



**Western Digital**

# Installation Guide

Ultrastar® Data102

Regulatory Model H4102-J  
Document D018-000236-000  
Revision 04  
March 2025

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## Revision History

Date	Revision	Comment
November 2017	1.0	Initial release
November 2017	1.1	<ul style="list-style-type: none"> <li>The crossbar on the CMA was changed. See the installation instructions for details.</li> <li>Changed required rack depth, see <a href="#">Required Rack Depth (page 5)</a>.</li> <li>Changed typical power consumption, see <a href="#">Typical Power Consumption (page 4)</a>.</li> </ul>
December 2017	1.2	<ul style="list-style-type: none"> <li>Added active cable support</li> <li>Added a note regarding single IOMs in SATA TLAs. See <a href="#">Ultrastar Data102Description (page 2)</a></li> <li>Updated the Non-Op altitude specification. See <a href="#">Non-Operational Altitude (page 4)</a>.</li> <li>Correct the packaging images to show the <b>two</b> CMA boxes that come in the accessory tray. See <a href="#">Packaging Layout (page 31)</a>.</li> </ul>
January 2018	1.2.1	Updated the product name
January 2018	1.2.2	Added an image for cage nut positioning in the installation procedure.
January 2018	1.3	<ul style="list-style-type: none"> <li>Updated information on the 2.5" drive carrier option. (topic removed)</li> <li>Added torque requirements for all screws used in the enclosure.</li> <li>Updated the IOM replacement section to account for the possibility of a firmware mismatch. (topic removed)</li> <li>Updated the drive assembly installation instructions to clarify the orientation of the drive assemblies. See <a href="#">Installation (page 37)</a>.</li> </ul>
April 2018	1.4	<ul style="list-style-type: none"> <li>Updated Compatible Drives List. See <a href="#">Compatible Drives (page 9)</a>.</li> <li>Updated the Rack Requirements. See <a href="#">Ultrastar Data102 Rack Requirements (page 6)</a>.</li> </ul>
June 2018	1.5	<ul style="list-style-type: none"> <li>Updated the Compatible Drives List. See <a href="#">Compatible Drives (page 9)</a></li> </ul>
December 2018	1.6	<ul style="list-style-type: none"> <li>Updated Compatible Drives List. See <a href="#">Compatible Drives (page 9)</a></li> </ul>
March 2019	1.7	Updated <a href="#">Installation (page 37)</a>
May 2019	1.8	Updated <a href="#">Installation (page 37)</a>

Date	Revision	Comment
July 2019	1.9	<ul style="list-style-type: none"> <li>Updated servicing image to correct length values and rail servicing extension in <a href="#">UltraStar Data102 Rack Requirements (page 6)</a> section.</li> <li>Updated <a href="#">Installation Overview (page 38)</a> section to include options for cable management.</li> <li>Updated <a href="#">Installation (page 37)</a> section to combine CMA Standard and CMA Lite instructions where applicable.</li> <li>Updated <a href="#">Cable Configuration for CMA Lite (page 71)</a> section to correct instructions.</li> <li>Updated revision history to remove broken links to topics no longer in this document.</li> </ul>
November 2019	1.10	<ul style="list-style-type: none"> <li>Replaced references to He12 drives with UltraStar DC HC520 in <a href="#">Compatible Drives (page 9)</a></li> <li>Updated images of chassis cover screws throughout</li> </ul>
December 2019	1.11	<ul style="list-style-type: none"> <li>Rebranded document to WD design</li> <li>Updated the <a href="#">Compatible Drives (page 9)</a></li> </ul>
April 2020	1.12	<ul style="list-style-type: none"> <li>Updated drive installation order in the <a href="#">Installation (page 37)</a></li> <li>Added <a href="#">SAS Cabling (page 65)</a></li> <li>Added note about minimum time between removing and reapplying power in <a href="#">Power Connections (page 27)</a></li> </ul>
August 2020	1.13	Updated <a href="#">SAS Cabling (page 65)</a>
October 2020	1.14	<ul style="list-style-type: none"> <li>Updated images and text in <a href="#">UltraStar Data102 Packaging Overview (page 31)</a> and <a href="#">UltraStar Data102 Unpacking Procedure (page 34)</a></li> <li>Added the following to <a href="#">Installation (page 37)</a>: <ul style="list-style-type: none"> <li>Note about input voltage at plug-in step</li> <li>Reference to User Guide after installation instructions</li> <li>Note about installation of 2.5in SSD Assembly</li> </ul> </li> <li>Added Operating the 2.5" Drive Carrier</li> <li>Updated table of approved SAS cables in <a href="#">SAS Cabling (page 65)</a></li> <li>Reordered cabling topics in <a href="#">Installation (page 37)</a> section</li> </ul>
December 2020	1.15	<ul style="list-style-type: none"> <li>Added UK Import Representation Contact</li> <li>Removed Formerica cables from <a href="#">SAS Cabling (page 65)</a></li> </ul>
February 2021	1.16	<ul style="list-style-type: none"> <li>Added UltraStar DC HC650 drives to <a href="#">Compatible Drives (page 9)</a></li> <li>Updated <a href="#">Electrical Specifications (page 4)</a> with Artesyn PSU info</li> <li>Updated <a href="#">Installation (page 37)</a> to include instructions for screw plate</li> </ul>

Date	Revision	Comment
August 2021	1.17	<ul style="list-style-type: none"><li>Removed Mexico from <a href="#">Country Certifications (page 24)</a></li><li>Separated installation procedure into individual tasks by component in <a href="#">Installation (page 37)</a></li></ul>
September 2021	01	Changed document number from 1ET1098 to D018-000236-000
March 2022	02	<ul style="list-style-type: none"><li>Added drive model numbers to <a href="#">Compatible Drives (page 9)</a></li><li>Reorganized <a href="#">SAS Cabling (page 65)</a> section, added note about compatibility between AOCs and 9300-, 9302-, and 9305-series HBAs, and removed Amphenol ICC (FCI) passive cables 10112041-2010LF, -2020LF, and -2030LF</li><li>Updated logo for detachable power cord in <a href="#">Safety Warnings and Cautions (page 29)</a></li><li>Updated drive installation instructions in <a href="#">Drive Installation (page 75)</a></li></ul>
September 2022	03	Updated document branding
March 2025	04	Updated document to new branding

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## Points of Contact

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**Website:**

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

**Email:**

[enterprisesupport@wdc.com](mailto:enterprisesupport@wdc.com)

### UK Import Representation Contact

PO Box 471  
Leatherhead KT22 2LU  
UK

**Telephone:** +44 1372 366000

### EU Import Representation Contact

BP 80006  
92135 Issy les Moulineaux, France

## 1.1 Product Label Information

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The following product information is required for technical support requests:

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

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

P/N: 1ESXXXX REV: XX



S/N: CCMMM0WWYYPPXXXX



### ##v~ ##A ##/## Hz (2x)

MODEL: XXXXX-X



H005 15



This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CAN ICES-3 (A)/NMB-3(A)

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

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



IS 13252 (PART1)/ IEC 60950-1



Laite on liitettävä suojamaadoituskoskettimilla varustettuun pistorasiaan  
Apparatet må tilkoples jordat stikkontakt  
Apparaten skall anslutas till jordat uttag



Electric shock hazard! Disconnect (2) power supply cords before servicing.

DATE CODE: MMDDYYYY  
COO

MANUFACTURED BY: Western Digital.

R-41042056



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# Overview

This section provides a high level overview of the features of the Ultrastar Data102 .

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## 1.1 Ultrastar Data102 Description

Figure 2: Ultrastar Data102



The Ultrastar Data102 is a 4U form factor, high availability, high density, rack-mounted storage enclosure. It is capable of hosting up to 102 HDD drives (SAS or SATA). The maximum data storage capacity of the Ultrastar Data102 is 2.65PB using 26TB Ultrastar HC580 drives (For a full list of compatible drives, see [Compatible Drives \(page 9\)](#)). The enclosure runs on an input voltage of 200-240 VAC and consumes ~1300W of power under typical conditions. It requires a maximum of 1600W (Delta PSU) / 1800W (Artesyn PSU) at full load.

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

- 4U Storage Enclosure
- Supports up to 102 Drives
- Supports 3.5in. drives in the 102 available drive bays.
- Up to 12W per drive slot for the 102 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<sup>1</sup>
- 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 \(page 7\)](#))
- Supports up to 3m passive SAS cables (limited to 3m or less) or active cables (any length) (see [SAS Cabling \(page 65\)](#))

1. SATA based models will only include 1 IOM

## 1.2 Ultrastar Data102 Layout

Figure 3: Front and Rear Product Layout

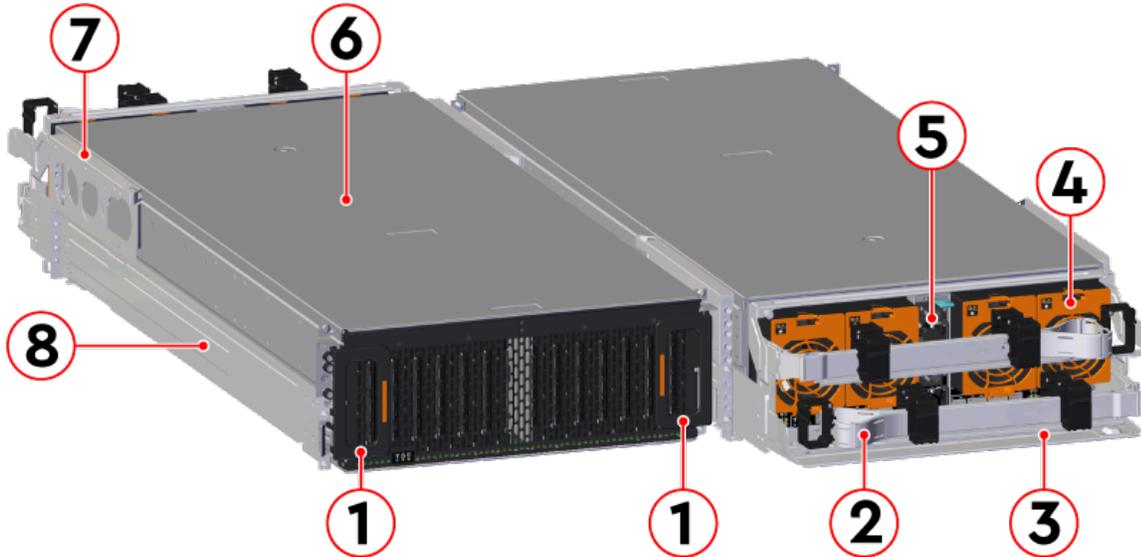
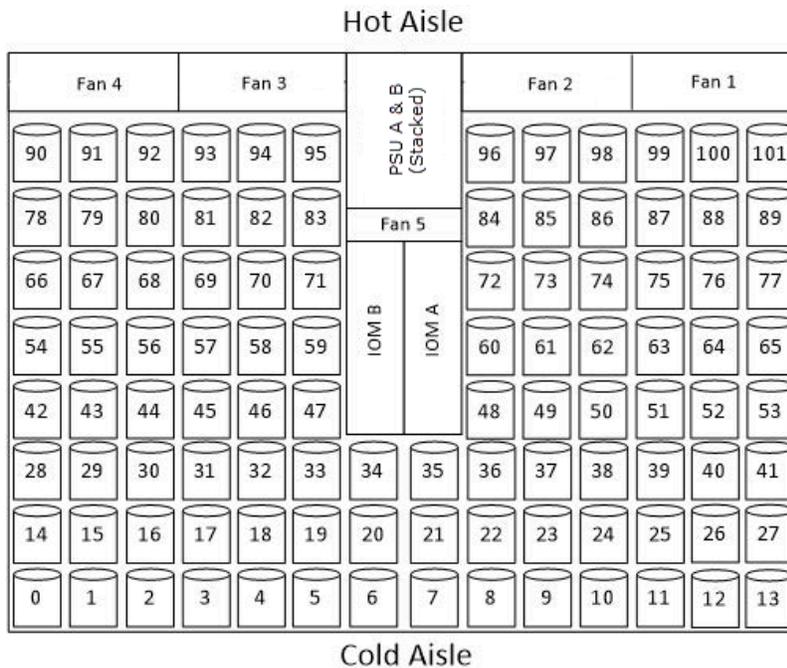


Table 2: Front and Rear Component Identification

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 Data102 .

Figure 4: Component Layout



## 1.3 Environmental Specifications

Table 3: 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
Altitude	-300m to 12,000m / -984 ft. to 39,370 ft	-300m to 3048m / -984 ft. to 10,000 ft.

## 1.4 Electrical Specifications

Table 4: Electrical Specifications

Specification	Value
Max Power Consumption	1600W (Delta PSU) / 1800W (Artesyn PSU)

Specification	Value
Typical Power Consumption <sup>2</sup>	~1300W
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 Data102 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.

## 1.5 Mechanical Specifications

Table 5: Mechanical Specifications

Specification	Non-Operational	Operational
Shock	10G, 0 - peak, 11ms half sine; 3 positive and 3 negative pulses in each axis Shock	5G, 0 - peak, 11ms half sine; 3 positive and 3 negative pulses in each axis - minimum 6 seconds between shocks to allow for write/read recovery
Vibration	0.75G, 0 - peak swept sine; 5 -500Hz; 1 complete sweep @ 1/2 octave per minute	0.10G, 0 - peak swept sine; 5 -500Hz; 1 complete sweep @ 1/2 octave per minute
Weight	118.8 kg / 262 lbs. <sup>3</sup>	
Enclosure Dimensions	W: 447.0 mm x L: 1044.2 mm x H: 174.5 mm / W: 17.60 in. x L: 41.11 in. x H: 6.87 in. <sup>4</sup>	
Length of Enclosure w/ CMA	CMA Standard: 1183mm / 46.57in. CMA Lite: 1148mm / 45.19in.	
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	1181-1197 mm (46.5in. - 47.13in.) of usable rack space, frame to frame	
Rack Units (U)	4U	

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 102 drives. It does not include the CMA, cable tray, accessories, or packaging/shipping materials.
4. Listed width is the chassis without rack ears

Specification	Non-Operational	Operational
Vertical Rack Rail Spacing	812.8 - 914.4 mm / 32 - 36 in.	

## 1.6 Performance Specifications

Table 6: Performance Specifications

Specification	Value
Number of Drive Slots	102
Data Transfer Rates	12Gbps SAS / 6Gbps SATA
Max Raw Data Storage Capacity	2.65PB using 26TB Ultrastar HC580 drives
SAS Ports	12 x Mini-SAS HD (6 per IOM)
Management Ports	2 x 10/100/1G Ethernet

## 1.7 Ultrastar Data102 Rack Requirements

The Ultrastar Data102 is designed to be installed into a rack that meets the EIA-310 standard at a minimum 1181-1197 mm (46.5in. - 47.13in.) of usable rack space, frame to frame. The vertical rack rails must be set between 812.8 - 914.4 mm / 32 - 36 in. to support the enclosure. It requires 4U of rack space, and it should be installed into the rack at the lowest possible U height to keep the load on the rack balanced.

Table 7: Required Rack Specifications

Parameter	Requirement
Rack Depth	1181-1197 mm (46.5in. - 47.13in.) of 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	812.8 - 914.4 mm / 32 - 36 in.
Static Load Rating	1360.7 kg. / 3000 lbs.
Dynamic Load Rating	1020.5 kg. / 2250 lbs.



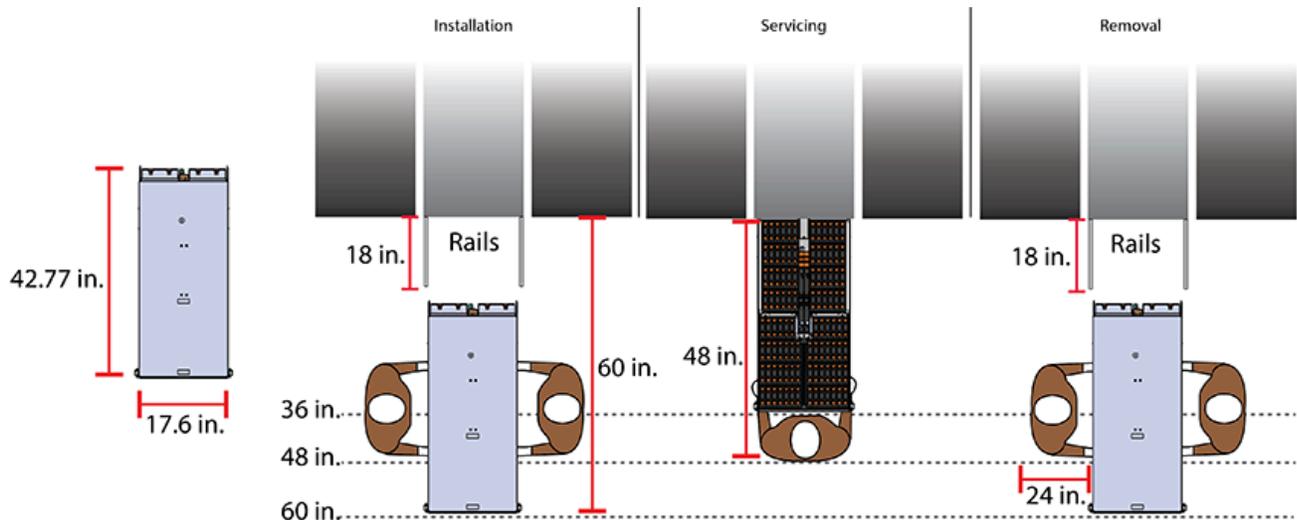
**Warning:** When extended out of the rack on the rail system, the Ultrastar Data102 will be ~950 mm / 37.4in. extended outward. This may be a potential tipping hazard depending on the configuration of the rack. Ensure that leveling feet, anti-tilt, and any other safety features recommended by the specific rack manufacturers have been deployed before servicing.

The following section provides specific information necessary to install, service, and remove the Ultrastar Data102. The installation of the Ultrastar Data102 requires two people and a space of 1524mm / 60in. in front of the installation space. The servicing of the enclosure requires one person and a minimum of 1219.2mm / 48in. of space in front of the installation space. The removal of the enclosure requires two people, 1371mm / 54in. 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 Data102 . 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.

For more information related to Ultrastar Data102 Rack Configurations see: Rack Configurations (page )

### 1.7.1 Compatible Rack Hardware Configuration

The following table(s) list the approved rack hardware configurations for the Ultrastar Data102 :

Table 8: 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 9: Compatible Hardware Configuration 2

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
<b>Vendor</b>	AFCO/Legrand	Server Technology	Server Technology	Various
<b>Part Number</b>	<b>Options:</b> 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
<b>Quantity</b>	1 rack	2	1	N/A

Table 10: Compatible Hardware Configuration 3

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
<b>Vendor</b>	TRIPP LITE	Server Technology	Server Technology	Various
<b>Part Number</b>	<b>Options:</b> 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
<b>Quantity</b>	1 rack	2	1	N/A

Table 11: Compatible Hardware Configuration 4

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
<b>Vendor</b>	APC/Schneider	Server Technology	Server Technology	Various

Parameter	Rack	PDU (Vertical)	PDU Mounting Bracket	Additional Mounting Bracket Hardware
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 Data102 rack configurations, see: Rack Configurations ([page](#) ).

