Installation Guide

Ultrastar® Data60
Regulatory Model: H4060-J
December 2019
Rev. 1.11
1ET1105

Western Digital.

Revision History

Date	Revision	Comment
November 2017	Revision 1.0	Initial Release
November 2017	Revision 1.1	• The crossbar on the CMA was changed. See the installation instructions for details. • Changed required rack depth, see Required Rack Depth *(page 5)*. • Changed typical power consumption, see Typical Power Consumption *(page 4)*.
December 2017	Revision 1.2	• Added active cable support • Added a note regarding single IOMs in SATA TLAs. See Ultrastar Data60 Description *(page 2)* • Updated the Non-Op altitude specification. See Non-Operational Altitude *(page 4)*. • Correct the packaging images to show the **two** CMA boxes that come in the accessory tray. See Packaging Layout *(page 32)*.
January 2018	Revision 1.2.1	Updated the product name
January 2018	Revision 1.2.2	Added an image for cage nut positioning in the installation procedure.
January 2018	Revision 1.3	• Updated information on the 2.5" drive carrier option. (topic removed) • Added torque requirements for all screws used in the enclosure. • Updated the IOM replacement section to account for the possibility of a firmware mismatch. (topic removed) • Updated the drive assembly installation instructions to clarify the orientation of the drive assemblies. See Ultrastar Data60 Installation Procedure *(page 39)*.
April 2018	Revision 1.4	• Updated Compatible Drives List. See List of Compatible Drives *(page 9)*. • Updated the Rack Requirements. See Ultrastar Data60 Rack Requirements *(page 5)*.
June 2018	Revision 1.5	• Updated the Compatible Drives List. See List of Compatible Drives *(page 9)*
December 2018	Revision 1.6	• Updated Compatible Drives List. See List of Compatible Drives *(page 9)*

Date	Revision	Comment
March 2019	Revision 1.7	Updated the following sections: • Ultrastar Data60 Installation Procedure *(page 39)* • Ultrastar Data60 Installation Procedure *(page 39)*
May 2019	Revision 1.8	Updated the Ultrastar Data60 Installation Procedure *(page 39)*
July 2019	Revision 1.9	• Updated servicing image to correct length values and rail servicing extension in Ultrastar Data60 Rack Requirements *(page 5)* section. • Updated revision history to remove broken links to topics no longer in this document.
November 2019	Revision 1.10	• Replaced references to He12 drives with Ultrastrar DC HC520 in List of Compatible Drives *(page 9)* section. • Corrected layout image annotations to match table numbering in Ultrastar Data60 Layout *(page 2)* • Updated images of chassis cover screws throughout
December 2019	Revision 1.11	• Rebranded document to WD design • Updated the List of Compatible Drives *(page 9)*

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1.1 Product Label Information

The following product information is required for technical support requests:

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

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

Table of Contents

Overview

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

In This Chapter:

1.1 Ultrastar® Data60 Description

Figure 2: Ultrastar Data60
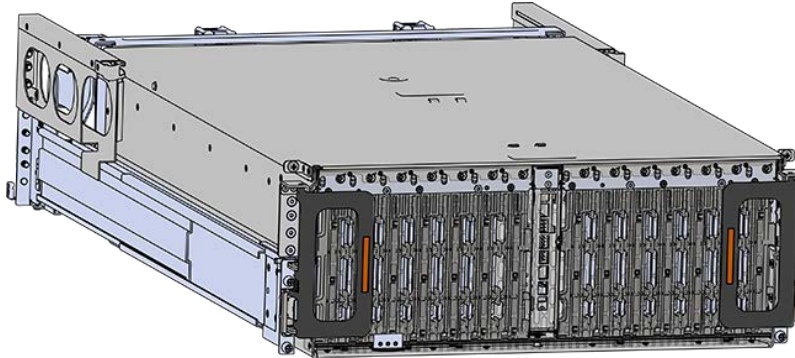
The Ultrastar® Data60 is a 4U form factor, high availability, high density, rack-mounted storage enclosure that is capable of hosting up to 60 SAS or SATA drives. The maximum data storage capacity of the Ultrastar Data60 is 840 TB using 14TB Ultrastar® HC530 drives . (For a full list of compatible drives and total storage capacities, see the hg *(page 9)*.) The enclosure runs on an input voltage of 200 - 240 VAC and consumes ~1000W of power under typical conditions. It requires a maximum of ~1250W at full load.

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

- 4U Storage Enclosure
- Supports up to 60 Drives
- Can support 3.5" drives and 2.5" SSD drives (2.5" requires an adapter) in the 60 available drive bays.
- Up to 12W per drive slot for the 60 data storage drives (Cannot exceed 85A on the 5V rail)
- House and control four (4) N+1 redundant 80mm rear fans
- House and control a dual rotor 40mm internal IOM Fan
- Controlled by two (2) redundant I/O Modules*
- Powered by two (2) redundant 1600W PSUs
- Full high availability with independent dual paths to all HDDs
- Toolless replacement of all Customer Replaceable Units (CRUs)
- Fits within a standard EIA-310 rack including all necessary cable management (see: Compatible Rack Hardware Configuration *(page 7)*)
- Supports up to 3m passive SAS cables (limited to 3m or less) or active cables (any length)
- Supports High line (220-240 VAC) Input Power

1.2 Ultrastar Data60 Layout

* SATA based models will only include 1 IOM

Figure 3: Front and Rear Product Layout
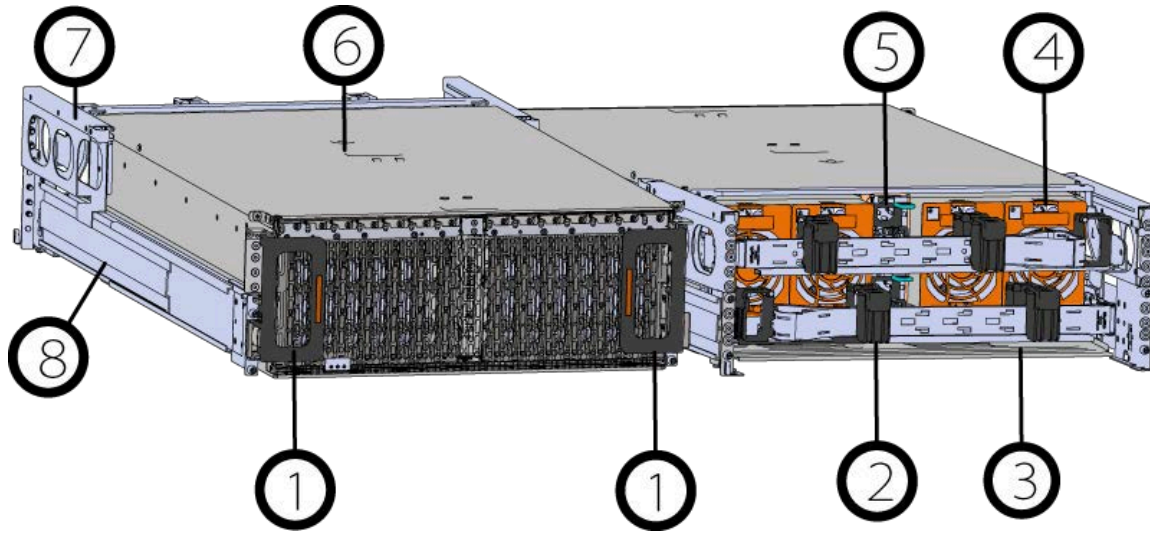
Table 1: Front and Rear Component Identification

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

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

Figure 4: Component Layout
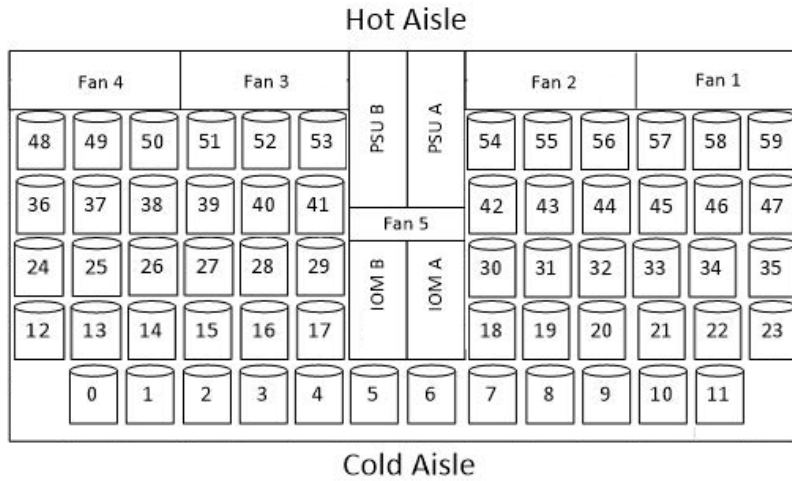
1.3 Ultrastar Data60 Specification Summary

Table 2: Environmental Specification Summary

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

Table 3: Electrical Specifications

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

* Max and typical power consumption values represent the output power to the system. Input power will vary depending on the PSU efficiency and load sharing between PSUs.

Specification	Value
Inrush Current Maximum (per PSU)	AC line inrush current shall not exceed 40A peak for up to one-quarter of the AC cycle, after which, the input current should be no more than the specified maximum input current.

⚠️ **Caution:** The Ultrastar Data60 can only be plugged into highline. If the unit is plugged into lowline, the PSU will report a "Critical" state when status pages are queried using SES. In this case, the enclosure will power up, but the drives will not. The enclosure will remain in low-power mode.

Table 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 @ 1/2octave per minute
Weight	79.4 kg. / 175 lbs.	
Dimensions	447mm x 890mm x 175mm / 17.67in. x 35.04in. x 6.89in.	
Length without CMA	712 mm / 28.03in.	
Required Rack Width	450mm (17.72in.) with 465mm (18.31in.) ± 1.5mm nominal hole spacing. See EIA-310 Rack Standard	
Required Rack Depth	900mm (35.43in.) usable rack space, frame to frame	
Rack Units (U)	4U	
Vertical Rack Rail Spacing	24 in. - 32 in.	

Table 5: Performance Specifications

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

1.4 Ultrastar Data60 Rack Requirements

The Ultrastar Data60 is designed to be installed into a rack that meets the EIA-310 standard at a minimum 900mm (35.43in.) usable rack space, frame to frame. The vertical rack rails must be set between 24 in. - 32 in. to support the enclosure. It requires 4U of rack space, and it should be installed into the rack at the lowest possible U height to keep the load on the rack balanced.

Table 6: Required Rack Specifications

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

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

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

⚠️ **Warning:** The handles on the front of the chassis are not intended to be used to support the weight of the Ultrastar Data60. Lifting the unit by the chassis handles or trying to support the unit on the handles can cause them to fail. This can cause serious damage to the unit or serious bodily harm to those handling the unit. Always team lift the chassis by gripping the underside of the unit, and never try to lift a chassis that is filled with drives.

Figure 5: Installation, Servicing, and Removal
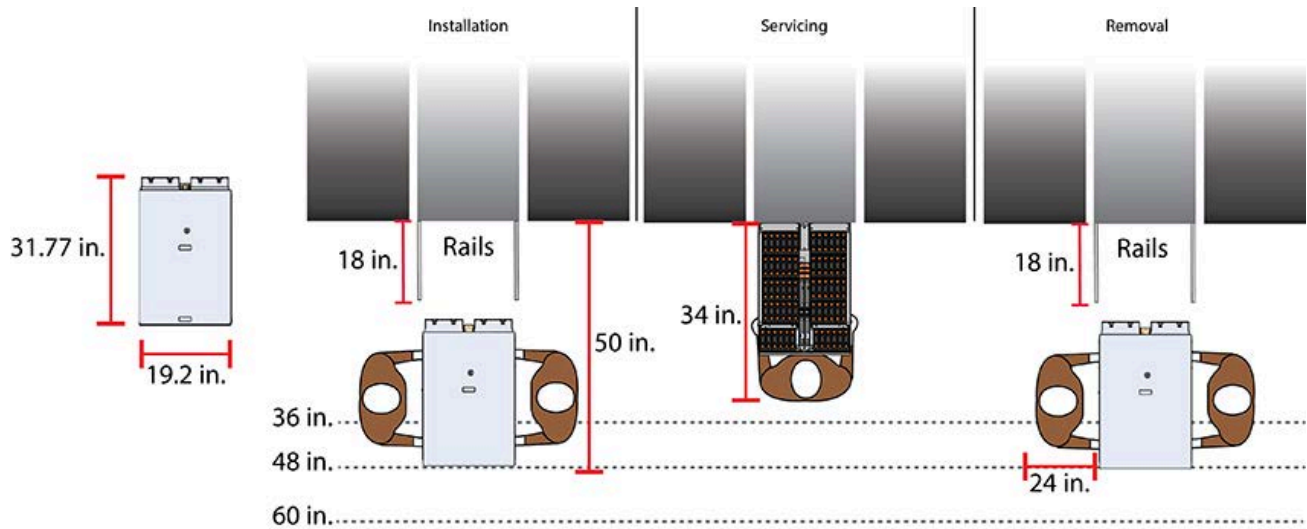
> ⓘ **Attention: Do not** install or remove the enclosure while it is populated with drives. The fully populated enclosure exceeds the amount of weight that a team of two should lift.

