



ThinkSystem SR645 V3 User Guide



Machine Type: 7D9C, 7D9D

Note

Before using this information and the product it supports, be sure to read and understand the safety information and the safety instructions, which are available at:

https://pubs.lenovo.com/safety_documentation/

In addition, be sure that you are familiar with the terms and conditions of the Lenovo warranty for your server, which can be found at:

<http://datacentersupport.lenovo.com/warrantylookup>

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

Antes de instalar este produto, leia as Informações de Segurança.

在安裝本产品之前，请仔细阅读 Safety Information（安全信息）。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας (safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.



Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

ཐོན་ཁུངས་འདི་བདེ་སྤྱད་མ་བྱས་གོང་། སྐྱོར་གྱི་ཡིད་གཟབ་
བྱ་འདྲ་མིན་ཡིད་པའི་འོད་མེར་བལྟ་དགོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

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canjbinj soengq cungj vahgangj ancien siusik.

Safety inspection checklist

Use the information in this section to identify potentially unsafe conditions with your server. As each machine was designed and built, required safety items were installed to protect users and service technicians from injury.

Note: The product is not suitable for use at visual display workplaces according to §2 of the Workplace Regulations.

Note: The set-up of the server is made in the server room only.

CAUTION:

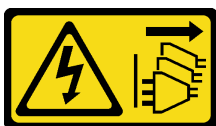
This equipment must be installed or serviced by trained personnel, as defined by the NEC, IEC 62368-1 & IEC 60950-1, the standard for Safety of Electronic Equipment within the Field of Audio/Video, Information Technology and Communication Technology. Lenovo assumes that you are qualified in the servicing of equipment and trained in recognizing hazards energy levels in products. Access to the equipment is by the use of a tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.

Important: Electrical grounding of the server is required for operator safety and correct system function. Proper grounding of the electrical outlet can be verified by a certified electrician.

Use the following checklist to verify that there are no potentially unsafe conditions:

1. If your working condition necessitates the server being powered off or you intend to power off, make sure that the power cord is disconnected.

S002



CAUTION:

The power-control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

Note: Under certain circumstances, powering off the server is not a prerequisite. Refer to the precautions before conducting any tasks.

2. Check the power cord.

- Make sure that the third-wire ground connector is in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and the frame ground.
- Make sure that the power cord is the correct type.

To view the power cords that are available for the server:

a. Go to:

<http://dcsc.lenovo.com/#/>

- b. Click **Preconfigured Model** or **Configure to order**.
 - c. Enter the machine type and model for your server to display the configurator page.
 - d. Click **Power → Power Cables** to see all line cords.
- Make sure that the insulation is not frayed or worn.
3. Check for any obvious non-Lenovo alterations. Use good judgment as to the safety of any non-Lenovo alterations.
4. Check inside the server for any obvious unsafe conditions, such as metal filings, contamination, water or other liquid, or signs of fire or smoke damage.
5. Check for worn, frayed, or pinched cables.
6. Make sure that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Chapter 1. Introduction

The ThinkSystem SR645 V3 server (7D9C, 7D9D) is a 2-socket 1U server that features AMD® EPYC™ 9004 or 9005 series processors. The server is designed to be highly flexible to support many kinds of Information Technology (IT) workloads. This higher performance, multi-core server is ideally suited for IT environments that require superior processor performance, input/output (I/O) flexibility, and flexible manageability.

Figure 1. ThinkSystem SR645 V3



Features

Performance, ease of use, reliability, and expansion capabilities were key considerations in the design of your server. These design features make it possible for you to customize the system hardware to meet your needs today and provide flexible expansion capabilities for the future.

Your server implements the following features and technologies:

- **Features on Demand**

If a Features on Demand feature is integrated in the server or in an optional device that is installed in the server, you can purchase an activation key to activate the feature. For information about Features on Demand, see:

<https://fod.lenovo.com/lkms>

- **Lenovo XClarity Controller (XCC)**

The Lenovo XClarity Controller is the common management controller for Lenovo ThinkSystem server hardware. The Lenovo XClarity Controller consolidates multiple management functions in a single chip on the system board (system board assembly). Some of the features that are unique to the Lenovo XClarity Controller are enhanced performance, higher-resolution remote video, and expanded security options.

The server supports Lenovo XClarity Controller 2 (XCC2). For additional information about Lenovo XClarity Controller 2 (XCC2), refer to https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.

- **UEFI-compliant server firmware**

Lenovo ThinkSystem firmware is Unified Extensible Firmware Interface (UEFI) compliant. UEFI replaces BIOS and defines a standard interface between the operating system, platform firmware, and external devices.

Lenovo ThinkSystem servers are capable of booting UEFI-compliant operating systems, BIOS-based operating systems, and BIOS-based adapters as well as UEFI-compliant adapters.

Note: The server does not support Disk Operating System (DOS).

- **Large system-memory capacity**

The server supports up to 24 TruDDR5 memory DIMMs operating at up to 4800 MHz. For more information about the specific types and maximum amount of memory, see [“Technical specifications” on page 3](#).

- **Integrated network support**

The server comes with an integrated 1-port Gigabit Ethernet controller with RJ-45 connector, which supports connection to a 10Mbps/100Mbps/1000 Mbps network.

- **Large data-storage capacity and hot-swap capability**

With the hot-swap feature, you can add, remove, or replace hard disk drives without turning off the server.

Storage capacity is different depending on server model. See “[Technical specifications](#)” on page 3 for more information.

- **Lightpath Diagnostics**

Lightpath Diagnostics provides LEDs to help you diagnose problems. For more information about the Lightpath Diagnostics, see “[Troubleshooting by system LEDs and diagnostics display](#)” on page 499.

- **Mobile access to Lenovo Service Information website**

The server provides a QR code on the system service label, which is on the cover of the server, that you can scan using a QR code reader and scanner with a mobile device to get quick access to the Lenovo Service Information website. The Lenovo Service Information website provides additional information for parts installation, replacement videos, and error codes for server support.

- **Active Energy Manager**

Lenovo XClarity Energy Manager is a power and temperature management solution for data centers. You can monitor and manage the power consumption and temperature of Converged, NeXtScale, System x, and ThinkServer servers, and improve energy efficiency using Lenovo XClarity Energy Manager.

- **Redundant networking connection**

The Lenovo XClarity Controller provides failover capability to a redundant Ethernet connection with the applicable application installed. If a problem occurs with the primary Ethernet connection, all Ethernet traffic that is associated with the primary connection is automatically switched to the optional redundant Ethernet connection. If the applicable device drivers are installed, this switching occurs without data loss and without user intervention.

- **Redundant cooling**

The redundant cooling by the fans in the server enables continued operation if one rotor of a fan fails.

- **ThinkSystem RAID support**

The ThinkSystem RAID adapter provides hardware redundant array of independent disks (RAID) support to create configurations. The standard RAID adapter provides RAID levels 0 and 1. Optional RAID adapter with RAID 5, 6, 10, 50, and 60 is available for purchase.

Tech Tips

Lenovo continually updates the support website with the latest tips and techniques that you can use to solve issues that your server might encounter. These Tech Tips (also called retain tips or service bulletins) provide procedures to work around issues or solve problems related to the operation of your server.

To find the Tech Tips available for your server:

1. Go to <http://datacentersupport.lenovo.com>, and input the model name or machine type of your server in the search bar to navigate to the support page.
2. Click on **How To's** from the navigation pane.
3. Click **Article Type** → **Solution** from the drop-down menu.

Follow the on-screen instructions to choose the category for the problem that you are having.

Security advisories

Lenovo is committed to developing products and services that adhere to the highest security standards in order to protect our customers and their data. When potential vulnerabilities are reported, it is the responsibility of the Lenovo Product Security Incident Response Team (PSIRT) to investigate and provide

information to our customers so they may put mitigation plans in place as we work toward providing solutions.

The list of current advisories is available at the following site:

https://datacentersupport.lenovo.com/product_security/home

Specifications

Summary of the features and specifications of the server. Depending on the model, some features might not be available, or some specifications might not apply.

Refer to the below table for specifications categories and the content of each category.

Technical specifications	<ul style="list-style-type: none">• Processor• Memory• Internal Drive• Expansion slots• Graphics processing units (GPU)• Integrated functions and I/O connectors• Network	<ul style="list-style-type: none">• Rear button• RAID adapter• Host bus adapter• System fan• Electrical input• Minimal configuration for debugging• Operating systems
Mechanical specifications	<ul style="list-style-type: none">• Dimension	<ul style="list-style-type: none">• Weight
Environmental specifications	<ul style="list-style-type: none">• Acoustical noise emissions• Ambient temperature management	<ul style="list-style-type: none">• Environmental

Technical specifications

Summary of the technical specifications of server. Depending on the model, some features might not be available, or some specifications might not apply.

Processor
Supports AMD® EPYC™ 9004 or 9005 series processors, with 5nm process technology. <ul style="list-style-type: none">• Up to two processors with the new LGA 6096 (SP5) socket• Up to 96 Zen4 cores (192 threads), 128 Zen4c cores (256 threads), 128 Zen5 cores (256 threads), or 128 Zen5c cores (384 threads) per socket• Up to 4 xGMI3 links at up to 32 GT/s• Thermal Design Power (TDP): up to 400 watts For a list of supported processors, see: https://serverproven.lenovo.com/ .

Memory

See “Memory module installation rules and order” on page 52 for detailed information about memory configuration and setup.

- Slots: 24 dual inline memory module (DIMM) slots (12 channels per processor, 1 DIMM per channel)
- Memory module types for 9004 series processors:
 - TruDDR5 4800 MHz x8 RDIMM: 16 GB (1Rx8), 32 GB (2Rx8), 48 GB (2Rx8)
 - TruDDR5 4800 MHz 10x4 RDIMM: 32 GB (1Rx4), 64 GB (2Rx4), 96 GB (2Rx4)
 - TruDDR5 4800 MHz 9x4 RDIMM: 32 GB (1Rx4), 64 GB (2Rx4)
 - TruDDR5 4800 MHz 3DS RDIMM: 128 GB (4Rx4), 256 GB (8Rx4)
 - TruDDR5 5600 MHz 10x4 RDIMM: 128 GB (2Rx4)
- Memory module types for 9005 series processors:
 - TruDDR5 6400 MHz x8 RDIMM: 16 GB (1Rx8), 32 GB (2Rx8), 48 GB (2Rx8)
 - TruDDR5 6400 MHz 10x4 RDIMM: 32 GB (1Rx4), 64 GB (2Rx4), 96 GB (2Rx4), 128 GB (2Rx4)
- Capacity:
 - Minimum: 16 GB (1 x 16 GB RDIMM)
 - Maximum:
 - 6 TB (24 x 256 GB 3DS RDIMM) for 9004 series processors
 - 3 TB (24 x 128 GB RDIMM) for 9005 series processors
- Maximum speed
 - 4800/5600 MHz RDIMMs: 4800 MT/s
 - 6400 MHz RDIMMs: 6400 MT/s

Notes:

- The operating speed depends on processor model and UEFI settings.
- For a list of supported memory options, see <https://serverproven.lenovo.com/>.
- Some 6400 MHz RDIMMs (see the table in the “Memory options” section in <https://lenovopress.lenovo.com/lp1607.pdf>) can operate at a maximum speed of 6400 MT/s provided that the latest system firmware is applied. All other 6400 MHz DIMMs operate at a maximum speed of 6000 MT/s.

Internal drives

Front:

- Up to two 3.5" hot-swap SATA and two 3.5" hot-swap NVMe/SATA drives
- Up to four 3.5" hot-swap SATA drives
- Up to four 3.5" hot-swap SAS/SATA drives
- Up to four 3.5" hot-swap AnyBay (SAS/SATA/NVMe) drives
- Up to four 3.5" hot-swap AnyBay (SAS/SATA/NVMe) drives for U.3 configuration
- Up to four 2.5" hot-swap SATA drives
- Up to four 2.5" hot-swap SAS/SATA drives
- Up to four 2.5" hot-swap NVMe drives
- Up to four 2.5" hot-swap AnyBay (SAS/SATA/NVMe) drives
- Up to eight 2.5" hot-swap SATA drives
- Up to eight 2.5" hot-swap SAS/SATA drives
- Up to eight 2.5" hot-swap AnyBay (SAS/SATA/NVMe) drives for U.3 configuration
- Up to six 2.5" hot-swap SAS/SATA and two 2.5" hot-swap AnyBay (SAS/SATA/NVMe) and two 2.5" hot-swap NVMe drives
- Up to six 2.5" hot-swap SAS/SATA and four 2.5" hot-swap AnyBay (SAS/SATA/NVMe) drives
- Up to ten 2.5" hot-swap SATA drives
- Up to ten 2.5" hot-swap SAS/SATA drives
- Up to ten 2.5" hot-swap NVMe drives
- Up to ten 2.5" hot-swap AnyBay (SAS/SATA/NVMe) drives
- Up to ten 2.5" hot-swap AnyBay (SAS/SATA/NVMe) drives for U.3 configuration
- Up to 16 hot-swap EDSFF drives

Inside:

- Up to two internal SATA or NVMe M.2 drives

Rear:

- Up to two 2.5" hot-swap SAS/SATA drives
- Up to two 2.5" hot-swap NVMe drives
- Up to two 7mm hot-swap SATA or RAID NVMe drives

Expansion slots		
<p>Depending on the model, your server supports up to three PCIe slots in the rear.</p> <ul style="list-style-type: none"> • PCIe x16/x8, low-profile • PCIe x16/x8, full-height <p>Note: The two PCIe slots in the front are only supported when 4 x 2.5" chassis is used. They are not supported for 10 x 2.5" chassis.</p>		
Maximum five external slots are supported.		
Riser	Slot	Expansion slots
Riser 1	Slot 1	<ul style="list-style-type: none"> • PCIe x16, low-profile, Gen 4 • PCIe x16, low-profile, Gen 5
	Slot 2	<ul style="list-style-type: none"> • PCIe x16, low-profile, Gen 4 • PCIe x16, full-height, Gen 4
Riser 2	Slot 3	<ul style="list-style-type: none"> • PCIe x16, low-profile, Gen 4 • PCIe x16, full-height, Gen 4 • PCIe x16, low-profile, Gen 5
Riser 3	Slot 4	<ul style="list-style-type: none"> • PCIe x8, low-profile, Gen 4
Riser 4	Slot 5	<ul style="list-style-type: none"> • PCIe x16/x8, full-height, Gen 4

Graphics processing unit (GPU)

Your server supports the following GPUs:

- Half-length, single-wide:
 - NVIDIA® A2
 - NVIDIA® L4

Integrated functions and I/O connectors

- Lenovo XClarity Controller (XCC), which provides service processor control and monitoring functions, video controller, and remote keyboard, video, mouse, and remote drive capabilities.
 - The server supports Lenovo XClarity Controller 2 (XCC2). For additional information about Lenovo XClarity Controller 2 (XCC2), refer to https://sysmgmt.lenovofiles.com/help/topic/lxccc_frontend/lxccc_overview.html.
- One XCC system management port (10/100/1000 Mbps RJ-45) on the rear to connect to a systems-management network. This RJ-45 connector is dedicated to the Lenovo XClarity Controller functions and runs at 10/100/1000 Mbps speed.
- A group of two or four Ethernet connectors on OCP 3.0 module
- Up to four USB 3.2 Gen1 (5 Gbps) ports:
 - Three on the rear of the server
 - (Optional) One on the front of the server¹.
- One internal USB 3.2 Gen1 (5 Gbps) port
- (Optional) One USB 2.0 port on the front of the server¹.
- (Optional) External diagnostics connector on the front of the server¹
- Up to two VGA connectors
 - One on the rear of the server
 - (Optional) One on the front of the server¹.
- (Optional) One serial port connector on the rear of the server².

Notes:

1. Available when the front I/O module is installed in the server.
2. Available when the serial port cable is installed in the server.

Note: The maximum video resolution is 1920 x 1200 at 60 Hz.

Network

OCP module

Note: If ThinkSystem V3 Management NIC Adapter Kit is installed on the server, it will not be displayed on the PCIe card list of system management software, such as XCC, LXPM, and so on.

Rear button

NMI button on the rear of the server

RAID adapter

Hardware RAID 0, 1, 10:

- ThinkSystem RAID 540-8i PCIe Gen4 12Gb Adapter
- ThinkSystem RAID 540-16i PCIe Gen4 12Gb Adapter

Hardware RAID 0, 1, 5, 10:

- ThinkSystem RAID 5350-8i PCIe 12Gb Adapter
- ThinkSystem RAID 5450-16i PCIe Gen4 24Gb Adapter

Hardware RAID 0, 1, 5, 6, 10, 50, 60:

- ThinkSystem RAID 9350-8i 2GB Flash PCIe 12Gb Internal Adapter
- ThinkSystem RAID 9350-8i 2GB Flash PCIe 12Gb Adapter
- ThinkSystem RAID 9350-16i 4GB Flash PCIe 12Gb Internal Adapter
- ThinkSystem RAID 9350-16i 4GB Flash PCIe 12Gb Adapter
- ThinkSystem RAID 940-8i 4GB Flash PCIe Gen4 12Gb Adapter
- ThinkSystem RAID 940-16i 4GB Flash PCIe Gen4 12Gb Adapter
- ThinkSystem RAID 940-16i 8GB Flash PCIe Gen4 12Gb Adapter
- ThinkSystem RAID 940-16i 8GB Flash PCIe Gen4 12Gb Internal Adapter
- ThinkSystem RAID 940-8e 4GB Flash PCIe Gen4 12Gb Adapter
- ThinkSystem RAID 9450-8i 4GB Flash PCIe Gen4 24Gb Adapter
- ThinkSystem RAID 9450-16i 8GB Flash PCIe Gen4 24Gb Adapter
- ThinkSystem RAID 9450-32i 8GB Flash PCIe Gen4 24Gb Adapter

Other RAID adapters without RAID levels:

- ThinkSystem 4350-8i SAS/SATA 12Gb HBA
- ThinkSystem 4350-16i SAS/SATA 12Gb HBA
- ThinkSystem 440-8i SAS/SATA PCIe Gen4 12Gb HBA
- ThinkSystem 440-16i SAS/SATA PCIe Gen4 12Gb HBA
- ThinkSystem 440-16i SAS/SATA PCIe Gen4 12Gb Internal HBA
- ThinkSystem 440-8e SAS/SATA PCIe Gen4 12Gb HBA
- ThinkSystem 440-16e SAS/SATA PCIe Gen4 12Gb HBA
- ThinkSystem 4450-16i SAS/SATA PCIe Gen4 24Gb HBA

Host bus adapter

Support the following HBAs:

- ThinkSystem 4350-8i SAS/SATA 12Gb HBA
- ThinkSystem 4350-16i SAS/SATA 12Gb HBA
- ThinkSystem 440-8e SAS/SATA PCIe Gen4 12Gb HBA
- ThinkSystem 440-8i SAS/SATA PCIe Gen4 12Gb HBA
- ThinkSystem 440-16e SAS/SATA 12Gb HBA
- ThinkSystem 440-16i SAS/SATA PCIe Gen4 12Gb HBA
- ThinkSystem 440-16i SAS/SATA PCIe Gen4 12Gb Internal HBA
- ThinkSystem Emulex 16Gb Gen6 FC Single-port HBA
- ThinkSystem Emulex 16Gb Gen6 FC Dual-port HBA
- ThinkSystem QLogic 16Gb Enhanced Gen5 FC Single-port HBA
- ThinkSystem QLogic 16Gb Enhanced Gen5 FC Dual-port HBA

System fan

Supported fan types:

- Standard fan 4056 (dual-rotor, 21000 RPM)
- Performance fan 4056 (dual-rotor, 28000 RPM)

Fan redundancy: N+1 redundancy, one redundant fan rotor

- One processor: six hot-swap dual-rotor system fans (one redundant fan rotor)
- Two processors: eight hot-swap dual-rotor system fans (one redundant fan rotor)

Notes:

- The redundant cooling by the fans in the server enables continued operation if one rotor of a fan fails.
- When the system is powered off but still plugged in to AC power, fans 1 and 2 may continue to spin at a much lower speed. This is the system design to provide proper cooling.

Electrical input

One or two hot-swap power supplies for redundancy support:

Power supply	100-127 V ac	200-240 V ac	240 V dc	-48 V dc
750-watt 80 PLUS Platinum		√	√	
750-watt 80 PLUS Titanium		√	√	
1100-watt 80 PLUS Platinum	√	√	√	
1100-watt 80 PLUS Titanium		√	√	
1100-watt -48 V DC				√
1800-watt 80 PLUS Platinum		√	√	
1800-watt 80 PLUS Titanium		√	√	

CAUTION:

- **240 V dc input is supported in Chinese Mainland ONLY.**
- **Power supply with 240 V dc input cannot support hot plugging power cord function. Before removing the power supply with dc input, please turn off server or disconnect dc power sources at the breaker panel or by turning off the power source. Then, remove the power cord.**

Minimal configuration for debugging

- One processor in processor socket 1
- One memory module in slot 7
- One power supply
- One HDD/SSD drive or one M.2 drive, or one 7mm drive (if OS is needed for debugging)
- Six system fans (with one processor)

Operating systems
<p>Supported and certified operating systems:</p> <ul style="list-style-type: none"> • Canonical Ubuntu • Microsoft Windows • Microsoft Windows Server • Red Hat Enterprise Linux • SUSE Linux Enterprise Server • VMware ESXi <p>References:</p> <ul style="list-style-type: none"> • Complete list of available operating systems: https://lenovopress.com/osig. • OS deployment instructions, see “Deploy the operating system” on page 494.

Mechanical specifications

Summary of the mechanical specifications of server. Depending on the model, some features might not be available, or some specifications might not apply.

Dimension
<p>1 U server</p> <ul style="list-style-type: none"> • Height: 43 mm (1.69 inches) • Width (with EIA flange): 481.7 mm (18.96 inches) • Depth: 827.3 mm (32.57 inches)
Weight
<ul style="list-style-type: none"> • Up to 26.3 kg (57.98 lb)

Environmental specifications

Summary of the environmental specifications of server. Depending on the model, some features might not be available, or some specifications might not apply.

Attention: Environment quality must be maintain over the lifetime of the system to receive warranty and support on affecting components. For water quality requirement, see [Lenovo Neptune Direct Water-Cooling Standards](#).

Acoustical noise emissions				
The server has the following acoustic noise emissions declaration:				
Configuration	Minimal	Typical	Storage rich	GPU rich
<p>Declared mean A-weighted sound power level, $L_{WA,m}$ (B)</p> <p>Statistical adder for verification, K_v (B) =0.4</p>	<ul style="list-style-type: none"> • Idling: 5.6 Bel • Operating: 7.6 Bel 	<ul style="list-style-type: none"> • Idling: 6.7 Bel • Operating: 8.7 Bel 	<ul style="list-style-type: none"> • Idling: 7.5 Bel • Operating: 7.7 Bel 	<ul style="list-style-type: none"> • Idling: 6.7 Bel • Operating: 8.3 Bel
<p>Declared mean A-weighted emission sound pressure level, $L_{pA,m}$ (dB)</p>	<ul style="list-style-type: none"> • Idling: 41.3 dBA • Operating: 61.5 dBA 	<ul style="list-style-type: none"> • Idling: 52.5 dBA • Operating: 72.5 dBA 	<ul style="list-style-type: none"> • Idling: 60.1 dBA • Operating: 62.8 dBA 	<ul style="list-style-type: none"> • Idling: 52.5 dBA • Operating: 67.8 dBA
The declared sound levels are based on the following configurations, which may change depending on configurations or conditions.				

Acoustical noise emissions				
Component	Minimal configuration	Typical configuration	Storage rich configuration	GPU rich configuration
Fan	Eight standard fans	Eight performance fans	Eight performance fans	Eight performance fans
Processor	Two 240 W processors	Two 300 W processors	Two 240 W processors	Two 300 W processors
Heat sink	Two 1U performance heat sinks	Two 1U performance heat sinks	Two 1U performance heat sinks	Two 1U performance heat sinks
Memory	Twenty-four 64 GB RDIMMs	Twenty-four 64 GB RDIMMs	Twelve 64 GB RDIMMs	Twenty-four 64 GB RDIMMs
Drive	Eight SAS hard disk drives	Ten SAS hard disk drives	Twelve SAS hard disk drives	Ten SAS hard disk drives
RAID adapter	One 440-16i CFF RAID adapter	One 940-16i SFF RAID adapter	One 940-16i SFF RAID adapter	One 940-16i SFF RAID adapter
OCP adapter	One Broadcom 5719 1GbE RJ45 4-port OCP Ethernet adapter	One Broadcom 5719 1GbE RJ45 4-port OCP Ethernet adapter	One Broadcom 5719 1GbE RJ45 4-port OCP Ethernet adapter	One Broadcom 5719 1GbE RJ45 4-port OCP Ethernet adapter
Power supply unit	Two 1100 W power supply units	Two 1100 W power supply units	Two 750 W power supply units	Two 1100 W power supply units
GPU adapter	None	None	None	One NVIDIA® A2 GPU
Notes: <ul style="list-style-type: none"> • These sound power levels are measured in controlled acoustical environments according to procedures specified by ISO 7779 and are reported in accordance with ISO 9296. • The declared sound levels may change depending on configuration/conditions, for example, with high-power NICs, high-power processors and GPUs, such as ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port/2-port PCIe Adapter, ThinkSystem Broadcom 57454 10GBASE-T 4-port OCP module. • Government regulations (such as those prescribed by OSHA or European Community Directives) may govern noise level exposure in the workplace and may apply to you and your server installation. The actual sound pressure levels in your installation depend upon a variety of factors, including the number of racks in the installation; the size, materials, and configuration of the room; the noise levels from other equipment; the room ambient temperature, and employee's location in relation to the equipment. Further, compliance with such government regulations depends on a variety of additional factors, including the duration of employees' exposure and whether employees wear hearing protection. Lenovo recommends that you consult with qualified experts in this field to determine whether you are in compliance with the applicable regulations. 				

Ambient temperature management

The server is supported in the following environment:

- Air temperature:
 - Operating:
 - ASHRAE class H1: 5–25°C (41–77°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 500 m (984 ft) of altitude increase.
 - ASHRAE class A2: 10–35°C (50–95°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 300 m (984 ft) of altitude increase.
 - ASHRAE class A3: 5–40°C (41–104°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 175 m (574 ft) of altitude increase.
 - ASHRAE class A4: 5–45°C (41–113°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 125 m (410 ft) of altitude increase.
 - Server off: 5–45°C (41–113°F)
 - Shipping or storage: -40–60°C (-40–140°F)
- Maximum altitude: 3050 m (10 000 ft)
- Relative humidity (non-condensing):
 - Operating:
 - ASHRAE Class H1: 8%–80%, maximum dew point: 17°C (62.6°F)
 - ASHRAE Class A2: 8%–80%, maximum dew point: 21°C (70°F)
 - ASHRAE Class A3: 8%–85%, maximum dew point: 24°C (75°F)
 - ASHRAE Class A4: 8%–90%, maximum dew point: 24°C (75°F)
 - Shipment or storage: 8%–90%
- Particulate contamination

Attention: Airborne particulates and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server. For information about the limits for particulates and gases, see [“Particulate contamination” on page 13](#).

Environment

ThinkSystem SR645 V3 complies with ASHRAE Class A2 specifications. System performance may be impacted when operating temperature is outside AHSARE A2 specification.

- Air temperature:
 - Operating
 - ASHARE Class A2: 10°C to 35°C (50°F to 95°F); the maximum ambient temperature decreases by 1°C for every 300 m (984 ft) increase in altitude above 900 m (2,953 ft).
 - Server off: 5°C to 45°C (41°F to 113°F)
 - Shipment/storage: -40°C to 60°C (-40°F to 140°F)
- Maximum altitude: 3,050 m (10,000 ft)
- Relative Humidity (non-condensing):
 - Operating
 - ASHRAE Class A2: 8% to 80%; maximum dew point: 21°C (70°F)
 - Shipment/storage: 8% to 90%
- Particulate contamination

Attention: Airborne particulates and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server. For information about the limits for particulates and gases, see [“Particulate contamination” on page 13](#).

Notes:

- The server is designed for standard data center environment and recommended to be placed in industrial data center.
- When the ambient temperature is greater than the supported maximum temperature (ASHARE A4 45°C), the server will shut down. The server will not power on again until the ambient temperature falls within the supported temperature range.

The server is designed for standard data center environment and is recommended to be placed in industrial data center. Depending on hardware configurations, the server complies with ASHRAE Class A2, A3, or A4 specifications with certain thermal restrictions. System performance may be impacted when operating temperature is out of permitted conditions.

Liquid to Air Module requirements

The restrictions to ASHRAE support are as follows (cooling by Liquid to Air Module (L2AM)):

- The ambient temperature must be no more than 30 °C if the server meets the following requirements:
 - Two processors are installed.
 - AOC in Slot 1 < 100 GB

Direct Water Cooling Module requirements

The restrictions to ASHRAE support are as follows (cooling by Direct Water Cooling Module (DWCM)):

- If GPU is installed in the server, *ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM-A v1* and *ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM-A v1* is not supported.
- The ambient temperature must be no more than 30 °C if the server meets the following requirements:
 - Two processors are installed.
 - The standard fan is installed.
 - AOC ≥ 100 GB
 - The standard fan must be installed in *ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM-A v1* for the following backplanes:

Note: The quantity of front 2.5" hot-swap drives should be no more than 8 pieces.

- 4 x 3.5" backplane
- 4 x 2.5" NVMe backplane
- 4 x 2.5" AnyBay backplane
- 4 x 2.5" SAS/SATA backplane
- 8 x 2.5" SAS/SATA backplane
- 6 x 2.5" SAS/SATA + 2 x 2.5" AnyBay + 2 x 2.5" NVMe backplane
- 6 x 2.5" SAS/SATA + 4 x 2.5" AnyBay backplane
- 10 x 2.5" AnyBay backplane (Gen 5)
- 10 x 2.5" NVMe backplane (Gen 4)
- 10 x 2.5" SAS/SATA backplane
- 16-EDSFF drive backplane
- The performance fan must be installed in *ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM-A v1* for the following backplanes:
 - 4 x 3.5" backplane
 - 8 x 2.5" SAS/SATA backplane
 - 6 x 2.5" SAS/SATA + 2 x 2.5" AnyBay + 2 x 2.5" NVMe backplane
 - 6 x 2.5" SAS/SATA + 4 x 2.5" AnyBay backplane
 - 10 x 2.5" AnyBay backplane (Gen 5)
 - 10 x 2.5" NVMe backplane (Gen 4)
 - 10 x 2.5" SAS/SATA backplane
 - 16-EDSFF drive backplane
- The ambient temperature must be no more than 35 °C if the server meets the following requirements:
 - Two processors are installed.
 - GPU ≤ 75W
 - AOC ≥ 100 GB
 - Qty. of front 2.5" hot-swap drives ≤ 8
 - The performance fan must be installed in *ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM-A v1* for the following backplanes:
 - 4 x 3.5" backplane
 - 8 x 2.5" SAS/SATA backplane
 - 6 x 2.5" SAS/SATA + 2 x 2.5" AnyBay + 2 x 2.5" NVMe backplane
 - 6 x 2.5" SAS/SATA + 4 x 2.5" AnyBay backplane
 - 10 x 2.5" AnyBay backplane (Gen 5)
 - 10 x 2.5" NVMe backplane (Gen 4)
 - 10 x 2.5" SAS/SATA backplane
 - 16-EDSFF drive backplane
 - The performance fan must be installed in *ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM-A v1* for the following backplanes:

Note: The quantity of front 2.5" hot-swap drives should be no more than 8 pieces.

- 4 x 3.5" backplane
- 8 x 2.5" SAS/SATA backplane
- 6 x 2.5" SAS/SATA + 2 x 2.5" AnyBay + 2 x 2.5" NVMe backplane
- 6 x 2.5" SAS/SATA + 4 x 2.5" AnyBay backplane
- 10 x 2.5" AnyBay backplane (Gen 5)
- 10 x 2.5" NVMe backplane (Gen 4)
- 10 x 2.5" SAS/SATA backplane
- 16-EDSFF drive backplane

Water requirements

ThinkSystem SR645 V3 is supported in the following environment:

Attention: The water required to initially fill the system side cooling loop must be reasonably clean, bacteria-free water (<100 CFU/ml) such as de-mineralized water, reverse osmosis water, de-ionized water, or distilled water. The water must be filtered with an in-line 50 micron filter (approximately 288 mesh). The water must be treated with anti-biological and anti-corrosion measures. Environment quality must be maintain over the lifetime of the system to receive warranty and support on affecting components. For more information please see [Lenovo Neptune Direct Water-Cooling Standards](#).

- Maximum pressure: 3 bars
- Water inlet temperature and flow rates:

Water inlet temperature	Water flow rate
50°C (122°F)	1.5 liters per minute (lpm) per server
45°C (113°F)	1 liter per minute (lpm) per server
40°C (104°F) or lower	0.5 liters per minute (lpm) per server

Note: The water required to initially fill the system side cooling loop must be reasonably clean, bacteria-free water (<100 CFU/ml) such as de-mineralized water, reverse osmosis water, de-ionized water, or distilled water. The water must be filtered with an in-line 50 micron filter (approximately 288 mesh). The water must be treated with anti-biological and anti-corrosion measures.

Particulate contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the device that is described in this document.

Attention: Environment quality must be maintain over the lifetime of the system to receive warranty and support on affecting components. For water quality requirement, see [Lenovo Neptune Direct Water-Cooling Standards](#).

Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the device to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If Lenovo determines that the levels of particulates or gases in your environment have caused damage to the device, Lenovo may condition provision of repair or replacement of devices or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 1. Limits for particulates and gases

Contaminant	Limits
Reactive gases	<p>Severity level G1 as per ANSI/ISA 71.04-1985¹:</p> <ul style="list-style-type: none"> The copper reactivity level shall be less than 200 Angstroms per month ($\text{\AA}/\text{month} \approx 0.0035 \mu\text{g}/\text{cm}^2\text{-hour weight gain}$).² The silver reactivity level shall be less than 200 Angstroms per month ($\text{\AA}/\text{month} \approx 0.0035 \mu\text{g}/\text{cm}^2\text{-hour weight gain}$).³ The reactive monitoring of gaseous corrosivity must be conducted approximately 5 cm (2 in.) in front of the rack on the air inlet side at one-quarter and three-quarter frame height off the floor or where the air velocity is much higher.
Airborne particulates	<p>Data centers must meet the cleanliness level of ISO 14644-1 class 8.</p> <p>For data centers without airside economizer, the ISO 14644-1 class 8 cleanliness might be met by choosing one of the following filtration methods:</p> <ul style="list-style-type: none"> The room air might be continuously filtered with MERV 8 filters. Air entering a data center might be filtered with MERV 11 or preferably MERV 13 filters. <p>For data centers with airside economizers, the choice of filters to achieve ISO class 8 cleanliness depends on the specific conditions present at that data center.</p> <ul style="list-style-type: none"> The deliquescent relative humidity of the particulate contamination should be more than 60% RH.⁴ Data centers must be free of zinc whiskers.⁵
<p>¹ ANSI/ISA-71.04-1985. <i>Environmental conditions for process measurement and control systems: Airborne contaminants</i>. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.</p> <p>² The derivation of the equivalence between the rate of copper corrosion growth in the thickness of the corrosion product in $\text{\AA}/\text{month}$ and the rate of weight gain assumes that Cu_2S and Cu_2O grow in equal proportions.</p> <p>³ The derivation of the equivalence between the rate of silver corrosion growth in the thickness of the corrosion product in $\text{\AA}/\text{month}$ and the rate of weight gain assumes that Ag_2S is the only corrosion product.</p> <p>⁴ The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.</p> <p>⁵ Surface debris is randomly collected from 10 areas of the data center on a 1.5 cm diameter disk of sticky electrically conductive tape on a metal stub. If examination of the sticky tape in a scanning electron microscope reveals no zinc whiskers, the data center is considered free of zinc whiskers.</p>	

Water quality requirement

Attention: The water required to initially fill the system side cooling loop must be reasonably clean, bacteria-free water ($<100 \text{ CFU}/\text{ml}$) such as de-mineralized water, reverse osmosis water, de-ionized water, or distilled water. The water must be filtered with an in-line 50 micron filter (approximately 288 mesh). The water must be treated with anti-biological and anti-corrosion measures. Environment quality must be maintain over the lifetime of the system to receive warranty and support on affecting components. For more information please see [Lenovo Neptune Direct Water-Cooling Standards](#).

Management options

The XClarity portfolio and other system management options described in this section are available to help you manage the servers more conveniently and efficiently.

Overview

Options	Description
Lenovo XClarity Controller	<p>Baseboard management controller (BMC)</p> <p>Consolidates the service processor functionality, Super I/O, video controller, and remote presence capabilities into a single chip on the server system board (system board assembly).</p> <p>Interface</p> <ul style="list-style-type: none"> • CLI application • Web GUI interface • Mobile application • Redfish API <p>Usage and downloads</p> <p>https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html</p>
Lenovo XCC Logger Utility	<p>Application that reports the XCC events to local OS system log.</p> <p>Interface</p> <ul style="list-style-type: none"> • CLI application <p>Usage and downloads</p> <ul style="list-style-type: none"> • https://pubs.lenovo.com/lxcc-logger-linux/ • https://pubs.lenovo.com/lxcc-logger-windows/
Lenovo XClarity Administrator	<p>Centralized interface for multi-server management.</p> <p>Interface</p> <ul style="list-style-type: none"> • Web GUI interface • Mobile application • REST API <p>Usage and downloads</p> <p>https://pubs.lenovo.com/lxca/</p>
Lenovo XClarity Essentials toolset	<p>Portable and light toolset for server configuration, data collection, and firmware updates. Suitable both for single-server or multi-server management contexts.</p> <p>Interface</p> <ul style="list-style-type: none"> • OneCLI: CLI application • Bootable Media Creator: CLI application, GUI application • UpdateXpress: GUI application <p>Usage and downloads</p> <p>http://sysmgt.lenovofiles.com/help/topic/xclarity_essentials/overview.html</p>

Options	Description
Lenovo XClarity Provisioning Manager	<p>UEFI-based embedded GUI tool on a single server that can simplify management tasks.</p> <p>Interface</p> <ul style="list-style-type: none"> • Web interface (BMC remote access) • GUI application <p>Usage and downloads</p> <p>https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html</p> <p>Important: Lenovo XClarity Provisioning Manager (LXPM) supported version varies by product. All versions of Lenovo XClarity Provisioning Manager are referred to as Lenovo XClarity Provisioning Manager and LXPM in this document, unless specified otherwise. To see the LXPM version supported by your server, go to https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.</p>
Lenovo XClarity Integrator	<p>Series of applications that integrate the management and monitoring functionalities of the Lenovo physical servers with the software used in a certain deployment infrastructure, such as VMware vCenter, Microsoft Admin Center, or Microsoft System Center while delivering additional workload resiliency.</p> <p>Interface</p> <ul style="list-style-type: none"> • GUI application <p>Usage and downloads</p> <p>https://sysmgt.lenovofiles.com/help/topic/lxci/lxci_product_page.html</p>
Lenovo XClarity Energy Manager	<p>Application that can manage and monitor server power and temperature.</p> <p>Interface</p> <ul style="list-style-type: none"> • Web GUI Interface <p>Usage and downloads</p> <p>https://datacentersupport.lenovo.com/solutions/Invo-lxem</p>
Lenovo Capacity Planner	<p>Application that supports power consumption planning for a server or rack.</p> <p>Interface</p> <ul style="list-style-type: none"> • Web GUI Interface <p>Usage and downloads</p> <p>https://datacentersupport.lenovo.com/solutions/Invo-lcp</p>

Functions

Options		Functions						
		Multi-system mgmt	OS deployment	System configuration	Firmware updates ¹	Event/alert monitoring	Inventory/logs	Power mgmt
Lenovo XClarity Controller				√	√ ²	√	√ ⁴	
Lenovo XCC Logger Utility						√		
Lenovo XClarity Administrator		√	√	√	√ ²	√	√ ⁴	
Lenovo XClarity Essentials toolset	OneCLI	√		√	√ ²	√	√	
	Bootable Media Creator			√	√ ²		√ ⁴	
	UpdateXpress			√	√ ²			
Lenovo XClarity Provisioning Manager			√	√	√ ³		√ ⁵	
Lenovo XClarity Integrator		√		√	√	√	√	√ ⁶
Lenovo XClarity Energy Manager		√				√		√
Lenovo Capacity Planner								√ ⁷

Notes:

1. Most options can be updated through the Lenovo tools. Some options, such as GPU firmware or Omni-Path firmware require the use of supplier tools.
2. The server UEFI settings for option ROM must be set to **Auto** or **UEFI** to update firmware using Lenovo XClarity Administrator, Lenovo XClarity Essentials, or Lenovo XClarity Controller.
3. Firmware updates are limited to Lenovo XClarity Provisioning Manager, Lenovo XClarity Controller, and UEFI updates only. Firmware updates for optional devices, such as adapters, are not supported.
4. The server UEFI settings for option ROM must be set to **Auto** or **UEFI** for detailed adapter card information, such as model name and firmware levels, to be displayed in Lenovo XClarity Administrator, Lenovo XClarity Controller, or Lenovo XClarity Essentials.
5. Limited inventory.
6. Power management function is supported only by Lenovo XClarity Integrator for VMware vCenter.
7. It is highly recommended that you check the power summary data for your server using Lenovo Capacity Planner before purchasing any new parts.

Chapter 2. Server components

This section contains information about each of the components associated with the server.

Top view

This section contains information on the top view of the server.

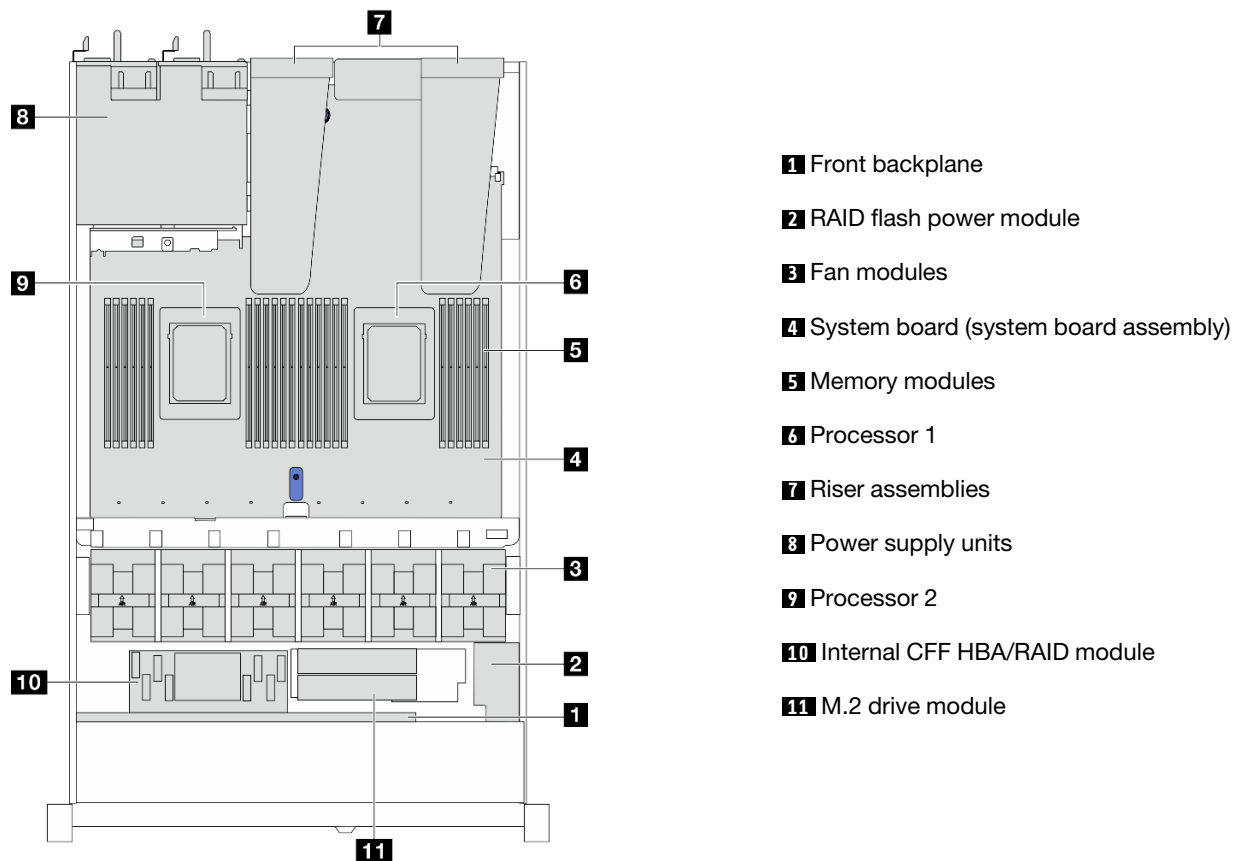
Note: Depending on the configuration, your server might be slightly different from the image.

Refer to the following top view for different server models:

- [“Top view with standard heat sinks” on page 19](#)
- [“Top view with liquid to air module” on page 20](#)
- [“Top view with direct water cooling module” on page 21](#)

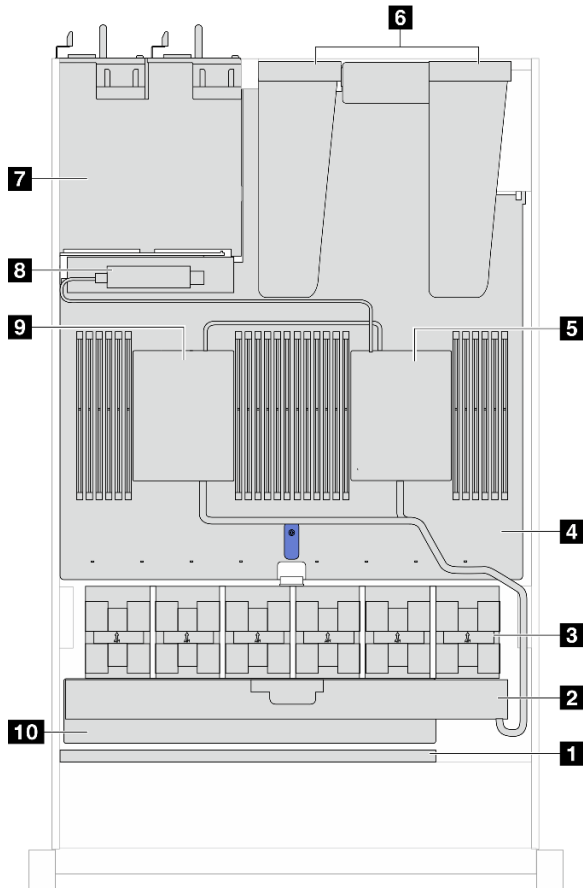
Top view with standard heat sinks

The following top view is based on 2.5" drive configuration.



Top view with liquid to air module

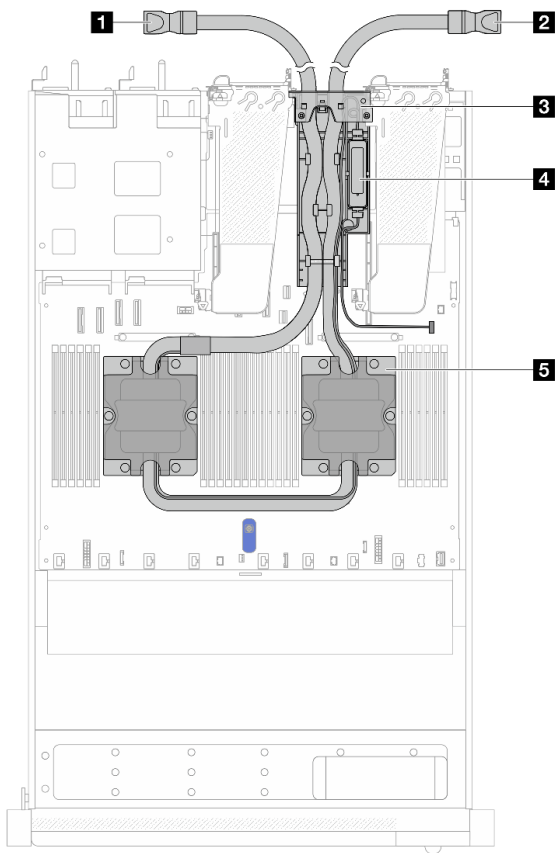
The following top view is based on server models with the Liquid to Air Module (L2AM).



- 1** Front backplane
- 2** The Lenovo Neptune Liquid to Air Module
- 3** Fan modules
- 4** System board (system board assembly)
- 5** Pump 1
- 6** Riser assemblies
- 7** Power supply units
- 8** Liquid detection sensor module
- 9** Pump 2
- 10** Radiator tray

Top view with direct water cooling module

The illustration below singles out the DWCM from other components in the chassis. The parts contained depend on the configuration of the server.



- 1** Outlet hose
- 2** Inlet hose
- 3** Hose holder
- 4** Leakage detection sensor module
- 5** Cold plate assembly

Front view

The front view of the server varies by model. Depending on the model, your server might look slightly different from the illustrations in this topic.

