Western Digital.

User Guide

OpenFlex™ Data24 4000 Series

FW Version 3.0.0
Regulatory Model: DCS0011
D018-000724-000
Doc. Version 05
July 2025

Table of Contents

Revision History

Date	Revision	Comment
November 2024	01	Initial release
December 2024	02	Updated the **List of CRUs** *(page 26)*
March 2025	03	• Added a section on **Disabling Device Sharing** *(page 171)* • Various editorial updates
March 2025	04	Branding update
July 2025	05	• Added SKUs for non-high availability platform. Refer to **Supported SKUs** *(page 22)* • Added the **System Level Block Diagram** *(page 11)* for the non-high availability platform • Updated the **OpenFlex Data24 4000 Series Overview** *(page 2)* and **Design Details** *(page 3)* to include the non-high availability configuration • Added notes about the impact to SSD availability during **IO Module (IOM) Replacement** *(page 56)* for non-high availability configuration • Added note to all replacement tasks instructing users to verify their configuration before beginning work. For example, refer to **Drive Assembly Replacement** *(page 38)* • Removed references to SPDK and use of multiple NICs on a single subnet in **Limitations & Restrictions** *(page 19)* • Clarified use of LDAP accounts is limited to vStore API. Refer to **Enabling LDAP on a Storage Device** *(page 177)* • Corrected location of MAC addresses in **Accessing the API** *(page 124)* • Corrected acronyms in **Device Sharing** *(page 169)* • Added instructions for **Drive Installation** *(page 42)* • Added information about port mapping. Refer to **Port-to-Drive Map for High Availability Systems** *(page 13)* and **Port-to-Drive Map for Non-High Availability Enclosures** *(page 15)* • Added instructions for finding the OOBM port IP addresses. Refer to **Finding OOBM Port IP Addresses with DHCP** *(page 125)* and **Finding OOBM Port IP Addresses with Non-DHCP Servers** *(page 126)*

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Points of Contact

For further assistance with a Western Digital product, contact Western Digital Datacenter Platforms technical support. Please be prepared to provide the following information, as applicable: part number (P/N), serial number (S/N), product name and/or model number, software version, and a brief description of the issue.

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Overview

In This Chapter:

1.1 OpenFlex™ Data24 4000 Series Overview

The OpenFlex™ Data24 4000 Series is a 2U rack mounted data storage enclosure built on the OpenFlex platform. OpenFlex is Western Digital's architecture that supports Open Composable Infrastructure (OCI). The OpenFlex Data24 4000 Series is a Just-a-Bunch-Of-Flash (JBOF) platform that leverages this OCI approach in the form of disagreggated data storage using NVMe-over-Fabrics (NVMe-oF™). NVMe-oF is a networked storage protocol that allows storage to be disaggregated from compute to make that storage widely available to multiple applications and hosts. By enabling applications to share a common pool of storage capacity, data can be easily shared between applications, or needed capacity can be allocated to an application regardless of location. Utilizing NVMe™ device-level performance, NVMe-oF promises to deliver the lowest end-to-end latency from application to shared storage. NVMe-oF enables composable infrastructures to deliver the data locality benefits of NVMe (low latency, high performance) while providing the agility and flexibility of sharing storage and compute.

Availability

Western Digital provides the OpenFlex Data24 4000 Series platform in both high availability (HA) and non-high availability (nHA) configurations. The platforms can be identified by the SKU number, available on the pull-out tabs and in the OCGUI. The HA configurations (4200 series) allows access to all SSDs through both IO Modules (IOMs). The nHA configurations (4100 series) map the drive slots to a single IOM. Refer to **Supported SKUs** ***(page 22)***.

OpenFlex

OpenFlex is Western Digital's architecture that supports Open Composable Infrastructure through storage disaggregation – both disk and flash natively attached to a scalable fabric. OpenFlex does not rule out multiple fabrics, but whenever possible, Ethernet will be used as a unifying connection for both flash and disk because of its broad applicability and availability.

Composable Infrastructure

An emerging category of datacenter infrastructure that seeks to disaggregate compute, storage, and networking fabric resources into shared resource pools that can be available for on-demand allocation (i.e., "composable"). Composability occurs at the software level, disaggregation occurs at the hardware level using NVMe-over-Fabric that will vastly improve compute and storage utilization, performance, and agility in the data center.

Open Composable API

Western Digital's Open Composable API is a REST interface designed for data center composability. It builds upon existing industry standards utilizing the best features of those standards as well as practices from proprietary management protocols.[1]

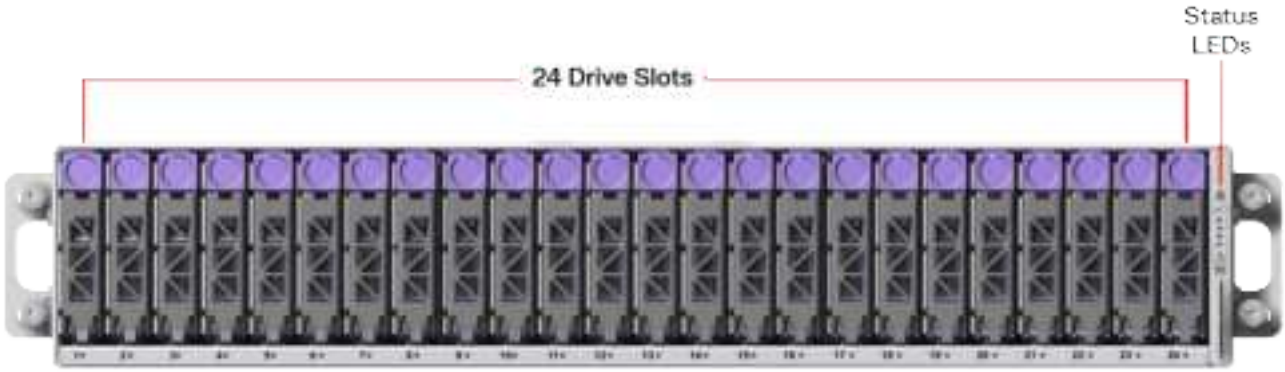
Features

- 1474.56TB Max Storage Capacity[2]
- 100Gbps NVMe-oF
- Operational Temperature: 10°C to 35°C
- 100V - 240V Input Voltages
- 2U Form Factor
- 15.6 kg / 34.4 lbs.
- Dual 800W PSUs
- Device Sharing

1.2 Design Details

On the front of the OpenFlex Data24 4000 Series there are the 24 Small Form Factor (SFF) drive slots, and the enclosure status LEDs. Each drive is individually removable/serviceable. Below each drive slot is a status and activity LED embedded in the chassis. For more details, see the **LEDs** ***(page 5)*** section.

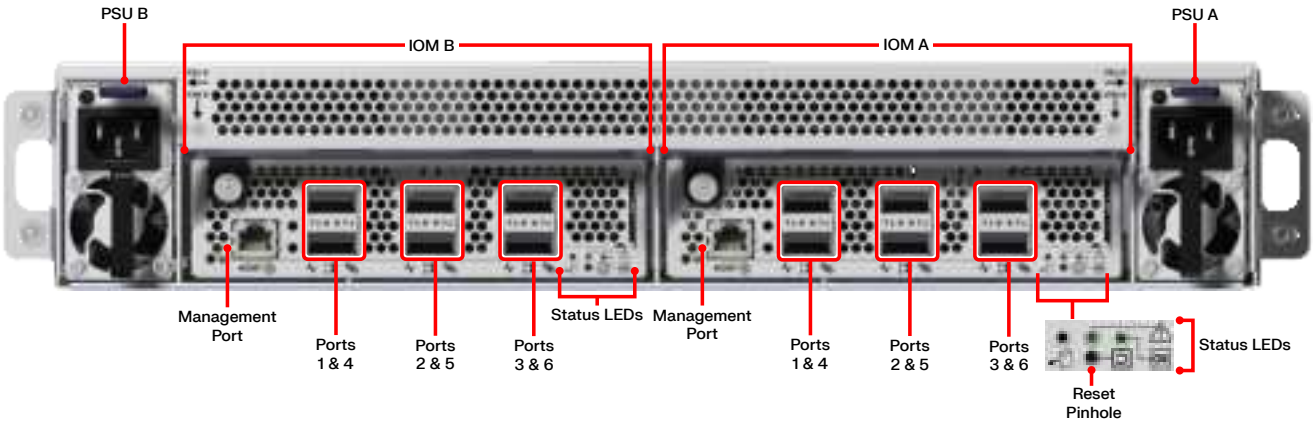
Figure 2: Front of the System



The rear of the platform contains the Power Supply Units (PSUs) and IOMs. All of these components are hot-swappable and do not require tools to replace.

Note: During an IOM hotswap, the SSDs connected to the IOM become inaccessible on the nHA configuration (the 4100 series).

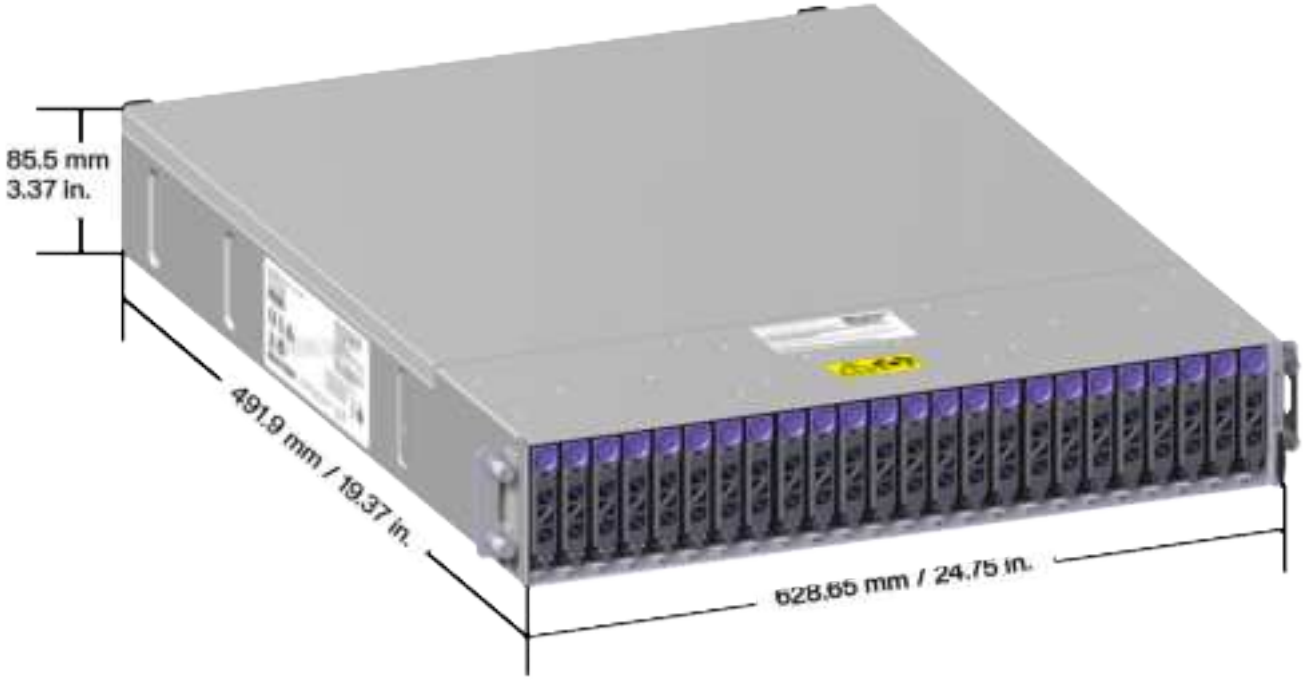
Figure 3: Rear of the System



Each IOM contains a Reset Pinhole that factory resets the enclosure when pressed for more than three seconds. The enclosure automatically restarts when the reset completes. Use of the Reset Pinhole is not recommended in Low Power Mode.

The enclosure measures 491.9 mm/19.37 in. wide by 628.65 mm/24.75 in. long. The height is 85.5 mm/3.37 in. or 2U.

Figure 4: Enclosure Measurements



1.2.1 LEDs

The OpenFlex Data24 4000 Series contains LEDs on the enclosure, PSU, drive slots, and the IOMs. This section defines the LED name, corresponding color, and the behavior of each of the LEDs on the system.

Enclosure LEDs

Figure 5: Enclosure LEDs

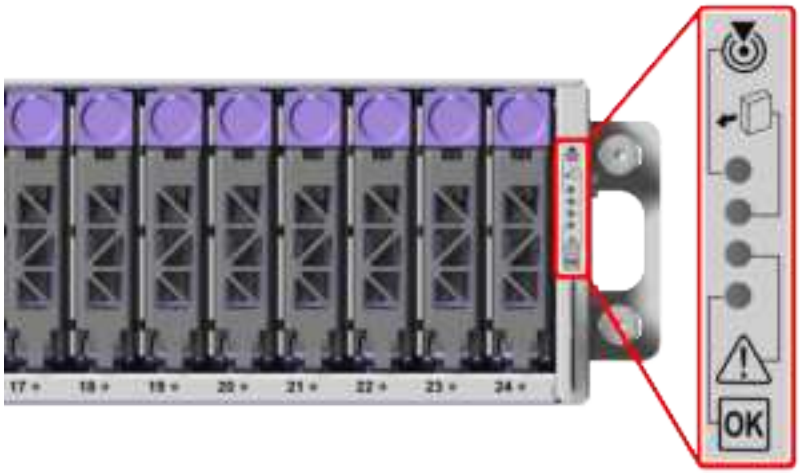


Table 2: Enclosure LED Flash Patterns

LED Name	LED Icon	Color	Behavior
Identification		White	**Fast Blink:** Enclosure is being identified/ located **Off:** Enclosure not being identified/ located
Service		Blue	No LED behavior (unused)
Fault		Amber	**Solid:** Enclosure has a fault **Off:** Enclosure has no fault
Power	OK	Green	**Off:** Enclosure is powered off or in a degraded state **Solid:** Enclosure is powered on **Standby Blink:** Enclosure is in sleep mode (low-power mode) **Slow Blink:** Enclosure is booting

Power Supply Unit (PSU) LED

Figure 6: Power Supply Unit (PSU) LED

Table 3: Power Supply Unit (PSU) LED Flash Patterns

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

Drive Assembly LED

Figure 7: Drive Assembly LED

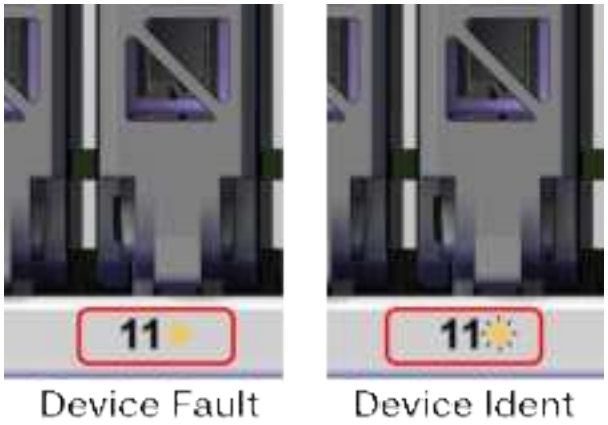


Table 4: Drive Assembly LED Flash Patterns

LED Name	Color	Behavior
Status	Amber	**Steady On:** Device has Fault **Fast Blink:** Device is being Identified **Off:** Device is Healthy

IO Module (IOM) LEDs

Figure 8: IO Module (IOM) LEDs

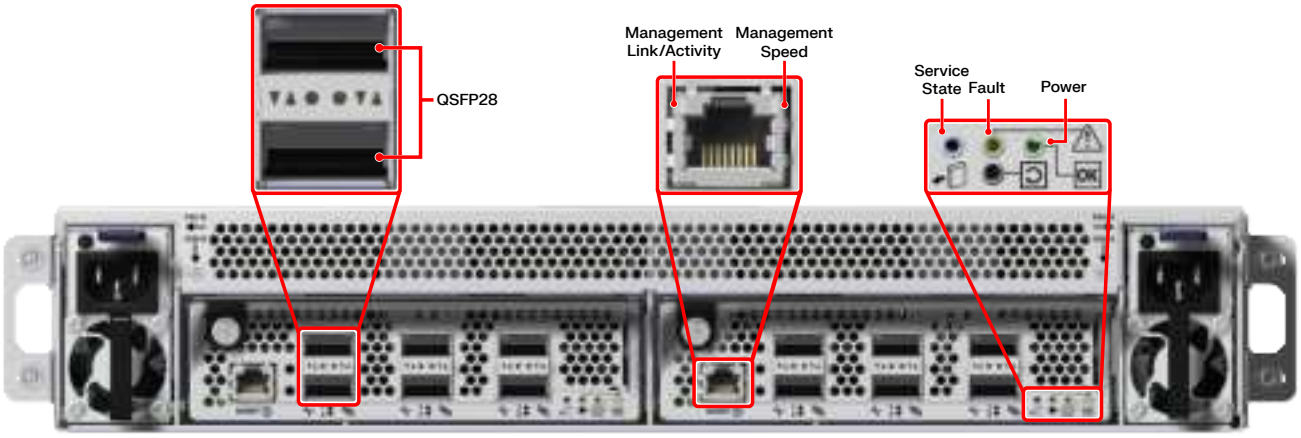


Table 5: IOM LEDs Flash Patterns

LED Name	Color/Number	Behavior
RJ45 Management Port Ethernet Link/Activity	Green	**Off:** No Connection **Solid:** Connected **Feedback Flash:** Activity
RJ45 Management Port Ethernet Speed	Bi-color Green/Amber	**Off:** Operating at 10 Mbps **Solid Green:** Operating at 100Mbps **Solid Amber:** Operating at 1000Mbps
QSFP28	QSFP28 (top port)	**Green Blinking:** Activity **Off:** No Activity
	Activity	**Off:** No Activity **Feedback Flash:** Activity
	Link	(unused)
	QSFP28 (bottom port)	**Green Blinking:** Activity **Off:** No Activity
	Activity	**Off:** No Activity **Feedback Flash:** Activity
	Link	(unused)
Service State (**unused**)	N/A	**N/A**
Fault	Amber	**Solid:** IOM has a fault **Off:** IOM has no fault
Power	Green	**Solid:** IOM is powered on **Off:** IOM is powered off IOM is in a degraded or warning state Enclosure is in low power mode

1.2.2 Cables

The following table displays the CRU power cables available from Western Digital:

Table 6: Available CRU Power Cables

Type	Part Number	Length
IEC C13 to IEC C14 Heavy Duty 15A Power Cable	1EX1530 (Provided in Accessory Kit)	3m

The following table displays the CRU Ethernet cables available from Western Digital:

Table 7: Available CRU Ethernet Cables

Vendor	Active/Passive	Vendor Model Number	Western Digital Part Number
Mellanox® Ethernet 100GbE, 100Gb/s, QSFP, PVC, 3m 28AWG	Passive	MCP1600-C003	1EX2705

The following table displays additional Ethernet cables qualified by Western Digital:

Table 8: Qualified Direct Attached Cables

Vendor	Active/ Passive	Vendor Model Number
Mellanox QSFP28 to QSFP28 Cable, 1m 30AWG	Passive	MCP1600-C001E30N
Mellanox QSFP28 to QSFP28 Cable, 2m 30AWG	Passive	MCP1600-C002E30N
Mellanox QSFP28 to QSFP28 Cable, 3m 30AWG	Passive	MCP1600-C003E30L
Mellanox QSFP28 to QSFP28 Cable, 5m 26AWG	Passive	MCP1600-C005E26L
Mellanox QSFP28 to QSFP28 Cable, 5m 26AWG	Active	MFA1A00-C005
Amphenol 100G/200G, QSFP28Gb 30AWG, 1m	Passive	NDAAFF-0001
Amphenol 100G/200G, QSFP28Gb 30AWG, 2m	Passive	NDAAFF-0002
Amphenol 100G/200G, QSFP28Gb 30AWG, 3m	Passive	NDAAFF-0003
Molex zQSFP+ to zQSFP+ Cable Assembly, 30AWG, 1.5m	Active	100297-1151
Molex zQSFP+ to zQSFP+ Cable Assembly, 30AWG, 2m	Active	100297-1201
FS 100G QSFP28 Cable Assembly, 30AWG, 10m	Active	Q28-AO10
FS 100G QSFP28 Cable Assembly, 30AWG, 15m	Active	Q28-AO15
FS 100G QSFP28 Cable Assembly, 30AWG, 20m	Active	Q28-AO20

1.2.3 Servicing Features

Toolless Servicing

- External system components can be serviced without any additional tools.
- **IO Module (IOM)** and **Power Supply Unit (PSU)** can be accessed from the rear, and have toolless latching mechanisms.
- All **Drive Assemblies** and **Drive Blanks** can be hotswapped from the front of the enclosure using built-in drive carrier latches.

Standard Servicing

- Standard servicing requires the use of tools.
- **System Fans** must be accessed with the top cover removed. This requires the system to be shut down and uninstalled from the installation location.
- **Rail Assembly** must be uninstalled using additional tools with the Chassis removed.

1.3 Electrical Specifications

Table 9: Electrical Specifications

Specification	Value
Max Power Consumption	800W
Typical Power Consumption	~700W
Input Voltage	100V - 240V
PSU Connector Type	C14
Inrush Current Maximum (per PSU)	AC line inrush current shall not exceed 40A peak, for up to one-quarter of the AC cycle after which, the input current should be no more than the specified maximum input current.
PSU Efficiency	80 Plus Titanium

1.4 Environmental Specifications

Table 10: Environmental Specifications

Specification	Non-Operational	Operational
Temperature	5°C to 45°C	10°C to 35°C
Temperature Gradient	30°C/hr Maximum	5°C per 15 minutes
Temperature De-rating	1°C per 300m above 3000m	1°C per 300m above 900m
Relative Humidity	5-95% Non-Condensing	8-80% Non-Condensing
Relative Humidity Gradient	30% per hour maximum	30% per hour maximum

Specification	Non-Operational	Operational
Altitude	-300m to 12,000m / -984 ft. to 39,370 ft	-300m to 3048m / -984 ft. to 10,000 ft.
Cooling	N/A	4 System Fans (N+2 Supported)

1.5 Mechanical Specifications

Table 11: Mechanical Specifications

Specification	Non-Operational	Operational
Shock	10G, 11ms half sine; 3 positive and 3 negative pulses in X, Y, and Z axes.	5G, 11ms half sine; positive and 3 negative pulses in X, Y, and Z axes.
Vibration	**Linear Random:** 0.54 Grms; 5-500 Hz; 10 minutes each axis in X, Y, and Z **Linear Random:** 0.54 Grms; 1-200 Hz; 60 minutes in Z axis. **Linear Random:** 0.80 Grms; 2 - 200Hz; 15 minutes in Z axis **Swept Sine:** 0.75 Grms, 0 - peak swept sine; 5 - 500Hz; 1 complete sweep @ 1/2 octave per minute	**Linear Random:** 0.15 Grms 5-500 Hz 10 minutes each axis in X, Y and Z **Swept Sine:**0.10 G, 0 - peak, 5-500 Hz 0.5 octaves/min, approx. 13 minutes each axis
Weight	**24 Drive Configuration**: 18.25 kg / 40.2 lbs. **12 Drive Configuration**: 15.6 kg / 34.4 lbs.	
Dimensions	**W:** 491.9 mm x **L:** 628.65 mm x **H:** 85.5 mm / **W:** 19.37 in. x **L:** 24.75 in. x **H:** 3.37 in.	
Required Rack Depth	1000 mm (39.4 in.) of usable rack space, door to door	
Required Rack Width	450mm (17.72in.) with 465mm (18.31in.) ± with 1.5mm nominal hole spacing. See EIA-310 Rack Standard	
Rack Units (U)	2U	
Vertical Rack Rail Spacing	650 mm – 850 mm / 25.6 in. – 33.46 in.	

1.6 System Level Block Diagram

The system block diagram for the OpenFlex Data24 4000 Series is a conceptual depiction of the communication and power relationships between major components within the system.

Figure 9: High Availability System Block Diagram

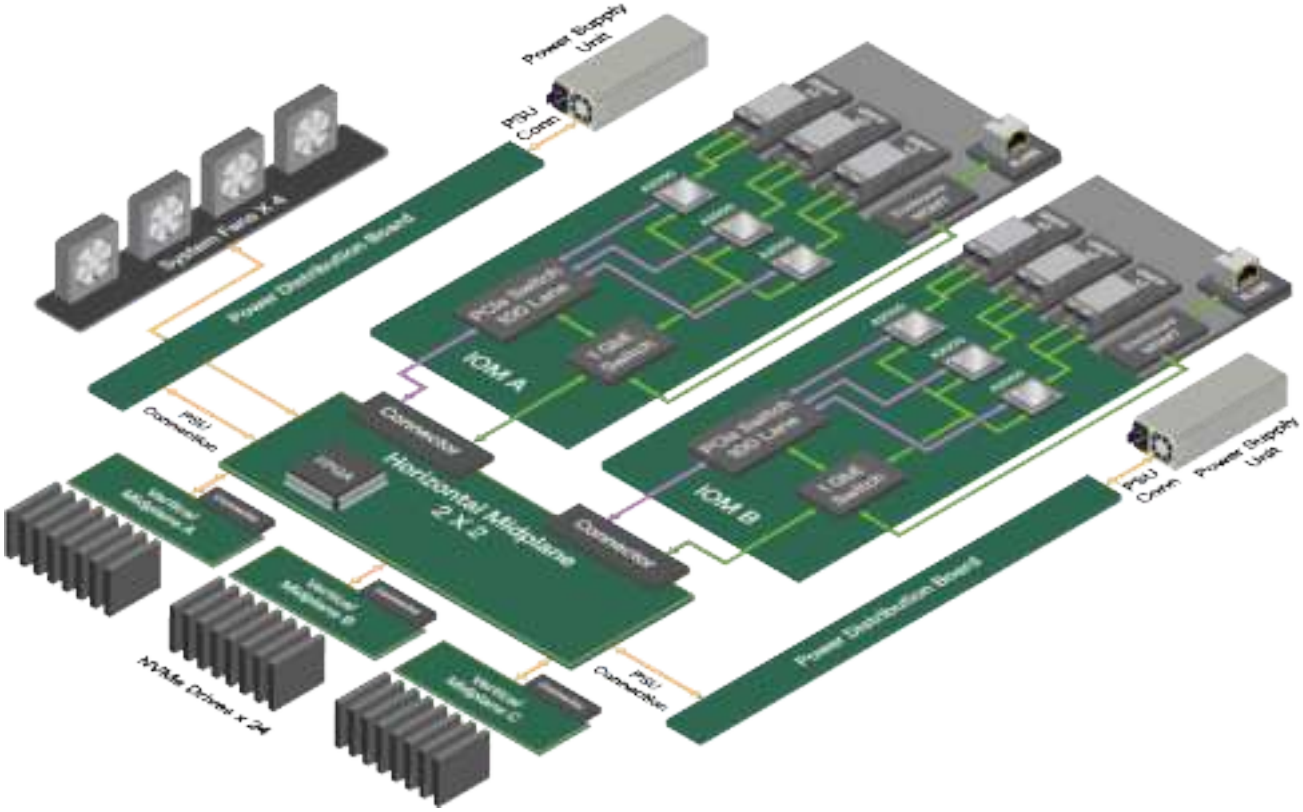
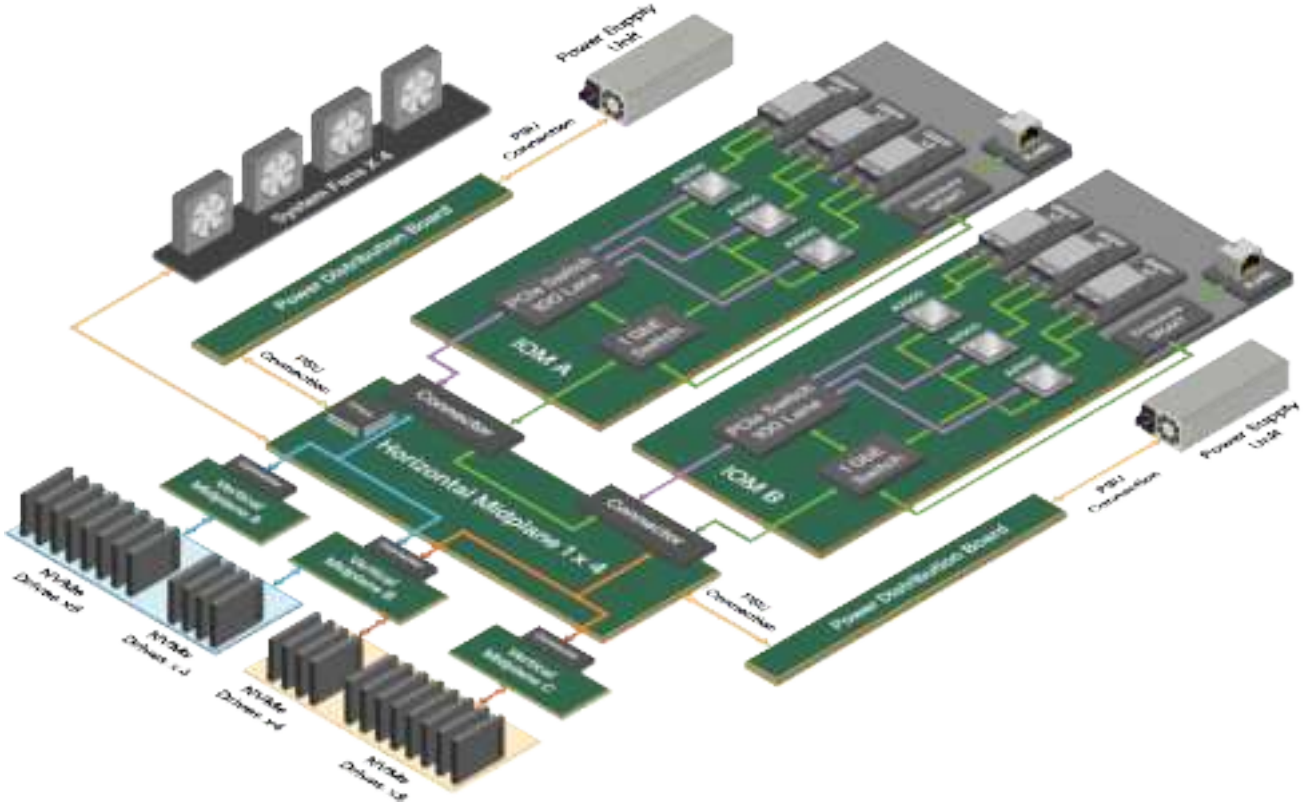


Figure 10: Non-High Availability System Block Diagram



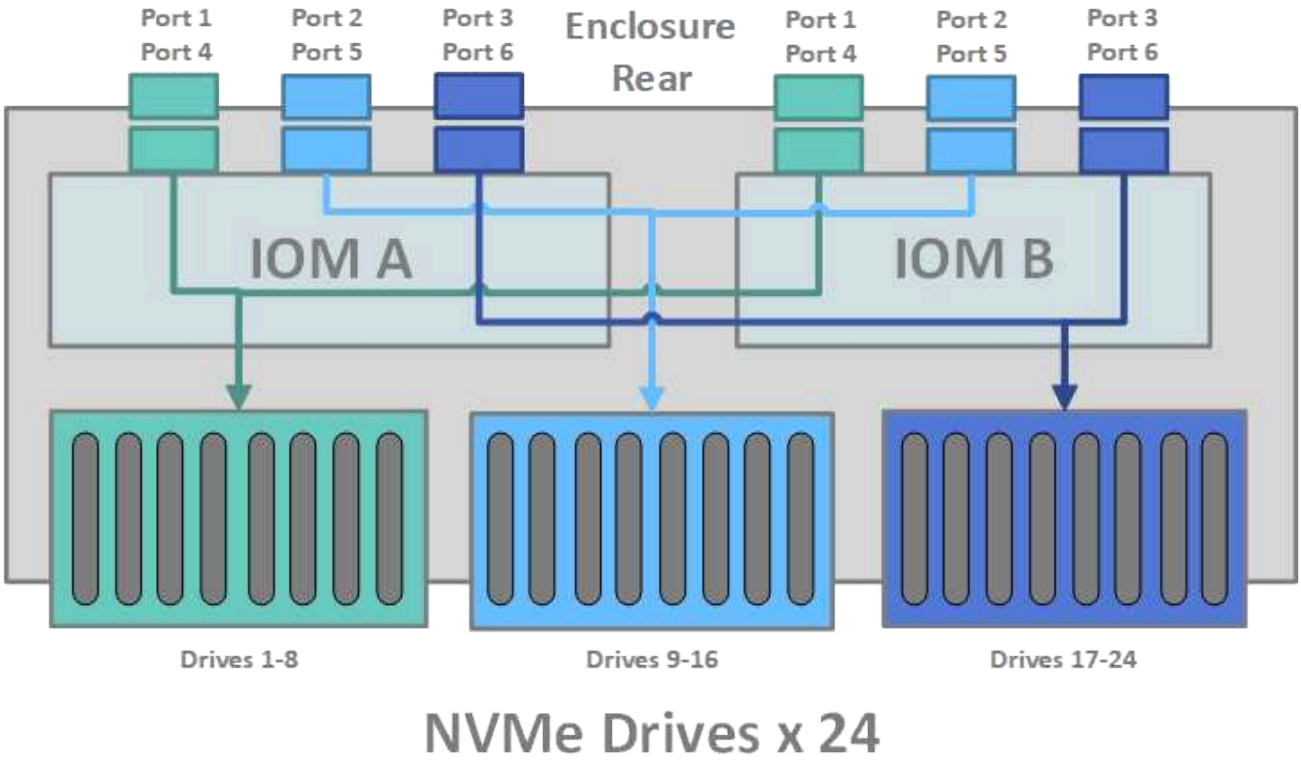
1.6.1 Port-to-Drive Map for High Availability Systems

The port-to-drive map for the OpenFlex Data24 4200 Series is a conceptual depiction of the relationship between the ports on each IOM and the assigned NVMe drives on high availability (HA) enclosures.

In non-device sharing mode, the IOM ports provide redundant access to drives. Each port on each IOM maps to the drives as follows:

- IOM A
  - Ports 1 and 4 connect to drives 1-8.
  - Ports 2 and 5 connect to drives 9-16.
  - Ports 3 and 6 connect to drives 17-24.
- IOM B
  - Ports 1 and 4 connect to drives 1-8.
  - Ports 2 and 5 connect to drives 9-16.
  - Ports 3 and 6 connect to drives 17-24.

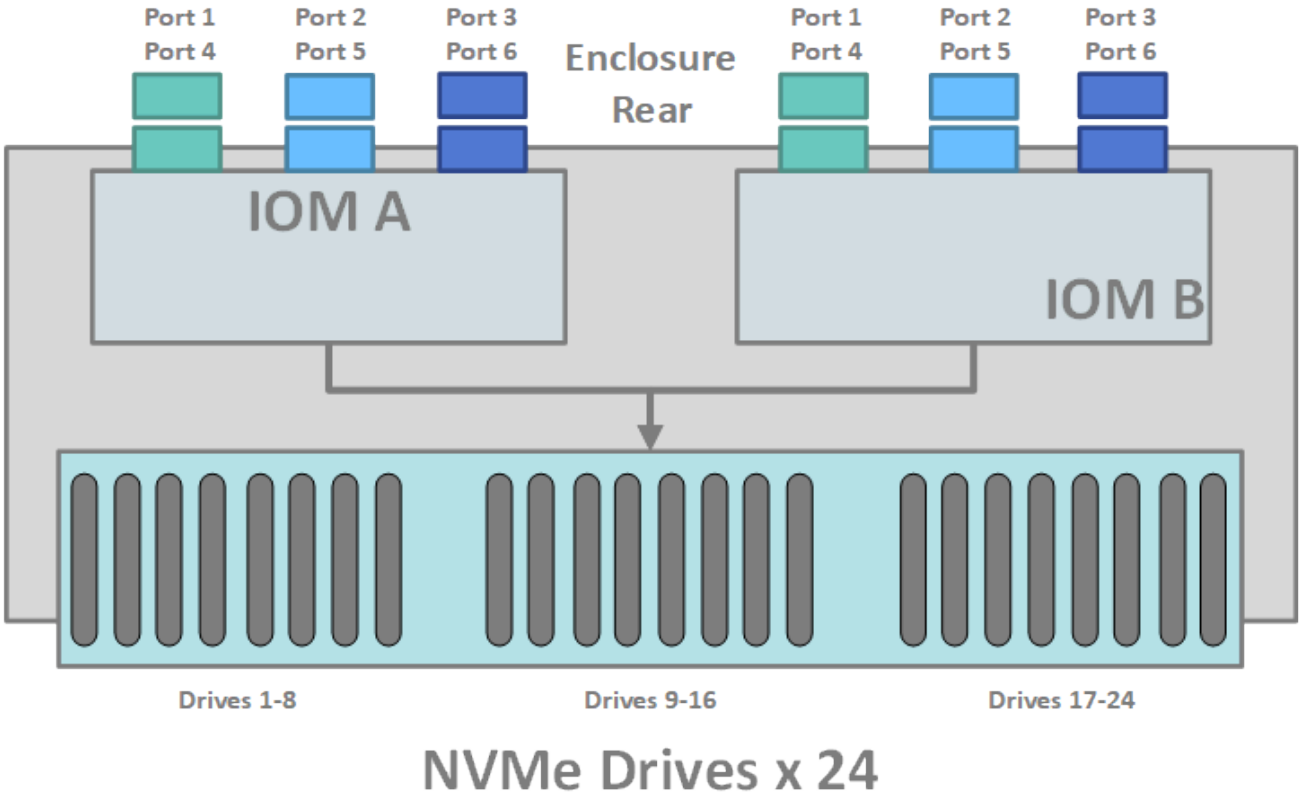
Figure 11: Port-to-Drive Mapping in Non-Device Sharing Mode for HA Enclosures



In device sharing mode, all ports on both IOMs connect to all 24 drives.

- IOM A
  - Ports 1 and 4 connect to drives 1-24.
  - Ports 2 and 5 connect to drives 1-24.
  - Ports 3 and 6 connect to drives 1-24.
- IOM B
  - Ports 1 and 4 connect to drives 1-24.
  - Ports 2 and 5 connect to drives 1-24.
  - Ports 3 and 6 connect to drives 1-24.

Figure 12: Port-to-Drive Mapping in Device Sharing Mode for HA Enclosures



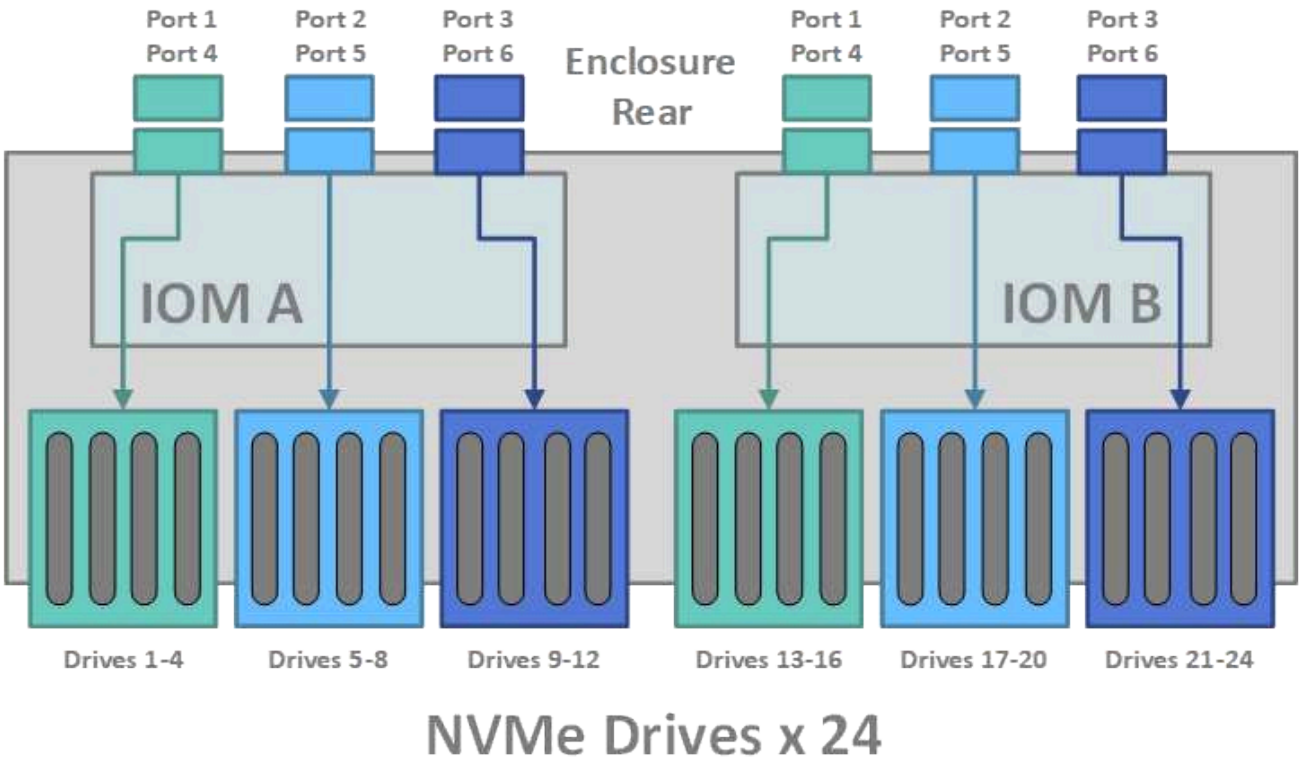
1.6.2 Port-to-Drive Map for Non-High Availability Enclosures

The port-to-drive map for the OpenFlex Data24 4100 Series is a conceptual depiction of the relationship between the ports on each IOM and the assigned NVMe drives for non-high availability (nHA) enclosures.

