offline.

Replacement Requirements	
Personnel Required	1
Avg. Replacement Time	1 min
Max Replacement Time	5 min

Tools	Qty. Needed	Required / Recommended
None	N/A	N/A

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 50: Unlatching a CMA Connector
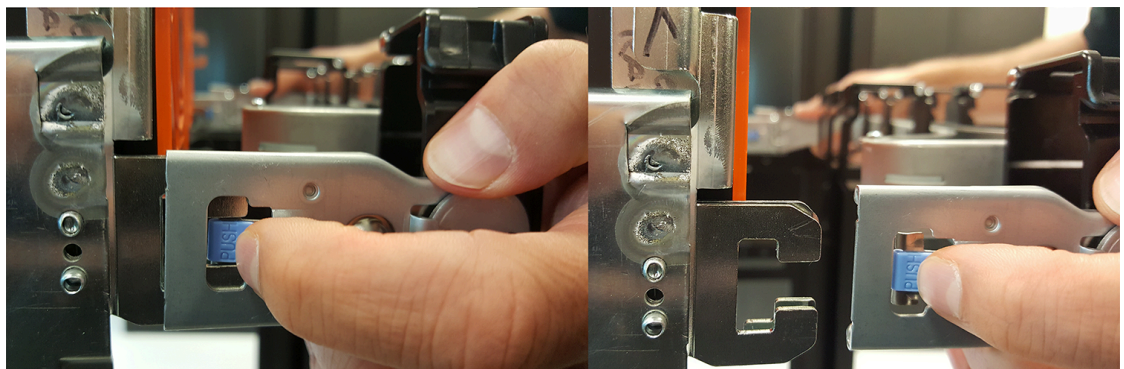
    b. Swing the CMA(s) away from the enclosure.

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

Figure 51: CMA(s) in service position (Cables not shown)
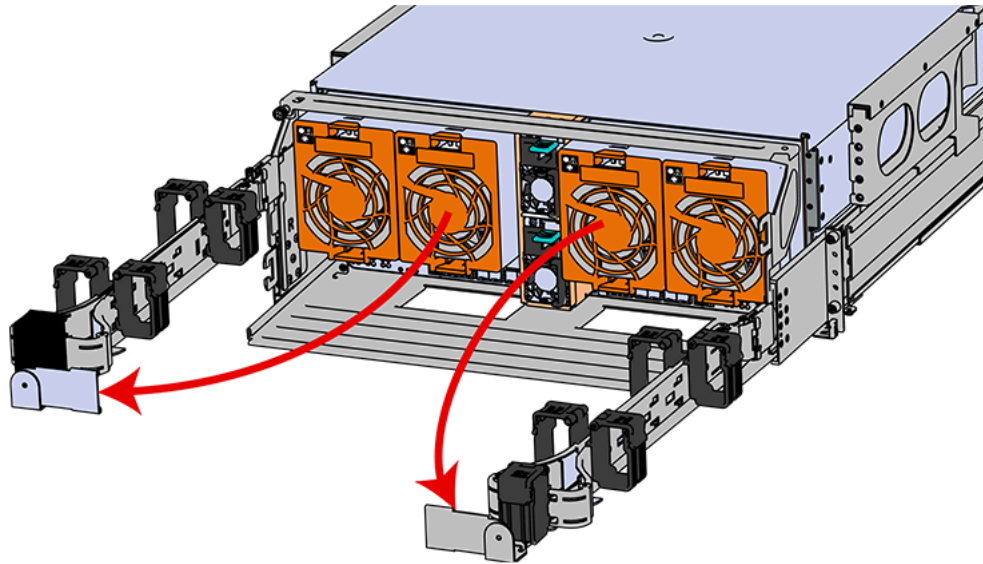
Step 2 : To unlatch the rear fan from the fan housing, use one hand to press the clip at the top and bottom of the fan and pull to free it from the chassis and remove it.

Figure 52: Uninstalling the Rear Fan
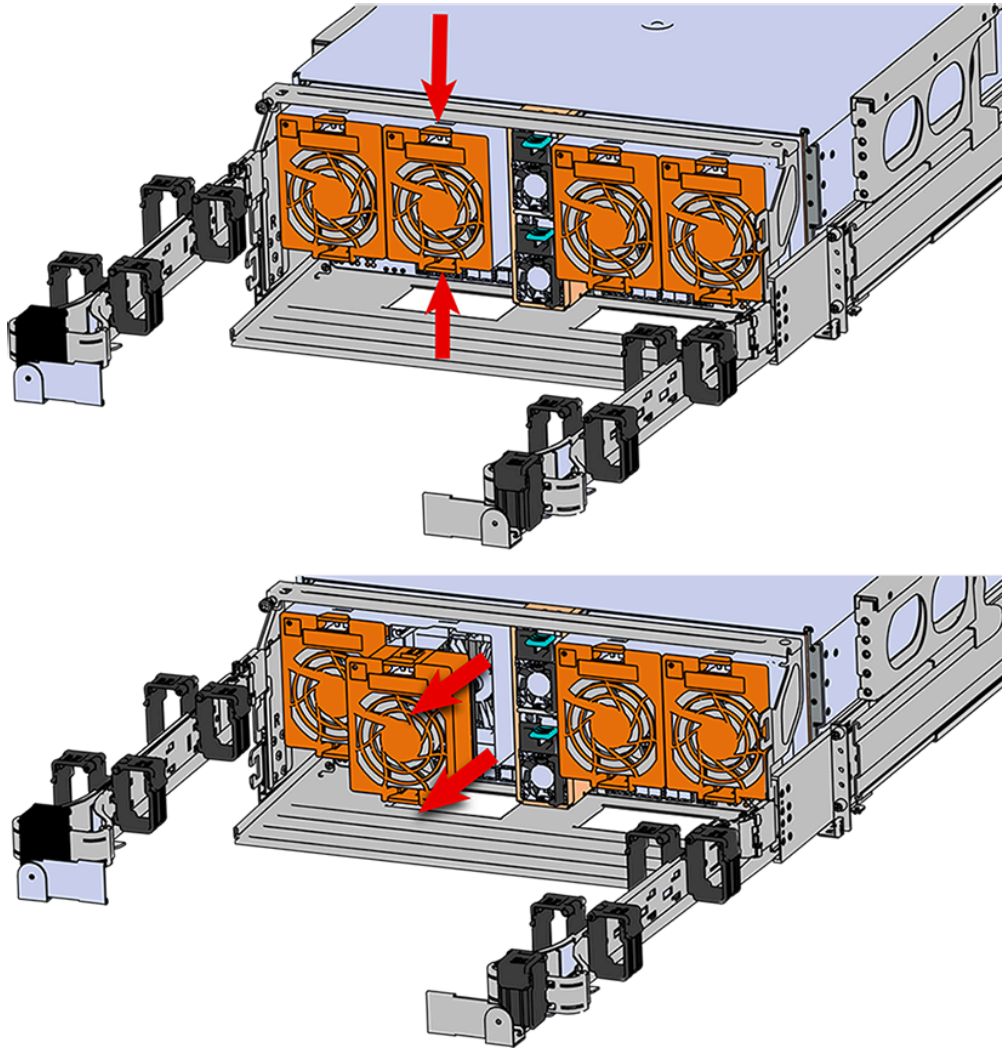
Step 3 :   Uninstall the remaining fans.

Step 4 :   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 53: Installing the Rear Fan
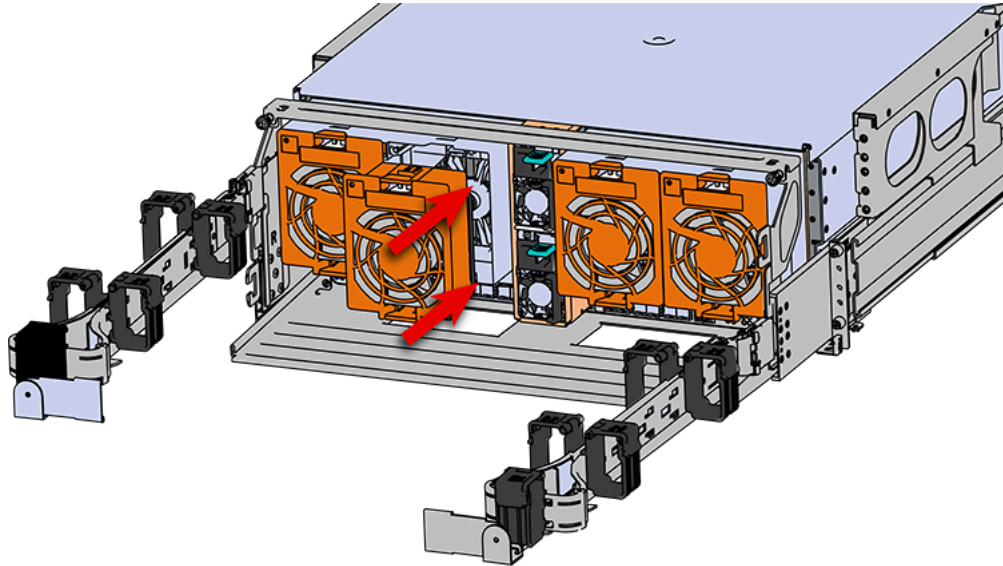
Step 5 :   Install the remaining fans.

Step 6 :   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.

3.5 IOM Fan Replacement

Replacement Requirements	
Personnel Required	1
Avg. Replacement Time	1 min
Max Replacement Time	5 min

Tools	Qty. Needed	Required / Recommended
None	N/A	N/A

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 54: Chassis Handle Operation
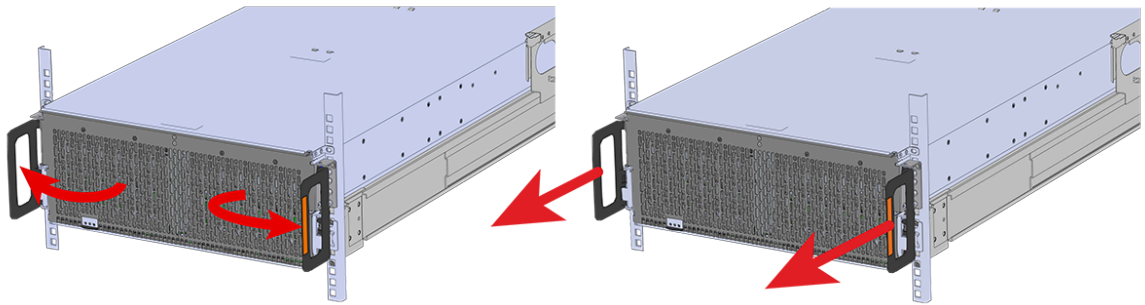
Step 2 : Remove the IOM Fan.

    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 55: Removing IOM Fan
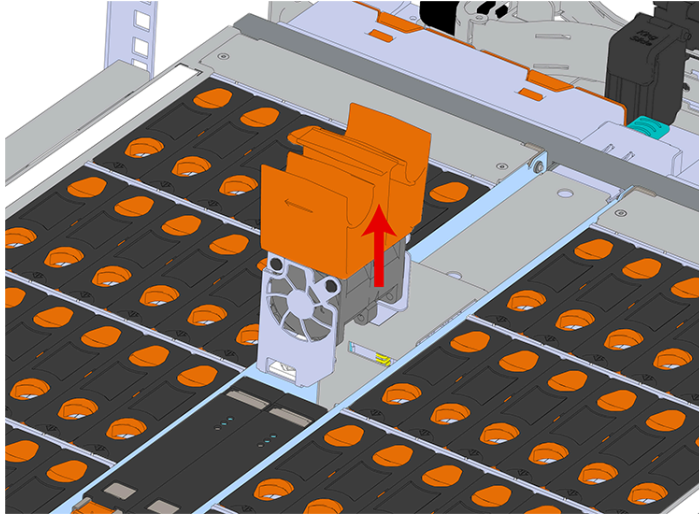
Step 3 : Install the IOM Fan.

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

Figure 56: Installing the IOM Fan
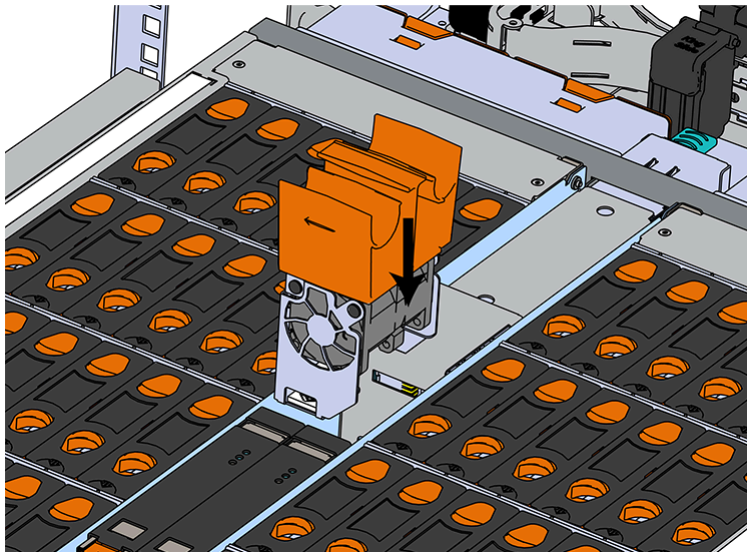
    b. Pinch the latch release mechanism slightly and carefully lower the IOM Fan into the slot.

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

3.6 3.5in HDD Assembly Replacement

Replacement Requirements	
Personnel Required	1
Avg. Replacement Time	1 min
Max Replacement Time	5 min

Tools	Qty. Needed	Required / Recommended
None	N/A	N/A

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 57: Chassis Handle Operation
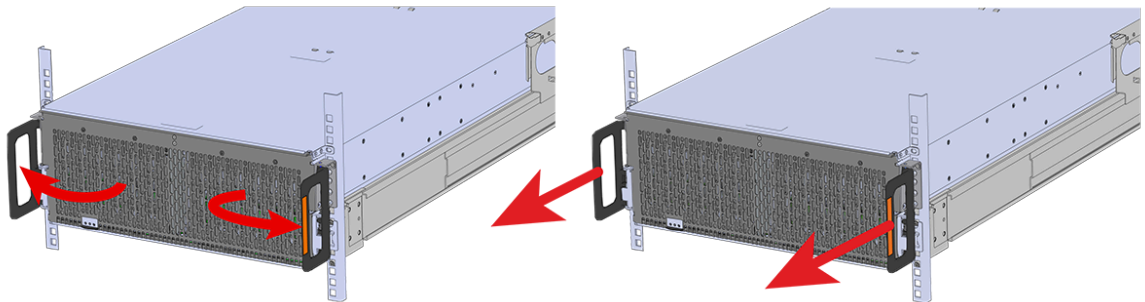
Only extend the enclosure out of the rack as far as is needed to reach the drive being replaced.

Step 2 : Locate the faulty 3.5in HDD Assembly by finding the illuminated amber LED or by activating the identification LED for the drive to be replaced.

Figure 58: HDD Assembly LED
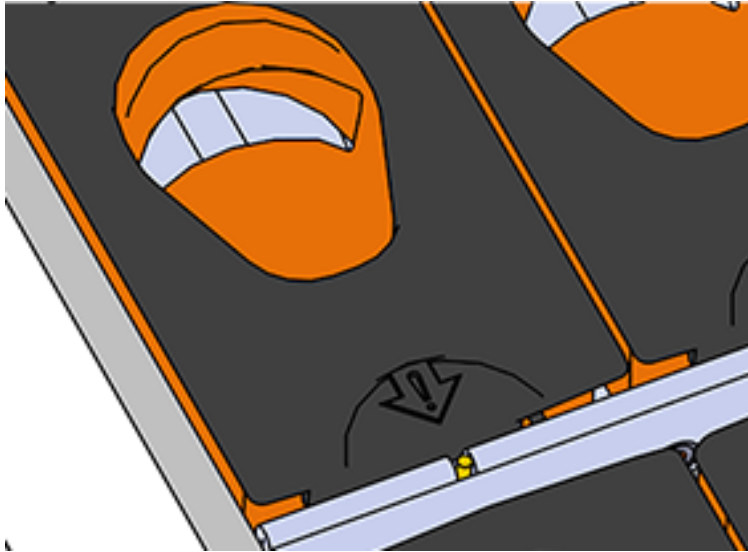
Step 3 : Follow these steps to remove a 3.5in HDD Assembly.

    a. Find the latch release mechanism on the 3.5in HDD Assembly being removed.

    b. Insert a finger and a thumb into the latch release and pinch to unlatch the 3.5in HDD Assembly.

Figure 59: Unlatch Drive Carrier (IOM Not Shown)
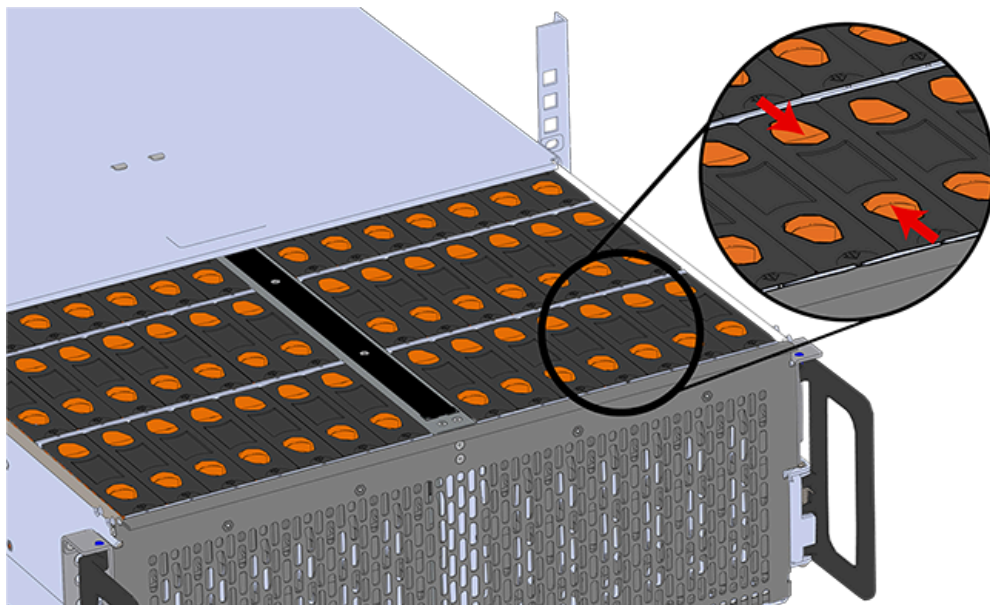
    c. Lift the 3.5in HDD Assembly free from the enclosure.

Figure 60: Removing 3.5in HDD Assembly
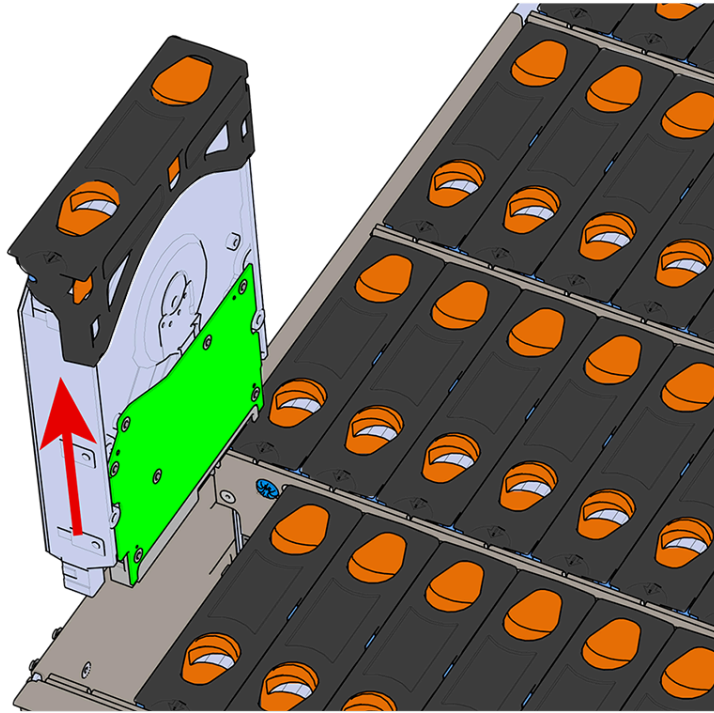
Step 4 :   Remove the new 3.5in HDD Assembly from its packaging.

Installing the 3.5in HDD Assembly

📄 **Note:** When installing drives, populate the enclosure from left-to-right, rear-to-front. For example, begin with slot 48 (as shown in the following diagram), continue through 59, then proceed with 36 through 47, and so on:

Figure 61: Drive Layout
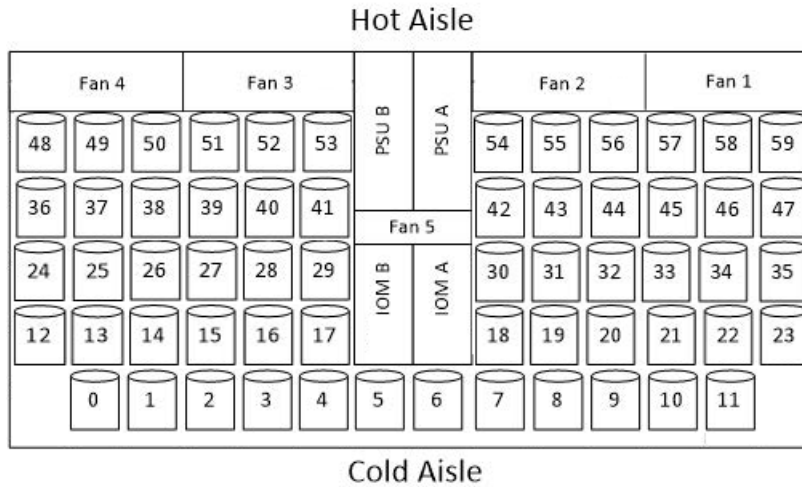
📄 **Note:** When installing drives, ensure that the LED pointer on the top of the drive carrier points toward the front of the enclosure, as shown in the following image:

Figure 62: LED Pointer Orientation
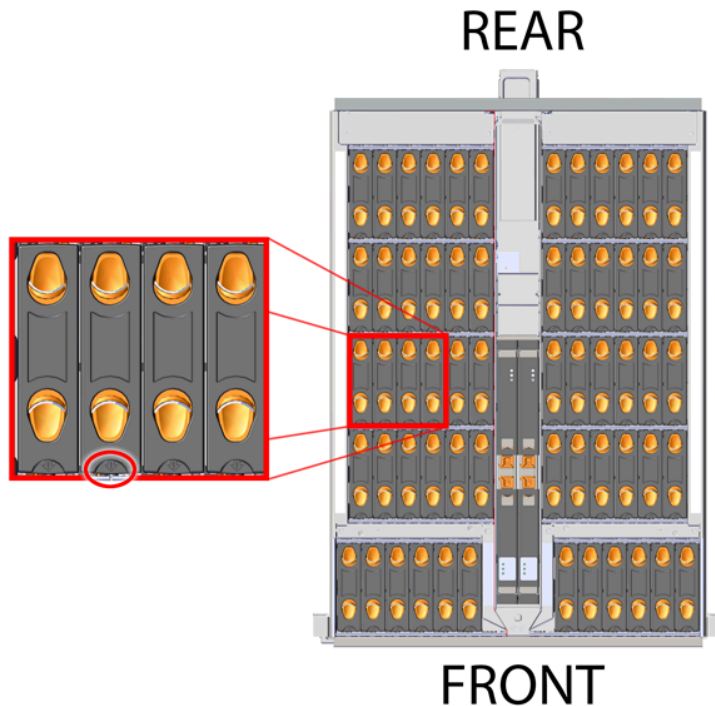
Step 6 : Install each drive in the place it was removed from by following the labels or marks that were added earlier.

Step 7 : Align the drive with the empty slot that will receive it. Lower it into the slot, ensuring that it stays level and does not bind.

Figure 63: Inserting a 3.5in HDD Assembly
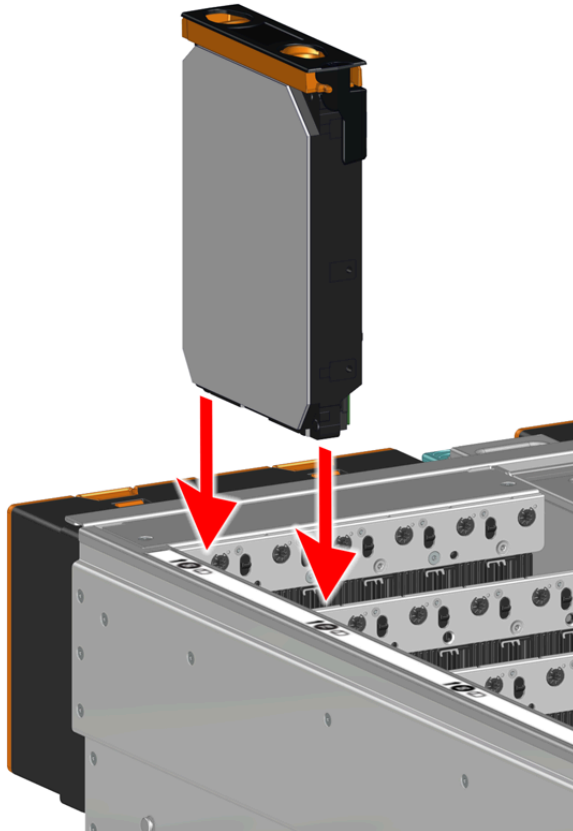
Step 8 : Lower the drive until the spring-loaded posts on the carrier contact the top edges of the drive slot. This is an intermediate position; the drive assembly will be fully seated later on.

Figure 64: Intermediate Install Position
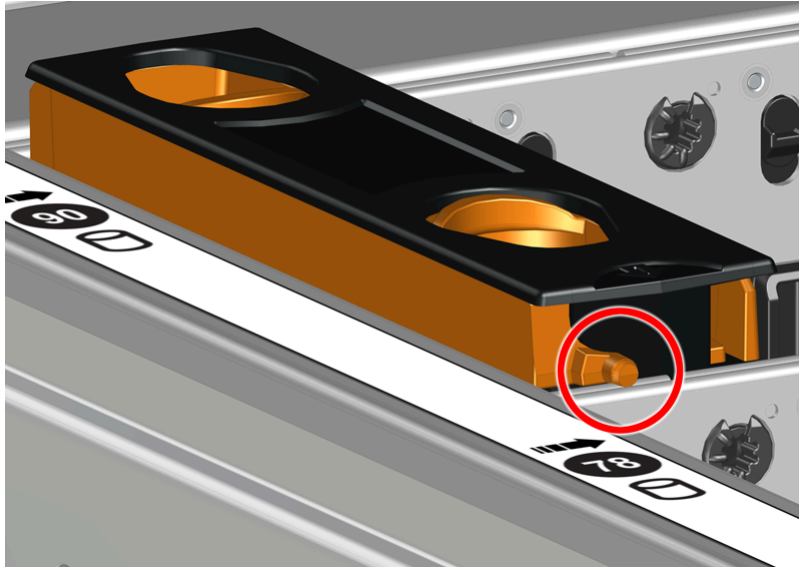
Step 9 : Repeat this intermediate installation for the remaining drive assemblies, populating the enclosure from left-to-right, rear-to-front. For example, begin at drive slot 90 and proceed through 101. Then continue with 78 through 89, and so on.

Figure 65: Populating the Enclosure
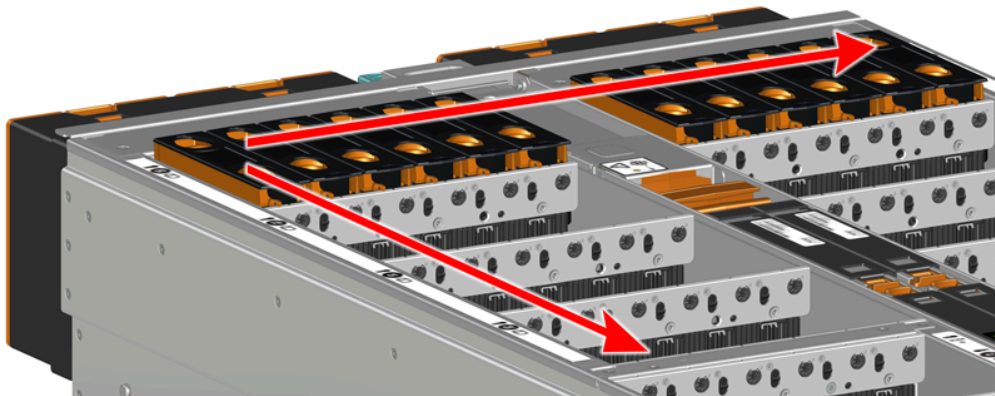
Step 10 : Returning to the first drive assembly, pinch the latch release and carefully press downward to fully seat the 3.5in HDD Assembly into the drive slot. As the drive mates with the enclosure connector, release the orange latch making sure that the latch pins on the drive seat correctly into the grommets on the drive dividers.

Figure 66: Seating the 3.5in HDD Assembly
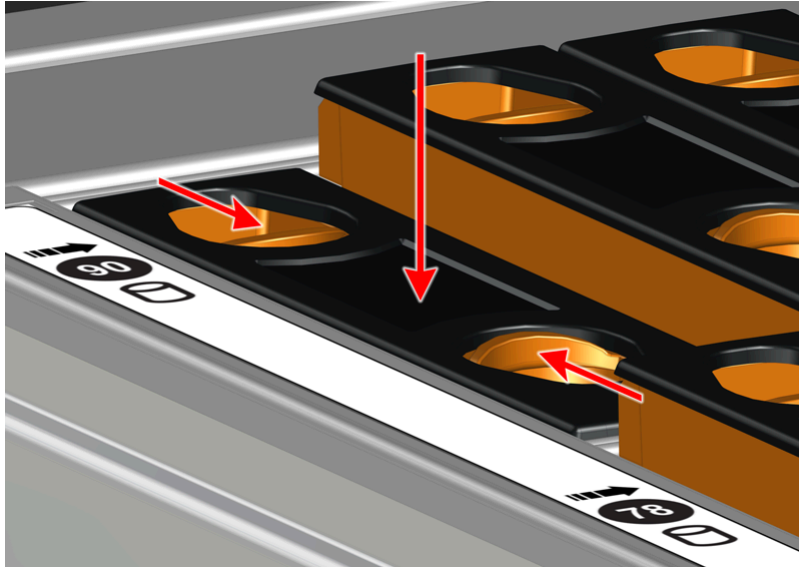
Figure 67: Grommet and Latch Pin Identification
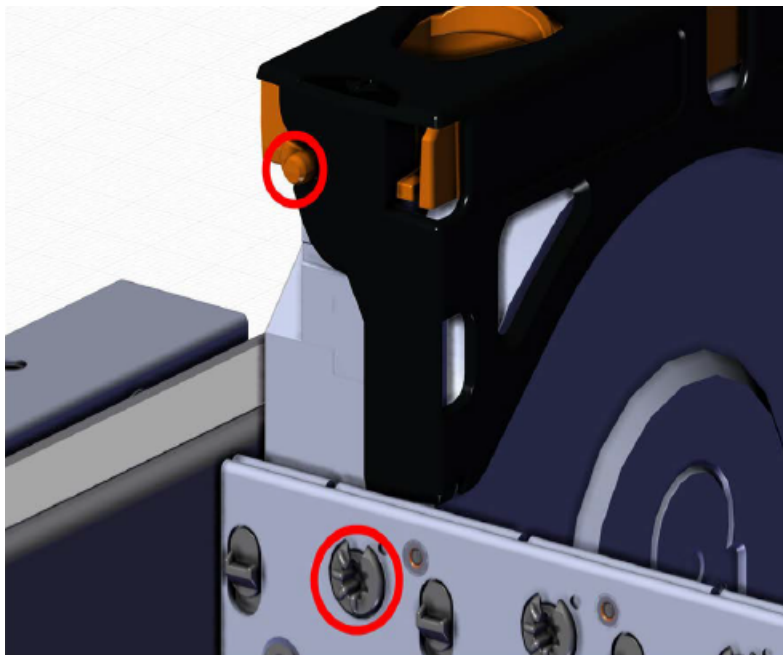
Step 11 :   View the enclosure from the side to make sure all drive assemblies are flush.

Figure 68: Verify Drive Assemblies Flush
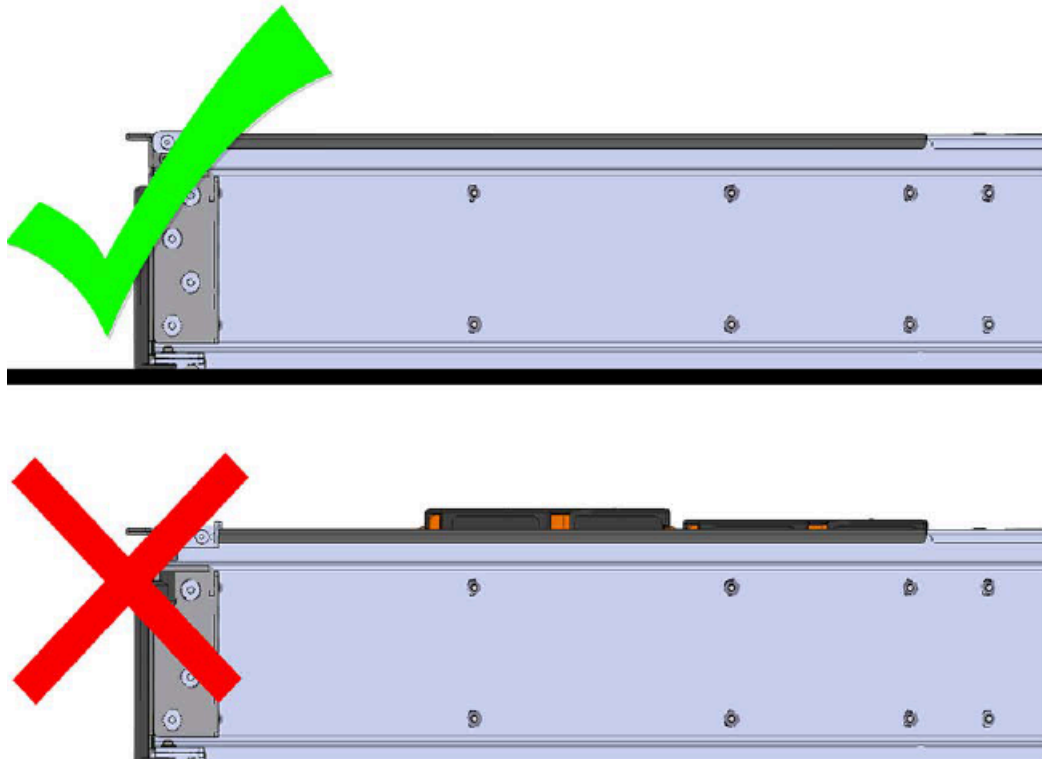
Step 12 : Repeat this action to fully install the remaining drive assemblies in the same order, from left-to-right, rear-to-front.

Step 13 : Push the enclosure back into the rack to ensure proper cooling.

3.7 CMA Replacement

Replacement Requirements	
Personnel Required	1
Avg. Replacement Time	15m
Max Replacement Time	

Tools	Required / Recommended
# 2 Philips Screwdriver	Required
Cable Ties (for configurations with greater than 10 total cables)	Recommended
Tape Measure	Recommended
Low-Profile M4 x 3.2mm Philips screws	Recommended

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 69: Unlatching a CMA Connector
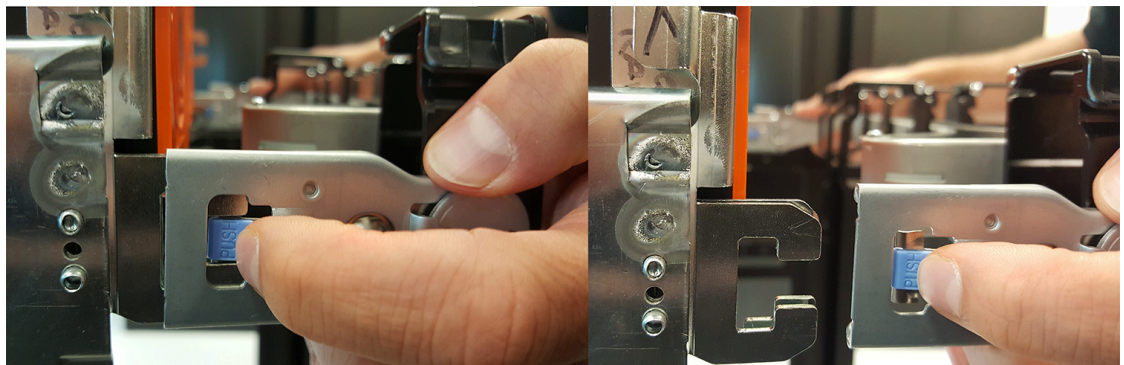
   b. Swing the CMA(s) away from the enclosure.

   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 mechanism from both power cords.

Figure 70: Clip-Style Cable Retention
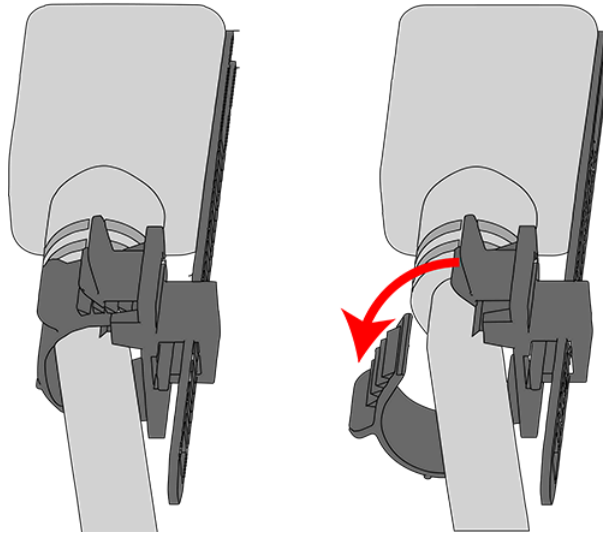
Figure 71: Strap-Style Cable Retention
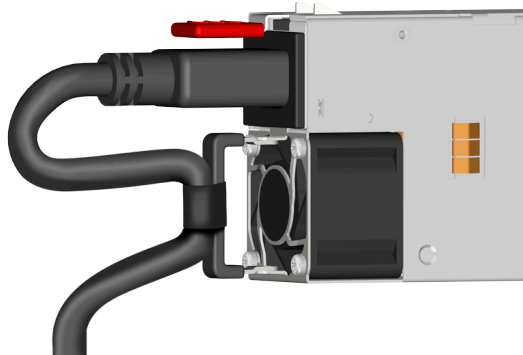
c. Power down the enclosure by disconnecting both power cables, one from each PSU.

Step 3 : Disconnect the remaining cables from the enclosure.

Step 4 : Uncable the CMA(s).

a. Open all of the baskets on the CMA.
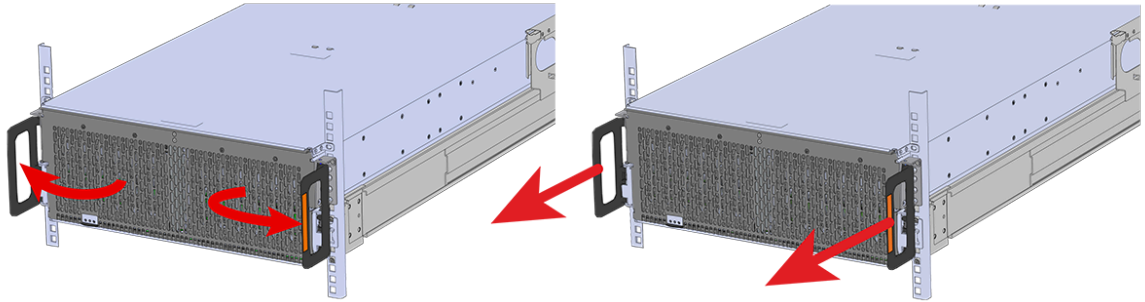
Figure 72: Open Baskets
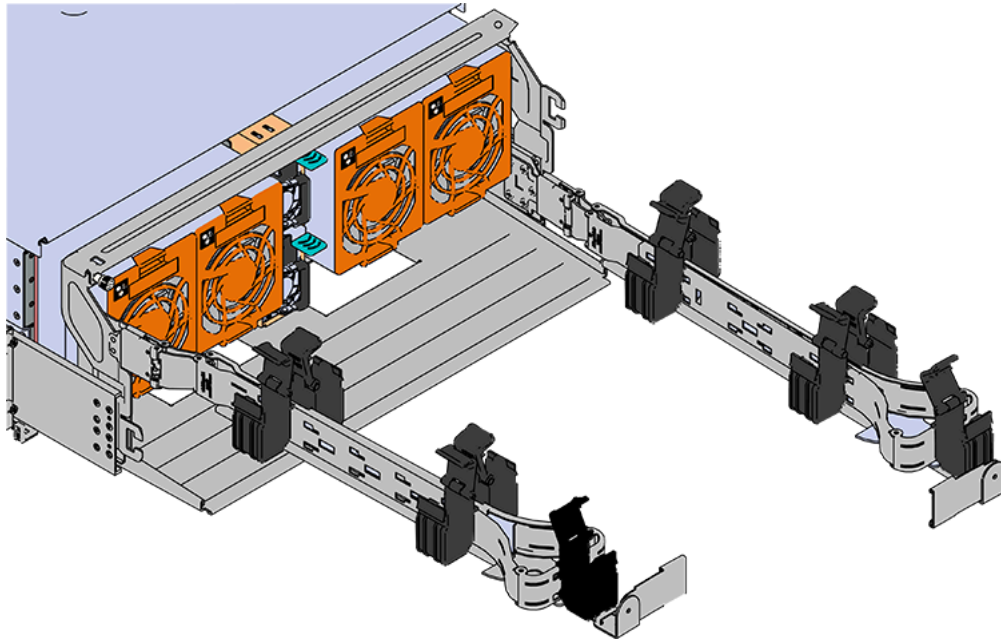
    b. Remove one cable from the CMA at a time making sure not to put too much strain on the arm.

    c. Repeat these steps to remove the cables from the second arm.

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 73: Unlatching a CMA Connector
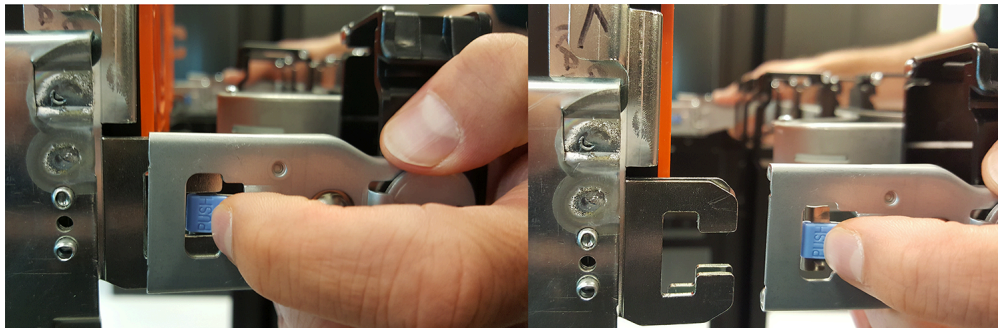
Step 6 : Grasp both handles at the front of the enclosure and pull with even pressure to extend the chassis out of the rack until it is stopped by the safety latches. The safety latches will prevent the enclosure from coming out of the rack completely and the cover will remain in the rack attached to the rear alignment brackets.

Figure 74: Chassis Handle Operation

Step 7 : Follow these steps to remove a 3.5in HDD Assembly.

    a. Find the latch release mechanism on the 3.5in HDD Assembly being removed.

    b. Insert a finger and a thumb into the latch release and pinch to unlatch the 3.5in HDD Assembly.

Figure 75: Unlatch Drive Carrier (IOM Not Shown)
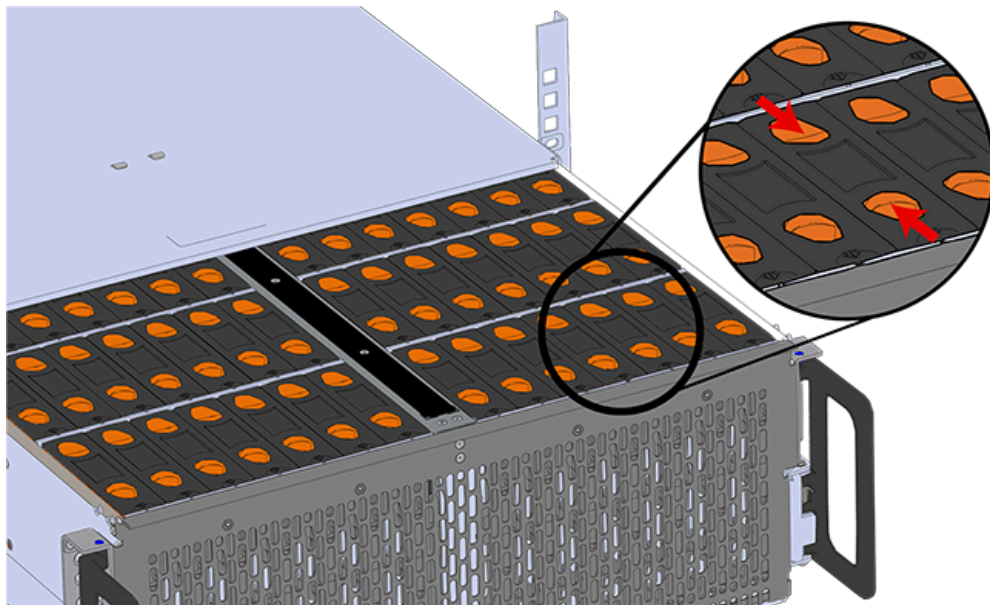
    c. Lift the 3.5in HDD Assembly free from the enclosure.

Figure 76: Removing 3.5in HDD Assembly
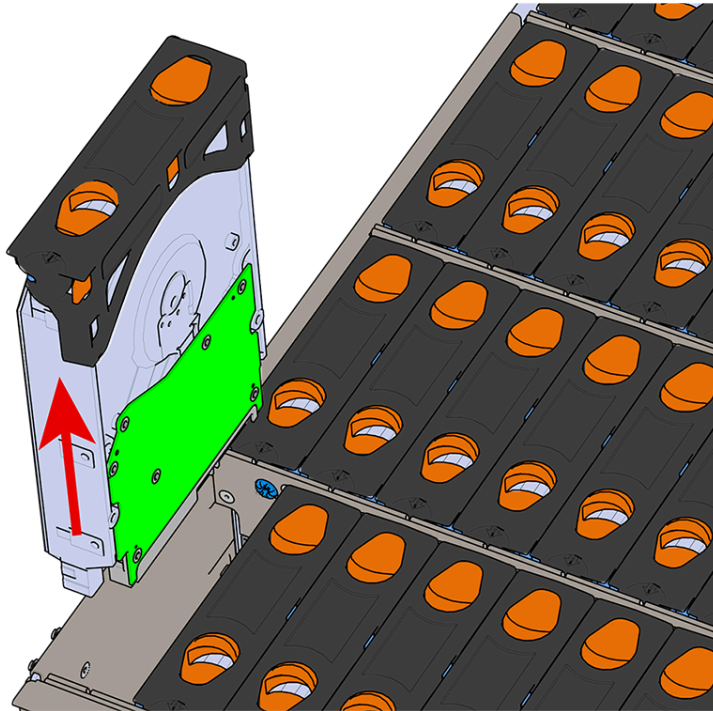
Step 8 : Follow the previous step for each drive in the enclosure. Attach a label or mark the drives with the drive slot they were removed from in order to add them to the same slot in the future. Store the drives in an ESD safe location until the drives are ready to be installed back into an enclosure.

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

Figure 77: Inner Rail Safety Latch Release

Step 10 : 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 78: 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.
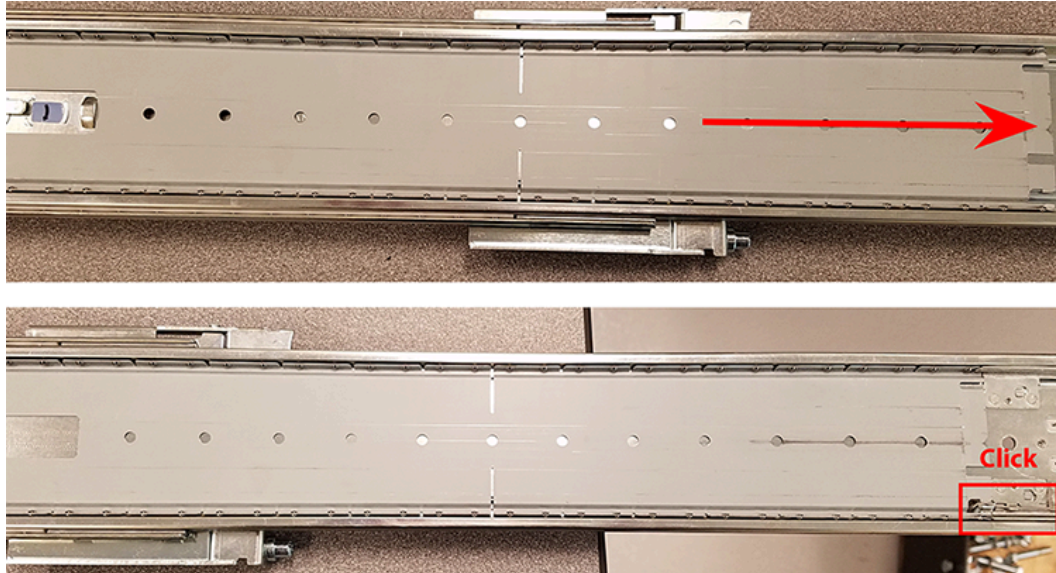
> ⚠️ **Warning:** Do not lift the chassis by the Cable Tray while removing the chassis from the rack OR while installing it into a rack. This can cause serious damage to the unit or serious bodily harm to those handling the unit. Always team lift the chassis by gripping the underside of the unit, and 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 : 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 79: 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.
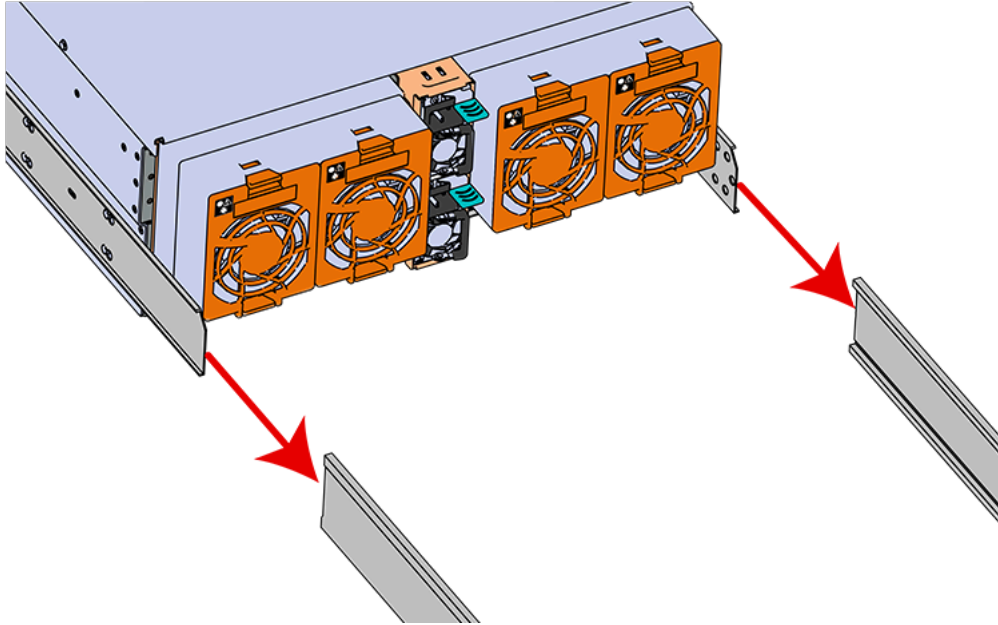
⚠️ **Warning:** The handles on the front of the chassis are not intended to be used to support the weight of the Ultrastar Data60 . Lifting the unit by the chassis handles or trying to support the unit on the handles can cause them to fail. This can cause serious damage to the unit or serious bodily 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).
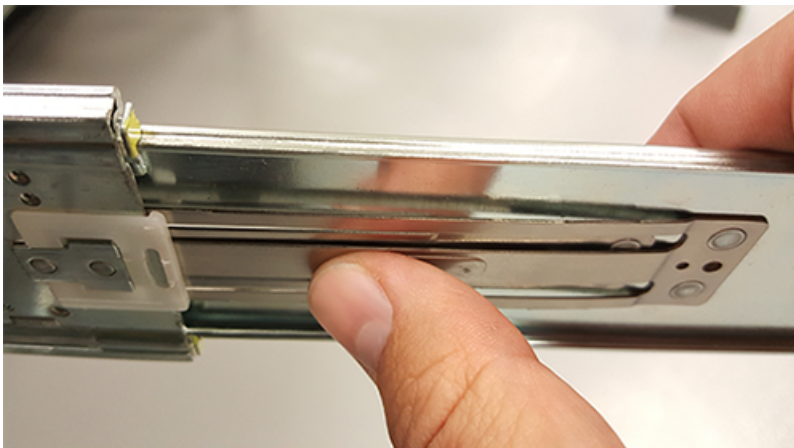
c. Team-lift the enclosure until the inner rails (which are attached to the chassis) align with the extended mid-rails (which are attached to the rack), and guide the inner rails on the chassis to mate with the rack rails.

Figure 80: 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 81: 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.
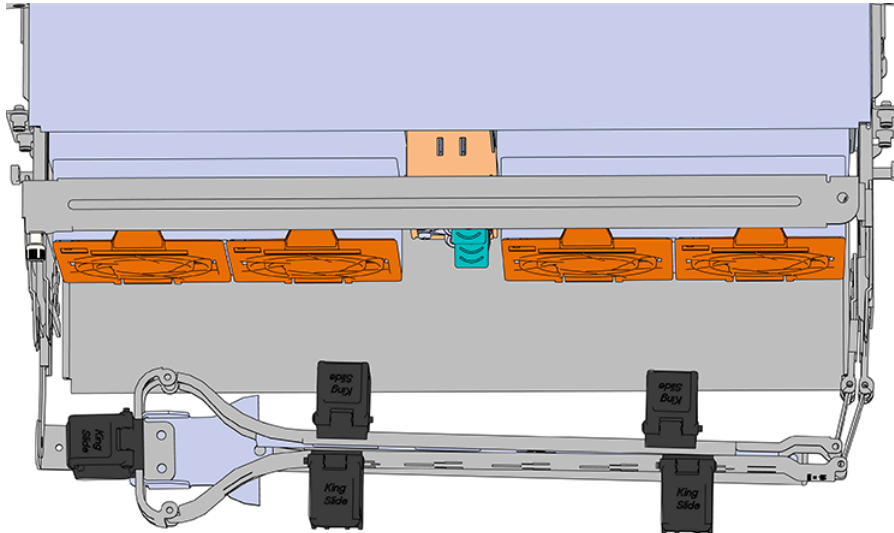
Step 12 : Install the CMA(s).

> **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 82: Lower CMA Orientation

c. Slowly slide the enclosure forward to ensure the arm is operating properly, then slide it back into the rack.

d. **CMA Standard:** Repeat these steps to install the upper arm with the elbow facing to the right.

Step 13 : 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:
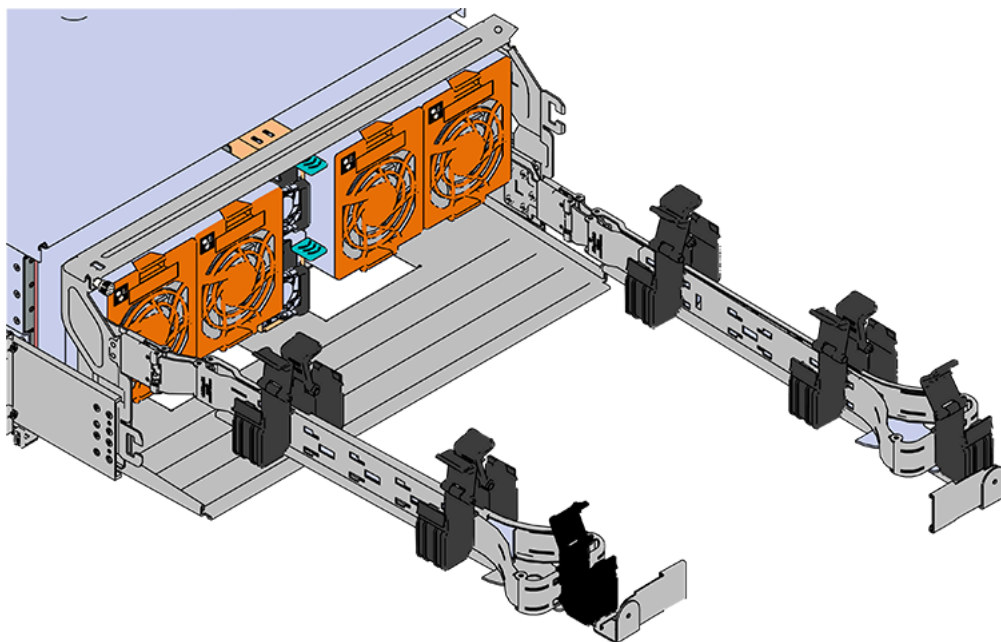
> **Note:** Route the cables supported by the lower arm to IOM A (left hand side looking at the rear). Second, route the cables supported by the upper arm to IOM B (right hand side looking at the rear) in a "criss-cross" pattern. See the Special Considerations for Cable Routing *(page 178)* for more information.

Figure 83: CMA Cable Routing
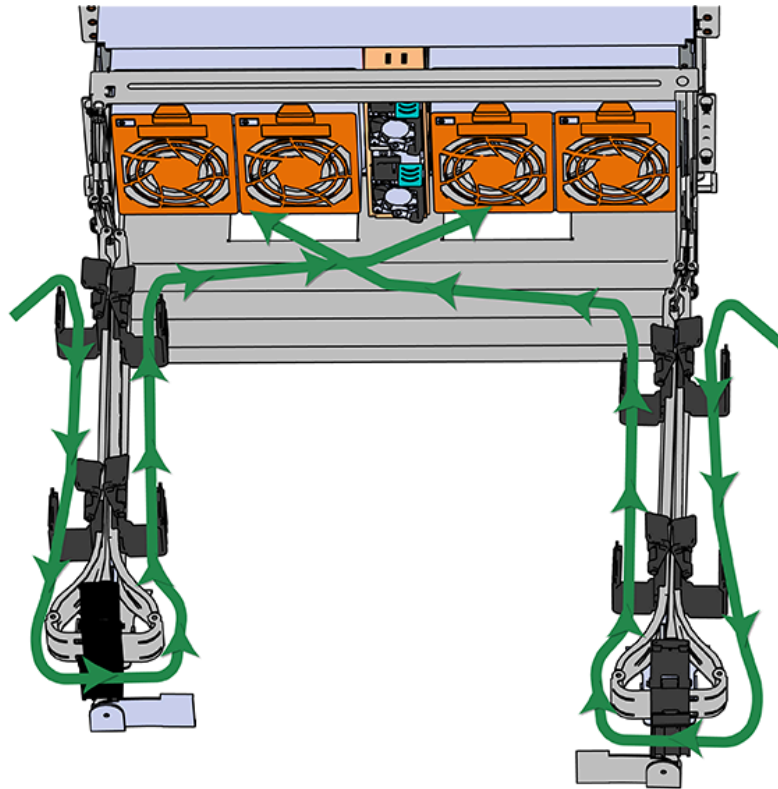
c. Open all of the baskets.

Figure 84: 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.

> **ⓘ** **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. Attach the cable retention mechanism.

For PSUs with the clip-style retention mechanism, loop the clip around the power cable and pinch it until the clip catches and locks in place. Then slide the clip forward until it stops near the cable connector.