## 1.8 Compatible Drives

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

Table 12: 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 HC320 CMR, 8TB HDD with 3.5" Drive Carrier

Table 13: 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 HC330 CMR, 10TB HDD with 3.5" Drive Carrier

Table 14: 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 HC510 CMR, 8TB HDD with 3.5" Drive Carrier

Table 15: DC HC510 Part / Model Numbers

Sector Size	SAS
	ISE
512e	1EX0392 / HUH721008AL-5200

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

Table 16: 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 HC520 CMR, 12TB HDD with 3.5" Drive Carrier

Table 17: 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 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 18: 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-5204	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 HC550 CMR, 16TB HDD with 3.5" Drive Carrier

Table 19: 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 CMR, 18TB HDD with 3.5" Drive Carrier

Table 20: 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 HC560 CMR, 20TB HDD with 3.5" Drive Carrier

Table 21: 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 HC570 CMR, 22TB HDD with 3.5" Drive Carrier**

Table 22: 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 HC580 CMR, 22TB HDD with 3.5" Drive Carrier**

Table 23: DC HC580 Part / Model Numbers

Sector Size	SATA	SAS
	SE	SE
512e	1EX3169 / WUH722422AL-5201	1EX3168 / WUH722424AL-5201

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

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

Table 25: DC HC580 Part / Model Numbers

Sector Size	SATA	SAS	
	SE	SE	TCG
512e	1EX3171 / WUH722424AL-E6L4	1EX3170 / WUH722424AL5204	
4Kn			1EX3230 / WUH722424AL5201

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

Table 26: 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:

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

OS	Kernel	HBA	HBA FW	HBA Driver
		9300-16e	30.00.00.00	49.00.00.00
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e		
		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		
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		
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		
		9500-16e	30.00.00.00	49.00.00.00

**Ultrastar DC HC590 CMR, 24TB HDD with 3.5" Drive Carrier**

Table 28: DC HC590 Part / Model Numbers

Sector Size	SATA	SAS	
	SE	SE	TCG
512e	1EX3268 / WUH722624ALN604	1EX3267 / WUH722624AL4204	1EX3327 / WUH722624AL4201

Ultrastar DC HC590 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	28.00.00.00	47.00.00.00
		9500-8e		
		9500-16e		
		9600-16e	8.8.1.0.0	8.8.1.0
		9600w-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	31.00.00.00	50.00.00.00
		9500-8e		
		9500-16e		
		9600-16e	8.9.1.0	8.9.1.0.0
		9600w-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e	31.00.00.00	50.00.00.00
		9500-8e		
		9500-16e		
		9600-16e	8.9.1.0	8.9.1.0.0
		9600w-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	31.00.00.00	50.00.00.00
		9500-8e		
		9500-16e		
		9600-16e	8.9.1.0	8.9.1.0.0

OS	Kernel	HBA	HBA FW	HBA Driver
		9600w-16e		

**Ultrastar DC HC590 CMR, 26TB HDD with 3.5" Drive Carrier**

Table 30: DC HC590 Part / Model Numbers

Sector Size	SATA	SAS	
	SE	SE	TCG
512e	1EX3270 / WUH722626ALN604	1EX3269 / WUH722626AL4204	1EX3328 / WUH722626AL4201

Ultrastar DC HC590 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	28.00.00.00	47.00.00.00
		9500-8e		
		9500-16e		
		9600-16e	8.8.1.0.0	8.8.1.0
		9600w-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	31.00.00.00	50.00.00.00
		9500-8e		
		9500-16e		
		9600-16e	8.9.1.0	8.9.1.0.0
		9600w-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e	31.00.00.00	50.00.00.00
		9500-8e		
		9500-16e		

OS	Kernel	HBA	HBA FW	HBA Driver
CentOS/RedHat Enterprise Linux (RHEL)	5.14.0.70.13.1	9600-16e	8.9.1.0	8.9.1.0.0
		9600w-16e		
		9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e	31.00.00.00	50.00.00.00
		9500-8e		
		9500-16e	8.9.1.0	8.9.1.0.0
		9600-16e		
9600w-16e				

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

Table 32: 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:

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	28.00.00.00	47.00.00.00
		9500-8e		
		9500-16e	8.8.1.0.0	8.8.1.0
		9600-16e		
9600w-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	31.00.00.00	50.00.00.00
		9500-8e		

OS	Kernel	HBA	HBA FW	HBA Driver
		9500-16e	8.91.0	8.91.0.0
		9600-16e		
		9600w-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	31.00.00.00	50.00.00.00
		9500-16e		
		9600-16e	8.91.0	8.91.0.0
		9600w-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	31.00.00.00	50.00.00.00
		9500-16e		
		9600-16e	8.91.0	8.91.0.0
		9600w-16e		

**Ultrastar DC HC680 SMR, 26TB HDD with 3.5" Drive Carrier**

Table 34: DC HC680 Part / Model Numbers

Sector Size	SATA
	SE
4Kn	1EX3172 / WSH722860ALN6L4

Ultrastar DC HC680 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		47.00.00.00

OS	Kernel	HBA	HBA FW	HBA Driver
		9500-8e	28.00.00.00	8.8.1.0
		9500-16e		
		9600-16e	8.8.1.0.0	
		9600w-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	31.00.00.00	50.00.00.00
		9500-8e		
		9500-16e		
		9600-16e	8.9.1.0	8.9.1.0.0
9600w-16e				
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e	31.00.00.00	50.00.00.00
		9500-8e		
		9500-16e		
		9600-16e	8.9.1.0	8.9.1.0.0
9600w-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	31.00.00.00	50.00.00.00
		9500-8e		
		9500-16e		
		9600-16e	8.9.1.0	8.9.1.0.0
9600w-16e				

Ultrastar DC HC680 SMR, **27TB** HDD with 3.5" Drive Carrier

Table 36: DC HC680 Part / Model Numbers

Sector Size	SATA
	SE
4Kn	1EX3173 / WSH722870ALN6L4

Ultrastar DC HC680 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	28.00.00.00	47.00.00.00
		9500-8e		
		9500-16e		
		9600-16e	8.8.1.0.0	8.8.1.0
		9600w-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	31.00.00.00	50.00.00.00
		9500-8e		
		9500-16e		
		9600-16e	8.9.1.0	8.9.1.0.0
		9600w-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e	31.00.00.00	50.00.00.00
		9500-8e		
		9500-16e		
		9600-16e	8.9.1.0	8.9.1.0.0
		9600w-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		

OS	Kernel	HBA	HBA FW	HBA Driver
		9400-8e	31.00.00.00	50.00.00.00
		9400-16e		
		9500-8e		
		9500-16e	8.9.1.0	8.9.1.0.0
		9600-16e		
		9600w-16e		

**Ultrastar DC HC680 SMR, 28TB HDD with 3.5" Drive Carrier**

Table 38: DC HC680 Part / Model Numbers

Sector Size	SATA
	SE
4Kn	1EX3174 / WSH722880ALN6L4

Ultrastar DC HC680 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	28.00.00.00	47.00.00.00
		9405-16e		
		9500-8e		
		9500-16e	8.8.1.0.0	8.8.1.0
		9600-16e		
		9600w-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	31.00.00.00	50.00.00.00
		9405-16e		
		9500-8e		
		9500-16e	8.9.1.0	8.9.1.0.0
		9600-16e		
		9600w-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		50.00.00.00
		9400-8e		
		9400-16e		
		9500-8e	31.00.00.00	
		9500-16e		
		9600-16e	8.9.1.0	
		9600w-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	31.00.00.00	
		9500-8e		
		9500-16e		
		9600-16e	8.9.1.0	
9600w-16e				

**Ultrastar DC HC690 SMR, 30TB HDD with 3.5" Drive Carrier**

Table 40: DC HC690 Part / Model Numbers

Sector Size	SATA	SAS	
	SE	SE	TCG
4Kn	1EX3272 / WSH723200ALN604	1EX3271 / WSH723200AL4204	1EX3329 / WSH723200AL4201

Ultrastar DC HC690 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	28.00.00.00	
		9500-8e		
		9500-16e		
		9600-16e	8.8.1.0.0	
9600w-16e				
Ubuntu 20.04	5.4.0-47-generic	9300-8e	22.00.00.00	43.00.00.00

OS	Kernel	HBA	HBA FW	HBA Driver
		9300-16e		
		9300-4i4e		
		9400-8e		
		9405-16e		
		9500-8e	31.00.00.00	50.00.00.00
		9500-16e		
		9600-16e	8.9.1.0	8.9.1.0.0
		9600w-16e		
Ubuntu 22.04	5.15	9300-8e	22.00.00.00	43.00.00.00
		9300-16e		
		9300-4i4e		
		9400-8e		
		9400-16e	31.00.00.00	50.00.00.00
		9500-8e		
		9500-16e	8.9.1.0	8.9.1.0.0
		9600-16e		
9600w-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	31.00.00.00	50.00.00.00
		9500-8e		
		9500-16e	8.9.1.0	8.9.1.0.0
		9600-16e		
9600w-16e				



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# Disclaimers

The following chapter describes the Regulatory Statement of Compliance, Safety Compliance, Electromagnetic Compatibility Agency Requirements, and country certifications for the Ultrastar Data102 .

## **In This Chapter:**

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- Restricted Access Location.....	25
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## 2.1 Country Certifications

Table 42: 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

## 2.2 Electromagnetic Compatibility (EMC) Class A Compliance

The H4102-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

## 2.3 Restricted Access Location

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The Ultrastar Data102 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

## 2.4 Safety Compliance

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Product Name: **Ultrastar Data102**  
System Regulatory Model: **H4102-J**

Electromagnetic Compatibility Emissions: **Class A**

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

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

- 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



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# Safety

The following chapter provides safety information for the Ultrastar Data102 .

## **In This Chapter:**

- Electrostatic Discharge.....	27
- Optimizing Location.....	27
- Power Connections.....	27
- Power Cords.....	27
- Rack-Mountable Systems.....	28
- Safety and Service.....	28
- Safety Warnings and Cautions.....	29

## 3.1 Electrostatic Discharge

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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

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- 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.

## 3.3 Power Connections

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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.



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.

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.

## 3.4 Power Cords

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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 Rack-Mountable Systems

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**CAUTION: Always install rack rails and storage enclosure according to Ultrastar Data102 product documentation. Follow all cautions, warnings, labels, and instructions provided within the rackmount instructions.**

Reliable grounding of rack-mounted equipment should be maintained.

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

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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 Data102 .



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.



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# Packaging

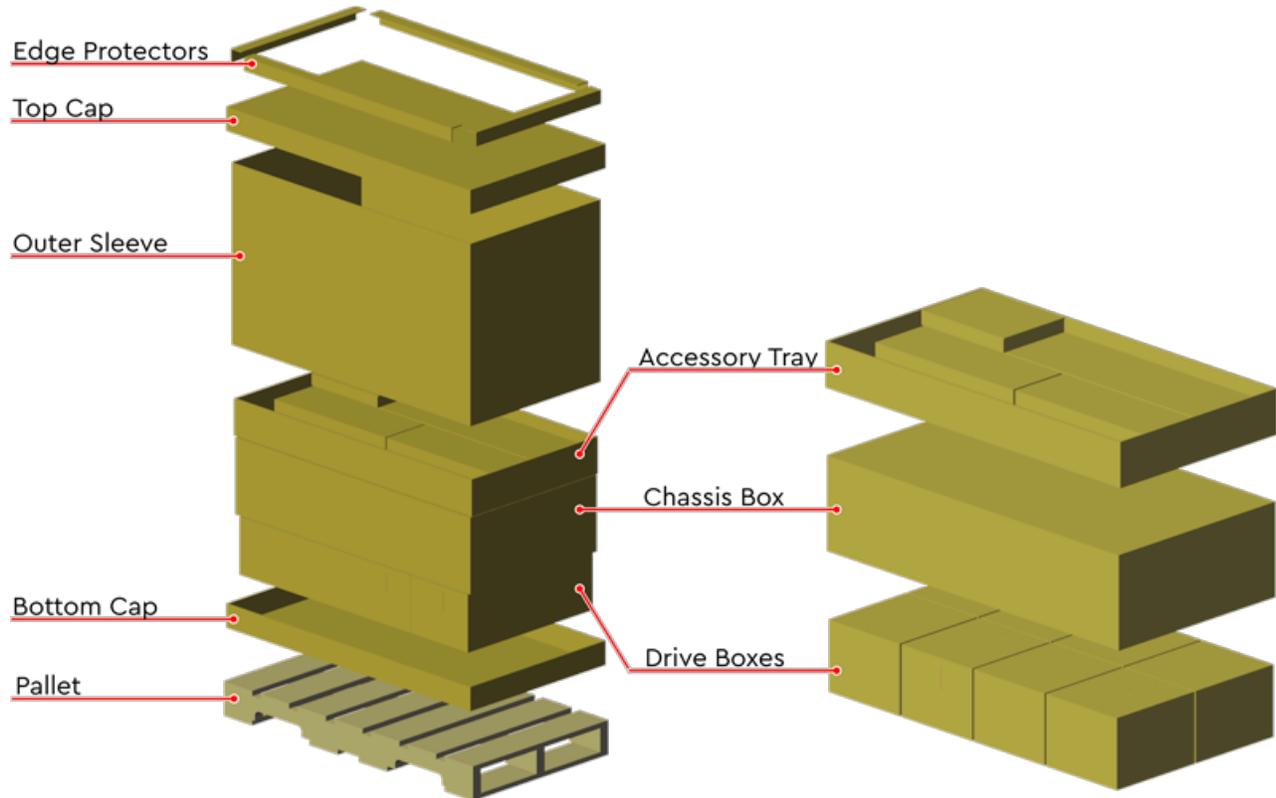
The following chapter provides information about how the Ultrastar Data102 is packaged and instructions for unpacking it.

## **In This Chapter:**

- Ultrastar Data102 Packaging Overview..... 31
- Ultrastar Data102 Unpacking Procedure..... 34

## 4.1 Ultrastar Data102 Packaging Overview

Figure 6: Outer Packaging



The Ultrastar Data102 is shipped in protective outer packaging that consists of cardboard caps on the top and bottom and an outer sleeve surrounding the sides. Edge protectors reinforce the top cap, while plastic banding surrounds the packaging and secures it all to the shipping pallet.

The inner contents of the Ultrastar Data102 packaging consists of three layers: the accessory tray (top), the chassis box (middle), and the drive boxes (bottom). The contents of each layer are detailed in the following sections.

### Accessory Tray

The accessory tray contains boxes for the CMA arms, the Rails, and the Top Cover Alignment Brackets, as well as plastic bags containing the cables and necessary hardware.

Figure 7: Accessory Tray Contents

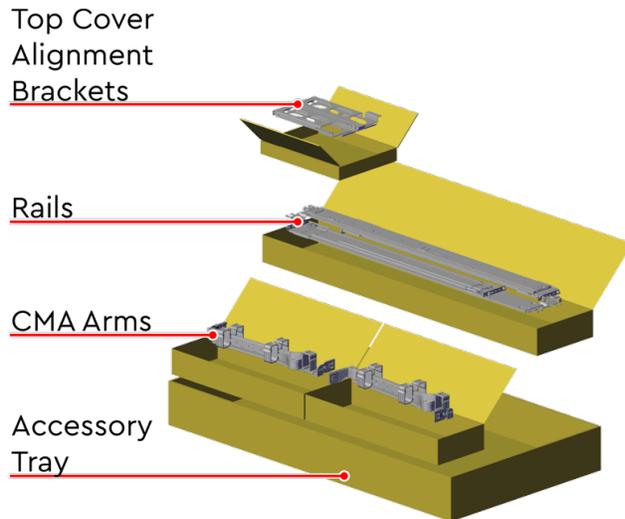


Table 43: Accessory Tray Contents

Container	Contents
CMA Box	2 CMA arms (1 upper, 1 lower)
Rails Box	<ul style="list-style-type: none"> <li>2 Rails (each containing 1 inner-rail &amp; 1 outer-rail)</li> <li>Cross-bar</li> </ul>
Brackets Box	2 Top Cover Alignment Brackets
Accessory Tray	<ul style="list-style-type: none"> <li>2 Rack Latch Brackets (1 left, 1 right)</li> <li>Screws &amp; Nuts                             <ul style="list-style-type: none"> <li>10 M5 cagenuts</li> <li>30 M5 x 12, T15 Torx screws</li> <li>2 M5 x 12 Philips panhead screws (for cover retention)</li> <li>16 custom round washers</li> <li>6 custom low-profile M4 xcrews (packaged with the rail kit)</li> </ul> </li> <li>Cables                             <ul style="list-style-type: none"> <li>2 C13 to C14 power cables (3m)</li> <li>2 MiniSAS HD cables (3m)</li> </ul> </li> </ul>

### Chassis Box

The Chassis is boxed in the middle layer and protected by foam padding. It comes with pre-installed Rear Fans, PSUs, IOM Fan, and IOMs.

Figure 8: Chassis Box Contents

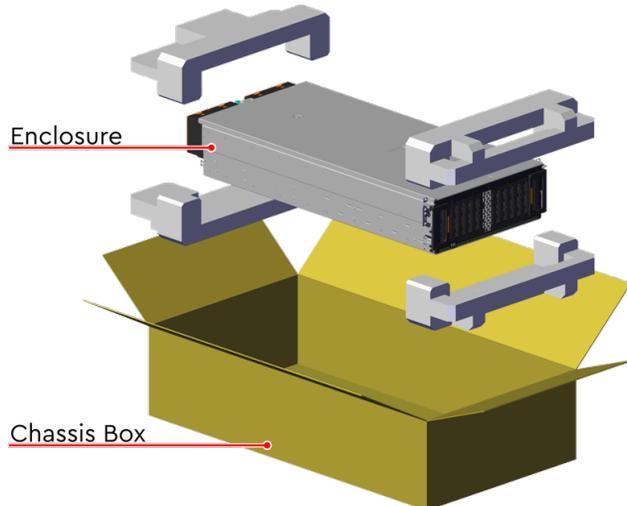


Table 44: Chassis Box Contents

Container	Contents
	1 Chassis w/ all internal components pre-installed (except HDDs):
Chassis box	<ul style="list-style-type: none"> <li>• 2 PSUs</li> <li>• 2 IOM s</li> <li>• 1 IOM Fan</li> <li>• 4 Rear Fans</li> </ul>

### Drive Boxes

On the bottom layer are seven drive boxes holding fourteen HDD assemblies each, and one box holding four HDD assemblies.