Refer to the following front view for different server models:

- [“Server model with four 2.5-inch drive bays” on page 22](#)
- [“Server models with four 2.5-inch front drive bays and a front riser assembly” on page 22](#)
- [“Server model with four 2.5-inch AnyBay drive bays” on page 23](#)
- [“Server model with eight 2.5-inch drive bays” on page 24](#)
- [“Server model with ten 2.5-inch drive bays” on page 24](#)
- [“Server models with 16 EDSFF front drives” on page 25](#)
- [“Server model with four 3.5-inch drive bays” on page 26](#)
- [“Server model with 2.5-inch drive bays \(backplane-less\)” on page 26](#)
- [“Server model with 3.5-inch drive bays \(backplane-less\)” on page 27](#)
- [“Server model with eight 2.5-inch drive bays \(with external diagnostics panel assembly\)” on page 27](#)
- [“Server models with 16 EDSFF front drives \(with LCD diagnostics panel\)” on page 28](#)

Server model with four 2.5" drive bays

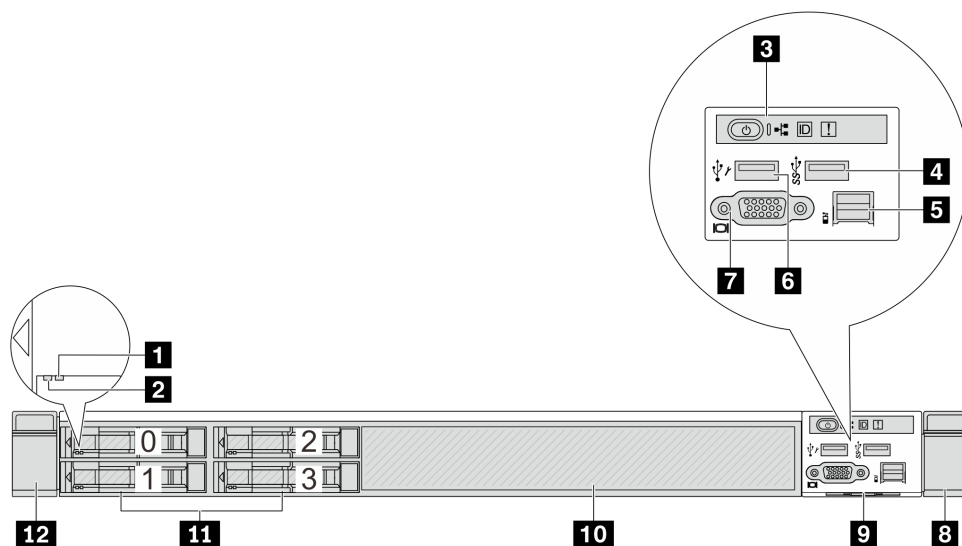


Table 2. Components on the front of the server

1 Drive status LED	2 Drive activity LED
3 Diagnostics panel	4 USB 3.2 Gen 1 (5Gbps) connector
5 External LCD connector	6 XClarity Controller USB connector
7 VGA connector (optional)	8 Rack latch (right)
9 Pull-out information tab	10 Drive filler (1)
11 Drive bays (4)	12 Rack latch (left)

Note: For more information about each component, see [“Front components overview”](#) on page 28.

Server model with four 2.5-inch drive bays and a front riser assembly

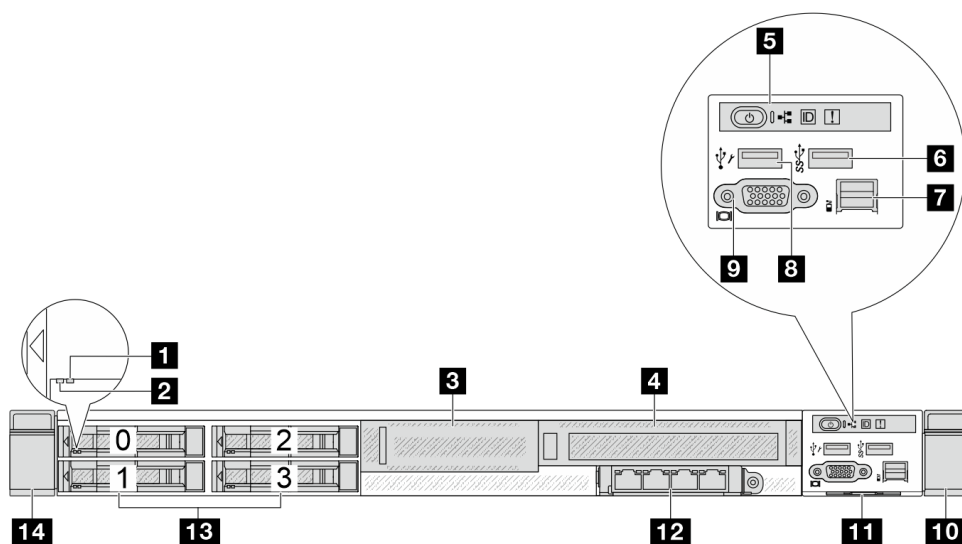


Table 3. Components on the front of the server

1 Drive status LED	2 Drive activity LED
3 Font low-profile PCIe (riser 3, slot 4)	4 Front full-height PCIe (riser 4, slot 5)
5 Diagnostics panel	6 USB 3.2 Gen 1 (5Gbps) connector
7 External LCD connector	8 XClarity Controller USB connector
9 VGA connector (optional)	10 Rack latch (right)
11 Pull-out information tab	12 Front OCP module
13 Drive bays (4)	14 Rack latch (left)

Note: For more information about each component, see [“Front components overview” on page 28](#).

Server model with four 2.5" AnyBay drive bays

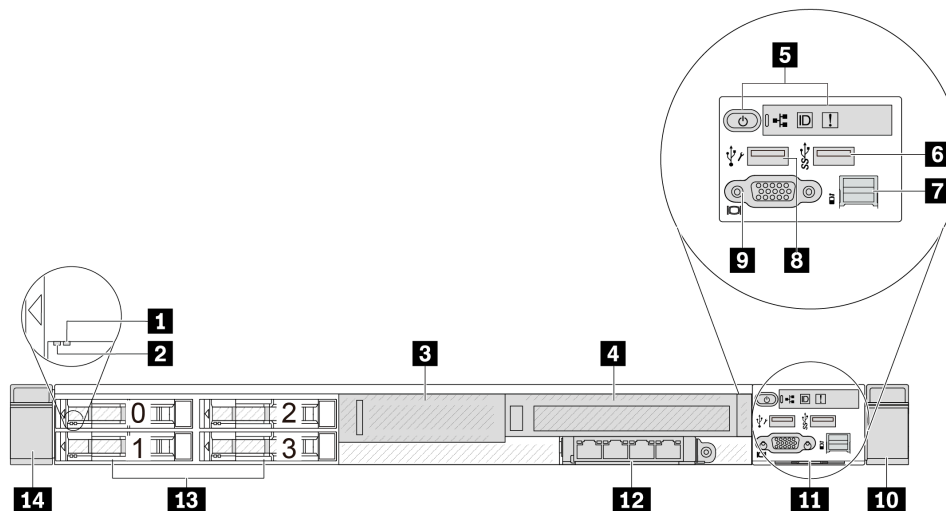


Table 4. Components on the front of the server

1 Drive status LED	2 Drive activity LED
3 Low-profile riser bracket	4 Full-height riser bracket
5 Diagnostics panel	6 USB 3.2 Gen 1 (5 Gbps) connector
7 External diagnostics connector	8 XClarity Controller USB connector
9 VGA connector (optional)	10 Rack latch (right)
11 Pull-out information tab	12 OCP 3.0 connectors
13 Drive bays (4)	14 Rack latch (left)

Note: For more information about each component, see [“Front components overview” on page 28](#).

Server model with eight 2.5" drive bays

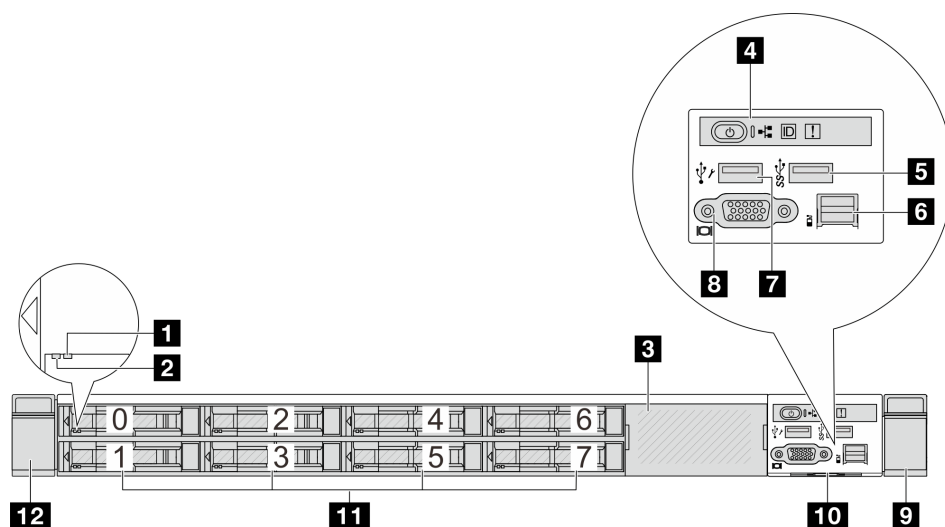


Table 5. Components on the front of the server

1 Drive status LED	2 Drive activity LED
3 Drive filler (1)	4 Diagnostics panel
5 USB 3.2 Gen 1 (5Gbps) connector	6 External LCD connector
7 XClarity Controller USB connector	8 VGA connector (optional)
9 Rack latch (right)	10 Pull-out information tab
11 Drive bays (8)	12 Rack latch (left)

Note: For more information about each component, see [“Front components overview” on page 28](#).

Server model with ten 2.5" drive bays

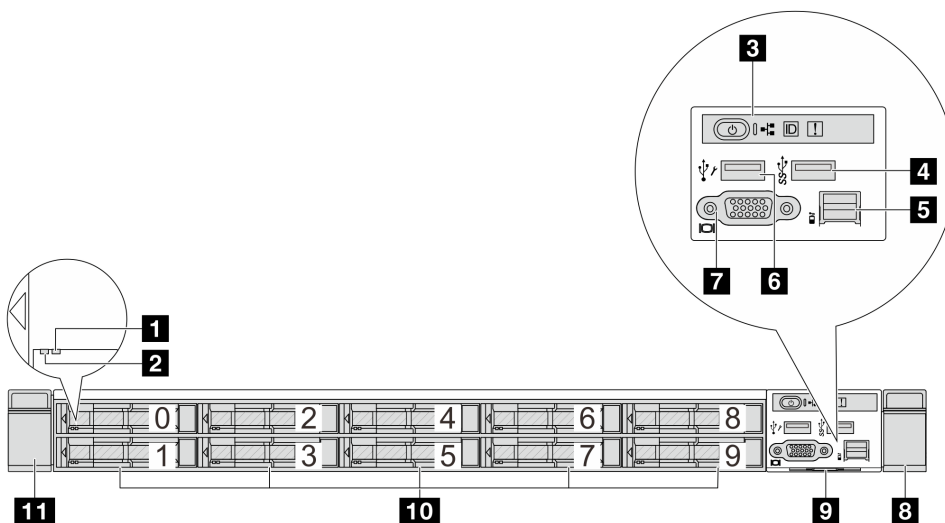


Table 6. Components on the front of the server

1 Drive status LED	2 Drive activity LED
3 Diagnostics panel	4 USB 3.2 Gen 1 (5Gbps) connector
5 External LCD connector	6 XClarity Controller USB connector
7 VGA connector (optional)	8 Rack latch (right)
9 Pull-out information tab	10 Drive bays (10)
11 Rack latch (left)	

Note: For more information about each component, see [“Front components overview” on page 28](#).

Server model with 16 EDSFF drives

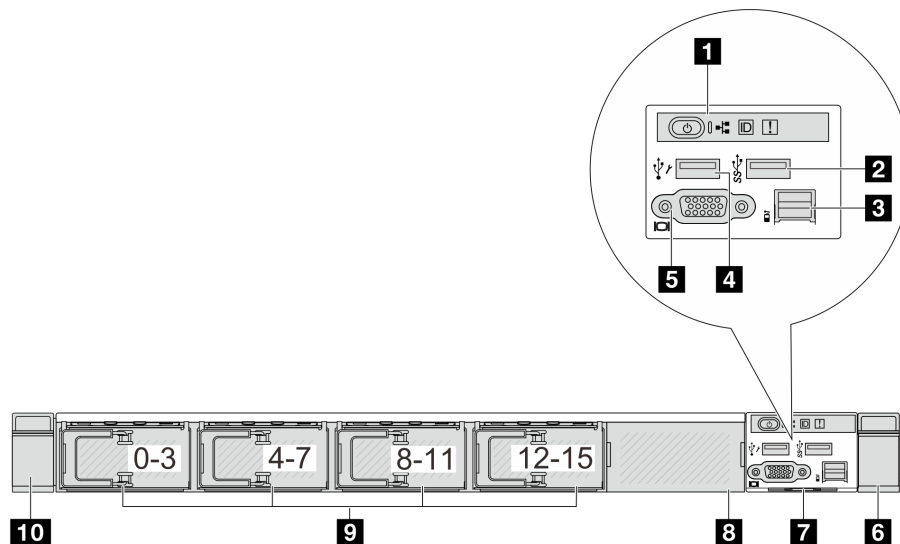


Table 7. Components on the front of the server

1 Diagnostics panel	2 USB 3.2 Gen 1 (5Gbps) connector
3 External LCD connector	4 XClarity Controller USB connector
5 VGA connector (optional)	6 Rack latch (right)
7 Pull-out information tab	8 Drive filler (1)
9 Drive bays (16)	10 Rack latch (left)

Note: For more information about each component, see [“Front components overview” on page 28](#).

Server model with four 3.5" drive bays

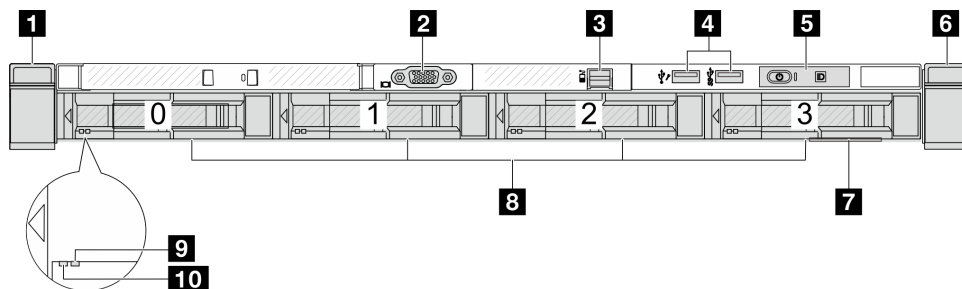


Table 8. Components on the front of the server

1 Rack latch (left)	2 VGA connector (optional)
3 External LCD connector	4 XClarity Controller USB connector and USB 3.2 Gen 1 (5Gbps) connector
5 Diagnostics panel	6 Rack latch (right)
7 Pull-out information tab	8 Drive bays (4)
9 Drive status LED	10 Drive activity LED

Note: For more information about each component, see [“Front components overview” on page 28](#).

Server model with 2.5" drive bays (backplane-less)

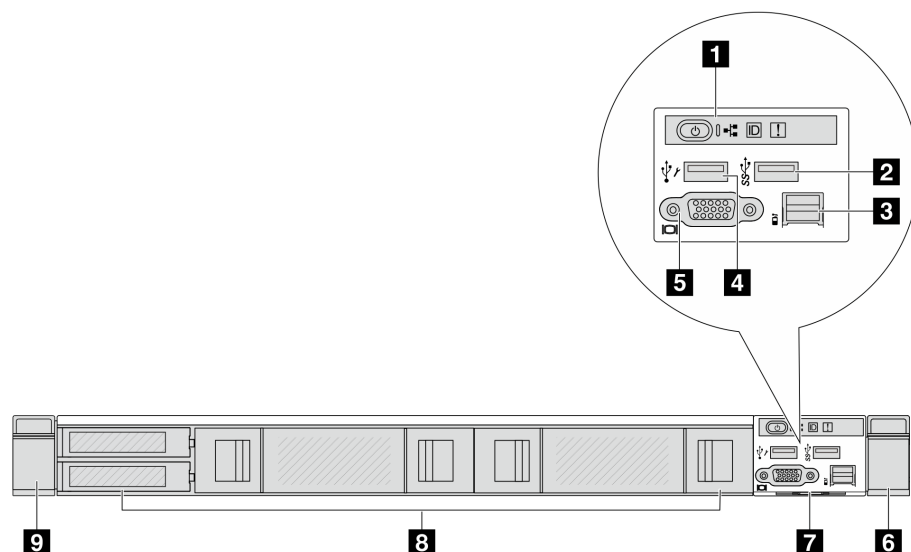


Table 9. Components on the front of the server

1 Diagnostics panel	2 USB 3.2 Gen 1 (5Gbps) connector
3 External LCD connector (reserved)	4 XClarity Controller USB connector
5 VGA connector (optional)	6 Rack latch (right)
7 Pull-out information tab	8 Drive fillers (4)
9 Rack latch (left)	

Note: For more information about each component, see [“Front components overview” on page 28](#).

Server model with 3.5" drive bays (backplane-less)

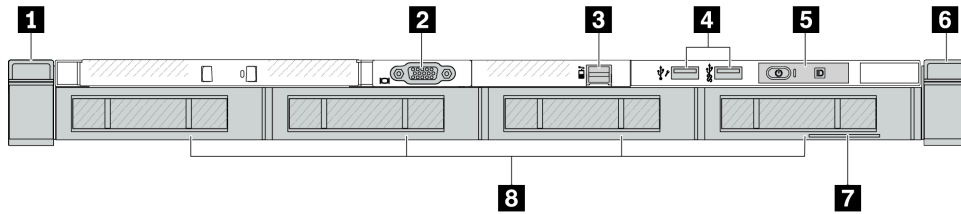


Table 10. Components on the front of the server

1 Rack latch (left)	2 VGA connector (optional)
3 External LCD connector	4 XClarity Controller USB connector and USB 3.2 Gen 1 (5Gbps) connector
5 Diagnostics panel	6 Rack latch (right)
7 Pull-out information tab	8 Drive fillers (4)

Note: For more information about each component, see [“Front components overview” on page 28](#).

Server model with eight 2.5" drive bays (with external diagnostics panel assembly)

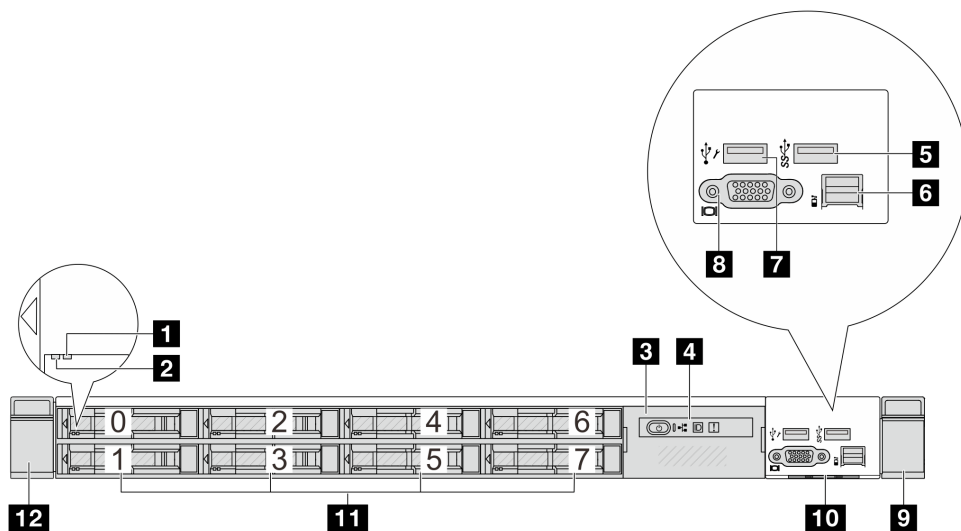


Table 11. Components on the front of the server

1 Drive status LED	2 Drive activity LED
3 External diagnostics panel assembly	4 External diagnostics panel
5 USB 3.2 Gen 1 (5Gbps) connector	6 External diagnostics connector
7 XClarity Controller USB connector	8 VGA connector (optional)
9 Rack latch (right)	10 Pull-out information tab
11 Drive bays (8)	12 Rack latch (left)

Note: For more information about each component, see [“Front components overview” on page 28](#).

Server model with 16 EDSFF drives (with external diagnostics panel assembly)

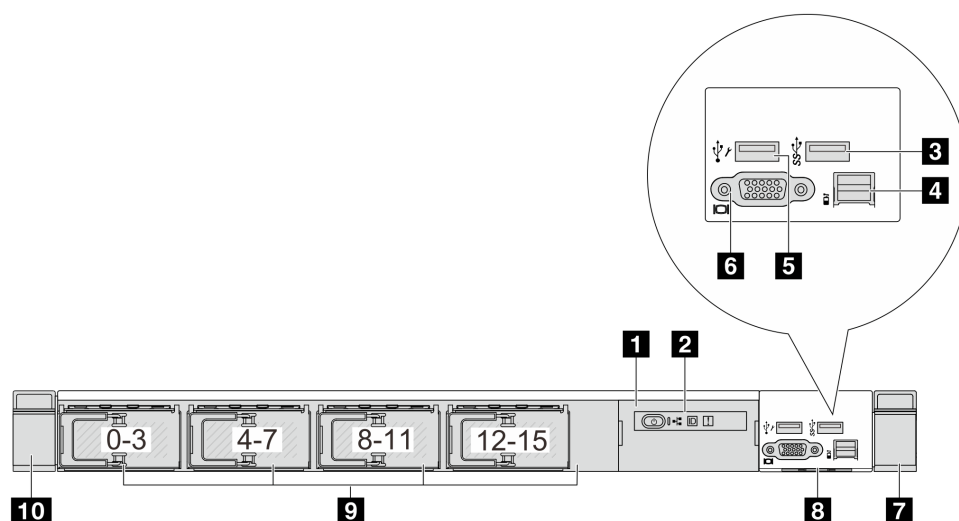


Table 12. Components on the front of the server

1 LCD diagnostics panel assembly	2 External diagnostics panel
3 USB 3.2 Gen 1 (5Gbps) connector	4 External diagnostics connector
5 XClarity Controller USB connector	6 VGA connector (optional)
7 Rack latch (right)	8 Pull-out information tab
9 Drive bays (16)	10 Rack latch (left)

Note: For more information about each component, see [“Front components overview”](#) on page 28.

Front components overview

Integrated Diagnostics Panel

The diagnostics panel is integrated in front I/O assembly on some models. For information about the controls and status LEDs on the diagnostics panel, see [“Integrated diagnostics panel”](#) on page 505.

External diagnostics port

The connector is for connecting an external diagnostics handset. For more about its functions, see [“External diagnostics handset”](#) on page 499.

Front operator panel

The assembly comes with an integrated diagnostics panel that can be used to quickly obtain system status, firmware levels, network information, and health information about the system. For more about the panel functions, see [“Front operator panel”](#) on page 509.

Hot-swap drives and drive bays

The drive bays on the front and rear of your server are designed for hot-swap drives. The number of the installed drives in your server varies by model. When you install drives, follow the order of the drive bay numbers.

The EMI integrity and cooling of the server are protected by having all drive bays occupied. Vacant drive bays must be occupied by drive fillers.

Pull-out information tab

The Lenovo XClarity Controller network access label is attached on the pull-out information tab. The default Lenovo XClarity Controller hostname and the IPv6 Link Local Address (LLA) are provided on the tab.

Rack latches

If your server is installed in a rack, you can use the rack latches to help you slide the server out of the rack. You also can use the rack latches and screws to secure the server in the rack so that the server cannot slide out, especially in vibration-prone areas. For more information, refer to the *Rack Installation Guide* that comes with your rail kit.

USB 3.2 Gen1 (5 Gbps) connectors

The USB 3.2 Gen1 (5 Gbps) connectors can be used to attach a USB-compatible device, such as a USB keyboard, USB mouse, or USB storage device.

VGA connector

The VGA connectors on the front and rear of the server can be used to attach a high-performance monitor, a direct-drive monitor, or other devices that use a VGA connector.

XClarity Controller USB connector

The XClarity Controller USB connector can function as a regular USB 2.0 connector to the host OS. In addition, it can also be used to connect the server to an android or iOS device, where you can then install and launch the Lenovo XClarity Mobile app to manage the system using XClarity Controller.

For details about using the Lenovo XClarity Mobile app, refer to https://pubs.lenovo.com/lxca/lxca_usemobileapp.

OCP 3.0 module



Figure 2. OCP module (two connectors)

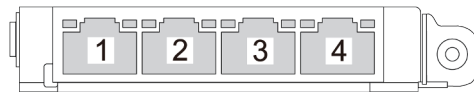


Figure 3. OCP module (four connectors)

- The OCP module provides two or four extra Ethernet connectors for network connections.
- By default, any Ethernet connector on the OCP module can also function as a management connector using the shared management capacity.

Rear view

The rear view of the server varies by model. Depending on the model, your server might look slightly different from the illustrations in this topic.

Refer to the following rear view for different server models:

- “Server model with three PCIe slots” on page 30
- “Server model with two PCIe slots” on page 30
- “Server model with two 2.5-inch hot-swap rear drive bays and one PCIe slot” on page 31
- “Server model with two 7mm hot-swap rear drive bays and two PCIe slots” on page 32
- “Server model with two 7mm hot-swap rear drive bays and one PCIe slot” on page 32
- “Server model with two PCIe slots and a direct water cooling module” on page 33

Server model with three PCIe slots

The following illustration shows the rear view of server model with three PCIe slots. Depending on the model, your server might look slightly different from the illustration below.

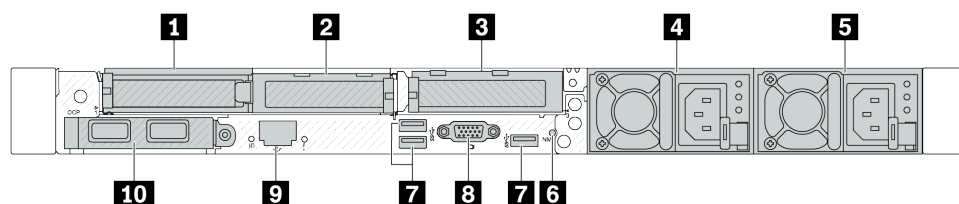


Figure 4. Rear view with 3 low profile PCIe adapters

Table 13. Components on the rear of the server

1 PCIe slot 1 on riser 1 assembly	2 PCIe slot 2 on riser 1 assembly
3 PCIe slot 3 on riser 2 assembly	4 Power supply 2 (optional)
5 Power supply 1	6 NMI button
7 USB 3.2 Gen 1 (5 Gbps) connectors (3 DCIs)	8 VGA connector
9 XClarity Controller network connector	10 Ethernet connectors on OCP 3.0 Ethernet adapter (optional)

Note: For more information about each component, see [“Rear components overview” on page 33](#).

Server model with two PCIe slots

The following illustration shows the rear views of the server model with two PCIe slots. Depending on the model, your server might look slightly different from the illustration below.

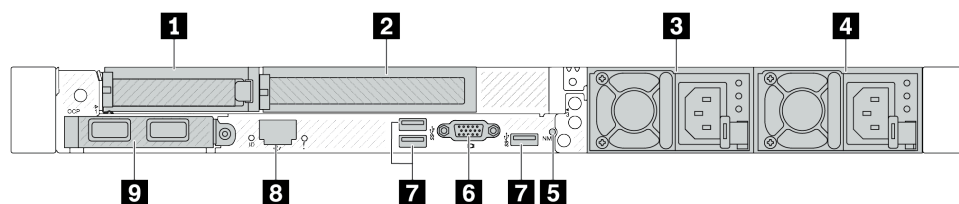


Figure 5. Rear view with one low profile PCIe adapter, one full height PCIe adapter, and one filler

Table 14. Components on the rear of the server

1 PCIe slot 1 on riser 1 assembly	2 PCIe slot 2 on riser 1 assembly
3 Power supply 2 (optional)	4 Power supply 1
5 NMI button	6 VGA connector
7 USB 3.2 Gen 1 (5 Gbps) connectors (3 DCIs)	8 XClarity Controller network connector
9 Ethernet connectors on OCP 3.0 Ethernet adapter (optional, two or four connectors may be available)	

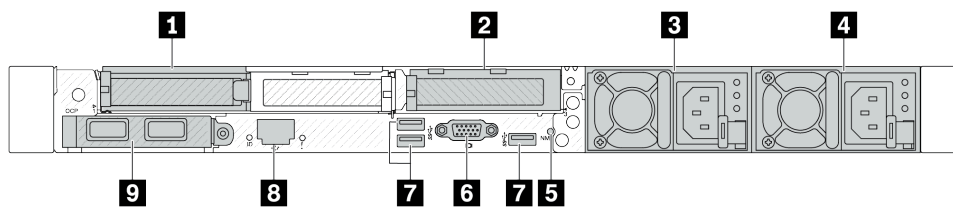


Figure 6. Rear view with 2 low profile PCIe adapters

Table 15. Components on the rear of the server

1 PCIe slot 1 on riser 1 assembly	2 PCIe slot 3 on riser 2 assembly
3 Power supply 2 (optional)	4 Power supply 1
5 NMI button	6 VGA connector
7 USB 3.2 Gen 1 (5 Gbps) connectors (3 DCIs)	8 XClarity Controller network connector
9 Ethernet connectors on OCP 3.0 Ethernet adapter (optional, two or four connectors may be available)	

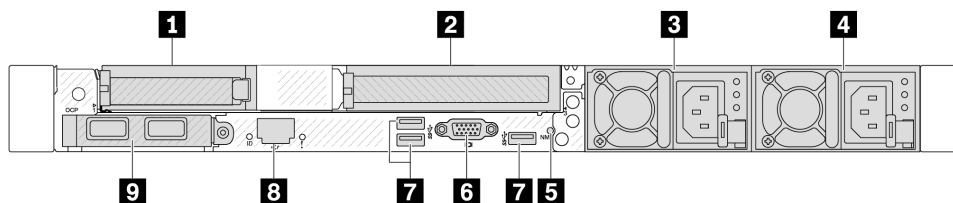


Figure 7. Rear view with one low profile PCIe adapter, one filler, and one full height PCIe adapter

Table 16. Components on the rear of the server

1 PCIe slot 1 on riser 1 assembly	2 PCIe slot 3 on riser 2 assembly
3 Power supply 2 (optional)	4 Power supply 1
5 NMI button	6 VGA connector
7 USB 3.2 Gen 1 (5 Gbps) connectors (3 DCIs)	8 XClarity Controller network connector
9 Ethernet connectors on OCP 3.0 Ethernet adapter (optional, two or four connectors may be available)	

Note: For more information about each component, see [“Rear components overview” on page 33](#).

Server model with two 2.5" hot-swap rear drive bays and one PCIe slot

The following illustration shows the rear view of the server model with two hot-swap drive bays and one PCIe slot. Depending on the model, your server might look slightly different from the illustration below.

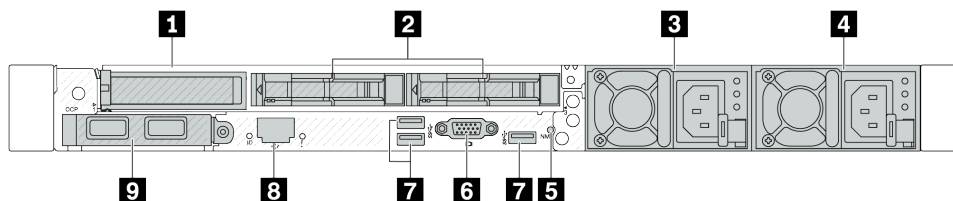


Table 17. Components on the rear of the server

1 PCIe slot 1 on riser 1 assembly	2 Rear 2.5" drive bays (2)
3 Power supply 2 (optional)	4 Power supply 1
5 NMI button	6 VGA connector
7 USB 3.2 Gen 1 (5 Gbps) connectors (3 DCIs)	8 XClarity Controller network connector
9 Ethernet connectors on OCP 3.0 Ethernet adapter (optional, two or four connectors may be available)	

Note: For more information about each component, see [“Rear components overview” on page 33](#).

Server model with two 7mm hot-swap rear drive bays and two PCIe slots

The following illustration shows the rear view of the server model with two 7mm hot-swap rear drive bays and two PCIe slots. Depending on the model, your server might look slightly different from the illustration below.

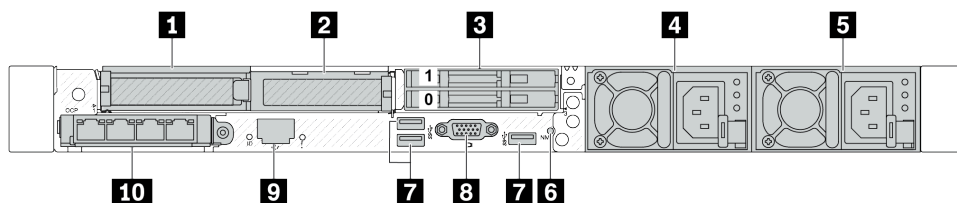


Table 18. Components on the rear of the server

1 PCIe slot 1 on riser 1 assembly	2 PCIe slot 2 on riser 1 assembly
3 Rear 7mm drive bays (2)	4 Power supply 2 (optional)
5 Power supply 1	6 NMI button
7 USB 3.2 Gen 1 (5 Gbps) connectors (3 DCIs)	8 VGA connector
9 XClarity Controller network connector	10 Ethernet connectors on OCP 3.0 Ethernet adapter (optional, two or four connectors may be available)

Note: For more information about each component, see [“Rear components overview” on page 33](#).

Server model with two 7mm hot-swap rear drive bays and one PCIe slot

The following illustration shows the rear view of the server model with two 7mm hot-swap rear drive bays and one PCIe slots. Depending on the model, your server might look slightly different from the illustration below.

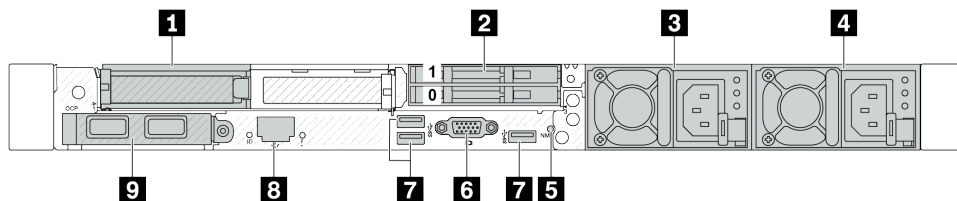


Table 19. Components on the rear of the server

1 PCIe slot 1 on riser 1 assembly	2 Rear 7mm drive bays (2)
3 Power supply 2 (optional)	4 Power supply 1
5 NMI button	6 VGA connector

Table 19. Components on the rear of the server (continued)

7 USB 3.2 Gen 1 (5 Gbps) connectors (3 DCIs)	8 XClarity Controller network connector
9 Ethernet connectors on OCP 3.0 Ethernet adapter (optional, two or four connectors may be available)	

Note: For more information about each component, see [“Rear components overview” on page 33](#).

Server model with two PCIe slots and a direct water cooling module

The following illustration shows the rear view of the server model with two PCIe slots and a direct water cooling module. Depending on the model, your server might look slightly different from the illustration below.

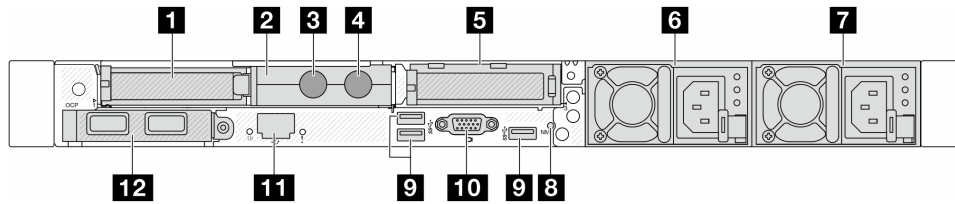


Table 20. Components on the rear of the server

1 PCIe slot 1 on riser 1 assembly	2 Hose holder
3 Inlet hose	4 Outlet hose
5 PCIe slot 3 on riser 2 assembly	6 Power supply 2 (optional)
7 Power supply 1	8 NMI button
9 USB 3.2 Gen 1 (5Gbps) connectors (3 DCIs)	10 VGA connector
11 XClarity Controller network connector	12 Ethernet connectors on OCP module (optional, two or four connectors may be available)

Note: For more information about each component, see [“Rear components overview” on page 33](#).

Rear components overview

OCP 3.0 module



Figure 8. OCP module (two connectors)

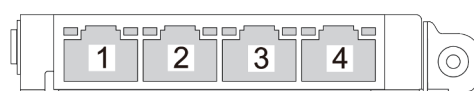


Figure 9. OCP module (four connectors)

- The OCP module provides two or four extra Ethernet connectors for network connections.
- By default, any Ethernet connector on the OCP module can also function as a management connector using the shared management capacity.

The OCP module provides two or four extra Ethernet connectors for network connections.

By default, any of the connectors on the OCP module can function as a shared management connector.

Hot-swap drives and drive bays

The drive bays on the front and rear of your server are designed for hot-swap drives. The number of the installed drives in your server varies by model. When you install drives, follow the order of the drive bay numbers.

The EMI integrity and cooling of the server are protected by having all drive bays occupied. Vacant drive bays must be occupied by drive fillers.

NMI button

Press this button to force a nonmaskable interrupt (NMI) to the processor. By this way, you can make the operating system halt (such as Windows Blue Screen of Death) and take a memory dump. You might have to use a pen or the end of a straightened paper clip to press the button.

PCIe slots

The PCIe slots are on the rear of the server and your server supports up to three PCIe slots on riser 1 and 2 assemblies.

Power supply units

The hot-swap redundant power supply helps you avoid significant interruption to the operation of the system when a power supply fails. You can purchase a power supply option from Lenovo and install the power supply to provide power redundancy without turning off the server.

On each power supply, there are three status LEDs near the power cord connector. For information about the LEDs, see [“Troubleshooting by system LEDs and diagnostics display” on page 499](#).

USB 3.2 Gen1 (5 Gbps) connectors

The USB 3.2 Gen1 (5 Gbps) connectors are direct connect interfaces (DCIs) for debugging, which can be used to attach a USB-compatible device, such as a USB keyboard, USB mouse, or USB storage device.

VGA connector

The VGA connectors on the front and rear of the server can be used to attach a high-performance monitor, a direct-drive monitor, or other devices that use a VGA connector.

XCC system management port (10/100/1000 Mbps RJ-45)

The XCC system management port (10/100/1000 Mbps RJ-45) can be used to attach an Ethernet cable to manage the baseboard management controller (BMC).

Front I/O module

The front I/O module of the server provides controls, connectors, and LEDs. The front I/O module varies by model.

Depending on server models, your server supports the following front I/O modules.

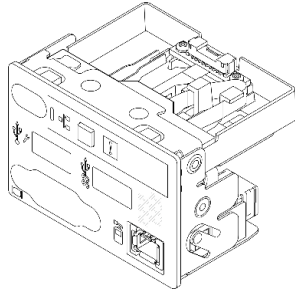


Figure 10. FIO module type 1

- 4 x 2.5 front drive bays with diagnostics panel
- 8 x 2.5 front drive bays with diagnostics panel
- 10 x 2.5 front drive bays with diagnostics panel
- 16 EDSFF front drive bays with diagnostics panel

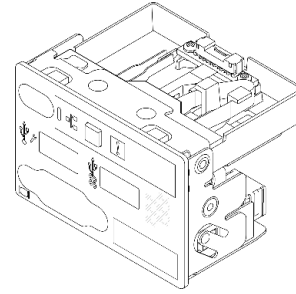


Figure 11. FIO module type 2

- 10 x 2.5 front drive bays with diagnostics panel

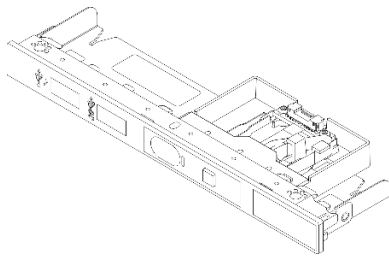


Figure 12. FIO module type 3 + external diagnostics cable

- 4 x 3.5 front drive bays with external diagnostics panel

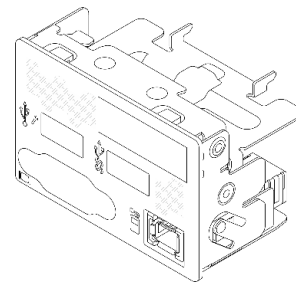
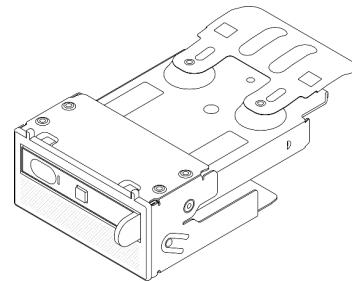


Figure 13. FIO module type 4 + integrated diagnostics panel

- 8 x 2.5 front drive bays without external diagnostics panel
- 16 EDSFF front drive bays without external diagnostics panel



System-board-assembly layout

This section provides information about the connectors, switches, and jumpers that are available on the system board (system board assembly).

The following illustration shows the layout of the system board (system board assembly) which contains the system I/O board and processor board.

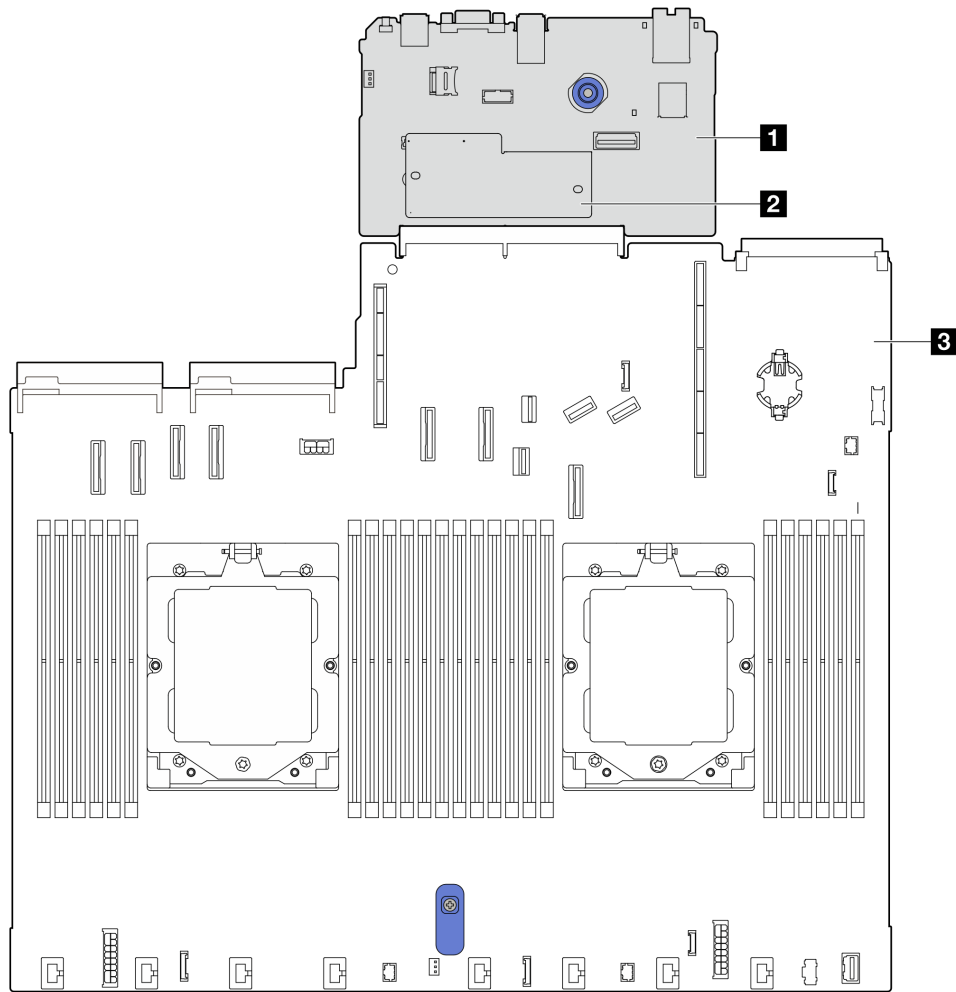


Figure 14. System-board-assembly layout

1 System I/O board	3 Processor board
2 Firmware and RoT security module	

For more information about the connectors, switches, or LEDs that are available on the system board (system board assembly), see:

- [“System-board-assembly connectors” on page 36](#)
- [“System-board-assembly switches” on page 38](#)
- [“LEDs on the system board assembly” on page 515](#)

System-board-assembly connectors

The following illustrations show the internal connectors on the system board (system board assembly).

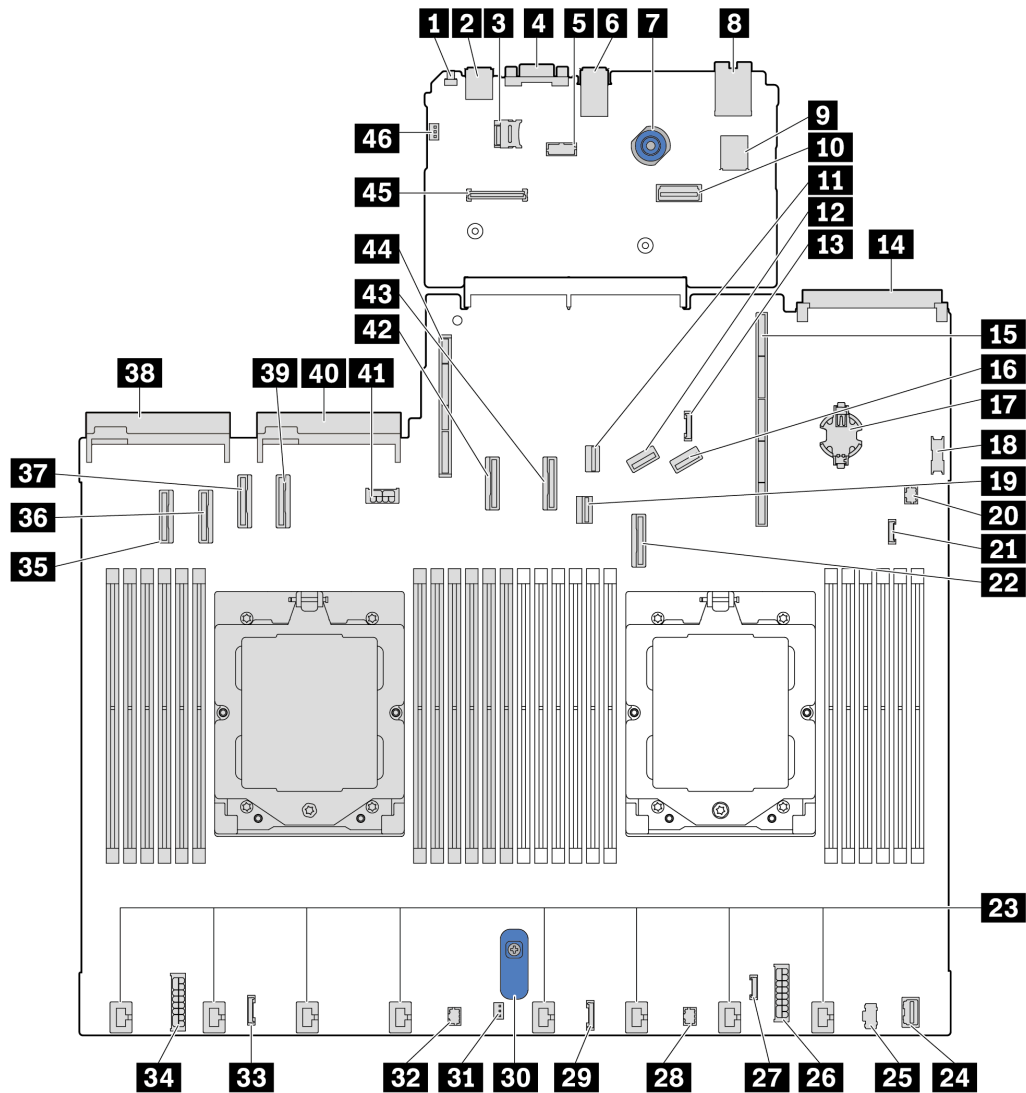


Figure 15. System-board-assembly connectors

Table 21. System-board-assembly connectors

1 NMI button	2 Rear USB connector 1
3 MicroSD socket	4 VGA connector
5 Serial port connector	6 Rear USB connector 2
7 Plunger	8 Management NIC connector
9 Internal USB connector	10 Second management Ethernet connector
11 M.2 signal connector	12 PCIe connector 8 / SATA connector 3
13 7mm/Rear backplane sideband connector	14 OCP 3.0 module connector
15 Riser 1 slot	16 PCIe connector 9 / SATA connector 4
17 CMOS battery (CR2032)	18 Front USB connector

Table 21. System-board-assembly connectors (continued)

19 7mm backplane signal connector	20 Pump 1 connector
21 Leak detection connector	22 PCIe connector 7 / SATA connector 2
23 Fan 1–8 connectors	24 Front VGA connector
25 M.2 power connector	26 Internal RAID power connector
27 External diagnostics connector	28 FIO_Y cable connector
29 FIO connector	30 Lift handle
31 Intrusion switch connector	32 Pump 2 connector
33 CFF retimer connector	34 Backplane power connector
35 PCIe connector 1	36 PCIe connector 2
37 PCIe connector 3 / SATA connector 0	38 Power supply 1 connector
39 PCIe connector 4 / SATA connector 1	40 Power supply 2 connector
41 GPU/7mm/Rear backplane power connector	42 PCIe connector 5
43 PCIe connector 6	44 Riser 2 slot
45 RoT connector	46 Intrusion switch connector (reserved)

System-board-assembly switches

The following illustrations show the location of the switches on the server.

Note: If there is a clear protective sticker on the top of the switch blocks, you must remove and discard it to access the switches.

Important:

- Before you change any switch settings or move any jumpers, turn off the server; then, disconnect all power cords and external cables. Review the following information:
 - https://pubs.lenovo.com/safety_documentation/
 - “Installation Guidelines” on page 49
 - “Handling static-sensitive devices” on page 52
 - “Power off the server” on page 65
- Any system-board-assembly switch or jumper block that is not shown in the illustrations in this document are reserved.