Figure 85: Clip-Style Cable Retention
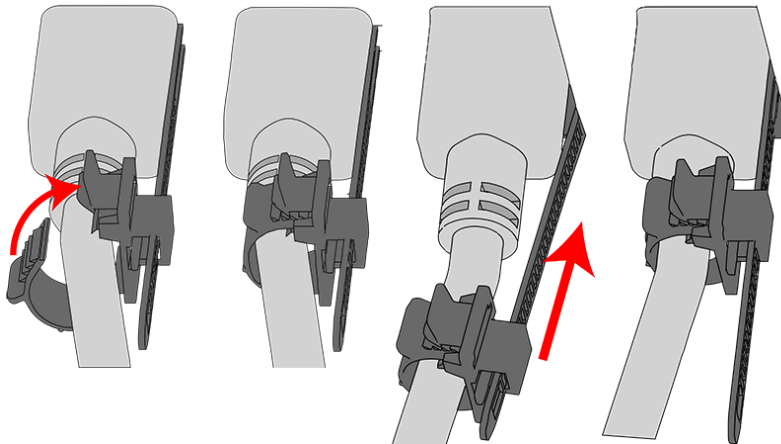
For PSUs with the strap-style retention mechanism, secure the power cable to the PSU handle with the hook-and-loop strap as shown in the following image.

Figure 86: Strap-Style Cable Retention
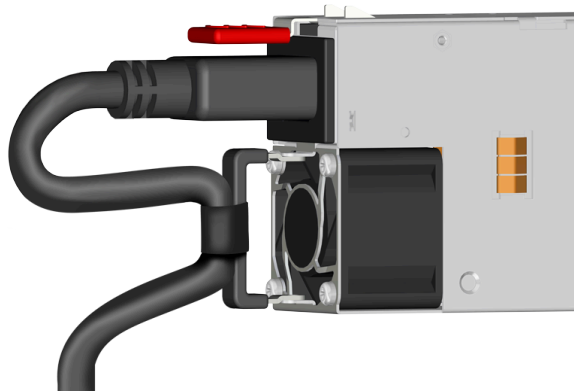
h. Route the power cable through each basket.

i. If the installation includes more than 10 total cables, follow the recommendations in Special Considerations for Cable Routing *(page 178)*, before proceeding.
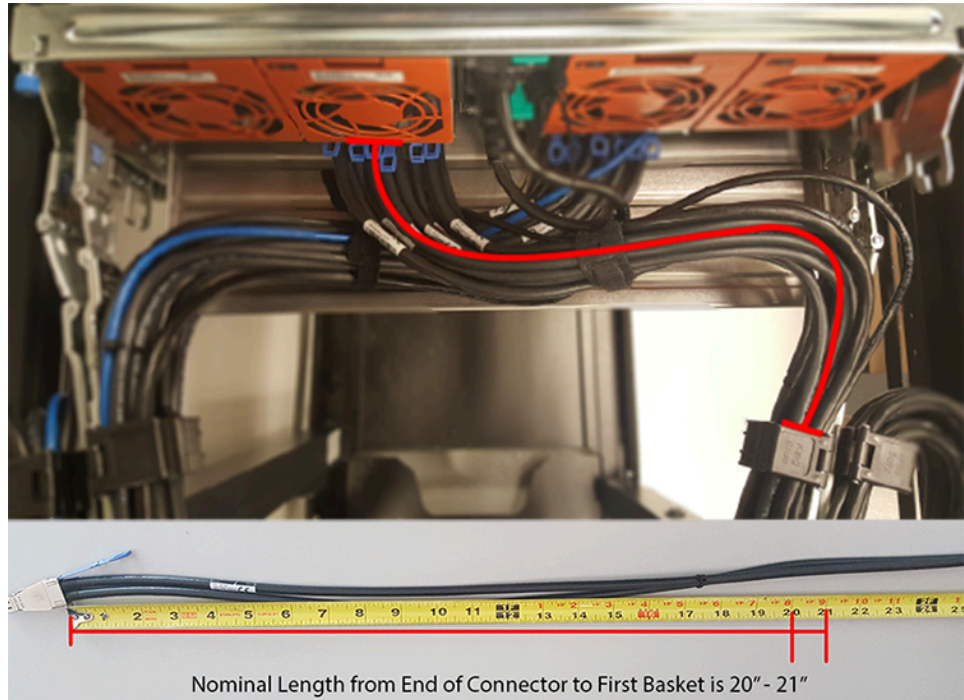
> 📄 **Note:** Each cable must be given enough slack at the connector end to operate smoothly. Allow 20 - 21 in. (508 – 533.4 mm) between the connector and the first basket.

Figure 87: Nominal Cable Length at Connectors

Nominal Length from End of Connector to First Basket is 20"- 21"

j. Close all of the baskets.

k. 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.

l. Reconnect the arm at the elbow to the connectors on the rail.

Step 14 : 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 15 : 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 16 : 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 88: Cover Retention Screws
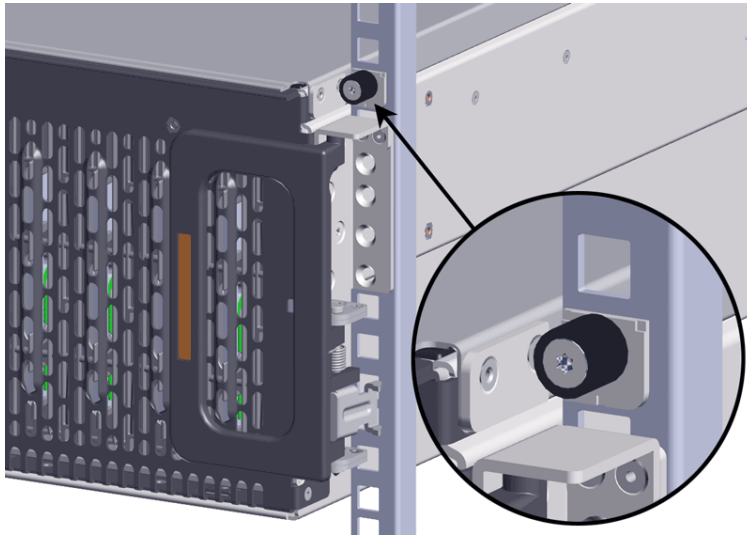
Step 17 : Now that the chassis is installed, test the installation by sliding the enclosure in and out of the rack a minimum of three times. If the enclosure binds, catches, or displays any incorrect motion or behavior repeat the installation.

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

Step 18 : 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 89: Chassis Handle Operation
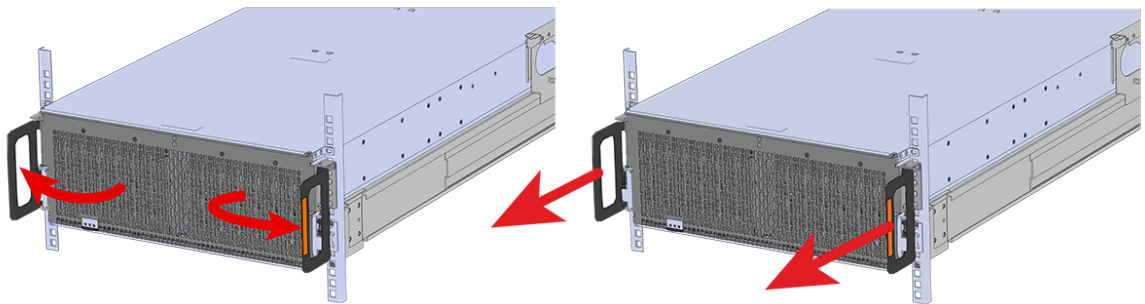
Step 19 : Perform this same action two more times without the drives loaded to make sure the rail kits are installed properly.

Installing the 3.5in HDD Assembly

Note: When installing drives, populate the enclosure from left-to-right, rear-to-front. For example, begin with slot 48 (as shown in the following diagram), continue through 59, then proceed with 36 through 47, and so on:

Figure 90: Drive Layout
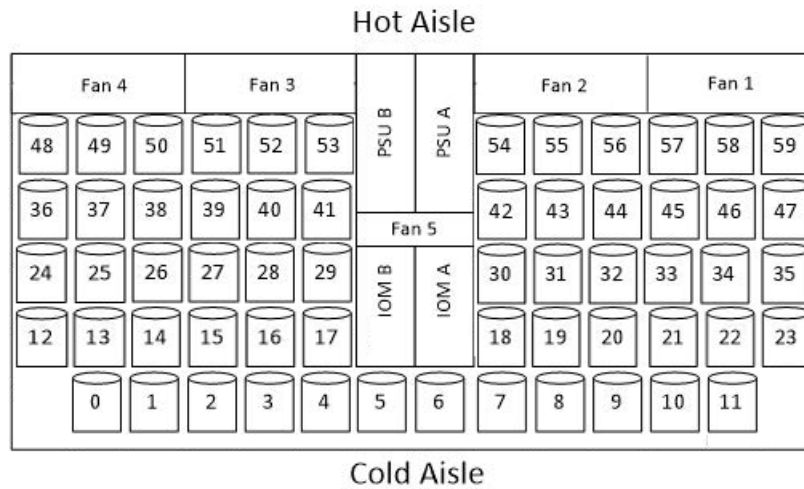
Note: When installing drives, ensure that the LED pointer on the top of the drive carrier points toward the front of the enclosure, as shown in the following image:

Figure 91: LED Pointer Orientation
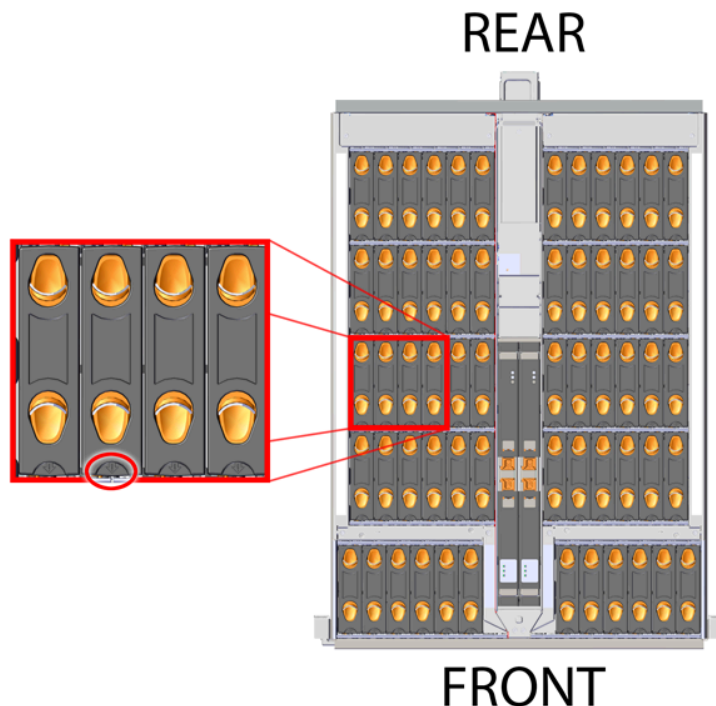
Step 21 : Install each drive in the place it was removed from by following the labels or marks that were added earlier.

Step 22 : Align the drive with the empty slot that will receive it. Lower it into the slot, ensuring that it stays level and does not bind.

Figure 92: Inserting a 3.5in HDD Assembly
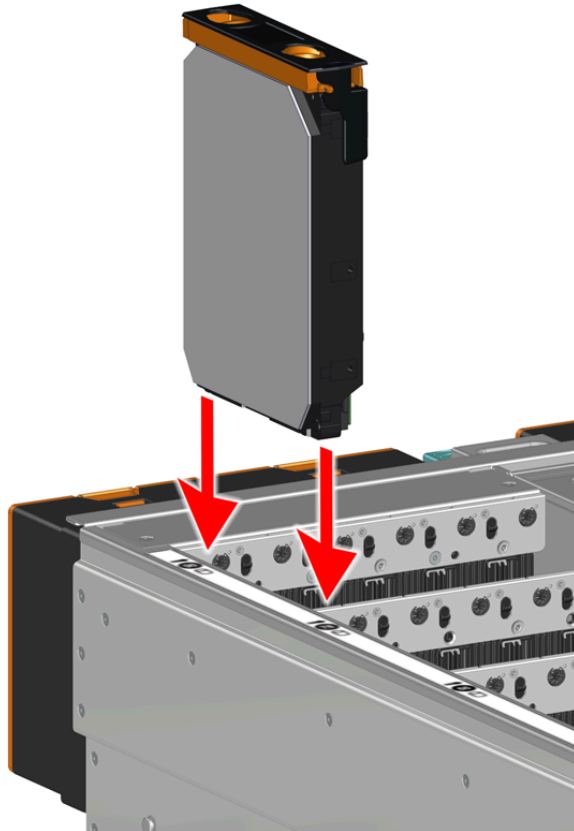
Step 23 : Lower the drive until the spring-loaded posts on the carrier contact the top edges of the drive slot. This is an intermediate position; the drive assembly will be fully seated later on.

Figure 93: Intermediate Install Position
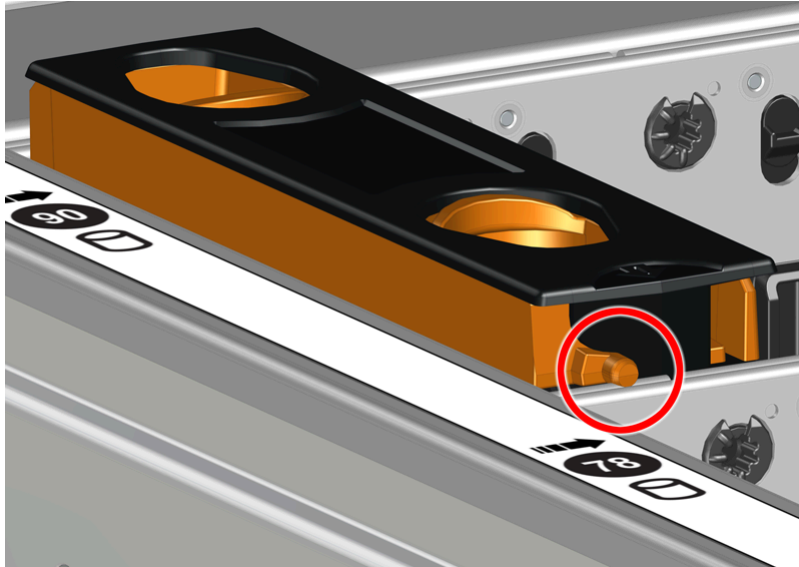
Step 24 : Repeat this intermediate installation for the remaining drive assemblies, populating the enclosure from left-to-right, rear-to-front. For example, begin at drive slot 90 and proceed through 101. Then continue with 78 through 89, and so on.

Figure 94: Populating the Enclosure
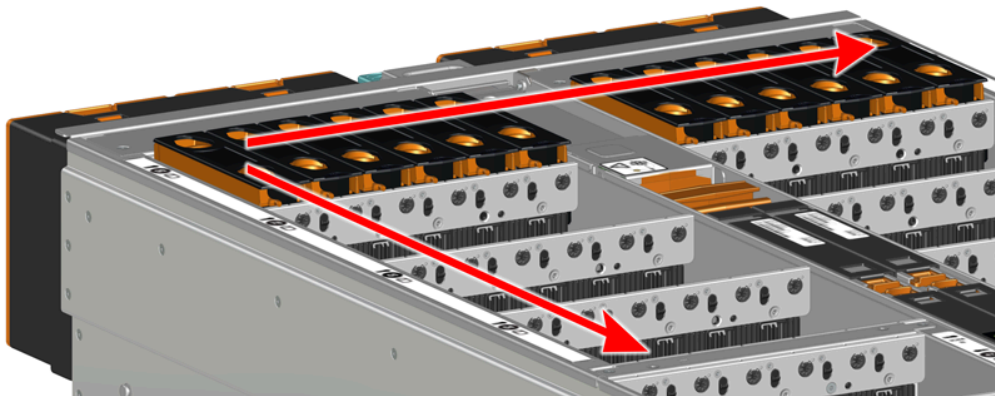
Step 25 : Returning to the first drive assembly, pinch the latch release and carefully press downward to fully seat the 3.5in HDD Assembly into the drive slot. As the drive mates with the enclosure connector, release the orange latch making sure that the latch pins on the drive seat correctly into the grommets on the drive dividers.

Figure 95: Seating the 3.5in HDD Assembly
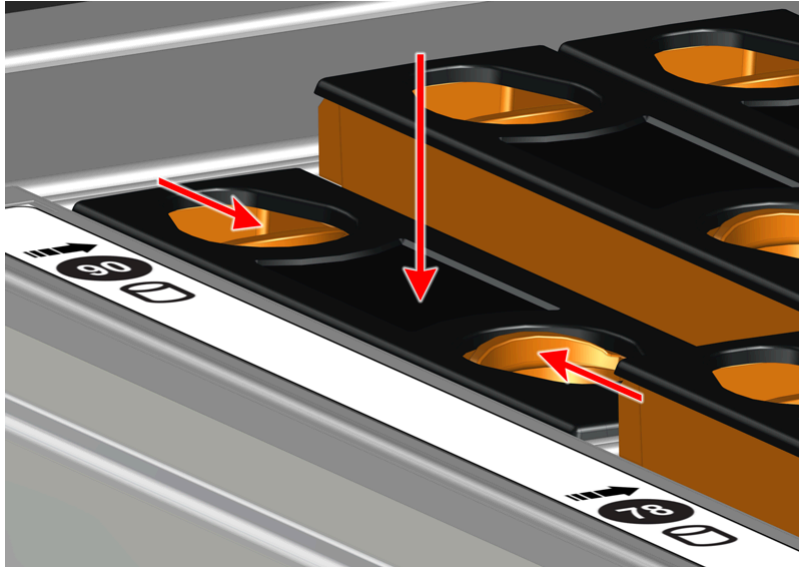
Figure 96: Grommet and Latch Pin Identification
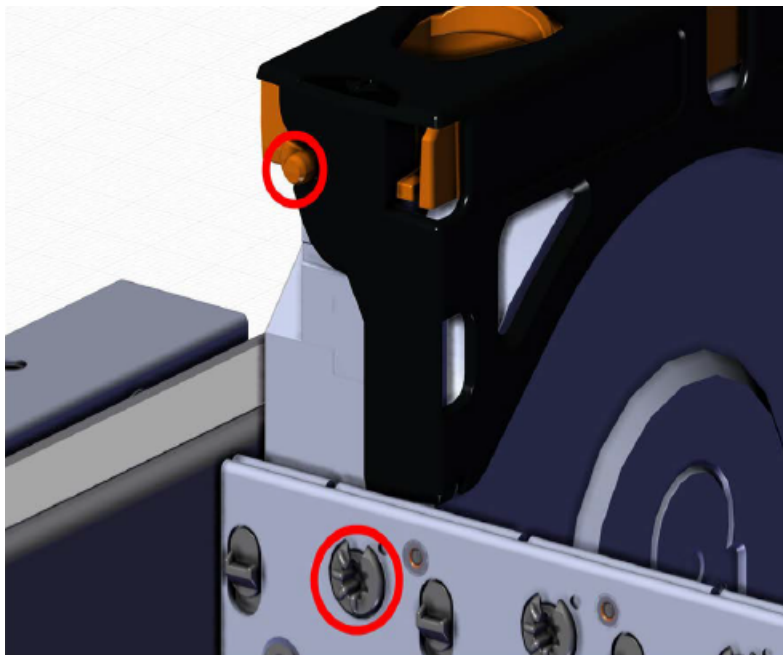
Step 26 : Repeat this action to fully install the remaining drive assemblies in the same order, from left-to-right, rear-to-front.

Step 27 : 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 28 : 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 97: Shipping Bracket Screw Locations
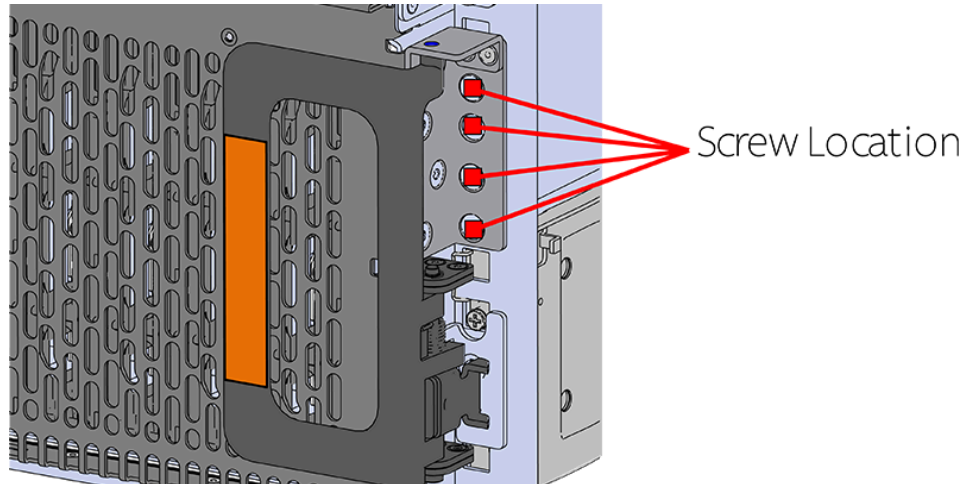
Step 29 : Plug the enclosure power cords into a PDU to power the enclosure.

Step 30 : Double check the power indicators and other LEDs to ensure that the system is booting.

3.8 Rails Replacement

Replacement Requirements	
Personnel Required	3 Total (2 for Team Lifting Purposes and 1 to Guide and Spot)
Avg. Replacement Time	~1 hr
Max Replacement Time	N/A

Tools	Required / Recommended
Long T15 Torx Screwdriver	Required
# 2 Philips Screwdriver	Required
Long T10 Torx Screwdriver	Recommended
Cable Ties (for configurations with greater than 10 total cables)	Recommended
Tape measure	Recommeded
Level	Recommeded
Option 1: M5 x 12mm T15 Flat Head Torx screws with washers **Option 2**: Toolless screwplate	Required
Low-Profile M4 x 3.2mm Philips screws (included with rail assembly)	Required
Optional (if using CMA Tray): M3 x 8mm T10 Torx screws	Recommeded

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 98: Unlatching a CMA Connector
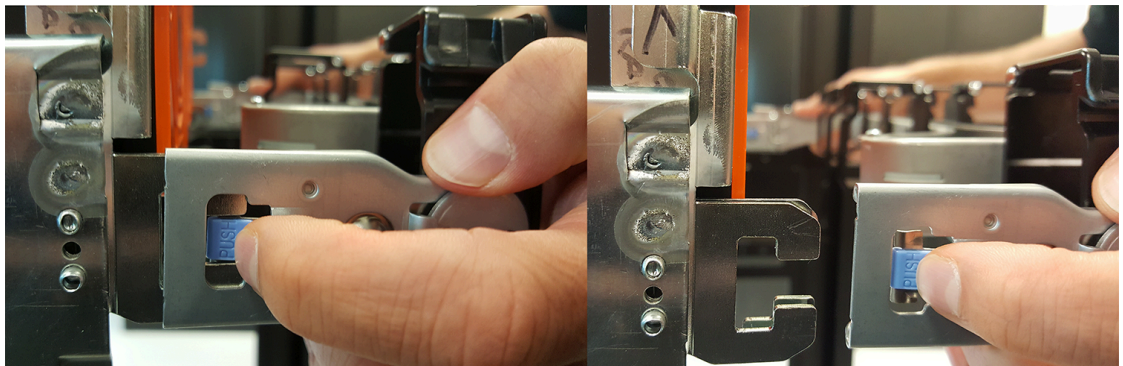
    b. Swing the CMA(s) away from the enclosure.

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

Figure 99: CMA(s) in service position (Cables not shown)
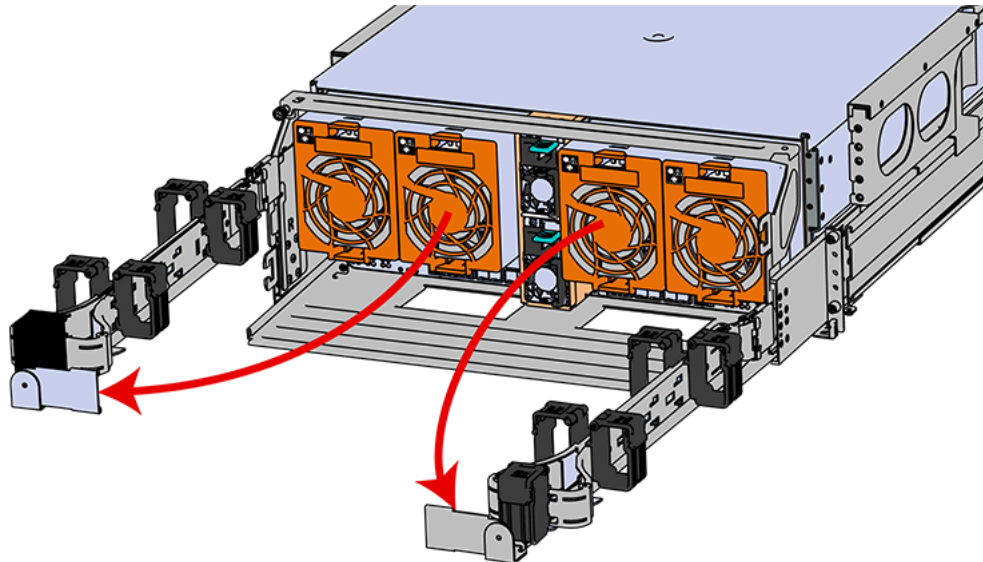
Step 2 :   Disconnect the Enclosure from power.

     a. Locate the redundant PSUs at the rear of the enclosure.

     b. Detach the cable retention mechanism from both power cords.

Figure 100: Clip-Style Cable Retention
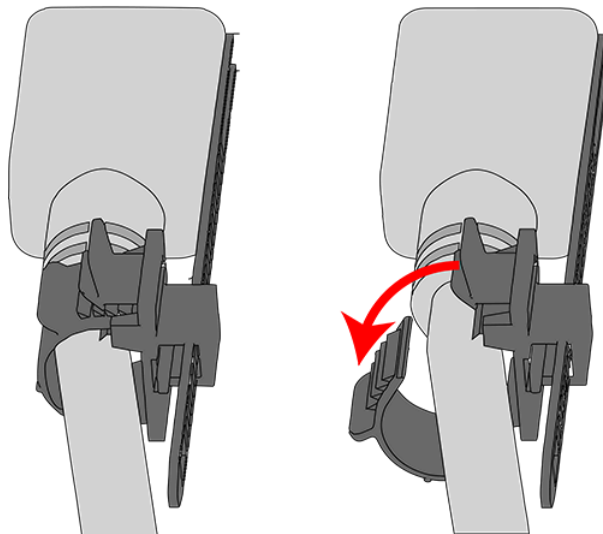
Figure 101: Strap-Style Cable Retention
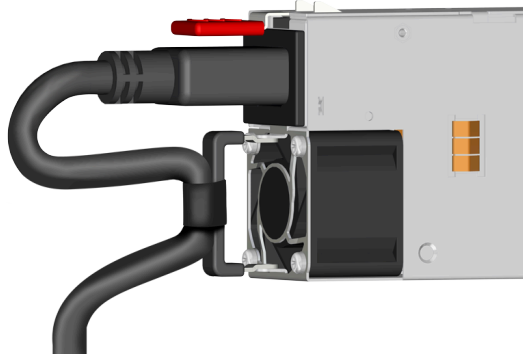
    c. Power down the enclosure by disconnecting both power cables, one from each PSU.

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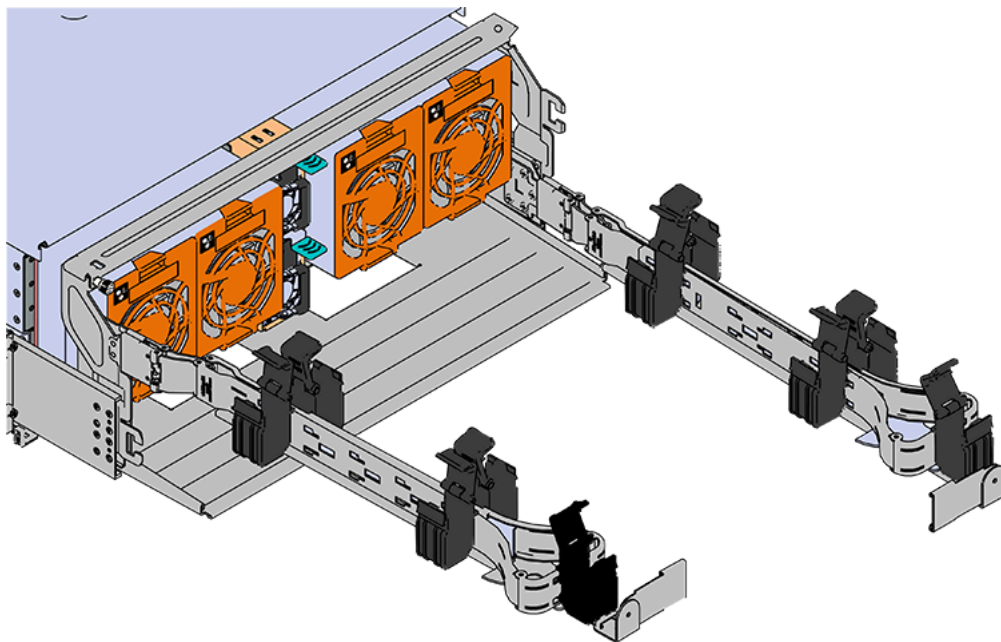
    b. Remove one cable at a time from the arm, making sure not to put too much strain on the arm.

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 103: Unlatching a CMA Connector
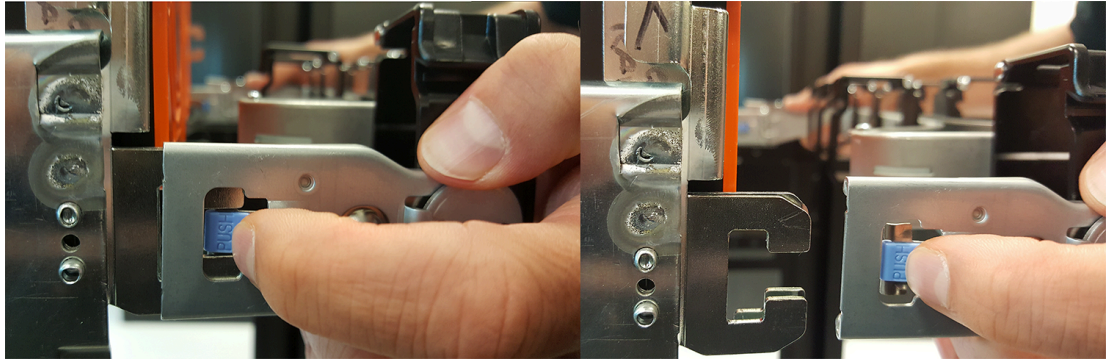
Step 7: Complete the previous step for the second CMA.

⚠ **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 104: Chassis Handle Operation
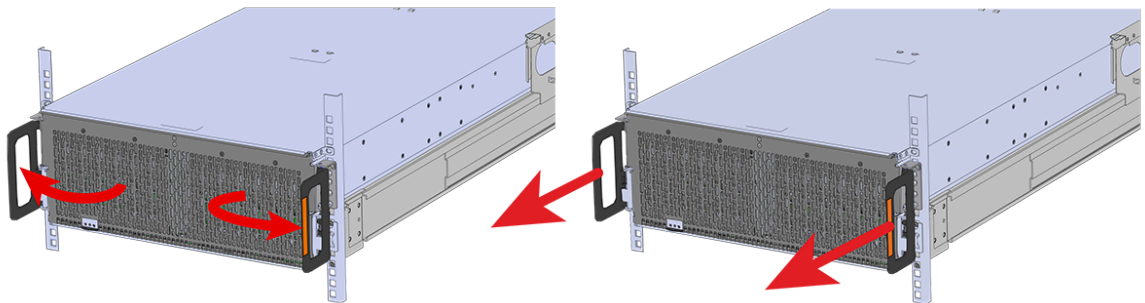
Step 9: Follow these steps to remove a 3.5in HDD Assembly.

a. Find the latch release mechanism on the 3.5in HDD Assembly being removed.

b. Insert a finger and a thumb into the latch release and pinch to unlatch the 3.5in HDD Assembly.

Figure 105: Unlatch Drive Carrier (IOM Not Shown)
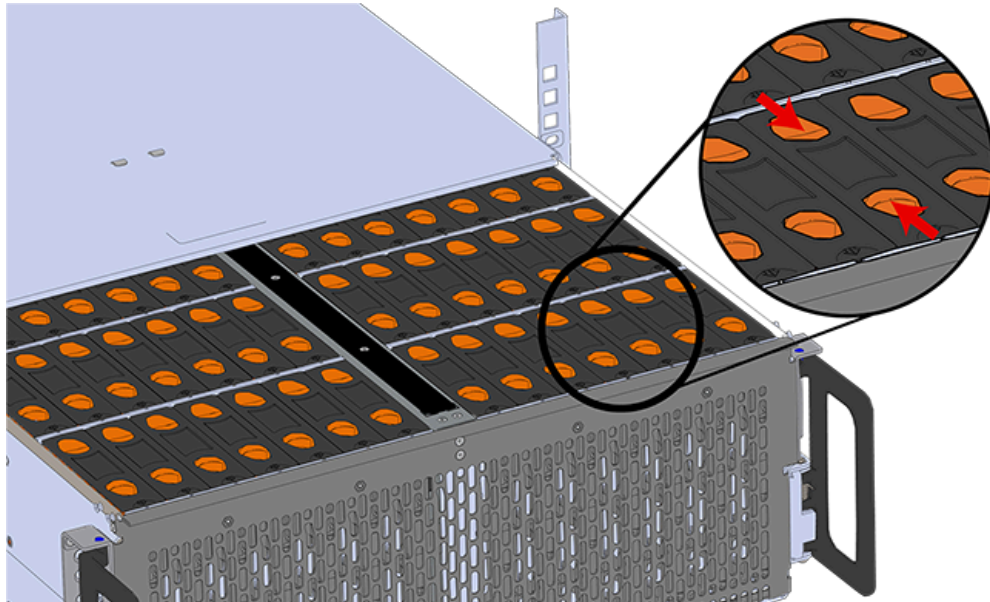
c. Lift the 3.5in HDD Assembly free from the enclosure.

Figure 106: Removing 3.5in HDD Assembly
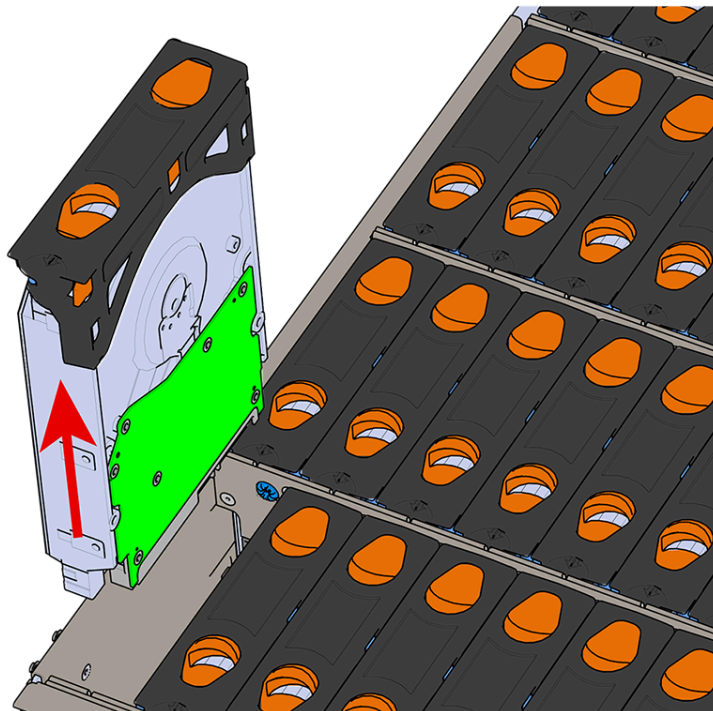
Step 10 : Follow the previous step for each drive in the enclosure. Attach a label or mark the drives with the drive slot they were removed from in order to add them to the same slot in the future. Store the drives in an ESD safe location until the drives are ready to be installed back into an enclosure.

Step 11 : Release the safety latch on the inner rails on each side of the chassis as shown in the following image.

Figure 107: 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.
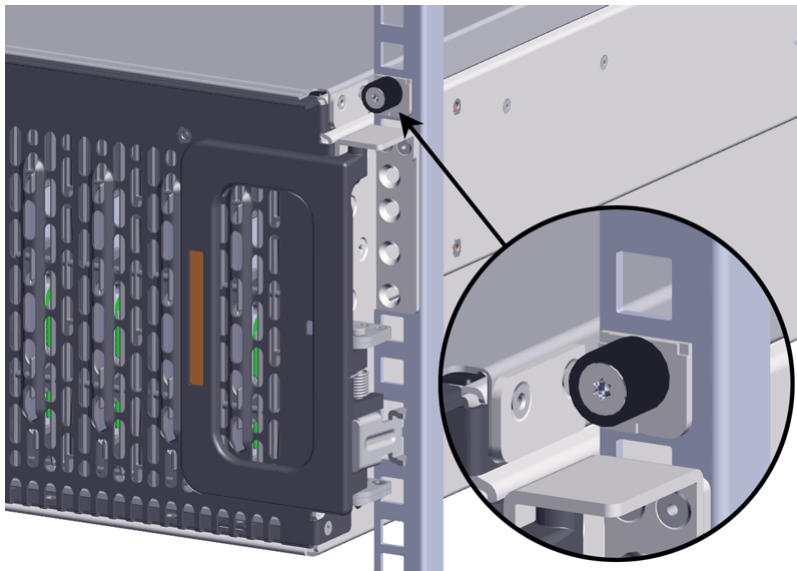
Step 14 : Remove the chassis from the rack.

    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 109: 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 110: Remove Inner Rail

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

Figure 111: Inner Rail Spring Latch
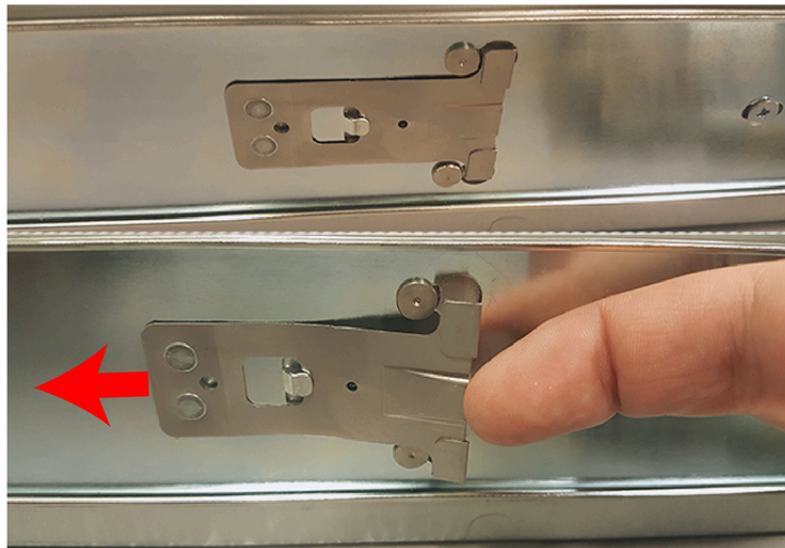
c. Slide the inner rail toward the front of the enclosure to unlock it from the pegs that secure it to the sidewall and pull it free.

Step 16 : Remove the screws that secure the alignment brackets and rails to the rack.

a. Remove the screws that secure the alignment bracket and rail to the rack. 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. The following images show two methods by which these components could be secured to the rack: individual screws (with washers) or a toolless screwplate.

Figure 112: Rear Screws Removal
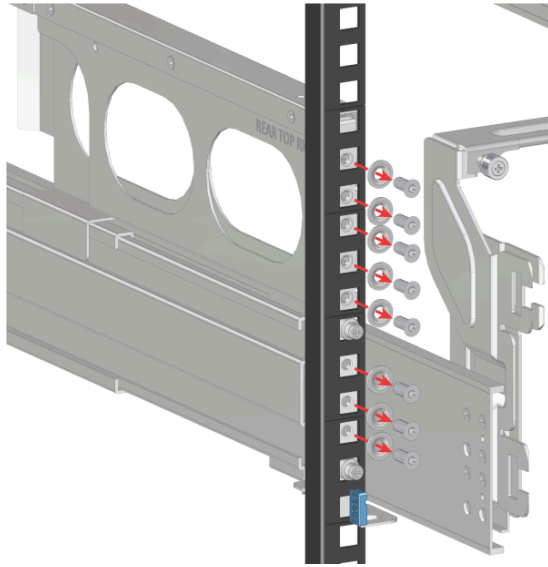
Figure 113: Rear Screwplate Removal
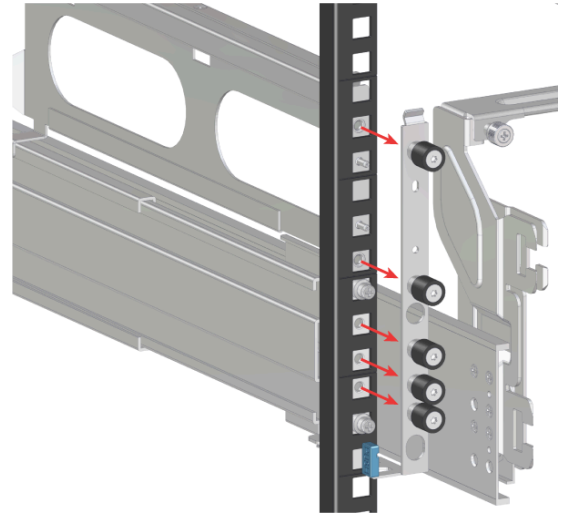
b. Move to the front of the rack and remove the three screws that hold the latch bracket to the front of the rack using a T15 Torx screwdriver. Be careful, the rack latch bracket will be free once the screws are removed. Make sure you have a solid grip on it before removing the final screw.

Figure 114: 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 115: Front Rail Release Clip Operation
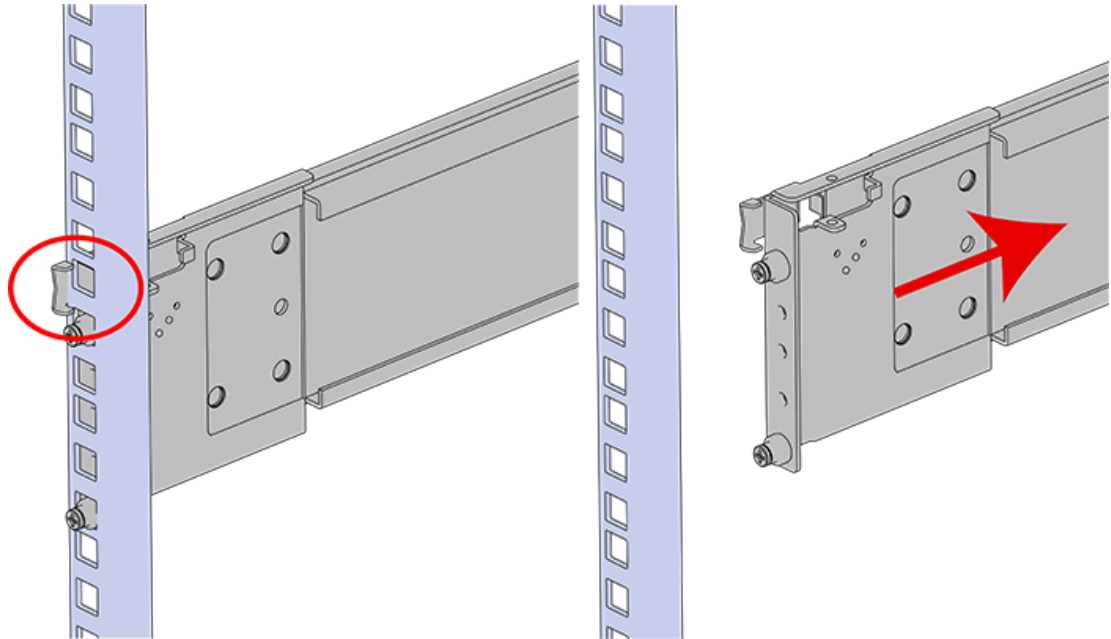
b. Press the release clip and press lightly toward the rear of the rack to compress the rail clear of the rack post.

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 116: Rear Rail Latch Release Button
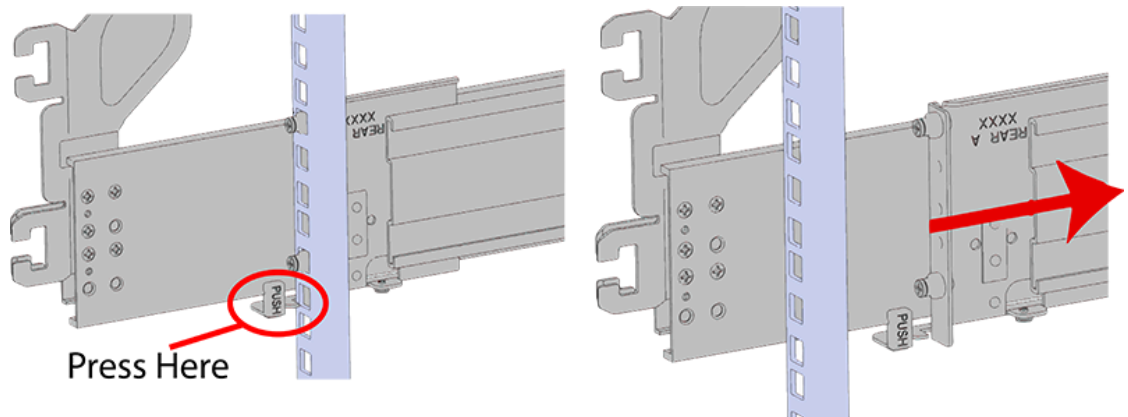
Step 18 : Gather the replacement rails and prepare to install them.

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.
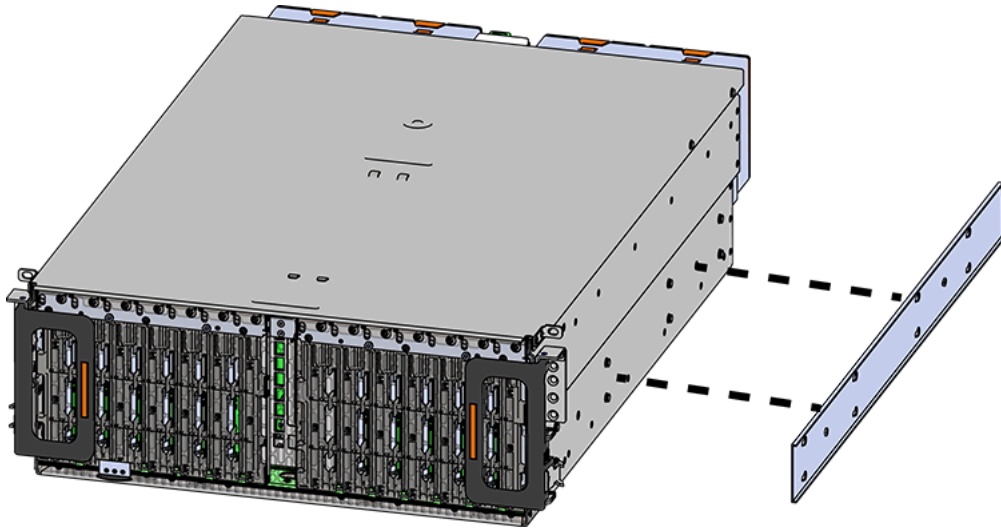
Figure 117: Rail Safety Latch
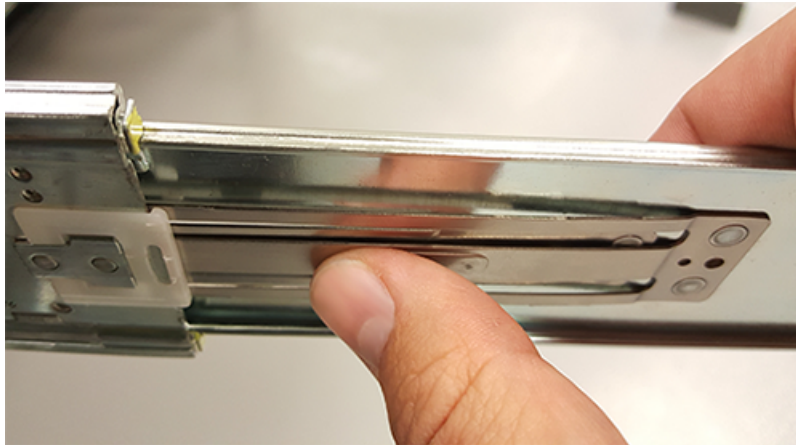
Step 20 : Install the inner rail onto the chassis making sure they are installed on the correct side. Each inner rail will read "R" for the right or "L" for the left embossed on the side that faces away from the chassis. Right and Left are with reference to looking at the front of the enclosure.

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 118: 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 119: Slide Inner Rail
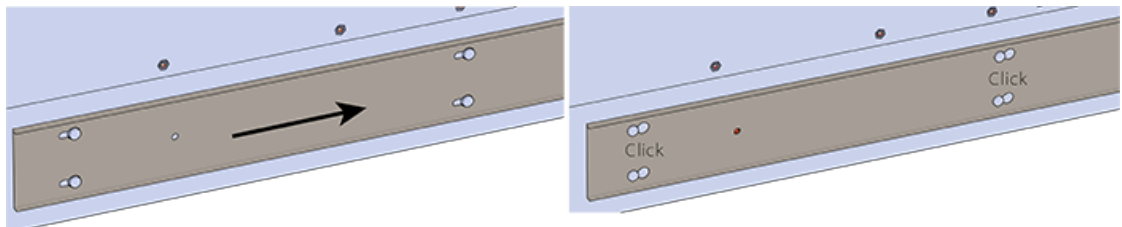
d. ⚠️ **Caution:** When installing the inner rail onto the chassis, make sure to only use the special Low-Profile M4 x 3.2mm Philips screws provided in the accessory kit with the CMA. These screws should be tightened to .90-1.12 Nm / 8-10 in-lbf using a # 2 Philips Screwdriver. These screws are specially 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 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 120: Rear Rail Latch Release Latch
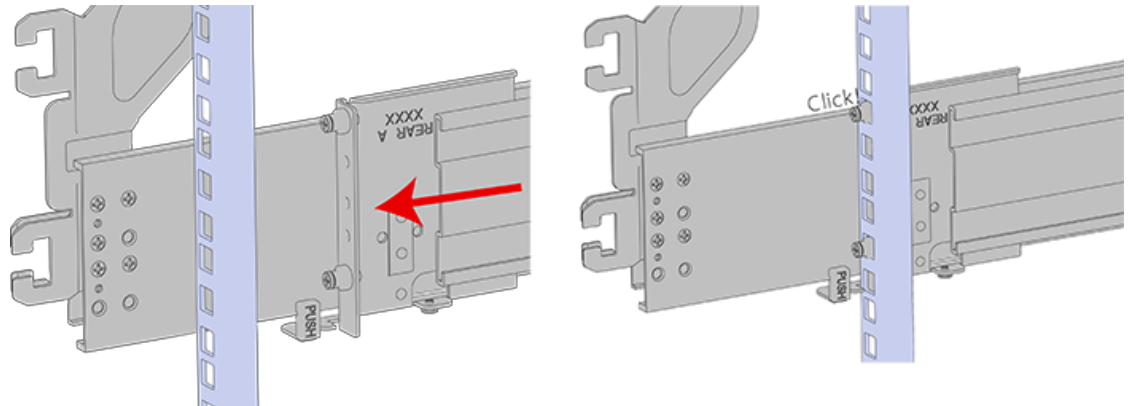
c. Align the rail on the rack posts at the U-height desired for installation. The bottom of the rail will be the lower most U of the total 4U height.

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 121: Front Rail Release Clip Operation
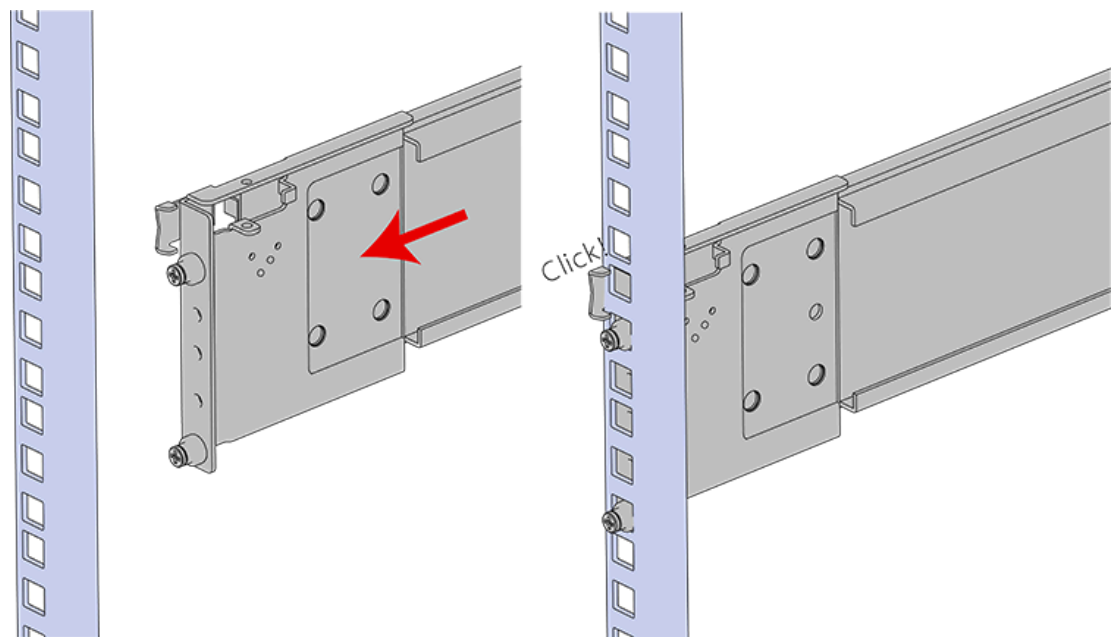
g. Use a level to make sure that the rails are aligned properly.

h. Follow these steps for the other outer rail.

Step 22 : Install the rear cover alignment brackets and secure the rear rails.

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 122: Alignment Bracket Groove (highlighted in red)
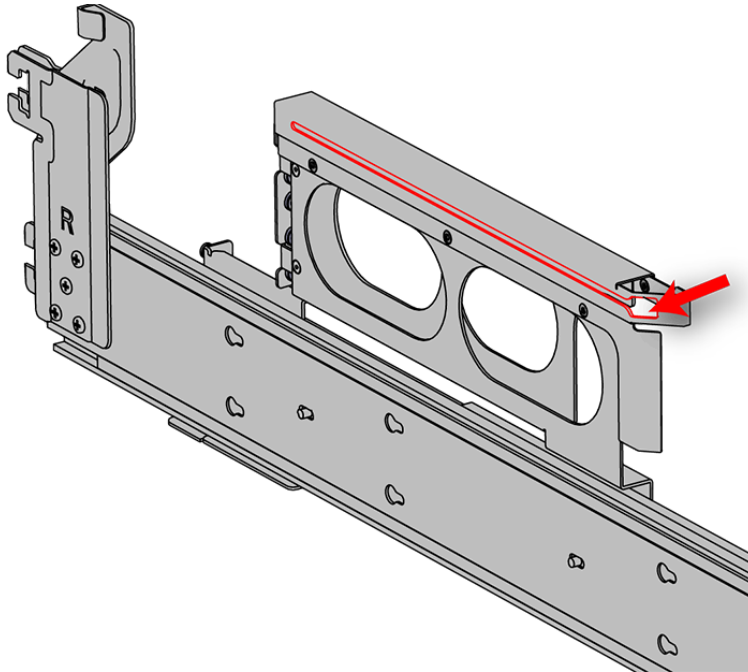
b. Attach the rear cover alignment bracket and rear rail to the vertical rack rail. The following examples show two methods for securing the bracket and rail to the rack: individual screws (with washers) or a screw plate.

Option 1: Using a Long T15 Torx Screwdriver, install M5 x 12mm T15 Flat Head Torx screws (with washers) to attach the rear cover alignment bracket. The number of required screws will vary depending on the bracket type. Install additional M5 x 12mm T15 Flat Head Torx screws (with washers) to attach the rear rail to the rack posts. Screw locations are shown in the following image. Tighten the rails screws to 3.38-3.61 Nm / 30-32 in-lbf.

Figure 123: Rear Screws Installation

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

Option2: Using a Long T15 Torx Screwdriver, install the screw plate to attach the rear cover alignment bracket and the rear rail to the rack posts. The screw locations are shown in the following image. Tighten the rail screws to 3.38-3.61 Nm / 30-32 in-lbf.

Figure 124: Screw Plate Installation

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 125: 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 126: 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 127: 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 128: 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 129: Cover Retention Screws
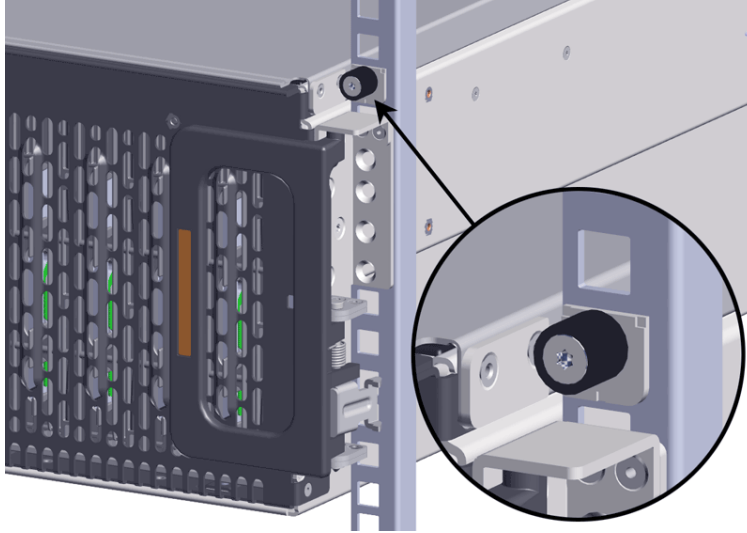
Note: If any drives were removed earlier to facilitate the removal of the chassis, follow the rest of the steps to reinstall the drives by following the labeling scheme noted earlier. If not, proceed to the cabling section.