Figure 9: Drive Box Contents

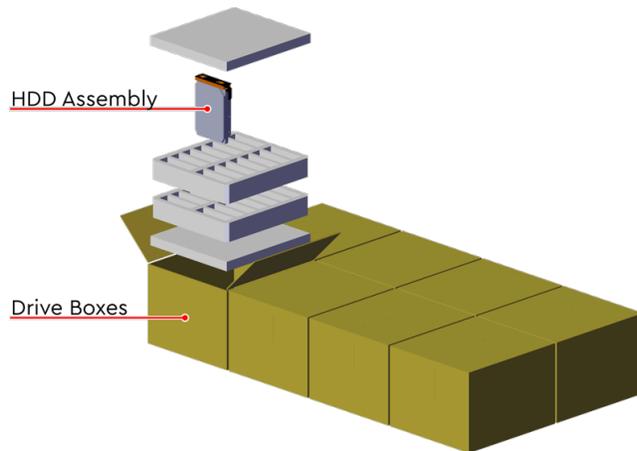


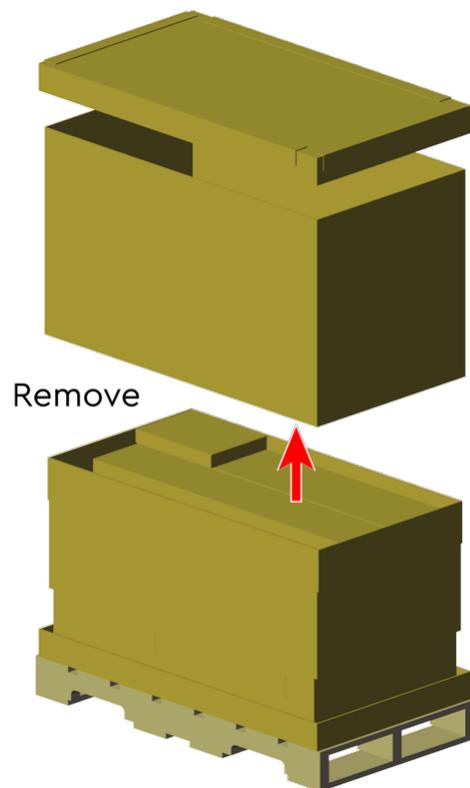
Table 45: Drive Box Contents

Container	Contents
7 boxes:	14 HDD assemblies each
1 box:	4 HDD assemblies
(total of 8 boxes)	(total of 102 HDD assemblies)

## 4.2 Ultrastar Data102 Unpacking Procedure

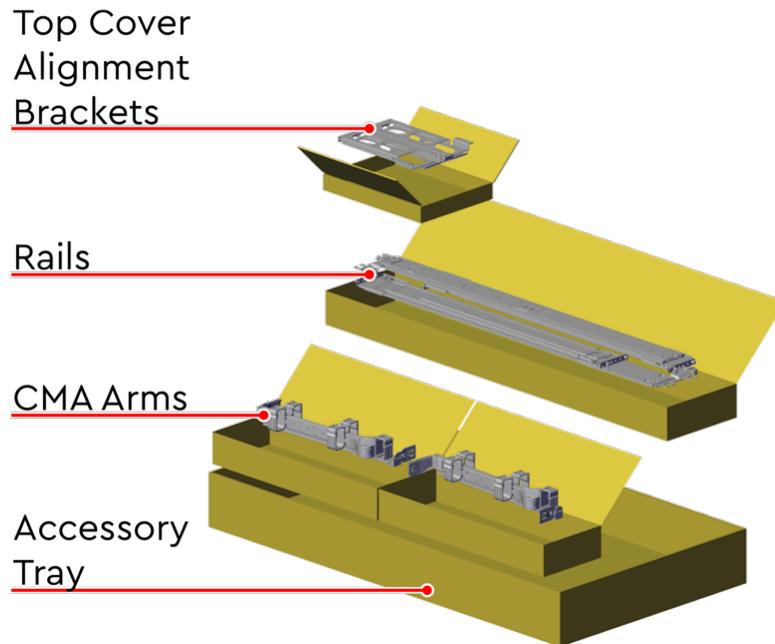
- Step 1:** Make sure that all of the necessary parts and equipment are available, including any equipment necessary to support the enclosure during installation. To verify the list of necessary parts, see [Ultrastar Data102 Packaging Overview \(page 31\)](#).
- Step 2:** Using a box cutter, cut the straps that secure the packaging to the pallet.
- Step 3:** Remove and discard the top cap and the outer sleeve.

*Figure 10: Top Cap and Sleeve Removal*



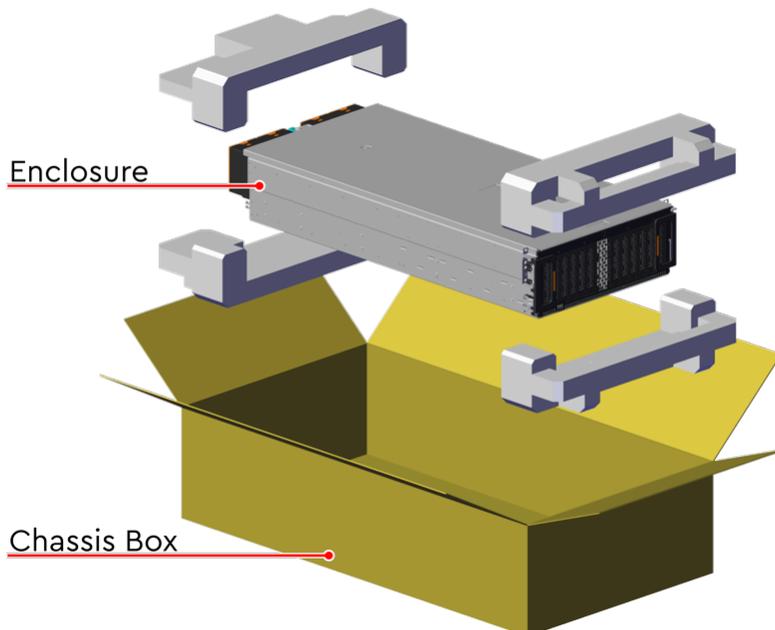
- Step 4:** From the accessory tray, open the boxes for the rails, CMA arms, and top cover alignment brackets. Remove these parts and set them aside.

Figure 11: Unpack Accessory Tray Contents



**Step 5:** Open the chassis box and remove the top cushions from the front and rear of the chassis.

Figure 12: Unpack Chassis Box Contents



**Step 6:** With assistance, and without using the system handles, remove the chassis from the chassis box and set it aside.



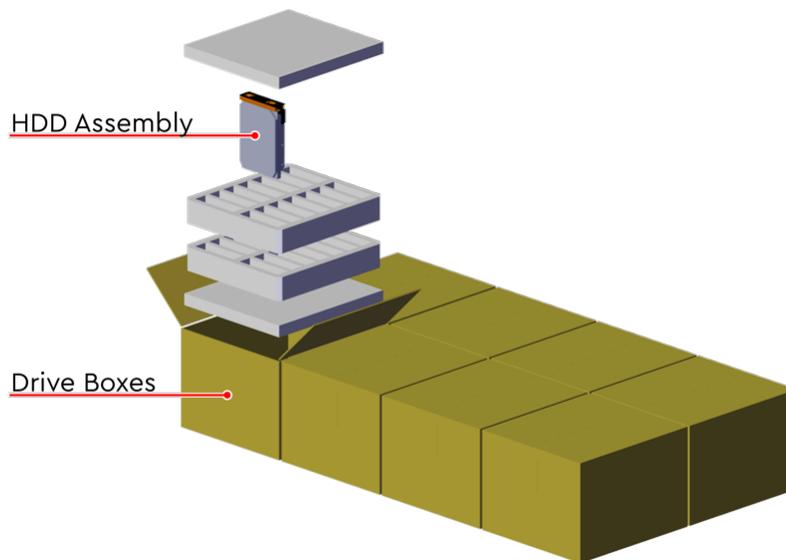
**Warning:** The chassis weight without drives is 32.34 kg / 71.3 lbs . To avoid injury, the chassis should be team lifted.



**Caution:** Do not lift the chassis by the system handles. The handles are designed only for sliding the enclosure out of the rack on its rails.

**Step 7:** Open the drive boxes and verify their contents. Depending on the version of the Ultrastar Data102 being unpacked, seven boxes should contain fourteen drive assemblies (in the form of HDDs, SSDs, or blanks), and one box should contain four drive assemblies. Once the contents are verified, leave them in the boxes. This will protect them from damage until they are installed in the enclosure.

*Figure 13: Verify Drives and Drive Blanks*





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# Installation

## In This Chapter:

- Installation Overview.....	38
- Cable Tray Installation (Optional).....	40
- Rails Installation.....	42
- Chassis Installation.....	52
- CMA Installation.....	55
- Cable Installation.....	58
- Top Cover Installation and Extension Test.....	73
- Drive Installation.....	75
- Shipping Screws Installation.....	83
- Enclosure Power On.....	85

## 5.1 Installation Overview

### Procedure Info

Required Tools	Required Parts	# of People Required	Time Required
<ul style="list-style-type: none"> <li>Long T15 Torx Screwdriver</li> <li># 2 Philips Screwdriver</li> <li>Long T10 Torx Screwdriver</li> <li>Cable Ties (for configurations with greater than 10 total cables)</li> <li>Tape Measure</li> <li>Level</li> </ul>	<ul style="list-style-type: none"> <li><b>Option 1:</b> M5 x 12mm T15 Flat Head Torx screws and included washers</li> <li><b>Option 2:</b> Screw plate</li> <li>M5 x 12mm Phillips Pan Head screws (to secure top cover)</li> <li>Low-Profile M4 x 3.2mm Philips screws (included with rail assembly)</li> <li>M3 x 8mm T10 Torx screws</li> <li>10 M5 cage nuts</li> <li>CMA Crossbar</li> <li>Cable Tray (optional)</li> <li><b>Optional (if using CMA Tray):</b> M3 x 8mm T10 Torx screws</li> <li>Zip Tie (from CMA box)</li> </ul>	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 or screw plate	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

## Cable Management

There are two different options for cable management in Ultrastar Data102 : CMA Standard and CMA Lite. Each of these options has a different installation, configuration, and purpose. The standard CMA configuration manages and protects the full cable load during normal operation of the Ultrastar Data102 . If a fully-configured Ultrastar Data102 is not necessary, CMA Lite provides a better management and protection solution for a lighter cable load, with a more compact hardware footprint. Utilizing front spacer brackets that shift the enclosure forward, and narrower basket clips for tighter cable management, CMA Lite allows the enclosure to fit within shallower racks and/or those with front and rear doors. The following information provides a list of the features of each cable management option:

### CMA Standard:

- Enables use of all I/O connections
- Manages and protects full set of cables during installation, operation, and servicing
- Easy cable routing with the open-top cable baskets
- Toolless installation

### CMA Lite:

- Smaller rack footprint for shallower racks and/or racks with doors
- Manages and protects a lighter cable load (with only one CMA arm) during installation, operation, and servicing
- Easy cable routing with the open-top cable baskets
- Toolless installation

## CMA and CMA Lite in the Installation Procedure

The installation procedure for the Ultrastar Data102 includes instructions for both CMA Standard and CMA Lite. These instructions are labeled, in-line, to notify the user when a step or part of a step is used for one option or the other. These options occur during the steps for **rail installation**, **CMA installation**, **cabling**, and **securing the enclosure to the rack**.



**Attention:** The CMA Lite replacement package includes a CMA arm and spacer brackets. Replacing the CMA arm can be done with the enclosure in place in the rack. To replace the spacer brackets, the enclosure must be removed from the rack.

## 5.2 Cable Tray Installation (Optional)

This procedure provides instructions for installing the cabling tray of an Ultrastar Data102 .

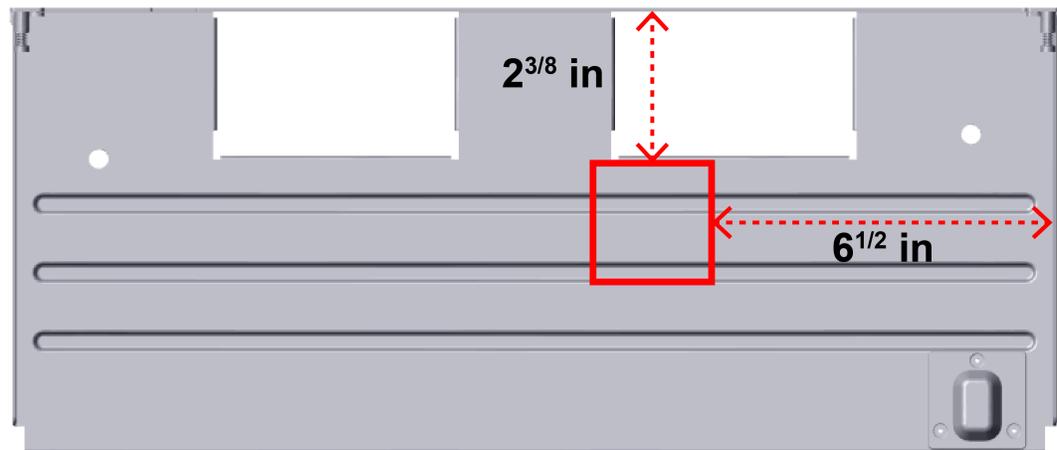
*Table 48: Installation Requirements*

<b>Tool(s):</b>	Long T10 Torx Screwdriver with torque measurement capability Cable tie mount
<b>Part(s):</b>	CMA Standard cable tray 1EX1119 or CMA Lite cable tray 1EX1603 M3 x 8mm T10 Torx screws
<b>Person(s):</b>	1
<b>Time:</b>	15 minutes

**Step 1:** Attach a cable tie mount to the cable tray.

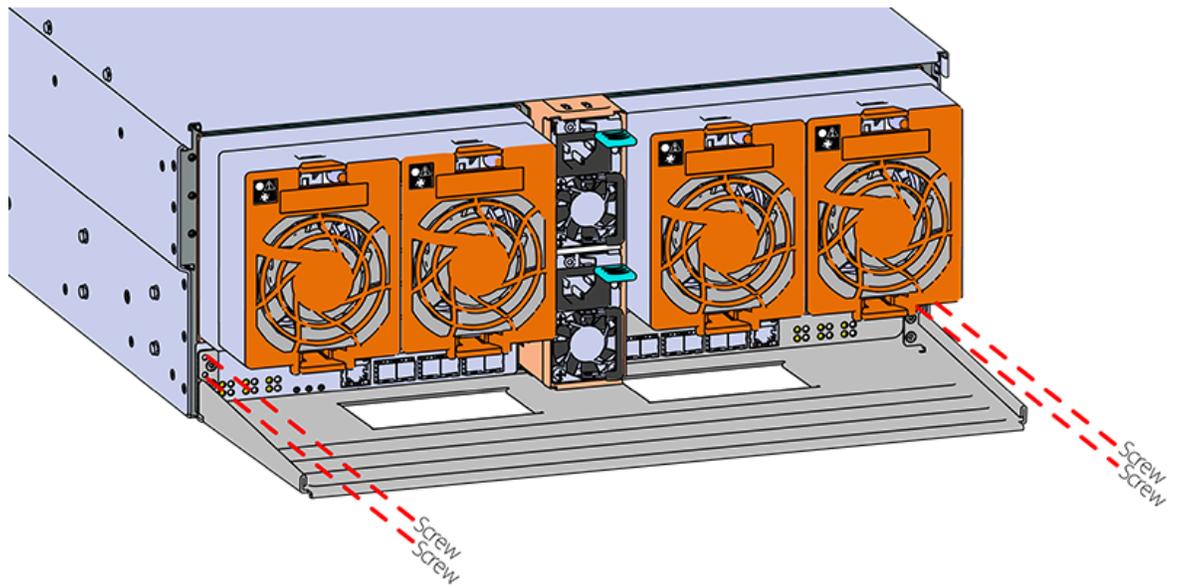
- Clean the surface of the cable tray, under the mounting area, with isopropyl alcohol and allow to dry.
- Adhere a cable tie mount in the approximate location shown in the following diagram:

*Figure 14: Cable Tie Mount Location*



**Step 2:** 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 15: Installing the Cable Tray



**What to do next:** The cable tray is now installed. Proceed to [Rails Installation \(page 42\)](#).

## 5.3 Rails Installation

This procedure provides instructions for installing the rails for an Ultrastar Data102 .

**Before you begin:** Complete the instructions in [Cable Tray Installation \(Optional\)](#) (page 40).



**Note: For CMA Lite only:** Ensure that the rack has about 2.5in. of extra space in front of the vertical rack rails. The intent of CMA Lite is to reposition the enclosure closer to the front of the rack to create a more centered enclosure.

Table 49: Installation Requirements

<b>Tool(s):</b>	# 2 Philips Screwdriver with torque measurement capability
	Long T15 Torx Screwdriver
	Rails Kit 1EX0435 (CMA Standard), or 1EX1601 (CMA Lite)
<b>Part(s):</b>	Low-Profile M4 x 3.2mm Philips screws
	M5 x 12mm T15 Flat Head Torx screws
	Screw plate (optional)
<b>Person(s):</b>	M5 cage nuts (CMA Standard)
	1
<b>Time:</b>	30 minutes

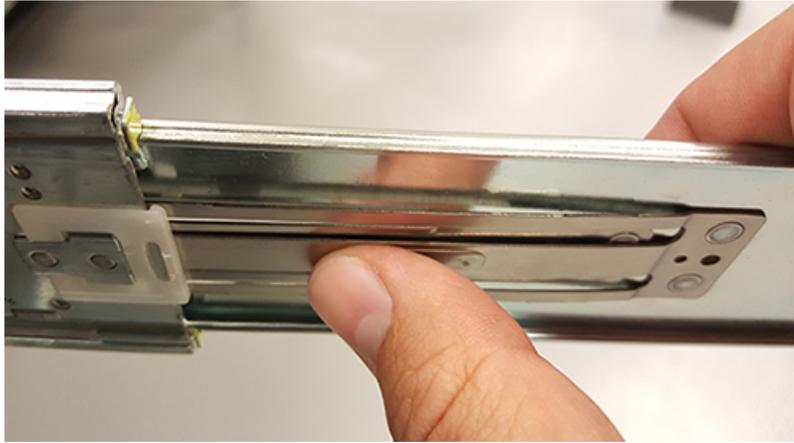
**Step 1:** Remove the inner rail that is nested inside the rack rails.