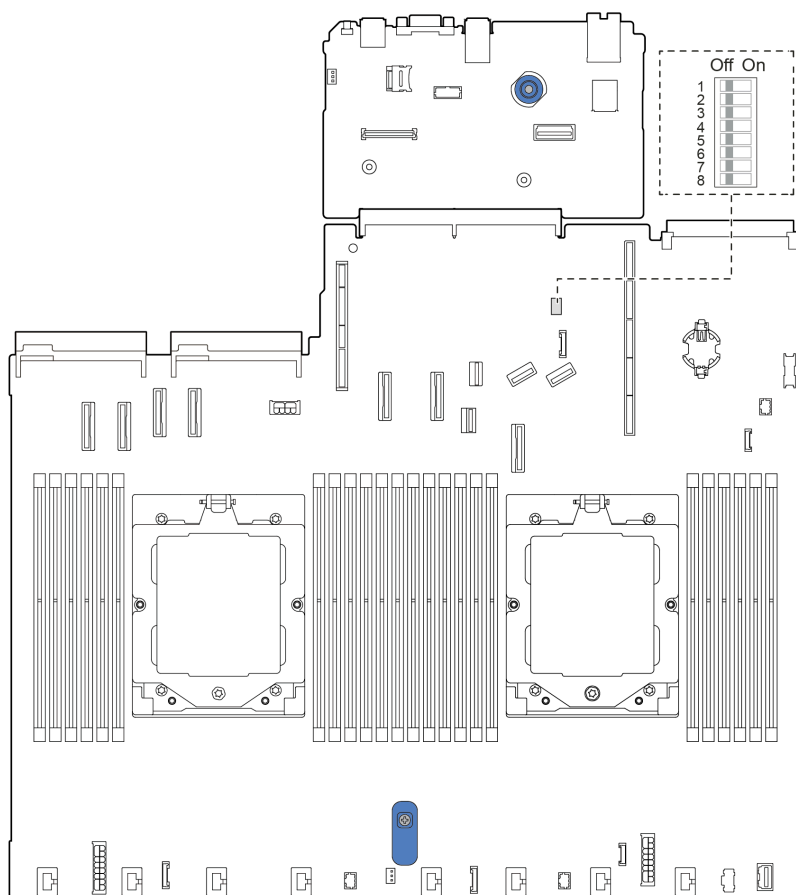


Figure 16. System-board-assembly switch

SW5 switch block

The following table describes the functions of the SW5 switch block on the system board (system board assembly).

Table 22. System-board-assembly SW5 switch block description

Switch-bit number	Switch name	Default position	Description
1 SW5-1	Force BMC CPU reset	Off	Forces BMC and CPU into reset when changing it to the ON position.
2 SW5-2	Clear CMOS	Off	Clears the real-time clock (RTC) registry when changing it to the ON position.
3 SW5-3	Password override	Off	Overrides the power-on password when changing it to the ON position.
4 SW5-4	FPGA reset	Off	Forces FPGA into reset when changing it to the ON position.
5 SW5-5	Reserved	Off	Reserved
6 SW5-6	Reserved	Off	Reserved

Table 22. System-board-assembly SW5 switch block description (continued)

Switch-bit number	Switch name	Default position	Description
7 SW5-7	Reserved	Off	Reserved
8 SW5-8	Reserved	Off	Reserved

Chapter 3. Parts list

Identify each of the components that is available for your server with the parts list.

For more information about ordering parts:

1. Go to <http://datacentersupport.lenovo.com> and navigate to the support page for your server.
2. Click **Parts**.
3. Enter the serial number to view a listing of parts for your server.

It is highly recommended that you check the power summary data for your server using Lenovo Capacity Planner before purchasing any new parts.

Note: Depending on the model, your server might look slightly different from the illustration.

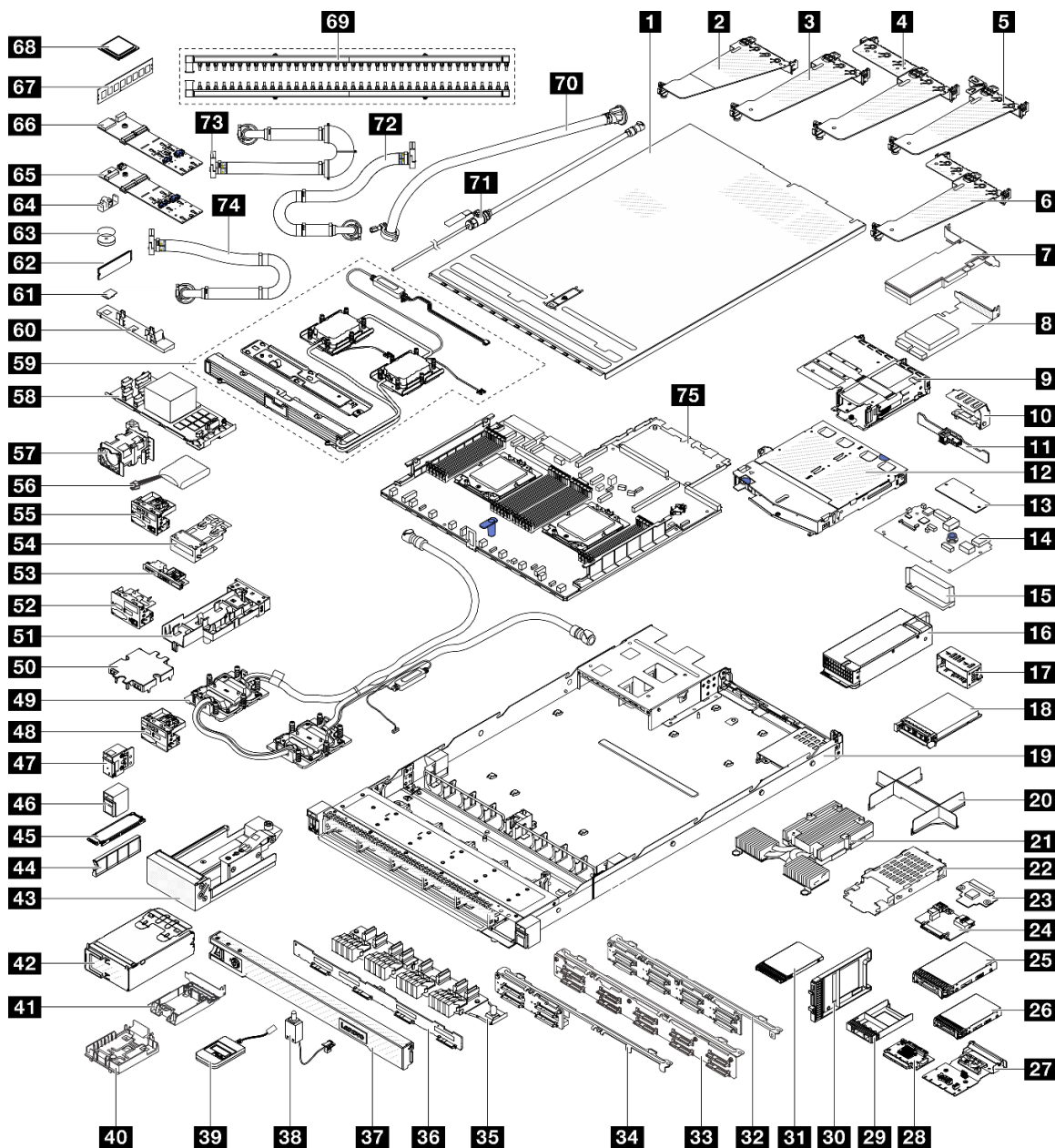


Figure 17. Server components

The parts listed in the following table are identified as one of the following:

- **T1:** Tier 1 customer replaceable unit (CRU). Replacement of Tier 1 CRUs is your responsibility. If Lenovo installs a Tier 1 CRU at your request with no service agreement, you will be charged for the installation.
- **T2:** Tier 2 customer replaceable unit (CRU). You may install a Tier 2 CRU yourself or request Lenovo to install it, at no additional charge, under the type of warranty service that is designated for your server.
- **F:** Field replaceable unit (FRU). FRUs must be installed only by trained service technicians.
- **C:** Consumable and Structural parts. Purchase and replacement of consumable and structural parts (components, such as a filler or bezel) is your responsibility. If Lenovo acquires or installs a structural component at your request, you will be charged for the service.

Description	Type	Description	Type
1 Top cover	T1	2 Rear riser bracket (full height)	T1
3 Rear riser bracket (low profile)	T1	4 Rear riser bracket (low profile-full height)	T1
5 Rear riser bracket (low profile-filler)	T1	6 Rear riser bracket (low profile-low profile)	T1
7 PCIe adapter	T1	8 RAID adapter	T1
9 Front riser bracket (low profile-full height)	T1	10 Rear wall bracket	C
11 2 x 2.5" rear drive backplane	T1	12 2 x 2.5" rear drive cage	T1
13 Firmware and RoT security module	F	14 System I/O board	F
15 Power supply unit air duct	T1	16 Power supply unit	T1
17 Power supply unit filler	C	18 OCP module	T1
19 Chassis	F	20 CPU dummy	C
21 Performance heat sink (T-shape)	F	22 7mm drive cage	T1
23 7mm drive backplane (top)	T2	24 7mm drive backplane (bottom)	T2
25 3.5" drive	T1	26 2.5" drive	T1
27 Rear OCP interposer	T1	28 Front OCP interposer	T1
29 2.5" drive bay filler	C	30 7mm drive bay filler	C
31 7mm drive	T1	32 8 x 2.5" front drive backplane	T1
33 10 x 2.5" front drive backplane	T2	34 4 x 2.5" front drive backplane	T2
35 16-EDSFF front drive backplane	T1	36 4 x 3.5" front drive backplane	T1
37 Security bezel	C	38 Intrusion switch cable	T1
39 External diagnostics handset	T1	40 RAID flash power module holder (in riser bracket)	T1
41 RAID flash power module holder (on chassis)	T1	42 4-EDSFF cage	T1
43 M.2 cage	T2	44 EDSFF drive bay filler	C
45 EDSFF drive	C	46 Rack latch (right)	T1
47 Rack latch (left)	T1	48 Front I/O module with diagnostics panel (1)	T1
49 Lenovo Neptune Processor Direct Water Cooling Module	F	50 Cold plate cover	C
51 Hose holder	C	52 Front I/O module with diagnostics panel (2)	T1
53 Front I/O module with diagnostics panel (3)	T1	54 Integrated diagnostics panel assembly	T1
55 Front I/O module with diagnostics panel (4)	T1	56 RAID flash power module	T1
57 Fan module	T1	58 Internal CFF HBA/RAID module	T2
59 The Lenovo Neptune Liquid to Air Module	F	60 Leakage detection sensor module holder	T1
61 MicroSD card	T1	62 M.2 drive	T1
63 CMOS battery (CR2032)	C	64 M.2 retainer clip	T1
65 M.2 PCIe 3.0 backplane	T1	66 M.2 PCIe 4.0 backplane	T1
67 Memory module	T1	68 Processor	F

Description	Type	Description	Type
69 Manifolds	F	70 42U in-row hose kit	F
71 Bleeder kit	F	72 42U/48U in-rack connection hose (return side)	F
73 42U in-rack connection hose (supply side)	F	74 48U in-rack connection hose (supply side)	F
75 Processor board	F		

Power cords

Several power cords are available, depending on the country and region where the server is installed.

To view the power cords that are available for the server:

1. Go to:
<http://dcsc.lenovo.com/#/>
2. Click **Preconfigured Model** or **Configure to order**.
3. Enter the machine type and model for your server to display the configurator page.
4. Click **Power** → **Power Cables** to see all line cords.

Notes:

- For your safety, a power cord with a grounded attachment plug is provided to use with this product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.
- Power cords for this product that are used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).
- For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.
- For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.
- For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.
- Power cords for a specific country or region are usually available only in that country or region.

Chapter 4. Unboxing and setup

Information in this section assists you on unboxing and setting up the server. When unboxing the server, check if the items in the package are correct, and learn where to find information of server serial number and Lenovo XClarity Controller access. Make sure to follow the instructions in [“Server setup checklist” on page 47](#) when setting up the server.

Server package contents

When you receive your server, verify that the shipment contains everything that you expected to receive.

The server package includes the following items:

- Server
- Rail installation kit*. Installation guide is provided in the package.
- Cable management arm*. Installation guide is provided in the package.
- Material box, including items such as power cords*, accessory kit, and printed documents.

Notes:

- Some of the items listed are available on select models only.
- Items marked with asterisk(*) are optional.

If any item is missing or damaged, contact your place of purchase. Ensure that you retain your proof of purchase and packing material. They might be required to receive warranty service.

Identify the server and access the Lenovo XClarity Controller

This section contains instruction on how to identify your server and where to find the Lenovo XClarity Controller access information.

Identifying your server

When you contact Lenovo for help, the machine type, model, and serial number information help support technicians to identify your server and provide faster service.

The illustration below shows the locations of the ID labels which contains the model number, machine type, and serial number of the server.

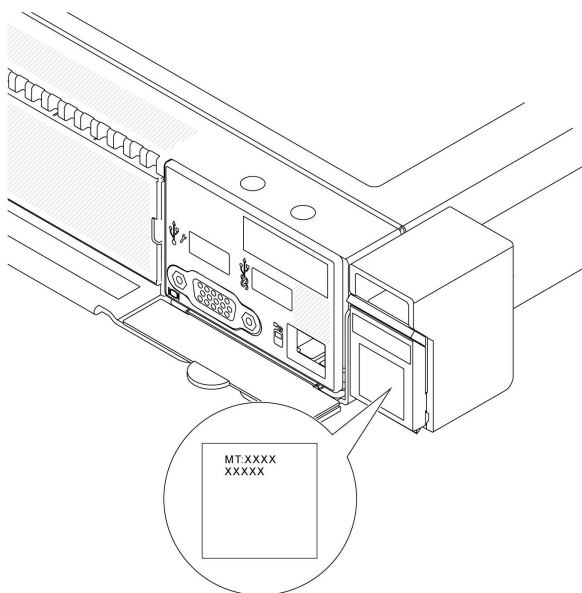


Figure 18. Location of the ID label

Lenovo XClarity Controller network access label

The Lenovo XClarity Controller (XCC) network access label is attached to the pull-out information tab located near the lower right corner in the front of the chassis, with MAC address accessible with a pull. After you receive the server, peel the XCC network access label away and store it in a safe place.

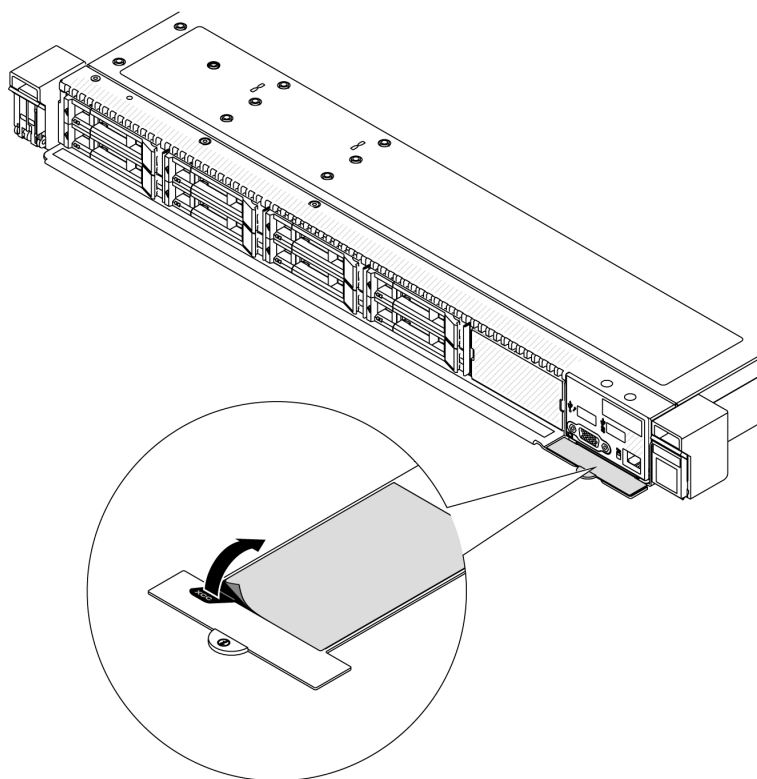


Figure 19. Lenovo XClarity Controller network access label on the pull-out information tab

Server setup checklist

Use the server setup checklist to ensure that you have performed all tasks that are required to set up your server.

The server setup procedure varies depending on the configuration of the server when it was delivered. In some cases, the server is fully configured and you just need to connect the server to the network and an AC power source, and then you can power on the server. In other cases, the server needs to have hardware options installed, requires hardware and firmware configuration, and requires an operating system to be installed.

The following steps describe the general procedure for setting up a server.

Setup the server hardware

Complete the following procedures to setup the server hardware.

1. Unpack the server package. See [“Server package contents” on page 45](#).
2. Install any required hardware or server options. See the related topics in [Chapter 5 “Hardware replacement procedures” on page 49](#).
3. If necessary, install the rail and CMA to a standard rack cabinet. Follow the instruction in *Rail Installation Guide* and *CMA Installation Guide* that comes with the rail installation kit.
4. If necessary, install the server into a standard rack cabinet. See [“Install the server to rack” on page 68](#).
5. Connect all external cables to the server. See [Chapter 2 “Server components” on page 19](#) for connectors locations.

Typically, you will need to connect the following cables:

- Connect server to the power source
 - Connect server to the data network
 - Connect the server to the storage device
 - Connect the server to the management network
6. Power on the server.

The server can be turned on (power LED on) in any of the following ways:

- You can press the power button.
- The server can restart automatically after a power interruption.
- The server can respond to remote power-on requests sent to the Lenovo XClarity Controller.

Note: You can access the management processor interface to configure the system without powering on the server. Whenever the server is connected to power, the management processor interface is available. For details about accessing the management server processor, see “Opening and Using the XClarity Controller Web Interface” section in the XCC documentation compatible with your server at https://sysmgmt.lenovofiles.com/help/topic/ixcc_frontend/ixcc_overview.html.

7. Validate the server. Make sure that the power LED, Ethernet connector LED, and network LED are lit with green light, which means the server hardware was set up successfully.

See [“Troubleshooting by system LEDs and diagnostics display” on page 499](#) for more information on the LED indications.

Configure the system

Complete the following procedures to configure the system. For detailed instructions, refer to [Chapter 7 “System configuration” on page 487](#).

1. Set the network connection for the Lenovo XClarity Controller to the management network.
2. Update the firmware for the server, if necessary.
3. Configure the firmware for the server.

The following information is available for RAID configuration:

- <https://lenovopress.com/lp0578-lenovo-raid-introduction>
 - <https://lenovopress.com/lp0579-lenovo-raid-management-tools-and-resources>
4. Install the operating system.
 5. Back up the server configuration.
 6. Install the applications and programs for which the server is intended to be used.

Chapter 5. Hardware replacement procedures

This section provides installation and removal procedures for all serviceable system components. Each component replacement procedure references any tasks that need to be performed to gain access to the component being replaced.

Installation Guidelines

Before installing components in your server, read the installation guidelines.

Before installing optional devices, read the following notices carefully:

Attention: Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

- Read the safety information and guidelines to ensure your safety at work:
 - A complete list of safety information for all products is available at:
https://pubs.lenovo.com/safety_documentation/
 - The following guidelines are available as well: “Working inside the server with the power on” on page 51 and “Handling static-sensitive devices” on page 52.
- Make sure the components you are installing are supported by your server.
 - For a list of supported optional components for the server, see <https://serverproven.lenovo.com/>.
 - For the option package contents, see <https://serveroption.lenovo.com/>.
- For more information about ordering parts:
 1. Go to <http://datacentersupport.lenovo.com> and navigate to the support page for your server.
 2. Click **Parts**.
 3. Enter the serial number to view a listing of parts for your server.
- When you install a new server, download and apply the latest firmware. This will help ensure that any known issues are addressed, and that your server is ready to work with optimal performance. Go to <https://datacentersupport.lenovo.com/tw/en/products/servers/thinksystem/sr645v3/7d9c/downloads/driver-list/> (to be updated) to download firmware updates for your server.

Important: Some cluster solutions require specific code levels or coordinated code updates. If the component is part of a cluster solution, verify that the latest Best Recipe code level menu for cluster supported for the cluster solution before you update the code.

- If you replace a part, such as an adapter, that contains firmware, you might also need to update the firmware for that part. For more information about updating firmware, see “Update the firmware” on page 489.
- It is good practice to make sure that the server is working correctly before you install an optional component.
- Keep the working area clean, and place removed components on a flat and smooth surface that does not shake or tilt.
- Do not attempt to lift an object that might be too heavy for you. If you have to lift a heavy object, read the following precautions carefully:
 - Make sure that you can stand steadily without slipping.
 - Distribute the weight of the object equally between your feet.
 - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
 - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Back up all important data before you make changes related to the disk drives.
- Have a small flat-blade screwdriver, a small Phillips screwdriver, and a T20 torx screwdriver available.
- To view the error LEDs on the system board (system board assembly) and internal components, leave the power on.

- You do not have to turn off the server to remove or install hot-swap power supplies, hot swap fans, or hot-plug USB devices. However, you must turn off the server before you perform any steps that involve removing or installing adapter cables, and you must disconnect the power source from the server before you perform any steps that involve removing or installing a riser card.
- When replacing power supply units or fans, make sure to refer to redundancy rules for these components.
- Blue on a component indicates touch points, where you can grip to remove a component from or install it in the server, open or close a latch, and so on.
- Except PSU, orange on a component or an orange label on or near a component indicates that the component can be hot-swapped if the server and operating system support hot-swap capability, which means that you can remove or install the component while the server is still running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- PSU with a release tab is a hot-swap PSU.
- The red strip on the drives, adjacent to the release latch, indicates that the drive can be hot-swapped if the server and operating system support hot-swap capability. This means that you can remove or install the drive while the server is still running.

Note: See the system specific instructions for removing or installing a hot-swap drive for any additional procedures that you might need to perform before you remove or install the drive.

- After finishing working on the server, make sure you reinstall all safety shields, guards, labels, and ground wires.

Safety inspection checklist

Use the information in this section to identify potentially unsafe conditions with your server. As each machine was designed and built, required safety items were installed to protect users and service technicians from injury.

Note: The product is not suitable for use at visual display workplaces according to §2 of the Workplace Regulations.

Note: The set-up of the server is made in the server room only.

CAUTION:

This equipment must be installed or serviced by trained personnel, as defined by the NEC, IEC 62368-1 & IEC 60950-1, the standard for Safety of Electronic Equipment within the Field of Audio/Video, Information Technology and Communication Technology. Lenovo assumes that you are qualified in the servicing of equipment and trained in recognizing hazards energy levels in products. Access to the equipment is by the use of a tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.

Important: Electrical grounding of the server is required for operator safety and correct system function. Proper grounding of the electrical outlet can be verified by a certified electrician.

Use the following checklist to verify that there are no potentially unsafe conditions:

1. If your working condition necessitates the server being powered off or you intend to power off, make sure that the power cord is disconnected.

S002



CAUTION:

The power-control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

Note: Under certain circumstances, powering off the server is not a prerequisite. Refer to the precautions before conducting any tasks.

2. Check the power cord.

- Make sure that the third-wire ground connector is in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and the frame ground.
- Make sure that the power cord is the correct type.

To view the power cords that are available for the server:

a. Go to:

<http://dcsc.lenovo.com/#/>

- b. Click **Preconfigured Model** or **Configure to order**.
 - c. Enter the machine type and model for your server to display the configurator page.
 - d. Click **Power** → **Power Cables** to see all line cords.
- Make sure that the insulation is not frayed or worn.
3. Check for any obvious non-Lenovo alterations. Use good judgment as to the safety of any non-Lenovo alterations.
4. Check inside the server for any obvious unsafe conditions, such as metal filings, contamination, water or other liquid, or signs of fire or smoke damage.
5. Check for worn, frayed, or pinched cables.
6. Make sure that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

System reliability guidelines

Review the system reliability guidelines to ensure proper system cooling and reliability.

Make sure the following requirements are met:

- When the server comes with redundant power, a power supply must be installed in each power-supply bay.
- Adequate space around the server must be spared to allow server cooling system to work properly. Leave approximately 50 mm (2.0 in.) of open space around the front and rear of the server. Do not place any object in front of the fans.
- For proper cooling and airflow, refit the server cover before you turn the power on. Do not operate the server for more than 30 minutes with the server cover removed, for it might damage server components.
- Cabling instructions that come with optional components must be followed.
- A failed fan must be replaced within 48 hours after malfunction.
- A removed hot-swap fan must be replaced within 30 seconds after removal.
- A removed hot-swap drive must be replaced within two minutes after removal.
- A removed hot-swap power supply must be replaced within two minutes after removal.
- Every air baffle that comes with the server must be installed when the server starts (some servers might come with more than one air baffle). Operating the server with a missing air baffle might damage the processor.
- All processor sockets must contain either a socket cover or a processor with heat sink.
- When more than one processor is installed, fan population rules for each server must be strictly followed.

Working inside the server with the power on

You might need to keep the power on with the server cover removed to look at system information on the display panel or to replace hot-swap components. Review these guidelines before doing so.

Attention: The server might stop and data loss might occur when internal server components are exposed to static electricity. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding systems when working inside the server with the power on.

- Avoid loose-fitting clothing, particularly around your forearms. Button or roll up long sleeves before working inside the server.
- Prevent your necktie, scarf, badge rope, or hair from dangling into the server.
- Remove jewelry, such as bracelets, necklaces, rings, cuff links, and wrist watches.
- Remove items from your shirt pocket, such as pens and pencils, in case they fall into the server as you lean over it.
- Avoid dropping any metallic objects, such as paper clips, hairpins, and screws, into the server.

Handling static-sensitive devices

Review these guidelines before you handle static-sensitive devices to reduce the possibility of damage from electrostatic discharge.

Attention: Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

- Limit your movement to prevent building up static electricity around you.
- Take additional care when handling devices during cold weather, for heating would reduce indoor humidity and increase static electricity.
- Always use an electrostatic-discharge wrist strap or other grounding system, particularly when working inside the server with the power on.
- While the device is still in its static-protective package, touch it to an unpainted metal surface on the outside of the server for at least two seconds. This drains static electricity from the package and from your body.
- Remove the device from the package and install it directly into the server without putting it down. If it is necessary to put the device down, put it back into the static-protective package. Never place the device on the server or on any metal surface.
- When handling a device, carefully hold it by the edges or the frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Keep the device from others' reach to prevent possible damages.

Technical rules

Refer to the below technical rules and limitations when you install the related server components.

Memory module installation rules and order

Memory modules must be installed in a specific order based on the memory configuration that you implement and the number of processors and memory modules installed in the server.

Supported memory types

For information on the types of memory module supported by this server, see “Memory” section in [“Technical specifications” on page 3](#).

Your server has 24 memory slots with 24 channels. For a list of supported memory options, see:

<https://serverproven.lenovo.com/>.

Information about optimizing memory performance and configuring memory is available at the Lenovo Press website:

<https://lenovopress.com/servers/options/memory>

In addition, you can take advantage of a memory configurator, which is available at the following site:

https://dcsc.lenovo.com/#/memory_configuration

Specific information about the required installation order of memory modules in your server based on the system configuration and memory mode that you are implementing is shown below.

General DIMM mixing rules

DIMMs	Coexist in a system
3DS RDIMMs and other DIMM types	X
128 GB 3DS RDIMMs and 256 GB 3DS RDIMMs	X
ECC DIMMs and Non-ECC DIMMs	X ¹
EC4 DIMMs and EC8 DIMMs	X
x4 DIMMs and x8 DIMMs	X
ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM-A v1 and ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM-A v2	X
Different DRAM density (16Gbit, 24Gbit, and 32Gbit) ^{4, 5, 6}	X (for 9004 series processors)
	√ (for 9005 series processors)
DIMMs manufactured by different vendors	√
DIMMs of different rank	√ ²
DIMMs of different capacity	√ ³
1. Only support ECC DIMMs. 2. Install the DIMM with the higher rank first. 3. Install the DIMM with the higher capacity first following the population sequence. 4. The 16Gbit DRAM is used in 16 GB, 32 GB, and 64 GB RDIMMs. The 24Gbit DRAM is used in 48 GB and 96 GB RDIMMs. The 32Gbit DRAM is used in 128 GB 2Rx4 RDIMMs. 5. Before installing 24Gbit-based RDIMMs, make sure to apply the UEFI firmware version KAE106S or later to the server first and remove all existing 16Gbit-based RDIMMs. 6. Mixing 1R and 2R RDIMMs or mixing RDIMMs based on different DRAM density in a system equipped with 9005 series processors may have an impact on performance.	

Memory module installation order

Notes: In the following tables:

- S1–S24 indicate DIMM slots 1–24.
- 1–24 indicate the installation order.

For example, when 12 DIMMs are installed for two processors, the installation order is slot 7, 19, 6, 18, 9, 21, 4, 16, 8, 20, 5, 17.

Server model with one processor

The following table shows the DIMM population sequence when one processor is installed.

Table 23. DIMM population sequence for one processor

Total DIMMs	Processor 1											
	S12	S11	S10	S9	S8	S7	S6	S5	S4	S3	S2	S1

Table 23. DIMM population sequence for one processor (continued)

1 DIMM						1						
2 DIMMs						1	2					
4 DIMMs				3		1	2		4			
6 DIMMs				3	5	1	2	6	4			
8 DIMMs		7		3	5	1	2	6	4		8	
10 DIMMs		7	9	3	5	1	2	6	4	10	8	
12 DIMMs	11	7	9	3	5	1	2	6	4	10	8	12

Server model with two processors

The following table shows the DIMM population sequence when two processors are installed.

Table 24. DIMM population sequence for two processors

Total DIMMs	Processor 1											
	S12	S11	S10	S9	S8	S7	S6	S5	S4	S3	S2	S1
2 DIMMs						1						
4 DIMMs						1	3					
8 DIMMs				5		1	3		7			
12 DIMMs				5	9	1	3	11	7			
16 DIMMs		13		5	9	1	3	11	7		15	
20 DIMMs		13	17	5	9	1	3	11	7	19	15	
24 DIMMs	21	13	17	5	9	1	3	11	7	19	15	23
Total DIMMs	Processor 2											
	S24	S23	S22	S21	S20	S19	S18	S17	S16	S15	S14	S13
2 DIMMs						2						
4 DIMMs						2	4					
8 DIMMs				6		2	4		8			
12 DIMMs				6	10	2	4	12	8			
16 DIMMs		14		6	10	2	4	12	8		16	
20 DIMMs		14	18	6	10	2	4	12	8	20	16	
24 DIMMs	22	14	18	6	10	2	4	12	8	20	16	24

PCIe slots and adapters

Understanding the technical rules for PCIe adapters helps you correctly install and configure PCIe adapters in the system.

PCIe adapters supported for different models

Table 25. Rear PCIe adapters supported and their locations

Notes:

- For the type of expansion slots, refer to [“Technical specifications” on page 3](#).
- To locate the PCIe slots, see [“Rear view” on page 29](#)

Table 25. Rear PCIe adapters supported and their locations (continued)

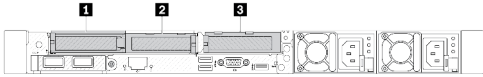
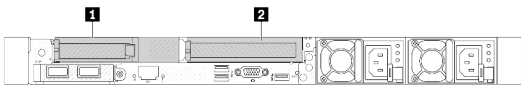
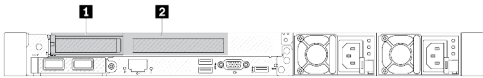
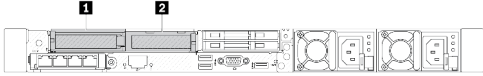
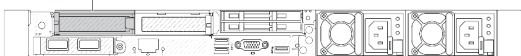
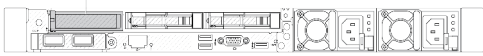
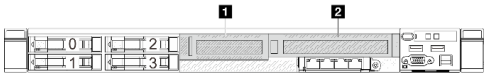
Server rear view	Supported types and slot location	Number of processors
	Riser 1 assembly 1 Slot 1: PCIe x16 (x8, x4, x1), low-profile 2 Slot 2: PCIe x16 (x8, x4, x1), low-profile	1 or 2
	Riser 2 assembly 3 Slot 3: PCIe x16 (x8, x4, x1), low-profile	2
	Riser 1 assembly 1 Slot 1: PCIe x16 (x8, x4, x1), low-profile	1 or 2
	Riser 2 assembly 2 Slot 3: PCIe x16 (x8, x4), full-height	2
	Riser 1 assembly 1 Slot 1: PCIe x16 (x8, x4, x1), low-profile 2 Slot 2: PCIe x16 (x8, x4, x1), full-height Note: One rear wall bracket must be installed next to the two PCIe slots.	1 or 2
	Riser 1 assembly 1 Slot 1: PCIe x16 (x8, x4, x1), low-profile 2 Slot 2: PCIe x16 (x8, x4, x1), low-profile	1 or 2
	Riser 1 assembly 1 Slot 1: PCIe x16 (x8, x4, x1), low-profile	1 or 2
	Riser 1 assembly 1 Slot 1: PCIe x16 (x8, x4, x1), low-profile	1 or 2

Table 26. Front PCIe adapters supported and their locations

Notes:

- For the type of expansion slots, refer to [“Technical specifications” on page 3](#).
- To locate the PCIe slots, see [“Front view” on page 21](#)

Table 26. Front PCIe adapters supported and their locations (continued)

Server front view	Supported types and slot location	Number of processors
	Riser 3 assembly 1 Slot 4: PCIe x8, low-profile <i>Note 1, 2</i> Riser 4 assembly 2 Slot 5: PCIe x16 (x16, x8), full-height	2
Notes: 1. When Gen 4 front PCIe risers are installed, the thermal design power of slot 4 is limited to 25W or lower. 2. When Gen 5 front PCIe risers are installed, the thermal design power of slot 4 is limited to 75W or lower.		

PCIe adapter installation rules and order

When installing different types of PCIe adapters, refer to the following suggested installation priority:

Table 27. Recommended installation priority for different types of PCIe adapters

Installation priority	
1. OCP card	2. Custom form factor (CFF) internal HBA/RAID adapter
3. Standard form factor (SFF) RAID adapter, M.2/7mm RAID adapter	4. Non-raid controller
5. Re-timer adapter	6. GPU adapter
7. InfiniBand adapter	8. Fiber channel adapter
9. Network adapter	10. External storage adapter
11. COM port bracket	

When installing a specific PCIe adapter, refer to the following suggested slot installation priority:

Table 28. Recommended slot installation priority for PCIe adapters

Recommended slot installation priority	PCIe adapters	Maximum supported number
Must be installed in slot 1	<ul style="list-style-type: none"> SFF RAID/HBA adapter Non-raid controller Re-timer adapter 	1
Must be installed in slot 2	<ul style="list-style-type: none"> SFF RAID/HBA adapter Network adapter 	1
	<ul style="list-style-type: none"> M.2/7mm RAID adapter 	2
Slot 1 > Slot 2 > Slot 3	<ul style="list-style-type: none"> Network adapter 	3
Slot 1 > Slot 3	<ul style="list-style-type: none"> InfiniBand adapter GPU adapter 	2
Slot 1 > Slot 3 > Slot 2	This rule is applicable to performance heat sink configuration. <ul style="list-style-type: none"> InfiniBand adapter Network adapter (size > 100 GB) GPU adapter 	3

Table 28. Recommended slot installation priority for PCIe adapters (continued)

Recommended slot installation priority	PCIe adapters	Maximum supported number
Slot 2 > Slot 3 > Slot 1	This rule is applicable to liquid cooling configuration. <ul style="list-style-type: none"> • Network adapter • COM port bracket 	1
Slot 5 > Slot 1 > Slot 2 > Slot 3	<ul style="list-style-type: none"> • GPU adapter • InfiniBand adapter • Network adapter 	4
Slot 5 > Slot 4 > Slot 1 > Slot 2 > Slot 3	<ul style="list-style-type: none"> • Fiber channel adapter • Network adapter • External storage adapter 	5
Slot 5 > Slot 1 > Slot 3	The following network adapters: <ul style="list-style-type: none"> • ThinkSystem NVIDIA ConnectX-7 NDR400 OSFP 1-port PCIe Gen5 Adapter • ThinkSystem Nvidia ConnectX-7 NDR200/HDR QSFP112 2-port PCIe Gen5 x16 InfiniBand Adapter 	3
Slot 5 > Slot 3	The following GPU adapter: <ul style="list-style-type: none"> • ThinkSystem Nvidia L4 24GB PCIe Gen4 Passive GPU 	2
Notes: <ul style="list-style-type: none"> • The following adapter can only be installed on Slot 3: <ul style="list-style-type: none"> – ThinkSystem RAID 9450-32i 8GB Flash PCIe Gen4 24Gb Adapter • If processor 9105/9115/9135/9175F/9255/9335/9365/9375F/9455/9645/9655/9845 is installed, the following adapters cannot be installed on Gen5 riser card: <ul style="list-style-type: none"> – ThinkSystem Broadcom 57414 10/25GbE SFP28 2-port PCIe Ethernet Adapter – ThinkSystem Broadcom 57416 10GBASE-T 2-Port PCIe Ethernet Adapter – ThinkSystem QLogic QLE2772 32Gb 2-Port PCIe Fibre Channel Adapter • Rules for GPU adapters: <ul style="list-style-type: none"> – The GPU adapter L4 is supported only on Gen5 riser with re-timer slot. – ThinkSystem NVIDIA L4 24GB PCIe Gen4 Passive GPU can only be installed in ThinkSystem V3 1U x8/x16 Gen5 risers. • RAID 940 series or 9350 series adapters require a RAID flash power module. • Mixing of RAID/HBA 4350/5350/9350 adapters (Gen 3) and RAID/HBA 440/540/940 adapters (Gen 4) in the same system is not allowed. • RAID/HBA adapters belonged to the same generation (Gen 3 or Gen 4) are allowed to be mixed in the same system. • Most adapters support one or two processors. However, two processors should be installed when using the following adapters: <ul style="list-style-type: none"> – ThinkSystem Mellanox ConnectX-6 HDR IB/200GbE Single Port x16 PCIe Adapter – ThinkSystem Mellanox HDR/200GbE 2x PCIe Aux Kit • The following adapter cannot be installed into slot 4 or slot 5: <ul style="list-style-type: none"> – ThinkSystem Broadcom 57454 10GBASE-T 4-port PCIe Ethernet Adapter • The following adapters cannot be installed into rear LP-FH riser cage: <ul style="list-style-type: none"> – ThinkSystem NetXtreme/I350-T4 PCIe 1Gb 4-Port RJ45 Ethernet Adapter – ThinkSystem QLogic QL41134 PCIe 10Gb 4-Port Base-T Ethernet Adapter – ThinkSystem Intel I350-T4 ML2 1Gb 4-Port RJ45 Ethernet Adapter – ThinkSystem Broadcom 57454 10GBASE-T 4-port PCIe Ethernet Adapter – ThinkSystem Intel I710-T4L 1G 4-Port RJ45 PCIe Ethernet Adapter – ThinkSystem Intel X710-T4L 10GBase-T 4-Port PCIe Ethernet Adapter • The following adapter can <i>only</i> be installed into FH riser cage: <ul style="list-style-type: none"> – ThinkSystem Broadcom 57454 10/25GbE SFP28 4-port PCIe Ethernet Adapter – ThinkSystem Broadcom 57504 10/25GbE SFP28 4-Port PCIe Ethernet Adapter – ThinkSystem Intel E810-DA4 10/25GbE SFP28 4-Port PCIe Ethernet Adapter • Only one adapter can be supported for the following InfiniBand adapter: <ul style="list-style-type: none"> – ThinkSystem Mellanox HDR/200GbE 2x PCIe Aux Kit 		

Drive installation rules

Understanding the technical rules for drives helps you correctly install and configure drives in the system.

General rules

1. The drive bays are numbered to indicate the installation order (starting from number “0”). Follow the installation order when you install a drive. See [“Front view” on page 21](#).
2. The drives in a single RAID array must be of the same type (as in hard disk drives, solid-state drives, and so on), same size, and same capacity.
3. For EDSFF drives, follow the numerical order of the drive bay sequence. Do not skip bays when installing EDSFF drives.

Mixing rules

1. You can use drives from different vendors.
2. You can mix drives of different types and different capacities in one system, but not in one RAID array. And when you deploy a drive mix, install drives of lower capacity first.
3. You can install a 2.5-inch solid-state/SAS/SATA drive in a 3.5-inch hard disk drive bay.
4. Mixing EDSFF, U.2 or U.3 drives in one RAID array is not supported.

Special notes

1. When ThinkSystem M.2 NVMe 2-Bay RAID Enablement Kit is installed, the 7mm SATA drive cannot be installed.
2. ThinkSystem M.2 NVMe 2-Bay RAID Enablement Kit cannot be installed into the 4 x 3.5" chassis.
3. Tri-mode RAID cards support U.3 NVMe SSDs but do not support U.2 NVMe SSDs
4. When 7mm drives are installed, two PCIe adapters can be installed on the rear at most.
5. When a Gen 3 M.2 SATA 2-Bay Enablement Kit is selected, at least one M.2 disk needs to be installed.
6. When rear 2x2.5 SSDs are installed, only one PCIe adapter can be installed on the rear.

Thermal rules

This topic provides thermal rules for the server.

- [“Server models with front drive bays only” on page 59](#)
- [“Server models with rear drive bays” on page 60](#)
- [“Server models with GPUs” on page 63](#)

Notes: When ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM-A v1 is used, the following requirements should be met:

- Ambient temperature at sea level $\leq 25^{\circ}\text{C}$
- CPU power $\leq 300\text{W}$
- AOC $\leq 25\text{ GB}$
- The performance fan and performance heat sink are installed.
- The front backplane, rear backplane, rear GPU are *not* installed.

Abbreviations used in tables below are defined as follows:

- Max.Temp.: Maximum ambient temperature at sea level
- TDP: Thermal design power
- P: Performance
- S: Standard
- A: The Lenovo Neptune Liquid to Air Module
- D: Lenovo Neptune(TM) Processor Direct Water Cooling Module
- Y1: Yes
- Y2: Yes when the maximum ambient temperature is less than 30°C
- Y3: Yes when the maximum ambient temperature is less than 25°C
- Y4: Yes when using the performance fan

- Y5: Yes except for ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM-A v1 and ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM-A v1
- Y6: Yes except for ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM-A v1
- Y7: Yes when the maximum ambient temperature is less than 30 °C and the performance fan is installed.
- Y8: Yes when the maximum ambient temperature is less than 35 °C and the performance fan is installed.
- NA: Not applicable

Server models with front drive bays only

This section provides thermal information for server models with front drive bays only.

Front bays	Max. Temp.	Processor TDP (watts)	Heat sink	Fan type	Pro- cessor Qty	Sup- port DIMMs ≥ 96 GB
4 x 3.5"	25°C <small>Note 1</small>	$320 \leq \text{TDP} \leq 400$	P	P	1 or 2	Y1
	30°C	$200 \leq \text{TDP} \leq 240$	P	S or P	1 or 2	Y4
	35°C	$200 < \text{TDP} \leq 400$	D	S or P	2	Y7
	35°C	$200 < \text{TDP} \leq 300$	P	P	1 or 2	Y2
	45°C	$200 \leq \text{TDP} \leq 240$	P	P	1 or 2	Y2
4 x 2.5"	25°C <small>Note 1</small>	$320 \leq \text{TDP} \leq 400$	P	P	1 or 2	Y1
	25°C	$320 \leq \text{TDP} \leq 400$	A	P	2	Y1
	30°C <small>Note 1, 2 and 4</small>	$320 \leq \text{TDP} \leq 400$	A	P	2	Y3
	30°C	$200 \leq \text{TDP} \leq 240$	P	S or P	1 or 2	Y4
	35°C	$200 \leq \text{TDP} \leq 400$	D	S or P	2	Y8
	35°C	$200 \leq \text{TDP} \leq 300$	A	P	2	Y3
	35°C	$200 \leq \text{TDP} \leq 300$	P	P	1 or 2	Y2
	45°C	$200 \leq \text{TDP} \leq 240$	P	P	1 or 2	Y2
8 x 2.5"	25°C <small>Note 1</small>	$320 \leq \text{TDP} \leq 400$	P	P	1 or 2	Y1
	30°C <small>Note 1, 2 and 4</small>	$320 \leq \text{TDP} \leq 400$	A	P	2	Y1
	30°C	$200 \leq \text{TDP} \leq 240$	P	S or P	1 or 2	Y4
	35°C	$200 \leq \text{TDP} \leq 400$	D	S or P	2	Y8
	35°C	$200 \leq \text{TDP} \leq 300$	P	P	1 or 2	Y2
	35°C	$200 \leq \text{TDP} \leq 300$	A	P	2	Y2
	45°C	$200 \leq \text{TDP} \leq 240$	P	P	1 or 2	Y2
10 x 2.5"	25°C <small>Note 1</small>	$320 \leq \text{TDP} \leq 400$	P	P	1 or 2	Y1
	35°C	$200 \leq \text{TDP} \leq 300$	P	P	1 or 2	Y2
	45°C	$200 \leq \text{TDP} \leq 240$	P	P	1 or 2	Y2
10 x 2.5" NVMe (Gen 4)	30°C <small>Note 1, 2 and 4</small>	$320 \leq \text{TDP} \leq 400$	A	P	2	Y1
	35°C	$200 \leq \text{TDP} \leq 400$	D	S or P	2	Y7
10 x 2.5" (Gen 4)	35°C	$200 \leq \text{TDP} \leq 300$	A	P	2	Y2

Front bays	Max. Temp.	Processor TDP (watts)	Heat sink	Fan type	Pro- cessor Qty	Sup- port DIMMs ≥ 96 GB
10 x 2.5" AnyBay (Gen 5)	35°C	$200 \leq \text{TDP} \leq 400$	D	S or P	2	Y7
16 EDSFF	30°C ^{Note 3}	$200 \leq \text{TDP} \leq 400$	D	S	2	Y6
	35°C	$200 \leq \text{TDP} \leq 400$	D	P	2	Y6
	35°C	$200 \leq \text{TDP} \leq 300$	P	P	1 or 2	Y1

Notes:

1. This line of thermal rule is applicable to the server installed with the processor 9555 / 9555P / 9565 / 9645 / 9655 / 9655P / 9745 / 9825 / 9845.
2. This line of thermal rule is applicable to the server installed with the processor 9175F / 9275F / 9375F / 9475F / 9575F.
3. *ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM-A v1* can only be used when the performance fan is installed.
4. If 9184X / 9384X / 9175F / 9275F / 9375F is installed and under UEFI Maximum Performance Mode, the processor temperature might reach 95°C in all configurations, and the processor frequency will be impacted but still meet AMD specifications.

Server models with rear drive bays

This section provides thermal information for server models with middle or rear drive bays.

Front bays	Rear bays	Max. Temp.	Processor TDP (watts)	Heat sink	Fan type	Processor Qty	Support DIMMs ≥ 96 GB
4 x 3.5"	2 x 7mm NVMe	25°C ^{Note 1}	$320 \leq \text{TDP} \leq 400$	P	P	1 or 2	Y1
		30°C	$200 \leq \text{TDP} \leq 300$	P	P	1 or 2	Y1
		35°C	$200 \leq \text{TDP} \leq 400$	D	S or P	2	Y7
	2 x 7mm SATA	30°C	$200 \leq \text{TDP} \leq 240$	P	S	1 or 2	Y1
		30°C	$200 \leq \text{TDP} \leq 300$	P	P	1 or 2	Y1
		35°C	$200 \leq \text{TDP} \leq 400$	D	S or P	2	Y7
	2 x 2.5" SAS/ SATA/ NVMe/ U.2/U.3	30°C	$200 \leq \text{TDP} \leq 300$	P	P	1 or 2	Y5

Front bays	Rear bays	Max. Temp.	Processor TDP (watts)	Heat sink	Fan type	Processor Qty	Support DIMMs ≥ 96 GB
4 x 2.5"	2 x 7mm NVMe	25°C ^{Note 1}	320 ≤ TDP ≤ 400	P	P	1 or 2	Y1
		25°C ^{Note 3}	320 ≤ TDP ≤ 400	A	P	2	Y1
		30°C	200 ≤ TDP ≤ 300	A	P	2	Y3
		35°C	200 ≤ TDP ≤ 400	D	S or P	2	Y8
		35°C	200 ≤ TDP ≤ 300	P	P	1 or 2	Y2
	2 x 7mm SATA	30°C	200 ≤ TDP ≤ 300	P	S	1 or 2	Y5
		35°C	200 ≤ TDP ≤ 400	D	S or P	2	Y8
		35°C	200 ≤ TDP ≤ 300	P	P	1 or 2	Y2
	2 x 2.5" NVMe/ U.2/U.3	25°C ^{Note 1, 2, and 3}	320 ≤ TDP ≤ 400	A	P	2	Y5
	2 x 2.5" SAS/ SATA/ NVMe/ U.2/U.3	30°C	200 ≤ TDP ≤ 300	P	P	1 or 2	Y5
8 x 2.5"	2 x 7mm NVMe	25°C ^{Note 1}	320 ≤ TDP ≤ 400	P	P	1 or 2	Y1
		25°C ^{Note 1, 2, and 3}	320 ≤ TDP ≤ 400	A	P	2	Y1
		30°C	200 ≤ TDP ≤ 300	P	P	1 or 2	Y1
		30°C	200 ≤ TDP ≤ 300	A	P	2	Y3
		35°C	200 ≤ TDP ≤ 400	D	S or P	2	Y8
	2 x 7mm SATA	30°C	200 ≤ TDP ≤ 240	P	S	1 or 2	Y2
		30°C	200 ≤ TDP ≤ 300	P	P	1 or 2	Y1
		35°C	200 ≤ TDP ≤ 400	D	S or P	2	Y8

Front bays	Rear bays	Max. Temp.	Processor TDP (watts)	Heat sink	Fan type	Processor Qty	Support DIMMs ≥ 96 GB
	2 x 2.5" SAS/ SATA/ NVMe/ U.2/U.3	30°C	$200 \leq \text{TDP} \leq 300$	P	P	1 or 2	Y5
10 x 2.5"	2 x 7mm NVMe	25°C ^{Note 1}	$320 \leq \text{TDP} \leq 400$	P	P	1 or 2	Y1
		30°C	$200 \leq \text{TDP} \leq 300$	P	P	1 or 2	Y1
	2 x 7mm SATA	30°C	$200 \leq \text{TDP} \leq 300$	P	P	1 or 2	Y1
	2 x 2.5" SAS/ SATA/ NVMe/ U.2/U.3	30°C	$200 \leq \text{TDP} \leq 300$	P	P	1 or 2	Y5
10 x 2.5" (Gen 4)	2 x 7mm NVMe	25°C ^{Note 1, 2, and 3}	$320 \leq \text{TDP} \leq 400$	A	P	2	Y1
		30°C	$200 \leq \text{TDP} \leq 300$	A	P	2	Y3
10 x 2.5" NVMe (Gen 4)	2 x 7mm NVMe 2 x 7mm SATA	35°C	$200 \leq \text{TDP} \leq 400$	D	S or P	2	Y7
10 x 2.5" Any-Bay (Gen 5)	2 x 7mm NVMe 2 x 7mm SATA	35°C	$200 \leq \text{TDP} \leq 400$	D	S or P	2	Y7

Front bays	Rear bays	Max. Temp.	Processor TDP (watts)	Heat sink	Fan type	Processor Qty	Support DIMMs ≥ 96 GB
16 EDSF-F	2 x 7mm NVMe	30°C	200 ≤ TDP ≤ 400	D	S	2	Y2
		35°C	200 ≤ TDP ≤ 400	D	P	2	Y6
		30°C	200 ≤ TDP ≤ 300	P	P	1 or 2	Y1
	2 x 7mm SATA	30°C	200 ≤ TDP ≤ 400	D	S	2	Y7
		35°C	200 ≤ TDP ≤ 400	D	P	2	Y6
		30°C	200 ≤ TDP ≤ 300	P	P	1 or 2	Y1

Notes:

1. This line of thermal rule is applicable to the server installed with the processor 9555 / 9555P / 9565 / 9645 / 9655 / 9655P / 9745 / 9825 / 9845.
2. This line of thermal rule is applicable to the server installed with the processor 9175F / 9275F / 9375F / 9475F / 9575F.
3. If 9184X / 9384X / 9175F / 9275F / 9375F is installed and under UEFI Maximum Performance Mode, the processor temperature might reach 95°C in all configurations, and the processor frequency will be impacted but still meet AMD specifications.