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 130: Shipping Bracket Screw Locations
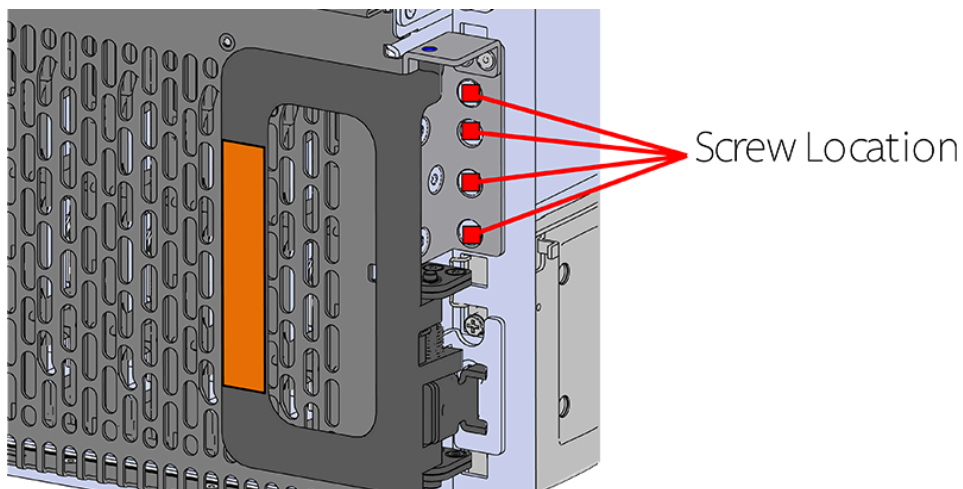
Screw Location

Installing the 3.5in HDD Assembly

Note: When installing drives, populate the enclosure from left-to-right, rear-to-front. For example, begin with slot 48 (as shown in the following diagram), continue through 59, then proceed with 36 through 47, and so on:

Figure 131: Drive Layout
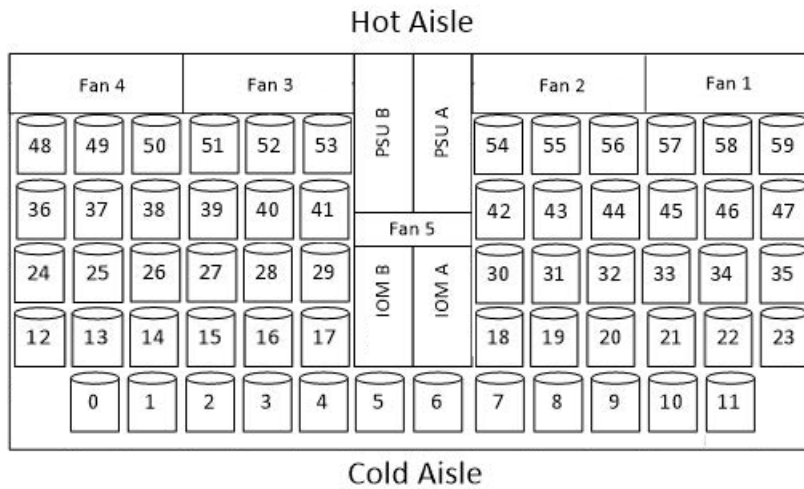
Note: When installing drives, ensure that the LED pointer on the top of the drive carrier points toward the front of the enclosure, as shown in the following image:

Figure 132: LED Pointer Orientation
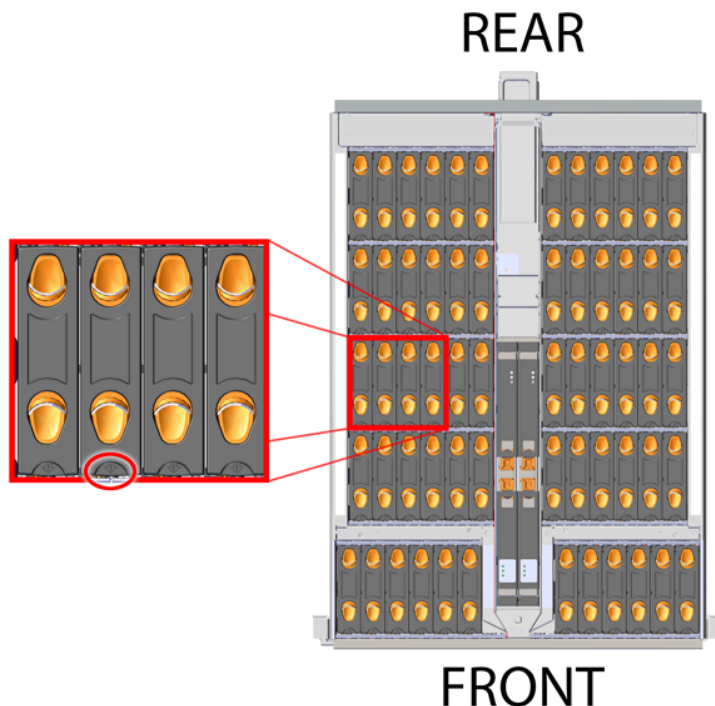
Step 28 : Install each drive in the place it was removed from by following the labels or marks that were added earlier.

Step 29 : Align the drive with the empty slot that will receive it. Lower it into the slot, ensuring that it stays level and does not bind.

Figure 133: Inserting a 3.5in HDD Assembly
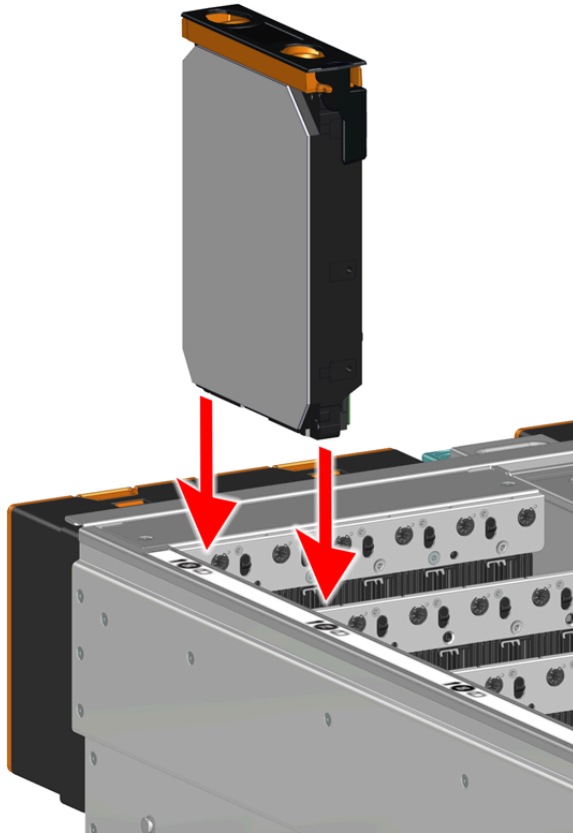
Step 30 : Lower the drive until the spring-loaded posts on the carrier contact the top edges of the drive slot. This is an intermediate position; the drive assembly will be fully seated later on.

Figure 134: Intermediate Install Position
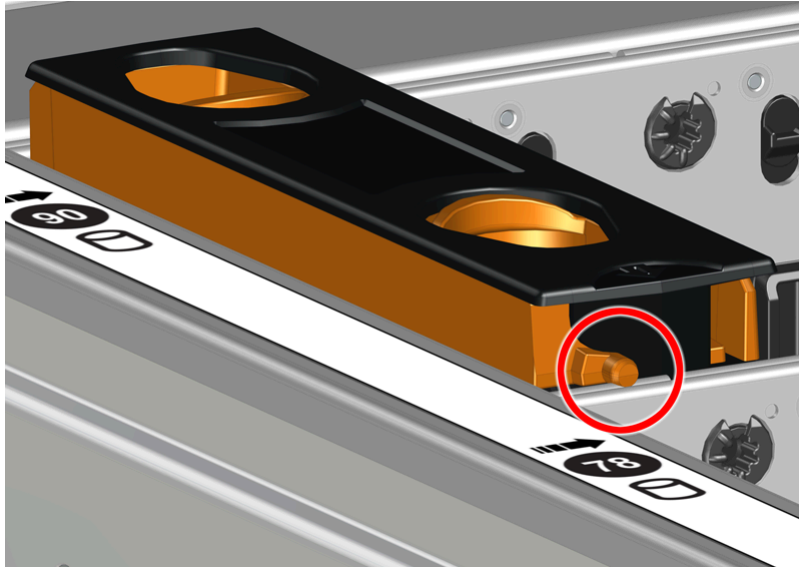
Step 31: Repeat this intermediate installation for the remaining drive assemblies, populating the enclosure from left-to-right, rear-to-front. For example, begin at drive slot 90 and proceed through 101. Then continue with 78 through 89, and so on.

Figure 135: Populating the Enclosure
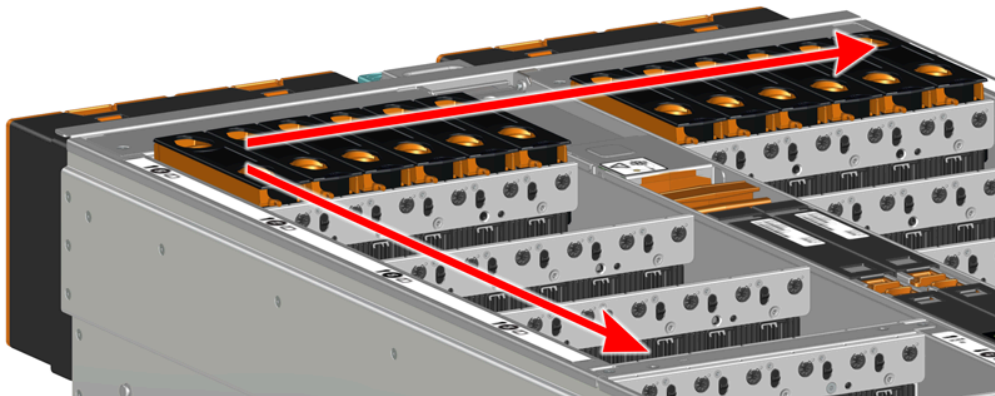
Step 32: Returning to the first drive assembly, pinch the latch release and carefully press downward to fully seat the 3.5in HDD Assembly into the drive slot. As the drive mates with the enclosure connector, release the orange latch making sure that the latch pins on the drive seat correctly into the grommets on the drive dividers.

Figure 136: Seating the 3.5in HDD Assembly
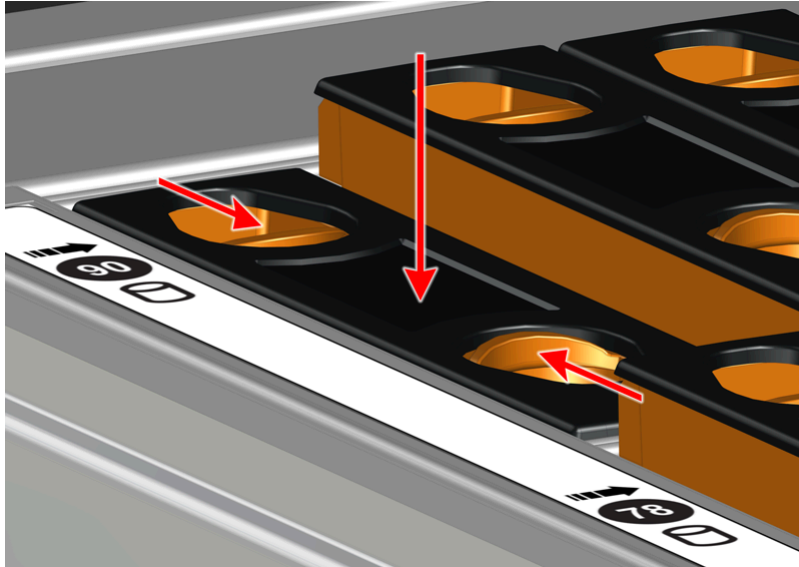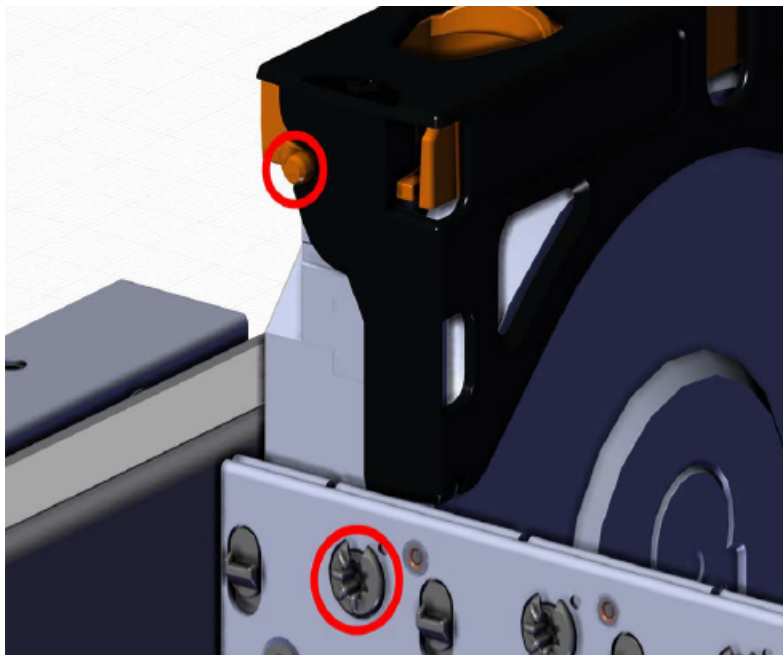
Figure 137: Grommet and Latch Pin Identification

Step 33 : Repeat this action to fully install the remaining drive assemblies in the same order, from left-to-right, rear-to-front.

Step 34 : 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 138: Lower CMA Orientation
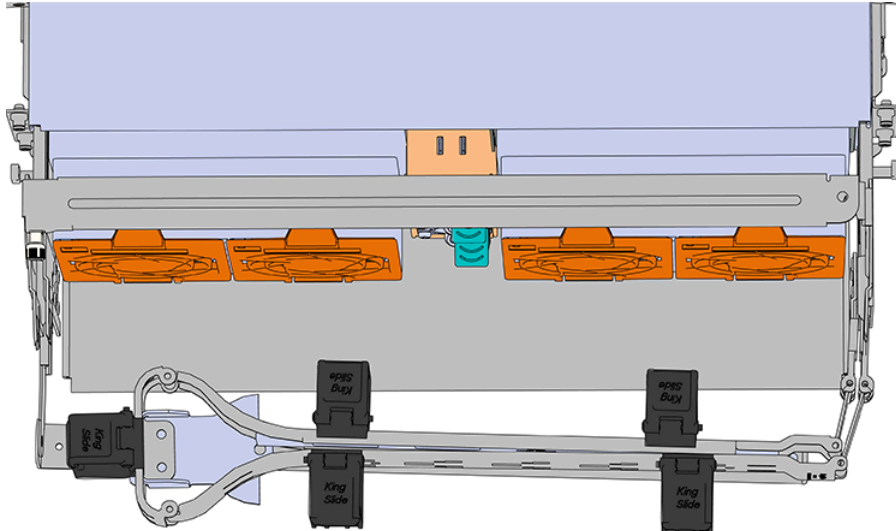
c. Slowly slide the enclosure forward to ensure the arm is operating properly, then slide it back into the rack.

d. CMA Standard: Repeat these steps to install the upper arm with the elbow facing to the right.

Step 35 : 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 178)* for more information.

Figure 139: CMA Cable Routing
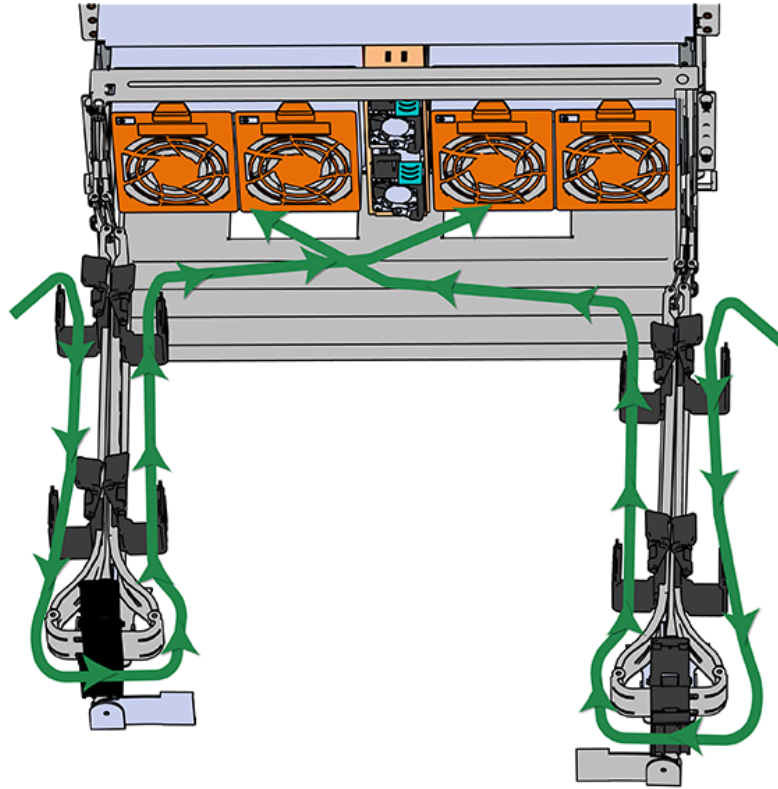
   c. Open all of the baskets.

Figure 140: 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.

> **ⓘ** **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. Attach the cable retention mechanism.

For PSUs with the clip-style retention mechanism, loop the clip around the power cable and pinch it until the clip catches and locks in place. Then slide the clip forward until it stops near the cable connector.

Figure 141: Clip-Style Cable Retention
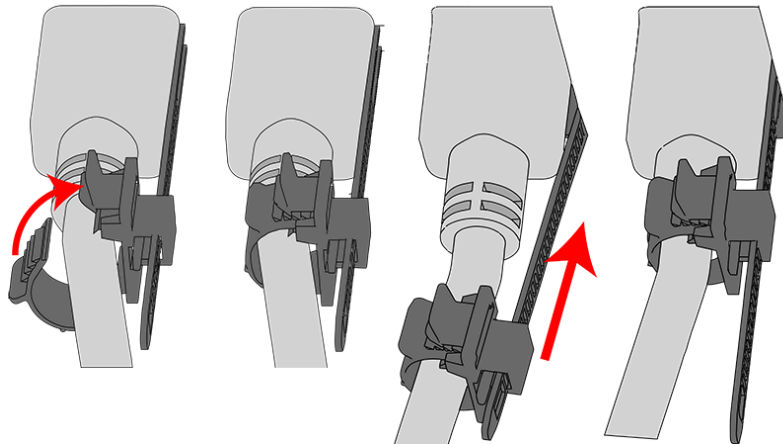
For PSUs with the strap-style retention mechanism, secure the power cable to the PSU handle with the hook-and-loop strap as shown in the following image.

Figure 142: Strap-Style Cable Retention
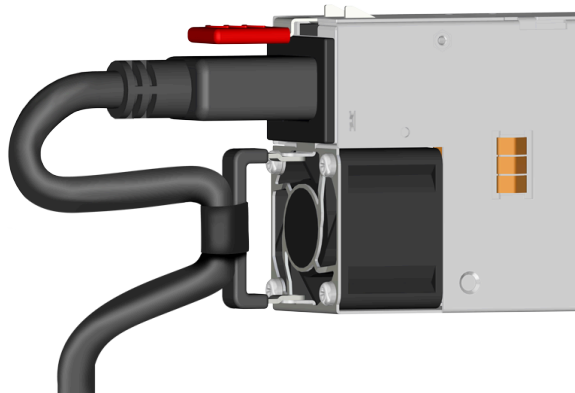
h. Route the power cable through each basket.

i. If the installation includes more than 10 total cables, follow the recommendations in Special Considerations for Cable Routing *(page 178)*, 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 143: Nominal Cable Length at Connectors
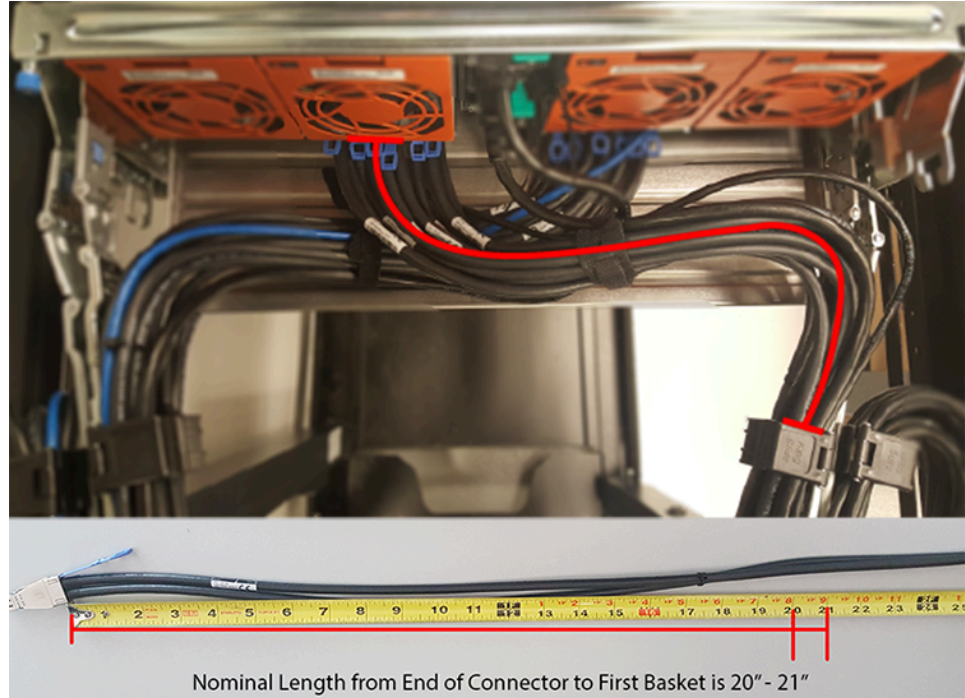
j. Close all of the baskets.

k. 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.

l. Reconnect the arm at the elbow to the connectors on the rail.

Step 36 : 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 144: Open Baskets
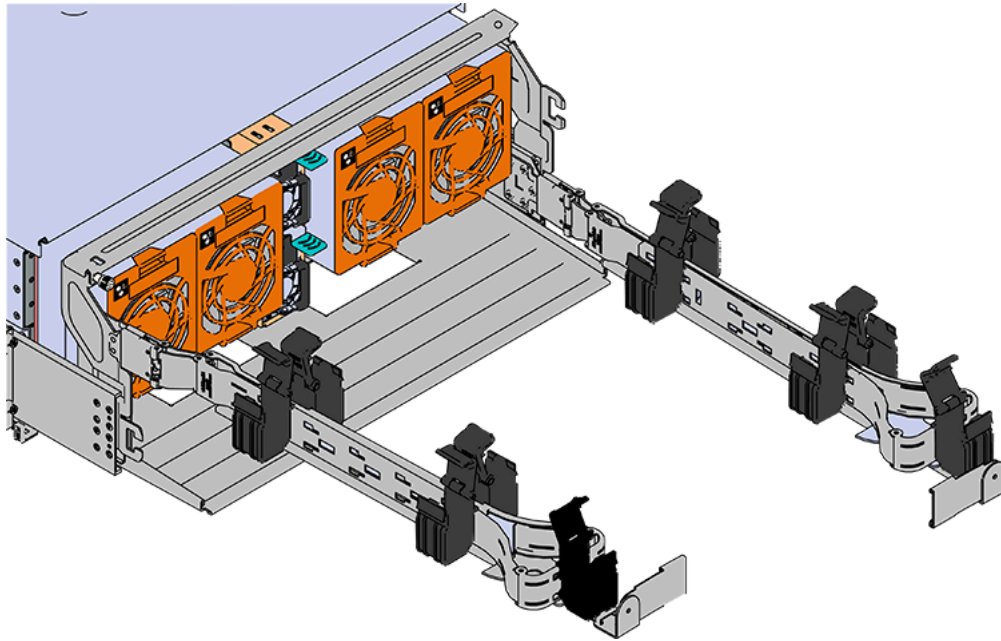
a. Connect the Ethernet cable to the Ethernet port on the right hand side of the Ultrastar Data60 and route the cable through each of the baskets on the CMA.

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 145: Connected Cable Routing
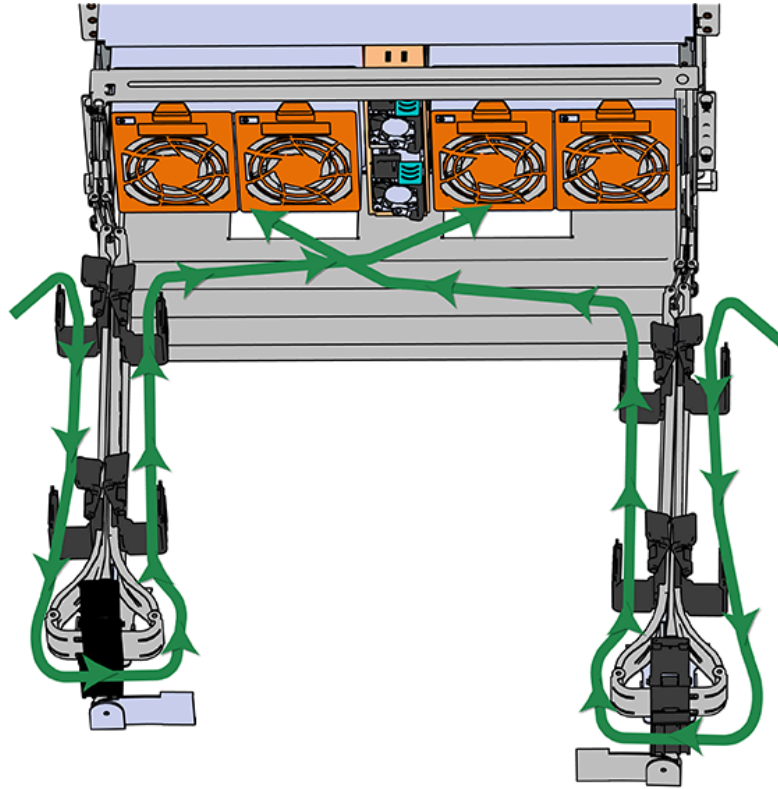
d. Wrap cable tie around the installed cable bundle between the ports and the first basket of the CMA

> 📄 **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.
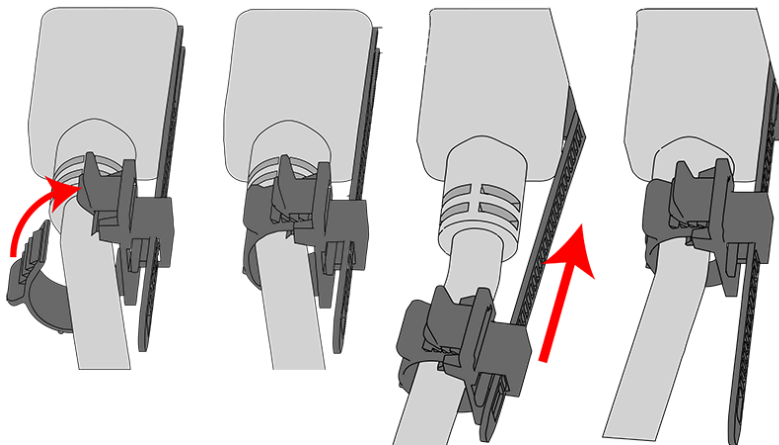
Figure 146: Nominal Cable Length at Connectors
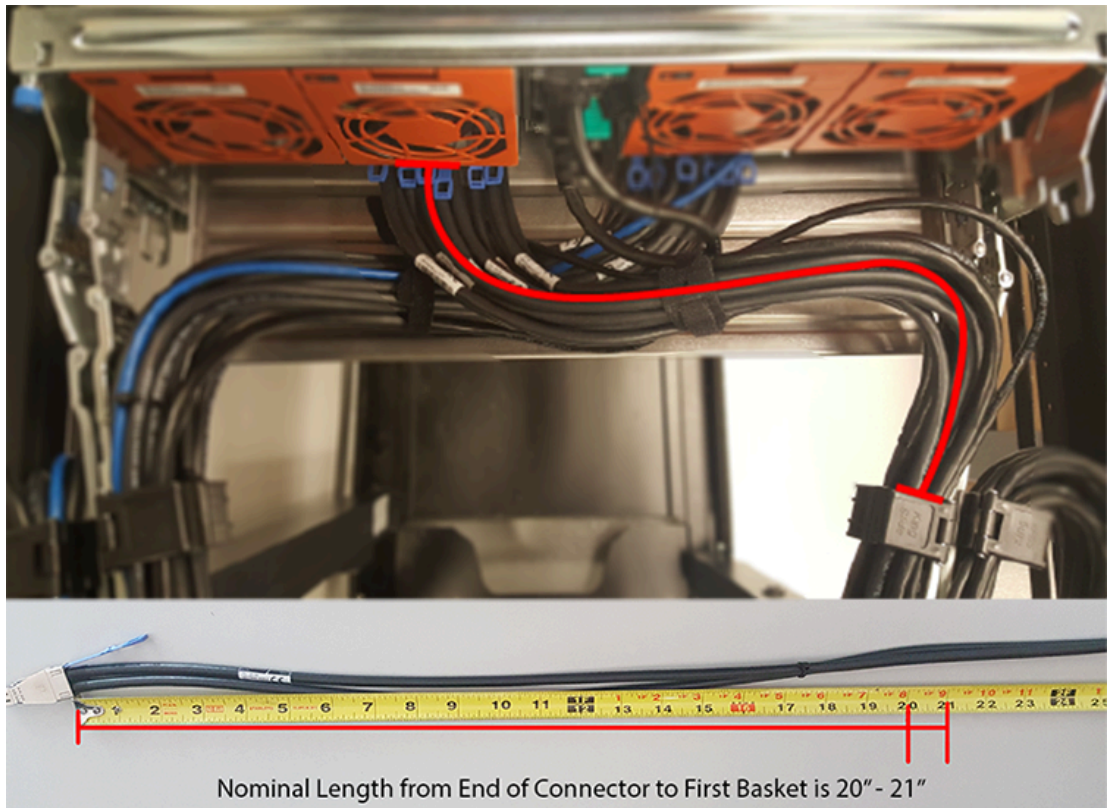
e. Attach the cable retention mechanism.

For PSUs with the clip-style retention mechanism, loop the clip around the power cable and pinch it until the clip catches and locks in place. Then slide the clip forward until it stops near the cable connector.

Figure 147: Clip-Style Cable Retention

For PSUs with the strap-style retention mechanism, secure the power cable to the PSU handle with the hook-and-loop strap as shown in the following image.

Figure 148: Strap-Style Cable Retention
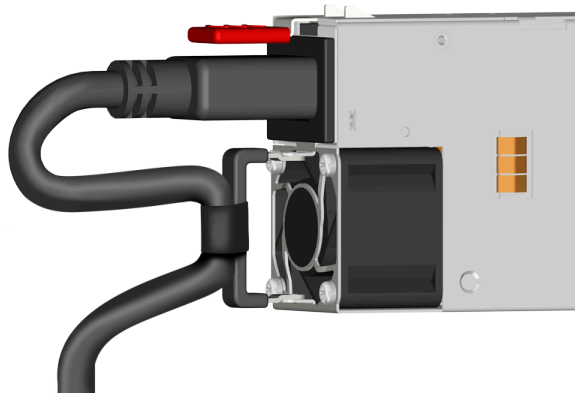
f. If the Ultrastar Data60 is being installed in a rack and will subsequently be transported inside that rack, it is important to use the included cable tie to wrap the CMA bundle to ensure it does not get damaged during transport. If the Ultrastar Data60 is instead being installed where it will operated, skip this step.

g. Close all of the baskets.

h. Reconnect the CMA at the elbow to connector A.

Step 37 : 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 38 : 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.

3.9 Chassis Replacement

Replacement Requirements	
Personnel Required	3
Avg. Replacement Time	2 hr.
Max Replacement Time	2 hr.

Tools	Required / Recommended
Long T15 Torx Screwdriver	Required
# 2 Philips Screwdriver	Required
T30 Torx Screwdriver	Required
Long T10 Torx Screwdriver	Required
Cable Ties (for configurations with greater than 10 total cables)	Recommended
Tape Measure	Recommended
Level	Recommended
Option 1: M5 x 12mm T15 Flat Head Torx screws with washers **Option 2**: Toolless screwplate	Required
Included Washers	Required
Low-Profile M4 x 3.2mm Philips screws (included with rail assembly)	Required
Optional (if using CMA Tray): M3 x 8mm T10 Torx screws	Required

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 149: Unlatching a CMA Connector
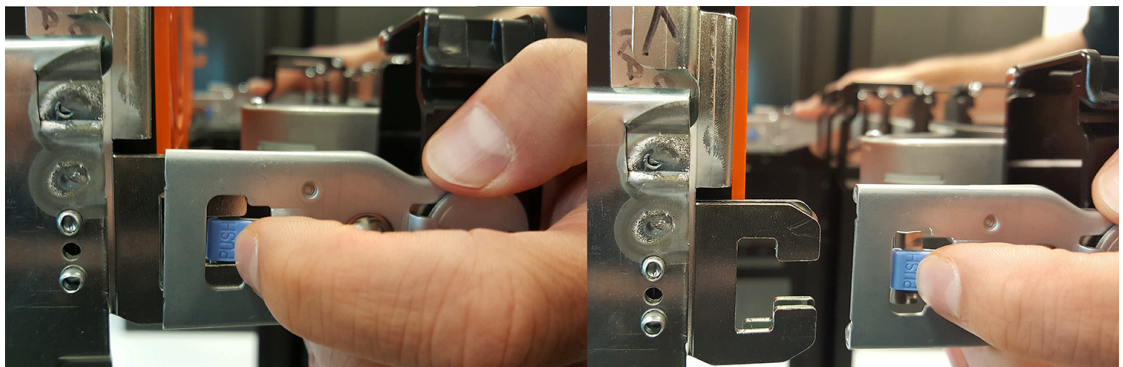
    b. Swing the CMA(s) away from the enclosure.

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

Figure 150: CMA(s) in service position (Cables not shown)
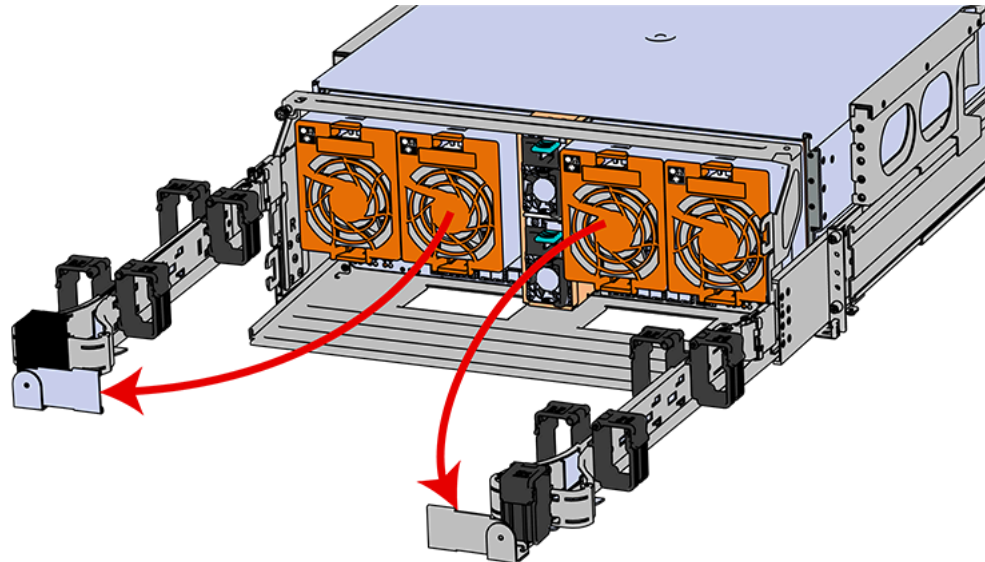
Step 2 : Disconnect the Enclosure from power.

    a. Locate the redundant PSUs at the rear of the enclosure.

    b. Detach the cable retention mechanism from both power cords.

Figure 151: Clip-Style Cable Retention
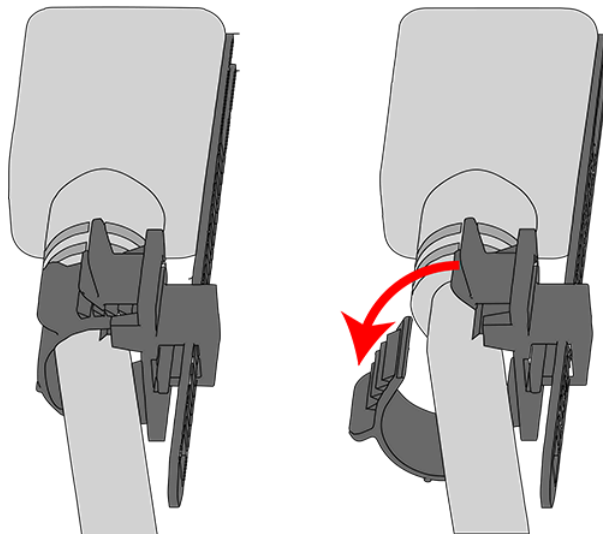
Figure 152: Strap-Style Cable Retention
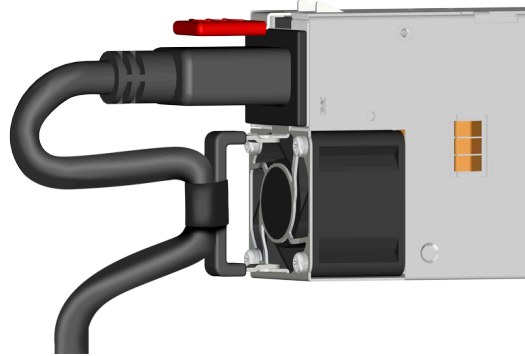
    c. Power down the enclosure by disconnecting both power cables, one from each PSU.

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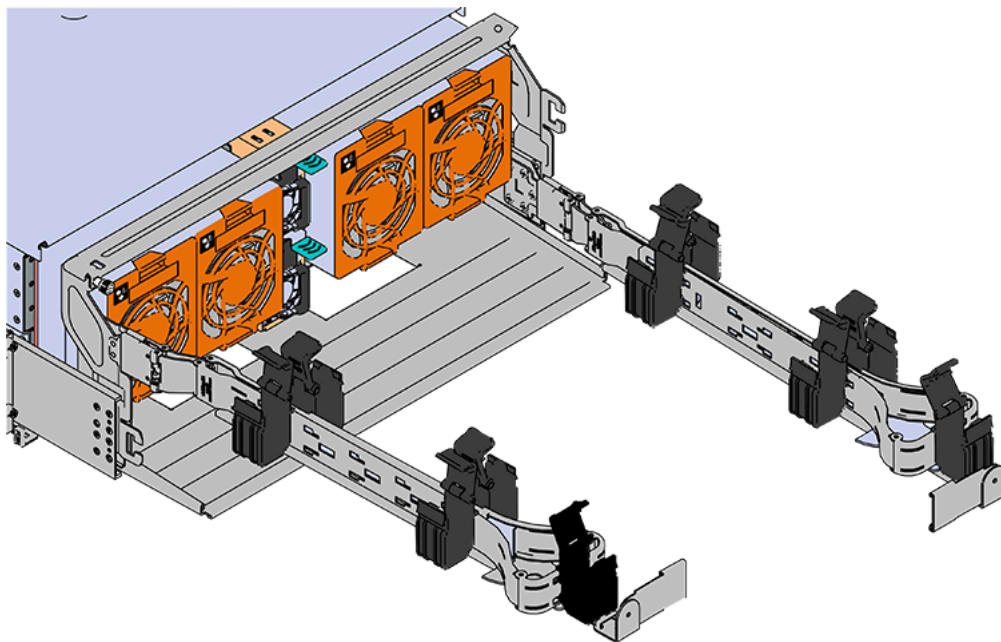
    b. Remove one cable at a time from the arm, making sure not to put too much strain on the arm.

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 154: Unlatching a CMA Connector
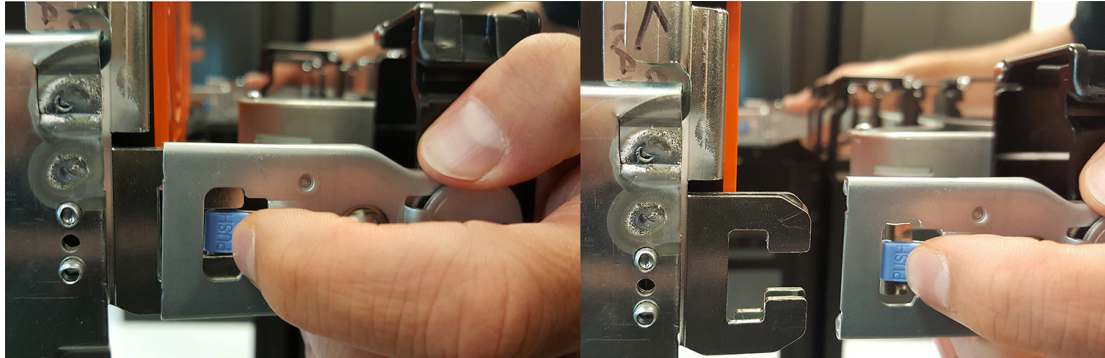
Step 7: Complete the previous step for the second CMA.

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 155: Unscrew Thumbscrew
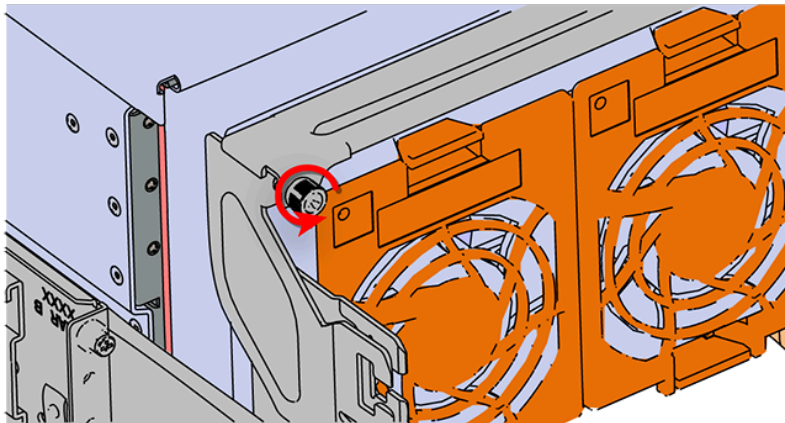
b. Swing the crossbar away from the enclosure.

Figure 156: Crossbar Swinging Out
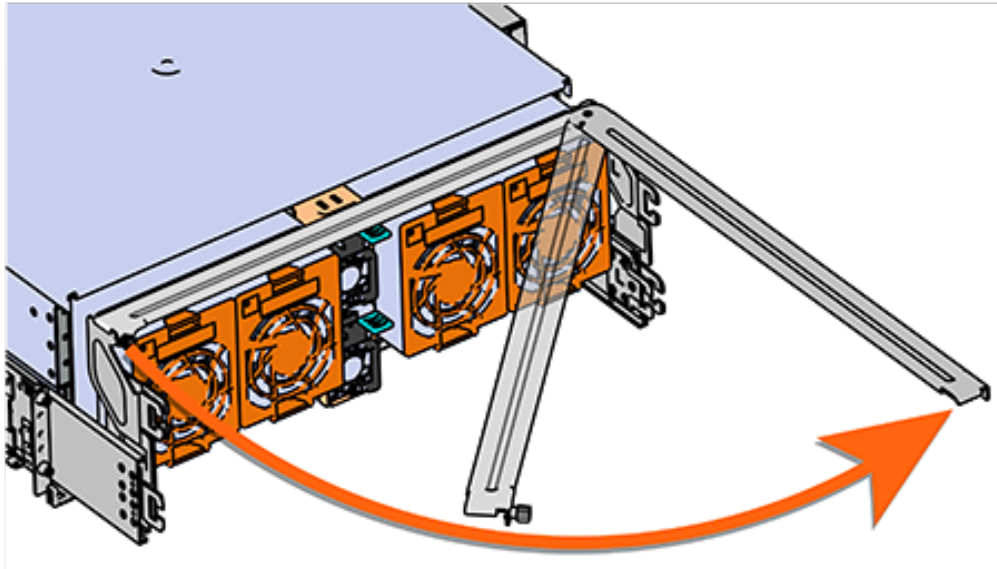
    c. Once the crossbar is straight it should easily come free from the mounting bracket.

Step 9 : Uninstall the PSU.

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

    b. Pull the PSU straight out with even pressure.

Figure 157: Uninstalling the PSU (Delta PSU shown)
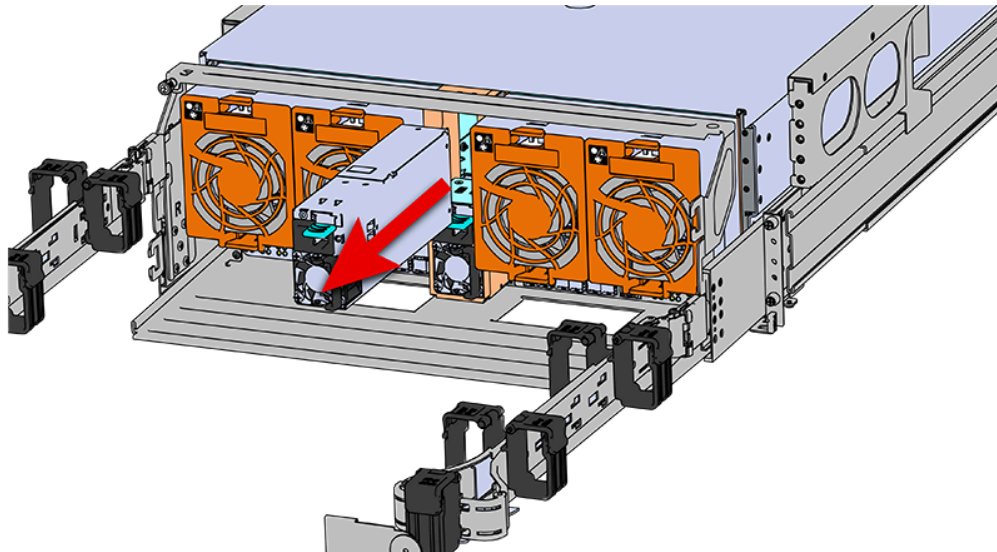
Step 10 : Repeat step 9 *(page 144)* to uninstall the second PSU.

Step 11 : 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 158: Uninstalling the Rear Fan
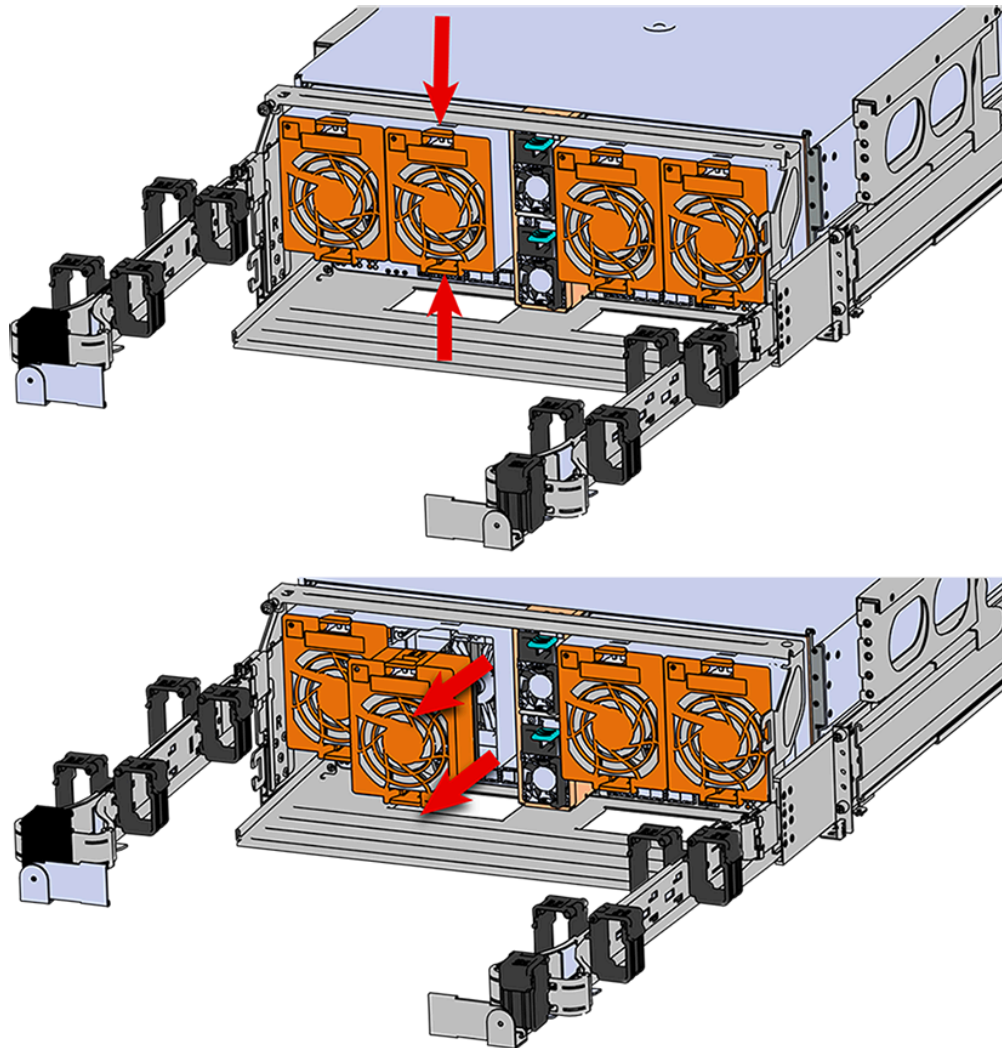
Step 12 : Grasp both handles at the front of the enclosure and pull with even pressure to extend the chassis out of the rack until it is stopped by the safety latches. The safety latches will prevent the enclosure from coming out of the rack completely and the cover will remain in the rack attached to the rear alignment brackets.

Figure 159: Chassis Handle Operation

Step 13 : 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 14 : Follow these steps to remove a 3.5in HDD Assembly.

    a. Find the latch release mechanism on the 3.5in HDD Assembly being removed.

    b. Insert a finger and a thumb into the latch release and pinch to unlatch the 3.5in HDD Assembly.

Figure 160: Unlatch Drive Carrier (IOM Not Shown)
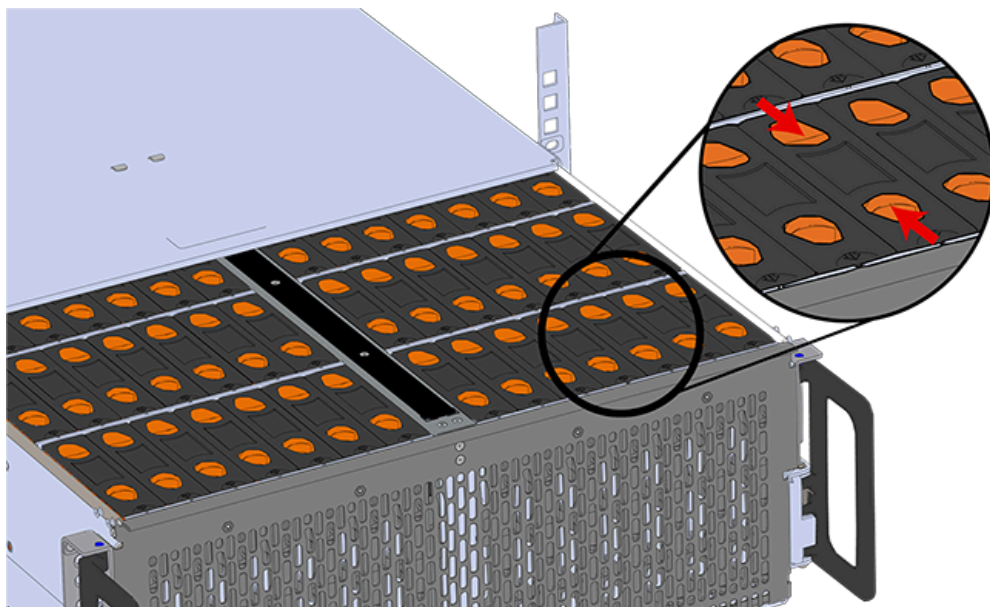
    c. Lift the 3.5in HDD Assembly free from the enclosure.

Figure 161: Removing 3.5in HDD Assembly
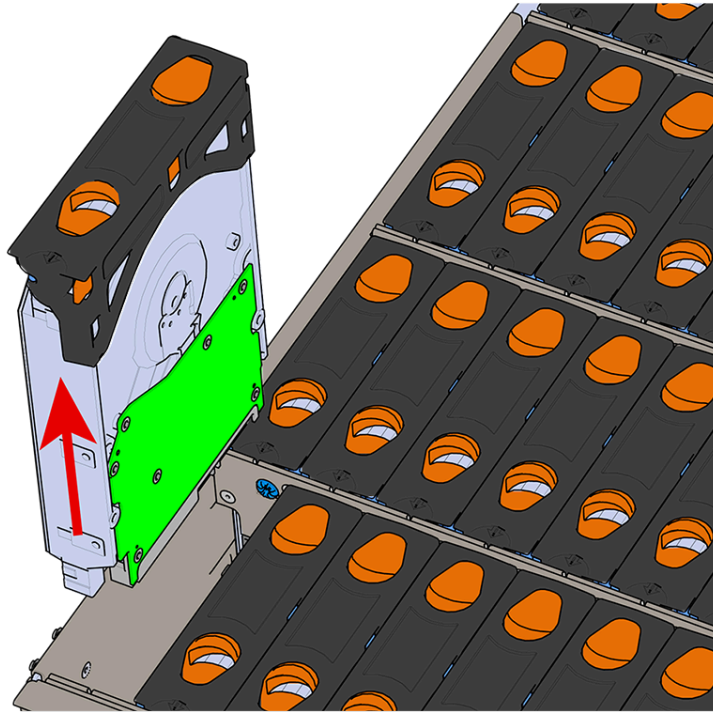
Step 15 : Follow the previous step for each drive in the enclosure. Attach a label or mark the drives with the drive slot they were removed from in order to add them to the same slot in the future. Store the drives in an ESD safe location until the drives are ready to be installed back into an enclosure.

Step 16 : Uninstall the IOM(s).

    a. Locate the latch release on the IOM and press it in the direction shown in the following image.

Figure 162: Unlatching the IOM
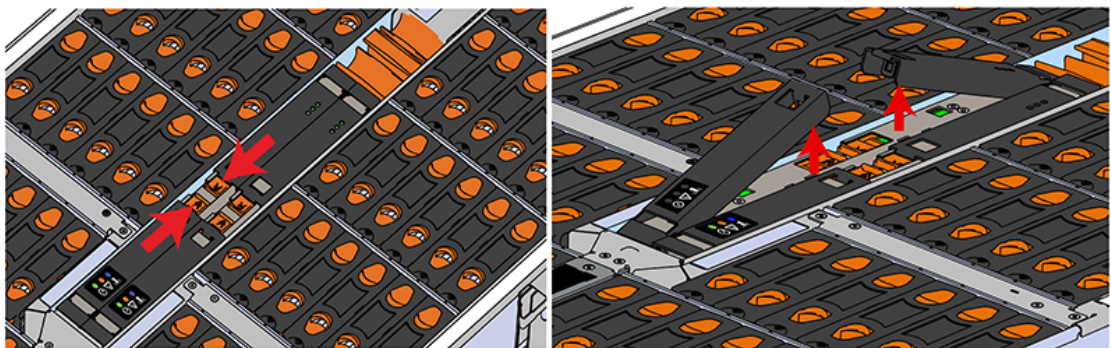
    b. Grasp both handles, one handle in each hand, and lift evenly with both hands to ensure the IOM comes out straight. This will prevent any damage to the pins on the internal connectors.

Figure 163: Removing IOM
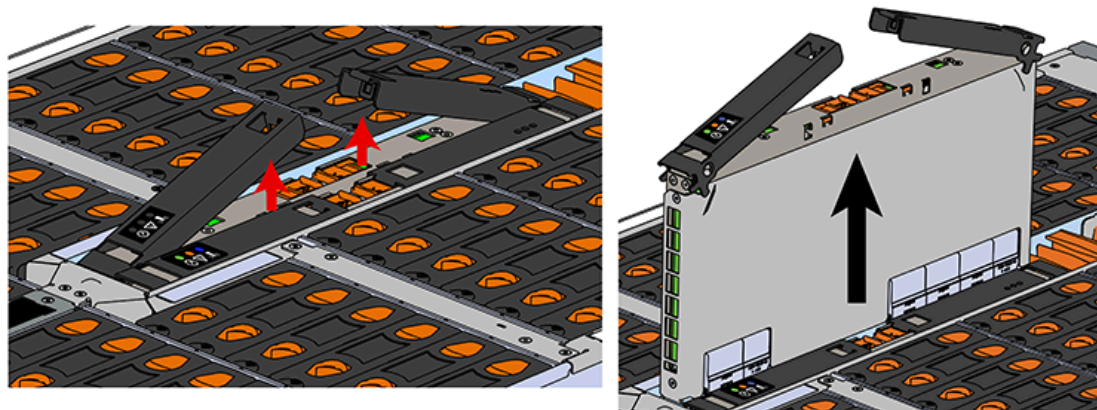
Step 17 : Remove the second IOM.

Step 18 : 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 164: Removing IOM Fan
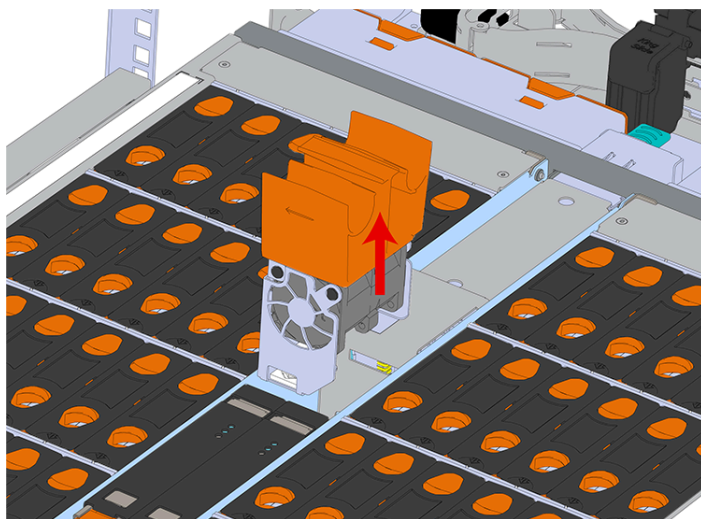
Step 19 : Release the safety latch on the inner rails on each side of the chassis as shown in the following image.

Figure 165: Inner Rail Safety Latch Release

Step 20 : Push the chassis back into the rack.

Step 21 : 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.
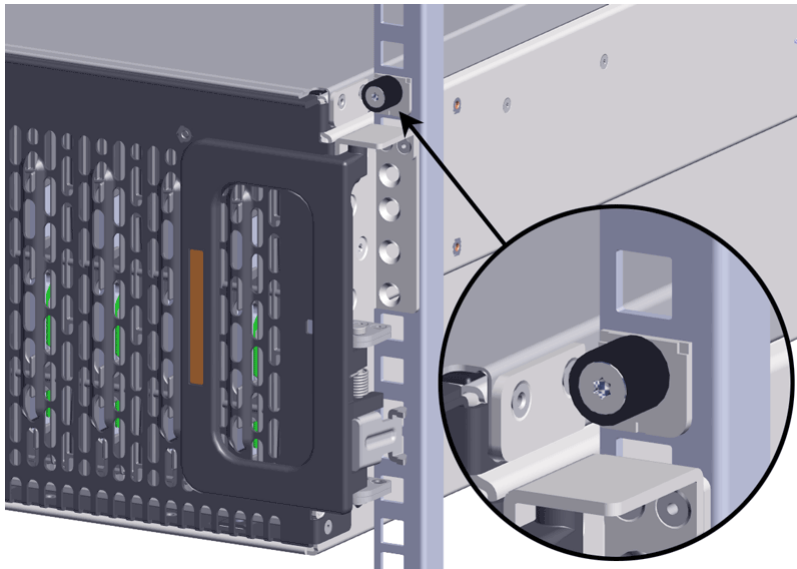
Step 22 : Grasp both handles at the front of the enclosure and pull with even pressure to extend the chassis out of the rack until it is stopped by the safety latches. Make sure that the top cover comes with the chassis as it is extended out of the rack. The safety latches will prevent the enclosure from coming out of the rack completely.

Step 23 : 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 167: 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 24 : 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 168: Remove Inner Rail
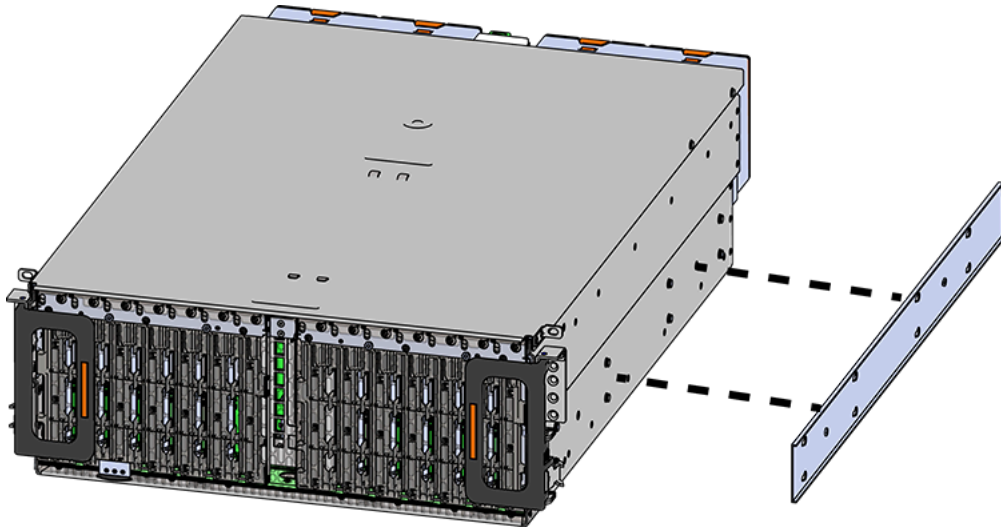
b. Locate and unlatch the springlock on the side of the inner rail.