**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.

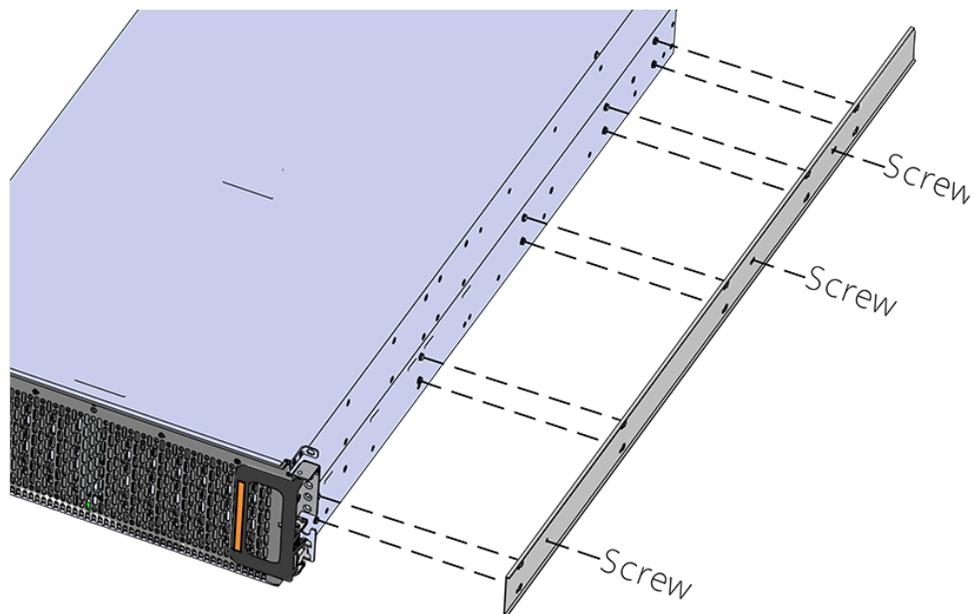
- a. Start by sliding the inner rail out of the outer/rack rail until the safety latch engages and the inner rail will not extend further. It will only slide one way.
- b. Press on the safety latch release spring located on the side of the rail and slide the inner rail out the rest of the way.

Figure 16: Rail Safety Latch



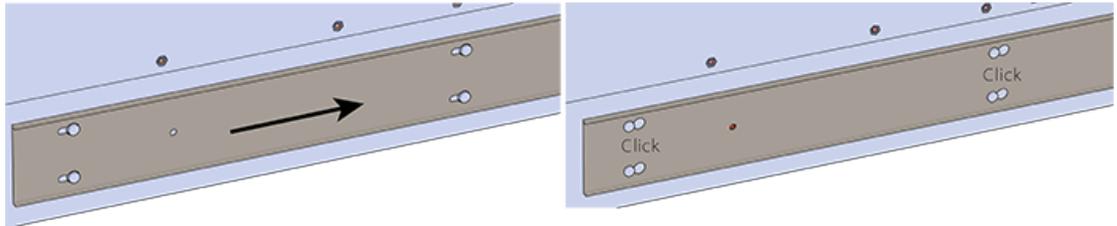
- Step 2:** Install the inner rail onto the chassis making sure they are installed on the correct side. Each inner rail will read "R" for the right or "L" for the left embossed on the side that faces away from the chassis. Right and Left are with reference to looking at the front of the enclosure.
- Orient the inner rails so that the flat side is facing the enclosure and the side with the grooves is facing away from the enclosure.
  - Align the keyholes on the inner rail to the mounting pegs on the side of the enclosure and press the inner rail flush against the chassis. If the keyholes don't line up with the pegs, flip the rail length-wise to see if this will align them.

Figure 17: Inner Rail Attachment



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

Figure 18: 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 three special low-profile M4 x 3.2mm Philips screws provided to secure the inner rail to the chassis.

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

**Step 3:** Set the vertical rack rail depth to between 32" and 36".

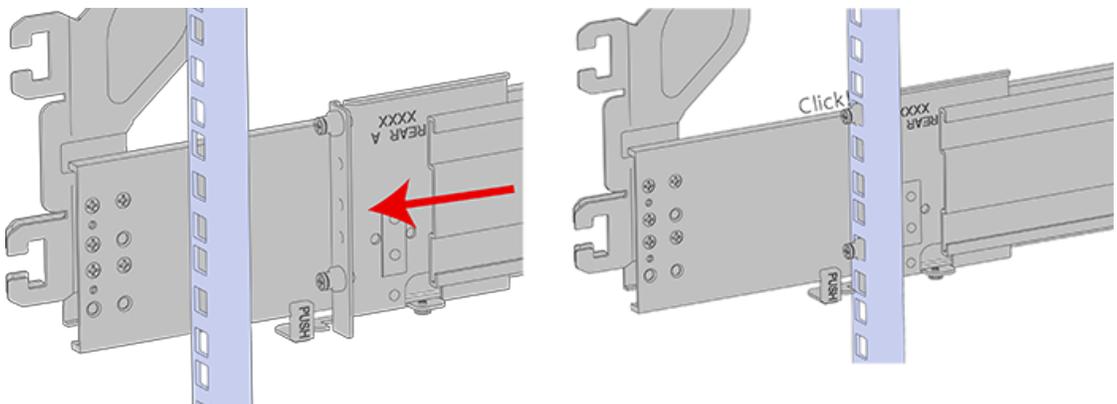


**Note:** Ensure that all of the vertical rails are set to the same depth using a tape measure.

**Step 4:** 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.

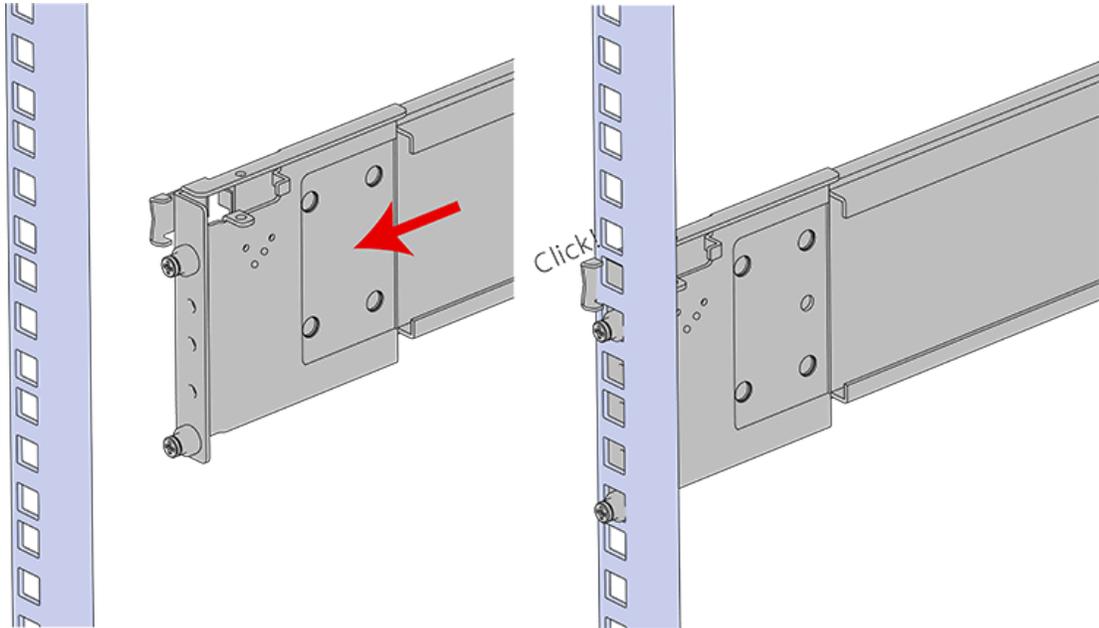
- a. Move to the rear of the rack.
- b. Orient the rail so that the word "REAR" that is embossed into the metal of the rail is at the rear end of the rack, and the release latch is facing the inside of the rack posts as shown in the following image.

Figure 19: 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 20: Front Rail Release Clip Operation



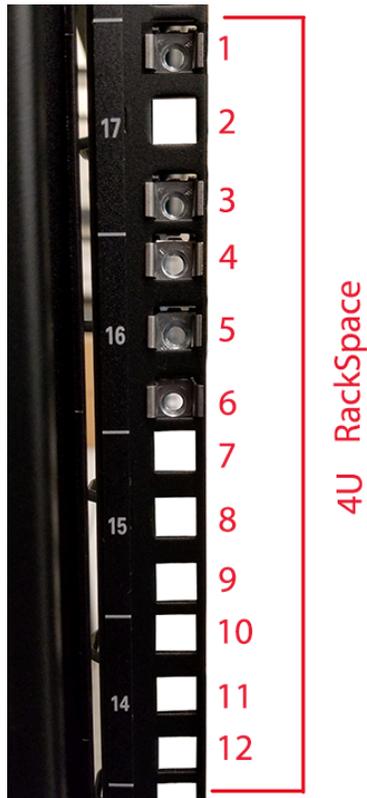
- g. Use a level to make sure that the rails are aligned properly.
- h. Follow these steps for the other outer rail.

**Step 5:** Install the rail mounting hardware, starting with the uppermost rack mounting hole of the 4U space on the front of the rack.

**CMA Standard:**

- a. Install one cagenut at the uppermost mounting hole of the 4U space that the enclosure will occupy.
- b. If the Ultrastar Data102 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 21: Cage Nut Spacing



**CMA Lite:**

- a. Line the spacer bracket up with the bottom of rack unit location of the installed outer rails. The bottom of the spacer bracket will rest on top of the bottom outer rail pin.

Figure 22: Spacer Bracket Orientation

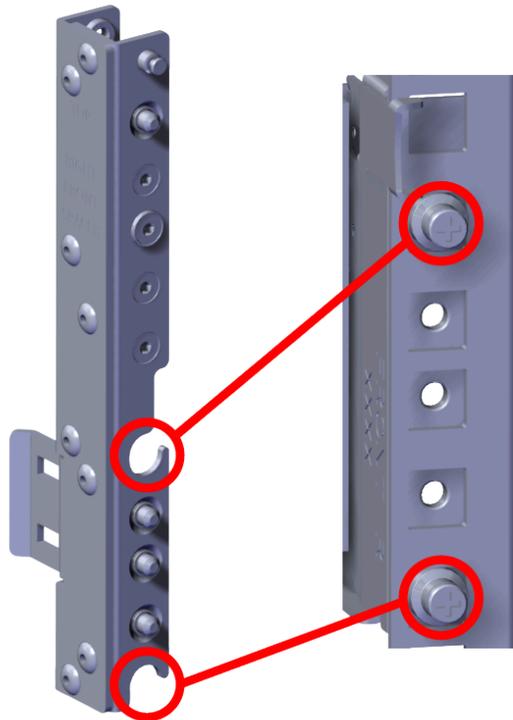
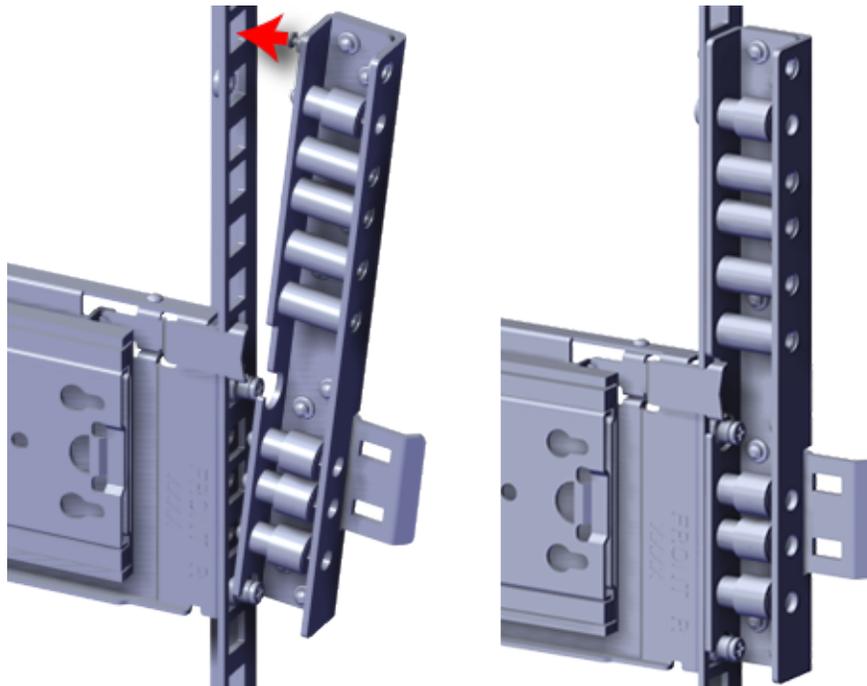
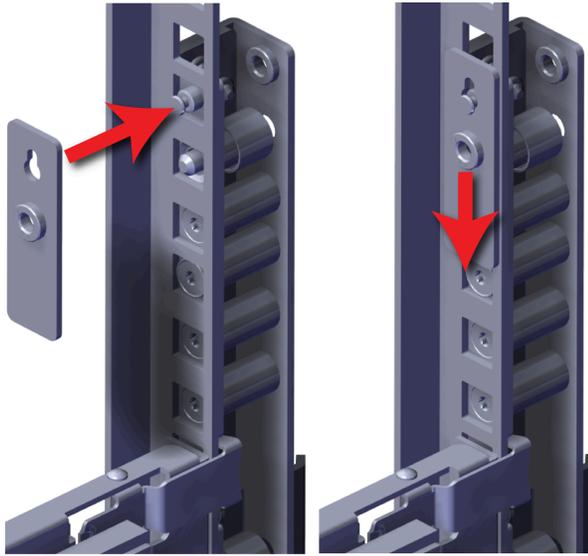


Figure 23: Spacer Bracket Placement



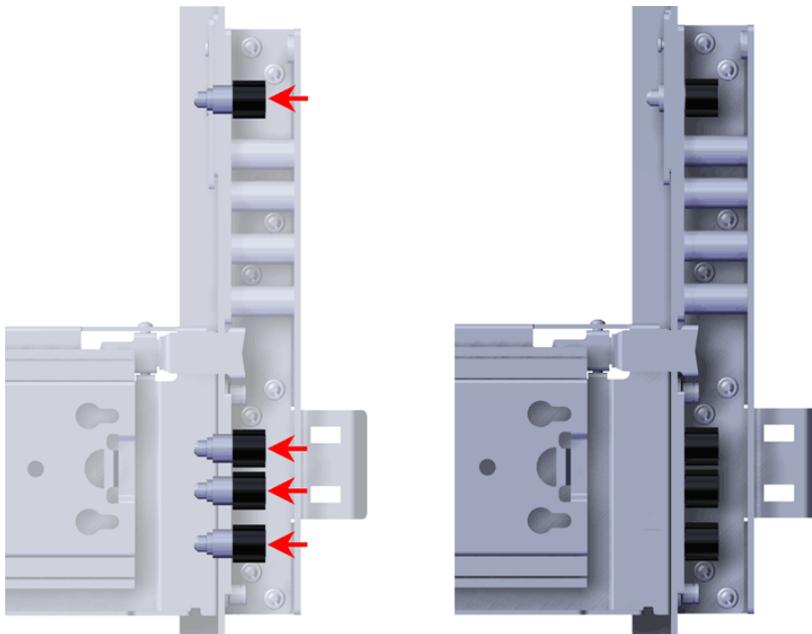
- b. Slide the nut plate down over the mounting pin on the back of the spacer bracket.

Figure 24: Rack Spacer Nut Plate Installation



- c. Using a T15 Torx screwdriver, tighten the top captive screw to secure the mounting plate in place. Tighten the remaining captive screws at the bottom of the spacer bracket, and torque all four of the captive screws to 3.38-3.61 Nm / 30-32 in-lbf.

Figure 25: Captive Screws

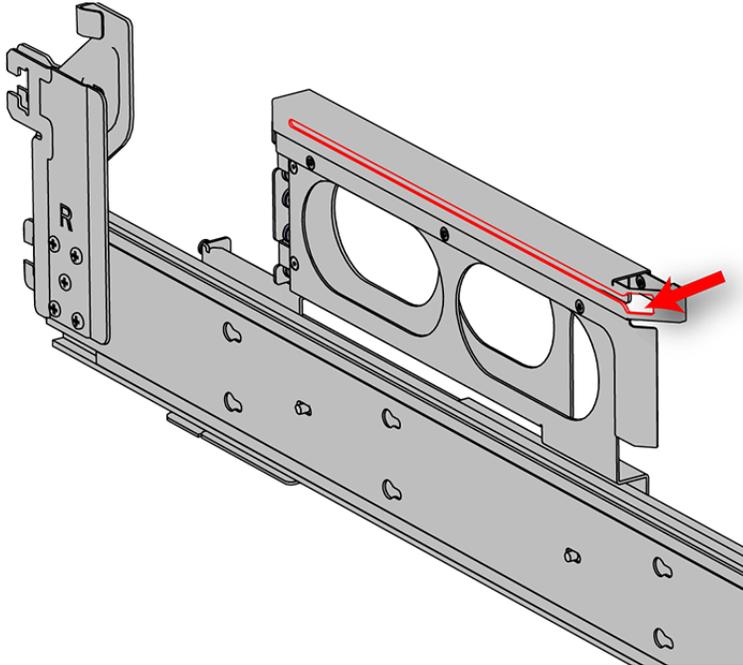


- d. Repeat these steps to install the remaining rack spacer.

**Step 6:** 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.

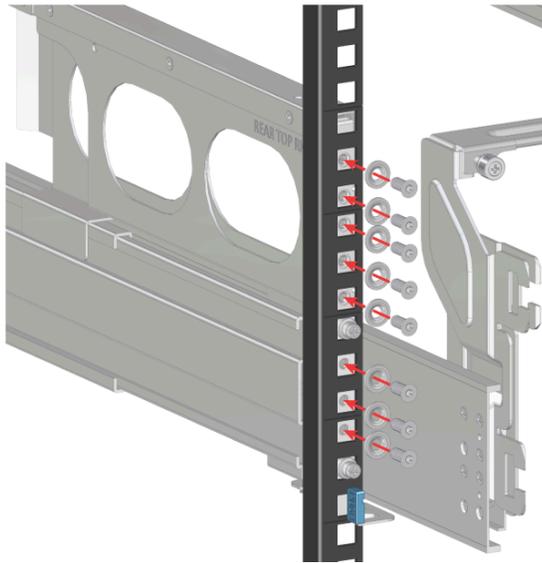
Figure 26: Alignment Bracket Groove (highlighted in red)



- 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.

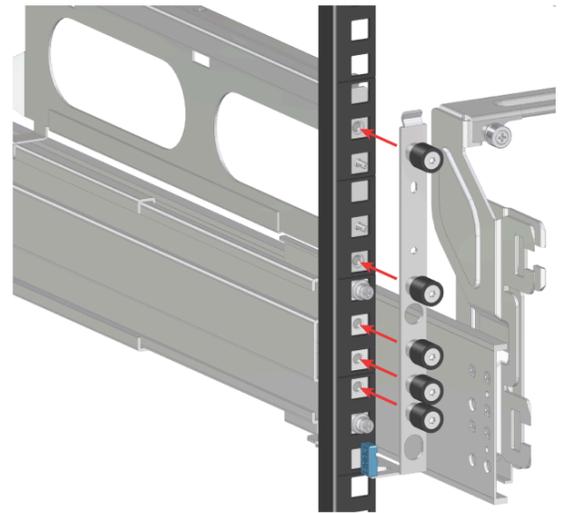
**Option 1:** Using a Long T15 Torx Screwdriver, install M5 x 12mm T15 Flat Head Torx screws (with washers) to attach the rear cover alignment bracket. The number of required screws will vary depending on the bracket type. Install additional M5 x 12mm T15 Flat Head Torx screws (with washers) to attach 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 27: Rear Screws Installation



**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 28: Screw Plate Installation



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

**Step 7: CMA Standard:** 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 29: 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.