In non-device sharing mode, the IOM ports provide non-redundant access to drives. Each port on each IOM maps to four drives as follows:

- IOM A
  - Ports 1 and 4 connect to drives 1-4.
  - Ports 2 and 5 connect to drives 5-8.
  - Ports 3 and 6 connect to drives 9-12.
- IOM B
  - Ports 1 and 4 connect to drives 13-16.
  - Ports 2 and 5 connect to drives 17-20.
  - Ports 3 and 6 connect to drives 21-24.

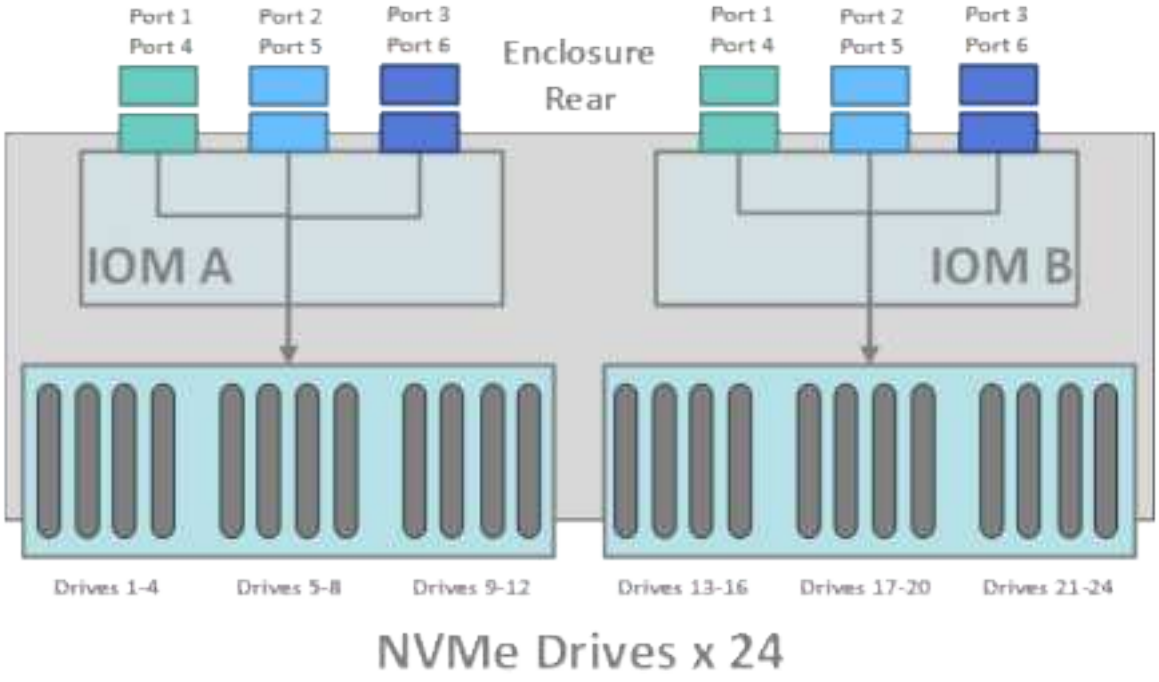
Figure 13: Port-to-Drive Mapping in Non-Device Sharing Mode for nHA Enclosures



In device-sharing mode, all ports on each IOM connect to 12 drives. IOM A ports connect to drives 1-12, and IOM B ports connect to drives 13-24.

- IOM A
  - Ports 1 and 4 connect to drives 1-12.
  - Ports 2 and 5 connect to drives 1-12.
  - Ports 3 and 6 connect to drives 1-12.
- IOM B
  - Ports 1 and 4 connect to drives 13-24.
  - Ports 2 and 5 connect to drives 13-24.
  - Ports 3 and 6 connect to drives 13-24.

Figure 14: Port-to-Drive Mapping in Device-Sharing Mode for nHA Enclosures



1.7 Best Practices

The following is a list of best practices to follow when using the OpenFlex™ Data24 4000 Series :

1. Contact customer support if the enclosure reflects critical health status. Refer to **Points of Contact *(page vii)***.
2. When working with the API allow time for configuration changes to complete before executing an API GET command.
3. Link local addresses are not supported. Configure OOBM ports to 169.254.1.X.
4. Port configurations require an IOM reset to take effect.
5. For best performance, recommend the following:
   a. Utilize the recommended network configuration for the product. Contact Western Digital for the best practices documentation on multi-path and network configuration.
   b. For High Availability (HA) platforms: Configure native NVMe multi-pathing instead of Device Mapper multi-pathing.
   c. For best bandwidth, balance concurrently accessed drives (e.g. a RAID set) equally across the devices.
6. For NVMe-oF stability, recommend the following:
   a. There are a maximum of 448 I/O connections for RoCE and TCP per RFX. It is recommended to share this resource equally across all hosts that connect to the RFX. It is recommended to open 8 I/O queues per NVMe connect command.
   b. Recommend using version 2.11 of the NVMe-CLI utility. Refer to the release notes for issues encountered with other NVMe-CLI versions. Incompatibilities may cause connect or disconnect issues.
   c. Disable auto-negotiate on the switch ports for the RFXs.
   d. Disable auto-negotiate on the host.
   e. Disable auto-negotiate on data ports.
   f. Set the Linux I/O timeout to 12 seconds RoCE and 30 seconds for TCP or greater to avoid the default I/O timeout of 1 second.
7. For optimal enclosure management, recommend the following:
   a. Wait 5 minutes before performing management actions after firmware updates, enclosure reboots or power state changes.
   b. Confirm that the enclosure is healthy through the OCAPI / User Interface and enclosure LEDs prior to making configuration changes.
   c. Check the health of the IOM after each firmware update. Once the firmware update is complete, verify that both IOMs are on the latest version of firmware. If the firmware is not the expected version, after the update, the enclosure will report a “Firmware Mismatch” warning.
   d. Configuration changes should not be made during the enclosure firmware update process.
   e. Configure NTP on the enclosure. It is disabled by default.
      - The configured NTP servers must be reachable at the time of configuration; otherwise, the request to enable NTP will be rejected.
      - Disable NTP if the enclosure cannot connect to a timeserver.
      - NTP requires the Out of Band management port be connected to the network.

f. Changing the enclosure name should only be done as an offline event. Changing the enclosure name requires an enclosure restart to go into effect. Changing the enclosure name changes the NVMe Qualified Name (NQN) for the devices, which affects access.

g. Changing the Device Sharing state should only be done as an offline event. Disconnect all devices before modifying the setting. When changing Device Sharing Setting, please note the following:

- The command to enable or disable Device Sharing must be issued to each IOM separately.
- Enabling or Disabling Device Sharing will cause the IOM to reboot. For best results, wait for the first IOM to finish rebooting before changing the setting on the other IOM.
- The Device Sharing setting must be the same on both IOMs.

h. To eliminate browser caching and ensure it returns accurate data, clear the web browser cache or use OCAPI curl commands.

1.8 Limitations & Restrictions

The following are limitations and restrictions when using the OpenFlex Data24 4000 Series :

1. Drive related:
   a. Maximum of 24 drives and 32 namespaces per drive is supported.
   b. Namespaces from the same drive, should have the same block size (either 4096 or 512B).
   c. Creating namespaces on the drive outside of the enclosure, and then inserting the drive into the unsupported enclosure.
   d. Update only four devices per RFX at a time when doing drive firmware updates using NVMe-CLI. Drive updates may be in parallel through different RFXs and may take up to five minutes to complete.
2. NVMe/NVMe-oF related:
   a. Maximum of 448 for RoCE and TCP I/O connections per RFX.
   b. Maximum of 64 Admin connections per RFX.
   c. The following NVMe Admin commands are not supported:
      - Asymmetric Namespace Access (ANA)
      - Reservations
      - Non-Transparent Bridge (NTB)
      - NVMe-MI Send/Receive
      - Directive Send/Receive
      - Virtualization Management
      - Doorbell Buffer Config
      - Fused (Compare and Write)
      - Zoned Namespaces (ZNS)
   d. Not all NVMe-cli wdc plug-in commands are supported. The following are supported if needed for support:
      - cap-diag (may take up to 50 minutes to complete)
      - vs-internal-log (specify transfer size of 0x1000)
      - vs-smart-add-log (-CA Log Page)
      - clear-pcie-correctable-errors
      - get-drive-status
   e. Extended metadata on 4k and 512B block sectors is not supported.
3. OCAPI and GUI related:
   a. Maximum of one GUI or OCAPI client per enclosure is supported. Launch one GUI to display one dashboard and up to one device page.
   b. The Web Client needs to operate with the HTTP Conditional capability provided by the Web Service. If the client does not, it may see a "precondition failed" error, match HTTP Conditional capability.
   c. Recommend that the number of threads used in an OCAPI client be limited to 6. Connections beyond that limit will result in a 429, system busy error.
   d. Daylight Savings Time (DST) field under system clock will always be disabled.
   e. TLS certification file size cannot exceed 4K when uploaded through in-band management.

f. Maximum of one openflex-api installed server in one subnet for managing up to three enclosures via in-band.

g. When using In-Band GUI enclosure management:

- One MI device is presented from each IOM for in-band enclosure management
- The first MI Device that is NVMe connected in the in-band setup process determines which controller (IOM) MI Device is used for the GUI Device Page
- Management through the other IOM requires changing the first MI Device connected or switch to the Out-of-Band IP on the other controller IOM
- Generally, either IOM can be used for enclosure management
- Refer to the **Management** *(page 123)* section for In-Band Management setup and usage instructions

h. When creating accounts for In-Band Management, setup the user credentials to be the same on storage nodes.

i. When using In-Band enclosure management, if the enclosure is put into low power sleep mode, the power must be restored back on through the out-of-band management port.

j. The OCAPI interface with the option stream=True may exceed all the available file handles. Explicitly close the connection if you are using stream=True. This issue does not exist when using cURL.

4. Enclosure related:

a. IPv6 networking is not supported.

b. VLAN tagging is not supported.

c. Hot swap only one CRU at a time.

d. Factory reset and pinhole reset are not supported when the enclosure is in sleep mode.

1.9 Rack Requirements

The OpenFlex Data24 4000 Series is designed to be installed into a rack that meets the EIA-310 standard with a minimum of 1000 mm (39.4 in.) of usable rack space, door to door. The vertical rack rails must be set between 650 mm – 850 mm / 25.6 in. – 33.46 in. to support the enclosure. It requires 2U 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 12: Required Rack Specifications

Parameter	Requirement
Rack Depth	1000 mm (39.4 in.) of usable rack space, door to door
Rack Width	450mm (17.72in.) with 465mm (18.31in.) ± with 1.5mm nominal hole spacing. See EIA-310 Rack Standard
Rack Units (U)	2U
Vertical Rack Rail Spacing	650 mm – 850 mm / 25.6 in. – 33.46 in.
Static Load Rating	Rack meets ISTA 3E or 3B test requirements and regulations when mounted to the shipping pallet
Dynamic Load Rating	Rack meets ISTA 3E or 3B test requirements and regulations when mounted to the shipping pallet

1.10 Space Requirements

The installation of the OpenFlex Data24 4000 Series requires enough space in front of the rack for two people to perform a safe installation. The recommended forward clearance is 914.4 mm / 36 in. from the front of the rack and 609.6 mm / 24 in. on both sides of the enclosure. It is also recommended to make considerations for any carts or lift equipment that might be used to perform the installation.[3] The servicing of the enclosure requires one person and a minimum of 711 mm / 27.99 in. of space in front of the rack to allow enough clearance to remove an enclosure.

1.11 Supported Operating Systems

The following table lists the operating systems tested on the OpenFlex Data24 4000 Series .

Table 13: Supported Operating Systems

Operating System	Supported Network Type	Kernel
RHEL 9.2	RoCE	5.14.0-284.11.1.el9_2.x86_64
Ubuntu 22.04	RoCE	5.15.0-131-generic
Ubuntu 24.04	TCP	6.8.0-55-generic
RHEL 9.4	RoCE	5.14.0-427.13.1.el9_4.x86_64
Rocky Linux 9.5	RoCE and TCP	5.14.0-503.40.1.el9_5.x86_64

3. The weight of the enclosure during installation will vary, depending on the number of devices and blanks contained in the OpenFlex Data24 4000 Series . In some situations, carts or lift equipment may be required.

1.12 Supported SKUs

The following tables list the versions of this Western Digital product that are supported by this document.

Table 14: Supported High Availability SKUs

Component	Capacity	SKU
OpenFlex Data24-0 4241 nTAA	0TB	1ES2365
OpenFlex Data24-12 4243 nTAA RI-1DW/D SE	46.08TB	1ES2415
OpenFlex Data24-12 4243 nTAA RI-1DW/D ISE	46.08TB	1ES2417
OpenFlex Data24-12 4243 nTAA RI-1DW/D TCG	46.08TB	1ES2420
OpenFlex Data24-12 4243 nTAA RI-1DW/D SE	92.16TB	1ES2416
OpenFlex Data24-24 4243 nTAA RI-1DW/D SE	92.16TB	1ES2380
OpenFlex Data24-12 4243 nTAA RI-1DW/D ISE	92.16TB	1ES2418
OpenFlex Data24-24 4243 nTAA RI-1DW/D ISE	92.16TB	1ES2387
OpenFlex Data24-12 4243 nTAA RI-1DW/D TCG	92.16TB	1ES2421
OpenFlex Data24-24 4243 nTAA RI-1DW/D TCG	92.16TB	1ES2412
OpenFlex Data24-24 4243 nTAA RI-3DW/D ISE	153.6TB	1ES2715
OpenFlex Data24-12 4243 nTAA RI-1DW/D SE	184.32TB	1ES2383
OpenFlex Data24-24 4243 nTAA RI-1DW/D SE	184.32TB	1ES2381
OpenFlex Data24-12 4243 nTAA RI-1DW/D ISE	184.32TB	1ES2419
OpenFlex Data24-24 4243 nTAA RI-1DW/D ISE	184.32TB	1ES2388
OpenFlex Data24-12 4243 nTAA RI-1DW/D TCG	184.32TB	1ES2422
OpenFlex Data24-24 4243 nTAA RI-1DW/D TCG	184.32TB	1ES2413
OpenFlex Data24-24 4243 nTAA RI-1DW/D SE	368.64TB	1ES2382
OpenFlex Data24-24 4243 nTAA RI-1DW/D ISE	368.64TB	1ES2389
OpenFlex Data24-24 4243 nTAA RI-1DW/D TCG	368.64TB	1ES2414
OpenFlex Data24-24 4243 nTAA RI-1DW/D SE	737.28TB	1ES2704
OpenFlex Data24-24 4243 nTAA RI-1DW/D ISE	737.28TB	1ES2705
OpenFlex Data24-24 4243 nTAA RI-1DW/D TCG	737.28TB	1ES2706
OpenFlex Data24-24 4243 nTAA RI-1DW/D SE	1474.56TB	1ES2707
OpenFlex Data24-24 4243 nTAA RI-1DW/D ISE	1474.56TB	1ES2708
OpenFlex Data24-24 4243 nTAA RI-1DW/D TCG	1474.56TB	1ES2709

Table 15: Supported Non-High Availability SKUs

Component	Capacity	SKU
OpenFlex Data24-0 4141 nTAA	0TB	1ES2364
OpenFlex Data24-24 4143 nTAA RI-1DW/D SE	184.32TB	1ES2377
OpenFlex Data24-24 4143 nTAA RI-1DW/D SE	368.64TB	1ES2378
OpenFlex Data24-12 4143 nTAA RI-1DW/D SE	184.32TB	1ES2379
OpenFlex Data24-24 4143 nTAA RI-1DW/D ISE	184.32TB	1ES2384
OpenFlex Data24-24 4143 nTAA RI-1DW/D ISE	368.64TB	1ES2385
OpenFlex Data24-12 4143 nTAA RI-1DW/D ISE	184.32TB	1ES2386

1.13 List of Compatible Devices

Table 16: Compatible Device List

Device	Volume[4]	Max Bandwidth[5]	Drive Writes	Encryption	Drive Firmware	Part Number
Western Digital Ultrastar DC SN655 SSD w/ Carrier	3.84 TB	3.3GB/s	RI-1DW/D	SE	RC610008	1EX3087
Western Digital Ultrastar DC SN655 SSD w/ Carrier	3.84 TB	3.3GB/s	RI-1DW/D	ISE	RC610008	1EX3079
Western Digital Ultrastar DC SN655 SSD w/ Carrier	3.84 TB	3.3GB/s	RI-1DW/D	TCG	RC610008	1EX3082
Western Digital Ultrastar DC SN655 SSD w/ Carrier	7.68 TB	3.3GB/s	RI-1DW/D	SE	RC610008	1EX3088
Western Digital Ultrastar DC SN655 SSD w/ Carrier	7.68 TB	3.3GB/s	RI-1DW/D	ISE	RC610008	1EX3080
Western Digital Ultrastar DC SN655 SSD w/ Carrier	7.68 TB	3.3GB/s	RI-1DW/D	TCG	RC610008	1EX3083
Western Digital Ultrastar DC SN655 SSD w/ Carrier	15.36 TB	3.3GB/s	RI-1DW/D	SE	RC610008	1EX3089
Western Digital Ultrastar DC SN655 SSD w/ Carrier	15.36 TB	3.3GB/s	RI-1DW/D	ISE	RC610008	1EX3081
Western Digital Ultrastar DC SN655 SSD w/ Carrier	15.36 TB	3.3GB/s	RI-1DW/D	TCG	RC610008	1EX3084
Western Digital Ultrastar DC SN655 SSD w/ Carrier	30.72 TB	3.3GB/s	RI-1DW/D	SE	RC910002	1EX3241
Western Digital Ultrastar DC SN655 SSD w/ Carrier	30.72 TB	3.3GB/s	RI-1DW/D	ISE	RC910002	1EX3242
Western Digital Ultrastar DC SN655 SSD w/ Carrier	30.72 TB	3.3GB/s	RI-1DW/D	TCG	RC910002	1EX3243

4. One terabyte (TB) is equal to one trillion bytes. Actual user capacity may be less due to operating environment.

5. Sequential read bandwidth, 64KiB block size. Based on internal testing. Performance will vary by capacity point, or with changes in useable capacity. All measurements are in full sustained mode and are peak values. Subject to change.

Device	Volume[4]	Max Bandwidth[5]	Drive Writes	Encryption	Drive Firmware	Part Number
Western Digital Ultrastar DC SN655 SSD w/ Carrier	61.44 TB	3.3GB/s	RI-1DW/D	SE	RC910002	1EX3244
Western Digital Ultrastar DC SN655 SSD w/ Carrier	61.44 TB	3.3GB/s	RI-1DW/D	ISE	RC910002	1EX3245
Western Digital Ultrastar DC SN655 SSD w/ Carrier	61.44 TB	3.3GB/s	RI-1DW/D	TCG	RC910002	1EX3246

Note: OpenFlex Data24 supports third-party device features that are within NVMe® specification as mandatory. Any third-party drive features that are vendor specific are not guaranteed to function.

4. One terabyte (TB) is equal to one trillion bytes. Actual user capacity may be less due to operating environment.

5. Sequential read bandwidth, 64KiB block size. Based on internal testing. Performance will vary by capacity point, or with changes in useable capacity. All measurements are in full sustained mode and are peak values. Subject to change.

1.14 List of CRUs

Table 17: List of Replaceable Components

Component	Package Dimensions	Packaged Weight	Part Number
OpenFlex Data24 4200 Chassis	**W:** 927.1 mm x **L:** 609.6 mm x **H:** 254 mm **W:** 36.5 in x **L:** 24 in x **H:** 10 in	9.34 kg / 20.6 lbs	1EX3076
OpenFlex Data24 4100 Chassis	**W:** 927.1 mm x **L:** 609.6 mm x **H:** 254 mm **W:** 36.5 in x **L:** 24 in x **H:** 10 in	9.34 kg / 20.6 lbs	1EX3077
Power Supply Unit (PSU) 800W Titanium	**W:** 177.8 mm x **L:** 184.1 mm x **H:** 133.3 mm **W:** 7 in x **L:** 7.25 in x **H:** 5.25 in	1.4 kg / 3.1 lbs	1EX3057
IO Module (IOM)	**W:** 292.1 mm x **L:** 469.9 mm x **H:** 203.2 mm **W:** 11.5 in x **L:** 18.5 in x **H:** 8 in	3.6 kg / 8 lbs	1EX3059
System Fan	**W:** 69.8 mm x **L:** 69.8 mm x **H:** 38.1 mm **W:** 2.75 in. x **L:** 2.75 in. x **H:** 1.5 in. **Fan Cable length:** 254 mm / 10 in.	0.49 kg / 1.1 lbs	1EX3060
Western Digital Ultrastar DC Drives w/ Carrier	**W:** 69.85 mm x **L:** 100.33 mm x **H:** 14.98 mm **W:** 2.75 in x **L:** 3.95 in x **H:** 0.59 in	0.49 kg / 1.1 lbs	List of Compatible Devices *(page 24)*
Rail Assembly	**W:** 990.6 mm x **L:** 812.8 mm x **H:** 50.8 mm **W:** 9 in x **L:** 32 in x **H:** 2 in	2.6 kg / 6.8 lbs	1EX3085
Drive Carrier	**W:** 79.3 mm x **L:** 60.0 mm x **H:** 20.5 mm **W:** 3.1 in x **L:** 2.4 in x **H:** 0.1 in	0.02 kg / 0.05 lb	1EX3377
Drive Carrier 24 Pack	**W:** 254 mm x **L:** 203.2 mm x **H:** 50.8mm **W:**10 in x **L:** 8 in x **H:** 2in	0.48 kg / 1.2 lbs[6]	1EX3342

6. Listed weight does not include packaging materials.

Component	Package Dimensions	Packaged Weight	Part Number
Power Cord 3m C13-C14 18AWG	**W:** 107.9 mm x **L:** 158.7 mm x **H:** 311.1 mm **W:** 4.25 in x **L:** 6.25 in x **H:** 12.25 in	0.81 kg / 1.8 lbs	1EX1530
QSFP28 to QSFP28 30AWG 3m Cable	**W:** 261.6 mm x **L:** 373.8 mm x **H:** 116.8 mm **W:** 10.3 in x **L:** 13.3 in x **H:** 4.6 in	0.95 kg / 2.1 lbs	1EX2705
Drive Blank	**W:** 261.6 mm x **L:** 373.8 mm x **H:** 116.8 mm **W:** 10.3 in x **L:** 13.3 in x **H:** 4.6 in	0.72 kg / 1.1 lbs	1EX3078
Rack Ear Kit	**W:** 261.6 mm x **L:** 373.8 mm x **H:** 116.8 mm **W:** 10.3 in x **L:** 13.3 in x **H:** 4.6 in	0.72 kg / 1.1 lbs	1EX3086

1.15 Third Party Licenses

This product may include or use open source software subject to open source licenses. If required by the applicable open source license, Western Digital may provide the open source code to you on request either electronically or on a physical storage medium for a charge covering the cost of performing such distribution, which may include the cost of media, shipping, and handling.

For open source licensing information, please download the **Third-Party Notices** from the Western Digital Business Support Center at **https://www.westerndigital.com/company/innovation/open-source/product-compliance**.

Components

In This Chapter:

2.1 Chassis

The chassis is the primary housing that contains and connects all of the system components. All of the drives are located at the front in the drive bay, and the rear houses the IO Modules, PSUs, and cable connections. There is a compartment cover on the top of the chassis that can be opened for access to the system fans for servicing.

2.1.1 Chassis Specifications

Table 18: OpenFlex Data24 4200 Chassis Specification Summary

Specification	Value
Part Number	1EX3076
Hot Swappable?	No
Service Window	N/A
Dimensions	**W:** 491.9 mm x **L:** 596.9mm x **H:** 85.5 mm **W:** 19.37 in. x **L:** 23.5 in. x **H:** 3.37 in.
Weight	8.89 kg / 19.6 lbs.

Table 19: OpenFlex Data24 4100 Chassis Specification Summary

Specification	Value
Part Number	1EX3077
Hot Swappable?	No
Service Window	N/A
Dimensions	**W:** 491.9 mm x **L:** 596.9mm x **H:** 85.5 mm **W:** 19.37 in. x **L:** 23.5 in. x **H:** 3.37 in.
Weight	8.89 kg / 19.6 lbs.

2.2 Power Supply Unit (PSU)

The Power Supply Units (PSUs) inside the OpenFlex™ Data24 4000 Series are 800W, 80 Plus Titanium efficiency rated, and operate within a 100V - 240V voltage range. The PSUs are redundant and can be hotswapped one at a time. There must always be one PSU in operation for continuous usage during replacements of the PSUs.

2.2.1 PSU Specifications

Table 20: Power Supply Unit (PSU) Specification Summary

Specification	Value
Part Number	1EX3057
Number per Enclosure	2
Hot Swappable?	Yes
Service window	5 minutes
Dimensions	**W:** 38.1 mm x **L:** 228.6 mm x **H:** 72.8 mm **W:** 1.5 in. x **L:** 9 in. x **H:** 2.87 in.
Weight	0.95 kg / 2.1 lbs.
Current Output	12V current output 65A maximum
Power Output	800W Maximum
Input Voltage	100V - 240V
Redundancy	N+1
PSU Type	Common Redundant Power Supply (CRPS)
80 PLUS Standard	Titanium
Connector Type	C14

2.3 IO Module (IOM)

Each IOM contains three chip down RapidFlex A2000s that provide system data connectivity through a QSFP28 cable, and supports cable lengths up to 10m. Out-of-Band Management (OOBM) features are accessed via an RJ45 port that supports a 10/100/1000 Mbps Ethernet connection. The IOM status LEDs report Fault and Power. The IOM is hotswappable and easily removable by removing cables/connectors, loosening the single thumbscrew and pulling on the handle.

Warning: It is important to remove the QSFP28 and management cables before unscrewing and lowering the handle. Lowering the handle while the cables are still installed can damage the internal components and the connector itself.

2.3.1 IOM Specifications

Table 21: IO Module (IOM) Specification Summary

Specification	Value
Part Number	1EX3059
Number per Enclosure	2
Number of ASICs	3
Hot Swappable?	Yes
Service window	5 minutes
Dimensions	**W:** 165.1 mm x **L:** 381 mm x **H:** 50.8 mm **W:** 6.5 in. x **L:** 15 in. x **H:** 2 in.
Weight	1.45 kg / 3.1 lbs.
Connector Type	Six QSFP28 connectors and one Management Port

2.4 Drive Assembly

The Drive Assembly is comprised of two basic parts: the 2.5 in. SSD and the drive carrier. The drive carrier connects to the 2.5 in. drive and enables toolless installation and replacement. The drive assembly is available in many different volumes, encryption, and block sizes.

2.4.1 Drive Assembly Specifications

Table 22: Drive Assembly Specification Summary

Specification	Value
Part Number	See **List of Compatible Devices** ***(page 24)***
Number per Enclosure	12 or 24 drive configurations
Maximum Drive Capacity	61.44 TB
Hot Swappable?	Yes
Dimensions	**W:** 15.7 mm x **L:** 136.3 mm x **H:** 76.2 mm **W:** 0.62 in. x **L:** 5.37 in. x **H:** 3 in.
Weight	0.15 kg / 0.4 lbs.

2.5 Drive Blank Assembly

The Drive Blank Assembly is a component that is used to fill empty drive slots in the chassis when a OpenFlex Data24 4000 Series enclosure is partially populated with drives.

2.5.1 Drive Blank Assembly Specifications

Table 23: Drive Assembly Specification Summary

Specification	Value
Part Number	1EX3078
Number per Enclosure	Up to 12
Hot Swappable?	Yes
Dimensions	**W:** 15.7 mm x **L:** 136.3 mm x **H:** 76.2 mm **W:** 0.62 in. x **L:** 5.37 in. x **H:** 3 in.
Weight	0.045 kg / 0.1 lbs.

2.6 Drive Carrier

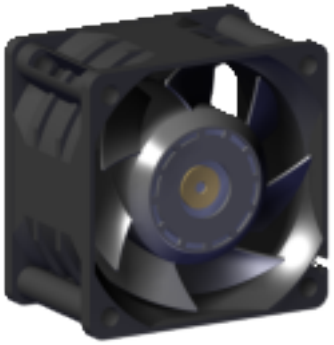
The Drive Carrier is a toolless module that houses a 2.5 in. SSD. The drive carrier contains an easy to use latching mechanism that secures the drive in place in the chassis.

2.6.1 Drive Carrier Specifications

Table 24: Drive Carrier Specification Summary

Specification	Value
Part Numbers	1EX3342: 24-Pack 1EX3377: Single
Hot Swappable?	Yes
Packaged Dimensions (Single Carrier)	**W:** 79.3 mm x **L:** 60.0 mm x **H:** 20.5 mm **W:** 3.1 in x **L:** 2.4 in x **H:** 0.1 in
Packaged Weight (Single Carrier)	0.02 kg / 0.05 lb

2.7 System Fan



The System Fans provide the primary system cooling for the OpenFlex Data24 4000 Series . There are a total of four N+2 redundant fans. The System Fans are coldswap capable components, and require the system to be shut down for servicing and accessed by removing the chassis cover.

2.7.1 System Fan Specifications

Table 25: System Fan Specification Summary

Specification	Value
Part Number	1EX3060
Number per Enclosure	4
Hot Swappable?	No
Service window	N/A
Dimensions	**W:** 69.8 mm x **L:** 38.1 mm x **H:** 69.8 mm **W:** 2.75 in. x **L:** 1.5 in. x **H:** 2.75 in.
Weight	0.15 kg / 0.3 lbs.
Fan Size	60 mm, single rotor
System Fan Cable Length	254 mm / 10 in.

2.8 Rail Assembly

The rails contained in the Rail Assembly included with the OpenFlex Data24 4000 Series are 2U, shelf style rails with inner arms that enable easy installation.

2.8.1 Rail Assembly Specification

Table 26: Rail Assembly Specification Summary

Specification	Value
Part Number	1EX3085
Number per Enclosure	1 Pair
Hot Swappable?	No
Service window	N/A
Dimensions	**W:** 40.6 mm x **L:** 590.5 mm x **H:** 88.9 mm **W:** 1.6 in. x **L:** 23.25 in. x **H:** 3.5 in.
Weight	2.6 kg / 5.8 lbs.
Rail Extension Length	590.5 - 825.5 mm / 23.25 - 32.5 in.
Mounting Hardware	Eight T15 Torx screws and eight washers

Support

In This Chapter:

3.1 Drive Assembly Replacement

This procedure supports the replacement of the Drive Assembly. The Drive Assembly is a toolless replacement meaning that it **does not** require the use of any tools.

Attention: Hot swappable CRUs must be replaced one at a time. If multiple drives are being replaced, there must be a waiting period of 30 seconds in between each drive insertion to avoid the drive entering a degraded warning state. This would cause the drive to disconnect from the host.

Important: Verify the enclosure configuration (nHA or HA) using the pull-out tabs or the OCGUI prior to initiating work. Refer to **Supported SKUs** *(page 22)* to distinguish between the two configurations.

Replacement Requirements	
Personnel Required	1
Average Replacement Time	3 minutes
Service Window	N/A

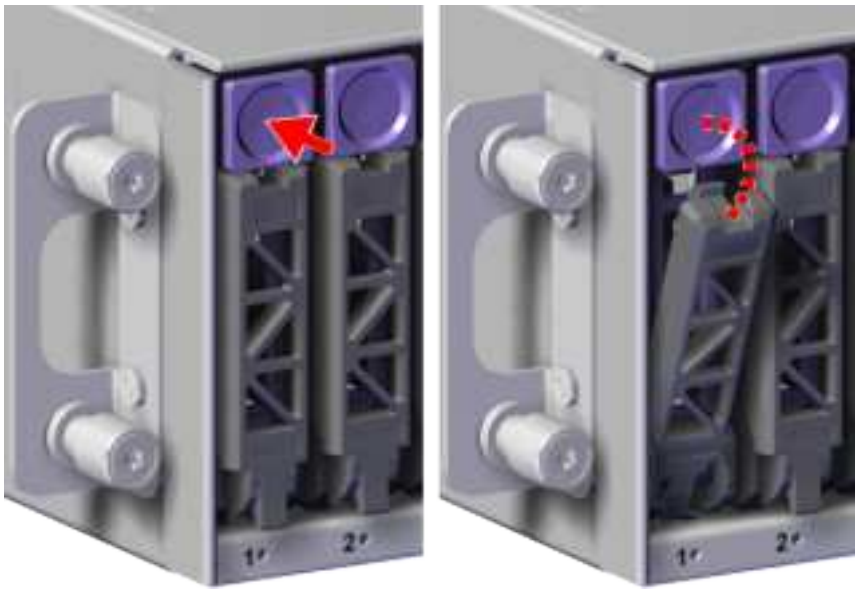
Safety List

- ESD Sensitive

Step 1: Uninstall the Drive Assembly from the enclosure.

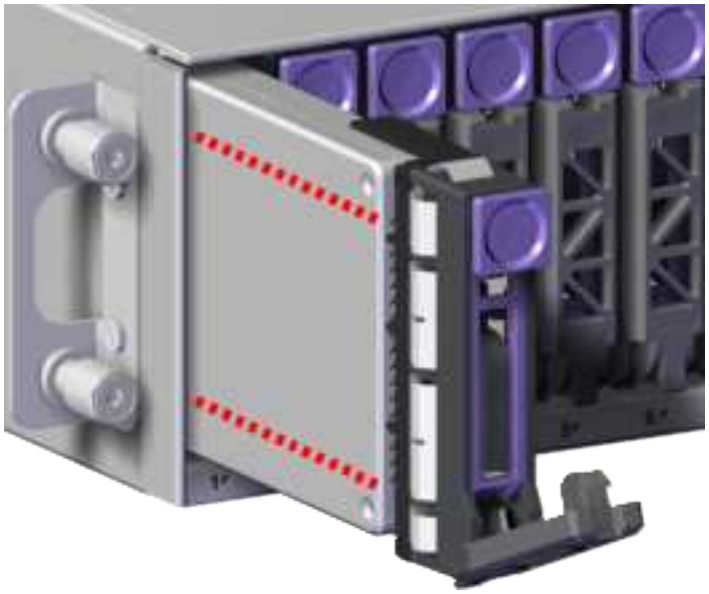
a. From the front of the rack, press the release button on the front of the Drive Assembly. The release handle will eject outward.

Figure 23: Drive Assembly Release Operation



b. Use the release handle to pull the Drive Assembly out of the enclosure.

Figure 24: Uninstall Drive Assembly



Step 2 : Unpack and inspect the new Drive Assembly for damage.

a. Inspect the packaging that the Drive Assembly replacement was shipped in and record any damage to the box. Large cuts, open boxes, and crushed corners should be reported.

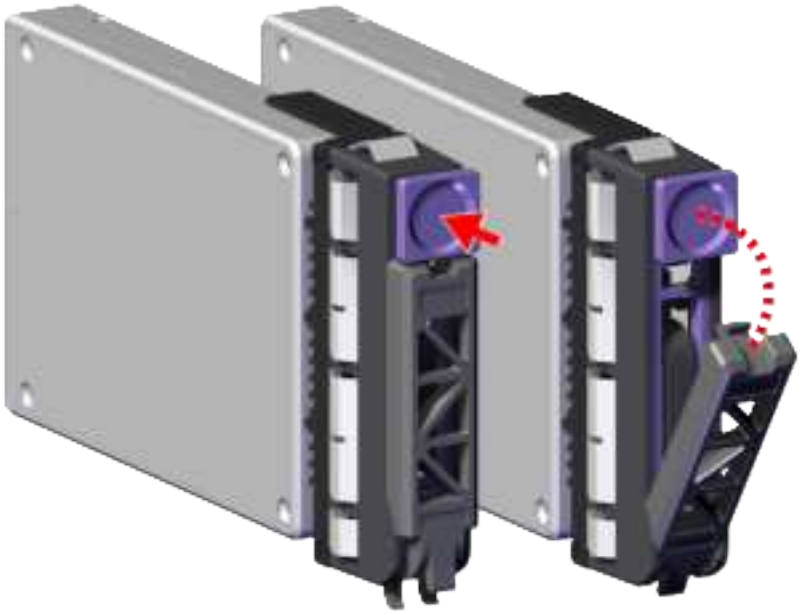
b. Remove the Drive Assembly from the packaging and verify that there is no damage to the Drive Assembly. Dents, scratches, and broken parts should be reported. If major damage has occurred to the Drive Assembly, DO NOT use the replacement part.

Step 3 : To install an SSD onto a Drive Carrier to create a Drive Assembly, refer to **Drive Removal** *(page 46)* and **Drive Installation** *(page 42)*.

Step 4 : Install the Drive Assembly into the enclosure.

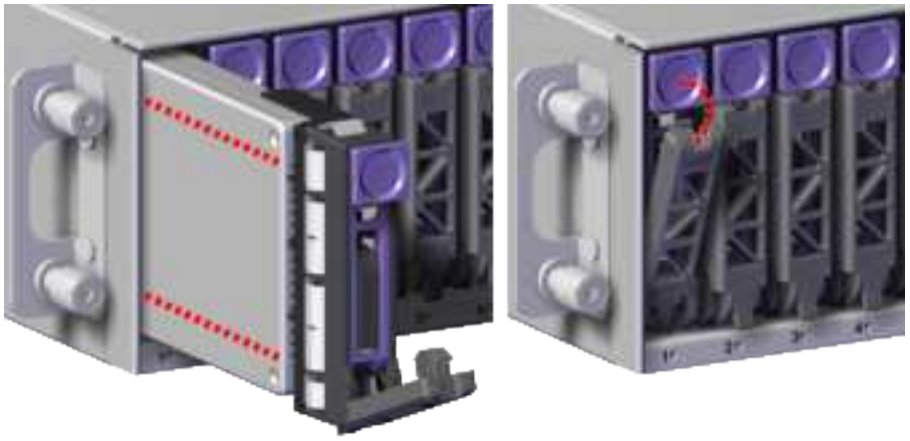
a. Prepare the Drive Assembly for installation by pressing the release button on the front of the Drive Assembly. The release handle will eject outward.

Figure 25: Drive Assembly Release Operation



b. From the front of the rack, gently slide the Drive Assembly into the Drive Assembly slot until the release handle lifts up slightly, indicating that it is engaged with the Chassis.

Figure 26: Drive Assembly Latch Engaged



c. Rotate the release handle up and press it into the Drive Assembly to secure it into the slot. When it is fully installed the user will feel the handle snap and lock into place.

Figure 27: Drive Assembly Installation

Result: The Drive Assembly has now been replaced.

3.1.1 Drive Installation

This task supports the installation of an SSD onto a Drive Carrier.

Figure 28: Fully Assembled Drive Carrier Assembly

Note: Use a new Drive Carrier each time you replace a drive.

Replacement Requirements		
Personnel Required		1
Avg. Replacement Time		5 min
Max Replacement Time		5 min
Tool	**# Needed**	**Required vs. Recommended**
N/A		

- ESD Sensitive
- Safe Lift: Under 50 lbs.

Step 1: Hold the Drive Carrier so that you can see the male alignment points on the top, bottom, and side of the drive cradle tabs.