Figure 169: Inner Rail Spring Latch
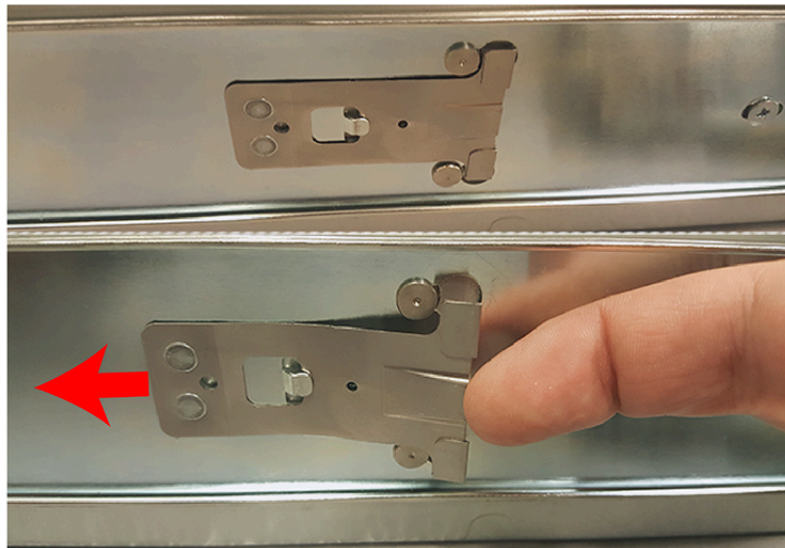
c. Slide the inner rail toward the front of the enclosure to unlock it from the pegs that secure it to the sidewall and pull it free.

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

Step 25 : Uninstall the Cable Tray by removing the M3 x 8mm screws using the long T10 Torx head screwdriver.

Figure 170: Uninstalling the Cable Tray
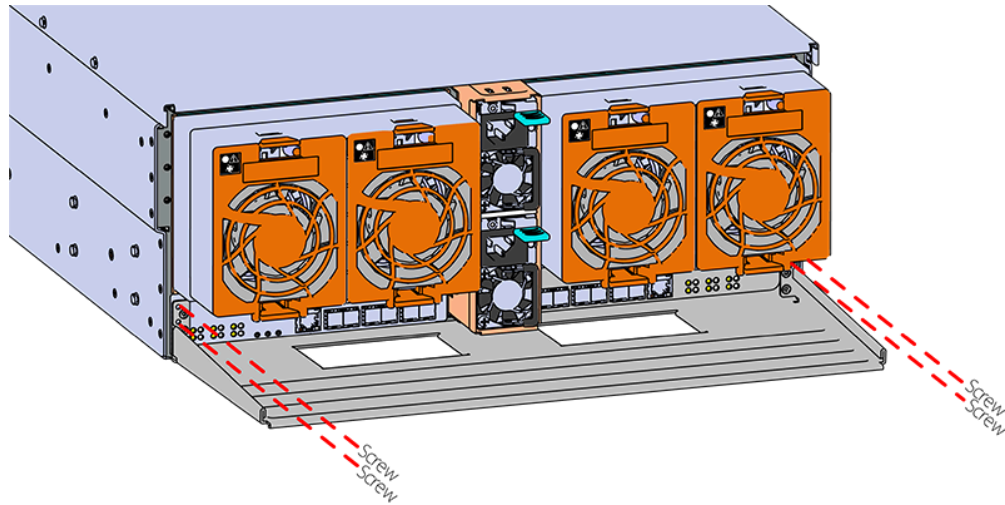
⚠️ **Caution:** Always install the top cover onto the enclosure before installing the chassis into a rack. Not having the top cover installed may damage the alignment brackets.

Step 26 : 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 27 : 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 171: Inner Rail Attachment
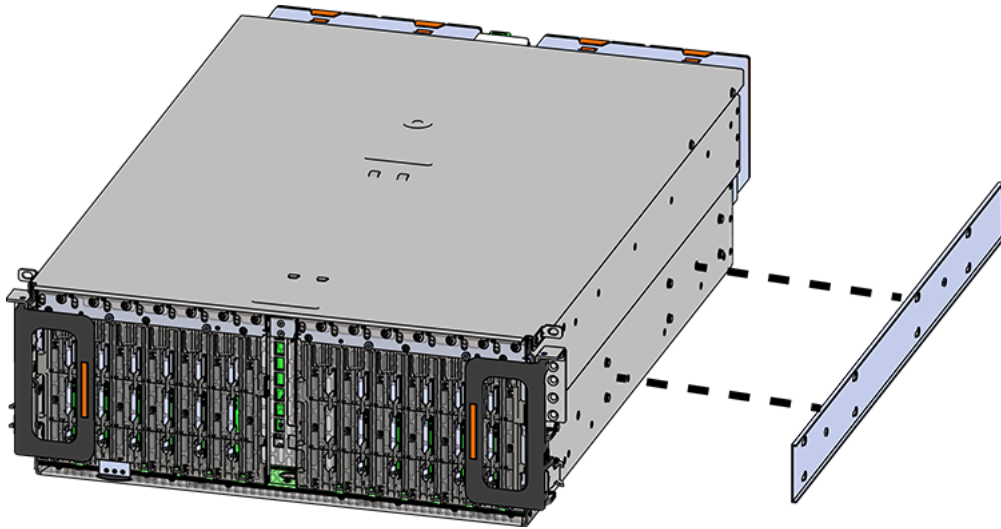
c. Slide the inner rail toward the rear of the chassis to lock it in place. There will be an audible click and the mounting pegs will cover the front part of the keyhole.

Figure 172: Slide Inner Rail
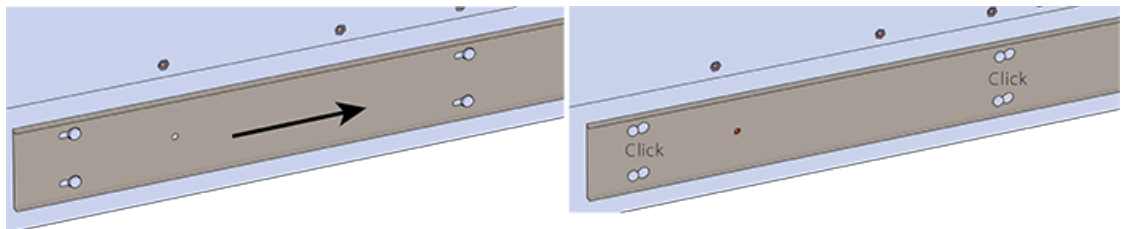
d. ⚠ **Caution:** When installing the inner rail onto the chassis, make sure to only use the special Low-Profile M4 x 3.2mm Philips screws provided in the accessory kit with the CMA. These screws should be tightened to .90-1.12 Nm / 8-10 in-lbf using a # 2 Philips Screwdriver. These screws are specially 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 28 : Attach a cable tie mount to the cable tray.

a. Clean the surface of the cable tray, under the mounting area, with isopropyl alcohol and allow to dry.

b. Adhere a cable tie mount in the approximate location shown in the following diagram:

Figure 173: Cable Tie Mount Location
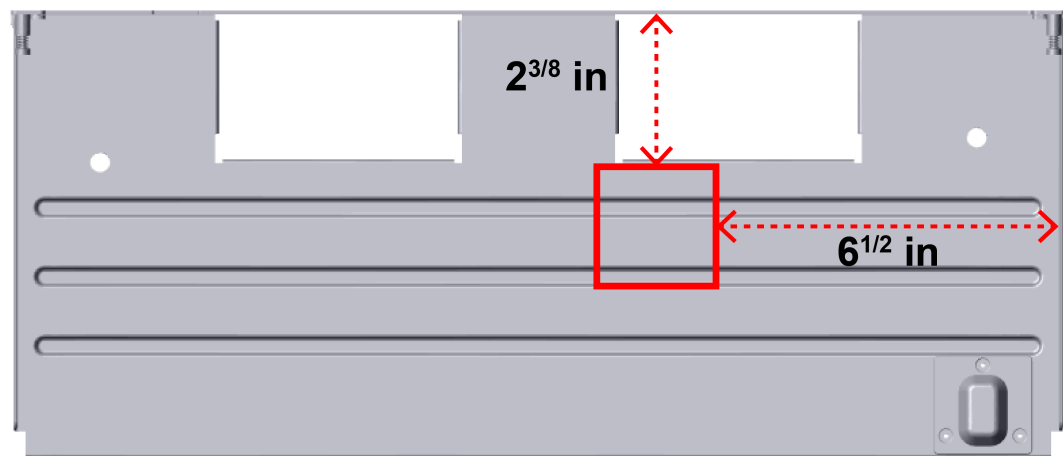
Step 29 : Secure the cable tray onto the enclosure using the included M3 x 8mm T10 Torx screws and the Long T10 Torx Screwdriver. These screws should be tightened to .33-.56 Nm / 3-5 in-lbf.

Figure 174: Installing the Cable Tray
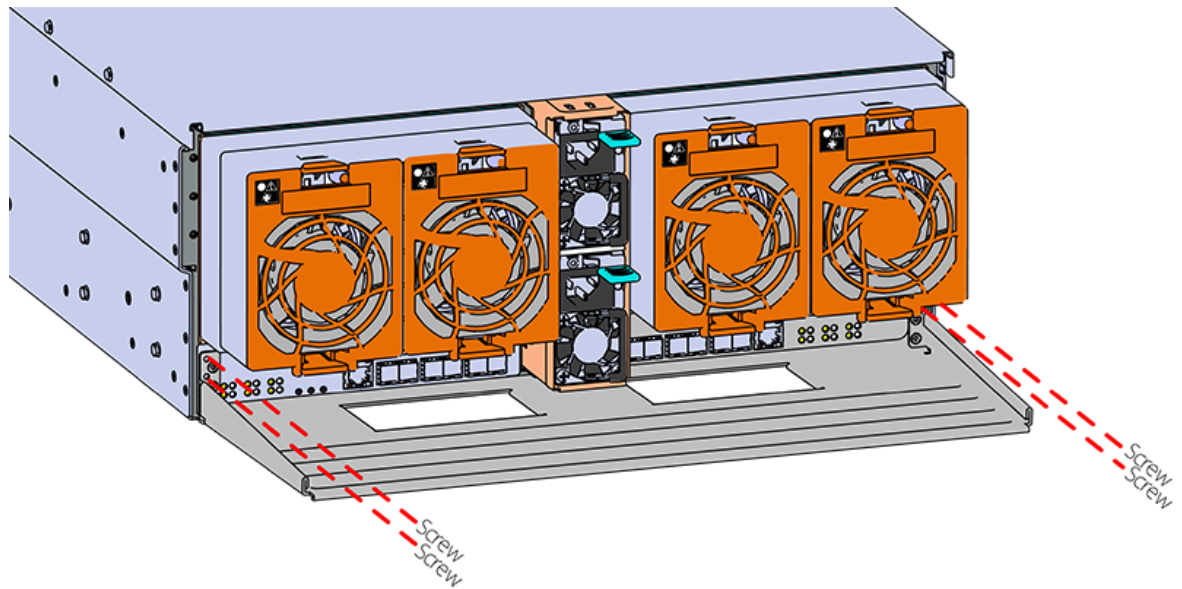
Step 30 : Extend the mid-rails out of the rack so that they are protruding from the front of the rack and the safety latches engage.

Figure 175: Extend Mid-Rails
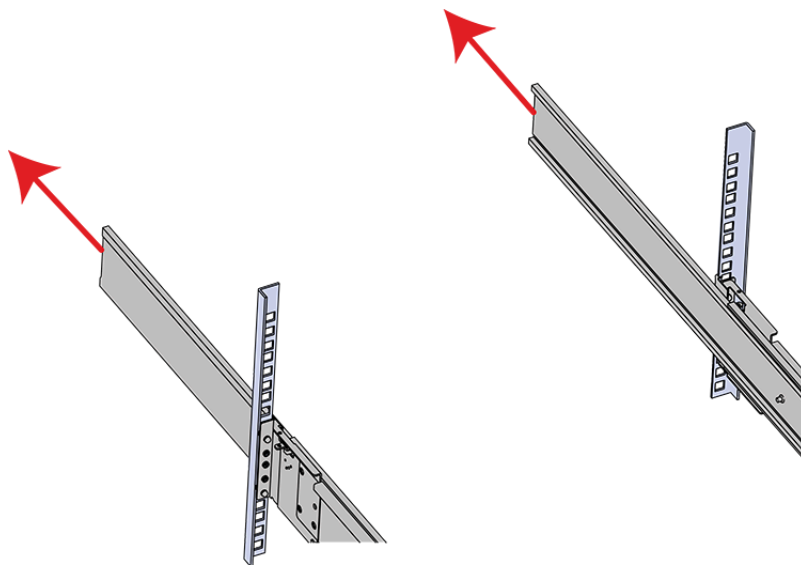
Step 31: Install the chassis into the rails.

    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 176: 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 177: Installing the Chassis
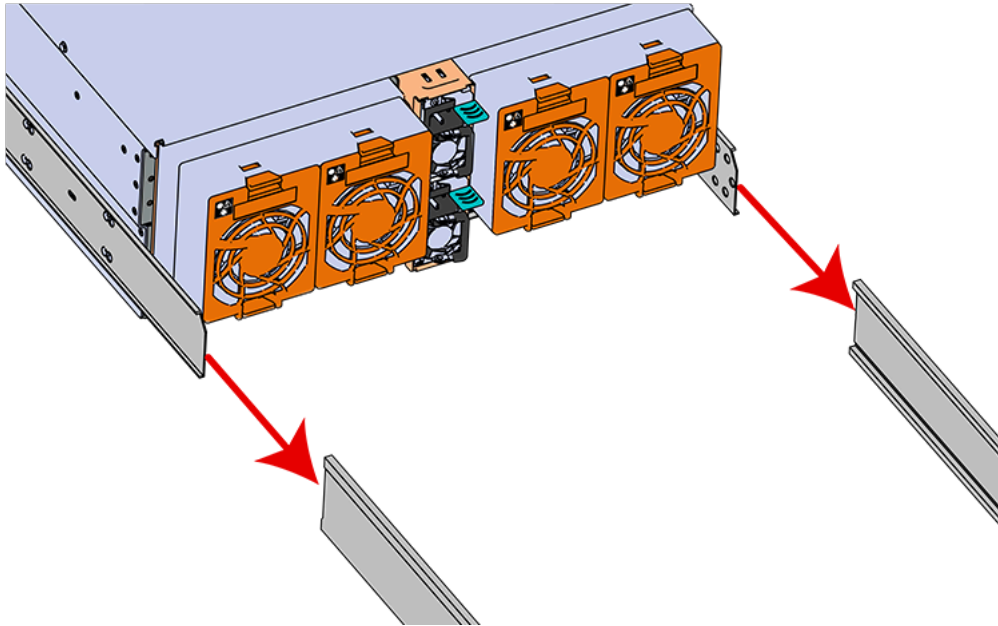
d. Once the rails are mated properly, slide the enclosure into the rack until it is stopped by the safety catch on the rails. Push the release lever on the safety latch (located on the side of each of the rails), and push the enclosure the rest of the way into the rack.

Figure 178: Safety Latch Release
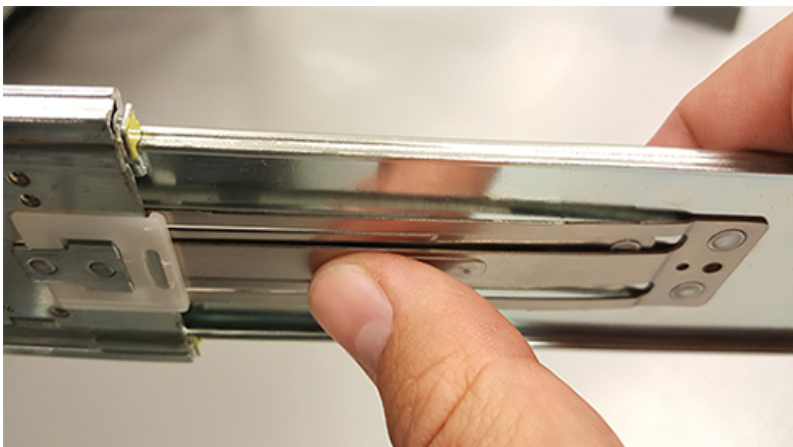
e. As the chassis is slid into the rack, position one installer at the rear of the rack to ensure that the pegs on the sides of the cover will slide correctly into the rear cover alignment brackets on both sides of the rack. If the chassis does not install smoothly or snags, check that the rear cover alignment brackets are not interfering with the chassis sidewalls, and try again.

Step 32 : 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 179: Cover Retention Screws
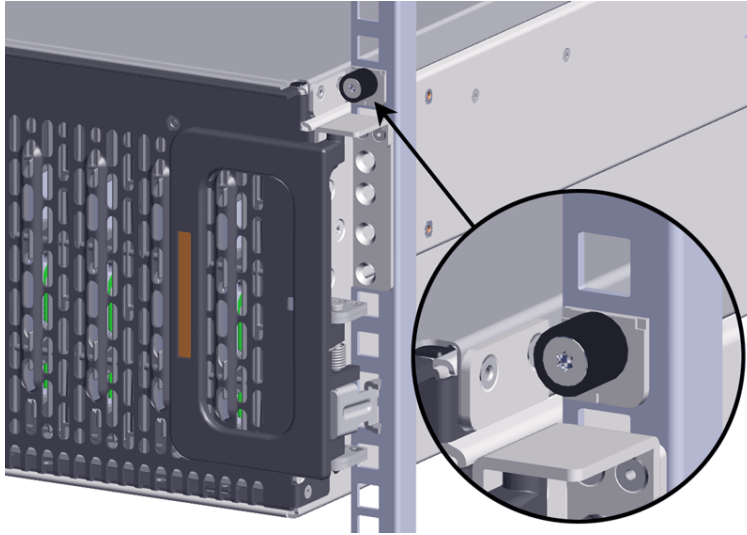
Step 33 : Now that the chassis is installed, test the installation by sliding the enclosure in and out of the rack a minimum of three times. If the enclosure binds, catches, or displays any incorrect motion or behavior repeat the installation.

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

Step 34 : 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 180: Lower CMA Orientation
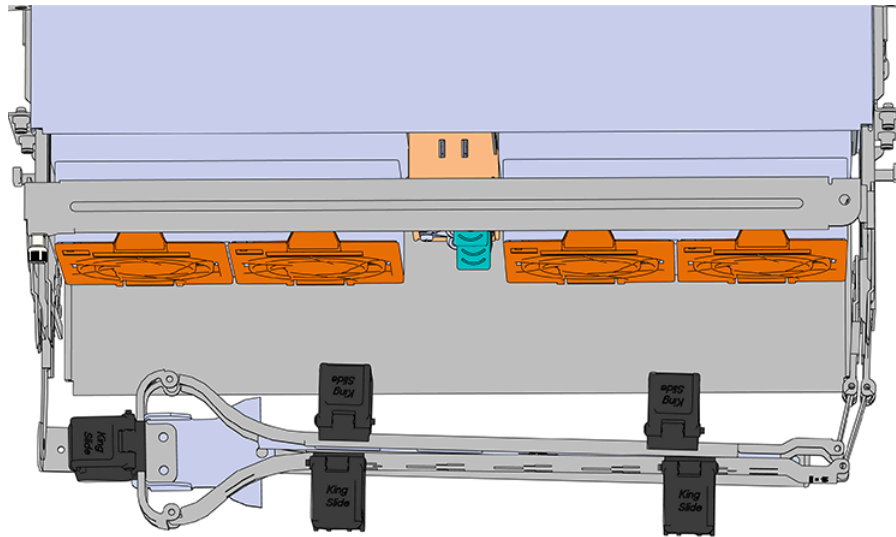
c. Slowly slide the enclosure forward to ensure the arm is operating properly, then slide it back into the rack.

d. CMA Standard: Repeat these steps to install the upper arm with the elbow facing to the right.

Step 35 : 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 181: Chassis Handle Operation
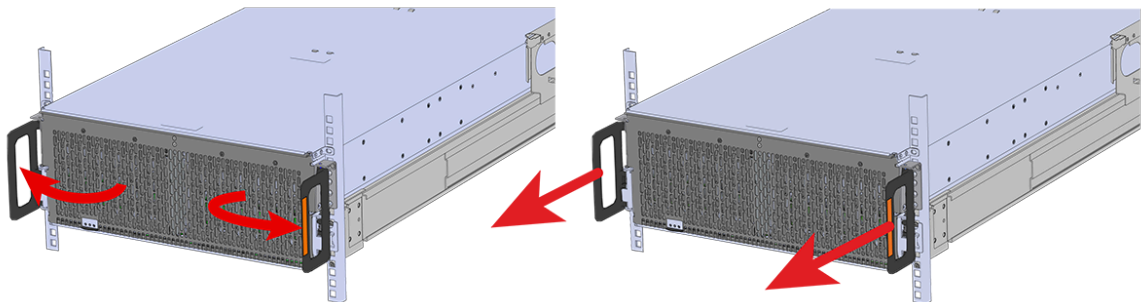
Step 36 : Install the IOM.

⚠ **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.

a. 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 182: Unlatching IOM Handles
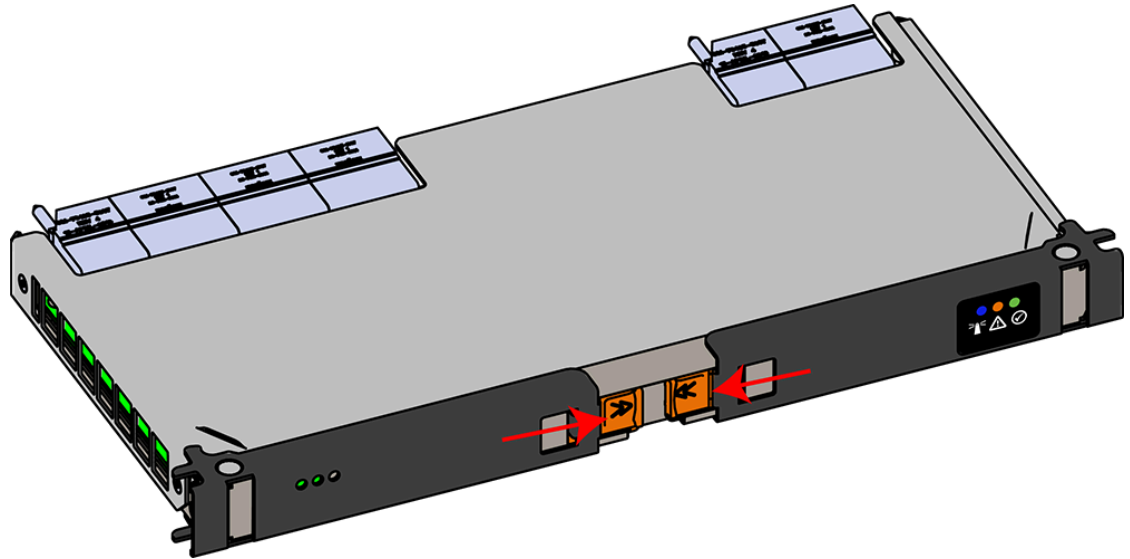
b. Align the IOM with the empty slot on the top of the chassis so that the arrow on the IOM latch release is facing toward the side shown in the following image.

c. Slowly lower the IOM into the empty slot while being careful to keep it level. Do not to force it.

Figure 183: Installing the IOM
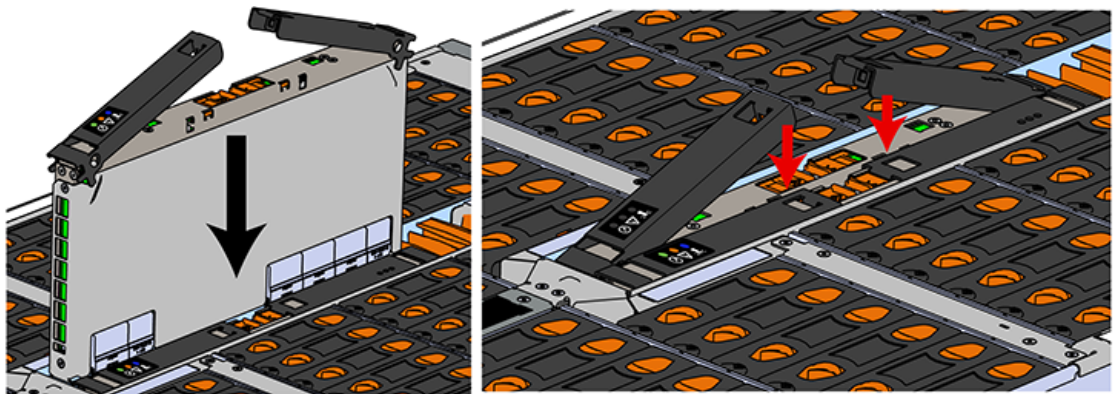
d. When the IOM is lowered fully, apply light pressure with both hands evenly on the IOM body, not the handles, to seat the IOM in the connector. If the IOM won't seat correctly, **DO NOT FORCE IT**. Instead, back the IOM out, check the pins to make sure none are damaged, and try again.

e. Once the IOM is seated properly in the slot, close the handles until they latch closed.

Step 37 : Install the second IOM using the same method as the first.

Step 38 : Install the IOM Fan.

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

Figure 184: Installing the IOM Fan
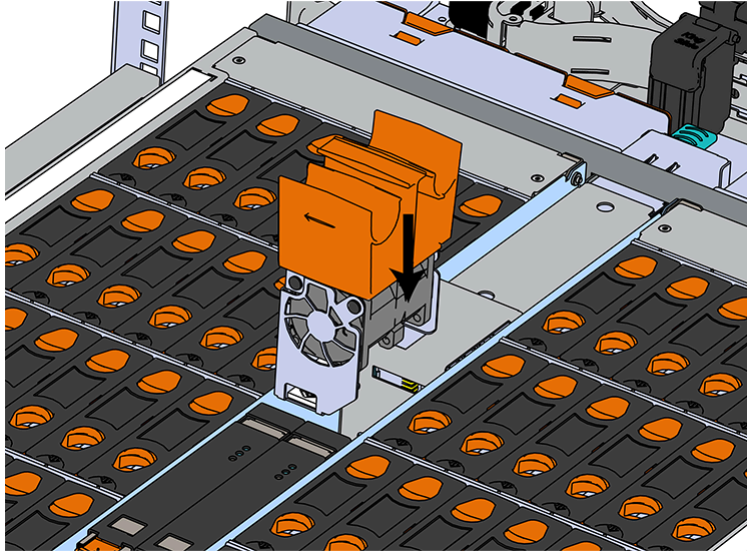
b. Pinch the latch release mechanism slightly and carefully lower the IOM Fan into the slot.

Installing the 3.5in HDD Assembly

📄 **Note:** When installing drives, populate the enclosure from left-to-right, rear-to-front. For example, begin with slot 48 (as shown in the following diagram), continue through 59, then proceed with 36 through 47, and so on:

Figure 185: Drive Layout
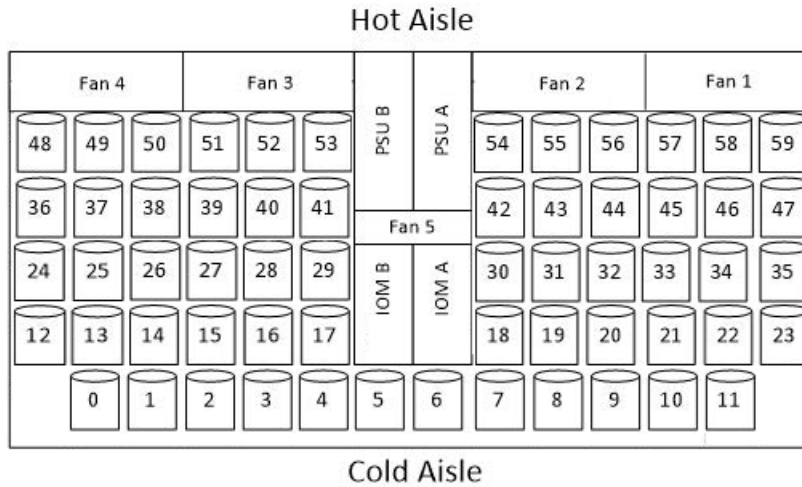
📄 **Note:** When installing drives, ensure that the LED pointer on the top of the drive carrier points toward the front of the enclosure, as shown in the following image:

Figure 186: LED Pointer Orientation
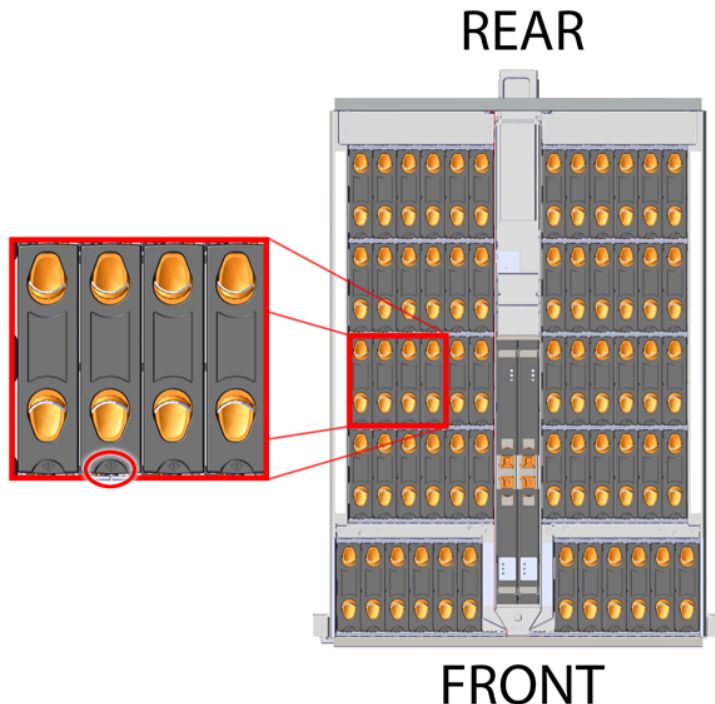
Step 40 : Install each drive in the place it was removed from by following the labels or marks that were added earlier.

Step 41 : Align the drive with the empty slot that will receive it. Lower it into the slot, ensuring that it stays level and does not bind.

Figure 187: Inserting a 3.5in HDD Assembly
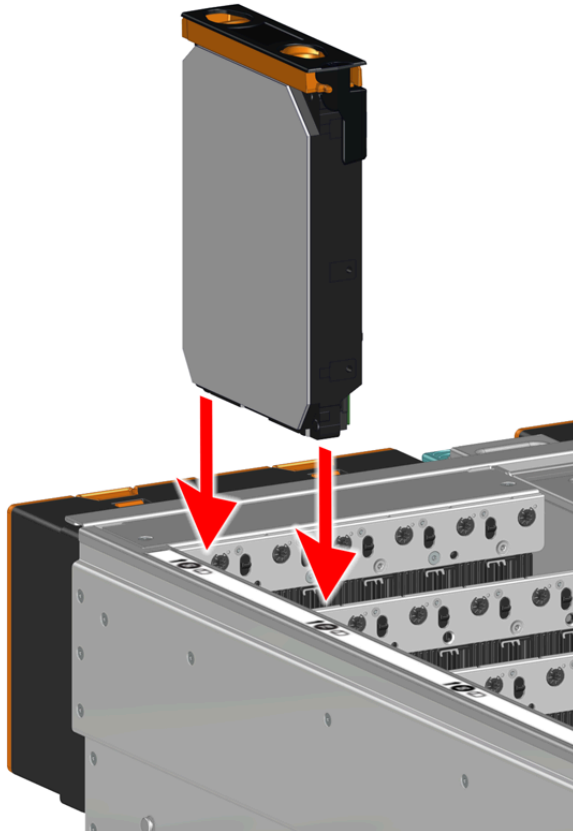
Step 42 : Lower the drive until the spring-loaded posts on the carrier contact the top edges of the drive slot. This is an intermediate position; the drive assembly will be fully seated later on.

Figure 188: Intermediate Install Position
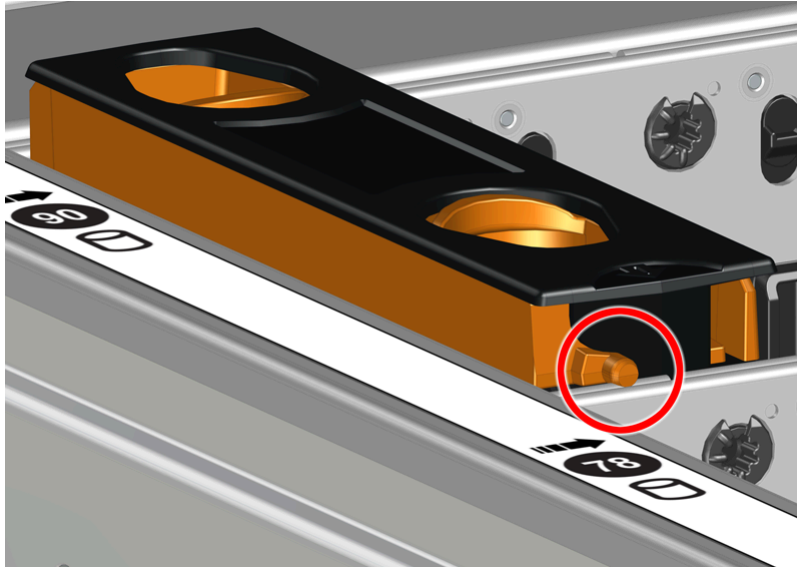
Step 43 : Repeat this intermediate installation for the remaining drive assemblies, populating the enclosure from left-to-right, rear-to-front. For example, begin at drive slot 90 and proceed through 101. Then continue with 78 through 89, and so on.

Figure 189: Populating the Enclosure
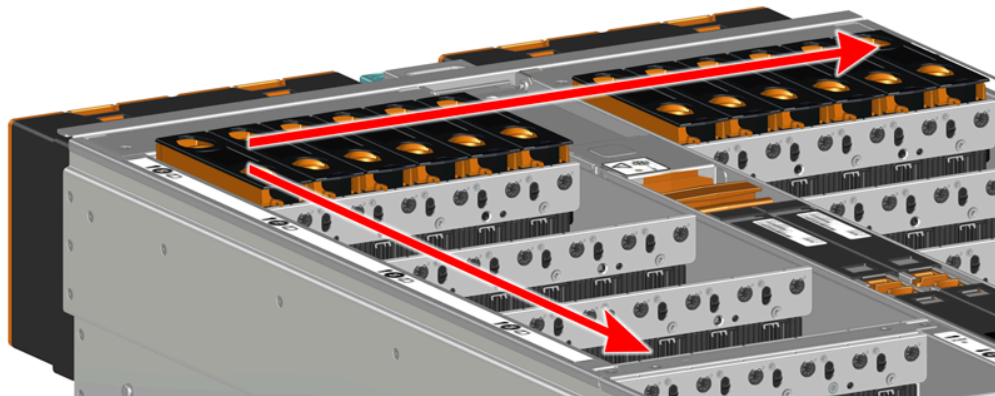
Step 44 : Returning to the first drive assembly, pinch the latch release and carefully press downward to fully seat the 3.5in HDD Assembly into the drive slot. As the drive mates with the enclosure connector, release the orange latch making sure that the latch pins on the drive seat correctly into the grommets on the drive dividers.

Figure 190: Seating the 3.5in HDD Assembly

Figure 191: Grommet and Latch Pin Identification

Step 45 : Repeat this action to fully install the remaining drive assemblies in the same order, from left-to-right, rear-to-front.

Step 46 : 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 192: Shipping Bracket Screw Locations
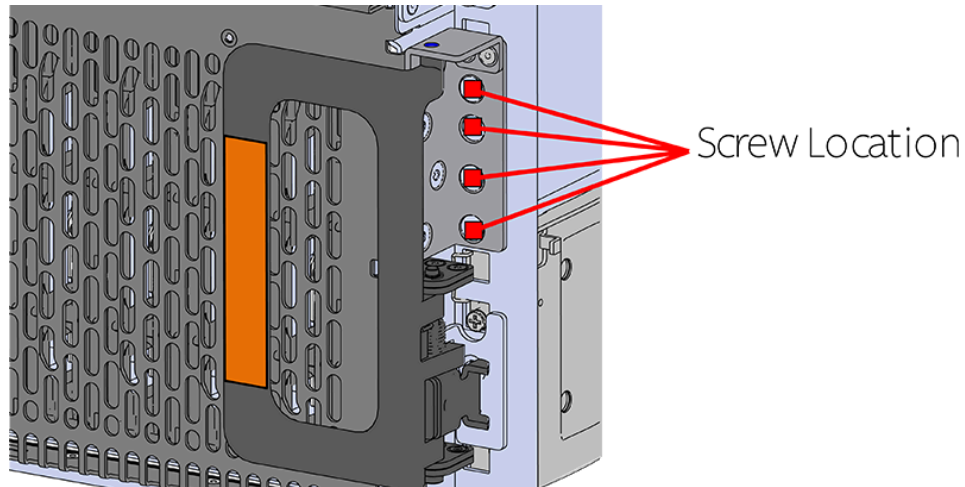
Step 47 : Install the PSU.

    a. Align the PSU in the orientation shown in the following image, and slide the PSU into the slot until it seats fully into the chassis.

Figure 193: Installing the PSU
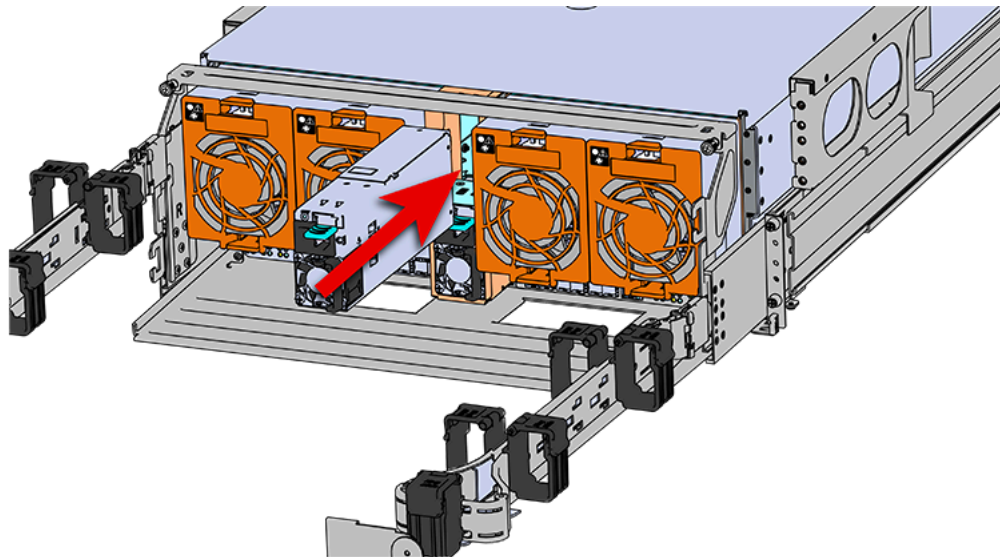
    b. Plug the power cable into the receptacle at the back of the PSU.

    c. Attach the cable retention mechanism.

       For PSUs with the clip-style retention mechanism, loop the clip around the power cable and pinch it until the clip catches and locks in place. Then slide the clip forward until it stops near the cable connector.

Figure 194: Clip-Style Cable Retention
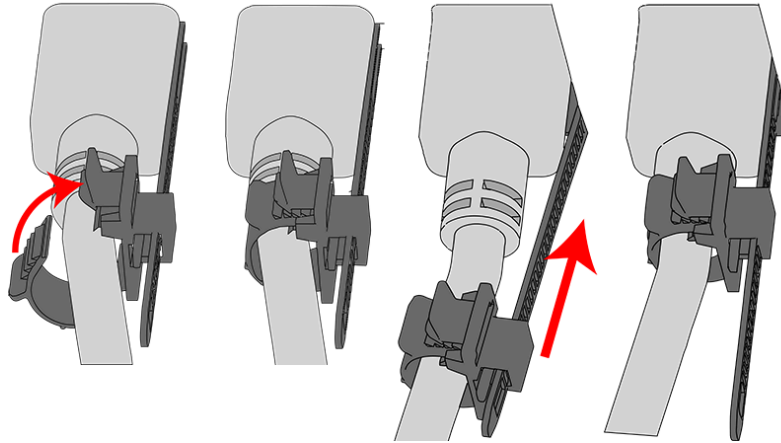
For PSUs with the strap-style retention mechanism, secure the power cable to the PSU handle with the hook-and-loop strap as shown in the following image.

Figure 195: Strap-Style Cable Retention
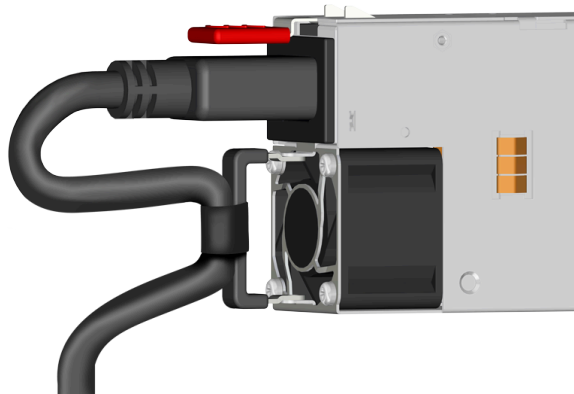
Step 48 : Install the second PSU.

Step 49 : 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 196: Installing the Rear Fan
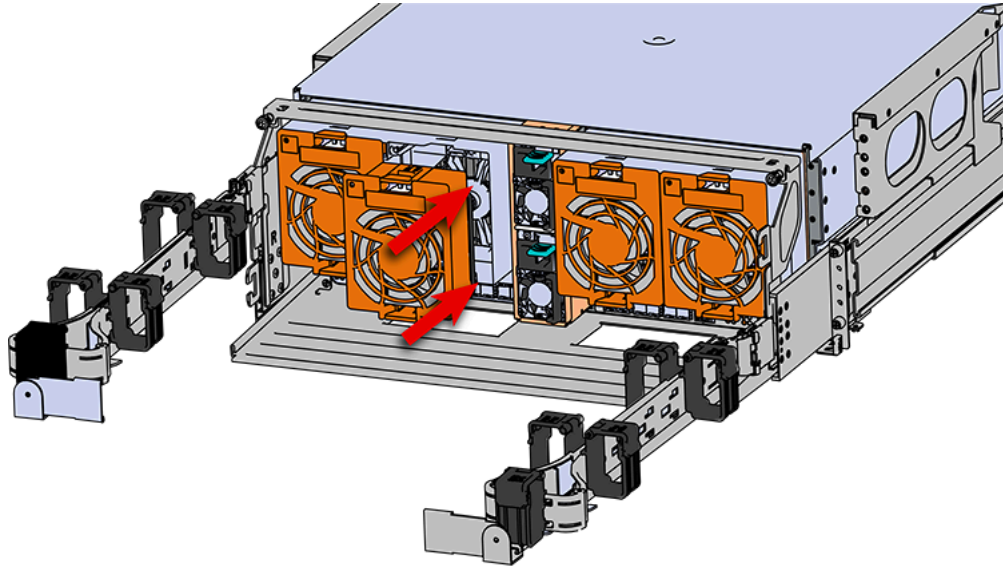
Step 50 : Install the rest of the rear fans into the rear of the enclosure.

Step 51 : 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 197: Lower CMA Orientation
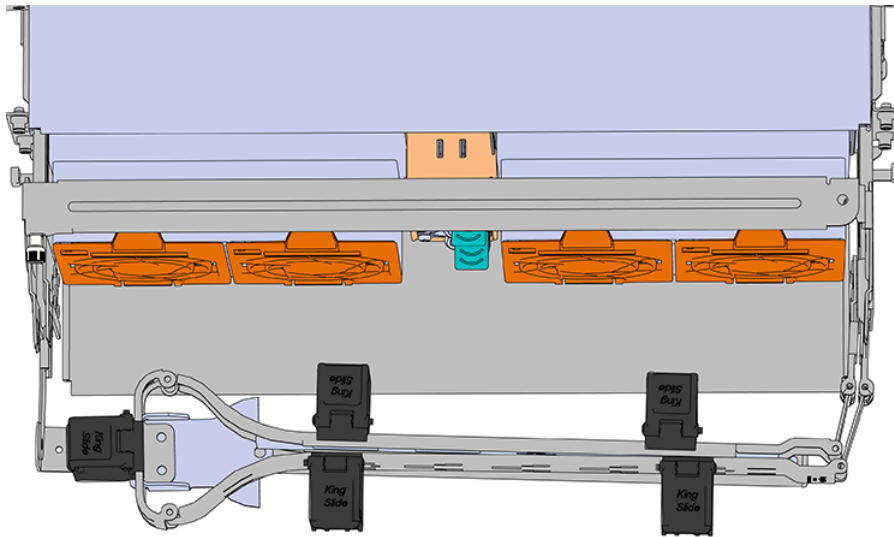
c. Slowly slide the enclosure forward to ensure the arm is operating properly, then slide it back into the rack.

d. **CMA Standard:** Repeat these steps to install the upper arm with the elbow facing to the right.

Step 52 : 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 198: Initial Alignment
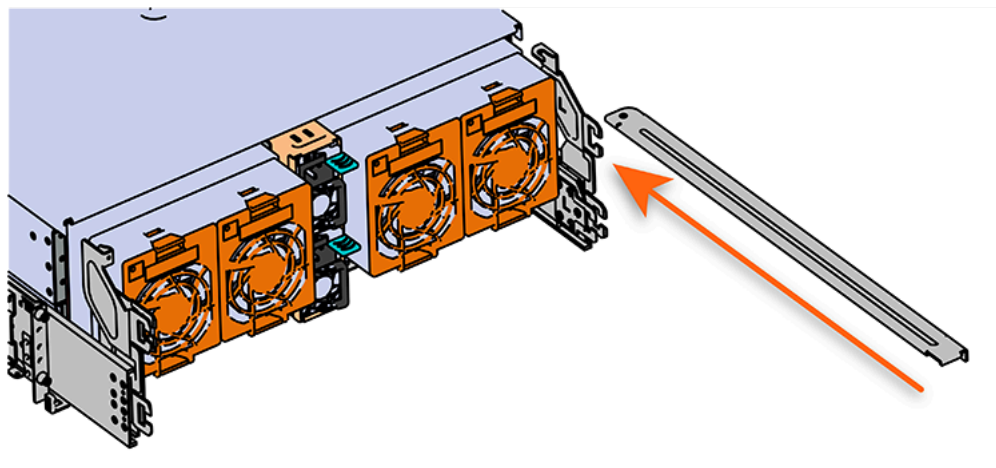
b. Insert the peg on the underside of the crossbar into the slot on the CMA mounting bracket.

Figure 199: Crossbar Underside Peg
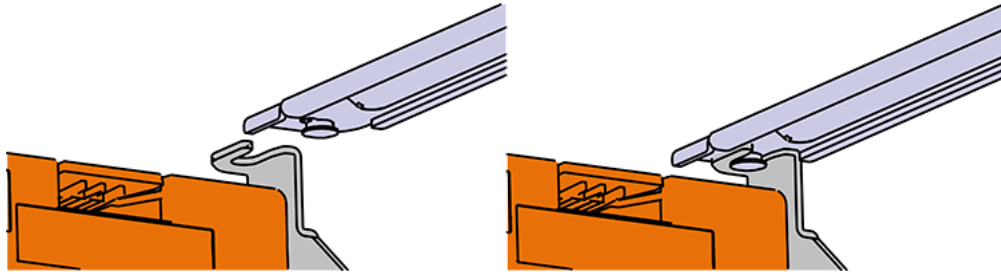
c. Swing the crossbar so that the thumbscrew lines up with the mounting hole on the opposite side of the enclosure.

Figure 200: Swinging Motion of Crossbar to Locking Position
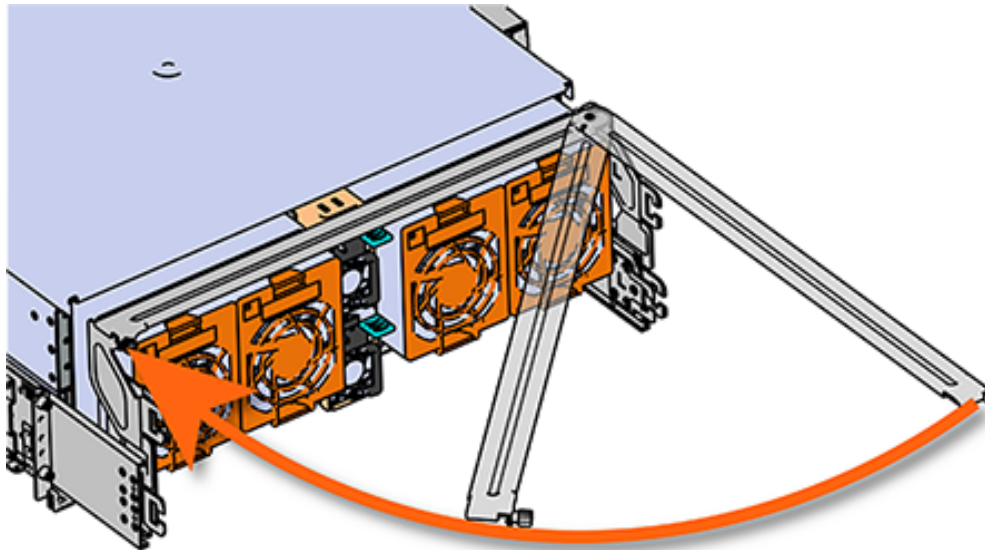
d. Press the crossbar against the CMA mounting bracket and secure the crossbar in place by pressing and turning the thumbscrew clockwise until snug.

Figure 201: Tightening the Thumbscrew
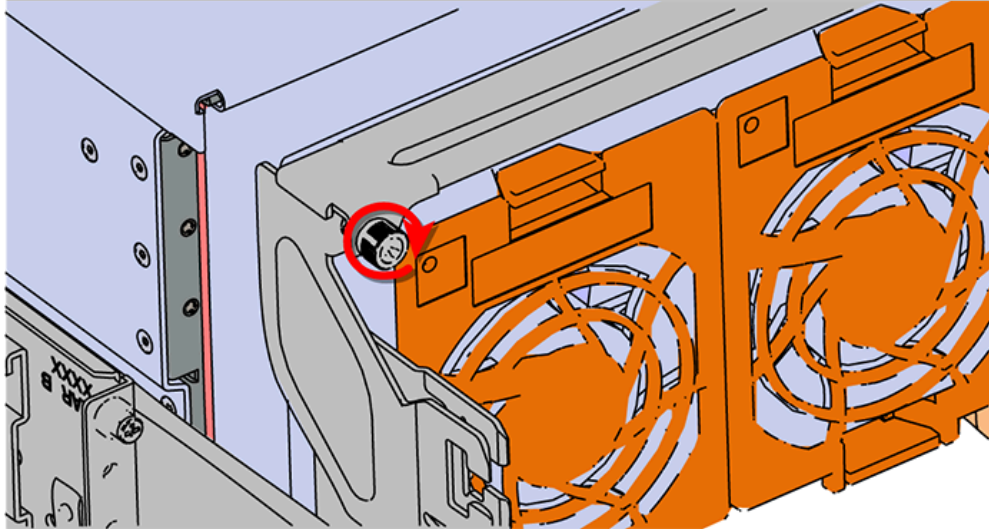
e. Check that the crossbar is fully secured to the CMA mounting bracket by pulling on the bar to ensure it does not move.

Step 53 : 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 178)* for more information.

Figure 202: CMA Cable Routing
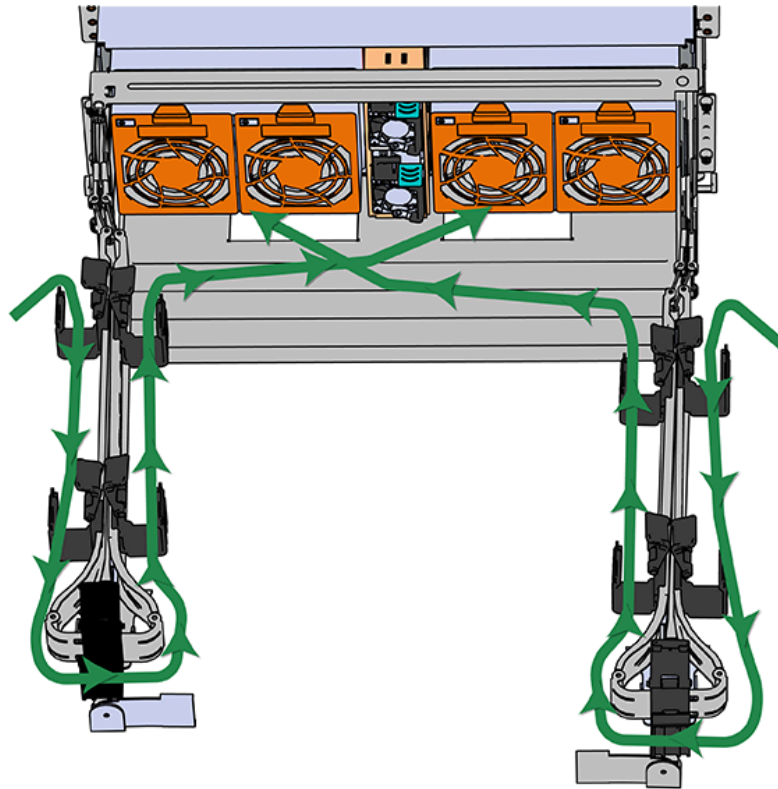
   c. Open all of the baskets.

Figure 203: 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.

> **i** **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. Attach the cable retention mechanism.

For PSUs with the clip-style retention mechanism, loop the clip around the power cable and pinch it until the clip catches and locks in place. Then slide the clip forward until it stops near the cable connector.

Figure 204: Clip-Style Cable Retention
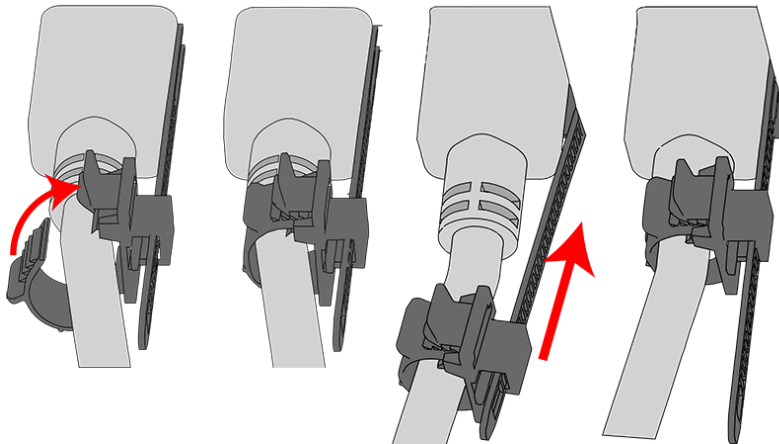
For PSUs with the strap-style retention mechanism, secure the power cable to the PSU handle with the hook-and-loop strap as shown in the following image.

Figure 205: Strap-Style Cable Retention
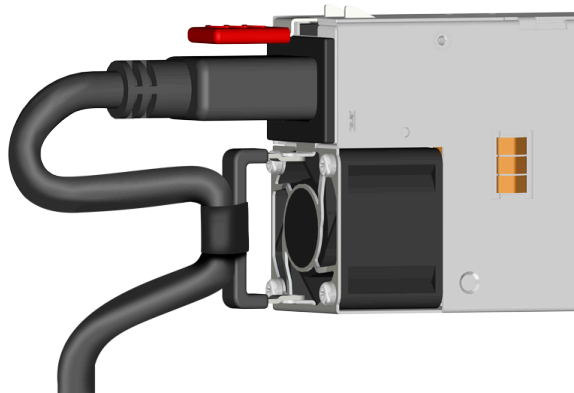
h. Route the power cable through each basket.

i. If the installation includes more than 10 total cables, follow the recommendations in Special Considerations for Cable Routing *(page 178)*, 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 206: Nominal Cable Length at Connectors
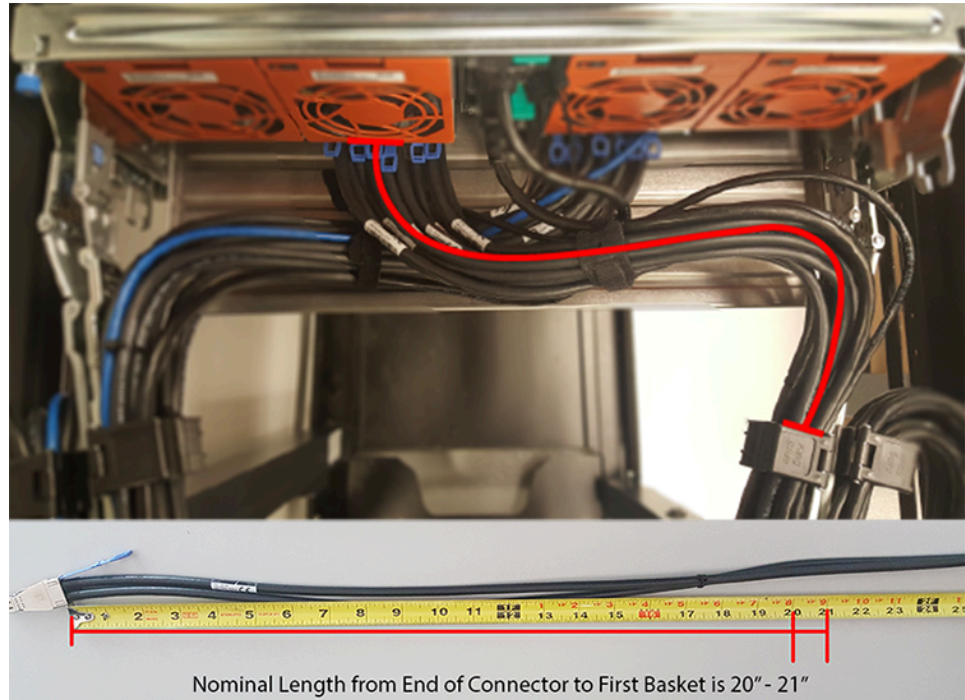
Nominal Length from End of Connector to First Basket is 20"- 21"

j. Close all of the baskets.

k. 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.

l. Reconnect the arm at the elbow to the connectors on the rail.

Step 54 : 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 207: Open Baskets
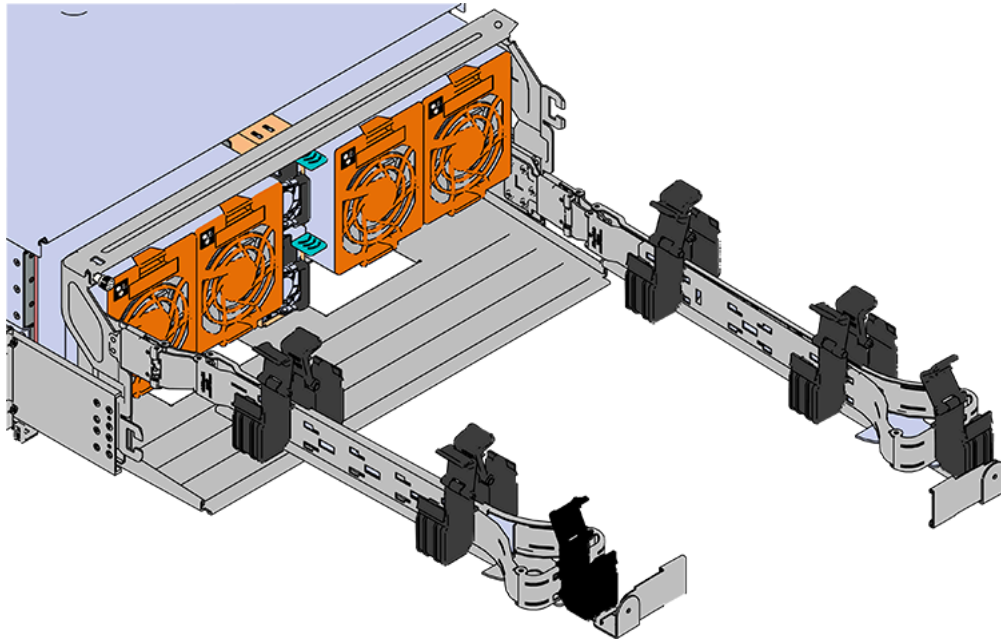
a. Connect the Ethernet cable to the Ethernet port on the right hand side of the Ultrastar Data60 and route the cable through each of the baskets on the CMA.