**What to do next:** The rails are now installed. Proceed to [Chassis Installation \(page 52\)](#).

## 5.4 Chassis Installation

This procedure provides instructions for installing the chassis of an Ultrastar Data102 .

**Before you begin:** Complete the instructions in [Rails Installation \(page 42\)](#).

Table 50: Installation Requirements

**Tool(s):** N/A

**Part(s):** N/A

**Person(s):** 2 for team-lifting, plus 1 to guide and spot (total of 3)

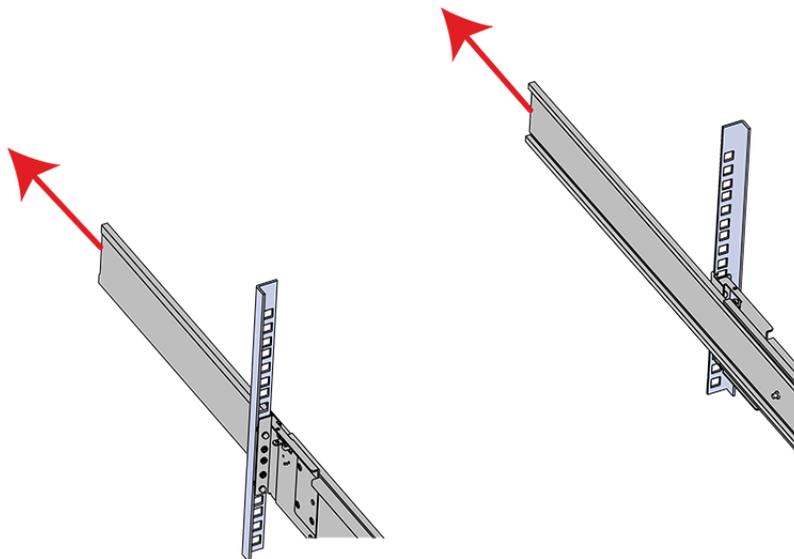
**Time:** 10 minutes



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

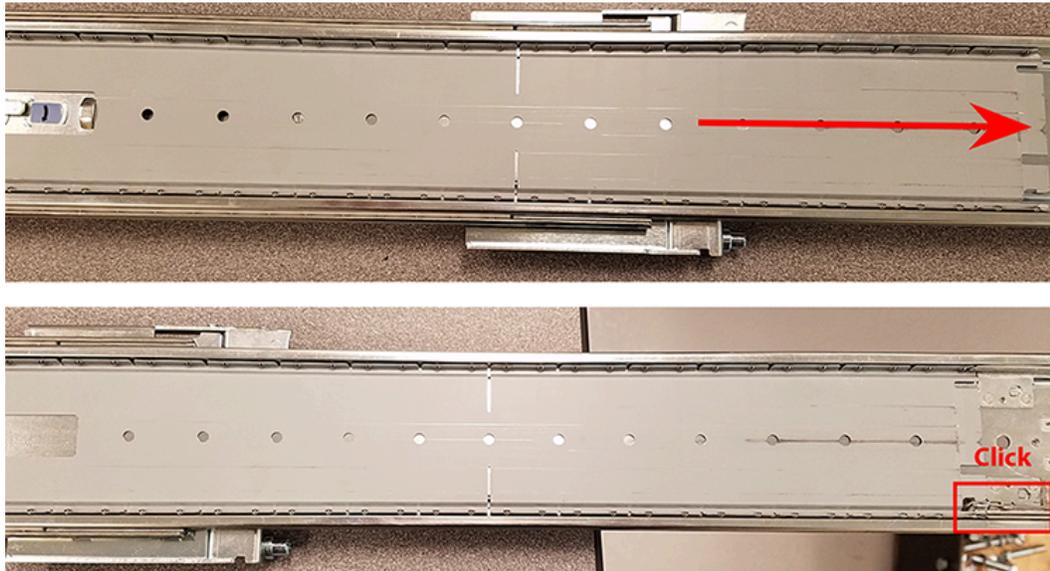
Figure 30: Extend Mid-Rails



**Step 2:** 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 31: 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.

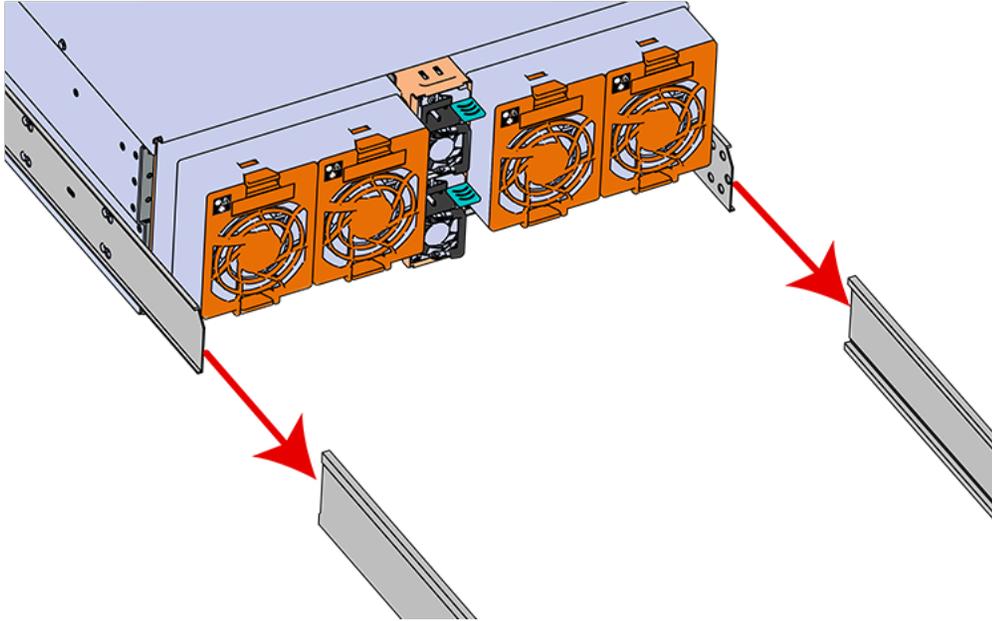
 **Warning:** The handles on the front of the chassis are not intended to be used to support the weight of the Ultrastar Data102 . Lifting the unit by the chassis handles or trying to support the unit on the handles can cause them to fail. This can cause serious damage to the unit or serious bodily harm 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).

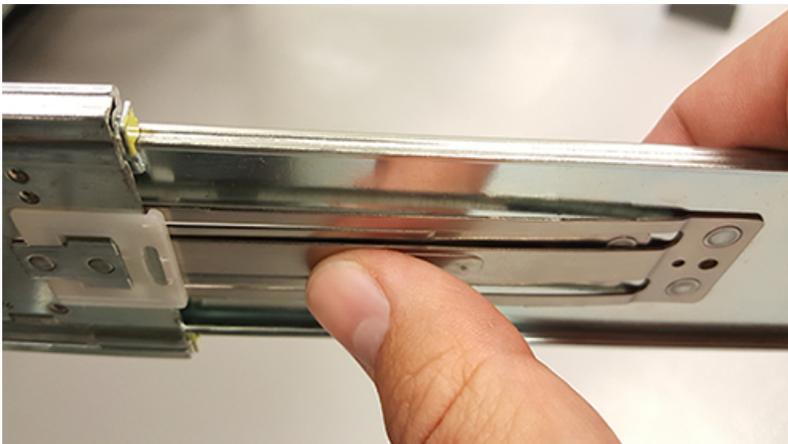
- c. Team-lift the enclosure until the inner rails (which are attached to the chassis) align with the extended mid-rails (which are attached to the rack), and guide the inner rails on the chassis to mate with the rack rails.

Figure 32: 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 33: 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.

**What to do next:** The chassis is now installed. Proceed to [CMA Installation \(page 55\)](#).

## 5.5 CMA Installation

This procedure provides instructions for installing the cable management assembly for an Ultrastar Data102 .

**Before you begin:** Complete the instructions in [Chassis Installation \(page 52\)](#).

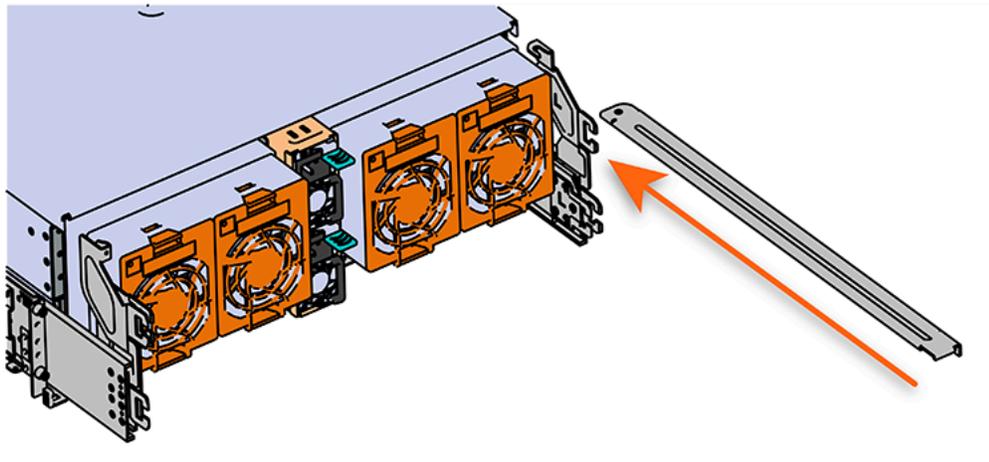
*Table 51: Installation Requirements*

<b>Tool(s):</b>	N/A
<b>Part(s):</b>	CMA Standard Arm 1EX1174 (single) or 1EX0437 (dual) CMA Lite Arm 1EX1834 (2U baskets) or 1EX1602 (1U baskets)
<b>Person(s):</b>	1
<b>Time:</b>	10 minutes

**Step 1:** Install the crossbar onto the CMA mounting bracket.

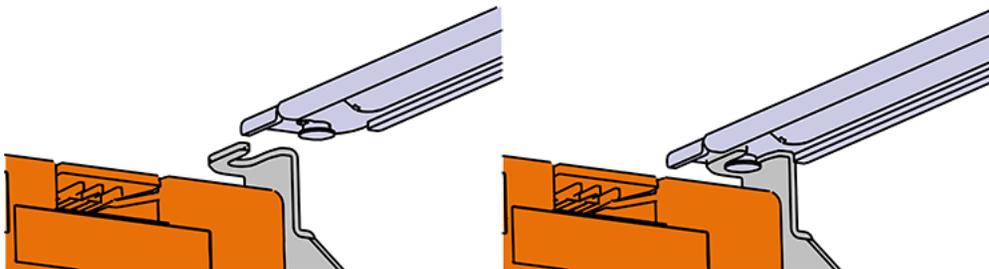
- a. Align the crossbar with the mounting peg facing down and pointing toward the CMA mounting bracket.

*Figure 34: Initial Alignment*



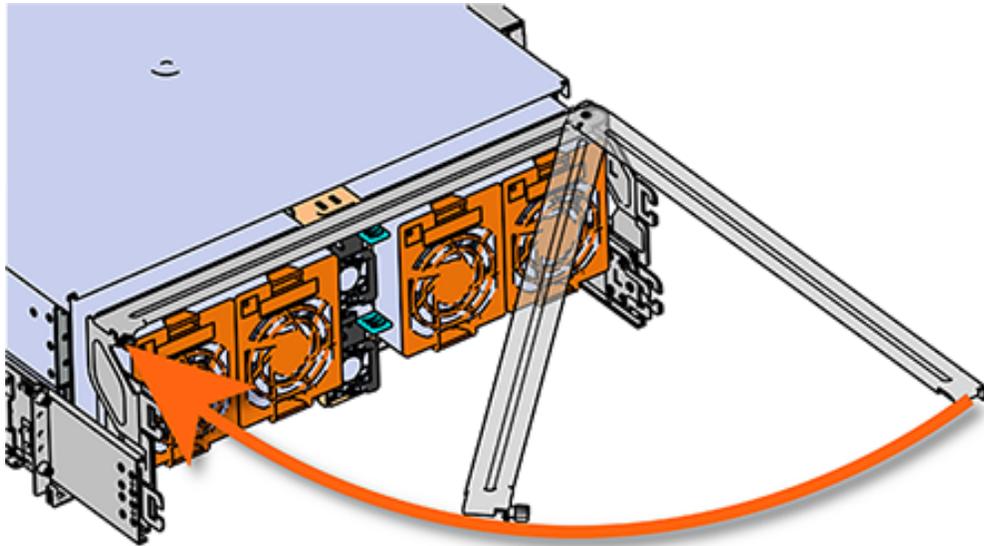
- b. Insert the peg on the underside of the crossbar into the slot on the CMA mounting bracket.

*Figure 35: Crossbar Underside Peg*



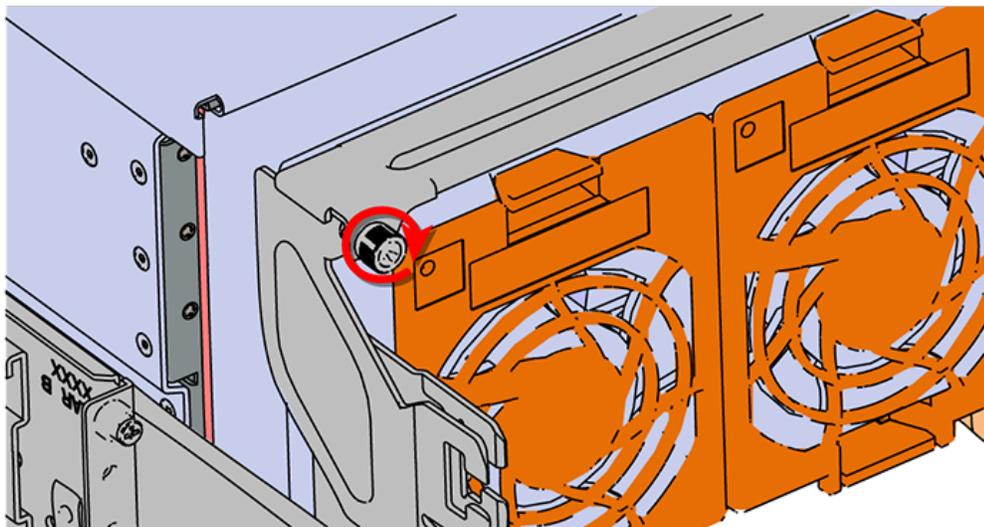
- c. Swing the crossbar so that the thumbscrew lines up with the mounting hole on the opposite side of the enclosure.

Figure 36: 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 37: 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 2:** Install the CMA(s).



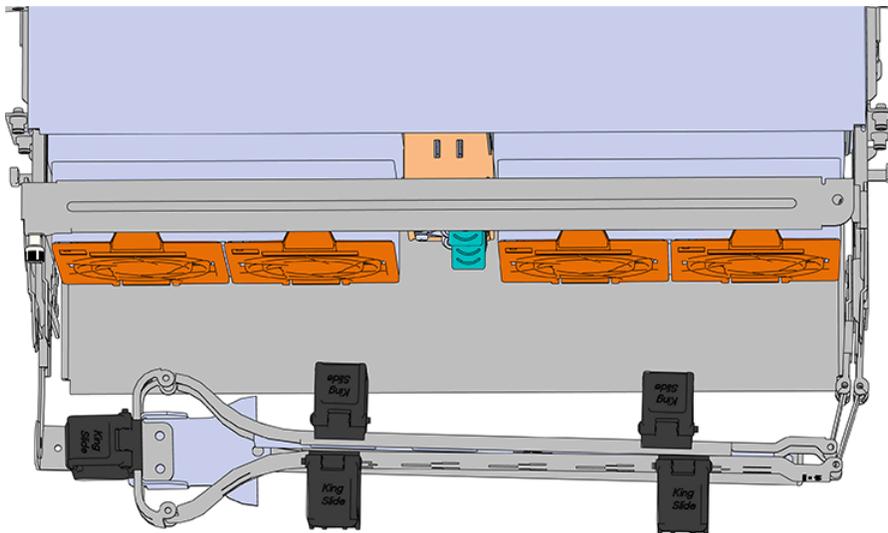
**Note:** The standard CMA has two arms, labeled "upper" and "lower." The lower arm should have the elbow on the left side and be installed first; the upper arm should have the elbow on the right side and be installed last.



**Note:** CMA Lite has one arm, to be installed at the lower position. This arm should have the elbow on the left side.

- 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 38: 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.

**What to do next:** The cable management assembly is now installed. Proceed to [Cable Installation \(page 58\)](#).

## 5.6 Cable Installation

This procedure provides instructions for installing the data and power cables for an Ultrastar Data102 .