Server models with GPUs

This section provides thermal information for server models with GPUs.

Your server supports the following GPU:

- NVIDIA® A2
- NVIDIA® L4

Front bays	Max. Temp.	Process- or TDP (watts)	Heat sink	Fan type	Max. GPU Qty.		Processor Qty.	Support DIMMs ≥ 96 GB
					Front	Rear		
4 x 3.5"	30°C	$200 \leq \text{TDP} \leq 300$	P	P	NA	3	1 or 2	Y5
	35°C	$200 \leq \text{TDP} \leq 400$	D	P	NA	2	2	Y5
	35°C	$200 \leq \text{TDP} \leq 240$	P	P	NA	2	1 or 2	Y5
4 x 2.5"	25°C ^{Note 1}	$320 \leq \text{TDP} \leq 400$	A	P	NA	2	2	Y1
	30°C	$240 < \text{TDP} \leq 300$	P	P	1	3	1 or 2	Y5
	35°C	$200 \leq \text{TDP} \leq 400$	D	P	NA	2	2	Y5

Front bays	Max. Temp.	Process- or TDP (watts)	Heat sink	Fan type	Max. GPU Qty.		Processor Qty.	Support DIMMs ≥ 96 GB
					Front	Rear		
	35°C	200 ≤ TDP ≤ 240	P	P	1	3	1 or 2	Y5
8 x 2.5"	30°C	200 ≤ TDP ≤ 300	P	P	NA	3	1 or 2	Y5
	35°C	200 ≤ TDP ≤ 400	D	P	NA	2	2	Y5
	35°C	200 ≤ TDP ≤ 240	P	P	NA	2	1 or 2	Y5
10 x 2.5"	30°C	200 ≤ TDP ≤ 300	P	P	NA	3	1 or 2	Y5
	35°C	200 ≤ TDP ≤ 240	P	P	NA	2	1 or 2	Y5
10 x 2.5" NVMe (Gen 4)	35°C	200 ≤ TDP ≤ 400	D	P	NA	2	2	Y5
10 x 2.5" AnyBay (Gen 5)	35°C	200 ≤ TDP ≤ 400	D	P	NA	2	2	Y5
16 EDSFF	30°C	200 ≤ TDP ≤ 400	D	P	NA	2	2	Y5
	30°C	200 ≤ TDP ≤ 300	P	P	NA	2	1 or 2	Y5
Notes: 1. If 9184X / 9384X / 9175F / 9275F / 9375F is installed and under UEFI Maximum Performance Mode, the processor temperature might reach 95°C in all configurations, and the processor frequency will be impacted but still meet AMD specifications.								

Power on and power off the server

Follow the instructions in this section to power on and power off the server.

Power on the server

After the server performs a short self-test (power status LED flashes quickly) when connected to input power, it enters a standby state (power status LED flashes once per second).

The server can be turned on (power LED on) in any of the following ways:

- You can press the power button.
- The server can restart automatically after a power interruption.
- The server can respond to remote power-on requests sent to the Lenovo XClarity Controller.

For information about powering off the server, see [“Power off the server” on page 65](#).

Power off the server

The server remains in a standby state when it is connected to a power source, allowing the Lenovo XClarity Controller to respond to remote power-on requests. To remove all power from the server (power status LED off), you must disconnect all power cables.

Power button location and power LED are specified in:

- [Chapter 2 “Server components” on page 19](#)
- [“Troubleshooting by system LEDs and diagnostics display” on page 499](#)

To place the server in a standby state (power status LED flashes once per second):

Note: The Lenovo XClarity Controller can place the server in a standby state as an automatic response to a critical system failure.

- Start an orderly shutdown using the operating system (if supported by your operating system).
- Press the power button to start an orderly shutdown (if supported by your operating system).
- Press and hold the power button for more than 4 seconds to force a shutdown.

When in a standby state, the server can respond to remote power-on requests sent to the Lenovo XClarity Controller. For information about powering on the server, see [“Power on the server” on page 64](#).

Server replacement

Follow instructions in this section to remove and install the server.

- [“Remove the server from rack” on page 65](#)
- [“Install the server to rack” on page 68](#)

Remove the server from rack

Follow instructions in this section to remove the server from the rack.

S036



18 - 32 kg (39 - 70 lb)



32 - 55 kg (70 - 121 lb)

CAUTION:
Use safe practices when lifting.

S006



CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).

CAUTION:

Make sure to have three people operate the server removal procedures to prevent injury.

Procedure

Step 1. Loosen the two **2** screws located on the **1** rack latches to disengage it from the rack.

Rack front

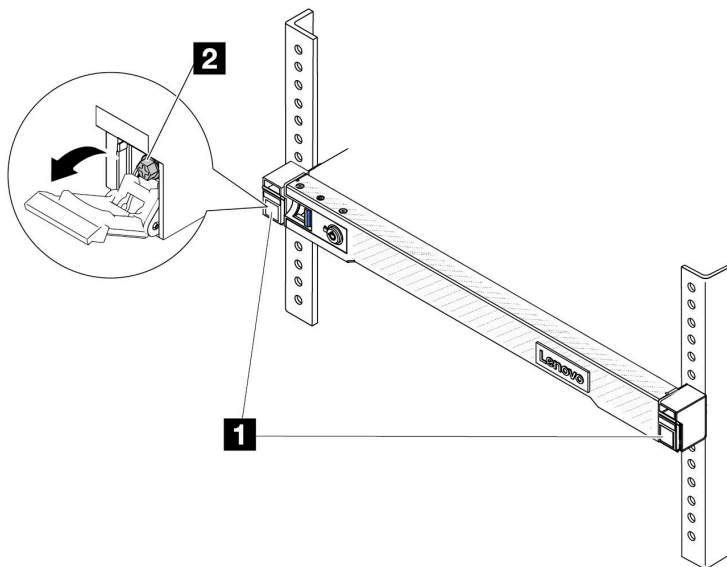


Figure 20. Disengaging server from the rack

Step 2. Hold the mounting ears on the front of the server; then, slide the server all the way out until it stops.

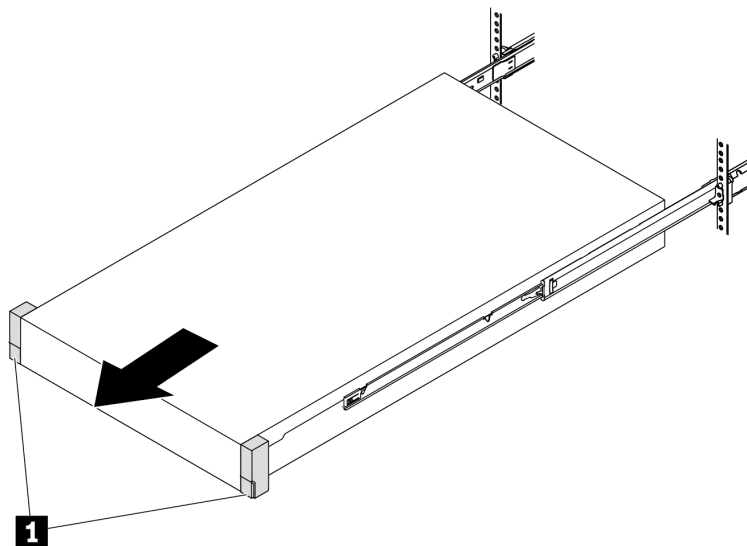


Figure 21. Pulling out the server

1

Mounting ears

Step 3. Remove the server from the rack.

CAUTION:

Make sure three people are lifting the sever by holding the lift points

Rack front

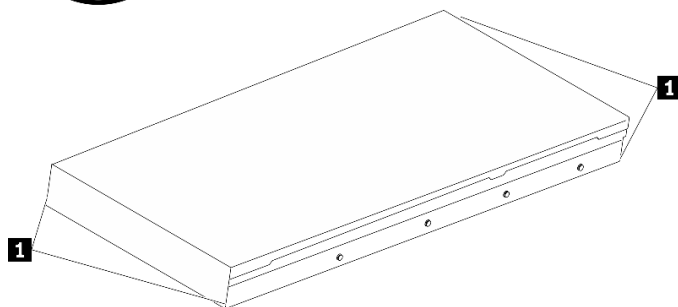


Figure 22. Lifting up the server

1

Lift points

Rack Front

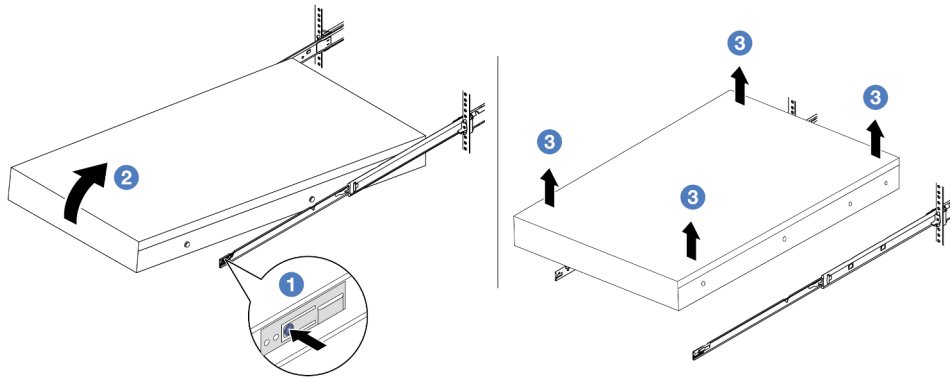


Figure 23. Removing the server from the rack.

- 1** Press the release tabs to disengage the rails from the server.
- 2** Carefully lift up the front end of the server slightly to detach the nailheads from the slots on the rails.
- 3** With three people, lift up the server to remove it from the rails completely. Place the server on a flat and sturdy surface.

After you finish

Carefully lay the server on a flat, static-protective surface.

Demo video

<https://www.youtube.com/watch?v=fo2RyxINIDg>

Install the server to rack

Follow instructions in this section to install the server to the rack.

S036



18 - 32 kg (39 - 70 lb)



32 - 55 kg (70 - 121 lb)

CAUTION:
Use safe practices when lifting.

S006



CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.

About this task

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “[Power off the server](#)” on page 65.

CAUTION:

Make sure to have three people operate the server installation procedures to prevent injury.

Firmware and driver download: You might need to update the firmware or driver after replacing a component.

- Go to <https://datacentersupport.lenovo.com/tw/en/products/servers/thinksystem/sr645v3/7d9c/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to “[Update the firmware](#)” on page 489 for more information on firmware updating tools.

Procedure

Step 1. From the front of the rack, pull the rails all the way out until they stop

Attention: You can only install the server successfully when the rails are fully extended.

Rack front

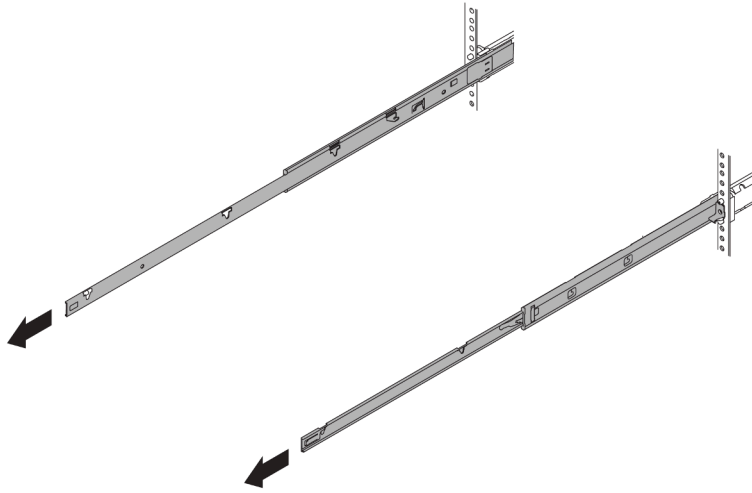


Figure 24. Pulling out the rails

Step 2. Carefully lift up the server with three people.

CAUTION:

Make sure three people are lifting the sever by holding the lift points

Rack front

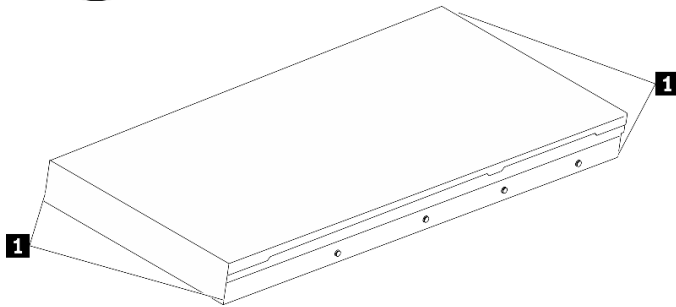
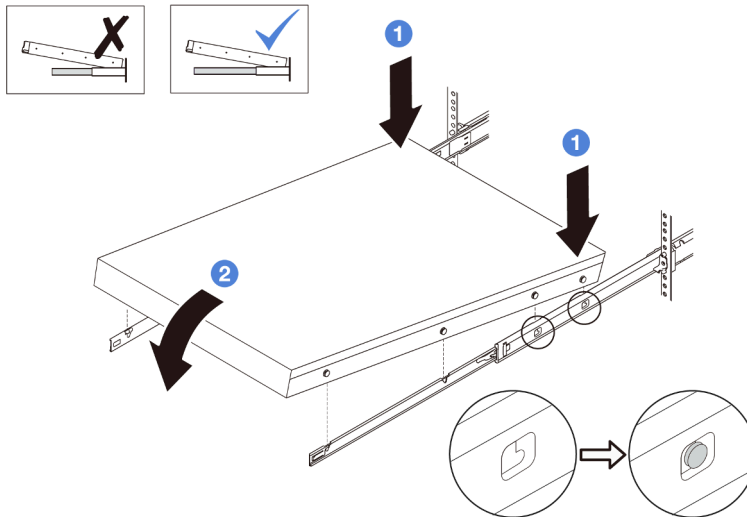


Figure 25. Lifting up the server

1	Lift points
----------	-------------

Step 3. From the front of the rack, install server into the rails.

Attention: You can only install the server successfully when the rails are fully extended.



- 1** Tilt the server and slowly lower its rear end; then, push the rails toward the server and make sure the farthest nailheads on server's left and right side go into the slots on the rail.
- 2** Slowly lower the server down and make sure the other 3 nailheads on server's left and right side slip into corresponding slots.

Step 4. Slide the server into rack.

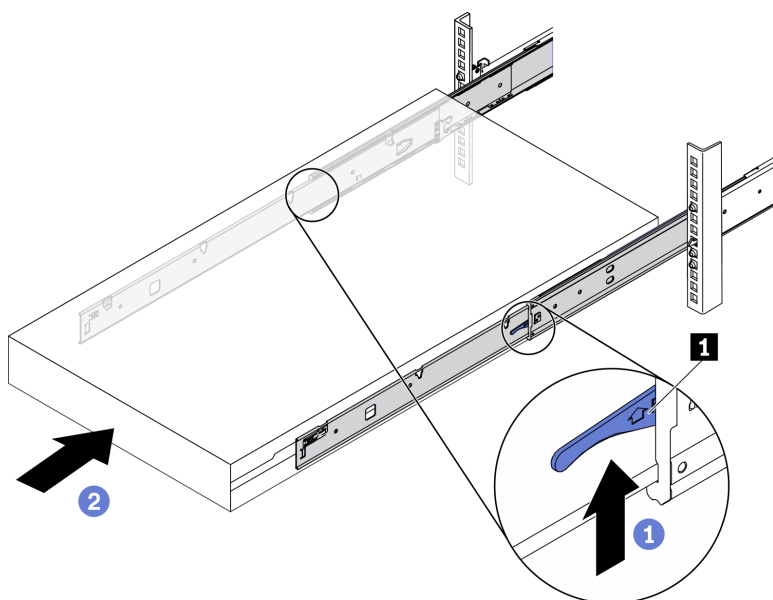


Figure 26. Installing the server into the rack

1	Latch
----------	-------

- a. **1** Push up the latches on the rails.
- b. **2** Push the server all the way into the rack until both latches lock into position with a click.

Step 5. (Optional) Secure the server to the rack.

- a. Install one M6 screw to each of the rails to secure the server to the rear of the rack.

Rack rear

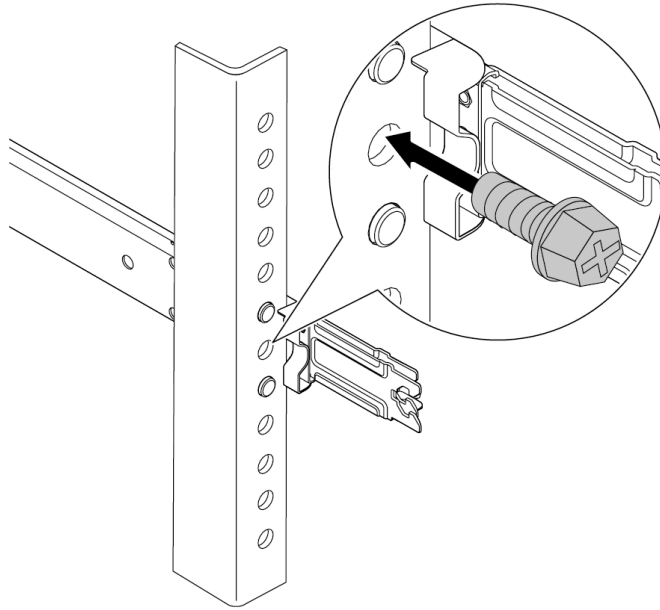


Figure 27. Securing the server to the rear of the rack

- b. Secure the server to the front of the rack. Fasten the two screws located on the front of the server.

Rack front

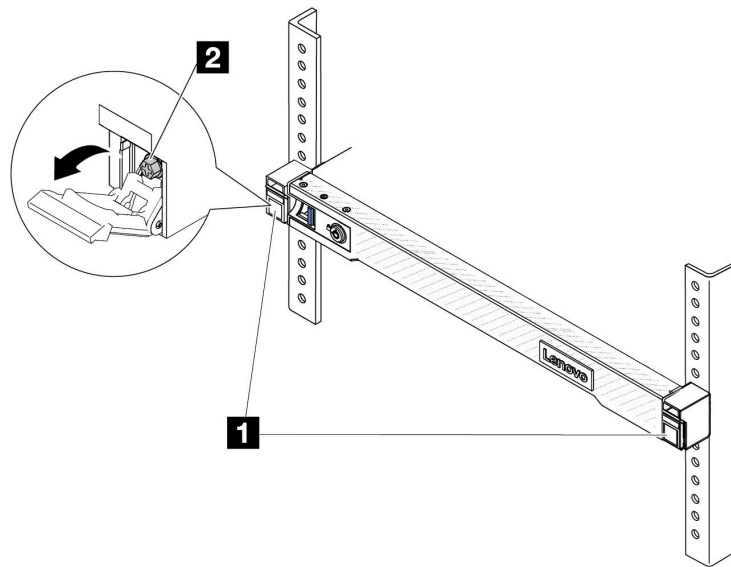


Figure 28. Securing the server to the front of the rack

1	Latches
2	Screw

After you finish

1. Reconnect the power cords and any cables that you removed.
2. Power on the server and any peripheral devices. See [“Power on the server” on page 64](#).
3. Update the server configuration. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=H7tTLsPmPG0>

CMOS battery (CR2032) replacement

Use this information to remove and install the CMOS battery.

- [“Remove the CMOS battery” on page 74](#)
- [“Install the CMOS battery” on page 77](#)

Remove the CMOS battery

Use this information to remove the CMOS battery.

About this task

The following tips describe information that you must consider when removing the CMOS battery.

- Lenovo has designed this product with your safety in mind. The lithium CMOS battery must be handled correctly to avoid possible danger. If you replace the CMOS battery, you must adhere to local ordinances or regulations for battery disposal.

- If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.
- To order replacement batteries, call your support center or business partner. For Lenovo support telephone numbers, see <https://datacentersupport.lenovo.com/supportphonelist> for your region support details.

Note: After you replace the CMOS battery, you must reconfigure the server and reset the system date and time.

S004



CAUTION:

When replacing the lithium battery, use only Lenovo specified part number or an equivalent type of battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

S002



CAUTION:

The power-control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 2. Remove any parts and disconnect any cables that might impede your access to the CMOS battery.
- Step 3. Locate the CMOS battery. See [“System-board-assembly connectors” on page 36](#).
- Step 4. Open the battery clip as shown and carefully take the CMOS battery out of the socket.

Attention:

- Failing to remove the CMOS battery properly might damage the socket on the processor board. Any damage to the socket might require replacing the processor board.
- Do not tilt or push the CMOS battery by using excessive force.

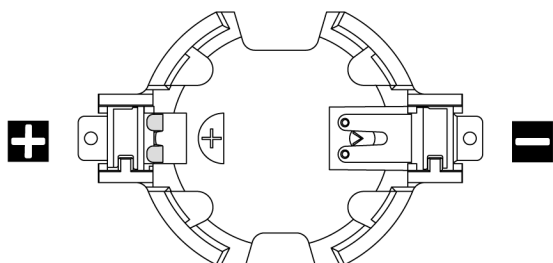


Figure 29. The positive and negative end on the CMOS battery socket

Note: Before you remove or install the CMOS battery from or into the socket, differentiate between the positive and negative ends. Use the illustration above for guidance.

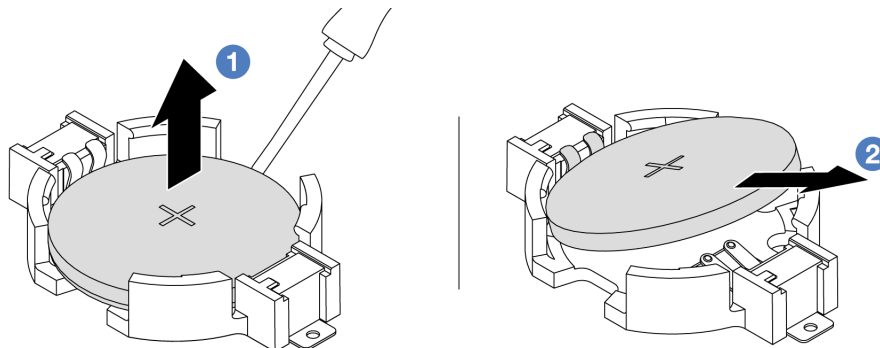


Figure 30. CMOS battery removal

1. ① Pry the CMOS battery from the socket with a flat-blade screwdriver.
2. ② Remove the CMOS battery.

After you finish

1. Install a new one. See [“Install the CMOS battery” on page 77](#).
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.
3. Dispose of the CMOS battery as required by local ordinances or regulations.

Demo video

<https://www.youtube.com/watch?v=qfMZxUL-Mhc>

Install the CMOS battery

Use this information to install the CMOS battery.

About this task

The following tips describe information that you must consider when installing the CMOS battery.

- Lenovo has designed this product with your safety in mind. The lithium CMOS battery must be handled correctly to avoid possible danger. If you replace the CMOS battery, you must adhere to local ordinances or regulations for battery disposal.
- If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.
- To order replacement batteries, call your support center or business partner. For Lenovo support telephone numbers, see <https://datacentersupport.lenovo.com/supportphonelist> for your region support details.

Note: After you replace the CMOS battery, you must reconfigure the server and reset the system date and time.

S004



CAUTION:

When replacing the lithium battery, use only Lenovo specified part number or an equivalent type of battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- Throw or immerse into water
- Heat to more than 100°C (212°F)
- Repair or disassemble

Dispose of the battery as required by local ordinances or regulations.

S002



CAUTION:

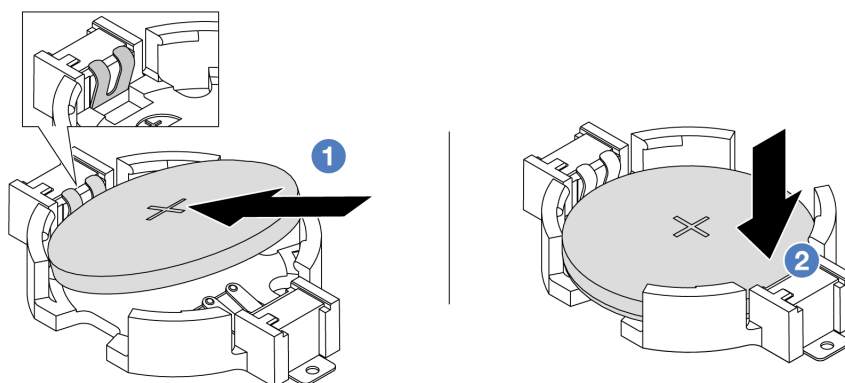
The power-control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “[Power off the server](#)” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the CMOS battery to any unpainted surface on the outside of the server. Then, take the CMOS battery out of the package.
- Step 2. Install the CMOS battery. Ensure that the CMOS battery is seated in place.



Note: Before you install the battery into the socket, make sure that the positive side faces upward.

1. **1** Tilt the battery and insert it to the positive end on the socket, and make sure that the battery goes tight to the metal clip.
2. **2** Press the battery down until it clicks into the socket.

Figure 31. CMOS battery installation

After you finish

1. Complete the parts replacement. See “[Complete the parts replacement](#)” on page 322.
2. Use the Setup utility to set the date, time, and any passwords.

Demo video

<https://www.youtube.com/watch?v=SiVSDzQ6LC8>

EDSFF cage replacement

Use this information to remove and install an EDSFF cage

- “[Remove an EDSFF cage](#)” on page 78
- “[Install an EDSFF cage](#)” on page 80

Remove an EDSFF cage

Use this information to remove an EDSFF cage.

About this task

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “[Power off the server](#)” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. If the security bezel is installed, remove it first. See “[Remove the security bezel](#)” on page 284.
- Step 2. Locate the EDSFF cage you need to remove, and then remove all the EDSFF drives installed in it. See “[Remove an EDSFF drive](#)” on page 123.
- Step 3. Remove the top cover. See “[Remove the top cover](#)” on page 318.
- Step 4. Remove the EDSFF cage from the chassis.

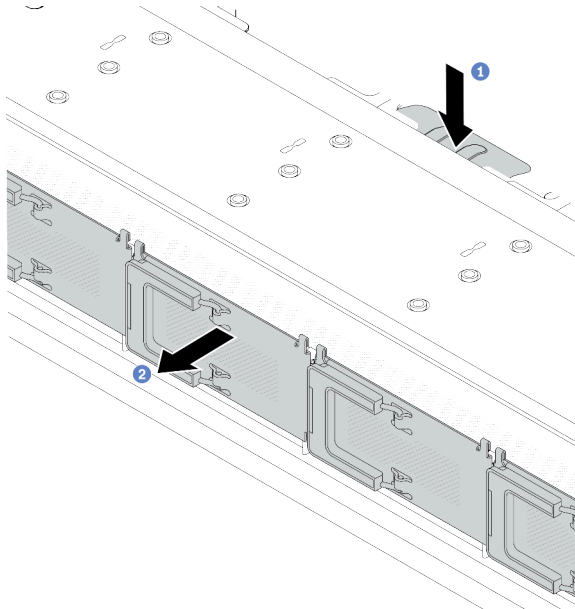


Figure 32. EDSFF cage removal

- a. **1** Press down the extended tab on the other side of the front chassis.
- b. **2** Slide the EDSFF cage out of the front chassis.

After you finish

1. Install a new EDSFF cage. See “[Install an EDSFF cage](#)” on page 80.
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=aj1BMZukolc>

Install an EDSFF cage

Use this information to install an EDSFF cage.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the EDSFF cage to any unpainted surface on the outside of the server. And then, take the EDSFF cage out of the package and place it on a static-protective surface.
- Step 2. Slide the diagnostics panel assembly into the front chassis as shown. And ensure that it is seated in place.

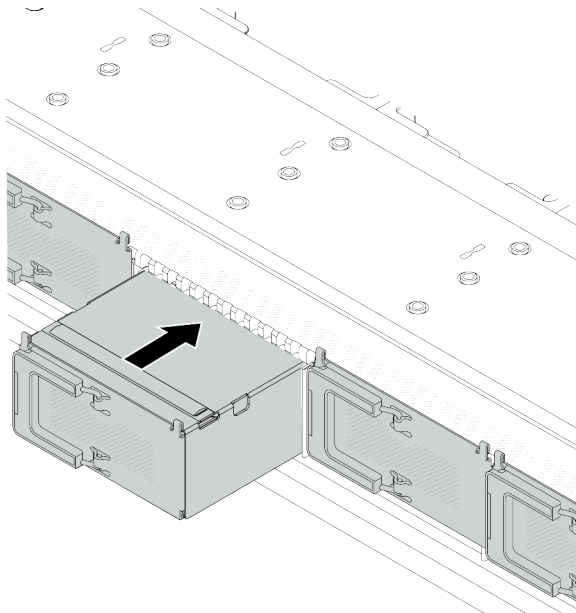


Figure 33. EDSFF cage installation

Step 3. Remove the EDSFF drive cage cover.

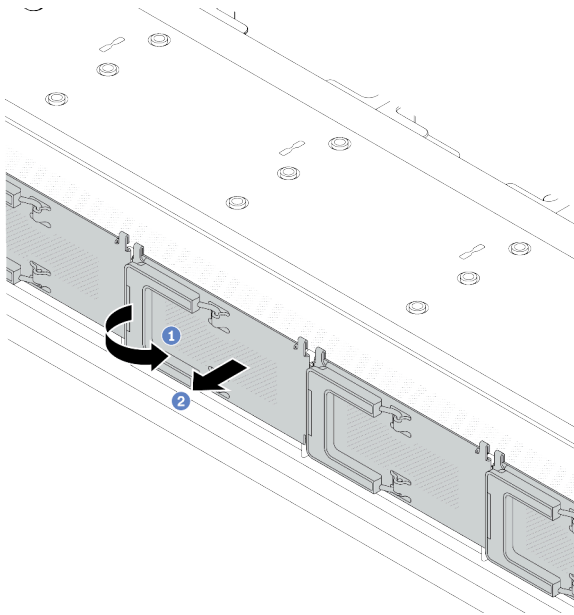


Figure 34. EDSFF drive cage cover removal

- a. ① Open the handle as shown.
- b. ② Grasp the handle and remove the drive cage cover.

Step 4. Install EDSFF drives into the EDSFF cage. See [“Install an EDSFF drive” on page 125](#).

Step 5. Install the drive cage cover.

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=-qJwO-OuzRA>

Front drive backplane replacement

Use this information to remove and install a front drive backplane.

- [“Remove the front 2.5'' drive backplane” on page 81](#)
- [“Install the front 2.5'' drive backplane” on page 83](#)
- [“Remove the front 3.5'' drive backplane” on page 85](#)
- [“Install the front 3.5'' drive backplane” on page 86](#)
- [“Remove the front 16-EDSFF drive backplane” on page 87](#)
- [“Install the front 16-EDSFF drive backplane” on page 89](#)

Remove the front 2.5'' drive backplane

Use this information to remove the backplane for four, eight, or ten 2.5'' hot-swap drives.

About this task

The following describes how to remove the backplane for ten 2.5" hot-swap drives. You can remove the backplane for four or eight 2.5" hot-swap drives in the same way.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 2. Remove all the installed drives and drive fillers from the drive bays. See [“Remove a 2.5"/3.5" hot-swap drive” on page 119](#).
- Step 3. Disconnect the cables from the backplane. See [Chapter 6 “Internal cable routing” on page 325](#). If the cable connectors come with protective dust caps, make sure to put them back on.
- Step 4. Grasp the backplane and carefully lift it out of the chassis.

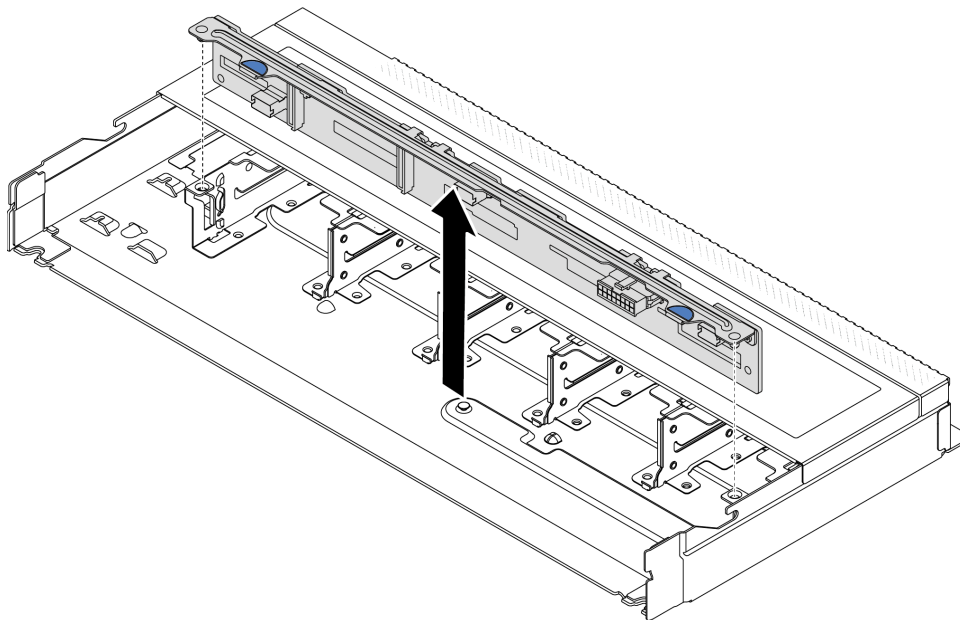


Figure 35. Removal of backplane for ten 2.5" hot-swap drives

- Step 5. Remove the backplane from its bracket.

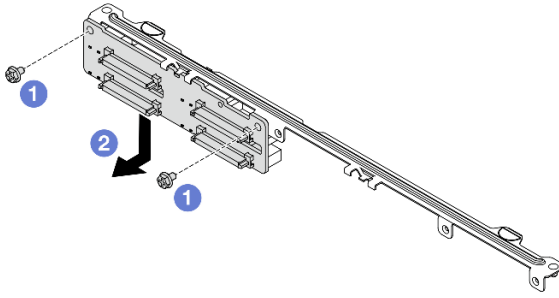


Figure 36. Removing a backplane

- a. ① Loosen two screws that lock the bracket.
- b. ② Slide the backplane down and remove it as illustrated above.

Note: The removal of 4 x 2.5-inch drive backplane with a short bracket is the same.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

https://www.youtube.com/watch?v=rOkbOyP_BEc

Install the front 2.5" drive backplane

Use this information to install the backplane for four, eight, or ten 2.5" hot-swap drives.

About this task

The following describes how to install the backplane for ten 2.5" hot-swap drives. You can install the backplane for four or eight 2.5" hot-swap drives in the same way.

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “[Power off the server](#)” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the backplane to any unpainted surface on the outside of the server. And then, take the backplane out of the package and place it on a static-protective surface.
- Step 2. Install the backplane to the bracket.

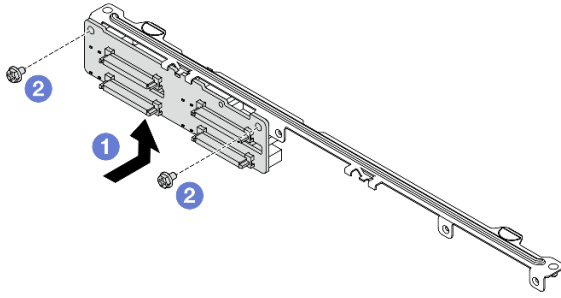


Figure 37. Installing a backplane

- a. ① Install the backplane as illustrated above and align the screw holes on the backplane and bracket.
- b. ② Tighten two screws to secure the backplane to the bracket.

Note: The installation of 4 x 2.5-inch drive backplane with a short bracket is the same.

Step 3. Align the two pins on the backplane with the corresponding holes in the chassis.

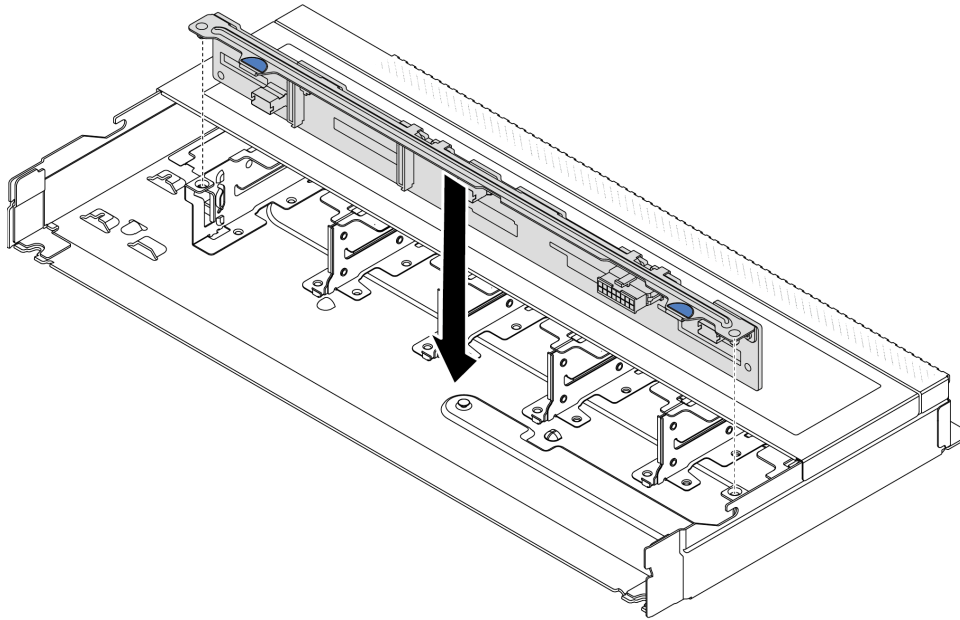


Figure 38. Installation of backplane for ten 2.5" hot-swap drives

- Step 4. Lower the backplane into the chassis. Ensure that the pins pass through the holes and the backplane is fully seated in place.
- Step 5. Connect the cables to the backplane. See [Chapter 6 “Internal cable routing” on page 325](#). If the cable connectors come with protective dust caps, make sure to remove them before plugging in.

After you finish

1. Reinstall all the drives and drive fillers into the drive bays. See [“Install a 2.5"/3.5" hot-swap drive” on page 121](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=4EOmEG4oIHU>

Remove the front 3.5" drive backplane

Use this information to remove the front 3.5" drive backplane.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Note: Depending on the specific type, your backplane might look different from the illustration in this topic.

Step 1. Prepare your server.

- a. Remove the top cover. See [“Remove the top cover” on page 318](#).
- b. Remove all installed drives and fillers (if any) from the drive bays. See [“Remove a 2.5"/3.5" hot-swap drive” on page 119](#).

Step 2. Record the cable connections on the backplane and then disconnect all cables from the backplane. See [Chapter 6 “Internal cable routing” on page 325](#). If the cable connectors come with protective dust caps, make sure to put them back on.

Step 3. Remove the backplane from the chassis.

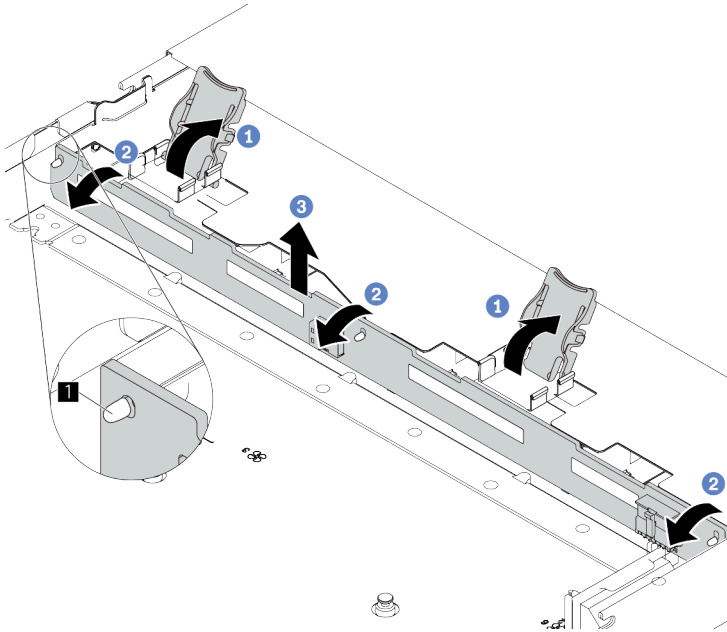


Figure 39. 3.5" drive backplane removal

- a. ① Open the release latches that secure the backplane.
- b. ② Pivot the backplane backward slightly to release it from the three pins ❶ on the chassis.
- c. ③ Carefully remove the backplane out of the chassis.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=WHksE5iSFIA>

Install the front 3.5" drive backplane

Use this information to install the front 3.5" drive backplane.

About this task

Attention:

- Read “Installation Guidelines” on page 49 and “Safety inspection checklist” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the backplane to any unpainted surface on the outside of the server. Then, take the backplane out of the package and place it on a static-protective surface.
- Step 2. Put the backplane down into place.

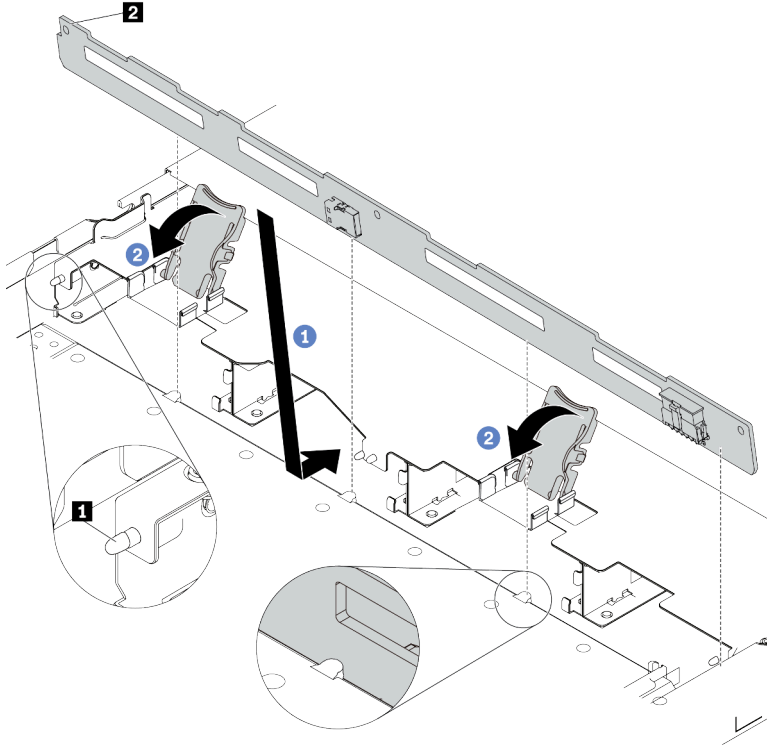


Figure 40. Installation of backplane for four 3.5" hot-swap drives

- a. **1** Put the backplane under the front I/O assembly cables, align it with the chassis, and lower it into the chassis. Put the backplane into place with it leaning backward slightly so that the three pins **1** on the chassis pass through the three holes **2** in the backplane.
 - b. **2** Close the release latches to secure the backplane in place.
- Step 3. Connect the cables to the system board assembly and the backplane. See [Chapter 6 “Internal cable routing” on page 325](#). If the cable connectors come with protective dust caps, make sure to remove them before plugging in.

After you finish

1. Reinstall all the drives and drive fillers into the drive bays. See [“Install a 2.5"/3.5" hot-swap drive” on page 121](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=HTJXVxL3YgQ>

Remove the front 16-EDSFF drive backplane

Use this information to remove the backplane for front 16 EDSFF drives.

About this task

Attention:

- Read “Installation Guidelines” on page 49 and “Safety inspection checklist” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See “Remove the top cover” on page 318.
- Step 2. Remove all the installed drives and drive cages from the drive bays. See “Remove an EDSFF drive” on page 123.
- Step 3. Disconnect the cables from the backplane. See “16-EDSFF drive backplane” on page 484. If the cable connectors come with protective dust caps, make sure to put them back on.
- Step 4. Remove the backplane from the chassis.

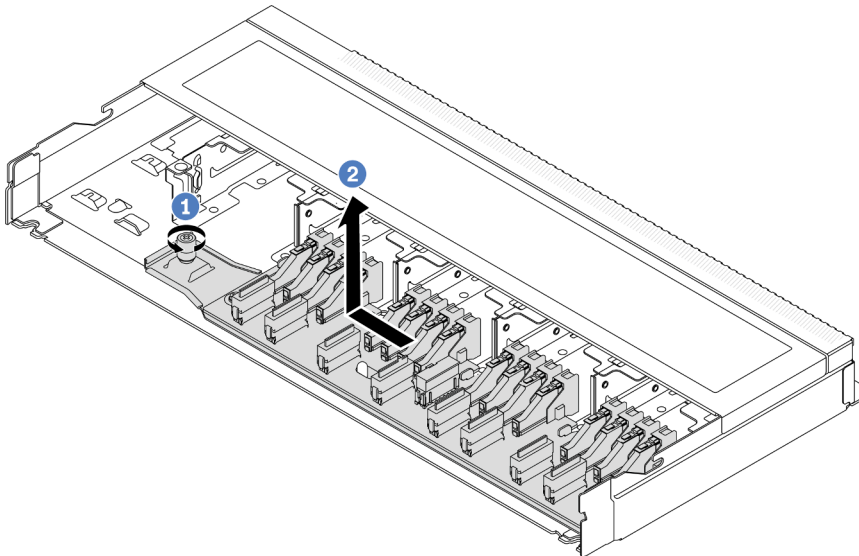


Figure 41. Removal of backplane for 16 EDSFF drives

- a. 1 Loosen the screw.
- b. 2 Slightly slide the backplane as shown and then lift it up.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=y9z8O6rwFDk>

Install the front 16-EDSFF drive backplane

Use this information to install the backplane for front 16 EDSFF drives.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the backplane to any unpainted surface on the outside of the server. And then, take the backplane out of the package and place it on a static-protective surface.
- Step 2. Connect the cables to the backplane. See [Chapter 6 “Internal cable routing” on page 325](#).
- Step 3. Put the backplane down into place.

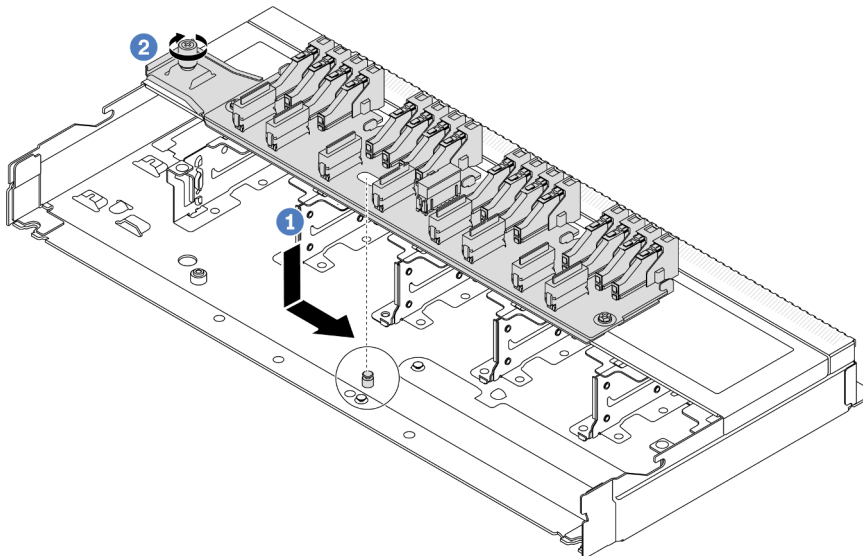


Figure 42. Installation of backplane for 16 EDSFF drives

- a. **1** Align the hole on the backplane with the pin on the chassis, place it down, and slightly slide it as shown.
 - b. **2** Tighten the screw to secure the backplane.
- Step 4. Connect the cables to the system board assembly and the backplane. See [Chapter 6 “Internal cable routing” on page 325](#). If the cable connectors come with protective dust caps, make sure to remove them before plugging in.

After you finish

1. Reinstall all the drives and drive cages into the drive bays. See [“Install an EDSFF drive” on page 125](#).

2. Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=bB8sKxHTuHU>

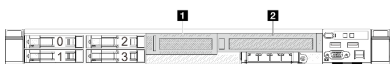
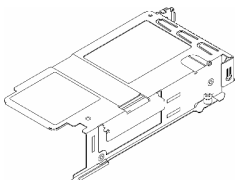
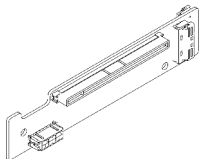
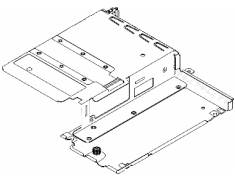
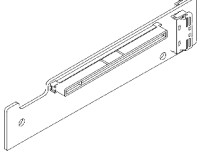
Front riser assembly replacement

A complete front riser assembly consists of two front riser cages, two front riser cards and two PCIe adapters. See this topic to understand how to remove and assemble a front riser assembly.