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 208: Connected Cable Routing
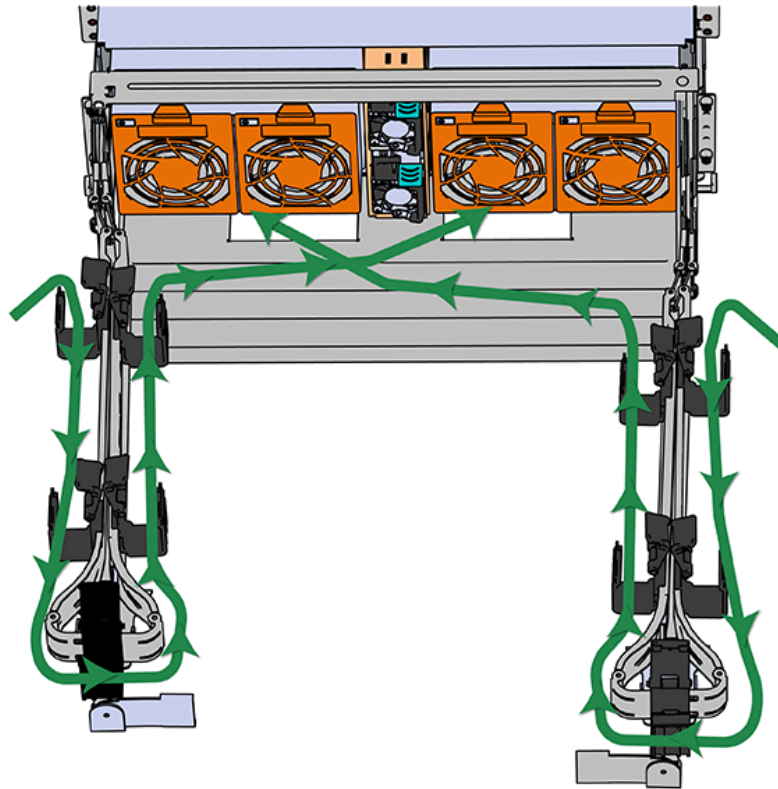
d. Wrap cable tie around the installed cable bundle between the ports and the first basket of the CMA

> **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 209: Nominal Cable Length at Connectors
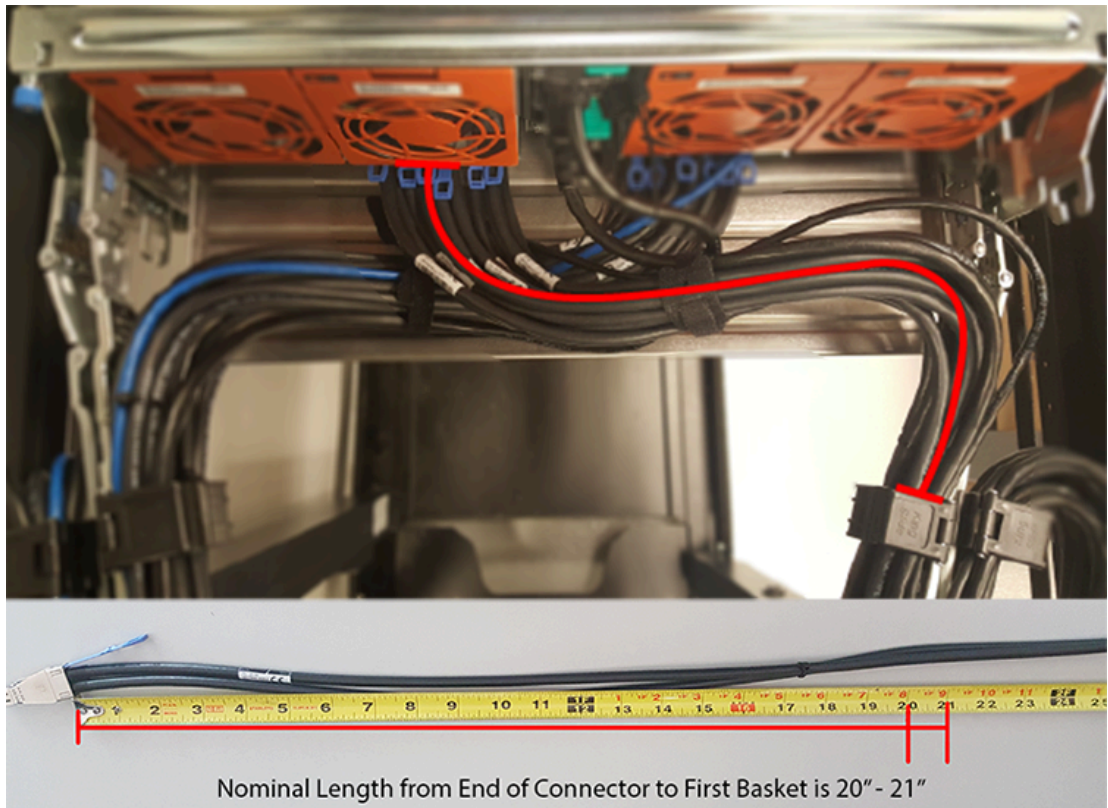
Nominal Length from End of Connector to First Basket is 20"- 21"

e. Attach the cable retention mechanism.

   For PSUs with the clip-style retention mechanism, loop the clip around the power cable and pinch it until the clip catches and locks in place. Then slide the clip forward until it stops near the cable connector.

Figure 210: Clip-Style Cable Retention

   For PSUs with the strap-style retention mechanism, secure the power cable to the PSU handle with the hook-and-loop strap as shown in the following image.

Figure 211: Strap-Style Cable Retention
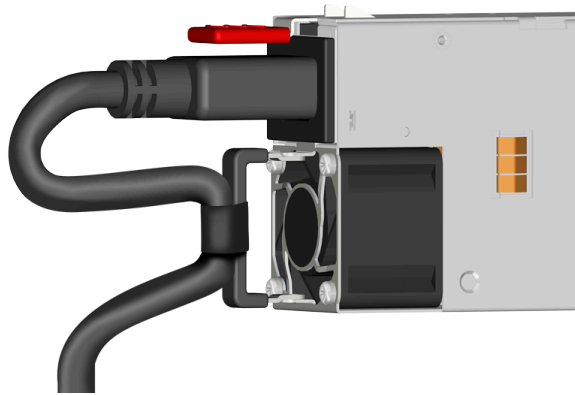
    f. If the Ultrastar Data60 is being installed in a rack and will subsequently be transported inside that rack, it is important to use the included cable tie to wrap the CMA bundle to ensure it does not get damaged during transport. If the Ultrastar Data60 is instead being installed where it will operated, skip this step.

    g. Close all of the baskets.

    h. Reconnect the CMA at the elbow to connector A.

Step 55 : 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 56 : 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.

3.10 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 212: Nominal Cable Length at Connectors

Nominal Length from End of Connector to First Basket is 20" - 21"
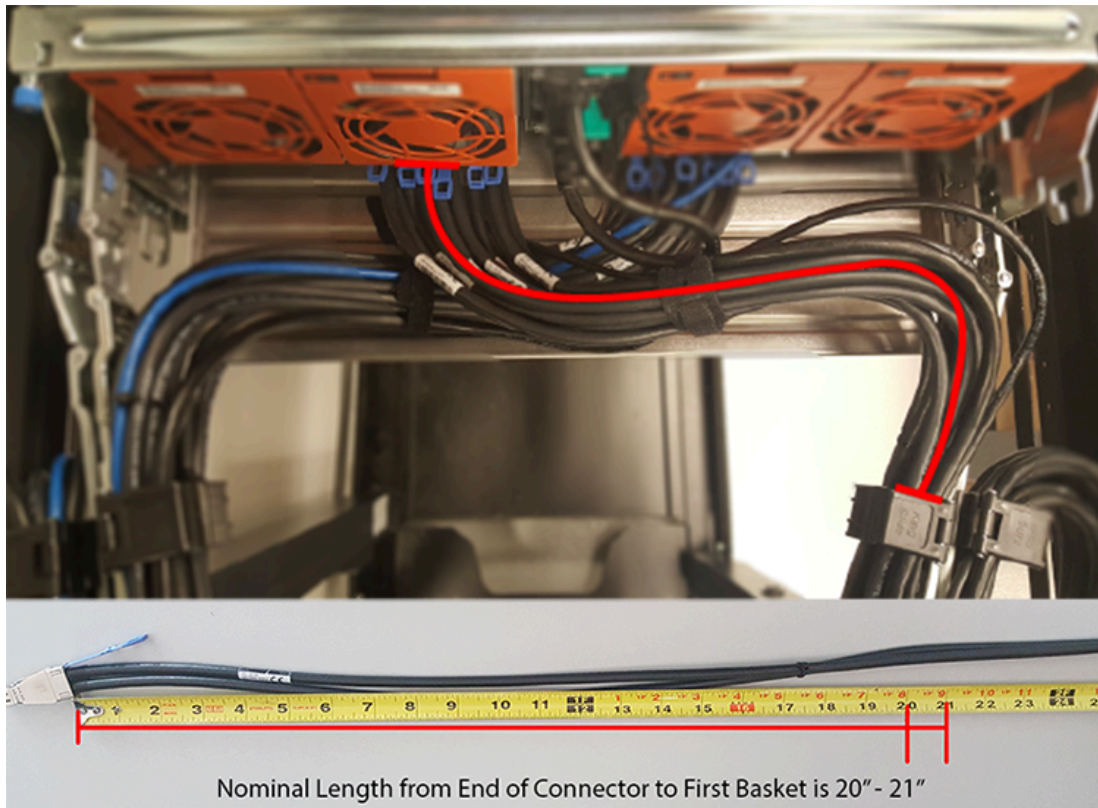
The cables at the port side of the CMA should crisscross in front of the IOMs. To accomplish this, the cables connected to the ports for IOM B (right hand side when facing the rear) should be connected to the upper CMA, and the cables connected to the ports for IOM A (left hand side when facing the rear) should be connected to the lower CMA.

Figure 213: Crisscross Cables
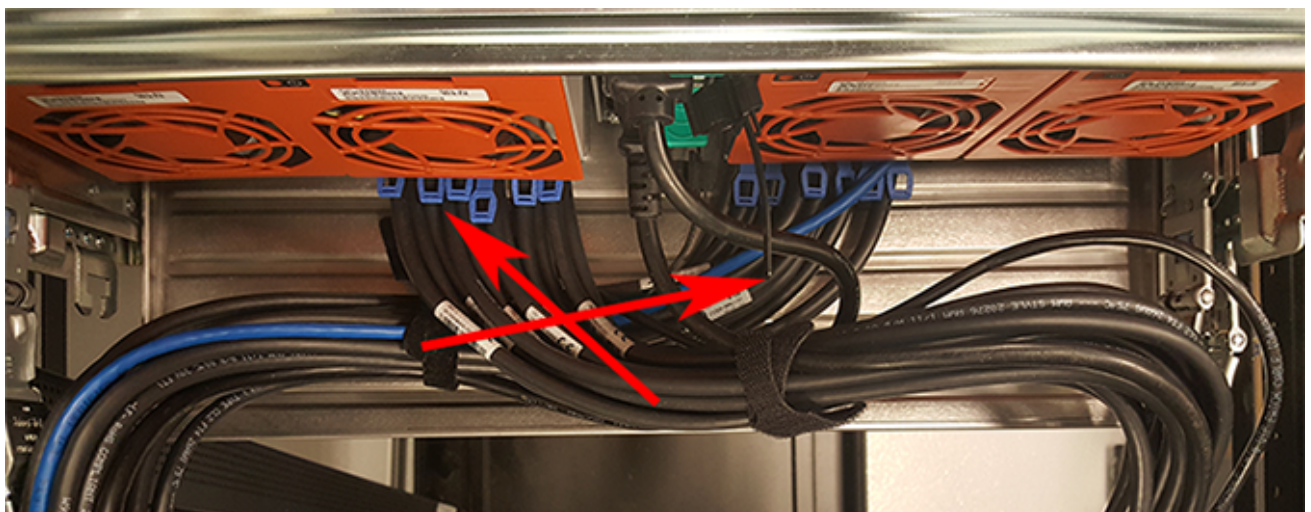
When the cables are routed into the CMA, make sure there is some slack given to the elbow joint of the CMA. It is recommended not to wrap the cables tightly around this joint because this can cause binding and prevent smooth operation. To ensure there is enough slack at the elbow, pull the enclosure 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 214: CMA Elbow with Full Cable Bundle
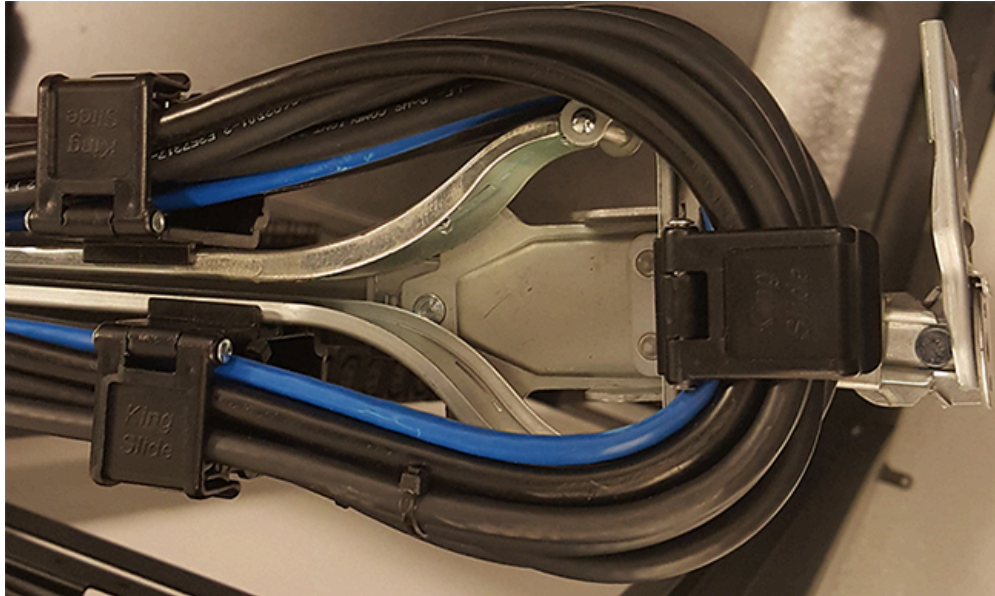
At the end of the CMA where the cables exit, use a cable tie to bundle the cables together. Make sure the cables are bending and not twisting.

Figure 215: Cable Tie at Exit of CMA
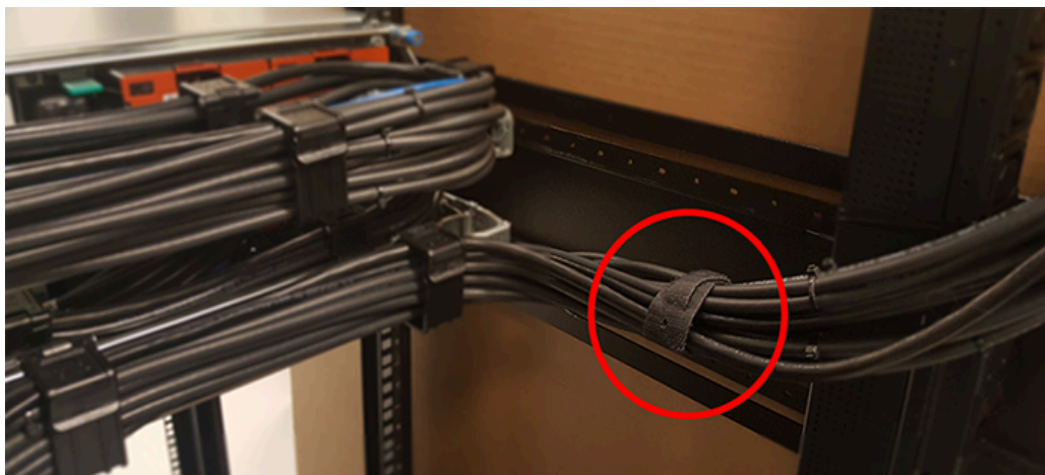
3.11 Cabling for CMA

3.11.1 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 verco strip will go. Apply the velco 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 216: Service Loop Dimension Figure
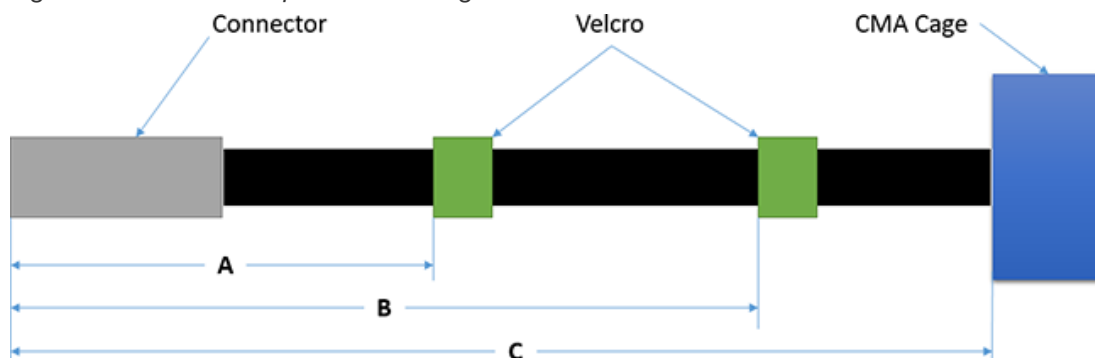
Table 88: Example Service Loop Dimension Table

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

In this case, the first measurement from the tip of the cable to the first velco 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.

3.11.2 Cabling CMA

3.11.2.1 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 217: Service Loop Dimension Figure
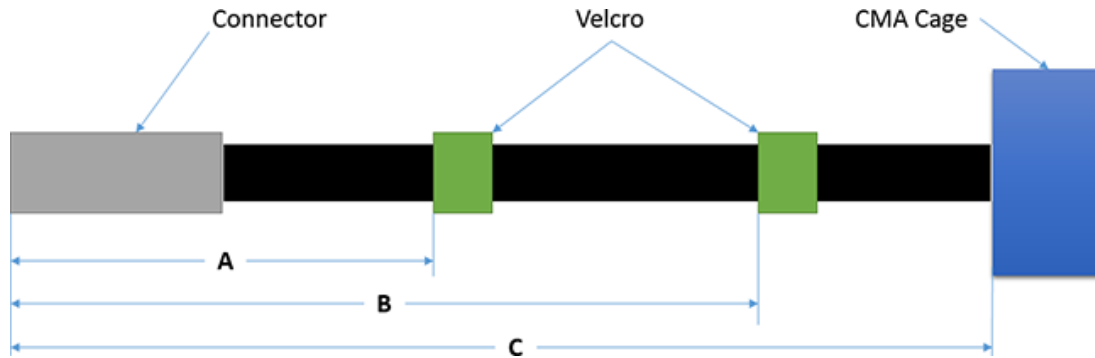
Table 89: Service Loop Dimension Table

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

Management

In This Chapter:

4.1 Management Overview

This section 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.

4.2 Firmware Upgrade

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

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.

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

Required Downloads:

- **SG3 Utils**: download version 1.47 from the SG3 Utils website at: http://sg.danny.cz/sg/sg3_utils.html

4.2.1 Downloading Firmware from the Support Portal

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

Step 1: Log in to the **Western Digital Enterprise Support Center** using a valid email address and password:

> **Note:** If you do not have registered Western Digital account, you may request one by clicking **Request access now** and selecting **Enterprise Support** from the access options before proceeding with the request.

Sign Into
BUSINESS SUPPORT CENTER

Western Digital.

User Name / Email Address

company@email.com

Password

••••••••••••

Login

Need an account?
Request access now.

Forgot Password?

The support portal will appear.
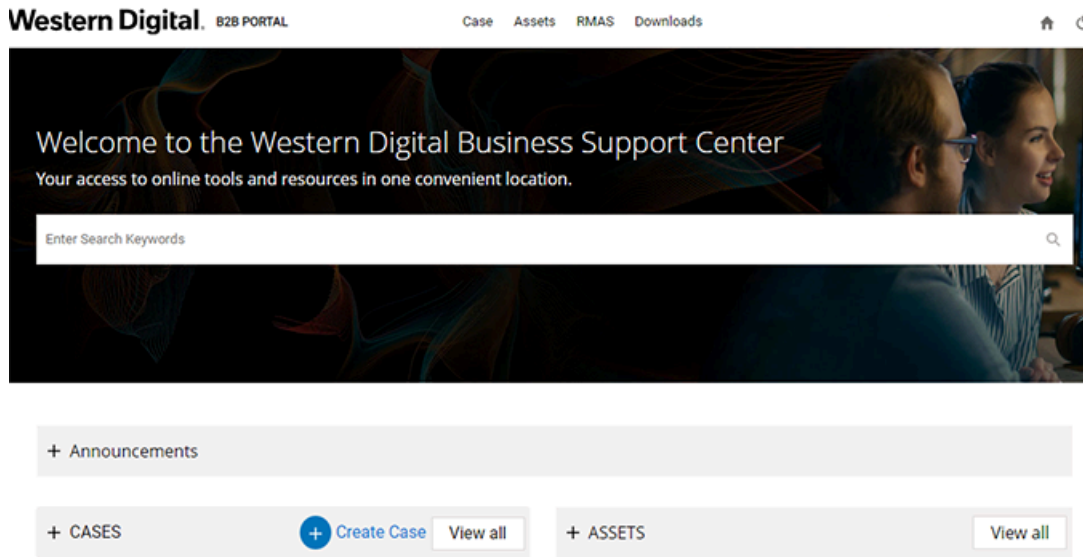
Step 2 : Click the **Downloads** option from the top banner.

The Western Digital downloads page will appear.

Step 3 : Choose a product from the **Select Product** dropdown list.

Note: Filenames will vary, depending on the options chosen from the **Select Product** section.
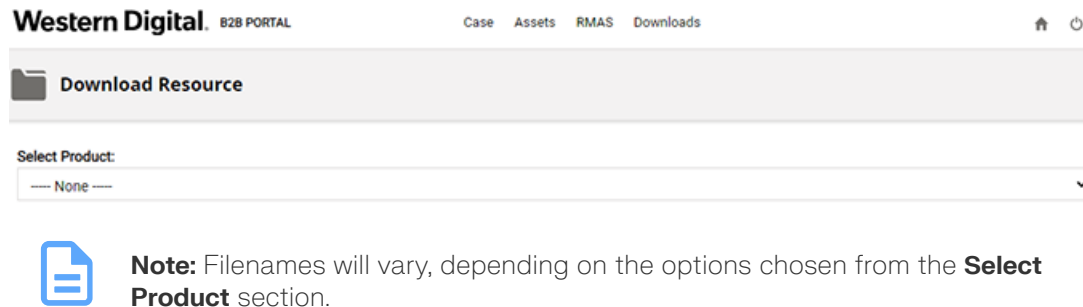
The product specific downloads will appear in the Download Resources section.
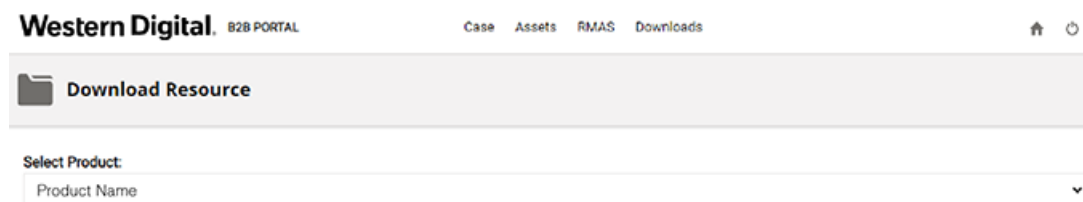
Step 4 : Expand a download option by clicking the caret next to the chosen category until files are displayed.

Please select the caret to expand each menu.

Select an option:

> -Change-Notices

> -Chassis-Firmware

> Expand Tree Branch

> -Enclosure-Tools

Step 5 : Download a file by clicking the chosen file.

Please select the caret to expand each menu.

Select an option:

> -Change-Notices
∨ -Chassis-Firmware
  ∨ -Current-2000-004
      Documentation
      Firmware
> Archive-0100-001
> Archive-0101-003
> Archive-0103-003
> Archive-1040-001
> -Documentation

Click on the filename to download

File Name	Size	Release Date
Firmware_File	9.76 MB	Jul 20, 2022

The file will automatically download.

Result: The enclosure firmware has now been downloaded.

ⓘ **Important:** Do not unzip/extract the tar.gz file. Doing so will result in errors during the firmware upgrade process.

4.3 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 the 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.

4.4 Enclosure Firmware Upgrade and Downgrade

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

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.

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

Required Downloads:

- **SG3 Utils**: download version 1.47 from the SG3 Utils website at: http://sg.danny.cz/sg/sg3_utils.html

4.4.1 Firmware Upgrade and Downgrade Version Information

This section provides details related to upgrade and downgrade versions. The upgrade tables detail the supported "Upgrade from Version" and the "Upgrade to Version" configurations. The downgrade tables detail the supported "Downgrade from Version" and the "Downgrade to Version" configurations.

> **(i) Attention:** If you have a system that needs to be upgraded from a firmware version older than 2040-015, contact Western Digital support at: enterprisesupport@wdc.com.

Table 90: Firmware Upgrade Version Information

Upgrade from Version	Upgrade to Version
2040-015_2.3.8	4011-005
2053-003_2.4.27	4011-005
3010-007_3.1.11	4011-005
4008-020_4.0.30	4011-005

Table 91: Firmware Downgrade Version Information

Downgrade from Version	Downgrade to Version
4011-005	2040-015_2.3.8
4011-005	2053-003_2.4.27
4011-005	3010-007_3.1.11
4011-005	4008-020_4.0.30

4.4.2 Upgrading Enclosure Firmware—Linux OS

> **(!) Warning:** Ensure that no IO is running to the drives in the enclosure. Upgrading is an offline event, and the drives will be disabled during this process.

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.

Step 2 : Issue 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.

Step 3 : Download the Firmware Update script and the 4011-005 Firmware bundle. If the current firmware is 4xxx-0xx to 4008-020, then also download the Transition code bundle - "HGST_Ultrastar-DATA60-DATA102-Server60-8_SEP_bundle_4T16-015_3.1.12.tar.gz" from the support portal: **https://portal.wdc.com/Support/s/**.

📄 **Note:** Firmware versions later than 4008-020 **do not** require the transition firmware.

Step 4 : Collect logs using wddcs tool.

```
wddcs getlog all
```

📄 **Note:** Results will be in /tmp/wddcs_<hostname>_<timestamp>.tgz

Step 5 : Check the current expander firmware and the OOBM versions.

```
wddcs <device> rcli "show enc"
wddcs <version>
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Device: <device>

Enclosure Information (IOM A)
    ENCL CONFIG : 4U60
    PARTNUM : 1ES1049-A5
    SERIAL : USWSJ01119EZ002C
    IOM A
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG005E
        FW(PRI) : xxxx-xxx
        FW(SEC1) : xxxx-xxx
        FW(SEC2) : xxxx-xxx
        FW(OOBM) : x.x.x
        MAC : 00:0C:CA:08:1E:B1
        IP ADDR : xx.xxx.xxx.214
    IOM B
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG0090
        FW(PRI) : xxxx-xxx
        FW(SEC1) : xxxx-xxx
        FW(SEC2) : xxxx-xxx
        FW(OOBM) : x.x.x
        MAC : 00:0C:CA:08:1D:E8
        IP ADDR : xx.xxx.xxx.146

Device: <device>

Enclosure Information (IOM B)
    ENCL CONFIG : 4U60
    PARTNUM : 1ES1049-A5
```

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```
  SERIAL : USWSJ01119EZ002C
 IOM A
     PARTNUM : 1EB1049-A2
     SERIAL : THCLS00719EG005E
     FW(PRI) : xxxx-xxx
     FW(SEC1) : xxxx-xxx
     FW(SEC2) : xxxx-xxx
     FW(OOBM) : x.x.x
     MAC : 00:0C:CA:08:1E:B1
     IP ADDR : xx.xxx.xxx.214
 IOM B
     PARTNUM : 1EB1049-A2
     SERIAL : THCLS00719EG0090
     FW(PRI) : xxxx-xxx
     FW(SEC1) : xxxx-xxx
     FW(SEC2) : xxxx-xxx
     FW(OOBM) : x.x.x
     MAC : 00:0C:CA:08:1D:E8
     IP ADDR : xx.xxx.xxx.146
```

Step 6 :   The versions listed in the WDDCS Tool output should be earlier versions of firmware than what is in the upgrade firmware bundle. If the SEP version is pre-4xxx-0xx then the Transition bundle will be needed by the Update script.

> ⓘ **Attention:** Upgrades from firmware versions prior to 2040 are not supported. Any enclosure that contains a firmware version previous to 2040 must be upgraded before completing the upgrade to 4008-020.

Step 7 :   Perform the upgrade on the enclosure.

> 📄 **Note:** Only one enclosure may be upgraded at a time.

a. Initiate the upgrade by issuing the following command:

```
./Ultrastar_Data60_102_FWUpdate -f HGST_Ultrastar-DATA60-DATA102-
Server60-8_SEP_bundle_<FW Version>.tar.gz
```

```
Ultrastar_Data60_102_FWUpdate v1.0.0
Copyright (c) 2022-2023 Western Digital Corporation or its affiliates

Logfile = Ultrastar_Data60_102_FWUpdate_2023_1_12_8_50_23.txt
Target File = HGST_Ultrastar-DATA60-DATA102-Server60-8_SEP_bundle_<FW
 Version>.tar.gz
Target Directory = <path to firmware files>


Identified below FW Upgradable Enclosure connected to Host
_____
Index       Enc Address           SEP              OOBM
1.          USCSJ04217EA0001     <FW Version>  <OOBM Version>
_____

4T16 Transition image is required
FW Update status for IOMB = [0x0]
Current FW Version = 2053-003
Target FW Version 4T16-015
```

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```
Starting FW update with file HGST_Ultrastar-DATA60-DATA102-
Server60-8_SEP_bundle_4T16-015_3.1.12.tar.gz on handle /dev/sg1
FW Download is completed Successfully
FW Update is completed for 4T16-015, reset command is sent, sleep for 10
 minutes.
Verify New FW  4T16-015 for Enclosure ID: USCSJ04217EA0001
FW Update completed Successfully for Version 4T16-015
Current FW Version = 4T16-015
Target FW Version 4011-005
Starting FW update with file HGST_Ultrastar-DATA60-DATA102-
Server60-8_SEP_bundle_4011-005_4.0.86.tar.gz on handle /dev/sg1
FW Download is completed Successfully
```

> **Note:** **<FW Version>** represents the latest version of firmware or the **Target FW Version**.

> **Attention:** The firmware upgrade will take approximately one hour to complete.

Step 8 : Use the WDDCS Tool to verify that the SEP and OOBM firmware has been upgraded to the preferred version of firmware and is running on all expanders.

```
# wddcs rcli "show enc"
wddcs v2.0.6.0
Copyright (c) 2019-2021 Western Digital Corporation or its affiliates

Device: <device>

Enclosure Information (IOM A)
    ENCL CONFIG : 4U60
    PARTNUM : 1ES1049-A5
    SERIAL : USWSJ01119EZ002C
    IOM A
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG005E
        FW(PRI) : <version>
        FW(SEC1) : <version>
        FW(SEC2) : <version>
        FW(OOBM) : <version>
        MAC : 00:0C:CA:08:1E:B1
        IP ADDR : xx.xxx.xxx.214
    IOM B
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG0090
        FW(PRI) : <version>
        FW(SEC1) : <version>
        FW(SEC2) : <version>
        FW(OOBM) : <version>
        MAC : 00:0C:CA:08:1D:E8
        IP ADDR : xx.xxx.xxx.146

Device: <device>

    Enclosure Information (IOM B)
    ENCL CONFIG : 4U60
    PARTNUM : 1ES1049-A5
```

```
     SERIAL : USWSJ01119EZ002C
IOM A
     PARTNUM : 1EB1049-A2
     SERIAL : THCLS00719EG005E
     FW(PRI) : <version>
     FW(SEC1) : <version>
     FW(SEC2) : <version>
     FW(OOBM) : <version>
     MAC : 00:0C:CA:08:1E:B1
     IP ADDR : xx.xxx.xxx.214
IOM B
     PARTNUM : 1EB1049-A2
     SERIAL : THCLS00719EG0090
     FW(PRI) : <version>
     FW(SEC1) : <version>
     FW(SEC2) : <version>
     FW(OOBM) : <version>
     MAC : 00:0C:CA:08:1D:E8
     IP ADDR : xx.xxx.xxx.146
```

Step 9 : Verify the firmware and OOBM information lists the version of the upgraded firmware.

Result: The enclosure firmware has now been upgraded.

4.4.3 Upgrading Enclosure Firmware—Windows OS

> **Warning:** Ensure that no IO is running to the drives in the enclosure. Upgrading is an offline event, and the drives will be disabled during this process.

Step 1: 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.

Step 2 : Log on to the Windows server and launch a command prompt.

Step 3 : 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 4 : To determine which IOM is which, use the **<dev>** string with the sg_ses command.

Step 5 : Download the Firmware Update script and the 4011-005 Firmware bundle. If the current firmware is 4xxx-0xx or later, then also download the Transition code bundle - "HGST_Ultrastar-DATA60-DATA102-Server60-8_SEP_bundle_4T16-015_3.1.12.tar.gz" from the support portal: **https://portal.wdc.com/Support/s/**.

Step 6 : Collect logs using wddcs tool.

```
wddcs getlog all
```

> **Note:** Results will be in /tmp/wddcs_<hostname>_<timestamp>.tgz

Step 7 : Use the WDDCS Tool to verify that the expander firmware and the OOBM version.

```
wddcs <device> rcli "show enc"
wddcs <version>
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Device: <device>

Enclosure Information (IOM A)
    ENCL CONFIG : 4U60
    PARTNUM : 1ES1049-A5
    SERIAL : USWSJ01119EZ002C
    IOM A
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG005E
        FW(PRI) : xxxx-xxx
        FW(SEC1) : xxxx-xxx
        FW(SEC2) : xxxx-xxx
        FW(OOBM) : x.x.x
        MAC : 00:0C:CA:08:1E:B1
        IP ADDR : xx.xxx.xxx.214
    IOM B
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG0090
        FW(PRI) : xxxx-xxx
        FW(SEC1) : xxxx-xxx
        FW(SEC2) : xxxx-xxx
        FW(OOBM) : x.x.x
        MAC : 00:0C:CA:08:1D:E8
        IP ADDR : xx.xxx.xxx.146

Device: <device>

Enclosure Information (IOM B)
    ENCL CONFIG : 4U60
    PARTNUM : 1ES1049-A5
    SERIAL : USWSJ01119EZ002C
    IOM A
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG005E
        FW(PRI) : xxxx-xxx
        FW(SEC1) : xxxx-xxx
        FW(SEC2) : xxxx-xxx
        FW(OOBM) : x.x.x
        MAC : 00:0C:CA:08:1E:B1
        IP ADDR : xx.xxx.xxx.214
    IOM B
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG0090
        FW(PRI) : xxxx-xxx
        FW(SEC1) : xxxx-xxx
        FW(SEC2) : xxxx-xxx
        FW(OOBM) : x.x.x
        MAC : 00:0C:CA:08:1D:E8
        IP ADDR : xx.xxx.xxx.146
```

Step 8 : The versions listed in the WDDCS Tool output should be an earlier version of firmware than the upgrade firmware bundle.

> ℹ️ **Attention:** Upgrades to firmware versions prior to 2040 are not supported. Any enclosure that contains a firmware version previous to 2040 must be upgraded before completing the upgrade to 4011-005.

Step 9 : Perform the upgrade on the enclosure.

> 📄 **Note:** Only one enclosure may be upgraded at a time.

a. Initiate the upgrade by issuing the following command:

```
./Ultrastar_Data60_102_FWUpdate -f HGST_Ultrastar-DATA60-DATA102-
Server60-8_SEP_bundle_<FW Version>.tar.gz.
```

```
Ultrastar_Data60_102_FWUpdate v1.0.0
Copyright (c) 2022-2023 Western Digital Corporation or its affiliates

Logfile = Ultrastar_Data60_102_FWUpdate_2023_1_12_8_50_23.txt
Target File = HGST_Ultrastar-DATA60-DATA102-Server60-8_SEP_bundle_<FW
 Version>.tar.gz
Target Directory = <path to firmware files>


Identified below FW Upgradable Enclosure connected to Host
_____
Index         Enc Address           SEP               OOBM
1.         USCSJ04217EA0001      <FW Version>   <OOBM Version>
_____

4T16 Transition image is required
FW Update status for IOMB = [0x0]
Current FW Version = 2053-003
Target FW Version 4T16-015
Starting FW update with file fw_files/HGST_Ultrastar-DATA60-DATA102-
Server60-8_SEP_bundle_4T16-015_3.1.12.tar.gz on handle /dev/sg1
FW Download is completed Successfully
FW Update is completed for 4T16-015, reset command is sent, sleep for 10
 minutes.
Verify New FW  4T16-015 for Enclosure ID: USCSJ04217EA0001
FW Update completed Successfully for Version 4T16-015
Current FW Version = 4T16-015
Target FW Version 4011-005
Starting FW update with file fw_files/HGST_Ultrastar-DATA60-DATA102-
Server60-8_SEP_bundle_4011-005_4.0.31.tar.gz on handle /dev/sg1
FW Download is completed Successfully
```

> 📄 **Note: <FW Version>** represents the latest version of firmware or the **Target FW Version**.

> ℹ️ **Attention:** The firmware upgrade will take approximately one hour to complete.

Step 10 : Use the WDDCS Tool to verify that the SEP and OOBM firmware has been upgraded to the preferred version of firmware and is running on all expanders.

```
# wddcs rcli "show enc"
wddcs v2.0.6.0
Copyright (c) 2019-2021 Western Digital Corporation or its affiliates

Device: <device>

Enclosure Information (IOM A)
    ENCL CONFIG : 4U60
    PARTNUM : 1ES1049-A5
    SERIAL : USWSJ01119EZ002C
    IOM A
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG005E
        FW(PRI) : <version>
        FW(SEC1) : <version>
        FW(SEC2) : <version>
        FW(OOBM) : <version>
        MAC : 00:0C:CA:08:1E:B1
        IP ADDR : xx.xxx.xxx.214
    IOM B
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG0090
        FW(PRI) : <version>
        FW(SEC1) : <version>
        FW(SEC2) : <version>
        FW(OOBM) : <version>
        MAC : 00:0C:CA:08:1D:E8
        IP ADDR : xx.xxx.xxx.146

Device: <device>

    Enclosure Information (IOM B)
    ENCL CONFIG : 4U60
    PARTNUM : 1ES1049-A5
    SERIAL : USWSJ01119EZ002C
    IOM A
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG005E
        FW(PRI) : <version>
        FW(SEC1) : <version>
        FW(SEC2) : <version>
        FW(OOBM) : <version>
        MAC : 00:0C:CA:08:1E:B1
        IP ADDR : xx.xxx.xxx.214
    IOM B
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG0090
        FW(PRI) : <version>
        FW(SEC1) : <version>
        FW(SEC2) : <version>
        FW(OOBM) : <version>
        MAC : 00:0C:CA:08:1D:E8
        IP ADDR : xx.xxx.xxx.146
```

Step 11 : Verify the firmware and OOBM information lists the version of the upgraded firmware.

Result: The enclosure firmware has now been upgraded.

4.4.4 Downgrading Enclosure Firmware—Linux OS

The following procedure provides instructions for downgrading the enclosure's current version of firmware using a Linux host.

> ⚠️ **Warning:** Ensure that no IO is running to the drives in the enclosure. Downgrading is an offline event, and the drives will be disabled during this process.

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.

> ℹ️ **Attention:** The drives will be inaccessible while the transition image is active.

Step 2 : Download the Firmware Update script and the desired Firmware downgrade bundle. If the current firmware is later than 4xxx-0xx, and the desired firmware is pre-4xxx-0xx, then also download the Transition code bundle - "HGST_Ultrastar-DATA60-DATA102-Server60-8_SEP_bundle_16T4-015_4.0.10.tar.gz" from the support portal: **https://portal.wdc.com/Support/s/**.

Step 3 : Issue 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  4011 [rmb=0 cmdq=1 pqual=0 pdev=0xd]
<dev>: scsi8 channel=0 id=204 lun=0
    HGST  H4060-J  4011 [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.

Step 4 : Use the WDDCS Tool to verify that the expander firmware and the OOBM version.

```
wddcs <device> rcli "show enc"
wddcs <version>
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Device: <device>

Enclosure Information (IOM A)
    ENCL CONFIG : 4U60
    PARTNUM : 1ES1049-A5
    SERIAL : USWSJ01119EZ002C
    IOM A
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG005E
        FW(PRI) : xxxx-xxx
        FW(SEC1) : xxxx-xxx
        FW(SEC2) : xxxx-xxx
        FW(OOBM) : x.x.x
```

```
        MAC : 00:0C:CA:08:1E:B1
        IP ADDR : xx.xxx.xxx.214
    IOM B
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG0090
        FW(PRI) : xxxx-xxx
        FW(SEC1) : xxxx-xxx
        FW(SEC2) : xxxx-xxx
        FW(OOBM) : x.x.x
        MAC : 00:0C:CA:08:1D:E8
        IP ADDR : xx.xxx.xxx.146

Device: <device>

Enclosure Information (IOM B)
    ENCL CONFIG : 4U60
    PARTNUM : 1ES1049-A5
    SERIAL : USWSJ01119EZ002C
    IOM A
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG005E
        FW(PRI) : xxxx-xxx
        FW(SEC1) : xxxx-xxx
        FW(SEC2) : xxxx-xxx
        FW(OOBM) : x.x.x
        MAC : 00:0C:CA:08:1E:B1
        IP ADDR : xx.xxx.xxx.214
    IOM B
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG0090
        FW(PRI) : xxxx-xxx
        FW(SEC1) : xxxx-xxx
        FW(SEC2) : xxxx-xxx
        FW(OOBM) : x.x.x
        MAC : 00:0C:CA:08:1D:E8
        IP ADDR : xx.xxx.xxx.146
```

Step 5 : The versions listed in the WDDCS Tool output should be later versions of firmware than what is in the downgrade firmware bundle. If the current SEP version is 4xxx-0xx or later and the target firmware is pre-4xxx-0xx, then the 16T4 Transition bundle will be needed by the Update script.

> (i) **Attention:** Downgrades to firmware versions prior to 2053-003 are not supported.

Step 6 : Perform the downgrade on the enclosure.

> 📄 **Note:** One enclosure may be downgraded at a time.

a. Initiate the downgrade by issuing the following command:

```
./Ultrastar_Data60_102_FWUpdate -f HGST_Ultrastar-DATA60-DATA102-
Server60-8_SEP_bundle_<FW Version>.tar.gz.
```

```
Ultrastar_Data60_102_FWUpdate v1.0.0
Copyright (c) 2022-2023 Western Digital Corporation or its affiliates

Logfile = Ultrastar_Data60_102_FWUpdate_2023_1_12_8_50_23.txt
```

```
Target File = HGST_Ultrastar-DATA60-DATA102-Server60-8_SEP_bundle_<FW
 Version>.tar.gz
Target Directory = <path to firmware files>


Identified below FW Upgradable Enclosure connected to Host
_____
Index        Enc Address          SEP             OOBM
1.          USCSJ04217EA0001     <FW Version>  <OOBM Version>
_____


16T4 Transition image is required
FW Update status for IOMB = [0x0]
Current FW Version = 4011-005
Target FW Version 16T4-015
Starting FW update with file fw_files/HGST_Ultrastar-DATA60-DATA102-
Server60-8_SEP_bundle_16T4-015_4.0.10.tar.gz on handle /dev/sg1
FW Download is completed Successfully
FW Update is completed for 16T4-015, reset command is sent, sleep for 10
 minutes.
Verify New FW  16T4-015 for Enclosure ID: USCSJ04217EA0001
FW Update completed Successfully for Version 16T4-015
Current FW Version = 16T4-015
Target FW Version 3010-007
Starting FW update with file fw_files/HGST_Ultrastar-DATA60-DATA102-
Server60-8_SEP_bundle_3010-007_3.1.11.tar.gz on handle /dev/sg1
FW Download is completed Successfully
FW Update is completed for 3010-007, reset command is sent, sleep for 10
 minutes.
Verify New FW  3010-007 for Enclosure ID: USCSJ04217EA0001
FW Update completed Successfully for Version 3010-007
FW Update is completed for all the files, Successful Exit!
```

(i) **Attention:** The firmware downgrade will take approximately one hour to complete.

Step 7 : Use the WDDCS Tool to verify that the SEP and OOBM firmware has been downgraded to the preferred version of firmware and is running on all expanders.

```
# wddcs rcli "show enc"
wddcs v2.0.6.0
Copyright (c) 2019-2021 Western Digital Corporation or its affiliates

Device: <device>

Enclosure Information (IOM A)
    ENCL CONFIG : 4U60
    PARTNUM : 1ES1049-A5
    SERIAL : USWSJ01119EZ002C
    IOM A
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG005E
        FW(PRI) : <version>
        FW(SEC1) : <version>
        FW(SEC2) : <version>
        FW(OOBM) : <version>
        MAC : 00:0C:CA:08:1E:B1
```

```
            IP ADDR : xx.xxx.xxx.214
      IOM B
            PARTNUM : 1EB1049-A2
            SERIAL : THCLS00719EG0090
            FW(PRI) : <version>
            FW(SEC1) : <version>
            FW(SEC2) : <version>
            FW(OOBM) : <version>
            MAC : 00:0C:CA:08:1D:E8
            IP ADDR : xx.xxx.xxx.146

 Device: <device>

      Enclosure Information (IOM B)
      ENCL CONFIG : 4U60
      PARTNUM : 1ES1049-A5
      SERIAL : USWSJ01119EZ002C
      IOM A
            PARTNUM : 1EB1049-A2
            SERIAL : THCLS00719EG005E
            FW(PRI) : <version>
            FW(SEC1) : <version>
            FW(SEC2) : <version>
            FW(OOBM) : <version>
            MAC : 00:0C:CA:08:1E:B1
            IP ADDR : xx.xxx.xxx.214
      IOM B
            PARTNUM : 1EB1049-A2
            SERIAL : THCLS00719EG0090
            FW(PRI) : <version>
            FW(SEC1) : <version>
            FW(SEC2) : <version>
            FW(OOBM) : <version>
            MAC : 00:0C:CA:08:1D:E8
            IP ADDR : xx.xxx.xxx.146
```

Step 8 : Verify the firmware and OOBM information lists the version of the downgraded firmware.

Result: The enclosure firmware has now been downgraded.

4.4.5 Downgrading Enclosure Firmware—Windows OS

The following procedure provides instructions for downgrading the enclosure current version of firmware using a Windows host.

> ⚠ **Warning:** Ensure that no IO is running to the drives in the enclosure. Downgrading is an offline event, and the drives will be disabled during this process.

Step 1: Make sure that **sg3_utils** is installed on the enclosure 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.

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 : Use the WDDCS Tool to verify that the expander firmware and the OOBM version.

```
wddcs <device> rcli "show enc"
wddcs <version>
Copyright (c) 2019-2021 Western Digital Corporation or its affiliates

Device: <device>

Enclosure Information (IOM A)
    ENCL CONFIG : 4U60
    PARTNUM : 1ES1049-A5
    SERIAL : USWSJ01119EZ002C
    IOM A
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG005E
        FW(PRI) : xxxxx-xxx
        FW(SEC1) : xxxxx-xxx
        FW(SEC2) : xxxxx-xxx
        FW(OOBM) : x.x.x
        MAC : 00:0C:CA:08:1E:B1
        IP ADDR : xx.xxx.xxx.214
    IOM B
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG0090
        FW(PRI) : xxxxx-xxx
        FW(SEC1) : xxxxx-xxx
        FW(SEC2) : xxxxx-xxx
        FW(OOBM) : x.x.x
        MAC : 00:0C:CA:08:1D:E8
        IP ADDR : xx.xxx.xxx.146

Device: <device>
```

```
Enclosure Information (IOM B)
    ENCL CONFIG : 4U60
    PARTNUM : 1ES1049-A5
    SERIAL : USWSJ01119EZ002C
    IOM A
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG005E
        FW(PRI) : xxxx-xxx
        FW(SEC1) : xxxx-xxx
        FW(SEC2) : xxxx-xxx
        FW(OOBM) : x.x.x
        MAC : 00:0C:CA:08:1E:B1
        IP ADDR : xx.xxx.xxx.214
    IOM B
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG0090
        FW(PRI) : xxxx-xxx
        FW(SEC1) : xxxx-xxx
        FW(SEC2) : xxxx-xxx
        FW(OOBM) : x.x.x
        MAC : 00:0C:CA:08:1D:E8
        IP ADDR : xx.xxx.xxx.146
```

Step 7 : The versions listed in the WDDCS Tool output should be a later version of firmware than the downgrade firmware bundle is.

> **(i)** **Attention:** Downgrades to firmware versions prior to 2053-003 are not supported.

Step 8 : Perform the downgrade on the enclosure.

> **Note:** One enclosure may be downgraded at a time.

a. Initiate the downgrade by issuing the following command:

```
./Ultrastar_Data60_102_FWUpdate -f HGST_Ultrastar-DATA60-DATA102-
Server60-8_SEP_bundle_<FW Version>.tar.gz.
```

```
Ultrastar_Data60_102_FWUpdate v1.0.0
Copyright (c) 2022-2023 Western Digital Corporation or its affiliates

Logfile = Ultrastar_Data60_102_FWUpdate_2023_1_12_8_50_23.txt
Target File = HGST_Ultrastar-DATA60-DATA102-Server60-8_SEP_bundle_<FW
 Version>.tar.gz
Target Directory = <path to firmware files>


Identified below FW Upgradable Enclosure connected to Host
_____
Index       Enc Address           SEP             OOBM
1.          USCSJ04217EA0001      <FW Version>   <OOBM Version>
_____

16T4 Transition image is required
FW Update status for IOMB = [0x0]
Current FW Version = 4011-005
Target FW Version 16T4-015
```

```
Starting FW update with file fw_files/HGST_Ultrastar-DATA60-DATA102-
Server60-8_SEP_bundle_16T4-015_4.0.10.tar.gz on handle /dev/sg1
FW Download is completed Successfully
FW Update is completed for 16T4-015, reset command is sent, sleep for 10
 minutes.
Verify New FW  16T4-015 for Enclosure ID: USCSJ04217EA0001
FW Update completed Successfully for Version 16T4-015
Current FW Version = 16T4-015
Target FW Version 3010-007
Starting FW update with file fw_files/HGST_Ultrastar-DATA60-DATA102-
Server60-8_SEP_bundle_3010-007_3.1.11.tar.gz on handle /dev/sg1
FW Download is completed Successfully
FW Update is completed for 3010-007, reset command is sent, sleep for 10
 minutes.
Verify New FW  3010-007 for Enclosure ID: USCSJ04217EA0001
FW Update completed Successfully for Version 3010-007
FW Update is completed for all the files, Successful Exit!
```

> **Attention:** The firmware downgrade will take approximately one hour to complete.

Step 9 : Use the WDDCS Tool to verify that the SEP and OOBM firmware has been downgraded to the preferred version of firmware and is running on all expanders.

```
# wddcs rcli "show enc"
wddcs v2.0.6.0
Copyright (c) 2019-2021 Western Digital Corporation or its affiliates

Device: <device>

Enclosure Information (IOM A)
    ENCL CONFIG : 4U60
    PARTNUM : 1ES1049-A5
    SERIAL : USWSJ01119EZ002C
    IOM A
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG005E
        FW(PRI) : <version>
        FW(SEC1) : <version>
        FW(SEC2) : <version>
        FW(OOBM) : <version>
        MAC : 00:0C:CA:08:1E:B1
        IP ADDR : xx.xxx.xxx.214
    IOM B
        PARTNUM : 1EB1049-A2
        SERIAL : THCLS00719EG0090
        FW(PRI) : <version>
        FW(SEC1) : <version>
        FW(SEC2) : <version>
        FW(OOBM) : <version>
        MAC : 00:0C:CA:08:1D:E8
        IP ADDR : xx.xxx.xxx.146

Device: <device>

    Enclosure Information (IOM B)
    ENCL CONFIG : 4U60
```

```
PARTNUM : 1ES1049-A5
SERIAL : USWSJ01119EZ002C
IOM A
     PARTNUM : 1EB1049-A2
     SERIAL : THCLS00719EG005E
     FW(PRI) : <version>
     FW(SEC1) : <version>
     FW(SEC2) : <version>
     FW(OOBM) : <version>
     MAC : 00:0C:CA:08:1E:B1
     IP ADDR : xx.xxx.xxx.214
IOM B
     PARTNUM : 1EB1049-A2
     SERIAL : THCLS00719EG0090
     FW(PRI) : <version>
     FW(SEC1) : <version>
     FW(SEC2) : <version>
     FW(OOBM) : <version>
     MAC : 00:0C:CA:08:1D:E8
     IP ADDR : xx.xxx.xxx.146
```

Step 10 : Verify the firmware and OOBM information lists the version of the downgraded firmware.

Result: The enclosure firmware has now been downgraded.

4.5 Firmware Auto-Sync

Introduced with firmware version 3000-058, Auto-Sync is a feature that automatically detects a mismatch of SEP and OOBM firmware between an enclosure's two IOMs and initiates an upgrade or downgrade to synchronize the firmware versions. This feature is designed to reduce the time required to update firmware after replacing one or both IOMs and can be utilized to achieve different outcomes depending on the user's needs. The following sections define use cases of this feature, requirements for its operation, and procedures for enabling and disabling it.

Single IOM Replacement

After removing one IOM from a powered-up enclosure, or booting an enclosure with only a single IOM, the firmware on the installed IOM (if v3 or higher) will become dominant. If a second IOM with different firmware is then installed, the enclosure will detect the mismatch and either upgrade or downgrade the firmware on the second IOM to match the first.

Dual IOM Replacement

After booting an enclosure with two installed IOMs, the highest version of IOM firmware will become dominant. The firmware on the other IOM will be upgraded to match.

Feature Requirements

- The dominant IOM must be running SEP firmware version 3xxx or higher and OOBM firmware 3.x.x or higher. This firmware bundle is collectively referred to as "v3".
- The non-dominant IOM must be running SEP firmware version 2020 or higher.
- The enclosure must have the Auto-Sync VPD bit enabled.
- To enable and disable the Auto-Sync VPD bit, the host must have the sg3_utils package installed: http://sg.danny.cz/sg/sg3_utils.html.

Restrictions

- Auto-Sync will not be operational when a manual firmware upgrade is in progress.
- Manual firmware upgrade will not be available when an Auto-Sync firmware upgrade is in progress.

4.5.1 Enabling Auto-Sync

Step 1: Follow the instructions in the Firmware Upgrade *(page 184)* section to download the v3 firmware bundle to the dominant IOM and activate it.

Step 2: From a host command line, use the `sg_modes` utility to verify that the enclosure's Auto-Sync VPD bit is currently **disabled** (00, bold in the following example):

```
sg_modes <dev> --page=0x20 --llbaa
    HGST  H4060-J  3010   peripheral_type: enclosure services device [0xd]
Mode parameter header from MODE SENSE(10):
  Mode data length=24, medium type=0x00, specific param=0x00, longlba=0
  Block descriptor length=0
>> page_code: 0x20, page_control: current
 00     a0 0e 01 00 00 00 00 00  00 00 00 00 00 00 00 00
```

Step 3: Use the `sg_wr_mode` utility to **enable** the enclosure's Auto-Sync VPD bit:

```
sg_wr_mode <dev> --dbd -s --page=0x20 --
contents=a0,0e,01,00,00,00,00,00,00,00,00,00,00,00,08,00 --
mask=00,00,00,00,00,00,00,00,00,00,00,00,00,00,08,00
```

Step 4: Use the `sg_modes` utility to verify that the enclosure's Auto-Sync VPD bit is now **enabled** (08, bold in the following example):

```
sg_modes <dev> --page=0x20 --llbaa
    HGST  H4060-J  3010   peripheral_type: enclosure services device [0xd]
Mode parameter header from MODE SENSE(10):
  Mode data length=24, medium type=0x00, specific param=0x00, longlba=0
  Block descriptor length=0
>> page_code: 0x20, page_control: current
 00     a0 0e 01 00 00 00 00 00  00 00 00 00 00 00 08 00
```

4.5.2 Checking Auto-Sync Status

Note: Depending on the user's system and configuration, it may take several minutes for the enclosure to detect a mismatch in firmware between its two IOMs, and several additional minutes for the synchronization to complete, before the upgraded/downgraded IOM reboots.

Step 1: To check the status of the Auto-Sync process, use the `sg_ses` utility to query the Download Microcode Status Diagnostic page for the IOM being upgraded/downgraded:

```
sg_ses <dev> --page=0xe
```

If the enclosure hasn't yet detected the mismatch, the `status` will indicate the following:

```
HGST  H4060-J  <FW Version>
Download microcode status diagnostic page:
```

```
 number of secondary subenclosures: 0
 generation code: 0x0
  subenclosure identifier: 0 [primary]
    download microcode status: No download microcode operation in progress
[0x0]
    download microcode additional status: 0x0
    download microcode maximum size: 1703914 bytes
    download microcode expected buffer id: 0x0
    download microcode expected buffer id offset: 0
```

When the mismatch is detected and the syncing has begun, the `expected buffer id offset` value will grow, and the `status` will alternate between the following:

```
download microcode status: Updating storage with deferred microcode [0x3]
```

```
download microcode status: Download in progress, awaiting more [0x1]
```

When the sync is complete, the status will indicate:

```
download microcode status: Complete, no error, start after hard reset or
 power cycle [0x11]
```

Step 2 :   After the firmware has been syncronized, the upgraded/downgraded IOM will reboot.

4.5.3 Disabling Auto-Sync

Step 1:   From a host command line, use the `sg_modes` utility to verify that the enclosure's Auto-Sync VPD bit is currently **enabled** (08, bold in the following example):

```
sg_modes <dev> --page=0x20 --llbaa
    HGST  H4060-J  3010   peripheral_type: enclosure services device [0xd]
Mode parameter header from MODE SENSE(10):
  Mode data length=24, medium type=0x00, specific param=0x00, longlba=0
  Block descriptor length=0
>> page_code: 0x20, page_control: current
 00     a0 0e 01 00 00 00 00 00  00 00 00 00 00 00 08 00
```

Step 2 :   Use the `sg_wr_mode` utility to **disable** the enclosure's Auto-Sync VPD bit:

```
sg_wr_mode <dev> --dbd -s --page=0x20 --
contents=a0,0e,01,00,00,00,00,00,00,00,00,00,00,00,00,00 --
mask=00,00,00,00,00,00,00,00,00,00,00,00,00,00,08,00
```

Step 3 :   Use the `sg_modes` utility to verify that the enclosure's Auto-Sync VPD bit is now **disabled** (00, bold in the following example):

```
sg_modes <dev> --page=0x20 --llbaa
    HGST  H4060-J  3010   peripheral_type: enclosure services device [0xd]
Mode parameter header from MODE SENSE(10):
  Mode data length=24, medium type=0x00, specific param=0x00, longlba=0
  Block descriptor length=0
>> page_code: 0x20, page_control: current
 00     a0 0e 01 00 00 00 00 00  00 00 00 00 00 00 00 00
```

4.6 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.

4.6.1 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,A8,00,01,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
```

- 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,A8,00,01,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
```

- 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,
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
```

- 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,
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
```

- 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 :

```
e3,01,00,30,03,00,00,00,00,00,00,00,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,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 <dev>
```

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

4.6.2 Configuring OOBM Static IP Address Using cURL

This procedure provides instructions for assiging a static IP address to the OOBM network interface using a cURL command.

> **Note:** This procedure uses angle brackets "`<example>`" to indicate text that should be modified for your specific needs.