1.4.1 Compatible Rack Hardware Configuration

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

Table 7: 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 8: Compatible Hardware Configuration 2

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
Vendor	AFCO/Legrand	Server Technology	Server Technology	Various
Part Number	**Options:**	412-0761-11_STV-4501	KIT-MB-40	None

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
	42RU – WEDIT605	412-0761-20_STV-4502		
		412-0761-23_STV-4503		
	45RU – WEDIT604			
	48RU – WEDIT603			
	51RU – WEDIT606			
Quantity	1 rack	2	1	N/A

Table 9: Compatible Hardware Configuration 3

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
Vendor	TRIPP LITE	Server Technology	Server Technology	Various
	Options:	412-0761-11_STV-4501	KIT-MBVPT-1B	None
	SR42UBDP (Rack)	412-0761-20_STV-4502		
	SREXTENDER 25U (Rack Extension)	412-0761-23_STV-4503		
Part Number	SREXTENDER 42U (Rack Extension)			
	SREXTENDER 48U (Rack Extension)			
Quantity	1 rack	2	1	N/A

Table 10: Compatible Hardware Configuration 4

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

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
Quantity	1 rack	2	2	Varies

1.5 List of Compatible Drives

Compatible Drives

Table 11: HDD w/ 3.5 in drive carrier

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

Drive	Type	Interface	Sector Size	Encryption	Volume	Part Number
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG-FIPS	6TB	1EX1852
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE	6TB	1EX1185
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG	6TB	1EX1184
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG-FIPS	6TB	1EX1853
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SE	6TB	1EX1187
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	TCG	6TB	1EX1186
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SE	6TB	1EX1189
Western Digital® Ultrastar® DC HC310 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	TCG	6TB	1EX1188
Western Digital® Ultrastar® DC HC320 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	SE	8TB	1EX1221
Western Digital® Ultrastar® DC HC320 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG	8TB	1EX1220
Western Digital® Ultrastar® DC HC320 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG-FIPS	8TB	1EX1342

Drive	Type	Interface	Sector Size	Encryption	Volume	Part Number
Western Digital® Ultrastar® DC HC320 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE	8TB	1EX1223
Western Digital® Ultrastar® DC HC320 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG	8TB	1EX1222
Western Digital® Ultrastar® DC HC320 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG-FIPS	8TB	1EX1343
Western Digital® Ultrastar® DC HC320 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SE	8TB	1EX1225
Western Digital® Ultrastar® DC HC320 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	TCG	8TB	1EX1224
Western Digital® Ultrastar® DC HC320 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SE	8TB	1EX1227
Western Digital® Ultrastar® DC HC320 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SED	8TB	1EX1226
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	SE	10TB	1EX2432
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG	10TB	1EX2433
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG-FIPS	10TB	1EX2434
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE	10TB	1EX2435

Drive	Type	Interface	Sector Size	Encryption	Volume	Part Number
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG	10TB	1EX2436
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG-FIPS	10TB	1EX2437
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SE	10TB	1EX2438
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SED	10TB	1EX2439
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SE	10TB	1EX2440
Western Digital® Ultrastar® DC HC330 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SED	10TB	1EX2441
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	ISE	10TB	1EX0482
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	SE	10TB	1EX0484
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG	10TB	1EX0483
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG-FIPS	10TB	1EX1340
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	ISE	10TB	1EX0485

Drive	Type	Interface	Sector Size	Encryption	Volume	Part Number
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE	10TB	1EX0487
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG	10TB	1EX0486
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG-FIPS	10TB	1EX1341
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	ISE	10TB	1EX0494
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SE	10TB	1EX0496
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SED	10TB	1EX0495
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	ISE	10TB	1EX0497
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SE	10TB	1EX0499
Western Digital® Ultrastar® DC HC510 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SED	10TB	1EX0498
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	ISE	12TB	1EX1004
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	SE	12TB	1EX1006

Drive	Type	Interface	Sector Size	Encryption	Volume	Part Number
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG	12TB	1EX1005
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG-FIPS	12TB	1EX1339
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	ISE	12TB	1EX1007
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE	12TB	1EX1009
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG	12TB	1EX1008
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG-FIPS	12TB	1EX1338
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	ISE	12TB	1EX1010
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SE	12TB	1EX1012
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SED	12TB	1EX1011
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	ISE	12TB	1EX1013
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SE	12TB	1EX1015

Drive	Type	Interface	Sector Size	Encryption	Volume	Part Number
Western Digital® Ultrastar® DC HC520 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SED	12TB	1EX1014
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	SE	14TB	1EX1788
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG	14TB	1EX1789
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	TCG-FIPS	14TB	1EX1854
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE	14TB	1EX1791
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	ISE	14TB	1EX1583
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG	14TB	1EX1792
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	TCG-FIPS	14TB	1EX1855
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	4Kn	SE	14TB	1EX1790
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SE	14TB	1EX1793
Western Digital® Ultrastar® DC HC530 w/ 3.5 in. drive carrier	HDD	SATA 6Gb/s	512e	SED	14TB	1EX1794

Drive	Type	Interface	Sector Size	Encryption	Volume	Part Number
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	ISE SMR-HM	14TB	1EX1604
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	SE SMR-HM	14TB	1EX1884
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	ISE SMR-HM	14TB	1EX1885
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE SMR-HM	14TB	1EX1886
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	ISE SMR-HM	14TB	1EX1887
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	4Kn	ISE SMR-HM	15TB	1EX1857
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE SMR-HM	15TB	1EX2152
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	SE SMR-HM	15TB	1EX2153
Western Digital® Ultrastar® DC HC620 w/ 3.5 in. drive carrier	HDD	SAS 12Gb/s	512e	ISE SMR-HM	15TB	1EX2154

Table 12: SSD w/ 3.5 in to 2.5 in drive carrier

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

Drive	Type	Interface	Drive Writes	Encryption	Volume	Part Number
Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	400GB	1EX1315
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG-FIPS	400GB	1EX1481
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	ISE	400GB	1EX1287
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	SE	400GB	1EX1289
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	TCG	400GB	1EX1312
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	TCG-FIPS	400GB	1EX1479
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	400GB	1EX1296
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	400GB	1EX1298
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	400GB	1EX1309
Sandisk® Cloudspeed Ultra Gen. II w/ 3.5 in to 2.5 in drive carrier	SSD	SATA 6Gb/s	RI-1.8DW/D	SE	400GB	1EX1294
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	400GB	1EX2020
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	400GB	1EX2021
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	400GB	1EX2087
Western Digital® Ultrastar® SS530	SSD	SAS 12Gb/s	ME-10DW/D	SE	400GB	1EX2012

Drive	Type	Interface	Drive Writes	Encryption	Volume	Part Number
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	ISE	400GB	1EX2013
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	TCG	400GB	1EX2083
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	TCG	480GB	1EX1318
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	SE	480GB	1EX2030
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	ISE	480GB	1EX2031
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	TCG	480GB	1EX2092
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	800GB	1EX1290
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	800GB	1EX1292
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	800GB	1EX1314
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	800GB	1EX1295
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	800GB	1EX1297
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	800GB	1EX1308
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG-FIPS	800GB	1EX1480
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	ISE	800GB	1EX1286

Drive	Type	Interface	Drive Writes	Encryption	Volume	Part Number
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	SE	800GB	1EX1288
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	TCG	800GB	1EX1311
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	TCG-FIPS	800GB	1EX1478
Sandisk® Cloudspeed Ultra Gen. II w/ 3.5 in to 2.5 in drive carrier	SSD	SATA 6Gb/s	RI-1.8DW/D	SE	800GB	1EX1305
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	800GB	1EX2022
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	800GB	1EX2023
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	800GB	1EX2088
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	SE	800GB	1EX2014
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	ISE	800GB	1EX2015
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	TCG	800GB	1EX2084
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	TCG	960GB	1EX1317
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	SE	960GB	1EX2032
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	ISE	960GB	1EX2033
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	TCG	960GB	1EX2093
Western Digital®	SSD	SAS 12Gb/s	RI-3DW/D	ISE	1.6TB	1EX1303

Drive	Type	Interface	Drive Writes	Encryption	Volume	Part Number
Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	1.6TB	1EX1304
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	1.6TB	1EX1313
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	1.6TB	1EX1299
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	1.6TB	1EX1300
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	1.6TB	1EX1307
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG-FIPS	1.6TB	1EX1787
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-10DW/D	ISE	1.6TB	1EX1301
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-10DW/D	SE	1.6TB	1EX1302
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-10DW/D	TCG	1.6TB	1EX1310
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	TCG-FIPS	1.6TB	1EX1786
Sandisk® Cloudspeed Ultra Gen. II w/ 3.5 in to 2.5 in drive carrier	SSD	SATA 6Gb/s	RI-1.8DW/D	SE	1.6TB	1EX1319
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	1.6TB	1EX2024
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	1.6TB	1EX2025
Western Digital® Ultrastar® SS530	SSD	SAS 12Gb/s	RI-3DW/D	TCG	1.6TB	1EX2089

Drive	Type	Interface	Drive Writes	Encryption	Volume	Part Number
w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	SE	1.6TB	1EX2016
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	ISE	1.6TB	1EX2017
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	TCG	1.6TB	1EX2085
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	TCG	1.92TB	1EX1316
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	SE	1.92TB	1EX2034
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	ISE	1.92TB	1EX2035
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	TCG	1.92TB	1EX2094
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	3.2TB	1EX0578
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	3.2TB	1EX1285
Western Digital® Ultrastar® SS300 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	3.2TB	1EX1306
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	3.2TB	1EX2026
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	3.2TB	1EX2027
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	3.2TB	1EX2090
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	SE	3.2TB	1EX2018

Drive	Type	Interface	Drive Writes	Encryption	Volume	Part Number
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	ISE	3.2TB	1EX2019
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	ME-10DW/D	TCG	3.2TB	1EX2086
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	ISE	3.84TB	1EX0579
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	ISE	3.84TB	1EX0579
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	SE	3.84TB	1EX2036
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	ISE	3.84TB	1EX2037
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	TCG	3.84TB	1EX2095
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	SE	6.4TB	1EX2028
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	ISE	6.4TB	1EX2029
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-3DW/D	TCG	6.4TB	1EX2091
Western Digital® Ultrastar® SS200 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	SE	7.68TB	1EX0580
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	SE	7.68TB	1EX2038
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	ISE	7.68TB	1EX2039
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	TCG	7.68TB	1EX2096
Western Digital®	SSD	SAS 12Gb/s	RI-1DW/D	SE	15.36TB	1EX2040

Drive	Type	Interface	Drive Writes	Encryption	Volume	Part Number
Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier						
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	ISE	15.36TB	1EX2041
Western Digital® Ultrastar® SS530 w/ 3.5 in to 2.5 in drive carrier	SSD	SAS 12Gb/s	RI-1DW/D	TCG	15.36TB	1EX2097

Disclaimers

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

The following chapter describes the Regulatory Statement of Compliance, Safety Compliance, and Electromagnetic Compatibility Agency Requirements for the Ultrastar Data60.

In This Chapter:

2.1 Restricted Access Location

The Ultrastar Data60 is intended for installation in a server room or computer room where at least one of the following conditions apply:

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

2.2 Safety Compliance

Product Name: **Ultrastar Data60**
Regulatory Model: **H4060-J**
Electromagnetic Compatibility Emissions: **Class A**

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

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

2.3 Electromagnetic Compatibility (EMC) Class A Compliance

The **H4060-J** complies with and conforms to the latest international standards as applicable:

Emissions

- FCC CFR 47 Part 15, Subpart B
- ICES-003
- EN 55032
- CISPR 32
- CE – EMC Directive 2014/30/EU
- VCCI V-3
- BSMI CNS14338
- KN32
- AS/NZS CISPR 32
- TR CU 020/2011

Immunity

- EN 61000-3-2 Harmonic Current Emissions
- EN 61000-3-3 Voltage Fluctuations and Flicker
- EN 55024
- KN35

- EN 61000-4-2 ESD
- EN 61000-4-3 Radiated Immunity
- EN 61000-4-4 EFT
- EN 61000-4-5 Surge
- EN 61000-4-6 RF Common Mode
- EN 61000-4-8 Power Frequency Magnetic Field
- EN 61000-4-11 Voltage Dips and Interruptions

2.4 Country Certifications

Table 13: Country Certifications

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

Safety

The following chapter provides safety and regulatory information for the Ultrastar Data60.