Server front configuration and riser assemblies

See this section to identify the correlations between the front configuration and riser assemblies.

Table 29. Server front configuration and riser assemblies

Server front configuration	Riser 3 assembly	Riser 4 assembly
 <p>Figure 43. Two front PCIe slots</p>	 <p>Figure 44. Riser 3 LP bracket</p>  <p>Figure 45. Riser 3 card</p>	 <p>Figure 46. Riser 4 FH bracket</p>  <p>Figure 47. Riser 4 card</p>

- [“Front riser cage replacement” on page 90](#)
- [“Front riser card and PCIe adapter replacement” on page 93](#)

Front riser cage replacement

Follow instructions in this section to remove and install the front riser cage.

- [“Remove the front riser cage” on page 90](#)
- [“Install the front riser cage” on page 92](#)

Remove the front riser cage

Follow the instructions in this section to remove the front riser cage.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover, see [“Remove the top cover” on page 318](#).
- Step 2. Remove the cables connected to the processor board, see [“Front riser assembly” on page 335](#).
- Step 3. Remove the front riser cage.

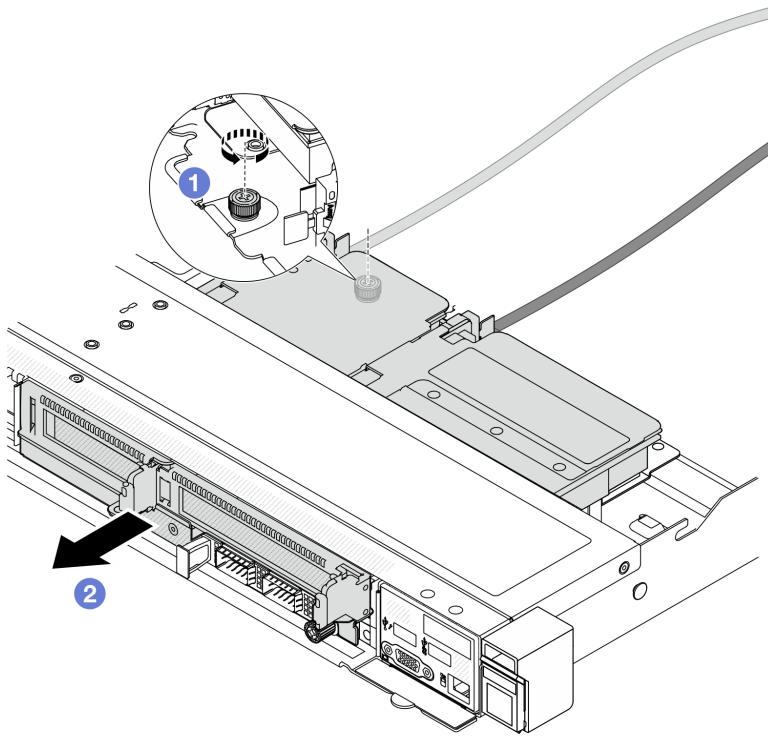


Figure 48. Removing the front riser cage

- a. ① Loosen the screw on the rear of the front riser cage.
 - b. ② Pull the front riser cage out of the chassis.
- Step 4. Remove the front riser assembly and PCIe adapter from the front riser cage, see [“Remove the front riser card and PCIe adapter” on page 93](#).

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

[Watch the procedure on YouTube](#)

Install the front riser cage

Follow the instructions in this section to install the front riser cage.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Install the front riser assembly and PCIe adapter to the front riser cage, see [“Install the front riser card and PCIe adapter” on page 95](#).
- Step 2. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 3. Install the front riser cage.

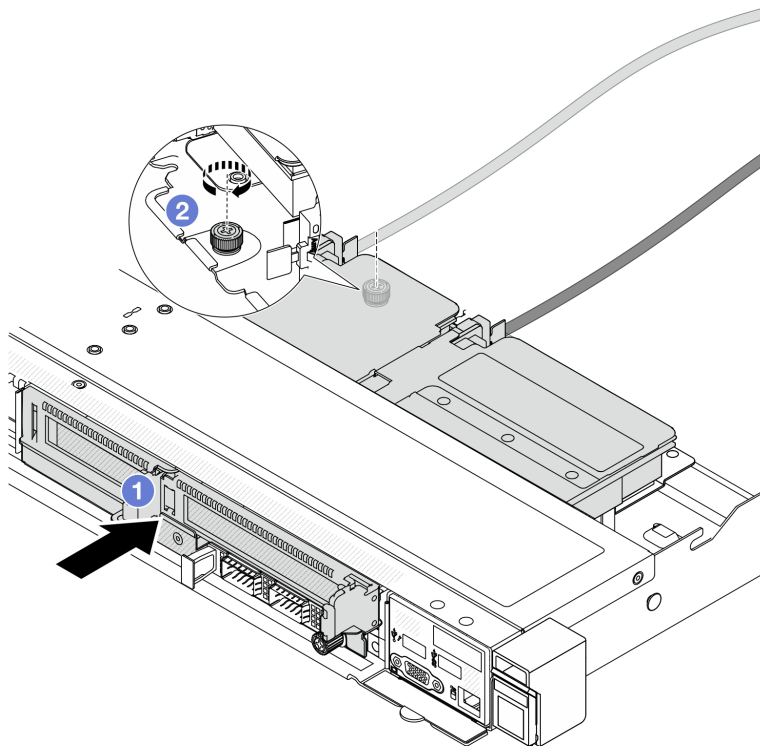


Figure 49. Installing the front riser cage

- a. ① Push the front riser cage into the chassis.

- b. **2** Tighten the screw on the rear of the front riser cage to secure it to the chassis.

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

[Watch the procedure on YouTube](#)

Front riser card and PCIe adapter replacement

Follow instructions in this section to remove and install a front riser assembly and PCIe adapter.

- [“Remove the front riser card and PCIe adapter” on page 93](#)
- [“Install the front riser card and PCIe adapter” on page 95](#)

Remove the front riser card and PCIe adapter

Follow the instructions in this section to remove the front riser card and PCIe adapter.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the front riser cage, see [“Remove the front riser cage” on page 90](#).
- Step 2. Separate the low-profile riser cage from the full-height riser cage.

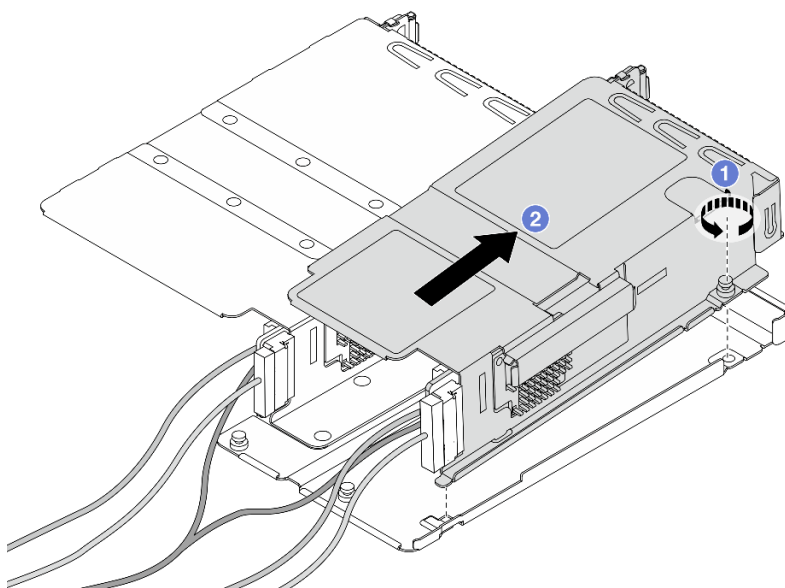


Figure 50. Separating the two cages

- a. ① Loosen the screw that secures the low-profile cage to full-height one.
- b. ② Tilt the cage and lift it out.

Step 3. Remove the PCIe adapter from the riser cage.

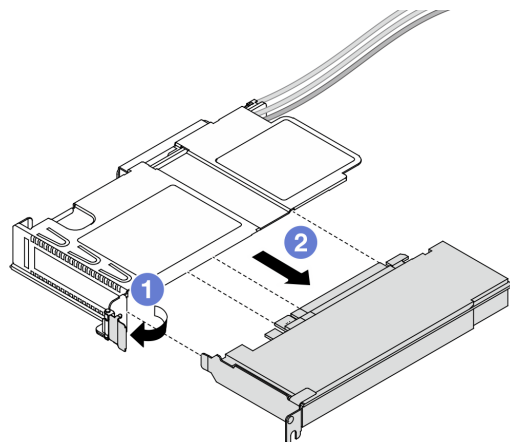


Figure 51. Removing the PCIe adapter

- a. ① Rotate the latch on the riser cage to open position.
- b. ② Disengage the PCIe adapter from the cage.

Step 4. Disconnect the cables from the riser card. For more details, see [“Front riser assembly” on page 335](#).

Step 5. Repeat the previous two steps on the full-height cage.

Step 6. Remove the riser cards from both riser cages.

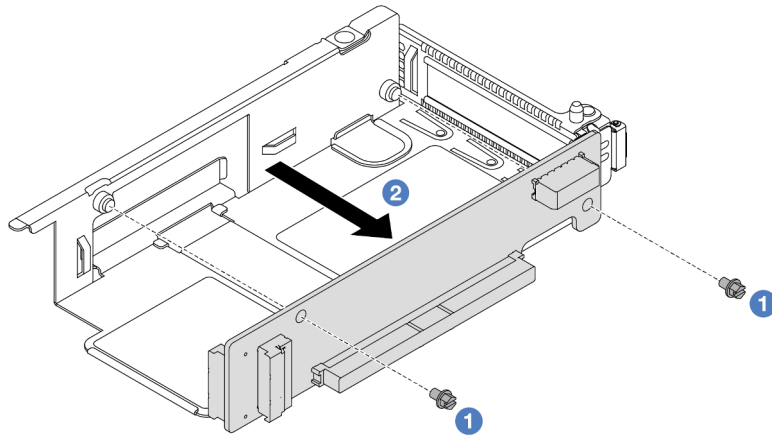


Figure 52. Removing the riser card from low-profile cage

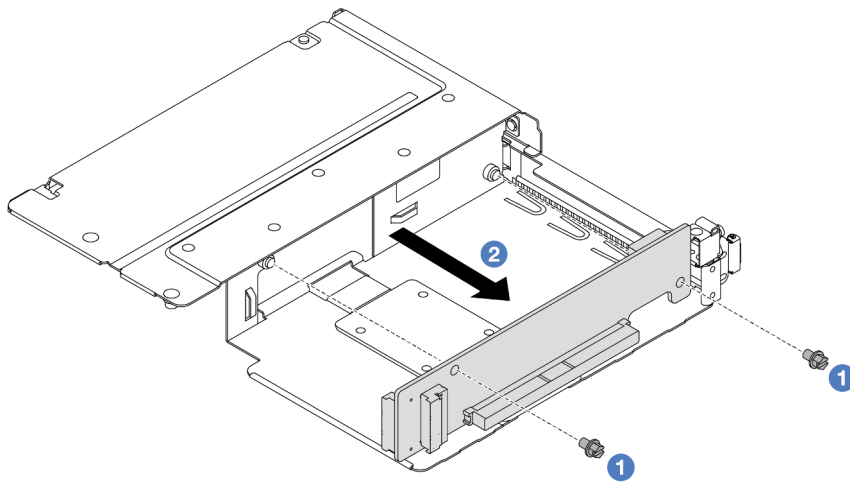


Figure 53. Removing the riser card from full-height cage

- a. ① Remove the two screws that secure the riser card to the cage.
- b. ② Remove the riser card.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

[Watch the procedure on YouTube](#)

Install the front riser card and PCIe adapter

Follow the instructions in this section to install the front riser card and PCIe adapter.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.
- For ThinkSystem AMD X3522 10/25GbE DSFP28 2-port PCIe Ethernet Adapter installed on the front riser card, make sure that the XCC firmware version is KAX3340 or later.

Procedure

- Step 1. Touch the static-protective package that contains the front riser card and PCIe adapter to any unpainted surface on the outside of the server. Then, take the front riser card and PCIe adapter out of the package and place it on a static-protective surface.
- Step 2. Install the front riser cards to both cages.

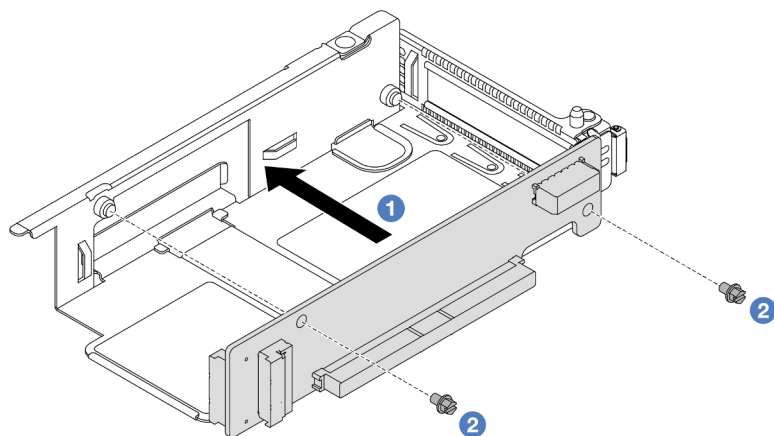


Figure 54. Installing the riser card to low-profile cage

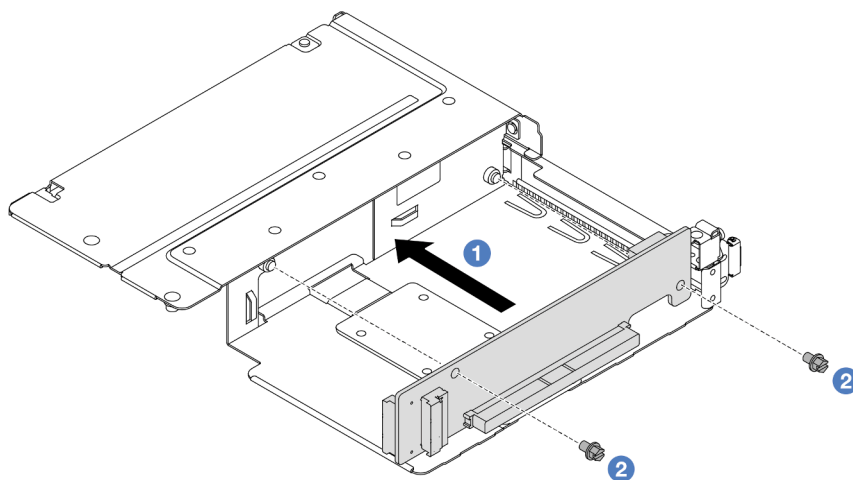


Figure 55. Installing the riser card to full-height cage

- a. ① Align the screw holes on the riser cards with the corresponding ones on the cages.
 - b. ② Install the two screws to secure the riser cards to the cages.
- Step 3. Connect the cables to the riser cards. For more details, see [“Front riser assembly” on page 335](#).
- Step 4. Install the PCIe adapter to the riser cage.

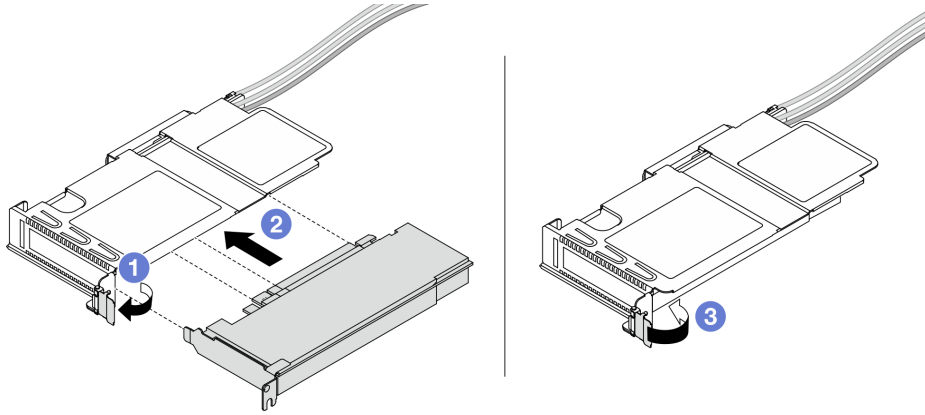


Figure 56. Installing the PCIe adapter

- a. ① Rotate the latch on the riser cage to open position.
 - b. ② Align the PCIe adapter with the PCIe slot on the riser card. Then, carefully press the PCIe adapter straight into the slot until it is securely seated.
 - c. ③ Rotate the latch on the riser cage to close position.
- Step 5. Repeat the previous step on the full-height cage.
- Step 6. Assemble the low-profile riser cage and the full-height riser cage.

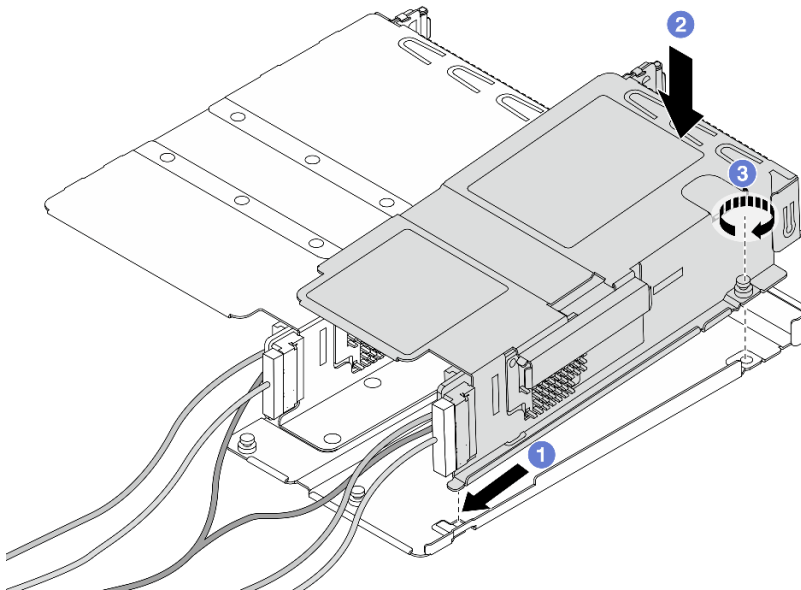


Figure 57. Assembling the two riser cages

- a. ① Tilt the low-profile cage and insert it to the latch on the full-height one.
- b. ② Place the low-profile cage down and align the screw holes.
- c. ③ Tighten the screw and make sure the low-profile cage is secured.

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

[Watch the procedure on YouTube](#)

Front OCP module and OCP interposer card replacement

Some server models support the front OCP module. The front OCP module and the front and rear OCP interposer cards are codependent. Follow instructions in this section to remove and install the front OCP module and the front and rear OCP interposer cards.

- [“Front OCP module replacement” on page 98](#)
- [“OCP interposer card replacement” on page 100](#)

Front OCP module replacement

Follow the instructions in this section to remove or install a front OCP module.

- [“Remove the front OCP module” on page 98](#)
- [“Install the front OCP module” on page 99](#)

Note: The OCP module is available only on some models.

Remove the front OCP module

Follow the steps in this section to remove a front OCP module.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Step 1. Remove the front OCP module.

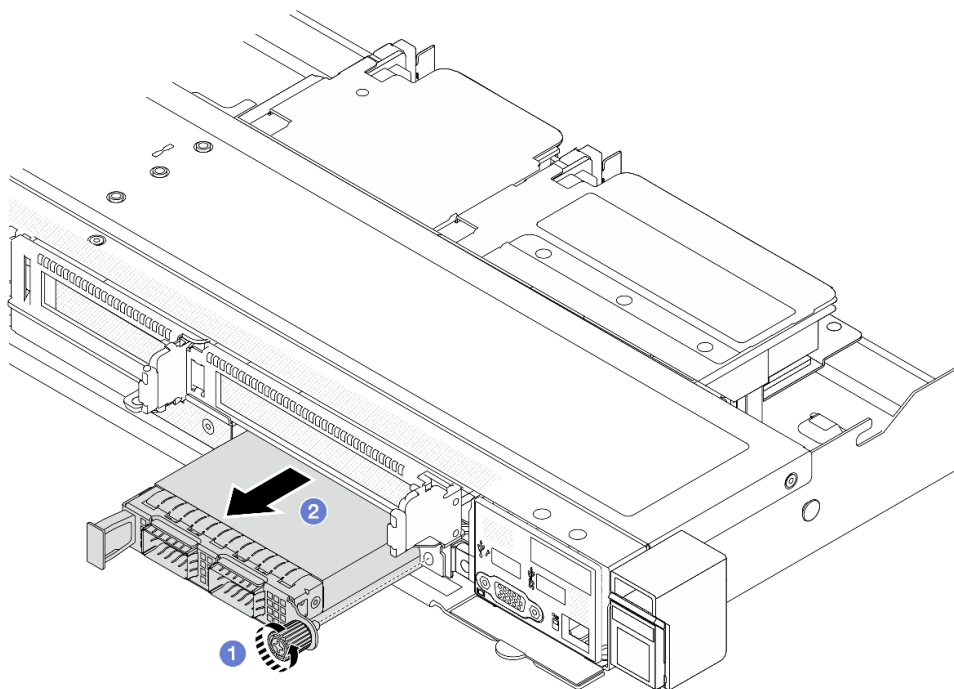


Figure 58. Removing the front OCP module

- a. 1 Loosen the thumbscrew that secures the OCP module. Use a screwdriver if needed.
- b. 2 Pull out the OCP module.

After you finish

1. Install a new front OCP module or a module filler. See [“Install the front OCP module” on page 99](#).
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

[Watch the procedure on YouTube](#)

Install the front OCP module

Follow the steps in this section to install a front OCP module.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the OCP module to any unpainted surface on the outside of the server. Then, take the OCP module out of the package and place it on a static-protective surface.
- Step 2. Install a front OCP module.

Note: Ensure that the Ethernet adapter is fully seated and the thumbscrew is securely tightened. Otherwise, the OCP module will not get full connection and may not function.

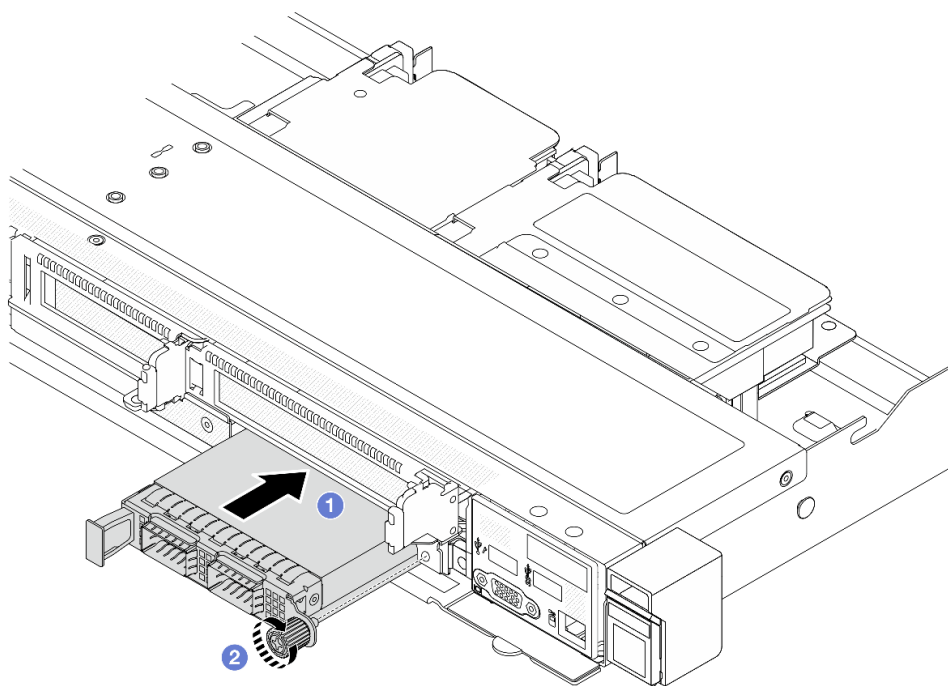


Figure 59. Installing the front OCP module

- a. ① Push the OCP module by its handle on the left until it is fully inserted into the connector on the front OCP interposer card.
- b. ② Fully tighten the thumbscrew to secure the adapter. Use a screwdriver if needed.

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

[Watch the procedure on YouTube](#)

OCP interposer card replacement

Follow the instructions in this section to remove or install the front and rear OCP interposer cards.

- [“Remove the front OCP interposer card” on page 101](#)
- [“Install the front OCP interposer card” on page 102](#)

- [“Remove the rear OCP interposer card” on page 103](#)
- [“Install the rear OCP interposer card” on page 104](#)

Remove the front OCP interposer card

Follow the steps in this section to remove a front OCP interposer card.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 2. Remove the front riser cage. See [“Remove the front riser cage” on page 90](#).
- Step 3. Remove the front OCP module. See [“Remove the front OCP module” on page 98](#).
- Step 4. Remove the front OCP interposer card.

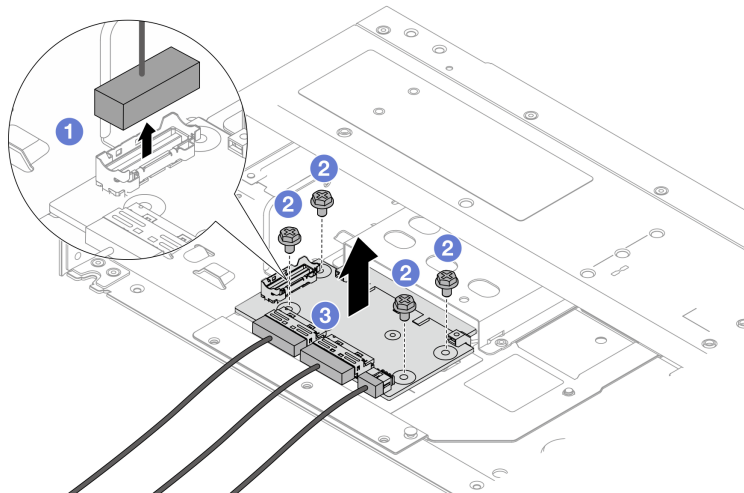


Figure 60. Removing the front OCP interposer card

- 1 Disconnect the sideband connector to gain access to the screw underneath.
- 2 Loosen four screws.
- 3 Lift the front OCP interposer card out of the chassis.

- Step 5. Disconnect the cables on the front OCP interposer card. For more details, see [“OCP interposer” on page 349](#).

After you finish

1. Install a new front OCP interposer card. See [“Install the front OCP interposer card” on page 102](#).
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

[Watch the procedure on YouTube](#)

Install the front OCP interposer card

Follow the steps in this section to install a front OCP interposer card.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the front OCP interposer card to any unpainted surface on the outside of the server. Then, take the front OCP interposer card out of the package and place it on a static-protective surface.
- Step 2. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 3. Connect the cables to the front OCP interposer card. For more details, see [“OCP interposer” on page 349](#).
- Step 4. Install the front OCP interposer card to the chassis.

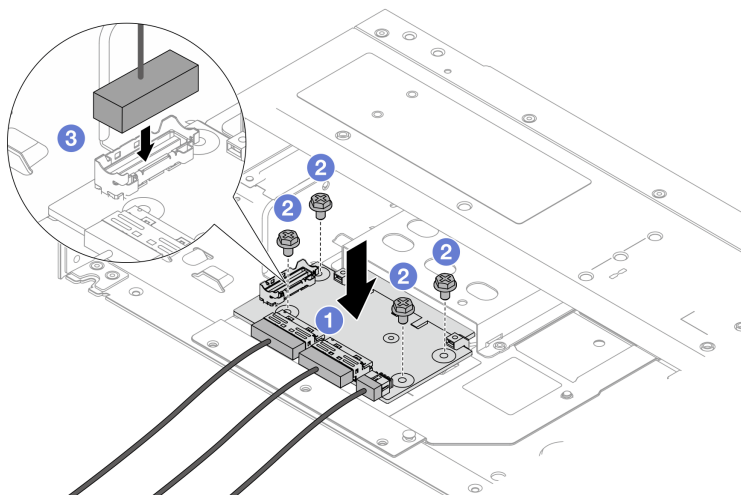


Figure 61. Installing the front OCP interposer card

- a. **1** Place the front OCP interposer card on the chassis, and align the screw holes.

- b. ② Tighten four screws.
- c. ③ Connect the sideband connector.

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

[Watch the procedure on YouTube](#)

Remove the rear OCP interposer card

Follow the steps in this section to remove a rear OCP interposer card.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 2. Disconnect the cables on the rear OCP interposer card. For more details, see [“OCP interposer” on page 349](#).
- Step 3. Remove the rear OCP interposer card.

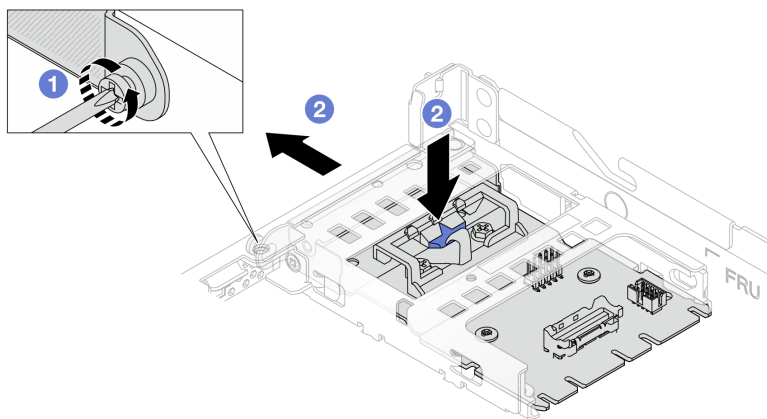


Figure 62. Removing the rear OCP interposer card

- a. ① Loosen the screw that secures the rear OCP interposer card.

- b. ② Press and hold the blue latch. And pull the rear OCP interposer card by the latch out from the chassis.

After you finish

1. Install a new rear OCP interposer card. See [“Install the rear OCP interposer card” on page 104](#).
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

[Watch the procedure on YouTube](#)

Install the rear OCP interposer card

Follow the steps in this section to install a rear OCP interposer card.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the rear OCP interposer card to any unpainted surface on the outside of the server. Then, take the rear OCP interposer card out of the package and place it on a static-protective surface.
- Step 2. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 3. Install the rear OCP interposer card.

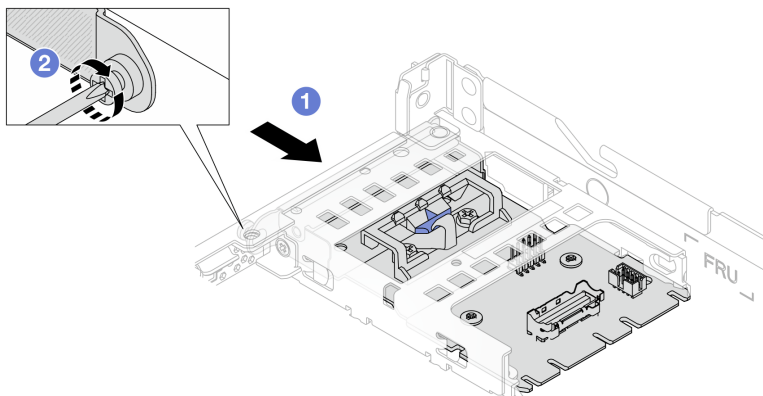


Figure 63. Installing the rear OCP interposer

- a. ① Slide the rear OCP interposer into the slot until it is fully seated.
- b. ② Tighten the screw to secure the rear OCP interposer.

Step 4. Connect the cables to the rear OCP interposer card. For more details, see [“OCP interposer” on page 349](#).

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

[Watch the procedure on YouTube](#)

Front I/O module replacement

Use this information to remove and install the front I/O module.

- [“Remove the front I/O module” on page 105](#)
- [“Install the front I/O module” on page 106](#)
- [“Remove the integrated diagnostics panel assembly” on page 107](#)
- [“Install the integrated diagnostics panel assembly” on page 109](#)
- [“Remove the external diagnostics cable \(4 x 3.5" chassis\)” on page 111](#)
- [“Install the external diagnostics cable \(4 x 3.5" chassis\)” on page 113](#)

Remove the front I/O module

Use this information to remove the front I/O module.

About this task

The following illustrates how to remove the front I/O module with front operator panel. You can remove other front I/O modules in the same way.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 2. If the security bezel is installed, remove it. See [“Remove the security bezel” on page 284](#).
- Step 3. Disconnect the front I/O cables from the processor board. See [“Front I/O module” on page 334](#).

Attention: To avoid damaging the system board, make sure to follow the instructions in [Chapter 6 “Internal cable routing” on page 325](#) when disconnecting cables from the system board.

Step 4. Remove the front I/O module.

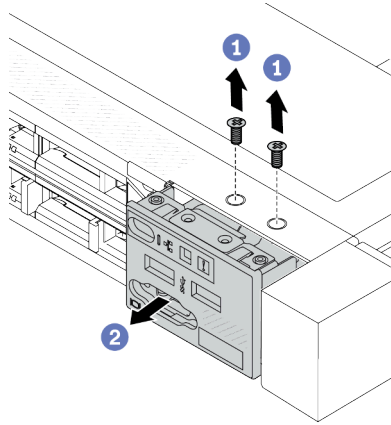


Figure 64. Remove a front I/O module on 2.5" chassis

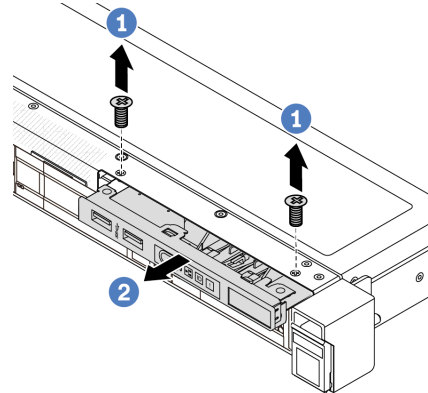


Figure 65. Remove a front I/O module on 3.5" chassis

- a. 1 Remove the screws that secure the front I/O module.
- b. 2 Slide the front I/O module out of the front chassis.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=GByjJMV6FvU>

Install the front I/O module

Use this information to install the front I/O module.

About this task

The following illustrates how to install the front I/O module with front operator panel. You can install other front I/O modules in the same way.

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “[Power off the server](#)” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the front I/O module to any unpainted surface on the outside of the server. Then, take the front I/O module out of the package and place it on a static-protective surface.

Step 2. Install the front I/O module.

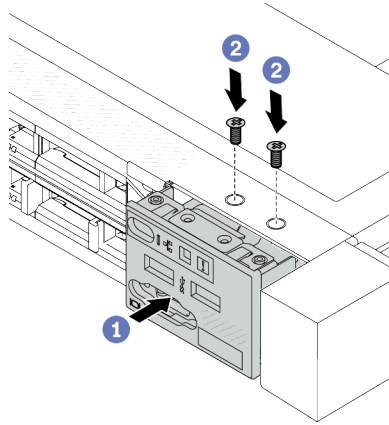


Figure 66. Install a front I/O module on 2.5" chassis

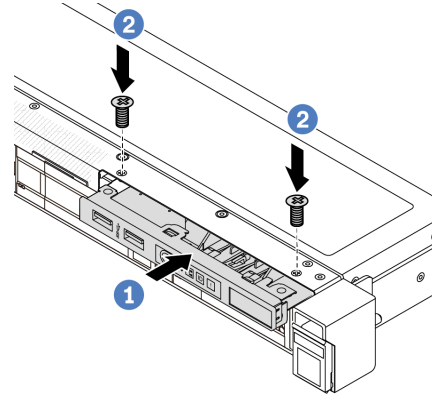


Figure 67. Install a front I/O module on 3.5" chassis

- a. 1 Insert the front I/O module into the front chassis.
- b. 2 Install the screws to secure the front I/O module in place.

After you finish

1. Install the front VGA filler or connect the front I/O cables to the system board (system board assembly). See [Chapter 6 “Internal cable routing” on page 325](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=hXXPBqeBIGI>

Remove the integrated diagnostics panel assembly

Use this information to remove the integrated diagnostics panel assembly.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 2. If the security bezel is installed, remove it. See [“Remove the security bezel” on page 284](#).
- Step 3. Disconnect cables from the processor board.

Step 4. Remove the integrated diagnostics panel assembly from the chassis.

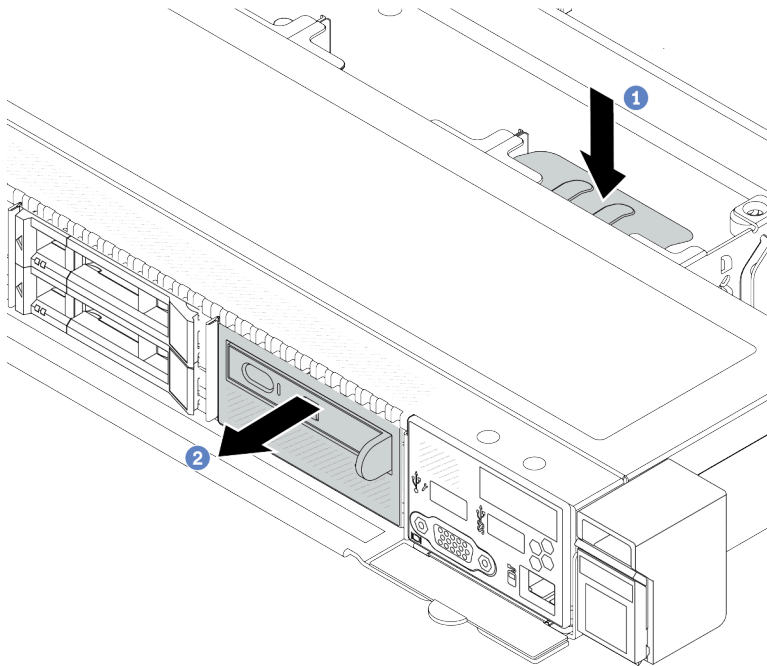


Figure 68. Integrated diagnostics panel assembly removal

- a. 1 Press down the extended tab on the other side of the front chassis.
- b. 2 Slide the assembly out of the front chassis.

Step 5. Remove the integrated diagnostics panel assembly from its assembly.

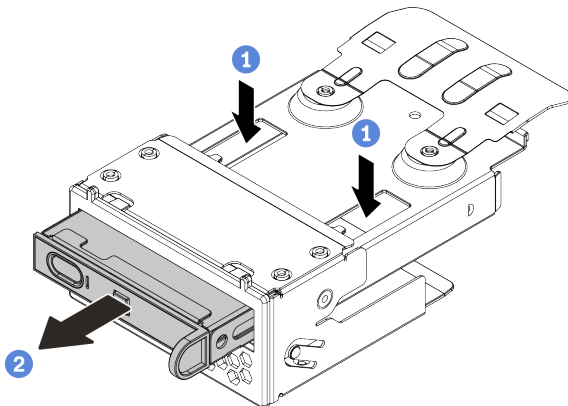


Figure 69. Integrated diagnostics panel assembly removal

- a. 1 Press down the clips as shown.
- b. 2 Pull the integrated diagnostics panel assembly by its handle to get it out of its assembly.

After you finish

1. Install a new integrated diagnostics panel assembly or filler. See [“Install the integrated diagnostics panel assembly” on page 109](#).

2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=pUbarvYYBaQ>

Install the integrated diagnostics panel assembly

Use this information to install the diagnostics panel assembly.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the diagnostics panel assembly to any unpainted surface on the outside of the server. And then, take the assembly out of the package and place it on a static-protective surface.
- Step 2. If there is a filler installed on the front chassis, remove it as shown.

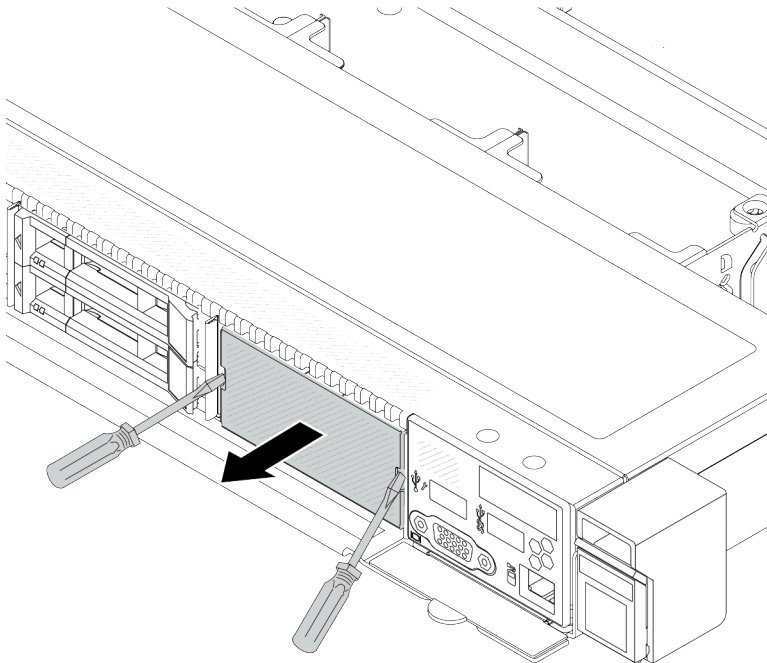


Figure 70. Filler removal

- Step 3. Insert the integrated diagnostics panel assembly into its assembly. Ensure that the panel is fully seated into its assembly.

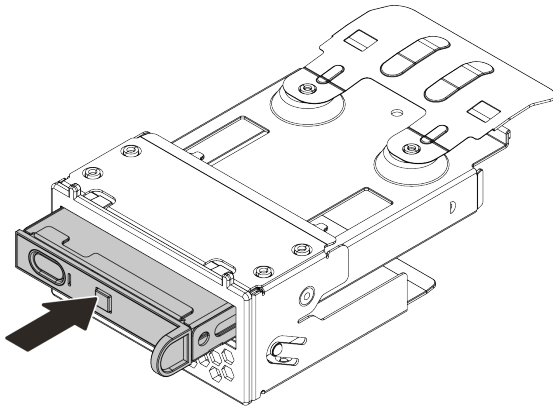


Figure 71. Integrated diagnostics panel assembly installation into its assembly

- Step 4. Slide the diagnostics panel assembly into the front chassis as shown. And ensure that it is seated in place.

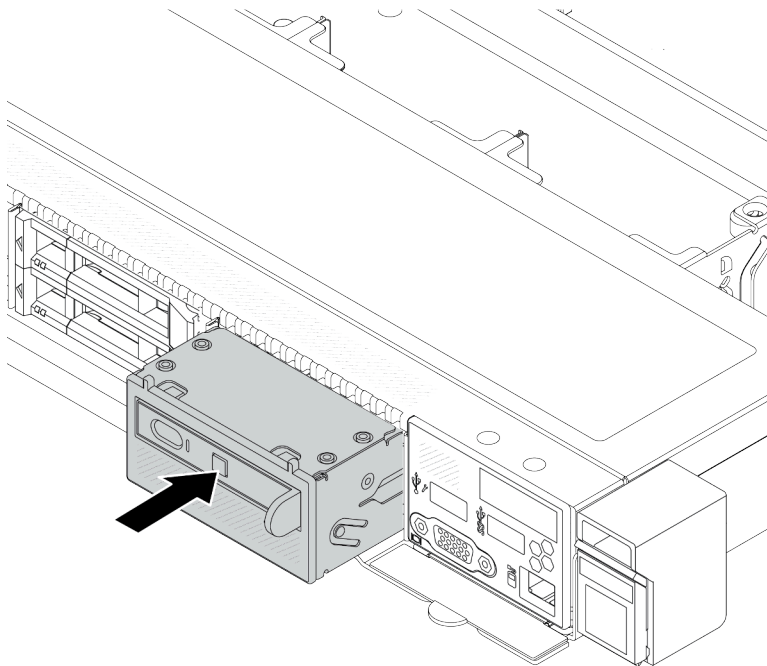


Figure 72. Diagnostics panel assembly installation

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322.](#)

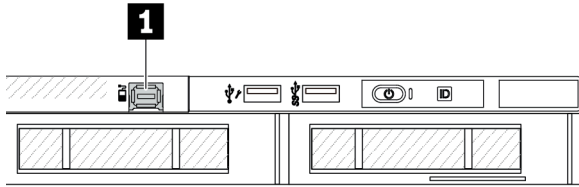
Demo video

<https://www.youtube.com/watch?v=7rFLkeZ8geA>

Remove the external diagnostics cable (4 x 3.5" chassis)

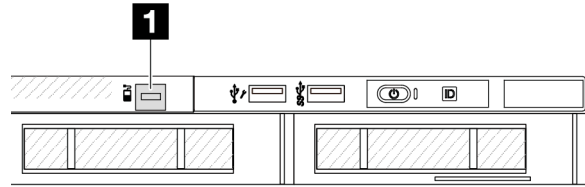
Use this information to remove the external diagnostics cable.

In the 4 x 3.5" chassis configuration, the external diagnostics cable is an optional part. You can choose either install or remove the cable according to your actual needs. Refer to the location of external diagnostics cable from the front view as below:



1 The external diagnostics cable connector

Figure 73. A front view with the cable installed



1 A filler for external diagnostics cable connector

Figure 74. A front view with a filler installed

Note: Before installing the cable, remove the filler first; after removing the cable, install the filler afterwards.

About this task

The following illustrates how to remove the external diagnostics cable from the chassis.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 2. If the security bezel is installed, remove it. See [“Remove the security bezel” on page 284](#).
- Step 3. Disconnect the external diagnostics cable, the front I/O cable, and the USB cable from the processor board.

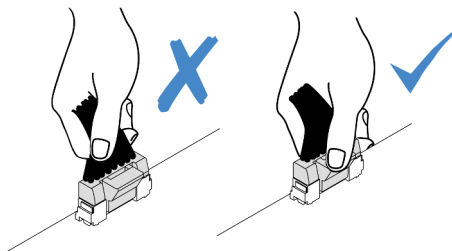


Figure 75. Disconnecting cable from the system board assembly

Step 4. To get a better view of the cable connector latch inside the chassis, remove the front I/O module first.

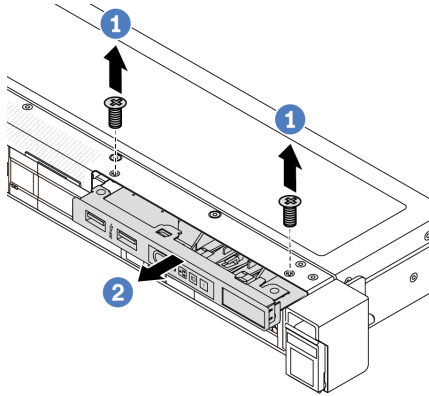


Figure 76. Front I/O module removal

- a. 1 Remove the screws that secure the front I/O module.
- b. 2 Slide the front I/O module out of the front chassis.

Step 5. Remove the external diagnostics cable.

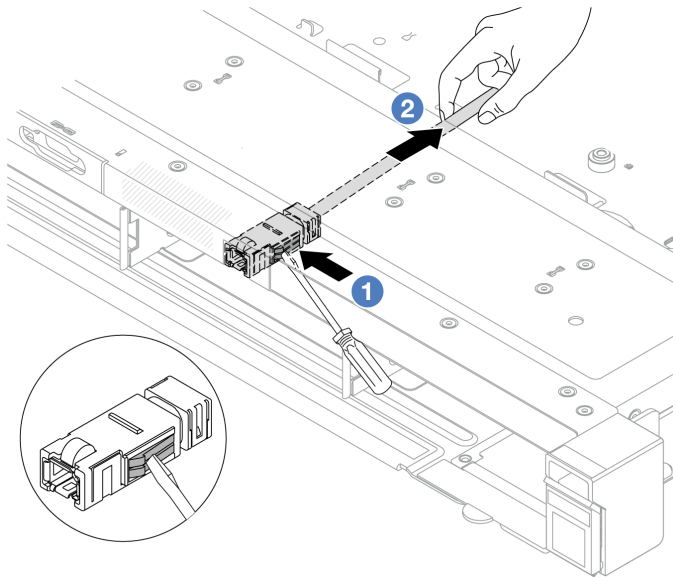


Figure 77. Removal of the external diagnostics cable

- a. 1 Poke the connector latch with the tip of a flat-blade screwdriver (3 or 4 mm) to disengage the connector from the chassis.
- b. 2 Pull out the cable from the back side.

Step 6. Install the front I/O module back to the chassis.

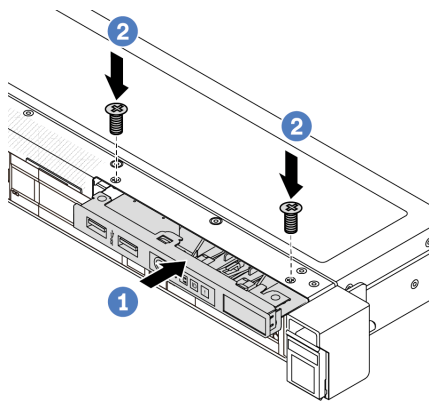


Figure 78. Front I/O module installation

- a. ① Insert the front I/O module into the front chassis.
- b. ② Install the screws to secure the front I/O module in place.

Step 7. Connect the front I/O cable and the USB cable to the processor board.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

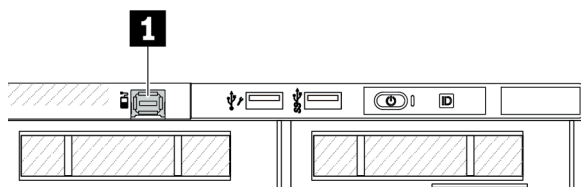
Demo video

<https://www.youtube.com/watch?v=PEcSFWZqFBM>

Install the external diagnostics cable (4 x 3.5" chassis)

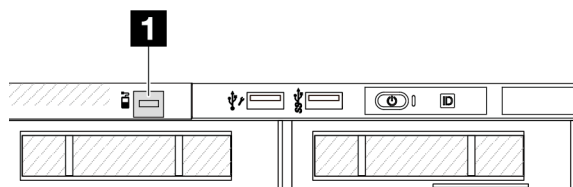
Use this information to install the external diagnostics cable.