Step 1: Issue a PATCH request to the applicable I/O module resource, using the data option to set the `AddressOrigin` to `Static` and provide the IP address, subnet mask, and gateway:

```
curl
-X PATCH
-sku <username>:<password>
https://<oobm_ip>/redfish/v1/Systems/Self/EthernetInterfaces/IOModule<A/B>FRU
-H 'Content-Type: application/json'
-d '
    {
        "IPv4Addresses": [
            {
                "Address": "<ip_address>",
                "SubnetMask": "<subnet_mask>",
                "AddressOrigin": "Static",
                "Gateway": "<gateway_ip>"
            }
        ]
    }
'
```

For example:

```
curl -X PATCH -sku admin:admin https://10.206.144.81/redfish/v1/Systems/
Self/EthernetInterfaces/IOModuleAFRU -H 'Content-Type: application/
json' -d '{"IPv4Addresses": [{"Address": "10.206.144.82", "SubnetMask":
 "255.255.248.0", "AddressOrigin": "Static", "Gateway": "10.206.144.1"}]}'
```

Step 2: Issue a GET request to the same resource, and review the response to confirm that the IP address details were set properly:

```
curl -X GET -u admin:admin https://10.206.144.81/redfish/v1/Systems/Self/
EthernetInterfaces/IOModuleAFRU
```

```
{
    "@odata.context": "/redfish/v1/
$metadata#EthernetInterface.EthernetInterface",
    "@odata.id": "/redfish/v1/Systems/Self/EthernetInterfaces/IOModuleA",
```

```
        "@odata.type": "#EthernetInterface.v1_2_0.EthernetInterface",
        "Name": "IOM A Ethernet Interface",
        "Id": "IOModuleA",
        "LinkStatus": "LinkUp",
        "PermanentMACAddress": "00:0C:CA:08:38:88",
        "SpeedMbps": 1000,
        "HostName": "oobm-00:0C:CA:08:38:88",
        "FQDN": "oobm-00:0C:CA:08:38:88.\n",
        "FullDuplex": "true",
        "IPv4Addresses": [
            {
                "Address": "10.206.144.81",
                "SubnetMask": "255.255.248.0",
                "AddressOrigin": "Static",
                "Gateway": "10.206.144.1"
            }
        ],
        "NameServers": [],
        "Oem": {
            "WDC": {
                "Copyright": "Copyright © 2017-2021 Western Digital Corporation"
            }
        }
    }
}
```

> **Note:** IOMA cannot be used to modify IOMB's OOBM IP address, and vice versa.

Step 3: If applicable, repeat these steps to set the OOBM IP address for the second I/O module.

4.6.3 Upgrading Firmware with OOBM

This procedure provides instructions for upgrading 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 location of the bin file.

> **Note:** TFTP and HTTPS are supported, requiring access to one of these services.

Linux Example:

```
{"ImageURI": "tftp://<tftp IP address>/HGST_Ultrastar-DATA60-DATA102-
Server60-8_SEP_bundle_3010-007_3.1.11.tar.gz"}
```

Windows Example:

```
{\"ImageURI\":\"https://<https IP address>/HGST_Ultrastar-DATA60-DATA102-
Server60-8_SEP_bundle_3010-007_3.1.11.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 `UpdateService.FWActivate` command:

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

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

- For a **non-automatic** activation, reset the IOMs manually by sending sequential POST requests to the `Chassis` object using the `Chassis.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
```

4.7 SES 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 enclosure's PSUs, HDDs, ESMs, and sensors.

> **Note:** Refer to the SCSI Enclosure Services Specification for more information on SES Page 02.

4.8 Zoning

> **Caution:** Zone configuration should only be performed during a maintenance window, when the system is offline (not in production).

4.8.1 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 184)*

4.8.2 Predefined Zoning Configurations

There are four predefined zoning configurations for the Ultrastar Data60 . Each configuration connects a different number of host ports to a set number of drives, called a zone group. This section provides information about each of the predefined zoning configurations.

Configuration 0

Configuration 0 is the default configuration of the enclosure when zoning is disabled; it allows all hosts to view all drive slots and the devices populating 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 the same color to display their connection to all of the drives within the enclosure.

- **In-band management**: Configuration 0 (default configuration) can be initiated in-band with the `sg_senddiag` command by passing `00` as the zoning configuration option. See: sg_senddiag Command *(page 218)* for the actual senddiag command.
- **Out-of-band management**: Configuration 0 (default configuration) can be initiated out-of-band to disable zoning by passing `0` as the `ZoningConfig` option for each IOM. The following are example Redfish and cURL POST commands:

  Redfish POST:

```
/redfish/v1/Systems/Self/Storage/<Enclosure Logical ID>/Actions/Storage.Zoning
{ "ZoningConfig": "0" }
```

cURL POST:

```
curl -X POST -k -u admin:admin -H "Content-type: application/json"
https://<IP Address>/redfish/v1/Systems/Self/Storage/<Enclosure Logical ID>/Actions/
Storage.Zoning -d
'{"ZoningConfig" : "0"}'
```

Figure 224: Configuration 0
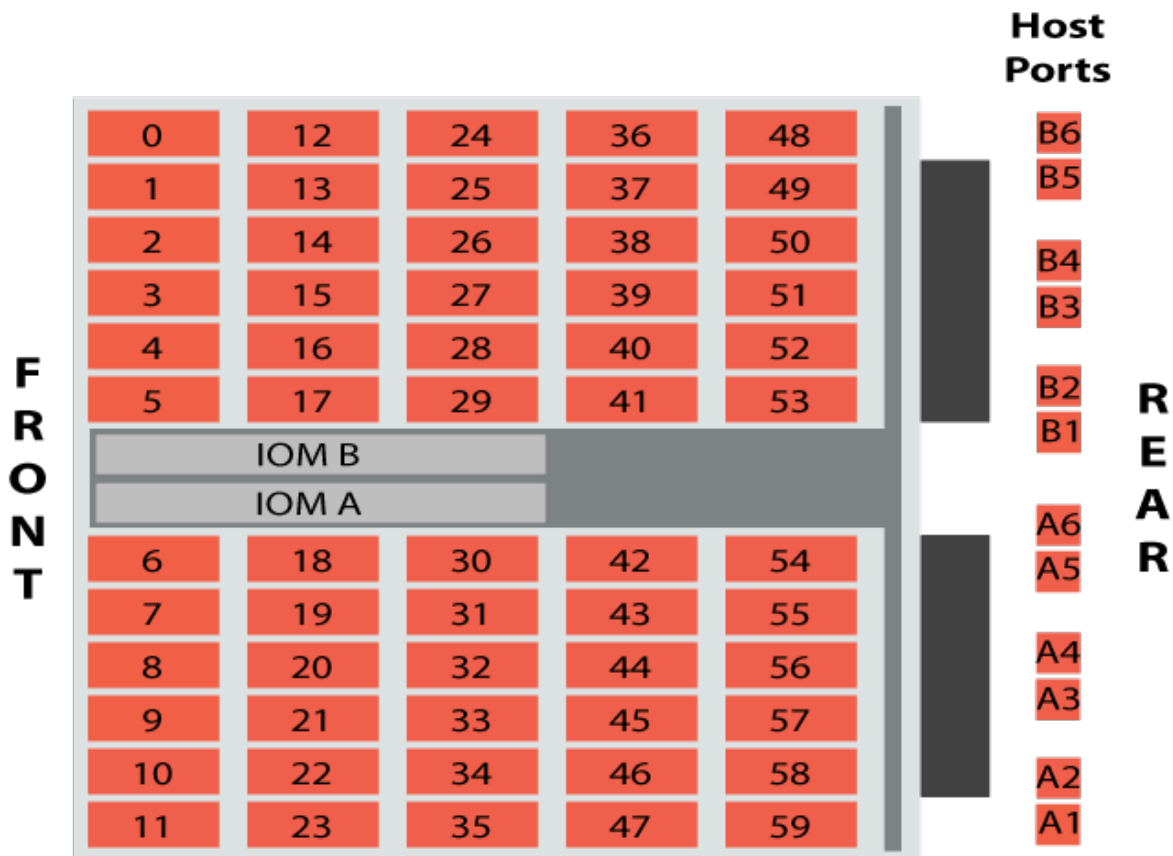
There is no SAS cable connection table for this configuration, because the host servers do not rely on specific ports to see specific drives and drive slots.

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 folloing image (represented by six different colors). Each zone group matches to a single SAS port on each IOM (represented by a matching color) to allow for the connections to six different hosts.

- **In-band management**: Configuration 1 can be initiated in-band with the `sg_senddiag` command by passing `01` as the zoning configuration option. See: sg_senddiag Command *(page 218)* for the actual senddiag command.
- **Out-of-band management**: Configuration 1 can be initiated out-of-band by passing `1` as the `ZoningConfig` option for each IOM. The following are example Redfish and cURL POST commands:

Redfish POST:

```
/redfish/v1/Systems/Self/Storage/<Enclosure Logical ID>/Actions/Storage.Zoning
{ "ZoningConfig": "1" }
```

cURL POST:

```
curl -X POST -k -u admin:admin -H "Content-type: application/json"
https://<IP Address>/redfish/v1/Systems/Self/Storage/<Enclosure Logical ID>/Actions/
Storage.Zoning -d
'{"ZoningConfig" : "1"}'
```

Figure 225: Configuration 1
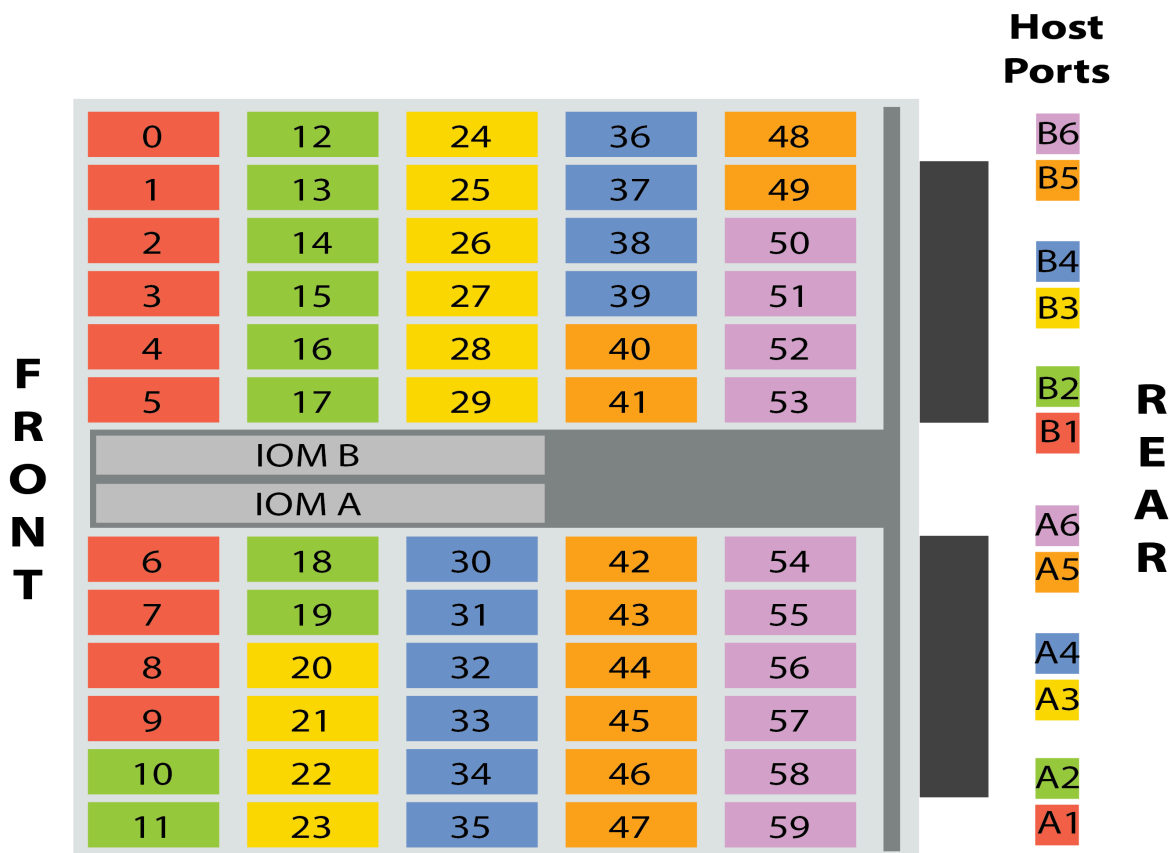
Connect the host servers to the enclosure using SAS cables in the configuration listed in the table below. The left side of the table displays the host number, and the right side displays the appropriate IOM SAS ports on the enclosure for that host.

Table 92: SAS Cable Connections for Configuration 1

Host	Enclosure IOM SAS Port
Host 1	A1
	B1
Host 2	A2
	B2
Host 3	A3
	B3
Host 4	A4
	B4
Host 5	A5
	B5
Host 6	A6
	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 20drives 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 IOM (represented by a matching color) to allow for the connections to three different hosts.

- **In-band management**: Configuration 2 can be initiated in-band with the `sg_senddiag` command by passing `02` as the zoning configuration option. See: sg_senddiag Command *(page 218)* for the actual senddiag command.
- **Out-of-band management**: Configuration 2 can be initiated out-of-band by passing `2` as the `ZoningConfig` option for each IOM. The following are example Redfish and cURL POST commands:

Redfish POST:

```
/redfish/v1/Systems/Self/ Storage/<Enclosure Logical ID>/Actions/Storage.Zoning
{ "ZoningConfig": "2" }
```

cURL POST:

```
curl -X POST -k -u admin:admin -H "Content-type: application/json"
https://<IP Address>/redfish/v1/Systems/Self/Storage/<Enclosure Logical ID>/Actions/
Storage.Zoning -d
'{"ZoningConfig" : "2"}'
```

Figure 226: Configuration 2
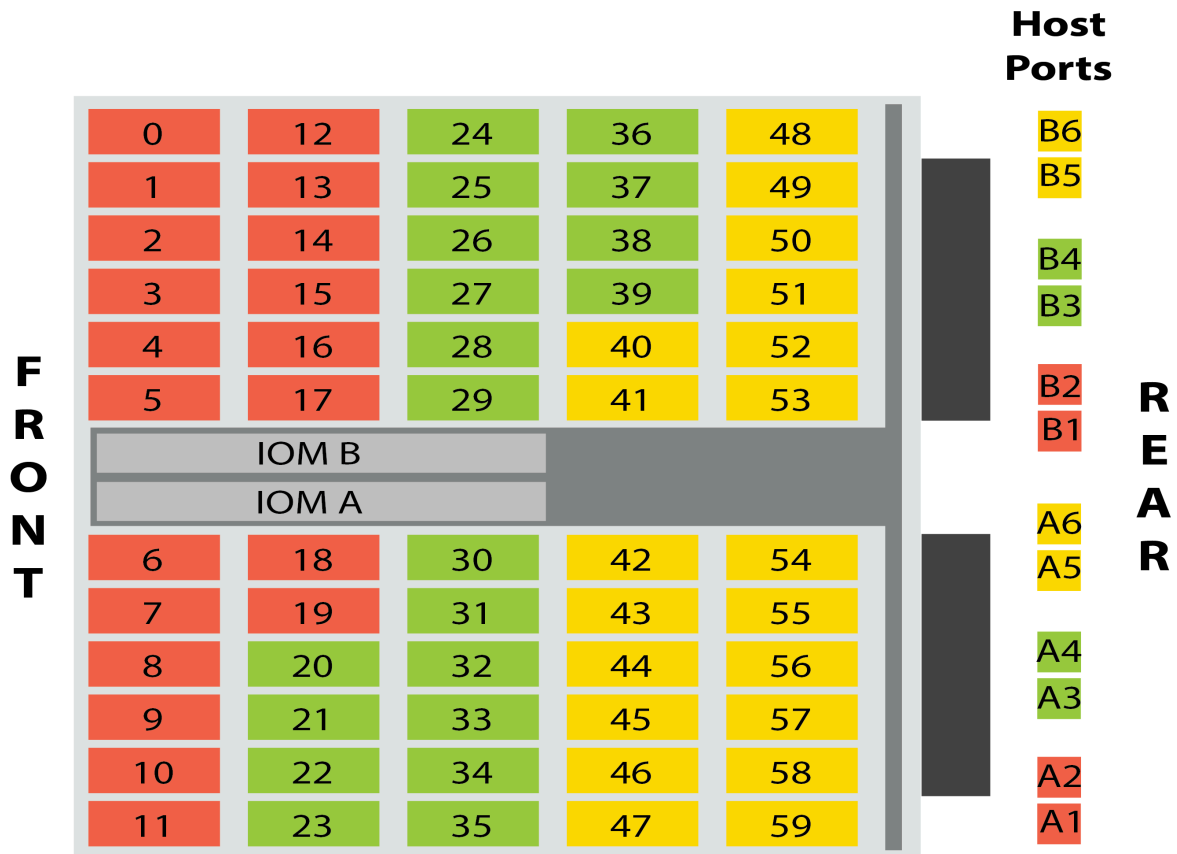
Connect the host servers to the enclosure using SAS cables in the configuration listed in the table below. The left side of the table displays the host number, and the right side displays the appropriate IOM SAS ports on the enclosure for that host.

Table 93: SAS Cable connections for Configuration 2

Host	Enclosure IOM SAS Port
Host 1	A1
	A2
	B1
	B2
Host 2	A3
	A4
	B3
	B4
Host 3	A5
	A6

Host	Enclosure IOM SAS Port
	B5
	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 IOM (represented by a matching color) to allow for the connections to two different hosts.

- **In-band management**: Configuration 3 can be initiated in-band with the `sg_senddiag` command by passing `03` as the zoning configuration option. See: sg_senddiag Command *(page 218)* for the actual senddiag command.
- **Out-of-band management**: Configuration 3 can be initiated out-of-band by passing `3` as the `ZoningConfig` option for each IOM. The following are example Redfish and cURL POSTcommands:

Redfish POST:

```
/redfish/v1/Systems/Self/Storage/<Enclosure Logical ID>/Actions/Storage.Zoning
{ "ZoningConfig": "3" }
```

cURL POST:

```
curl -X POST -k -u admin:admin -H "Content-type: application/json"
https://<IP Address>/redfish/v1/Systems/Self/Storage/<Enclosure Logical ID>/Actions/
Storage.Zoning -d
'{"ZoningConfig" : "3"}'
```

Figure 227: Configuration 3
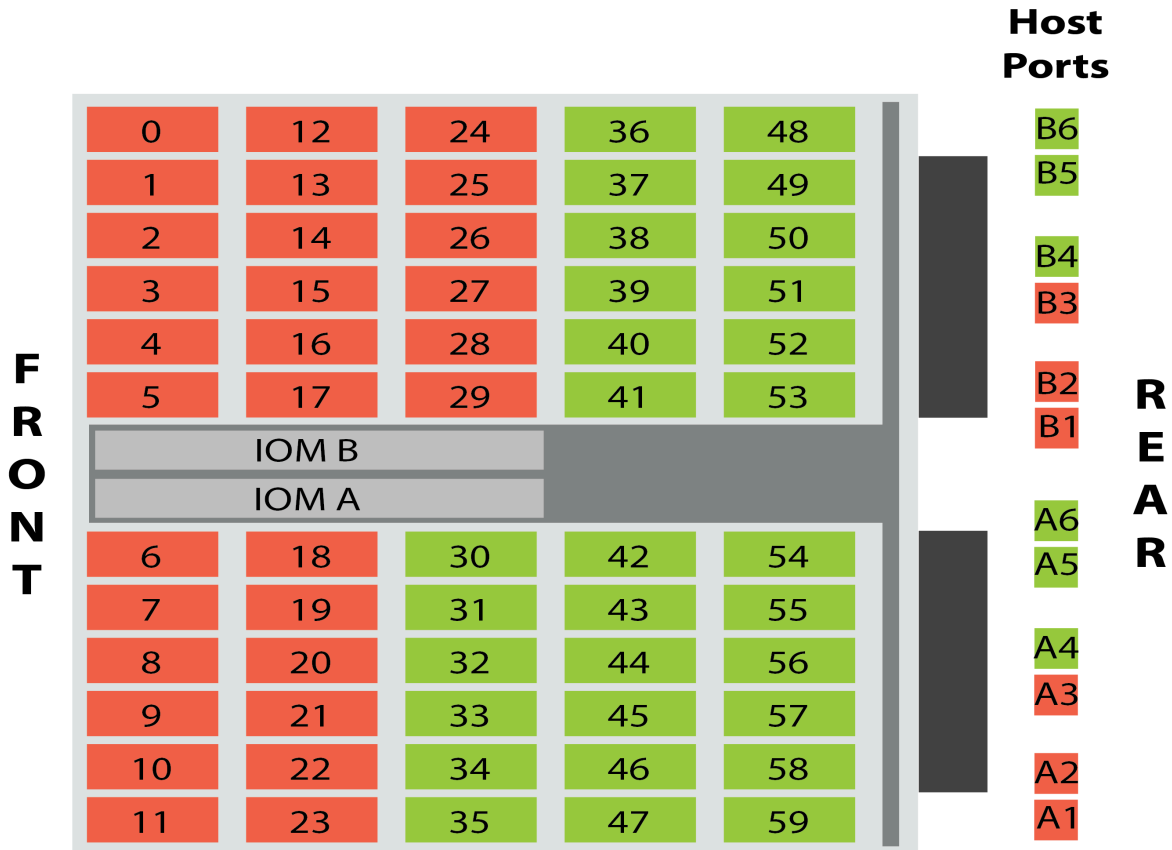
Connect the host servers to the enclosure using SAS cables in the configuration listed in the table below. The left side of the table displays the host number, and the right side displays the appropriate IOM SAS ports on the enclosure for that host.

Table 94: SAS Cable connections for Configuration 3

Host	Enclosure IOM SAS Port
Host 1	A1
	A2
	A3
	B1
	B2
	B3
Host 2	A4
	A5
	A6
	B4

Host	Enclosure IOM SAS Port
	B5
	B6

4.8.3 sg_senddiag Command

The `sg_senddiag` command is used to configure zoning on the Ultrastar Data60 . This command contains several values that are important for enabling and disabling 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 matches an explanation of that part's function. Understanding the parts of the command will ensure that the proper information is collected to build the commands 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`** – a utility that performs a SCSI send diagnostic command
- **`<a>`** – 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 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>`** – 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>`** – the value that chooses the zoning configuration that will be applied to the enclosure. Input one of the following values:
  - **`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 242)*.

- **`<d>`** – 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.

4.8.4 Enabling Zoning using Linux

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

  a. Use the sg_scan utility to scan for all sg devices in the enclosure:

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

b. From the output, identify the device handles (bolded in the following example):

```
/dev/sg<dev>: scsi9 channel=0 id=43 lun=0
    HGST  H4060-J  3010 [rmb=0 cmdq=1 pqual=0 pdev=0xd]
'--
/dev/sg<dev>: scsi9 channel=0 id=196 lun=0
    HGST  H4060-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. From the output, identify the IOM SAS address for both IOMs. Each address appears before the IP address as bolded in the following example.

```
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 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 following example.

```
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 command described in sg_senddiag Command *(page 218)* to complete the specific 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 211)*.

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 command described in sg_senddiag Command *(page 218)* to complete the specific 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 211)*.

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.

4.8.5 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/sg<dev>: scsi9 channel=0 id=43 lun=0
    HGST  H460-J  0101 [rmb=0 cmdq=1 pqual=0 pdev=0xd]
'--
/dev/sg<dev>: 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 211)*.

    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 211)*.

    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 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
```

> **Note:** Repeat this substep for all hosts.

4.8.6 Enabling Zoning using Windows

Step 1: From the host server, identify the SCSI devices 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. Use the sg_scan utility to scan for all SCSI devices in the enclosure:

```
sg_scan -s | findstr /i h4060
```

b. From the output, identify the device handles (bolded in the following example):

```
SCSI<dev>   claimed=0 pdt=dh     HGST   H4060-J   3010
SCSI<dev>    claimed=0 pdt=dh     HGST   H4060-J   3010
```

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

a. Issue the following command:

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

> **Note:** For **<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.

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 previous example of the sg_senddiag command 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 211)*.

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 previous example of the sg_senddiag command 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 211)*.

     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]
```

4.8.7 Disabling 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**.

```
SCSI0<dev>    claimed=0 pdt=dh         HGST        H4060-J        0101
      0428
SCSI0<dev>    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 | findstr /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 previous example of the sg_senddiag command 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 211)*.

    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 previous example of the sg_senddiag command 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 211)*.

    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.

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
```

4.8.8 File-Based Zoning

File-based zoning—introduced with firmware 2030—is a method of configuring zoning on an enclosure using a binary configuration file provided by Western Digital Engineering. The file is downloaded to the enclosure, and the zoning configuration is stored on the baseboard, where it both enables the file-based zoning feature and configures the default zoning of the enclousre. Any newly installed IOM will then automatically use the zoning configuration stored on the baseboard.

> ⚠️ **Caution:** If zoning is later reconfigured using another standard method (i.e. OOBM, sg_senddiag, SMP, WDDCS Tool), that configuration will only last until the enclousre is power-cycled or reset. Once rebooted, the enclosure will read and enable the default configuration from its baseboard. This behavior will continue as long as the file-based zoning feature is enabled.

Zoning Files

Zoning files are available through the Western Digital Enterprise Support Center (**https://portal.wdc.com/Support/s/**) for each of the predefined zoning configurations described in Predefined Zoning Configurations *(page 211)* as well as the disabling options described in Disabling File-Based Zoning *(page 230)* below. To request a custom zoning configuration file, please open a support case through the Western Digital Enterprise Support Center.

Disabling File-Based Zoning

File-based zoning can be disabled at any time by following the instructions in Disabling File-Based Zoning Using Linux *(page 233)* or Disabling File-Based Zoning Using Windows *(page 239)*. "Disabling file-based zoning" may mean one of two distinct options, both of which are available to the user and described in the disabling procedures:

- **Disabling zoning using the file-based feature** – This involves downloading and activating a binary file (`Disable_Config.bin`) that sets the enclosure zoning to configuration 0, thereby "disabling" zoning while keeping the file-based zoning feature enabled.
- **Disabling the file-based zoning feature itself** – This involves downloading and activating a binary file (`Clear_Config.bin`) that disables the file-based zoning feature and any file-based zoning configuration, allowing zoning via other standard methods to persist through enclosure power cycles.

4.8.8.1 Enabling File-Based Zoning Using Linux

This task provides instructions for enabling the file-based zoning feature and configuring zoning using the file-based method in a Linux operating system environment.

Step 1: From a command line, use the `lsscsi` and `grep` commands to list all enclosure devices connected to the host:

```
# lsscsi -g | grep -i enc
```

From the output, note the device names for the IOMs (i.e. `/dev/sgX`):

```
[1:0:3051:0] enclosu  HGST  H4060-J  2050  -  /dev/<dev>
[1:0:3154:0] enclosu  HGST  H4060-J  2050  -  /dev/<dev>
```

Note: Depending on the user's setup, the devices listed in the output may represent multiple HBAs, connected to multiple IOMs, within multiple enclosures. Further investigation may be required to determine the correct enclosure for zoning. If further investigation is not required, proceed to step 3 *(page 232)*.

Step 2 : To determine the correct enclosure:

a. Use the `sg_inq` utility for each device to determine the serial number of its enclosure:

```
# sg_inq /dev/<dev>
standard INQUIRY:
  PQual=0  Device_type=13  RMB=0  LU_CONG=0  version=0x06  [SPC-4]
  [AERC=0]  [TrmTsk=0]  NormACA=0  HiSUP=0  Resp_data_format=2
  SCCS=0  ACC=0  TPGS=0  3PC=0  Protect=0  [BQue=0]
  EncServ=1  MultiP=0  [MChngr=0]  [ACKREQQ=0]  Addr16=0
  [RelAdr=0]  WBus16=0  Sync=0  [Linked=0]  [TranDis=0]  CmdQue=1
  [SPI: Clocking=0x0  QAS=0  IUS=0]
    length=96 (0x60)   Peripheral device type: enclosure services device
 Vendor identification: HGST
 Product identification: H4060-J
 Product revision level: 2050
 Unit serial number: USCSJ03717EB0001

# sg_inq /dev/<dev>
standard INQUIRY:
  PQual=0  Device_type=13  RMB=0  LU_CONG=0  version=0x06  [SPC-4]
  [AERC=0]  [TrmTsk=0]  NormACA=0  HiSUP=0  Resp_data_format=2
  SCCS=0  ACC=0  TPGS=0  3PC=0  Protect=0  [BQue=0]
  EncServ=1  MultiP=0  [MChngr=0]  [ACKREQQ=0]  Addr16=0
  [RelAdr=0]  WBus16=0  Sync=0  [Linked=0]  [TranDis=0]  CmdQue=1
  [SPI: Clocking=0x0  QAS=0  IUS=0]
    length=96 (0x60)   Peripheral device type: enclosure services device
```

```
    Vendor identification: HGST
    Product identification: H4060-J
    Product revision level: 2050
    Unit serial number: USCSJ03717EB0001
```

If multiple serial numbers are identified, the numbers can then be matched to their corresponding physical enclosures to determine which is the correct one for zoning.

Note: If multiple devices share a serial number, the devices represent either multiple HBAs within the host or multiple IOMs within the enclosure. In either situation, any of the listed device paths can be used to send the binary zoning configuration file to the enclosure.

Step 3 : Use the `sg_ses_microcode` utility to send the binary zoning configuration file to the enclosure using any of the IOM SEP handles:

```
# sg_ses_microcode /dev/<dev> -m0xe -b 4096 -N -I H4060-
J_Zoning_10x1_Config.bin
```

Note: In this example, the binary file for configuration 1 is being used. For more information about this and other predefined zoning configurations, see Predefined Zoning Configurations *(page 211)*.

Step 4 : Use the `sg_ses_microcode` utility to activate the zoning configuration file:

```
# sg_ses_microcode /dev/<dev> -m0xf
```

After the file is activated, the SAS connectors will be cycled off and on, triggering the host to perform discovery.

Step 5 : The enclosure SEP handles may have changed as a result of the activation. Repeat the `lsscsi` command to view the SEP handles again:

```
# lsscsi -g | grep -i enc
[1:0:3257:0] enclosu  HGST  H4060-J  2050  -  /dev/<dev>
[1:0:3275:0] enclosu  HGST  H4060-J  2050  -  /dev/<dev>
```

Note: The file-based zoning feature and the specified zoning configuration are now enabled. The remaining steps in this task are for verification purposes and require the WDDCS Tool. For instructions on enabling file-based zoning using **only** the WDDCS Tool, please see the *WDDCS Tool User Guide*.

Step 6 : Use the WDDCS Tool's `show` command to view the SEP device handles:

```
# wddcs show
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: /dev/<dev>
    product : H4060-J
    serial  : USCSJ03717EB0001
    firmware: 2050-028
    name    : Ultrastar Data60
```

```
Device: /dev/<dev>
    product : H4060-J
    serial  : USCSJ03717EB0001
    firmware: 2050-028
    name    : Ultrastar Data60
```

Step 7 : Use the WDDCS Tool's `iom` command to determine which IOM each handle is assigned to:

```
# wddcs iom
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: /dev/<dev>
Dual IOM operation
IOM A

Device: /dev/<dev>
Dual IOM operation
IOM B
```

Step 8 : Use the WDDCS Tool's `zone status` command along with the appropriate SEP handle to verify the zoning configuration of each IOM:

```
# wddcs /dev/<dev> zone status
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: /dev/<dev>
Zoning (Enabled)
 Host    : Slots
-----------------------
  Host 0 : 0-9
  Host 1 : 10-19
  Host 2 : 20-29
  Host 3 : 30-39
  Host 4 : 40-49
  Host 5 : 50-59
```

```
# wddcs /dev/<dev> zone status
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: /dev/<dev>
Zoning (Enabled)
 Host    : Slots
-----------------------
  Host 0 : 0-9
  Host 1 : 10-19
  Host 2 : 20-29
  Host 3 : 30-39
  Host 4 : 40-49
  Host 5 : 50-59
```

Result: The zoning status for each IOM should match the configuration from the file sent to the enclosure in step 3 *(page 232)*.

4.8.8.2 Disabling File-Based Zoning Using Linux

This task provides instructions for disabling zoning and/or disabling the file-based zoning feature in a Linux operating system environment.

Step 1: From a command line, use the `lsscsi` and `grep` commands to list all enclosure devices attached to the host:

```
# lsscsi -g | grep -i enc
```

From the output, note the device names for the IOMs (i.e. `/dev/sgX`):

```
[1:0:3257:0] enclosu  HGST  H4060-J  2050  -  /dev/<dev>
[1:0:3275:0] enclosu  HGST  H4060-J  2050  -  /dev/<dev>
```

Note: Depending on the user's setup, the devices listed in the output may represent multiple HBAs, connected to multiple IOMs, within multiple enclosures. Further investigation may be required to determine the correct enclosure for disabling file-based zoning. If further investigation is not required, proceed to step 3 *(page 235)*.

Step 2 : To determine the correct enclosure:

a. Use the `sg_inq` utility for each device to determine the serial number of its enclosure:

```
# sg_inq /dev/<dev>
standard INQUIRY:
  PQual=0  Device_type=13  RMB=0  LU_CONG=0  version=0x06  [SPC-4]
  [AERC=0]  [TrmTsk=0]  NormACA=0  HiSUP=0  Resp_data_format=2
  SCCS=0  ACC=0  TPGS=0  3PC=0  Protect=0  [BQue=0]
  EncServ=1  MultiP=0  [MChngr=0]  [ACKREQQ=0]  Addr16=0
  [RelAdr=0]  WBus16=0  Sync=0  [Linked=0]  [TranDis=0]  CmdQue=1
  [SPI: Clocking=0x0  QAS=0  IUS=0]
    length=96 (0x60)   Peripheral device type: enclosure services device
 Vendor identification: HGST
 Product identification: H4102-J
 Product revision level: 2050
 Unit serial number: USCSJ03717EB0001
```

```
# sg_inq /dev/<dev>
standard INQUIRY:
  PQual=0  Device_type=13  RMB=0  LU_CONG=0  version=0x06  [SPC-4]
  [AERC=0]  [TrmTsk=0]  NormACA=0  HiSUP=0  Resp_data_format=2
  SCCS=0  ACC=0  TPGS=0  3PC=0  Protect=0  [BQue=0]
  EncServ=1  MultiP=0  [MChngr=0]  [ACKREQQ=0]  Addr16=0
  [RelAdr=0]  WBus16=0  Sync=0  [Linked=0]  [TranDis=0]  CmdQue=1
  [SPI: Clocking=0x0  QAS=0  IUS=0]
    length=96 (0x60)   Peripheral device type: enclosure services device
 Vendor identification: HGST
 Product identification: H4102-J
 Product revision level: 2050
 Unit serial number: USCSJ03717EB0001
```

If multiple serial numbers are identified, the numbers can then be matched to their corresponding physical enclosures to determine which is the correct one for disabling file-based zoning.

Note: If multiple devices share a serial number, the devices represent either multiple HBAs within the host or multiple IOMs within the enclosure. In either situation, any of the listed device paths can be used to send the binary file to the enclosure.

Step 3 : Use the `sg_ses_microcode` utility to send the binary file (either `Disable_Config.bin` or `Clear_Config.bin`) to the enclosure through any of the IOM SEP handles:

```
# sg_ses_microcode /dev/<dev> -m0xe -b 4096 -N -I H4060-
J_Zoning_Clear_Config.bin
```

Note: In this example, the `Clear_Config.bin` file is being used.

Step 4 : Use the `sg_ses_microcode` utility to activate the file:

```
# sg_ses_microcode /dev/<dev> -m0xf
```

After the file is activated, the SAS connectors will be cycled off and on, triggering the host to perform discovery.

Note: Depending on which binary file was used, either zoning is now disabled or the file-based zoning feature itself is now disabled. The remaining steps in this task are for verification purposes and require the WDDCS Tool. For instructions on disabling file-based zoning using **only** the WDDCS Tool, please see the *WDDCS Tool User Guide*.

Step 5 : Use the WDDCS Tool's `show` command to view the SEP device handles:

```
# wddcs show
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: /dev/<dev>
    product : H4060-J
    serial  : USCSJ03717EB0001
    firmware: 2050-028
    name    : Ultrastar Data60

Device: /dev/<dev>
    product : H4060-J
    serial  : USCSJ03717EB0001
    firmware: 2050-028
    name    : Ultrastar Data60
```

Step 6 : Use the WDDCS Tool's `iom` command to determine which IOM each handle is assigned to:

```
# wddcs iom
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: /dev/<dev>
Dual IOM operation
IOM A
```

```
Device: /dev/<dev>
Dual IOM operation
IOM B
```

Step 7 : Use the WDDCS Tool's `zone status` command along with the appropriate SEP handle to verify the zoning configuration of each IOM:

```
# wddcs /dev/<dev> zone status
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: /dev/<dev>
Zoning (Disabled)
```

```
# wddcs /dev/<dev> zone status
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: /dev/<dev>
Zoning (Disabled)
```

Result: The zone status of both IOMs should now be `Disabled`.

4.8.8.3 Enabling File-Based Zoning Using Windows

This task provides instructions for enabling the file-based zoning feature and configuring zoning using the file-based method in a Windows operating system environment.

Step 1: From a command line, use the `sg_scan` and `findstr` commands to list the enclosure devices connected to the host:

```
C:\> sg_scan -s | findstr -i H4060
```

From the output, note the device names for the IOMs (i.e. `SCSIX:X:X:X`):

```
SCSI<dev>      claimed=0 pdt=dh     HGST   H4060-J   2050
SCSI<dev>      claimed=0 pdt=dh     HGST   H4060-J   2050
```

Note: Depending on the user's setup, the devices listed in the output may represent multiple HBAs, connected to multiple IOMs, within multiple enclosures. Further investigation may be required to determine the correct enclosure for zoning. If further investigation is not required, proceed to step .

Step 2 : To determine the correct enclosure:

a. Use the `sg_inq` utility for each device to determine the serial number of its enclosure:

```
C:\> sg_inq SCSI<dev>
standard INQUIRY:
  PQual=0  Device_type=13  RMB=0  LU_CONG=0  version=0x06  [SPC-4]
  [AERC=0]  [TrmTsk=0]  NormACA=0  HiSUP=0  Resp_data_format=2
  SCCS=0  ACC=0  TPGS=0  3PC=0  Protect=0  [BQue=0]
  EncServ=1  MultiP=0  [MChngr=0]  [ACKREQQ=0]  Addr16=0
  [RelAdr=0]  WBus16=0  Sync=0  [Linked=0]  [TranDis=0]  CmdQue=1
  [SPI: Clocking=0x0  QAS=0  IUS=0]
```

```
     length=96 (0x60)   Peripheral device type: enclosure services device
   Vendor identification: HGST
   Product identification: H4060-J
   Product revision level: 2050
   Unit serial number: USWSJ02819EZ0012
```

```
C:\> sg_inq SCSI<dev>
standard INQUIRY:
  PQual=0  Device_type=13  RMB=0  LU_CONG=0  version=0x06  [SPC-4]
  [AERC=0]  [TrmTsk=0]  NormACA=0  HiSUP=0  Resp_data_format=2
  SCCS=0  ACC=0  TPGS=0  3PC=0  Protect=0  [BQue=0]
  EncServ=1  MultiP=0  [MChngr=0]  [ACKREQQ=0]  Addr16=0
  [RelAdr=0]  WBus16=0  Sync=0  [Linked=0]  [TranDis=0]  CmdQue=1
  [SPI: Clocking=0x0  QAS=0  IUS=0]
     length=96 (0x60)   Peripheral device type: enclosure services device
   Vendor identification: HGST
   Product identification: H4060-J
   Product revision level: 2050
   Unit serial number: USWSJ02819EZ0012
```

If multiple serial numbers are identified, the numbers can then be matched to their corresponding physical enclosures to determine which is the correct one for zoning.

> **Note:** If multiple devices share a serial number, the devices represent either multiple HBAs within the host or multiple IOMs within the enclosure. In either situation, any of the listed device paths can be used to send the binary zoning configuration file to the enclosure.

Step 3: Use the `sg_ses_microcode` utility to send the binary zoning configuration file to the enclosure using any of the IOM SEP handles:

```
C:\> sg_ses_microcode SCSI<dev> -m0xe -N -b 4096 -I H4060-
J_Zoning_10x1_Config.bin
```

> **Note:** In this example, the binary file for configuration 1 is being used. For more information about this and other predefined zoning configurations, see Predefined Zoning Configurations *(page 211)*.

Step 4: Use the `sg_ses_microcode` utility to activate the zoning configuration file:

```
C:\> sg_ses_microcode SCSI<dev> -m0xf
```

After the file is activated, the SAS connectors will be cycled off and on, triggering the host to perform discovery.

> **Note:** The file-based zoning feature and the specified zoning configuration are now enabled. The remaining steps in this task are for verification purposes and require the WDDCS Tool. For instructions on enabling file-based zoning using **only** the WDDCS Tool, please see the *WDDCS Tool User Guide*.

Step 5: Use the WDDCS Tool's `show` command to view the SEP device handles:

```
C:\> wddcs show
```

```
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: <dev>
    product : H4060-J
    serial  : USWSJ02819EZ0012
    firmware: 2050-028
    name    : Ultrastar Data60
Device: <dev>
    product : H4060-J
    serial  : USWSJ02819EZ0012
    firmware: 2050-028
    name    : Ultrastar Data60
```

Step 6:   Use the WDDCS Tool's `iom` command to determine which IOM each handle is assigned to:

```
C:\> wddcs iom
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: SCSI<dev>
Dual IOM operation
IOM A

Device: SCSI<dev>
Dual IOM operation
IOM B
```

Step 7:   Use the WDDCS Tool's `zone status` command along with the appropriate SEP handle to verify the zoning configuration of each IOM:

```
C:\> wddcs SCSI<dev> zone status
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: SCSI<dev>
Zoning (Enabled)
 Host    : Slots
-----------------------
  Host 0 : 0-9
  Host 1 : 10-19
  Host 2 : 20-29
  Host 3 : 30-39
  Host 4 : 40-49
  Host 5 : 50-59
```

```
C:\> wddcs SCSI<dev> zone status
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: SCSI<dev>
Zoning (Enabled)
 Host    : Slots
-----------------------
  Host 0 : 0-9
  Host 1 : 10-19
  Host 2 : 20-29
  Host 3 : 30-39
```

```
     Host 4 : 40-49
     Host 5 : 50-59
```

Result: The zoning status for each IOM should match the configuration from the file sent to the enclosure in step *3 (page 237)*.

4.8.8.4 Disabling File-Based Zoning Using Windows

This task provides instructions for disabling zoning and/or disabling the file-based zoning feature in a Windows operating system environment.

Step 1: From a command line, use the `sg_scan` and `findstr` commands to list the enclosure devices connected to the host:

```
C:\> sg_scan -s | findstr -i H4060
```

From the output,note the device names for the IOMs (i.e. `scsix:x:x:x`):

```
SCSI<dev>     claimed=0 pdt=dh    HGST  H4060-J  2050
SCSI<dev>     claimed=0 pdt=dh    HGST  H4060-J  2050
```

Step 2 : Use the `sg_ses_microcode` utility to send the binary file (either `Disable_Config.bin` or `Clear_Config.bin`) to the enclosure through any of the IOM SEP handles:

```
C:\> sg_ses_microcode SCSI<dev> -m0xe -b 4096 -N -I H4060-
J_Zoning_Clear_Config.bin
```

> **Note:** In this example, the `Clear_Config.bin` file is being used.

Step 3 : Use the `sg_ses_microcode` utility to activate the file:

```
C:\> sg_ses_microcode SCSI<dev> -m0xf
```

After the file is activated, the SAS connectors will be cycled off and on, triggering the host to perform discovery.

> **Note:** Depending on which binary file was used, either zoning is now disabled or the file-based zoning feature itself is now disabled. The remaining steps in this task are for verification purposes and require the WDDCS Tool. For instructions on disabling file-based zoning using **only** the WDDCS Tool, please see the *WDDCS Tool User Guide*.

Step 4 : Use the WDDCS Tool's `show` command to view the SEP device handles:

```
C:\> wddcs show
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: SCSI<dev>
    product : H4060-J
    serial  : USWSJ02819EZ0012
    firmware: 2050-028
    name    : Ultrastar Data60
Device: SCSI<dev>
```

```
        product : H4060-J
        serial  : USWSJ02819EZ0012
        firmware: 2050-028
        name    : Ultrastar Data60
```

Step 5: Use the WDDCS Tool's `iom` command to determine which IOM each handle is assigned to:

```
C:\> wddcs iom
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: SCSI<dev>
Dual IOM operation
IOM A

Device: SCSI<dev>
Dual IOM operation
IOM B
```

Step 6: Use the WDDCS Tool's `zone status` command along with the appropriate SEP handle to verify the zoning configuration of each IOM:

```
C:\> wddcs SCSI<dev> zone status
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: SCSI<dev>
Zoning (Disabled)
```

```
C:\> wddcs SCSI<dev> zone status
wddcs v4.0.3.0
Copyright (c) 2019-2024 Western Digital Corporation or its affiliates

Device: SCSI<dev>
Zoning (Disabled)
```

Result: The zone status of both IOMs should now be `Disabled`.

4.9 Subenclosure Nickname

4.9.1 Setting the Subenclosure Nickname

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

Before you begin: 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`).

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:
```

4.10 Partially Populated Enclosures

4.10.1 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 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 228: Minimum HDD Partial Population
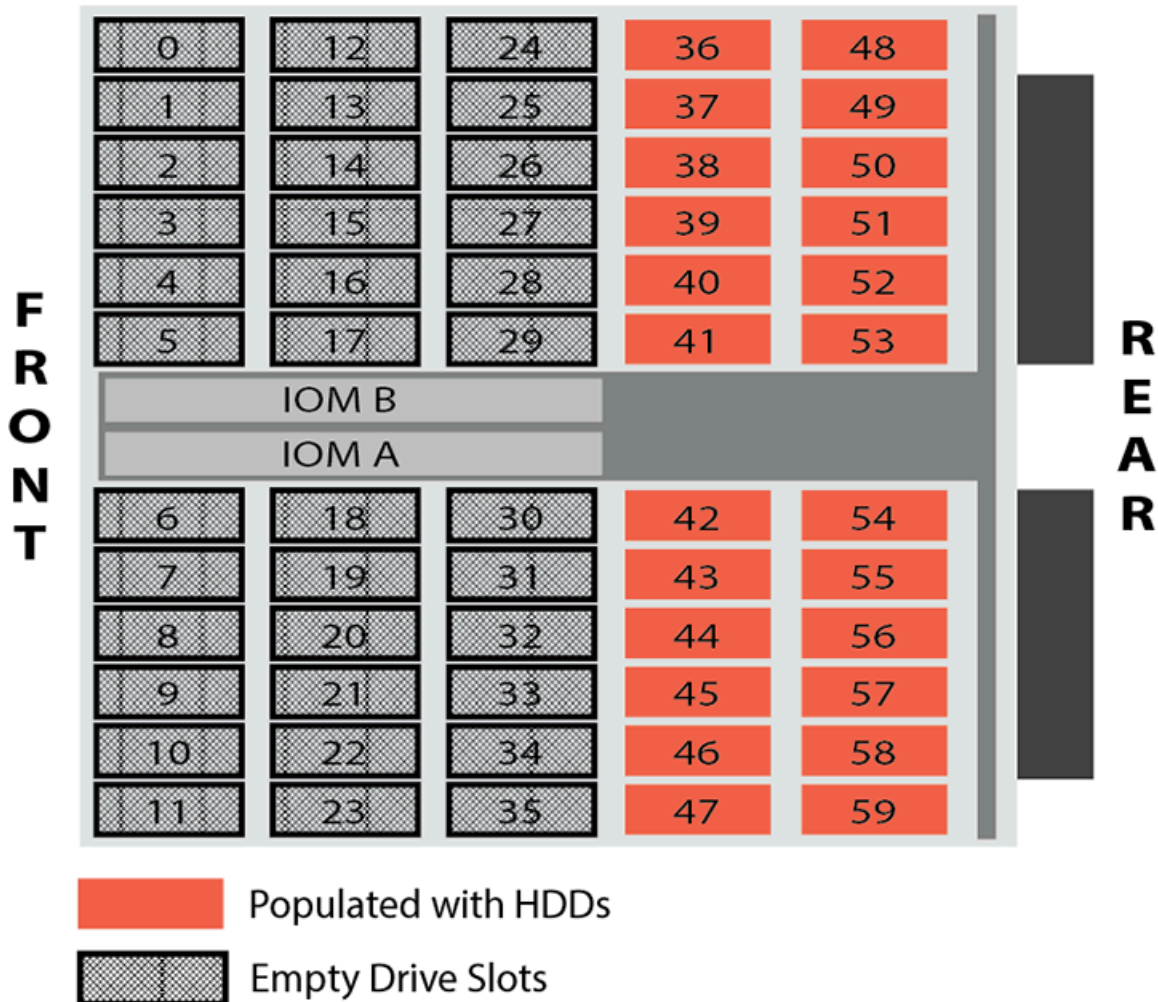
4.10.2 Installing Drives

This section provides steps on how to install drives into the enclosure. The enclosure is shipped with a minimum of 24 HDDs. Before beginning the process of adding drives, refer to the Partial Population Configurations *(page 242)* 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 229: Chassis Handle Operation
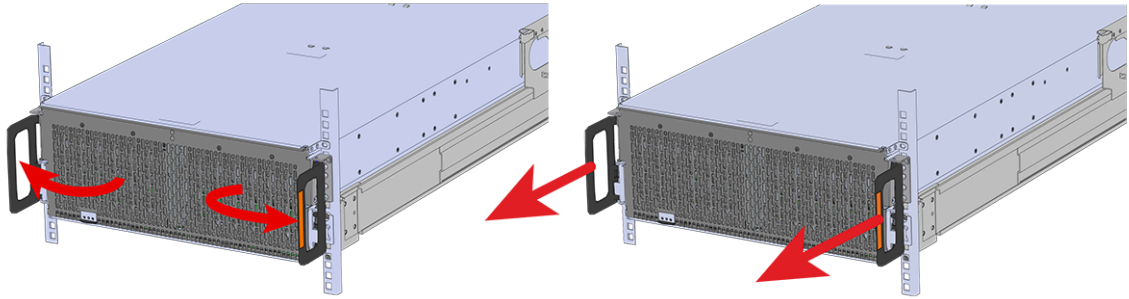
Step 2: Locate the area that the new drives will be installed into.

Step 3: Follow the requirements for partial populations listed in Partial Population Configurations *(page 242)*.

Installing the 3.5in HDD Assembly

📄 **Note:** When installing drives, populate the enclosure from left-to-right, rear-to-front. For example, begin with slot 48 (as shown in the following diagram), continue through 59, then proceed with 36 through 47, and so on:

Figure 230: Drive Layout
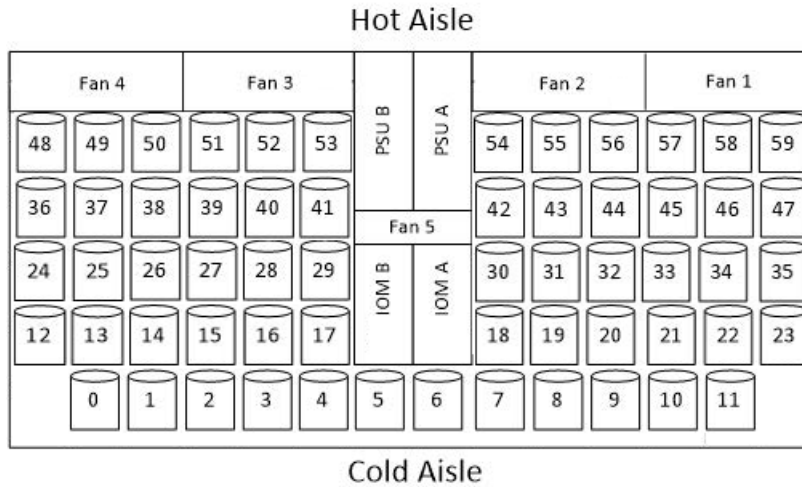
📄 **Note:** When installing drives, ensure that the LED pointer on the top of the drive carrier points toward the front of the enclosure, as shown in the following image:

Figure 231: LED Pointer Orientation
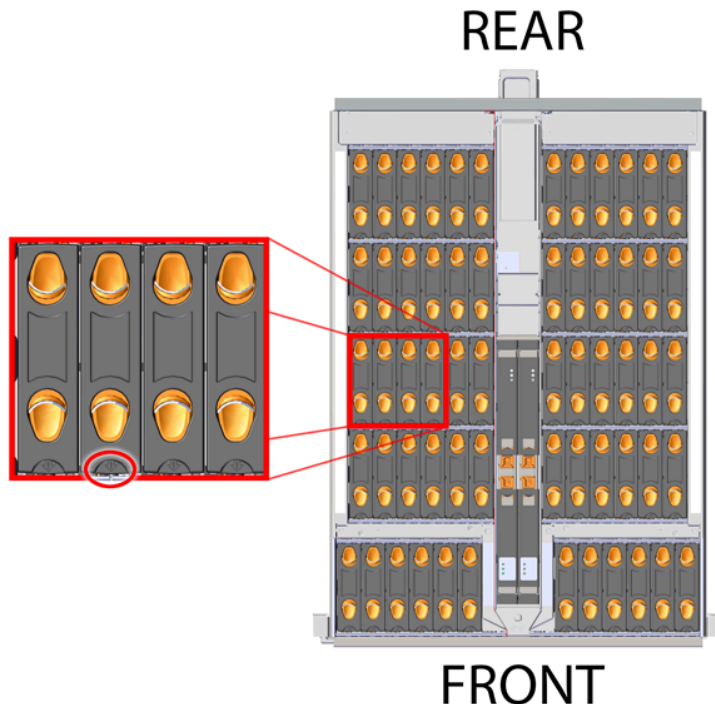
Step 5 : Align the drive with the empty slot that will receive it. Lower it into the slot, ensuring that it stays level and does not bind.

Figure 232: Inserting a 3.5in HDD Assembly
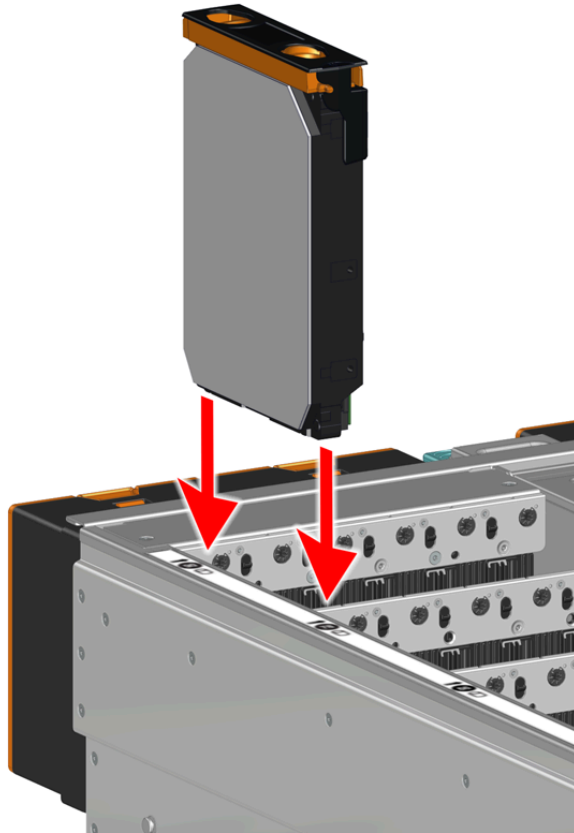
Step 6 : Lower the drive until the spring-loaded posts on the carrier contact the top edges of the drive slot. This is an intermediate position; the drive assembly will be fully seated later on.

Figure 233: Intermediate Install Position
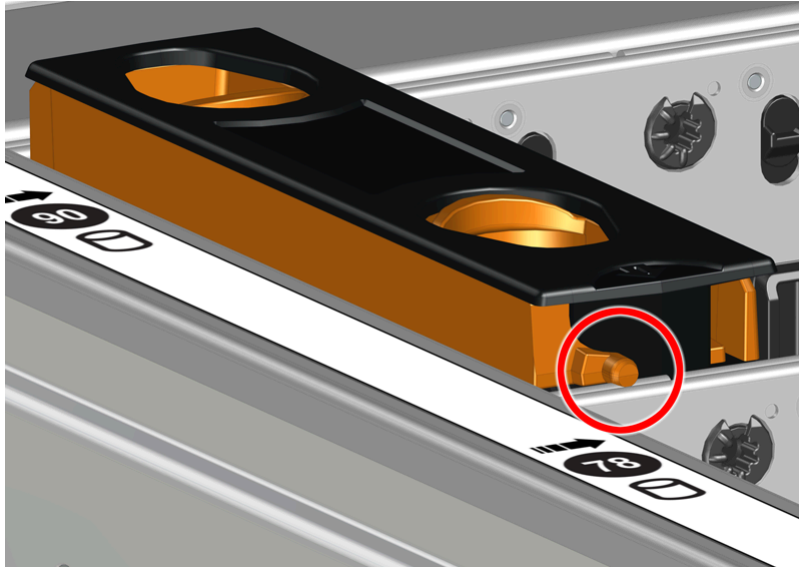
Step 7 : Repeat this intermediate installation for the remaining drive assemblies, populating the enclosure from left-to-right, rear-to-front. For example, begin at drive slot 90 and proceed through 101. Then continue with 78 through 89, and so on.

Figure 234: Populating the Enclosure
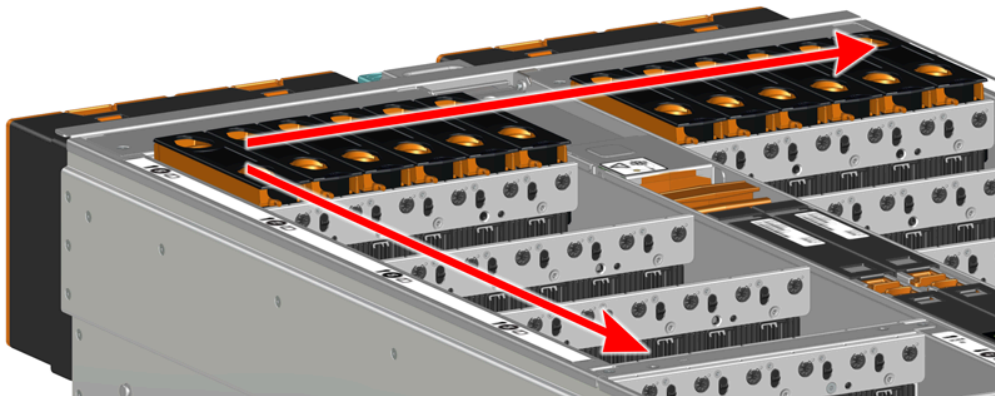
Step 8 : Returning to the first drive assembly, pinch the latch release and carefully press downward to fully seat the 3.5in HDD Assembly into the drive slot. As the drive mates with the enclosure connector, release the orange latch making sure that the latch pins on the drive seat correctly into the grommets on the drive dividers.