Figure 29: Top and Bottom Male Alignment Points

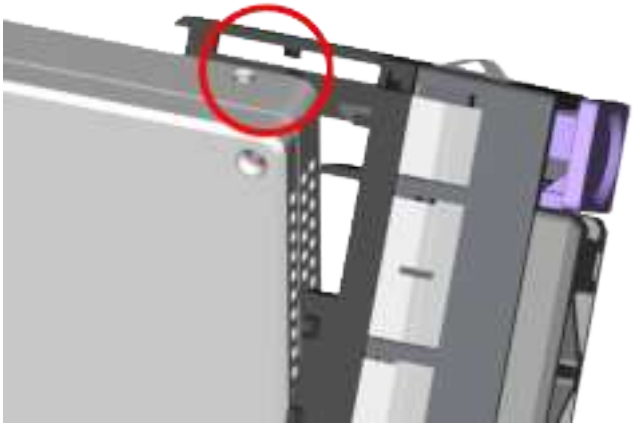
Figure 30: Side Male Alignment Points

Step 2 : Locate the female alignment points on the top, bottom, and side of the drive.

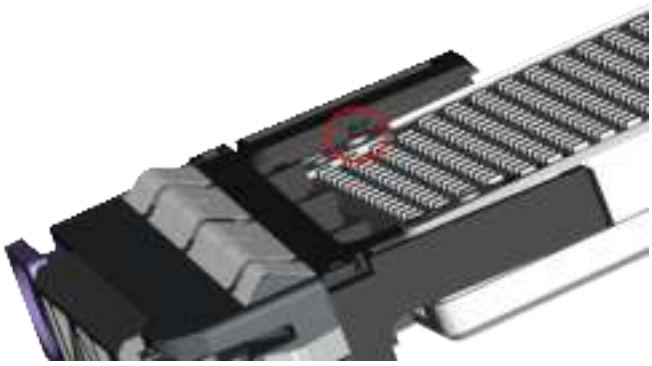
Figure 31: Top and Bottom Female Alignment Points

Figure 32: Side Female Alignment Points

Step 3 : Insert the top alignment point on the carrier into the top alignment point on the drive.



Step 4 : Gently snap the side alignment point on the carrier into the side alignment point on the drive.

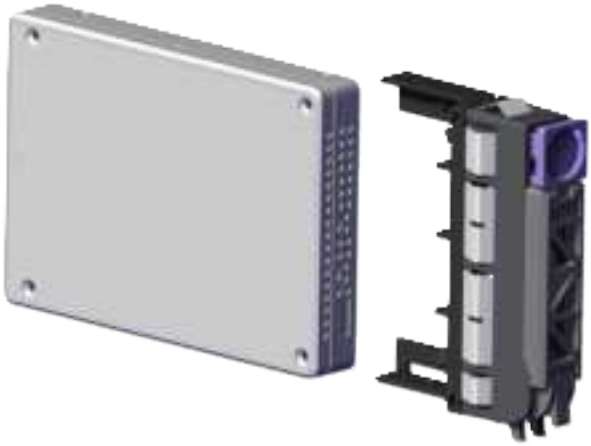


Step 5 : Repeat steps 5 and 6 on the other side of the drive and carrier.

3.1.2 Drive Removal

This task supports removal of an SSD from the Drive Carrier.

Figure 35: Decoupled Drive Carrier Assembly



Note: Use a new Drive Carrier each time you replace a drive.

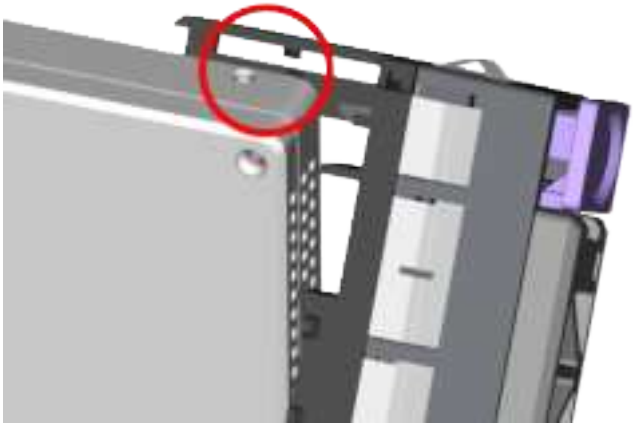
Removal Requirements		
Personnel Required		1
Avg. Removal Time		1 min
Max Removal Time		5 min
Tool	**# Needed**	**Required vs. Recommended**
Spudger	1	Recommended

- ESD Sensitive
- Safe Lift: Under 50 lbs.

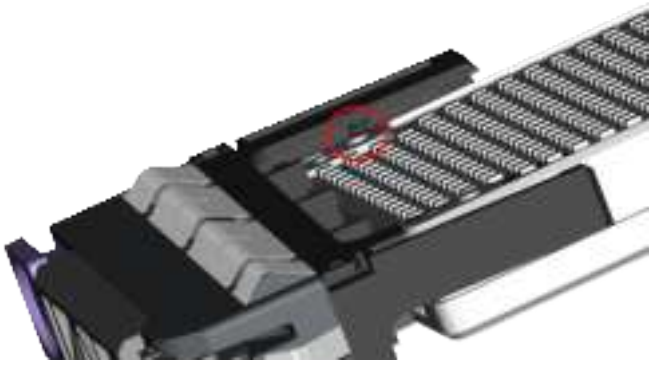
Step 1: Remove the Drive Assembly from the enclosure. Refer to **Drive Assembly Replacement** *(page 38)*.

Step 2: Insert the flat end of the spudger between the Drive Carrier alignment tab on top of the Drive Assembly and the SSD.

Step 3 : Gently twist the spudger to remove the male alignment point on the Drive Carrier alignment tab from the drive alignment point on the SSD.



Step 4 : Insert the spudger's flat end between the side Drive Carrier cradle tab and the SSD's side alignment point.



Step 5 : Carefully twist the Drive Carrier away from the drive.

Step 6 : Repeat steps 2-5 to remove the carrier from the other side of the drive.

Step 7 : If you are not replacing the Drive Assembly, install a Drive Blank Assembly to protect the enclosure from contamination.

3.2 Drive Blank Assembly Replacement

This procedure supports the replacement of the Drive Blank Assembly. The Drive Blank Assembly is a toolless replacement meaning that it **does not** require the use of any tools.

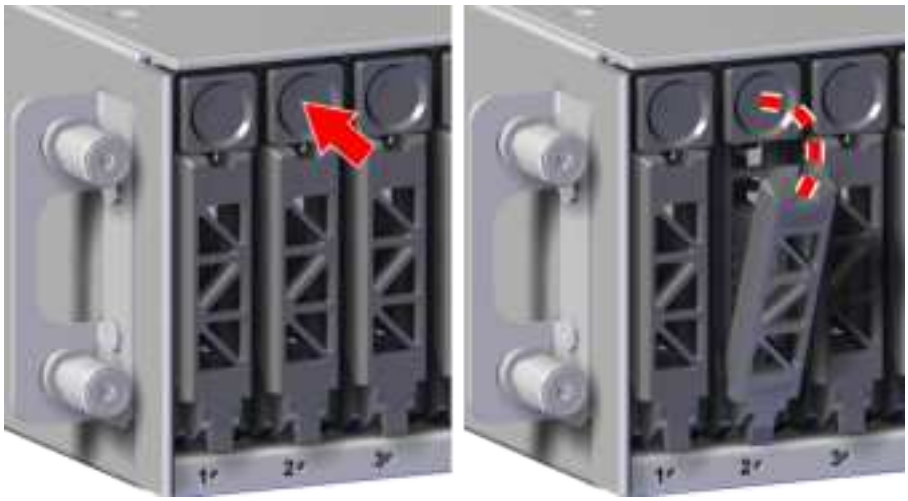
Important: Verify the enclosure configuration (nHA or HA) using the pull-out tabs or the OCGUI prior to initiating work. Refer to **Supported SKUs** *(page 22)* to distinguish between the two configurations.

Replacement Requirements	
Personnel Required	1
Average Replacement Time	3 minutes

Step 1: Uninstall the Drive Blank Assembly from the enclosure.

a. From the front of the rack, press the release button on the front of the Drive Blank Assembly. The release handle will eject outward.

Figure 38: Drive Blank Assembly Release Operation



b. Use the release handle to pull the Drive Blank Assembly out of the enclosure.

Figure 39: Uninstall Drive Blank Assembly

Step 2 : Unpack and inspect the new Drive Blank Assembly for damage.

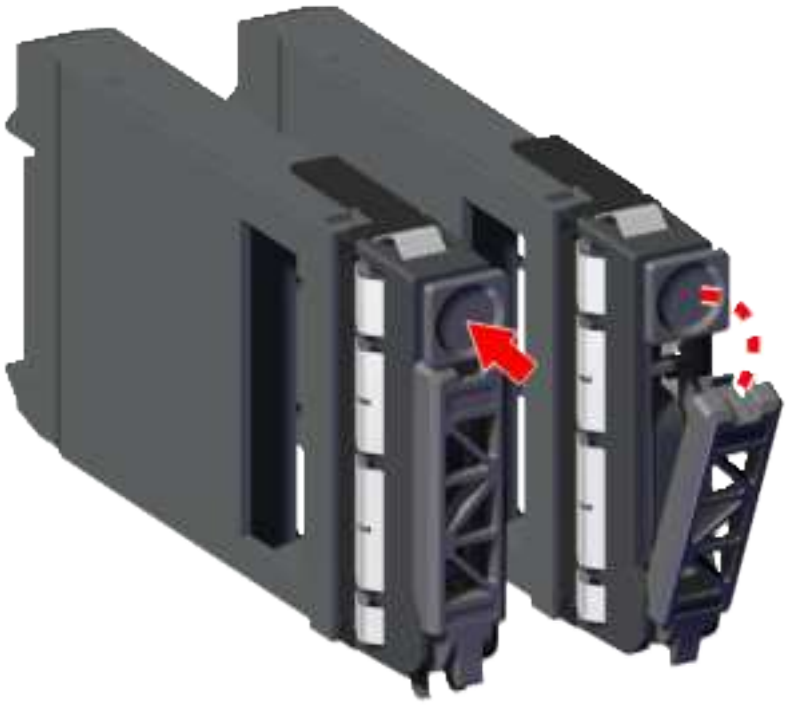
a. Inspect the packaging that the Drive Blank Assembly replacement was shipped in and record any damage to the box. Large cuts, open boxes, and crushed corners should be reported.

b. Remove the Drive Blank Assembly from the packaging and verify that there is no damage to the Drive Blank Assembly. Dents, scratches, and broken parts should be reported. If major damage has occurred to the Drive Blank Assembly, DO NOT use the replacement part.

Step 3 : Install the Drive Blank Assembly into the enclosure.

a. Prepare the Drive Blank Assembly for installation by pressing the release button on the front of the Drive Blank Assembly. The release handle will eject outward.

Figure 40: Drive Blank Assembly Release Operation



b. From the front of the rack, gently slide the Drive Blank Assembly into the Drive Blank Assembly slot until the release handle lifts up slightly, indicating that it is engaged with the Chassis.

Figure 41: Drive Blank Assembly Latch Engaged

c. Rotate the release handle up and press it into the Drive Blank Assembly to secure it into the slot. When it is fully installed the user will feel the handle snap and lock into place.

Figure 42: Drive Blank Assembly Installation

Result: The Drive Blank Assembly has now been replaced.

3.3 Power Supply Unit (PSU) Replacement

This procedure supports the replacement of the PSU. The PSU is a toolless replacement meaning that it **does not** require the use of any tools.

Attention: Hot swappable CRUs must be replaced one at a time.

Important: Verify the enclosure configuration (nHA or HA) using the pull-out tabs or the OCGUI prior to initiating work. Refer to **Supported SKUs** *(page 22)* to distinguish between the two configurations.

Replacement Requirements	
Personnel Required	1
Average Replacement Time	5 minutes
Service Window	5 minutes

Safety List

- ESD Sensitive
- Electric Shock
- Fan Blade Danger

Step 1: Move to the rear of the rack.

Step 2: Disconnect the power cable from the PSU.

a. Remove the hook and loop strap that secures the power cable to the PSU.

b. Disconnect the power cable from the PSU power port.

Figure 43: Disconnect Power Cable

Step 3: Uninstall the PSU from the enclosure.

a. From the rear of the rack, grasp the ring handle with your index finger and use your thumb to press the latch release using a pinching motion.

Figure 44: PSU Release Latch Operation

b. Carefully pull the PSU out of the PSU slot.

Figure 45: Uninstall PSU

Step 4 : Unpack and inspect the new PSU for damage.

a. Inspect the packaging that the PSU replacement was shipped in and record any damage to the box. Large cuts, open boxes, and crushed corners should be reported.

b. Remove the PSU from the packaging and verify that there is no damage to the PSU. Dents, scratches, and broken parts should be reported. If major damage has occurred to the PSU, DO NOT use the replacement part.

Step 5 : Install the PSU into the enclosure.

a. Orient the PSU with the power port located on the top and insert it into the PSU slot. The location of the power port is shown in the following image.

Figure 46: Power Port Location

b. Carefully push the PSU into the PSU slot.

Figure 47: PSU Installation

c. Verify that the PSU is fully seated and latched into the PSU slot by gently pulling on the handle.

Step 6 : Connect the power cable to the PSU.

a. Plug the power cable into the PSU power port.

Figure 48: Connect Power Cable

b. Secure the power cable to the PSU by wrapping the hook and loop strap around the power cable.

Result: The PSU has now been replaced.

3.4 IO Module (IOM) Replacement

This procedure supports the replacement of the IOM. The IOM is a toolless replacement meaning that it **does not** require the use of any tools.

Attention: Hot swappable CRUs must be replaced one at a time.

Note: During an IOM hotswap, the SSDs connected to the IOM become inaccessible on the nHA configuration (the 4100 series).

Important: Verify the enclosure configuration (nHA or HA) using the pull-out tabs or the OCGUI prior to initiating work. Refer to **Supported SKUs** *(page 22)* to distinguish between the two configurations.

Replacement Requirements	
Personnel Required	1
Average Replacement Time	4 minutes
Service Window	5 minutes

Safety List

- ESD Sensitive
- Electric Shock

Step 1: Move to the rear of the rack.

Step 2: Record the QSFP28 cable connections for each port.

Step 3: Disconnect the QSFP28 cable from the IOM by pulling on the release tab and removing the cable from the port.

Figure 49: Disconnect QSFP28 Cable

Step 4 : Repeat the previous step to uninstall the remaining QSFP28 cable(s).

Step 5 : Disconnect the Ethernet cable from the IOM Ethernet Management port.

Figure 50: Disconnect Ethernet Cable

Step 6 : Uninstall the IOM from the enclosure.

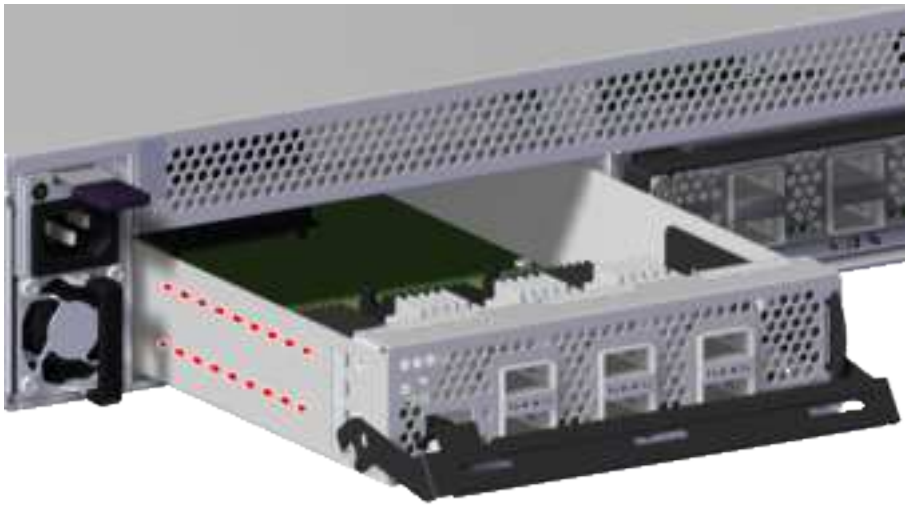
a. Unlock the IOM by turning the thumbscrew counterclockwise until the screw threads are no longer engaged any longer. The location of the thumbscrew is shown in the following image. A screwdriver may be used if desired.

Figure 51: IOM Thumbscrew Operation

b. Pull the release handle down until the IOM is unseated and can be removed from the IOM slot.

Figure 52: IOM Release Handle Operation

Figure 53: Uninstall IOM



Step 7 : Unpack and inspect the new IOM for damage.

a. Inspect the packaging that the IOM replacement was shipped in and record any damage to the box. Large cuts, open boxes, and crushed corners should be reported.

b. Remove the IOM from the packaging and verify that there is no damage to the IOM. Dents, scratches, and broken parts should be reported. If major damage has occurred to the IOM, DO NOT use the replacement part.

Step 8 : Install the IOM into the enclosure.

a. Unlock the IOM by turning the thumbscrew counterclockwise until the screw threads are not engaged any longer. The location of the thumbscrew is shown in the following image.

Figure 54: Prepare IOM

b. Gently slide the IOM into the IOM slot until the release handle is engaged with the Chassis. When the handle lifts up slightly, it is an indicator that the release handle is engaged with the Chassis.

Figure 55: IOM Handle Engaged

c. Press the release handle into the IOM and secure it in place by turning the thumbscrew clockwise until it is tight.

Figure 56: IOM Secure

d. Verify that the IOM is securely latched into the Chassis by pulling on the release handle and ensuring the IOM does not move when pulled. Reinstall the IOM if it is not securely installed into the Chassis.

Step 9 : Connect the Ethernet cable into the Ethernet Management port on the IOM.

Figure 57: Connect Ethernet Cable

Step 10 : Refer to the QSFP28 location connections that where recorded earlier in the replacement.

Step 11 : Connect the QSFP28 cable to the IOM to the QSFP the port.

Figure 58: Connect QSFP28 Cable

Result: The IOM has now been replaced.

3.5 Rail Assembly Replacement

This procedure supports the replacement of the Rail Assembly. This procedure requires the Chassis be placed on an ESD safe surface.

Important: Verify the enclosure configuration (nHA or HA) using the pull-out tabs or the OCGUI prior to initiating work. Refer to **Supported SKUs** *(page 22)* to distinguish between the two configurations.

Replacement Requirements		
Personnel Required		1
Average Replacement Time		15 minutes
Service Window		N/A
Tool	**# Needed**	**Required vs. Optional**
T15 Torx screwdriver	1	Required
ESD Mitigation Equipment (site specific)	1	Required
Level	1	Optional
Lift Equipment	1	Optional

Safety List

- ESD Sensitive
- Electric Shock
- Team Lift Recommended

Step 1: Move to the rear of the rack.

Step 2: Disconnect the power cable from the PSU.

a. Remove the hook and loop strap that secures the power cable to the PSU.

b. Disconnect the power cable from the PSU power port.

Figure 59: Disconnect Power Cable

Step 3: Repeat the previous step to uninstall the remaining power cable.

Step 4 : Disconnect the QSFP28 cable from the IOM by pulling on the release tab and removing the cable from the port.

Figure 60: Disconnect QSFP28 Cable

Step 5 : Repeat the previous step to uninstall the remaining QSFP28 cable(s).

Step 6 : Disconnect the Ethernet cable from the IOM Ethernet Management port.

Figure 61: Disconnect Ethernet Cable

Step 7 : Repeat the previous step to uninstall the remaining Ethernet cable.

Step 8 : Uninstall the Chassis from the rack mounted rails.

a. From the front of the rack, using the T15 Torx screwdriver, loosen the two Torx captive screws that secure the Chassis to the rail. Repeat this step to loosen the two Torx captive screws that secure the Chassis to the remaining rail. The location of the captive screws are shown in the following image.

Figure 62: Captive Screw Loosen

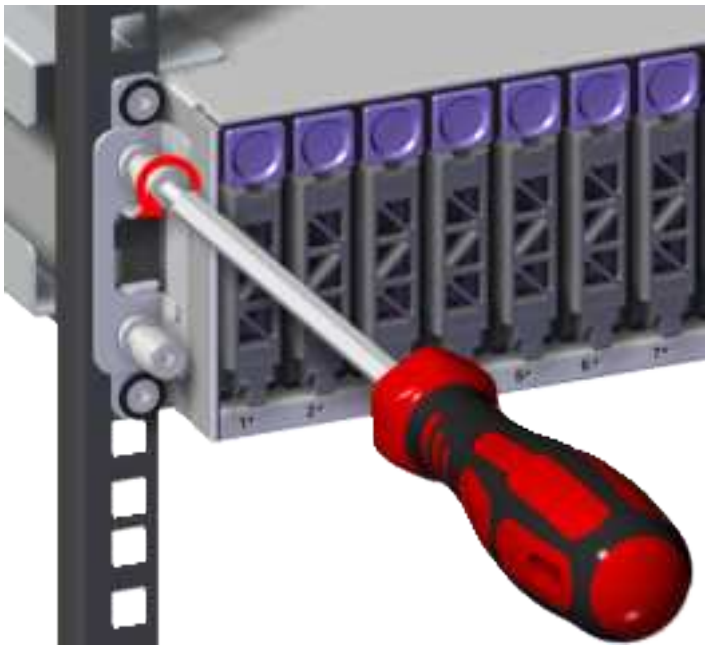
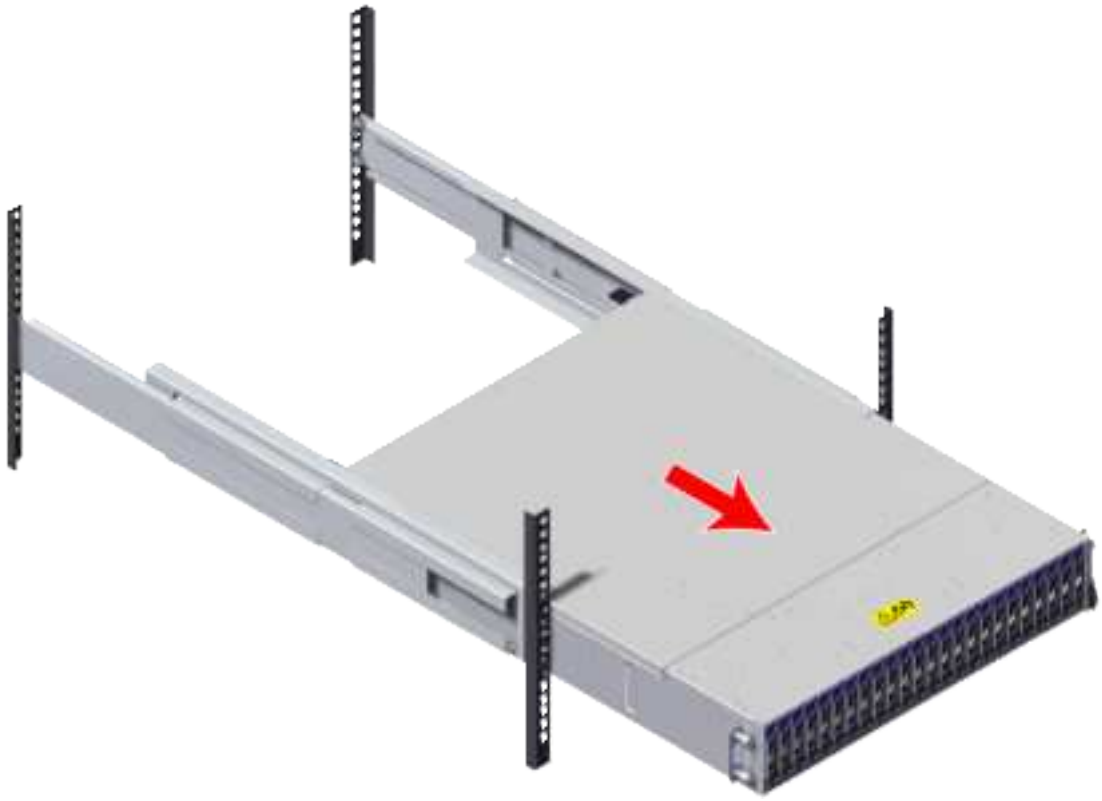


Figure 63: Captive Screw Location

b. Carefully pull the Chassis out of the rack and ensure extra care is taken to support the weight of the Chassis when the Chassis is clear of the rack mount rails.

Figure 64: Uninstall Chassis



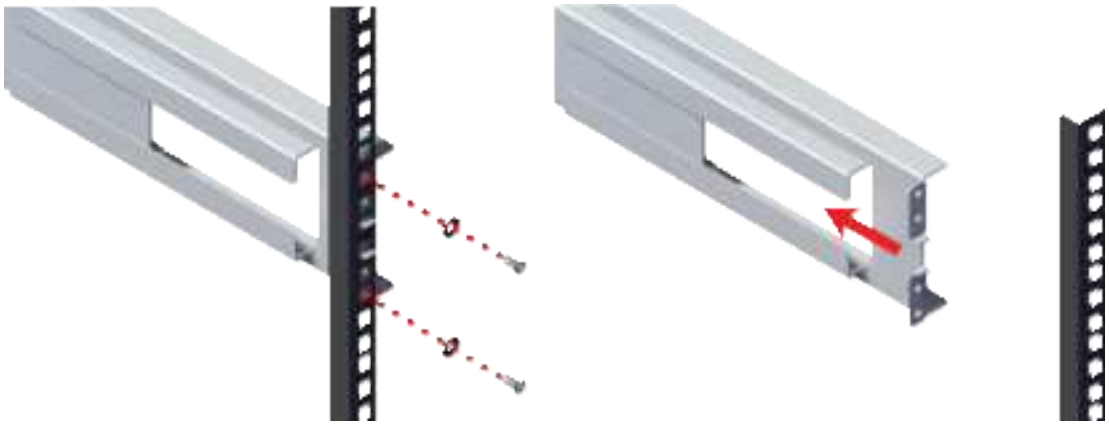
Step 9 : Carefully place the enclosure on a sturdy ESD safe surface.

Figure 65: Chassis on an ESD Safe Table

Step 10 : Uninstall the Rail Assembly.

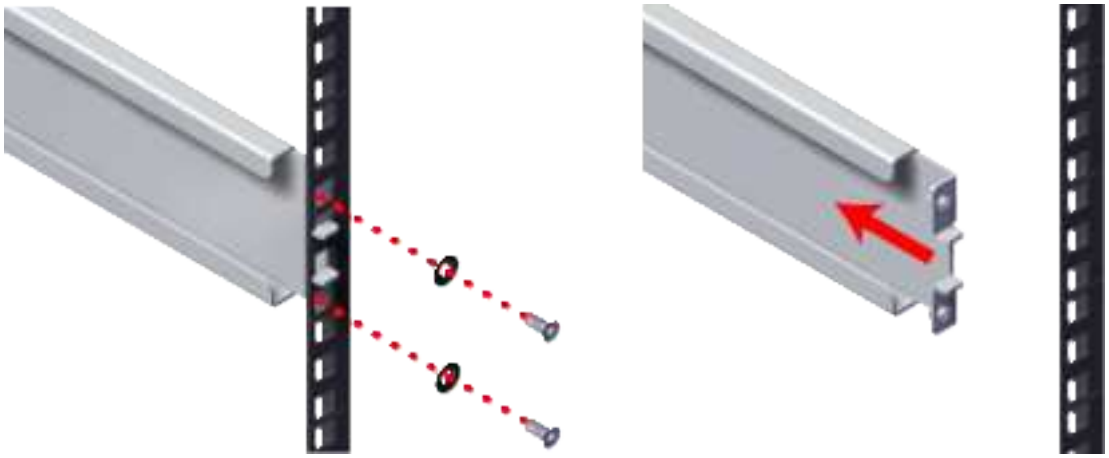
a. From the front of the rack, using the T15 Torx screwdriver, uninstall the two screws and washers that secure the front of the left rack mount Rail Assembly and bracket to the rack.

Figure 66: Uninstall Front Rack Mount



b. From the rear of the rack, using the T15 Torx screwdriver, uninstall the two screws and washers that secure the rear of the left rack mount Rail Assembly to the rack. Remove the Rail from the rack by rotating the front mount out and pulling the rear mount out of the rack.

Figure 67: Uninstall Rear Rack Mount



Step 11 : Uninstall the right Rail Assembly in the same way the first was uninstalled.

Step 12 : Unpack and inspect the new Rail Assembly for damage.

a. Inspect the packaging that the Rail Assembly replacement was shipped in and record any damage to the box. Large cuts, open boxes, and crushed corners should be reported.

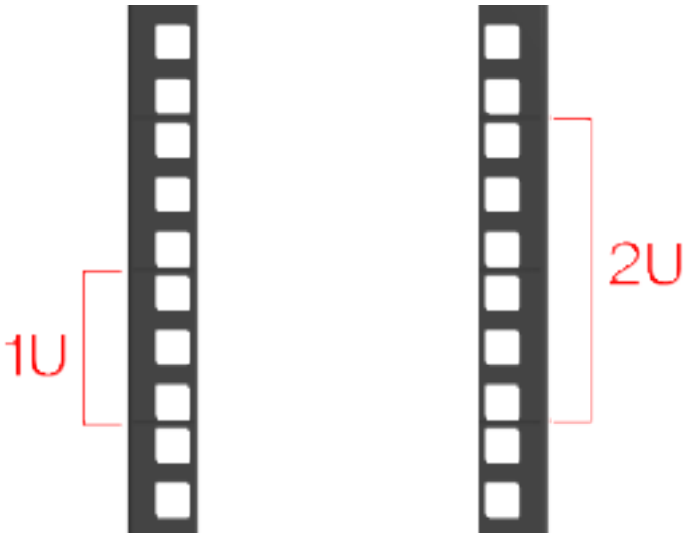
b. Remove the Rail Assembly from the packaging and verify that there is no damage to the Rail Assembly. Dents, scratches, and broken parts should be reported. If major damage has occurred to the Rail Assembly, DO NOT use the replacement part.

Step 13 : Install the rack mount Rail Assembly.

a. Identify a 2U location in the rack to install the Rail Assembly.

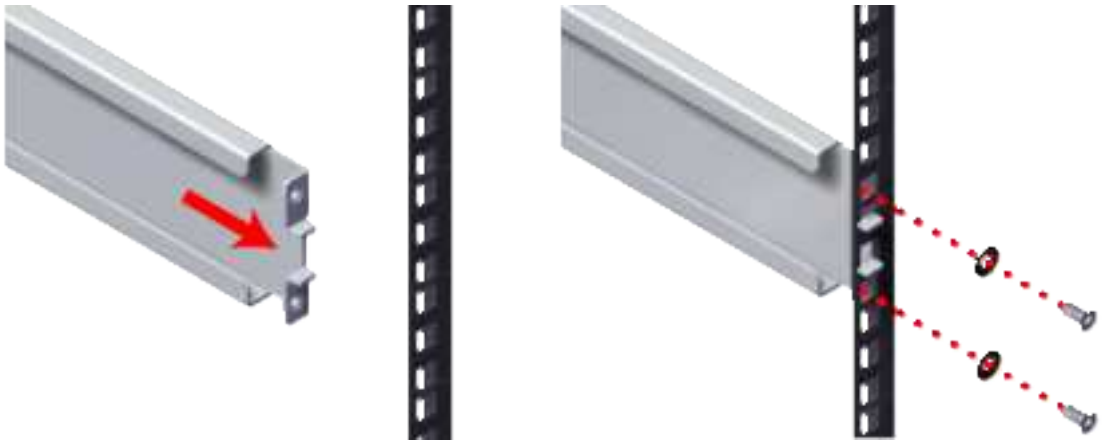
b. From the rear of the rack, set the rear of the Rail Assembly in the identified 2U location and extend it so that the pins fit into the same U holes on the front of the rack.

Figure 68: Rail Assembly U Location



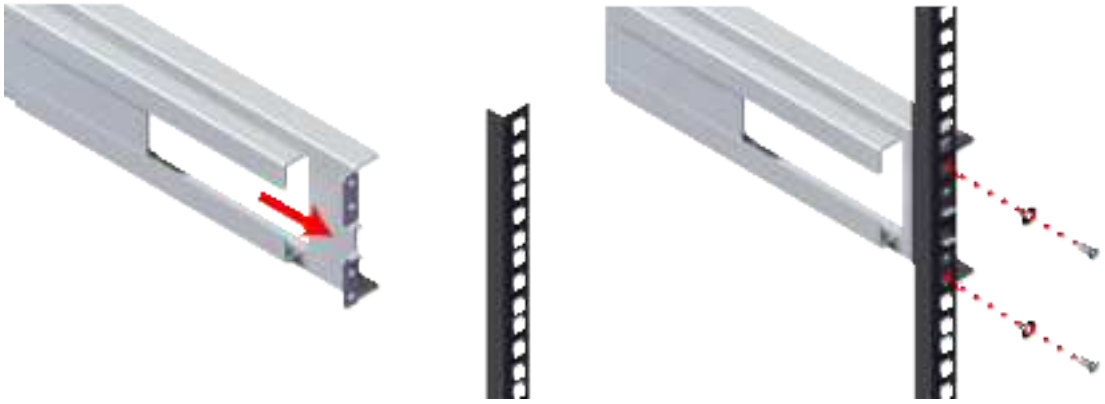
c. Secure the rear of the rack mount Rail Assembly to the rack using the T15 Torx screwdriver and secure the rail mount using the two washers and screws.

Figure 69: Install Rear Rack Mount



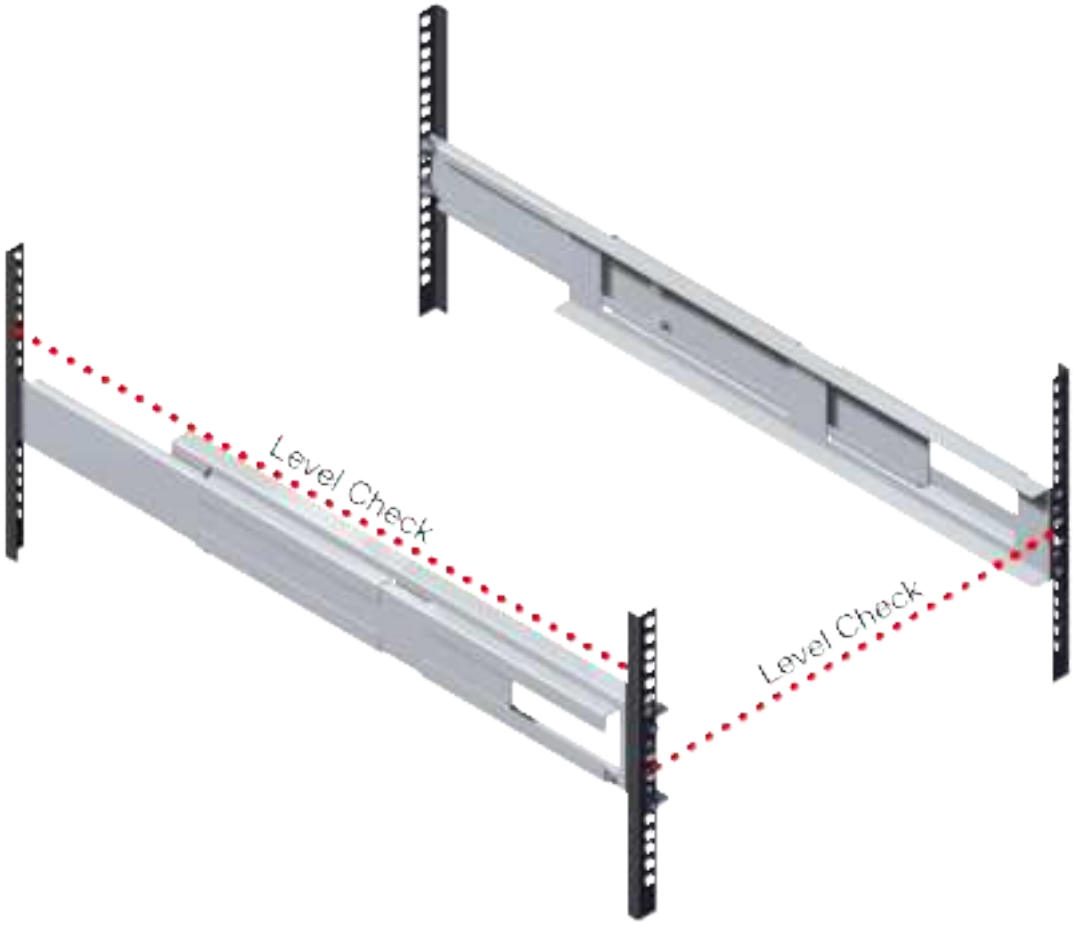
d. From the front of the rack, using the T15 Torx screwdriver, install the two washers and screws that secure the front of the rack mount Rail Assembly.

Figure 70: Install Front Rack Mount



e. It is recommended at this point to use a level to ensure that the rails are installed in the appropriate position in the rack. Check each rail is installed level individually, and then ensure they are installed at the appropriate rack by spanning both rails. It may be necessary to insert the level used at an angle to rest inside the rack shelf space.

Figure 71: Rail Level Check

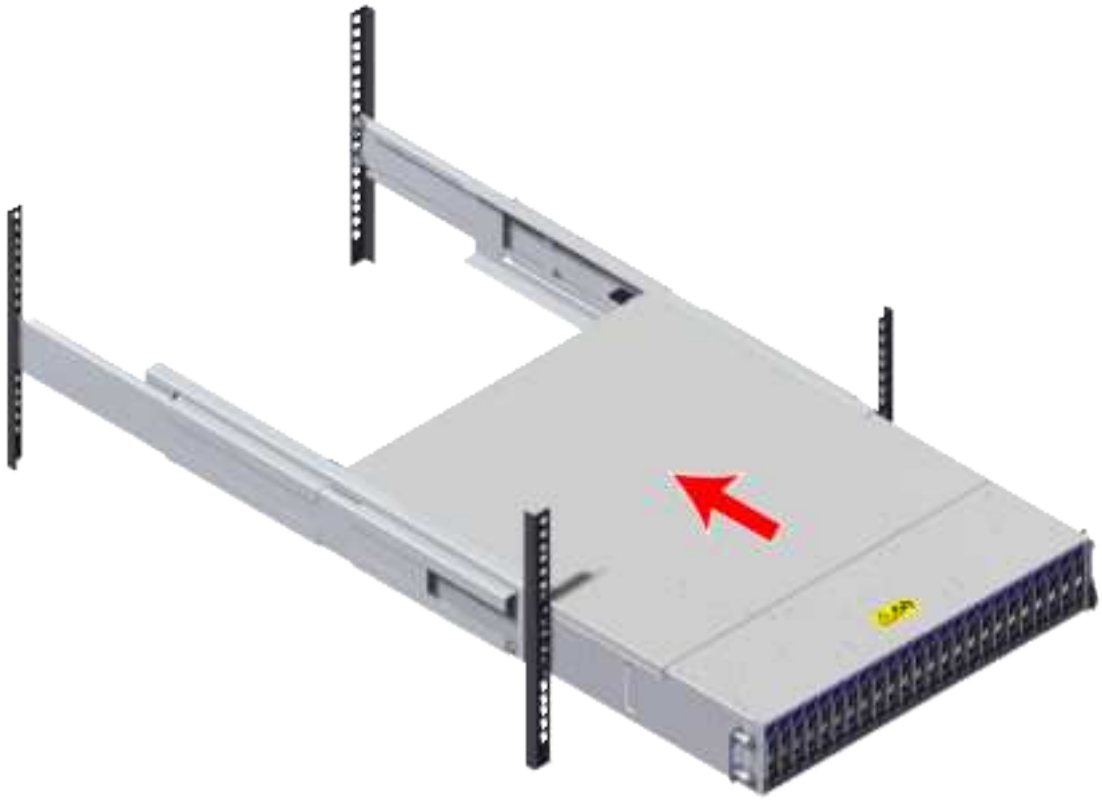


Step 14 : Install the remaining Rail Assembly in the same way the first was installed.

Step 15 : Install the Chassis onto the rack mounted rails.

a. Carefully slide the Chassis onto the rails until the rack mounts are flush with the mounts on the rails.

Figure 72: Chassis Installation



b. Using the T15 Torx screwdriver, tighten the two Torx captive screws to secure the Chassis to the rail. Repeat this step to secure the remaining rack mount to the remaining rail.