In the 4 x 3.5" chassis configuration, the external diagnostics cable is an optional part. You can choose either install or remove the cable according to your actual needs. Refer to the location of external diagnostics cable from the front view as below:



① The external diagnostics cable connector

Figure 79. A front view with the cable installed



① A filler for external diagnostics cable connector

Figure 80. A front view with a filler installed

Note: Before installing the cable, remove the filler first; after removing the cable, install the filler afterwards.

About this task

The following illustrates how to remove the external diagnostics cable from the chassis.

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “[Power off the server](#)” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the external diagnostics cable to any unpainted surface on the outside of the server. Then, take the external diagnostics LCD cable out of the package and place it on a static-protective surface.
- Step 2. Install the external diagnostics cable.

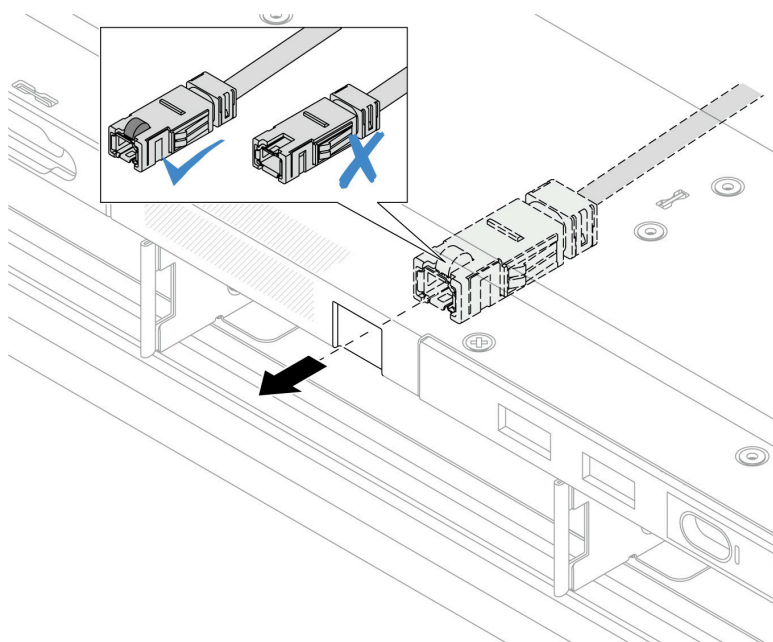


Figure 81. Installation of the external diagnostics cable

Note: The front and back sides of the connector to external diagnostics slot are different, and it is required to plug in with the front side.

When plugging in, face the front side upward and slide the connector into the chassis. Refer to the illustration above.

After you finish

1. Connect the external diagnostics cable to the processor board. See [Chapter 6 “Internal cable routing” on page 325](#).
2. Complete the parts replacement. See “[Complete the parts replacement](#)” on page 322.

Demo video

<https://www.youtube.com/watch?v=76EhslkTMmA>

GPU replacement

Use this information to remove and install a GPU adapter.

- [“Remove a GPU adapter” on page 115](#)
- [“Install a GPU adapter” on page 117](#)

Remove a GPU adapter

Use this information to remove a GPU adapter.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.
- Depending on the specific type, your GPU adapter might look different from the illustration in this topic.

Procedure

Step 1. Make preparation for the task.

- a. If the server is installed in a rack, slide the server out on its rack slide rails to gain access to the top cover, or remove the server from the rack. See [“Remove the server from rack” on page 65](#).
- b. Remove the top cover. See [“Remove the top cover” on page 318](#).
- c. If you are replacing a GPU adapter from riser 1 or riser 2 assembly, remove the adjacent riser assembly for easier operation. See [“Remove the rear riser card” on page 281](#).
- d. Disconnect GPU power cable. See [“GPU adapter \(optional\)” on page 341](#). If the cable connectors come with protective dust caps, make sure to put them back on.

Notes:

- If you need to disconnect cables from the system board (system board assembly), disengage all latches or release tabs on cable connectors first. Failing to release the tab before removing the cables will damage the cable sockets on the system board (system board assembly). Any damage to the cable sockets might require replacing the system board (system board assembly).
- The connectors on your system board (system board assembly) might look different from those in the illustration, but the removal procedure is the same.
 1. Press the release tab to release the connector.
 2. Disengage the connector from the cable socket.

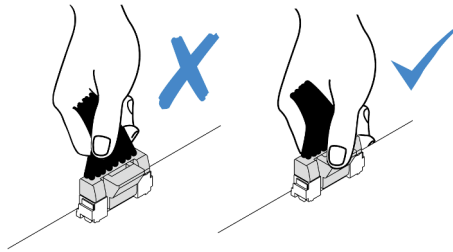


Figure 82. Disconnecting cables from the system board (system board assembly)

Step 2. Remove the riser assembly that has the GPU adapter installed from the system board (system board assembly).

Note: The following uses riser 1 assembly as an example for illustration. It is similar for other riser assemblies. See [“Remove the rear riser card” on page 281](#).

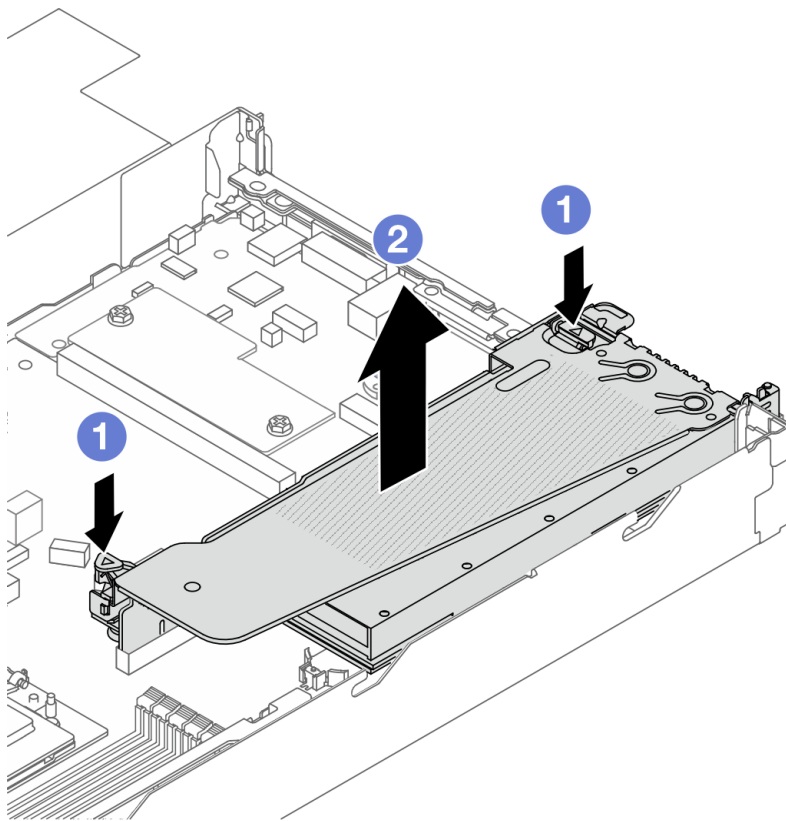


Figure 83. Removing the riser assembly

- a. ① Press the latches on the riser bracket.
- b. ② Grasp the riser assembly by its edges and carefully lift it straight up and off the chassis.

Note: If you are removing a GPU adapter on riser 3 assembly, slightly lift the riser assembly up, and disconnect cables from the system board (system board assembly) first.

Step 3. Remove the GPU adapter from the riser bracket.

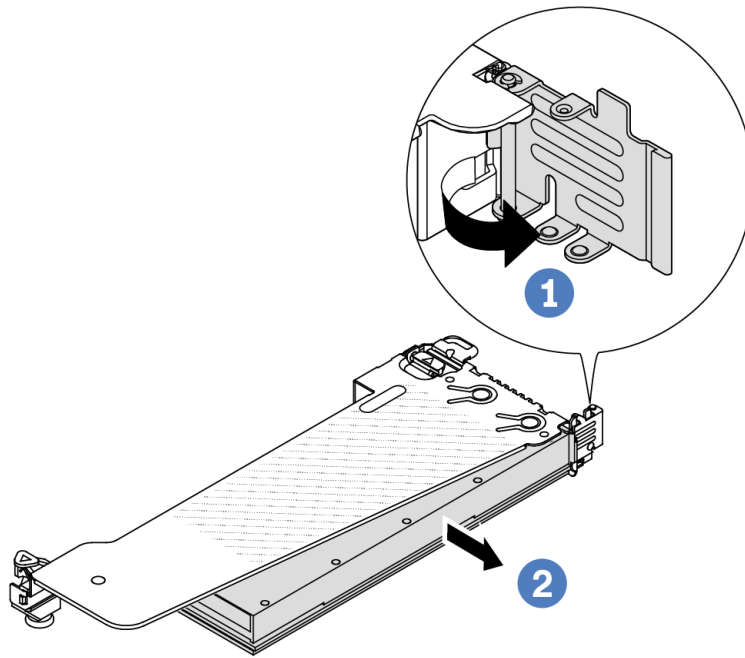


Figure 84. Removing the GPU adapter

- a. ① Rotate the GPU adapter retention latch to the open position.
- b. ② Grasp the GPU adapter by its edges and carefully pull it out of the PCIe slot.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=qdTNwcYjAPg>

Install a GPU adapter

Use this information to install a GPU adapter.

About this task

Attention:

- Read “Installation Guidelines” on page 49 and “Safety inspection checklist” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 65.

- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.
- GPU adapters are supported on some server models with requirements. See [“Thermal rules” on page 58](#).
- All installed GPU adapters must be identical.

Procedure

- Step 1. Make preparation for the task.
- Step 2. Locate the appropriate PCIe slot for the new GPU adapter. See [“PCIe slots and adapters” on page 54](#).
- Step 3. Install the GPU adapter into the PCIe slot on the riser card.

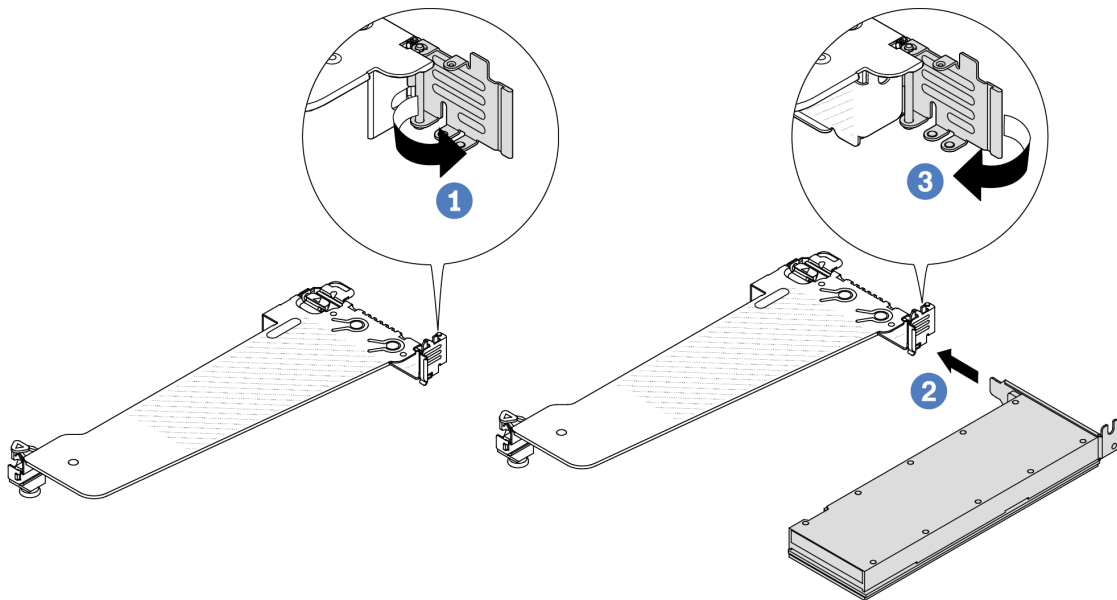


Figure 85. Installing the GPU adapter

- 1 Open the blue latch on the riser cage.
 - 2 Align the GPU adapter with the PCIe slot on the riser card. Then, carefully press the GPU adapter straight into the slot until it is securely seated.
 - 3 Close the blue latch.
- Step 4. Connect GPU power cable. See [“GPU adapter \(optional\)” on page 341](#). If the cable connectors come with protective dust caps, make sure to put them back on.
- Step 5. Install the riser assembly with the GPU adapter: Align the riser card with the PCIe slot on the system board (system board assembly). Carefully press the riser card straight into the slot until it is securely seated.

Note: The following uses riser 1 assembly as an example for illustration. It is similar for other riser assemblies. See [“Install the rear riser card” on page 283](#).

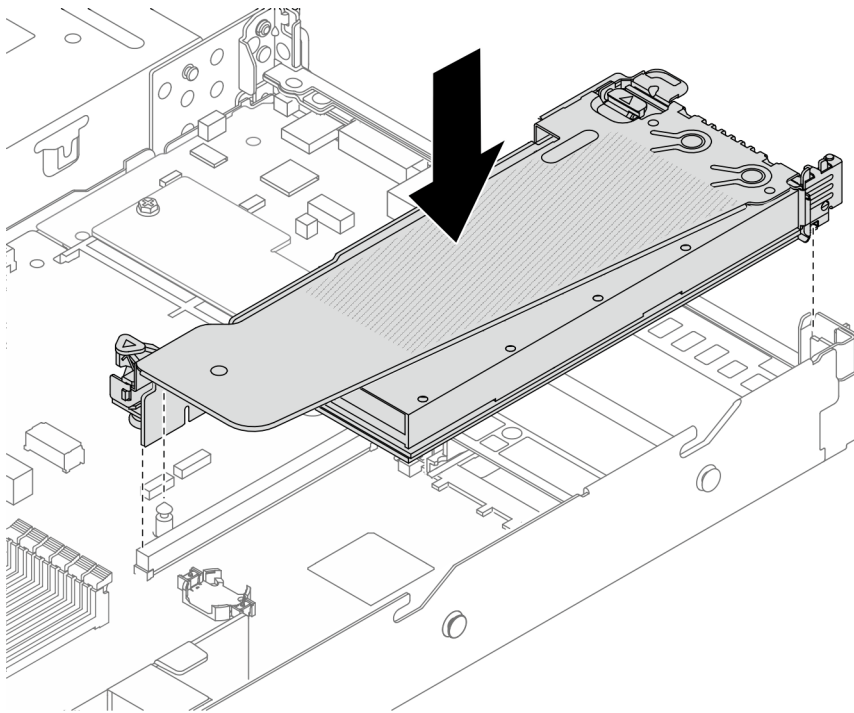


Figure 86. Installing the riser assembly

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=Llim9LQVz3o>

Hot-swap drive replacement

Use this information to remove and install a hot-swap drive. You can remove or install a hot-swap drive without turning off the server, which helps you avoid significant interruption to the operation of the system.

Notes:

- The term “hot-swap drive” refers to all the supported types of hot-swap hard disk drives, hot-swap solid-state drives, and hot-swap NVMe drives.
- Use any documentation that comes with the drive, and follow the instructions and those in this topic.
- The electromagnetic interference (EMI) integrity and cooling of the server are protected by having all drive bays covered or occupied. The vacant bays are either covered by an EMI-protective panel or occupied by drive fillers. When installing a drive, save any removed drive fillers for future use to cover vacant bays.
- To avoid damage to the drive connectors, ensure that the top cover is in place and fully closed whenever you install or remove a drive.
- [“Remove a 2.5"/3.5" hot-swap drive” on page 119](#)
- [“Install a 2.5"/3.5" hot-swap drive” on page 121](#)
- [“Remove an EDSFF drive” on page 123](#)
- [“Install an EDSFF drive” on page 125](#)

Remove a 2.5"/3.5" hot-swap drive

Use this information to remove a 2.5"/3.5" hot-swap drive.

About this task

The following describes the information that you must consider for this task:

- Ensure that you have backed up data on your drive, especially if it is part of a RAID array.
 - Before you make changes to drives, RAID adapters, or drive backplanes, back up all important data that is stored on the drives.
 - Before you remove any component of a RAID array, back up all RAID configuration information.
- If one or more NVMe drives are to be removed, it is recommended to disable them first in Safely Remove Hardware and Eject Media (Windows) or filesystem (Linux). Log in to XClarity Controller and go to the **Storage** menu to identify and locate the drive type and corresponding drive bay number. If the drive bay numbers come with the term “NVMe”, it indicates that the installed drives are NVMe drives.

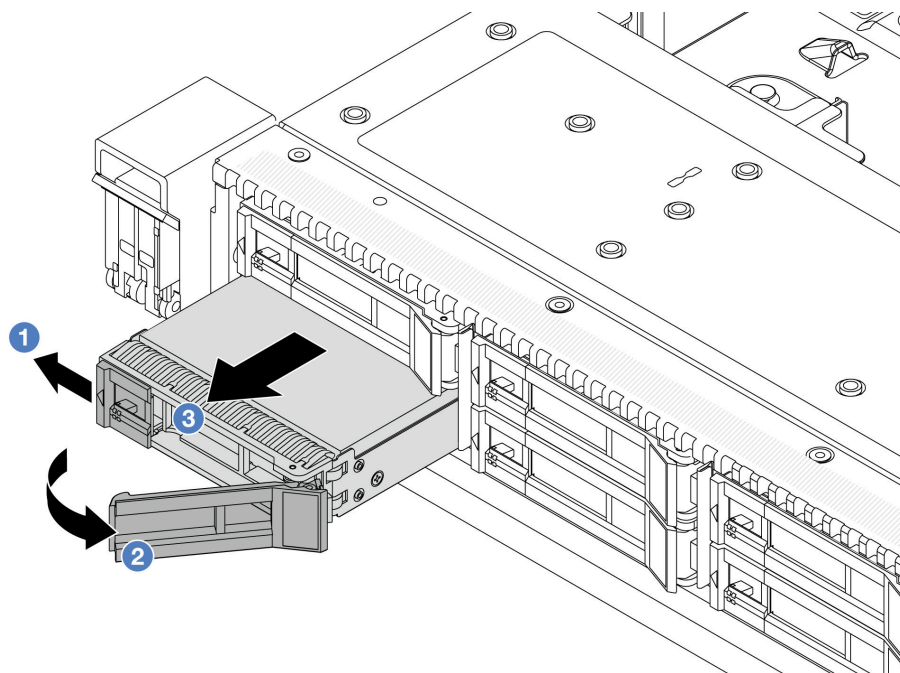
Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.
- To ensure that there is adequate system cooling, do not operate the server for more than two minutes without either a drive or a drive filler installed in each bay.

Procedure

Step 1. If the security bezel is installed, remove it first. See [“Remove the security bezel” on page 284](#).

Step 2. Remove a hot-swap drive.

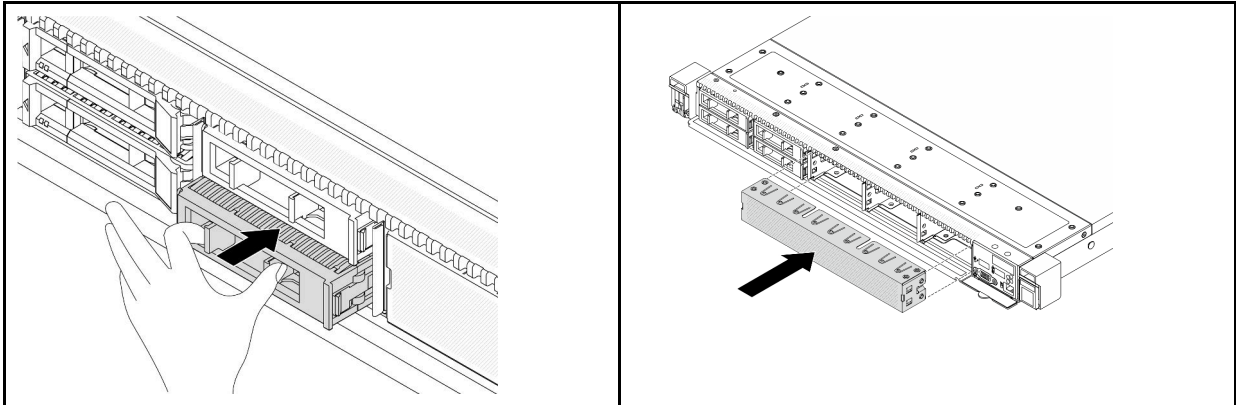


- a. ① Slide the release latch to the left to open the drive tray handle.
- b. ② Open the drive handle.
- c. ③ Slide the drive out of the drive bay.

After you finish

1. Install a drive filler or a new drive ([“Install a 2.5"/3.5" hot-swap drive” on page 121](#)) to cover the drive bay.

Table 30. Install a drive filler



Note: The installation steps vary with drive filler types.

2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=Y7BbNALVQL0>

Install a 2.5"/3.5" hot-swap drive

Use this information to install a 2.5"/3.5" hot-swap drive.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the drive to any unpainted surface on the outside of the server. And then, take the drive out of the package and place it on a static-protective surface.
- Step 2. Remove the drive filler from the drive bay and keep the drive filler in a safe place.

Note: The removal steps vary with drive filler types.

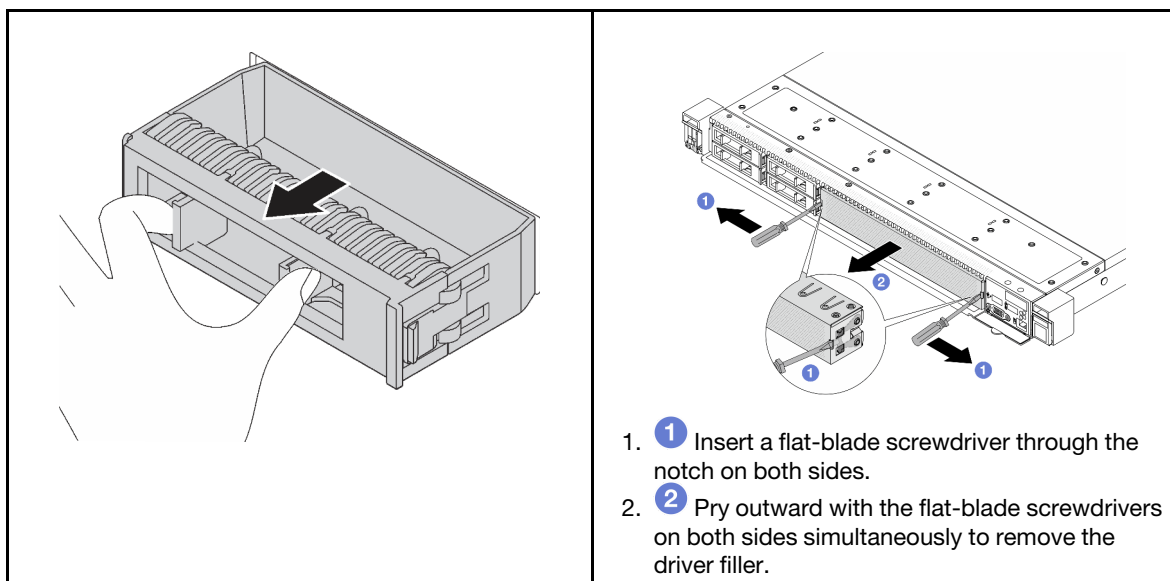


Figure 87. Drive filler removal

Step 3. Install the drive in the drive bay.

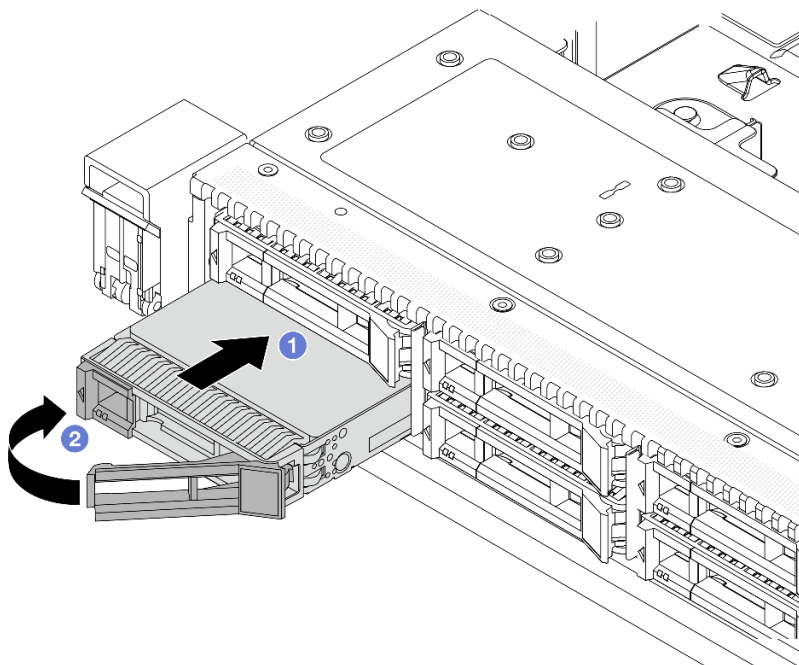


Figure 88. Hot-swap drive installation

- a. ① Ensure that the drive tray handle is in the open position. Slide the drive into the drive bay until it snaps into position.
- b. ② Close the drive tray handle to lock the drive in place.

Step 4. Check the drive LEDs to verify that the drive is operating normally. For details, see [“Drive LEDs” on page 511](#).

Step 5. Continue to install additional hot-swap drives if necessary.

After you finish

1. Reinstall the security bezel if you removed it. See [“Install the security bezel” on page 286](#).
2. Use the Lenovo XClarity Provisioning Manager to configure the RAID if necessary. For more information, see:
https://sysmgt.lenovofiles.com/help/topic/ixpm_frontend/ixpm_product_page.html

Demo video

<https://www.youtube.com/watch?v=1v45wGaENIU>

Remove an EDSFF drive

Use this information to remove an EDSFF drive.

About this task

The following describes the information that you must consider for this task:

- Ensure that you have backed up data on your drive, especially if it is part of a RAID array.
 - Before you make changes to drives, RAID adapters, or drive backplanes, back up all important data that is stored on the drives.
 - Before you remove any component of a RAID array, back up all RAID configuration information.
- If one or more NVMe drives are to be removed, it is recommended to disable them first in Safely Remove Hardware and Eject Media (Windows) or filesystem (Linux). Log in to XClarity Controller and go to the **Storage** menu to identify and locate the drive type and corresponding drive bay number. If the drive bay numbers come with the term “NVMe”, it indicates that the installed drives are NVMe drives.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.
- To ensure that there is adequate system cooling, do not operate the server for more than two minutes without either a drive or a drive filler installed in each bay.

Procedure

Step 1. If the security bezel is installed, remove it first. See [“Remove the security bezel” on page 284](#).

Step 2. Remove the EDSFF drive cage cover.

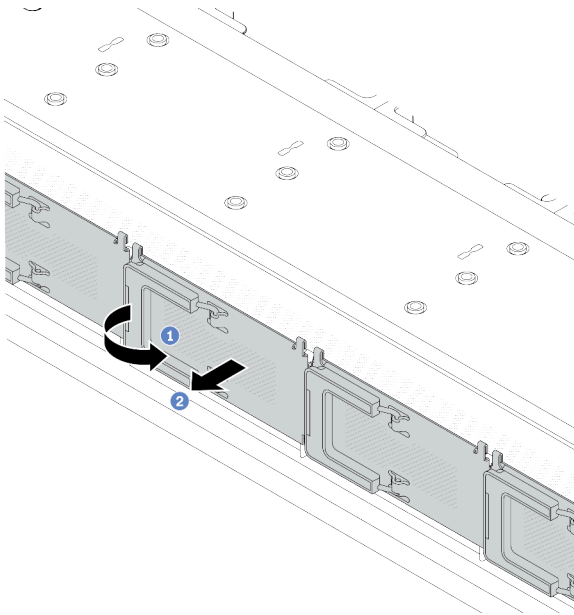


Figure 89. EDSFF drive cage cover removal

- a. ① Open the handle as shown.
- b. ② Grasp the handle and remove the drive cage cover.

Step 3. Remove the EDSFF drive.

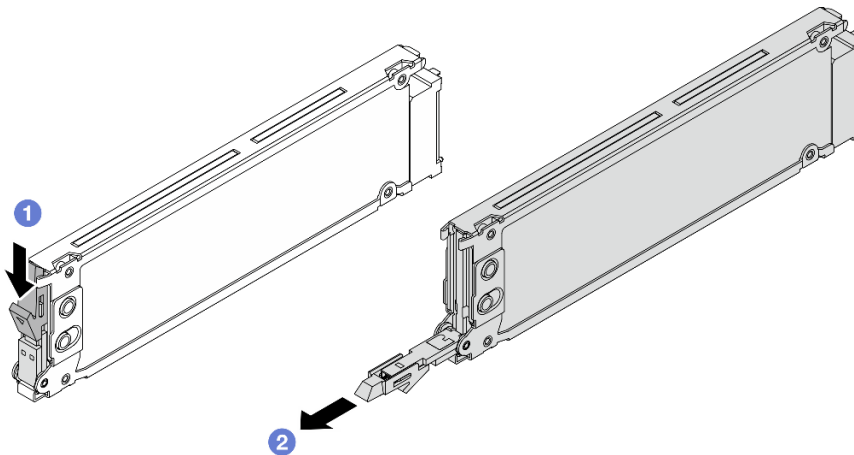


Figure 90. EDSFF drive removal

- a. ① Slide the release latch as shown to open the drive tray handle.
- b. ② Grasp the handle and slide the drive out of the drive bay.

After you finish

1. Install a new drive or a drive cage cover to cover the drive bay.

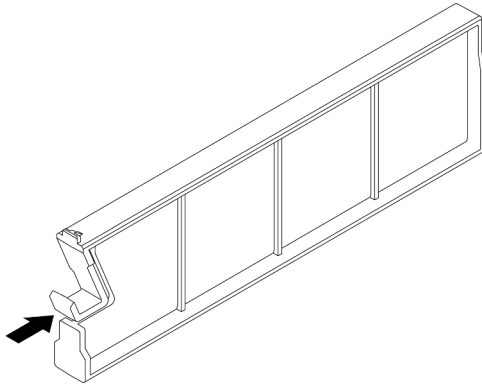


Figure 91. EDSFF drive filler installation

2. Install the drive cage cover.
3. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

https://www.youtube.com/watch?v=IUZT_0uS0pc

Install an EDSFF drive

Use this information to install an EDSFF drive.

About this task

Attention:

- Read “[Installation Guidelines](#)” on [page 49](#) and “[Safety inspection checklist](#)” on [page 50](#) to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the drive to any unpainted surface on the outside of the server. Then, take the drive out of the package and place it on a static-protective surface.
- Step 2. Remove the drive filler from the drive bay and keep the drive filler in a safe place.

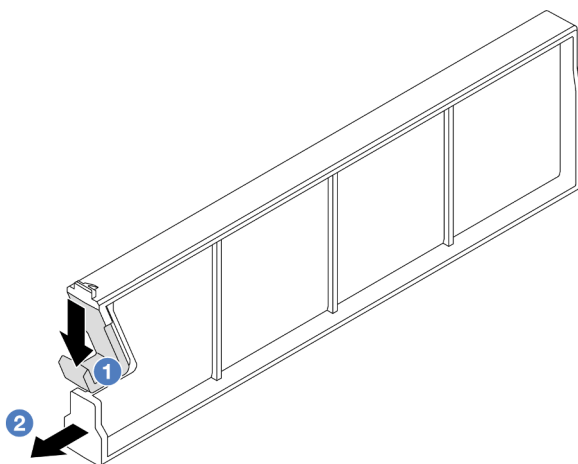


Figure 92. Remove an EDSFF drive filler

- a. 1 Press the latch down to disengage the drive clip from the cage.
- b. 2 Pull and slide the filler out.

Step 3. Install the EDSFF drive.

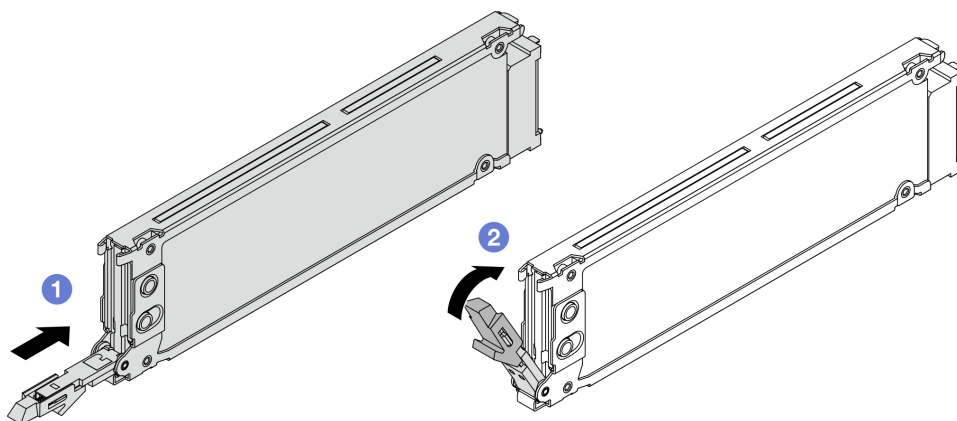


Figure 93. EDSFF drive installation

- a. 1 Ensure that the drive tray handle is in the open position. Slide the drive into the drive bay until it snaps into position.
- b. 2 Close the drive tray handle to lock the drive in place.

Step 4. Continue to install additional EDSFF drives if necessary.

Step 5. Install the EDSFF drive cage cover.

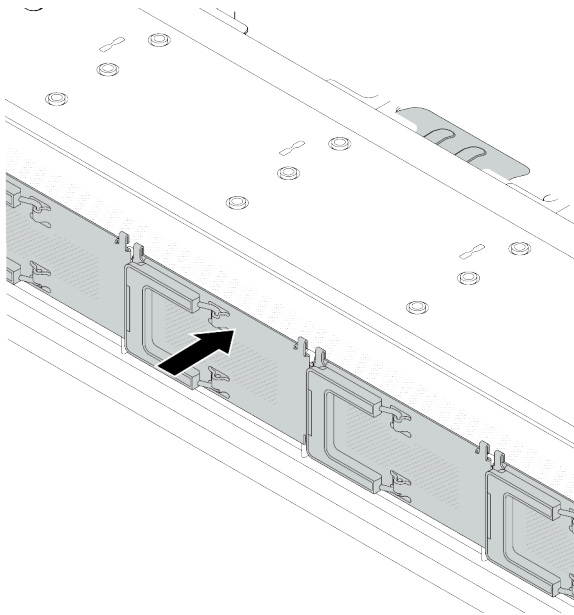


Figure 94. EDSFF drive cage cover installation

After you finish

1. Reinstall the security bezel if you have removed it. See [“Install the security bezel” on page 286](#).
2. Use the Lenovo XClarity Provisioning Manager to configure the RAID if necessary. For more information, see:
https://sysmgt.lenovofiles.com/help/topic/ixpm_frontend/ixpm_product_page.html

Demo video

<https://www.youtube.com/watch?v=cALUsYDRIXI>

Internal CFF HBA/RAID adapter replacement

Use this information to remove and install the internal CFF HBA/RAID adapter.

- [“Remove the internal CFF HBA/RAID adapter” on page 127](#)
- [“Install the internal CFF HBA/RAID adapter” on page 128](#)

Remove the internal CFF HBA/RAID adapter

Use this information to remove the internal CFF HBA/RAID adapter.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 2. Remove any components that may impede access to the internal CFF HBA/RAID adapter.
- Step 3. Disconnect all cables from the internal CFF HBA/RAID adapter.
- Step 4. Lift the release pin, slightly slide the internal CFF HBA/RAID adapter as shown, and carefully lift it out of the chassis.

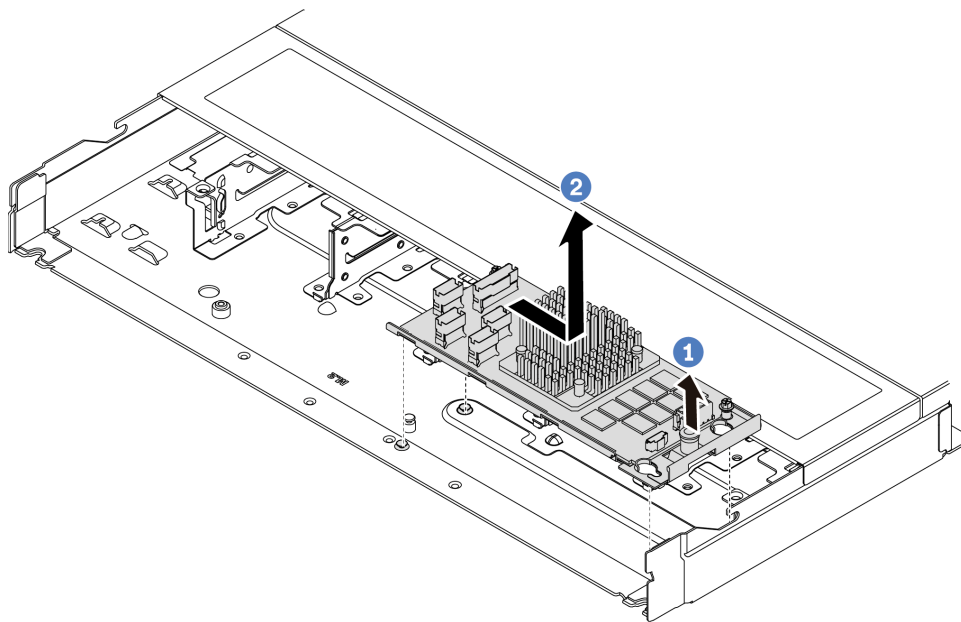


Figure 95. Internal CFF HBA/RAID adapter removal

- a. ① Release the push pin on the internal CFF RAID adapter.
- b. ② Move the adapter to the right and then lift it out of the chassis.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=K68CReaBeTc>

Install the internal CFF HBA/RAID adapter

Use this information to install the internal CFF HBA/RAID adapter.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).

- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the internal CFF HBA/RAID adapter to any unpainted surface on the outside of the server. Then, take the internal CFF HBA/RAID adapter out of the package and place it on a static-protective surface.
- Step 2. Align the notches on the tray with the pins on the chassis, place down the internal CFF HBA/RAID adapter, and slightly slide it as shown to secure it on the chassis.

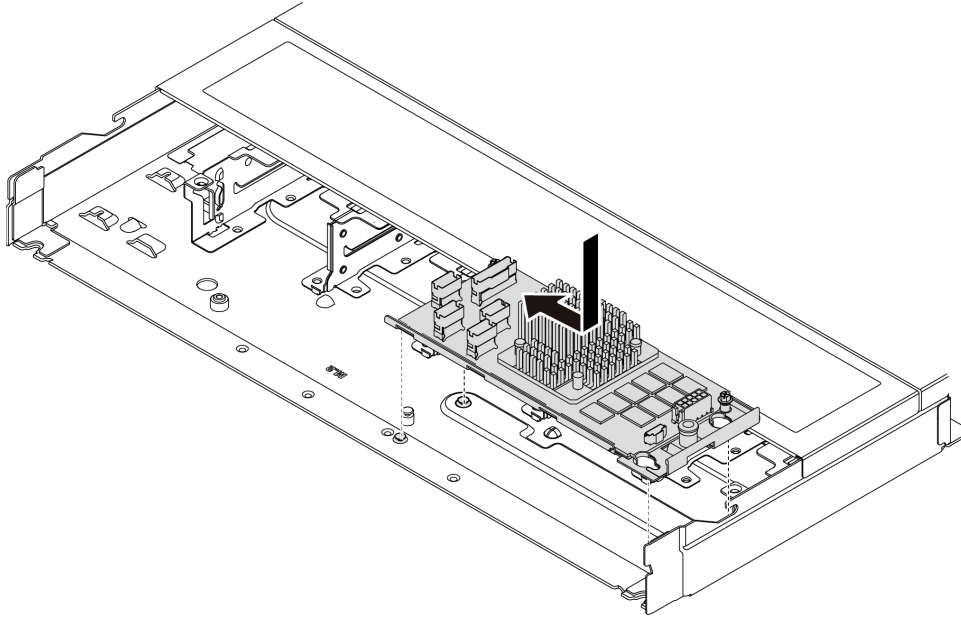


Figure 96. Internal CFF HBA/RAID adapter installation

- Step 3. Connect cables to the internal RAID adapter. See [“CFF RAID adapter” on page 333](#).

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=FFiCPCOGMdQ>

Intrusion switch replacement

Use this information to remove and install an intrusion switch. The intrusion switch informs you that the server cover is not properly installed or closed by creating an event in the system event log (SEL).

The intrusion switch informs you that the server cover is not properly installed or closed by creating an event in the system event log (SEL).

- [“Remove an intrusion switch” on page 130](#)
- [“Install an intrusion switch” on page 132](#)

Remove an intrusion switch

Use this information to remove an intrusion switch.

About this task

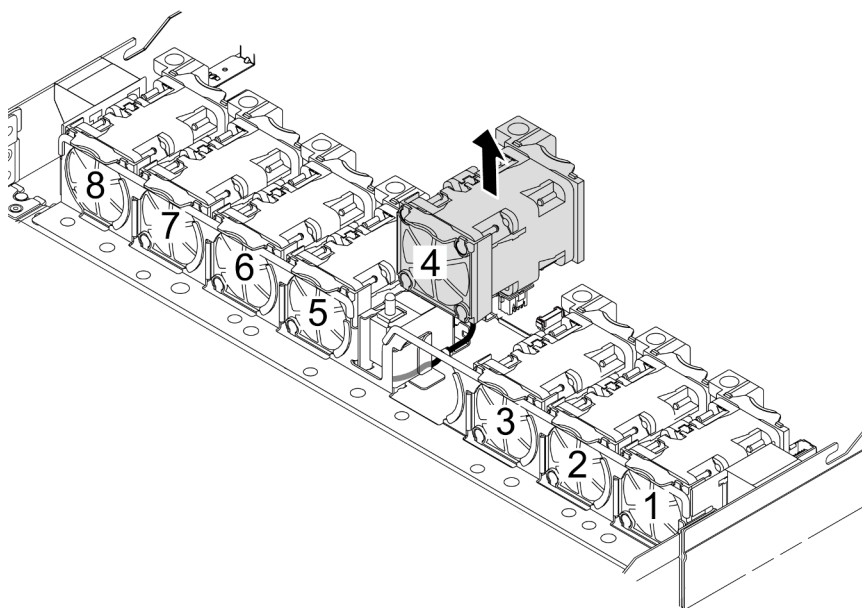
Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

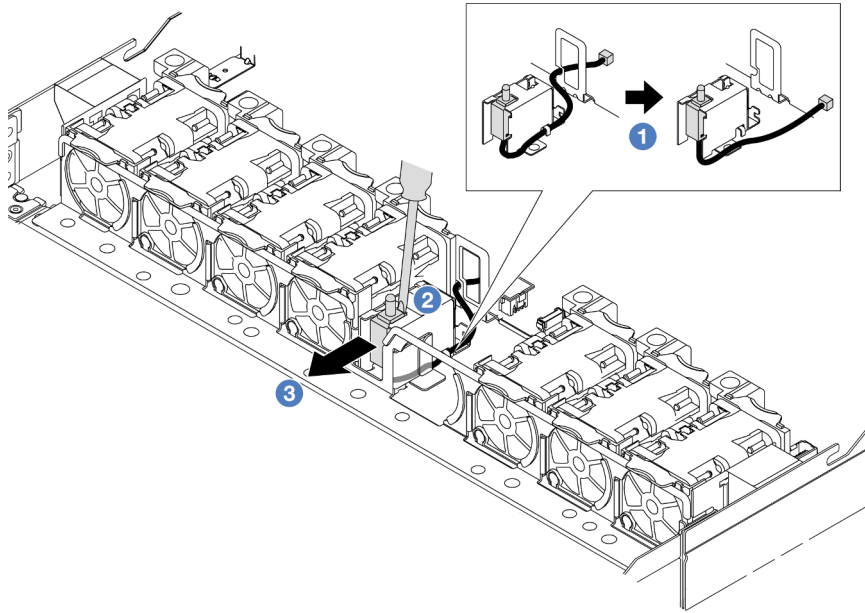
Procedure

Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).

Step 2. Remove the number 4 fan.

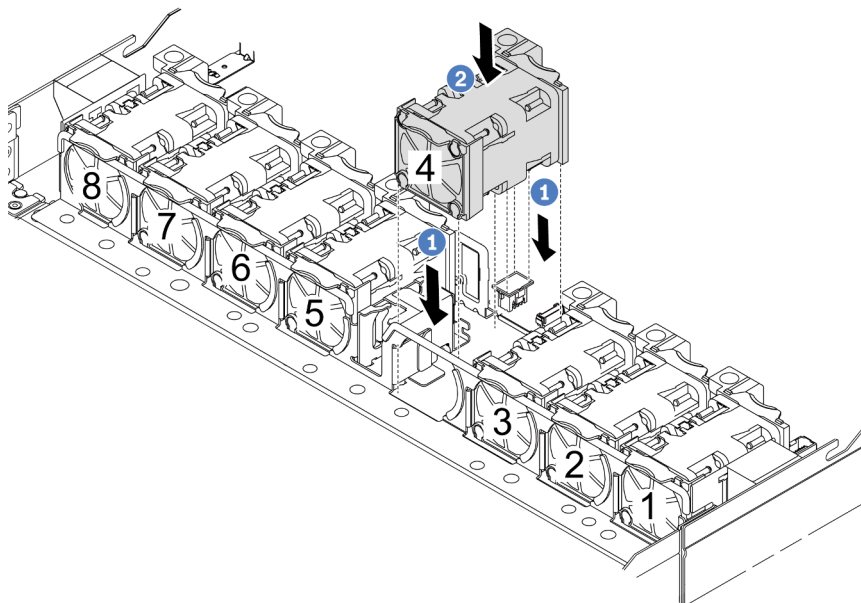


Step 3. Remove the intrusion switch.



- a. ① Disconnect the cable of the intrusion switch from the processor board. For the location of the intrusion switch connector and cable routing information, refer to and [“Intrusion switch” on page 342](#). Route the cable out of the cable clip.
- b. ② Insert the tip of a slotted screwdriver into the gap between the cage and switch and push outwards.
- c. ③ Slide the intrusion switch as shown to remove it.

Step 4. Re-install the number 4 fan.



- a. ① Align the four corners of the fan to fan module socket and put it down.

- b. **2** Press the fan latch down to ensure that it is plugged in the connector.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=IWLptjQV-ZE>

Install an intrusion switch

Use this information to install an intrusion switch.

About this task

Attention:

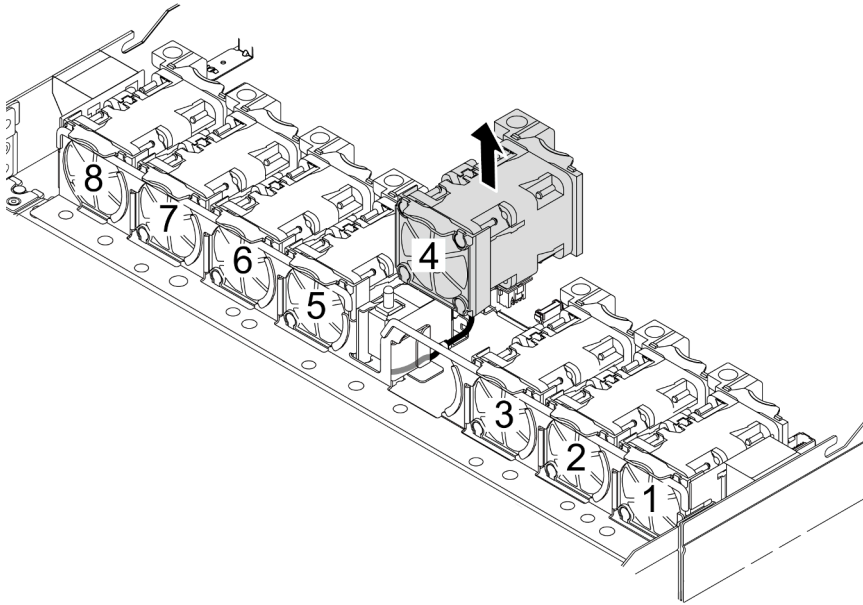
- Read “Installation Guidelines” on page 49 and “Safety inspection checklist” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Watch the procedure

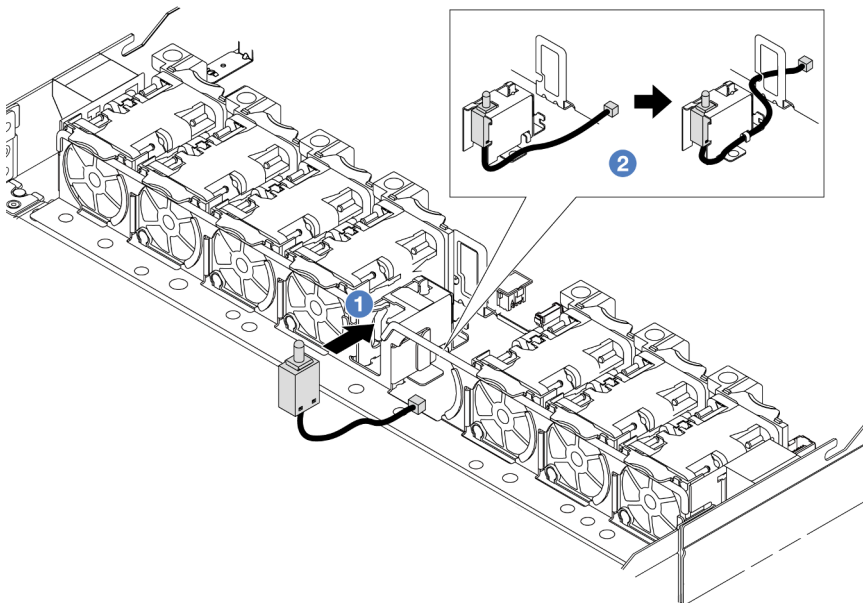
A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-CTkyVDu-5Lhy1r9G-4PQGI>.