In This Chapter:

3.1 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.

3.2 Optimizing Location

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

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

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

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

3.3 Power Connections

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

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

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

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

3.4 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.

3.5 Rackmountable Systems

CAUTION

Always install rack rails and storage enclosure according to Ultrastar Data60 product documentation. Follow all cautions, warnings, labels, and instructions provided within the rackmount instructions.

Reliable grounding of rack-mounted equipment should be maintained.

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

3.6 Safety and Service

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

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

⚡ When replacing a hot-plug power supply, unplug the power cord to the power supply being replaced before removing it from the Ultrastar Data60.

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

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

3.7 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.

Packaging

In This Chapter:

4.1 Ultrastar Data60 Packaging Overview

Figure 6: Packaging Layout
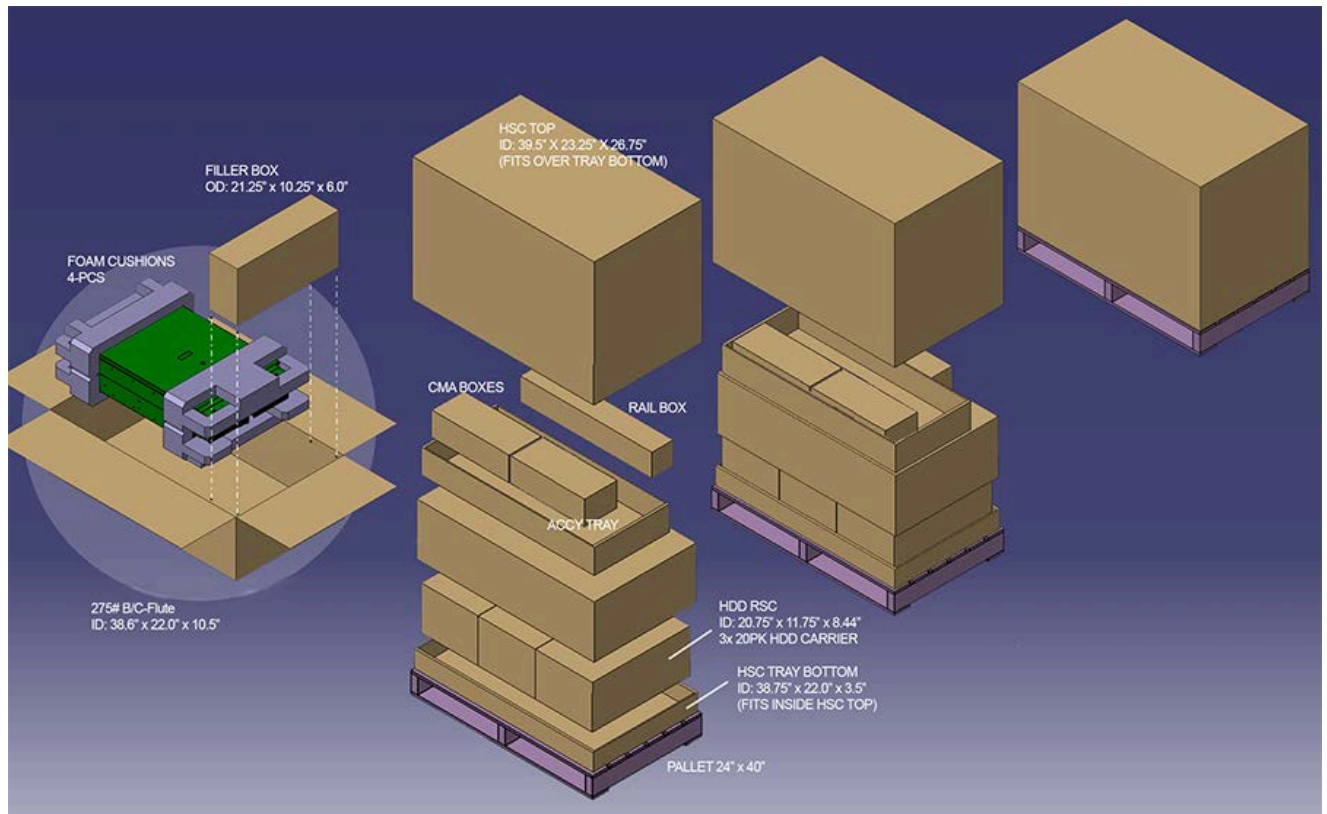
The Ultrastar Data60 packaging consists of three layers of packaging: The accessory tray is on top, the enclosure chassis box is in the middle, and the drive assemblies are on the bottom. The accessory tray contains three cartons, two for the CMA assembly and one for the rails, as well as plastic bags that contain all necessary hardware listed below in the tables and the included cables. The chassis is boxed in the middle and protected by foam padding. It has the rear fans, PSUs, IOM fan, and IOMs pre-installed. On the bottom there are three containers that hold twenty drive assemblies each. These three layers of packaging are contained by cardboard caps on the top and bottom, and an outer sleeve that surrounds the sides. Plastic banding surround the packaging and pallet to keep them contained.

Table 14: Box Contents

Container	Contents
CMA Box	2 CMA arms, 1 upper and 1 lower CMA cross-bar
Accessory Tray	• 2 Top Cover Guide Brackets • 2 Rack Latch brackets (One Left, One Right) • Screws & Nuts ◦ 10 M5 Cagenuts

Container	Contents
	○ 30 M5 x 12, T15 Torx screws
	○ 2 M5 x 12 Philips Panhead screws (for cover retention)
	○ 16 Custom Round Washers
	○ 4 Custom Low-Profile M4 Screws (packaged with the rail kit)
	• Cables
	○ 2 C13 to C14 Power Cables (3m)
	○ 2 MiniSAS HD cables (3m)
Rails Box	2 Rack Rails w/ 1 Inner Rail per Rack Rail
Chassis	Chassis w/ all internal components pre-installed except drives.
3 Drive boxes	20 drives per container

4.2 Ultrastar Data60 Unpacking Procedure

Step 1: Make sure that all of the necessary equipment is available, including any equipment necessary to support the enclosure during installation. To verify the list of necessary equipment, see: Table 14: Box Contents *(page 32)*.

Step 2: Cut the straps that secure the packaging to the pallet with a box cutter.

Step 3: Remove the top cap and the outer sleeve and discard them both.

Figure 7: Top Cap and Sleeve Removal
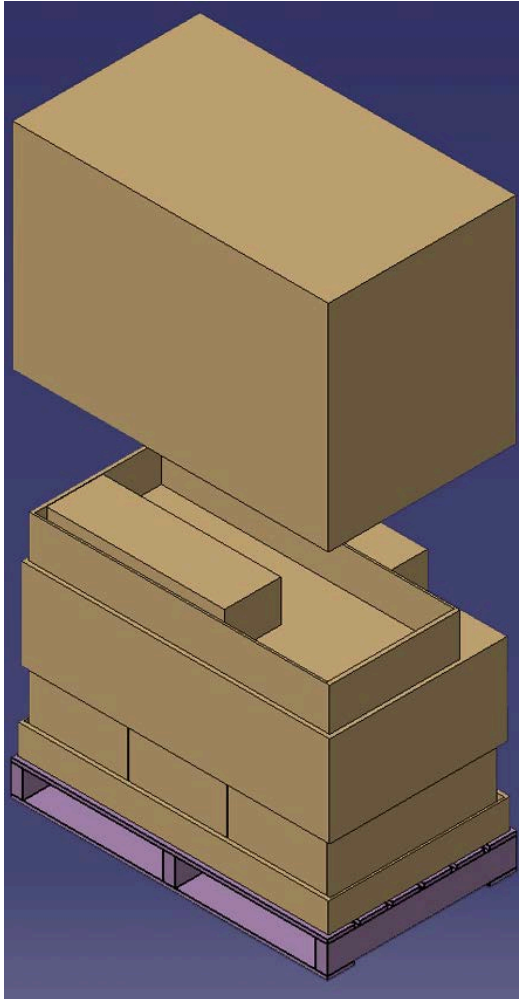
Step 4: Open the rail box and remove the two rail assemblies. Set them aside.

Figure 8: Accessory Tray
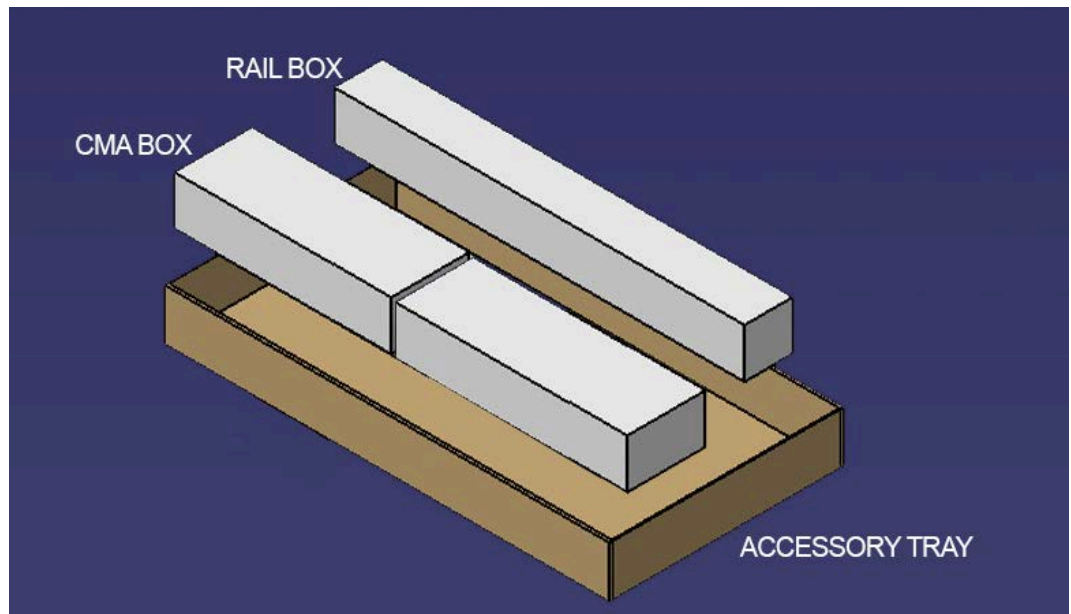
Step 5: Open the CMA box and remove the CMA arm(s) and cross-bar. Set them aside.

Step 6: Open the chassis box and remove the top cushions, on the front and rear of the chassis.

Figure 9: Unpack Chassis
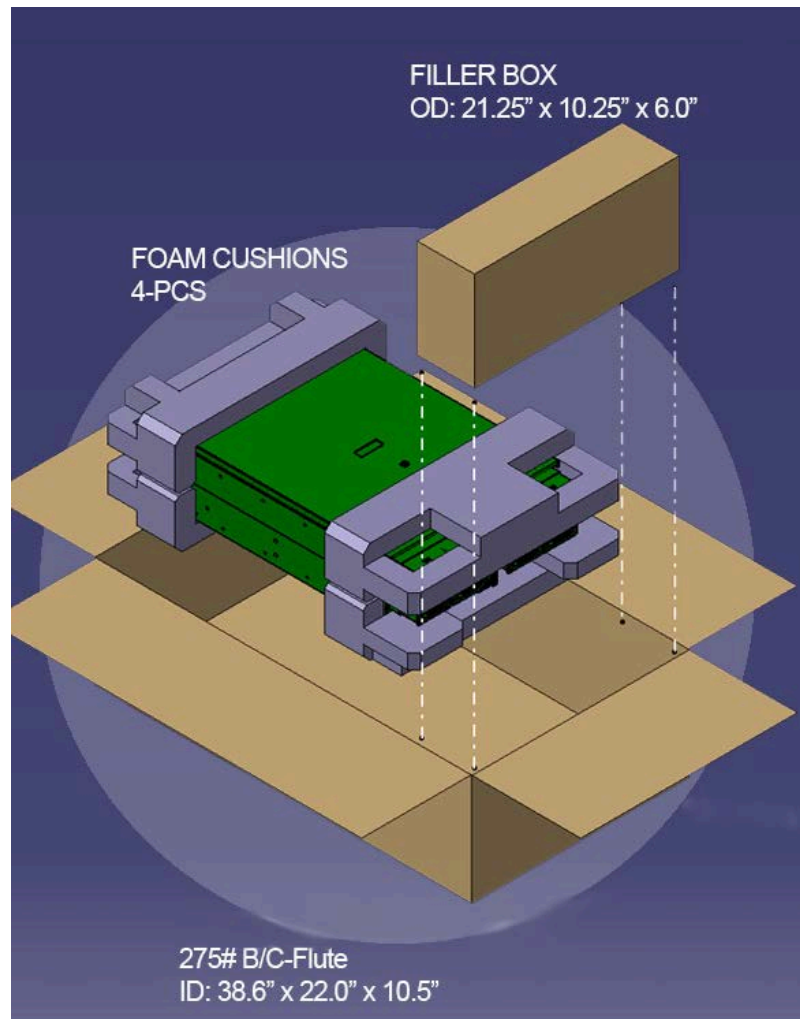
Step 7: Remove the chassis itself from the chassis box. The chassis should be team lifted for safety. Do not lift the chassis by system handles. The chassis weight without drives is 20 kg / 44 lbs.