**Before you begin:** Complete the instructions in [CMA Installation \(page 55\)](#).

*Table 52: Installation Requirements*

<b>Tool(s):</b>	N/A
<b>Part(s):</b>	Power cable(s) 1EX1158 Data cable(s) - quantity and type will vary by configuration
<b>Person(s):</b>	1
<b>Time:</b>	30 minutes

**Step 1:** Cable the CMA(s).

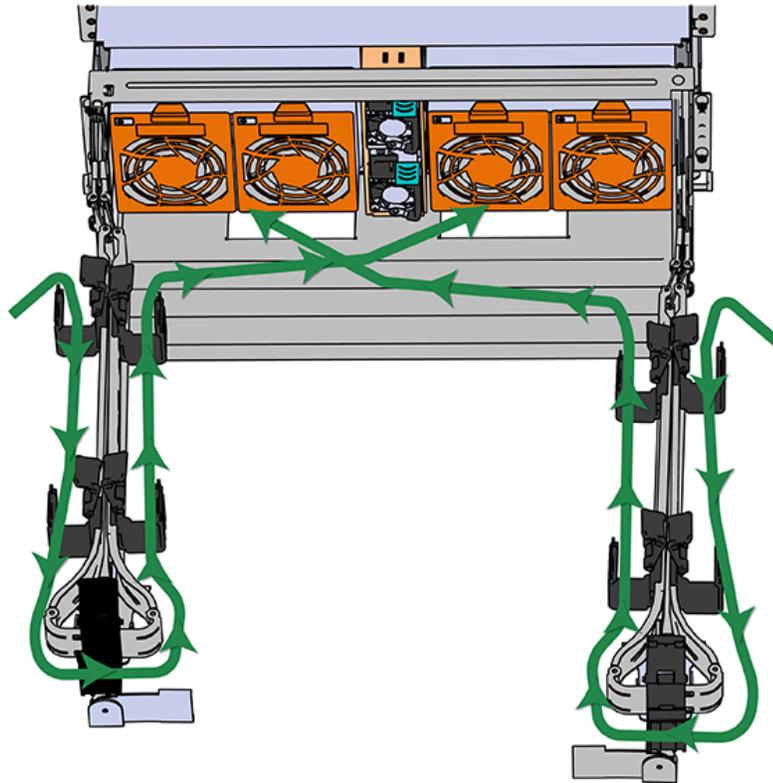
**CMA Standard:**

- 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:



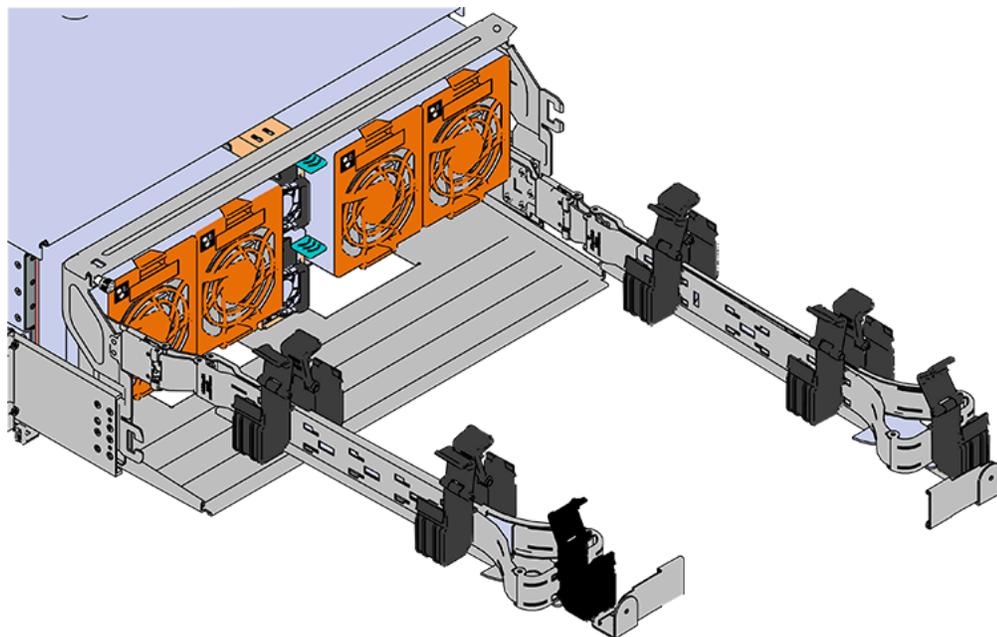
**Note:** Route the cables supported by the lower arm to IOM A (left hand side looking at the rear). Second, route the cables supported by the upper arm to IOM B (right hand side looking at the rear) in a "criss-cross" pattern. See the [Special Considerations for Cable Routing \(page 67\)](#) for more information.

Figure 39: CMA Cable Routing



- c. Open all of the baskets.

Figure 40: 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.

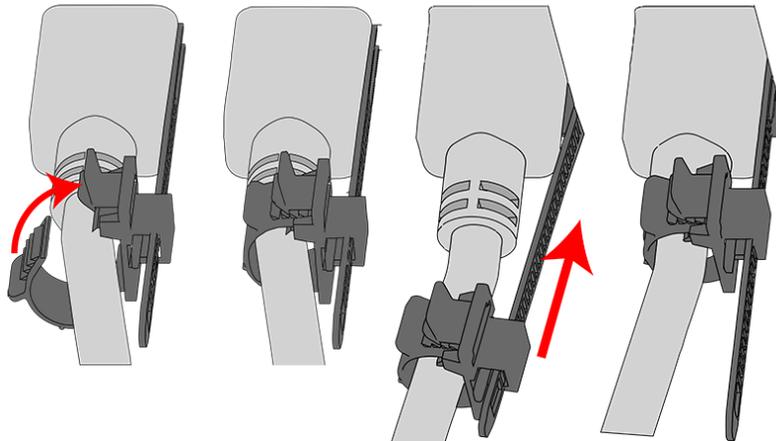


**Attention: Make sure the power cable is not connected to a PDU.** If it is, the system will power up when the cable is connected to a PSU. This is not intended at this stage of installation.

- g. Attach the cable retention mechanism.

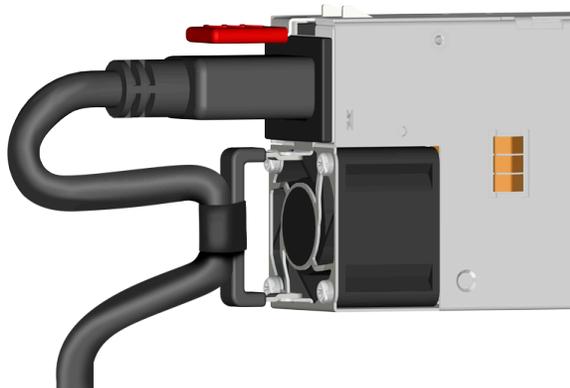
For PSUs with the clip-style retention mechanism, loop the clip around the power cable and pinch it until the clip catches and locks in place. Then slide the clip forward until it stops near the cable connector.

*Figure 41: 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 42: Strap-Style Cable Retention*



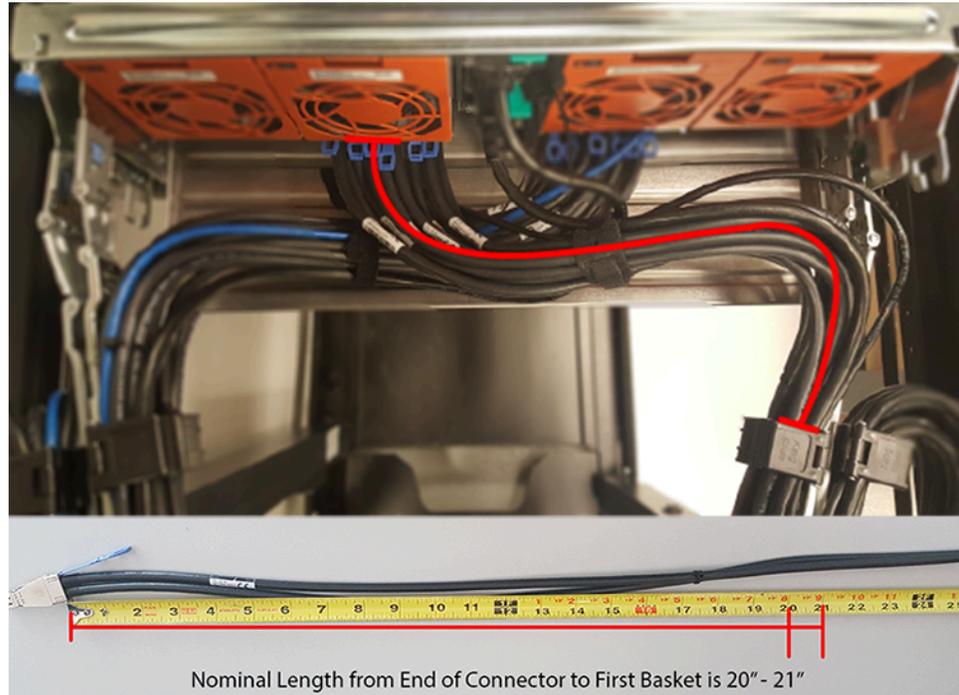
- h. Route the power cable through each basket.

- i. If the installation includes more than 10 total cables, follow the recommendations in **Special Considerations for Cable Routing (page 67)**, 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 43: Nominal Cable Length at Connectors*

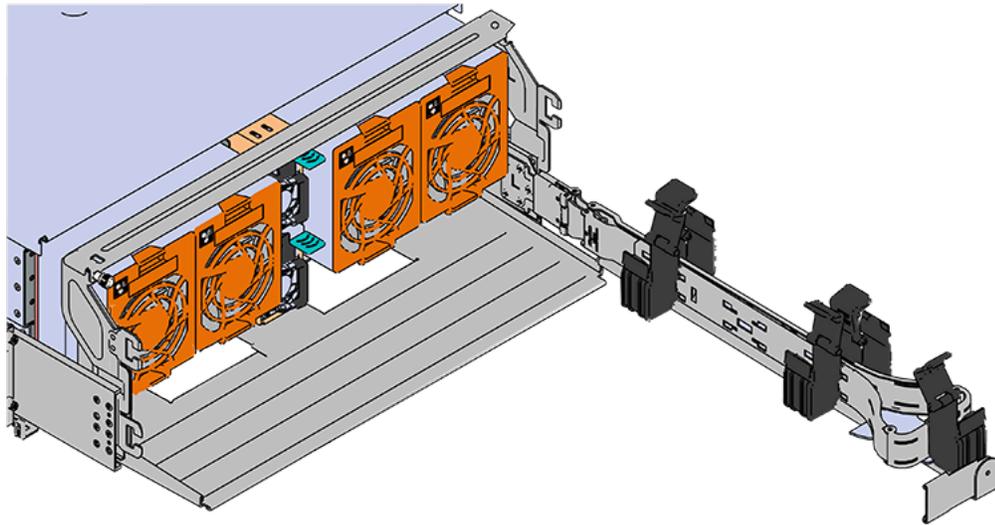


- j. Close all of the baskets.
- k. If the Ultrastar Data102 is being installed in a rack and will subsequently be transported inside that rack, it is important to use the included cable tie to wrap the CMA bundle to ensure it does not get damaged during transport. If the Ultrastar Data102 is instead 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.

**CMA Lite:**

- a. Press the blue latch button labeled "push" to unlatch the elbow side of the CMA arm, and then swing the arm open.
- b. Open all of the baskets.

Figure 44: Open Baskets



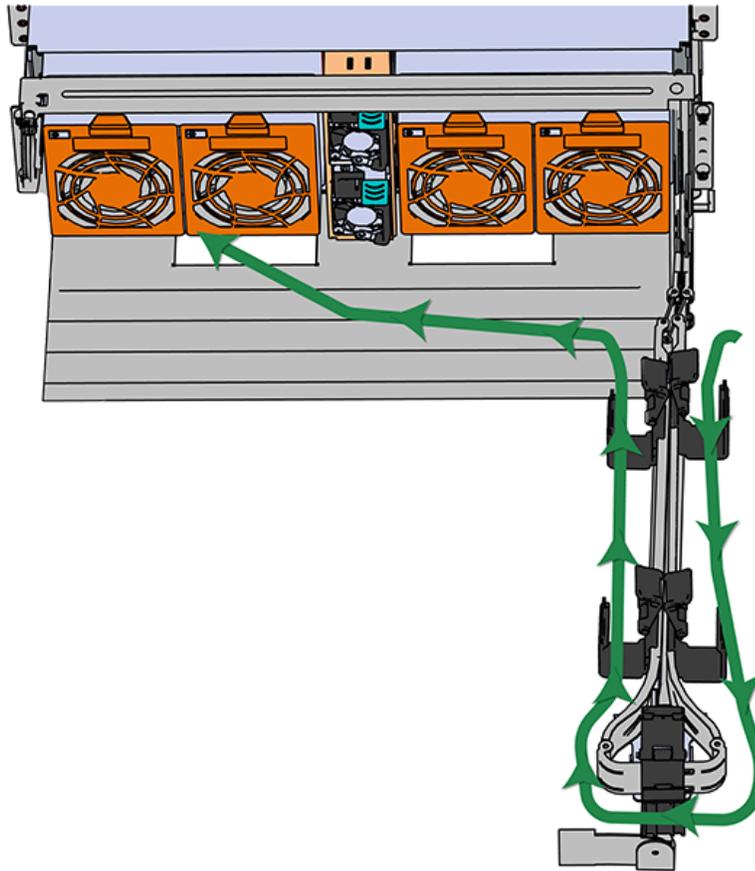
- c. Gather the SAS, power, and Ethernet cables for installation.



**Note:** Route all cables to IOM A (left hand side looking at the rear).

- d. Connect the Ethernet cables to the Ethernet ports on the left hand side of the Ultrastar Data102 , and then route the cables through each of the baskets on the arm.

Figure 45: Connected Cable Routing



- e. Connect the SAS cables and route them through the baskets one at a time. Follow the labels to ensure they are connected to the proper ports.
- f.  **Important: Make sure the power cable is not connected to a PDU.** If it is, the system will power up when the cable is plugged into the PSU. This is not intended at this stage of installation.

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

- g. Close all of the baskets.
  - h. If the Ultrastar Data102 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 Data102 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.
  - i. Reconnect the arm to the rail by the connector at the elbow.
- Step 2:** 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 3:** 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.

**What to do next:** The data and power cables are now installed. Proceed to [Top Cover Installation and Extension Test \(page 73\)](#).

## 5.6.1 SAS Cabling

The Ultrastar Data102 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 Data102 enclosures together, active cables must be used between enclosures for improved signal integrity.



**Important:** Active Optical SAS cable support is limited to Broadcom 9300-, 9302-, 9305-, 9400-, 9500-, and 9600-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 53: Approved Active Optical HD Mini-SAS to HD Mini-SAS Cables

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

### Passive Cabling

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

Table 54: Approved Passive HD Mini-SAS to HD Mini-SAS Cables

Length	Manufacturer	Vendor Part Number
1m	Amphenol ICC (FCI)	10112041-2010LF

- Listed JPC P5388FC300xxx cables are compatible, beginning with firmware version 4008-020 and later.
- Listed FOHHB23P00xxx cables are compatible, beginning with firmware version 2052-020 and later.

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

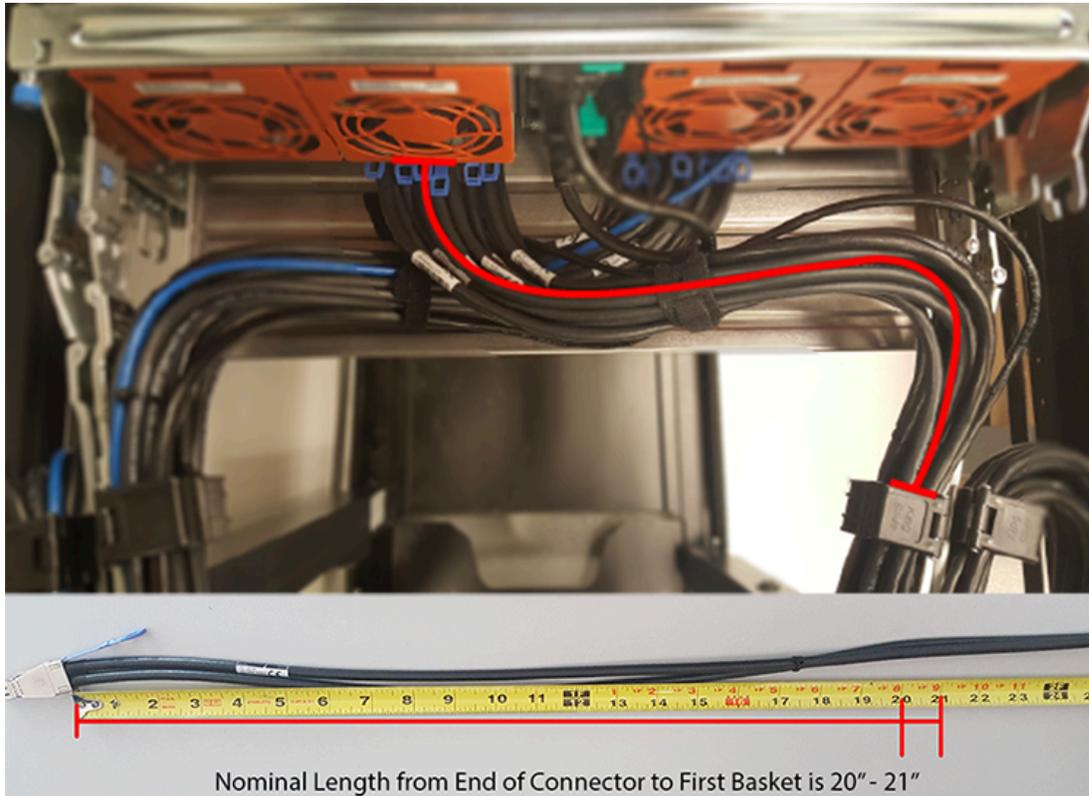
Edge buffering is an enclosure feature that increases the overall performance when a 6Gb/s target is connected. With edge buffering disabled, primitives that can be deleted from the initiator are added to slow the effective logical rate to the slowest target device connected between the initiator and 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.

## 5.6.2 Special Considerations for Cable Routing

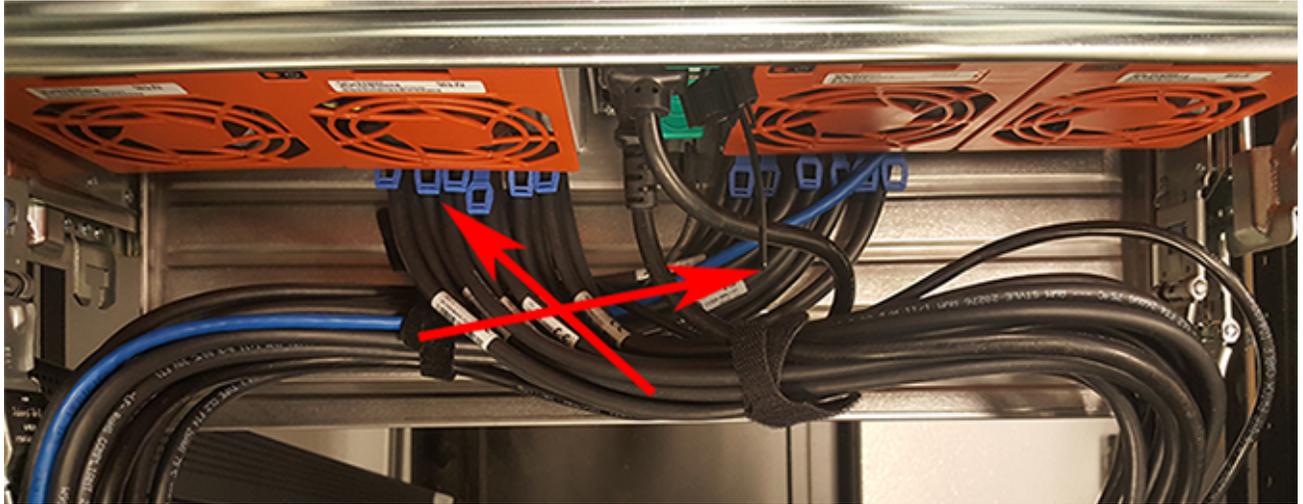
There are a number of special considerations installers should take when routing cables through the CMA. This section outlines those considerations.

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.