Figure 235: Seating the 3.5in HDD Assembly
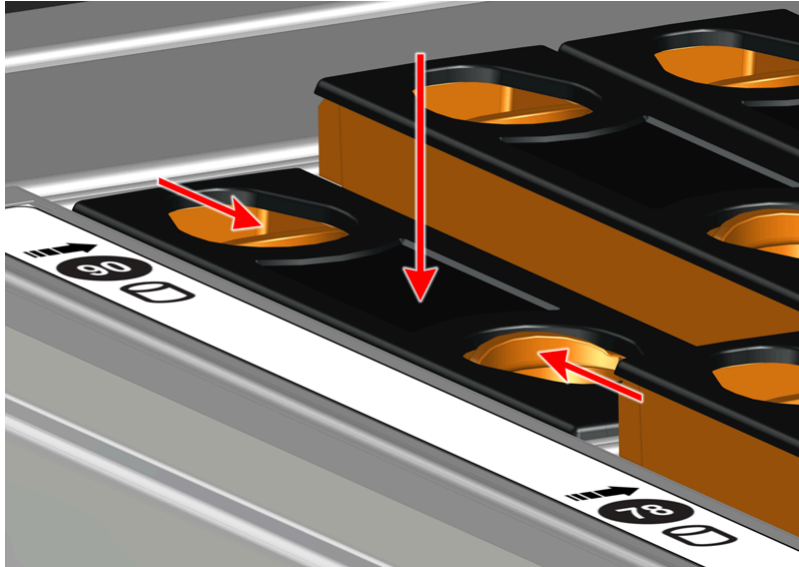
Figure 236: Grommet and Latch Pin Identification
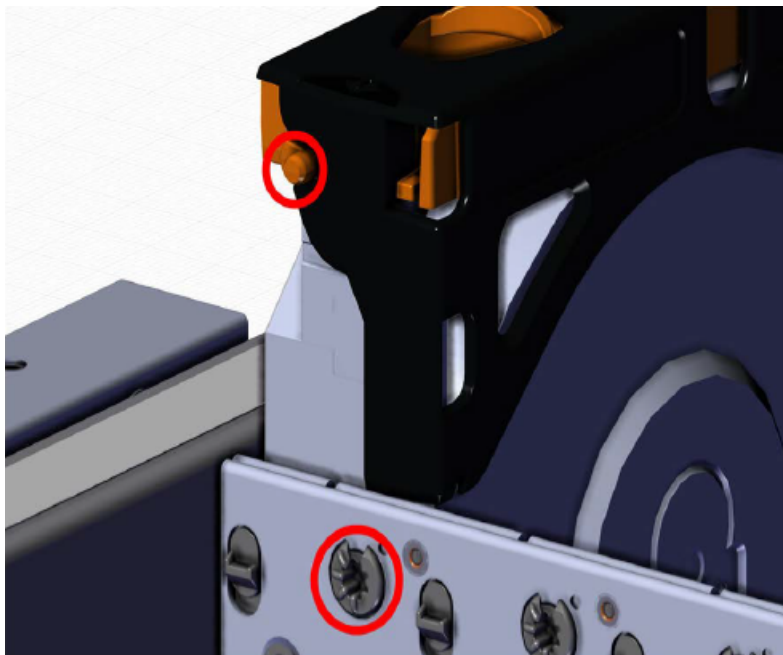
Step 9 :   View the enclosure from the side to make sure all drive assemblies are flush.

Figure 237: Verify Drive Assemblies Flush
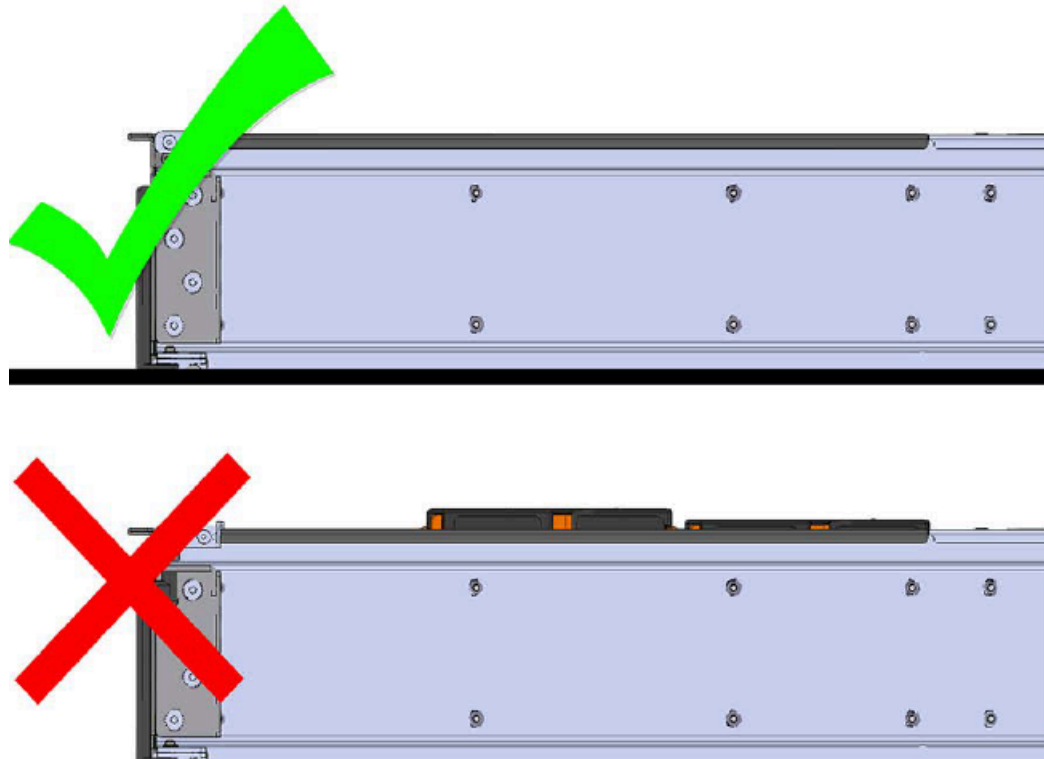
Step 10 : Repeat this action to fully install the remaining drive assemblies in the same order, from left-to-right, rear-to-front.

Step 11 : Push the enclosure back into the rack to ensure proper cooling.

4.11 Daisy Chaining

This chapter provides information related to predefined daisy chaining configurations and specific requirements.

4.11.1 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.
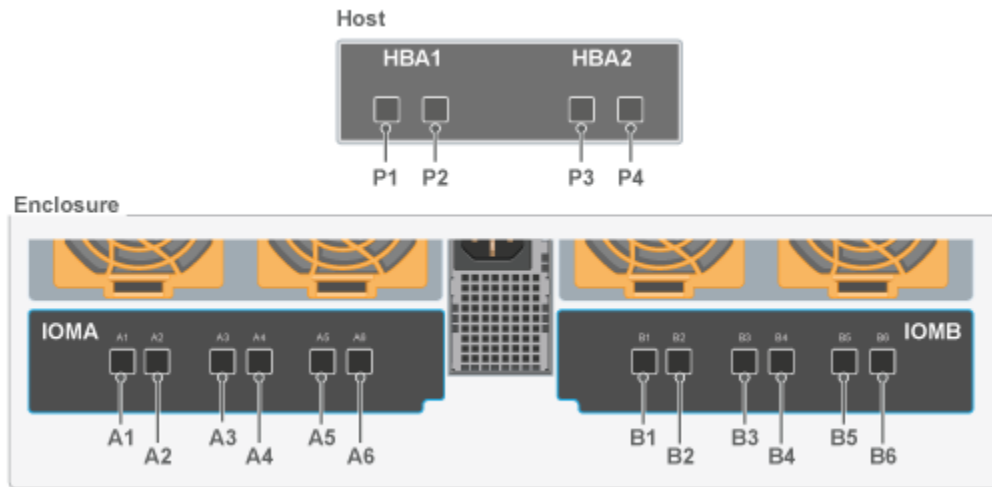
The following section identifies the different host configurations for daisy chaining multiple enclosures with either one or two hosts.

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 250)*.

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 256)*.

Table 95: Daisy Chaining Configurations

Type of Enclosure	Number of Hosts	Number of HBAs per Host	Number of Enclosures
SAS	1	1 HBA	2-4
	2		
	1	2 HBAs	2-4
	2		
SATA	1	1 HBA	4

4.11.2 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
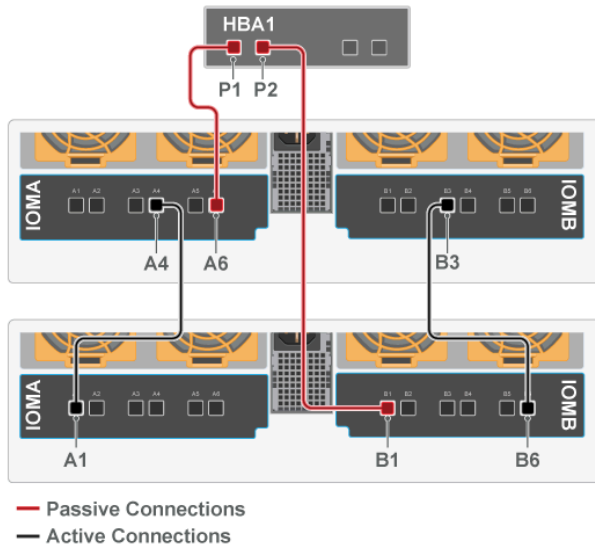
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure2: IOMB, B1
Enclosure1: IOMA, A4	Enclosure2: IOMA, A1
Enclosure1: IOMB, B3	Enclosure2: IOMB, B6

Two Enclosures: One Host with a Two HBAs
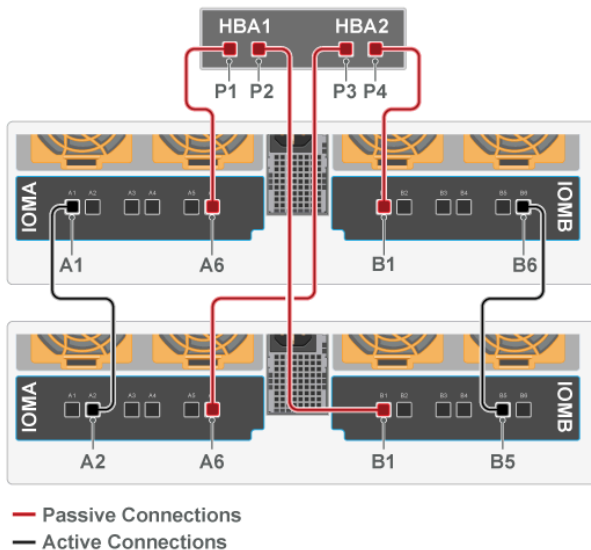
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure2: IOMB, B1
Host1: P3	Enclosure2: IOMA, A6
Host1: P4	Enclosure1: IOMB, B1
Enclosure1: IOMA, A1	Enclosure2: IOMA, A2
Enclosure1: IOMB, B6	Enclosure2: IOMB, B5

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
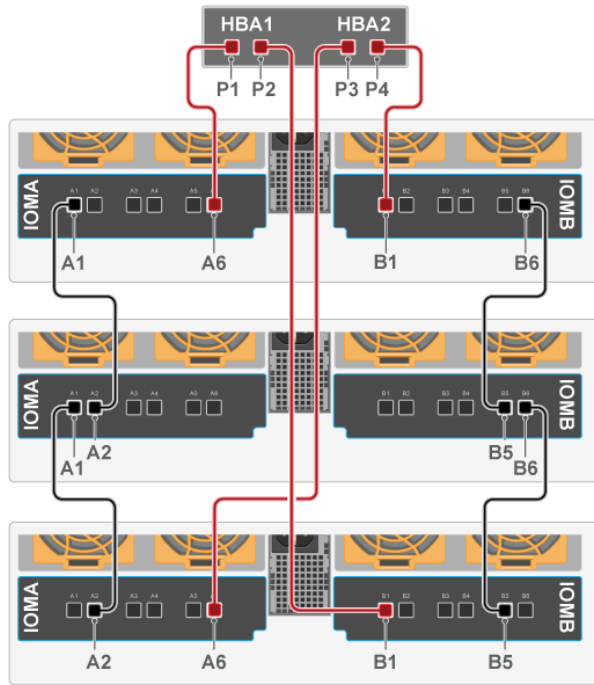
— Passive Connections
— Active Connections

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
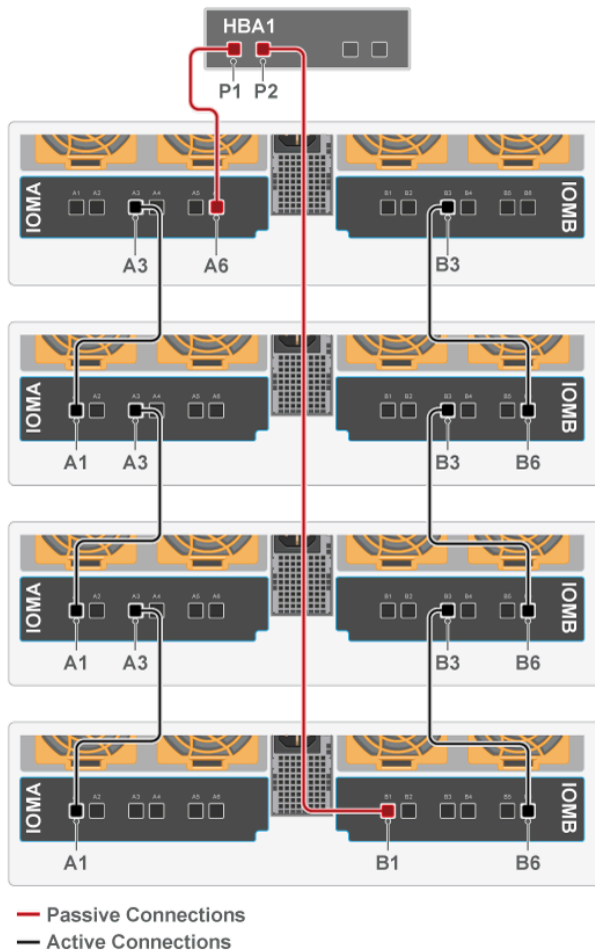
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure4: IOMB, B1
Enclosure1: IOMA, A3	Enclosure2: IOMA, A1
Enclosure1: IOMB, B3	Enclosure2: IOMB, B6
Enclosure2: IOMA, A3	Enclosure3: IOMA, A1
Enclosure2: IOMB, B3	Enclosure3: IOMB, B6
Enclosure3: IOMA, A3	Enclosure4: IOMA, A1
Enclosure3: IOMB, B3	Enclosure4: IOMB, B6

Four Enclosures: One Host with a Two HBAs

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

Passive Connections
Active Connections

Four SATA Enclosure: One Host with a Single HBA
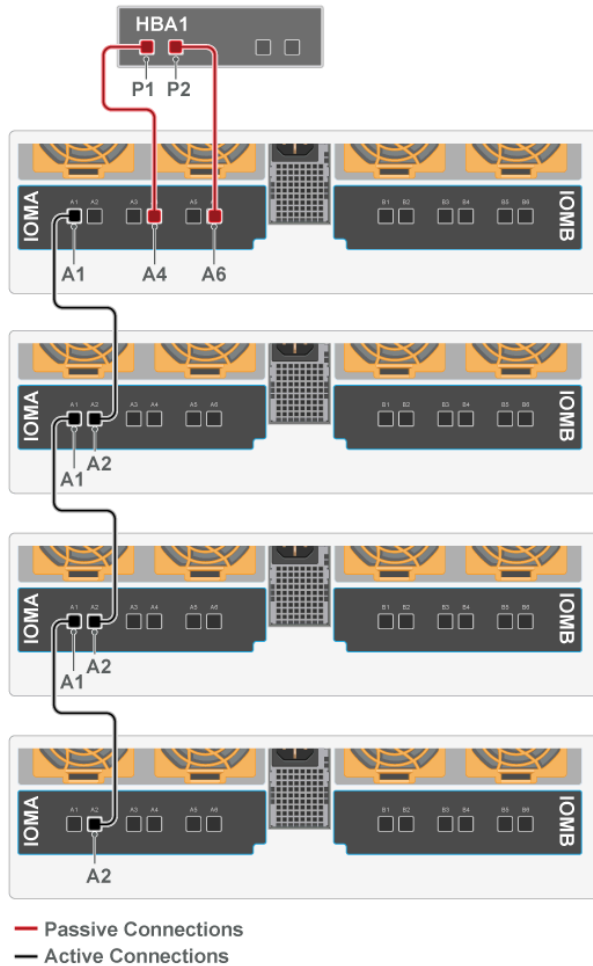
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A4
Host1: P2	Enclosure1: IOMA, A6
Enclosure1: IOMA, A1	Enclosure2: IOMA, A2
Enclosure2: IOMA, A1	Enclosure3: IOMA, A2
Enclosure3: IOMA, A1	Enclosure4: IOMA, A2

4.11.3 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

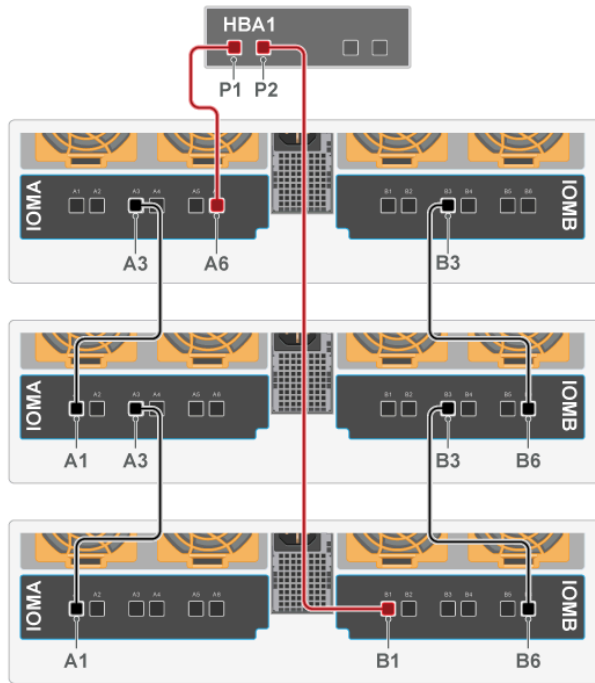| Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure2: IOMB, B1
Host2: P1	Enclosure1: IOMB, B1
Host2: P2	Enclosure2: IOMA, A6
Enclosure1: IOMA, A3	Enclosure2: IOMA, A1
Enclosure1: IOMB, B5	Enclosure2: IOMB, B6

Two Enclosures: Two Hosts with Two HBAs
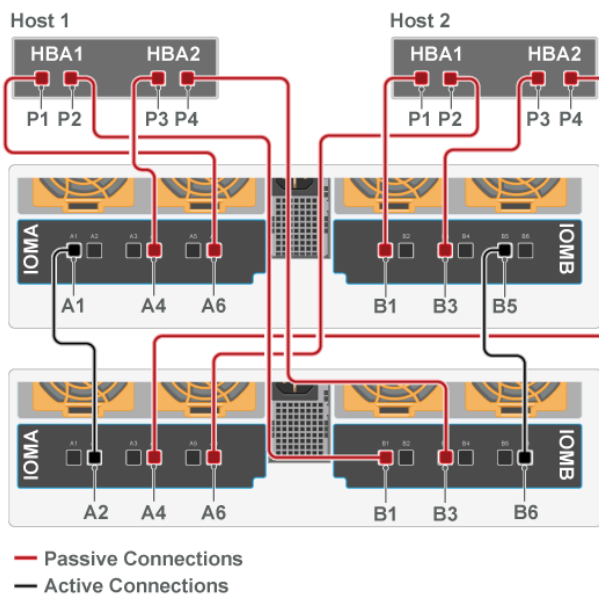
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure2: IOMB, B1
Host1: P3	Enclosure1: IOMA, A4
Host1: P4	Enclosure2: IOMB, B3
Host2: P1	Enclosure1: IOMB, B1
Host2: P2	Enclosure2: IOMA, A6
Host2: P3	Enclosure1: IOMB, B3
Host2: P4	Enclosure2: IOMA, A4
Enclosure1: IOMA, A1	Enclosure2: IOMA, A2
Enclosure1: IOMB, B5	Enclosure2: IOMB, B6

Three Enclosures: Two Hosts with One HBA
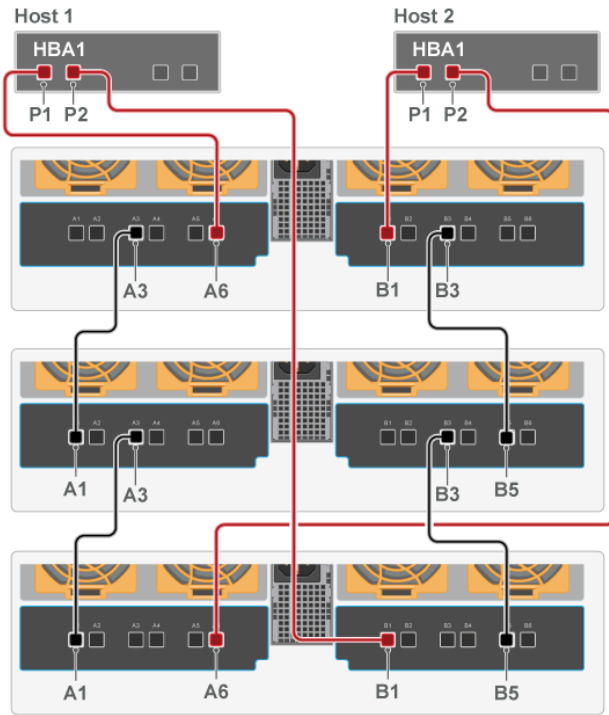
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure3: IOMB, B1
Host2: P1	Enclosure1: IOMB, B1
Host2: P2	Enclosure3: IOMA, A6
Enclosure1: IOMA, A3	Enclosure2: IOMA, A1
Enclosure2: IOMA, A3	Enclosure3: IOMA, A1
Enclosure1: IOMB, B3	Enclosure2: IOMB, B5
Enclosure2: IOMB, B3	Enclosure3: IOMB, B5

Three Enclosures: Two Hosts with Two HBAs
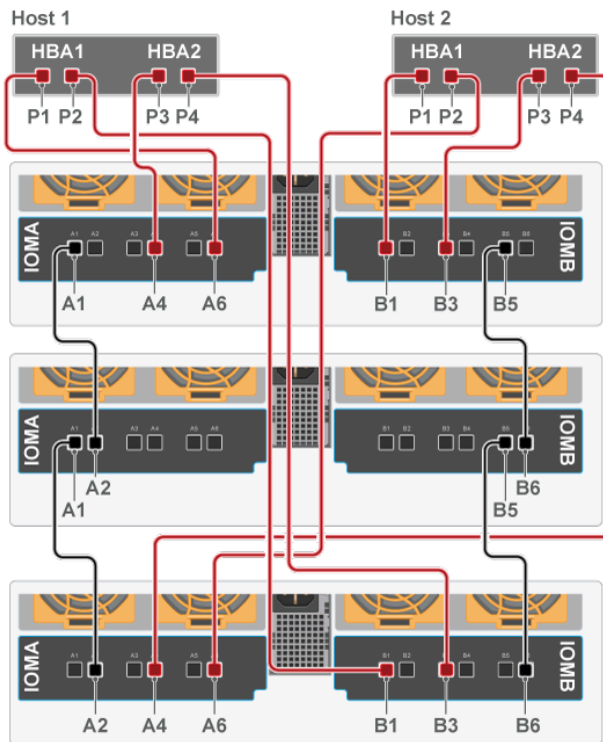
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure3: IOMB, B1
Host1: P3	Enclosure1: IOMA, A4
Host1: P4	Enclosure3: IOMB, B3
Host2: P1	Enclosure1: IOMB, B1
Host2: P2	Enclosure3: IOMA, A6
Host2: P3	Enclosure1: IOMB, B3
Host2: P4	Enclosure3: IOMA, A4
Enclosure1: IOMA, A1	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
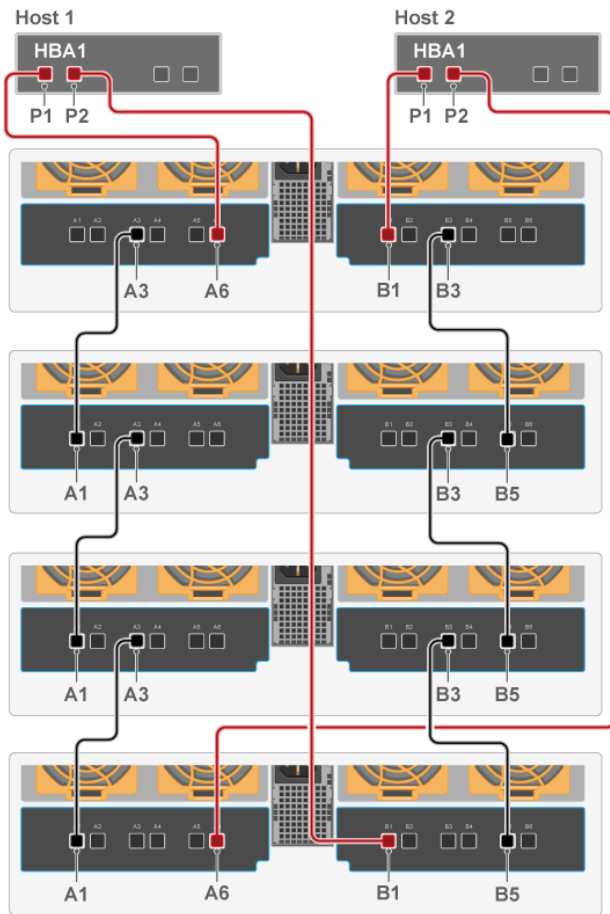
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure4: IOMB, B1
Host2: P1	Enclosure1: IOMB, B1
Host2: P2	Enclosure4: IOMA, A6
Enclosure1: IOMA, A3	Enclosure2: IOMA, A1
Enclosure2: IOMA, A3	Enclosure3: IOMA, A1
Enclosure3: IOMA, A3	Enclosure4: IOMA, A1
Enclosure1: IOMB, B3	Enclosure2: IOMB, B5
Enclosure2: IOMB, B3	Enclosure3: IOMB, B5
Enclosure3: IOMB, B3	Enclosure4: IOMB, B5

Four Enclosures: Two Hosts with Two HBAs
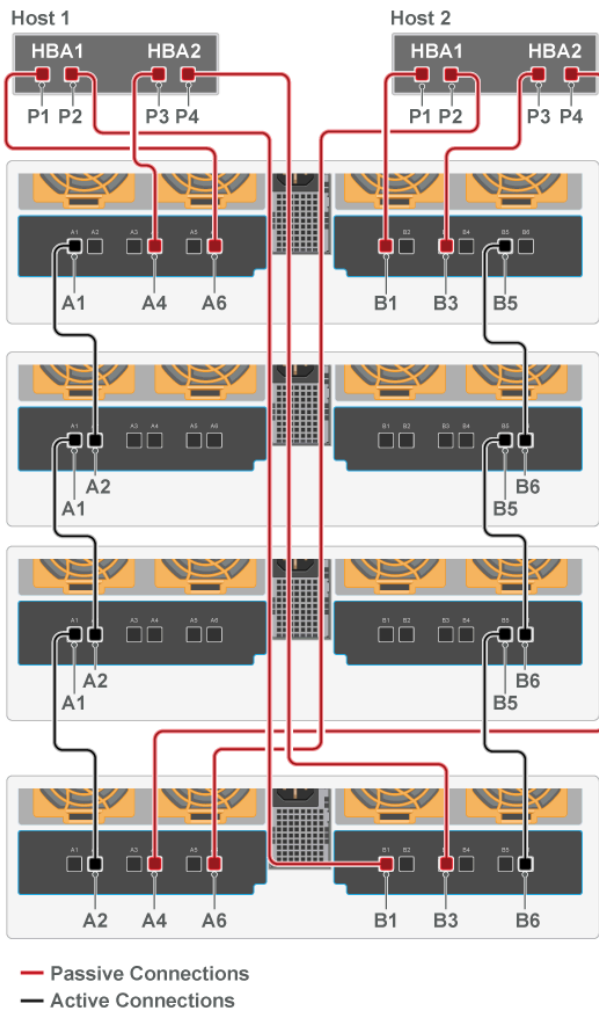
Source Device	Destination Device
Host1: P1	Enclosure1: IOMA, A6
Host1: P2	Enclosure4: IOMB, B1
Host1: P3	Enclosure1: IOMA, A4
Host1: P4	Enclosure4: IOMB, B3
Host2: P1	Enclosure1: IOMB, B1
Host2: P2	Enclosure4: IOMA, A6
Host2: P3	Enclosure1: IOMB, B3
Host2: P4	Enclosure4: IOMA, A4
Enclosure1: IOMA, A1	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

— Passive Connections
— Active Connections

4.11.4 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 250)* section or Two Host Cable Configurations *(page 256)* 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 178)* for more information.

Figure 252: Connected Cable Routing
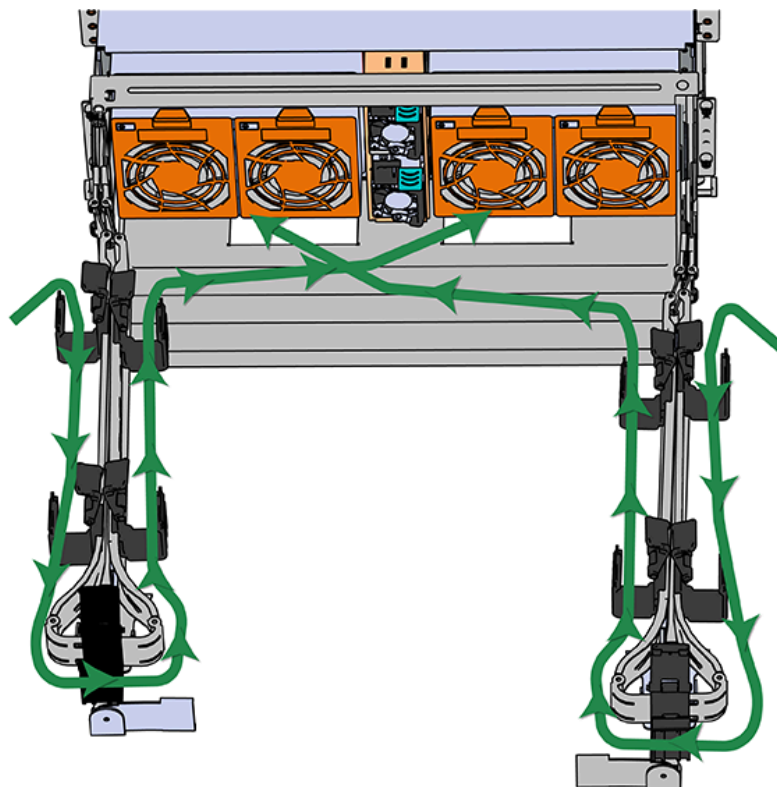
c. Open all of the baskets

Figure 253: Open Baskets
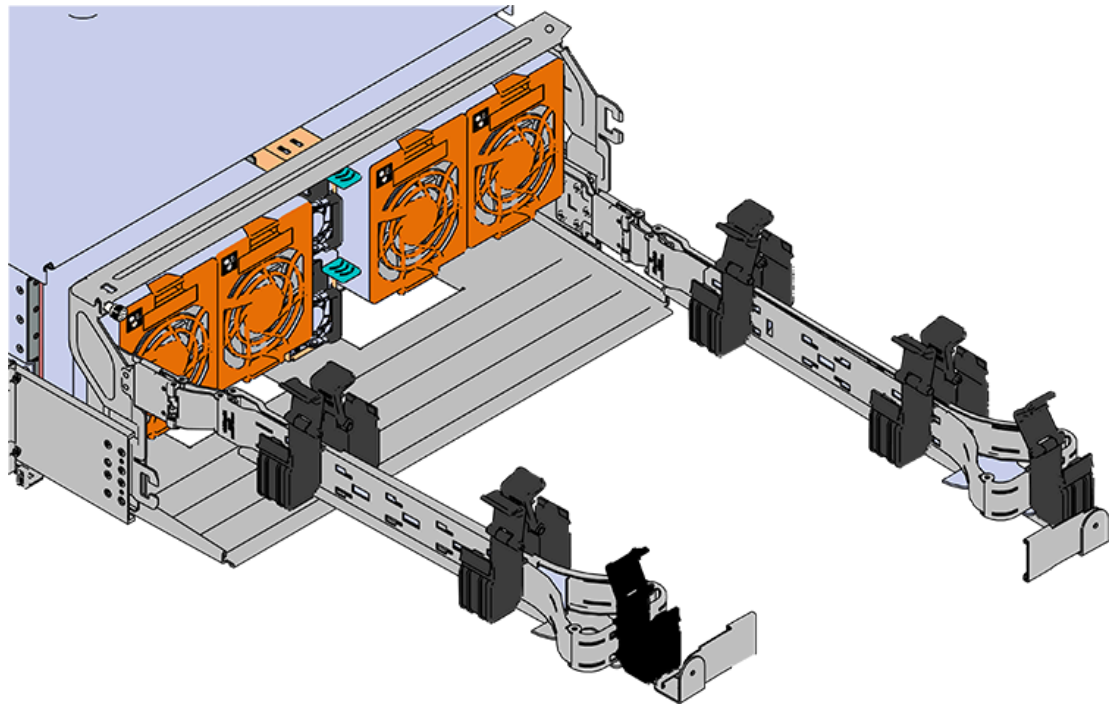
d. Connect all of the SAS cables that will be used and route them through the baskets one at a time. Make sure to follow the labels to make sure they are connected to the proper port.

e. If the installation includes more than 10 total cables, follow the recommendations in Special Considerations for Cable Routing *(page 178)*. 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 254: Nominal Cable Length at Connectors
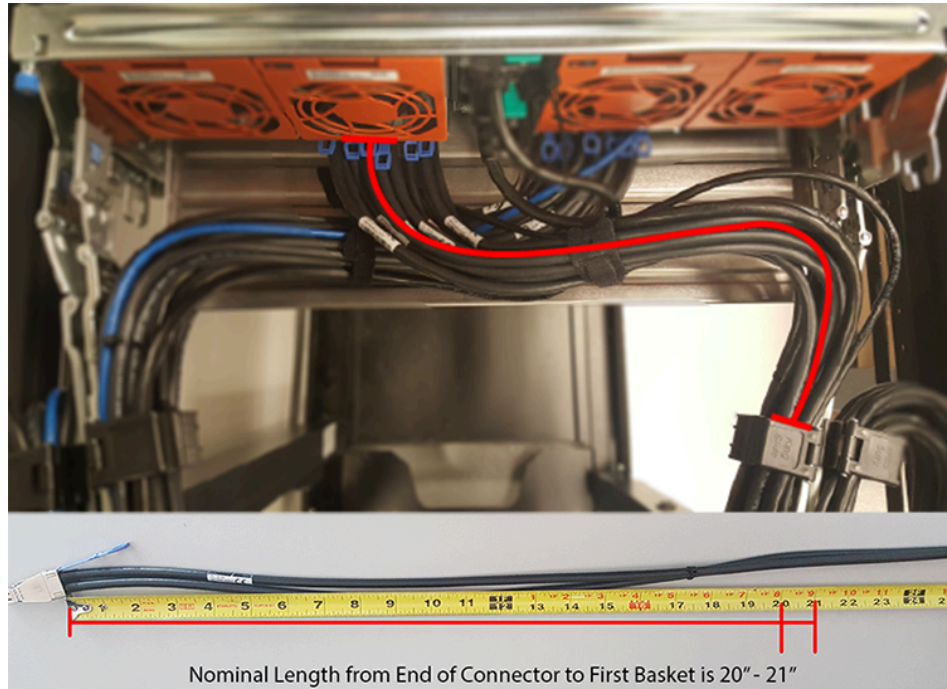
f. Close all of the baskets.

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 255: Open Baskets
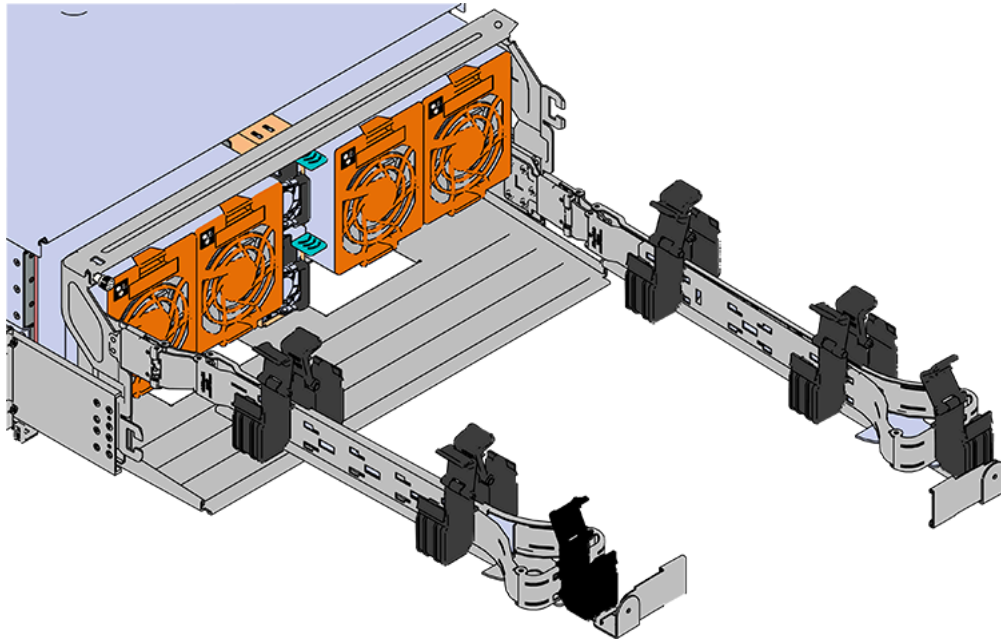
a. Connect the SAS cables and route them through the baskets one at a time. Make sure to follow the labels to make sure they are connected to the proper port.

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 256: Connected Cable Routing
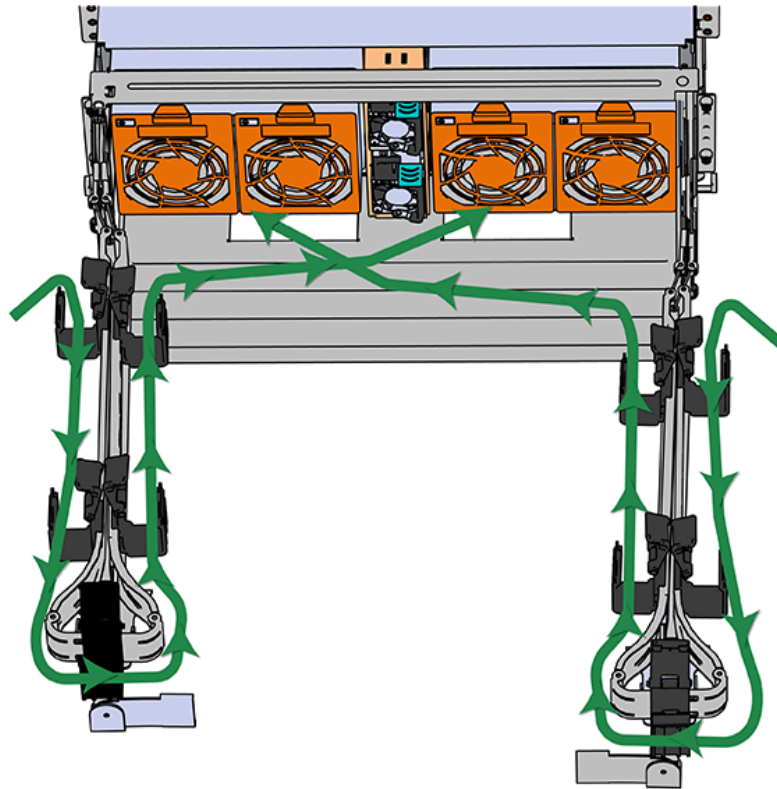
c. Wrap cable tie around the installed cable bundle between the ports and the first basket of the CMA

> **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 257: Nominal Cable Length at Connectors
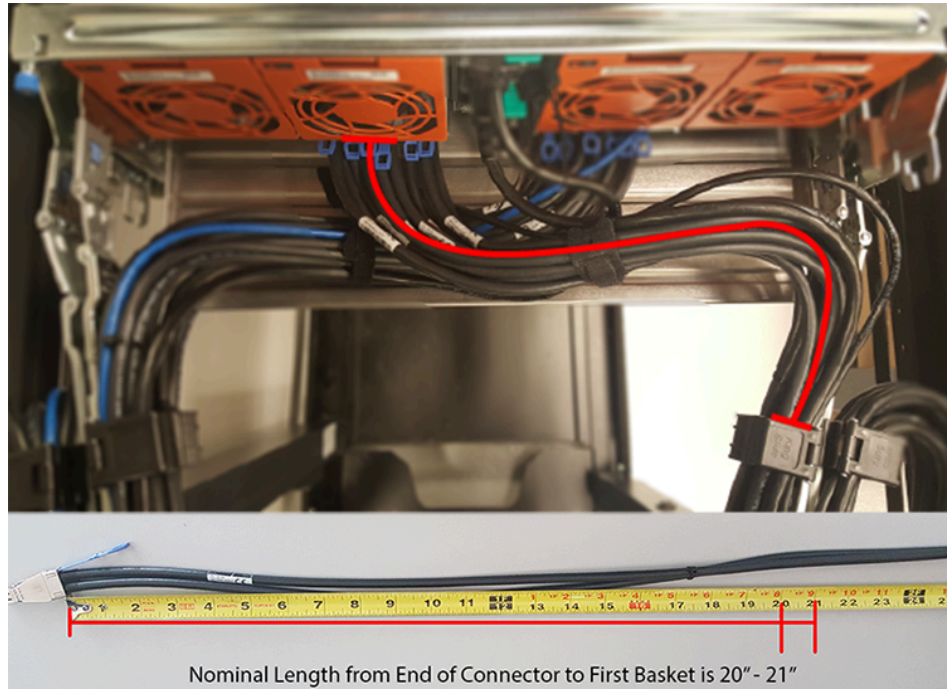
    d. Close all of the baskets.

    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 250)* and Two Host Cable Configurations *(page 256)*.

Safety

The following chapter provides safety information for the Ultrastar Data60 .

In This Chapter:

5.1 Electrostatic Discharge

⚠️ **CAUTION**

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.

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

5.3 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 and 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.

When power cycling the unit, wait 10 seconds before re-applying power. Failure to do so may cause the enclosure to boot up in an inaccessible state. If this is encountered, remove power, wait 10 seconds, and then reapply power.

5.4 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.

5.5 Rack-Mountable 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 (Tma) 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.

5.6 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 a 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.

5.7 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.

Regulatory

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:

6.1 Country Certifications

Table 109: Country Certifications

Country/Region	Authority or Mark
Australia/New Zealand	RCM
European Union	CE
India	BIS
Israel	SII
Japan	VCCI
Korea	MSIP
North America (Canada, USA)	Nemko
South Africa	SABS
Taiwan	BSMI
Ukraine	Ukrsepro

6.2 Electromagnetic Compatibility (EMC) Class A Compliance

The H4060-J complies with and conforms to the latest international standards as applicable:

Emissions

- AS/NZS CISPR 32
- BSMI CNS14338
- CE – EMC Directive 2014/30/EU
- CISPR 32 Edition 6
- FCC CFR 47 Part 15, Subpart B
- ICES-003, Issue 7
- IEC 55032
- KN32
- TR CU 020/2011
- VCCI V-3

Immunity

- IEC 55024
- IEC 61000-3-2 Harmonic Current Emissions
- IEC 61000-3-3 Voltage Fluctuations and Flicker
- IEC 61000-4-2 ESD
- IEC 61000-4-3 Radiated Immunity
- IEC 61000-4-4 EFT
- IEC 61000-4-5 Surge
- IEC 61000-4-6 RF Common Mode

- IEC 61000-4-8 Power Frequency Magnetic Field
- IEC 61000-4-11 Voltage Dips and Interruptions
- KN35

6.3 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

6.4 Safety Compliance

Product Name: **Ultrastar Data60**
System 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.

- CE – Low Voltage Directive
- CNS 14336-1
- CSA 60950-1-03, Second Edition
- IEC 60950-1, Second Edition
- IEC 62368-1, Second Edition Am1, Am2
- TR CU 004/2011

6.5 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.

- Ecodesign Directive (2019/424/EU)
- RoHS Directive 2011/65/EU

UK Import Representation Contact

Western Digital UK Limited

PO Box 471
Leatherhead KT22 2LU
UK

Telephone: +44 1372 366000

EU Import Representation Contact

Western Digital EU Limited
PO Box 13379
Swords, Co
Dublin, Ireland

6.6 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.

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

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numerique de la classe A est conforme à la norme NMB-003 du Canada.

6.8 Japanese Compliance Statement, Class A ITE

The following Japanese compliance statement pertains to VCCI EMI regulations:

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

English translation:

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

6.9 South Korea Warning Label Statement, Class A ITE

NOTICE

Class A equipment (equipment for business use).

This equipment has been evaluated for its suitability for use in a business environment.

When used in a residential environment, there is a concern of radio interference.

주의사항

A급 기기(업무용 방송통신기자재)

이 기기는 업무용환경에서 사용할 목적으로 적합성평가를 받은 기기

로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

6.10 Taiwan Warning Label Statement, Class A ITE

警告:

為避免電磁干擾,本產品不應安裝或使用於住宅環境

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.

Safety warnings:

請仔細閱讀以下說明

1. 本設備勿置于潮濕處。

2. 連接至電源前,請先檢查電壓。

3. 當設備不用時,請將電源綫拔除避免電壓不穩而造成傷害。

4. 勿將任何液體濺入設備中,避免綫路短路。

5. 基于安全理由,只有受到專業訓練的從業人員,才可以打開本設備。

6. 請勿自行調整或修理已通電的設備,以確保您的安全。

7. 如不小心受傷,請立刻找急救人員給予您適當的救護,千萬別因傷勢輕微而忽略自己的傷勢。

English translation:

Please read the following instructions carefully

1. Do not place the device in a humid place.
2. Check the voltage before connecting to the power source.
3. When the device is not in use, please unplug the power cord to avoid injury due to unstable voltage.
4. Do not spill any liquid into the equipment to avoid short circuits.
5. For safety reasons, only practitioners who have received professional training can open the device.
6. Please do not adjust or repair the powered equipment by yourself to ensure your safety.
7. If you are accidentally injured, please find emergency personnel to give you proper first aid immediately. Don't ignore your injury because of the minor injury.

6.11 Taiwan Safety Warnings

⚠️警示：安全指示說明

請務必遵守下列安全指導說明，以確保您的人身安全，避免可能對系統和工作環境造成損害。

⚠️警告： 您系統中的電源供應器可能會釋放出高電壓或電能，可能會對您的身體產生危害。除非另有指示，否則僅限受過專業訓練之維修技師有權卸除機殼及拆裝任何系統內部的元件。

⚠️警告： 如果電池安裝不正確，會有發生爆炸的危險。更換電池時，請務必使用製造商建議的同等種類品牌。請參閱《處理廢棄電池》。

⚠️⚠️警告： 本系統可能有一條以上的電源線。為了降低觸電風險，專業服務技術人員必須先拔掉所有電源線後才能維修系統。

安全性：一般

- 請仔細注意並遵守維修標示上的說明。請務必遵照系統文件載明的方式使用產品。如果外殼貼有一個發光燈泡圖樣的三角形標誌，代表打開或卸除它可能會發生觸電。建議只有專業的服務人員才能接觸這些內部元件。
- 如果發生下列任何一個情況，請拔掉本產品的電源並更換損壞零件，或者是聯絡專業的服務提供者：
  - 電源線、延長線或插頭損壞。
  - 有東西掉進本產品內。
  - 產品淋到水。
  - 產品摔到或損壞。
  - 雖有遵守操作指示，但產品無法正常運作。
- 請勿將產品放在靠近輻射物或太熱的地方。此外，請勿擋住產品的通風孔。
- 請注意不要讓食物或液體灑到系統元件上，避免在潮濕的環境中使用本產品。如果系統受潮，請參閱《安全性：萬一系統受潮》一節中的相關說明。
- 請勿將任何物件硬塞入您的系統開口內。這麼做可能會造成內部元件短路，導致起火或觸電。
- 請務必搭配經過認可的設備使用本產品。
- 在卸除外殼或接觸內部元件前，請先稍待一段時間讓產品冷卻下來。
- 請注意，本產品連接的外部電源必須符合額定功率標誌上的載明規格。如果您不確定電源類型，請洽詢您的服務提供者或當地的電力公司。

➡️注意： 為了避免損壞您的系統，請務必將變壓器(如果有提供的話) 切到最接近您當地國家的供電電壓。此外，請確定您的顯示器和連接裝置有支援當地國家的電源功率。

- 請務必使用經過認證的合格電源線。如果您的系統沒有隨附電源線或專用的AC 電源接線，請購買經過您所在國家認證的合格電源線。電源線必須支援產品額定功率標籤上標明的電壓和電流規格。接線的電壓和電流承載量必須大於產品上標明的電壓和電流規格。
- 為防觸電，請將系統和周邊設備的電源線插到有適當接地的插座中。這些接線配有三 腳插頭，可確保適當接地。請勿使用變壓整流器的插頭或者是拔掉插頭上的接地腳。如果您必須用到延長線，請使用配有適當接地插頭的三 線式接線。
- 請特別注意延長線及其多孔電源插座盒的功率規格。請注意，所有產品接到延長線或多孔電源插座盒的總電流不得超過延長線或多孔電源插座盒本身電流上限的百分之八十。
- 為避免您的系統供電發生突波的不穩定現象，請使用穩壓器、電路調節器或不斷電電源供應器(UPS)。
- 請小心配置系統接線和電源線；務必將接線整理妥當以免有人不慎踩到或絆倒。請確保沒有任何東西壓在接線上。
- 請勿任意改造電源線或插頭。如需修改您的場地配線，請洽詢有執照的專業電匠或您當地的電力公司。請務必遵循您當地/全國的配線法規。
- 為避免損壞主機板，關閉系統電源後請再等待五秒，之後再拆下系統主機板上的元件或拔除系統周邊裝置。
- 處理電池時請特別小心。請勿將電池拆開、壓碎、刺穿、使其外部連接短路、丟棄到火裡或水中，或者是使其暴露在高於攝氏60度(華氏140 度) 環境下。請勿自行嘗試拆開或修復電池；務必更換產品指定使用的電池類型。
- 如果您的系統有隨附熱插拔電源供應器，請特別注意下列有關接上或拔除接線的指示說明：
    - 接上電源線前，請先裝好電源供應器。
    - 移除電源供應器前請先拔除電源線。
    - 如果系統有多個供電來源，請拔除所有電源供應器的電源接線來切斷系統供電。
- 搬動產品請格外小心；請確認所有腳輪和/或支腳有牢牢地接在系統上。請避免突然停下或在凹凸的表面上搬運產品。
- 根據本產品德國工作場所法則第§2 條有關視訊顯示裝置的規定，本產品不適於搭配視訊顯示裝置使用。

安全性：萬一 系統受潮

備註：在開始執行下列步驟前，請先參閱《安全性：一般》和《安全性：避免靜電釋放》中的相關說明。

1 請關閉系統和裝置電源，拔除它們的電源接線，並等待10 到20 秒後再打開系統機殼。
2 請讓系統自然風乾至少24 小時。在繼續進行下列程序前，請先確認系統已 完全乾燥。
3 除圖形卡外，請拆下 安裝在系統內的所有配接卡。如果您的主 要硬碟是連接到磁碟控制卡而非系統的主機板連接器，則請勿拆下磁碟控制卡。
4 闔上系統機殼，重新接妥系統和裝置的電源線後開啓系統。
5 如果您系統的供電情況正常，請繼續執行步驟6。如果無法正常供電，請聯絡尋求技術支援(請參見您系統文件中載明的適當聯絡資訊)。

6 請關閉系統和裝置電源，拔除它們的電源接線，並等待10 到20 秒後再打開系統機殼。

7 將所有配接卡重新裝到系統中。

8 闔上系統機殼，重新接妥系統和裝置的電源線後開啓系統。

9 執行診斷程式。

10 如果有任何測試失敗，請聯絡尋求技術支援(請參見您系統文件中載明的適當聯絡資訊)。

如果您的系統備有AC 整流器：

• 請將AC 整流器放置在通風良好的地方，如桌面或地面上。

• 系統正常運作時AC 整流器可能會發熱。於系統運作時或開始運作後調整整流器時，請務必格外小心。

安全性：架設系統機架

請仔細閱讀下列注意事項，以確保機架的穩定性和安全。另請參閱系統和機架隨附的機架安裝說明文件，閱讀其中的特別注意聲明和安裝程序。

系統是指放在機架中的元件。因此，「元件」可以代表任何系統及各種周邊裝置，或者是支援硬體。

⚠ 警告：　將系統安裝到機架中前，請先裝好獨立(單一) 機架的正面和側邊支腳，或者是裝好連接機架的正面支腳。如果沒有事先裝好支腳就冒然將系統安裝到機架中，可能會導致機架傾覆，更嚴重的話可能還會造成人員受傷。因此，將元件安裝到機架中前請務必先裝好支腳。

將系統/元件安裝到機架中後，一次最多只能拉動一個滑軌裝置，將單一元件拉出機架。如果拉出一個以上的元件，其重量可能會造成機架傾覆，進而導致嚴重的人身傷害。

備註：　建議您將系統裝在使用機架套件所組裝的機櫃中，以確保您獨立裝置和機櫃元件的使用安全。如果您將系統和機架套件安裝在其他機櫃中，皆屬於未經安全機構認可的架設方式。您必須全權負責最終組裝出來的系統和機架配置符合所有適用安規標準和當地電工法規。

• 系統機架套件應由專業的服務技術人員來架設。如果您將機架套件裝在其他機架中，請確認其必須符合所有必要的機架規格。

⚠ 警告：　請勿自行搬動機架。因為機架具有相當的高度和重量，至少要由兩個人來搬動機架。

• 試圖搬動機架前，請先確認支腳有牢牢地固定在機架上並延伸到地板，且所有的機架重量已落在地面上。在組裝機架前，請先裝好獨立機架的正面和側邊支腳，或連接機架的側邊支腳。

• 一律以由下到上的方式——將系統裝到機架中，並從最重的裝置開始載裝。

• 將元件拉出機架前，請先確認機架是否平衡及穩固。

• 壓下元件的滑軌鬆脫閂鎖將元件滑進或拉出機架時請格外小心，以防滑軌閂鎖夾到您的手指。

• 將元件插入到機架內後，請小心將滑軌推到鎖定位置，然後將元件滑入機架中。

• 請勿讓提供機架電源的交流電分支電路超載。機架的總負載量不應超過分支電路額定量的百分之八十。

• 請確保機架內件的空氣流通。

• 在維修元件時，請注意不要踩到或站在任何元件上。

安全性：數據機、電信或區域網路選項

• 如果您的系統包含數據機裝置，則連接該數據機的接線至少須符合美國線規值26 和FCC 相容之

RJ-11 型網路/ 電話用插頭的製造規格。

- 在打雷閃電時，請勿連接或使用數據機。因爲可能會有觸電風險。
- 請勿在潮濕的環境中連接或使用數據機。
- 請勿將數據機或電話線插入網路介面控制器(NIC) 插座中。
- 在打開產品外殼、接觸或安裝內部元件，或是碰觸未絕緣的數據纜線或插座前，請先拔除數據纜線。

安全性：附有雷射裝置的產品

- 除非在產品說明文件中有特別說明，否則請勿任意開啓雷射裝置的面板、操作其控制項、任意調整或執行任何步驟。
- 唯有專業的服務技術人員才能修復雷射裝置。

安全性：處理系統內部

卸除系統外殼前，請先依序執行下列步驟。

⚠️ **警告： 除非文件內另有指示說明，否則僅限受過專業訓練之維修技師才能卸除系統機殼及拆裝任何系統內部的元件。**

➡️ **注意： 爲避免損壞主機板，關閉系統電源後請再等待五秒，之後再拆下系統主機板上的元件或拔除周邊裝置。**

1 關閉系統和所有裝置的電源。
2 爲防止您身上的靜電破壞系統內部元件，請碰觸機盒上未上漆的金屬表面以達接地效果。
3 工作時，建議您不時碰觸機盒上未上漆的金屬表面，以將可能傷害內部元件的靜電導引至地端。
4 拔除系統及裝置的電源。爲降低人身受傷或觸電的風險，請拔除系統所有的電信線路。
   並請適時記下這些安全性指導原則：
- 拔除電纜時，請握住插頭或耐扭式電源線環，勿直接拉扯電纜。有些電纜的插頭上附有鎖片，如果您要拔除這種類型的電纜，拔除前請先按壓鎖片。拔除插頭時，請將插頭整齊排列、間隔均等，以避刷折彎插頭插腳。此外，接上電纜前也請確保兩個插頭方向正確且對齊。
- 請小心處理元件與設備用卡。請勿碰觸卡上的元件或接點。請拿著卡的邊緣或金屬固定架。請拿著元件(如微處理器晶片) 的邊緣而非其插腳。

安全性：避免靜電釋放

靜電會對系統內精密的元件造成傷害。爲避免靜電損傷，在您接觸任何電子元件(如微處理器) 前請先釋放身體靜電。只要定期碰觸機殼底部未塗漆的金屬表面即可釋放身體的靜電。

您亦可採取下列步驟來避免靜電釋放(ESD) 所造成的損傷：
- 從裝貨紙箱取出高靜電敏感度的元件前，若您尚未準備好將該元件安裝至系統上，請勿將之從抗靜電的包裝材料中取出。打開抗靜電包裝前，請確定已釋放出您體內的靜電。
- 運送高敏感度的元件時，請先將之置於抗靜電的容器或包裝內。
- 在無靜電危險的區域處理所有高敏感度的元件。如果可能的話，請使用抗靜電地板墊、工作台墊和抗靜電接地手環。

安全性：電池處置

您的系統可能使用鎳氫金屬電池、鋰性鈕扣式電池與/或鋰離子電池。鎳氫電池、鋰性鈕扣式電池及鋰離子電池均為長效型電池，您可能永遠無需更換電池。但若您需更換電池，請參考系統文件說明以取得操作指示。請勿將電池隨同家庭垃圾一起處置。請與住家當地的廢棄物處理單位聯繫，以瞭解就近的電池回收站地址。

備註： 您的系統裡可能也有電路卡或其他含有電池的元件。這些電池均須送往電池回收處理站處理。如需更多有關此類電池的資訊，請參考特定設備用卡或元件的文件說明。

回收資訊

建議客戶以符合環保的方式，丟棄使用過的電腦硬體、顯示器、印表機和其他周邊裝置。可能方法包括零部件或整個產品的再利用，以及回收產品、元件和/或材料。

台灣地區電池回收標誌

6.12 Taiwan RoHS Information

設備名稱：硬式磁碟機 Equipment name	型號（型式）Data Storage Subsystem Type designation (Type) Type list in next page					
單元 Unit	限用物質及其化學符號 Restricted substances and its chemical symbols					
	鉛 Lead (Pb)	汞 Mercury (Hg)	鎘 Cadmium (Cd)	六價鉻 Hexavalent chromium (Cr^{+6})	多溴聯苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
Enclosure Assembly	○	○	○	○	○	○
Hard Disk Drive 硬式磁碟機	—	○	○	○	○	○
Solid State Drive 固態硬碟	—	○	○	○	○	○
PCB Assembly 印刷電路板總成	—	○	○	○	○	○

備考1.〝超出0.1 wt %〞及〝超出0.01 wt %〞係指限用物質之百分比含量超出百分比含量基準值。
  Note 1："Exceeding 0.1 wt %" and "exceeding 0.01 wt %" indicate that the percentage content of the restricted substance exceeds the
    reference percentage value of presence condition.
備考2.〝○〞係指該項限用物質之百分比含量未超出百分比含量基準值。
  Note 2："○" indicates that the percentage content of the restricted substance does not exceed the percentage of reference value of presence.
備考3.〝—〞係指該項限用物質為排除項目。
  Note 3：The "–" indicates that the restricted substance corresponds to the exemption.

Appendices

In This Chapter:

7.1 nTAA SKUs for Fully Populated Configurations

Table 110: Fully Populated Configurations

Capacity	Drive Type	Sector Size	SATA			SAS			
			SE	SED	ISE	SE	ISE	TCG	TCG-FIPS
1440TB	HC580	512e	1ES2526						
		512e	1ES2540						
1320TB	HC570	512e	1ES2203	1ES2204		1ES2063		1ES2198	
	HC580	512e	1ES2522						
		512e	1ES2536						
1200TB	HC560	512e	1ES2135	1ES2136		1ES2143		1ES2144	
1080TB	HC550	512e	1ES1871	1ES1872		1ES1865		1ES1866	
960TB	HC550	512e	1ES1881	1ES1882		1ES1875		1ES1876	
840TB	HC550	512e	1ES2345			1ES2344			
		512e	1ES2347			1ES2346			
		512e	1ES2351			1ES2350			
	HC530	512e	1ES1466*	1ES1467*		1ES1464*		1ES1465*	1ES1947*
		4Kn	1ES1463*			1ES1461*		1ES1462*	
720TB	HC520	512e	1ES0370		1ES0368	1ES0364	1ES0362	1ES0363	
		4Kn	1ES0367		1ES0365	1ES0361	1ES0359	1ES0360	
600TB	HC330	512e	1ES1835	1ES1834		1ES1827		1ES1822	
		4Kn	1ES1836	1ES1837		1ES1824		1ES1825	
480TB	HC320	512e	1ES1241	1ES1240		1ES1237		1ES1236	
		4Kn	1ES1239	1ES1238		1ES1235		1ES1234	
360TB	HC320	512e	1ES1164	1ES1163		1ES1160		1ES1159	
		4Kn	1ES1162	1ES1161		1ES1158		1ES1157	
240TB	HC310	512e				1ES1645		1ES1646	1ES1647
		4Kn				1ES1560		1ES1643	1ES1644

* This part number is no longer available.