Step 8: Open the HDD boxes and verify their contents. Depending on the version of the Ultrastar Data60 being unpacked, they should contain 20 drives each. Once the contents are verified, leave them in the boxes. This will protect them from damage until they are installed in the enclosure.

Figure 10: Inspect Drives and Drive Blanks
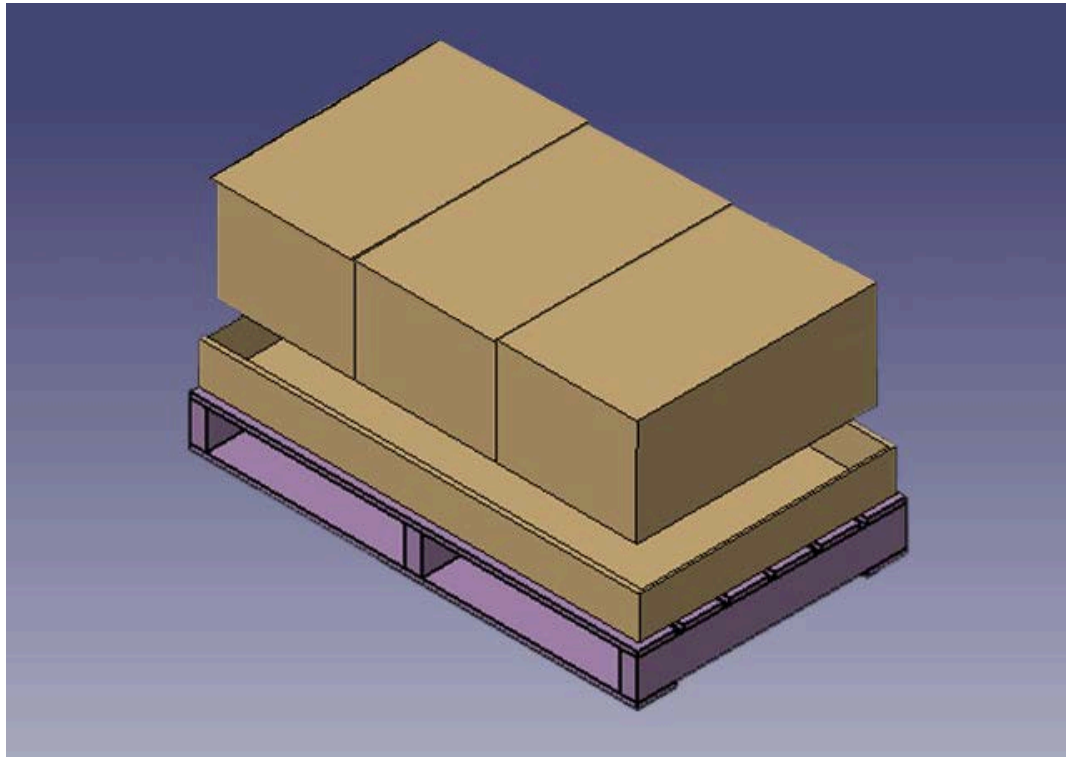
Installation

In This Chapter:

5.1 Ultrastar Data60 Installation Overview

Procedure Info

Required Tools	Required Parts	# of People Required	Time Required
- Long T15 Torx Screwdriver # 2 Philips Screwdriver - Long T10 Torx Screwdriver - Cable Ties (for configurations with greater than 10 total cables) - Tape Measure - Level	- M5 x 12mm T15 Flat Head Torx screws - M5 x 12mm Phillips Pan Head screws (to secure top cover) - Included Washers - Low-Profile M4 x 3.2mm Philips screws (included with rail assembly) - M3 x 8mm T10 Torx screws 10 M5 cage nuts - CMA Crossbar - Cable Tray (optional) **Optional (if using CMA Tray):** M3 x 8mm T10 Torx screws - Zip Tie (from CMA box)	3 Total (2 for Team Lifting Purposes and 1 to Guide and Spot)	45 min.

Torque Specifications for Screws

Screw Type	Torque Value
M5 x 12mm T15 Flat Head Torx screws	3.38-3.61 Nm / 30-32 in-lbf
M5 x 12mm Phillips Pan Head screws	3.38-3.61 Nm / 30-32 in-lbf
Low-Profile M4 x 3.2mm Philips screws	.90-1.12 Nm / 8-10 in-lbf
M3 x 8mm T10 Torx screws	.33-.56 Nm / 3-5 in-lbf
Captive M5 Torx chassis cover thumb screws	3.38-3.61 Nm / 30-32 in-lbf

5.2 Ultrastar Data60 Installation Procedure

⚠️ **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.

ⓘ **Attention:** This procedure utilizes "Right" and "Left" as to inform the user on actions related to the installation. "Right" and "Left" will be in reference to where the user is positioned, whether at the front or the rear of the installation space.

Step 1: 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 11: Rail Safety Latch
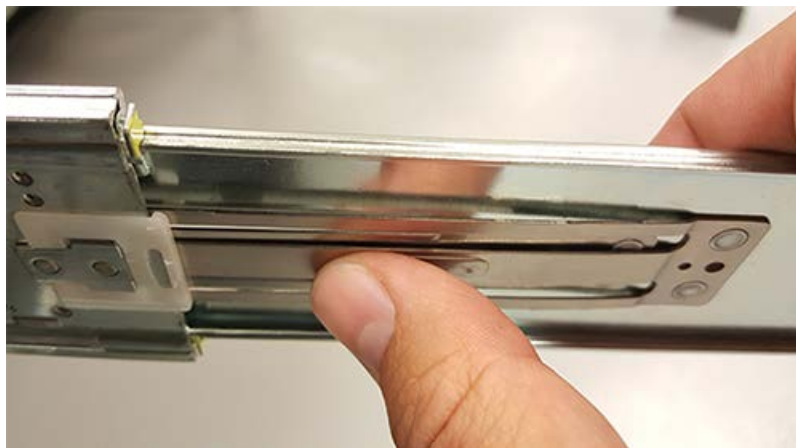
Step 2: Install the inner rail onto the chassis making sure they are installed on the correct side. Each inner rail will read "R" for the right or "L" for the left embossed on the side that faces away from the chassis. Right and Left are with reference to looking at the front of the enclosure.

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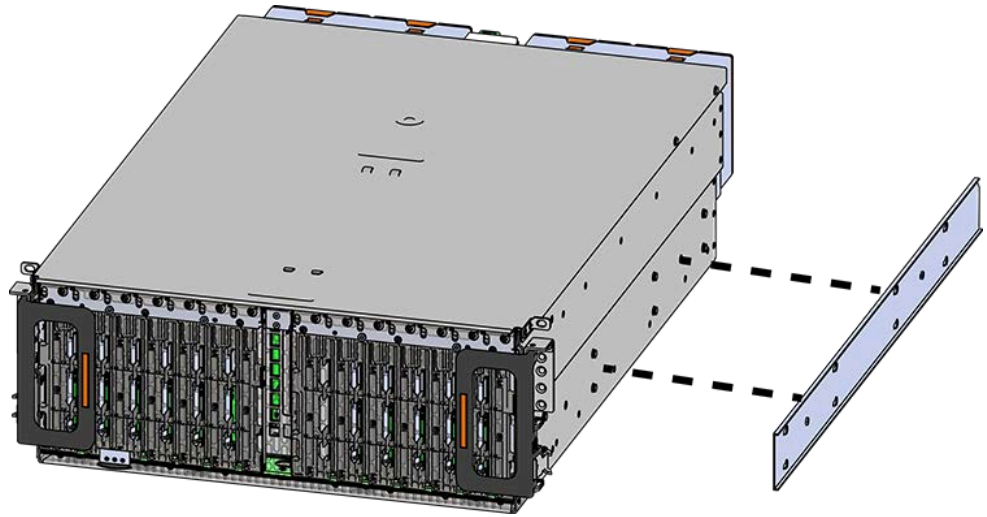
c. Slide the inner rail toward the rear of the chassis to lock it in place. There will be an audible click and the mounting pegs will cover the front part of the keyhole.

Figure 13: Slide Inner Rail
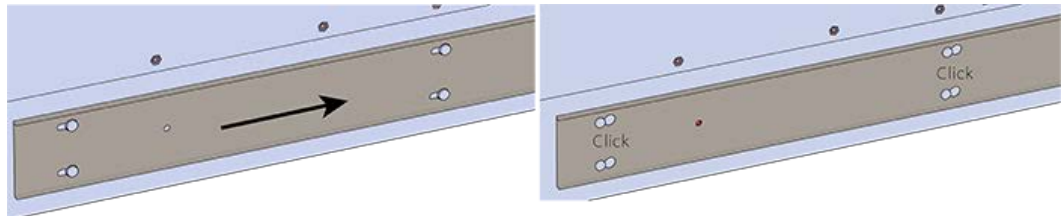
d. ⚠ **Caution:** When installing the inner rail onto the chassis, make sure to only use the special Low-Profile M4 x 3.2mm Philips screws provided in the accessory kit with the CMA. These screws should be tightened to .90-1.12 Nm / 8-10 in-lbf using a # 2 Philips Screwdriver. These screws are specially 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 3 : Secure the Cable Tray onto the enclosure using the included M3 x 8mm T10 Torx screws and the Long T10 Torx Screwdriver. These screws should be tightened to .33-.56 Nm / 3-5 in-lbf using a Long T10 Torx Screwdriver.

Figure 14: Installing the Cable Tray
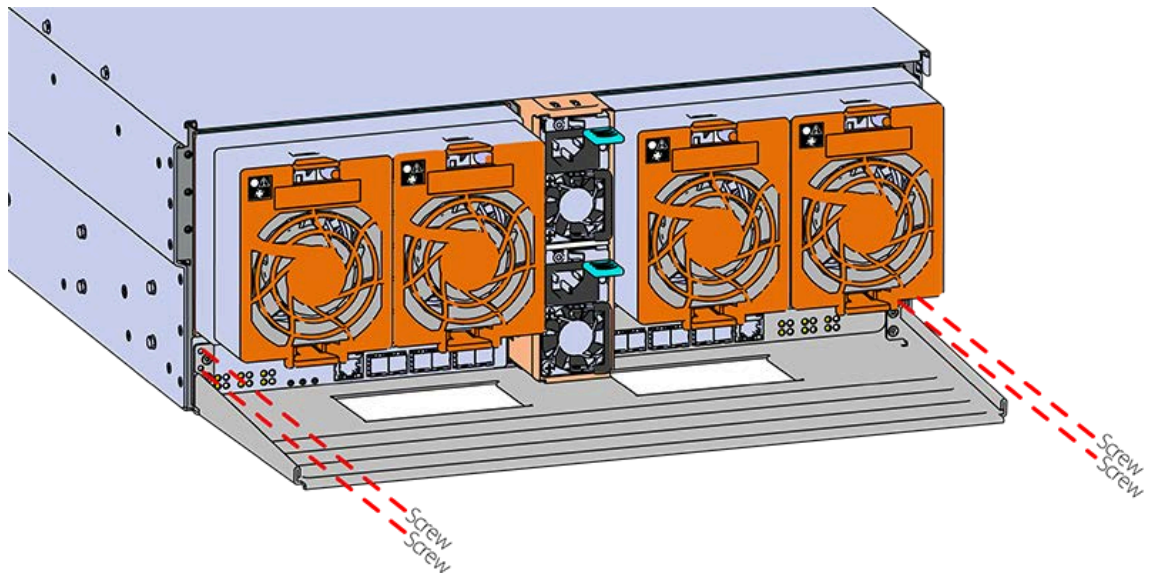
Step 4: Set the vertical rack rail depth to 24" and 32".

Step 5: 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 15: Rear Rail Latch Release Latch
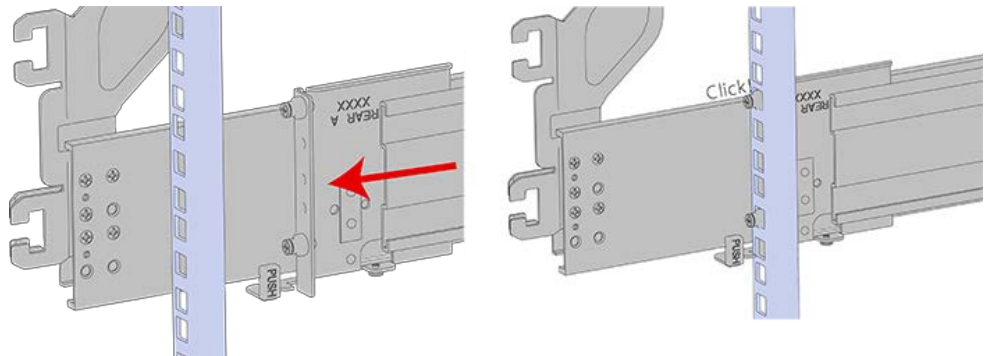
    c. Align the rail on the rack posts at the U-height desired for installation. The bottom of the rail will be the lower most U of the total 4U height.