Procedure

- Step 1. Touch the static-protective package that contains the intrusion switch to any unpainted surface on the outside of the server. Then, take the intrusion switch out of the package and place them on a static-protective surface.
- Step 2. Remove the number 4 fan.



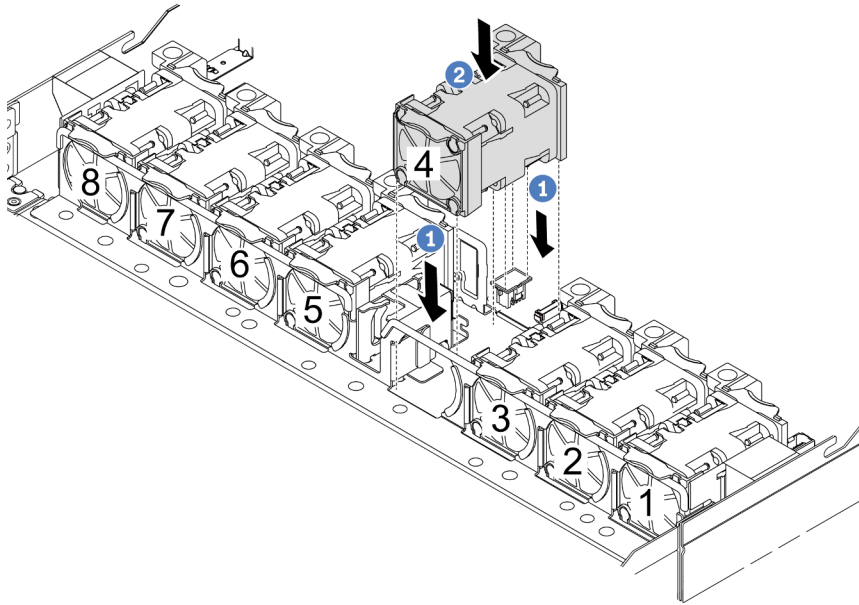
Step 3. Install the intrusion switch.



- a. ① Insert the intrusion switch into the cage.
- b. ② Route the cable into the cable clip.

Step 4. Connect the cable of the intrusion switch to the intrusion switch connector on the system board (system board assembly). See [“Intrusion switch” on page 342](#).

Step 5. Re-install the number 4 fan.



- a. 1 Align the four corners of the fan to fan module socket and put it down.
- b. 2 Press the fan latch down to ensure that it is plugged in the connector.

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322.](#)

Demo video

<https://www.youtube.com/watch?v=Tpya1mUrGPs>

The Lenovo Neptune® Liquid to Air Module replacement (trained technicians only)

Follow instructions in this section to remove and install the L2AM (The Lenovo Neptune Liquid to Air Module).

Important:

- This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.
- When the server has an L2AM module (close-loop cooling module) installed, you must apply for a handle first if you need to install or remove the processor board, I/O board, and processor. However, while replacing the old L2AM module with a new one, you do not need to apply for a handle as the new L2AM module contains it.
- This section is for L2AM (The Lenovo Neptune Liquid to Air Module) replacement. For the replacement of the processor and heat sink, refer to [“Processor and heat sink replacement \(trained technicians only\)” on page 243.](#)
- [“Remove the Lenovo Neptune® Liquid to Air Module” on page 134](#)
- [“Install the Lenovo Neptune® Liquid to Air Module” on page 138](#)

Remove the Lenovo Neptune® Liquid to Air Module

Follow instructions in this section to remove the L2AM (The Lenovo Neptune Liquid to Air Module).

About this task

Safety information for liquid detection sensor module cable

S011



CAUTION:

Sharp edges, corners, or joints nearby.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- If the server is installed in a rack, slide the server out on its rack slide rails to gain access to the top cover, or remove the server from the rack. See [“Remove the server from rack” on page 65](#).

Prepare the following screwdrivers to ensure to install and remove the corresponding screws properly.

Torque screwdriver type list	Screw Type
Torx T20 screwdriver	Torx T20 screw
Phillips 2 screwdriver	Phillips 2 screw

CAUTION:

Ensure that the module handle (LACM heat sink bracket) is installed when removing or installing the L2AM. Do not touch the radiator fins. Touching the radiator fins might damage the L2AM.

Procedure

Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).

Step 2. Disconnect the pump cable and leak detection cable of the LACM module from the connector on the processor board. See [“The Lenovo Neptune® Liquid to Air Module” on page 361](#).

Notes:

- If you need to disconnect cables from the system board assembly, disengage all latches or release tabs on cable connectors first. Failing to release the tab before removing the cables will damage the cable sockets on the system board assembly. Any damage to the cable sockets might require replacing the system board assembly.
- The connectors on your system board assembly might look different from those in the illustration, but the removal procedure is the same.
 1. Press the release tab to release the connector.
 2. Disengage the connector from the cable socket.

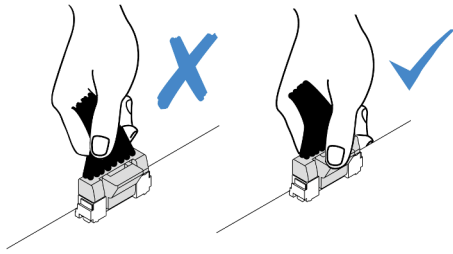
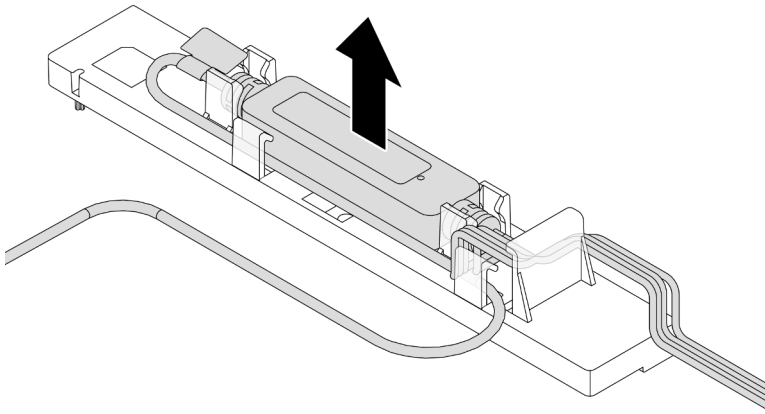


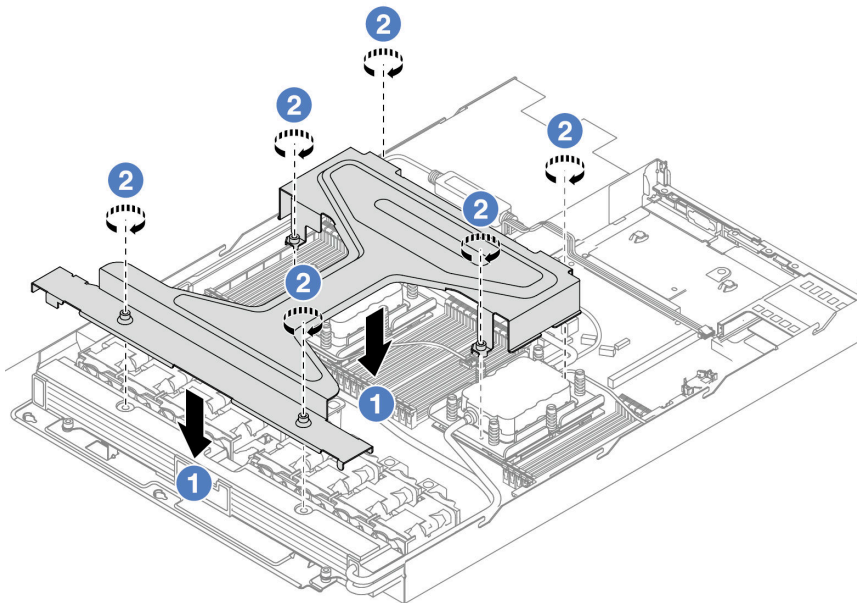
Figure 97. Disconnecting cables from the processor board

- Step 3. Disconnect the leak detection cable from the processor board, and route it out of the cable clips on the liquid detection sensor module holder.



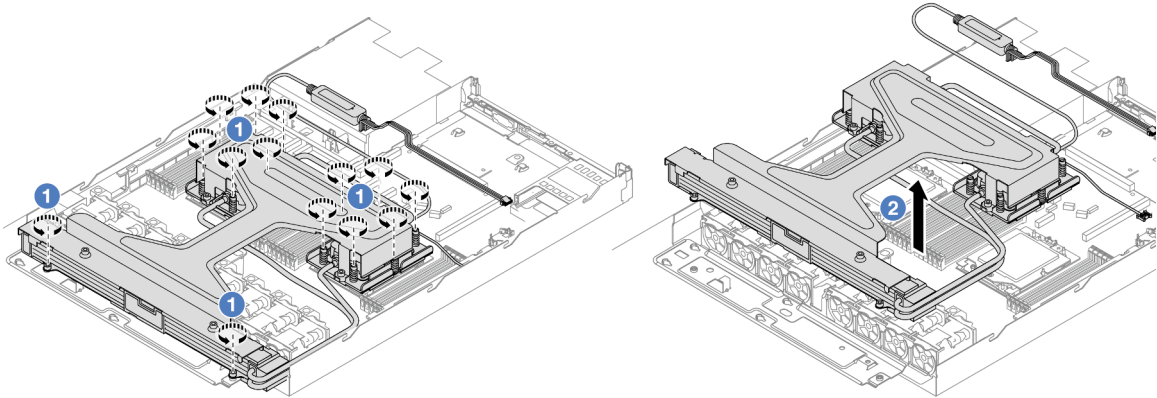
Note: It is advised to disengage the cable connector from the processor board by pulling the safety information label or liquid detection sensor module.

- Step 4. Re-install the module handle (LACM heat sink bracket) to the L2AM.



- a. ① Place the module handle (LACM heat sink bracket) evenly on the L2AM and align screw holes.
- b. ② Tighten six Torx T20 screws. Ensure that the screws are secured in place.

Step 5. Disengage the LACM from the processor board.



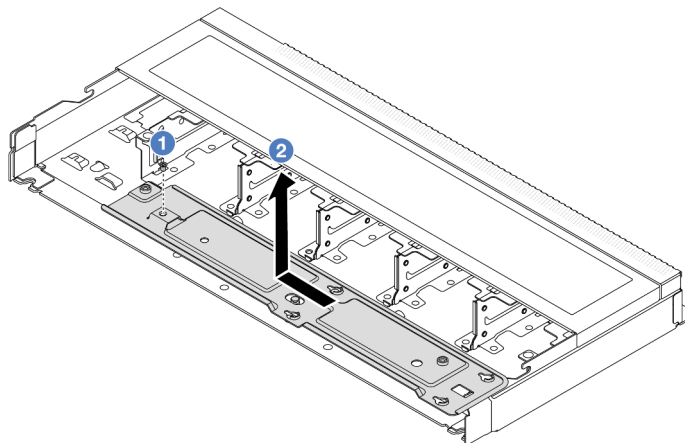
- a. ① Fully loosen fourteen Torx T20 screws on the cold plate assembly and radiator.
- b. ② Grasp the middle of the module handle (LACM heat sink bracket) and one of the two T20 screws fastening the radiator to carefully lift the LACM from the processor sockets. If the LACM cannot be fully lifted out of the socket, further loosen the Torx T20 screws and try lifting the LACM again.

Step 6. Place the L2AM upside down on the clean surface.

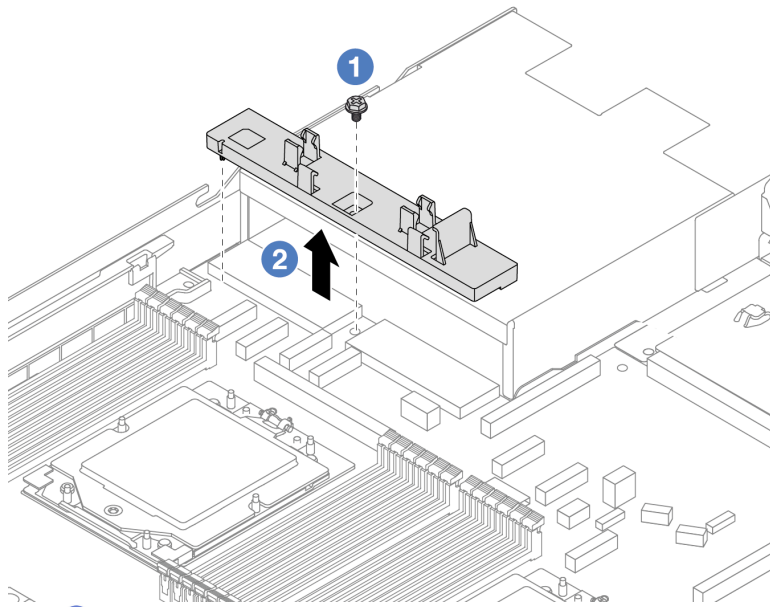
Step 7. If there is any old thermal grease on the processors and the cold plates, gently clean the top of the processors and the cold plates with an alcohol cleaning pad.

Step 8. Optionally, if you do not need to install a new LACM module, do the following:

- a. Remove the radiator tray from the chassis.



1. ① Remove the Phillips 2 screw on the radiator tray.
2. ② Move the radiator tray to the left and lift it out of the chassis.
- b. Remove the liquid detection sensor module holder from the chassis.



1. 1 Remove the Phillips 2 screw on the liquid detection sensor module holder.
2. 2 Lift the liquid detection sensor module holder out of the chassis.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=hOBVmOWRJX8>

Install the Lenovo Neptune® Liquid to Air Module

Follow instructions in this section to install the L2AM (The Lenovo Neptune Liquid to Air Module).

About this task

Safety information for liquid detection sensor module cable

S011



CAUTION:

Sharp edges, corners, or joints nearby.

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.

CAUTION:

When removing a new L2AM from the shipping box, lift out the cold plate assembly with the shipping tray attached to prevent thermal grease on the cold plate assembly from damage.

CAUTION:

Ensure that the module handle (LACM heat sink bracket) is installed when removing or installing the L2AM. Do not touch the radiator fins. Touching the radiator fins might damage the L2AM.

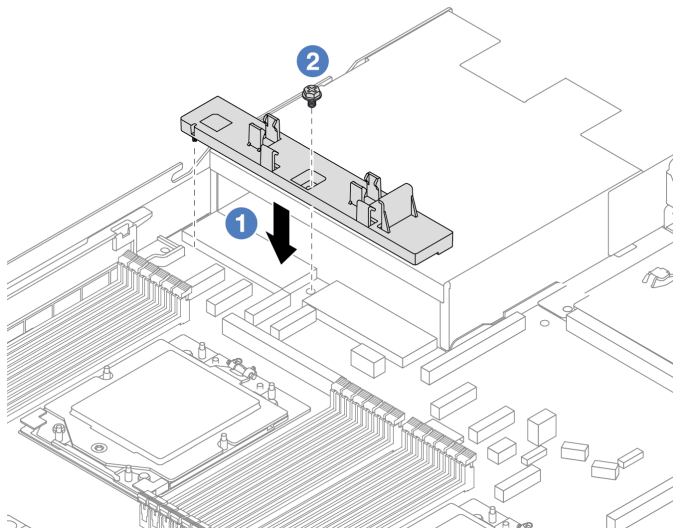
Prepare the following screwdrivers to ensure you can install and remove the corresponding screws properly.

Torque screwdriver type list	Screw Type
Torx T20 screwdriver	Torx T20 screw
Phillips 2 screwdriver	Phillips 2 screw

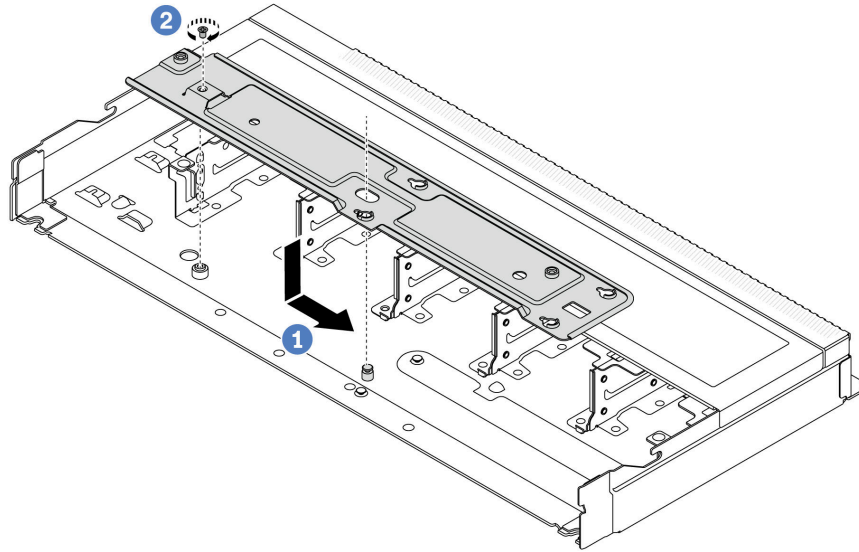
Procedure

Step 1. Prepare your server.

- a. Install the liquid detection sensor module holder to the chassis.

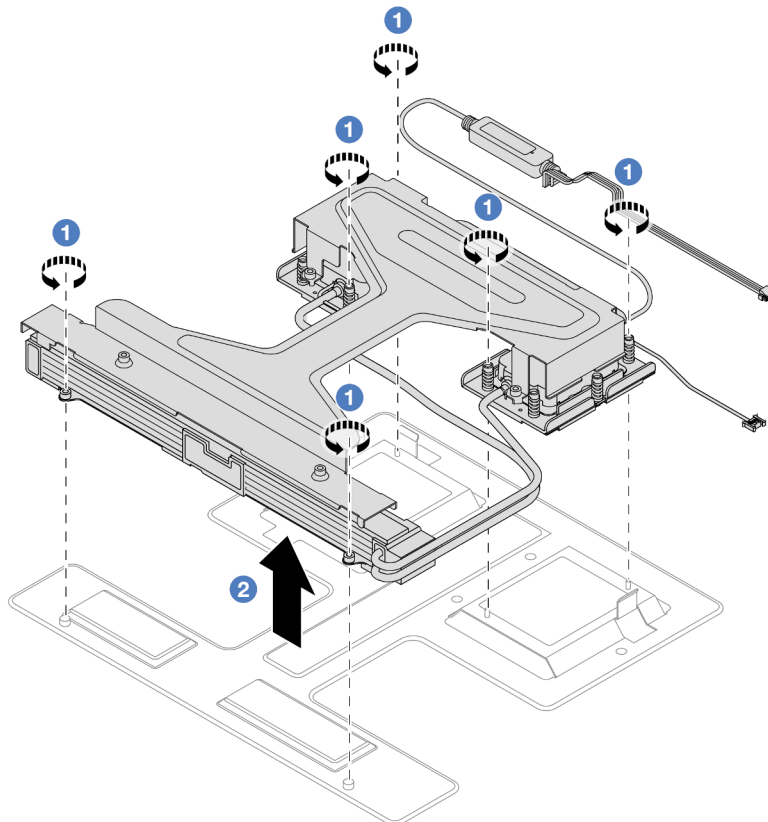


1. ① Align the liquid detection sensor module holder to the corresponding screw hole on the chassis.
 2. ② Tighten the Phillips 2 screw and ensure that the holder is secured in place.
- b. Install the radiator tray to the chassis.



1. ① Place the tray evenly into the chassis and then move it to the right so that the screw hole on the tray aligns with the hole on the chassis.
2. ② Tighten the Phillips 2 screw.

Step 2. Separate the L2AM module from the shipping tray.

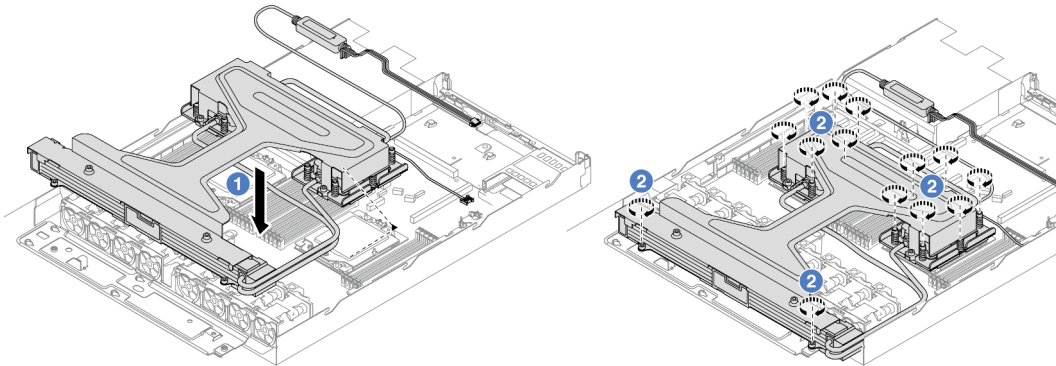


1. ① Loosen the six Torx T20 screws on the L2AM module shipping tray.
2. ② Grasp the middle of the module handle (LACM heat sink bracket) and one of the two T20 screws fastening the radiator to lift the L2AM by the module handle (LACM heat sink bracket) to separate the module from the shipping tray.

Step 3. Make sure you have an alcohol cleaning pad available.

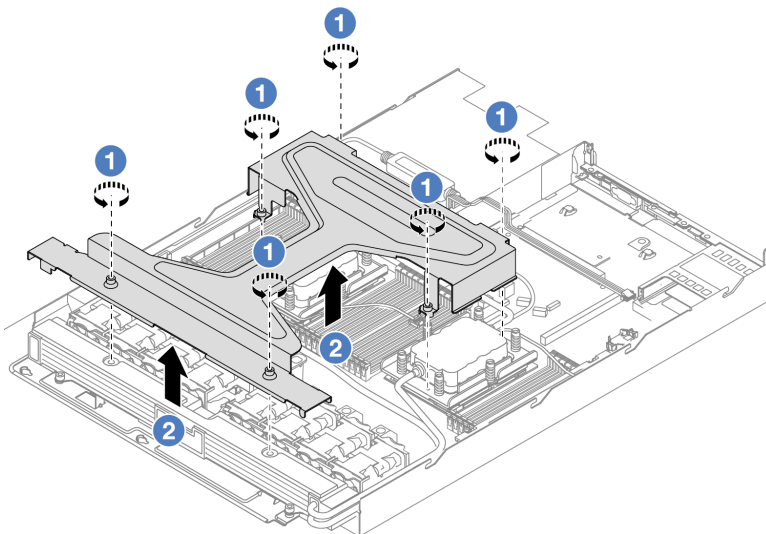
Attention: If there is any old thermal grease on the processors, gently clean the top of the processors with an alcohol cleaning pad.

Step 4. Install the L2AM on the processor board.



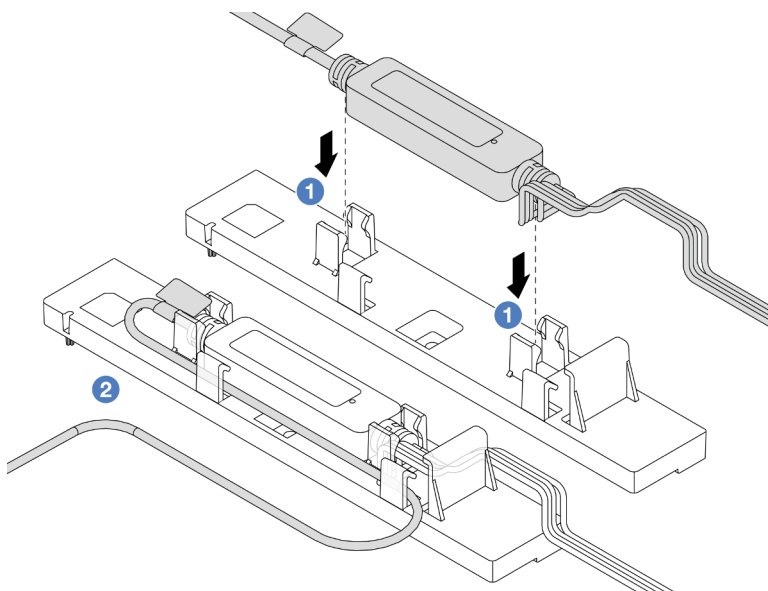
1. ① Align the triangular mark on the cold plate assembly label with the triangular mark on the processor carrier and processor. Install the LACM onto the processor-carrier.
2. ② Fully tighten the fourteen Torx T20 nuts *in the installation sequence shown* on the cold plate assembly and the radiator. Tighten the screws until they stop; then, visually inspect to make sure that there is no gap between the screw shoulder beneath the cold plate assembly and the processor socket. (For reference, the torque required for the fasteners to fully tighten is 1.22-1.47 newton-meters, 10.8-13.0 inch-pounds.)

Step 5. Separate the module handle (LACM heat sink bracket) from the module.



1. ① Loosen the six Torx T20 screws on the module handle (LACM heat sink bracket).
2. ② Grasp the middle of the module handle (LACM heat sink bracket) to separate it from the module.

Step 6. Install the leak detection module to the holder.



1. ① Install the liquid detection sensor module into the two clips on the holder. Ensure that the module is secured in place.
2. ② After the module is secured, route the cable through the cable clips to keep tidy for later cable routing arrangements.

Note: For liquid detection sensor module working status, see “[LED on the leak detection sensor module](#)” on page 517.

- Step 7. Connect the pump cable and leak detection cable of the LACM to the connectors on the processor board. See “[The Lenovo Neptune® Liquid to Air Module](#)” on page 361.

After you finish

1. Complete the parts replacement. See “[Complete the parts replacement](#)” on page 322.

Demo video

<https://www.youtube.com/watch?v=TsKgt7BuUd4>

Lenovo Neptune® Processor Direct Water Cooling Module replacement (trained technicians only)

Follow the instructions in this section to remove and install the Direct Water Cooling Module (DWCM).

Important:

- This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.
- Configurations with DWCM do not support rail kits with cable management arm (CMA).
- “[Remove the Lenovo Neptune® Processor Direct Water Cooling Module](#)” on page 142
- “[Install the Lenovo Neptune® Processor Direct Water Cooling Module](#)” on page 146

Remove the Lenovo Neptune® Processor Direct Water Cooling Module

Follow the instructions in this section to remove the Direct Water Cooling Module (DWCM).

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

About this task

Safety information for leakage detection sensor module cable

S011



CAUTION:

Sharp edges, corners, or joints nearby.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Prepare the following screwdrivers to ensure you can install and remove the corresponding screws properly.

Torque screwdriver type list	Screw Type
Torx T20 head screwdriver	Torx T20 screw

Procedure

- Step 1. To remove the quick connect plugs from the manifolds, see [“Remove the manifold \(in-rack system\)” on page 156](#) or [“Remove the manifold \(in-row system\)” on page 180](#).
- Step 2. To remove the server from the rack, see [“Remove the server from rack” on page 65](#).
- Step 3. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 4. Disconnect the liquid detection sensor module cable of the DWCM from the connector on the system board assembly. See [“Direct water cooling module” on page 360](#).
- Step 5. Remove the hose holder cover.

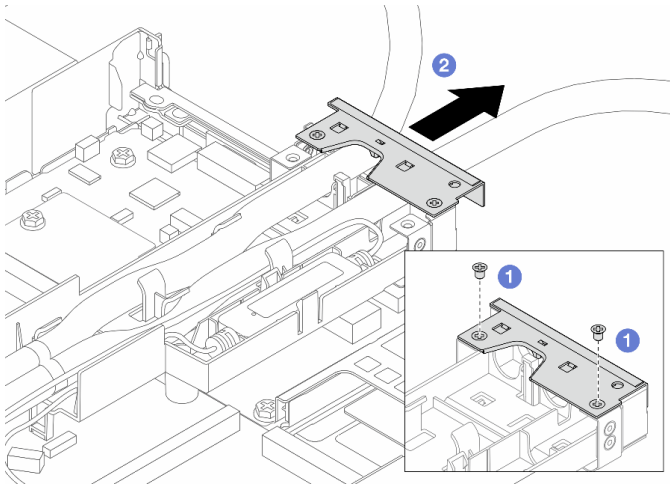


Figure 98. Removing the holder cover

- a. ① Loosen the two screws from the cover.
- b. ② Pull the cover backwards to disengage it from the holder.

Step 6. Disengage the hoses and liquid detection sensor module.

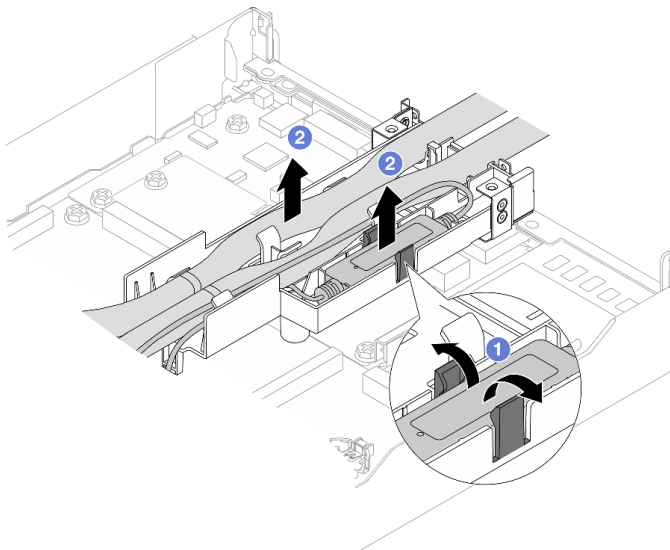


Figure 99. Disengaging the hoses and module

- a. ① Push the holder latches to both sides to unlock the module.
- b. ② Disengage the hoses and module from the hose holder.

Step 7. Remove the DWCM from the processor board.

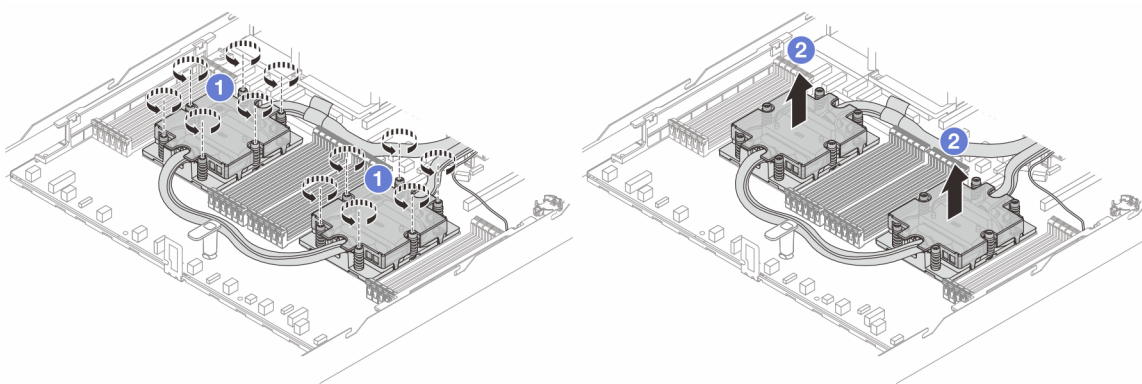


Figure 100. Removing the DWCM

- a. ① Fully loosen all the screws *in the removal sequence shown* on the cold plate assembly.
- b. ② Carefully lift the DWCM from the processor socket.

Step 8. If there is any old thermal grease on the four GPUs and the cold plates, gently clean the top of the four GPUs and the cold plates with an alcohol cleaning pad.

Step 9. If you are replacing a processor, remove the processor. See [“Remove a processor” on page 246](#).

Step 10. Remove the hose holder.

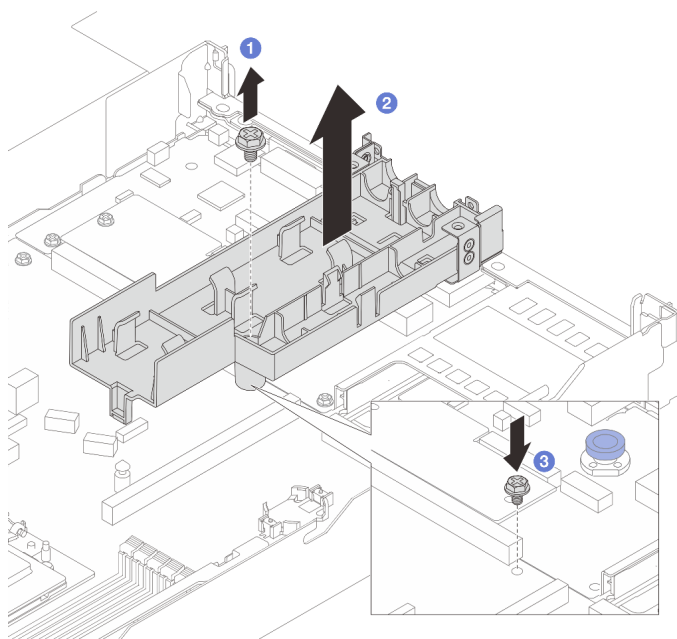


Figure 101. Removing the holder

- a. ① Loosen the screw that locks the holder to the processor board.
- b. ② Lift the holder out of the chassis.
- c. ③ Re-install the screw back to the processor board.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

https://www.youtube.com/watch?v=SPSrWCZ_Avg

Install the Lenovo Neptune® Processor Direct Water Cooling Module

Follow the instructions in this section to install the Direct Water Cooling Module (DWCM).

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

About this task

Safety information for liquid detection sensor module cable

S011



CAUTION:

Sharp edges, corners, or joints nearby.

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “[Power off the server](#)” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

CAUTION:

When removing a new DWCM from the shipping box, lift out the cold plate assembly with the shipping tray attached to prevent thermal grease on the cold plate assembly from damage.

Prepare the following screwdrivers to ensure you can install and remove the corresponding screws properly.

Torque screwdriver type list	Screw Type
Torx T20 screwdriver	Torx T20 screw
Phillips 2 screwdriver	Phillips 2 screw

Procedure

Step 1. Prepare your server.

- a. Install the hose holder to the chassis.

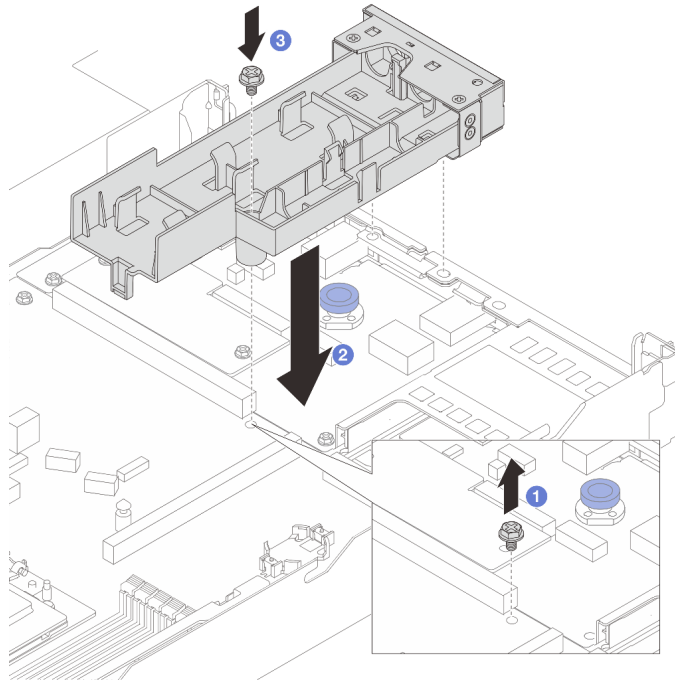


Figure 102. Installing the hose holder

1. ① Loosen the screw on the processor board.
 2. ② Align the screw holes on the hose holder and processor board, and align the guiding pins of the holder to the rear wall.
 3. ③ Tighten the screw to secure the holder to the processor board.
- b. Remove the hose holder cover.

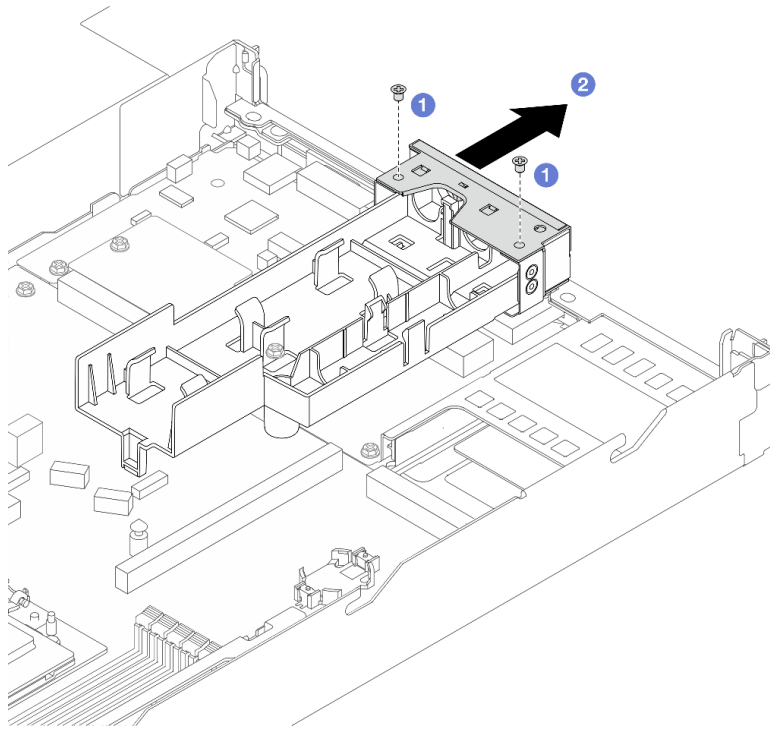


Figure 103. Removing the holder cover

1. ① Loosen the two screws from the hose holder cover.
2. ② Pull the cover backwards to disengage it from the holder.

Step 2. Make sure you have an alcohol cleaning pad available.

Attention: If there is any old thermal grease on the processors, gently clean the top of the processors with an alcohol cleaning pad.

Step 3. Install the processor. For more information, see [“Install a processor” on page 247](#).

Step 4. Install the DWCM to the system board assembly.

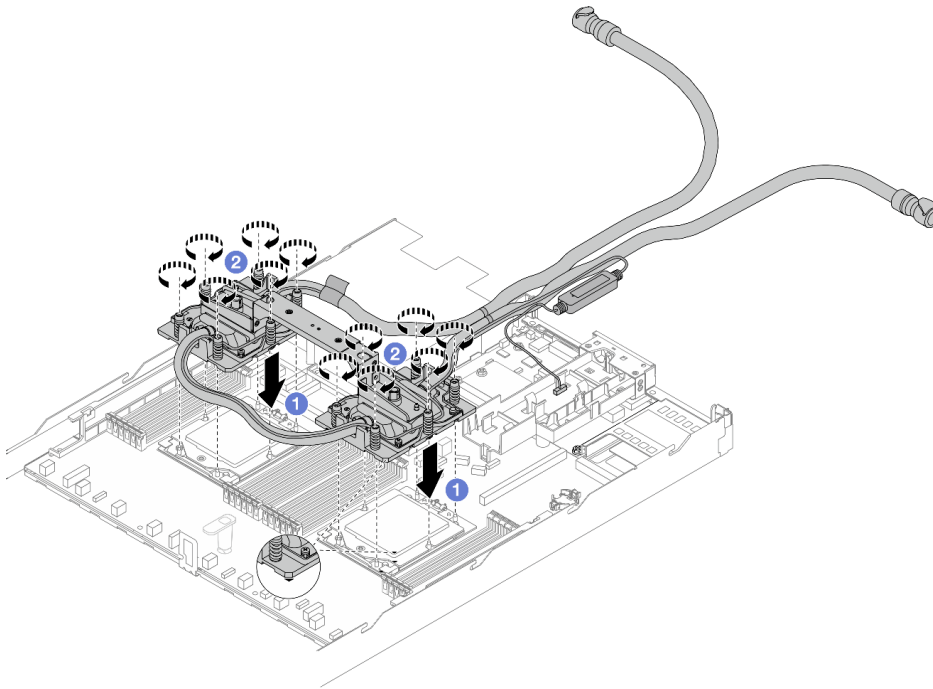


Figure 104. Installing the DWCM

1. ① Align the triangular mark and the Torx T20 nuts on the cold plate assembly with the triangular mark and threaded posts of the processor socket; then, insert the cold plate assembly into the processor socket.
2. ② Fully tighten the Torx T20 nuts *in the installation sequence shown* on the cold plate assembly. Tighten the screws until they stop; then, visually inspect to make sure that there is no gap between the screw shoulder beneath the cold plate assembly and the processor socket. (For reference, the torque required for the fasteners to fully tighten is 1.25-1.45 newton-meters, 11-13 inch-pounds.)

Step 5. Remove the module handle from the DWCM.

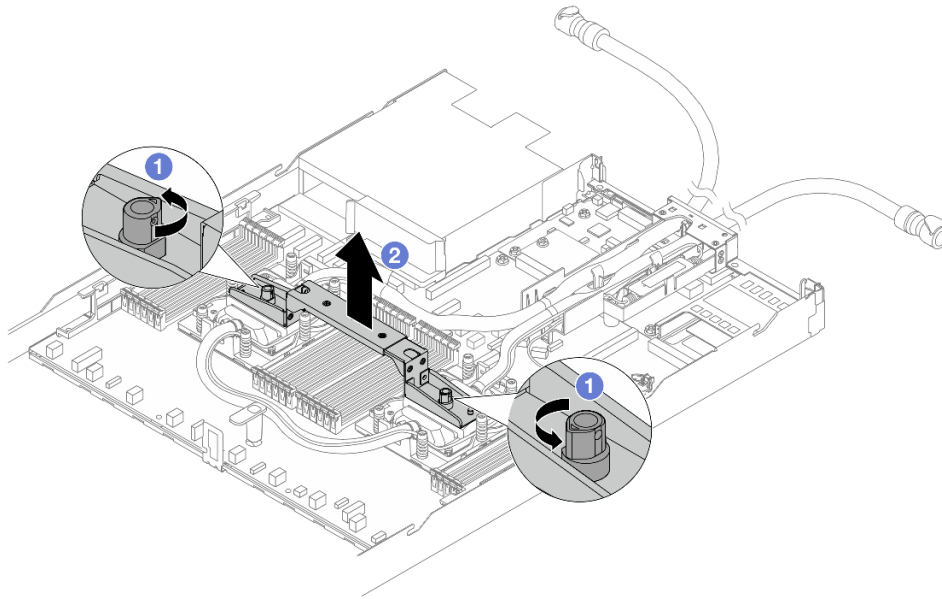


Figure 105. Removing the module handle

- a. ① Rotate the screws as illustrated above to unlock the handle.
- b. ② Separate the handle from DWCM.

Notes: A new DWCM comes with a handle.

1. To replace an old DWCM with a new one, remove the handle of the new one as illustrated above.
2. To replace processors without changing the DWCM, a handle is not needed. Skip [Step 5 step 5 on page 149](#) and proceed with further installation.

Step 6. Install the cold plate covers. Press the cover down as illustrated below.

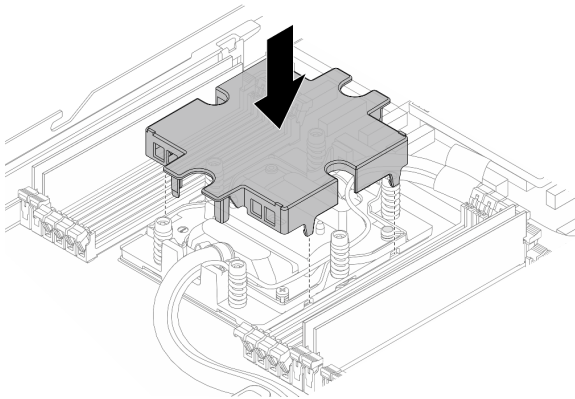


Figure 106. Installing a cold plate cover

Step 7. Place the hoses, the liquid detection sensor module and the cable.

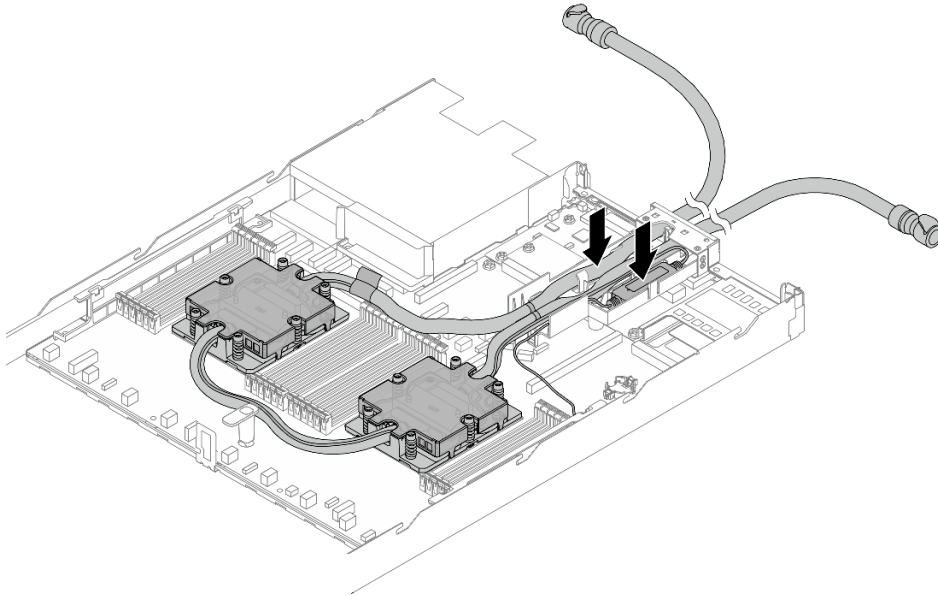


Figure 107. Placing the hoses and module

Notes:

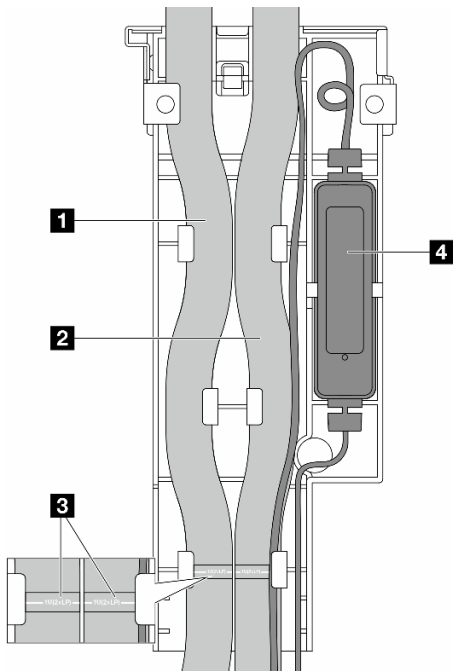


Figure 108. The installation details

- The hoses: place the middle part of the hose against the blue latch; and insert the **1** outlet and **2** inlet hoses into the holder.
- The hoses have guiding labels **3** attached, check for the labels before installation. The labels help hoses go to the right place, so align the labels with holder latches. Otherwise the hoses might obstruct open connectors on the system board assembly.
- The liquid detection sensor module **4**: Insert the module to the holder beside the hoses. And make sure that the side with a status LED is up and route the cable as illustrated above.

- For liquid detection sensor module working status, see “LED on the leak detection sensor module” on page 517.

Step 8. Re-install the hose holder cover.

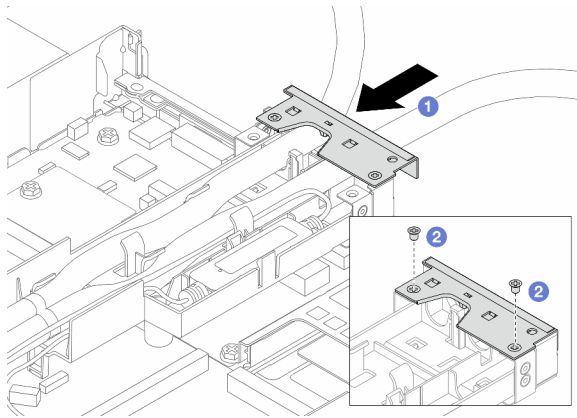


Figure 109. Installing the cover back

- 1 Slide the holder cover in and align the screw holes.
- 2 Tighten the screws.

Step 9. Connect the liquid detection sensor module cable of the DWCM to the connector on the system board assembly. See “Direct water cooling module” on page 360.

Step 10. Install the top cover. See “Install the top cover” on page 320.

Step 11. To install the server into the rack, see “Install the server to rack” on page 68.

Step 12. To install the quick connect plugs to the manifolds, see “Install the manifold (in-rack system)” on page 166 or “Install the manifold (in-row system)” on page 191.

After you finish

Complete the parts replacement. See “Complete the parts replacement” on page 322.

Demo video

<https://www.youtube.com/watch?v=r9OGhF4GP7k>

Management NIC adapter replacement

Follow instructions in this section to install or remove the ThinkSystem V3 Management NIC Adapter Kit (management NIC adapter).

Note: If the ThinkSystem V3 Management NIC Adapter Kit (management NIC adapter) is installed on the server, it will not be displayed on the PCIe card list of system management software, such as XCC, LXPM, and so on.

- “Remove the management NIC adapter” on page 152
- “Install the management NIC adapter” on page 154

Remove the management NIC adapter

Follow instructions in this section to remove the ThinkSystem V3 Management NIC Adapter Kit (management NIC adapter).

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Step 1. Prepare for the task.

- a. Access the Lenovo XClarity Controller; then, select **Network** in **BMC Configuration** and disable **Ethernet Port 2**.
- b. If the server is installed in a rack, remove the server from the rack.
- c. Remove the top cover. See [“Remove the top cover” on page 318](#).
- d. If the server comes with a riser 1 assembly, remove it first. See [“Remove the rear riser card” on page 281](#).

Step 2. Disconnect the cable on the management NIC adapter, see [“Management NIC adapter” on page 343](#).

Step 3. Remove the management NIC adapter.