Figure 73: Captive Screw Tighten

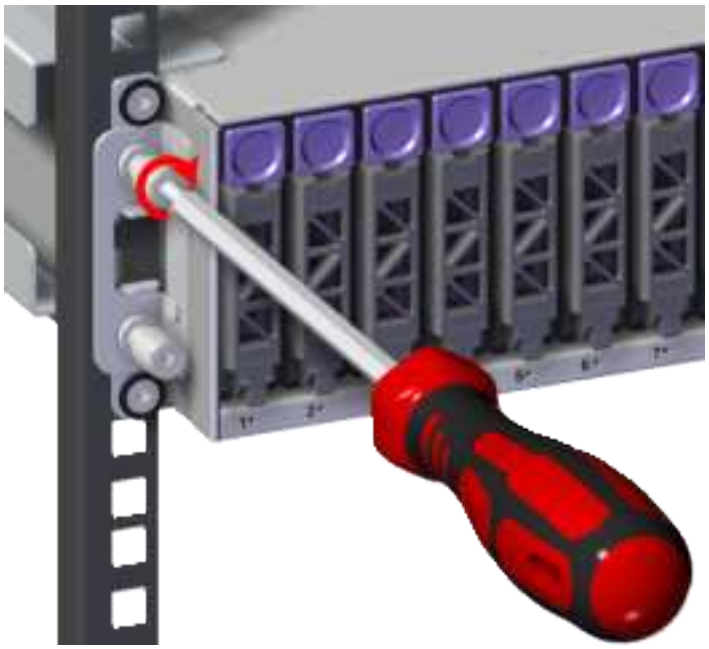


Figure 74: Captive Screw Location

Step 16 : Connect the Ethernet cable into the Ethernet Management port on the IOM.

Figure 75: Connect Ethernet Cable

Step 17 : Repeat the previous step to install the remaining Ethernet cable.

Step 18 : Connect the QSFP28 cable to the IOM to the QSFP the port.

Figure 76: Connect QSFP28 Cable

Step 19 : Repeat the previous step to install the remaining QSFP28 cable(s).

Step 20 : Connect the power cable to the PSU.

a. Plug the power cable into the PSU power port.

Figure 77: Connect Power Cable

b. Secure the power cable to the PSU by wrapping the hook and loop strap around the power cable.

Step 21: Repeat the previous step to install the remaining power cable.

Result: The Rail Assembly has now been replaced.

3.6 System Fan Replacement

This procedure supports the replacement of the System Fan. The enclosure has to be taken offline and uninstalled to replace the System Fan.

Important: Verify the enclosure configuration (nHA or HA) using the pull-out tabs or the OCGUI prior to initiating work. Refer to **Supported SKUs** *(page 22)* to distinguish between the two configurations.

Replacement Requirements		
Personnel Required		1
Average Replacement Time		40 minutes
Service Window		N/A
Tool	**# Needed**	**Required vs. Optional**
T7 Torx screwdriver	1	Required
T15 Torx screwdriver	1	Required

Safety List

- ESD Sensitive
- Electric Shock
- Team Lift Recommended

Step 1: Move to the rear of the rack.

Step 2: Disconnect the power cable from the PSU.

a. Remove the hook and loop strap that secures the power cable to the PSU.

b. Disconnect the power cable from the PSU power port.

Figure 78: Disconnect Power Cable

Step 3: Repeat the previous step to uninstall the remaining power cable.

Step 4: Disconnect the QSFP28 cable from the IOM by pulling on the release tab and removing the cable from the port.

Figure 79: Disconnect QSFP28 Cable

Step 5 : Repeat the previous step to uninstall the remaining QSFP28 cable(s).

Step 6 : Disconnect the Ethernet cable from the IOM Ethernet Management port.

Figure 80: Disconnect Ethernet Cable

Step 7 : Repeat the previous step to uninstall the remaining Ethernet cable.

Step 8 : Uninstall the IOM from the enclosure.

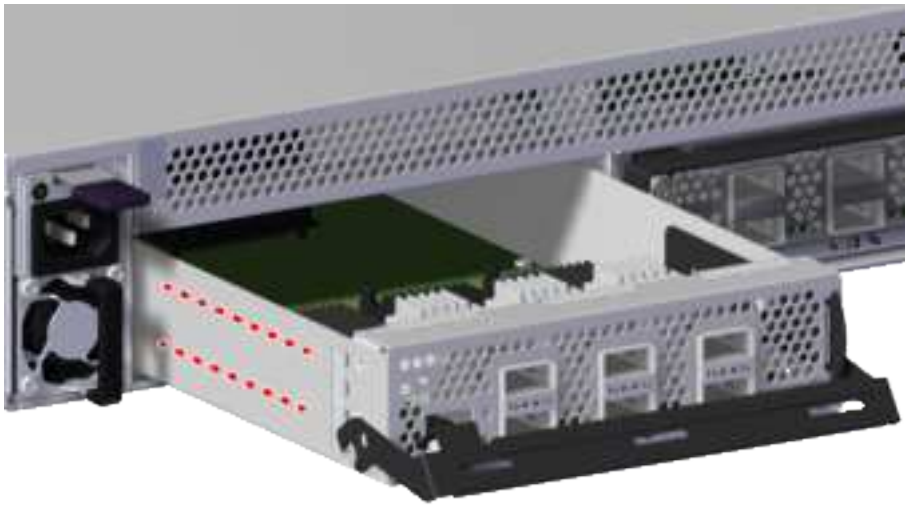
a. Unlock the IOM by turning the thumbscrew counterclockwise until the screw threads are no longer engaged any longer. The location of the thumbscrew is shown in the following image. A screwdriver may be used if desired.

Figure 81: IOM Thumbscrew Operation

b. Pull the release handle down until the IOM is unseated and can be removed from the IOM slot.

Figure 82: IOM Release Handle Operation

Figure 83: Uninstall IOM



Step 9 : Repeat the previous step to uninstall the remaining IOM.

Step 10 : Ensure that the IOMs are placed on a sturdy ESD safe surface.

Step 11 : Uninstall the PSU from the enclosure.

a. From the rear of the rack, grasp the ring handle with your index finger and use your thumb to press the latch release using a pinching motion.

Figure 84: PSU Release Latch Operation

b. Carefully pull the PSU out of the PSU slot.

Figure 85: Uninstall PSU

Step 12 : Repeat the previous step to uninstall the remaining PSU.

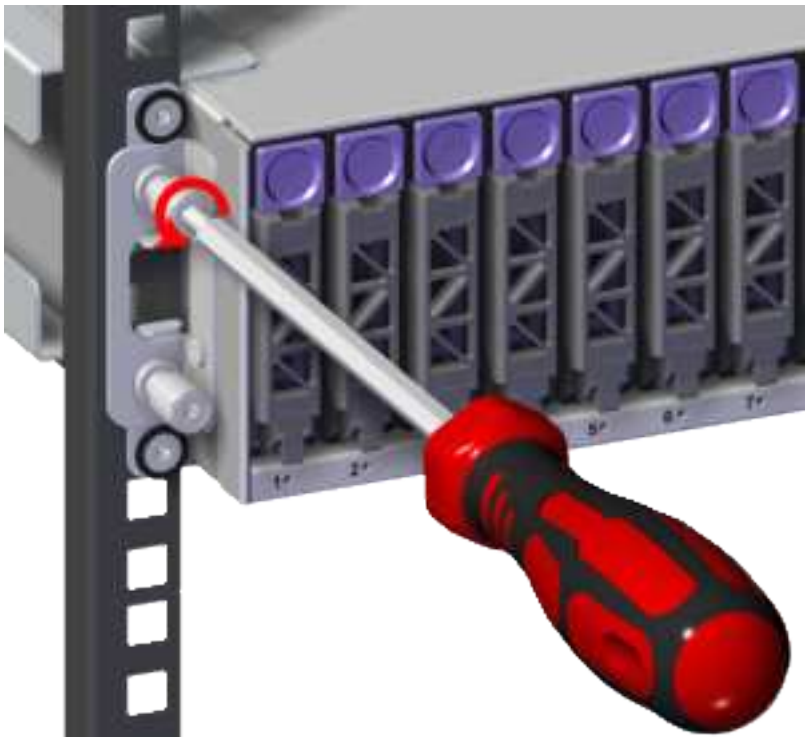
Step 13 : Ensure that the PSUs are placed on a sturdy ESD safe surface.

Step 14 : Uninstall the Chassis from the rack mounted rails.

a. From the front of the rack, using the T15 Torx screwdriver, loosen the two Torx captive screws that secure the Chassis to the rail. Repeat this step to loosen the two Torx captive screws that secure the Chassis to the remaining rail. The location of the captive screws are shown in the following image.

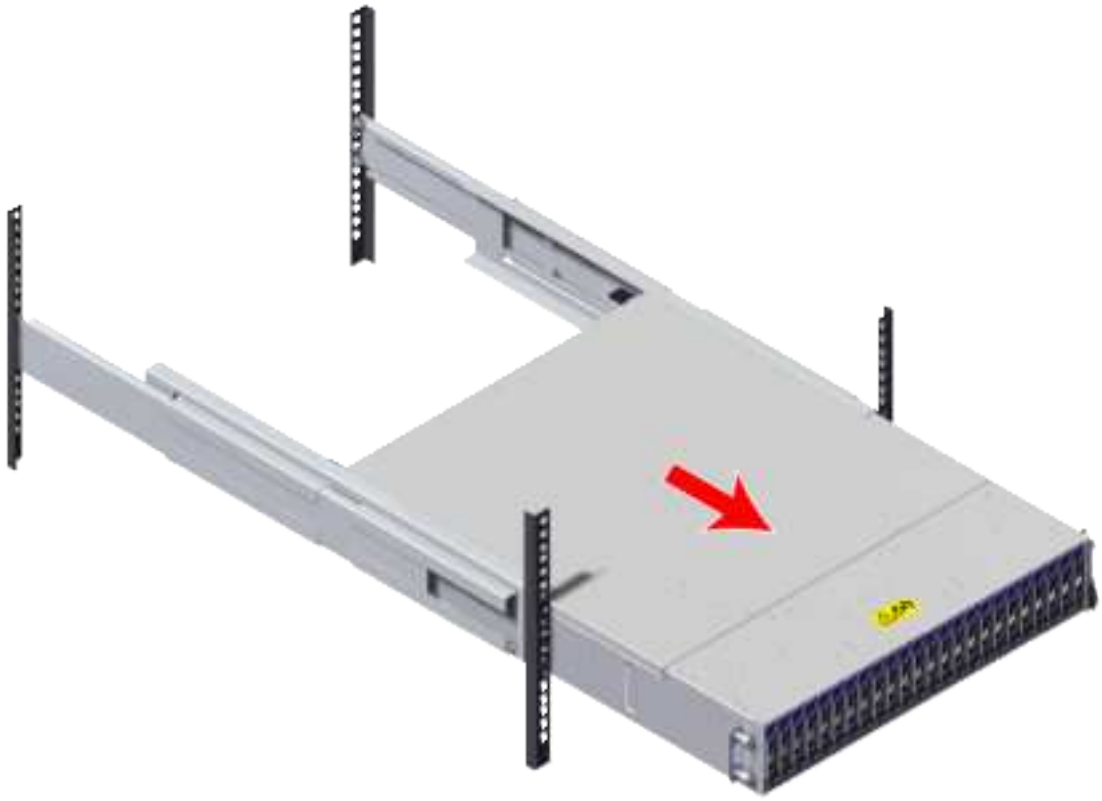
Figure 86: Captive Screw Location

Figure 87: Captive Screw Loosen



b. Carefully pull the Chassis out of the rack and ensure extra care is taken to support the weight of the Chassis when the Chassis is clear of the rack mount rails.

Figure 88: Uninstall Chassis

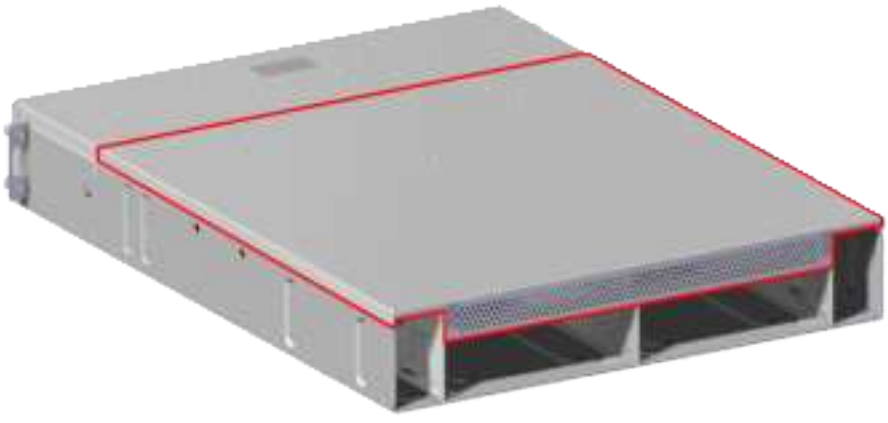


Step 15 : Carefully place the enclosure on a sturdy ESD safe surface.

Figure 89: Chassis on an ESD Safe Table

Step 16 : Uninstall theChassis cover.

Figure 90: Chassis Cover Location



a. Using a T7 Torx screwdriver, remove the eight (8) screws from the top of the Chassis cover.

Figure 91: Top Chassis Cover Screw Locations

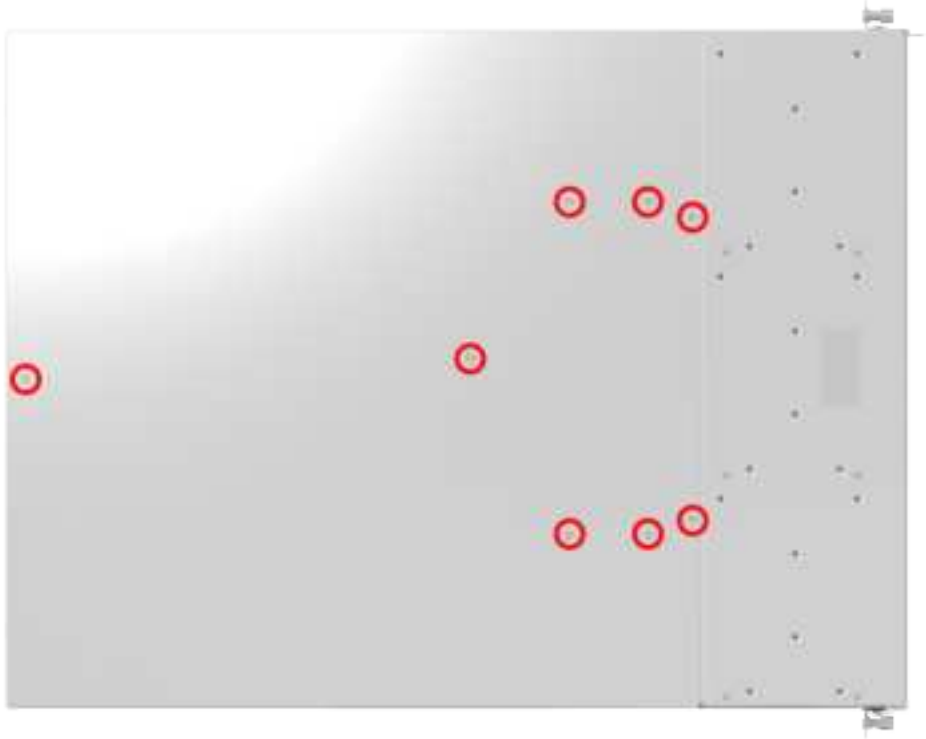
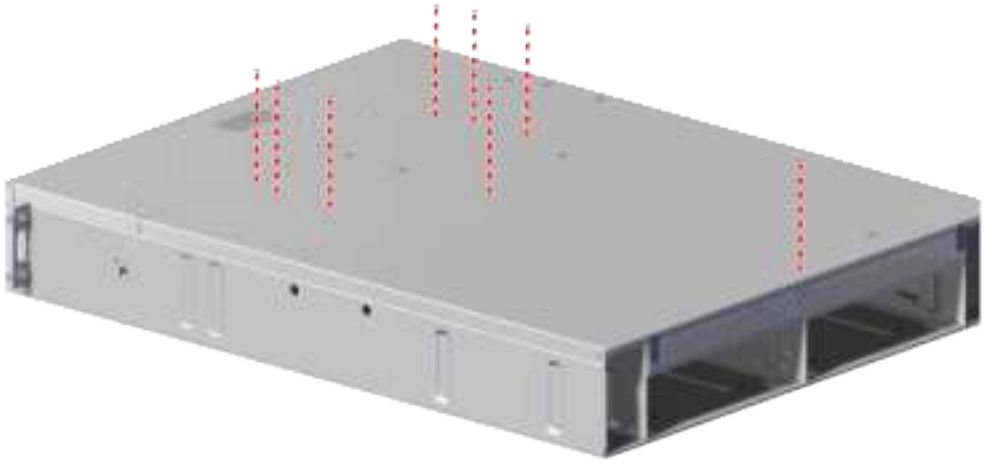


Figure 92: Remove Top Chassis Cover Screws



b. Using a T7 Torx screwdriver, remove the two (2) screws from the right side of the Chassis cover.

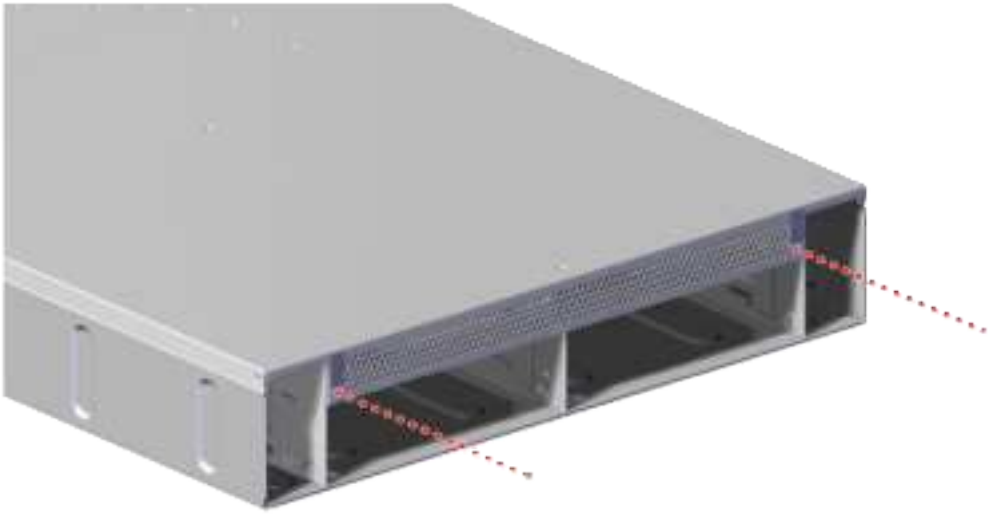
Figure 93: Right Chassis Cover Screw Locations

c. Using a T7 Torx screwdriver, remove the two (2) screws from the left side of the Chassis cover.

Figure 94: Left Chassis Cover Screw Locations

d. From the rear of the Chassis, using a T7 Torx screwdriver, remove the two (2) screws positioned just over the outer edge of each IOM bays.

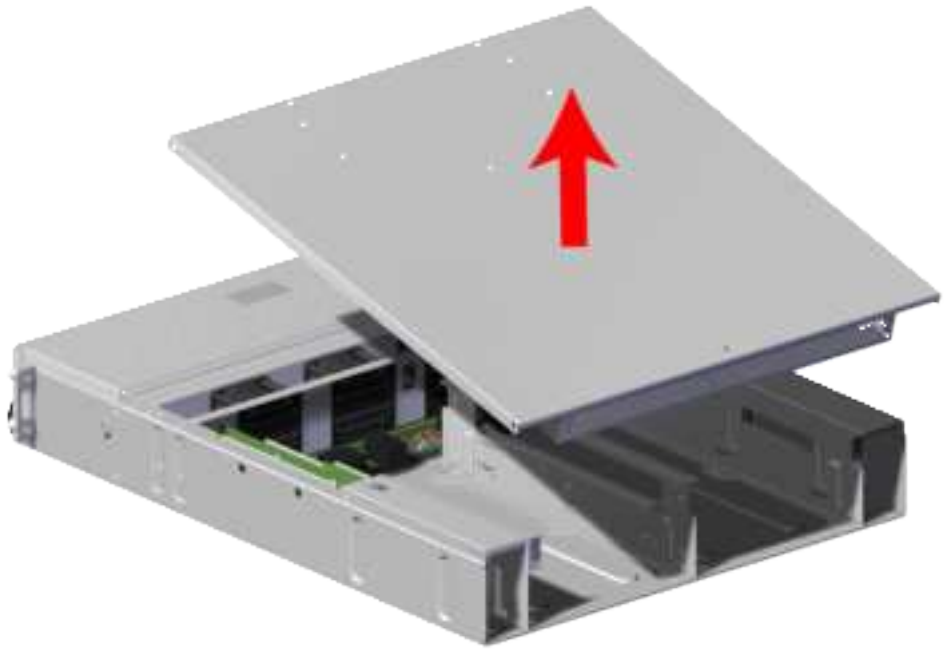
Figure 95: Rear Chassis Cover Screw Locations



e. Carefully lift the end of the cover closest to the drive bay to about 15 degrees and slide the Chassis cover toward the rear of the Chassis until it is free of the Chassis.

Figure 96: Slide Off the Rear Chassis Cover

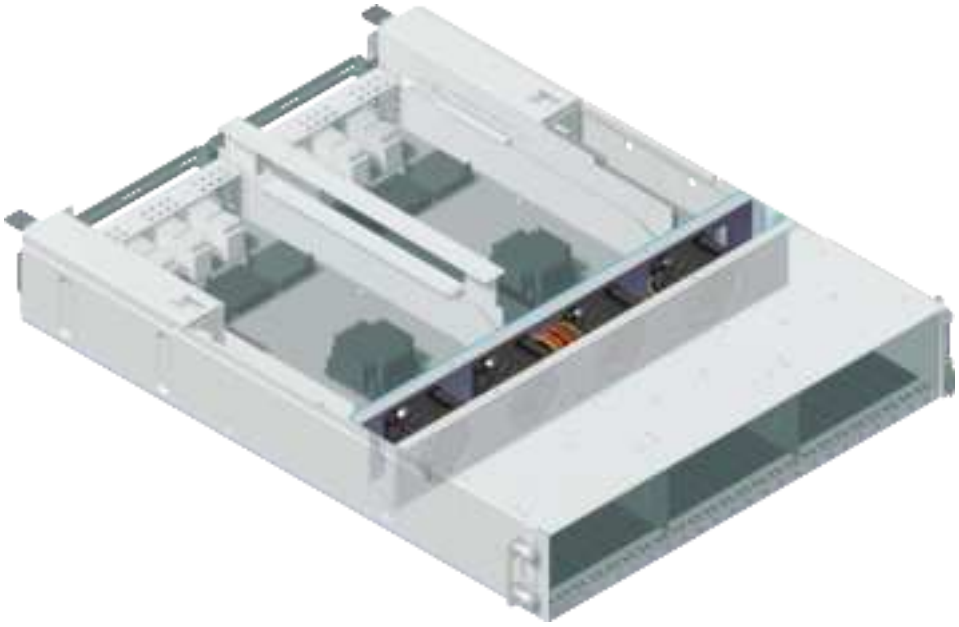
Figure 97: Removing the Rear Chassis Cover



Step 17 : Locate the System Fan in need of replacement.

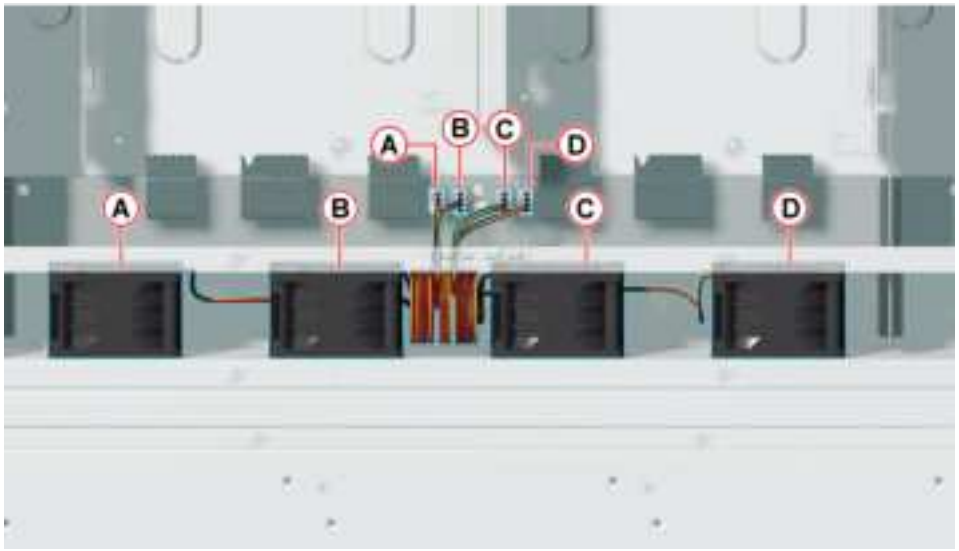
a. Find the System Fan location by discovering the letter indicated in the system management. The fan bay is labeled A thought D.

Figure 98: Locating the System Fan



b. Once the System Fan is located, find the System Fan connector. This can be done by locating the same position order as the fan module being replaced. For example, fan module A is located on the far left and the coinciding connector is on the far left and so on.

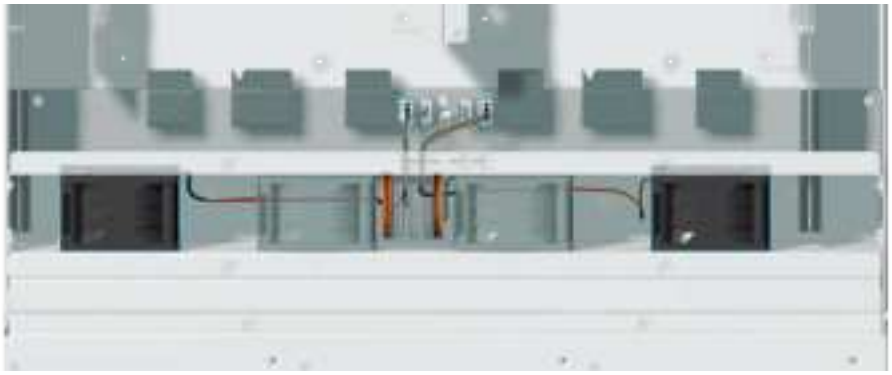
Figure 99: Locating the System Fan Connector



Step 18 : Uninstall the System Fan.

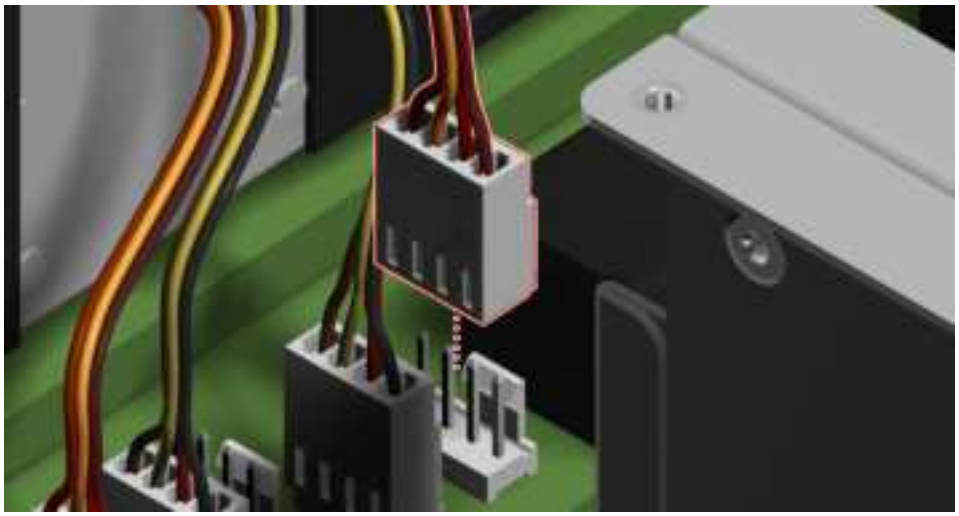
Attention: Before uninstalling the System Fan from the fan bay, take note of how the cables are run through the fan bay. The fan module cable may run under the fan module depending on the position.

Figure 100: Fan Bay Layout



a. Disconnect the System Fan connector from the horizontal midplane by carefully pulling on the System Fan connector until it is disconnected from the horizontal midplane.

Figure 101: Disconnect the System Fan Connector

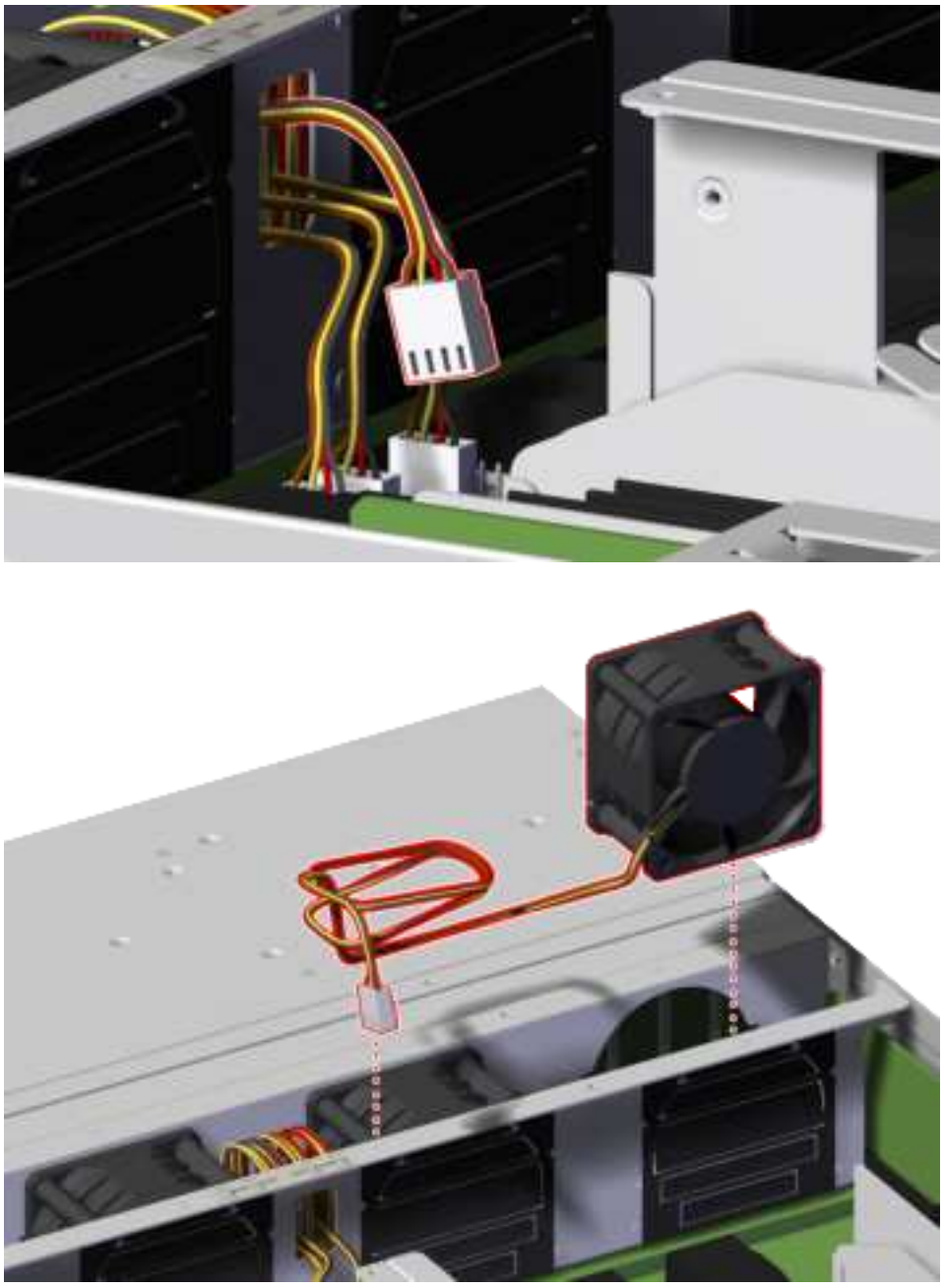


Note: The System Fan cable may run under another System Fan. If this occurs, you may pull the System Fan that is in the way partially out of the fan bay so that it may have proper clearance for the cable and connector.

Figure 102: System Fan Cable Clearance

b. Grip the edges of the System Fan and pull it from the fan bay while feeding the cable through the cutout on the fan bay.

Figure 103: Remove the System Fan from the Fan Bay



Step 19 : Unpack and inspect the new System Fan for damage.

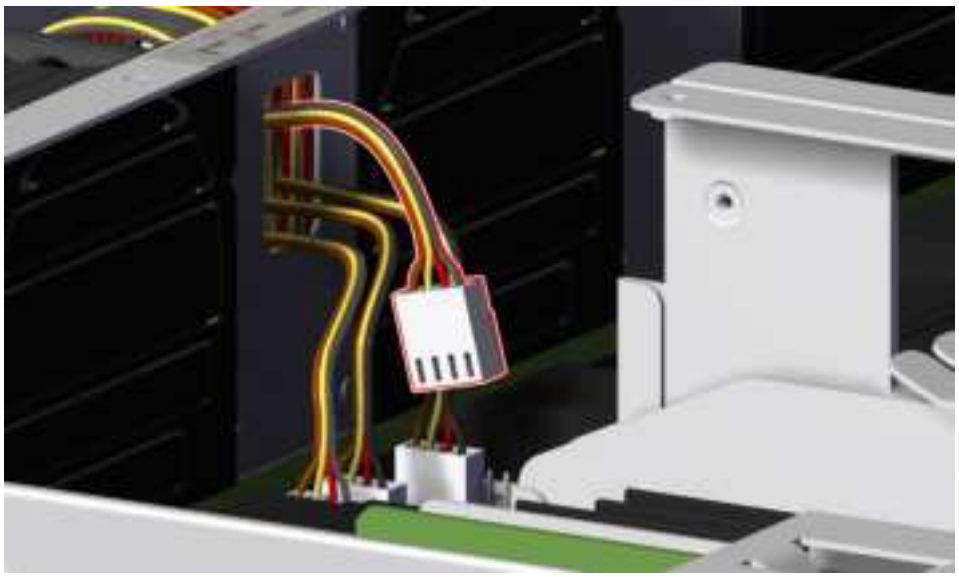
a. Inspect the packaging that the System Fan replacement was shipped in and record any damage to the box. Large cuts, open boxes, and crushed corners should be reported.

b. Remove the System Fan from the packaging and verify that there is no damage to the System Fan. Dents, scratches, and broken parts should be reported. If major damage has occurred to the System Fan, DO NOT use the replacement part.

Step 20 : Install the System Fan.

a. Feed the connector end of the System Fan cable through the cutout on the fan bay.

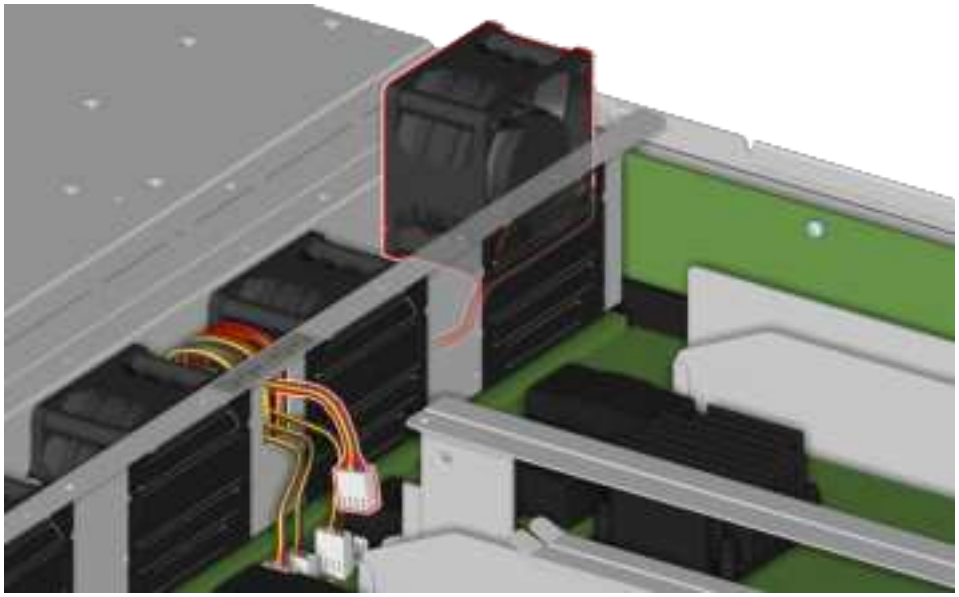
Figure 104: System Fan Connector Feed (Start)



Note: The System Fan cable may run under another System Fan. If this occurs, you may pull the System Fan that is in the way partially out of the fan bay so that it may have proper clearance to feed the cable and connector though the fan bay.

b. Begin to seat the System Fan into the fan bay while continuing to feed the cable though the fan bay cutout.

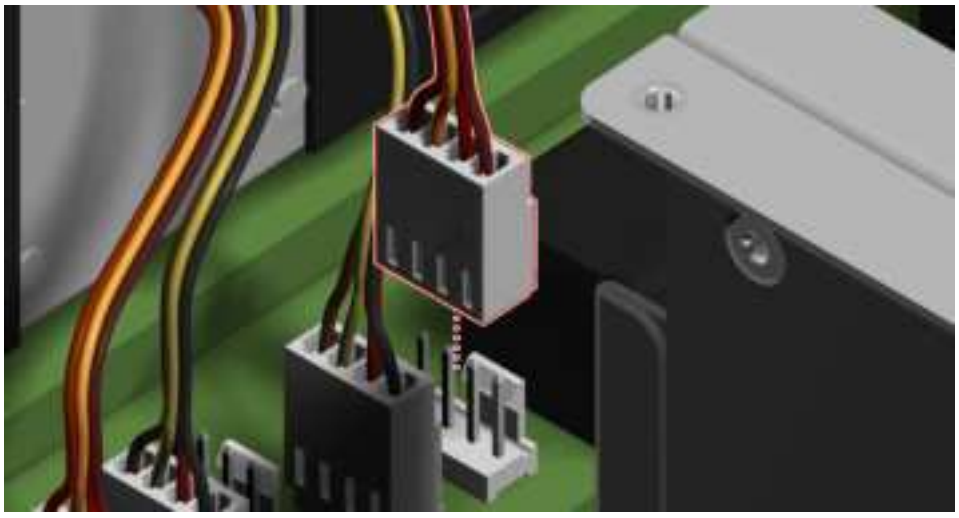
Figure 105: System Fan Connector Feed (Continue)



c. Set the System Fan taking care to not allow the cable to get bunched up under the System Fan.

d. Seat the System Fan connector to the board by carefully pushing down on the System Fan connector until it is secured to the horizontal midplane.

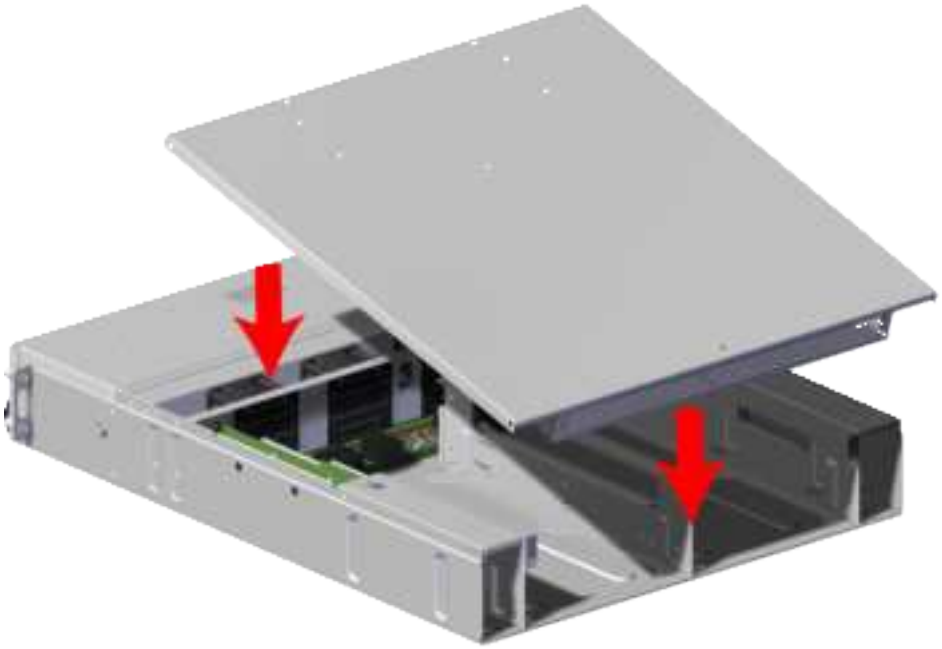
Figure 106: Seat the System Fan Connector on the Horizontal Midplane



Step 21 : Install the Chassis cover.