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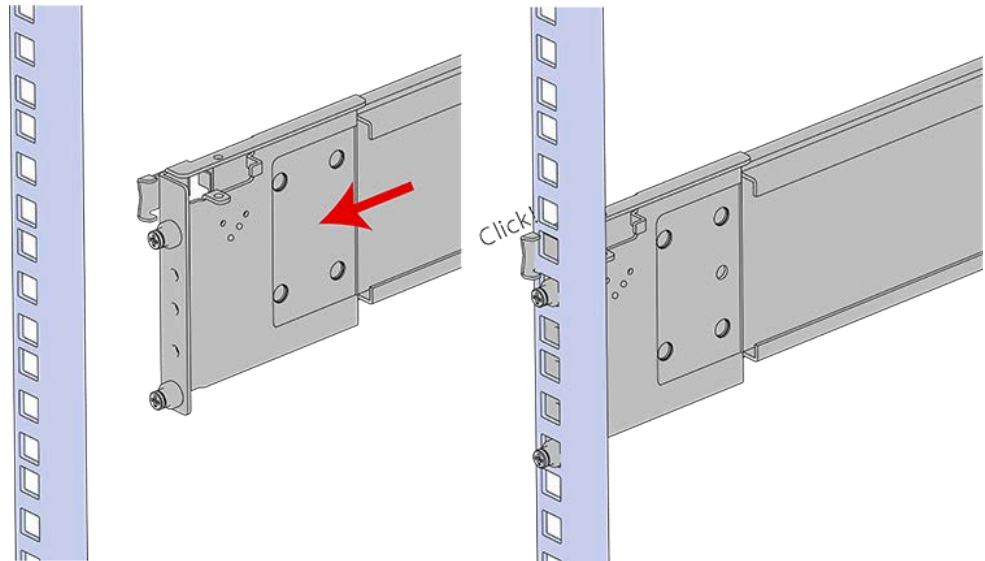
g. Use a level to make sure that the rails are aligned properly.

h. Follow these steps for the other outer rail.

Step 6: Install the rail mounting hardware, starting with the uppermost rack mounting hole of the 4U space on the front of the rack.

a. Install one cagenut at the uppermost mounting hole of the 4U space that the enclosure will occupy.

b. If the Ultrastar Data60 will be installed in a rack for shipping purposes, install four more M5 cage nuts in the holes 3-6 of the 4U space. These will receive the M5 x 12mm T15 Flat Head Torx screws that secure the enclosure to the rack with the shipping bracket.

Figure 17: Cage Nut Spacing
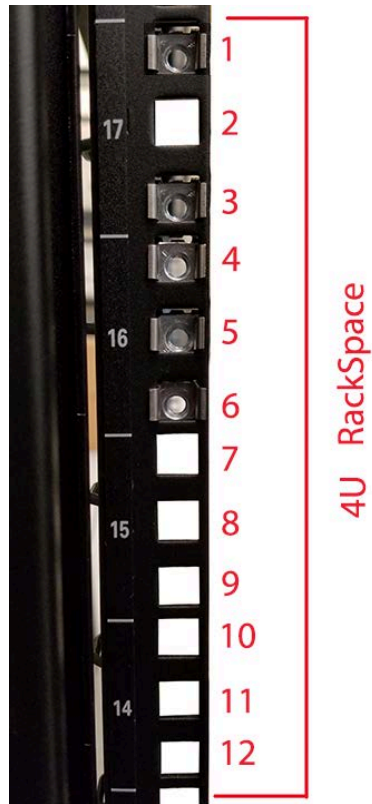
Step 7 :   Install the rear cover alignment brackets.

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

Figure 18: Alignment Bracket Groove (highlighted in red)
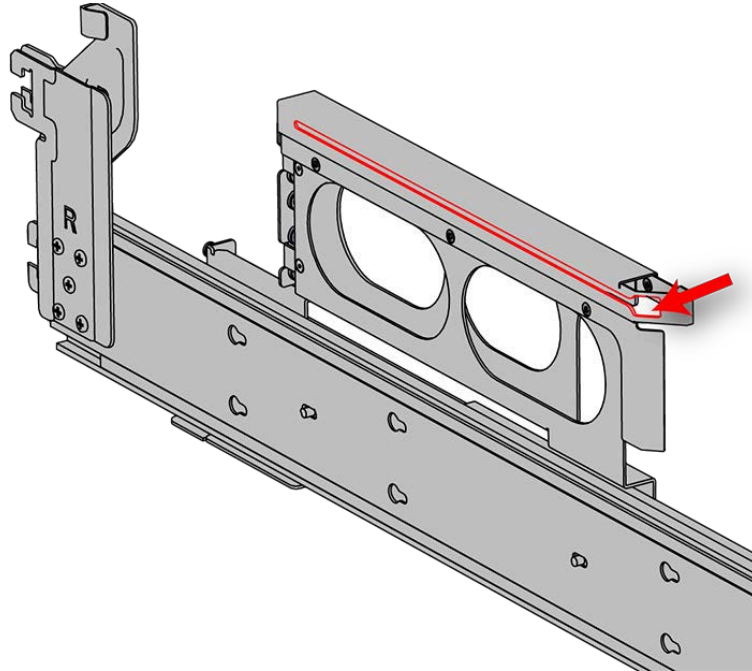
b. Use five of the M5 x 12mm T15 Flat Head Torx screws and five of the included washers and attach the rear cover alignment bracket to the vertical rail with the Long T15 Torx Screwdriver. Add three M5 x 12mm T15 Flat Head Torx screws and three included washers to attach the rear rail (the three lower holes) to the rack posts as shown in the following image. These screws should be tightened to 3.38-3.61 Nm / 30-32 in-lbf using a Long T15 Torx Screwdriver.

Figure 19: Screw and Washer Order
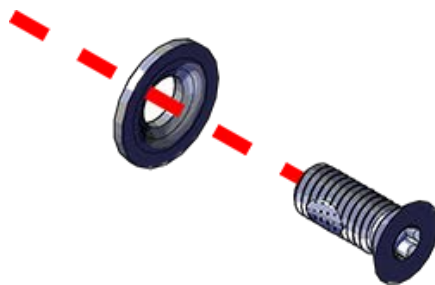
⚠️ **Caution:** Be careful to set the screws properly cover alignment bracket and rail to prevent crossthreading.

Figure 20: Screw Installation Location
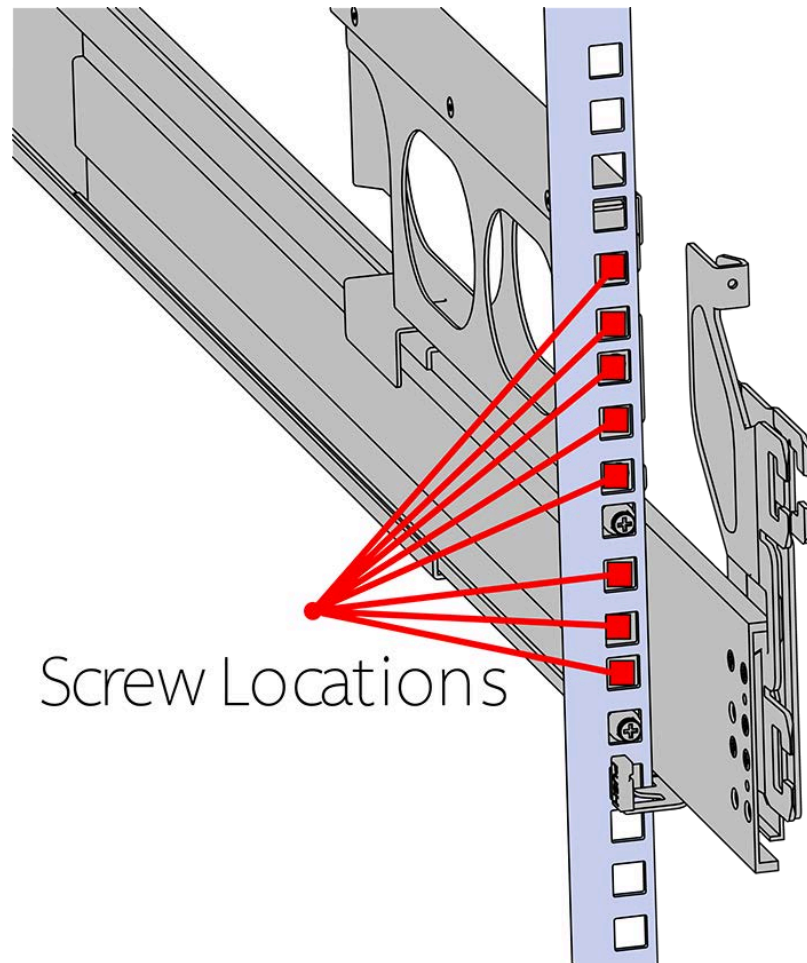
Step 8: Install the two rack latch brackets at the front of the rack.

    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 21: 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 9: 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 22: Extend Mid-Rails
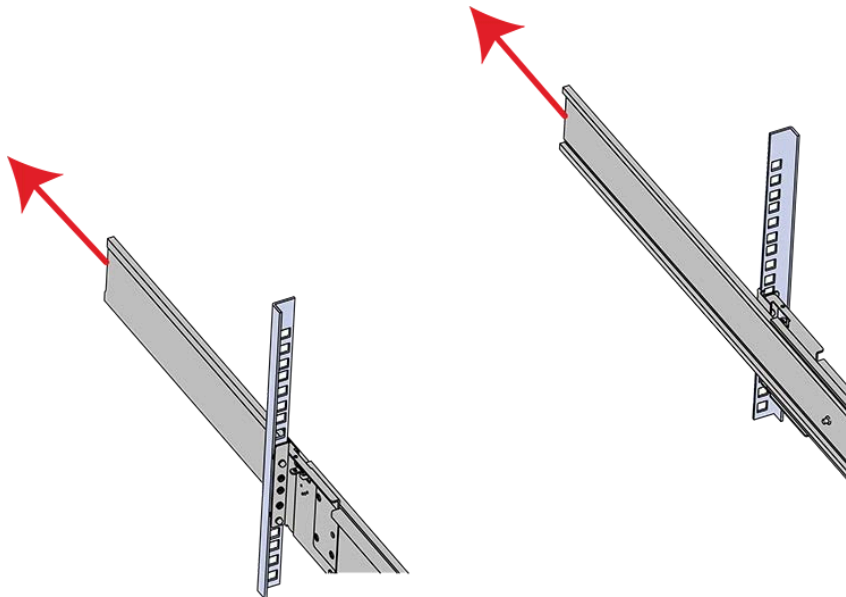
Step 10 : Install the chassis into the rails.

    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 23: 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 24: Installing the Chassis
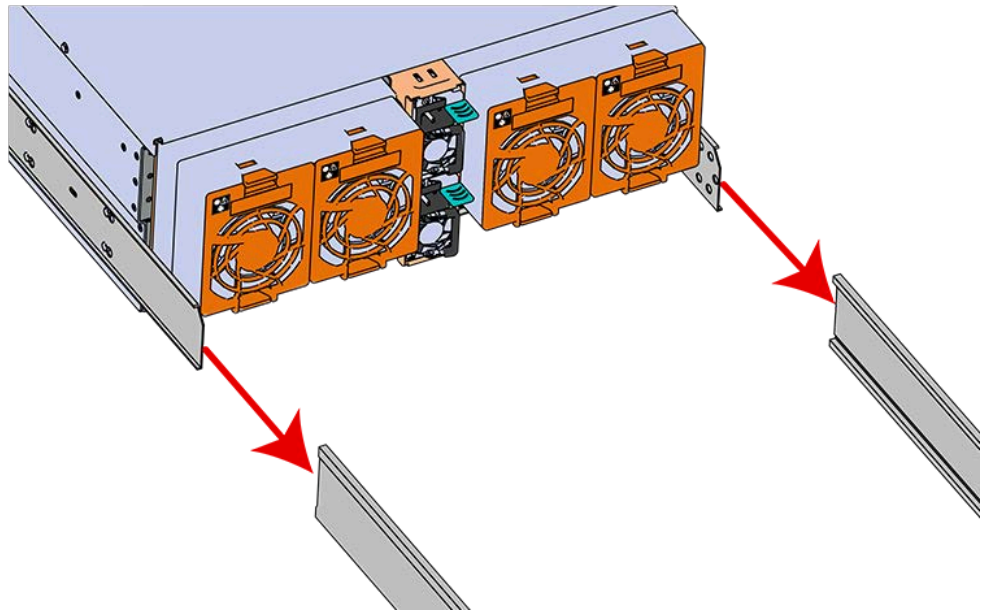
d. Once the rails are mated properly, slide the enclosure into the rack until it is stopped by the safety catch on the rails. Push the release lever on the safety latch (located on the side of each of the rails), and push the enclosure the rest of the way into the rack.