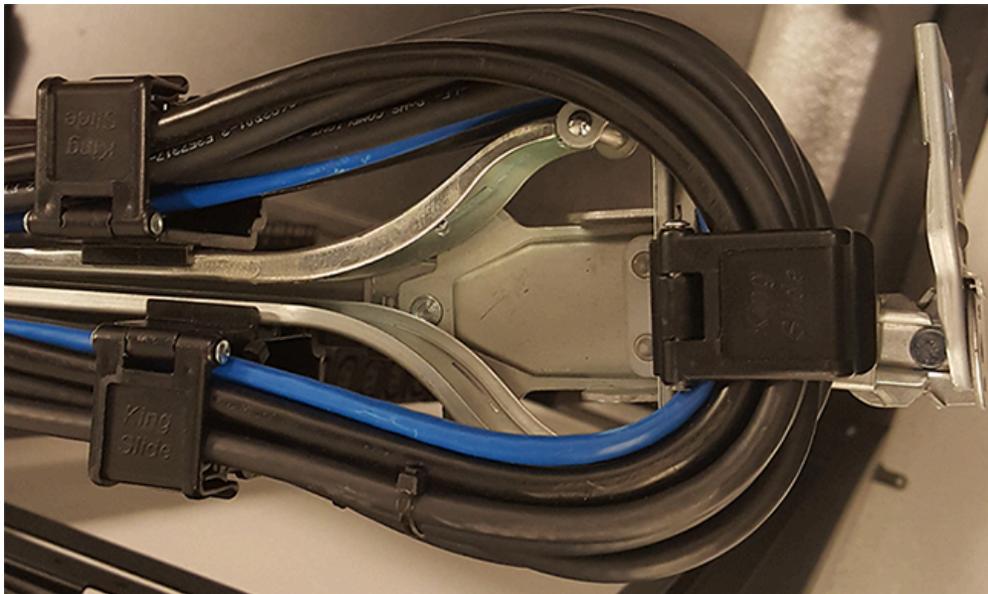
Figure 46: Nominal Cable Length at Connectors



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

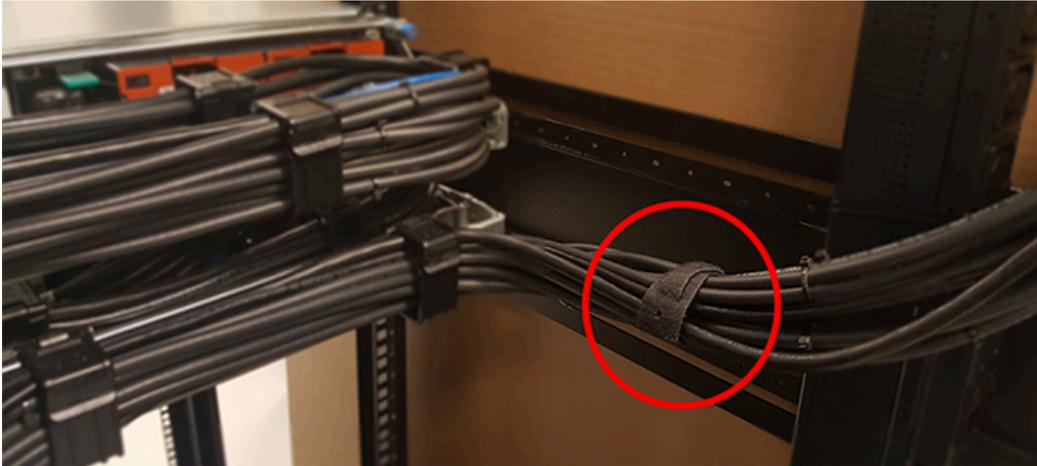
*Figure 47: Crisscross Cables*

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 48: 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 49: Cable Tie at Exit of CMA



### 5.6.3 Cabling for CMA Standard and CMA Lite

#### 5.6.3.1 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 either the CMA Standard or CMA Lite. The power and Ethernet cables do not need to be added to the Service Loop bundle. This concept utilizes measurements that begin at the connector end of the cable and along the cable itself. The Service Loop Dimensions figure and the Service Loop Dimensions table are paired together to communicate the length in which connectors, velcro, and the CMA cage must be set at to avoid binding or snagging.



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

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

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

Figure 50: Service Loop Dimension Figure

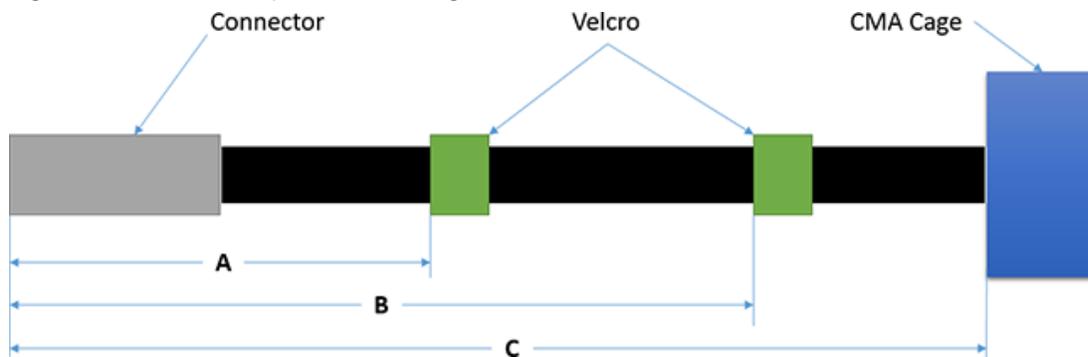


Table 56: Example Service Loop Dimension Table

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

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

### 5.6.3.2 Cabling CMA Standard

#### 5.6.3.2.1 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 51: Service Loop Dimension Figure

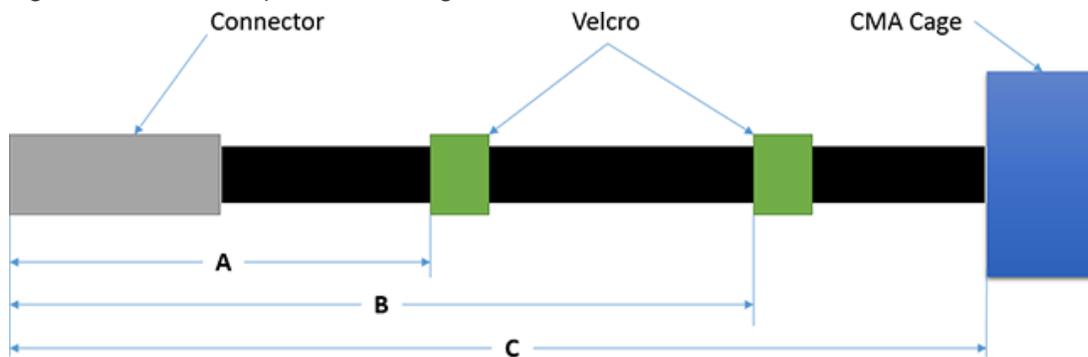


Table 57: Service Loop Dimension Table

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

### 5.6.3.3 Cable Configuration for CMA Lite

#### 5.6.3.3.1 Maximum HD Mini-SAS Configuration

This configuration includes the use of up to **two** HD Mini-SAS cables, **two** Ethernet cables, and **two** power cables installed into a CMA Lite arm.

Figure 52: Service Loop Diagram

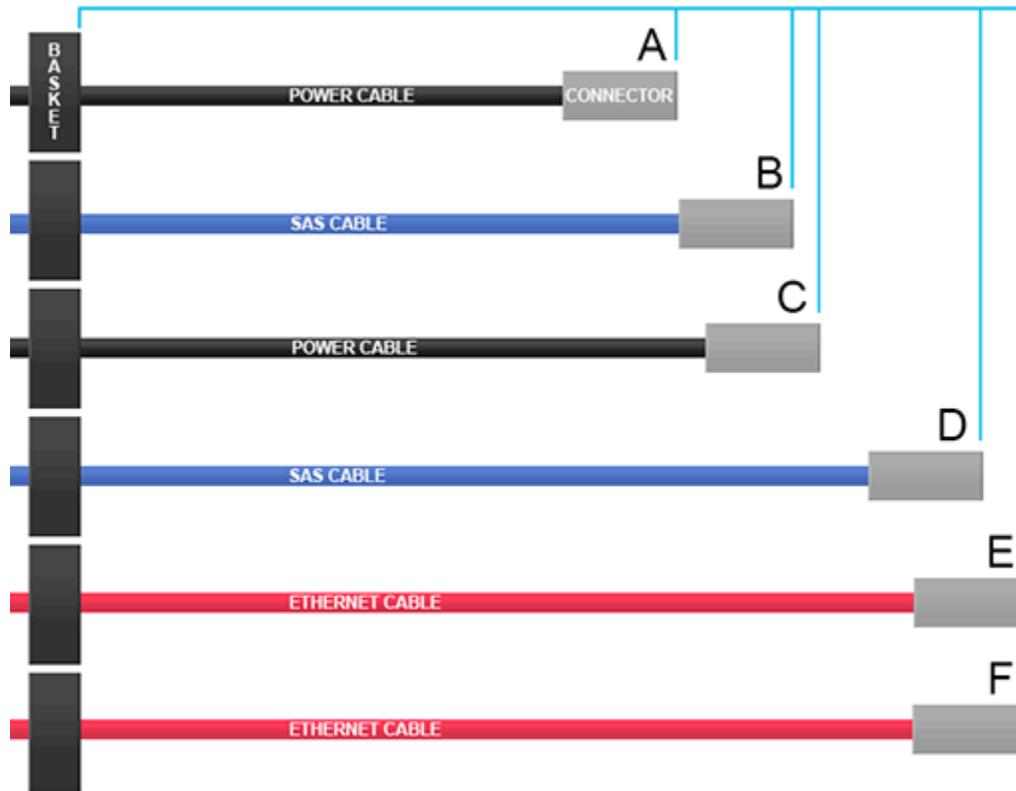


Table 58: Service Loop Lengths

Cable Identifier	Length to First Basket Clip
A	16 in / 406 mm
B	18 in / 457 mm
C	19 in / 483 mm
D	22 in / 559 mm
E	23 in / 584 mm
F	23 in / 584 mm

## 5.7 Top Cover Installation and Extension Test

This procedure provides instructions for installing the top cover and performing an enclosure extension test for an Ultrastar Data102 .

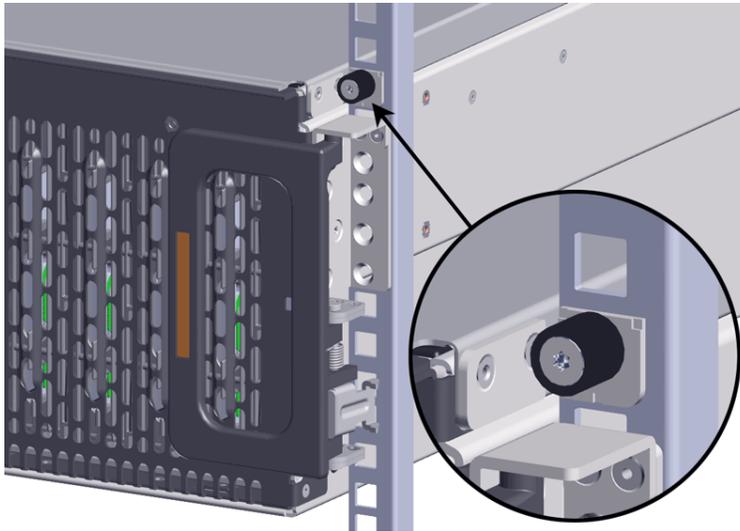
**Before you begin:** Complete the instructions in [Cable Installation \(page 58\)](#).

*Table 59: Installation Requirements*

<b>Tool(s):</b>	Long T15 Torx Screwdriver
<b>Part(s):</b>	N/A
<b>Person(s):</b>	1
<b>Time:</b>	5 minutes

**Step 1:** 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 53: Cover Retention Screws*



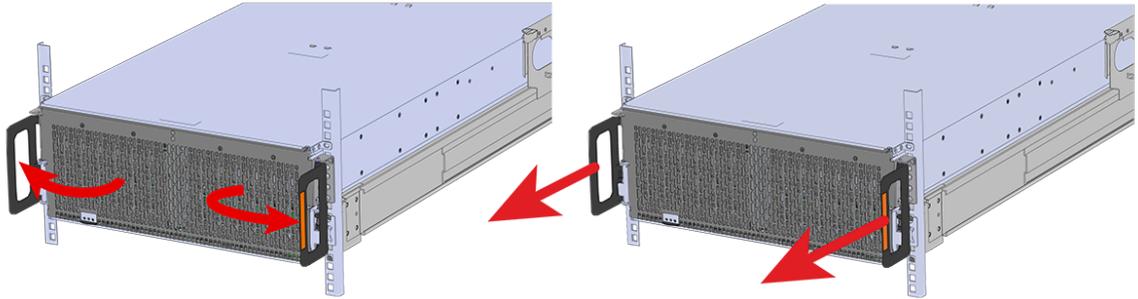
**Step 2:** Now that the chassis is installed, test the installation by sliding the enclosure in and out of the rack a minimum of three times. If the enclosure binds, catches, or displays any incorrect motion or behavior repeat the installation.



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

**Step 3:** 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 4:** Perform this same action two more times without the drives loaded to make sure the rail kits are installed properly.

**What to do next:** The top cover is now installed, and extension of the enclosure for servicing has been tested. Proceed to [Drive Installation \(page 75\)](#).

## 5.8 Drive Installation

This procedure provides instructions for installing drives in an Ultrastar Data102 .

**Before you begin:** Complete the instructions in [Top Cover Installation and Extension Test \(page 73\)](#).

Table 60: Installation Requirements

<b>Tool(s):</b>	N/A
<b>Part(s):</b>	3.5in HDD Assembly and/or 2.5in SSD Assembly
<b>Person(s):</b>	1
<b>Time:</b>	30 minutes

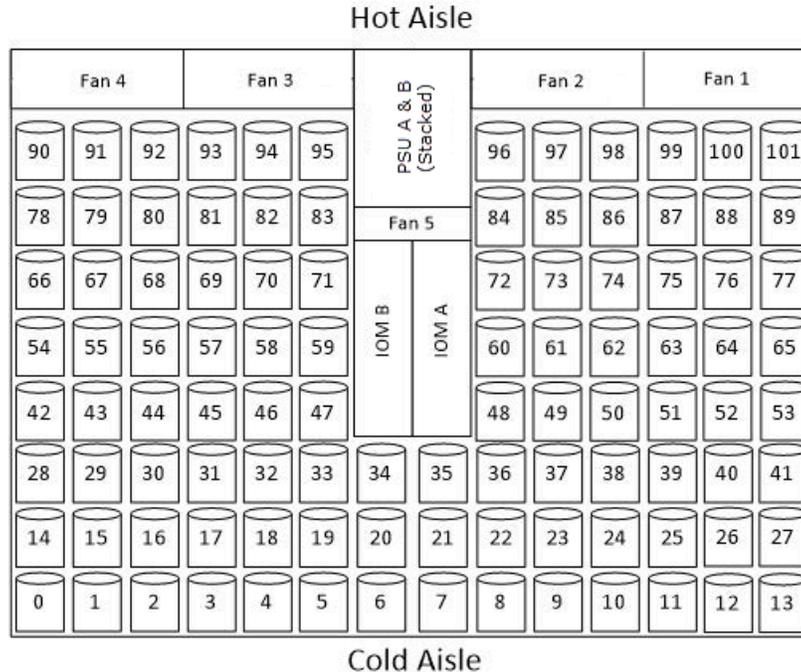


**Note:** The 2.5in SSD Assembly is installed in the same manner as the 3.5in HDD Assembly. For instructions on assembling the 2.5in SSD Assembly, see [Operating the 2.5" Drive Carrier \(page 81\)](#).



**Note:** When installing drives, populate the enclosure from left-to-right, rear-to-front. For example, begin with slot 90 (as shown in the following diagram), continue through 101, then proceed with 78 through 89, and so on:

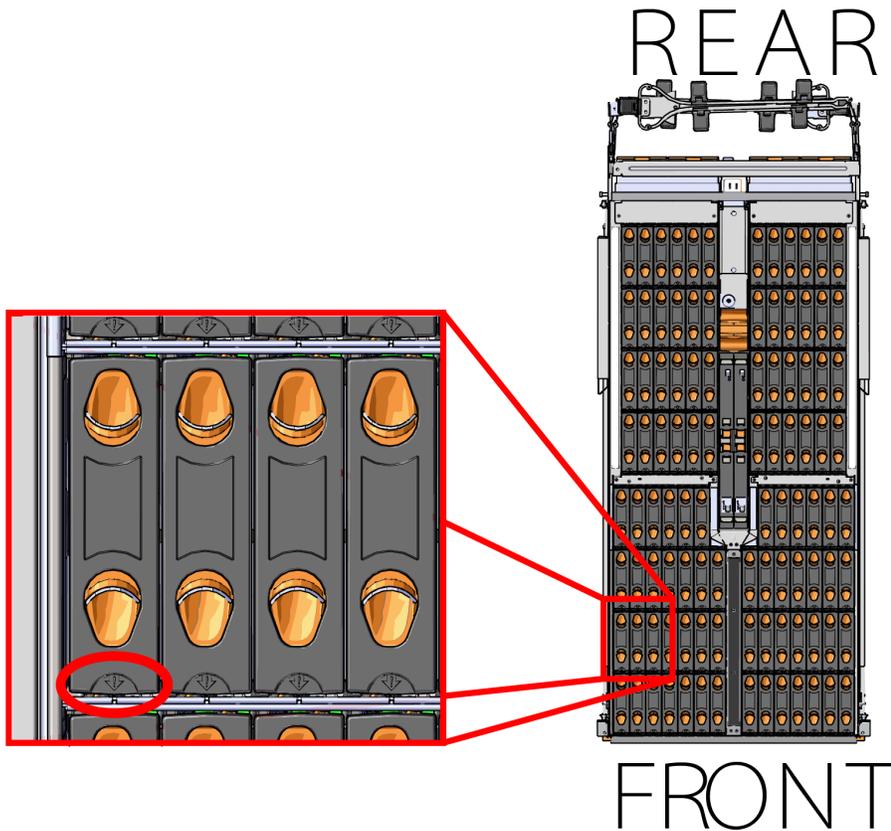
Figure 55: Drive Layout



**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:



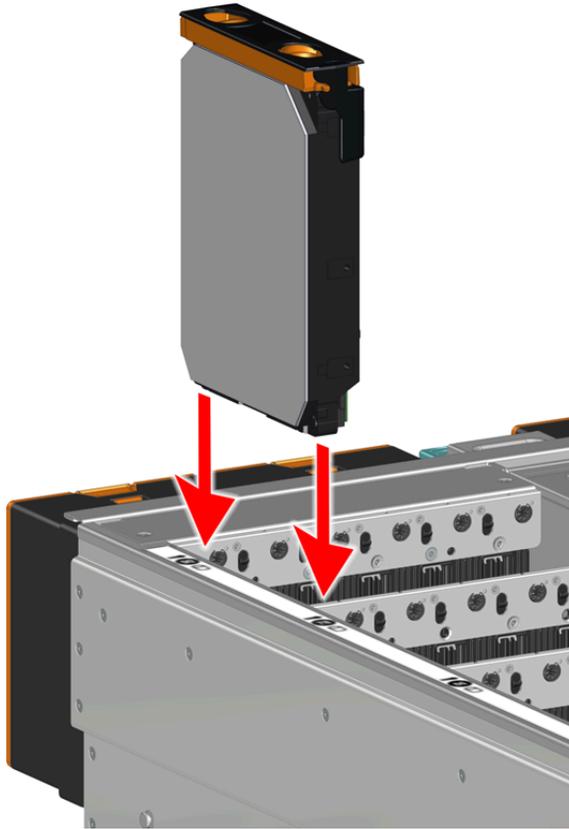
Figure 56: LED Pointer Orientation



**Caution:** To ensure proper airflow for enclosure cooling, all drive slots must be populated with either drives or drive blanks.