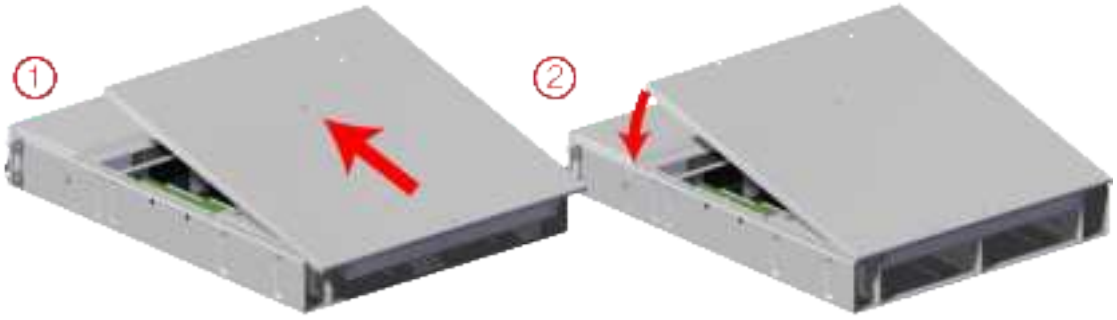
a. Carefully slide the end of the cover under the tabs located above the IOM bays on the Chassis toward the front of the enclose at about a 15 degree angle.

Figure 107: Aligning the Chassis Cover



b. Once the cover has cleared the tabs above the IOM bays, rotate the front part of the cover down to seat it into place over the Chassis.

Figure 108: Seating the Chassis Cover



c. Using a T7 Torx screwdriver, install the eight (8) screws on the top the Chassis cover.

Figure 109: Top Chassis Cover Screw Locations

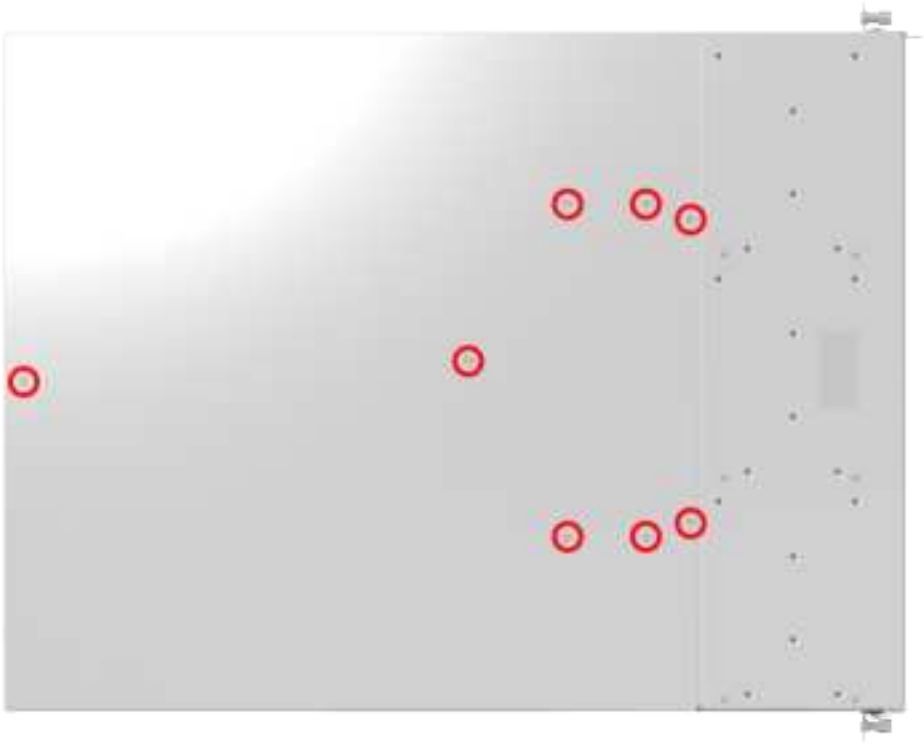
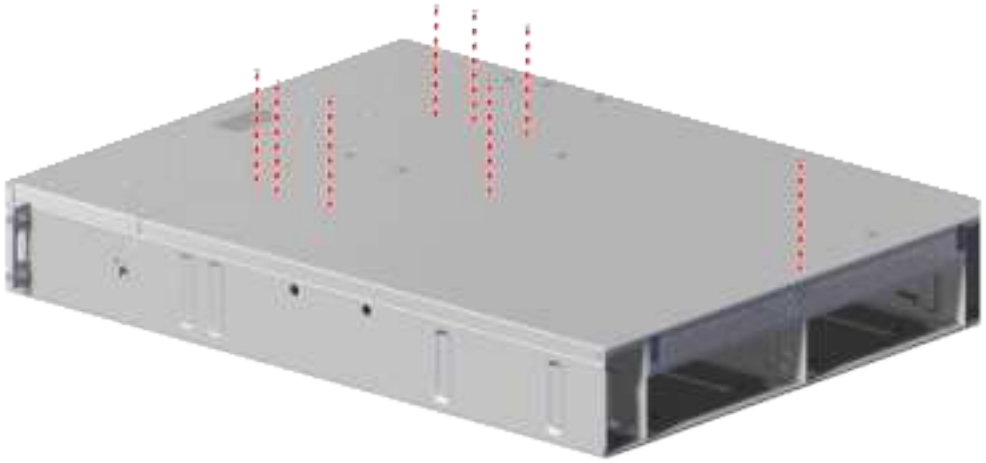


Figure 110: Install Top Chassis Cover Screws



d. Using a T7 Torx screwdriver, install the two (2) screws on the right side of the Chassis cover.

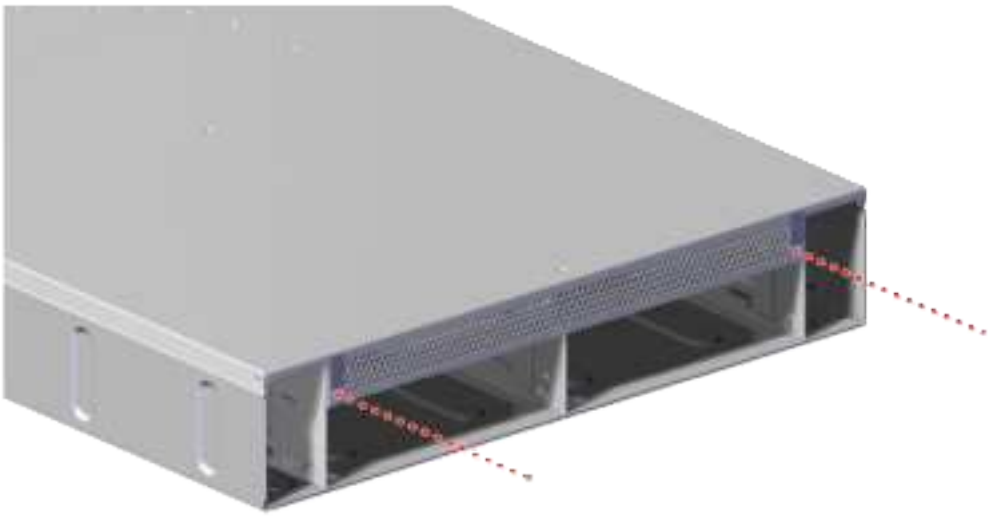
Figure 111: Right Chassis Cover Screw Locations

e. Using a T7 Torx screwdriver, install the two (2) screws on the left side of the Chassis cover.

Figure 112: Left Chassis Cover Screw Locations

f. From the rear of the Chassis, using a T7 Torx screwdriver, install the two (2) screws positioned just over the outer edge of each IOM bays.

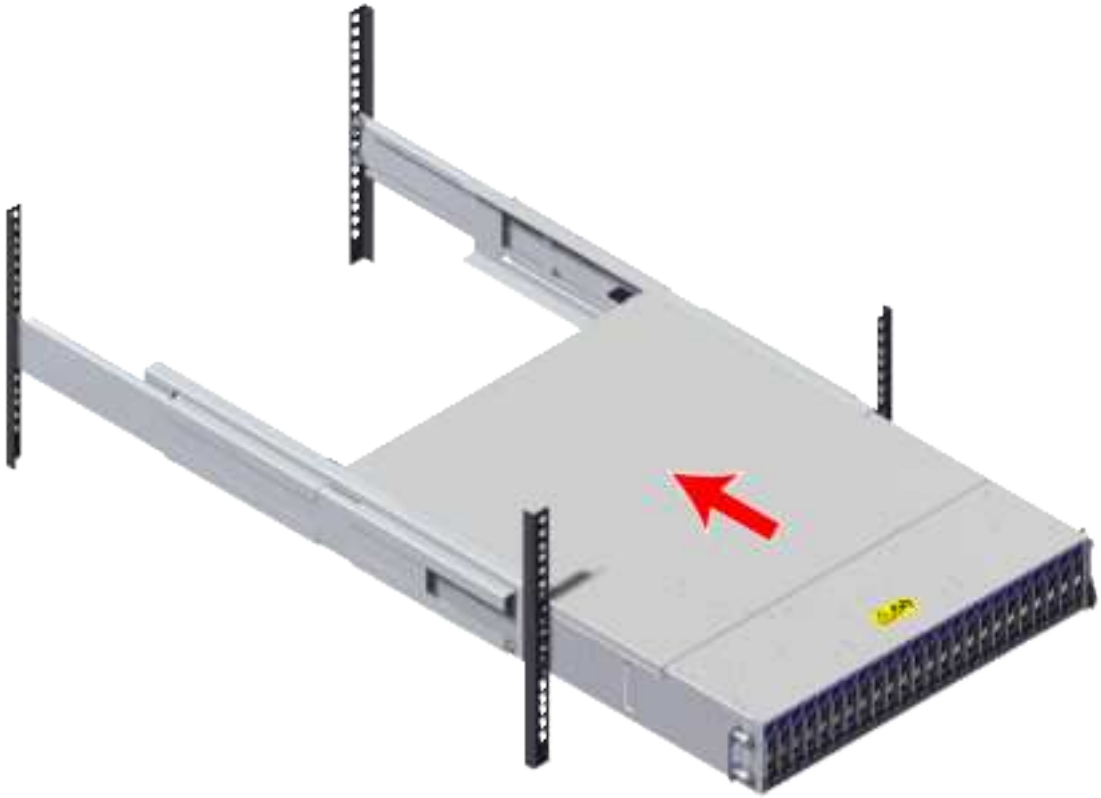
Figure 113: Rear Chassis Cover Screw Locations



Step 22 : Install the Chassis onto the rack mounted rails.

a. Carefully slide the Chassis onto the rails until the rack mounts are flush with the mounts on the rails.

Figure 114: Chassis Installation



b. Using the T15 Torx screwdriver, tighten the two Torx captive screws to secure the Chassis to the rail. Repeat this step to secure the remaining rack mount to the remaining rail.

Figure 115: Captive Screws Tighten

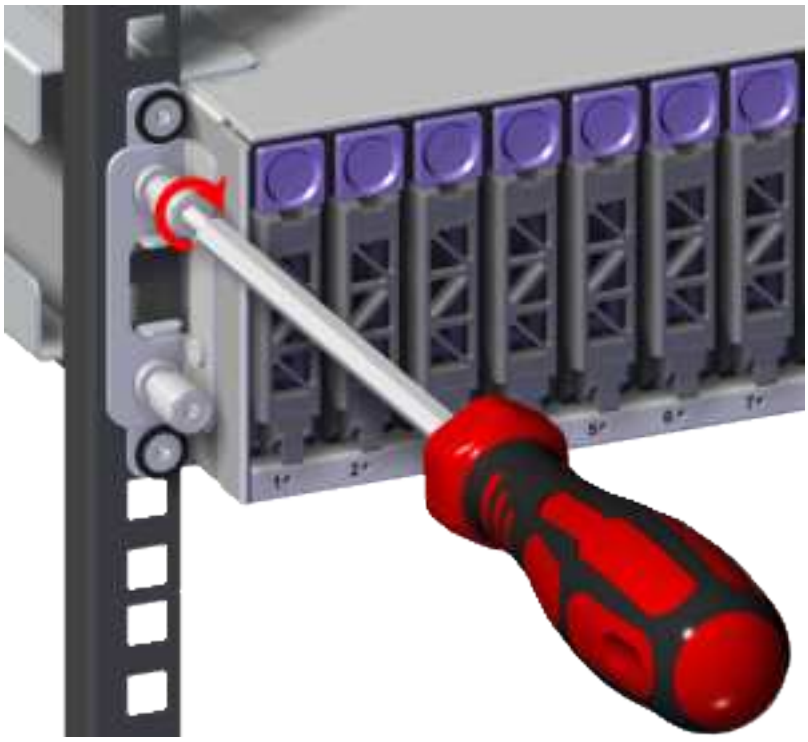


Figure 116: Captive Screw Location

Step 23 : Install the PSU into the enclosure.

a. Orient the PSU with the power port located on the top and insert it into the PSU slot. The location of the power port is shown in the following image.

Figure 117: Power Port Location

b. Carefully push the PSU into the PSU slot.

Figure 118: PSU Installation

c. Verify that the PSU is fully seated and latched into the PSU slot by gently pulling on the handle.

Step 24 : Repeat the previous step to install the remaining PSU.

Step 25 : Install the IOM into the enclosure.

a. Unlock the IOM by turning the thumbscrew counterclockwise until the screw threads are not engaged any longer. The location of the thumbscrew is shown in the following image.

Figure 119: Prepare IOM

b. Gently slide the IOM into the IOM slot until the release handle is engaged with the Chassis. When the handle lifts up slightly, it is an indicator that the release handle is engaged with the Chassis.

Figure 120: IOM Handle Engaged

c. Press the release handle into the IOM and secure it in place by turning the thumbscrew clockwise until it is tight.

Figure 121: IOM Secure

d. Verify that the IOM is securely latched into the Chassis by pulling on the release handle and ensuring the IOM does not move when pulled. Reinstall the IOM if it is not securely installed into the Chassis.

Step 26 : Repeat the previous step to install the remaining IOM.

Step 27 : Connect the Ethernet cable into the Ethernet Management port on the IOM.

Figure 122: Connect Ethernet Cable

Step 28 : Repeat the previous step to install the remaining Ethernet cable.

Step 29 : Connect the QSFP28 cable to the IOM to the QSFP the port.

Figure 123: Connect QSFP28 Cable

Step 30 : Repeat the previous step to install the remaining QSFP28 cable(s).

Step 31 : Connect the power cable to the PSU.

a. Plug the power cable into the PSU power port.

Figure 124: Connect Power Cable

b. Secure the power cable to the PSU by wrapping the hook and loop strap around the power cable.

Step 32 : Repeat the previous step to install the remaining power cable.

Result: The System Fan has now been replaced.

3.7 Chassis Replacement

This procedure supports the replacement of the Chassis.

Important: Verify the enclosure configuration (nHA or HA) using the pull-out tabs or the OCGUI prior to initiating work. Refer to **Supported SKUs** *(page 22)* to distinguish between the two configurations.

Replacement Requirements		
Personnel Required		1
Average Replacement Time		60 minutes
Tool	**# Needed**	**Required vs. Optional**
T15 Torx screwdriver	1	Required

Safety List

- ESD Sensitive
- Electric Shock
- Team Lift Recommended

Step 1: Move to the rear of the rack.

Step 2: Disconnect the power cable from the PSU.

a. Remove the hook and loop strap that secures the power cable to the PSU.

b. Disconnect the power cable from the PSU power port.

Figure 125: Disconnect Power Cable

Step 3: Repeat the previous step to uninstall the remaining power cable.

Step 4: Record the QSFP28 cable connections for each port.

Step 5: Disconnect the QSFP28 cable from the IOM by pulling on the release tab and removing the cable from the port.

Figure 126: Disconnect QSFP28 Cable

Step 6 : Repeat the previous step to uninstall the remaining QSFP28 cable(s).

Step 7 : Disconnect the Ethernet cable from the IOM Ethernet Management port.

Figure 127: Disconnect Ethernet Cable

Step 8 : Repeat the previous step to uninstall the remaining Ethernet cable.

Step 9 : Record the IOM location to ensure they are installed into the same IOM bay.

Step 10 : Uninstall the IOM from the enclosure.

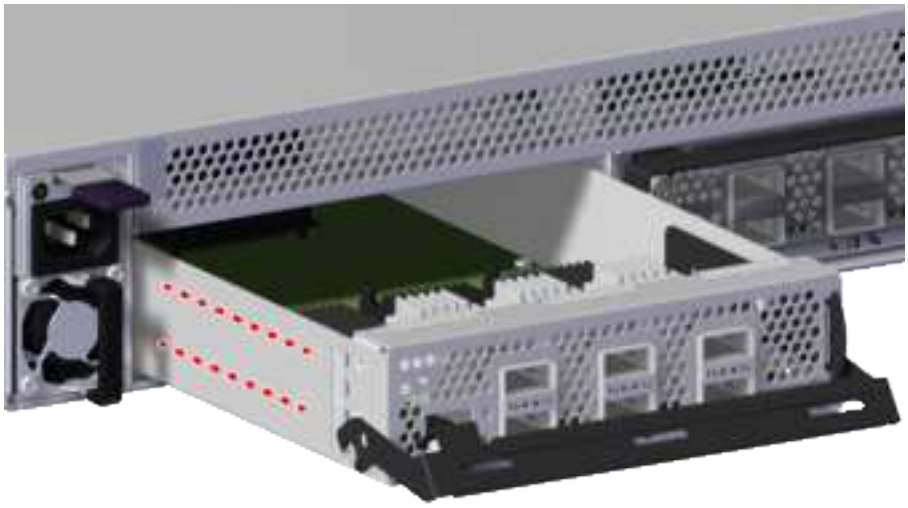
a. Unlock the IOM by turning the thumbscrew counterclockwise until the screw threads are no longer engaged any longer. The location of the thumbscrew is shown in the following image. A screwdriver may be used if desired.

Figure 128: IOM Thumbscrew Operation

b. Pull the release handle down until the IOM is unseated and can be removed from the IOM slot.

Figure 129: IOM Release Handle Operation

Figure 130: Uninstall IOM



Step 11 : Repeat the previous step to uninstall the remaining IOM.

Step 12 : Ensure that the IOMs are placed on a sturdy ESD safe surface.

Step 13 : Uninstall the PSU from the enclosure.

a. From the rear of the rack, grasp the ring handle with your index finger and use your thumb to press the latch release using a pinching motion.

Figure 131: PSU Release Latch Operation

b. Carefully pull the PSU out of the PSU slot.

Figure 132: Uninstall PSU

Step 14 : Repeat the previous step to uninstall the remaining PSU.

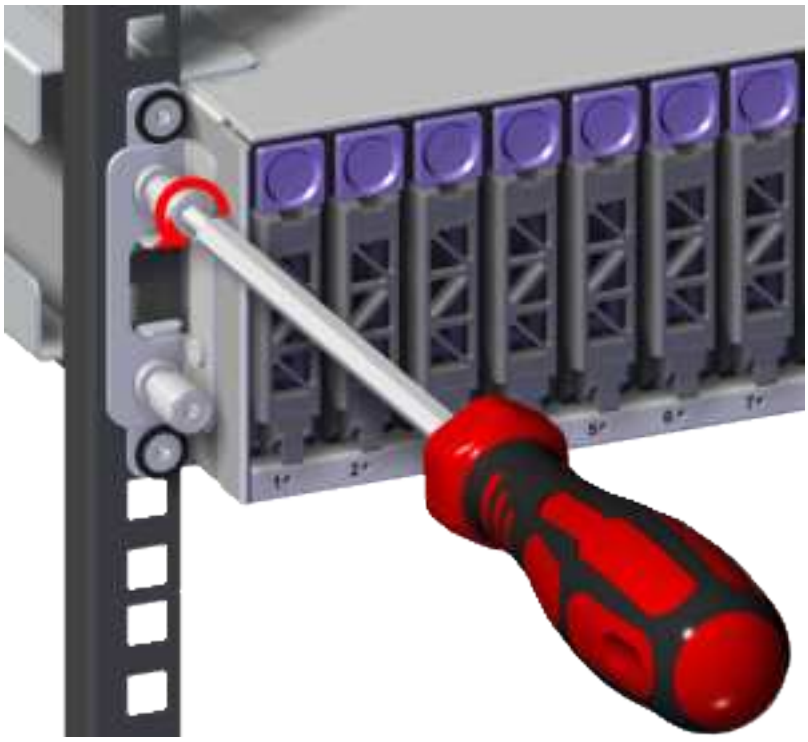
Step 15 : Ensure that the PSUs are placed on a sturdy ESD safe surface.

Step 16 : Uninstall the Chassis from the rack mounted rails.

a. From the front of the rack, using the T15 Torx screwdriver, loosen the two Torx captive screws that secure the Chassis to the rail. Repeat this step to loosen the two Torx captive screws that secure the Chassis to the remaining rail. The location of the captive screws are shown in the following image.

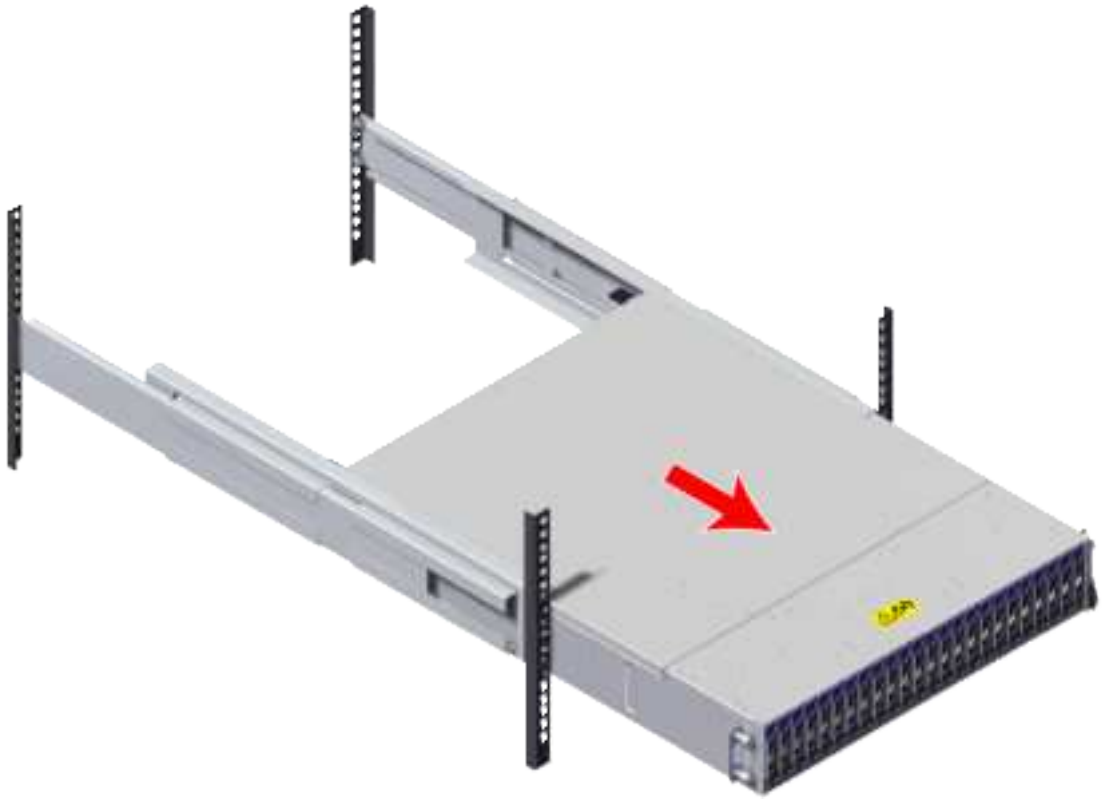
Figure 133: Captive Screw Location

Figure 134: Captive Screw Loosen



b. Carefully pull the Chassis out of the rack and ensure extra care is taken to support the weight of the Chassis when the Chassis is clear of the rack mount rails.

Figure 135: Uninstall Chassis

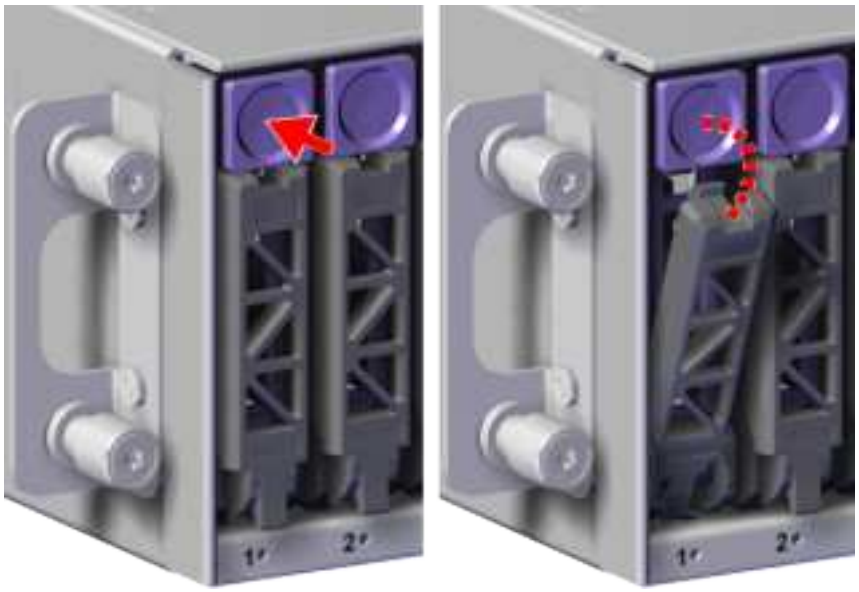


Step 17 : Record the order of each Drive Assembly in order to ensure the drives are reinstalled in the same order.

Step 18 : Uninstall the Drive Assembly from the enclosure.

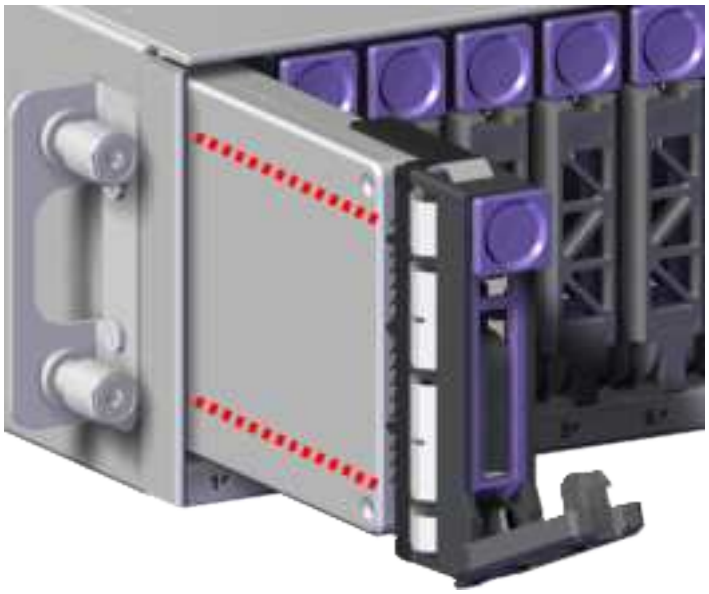
a. From the front of the rack, press the release button on the front of the Drive Assembly. The release handle will eject outward.

Figure 136: Drive Assembly Release Operation



b. Use the release handle to pull the Drive Assembly out of the enclosure.

Figure 137: Uninstall Drive Assembly



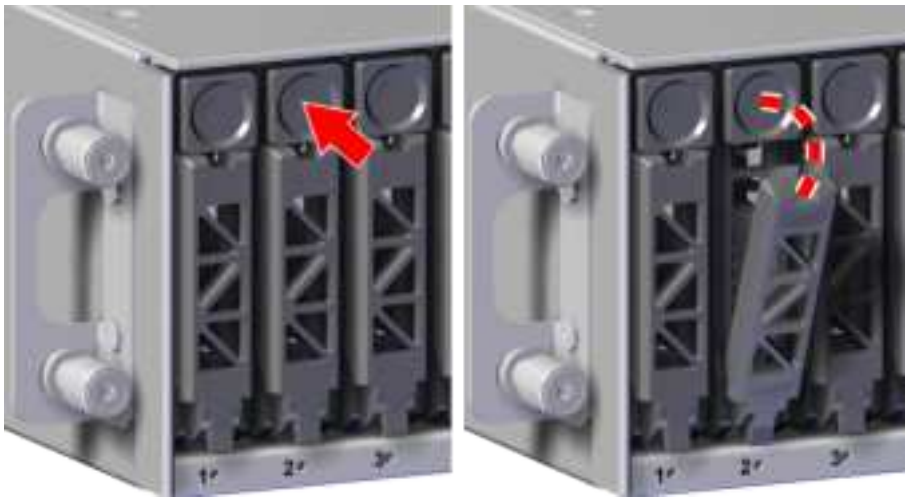
Step 19 : Repeat the previous step to uninstall the remaining Drive Assemblies.

Step 20 : Ensure that the Drive Assemblies are placed on a sturdy ESD safe surface.

Step 21 : **Optional:** Uninstall the Drive Blank Assembly from the enclosure.

a. From the front of the rack, press the release button on the front of the Drive Blank Assembly. The release handle will eject outward.

Figure 138: Drive Blank Assembly Release Operation



b. Use the release handle to pull the Drive Blank Assembly out of the enclosure.

Figure 139: Uninstall Drive Blank Assembly

Step 22 : Repeat the previous step to uninstall the remaining Drive Blank Assemblies.

Step 23 : Unpack and inspect the new Chassis for damage.

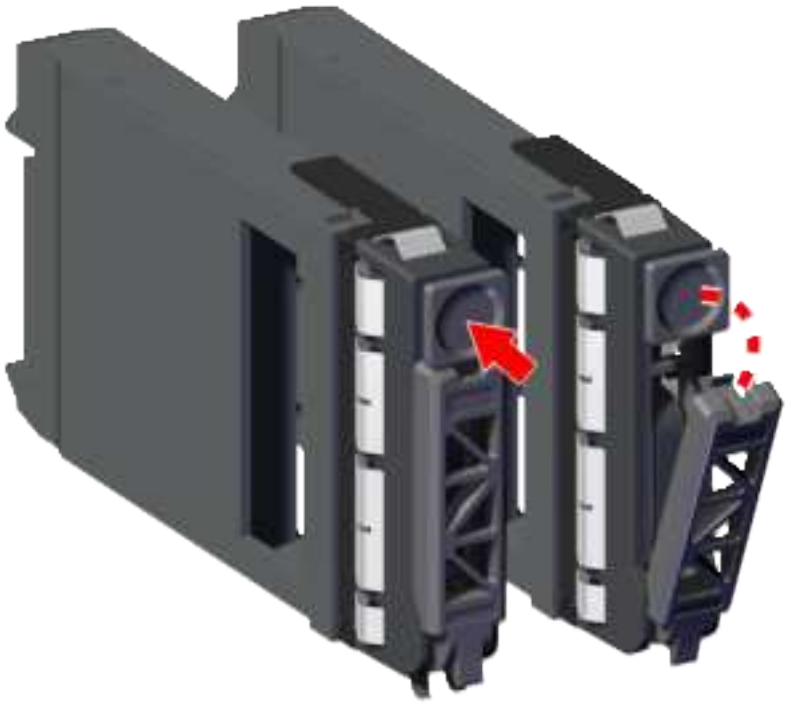
a. Inspect the packaging that the Chassis replacement was shipped in and record any damage to the box. Large cuts, open boxes, and crushed corners should be reported.

b. Remove the Chassis from the packaging and verify that there is no damage to the Chassis. Dents, scratches, and broken parts should be reported. If major damage has occurred to the Chassis, DO NOT use the replacement part.

Step 24 : **Optional:** Install the Drive Blank Assembly into the enclosure.

a. Prepare the Drive Blank Assembly for installation by pressing the release button on the front of the Drive Blank Assembly. The release handle will eject outward.

Figure 140: Drive Blank Assembly Release Operation



b. From the front of the rack, gently slide the Drive Blank Assembly into the Drive Blank Assembly slot until the release handle lifts up slightly, indicating that it is engaged with the Chassis.

Figure 141: Drive Blank Assembly Latch Engaged

c. Rotate the release handle up and press it into the Drive Blank Assembly to secure it into the slot. When it is fully installed the user will feel the handle snap and lock into place.

Figure 142: Drive Blank Assembly Installation

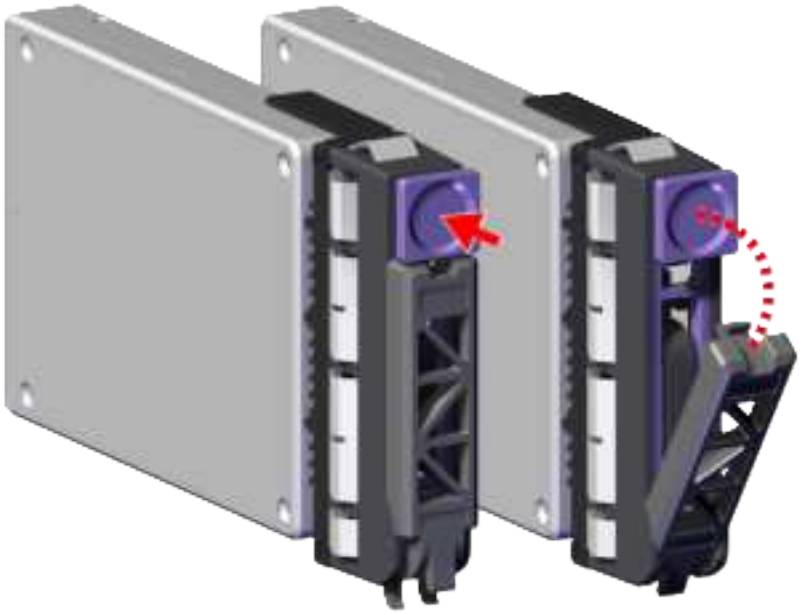
Step 25 : Repeat the previous step to install the remaining Drive Blank Assemblies.

Step 26 : Refer to the Drive Assembly list that was recorded earlier to ensure the drives are reinstalled in the same order.

Step 27 : Install the Drive Assembly into the enclosure.

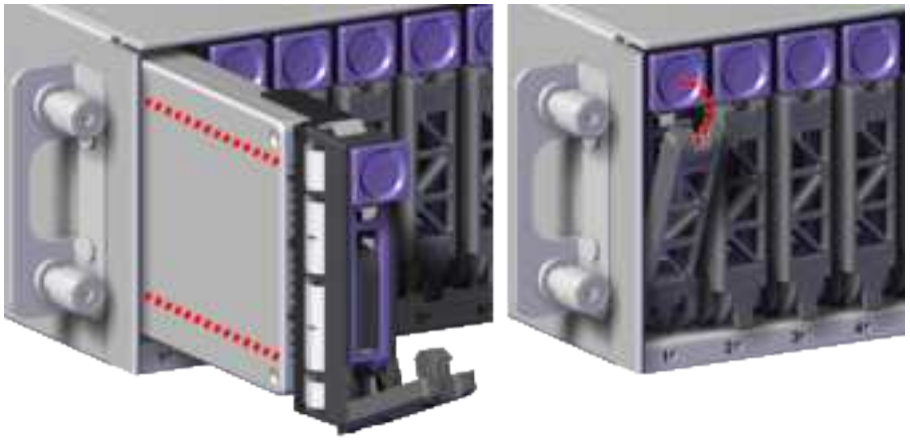
a. Prepare the Drive Assembly for installation by pressing the release button on the front of the Drive Assembly. The release handle will eject outward.

Figure 143: Drive Assembly Release Operation



b. From the front of the rack, gently slide the Drive Assembly into the Drive Assembly slot until the release handle lifts up slightly, indicating that it is engaged with the Chassis.

Figure 144: Drive Assembly Latch Engaged



c. Rotate the release handle up and press it into the Drive Assembly to secure it into the slot. When it is fully installed the user will feel the handle snap and lock into place.

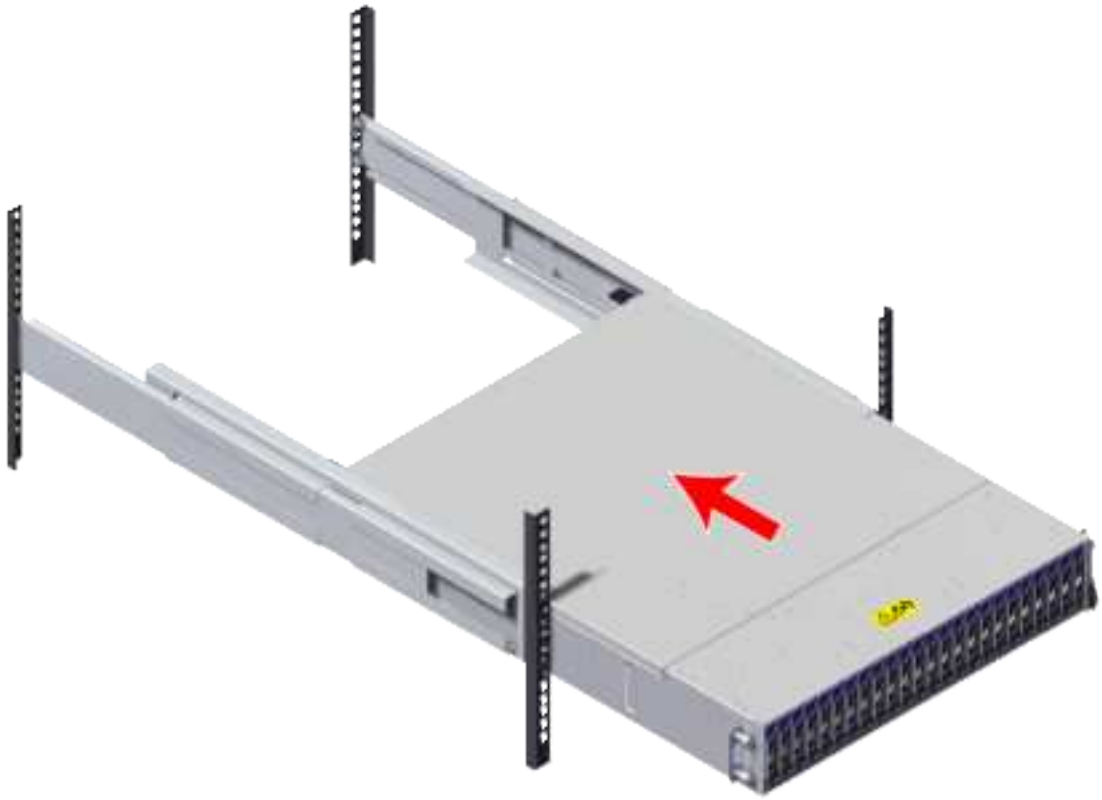
Figure 145: Drive Assembly Installation

Step 28 : Repeat the previous step to install the remaining Drive Assemblies.

Step 29 : Install the Chassis onto the rack mounted rails.

a. Carefully slide the Chassis onto the rails until the rack mounts are flush with the mounts on the rails.

Figure 146: Chassis Installation



b. Using the T15 Torx screwdriver, tighten the two Torx captive screws to secure the Chassis to the rail. Repeat this step to secure the remaining rack mount to the remaining rail.

Figure 147: Captive Screws Tighten

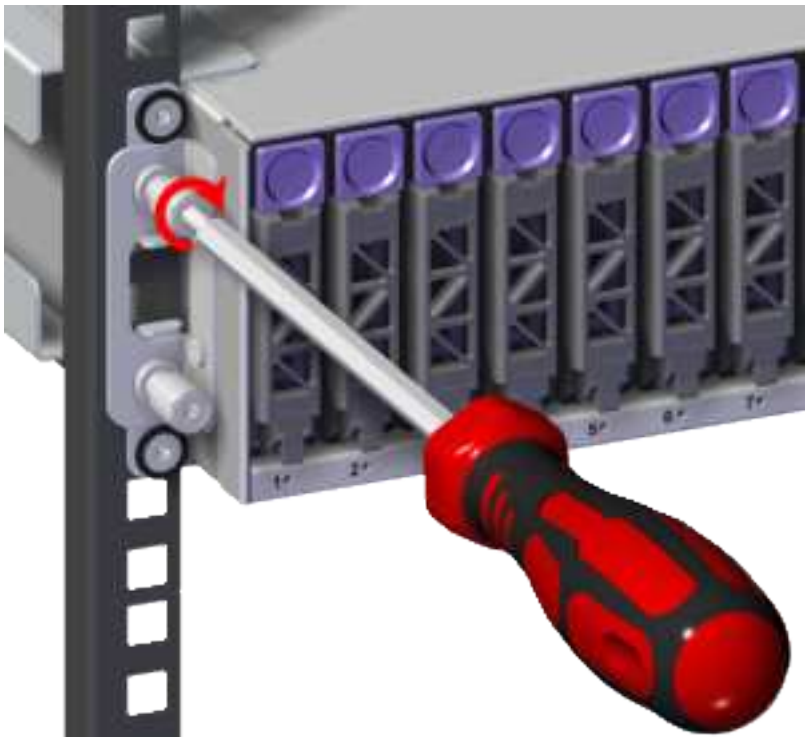


Figure 148: Captive Screw Location

Step 30 : Install the PSU into the enclosure.

a. Orient the PSU with the power port located on the top and insert it into the PSU slot. The location of the power port is shown in the following image.