Figure 25: Safety Latch Release
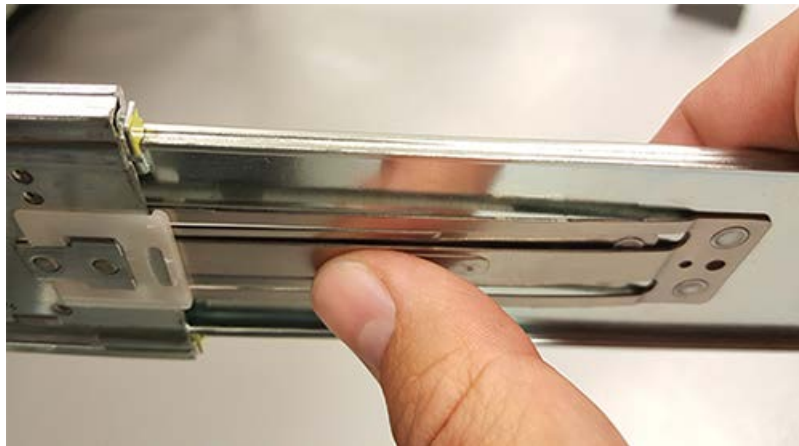
e. As the chassis is slid into the rack, position one installer at the rear of the rack to ensure that the pegs on the sides of the cover will slide correctly into the rear cover alignment brackets on both sides of the rack. If the chassis does not install smoothly or snags, check that the rear cover alignment brackets are not interfering with the chassis sidewalls, and try again.

Step 11: 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 26: Initial Alignment
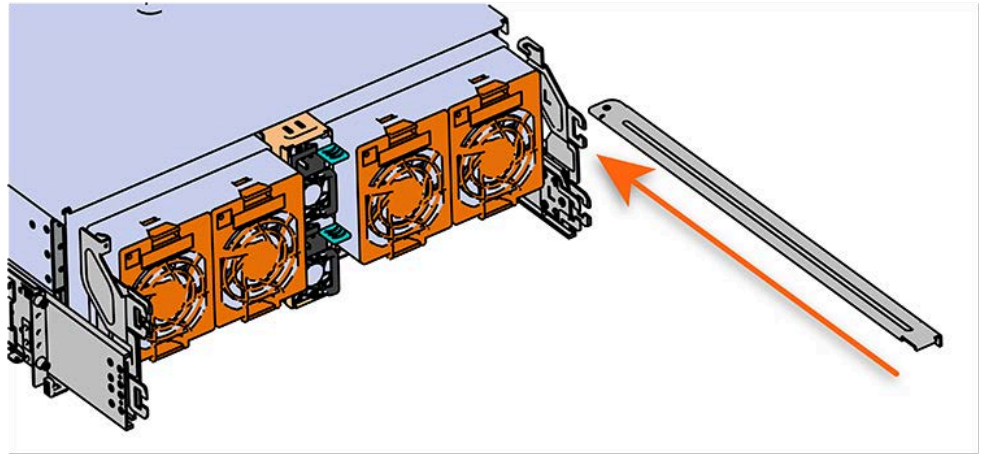
b. Insert the peg on the underside of the crossbar into the slot on the CMA mounting bracket.

Figure 27: Crossbar Underside Peg
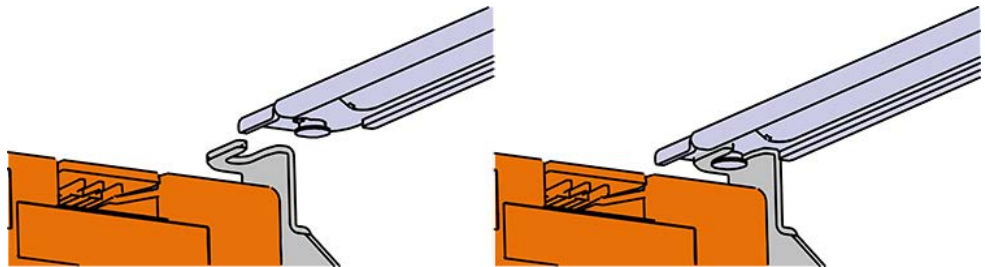
c. Swing the crossbar so that the thumbscrew lines up with the mounting hole on the opposite side of the enclosure.

Figure 28: Swinging Motion of Crossbar to Locking Position
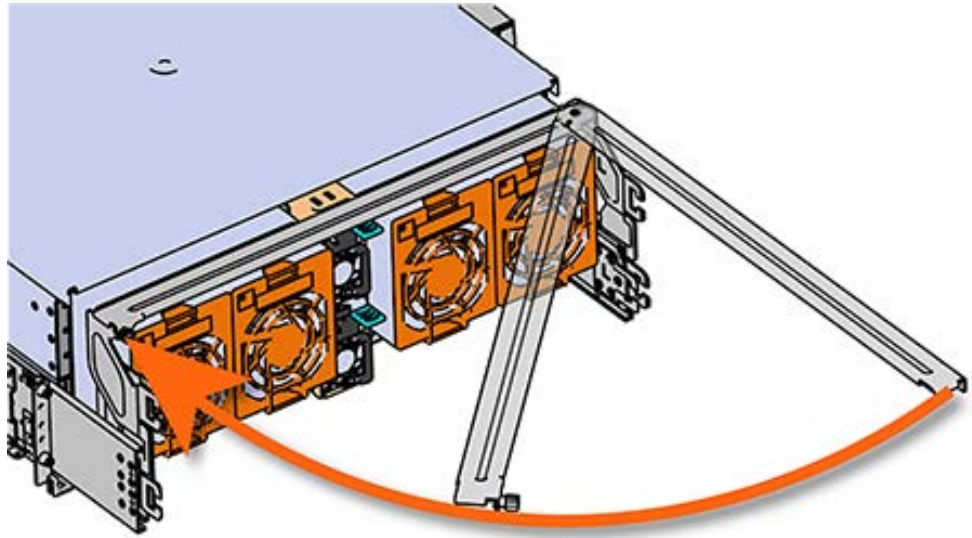
d. Press the crossbar against the CMA mounting bracket and secure the crossbar in place by pressing and turning the thumbscrew clockwise until snug.

Figure 29: Tightening the Thumbscrew
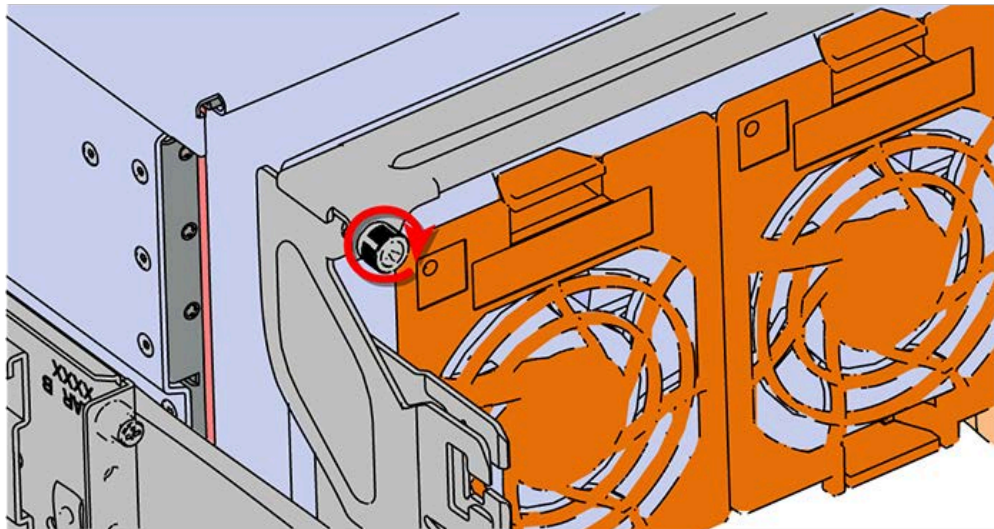
a. Check that the crossbar is fully secured to the CMA mounting bracket by pulling on the bar to ensure it does not move.

Step 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 30: Lower CMA Orientation
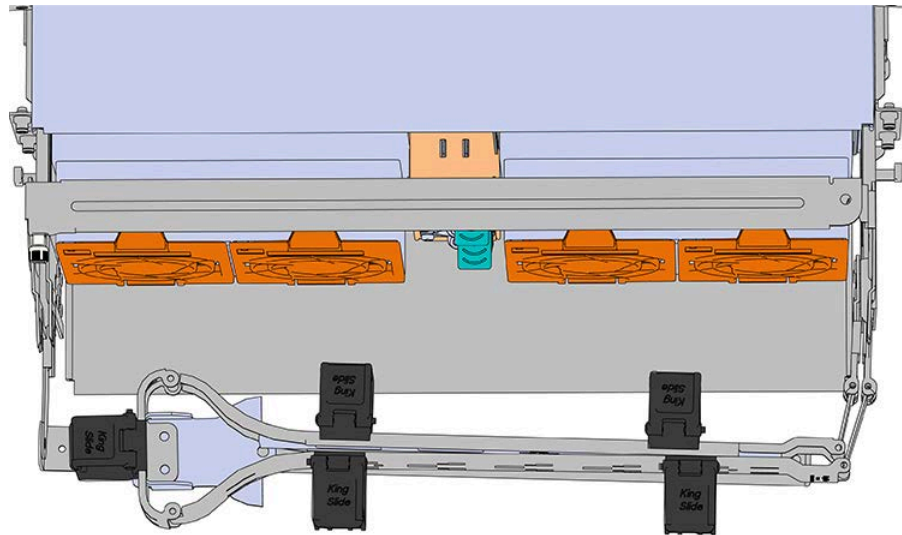
c. Slowly slide the enclosure forward to ensure the arm is operating properly, then slide it back into the rack.

a. Repeat these steps to install the upper arm with the elbow facing to the right.

Step 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:
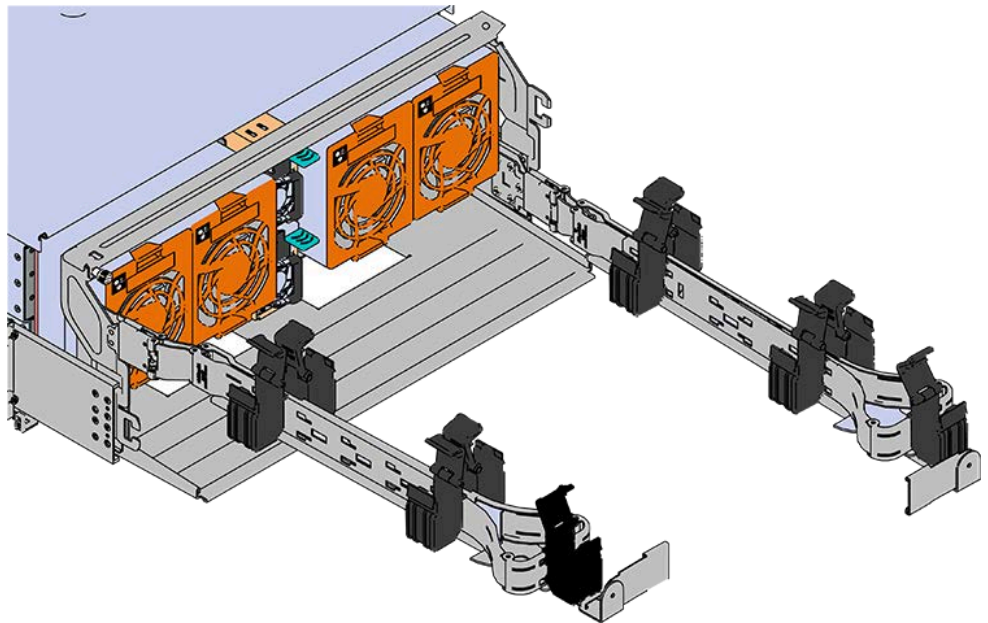
📄 **Note:** Route the cables supported by the lower arm to IOM A (left hand side looking at the rear). Second, route the cables supported by the upper arm to IOM B (right hand side looking at the rear) in a "criss-cross" pattern. See the Special Considerations for Cable Routing *(page 59)* for more information.