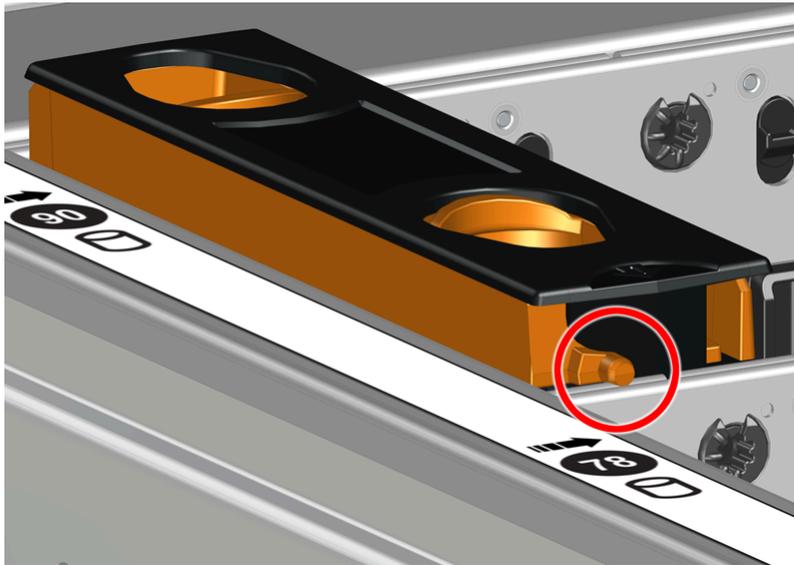
- Step 1:** Ensure that the enclosure has been pulled out of the rack until the rail latches engage.
- Step 2:** Align the drive with the empty slot that will receive it. Lower it into the slot, ensuring that it stays level and does not bind.

Figure 57: Inserting a 3.5in HDD Assembly



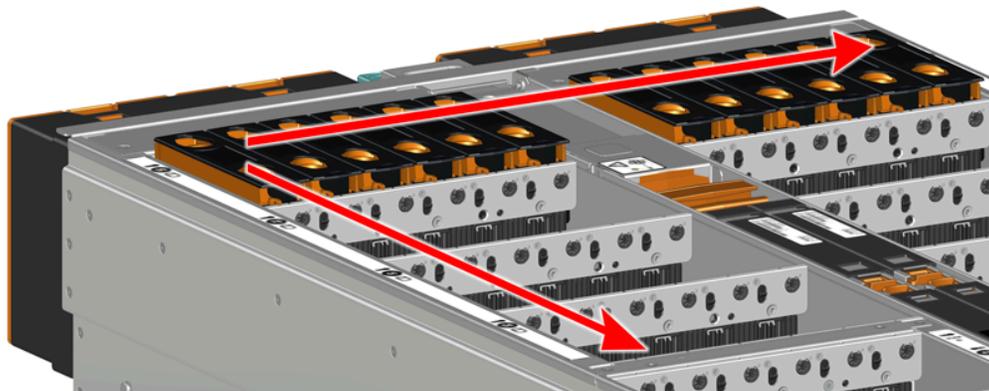
**Step 3:** Lower the drive until the spring-loaded posts on the carrier contact the top edges of the drive slot. This is an intermediate position; the drive assembly will be fully seated later on.

Figure 58: Intermediate Install Position



- Step 4:** 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 59: Populating the Enclosure



- Step 5:** 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 60: Seating the 3.5in HDD Assembly

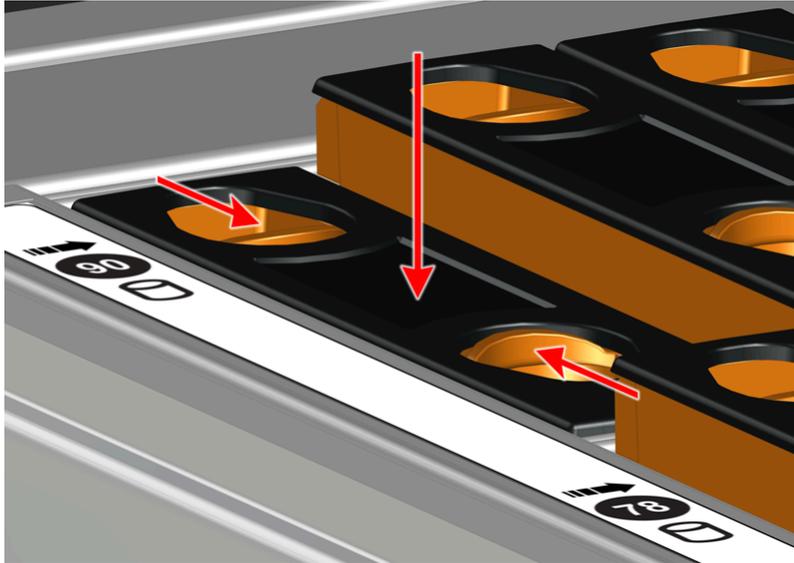
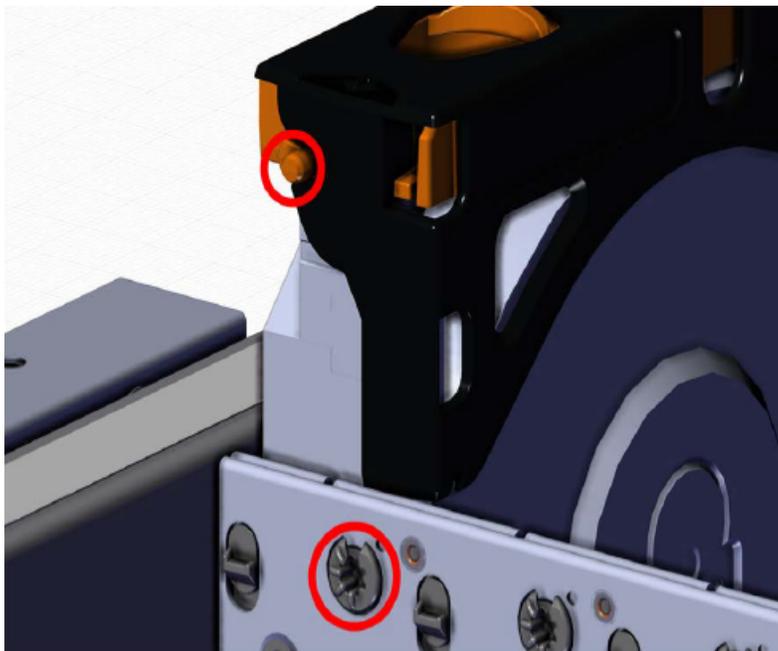
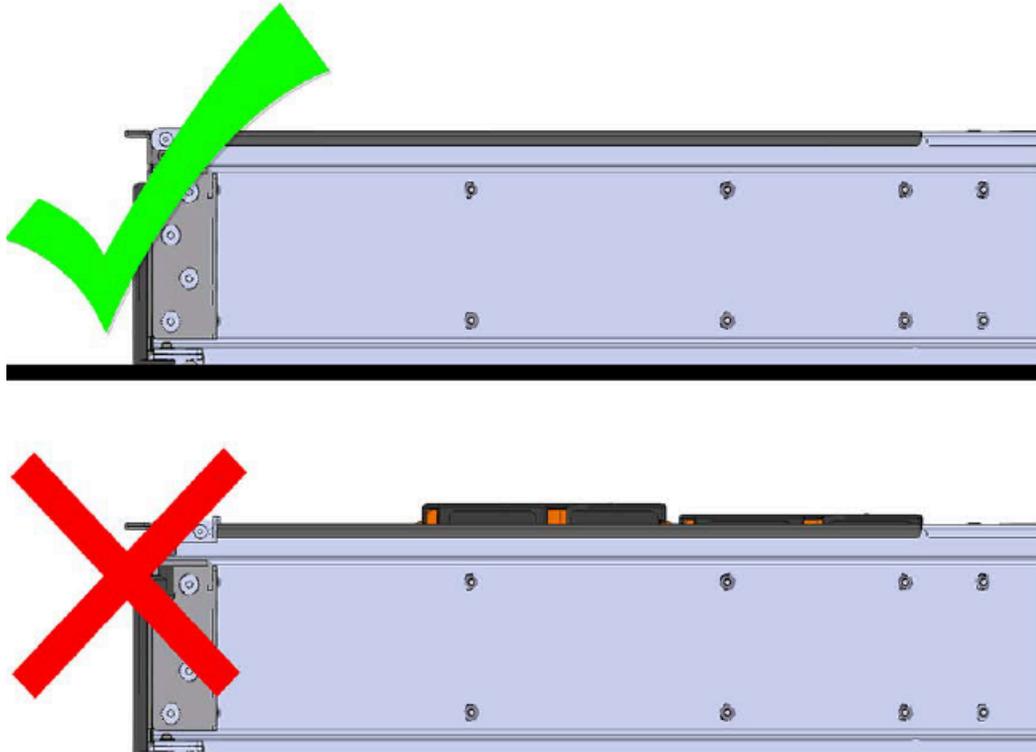


Figure 61: Grommet and Latch Pin Identification



- Step 6:** Repeat this action to fully install the remaining drive assemblies in the same order, from left-to-right, rear-to-front.
- Step 7:** View the enclosure from the side to make sure all drive assemblies are flush.

Figure 62: Verify Drive Assemblies Flush



**Step 8:** 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.

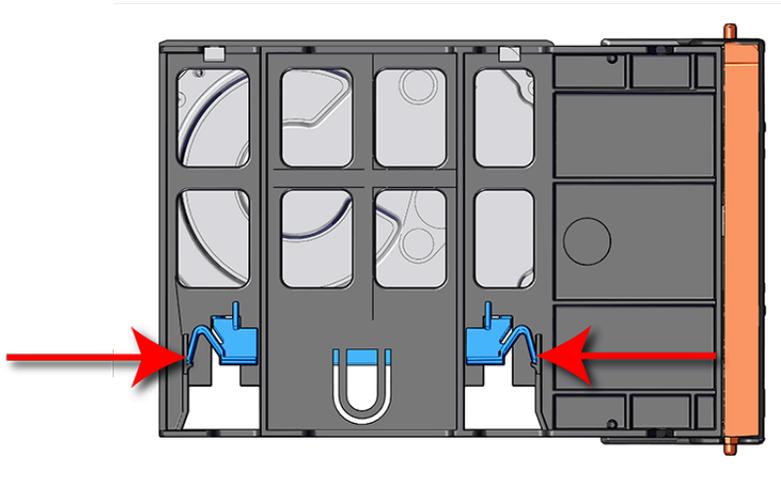
**What to do next:** The drives are now installed. Proceed to [Shipping Screws Installation \(page 83\)](#).

### 5.8.1 Operating the 2.5" Drive Carrier

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

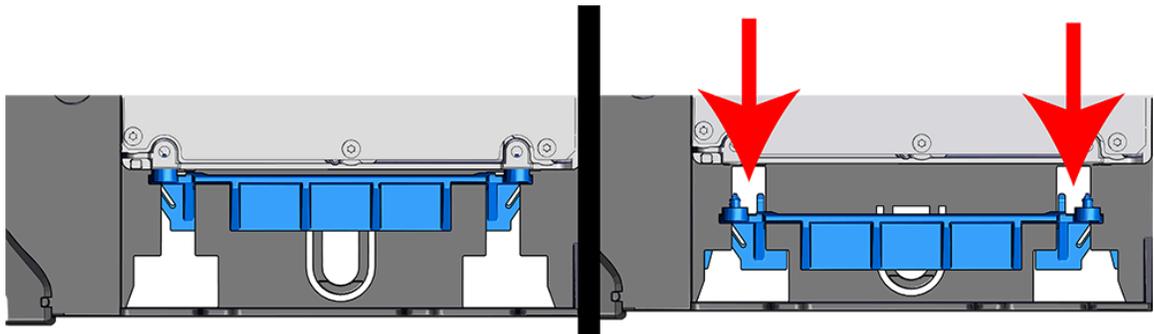
**Step 1:** Locate the release clips on the rear and press them inward to release the clamp.

Figure 63: Clamp Release (clamp shown in blue for visual clarity)



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

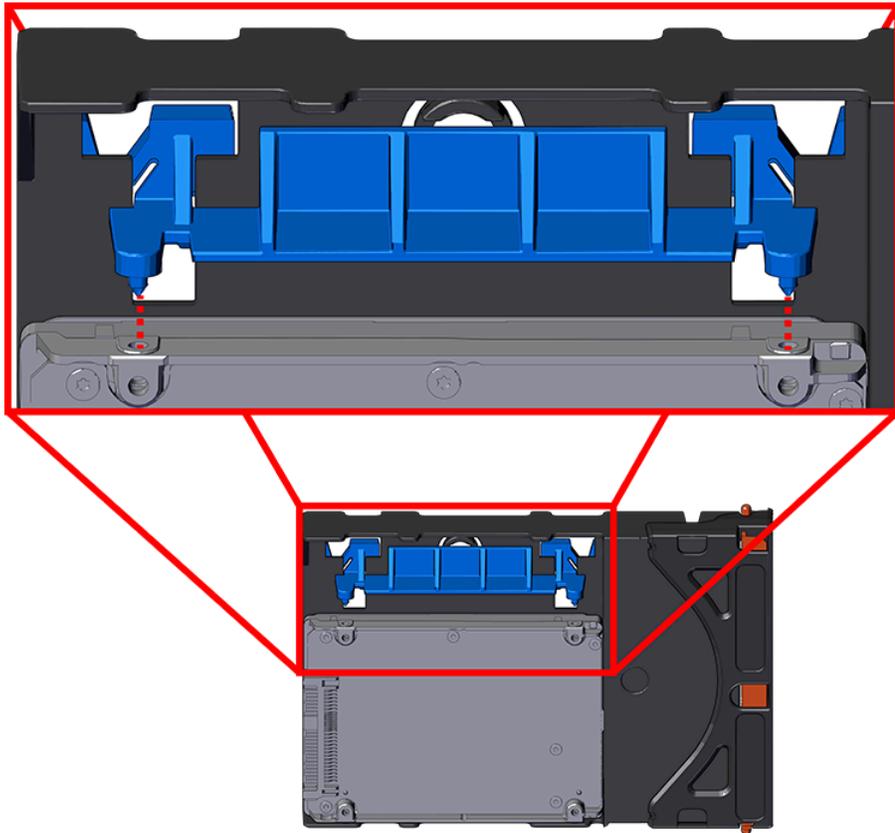
Figure 64: Clamp Slide (clamp shown in blue for visual clarity)



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

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

Figure 65: Clamp Pins (clamp shown in blue for visual clarity)



## 5.9 Shipping Screws Installation

This procedure provides instructions for securing an Ultrastar Data102 to the rack for shipping.

**Before you begin:** Complete the instructions in [Drive Installation \(page 75\)](#).

*Table 61: Installation Requirements*

**Tool(s):** Long T15 Torx Screwdriver

**Part(s):** M5 x 12mm T15 Flat Head Torx screws

**Person(s):** 1

**Time:** 5 minutes

**Step 1:** 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 66: Shipping Bracket Screw Locations (CMA Standard)*

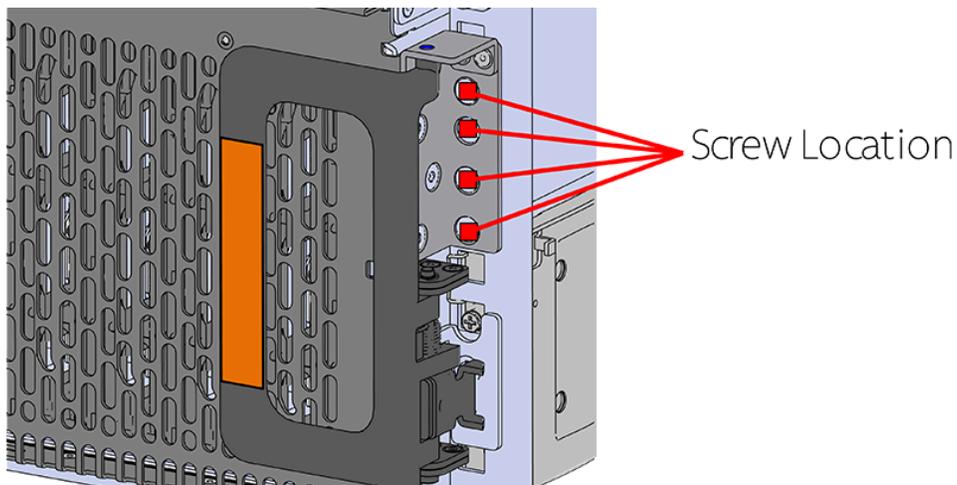


Figure 67: Shipping Bracket Screw Locations (CMA Lite)



**What to do next:** The shipping screws are now installed. Proceed to [Enclosure Power On \(page 85\)](#).

## 5.10 Enclosure Power On

This procedure provides instructions for powering on an Ultrastar Data102 .

**Before you begin:** Complete the instructions in [Shipping Screws Installation \(page 83\)](#).

*Table 62: Installation Requirements*

<b>Tool(s):</b>	N/A
<b>Part(s):</b>	N/A
<b>Person(s):</b>	1
<b>Time:</b>	5 minutes

**Step 1:** Plug the enclosure power cords into a PDU to power the enclosure.



**Caution:** The Ultrastar Data102 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.

**Step 2:** Double check the power indicators and other LEDs to ensure that the system is booting. See the following table for details on LED status during power-up:

*Table 63: LED Status During Power-Up*

LED	At Power-Up	After Primary Expander Booted (1-3 min.)
Identify	On	Off
Fault	On	Off
Power	On	On

**What to do next:** The enclosure is now installed and ready for operation. For instructions on how to operate the enclosure, please refer to the Ultrastar Data102 User Guide.