Figure 149: Power Port Location

b. Carefully push the PSU into the PSU slot.

Figure 150: PSU Installation

c. Verify that the PSU is fully seated and latched into the PSU slot by gently pulling on the handle.

Step 31 : Repeat the previous step to install the remaining PSU.

Step 32 : Refer to the IOM list that was recorded earlier to ensure the IOMs are reinstalled in the same order as the previous configuration.

Step 33 : Install the IOM into the enclosure.

a. Unlock the IOM by turning the thumbscrew counterclockwise until the screw threads are not engaged any longer. The location of the thumbscrew is shown in the following image.

Figure 151: Prepare IOM

b. Gently slide the IOM into the IOM slot until the release handle is engaged with the Chassis. When the handle lifts up slightly, it is an indicator that the release handle is engaged with the Chassis.

Figure 152: IOM Handle Engaged

c. Press the release handle into the IOM and secure it in place by turning the thumbscrew clockwise until it is tight.

Figure 153: IOM Secure

d. Verify that the IOM is securely latched into the Chassis by pulling on the release handle and ensuring the IOM does not move when pulled. Reinstall the IOM if it is not securely installed into the Chassis.

Step 34 : Repeat the previous step to install the remaining IOM.

Step 35 : Connect the Ethernet cable into the Ethernet Management port on the IOM.

Figure 154: Connect Ethernet Cable

Step 36 : Repeat the previous step to install the remaining Ethernet cable.

Step 37 : Refer to the QSFP28 location connections that where recorded earlier in the replacement.

Step 38 : Connect the QSFP28 cable to the IOM to the QSFP the port.

Figure 155: Connect QSFP28 Cable

Step 39 : Repeat the previous step to install the remaining QSFP28 cable(s).

Step 40 : Connect the power cable to the PSU.

a. Plug the power cable into the PSU power port.

Figure 156: Connect Power Cable

b. Secure the power cable to the PSU by wrapping the hook and loop strap around the power cable.

Step 41 : Repeat the previous step to install the remaining power cable.

Result: The Chassis has now been replaced.

3.8 Power Cable Replacement

This procedure supports the replacement of the power cable. The power cable is a toolless replacement meaning that it **does not** require the use of any tools.

Attention: Power cables must be replaced one at a time.

Important: Verify the enclosure configuration (nHA or HA) using the pull-out tabs or the OCGUI prior to initiating work. Refer to **Supported SKUs** *(page 22)* to distinguish between the two configurations.

Replacement Requirements	
Personnel Required	1
Average Replacement Time	5 minutes
Service Window	5 minutes

Safety List

- Electric Shock

Step 1: Move to the rear of the rack.

Step 2: Disconnect the power cable from the PSU.

a. Remove the hook and loop strap that secures the power cable to the PSU.

b. Disconnect the power cable from the PSU power port.

Figure 157: Disconnect Power Cable

Step 3: Unpack and inspect the new power cable for damage.

a. Inspect the packaging that the power cable replacement was shipped in and record any damage to the box. Large cuts, open boxes, and crushed corners should be reported.

b. Remove the power cable from the packaging and verify that there is no damage to the power cable. Broken parts should be reported. If major damage has occurred to the power cable, DO NOT use the replacement part.

Step 4: Connect the power cable to the PSU.

a. Plug the power cable into the PSU power port.

Figure 158: Connect Power Cable

b. Secure the power cable to the PSU by wrapping the hook and loop strap around the power cable.

Result: The power cable has now been replaced.

3.9 QSFP28 Cable Replacement

This procedure supports the replacement of the QSFP28 cable. The QSFP28 cable is a toolless replacement meaning that it **does not** require the use of any tools.

Attention: QSFP28 cables must be replaced one at a time.

Important: Verify the enclosure configuration (nHA or HA) using the pull-out tabs or the OCGUI prior to initiating work. Refer to **Supported SKUs** *(page 22)* to distinguish between the two configurations.

Replacement Requirements	
Personnel Required	1
Average Replacement Time	5 minutes
Service Window	5 minutes

Safety List

- Electric Shock

Step 1: Move to the rear of the rack.

Step 2: Disconnect the QSFP28 cable from the IOM by pulling on the release tab and removing the cable from the port.

Figure 159: Disconnect QSFP28 Cable

Step 3: Unpack and inspect the new QSFP28 cable for damage.

a. Inspect the packaging that the QSFP28 cable replacement was shipped in and record any damage to the box. Large cuts, open boxes, and crushed corners should be reported.

b. Remove the QSFP28 cable from the packaging and verify that there is no damage to the QSFP28 cable. Broken parts should be reported. If major damage has occurred to the QSFP28 cable, DO NOT use the replacement part.

Step 4 : Connect the QSFP28 cable to the IOM to the QSFP the port.

Figure 160: Connect QSFP28 Cable

Result: The QSFP28 cable has now been replaced.

Management

In This Chapter:

4.1 Open Composable API

The Open Composable API is a RESTful interface for OpenFlex that enables a Unified Fabric Control Plane for Storage Fabric Devices. This allows for composing disaggregated storage resources—with compute, networking, and memory—into virtual systems in the future. These virtual systems will be dynamically provided to the right application at the right time, ensuring SLAs can be met automatically.

- Monitor hardware sensors (temperatures, voltages, hardware state)
- Configure hardware (update firmware, reboot individual components or systems, locate LEDs)
- Capture inventory data (serial number, part number, etc.)
- Capture log information
- Configure policies (user access lists, authentication, HTTPS/TLS encryption/security with certificate/key settings)
- Self-discovery of other locally-available resources configurable using the Open Composable API for OpenFlex

4.1.1 Accessing the API

The API is accessible on every fabric device connected to the fabric network and management port. The simplest way to access the API is to find the IP address of the management ports on the rear of the enclosure. This is set to DHCP by default. The DHCP IP Address may be obtained from the DHCP Server and cross referenced with the MAC addresses on IOM pull out tabs at the rear of the enclosure. Note that each IOM has its own pull out tab. Refer to **Finding OOBM Port IP Addresses with DHCP** ***(page 125)*** for detailed instructions on finding the DHCP IP address. Enter the DHCP IP address in a browser with `/Query/` added to the end of the URL. This returns top level status information. A few APIs follow case sensitive behavior.

The IP addresses/API targets listed in this response body will help in navigating the resources available on this device, as well as provide links and contextual information related to other devices connected on the fabric. The entire system is accessible from either IOM management or fabric ports using the API. For details on using OCAPI, refer to the OCAPI Reference Manual.

4.1.2 RESTful API

This API is based on the true REST architectural style meaning that all actions/verbs will be handled exclusively by the existing HTTP Methods (GET, POST, PUT, DELETE, HEAD, OPTIONS) along with all URI patterns containing only fully qualified collections of resources and resource instantiations (nouns only, no action verbs permitted in the URI). HTTP response data is compressed when requested by the browser for reduced network traffic. Open Composable GUI (OCGUI) and in-band management always compress the response data transparent to the user.

4.1.3 Finding OOBM Port IP Addresses with DHCP

This section provides instructions for finding OOBM port IP addresses on the OpenFlex Data24 4000 Series using DHCP.

Before you begin:

If the network has been configured with a DHCP server, the enclosure's RJ45 management ports and QSFP28 data ports are assigned IP addresses using DHCP when the enclosure is initially connected to the network.

The enclosure manager configures the enclosure name using the following naming convention:

- **High availability:** ofdata24-42xx-<serial number>-iom<a|b>-mgmt
- **Non-high availability:** ofdata24-41xx-<serial number>-iom<a|b>-mgmt

IOM management and data port naming conventions are:

- **IOM management ports:** <enclosurename>-iom<a|b>
- **IOM data ports:** <enclosurename>-iom<a|b>-rfx<a|b|c>
  - Use RFX A for data ports 1 and 4
  - Use RFX B for data ports 2 and 5
  - Use RFX C for data ports 3 and 6

Step 1: Use the pullout tab on the OpenFlex Data24 4000 Series chassis to find the serial number for the enclosure.

Step 2: Use the pullout tabs on the OpenFlex Data24 4000 Series IOMs to find the IOM MAC addresses.

Step 3: Cross-reference the IOM MAC addresses using a DHCP server to find and record the IP addresses assigned to them.

Note: If desired, make a DHCP reservation for those IPs or set them to static IPs so that the OOBM port IPs do not change.

Step 4: When a DHCP server is unavailable, use the static link-local IP assigned to the OOBM ports. For detailed instructions, refer to **Finding OOBM Port IP Addresses with Non-DHCP Servers** ***(page 126)***.

4.1.4 Finding OOBM Port IP Addresses with Non-DHCP Servers

This section provides instructions for finding OOBM port IP addresses on the OpenFlex Data24 4000 Series without a DHCP server.

Before you begin: Refer to **Finding OOBM Port IP Addresses with DHCP** *(page 125)* for instructions on finding IP addresses with DHCP.

Without an available DHCP server available on the network, the platform reverts to static link-local addresses in the 169.254.0.0/16 IP range for both data and management ports. The host name adds the .local suffix. Use local access through the RJ45 management port to connect directly to a host or laptop for initial configuration.

Note: The steps below provide results using a Linux server to connect to the enclosure. The steps are the same whether connecting to a high availability (42XX series) or non-high availability (41XX series) enclosure.

The enclosure manager configures the enclosure name using the following naming convention:

- **High availability:** ofdata24-42xx-<serial number>-iom<a|b>-mgmt
- **Non-high availability:** ofdata24-41xx-<serial number>-iom<a|b>-mgmt

IOM management and data port naming conventions are:

- **IOM management ports:** <enclosurename>-iom<a|b>
- **IOM data ports:** <enclosurename>-iom<a|b>-rfx<a|b|c>
  - Use RFX A for data ports 1 and 4
  - Use RFX B for data ports 2 and 5
  - Use RFX C for data ports 3 and 6

Step 1: Plug an ethernet cable from the local server into the OpenFlex Data24 4000 Series IOM management port.

Step 2: Configure the local server's ethernet port to be on the 169.254.0.0/16 network.

Step 3: Print the ethernet interfaces available using `ifconfig -a` or `ip a`.

Step 4: Configure the interface to connect to the OpenFlex Data24 4000 Series IOM management port.

Sample ethernet interface configuration in the etc/sysconfig/network-scripts/ifcfg-<interface> file:

```
BOOTPROTO="static"
IPADDR="169.254.X.X"
NETMASK="255.255.0.0"
DEVICE=<enclosure name>
HWADDR="c4:cb:e1:e1:b4:a1"
ONBOOT=yes
PEERDNS=yes
PEERROUTES=yes
DEFROUTE=yes
```

Step 5: Activate the interface with `ifup`.

```
testhost ~ # ifup <enclosure name>
```

```
Connection successfully activated <D-Bus active path: /org/freedesktop/
NetworkManager/ActiveConnection/18
```

Step 6 : Use `ifconfig -a` or `ip a` to print the interfaces again to show the 169.254.X.X IP used in the configuration file.

```
testhost ~ # ifconfig <enclosure name>
<enclosure name>: flags=4163>UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
                  inet 10.XXX.XXX.XXX netmask 255.XXX.XXX.X broadcast
 10.XXX.XXX.X
                  inet6 fe80::c6cb:e1ff:fee1:b4a0 prefixlen 64 scopeid
 0x20<link>
                  ether c4:cb:e1:e1:b4:a0 txqueuelen 1000 (Ethernet)
                  RX packets 2821816 bytes 514182108 (490.3 MiB)
                  RX errors 0 dropped 0 overruns 0 frame 0
                  TX packets 470144 bytes 89312796 (85.1 MiB)
                  TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
                  device interrupt 16
<enclosurename>:  flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
                  inet 169.254.X.XX  netmask 255.255.0.0  broadcast
 169.254.255.255
                  ether c4:cb:e1:e1:b4:a1  txqueuelen 1000  (Ethernet)
                  RX packets 113831  bytes 42065780 (40.1 MiB)
                  RX errors 0  dropped 0  overruns 0  frame 0
                  TX packets 24098  bytes 4032533 (3.8 MiB)
                  TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
                  device interrupt 17
```

Step 7 : Use NMAP to search for IPs on the 169.254.0.0 subnet making sure to include the CIDR notation.

```
testhost network-scripts # nmap -sn 169.254.0.0/16
Starting Nmap 7.92 ( https://nmap.org ) at 2025-05-09 13:32 MDT
Nmap scan report for 169.254.0.100
Host is up (0.00031s latency).
MAC Address: 00:0C:CA:0A:18:E6 (Hgst a Western Digital Company)
Nmap scan report for 169.254.X.XXX
Host is up (0.00026s latency).
MAC Address: 00:0C:CA:0A:18:E6 (Hgst a Western Digital Company)
Nmap scan report for 169.254.X.XX
Host is up.
```

Step 8 : Connect to the identified IP (169.254.X.XXX in this example) to verify it is the OpenFlex Data24 platform.

```
# wddcs http=169.254.X.XXX show
wddcs v4.3.2.0
Copyright (c) 2019-2025 Western Digital Corporation or its affiliates

Model       : OpenFlex Data24 4240
Serial      : USALPXXXXXSAXXXX
ID          : ofdata24-4240-usalpXXXXXSAXXXX
Name        : ofdata24-4240-usalpXXXXXSAXXXX
Firmware    : 3.0.0
Power state : On
LED         : Off
Slot        : 1
State       : In service
```

```
Health      : OK
Details     : None
Capacity    : 368.71 TB

More data is available for the following resource types:
  adapter
  controller
  cooling
  media
  port
  power
  sensor
  clock

Enter "show=<resource>" to get more data
Example: wddcs http=1.2.3.4 show=media
```

4.1.5 Discovering and Connecting to NVMe Devices using the Open Composable API

Before you begin: The user needs to use the GUI or the REST API to set/get the IP address of the 100Gb high-speed links.

Note: This procedure may be used in cases where the network may not detect the IP addresses of the adapters that will be connected.

Attention: The following procedure uses JSON indicated by "jq". This may require you to download JSON if you would like to use the "jq" option to parse the commands. In Ubuntu, the JSON processor may be installed by issuing `sudo apt install jq` in the CLI.

Step 1: To determine the Storage Device ID, issue a GET to `/Query/` to review a list of devices installed in the target enclosure. This is the Management port on the IOM.

```
curl -u http://ip.of.target.iom/Query/ | jq
```

Note: In addition, you may use the following:

```
curl -u https://ip.of.target.iom/Query/ | jq
```

Step 2: Review the data returned to find the device ID of the target device. Refer to the highlighted example below.


```
{
    "Self": "http://10.20.30.40:80/Query/",
    "SystemQuery": "http://10.20.30.40:80/System/Query/",
    "InformationStructure": {
        "Self": "http://10.20.30.40:80/Query/InformationStructure/",
        "AuthenticationType": {
            "ID": 0,
            "Name": "Basic"
        },
        "HTTPPort": 80,
        "HTTPSPort": 443,
        "LogLevel": "debug",
        "MaximumThreads": 5,
        "Name": "OpenFlex API",
        "OwningOrganization": "WDC",
        "Status": "Released",
        "StructureDescription": "REST-based API for Device Management. Use
 HTTP OPTIONS with header
                                {\"Documentation\": \"Schema\"} to get
 resource schema information based on URI.
                                Use HTTP OPTIONS with header {\"Documentation
\": \"Info\"} to get general information
                                based on URI. ",
        "URI": "/Query/",
        "TimeoutMultiplier": 1,
```

```
        "Version": "1.2.0-301"
    },
    "Devices": {
        "Self": "http://10.20.30.40:80/Devices/",
        "Members": [
            {
                "Self": "http://10.20.30.40:80/Storage/Devices/ofdata24-4XXX-
<EncSerialNum>/",
                "SystemType": {
                    "ID": 2,
                    "Name": "Storage"
                },
                "Name": "ofdata24-4XXX-<EncSerialNum>",
                "ID": "ofdata24-4XXX-<EncSerialNum>",
                "OperatingSystem": {
                    "Self": "http://10.20.30.40:80/Storage/Devices/
ofdata24-4XXX-<EncSerialNum>/OperatingSystem/",
                    "Name": "Vendor Firmware",
                    "OSType": {
                        "ID": 59,
                                                    Truncated Example
```

Step 3: Determine the Adapters URL by sending a GET to the device ID gathered in the previous step.

```
curl -u http://ip.of.target.iom/Storage/Devices/ofdata24-4XXX-<EncSerialNum>/
Adapters/ | jq
```

Note: The URL is bolded in the following example output.

```
"Adapters": {
    "Self": "http://ofdata24-4XXX-<EncSerialNum>-ioma-mgmt:80/Storage/
Devices/ofdata24-4213-<EncSerialNum>/Adapters/"
  }
```

Step 4: Review the output to locate the IP of the appropriate port. The port location in the following output is identified by **`"Name": "IOMA-PORT4"`**.

```
{
    "Self": "http://10.20.30.40:80/Storage/Devices/ofdata24-4XXX-
<EncSerialNum>/Adapters/",
    "Members": [
        {
            "Self": "http://10.20.30.40:80/Storage/Devices/ofdata24-4XXX-
<EncSerialNum>/Adapters/1/",
            "ID": "1",
            "Name": "IOMA-PORT4",
            "Status": {
                "State": {
                    "ID": 16,
                    "Name": "In service"
                },
                "Health": [
                    {
                        "ID": 5,
                        "Name": "OK"
                    }
                ]
```

```
            },
            "HostName": "ofdata24-4XXX-<EncSerialNum>-ioma-port4",
            "Ports": "http://10.20.30.40:80/Storage/Devices/ofdata24-4XXX-
<EncSerialNum>/Ports/?adapterid=1"
        },
                                                    Truncated Example
```

Step 5 : Determine the IP address of the adapter that is attached to your host using the ports link. This will be the IP that is used to perform an `nvme discover` to find drives connected on the fabric. Send a GET to the Ports object associated with the adapter.

```
curl -u username:password http://10.20.30.40:80/Storage/Devices/
ofdata24-4XXX-<EncSerialNum>/Ports/?adapterid=1 | jq
```

Step 6 : Review the returned data to find the IP of the proper port.

```
{
    "Self": "http://10.20.30.40:80/Storage/Devices/ofdata24-4XXX-
<EncSerialNum>/Ports/",
    "Members": [
        {
            "Self": "http://10.20.30.40:80/Storage/Devices/ofdata24-4XXX-
<EncSerialNum>/Ports/70_b3_d5_76_8a_be_192_168_10_51_24/",
            "ID": "70_b3_d5_76_8a_be_192_168_10_51_24",
            "Status": {
                "State": {
                    "ID": 16,
                    "Name": "In service"
                },
                "Health": [
                    {
                        "ID": 5,
                        "Name": "OK"
                    }
                ]
            },
            "AddressOrigin": {
                "ID": 65536,
                "Name": "DHCPv4"
            },
            "IPv4Address": "192.168.10.51/24",
            "IPv4Gateway": "192.168.10.1",
            "MACAddress": "70:b3:d5:76:8a:be",
            "NetworkType": {
                "ID": 8,
                "Name": "IPv4 Network"
            },
            "MTUBytes": 4500,
            "Adapters": "http://10.20.30.40:80/Storage/Devices/ofdata24-4XXX-
<EncSerialNum>/Adapters/?portid=70_b3_d5_76_8a_be_192_168_10_51_24"
        }
    ]
}
```

4.2 Open Composable GUI

The Open Composable Graphical User Interface (OCGUI) is the graphical representation of all of the data shared up to the fabric by the OCAPI. This GUI is presented to the user by browsing to the IP address of any device on the fabric and the management port for each IOM. The GUI has a "command-center" design layout that presents all vital health, utilization, and performance statistics related to devices on the network at a glance.

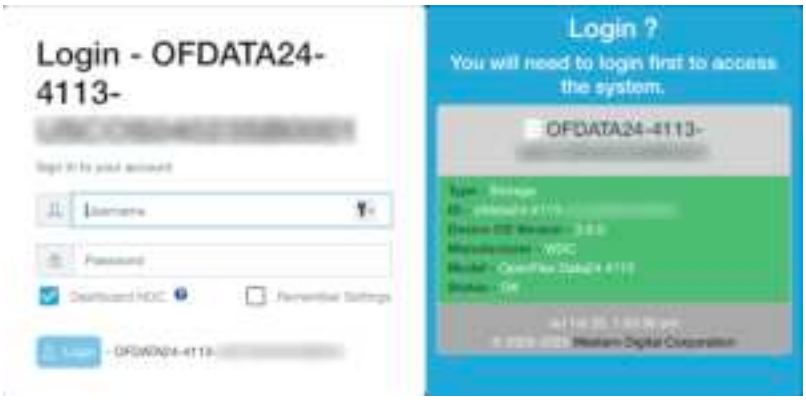
4.2.1 Compatible Browsers

The OCGUI is compatible with the following web browsers. Some browsers require a JSON plugin in order to view OCAPI data. The JSON plugin is not required for accessing OCGUI.

Table 38: OCGUI Browser Compatibility

Browser	Version
Google Chrome™	71.0.3578.98 and higher
Mozilla Firefox	40.15063.674.0 and higher
Microsoft Edge	60.5.0 and higher

4.2.2 Login Page



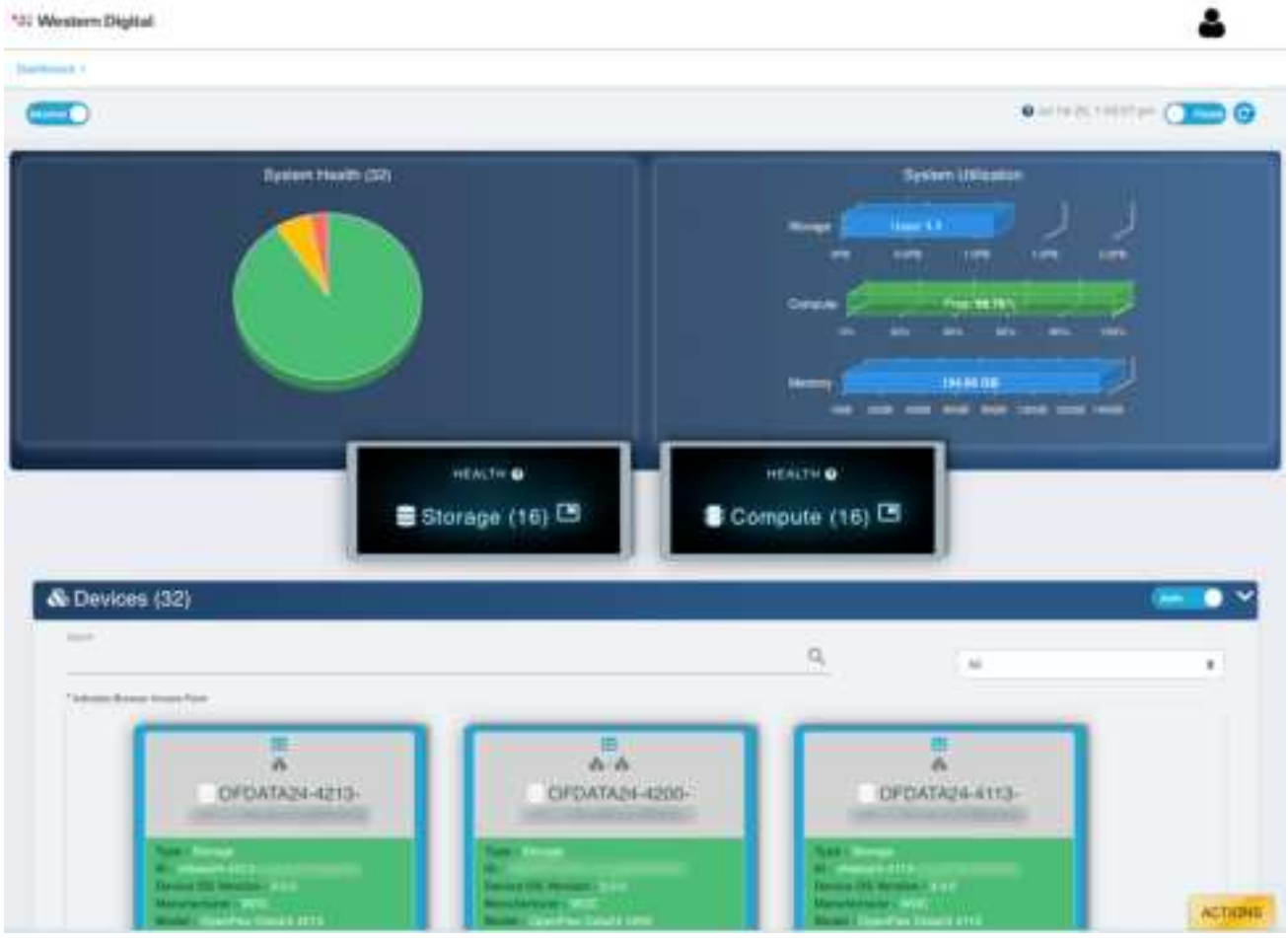
The login page displays two panels. The left panel provides **username** and **password** fields for logging into the device. This panel also displays two options:

- **Dashboard NOC**: Selected by default. Will timeout after 30 minutes if NOC is not selected. The NOC option enables the dashboard to display in the Network Operations Center (NOC) mode without timing out the session.
- **Remember Settings**: Will remember the settings of the last user that signed in.

The right panel lists basic information about the device itself, including its type, status, and OS version.

Note: For instructions on navigating to the login page, refer to Navigating to a Device *(page 144)*.

4.2.3 Dashboard



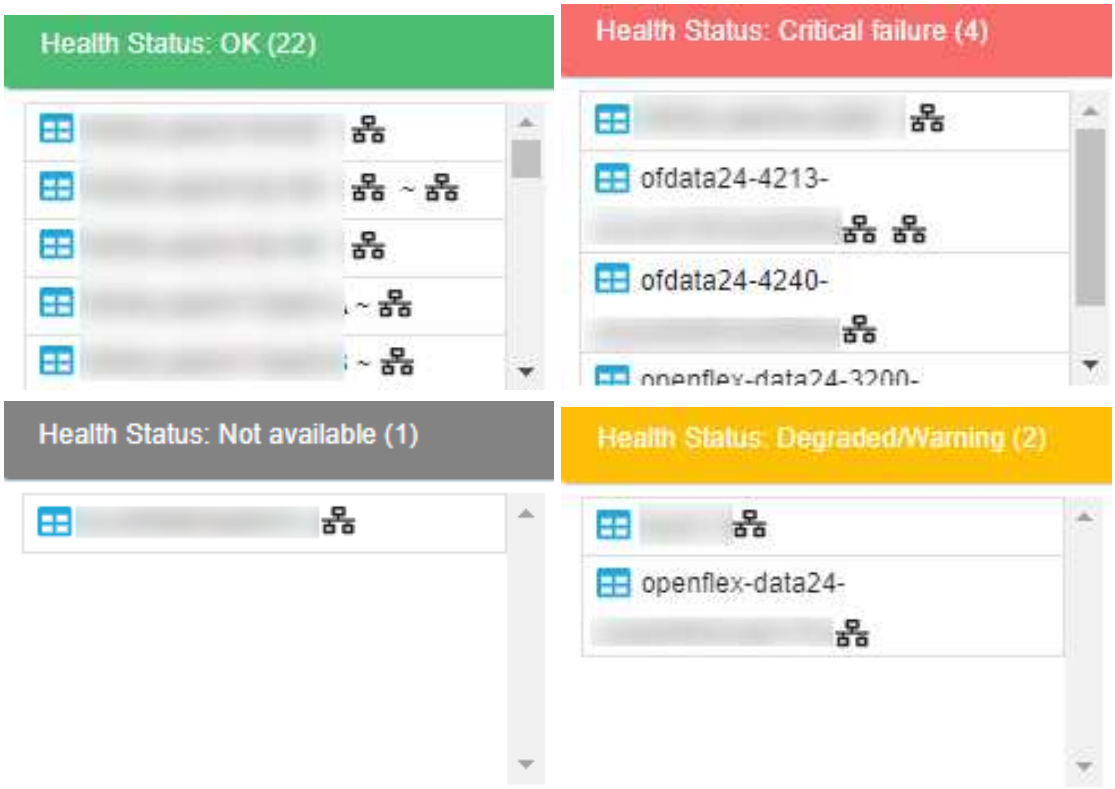
The **Dashboard** is the first page that will load when one logs into any of the fabric-attached devices or management ports. It provides vital statistics on the health and performance of all devices on the subnet configured on the Enclosure Manager. In addition, it provides a clickable list that allows users to navigate to the device page for any device on the subnet.

4.2.3.1 System Health

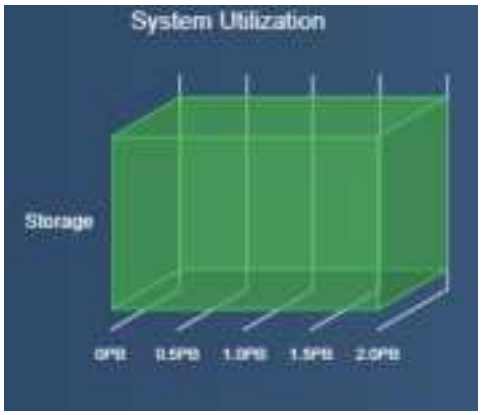
The **System Health** section provides an overview of the health of the fabric network showing all **OpenFlex** devices visible on the network. . The interfaces of all devices on the same subnet as the Storage devices are queried when the page loads, and the pie chart is updated with their responses. If fabric devices respond with errors or faults, the system health chart will update accordingly.

4.2.3.2 System Health States

The **System Health** pie chart contains segments for grouping devices by their health states. Clicking on a segment will bring up a modal window that provides a summary of the devices in that state. The following is a sampling of modal windows:



4.2.3.3 System Utilization



The **System Utilization** section displays the total, free, and used storage on the fabric. For the OpenFlex Data24 4000 Series , all storage capacity is presented as Used.

4.2.3.4 Storage Health

The **Storage Health** modal provides an overview of the health of all storage devices visible on the fabric (those in the subnets of what is configured on the enclosure). The modal provides separate tables for fabric devices that are presenting different health states up to the OCGUI.

4.2.3.5 Devices

The **Devices** list provides summary details about all devices visible on the fabric. Vital information is provided, such as the device ID, serial number, model, manufacturer, and the type of device that was discovered. This list will be updated with each refresh of the page, as a `/Query/` command is sent across the fabric network to discover OpenFlex devices. The search field—located at the top of the devices list—allows for users to access specific devices without having to review the list for specific devices or device configurations.

4.2.4 Storage Device Page

The storage device page presents all of the vital information related to a specific storage resource.

4.2.4.1 Storage Device Health

The storage **Device Health** section provides a visual summary of the health of the enclosure, including drives on the device.

4.2.4.2 Storage Device Utilization

The storage **Device Utilization** section provides a visual summary of the available and used storage on the device.

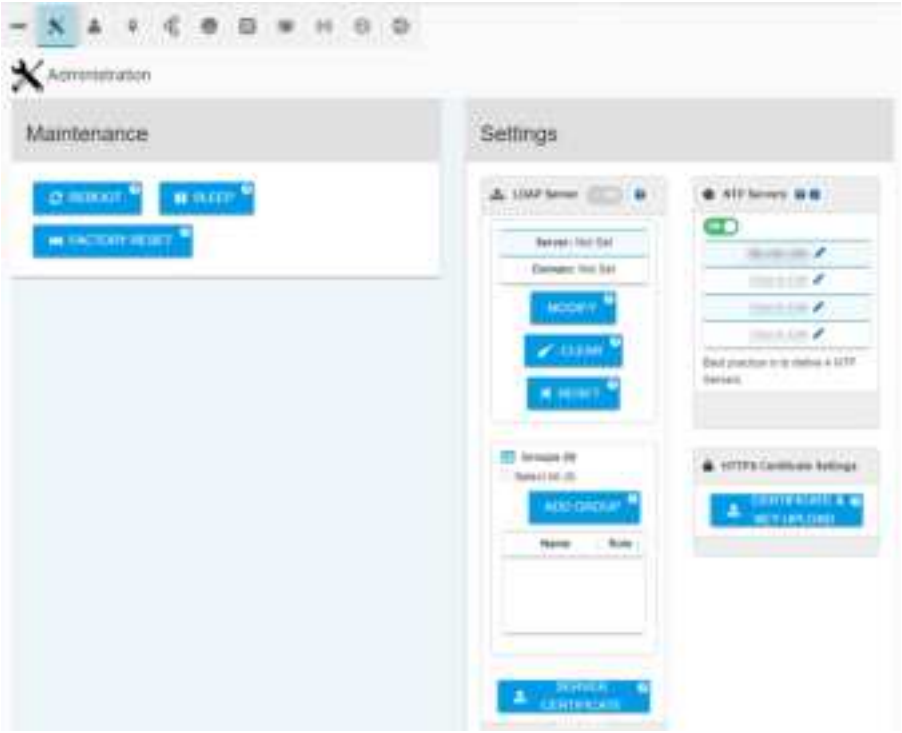
4.2.4.3 Storage Device Temperature

The storage **Maximum Temperature Sensor** section provides a visual summary of the current Maximum Temperature of the device. When the Maximum Temperature Sensor is selected it will display the device with the highest temperature.

4.2.4.4 Storage Device Information

The storage **Device Information** section provides information about the device itself, such as the ID, Serial Number, and Model.

4.2.4.5 Storage Administration



The storage device's **Administration** section allows system administrators to perform important management functions to the device.

4.2.4.6 Storage Accounts

The storage device's **Accounts** section provides a list of all accounts that can access the device, as well as options for creating, modifying, and deleting accounts.

4.2.4.7 Storage Location

The storage device's **Location** section provides information about the physical location of the device and controls for setting or clearing location attributes.

4.2.4.8 Controllers

The storage device's **Controllers** section provides access to the IOMs that are connected to the device, and provides options for rebooting and configuring the DNS settings of the controllers.

4.2.4.9 Power Supplies

The storage device's **Power Supplies** section provides access to the Power Supplies health statistics.

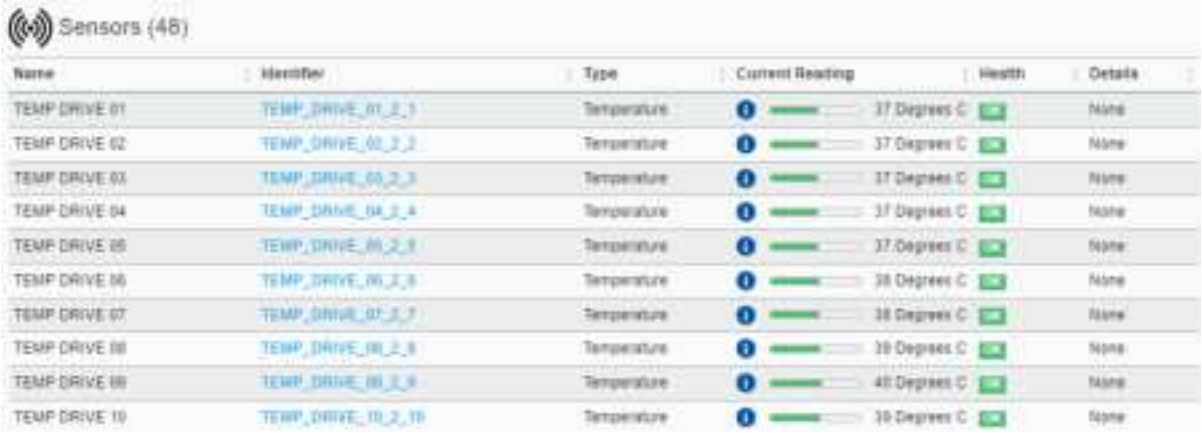
4.2.4.10 Cooling Devices

The storage device's **Cooling Devices** section provides access to the Fans health statistics.

4.2.4.11 Ports

The storage device's **Ports** section provides access to the networking settings for the ports that exist on the device. It also displays the cable connection status, link status, and speed information.

4.2.4.12 Storage Sensors



The storage device's **Sensors** section lists all the sensors present on the device hardware and reports the readings from those sensors.

4.2.4.13 Storage Device OS

The storage **Device OS** section displays the device's firmware version and can be used to upgrade firmware.

4.2.4.14 Media

The storage device's **Media** section lists all of the information related to media specifications, health, and power state, and provides the option to change the power state of the media.

4.2.5 Basic Operational Functions

This section provides instructions for basic operational functions that the user is likely to perform during the initial operation of the OpenFlex Data24 4000 Series , such as checking the system health, creating a user account, and so on.

4.2.5.1 Navigating to a Device

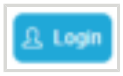
This task provides instructions for using the OCGUI to navigate to a device's dashboard through any other fabric-connected device.

Step 1: Open a browser and enter the IP address or hostname for any fabric-connected device into the **address bar**.

The login page for the device appears:

Note: mDNS has the ability to connect to the system using **http://openflex-data24-4x00-<product_SN>-ioma|b.<domain>** when the corporate DHCP Server IP list may not be available.

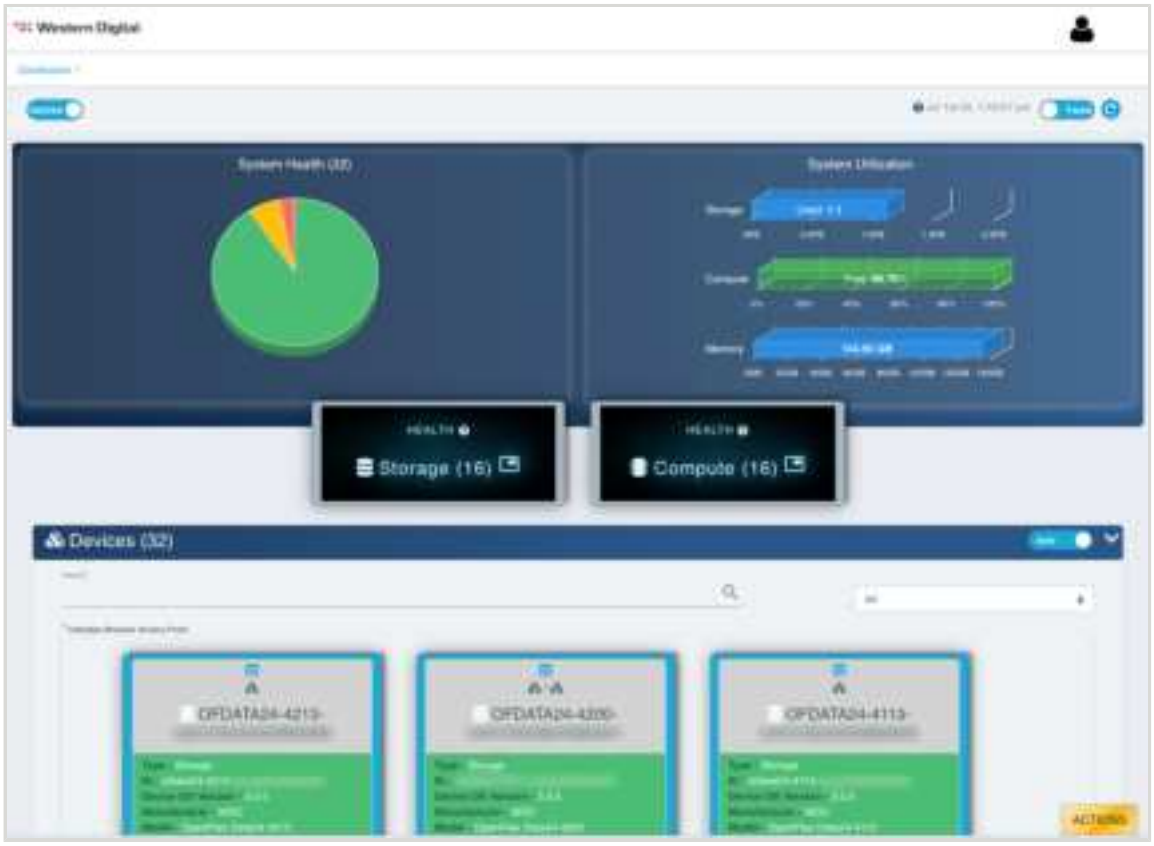
Step 2: Enter a valid username and password, and click the **Login** button:



Note: The default username/password is `admin/admin`.