Figure 31: CMA Cable Routing
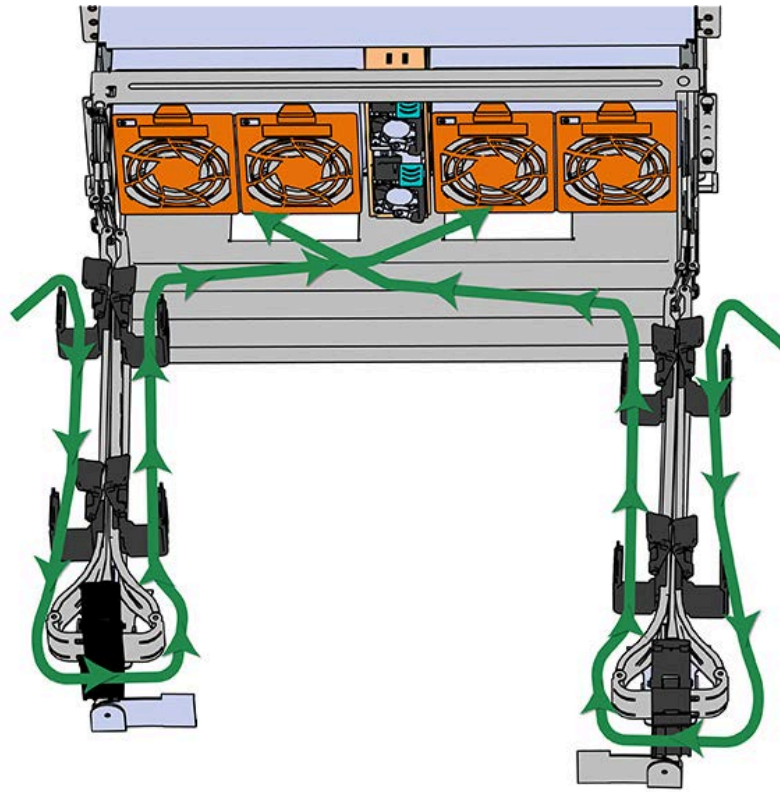
   c. Open all of the baskets.

Figure 32: Open Baskets

d. Connect the Ethernet cable to the Ethernet port, and route the cable through each of the baskets on the arm.

e. Connect the SAS cables to the SAS ports, and route them through the baskets one at a time. Make sure to follow the labels to ensure they are connected to the proper ports.

**f.** Connect the power cable to the PSU and route it through each basket.

> **(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. If the installation includes more than 10 total cables, follow the recommendations in Special Considerations for Cable Routing *(page 59)*, 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 33: Nominal Cable Length at Connectors

Nominal Length from End of Connector to First Basket is 20"- 21"
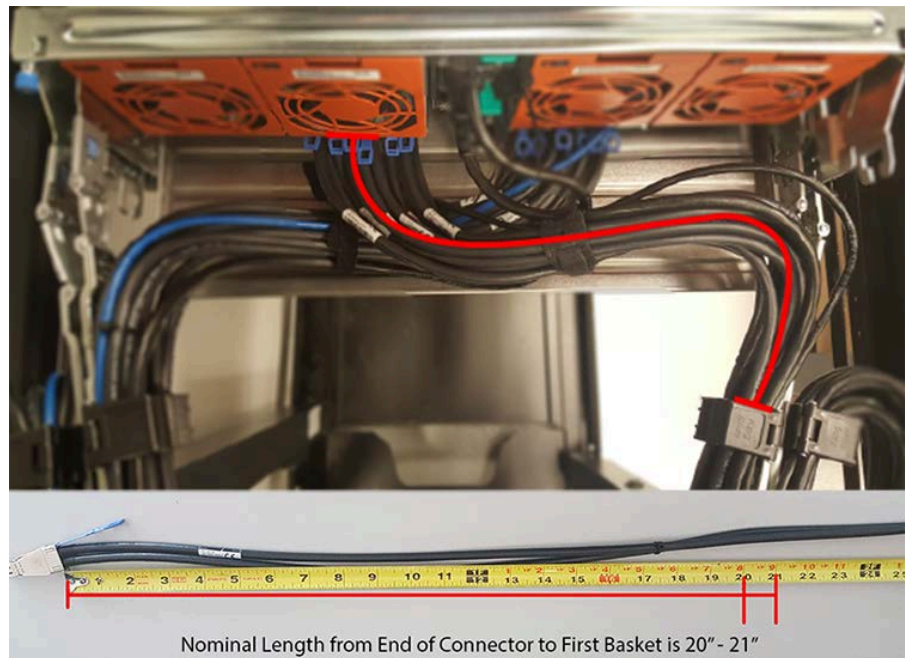
h. Close all of the baskets.

i. If the Ultrastar Data60 is being installed in a rack and will subsequently be transported inside that rack, it is important to use the included cable tie to wrap the CMA bundle to ensure it does not get damaged during transport. If the Ultrastar Data60 is instead being installed where it will be operated, skip this step. Remember to remove the cable ties after the enclosure has reached its final operational location.

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

Step 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 34: Cover Retention Screws
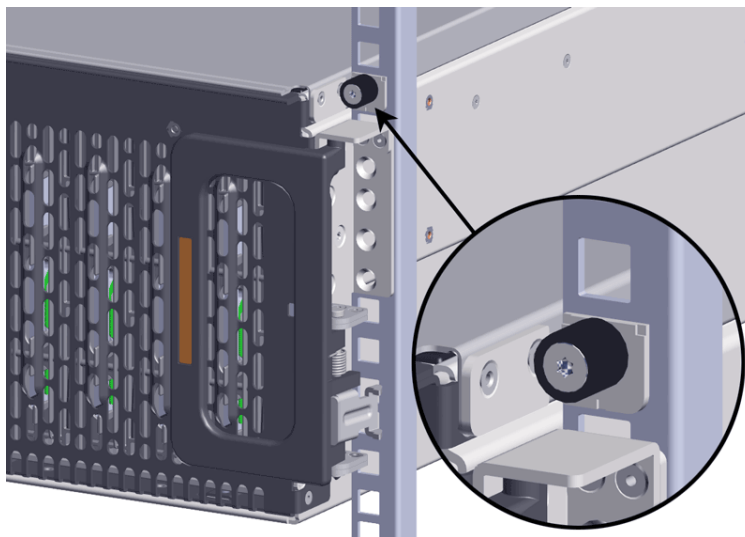
Step 17 : Now that the chassis is installed, test the installation by sliding the enclosure in and out of the rack a minimum of three times. If the enclosure binds, catches, or displays any incorrect motion or behavior repeat the installation.

> **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 35: Chassis Handle Operation
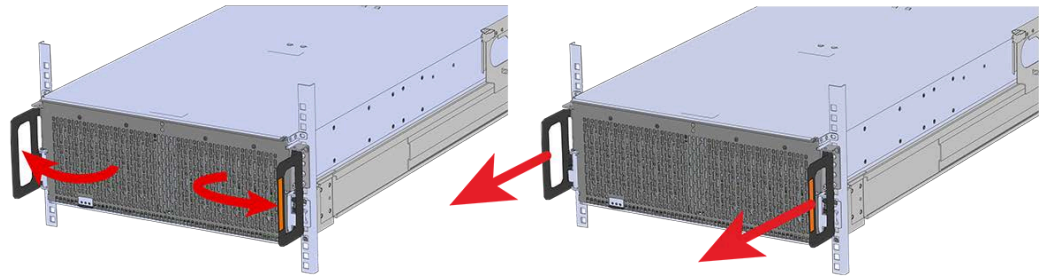
Step 19 : Perform this same action two more times without the drives loaded to make sure the rail kits are installed properly.
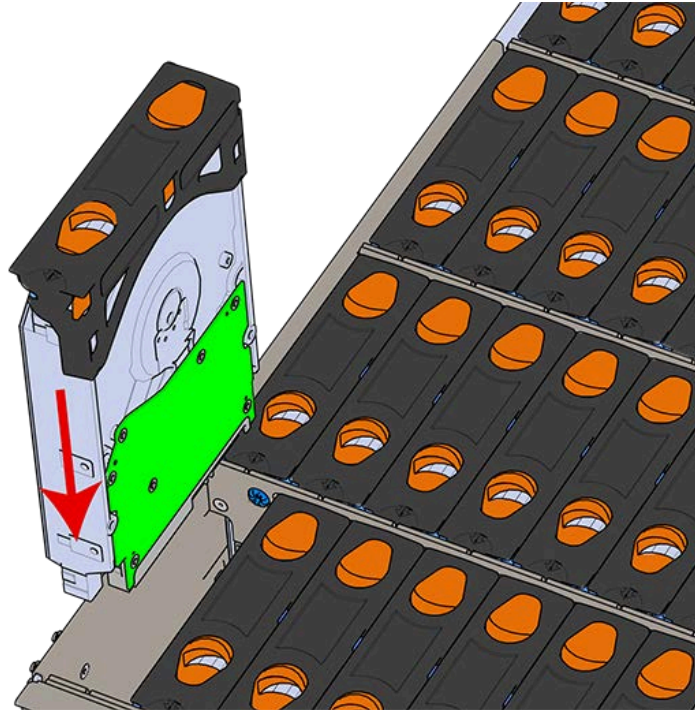
Step 20 : Install the Drive Assembly.

    a. Ensure that the enclosure has been pulled out of the rack until the rail latches engage.

    b. Find the LED pointer on the top of the drive carrier. This pointer should point toward the front of the unit as shown in the following image.

Figure 36: LED Pointer Orientation
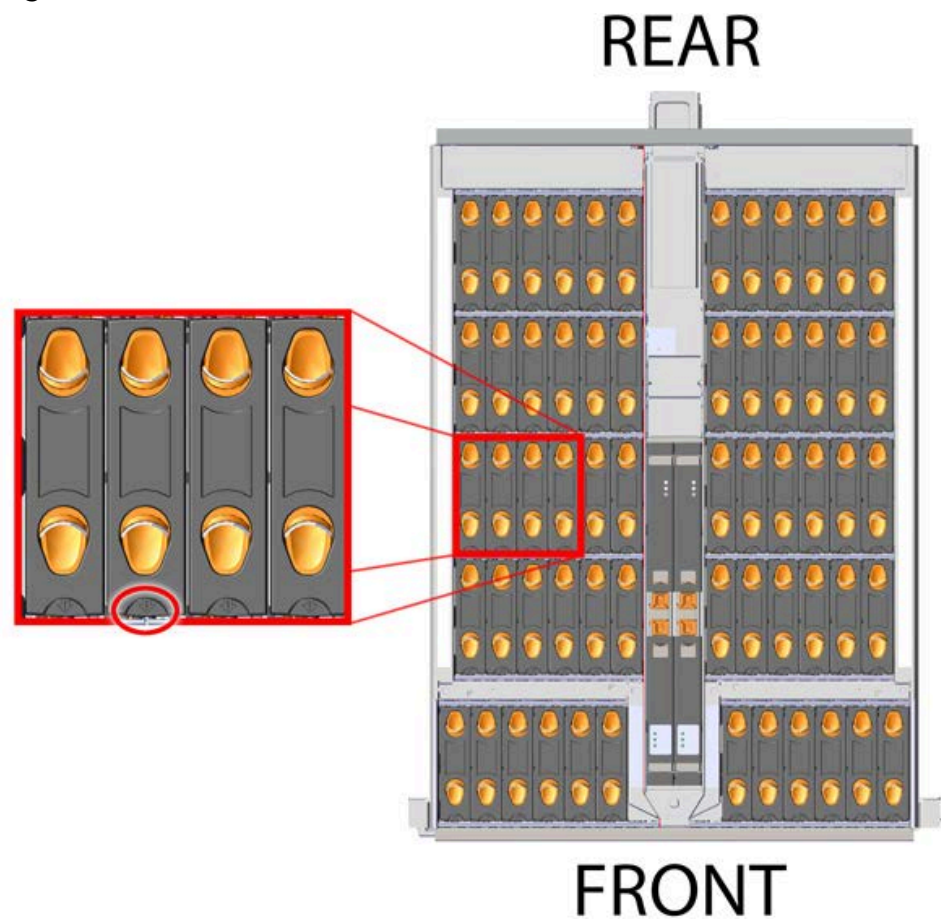
c. Align the drive with the empty slot that will receive it. Lower it into the slot, making sure it stays level and does not snag.
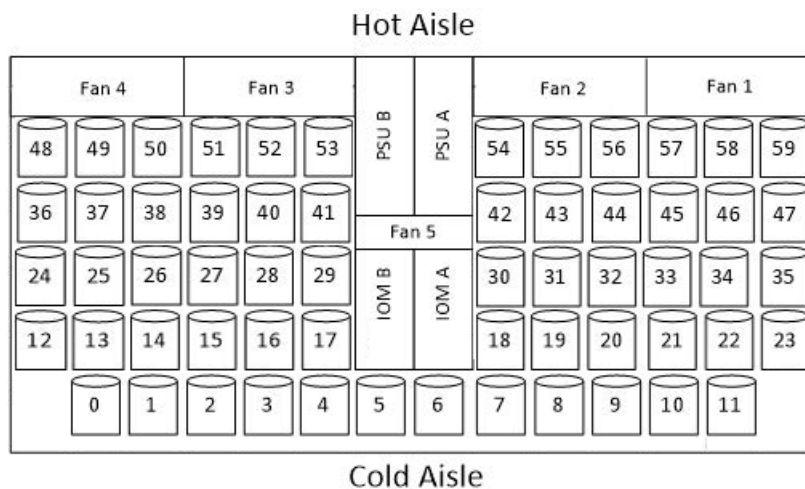
Figure 37: Installing a Drive Assembly

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

Step 21: Install each drive in the same way the first was installed. Make sure to follow the drive layout in numerical sequence as shown in the following image.