7.2 nTAA SKUs for Partially Populated Configurations

Table 111: Partially Populated Configurations

Capacity	Drive Type	Sector Size	SATA			SAS			
			SE	SED	ISE	SE	ISE	TCG	TCG-FIPS
576TB	HC580	512e	1ES2527						
		512e	1ES2541						
528TB	HC570	512e	1ES2205	1ES2206		1ES2200		1ES2201	
	HC580	512e	1ES2523						
		512e	1ES2537						
480TB	HC560	512e	1ES2146	1ES2147		1ES2148		1ES2149	
432TB	HC550	512e	1ES1873	1ES1874		1ES1868		1ES1869	
384TB	HC550	512e	1ES1883	1ES1884		1ES1878		1ES1879	
336TB	HC550	512e	1ES2349			1ES2348			
		512e	1ES2353			1ES2352			
	HC530	512e	1ES1473*	1ES1474*		1ES1471*		1ES1472*	1ES1948*
		4Kn	1ES1470*			1ES1468*		1ES1469*	
288TB	HC520	512e	1ES0400		1ES0398	1ES0394	1ES0392	1ES0393	
		4Kn	1ES0397		1ES0395	1ES0391	1ES0389	1ES0390	
240TB	HC330	512e	1ES1838	1ES1839		1ES1828		1ES1829	
		4Kn	1ES1840	1ES1841		1ES1831		1ES1832	
192TB	HC320	512e	1ES1249	1ES1248		1ES1245		1ES1244	
		4Kn	1ES1247	1ES1246		1ES1243		1ES1242	
144TB	HC310	512e	1ES1173	1ES1172		1ES1169		1ES1168	
		4Kn	1ES1171	1ES1170		1ES1167		1ES1166	
96TB	HC310	512e				1ES1651		1ES1652	1ES1653
		4Kn				1ES1648		1ES1649	1ES1650

* This part number is no longer available.

7.3 TAA SKUs for Fully Populated Configurations

Table 112: Fully Populated Configurations

Capacity	Drive Type	Sector Size	SATA			SAS			
			SE	SED	ISE	SE	ISE	TCG	TCG-FIPS
1440TB	HC580	512e	1ES2551						
		512e	1ES2558						
1320TB	HC570	512e	1ES2223	1ES2209		1ES2224		1ES2207	
	HC580	512e	1ES2549						
		512e	1ES2556						
1200TB	HC560	512e	1ES2225	1ES2183		1ES2226		1ES2181	
1080TB	HC550	512e	1ES2227	1ES2098		1ES2228		1ES2096	1ES2097
960TB	HC550	512e	1ES2229	1ES2095		1ES2230		1ES2093	1ES2094
840TB	HC530	512e	1ES2231*	1ES2092*		1ES2232*		1ES2090*	1ES2091*
720TB	HC520	512e	1ES2233	1ES2127		1ES2234		1ES2124	1ES2125

* This part number is no longer available.

7.4 nTAA SKUs for Scale-Up Modules

Table 113: 12-Pack nTAA Scale-Up Modules

Capacity	Drive Type	Sector Size	SATA SE	SATA SED	SATA ISE	SAS SE	SAS ISE	SAS TCG	SAS TCG-FIPS
312TB	HC670	4Kn	1EX3008	1EX3009		1EX3005		1EX3006	
288TB	HC580	512e	1EX3164						
264TB	HC570	512e	1EX2961	1EX2962		1EX2958		1EX2959	
264TB	HC580	512e	1EX3162						
240TB	HC560	512e	1EX2904	1EX2905		1EX2901		1EX2902	
216TB	HC550	512e	1EX2491	1EX2492		1EX2488		1EX2489	1EX2490
216TB	HC550	4Kn				1EX2785			
192TB	HC550	512e	1EX2486	1EX2487		1EX2483		1EX2484	1EX2485
168TB	HC550	512e	1EX3044			1EX3043			
168TB	HC530	512e	1EX1847*	1EX1848*		1EX1845*		1EX1846*	
168TB	HC530	4Kn	1EX1844*			1EX1842*		1EX1843*	
144TB	HC520	512e	1EX0553		1EX0551	1EX0547	1EX0545	1EX0546	
144TB	HC520	4Kn	1EX0550		1EX0548	1EX0544	1EX0542	1EX0543	
120TB	HC330	512e	1EX2460	1EX2461		1EX2455		1EX2456	
120TB	HC330	4Kn	1EX2458	1EX2459		1EX2452		1EX2453	
96TB	HC320	512e	1EX1243	1EX1242		1EX1239		1EX1238	
96TB	HC320	4Kn	1EX1241	1EX1240		1EX1237		1EX1236	
72TB	HC310	512e	1EX1213	1EX1212		1EX1209		1EX1208	
72TB	HC310	4Kn	1EX1211	1EX1210		1EX1207		1EX1206	
48TB	HC310	512e				1EX2250		1EX2251	1EX2252
48TB	HC310	4Kn				1EX2247		1EX2248	1EX2249

* This part number is no longer available.

7.5 Rack Configurations

This section provides an overview of rack requirements and recommendations.

7.5.1 Compatible Rack Hardware Configuration

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

Table 114: Compatible Hardware Configuration 1

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
Vendor	CRENLO/ EMCOR	Server Technology	Server Technology	Various
Part Number	AS-160099-03 (Drawing Number EMCOR 526121 Rev 5)	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	2	2	Varies

Table 115: 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:** 42RU – WEDIT605 45RU – WEDIT604 48RU – WEDIT603 51RU – WEDIT606	412-0761-11_STV-4501 412-0761-20_STV-4502 412-0761-23_STV-4503	KIT-MB-40	None
Quantity	1 rack	2	1	N/A

Table 116: Compatible Hardware Configuration 3

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
Vendor	TRIPP LITE	Server Technology	Server Technology	Various

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
Part Number	**Options:** SR42UBDP (Rack) SREXTENDER 25U (Rack Extension) SREXTENDER 42U (Rack Extension) SREXTENDER 48U (Rack Extension)	412-0761-11_STV-4501 412-0761-20_STV-4502 412-0761-23_STV-4503	KIT-MBVPT-1B	None
Quantity	1 rack	2	1	N/A

Table 117: 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

For more details related to Ultrastar Data60 rack configurations, see: .

7.5.2 Rack Safety

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 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.

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.

Figure 265: Shipping Bracket Screw Locations
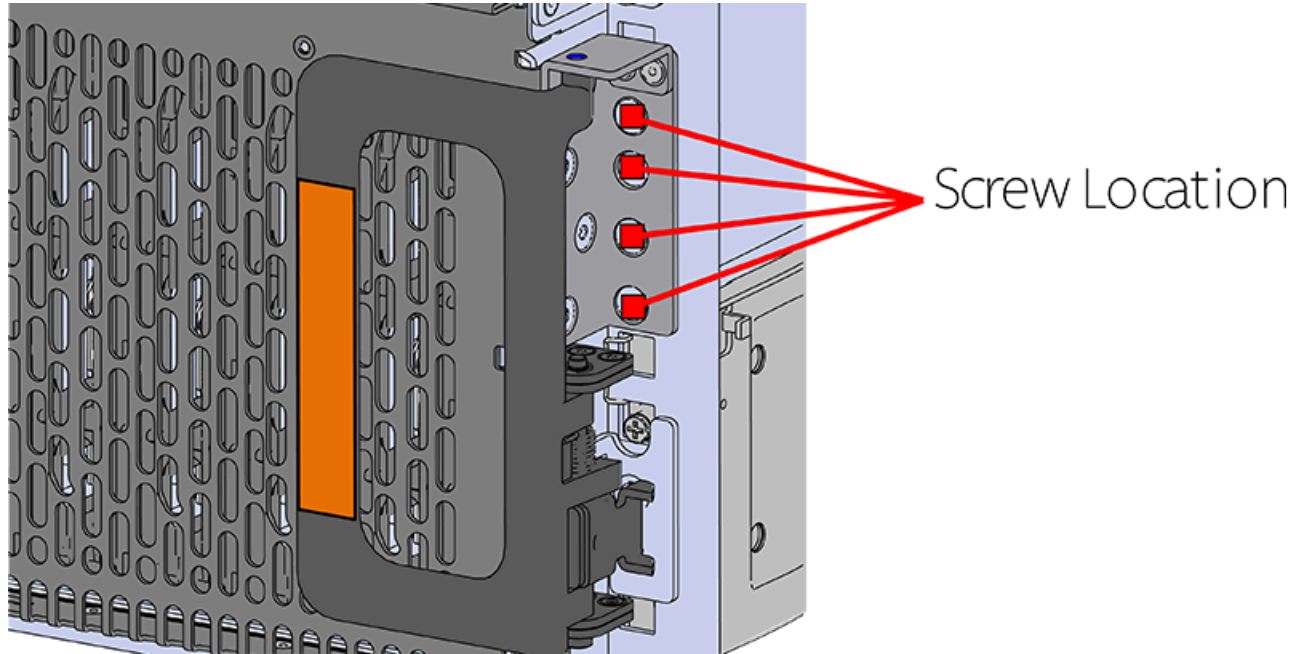
7.5.3 CMA Standard Recommended Racks

The following is a list of racks that are recommended for the Ultrastar Data60 using CMA Standard.

Table 118: Recommended Racks

Vendor	Part Number	Rack Units	Dimensions	Notes
EMCOR/ CRENLO	AS-160099-03	42	**H:** 2060mm x **W:** 600mm x **D:** 1200mm/ **H:** 81.1in. x **W:** 23.6in. x **D:** 47.2in.	N/A
	DC-42U2448-G	42	**H:** 2057mm x **W:** 600mm x **D:** 1270mm/ **H:** 80.98in. x **W:** 23.6in. x **D:** 50in.	N/A
AFCO/Legrand	WEDIT602	52	**H:** 2989.2mm x **W:** 609.6mm x **D:** 1317.6mm/ **H:** 98in. x **W:** 24in. x **D:** 51.9in.	N/A
	WEDIT603	48	**H:** 2311.4mm x **W:** 609.6mm x **D:** 1317.6mm/ **H:** 91in. x **W:** 24in. x **D:** 51.9in.	N/A

Vendor	Part Number	Rack Units	Dimensions	Notes
	WEDIT604	45	**H:** 2178.1mm x **W:** 609.6mm x **D:** 1317.6mm/ **H:** 85.75in. x **W:** 24in. x **D:** 51.8in.	N/A
	WEDIT605	42	**H:**2044.7mm x **W:** 609.6mm x **D:** 1317.6mm/ **H:** 80.5in. x **W:** 24in. x **D:** 51.8in.	N/A
	WEDIT606	51	**H:** 2444.8mm x **W:** 609.6mm x **D:** 1317.6mm/ **H:** 96.25in. x **W:** 24in. x **D:** 51.8in.	N/A
APC/Schneider	AR3300W	42	**H:** 1991mm x **W:** 600mm x **D:** 1222mm **H:** 78.4in. x **W:** 23.6in. x **D:** 48.18in.	The rear door must be removed when using the standard CMA with this rack.
TRIPP LITE w/ Rack Extender	**Rack:**SR42UBDP **Extender:** SREXTENDER	42	**H:** 2444.8mm x **W:** 609.6mm x **D:** 1200mm or 1403.2mm w/ Rack Extender/ **H:** in. x **W:** in. x **D:** in. w/ Rack Extender	N/A

7.5.4 CMA Lite Recommended Racks

The following is a list of racks that are recommended for the Ultrastar Data60 using CMA Lite.

Table 119: Recommended Racks

Vendor	Part Number	Rack Units	Dimensions	Notes
EMCOR/ CRENLO	AS-160099-03	42	**H:** 2060mm x **W:** 600mm x **D:** 1200mm/ **H:** 81.1in. x **W:** 23.6in. x **D:** 47.2in.	N/A
	DC-42U2448-G	42	**H:** 2057mm x **W:** 600mm x **D:** 1270mm/ **H:** 80.98in. x **W:** 23.6in. x **D:** 50in.	N/A
AFCO/Legrand	WEDIT602	52	**H:** 2989.2mm x **W:** 609.6mm x **D:** 1317.6mm/ **H:** 98in. x **W:** 24in. x **D:** 51.9in.	The enclosure cannot be installed into the U spaces that are in line with the front door stiffeners or the door latch in the CMA Lite configuration.

Vendor	Part Number	Rack Units	Dimensions	Notes
	WEDIT603	48	**H:** 2311.4mm x **W:** 609.6mm x **D:** 1317.6mm/ **H:** 91in. x **W:** 24in. x **D:** 51.9in.	The enclosure cannot be installed into the U spaces that are in line with the front door stiffeners or the door latch in the CMA Lite configuration.
	WEDIT604	45	**H:** 2178.1mm x **W:** 609.6mm x **D:** 1317.6mm/ **H:** 85.75in. x **W:** 24in. x **D:** 51.8in.	The enclosure cannot be installed into the U spaces that are in line with the front door stiffeners or the door latch in the CMA Lite configuration.
	WEDIT605	42	**H:**2044.7mm x **W:** 609.6mm x **D:** 1317.6mm/ **H:** 80.5in. x **W:** 24in. x **D:** 51.8in.	The enclosure cannot be installed into the U spaces that are in line with the front door stiffeners or the door latch in the CMA Lite configuration.
	WEDIT606	51	**H:** 2444.8mm x **W:** 609.6mm x **D:** 1317.6mm/ **H:** 96.25in. x **W:** 24in. x **D:** 51.8in.	The enclosure cannot be installed into the U spaces that are in line with the front door stiffeners or the door latch in the CMA Lite configuration.
APC	AR3300W	42	**H:** 1991mm x **W:** 600mm x **D:** 1222mm **H:** 78.4in. x **W:** 23.6in. x **D:** 48.18in.	N/A

Vendor	Part Number	Rack Units	Dimensions	Notes
Tripplite w/ Rack Extender	**Rack:**SR42UBDP **Extender:** SREXTENDER	42	**H:** 2444.8mm x **W:** 609.6mm x **D:** 1200mm or 1403.2mm w/ Rack Extender/ **H:** in. x **W:** in. x **D:** in. w/ Rack Extender	N/A

7.5.5 Vertical Rack Rail Settings

The vertical rack rails should be adjusted to the specified measurements in all of the recommended rack configurations to ensure the enclosure and cable management fit properly. After the front and rear vertical rack rails have been adjusted the enclosure rails can be extended or retracted to best fit these adjustments. Refer to the specific rack manufacturer documentation for instructions on how to adjust the vertical rack rails on the chosen rack.
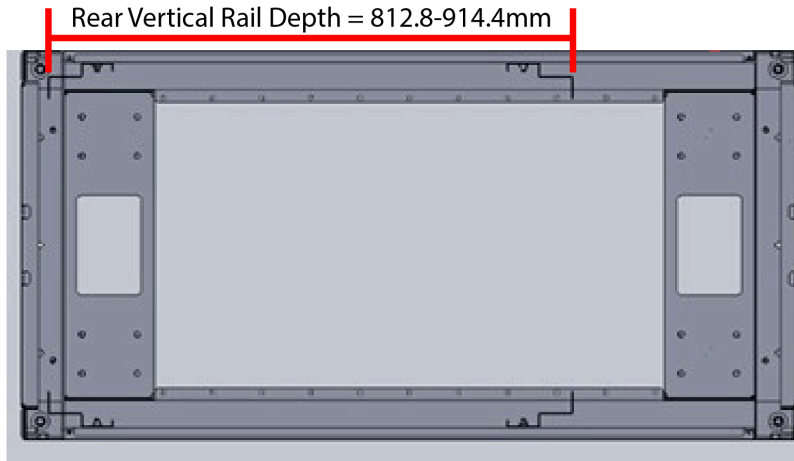
Both front vertical rack rails should be adjusted to a depth of 41mm / 1.61in. from the front of the rack frame as shown in the image below.

Figure 266: Front Vertical Rack Rails
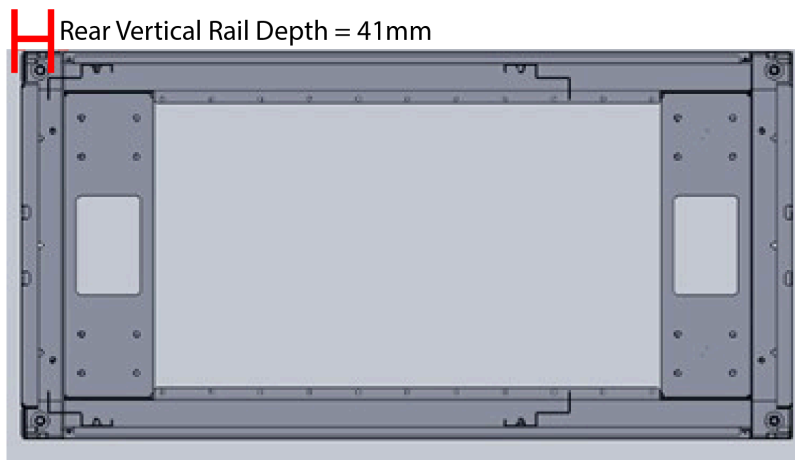
Both rear vertical rack rails should be adjusted to a depth of 812mm - 914.4mm / 32in. -36 in. from the front vertical rack rails as shown in the image below.

Figure 267: Rear Vertical Rack Rails

## 7.5.6 Recommended PDUs and Available Installation Space

The following is a list of available PDU space that is recommended for use in each rack.

Table 120: Available PDU Space

Rack	Model	PDU Orientation	Space Available
EMCOR/CRENLO	AS-160099-03	Rear Facing	**W:** 56mm x **D:** 190mm/ **W:** 2.2in. x **D:** 7.5in.
	DC-42U2448-G		
AFCO/Legrand	WEDIT602	Rear or Inward Facing	**W:** 67mm x **D:** 200mm/ **W:** 2.6in. x **D:** 7.9in.
	WEDIT603		
	WEDIT604		
	WEDIT605		
	WEDIT606		
APC/Schneider	AR3300	Rear Facing	**W:** 60mm x **D:** 113mm/ **W:** 2.4in. x **D:** 4.4in.
TRIPP LITE w/ Rack Extender	**Rack:**SR42UBDP **Extender:** SREXTENDER	Rear or Inward Facing	**W:** 60mm x **D:** 120mm/ **W:** 2.4in. x **D:** 4.7in.

The following image displays the available zero space for mounting the PDU into the rack. This can be used to size the PDU and related installation hardware outside of the hardware that is specified within this document.

Figure 268: PDU in the Zero Space
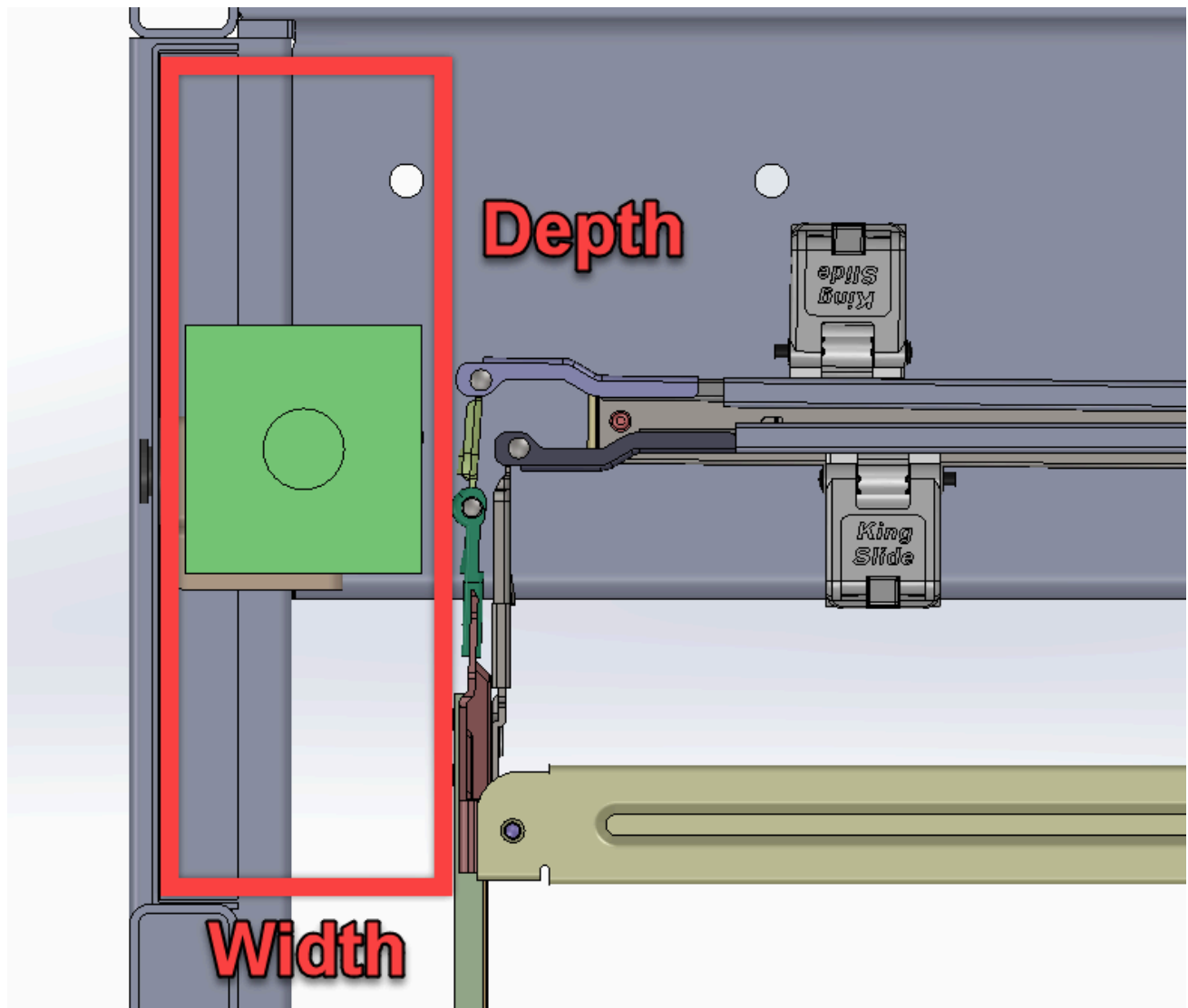
7.5.7 CMA Standard Rack Specifications

This section provides information related to the recommended rack models, compatible PDUs, and required accessories and hardware using CMA Standard. Each rack recommendation comes with information specific to what PDUs are approved and what hardware is required to mount them.

7.5.7.1 CRENLO/EMCOR

Table 121: Recommended CRENLO/EMCOR Rack Models

Model Number	Rack Units	Dimensions
AS-160099-03	42U	**H:** 2060mm x **W:** 600mm x **D:** 1200mm / **H:** 81.1in. x **W:** 23.6in. x **D:** 47.2in.
DC-42U2448-G	42U	**H:** 2057mm x **W:** 600mm x **D:** 1270mm / **H:** 80.9in. x **W:** 23.6in. x **D:** 50in.

Table 122: Compatible PDUs

PDU	Model Number	Width	Depth	Orientation
Server Technology	STV-4501	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear
	STV-4502	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear
	STV-4503	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear

Table 123: Required Accessories and Hardware

Supplier	Part Number	QTY	Description
Server Technology	KIT-MBVPT-1B	1	PDU Mounting Bracket
Generic/Various	M6 x 16 Hex Cap Screws	4	N/A
	M6 Fender Washers	8	N/A
	M6 Hex Nut with Nylon Lock	4	N/A

7.5.7.2 AFCO/Legrand

Table 124: Recommended AFCO/Legrand Rack Models

Model Number	Rack Units	Dimensions
WEDIT602	52	**H:** 2989.2mm x **W:** 609.6mm x **D:** 1317.6mm/ **H:** 98in. x **W:** 24in. x **D:** 51.9in.
WEDIT603	48	**H:** 2311.4mm x **W:** 609.6mm x **D:** 1317.6mm / **H:** 91in. x **W:** 24in. x **D:** 51.8in.
WEDIT604	45	**H:** 2178.1mm x **W:** 609.6mm x **D:** 1317.6mm / **H:** 85.75in. x **W:** 24in. x **D:** 51.8in.
WEDIT605	42	**H:**2044.7mm x **W:** 609.6mm x **D:** 1317.6mm / **H:** 80.5in. x **W:** 24in. x **D:** 51.8in.
WEDIT606	51	**H:** 2444.8mm x **W:** 609.6mm x **D:** 1317.6mm / **H:** 96.25in. x **W:** 24in. x **D:** 51.8in.

Table 125: Compatible PDUs

PDU	Model Number	Width	Depth	Orientation
Server Technology	STV-4501	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear
	STV-4502	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear
	STV-4503	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear

Table 126: Required Accessories and Hardware

Supplier	Part Number	QTY	Description
Server Technology	KIT-MB40	1	PDU Mounting Bracket

7.5.7.3 TRIPP LITE

Table 127: Recommended TRIPP LITE Rack Models

Model Number	Rack Units	Dimensions
SR42UBDP	42U	**H:** 1111.25mm x **W:** 601.98mm x **D:** 1200mm / **H:** 43.75in. x **W:** 23.7in. x **D:** 47.2in.

Table 128: Recommended TRIPP LITE Rack Extender Models

Model Number	Rack Units	Dimensions
SREXTENDER	42U	Shipping Dimensions: **H:** 236.22mm x **W:** 1206.5mm x **D:** 203.2mm / **H:** 9.3in. x **W:** 47.5in. x **D:** 8 in. Assembled Dimensions: **H:** 1866.9mm x **W:** 601.98mm x **D:** 200.66mm / **H:** 73.5in. x **W:** 47.5in. x **D:** 7.9in.
SREXTENDER	48U	Shipping Dimensions: **H:** 236.22mm x **W:** 1206.5mm x **D:** 203.2mm / **H:** 9.3in. x **W:** 47.5in. x **D:** 8 in. Assembled Dimensions: **H:** 2133.6mm x **W:** 601.98mm x **D:** 200.66mm / **H:** 84in. x **W:** 47.5in. x **D:** 7.9in.

Note: Installation instructions for the Tripp Lite SREXTENDER, may be acquired from the manufacturers website.

Table 129: Compatible PDUs

PDU	Model Number	Width	Depth	Orientation
Server Technology	STV-4501	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear
	STV-4502	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear

PDU	Model Number	Width	Depth	Orientation
	STV-4503	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear

Table 130: Required Accessories and Hardware

Supplier	Part Number	QTY	Description
Server Technology	KIT-MB40	1	PDU Mounting Bracket
Tripp Lite	SREXTENDER	1	Rack Extension

7.5.7.4 APC/Schneider

Table 131: Recommended APC/Schneider Rack Models

Model Number	Rack Units	Dimensions
AR3300	42	**H:** 1991mm x **W:** 600mm x **D:** 1222mm **H:** 78.4in. x **W:** 23.6in. x **D:** 48.18in.

Table 132: Compatible PDUs

PDU	Model Number	Width	Depth	Orientation
Server Technology	STV-4501	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear
	STV-4502	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear
	STV-4503	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear

Table 133: Required Accessories and Hardware

Supplier	Part Number	QTY	Description
Server Technology	KIT-MBVPT-1B	1	PDU Mounting Bracket
Generic/Various	M6 x 16 Hex Cap Screws	4	N/A
	M6 Fender Washers	8	N/A
	M6 Hex Nut with Nylon Lock	4	N/A

7.5.8 CMA Lite Rack Specifications

This section provides information related to the recommended rack models, compatible PDUs, and required accessories and hardware using CMA Lite. Each rack recommendation comes with information specific to what PDUs are approved and what hardware is required to mount them.

7.5.8.1 CRENLO/EMCOR

Table 134: Recommended CRENLO/EMCOR Rack Models

Model Number	Rack Units	Dimensions
AS-160099-03	42U	**H:** 2060mm x **W:** 600mm x **D:** 1200mm / **H:** 81.1in. x **W:** 23.6in. x **D:** 47.2in.
DC-42U2448-G	42U	**H:** 2057mm x **W:** 600mm x **D:** 1270mm / **H:** 80.9in. x **W:** 23.6in. x **D:** 50in.

Table 135: Compatible PDUs

PDU	Model Number	Width	Depth	Orientation
Server Technology	STV-4501	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear
	STV-4502	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear
	STV-4503	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear

Table 136: Required Accessories and Hardware

Supplier	Part Number	QTY	Description
Server Technology	KIT-MBVPT-1B	1	PDU Mounting Bracket
Generic/Various	M6 x 16 Hex Cap Screws	4	N/A
	M6 Fender Washers	8	N/A
	M6 Hex Nut with Nylon Lock	4	N/A

7.5.8.2 AFCO/Legrand

Table 137: Recommended AFCO/Legrand Rack Models

Model Number	Rack Units	Dimensions
WEDIT602	52	**H:** 2989.2mm x **W:** 609.6mm x **D:** 1317.6mm/ **H:** 98in. x **W:** 24in. x **D:** 51.9in.
WEDIT603	48	**H:** 2311.4mm x **W:** 609.6mm x **D:** 1317.6mm / **H:** 91in. x **W:** 24in. x **D:** 51.8in.
WEDIT604	45	**H:** 2178.1mm x **W:** 609.6mm x **D:** 1317.6mm / **H:** 85.75in. x **W:** 24in. x **D:** 51.8in.
WEDIT605	42	**H:** 2044.7mm x **W:** 609.6mm x **D:** 1317.6mm / **H:** 80.5in. x **W:** 24in. x **D:** 51.8in.
WEDIT606	51	**H:** 2444.8mm x **W:** 609.6mm x **D:** 1317.6mm / **H:** 96.25in. x **W:** 24in. x **D:** 51.8in.

Table 138: Compatible PDUs

PDU	Model Number	Width	Depth	Orientation
Server Technology	STV-4501	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear
	STV-4502	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear
	STV-4503	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear

Table 139: Required Accessories and Hardware

Supplier	Part Number	QTY	Description
Server Technology	KIT-MB40	1	PDU Mounting Bracket

7.5.8.3 TRIPP LITE

Table 140: Recommended TRIPP LITE Rack Models

Model Number	Rack Units	Dimensions
SR42UBDP	42U	**H:** 1111.25mm x **W:** 601.98mm x **D:** 1200mm / **H:** 43.75in. x **W:** 23.7in. x **D:** 47.2in.

Table 141: Recommended TRIPP LITE Rack Extender Models

Model Number	Rack Units	Dimensions
SREXTENDER	42U	Shipping Dimensions: **H:** 236.22mm x **W:** 1206.5mm x **D:** 203.2mm / **H:** 9.3in. x **W:** 47.5in. x **D:** 8 in. Assembled Dimensions: **H:** 1866.9mm x **W:** 601.98mm x **D:** 200.66mm / **H:** 73.5in. x **W:** 47.5in. x **D:** 7.9in.
SREXTENDER	48U	Shipping Dimensions: **H:** 236.22mm x **W:** 1206.5mm x **D:** 203.2mm / **H:** 9.3in. x **W:** 47.5in. x **D:** 8 in. Assembled Dimensions: **H:** 2133.6mm x **W:** 601.98mm x **D:** 200.66mm / **H:** 84in. x **W:** 47.5in. x **D:** 7.9in.

Note: Installation instructions for the Tripp Lite SREXTENDER, may be acquired from the manufacturers website.

Table 142: Compatible PDUs

PDU	Model Number	Width	Depth	Orientation
Server Technology	STV-4501	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear
	STV-4502	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear

PDU	Model Number	Width	Depth	Orientation
	STV-4503	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear

Table 143: Required Accessories and Hardware

Supplier	Part Number	QTY	Description
Server Technology	KIT-MB40	1	PDU Mounting Bracket
Tripp Lite	SREXTENDER	1	Rack Extension

7.5.8.4 APC/Schneider

Table 144: Recommended APC/Schneider Rack Models

Model Number	Rack Units	Dimensions
AR3300	42	**H:** 1991mm x **W:** 600mm x **D:** 1222mm **H:** 78.4in. x **W:** 23.6in. x **D:** 48.18in.

Table 145: Compatible PDUs

PDU	Model Number	Width	Depth	Orientation
Server Technology	STV-4501	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear
	STV-4502	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear
	STV-4503	55.5mm / 2.18in.	86.15mm / 3.39in.	Rear

Table 146: Required Accessories and Hardware

Supplier	Part Number	QTY	Description
Server Technology	KIT-MBVPT-1B	1	PDU Mounting Bracket
Generic/Various	M6 x 16 Hex Cap Screws	4	N/A
	M6 Fender Washers	8	N/A
	M6 Hex Nut with Nylon Lock	4	N/A

7.5.9 Installation

7.5.9.1 PDU Mounting Bracket Installation (KIT-MBVPT-1B)

The installation of PDU mounting bracket kit (KIT-MBVPT-1B) for the AFCO, TRIPPLITE, and CRENLO racks extends the PDUs farther back in the rack to allow for more room for the CMA and enclosure.

> **Note:** For recommended vertical rack rail settings, see: Vertical Rack Rail Settings *(page 297)*.

Table 147: Procedure Info

| Required Tools	Required Parts	# of People Required
• Torx T15 Screwdriver	• Two Flat Brackets • Two Right-Angle Brackets • Two Backer Plates • M6 x 16 Hex Cap Screws • M6 Fender Washers • M6 Hex Nut with Nylon Lock	1

Step 1: Install the bottom side bracket using the provided hardware.

    a. Locate the two screw holes at the bottom of the back side of the PDU.

    b. Align the flat bracket with the two bottom PDU screw holes as shown.

Figure 269: Flat Bracket (bottom)
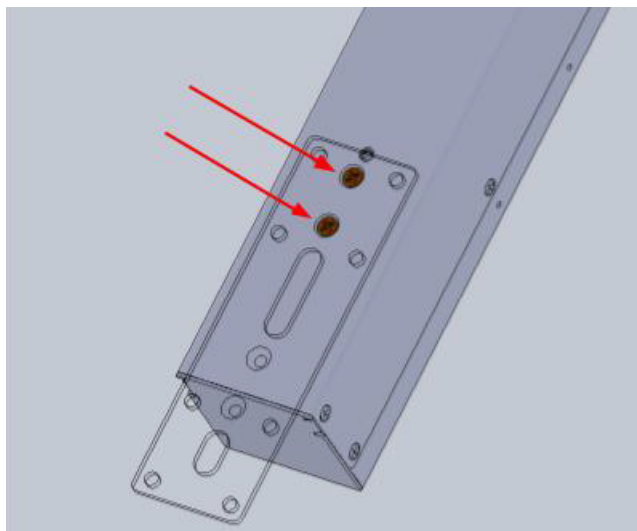
    c. Secure the flat bracket to the PDU by using the screws provided in the PDU mounting kit as shown in the image below.

Figure 270: Flat Bracket Installation (bottom)
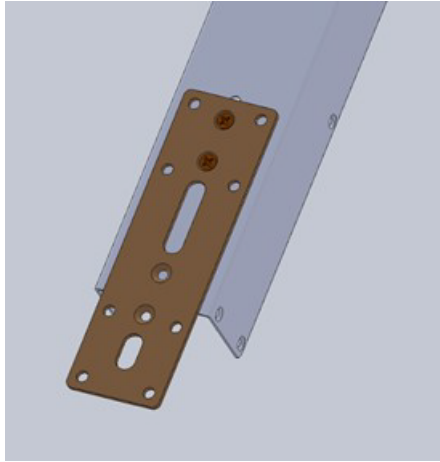
d. Align the right-angle bracket behind the flat bracket over the holes on the left-hand side of the flat bracket.

e. Slide the washers onto the mounting bolts and secure the right-angle bracket to the backer plate through the flat bracket. Before fully tightening the bolts, ensure that the right-angle bracket is flush with the edge of the PDU before tightening.
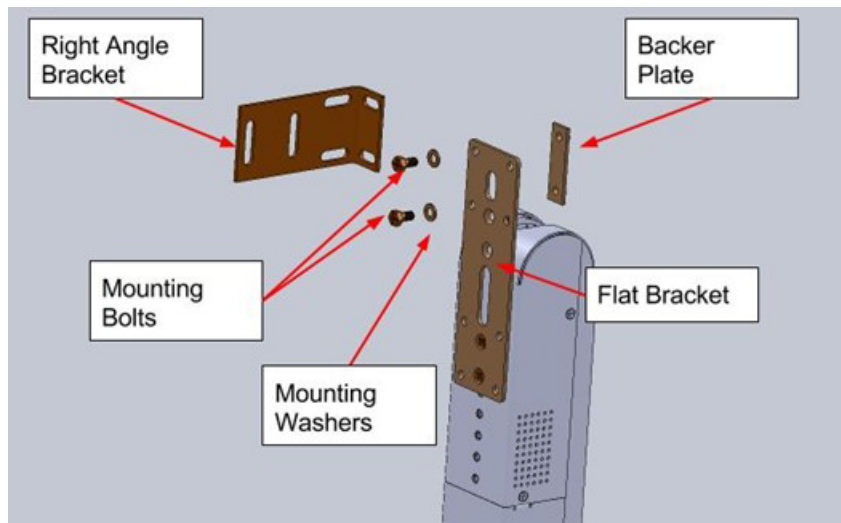
Figure 271: Right-Angle Bracket Installation (bottom)
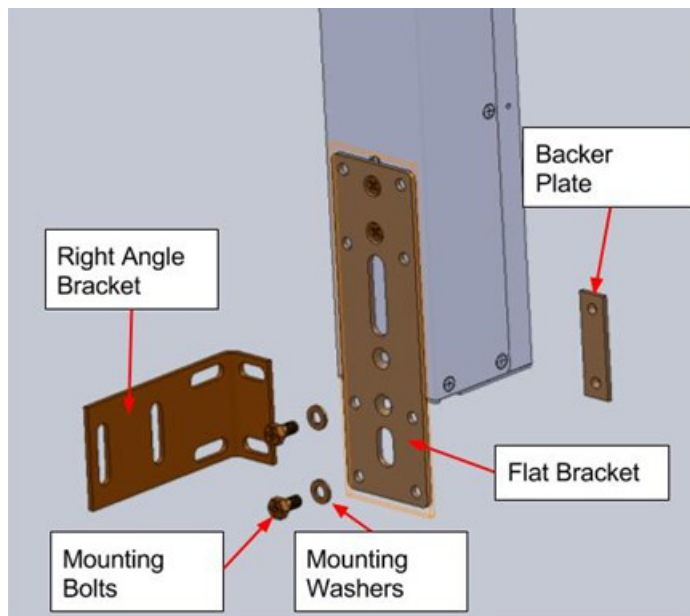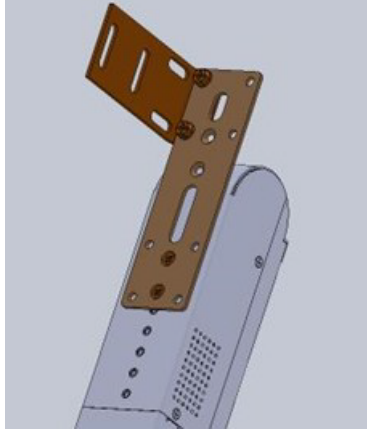
Figure 272: Right-Angle Bracket Installed (bottom)
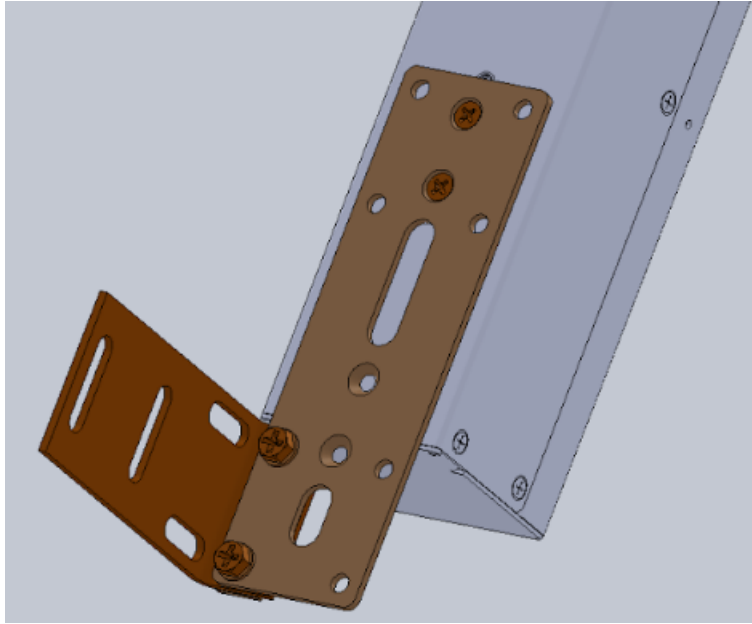
Figure 273: Flush Right-Angle Bracket (bottom)
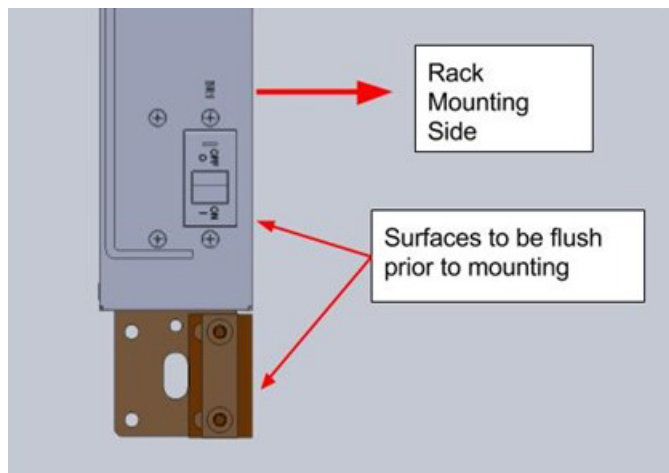
Step 2 : Install the top side bracket using the provided hardware.

    a. Locate the two screw holes at the top of the back side of the PDU.

    b. Align the flat bracket with the two top PDU screw holes as shown.

Figure 274: Flat Bracket (top)
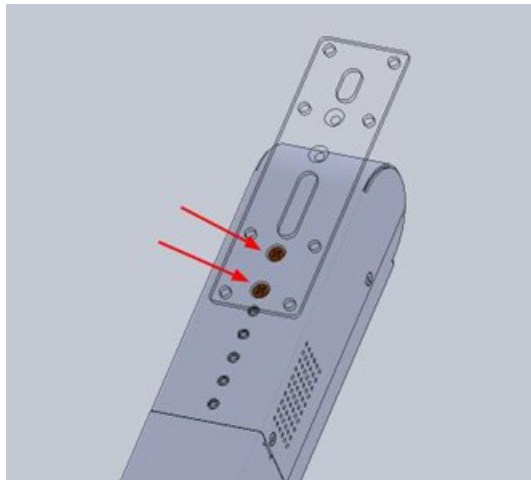
    c. Secure the flat bracket to the PDU by using the screws provided in the PDU mounting kit as shown in the image below.

Figure 275: Flat Bracket Installation (top)
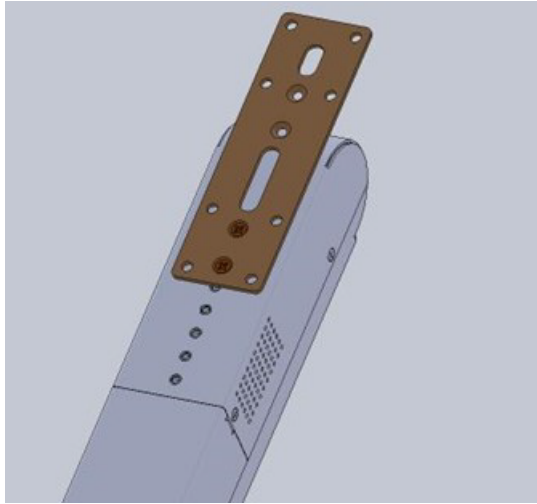
d. Align the right-angle bracket behind the flat bracket over the holes on the left-hand side of the flat bracket.

e. Slide the washers onto the mounting bolts and secure the right-angle bracket to the backer plate through the flat bracket. Before fully tightening the bolts, ensure that the right-angle bracket is flush with the edge of the PDU before tightening.

Figure 276: Right-Angle Bracket Installation (top)

Figure 277: Right-Angle Bracket Installed (top)

Figure 278: Flush Right-Angle Bracket (top)
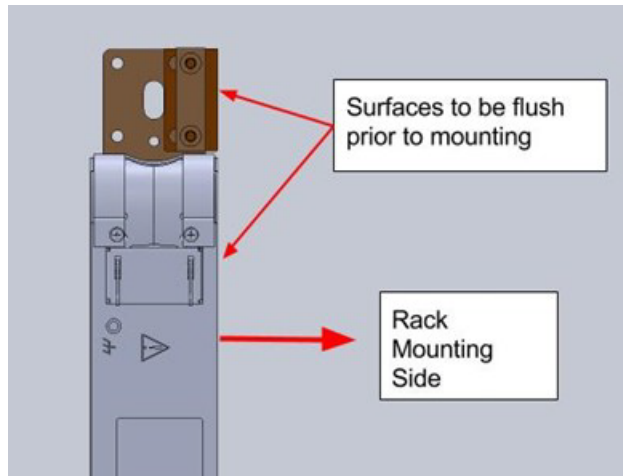
Step 3 : Install the PDU into the rear of the rack.

    a. Locate the top row of holes on the top vertical rail.

    b. Secure the right-angle bracket on the top vertical rail with the provided bolts and nuts. Before fully tightening the bolts, ensure that the plug side of the PDU is 145mm / 5.7in away from the rear rack rail.
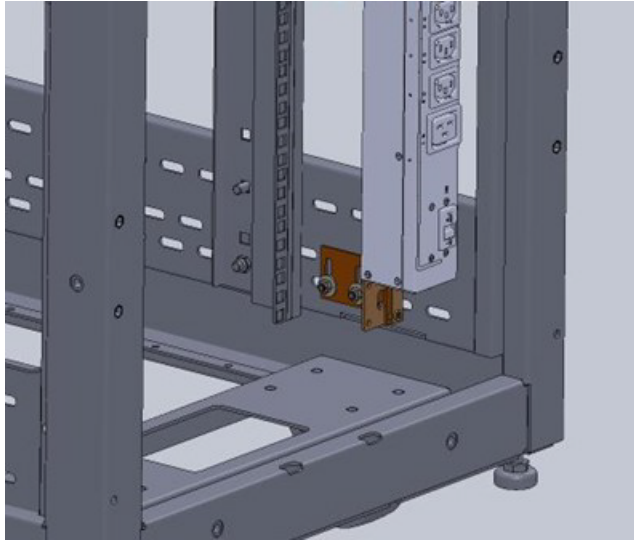
Figure 279: PDU Distance from Rack Rear Rail
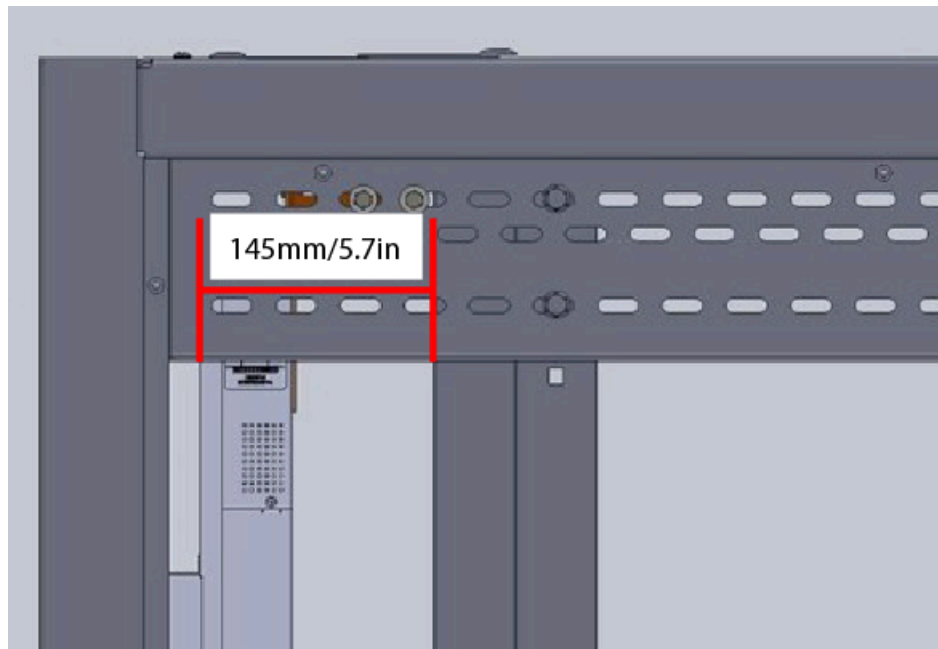
    c. Locate the bottom row of holes on the bottom vertical rail.

    d. Secure the right-angle bracket on the top vertical rail with the provided bolts and nuts. Before fully tightening the bolts, ensure that the plug side of the PDU is 145mm / 5.7in away from the rear rack rail.

Figure 280: PDU Installation (bottom)

Figure 281: PDU Distance from Rack Rear Rail

145mm/5.7in
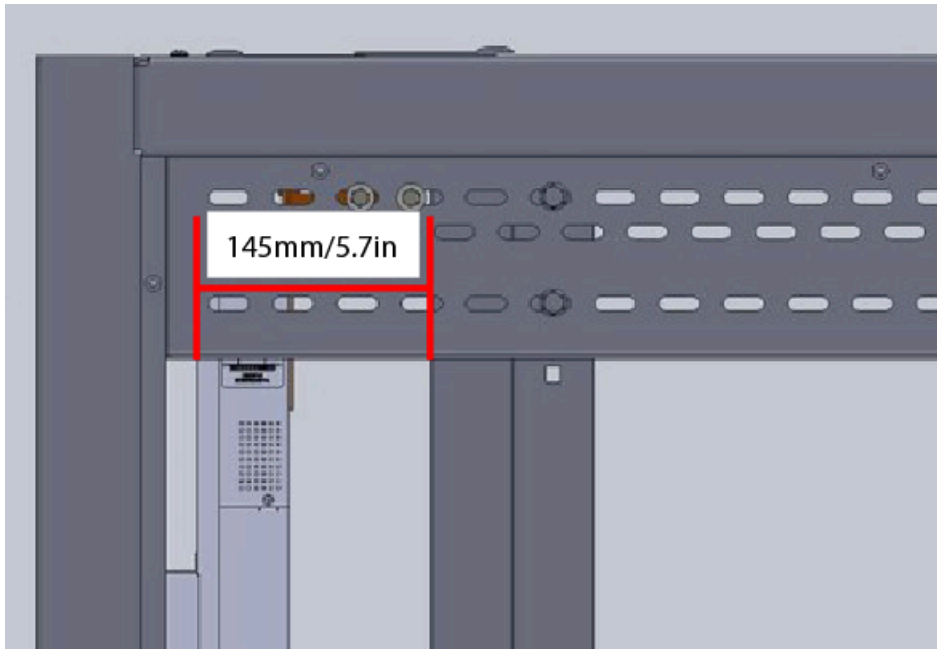
7.5.9.2 PDU Mounting Bracket Installation (KIT-MB-40)

The installation of PDU mounting bracket kit (KIT-MB-40) for the AFCO, TRIPPLITE, and CRENLO racks extends the PDUs farther back in the rack to allow for more room for the CMA and enclosure. The PDU Bracket Installation procedure should be completed after the installation of the system, rails, and cables.

> **Note:** For recommended vertical rack rail settings, see: Vertical Rack Rail Settings *(page 297)*.

Table 148: Procedure Info

Required Tools	Required Parts	# of People Required
• # 2 Philips Screwdriver • Torx T10 Screwdriver	• Two 90 degree angle brackets for 56 mm wide PDUs • Four M4 x 6mm screws	1

Step 1: Remove the PDU mounting buttons from the back of the PDU.

    a. Locate the PDU mounting buttons on the rear of the PDU. There is one at the top and one at the bottom.

Figure 282: Locate PDU Mounting Buttons
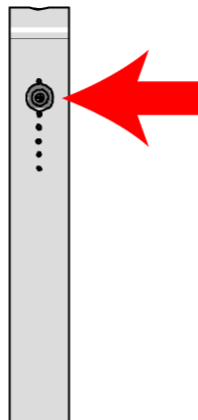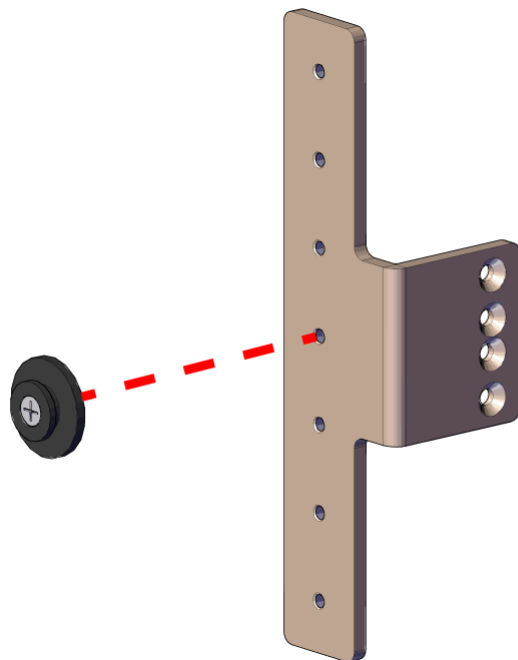

    b. Remove the screws that secure the PDU mounting buttons using the # 2 Philips Screwdriver.

Step 2: Mount the PDU mounting buttons onto the angle-bracket.

    a. Secure the PDU mounting button to the center hole of the long side of the angle-bracket.

Figure 283: Install the PDU Mounting Button onto the Angle Bracket


    b. Repeat the previous step to install the PDU mounting button on the remaining angle-bracket.

Step 3 : Install the angle-bracket to the bottom of the PDU using the provided hardware.

    a. Locate the middle set of holes on the back side of the PDU.

    b. Align the short side of the angle-bracket over the two middle PDU mounting holes on the rear of the PDU. The long side of the right angle bracket should be on the left (back) side of the PDU.

    c. Secure the angle-bracket to the PDU by using the screws provided in the PDU mounting kit as shown in the image below.

Figure 284: Install the Angle Bracket on the PDU (Bottom)
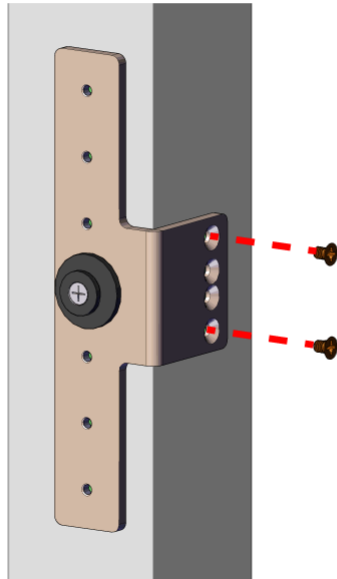
Step 4 : Install the angle-bracket to the top of the PDU using the provided hardware.

    a. Locate the two screw holes at the top of the back side of the PDU.

    b. Align the short side of the angle-bracket over the two top PDU mounting holes on the rear of the PDU. The long side of the right angle bracket should be on the left (back) side of the PDU.

    c. Secure the angle-bracket to the PDU by using the screws provided in the PDU mounting kit as shown in the image below.

Figure 285: Install the Angle Bracket on the PDU (Top)
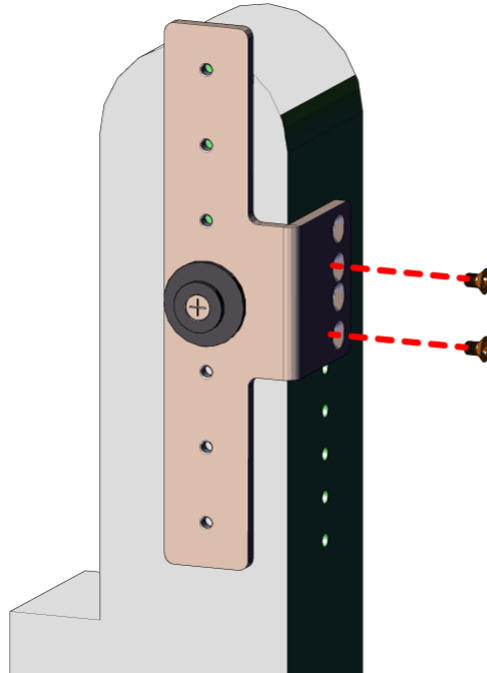
Step 5 : Install the PDU into the rear of the rack.

    a. Locate the middle set of keyholes on the rear vertical rack rails.

    b. Align the PDU mounting buttons with the keyholes on the rear vertical rack rails and slide down until the PDU is secure.
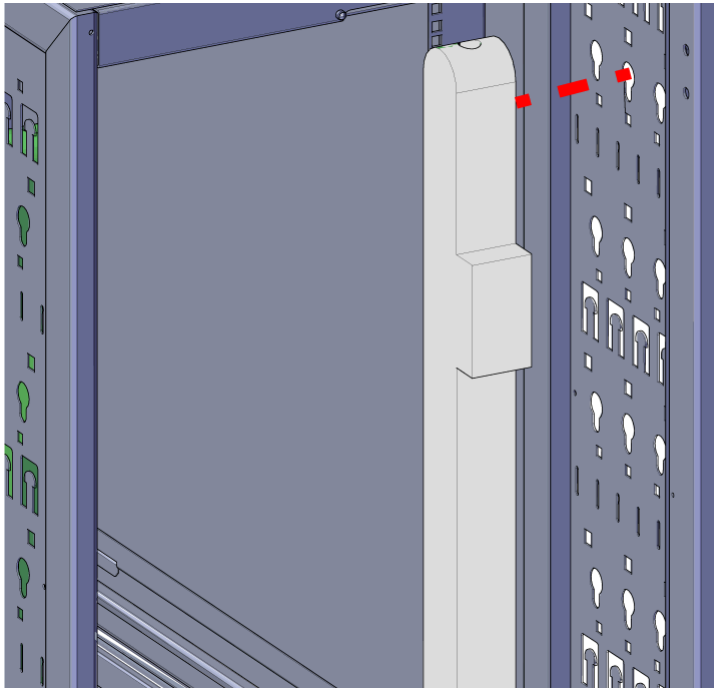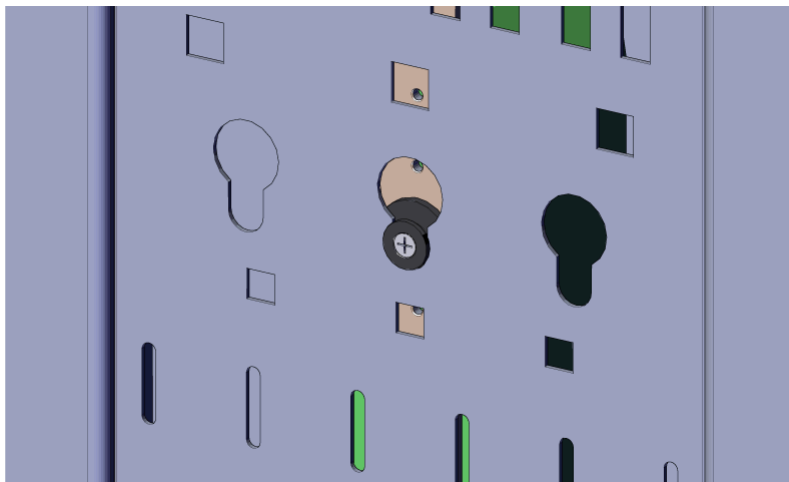
Figure 286: Align PDU with Keyholes

Figure 287: PDU Installed into Keyholes

c. Verify that the PDU is secure by pressing on the front of the PDU. If the PDU does not shift, it is properly mounted. If the PDU does shift, remove the PDU and repeat the PDU installation step to ensure it is secure.