Warning: After initial login, change the default username/password as a security best practice. Refer to **Changing the Default Administrator Password *(page 162)*** for instructions.

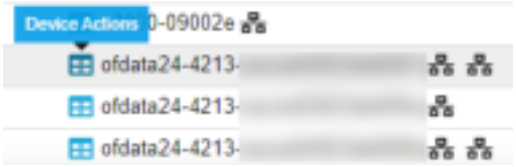
The system dashboard appears. In addition, the **Devices** section provides access to all other fabric-connected devices:



Step 3 : If needed, click the **Devices** banner to expand the list of all connected devices:

Step 4 : From the list, identify the device to which you want to navigate.

Step 5 : Click the **Device Actions** icon:



The **Device Actions** window appears:

Step 6 : Click the **Open in a new tab/window** option to open the device page in a new window.

The device's dashboard appears in a new tab/window.

4.2.5.2 Checking System Health

This task provides instructions for checking the health of the using the OCGUI, including:

- Device Information
- Administration
- Accounts
- Location
- Controllers
- Power Supplies
- Cooling Devices
- Ports
- Sensors
- Device OS
- Media

Attention: Always confirm that the enclosure status is "Healthy" after changing settings to ensure that the system is operating properly.

Checking the Device Information

Step 1: Navigate to the device. Refer to **Navigating to a Device** ***(page 144)***.

Step 2: Click the storage **Device Information** icon:

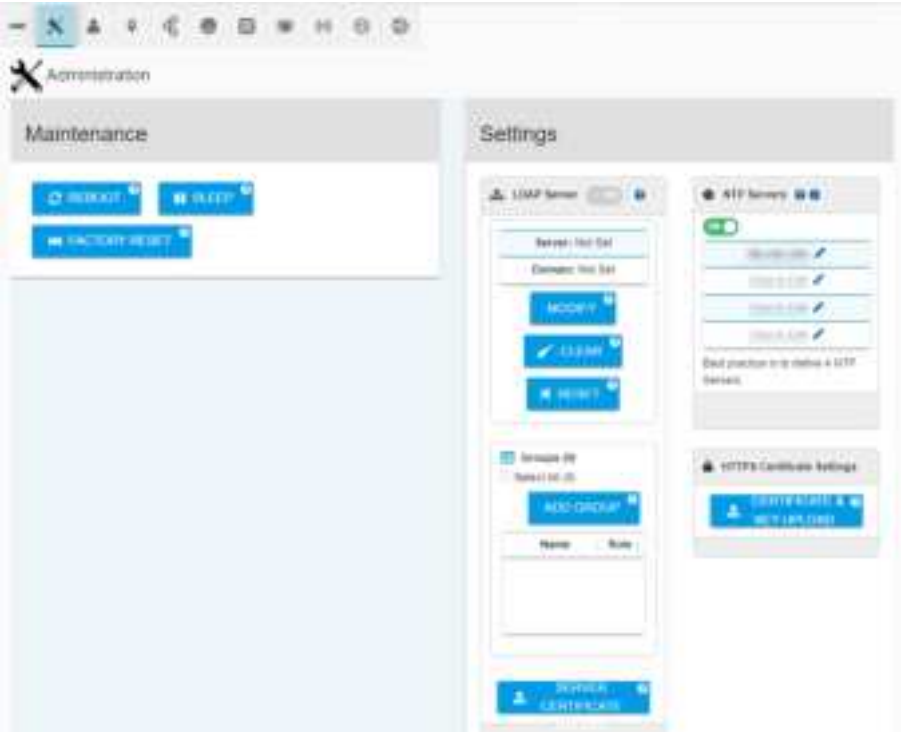
The **Device Information** appears:

Step 3: Review the device information and ensure that its health status reports **OK** in the header.

Checking the Administration Information

Step 4 : Click the storage device's **Administration** icon:

The **Administration** information appears:



Checking Accounts

Step 5 : Click the storage device's **Accounts** icon:

The **Accounts** information appears:

Checking the Location

Step 6 : Click the storage device's **Location** icon:

The **Location** information appears:

Checking Controllers

Step 7 : Click the device's **Controllers** icon:

The **Controllers** information appears:

Checking the Power Supplies

Step 8 : Click the chassis's **Power Supplies** icon:

The **Power Supplies** information appears:

Step 9 : Review the power supply information and ensure that both PSUs report **OK** in the **Health** column.

Checking the Fans

Step 10 : Click the **Cooling Devices** icon:

The **Cooling Devices** information appears:

Step 11 : Review the cooling devices information and ensure that each fan reports **OK** in the **Health** column.

Checking the Ports

Step 12 : Click the chassis's **Ports** icon:

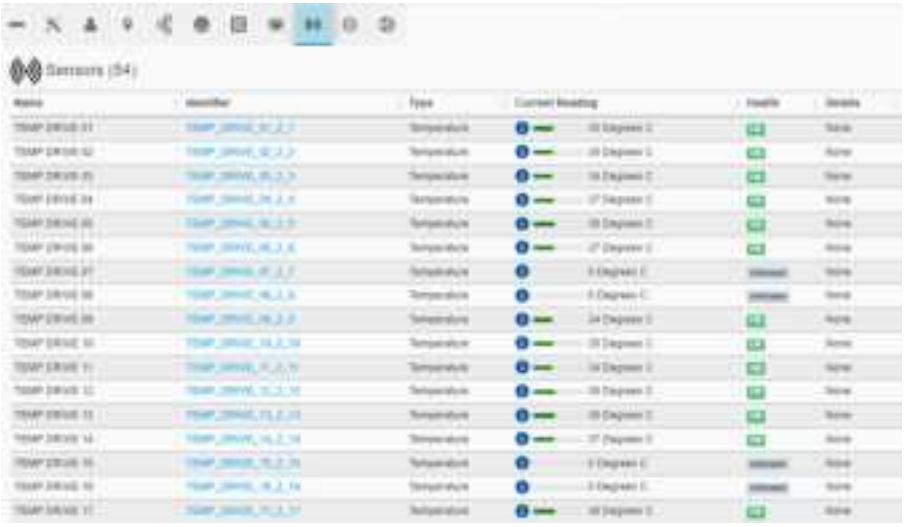
The **Ports** information appears:

Step 13 : Review the port information and ensure that each port is reporting **OK** in the **Health** column.

Checking the Sensors

Step 14 : Click the device's **Sensors** icon:

The **Sensors** information appears:



Step 15 : The sensor section provides an **Identifier** or name for each sensor, its **Type**, and **Current Reading**. The chassis's sensor information also includes a **Health** status. Hovering over the information icon in the temperature column will provide specific information related to that component's temperature thresholds, if applicable.

Figure 197: Threshold Information Example

Checking the Operating System (OS)

Step 16 : Click the device's **OS** icon:

Figure 198: Storage Device OS Icon

The **Device OS** information appears:

Figure 199: Storage Device OS Information

Checking the Media

Step 17 : Click the device's **Media** icon:

Figure 200: Storage Media Icon

The **Media** information appears:

Figure 201: Storage Media Information

Step 18 : Review the operating system information for the device. If the OS requires updating, refer to Upgrading Firmware *(page 186)*.

4.2.5.3 Creating a Secure HTTPS Connection

This task provides instructions for creating a secure HTTPS connection for the OpenFlex Data24 4000 Series using the OCGUI.

The OCGUI provides a feature for uploading a customer-generated SSL/TLS certificate and key, based on the IP address and/or DNS name, to create a fully-secure HTTPS connection to a device.

Attention: Always confirm that the enclosure status is "Healthy" after changing settings to ensure that the system is operating properly.

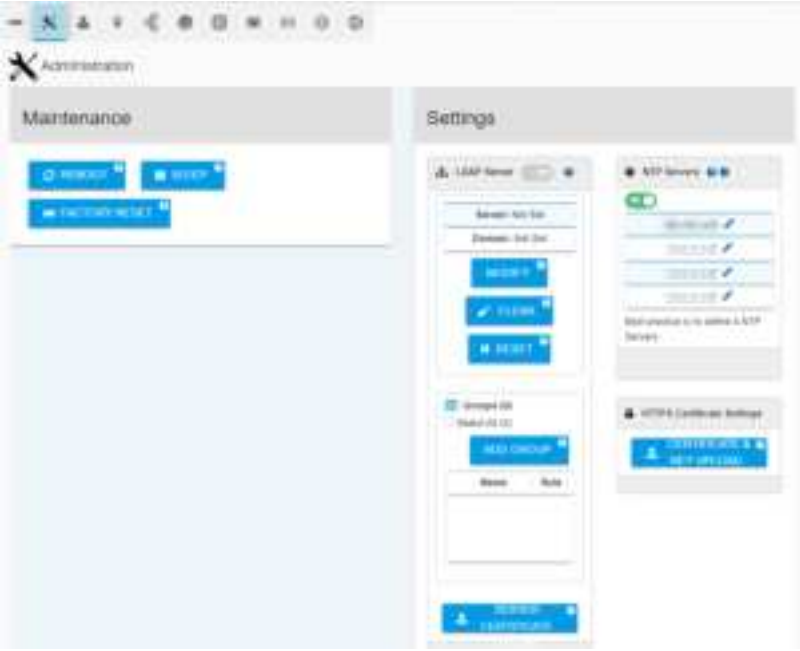
Step 1 : Navigate to the storage device. Refer to Navigating to a Device *(page 144)*.

Step 2 : Click the device's **Administration** icon:

Figure 202: Storage Device Administration Icon

The **Administration** information appears:

Figure 203: Storage Device Administration Information



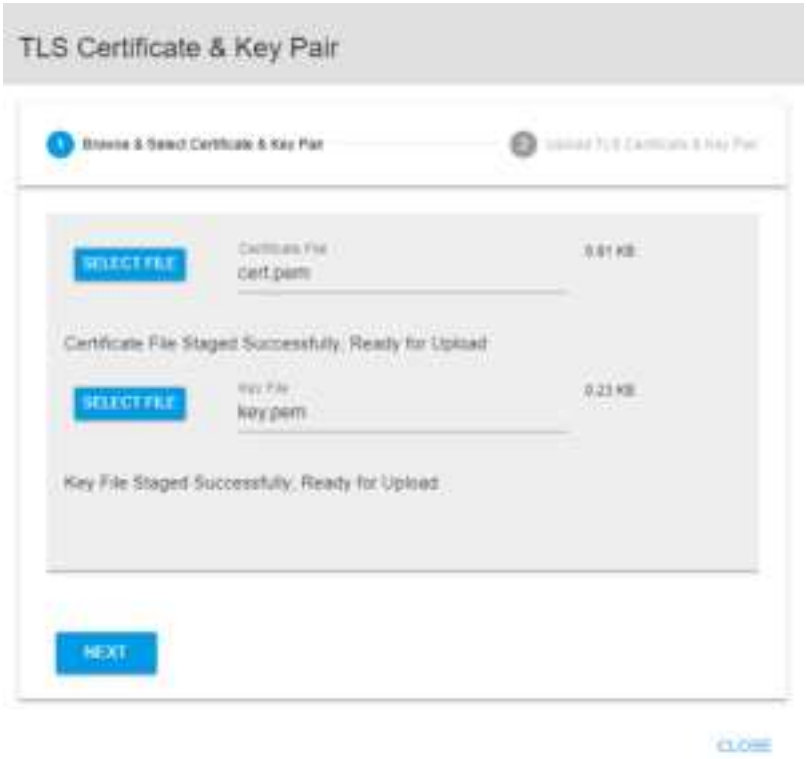
Step 3 : Click the **Certificate & Key Upload** button:

The **TLS Certificate & Key Pair** window appears, showing the **Browse & Select Certificate & Key Pair** step:

Step 4 : Click the **Select File** button:

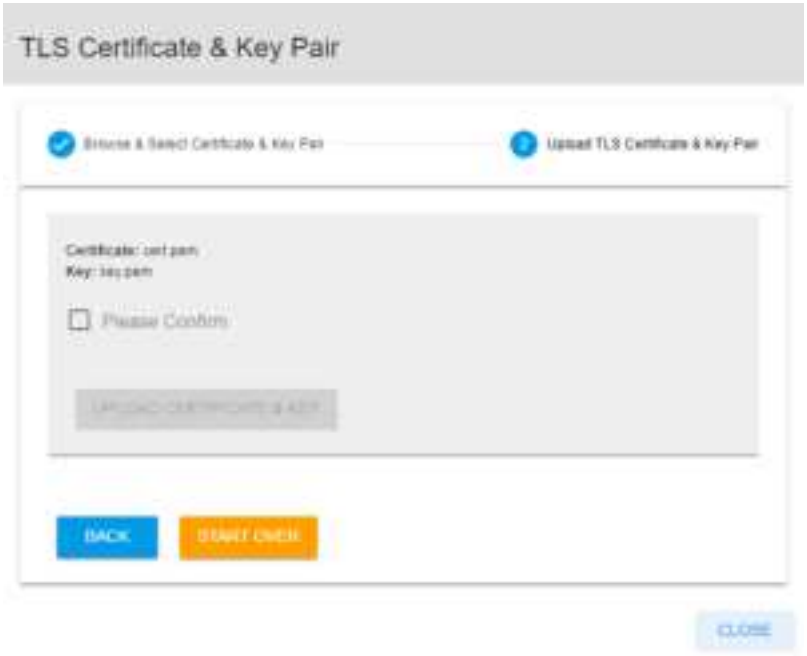
Step 5 : Navigate to the location of the appropriate PEM files for the **Certificate File** and **Key File** fields:

Note: The files are not validated. It is the user's responsibility to ensure that the correct file is chosen for the appropriate field. If the chosen files are not valid, the OCGUI will reuse the defaults already on the system.

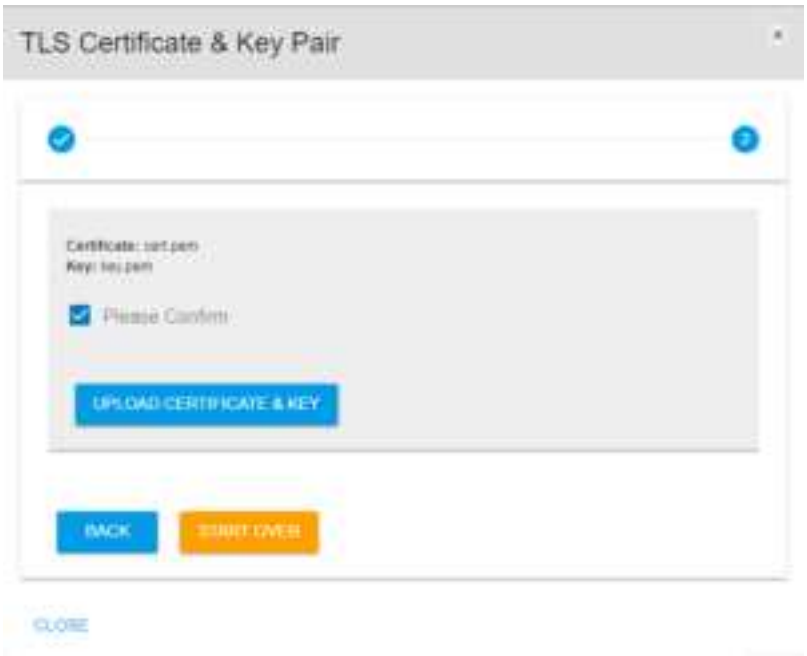


Step 6 : Click the **Next** button:

The **TLS Certificate & Key Pair** confirmation window updates, showing the **Upload TLS Certificate & Key Pair** step:



Step 7 : Confirm that the correct files are listed for **Certificate** and **Key**. If so, select the **Please Confirm** checkbox and click the **Upload Certificate & Key** button:



The **TLS Certificate & Key Pair** confirmation window closes, and the device's dashboard appears.

Step 8 : Click the **Device Information** icon:

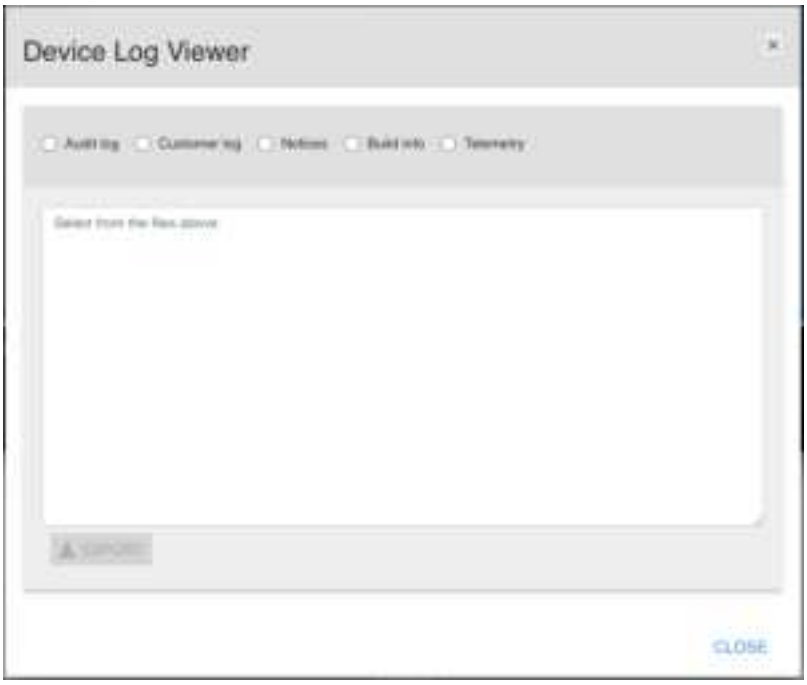
Figure 208: Storage Device Information Icon

The **Device Information** appears:

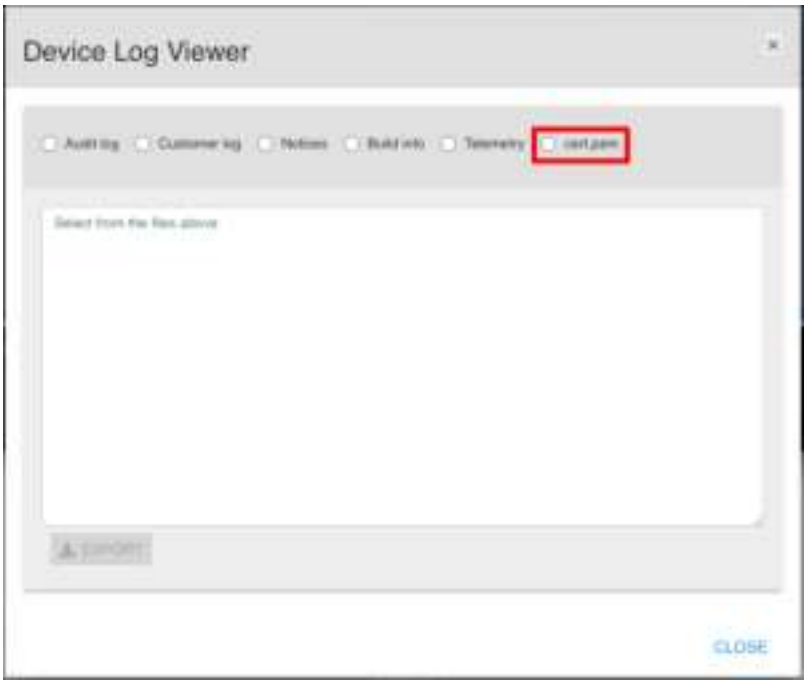
Figure 209: Storage Device Information

Step 9 : Click the **Device Logs** button:

The **Device Log Viewer** appears:



Step 10 : Confirm that the chosen certificate file is one of the selectable options. If so, a secure HTTPS connection has been established:



Step 11 : Repeat this process for each IOM to ensure cert.pem file availability from both IOMs.

4.2.5.4 Creating Accounts

This task provides instructions for creating a user account on the OpenFlex Data24 4000 Series using the OCGUI.

Note: Accounts must be created on both IOMs.

Attention: Always confirm that the enclosure status is "Healthy" after changing settings to ensure that the system is operating properly.

Step 1: Navigate to the storage device. Refer to **Navigating to a Device** *(page 144)*.

Step 2: Click the device's **Accounts** icon:

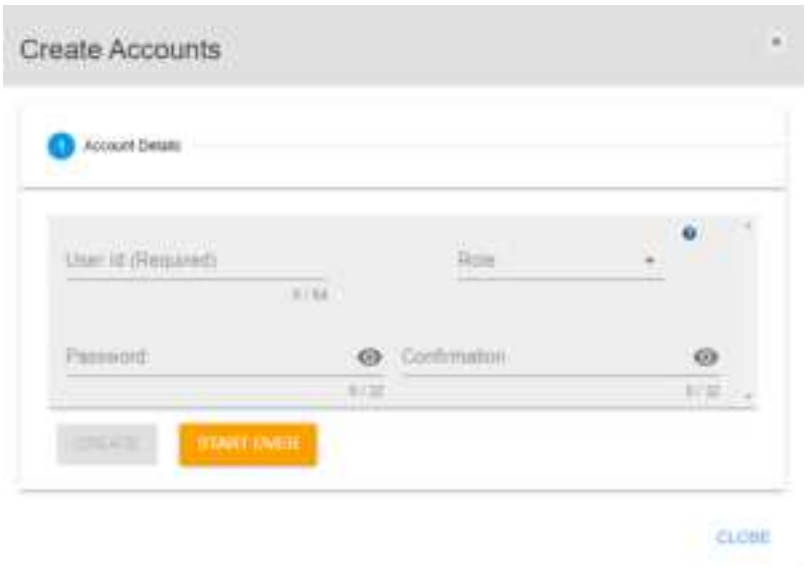
Figure 212: Storage Device Accounts Icon

The **Accounts** information appears:

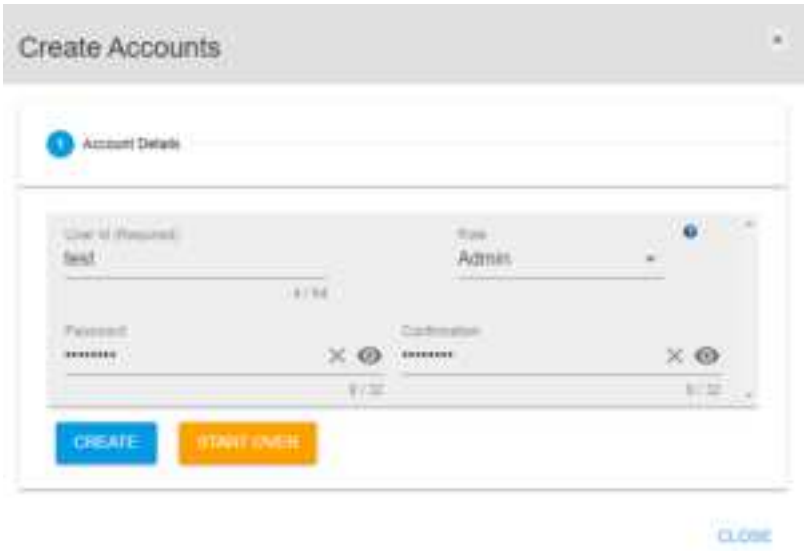
Figure 213: Storage Device Accounts Information

Step 3: Click the **Create Accounts** button:

The **Create Accounts** window appears, showing the **Account Details** step:



Step 4 : Type a **User Id**, choose a **Role**, and type a **Password**:



The **Roles** selection allows you to create an account for a user and set their permissions to ReadOnly or Admin.

- **Admin**: This option allows for full access to all account options when logged into the GUI.
- **ReadOnly**: This option allows for read only access when logged into the GUI.

Step 5 : Click the **Create** button to create the account:

Step 6 : Click **Close** to close the **Create Accounts** window:

CLOSE

The **Accounts** information appears, showing the newly created account:

Figure 218: Storage Device New Account

4.2.5.5 Configuring a Location

This task includes instructions for configuring location information for the OpenFlex Data24 4000 Series using the OCGUI.

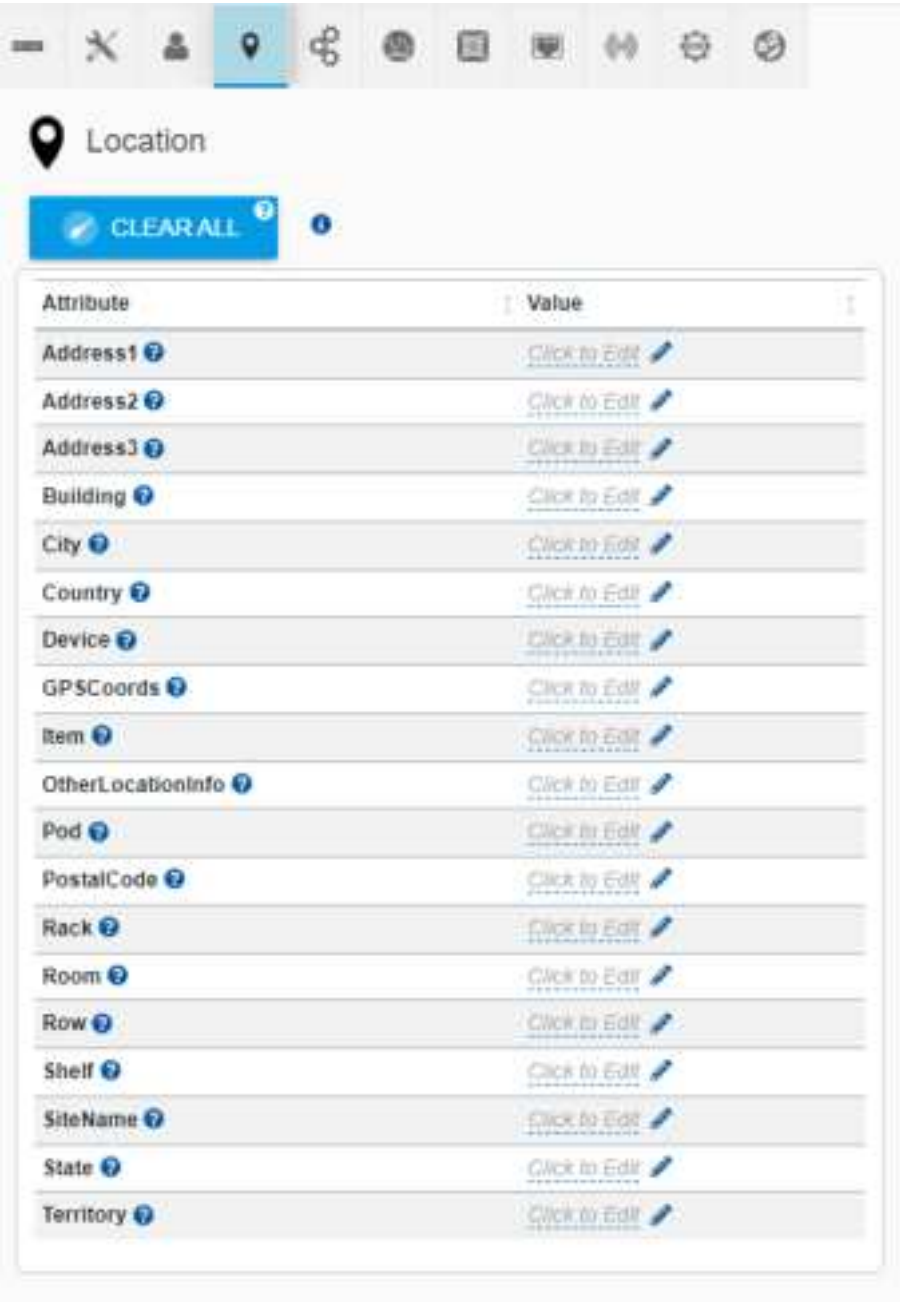
Attention: Always confirm that the enclosure status is "Healthy" after changing settings to ensure that the system is operating properly.

Step 1: Navigate to the storage device. Refer to **Navigating to a Device** ***(page 144)***.

Step 2: Click the device's **Location** icon:

Figure 219: Storage Device Location Icon

The **Location** information appears:



Step 3 : Each location attribute can be assigned a value by clicking its pencil icon in the **Value** column. Add the appropriate text to the field, and click the check mark to save the value. Enter all of the values that apply.

4.2.5.6 Changing the Default Administrator Password

This procedure will provide information on changing the default administrator password using OCGUI.

Note: It is highly recommended that this is accomplished as part of the initialization process.

Attention: Always confirm that the enclosure status is "Healthy" after changing settings to ensure that the system is operating properly.

Step 1: Login to the device using the default admin credentials.

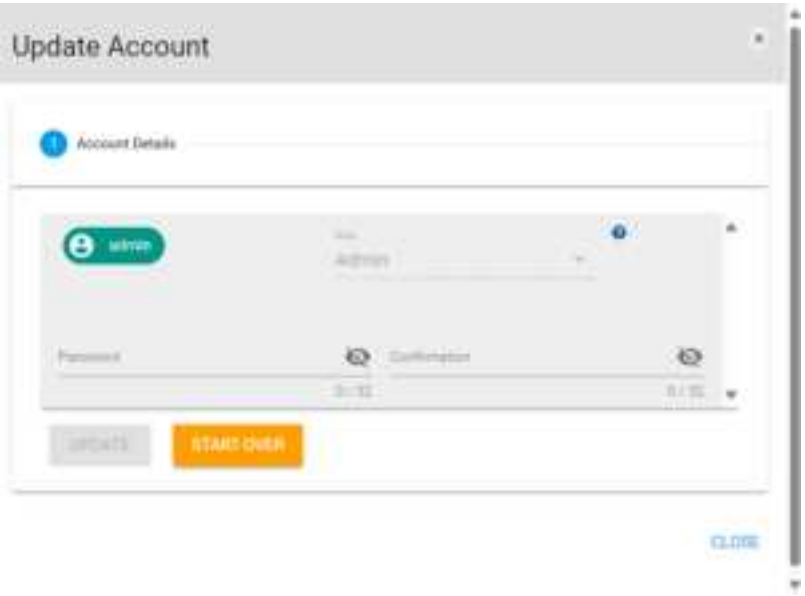
Step 2: Navigate to the storage device. Refer to **Navigating to a Device** *(page 144)*.

Step 3: Click the storage device's **Accounts** icon:

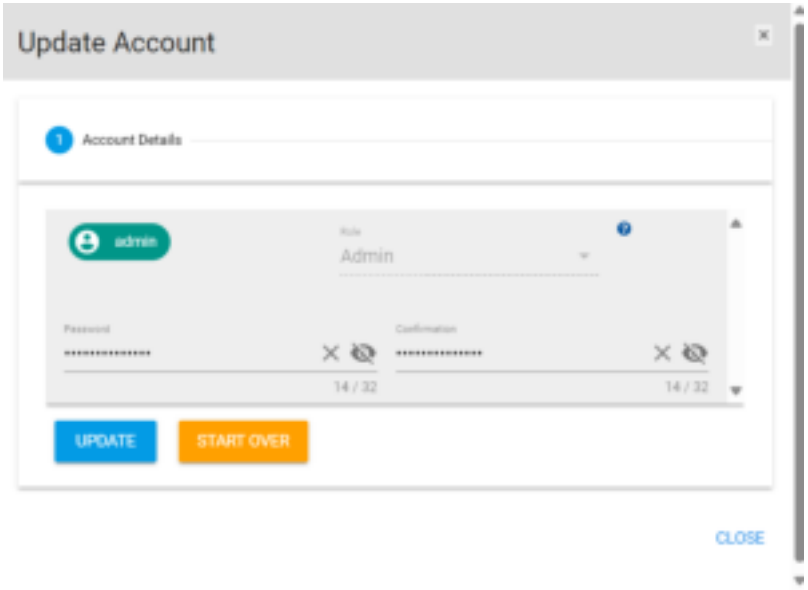
The **Accounts** information appears:

Step 4: Click the pencil icon next to the **User Id**.

The **Update Account** information appears in a new window:



Step 5: Type the new Administrator password into the **Password** and **Confirmation** fields.



Note: The passwords need to match in order to continue.

Step 6: Click the **Update** button.

The administrator password updates.

4.2.5.7 Configuring an NTP Server

This procedure will provide information on configuring an NTP server using OCGUI.

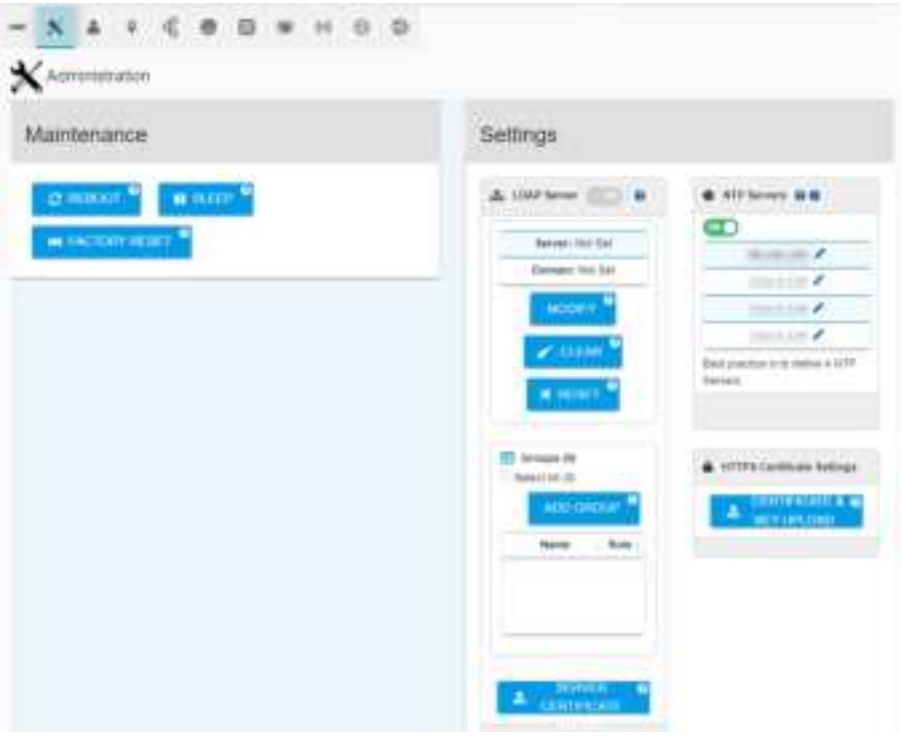
Note: It is highly recommended that this accomplished as part of the initialization process.

Attention: Always confirm that the enclosure status is "Healthy" after changing settings to ensure that the system is operating properly.

Step 1: Navigate to the storage device. Refer to **Navigating to a Device** ***(page 144)***.

Step 2: Click the storage device's **Administration** icon:

The **Administration** information appears:



Step 3 : From the right-hand side of the GUI, in the **NTP Servers** section, click the pencil icon next to a server.

A field will appear below the selected server:

Step 4 : Edit or add the name of the NTP server and click the green checkmark.

The NTP Server will update with the new information. The update will apply to both IOMs.

Attention: If the source cannot be resolved, an error message will appear. Visit https://www.ntppool.org/en/ to find the matching server for the local time zone and redo the configuration.

4.2.5.8 Editing Port Information

This task provides instructions for editing the port information for the OpenFlex Data24 4000 Series using the OCGUI.

Attention: Always confirm that the enclosure status is "Healthy" after changing settings to ensure that the system is operating properly.

Step 1: Navigate to the storage device. Refer to **Navigating to a Device** *(page 144)*.

Step 2: Click the device's **Ports** icon:

Figure 230: Storage Device Ports Icon

The **Ports** information appears:

Figure 231: Storage Device Ports Information

Step 3: To edit the port information for an IOM, click the pencil icon next to that port's **Adapter** name.

Note: The port will be updated and reset, resulting in dropping any active connections.

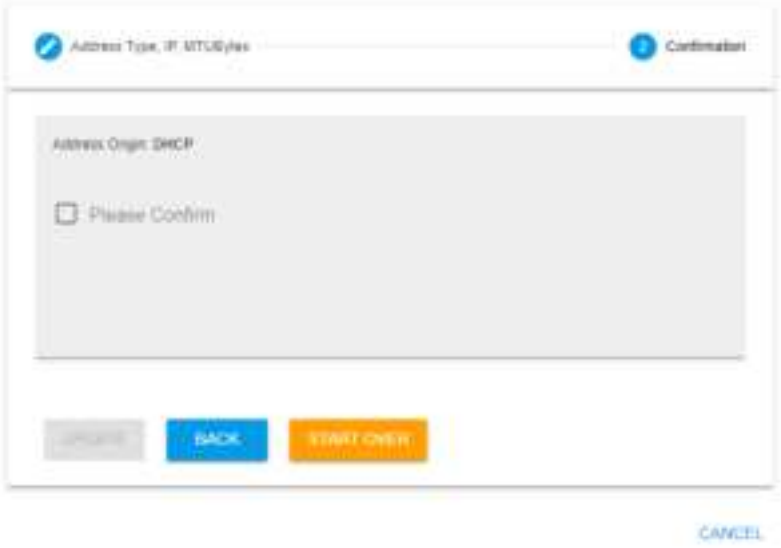
Attention: The MTU Bytes for the IOM defaults to a value of 1500 for the management port and 4500 for the data ports.

The **Update Port** window appears, showing the **Address Type, IP, MTUBytes** step:

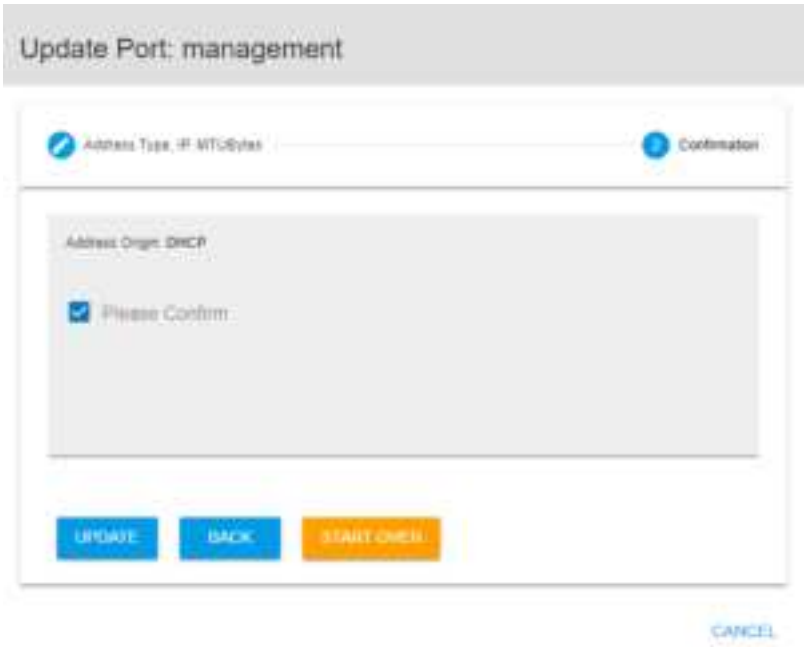
Figure 232: IOM Device Update Port Window

Step 4 : Edit the port information for the device and click the **Next** button:

The **Confirmation** step appears:



Step 5 : Select the **Please Confirm** checkbox to confirm the edits:



Step 6 : Click the **Update** button to save the updates:

4.2.5.9 Obtaining the Drive NQN Value

Attention: Always confirm that the enclosure status is "Healthy" after changing settings to ensure that the system is operating properly.

Step 1 : Navigate to the storage device. Refer to **Navigating to a Device** *(page 144)*.

Step 2 : Click the device's **Media** icon:

Figure 234: Storage Media Icon

The **Media** information appears:

Figure 235: Storage Media Information

Step 3 : Review the **Durable Name** value next to the devices to view the NQN value.

Note: The NQN value for non-high availability systems contains the IOM that controls the drive. Because the high availability platform maps both IOMs to all drives, the IOM is not a part of the drive NQN value on these systems.

4.2.6 Device Sharing

Device sharing allows a single NVMe device to be shared across multiple RapidFlex A2000 Fabric Bridges. When the A2000's are configured for device sharing they have the ability to export or present those devices to connected hosts and servers.

One or more A2000's are connected through PCIe to a device switch as a management processor. The management processor implements a PCIe root complex that enumerates all of the downstream NVMe devices connected to the device switch. The management processor firmware performs NVMe initialization on each NVMe device, including the creation of an NVMe admin queue for each device. When device sharing is enabled, the device switch will be configured to present a unique PCIe endpoint to each connected A2000. This unique endpoint provides the PCIe non-transparent bridging between A2000 and backend NVMe devices.