Figure 38: Drive Layout

Step 22 : 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 23 : 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 39: Shipping Bracket Screw Locations
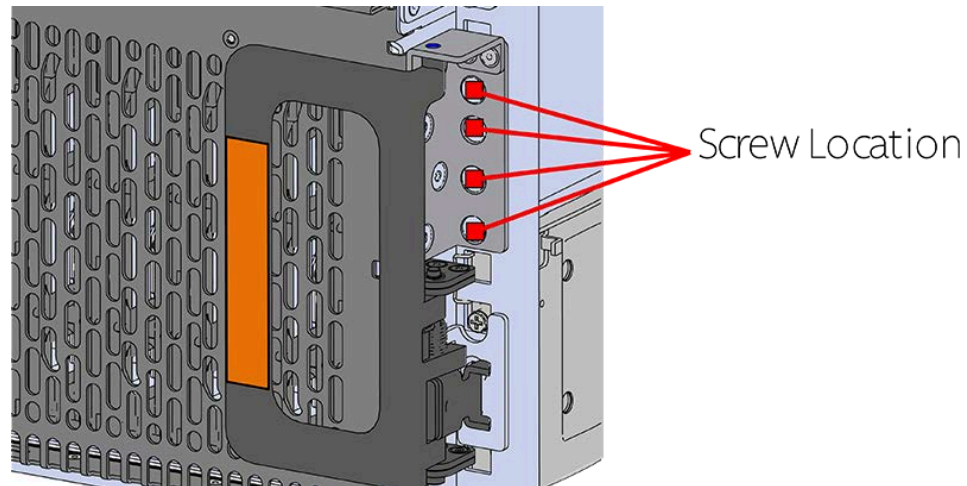
**Step 24 :** Plug the enclosure power cords into a PDU to power the enclosure.

Step 25 : Double check the power indicators and other LEDs to ensure that the system is booting.

5.2.1 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 40: Nominal Cable Length at Connectors

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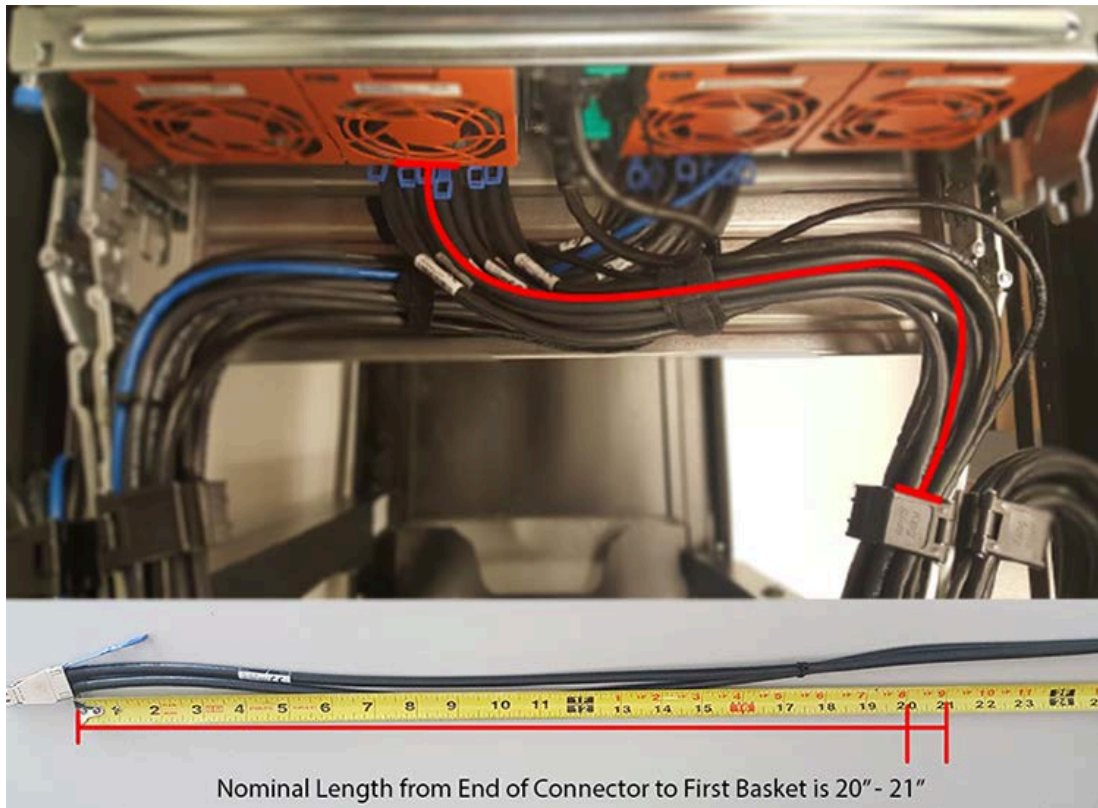
The cables at the port side of the CMA should crisscross in front of the IOMs. To accomplish this, the cables connected to the ports for IOM B (right hand side when facing the rear) should be connected to the upper CMA, and the cables connected to the ports for IOM A (left hand side when facing the rear)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

Figure 41: Crisscross Cables
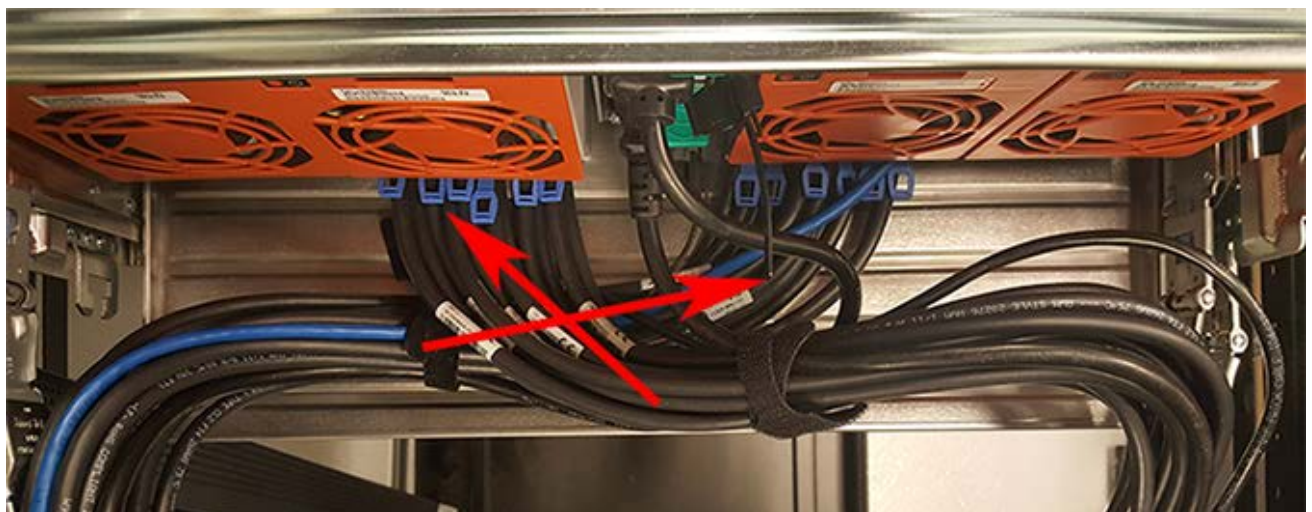
When the cables are routed into the CMA, make sure there is some slack given to the elbow joint of the CMA. It is recommended not to wrap the cables tightly around this joint because this can cause binding and prevent smooth operation. To ensure there is enough slack at the elbow, pull the enclosure 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 42: 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 43: Cable Tie at Exit of CMA
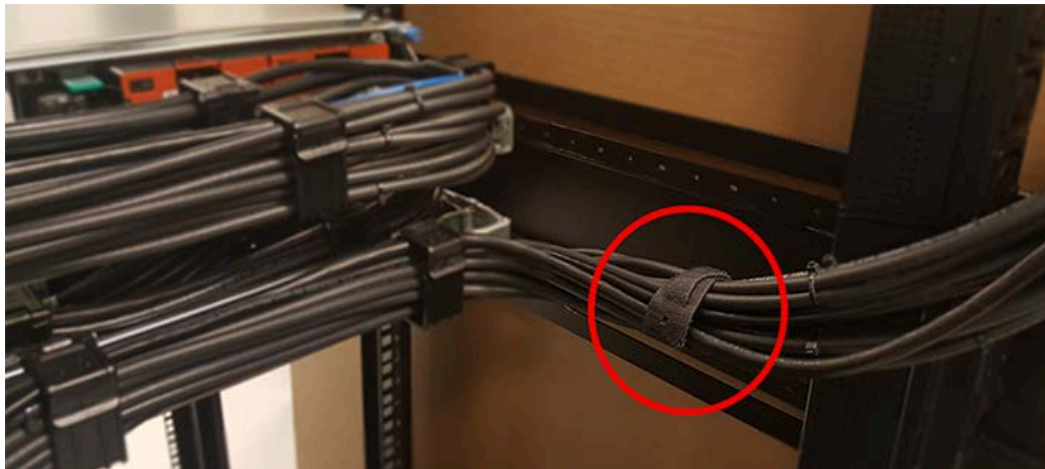
5.3 Cabling for CMA

5.3.1 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:

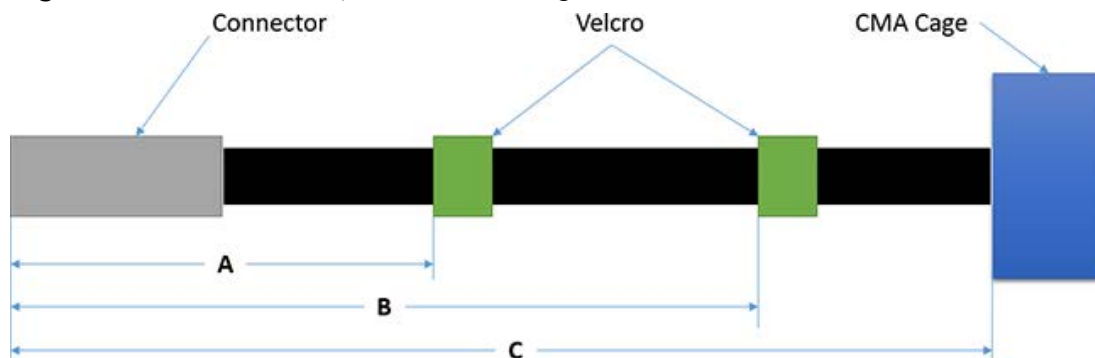**Figure 44:** Service Loop Dimension Figure

Table 15: 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.

5.3.2 Cabling CMA

5.3.2.1 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.
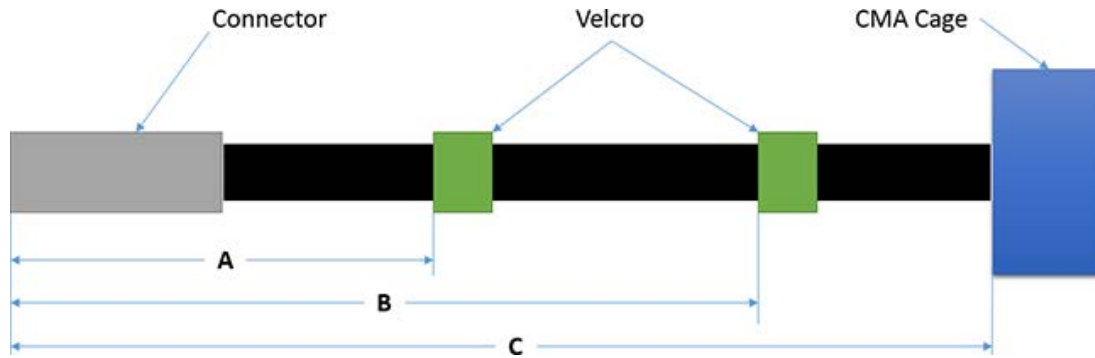
Figure 45: Service Loop Dimension Figure

Table 16: Service Loop Dimension Table

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