Changing the Device Sharing state should only be done as an offline event. Disconnect all devices before modifying the setting. When changing Device Sharing Setting, please note the following:

- The command to enable or disable Device Sharing must be issued to each IOM separately.
- Enabling or Disabling Device Sharing will cause the IOM to reboot. For best results, wait for the first IOM to finish rebooting before changing the setting on the other IOM.
- The Device Sharing setting must be the same on both IOMs.

Warning: Device sharing must be enabled or disabled on all IOMs in a system. Different settings within a system cause operational degradation.

Non-Transparent Bridging

The A2000 root complex performs PCIe enumeration and discovers an endpoint device that is exposed by the device switch. As a result, the endpoint class indicates a Non-Transparent Bridging (NTB) Device Sharing system, or a Non-Transparent End Point (NTEP), to the A2000.

The NTEP is configured in the device switch to deliver all access to the PCIe memory space to the Management Processor firmware for servicing. The device switch is programmed to deliver all access to this PCIe memory space directly to the corresponding NVMe device. The Management Processor firmware is not involved for this access, instead, the device switch hardware routing and translation tables are programmed to deliver access directly, at speed.

NVMe

The Management Processor controls the backend NVMe devices that PCIe enumerates, performs NVMe initialization, and creates the NVMe Admin Queues.

The Management Processor is the only entity that can directly issue NVMe Admin commands to the backend NVMe device. Using Virtual NVMe Admin Queues, A2000 can be connected to the device switch and any host to which A2000 connects. This is utilized to issue NVMe Admin commands to a backend NVMe device. Virtual Admin Queues are created by each A2000 to provide a path for the A2000 to send admin commands to each backend NVMe device.

4.2.6.1 Enabling Device Sharing

Attention: Use the NVMe CLI to disconnect NVMe disks prior to starting this operation. Refer to NVMe-CLI *(page 191)*.

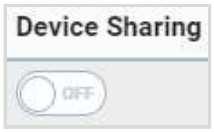
Attention: Always confirm that the enclosure status is "Healthy" after changing settings to ensure that the system is operating properly.

Step 1: Navigate to the storage device. Refer to Navigating to a Device *(page 144)*.

Step 2: Click the device's **Controllers** icon:

The **Controllers** information appears:

Step 3: Click the **Device Sharing** toggle next to the preferred device:



A message requesting confirmation appears.

Step 4 : Click **Proceed** to enable sharing for the chosen device:

A "Reboot in Progress..." message appears and the device reboots.

Step 5 : Verify that the **Device Sharing** toggle next to the enabled device appears as **On**.

Step 6 : Repeat the previous steps to enable sharing for other devices.

4.2.6.2 Disabling Device Sharing

Attention: Use the NVMe CLI to disconnect NVMe disks prior to starting this operation. Refer to NVMe-CLI *(page 191)*.

Attention: Always confirm that the enclosure status is "Healthy" after changing settings to ensure that the system is operating properly.

Step 1 : Navigate to the storage device. Refer to **Navigating to a Device** *(page 144)*.

Step 2 : Click the device's **Controllers** icon:

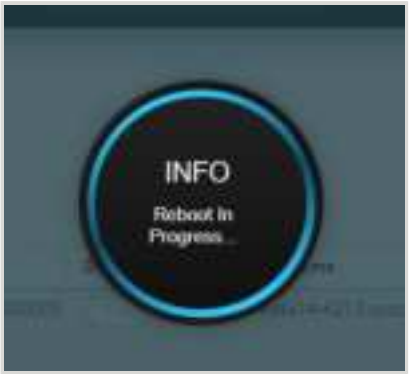
The **Controllers** information appears:

Step 3 : Click the **Device Sharing** toggle next to the preferred device:

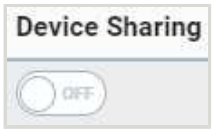
A message requesting confirmation appears.

Step 4 : Click **Proceed** to disable sharing for the chosen device:

A "Reboot in Progress..." message appears, and the device reboots.



Step 5 : Verify that the **Device Sharing** toggle next to the disabled device appears as **Off**.



Step 6 : Repeat the previous steps to disable sharing for additional devices.

4.2.7 Maintenance

For the OpenFlex Data24 4000 Series , maintenance includes the options to reboot, put a device to sleep, and factory reset the enclosure.

4.2.7.1 Rebooting a Storage Device

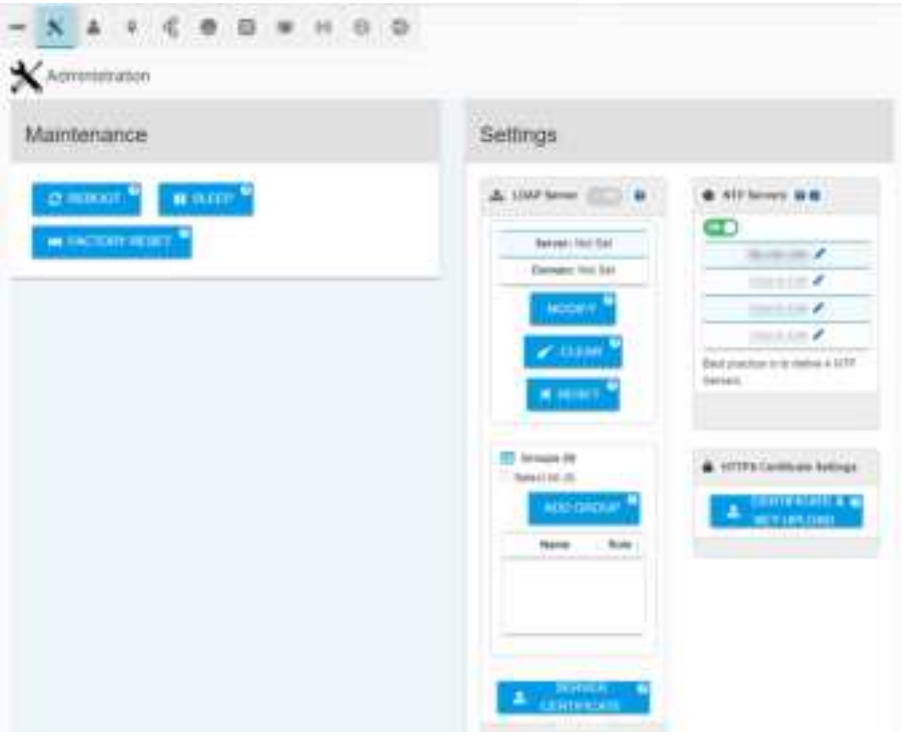
This task provides instructions for rebooting an OpenFlex™ Data24 4000 Series storage device using the OCGUI.

Attention: Always confirm that the enclosure status is "Healthy" after changing settings to ensure that the system is operating properly.

Step 1 : Navigate to the storage device. Refer to **Navigating to a Device** *(page 144)*.

Step 2 : Click the storage device's **Administration** icon:

The **Administration** information appears:



Step 3 : Click the **Reboot** button:

A window appears, prompting the user to confirm the reboot:

Step 4 : Click **Reboot**:

REBOOT

Step 5 : The storage device will reboot, rendering it unavailable until the reboot is complete.

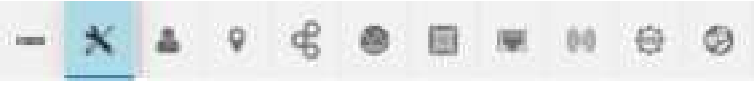
4.2.7.2 Putting the Storage Device to Sleep

This task provides instructions for putting the storage device to sleep using the OCGUI.

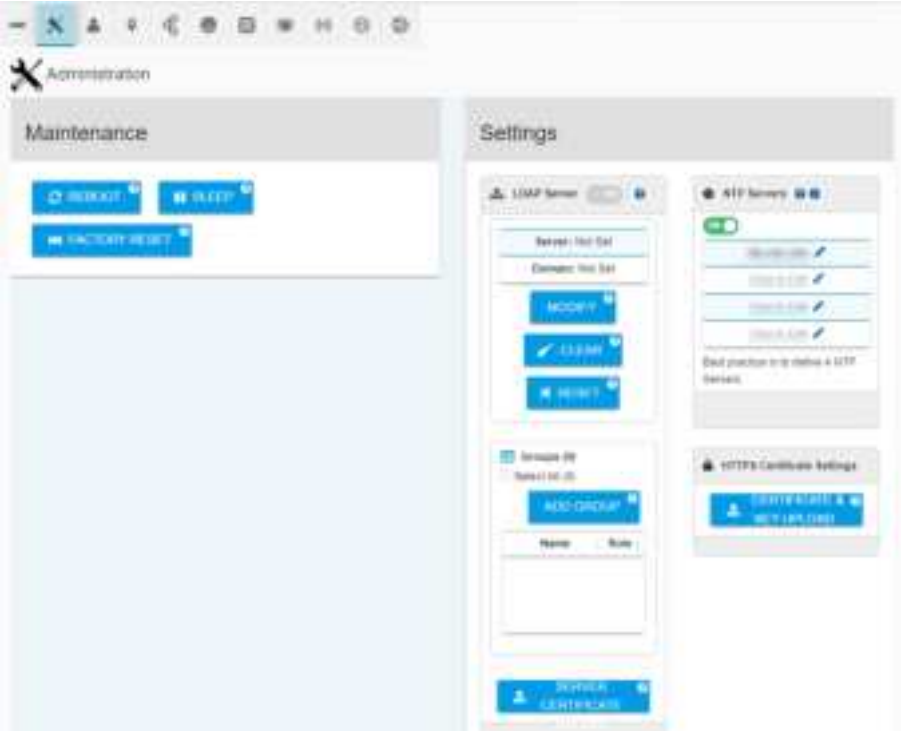
Attention: Always confirm that the enclosure status is "Healthy" after changing settings to ensure that the system is operating properly.

Step 1: Navigate to the storage device. Refer to **Navigating to a Device** *(page 144)*.

Step 2: Click the storage device's **Administration** icon:



The **Administration** information appears:



Step 3: Click the **Sleep** button:

A window appears, prompting the user to confirm the reboot:

Step 4: Click **Sleep**:

Step 5 : The storage device will go to sleep, rendering it unavailable.

4.2.7.3 Factory Resetting a Storage Device

This task provides instructions for factory reseting on an OpenFlex Data24 4000 Series storage device using the OCGUI.

Before you begin: The Factory Reset feature does the following:

- Sets the network setting back to default (100G and 1G ports on both IOMs)
- Set NTP time settings back to the default (Management port)
- All devices will be powered on (default)
- Re-enables disabled drives (power on drives upon factory reset)
- Set enclosure name back to default
- Reset user accounts and authentication (drop/recreate read/write partition, deleting all user created data and authentication accounts)

Attention: A Factory Reset should not be done while there are active connections. Factory reset cannot be performed if the system is in Sleep Mode.

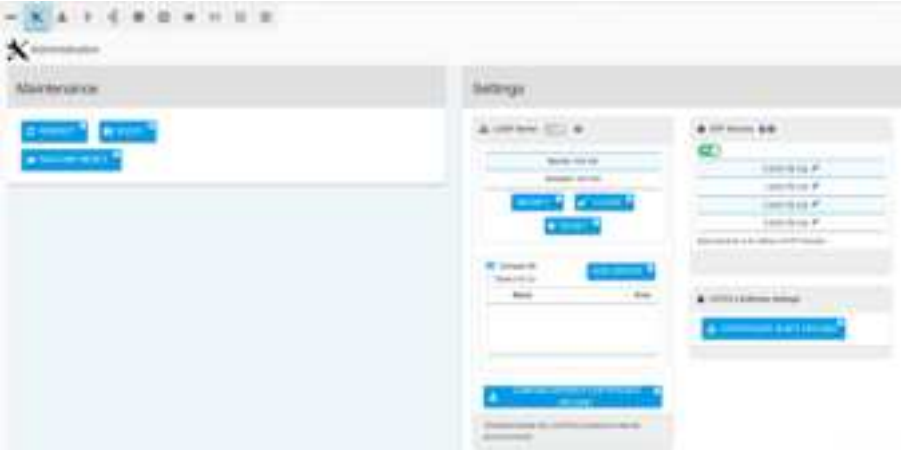
Attention: Always confirm that the enclosure status is "Healthy" after changing settings to ensure that the system is operating properly.

Step 1 : Navigate to the storage device. Refer to **Navigating to a Device** ***(page 144)***.

Performing the Factory Reset

Step 2 : Click the storage device's **Administration** icon:

The **Administration** information appears.:



Step 3 : Click the **Factory Reset** button:

A window appears, prompting the user to confirm the Factory Reset.

Step 4 : Click **Factory Reset**:

The GUI session will end and the enclosure will reboot.

Result: The enclosure will shut down and automatically restart once the factory reset procedure is complete.

4.2.7.4 Enabling LDAP on a Storage Device

This task provides instructions to enable LDAP on a OpenFlex Data24 4000 Series storage device using the OCGUI.

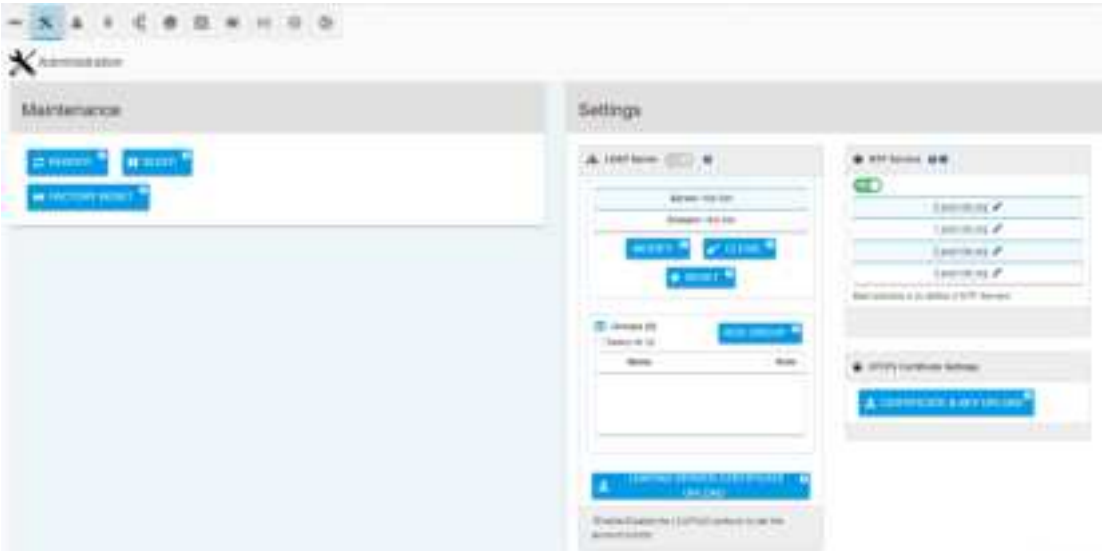
Note: Use of LDAP accounts is limited to the vStore API.

Attention: Always confirm that the enclosure status is "Healthy" after changing settings to ensure that the system is operating properly.

Step 1 : Navigate to the storage device. Refer to **Navigating to a Device** *(page 144)*.

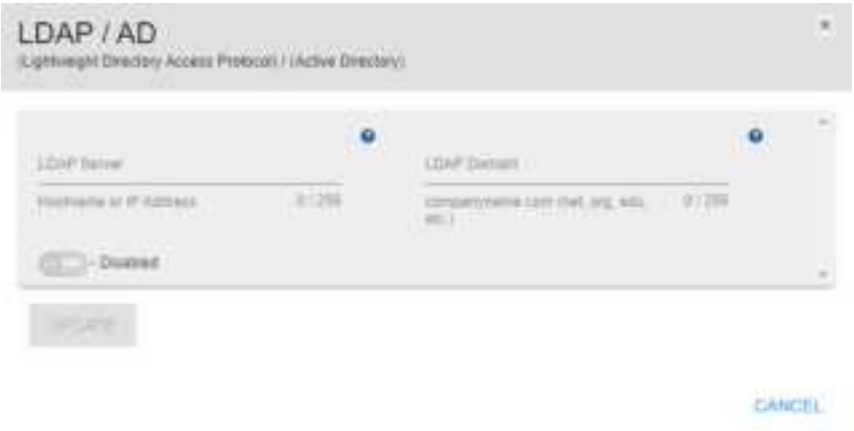
Step 2 : Click the storage device's **Administration** icon:

The **Administration** information appears.:



Step 3 : From the LDAP Server section, click **MODIFY** .

The LDAP / AD window will appear.



Step 4 : Type a Hostname or IP Address and LDAP Domain in the fields of the LDAP / AD window.

Step 5 : Click **UPDATE**.

The LDAP / AD window will close and the IP Address and the Hostname will update in the LDAP Server section.

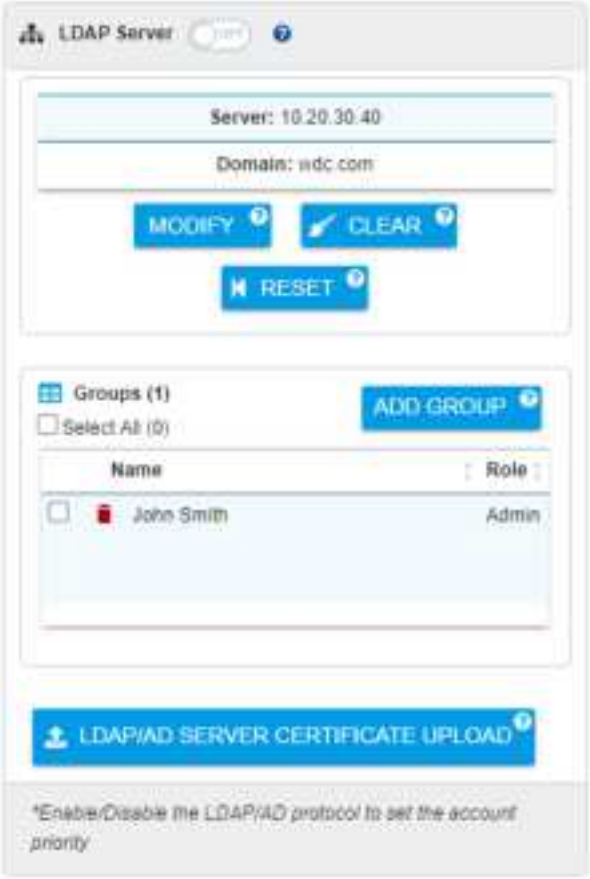
Step 6 : Click **ADD GROUP**.

The Add Group window will appear.

Step 7 : Type a Group Name and select a role from the options.

Step 8 : Click **ADD GROUP**.

The Group and Role are added to the LDAP Server section.



Step 9 : From the Add Group window, click **Close**.

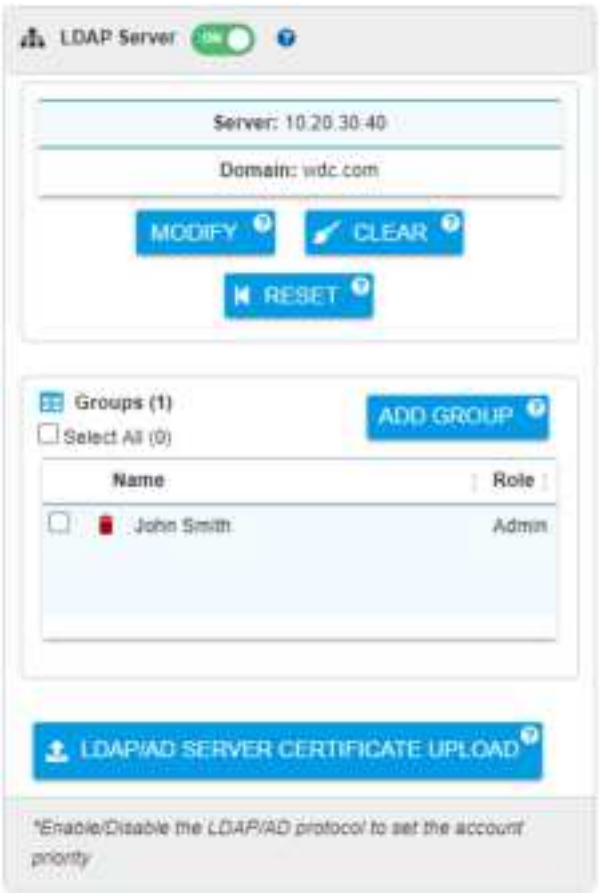
Step 10 : From the LDAP Server, click **MODIFY** .

The LDAP / AD window appears.

Step 11 : From the LDAP / AD window, click the **Disabled** option slider to enable the LDAP Server. The slider option will now display as Enabled.

Step 12 : Click **UPDATE**.

The LDAP Server section updates and the LDAP Server displays as ON.


LDAP Server
ON
Server: 10.20.30.40
Domain: wdc.com
MODIFY
CLEAR
RESET
Groups (1)
Select All (0)
ADD GROUP
Name
Role
John Smith
Admin
LDAP/AD SERVER CERTIFICATE UPLOAD
*Enable/Disable the LDAP/AD protocol to set the account priority

4.3 Firmware Upgrade

The following section provides the necessary information and procedures to execute firmware upgrades on the OpenFlex Data24 4000 Series and sub-assemblies contained within the system.

4.3.1 Downloading Firmware from the Support Portal

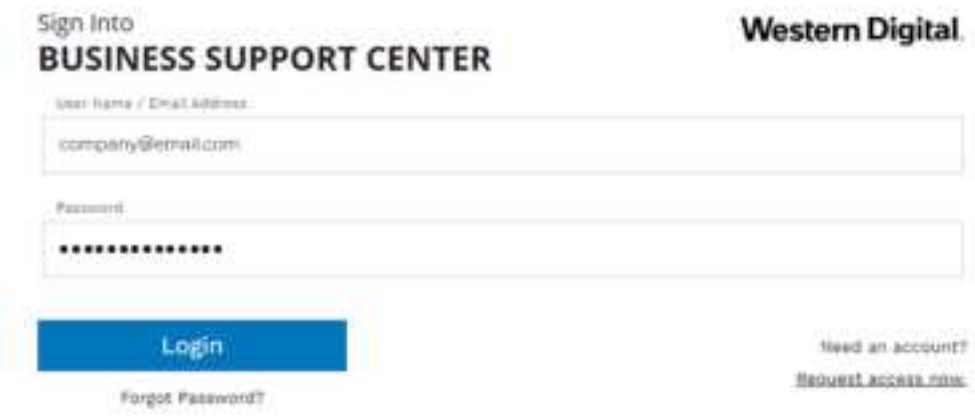
Note: The product must be registered in order to download firmware updates.

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

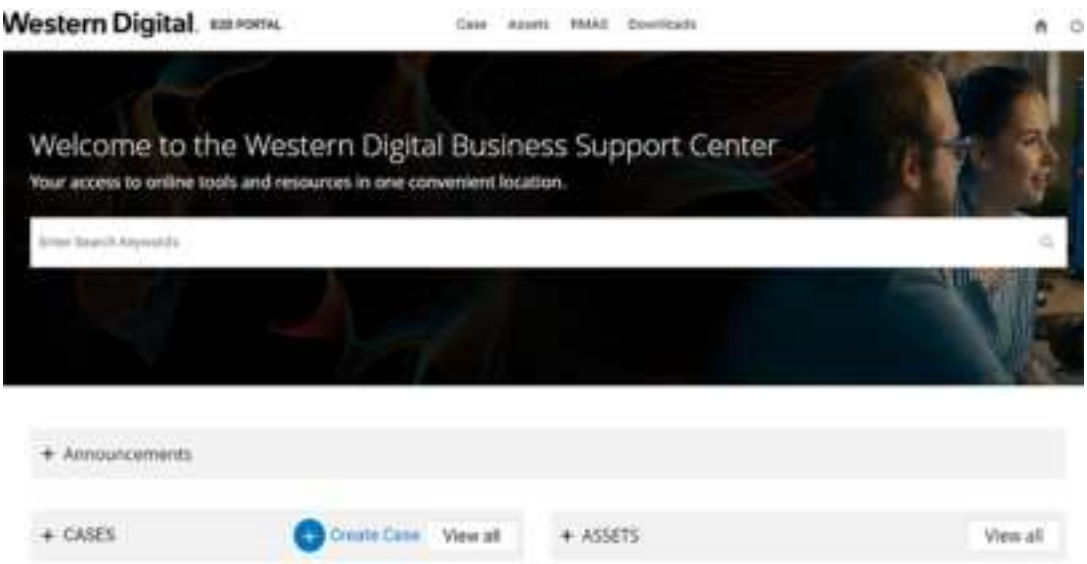
The **Western Digital Enterprise Support Center** will appear.

Step 2: Log in to the **Western Digital Enterprise Support Center** using a valid email address and password:

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



The support portal will appear.



Step 3 : Click the **Downloads** option from the top banner.

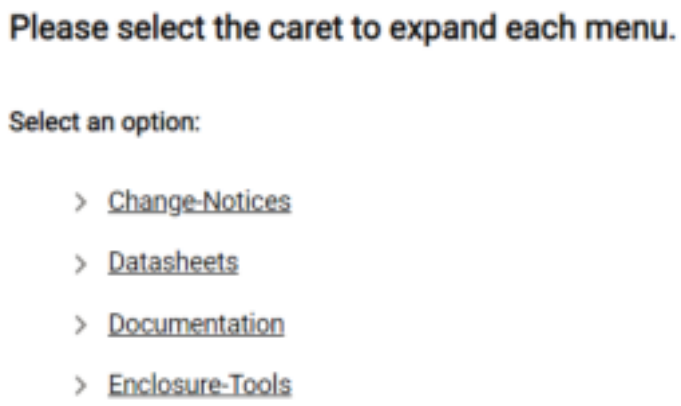
The Western Digital downloads page will appear.

Step 4 : Choose a product from the **Select Product** dropdown list.

Note: Filenames will vary, depending on the options chosen from the **Select Product** section.

The product specific downloads will appear in the Download Resources section.

Step 5 : Expand a download option by clicking the caret next to the chosen category until files are displayed.



Step 6 : Download a file by clicking the chosen file.

The file will automatically download.

4.3.2 Upgrading Firmware

This task provides instructions for upgrading firmware on the OpenFlex Data24 4000 Series using the OCGUI.

Before you begin:

Attention: Ensure that there are no control/configuration operations occurring during the firmware upgrade.

Step 1 : The latest version of firmware must be downloaded before continuing this upgrade procedure. If the firmware has not been downloaded, follow the instructions in **Downloading Firmware from the Support Portal** *(page 184)*.

Step 2 : Click the device's **OS** icon:

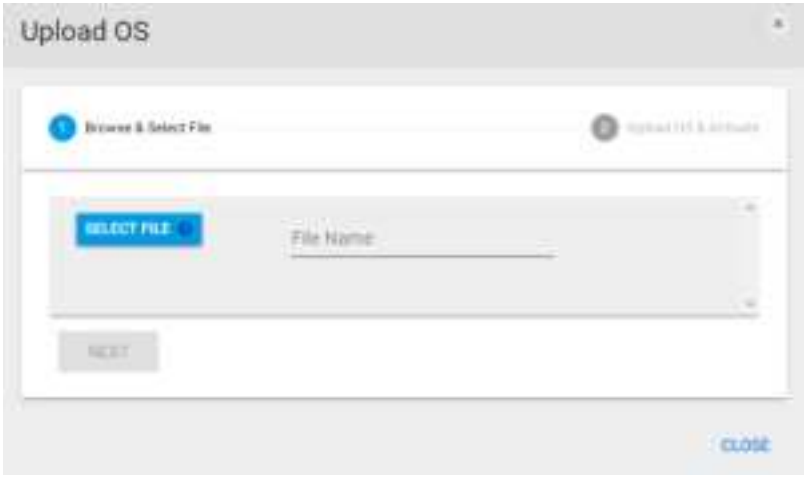
Figure 280: Storage Device OS Icon

The **Device OS** information appears:

Figure 281: Storage Device OS Information

Step 3 : Click the **Update OS** button:

The **Update OS** window appears, showing the **Browse & Select File** step:



Step 4 : Click **Select File**, navigate to the location of the new firmware download, select the file, and click **Open**.

The **Upload OS** window updates to display the selected file:

Step 5 : Click the **Next** button:

Note: This upload may take up to a few minutes.

The **Upload OS** window updates to show the **Upload OS & Activate** step:

Step 6 : Click the checkbox beside **Please Confirm**. Then click the **Upload** button:

The **Upload OS** window updates, showing an upload status:

Step 7 : After the device has rebooted, click the storage device's **OS** icon:

The **Device OS** information appears:

Step 8 : Review the **Device OS** information to verify the firmware version by selecting the device and going to the Device Logs.

Step 9 : Click the storage **Device Information** icon:

The **Device Information** appears:

Step 10 : Click the **Device Logs** button:

The **Device Log Viewer** appears:

Step 11 : Select the **Build Info** log type by clicking its radio button.

The **Device Log Viewer** updates to show the Build Info log information, which can then be exported by clicking the **Export** button at the bottom of the viewer:

4.3.3 Drive Firmware Upgrade

This section provides instructions for updating drives firmware on the OpenFlex Data24 4000 Series using NVMe-CLI.

Before you begin:

Attention: Ensure that all drive I/O has been halted before initiating any drive firmware updates.

Prerequisites

- NVMe-CLI
- Supported OS
- Device identifier(s) for drives that will be updated.
- This procedure assumes that the targeted NVMe device has already been connected. For an example of how to connect a device see **Discovering and Connecting to NVMe Devices using the Open Composable API *(page 129)***.

Note: Only one drive may be updated using a single data port. Multiple drives may be updated at a time using multiple data ports.

Step 1: Follow the instructions in **Downloading Firmware from the Support Portal *(page 184)*** to download the firmware file to an appropriate location on the host.

Step 2: Use `fw-log` to verify the current firmware on the target NVMe device.

```
nvme fw-log /dev/nvme3
```

The NVMe device firmware information is displayed.

```
Firmware Log for device:nvme3
afi : 0x22
frs1 : 0x3330303930313252 (R2109003) - FW Slot 1 r.o.
frs2 : 0x3330303930313252 (R2109003) - FW Slot 2 r/w
frs3 : 0x3030323930323252 (R2209200) - FW Slot 3 r/w
frs4 : 0x3330303930313252 (R2109003) - FW Slot 4 r/w
```

- **frs<number>**: represents one of four firmware slots on each drive
- **R<number>**: represents firmware file residing in that slot
- **frs1**: is a read-only slot and all other slots are read/write
- The first afi number, occurring after the **0x**, represents the currently active firmware slot (e.g. 0x**2**2)
- The second afi number **0x**, occurring after the, represents the firmware slot that will be active after next drive reset/restart (e.g. 0x3**3**). 'afi: 0x33' indicates that the firmware in Slot 3 is currently active and will remain active after next drive reboot/reset.

Step 3: Use `fw-download` to load the new drive firmware onto the target NVMe device.

```
nvme fw-download /dev/nvme3 -f /<path-to-fw-file>/<drive_fw>.vpkg
```

The firmware is downloaded.

Step 4 : Use `fw-activate` to activate firmware and commit to install the loaded firmware version.

```
nvme fw-activate /dev/nvme3 -s 3 -a 3
```

Note: When updating drive firmware use nvme fw-activate action 3.

The firmware is successfully committed and the SSDs will reset.

Step 5 : Confirm the firmware version that is now loaded on the drive use `fw-log` and review the ouput.

```
nvme fw-log /dev/nvme3
```

The NVMe device firmware information is displayed.

```
Firmware Log for device:nvme3
afi  : 0x33
frs1 : 0x3330303930313252 (R2109003)
frs2 : 0x3330303930313252 (R2109003)
frs3 : 0x3030323930323252 (R2209200)
frs4 : 0x3330303930313252 (R2109003)
```

Step 6 : Verify that the expected firmware slot is active under 'afi' by confirming both the first and second afi values are the same. This ensures that the firmware stays persistent after drive reboot/reset. The API Firmware data does not update until the drive or the enclosure is rebooted.

Step 7 : Repeat this procedure in order to upgrade the remaining drives.

4.4 Enclosure Pullout Tabs

There is a small plastic tab located on the front of the Chassis that can be pulled out to show the vital system details such as the part number, serial number, and chassis revision number.

Figure 294: Chassis Pullout Tab Location

4.5 In-band Enclosure Management

The OpenFlex Data24 4000 Series provides In-Band Enclosure Management functionality through the OCAPI and OCGUI. To leverage the In-Band Management features, users must install a standalone version of the openflex-api software onto an initiator or host and connect a management device that is presented up to the fabric via the IOM and discoverable using `nvme discover`.

4.6 NVMe-CLI

NVMe-CLI is an open-source management tool for NVMe storage devices in Linux. The tool allows users to manage device firmware, erase data securely, output error logs, and other similar management functions. It is a command-line utility and can be used to script management functions for large storage arrays.

Note: OpenFlex Data24 4000 Series supports a minimum version of NVMe-CLI 1.16 up to the latest version of 2.11.

To install NVMe-CLI on Ubuntu 24.04:

```
sudo apt-get install -y nvme-cli
```

To Install NVMe-CLI on RHEL 9.2:

```
sudo yum install nvme-cli
```

For further details on NVMe-CLI see the following resources:

- NVMe-CLI Debian Manpages
- General NVMe-CLI Information from nvmexpress.org

4.6.1 Supported NVMe-CLI Commands

Table 39: NVMe-CLI Fabric Commands

Command	Support Details
connect	Supported
connect-all	Supported
disconnect	Supported
disconnect-all	Supported
discover	Supported
fw-download (drives only)	Supported
fw-activate (drive only)	Supported
fw-log	Supported
nvme-device-self-test	Supported
reset (drives only)	Supported
format	Supported

4.6.2 Unsupported NVMe Drive Level Commands

The following is a list of unsupported NVMe drive level commands for OpenFlex Data24 4000 Series .

Table 40: Usupported NVMe

Drive Command
NVMe-MI Send/Receive
Directive Send/Receive
Virtualization Management
Doorbell Buffer Config
Reservations
ZNS

Safety

In This Chapter:

5.1 Electrostatic Discharge

CAUTION

Electrostatic discharge can harm delicate components inside Western Digital products.

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

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

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

5.2 Optimizing Location

- Failure to recognize the importance of optimally locating your product, and failure to protect against electrostatic discharge (ESD) when handling your product, can result in lowered system performance or system failure.
- Do not position the unit in an environment with extreme high temperatures or extreme low temperatures. Be aware of the proximity of the unit to heaters, radiators, and air conditioners.
- Position the unit so that there is adequate space around it for proper cooling and ventilation.
- Keep the unit away from direct strong magnetic fields, excessive dust, and electronic/electrical equipment that generate electrical noise.

5.3 Power Connections

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

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

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

When power cycling the unit, wait 10 seconds before re-applying power. Failure to do so may cause the enclosure to boot up in an inaccessible state. If this is encountered, remove power, wait 10 seconds, and then reapply power.

5.4 Power Cords

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

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

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

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

5.5 Rack-Mountable Systems

CAUTION: **Always install rack rails and storage enclosure according to OpenFlex™ Data24 4000 Series product documentation. Follow all cautions, warnings, labels, and instructions provided within the rackmount instructions.**

Reliable grounding of rack-mounted equipment should be maintained.

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

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

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

5.6 Safety and Service

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

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

 When replacing a hot-plug power supply, unplug the power cord to the power supply being replaced before removing it from the OpenFlex™ Data24 4000 Series .

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

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

5.7 Safety Warnings and Cautions

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

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

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

 Indicates potential hazard if indicated information is ignored.

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

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

 Indicates disconnect all power sources before servicing.

Regulatory

In This Chapter:

6.1 Country Certifications

Table 41: Country Certifications

Country/Region	Authority or Mark
Australia/New Zealand	RCM
European Union	CE
Great Britain	UKCA
Israel	SII
Japan	VCCI
Korea	MSIP
North America (Canada, USA)	Nemko
Taiwan	BSMI

6.2 Electromagnetic Compatibility (EMC) Class A Compliance

The DCS0011 complies with and conforms to the latest international standards as applicable:

Emissions

- AS/NZS CISPR 32
- CISPR 32 Edition 6
- CNS 13438
- FCC CFR 47 Part 15, Subpart B
- ICES-003, Issue 7
- IEC 55032
- KN32
- VCCI V-3

Immunity

- IEC 55035
- KN35

6.3 Restricted Access Location

The OpenFlex™ Data24 4000 Series is intended for installation in a server room or computer room where at least one of the following conditions apply:

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

6.4 Regulatory Statement of Compliance

Product Name: **OpenFlex™ Data24 4000 Series**

Regulatory Model: DCS0011

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.

- BS EN 62368-1
- CAN/CSA-C22.2 No. 62368-1-14 (R2019)
- CNS 14336-1
- IEC 62368-1, Second Edition Am1, Am2
- UL 62368-1, Second Edition Am1, Am2

6.5 Europe (CE Declaration of Conformity)

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

- Ecodesign Directive (2019/424/EU)
- RoHS Directive 2011/65/EU

UK Import Representation Contact

PO Box 471
Leatherhead KT22 2LU
UK

Telephone: +44 1372 366000

EU Import Representation Contact

BP 80006
92135 Issy les Moulineaux, France

6.6 FCC Class A Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.

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

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if it is not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Any modifications made to this device that are not approved by Western Digital may void the authority granted to the user by the FCC to operate equipment.

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

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numerique de la classe A est conforme à la norme NMB-003 du Canada.

6.8 Japanese Compliance Statement, Class A ITE

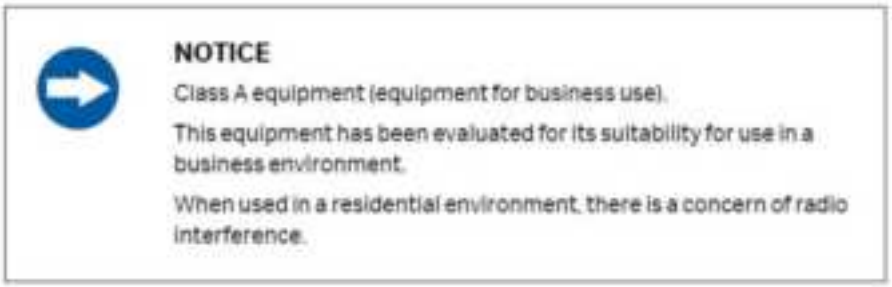
The following Japanese compliance statement pertains to VCCI EMI regulations:

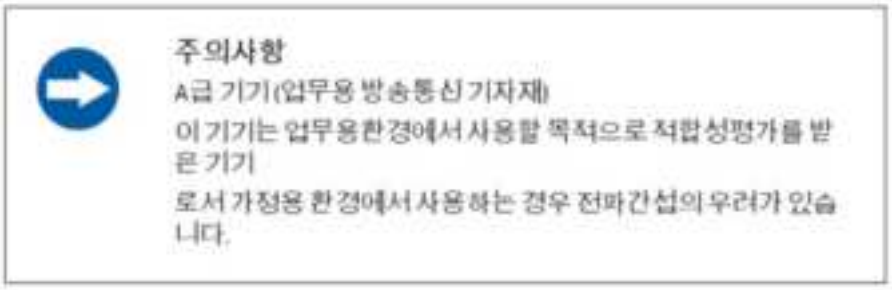
この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI－A

English translation:

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

6.9 South Korea Warning Label Statement, Class A ITE





6.10 Taiwan Warning Label Statement, Class A ITE

警告:

為避免電磁干擾，本產品不應安裝或使用於住宅環境

English translation:

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

Safety warnings:

請仔細閱讀以下說明

1. 本設備勿置於潮濕處。
2. 連接至電源前，請先檢查電壓。
3. 當設備不用時，請將電源線拔除避免電壓不穩而造成傷害。
4. 勿將任何液體灑入設備中，避免線路短路。
5. 基于安全理由，只有受到專業訓練的維修人員，才可以打開本設備。
6. 請勿自行調整或修理已通電的設備，以確保您的安全。
7. 如不小心受傷，請立刻找急救人員給予您適當的救護，千萬別因傷勢輕微而忽略自己的傷處。

English translation:

Please read the following instructions carefully

1. Do not place the device in a humid place.
2. Check the voltage before connecting to the power source.
3. When the device is not in use, please unplug the power cord to avoid injury due to unstable voltage.
4. Do not spill any liquid into the equipment to avoid short circuits.
5. For safety reasons, only practitioners who have received professional training can open the device.
6. Please do not adjust or repair the powered equipment by yourself to ensure your safety.
7. If you are accidentally injured, please find emergency personnel to give you proper first aid immediately. Don't ignore your injury because of the minor injury.