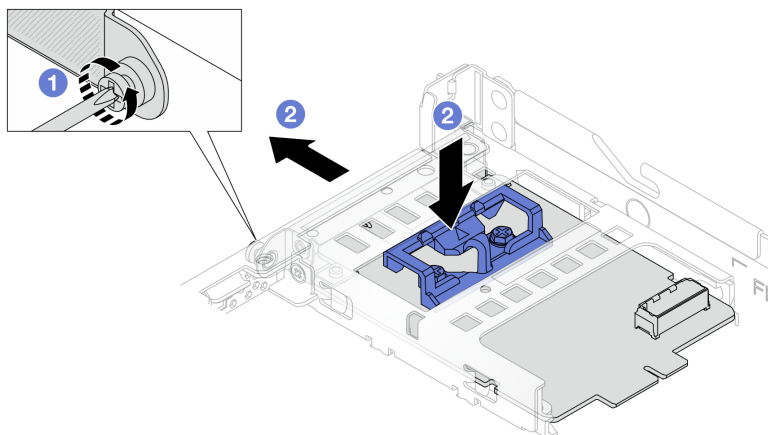


Figure 110. Removing the management NIC adapter

- a. ① Loosen the screw that secures the management NIC adapter.
- b. ② Press and hold the blue latch. And pull the management NIC adapter by the latch out from the chassis.

After you finish

1. Install a replacement unit or a filler. See [“Install the management NIC adapter” on page 154](#).
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

[Watch the procedure on YouTube](#)

Install the management NIC adapter

Follow instructions in this section to install the ThinkSystem V3 Management NIC Adapter Kit (management NIC adapter).

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Firmware and driver download: You might need to update the firmware or driver after replacing a component.

- Go to <https://datacentersupport.lenovo.com/tw/en/products/servers/thinksystem/sr645v3/7d9c/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to [“Update the firmware” on page 489](#) for more information on firmware updating tools.

Procedure

Step 1. If a filler is installed, remove it.

Step 2. Install the management NIC adapter.

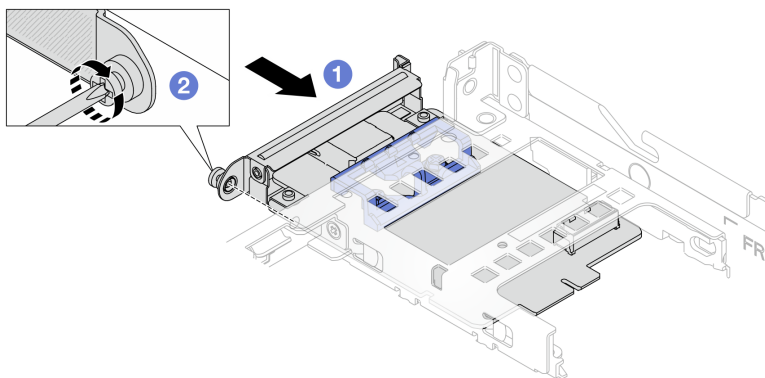


Figure 111. Installing the management NIC adapter

- a. 1 Slide the management NIC adapter into the slot until it is fully seated.
- b. 2 Tighten the screw to secure the management NIC adapter.

Step 3. Connect the cable to the management NIC adapter. See [“Management NIC adapter” on page 343](#).

Step 4. Install the riser 1 assembly if you have removed it. See [“Install the rear riser card” on page 283](#).

After you finish

1. Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).
2. Access the Lenovo XClarity Controller; then, select **Network** in **BMC Configuration** and enable **Ethernet Port 2**.

Demo video

[Watch the procedure on YouTube](#)

Manifold replacement (trained technicians only)

Use the following procedures to remove and install the manifolds.

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

The coolant runs through the cooling system is de-ionized water. For more information about the coolant, see [“Water requirements” on page](#) .

The server can be installed in the ThinkSystem Heavy Duty Full Depth Rack Cabinets. For ThinkSystem Heavy Duty Full Depth Rack Cabinets User Guide, see [ThinkSystem Heavy Duty Full Depth Rack Cabinets User Guide](#).

For more operation and maintenance guidelines on Coolant Distribution Unit (CDU), see [Lenovo Neptune DWC RM100 in-rack Coolant Distribution Unit \(CDU\) Operation & Maintenance Guide](#).

The illustrations below present the rear views of a rack cabinet; three sets of manifolds and three sets of connection hoses. There are two labels attached to the front of the manifolds, and one label on one end of each hose.

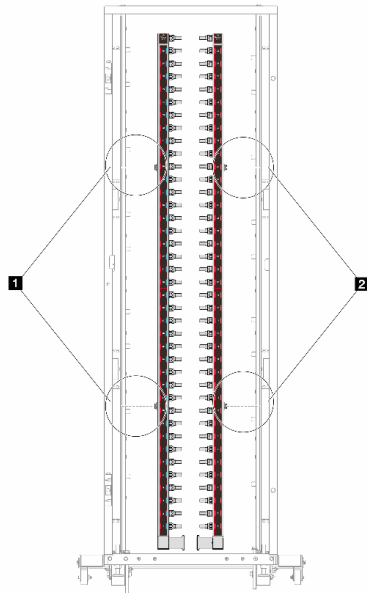


Figure 112. Manifolds in a 42U in-row system

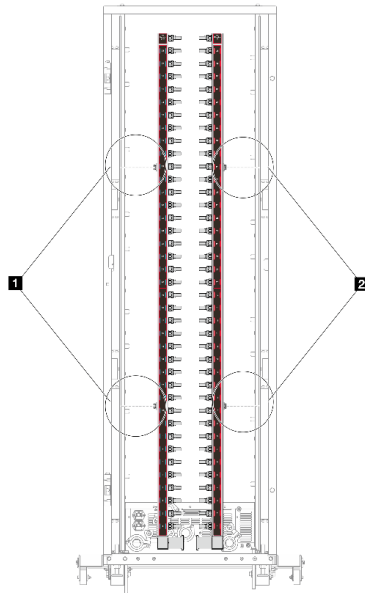


Figure 113. Manifolds in a 42U in-rack system

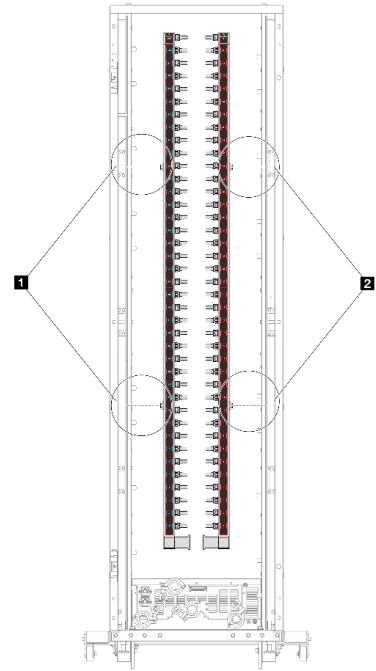


Figure 114. Manifolds in a 48U in-rack system

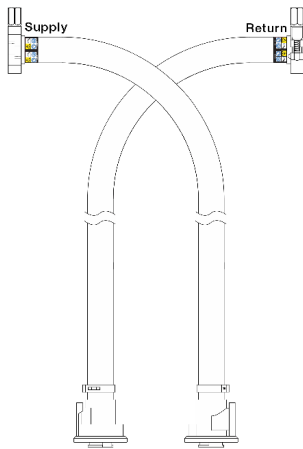


Figure 115. 42U in-row hose kit

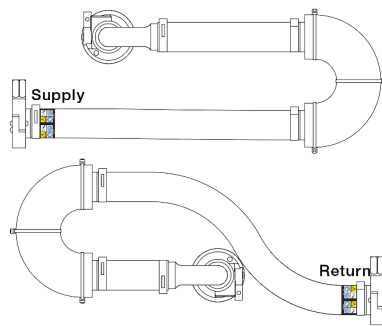


Figure 116. 42U in-rack connection set

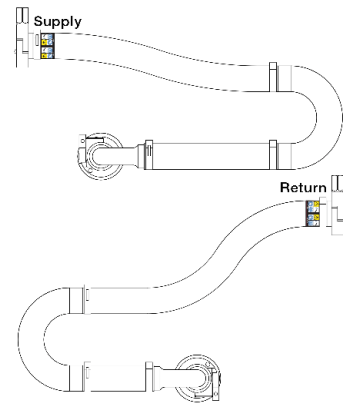


Figure 117. 48U in-rack connection set

- **1** Two left spools on supply manifold
- **2** Two right spools on return manifold
- “Remove the manifold (in-rack system)” on page 156
- “Install the manifold (in-rack system)” on page 166
- “Remove the manifold (in-row system)” on page 180
- “Install the manifold (in-row system)” on page 191

Remove the manifold (in-rack system)

Use this information to remove the manifold in an in-rack direct water cooling system.

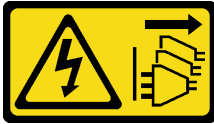
About this task

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

CAUTION:

The coolant might cause irritation to the skin and eyes. Avoid direct contact with the coolant.

S002



CAUTION:

The power-control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

S011



CAUTION:

Sharp edges, corners, or joints nearby.

S038



CAUTION:

Eye protection should be worn for this procedure.

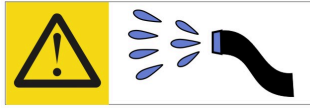
S040



CAUTION:

Protective gloves should be worn for this procedure.

L016



خطر: قد يتم التعرض لخطر الصدمة الكهربائية بسبب الماء أو المحلول المائي الذي يوجد بهذا المنتج.
تجنب العمل في أو بالقرب من أي جهاز فعال بأيدي مبللة أو عند وجود تسرب للماء. (L016)

AVISO: Risco de choque elétrico devido à presença de água ou solução aquosa no produto. Evite trabalhar no equipamento ligado ou próximo a ele com as mãos molhadas ou quando houver a presença de água derramada. (L016)

ОПАСНО: Риск от токов удар поради вода или воден разтвор, присъстващи в продукта.
Избягвайте работа по или около оборудване под напрежение,
докато сте с мокри ръце или когато наоколо има разляна вода.
(L016)

DANGER : Risque de choc électrique lié à la présence d'eau ou d'une solution aqueuse dans ce produit. Évitez de travailler avec ou à proximité d'un équipement sous tension avec des mains mouillées ou lorsque de l'eau est renversée. (L016)

危险: 由于本产品中存在水或者水溶液, 因此存在电击风险。请避免使用潮湿的手在带电设备或者有水溅出的环境附近工作。 (L016)

危險: 本產品中有水或水溶液, 會造成電擊的危險。手濕或有潑濺的水花時, 請避免使用或靠近帶電的設備。 (L016)

OPASNOST: Rizik od električnog udara zbog vode ili tekućine koja postoji u ovom proizvodu.
Izbjegavajte rad u
blizini opreme pod naponom s mokrim rukama ili kad je u blizini prolivena
tekućina.
(L016)

NEBEZPEČÍ: Riziko úrazu elektrickým proudem v důsledku vody nebo vodního roztoku přítomného v tomto produktu. Dejte pozor, abyste při práci s aktivovaným vybavením nebo v jeho blízkosti neměli mokré ruce a vyvarujte se potřísnění nebo polití produktu vodou. (L016)

Fare! Risiko for stød på grund af vand eller en vandig opløsning i produktet. Undgå at arbejde med eller i nærheden af strømførende udstyr med våde hænder, eller hvis der er spildt vand. (L016)

GEVAAR: Risico op elektrische schok door water of waterachtige oplossing die aanwezig is in dit product. Vermijd werken aan of naast apparatuur die onder spanning staat als u natte handen hebt of als gemorst water aanwezig is. (L016)

DANGER: Risk of electric shock due to water or a water solution which is present in this product. Avoid working on or near energized equipment with wet hands or when spilled water is present. (L016)

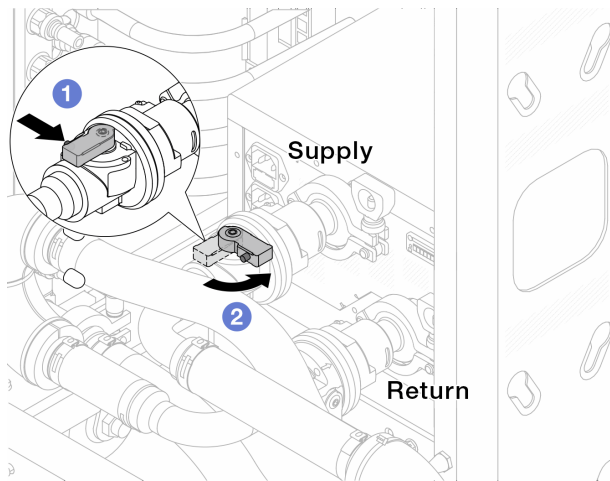


Figure 118. Closing ball valves

- a. ① Press the button on the ball valve switch.
- b. ② Rotate the switch to close the valves as illustrated above.

Step 3. Remove the quick connect plugs to separate the DWCM hoses from the manifold.

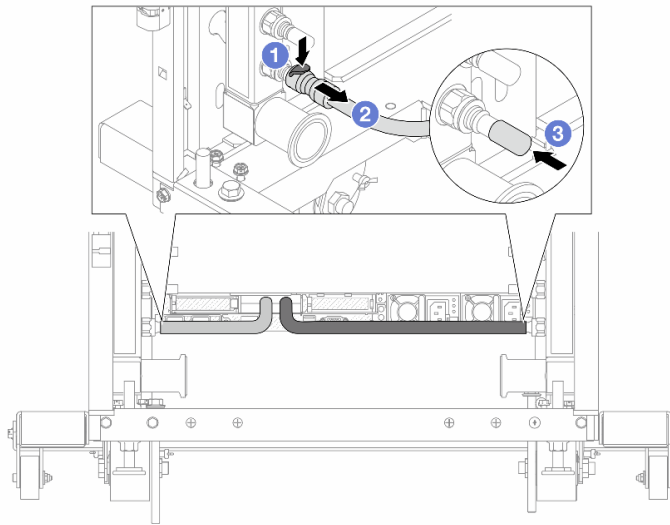


Figure 119. Quick connect plug removal

- a. ① Press the latch down to unlock the hose.
- b. ② Pull the hose off.
- c. ③ Re-install the rubber quick connect plug covers to the ports on the manifold.

Step 4. Repeat [Step 3 step 3 on page 161](#) to the other manifold.

Step 5. Disengage the connection set from ball valves.

Note: Disengage the return side first, then disengage the supply side.

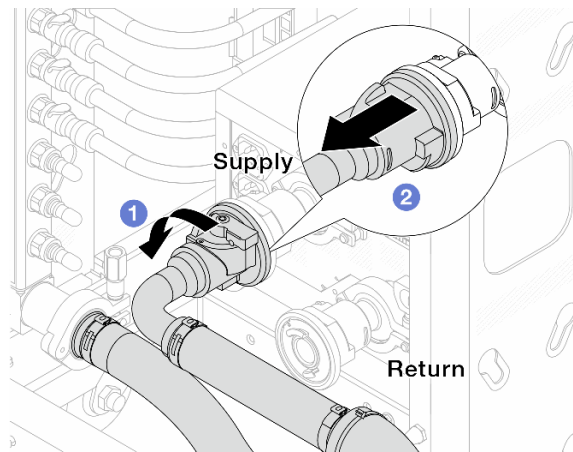


Figure 120. Removing the connection set

- a. ① Rotate the ball valve to the left.
- b. ② Pull the connection set off from ball valve.

Step 6. Remove the manifold with the connection set attached.

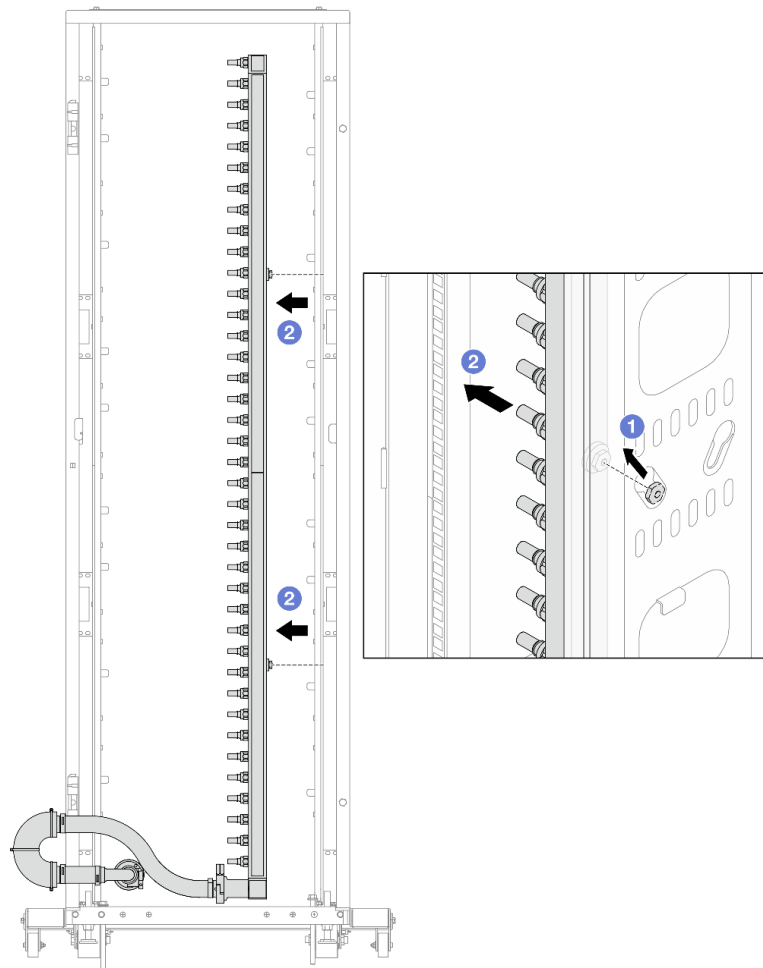


Figure 121. Removing the manifold

- a. ① Hold the manifold with both hands, and lift it upward to relocate the spools from the small openings to large ones on the rack cabinet.
- b. ② Remove the manifold with the connection set attached.

Step 7. Repeat [Step 6 step 6 on page 162](#) to the supply manifold.

Notes:

- There is remaining coolant inside the manifold and the connection set. Remove both together and leave the further draining to the next step.
- For more information about the rack cabinet, see [ThinkSystem Heavy Duty Full Depth Rack Cabinets User Guide](#).

Step 8. Install the bleeder kit to the manifold supply side.

Note: This step drains the coolant with the help of a pressure difference inside and outside the supply manifold.

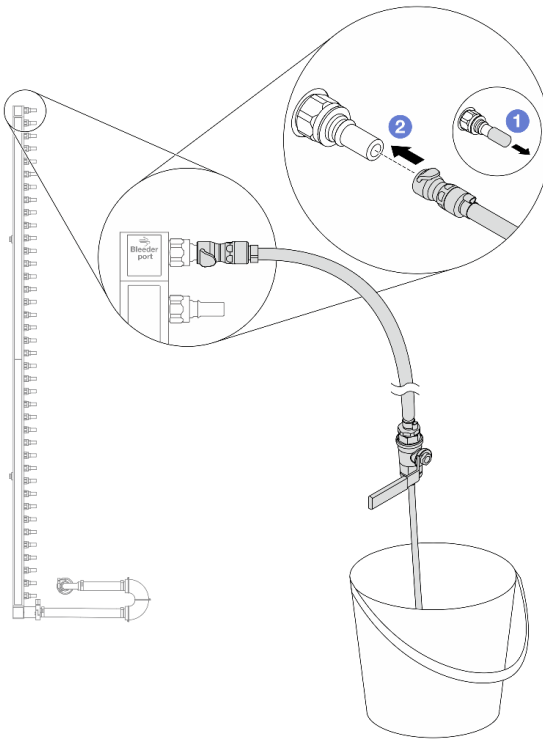


Figure 122. Installing the bleeder kit to the supply side

- a. ① Remove the rubber quick connect plug covers from the ports on the manifold.
- b. ② Plug the bleeder kit to the manifold.

Step 9. Slowly open the bleeder valve to allow a steady stream of coolant to drain. Close the bleeder valve once coolant stops flowing.

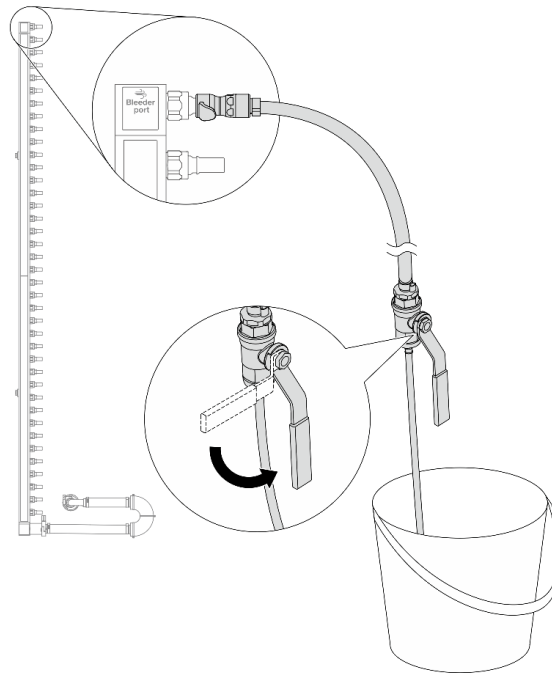


Figure 123. Opening the bleeder valve

Step 10. Install the bleeder kit to the manifold return side.

Note: This step drains the coolant with the help of a pressure difference inside and outside the return manifold.

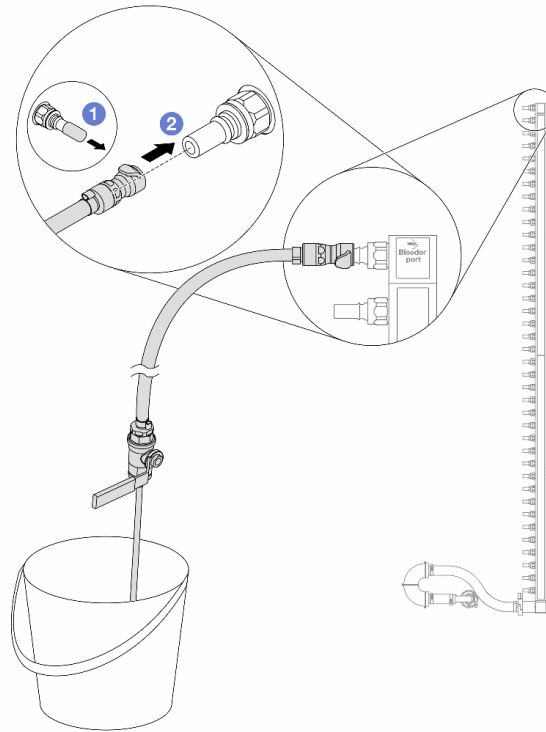


Figure 124. Installing the bleeder kit to the return side

- a. ① Remove the rubber quick connect plug covers from the ports on the manifold.
- b. ② Plug the bleeder kit to the manifold.

Step 11. Slowly open the bleeder valve to allow a steady stream of coolant to drain. Close the bleeder valve once coolant stops flowing.

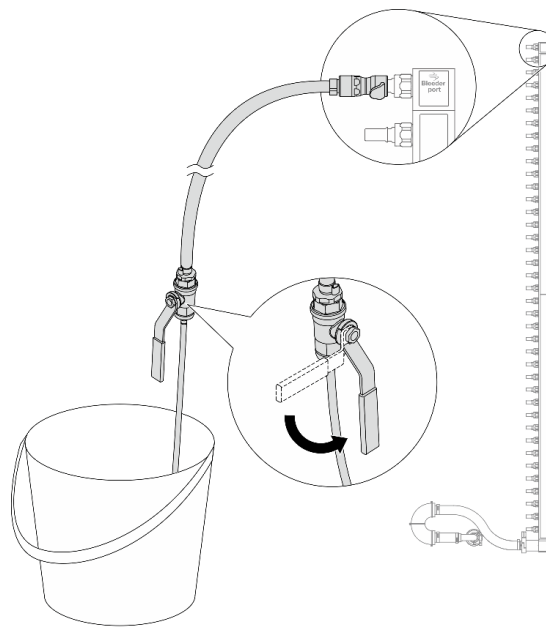


Figure 125. Opening the bleeder valve

Step 12. Separate the return manifold from the connection set in a dry and clean work area, and keep a bucket and absorbent cloths around to collect any coolant that may drain out.

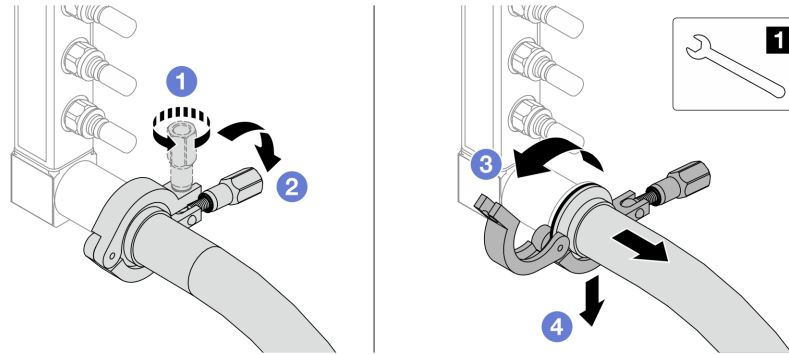


Figure 126. Separating the manifold from the connection set

1 17 mm wrench

- a. **1** Loosen the screw that locks the ferrule.
- b. **2** Put the screw down.
- c. **3** Open the clamp.
- d. **4** Remove the ferrule and connection set from the manifold.

Step 13. Repeat [Step 12 step 12 on page 166](#) to the other manifold.

Step 14. For better sanitation, keep the manifold ports and connection sets dry and clean. Re-install quick connect plug covers or any covers that protect connection sets and manifold ports.

Step 15. To remove the server from the rack, see [“Remove the server from rack” on page 65](#).

Step 16. To remove the Direct Water Cooling Module (DWCM), see [“Remove the Lenovo Neptune® Processor Direct Water Cooling Module” on page 142](#).

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=m4oUCUMYqw0>

Install the manifold (in-rack system)

Use this information to install the manifold in an in-rack direct water cooling system.

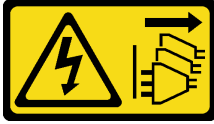
About this task

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

CAUTION:

The coolant might cause irritation to the skin and eyes. Avoid direct contact with the coolant.

S002



CAUTION:

The power-control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

S011



CAUTION:

Sharp edges, corners, or joints nearby.

S038



CAUTION:

Eye protection should be worn for this procedure.

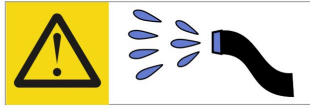
S040



CAUTION:

Protective gloves should be worn for this procedure.

L016



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تجنب العمل في أو بالقرب من أي جهاز فعال بأيدي مبللة أو عند وجود تسرب للماء. (L016)

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Избягвайте работа по или около оборудване под напрежение,
докато сте с мокри ръце или когато наоколо има разляна вода.
(L016)

DANGER : Risque de choc électrique lié à la présence d'eau ou d'une solution aqueuse dans ce produit. Évitez de travailler avec ou à proximité d'un équipement sous tension avec des mains mouillées ou lorsque de l'eau est renversée. (L016)

危险: 由于本产品中存在水或者水溶液, 因此存在电击风险。请避免使用潮湿的手在带电设备或者有水溅出的环境附近工作。 (L016)

危險: 本產品中有水或水溶液, 會造成電擊的危險。手濕或有潑濺的水花時, 請避免使用或靠近帶電的設備。 (L016)

OPASNOST: Rizik od električnog udara zbog vode ili tekućine koja postoji u ovom proizvodu.
Izbjegavajte rad u
blizini opreme pod naponom s mokrim rukama ili kad je u blizini prolivena
tekućina.
(L016)

NEBEZPEČÍ: Riziko úrazu elektrickým proudem v důsledku vody nebo vodního roztoku přítomného v tomto produktu. Dejte pozor, abyste při práci s aktivovaným vybavením nebo v jeho blízkosti neměli mokré ruce a vyvarujte se potřísnění nebo polití produktu vodou. (L016)

Fare! Risiko for stød på grund af vand eller en vandig opløsning i produktet. Undgå at arbejde med eller i nærheden af strømførende udstyr med våde hænder, eller hvis der er spildt vand. (L016)

GEVAAR: Risico op elektrische schok door water of waterachtige oplossing die aanwezig is in dit product. Vermijd werken aan of naast apparatuur die onder spanning staat als u natte handen hebt of als gemorst water aanwezig is. (L016)

DANGER: Risk of electric shock due to water or a water solution which is present in this product. Avoid working on or near energized equipment with wet hands or when spilled water is present. (L016)

ОПАСНО: Риск поражения электрическим током вследствие присутствия в этом продукте воды или водного раствора. Избегайте выполнения работ на оборудовании, находящемся под напряжением, или рядом с таким оборудованием влажными руками или при наличии пролитой воды. (L016)

NEBEZPEČENSTVO: Riziko úrazu elektrickým prúdom v dôsledku prítomnosti vody alebo vodného roztoku v tomto produkte. Vyhnite sa práci na zapnutom zariadení alebo v jeho blízkosti s vlhkými rukami, alebo keď je prítomná rozliata voda. (L016)

NEVARNOST: Nevarnost električnega udara zaradi vode ali vodne raztopine, prisotne v izdelku. Ne delajte na opremi ali poleg opreme pod energijo z mokrimi rokami ali ko je prisotna razlita voda. (L016)

PELIGRO: Existe riesgo de choque eléctrico por agua o por una solución de agua que haya en este producto. Evite trabajar en equipos bajo tensión o cerca de los mismos con las manos húmedas o si hay agua derramada. (L016)

Fara: Risk för elektriska stötar på grund av vatten eller vattenbaserat medel i denna produkt. Arbeta inte med eller i närheten av elektriskt laddad utrustning om du har våta händer eller vid vattenspill. (L016)

ཉེན་བརྒྱུ: རྩོམ་ཆས་འདིའི་ནང་དུ་ཆུ་འཕྲུལ་ཆུ་འཕྲུལ་གྱི་ཤེར་གཟུགས་འདུས་ཡོད་པ་སྟེ། དེ་ལས་སློག་ཆུག་པའི་ཉེན་ཁ་ཡོད། ལག་པའི་ཐག་ཆུ་ཡོད་པའམ་ཆུ་ཐིག་མར་བཟུར་བའི་གནས་ཚུལ་འོག་སློག་ཆས་ལ་བཞག་སྟེ་བྱེད་མི་ཉེན་ཁ་ཡོད། (L016)

خەتەرلىك: بۇ مەھسۇلاتتا سۇ ياكى ئېرىتمە بولغاچقا، شۇڭا توك سوقۇۋېتىش خەۋپى مەۋجۇتدۇر. قول ھۆل ھالەتتە ۋە ياكى سۇ سىرغىپ چىققان ھالەتتە، توكلۇق ئۇسكۇنىگە قارىتا ۋە ياكى توكلۇق ئۇسكۇنىنىڭ ئەتراپىدا مەشغۇلات ئېلىپ بارغىلى بولمايدۇ. (L016)

Yungyiemy: Youzyiz aen canjbinj miz raemx roxnaeuz raemx yungzyiz, sojyij miz yungyiemy bungqden. Mboujndaej fwngz miz raemx seiz youq ndaw sezbi roxnaeuz youq henzgyawj guhhong. (L016)

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.
- Ensure proper handling procedures are followed when working with any chemically treated coolant used in the rack cooling system. Ensure that material safety data sheets (MSDS) and safety information are provided by the coolant chemical treatment supplier and that proper personal protective equipment (PPE) is available as recommended by the coolant chemical treatment supplier. Protective gloves and eyewear may be recommended as a precaution.
- This task requires two or more people.

Procedure

- Step 1. Make sure that the in-rack CDU and other devices are not powered on, and that all external cables are disconnected.
- Step 2. To install the Direct Water Cooling Module (DWCM), see [“Install the Lenovo Neptune® Processor Direct Water Cooling Module” on page 146](#).
- Step 3. To install the server into the rack, see [“Install the server to rack” on page 68](#).
- Step 4. Install the manifold.

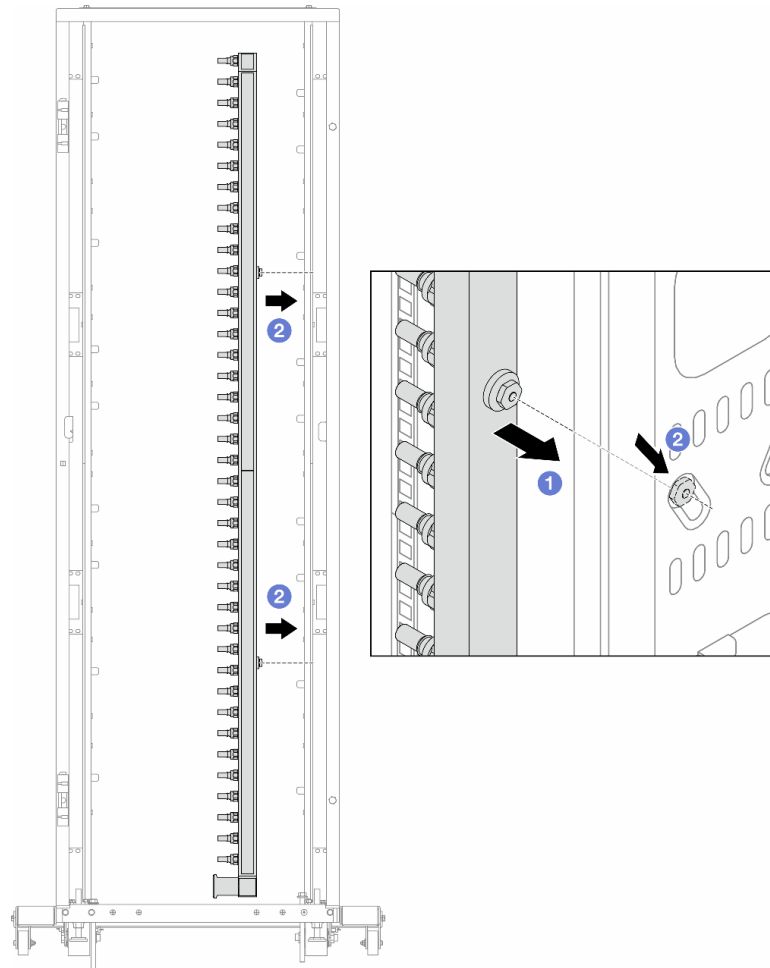


Figure 127. Installing the manifold

- a. ① Hold the manifold with both hands, and mount it onto the rack cabinet.
- b. ② Align the spools with holes, and clutch the cabinet.

Note: For more information about the rack cabinet, see [ThinkSystem Heavy Duty Full Depth Rack Cabinets User Guide](#).

Step 5. Repeat [Step 4 step 4 on page 170](#) to the other manifold.

Step 6. Separate ball valves from connection sets.

Note: One end of a connection set comes with a detachable ball valve, and the two parts are connected by a ferrule. Remove the ferrule to separate the ball valve that is bound for CDU in [Step 7 step 7 on page 172](#).

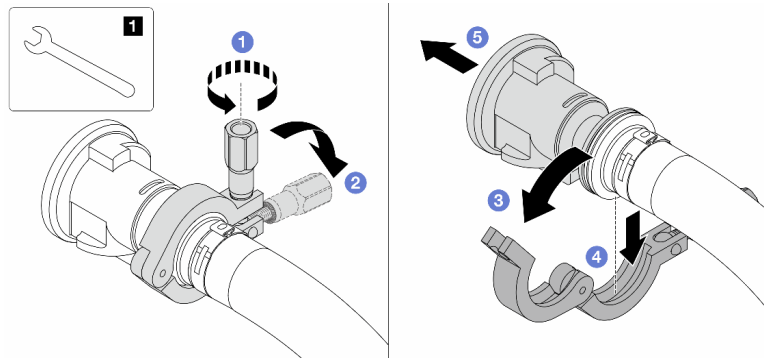


Figure 128. Separating ball valves

1 17 mm wrench

- a. **1** Loosen the screw that locks the ferrule.
- b. **2** Put the screw down.
- c. **3** Open the clamp.
- d. **4** Remove the ferrule.
- e. **5** Remove the ball valve from connection set.

Step 7. Install ball valves to CDU.

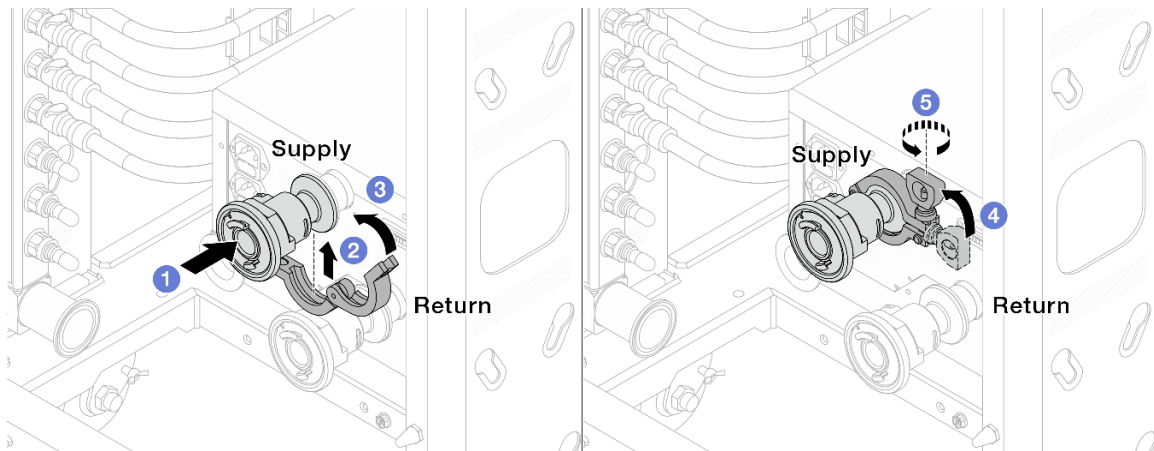


Figure 129. Installing ball valves

- a. **1** Connect the ball valves to **Supply** and **Return** ports.
- b. **2** Wrap the interface around with the clamp.
- c. **3** Close the clamp.
- d. **4** Lift the screw upright.
- e. **5** Tighten the screw and make sure that it is secured.

Step 8. Install the connection set to manifolds.

Note: Install the supply side first, then install the return side.

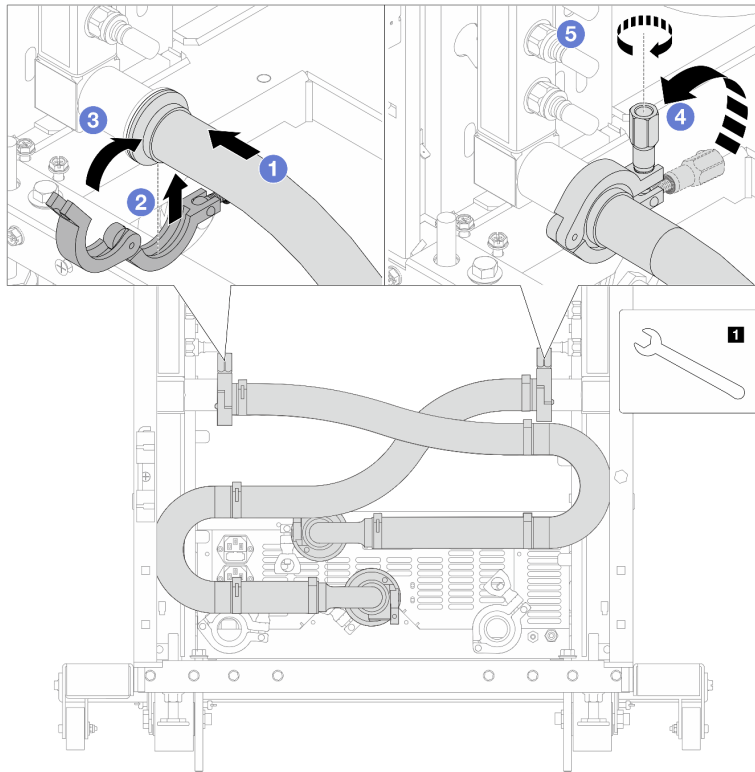


Figure 130. Installing the connection set

1 17 mm wrench

- a. **1** Connect the connection set to both manifolds.
- b. **2** Wrap the interface around with the clamp.
- c. **3** Close the clamp.
- d. **4** Lift the screw upright.
- e. **5** Tighten the screw and make sure that it is secured.

Step 9. Install the connection set to ball valves.

Note: Install the supply side first, then install the return side.

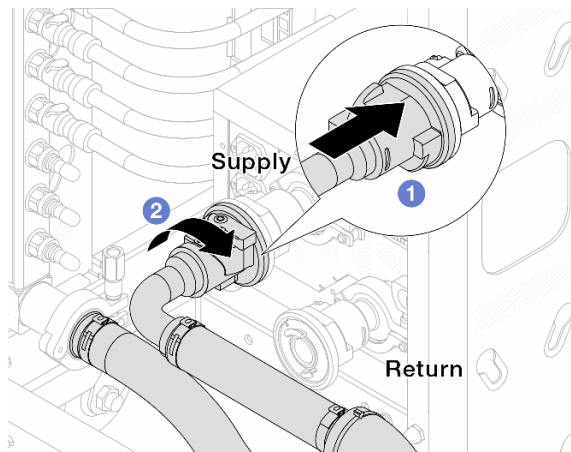


Figure 131. Connecting ball valves

- a. ① Connect ball valves.
- b. ② Rotate to the right to lock the two valves.

Step 10. Prepare the in-rack CDU.

- a. Connect the feed hose to inlet port on the front.

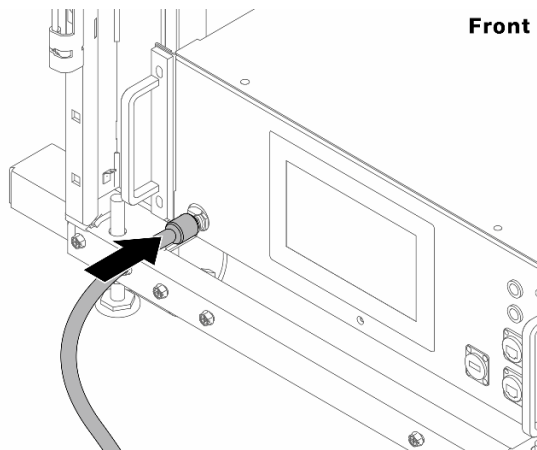


Figure 132. The front of CDU

- b. Connect hoses to the drain port and bleeder port on the rear.

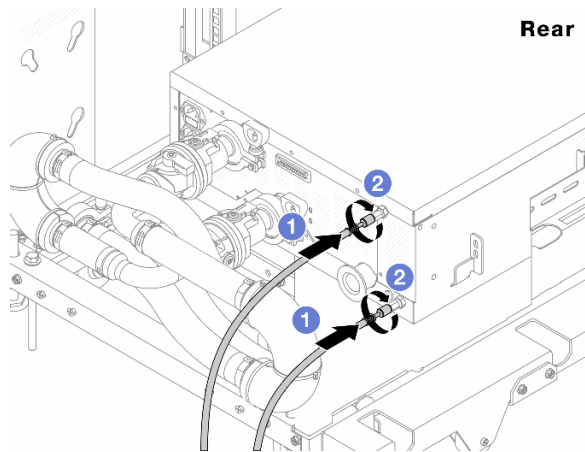


Figure 133. The rear of CDU

- 1 Connect both drain and bleeder hoses to CDU.
- 2 Rotate the connectors to the right to secure the connection.

Important:

- For more operation and maintenance guidelines, see [Lenovo Neptune DWC RM100 in-rack Coolant Distribution Unit \(CDU\) Operation & Maintenance Guide](#).
- For service support, associated warranty and maintenance sizing, contact Lenovo Professional Services team at cdusupport@lenovo.com.

Step 11. Install the quick connect plug to the manifolds.

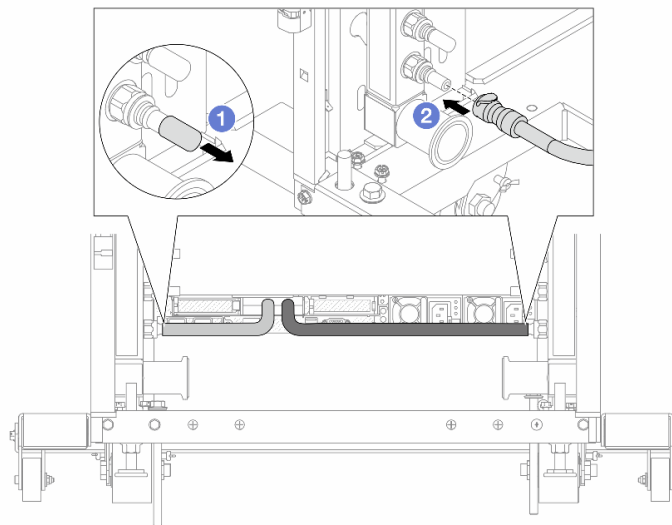


Figure 134. Installing the quick connect plug

- a. 1 Remove the rubber quick connect plug covers from the ports on the manifold.
- b. 2 Connect the plug to the manifold port.

Step 12. Install the bleeder kit to the manifold supply side.

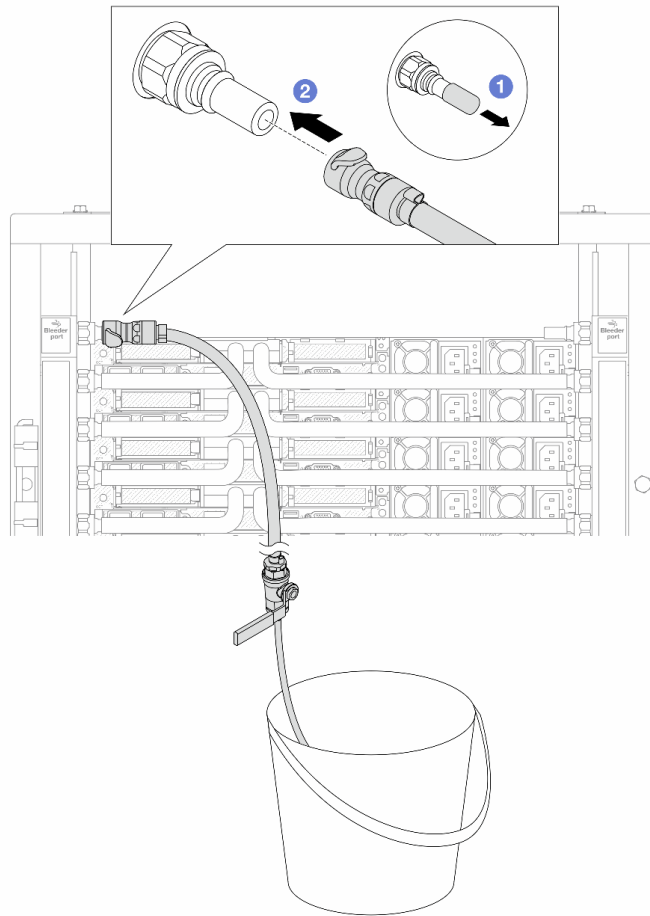


Figure 135. Installing the bleeder kit to the supply side

- a. ① Remove the rubber quick connect plug covers from the ports on the manifold.
- b. ② Plug the bleeder kit to the manifold.

Step 13. To push the air out of the manifolds, open ball valve switches to let coolant fill the system.

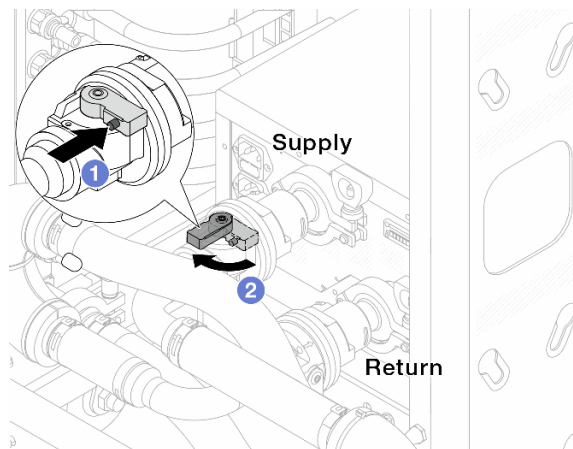


Figure 136. Opening ball valves

- a. ① Press the button on the ball valve switch.

- b. ② Rotate the switch to fully open the valves as illustrated above.

Attention:

- Pay close attention to the front display of CDU and maintain the system pressure at **one bar**.
- For more information about coolant temperature and system pressure requirements, see [“Water requirements” on page .](#)

Step 14. Slowly open the bleeder valve to conduct the air out of the hose. Close the bleeder valve once a steady stream of water flows into the bucket or there are only minimal bubbles in the bleeder hose.

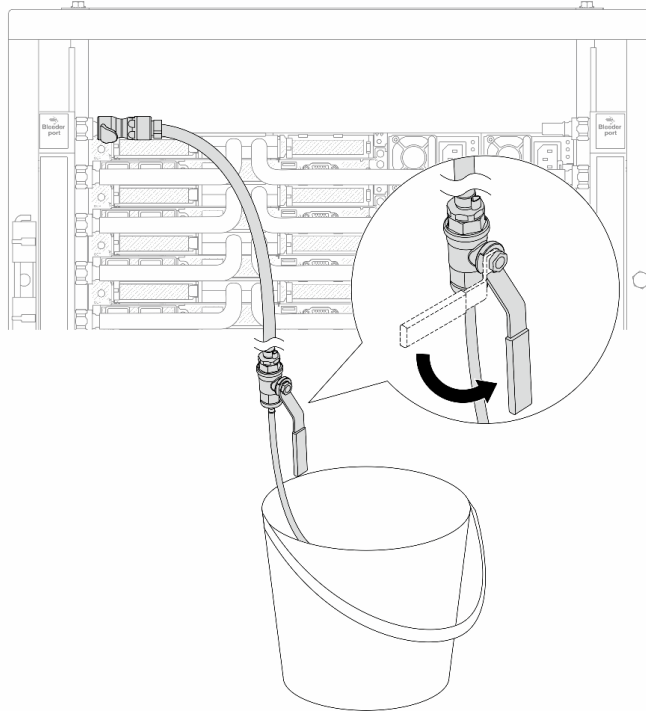


Figure 137. Opening the bleeder valve on the supply side

Step 15. Install the bleeder kit to the manifold return side.

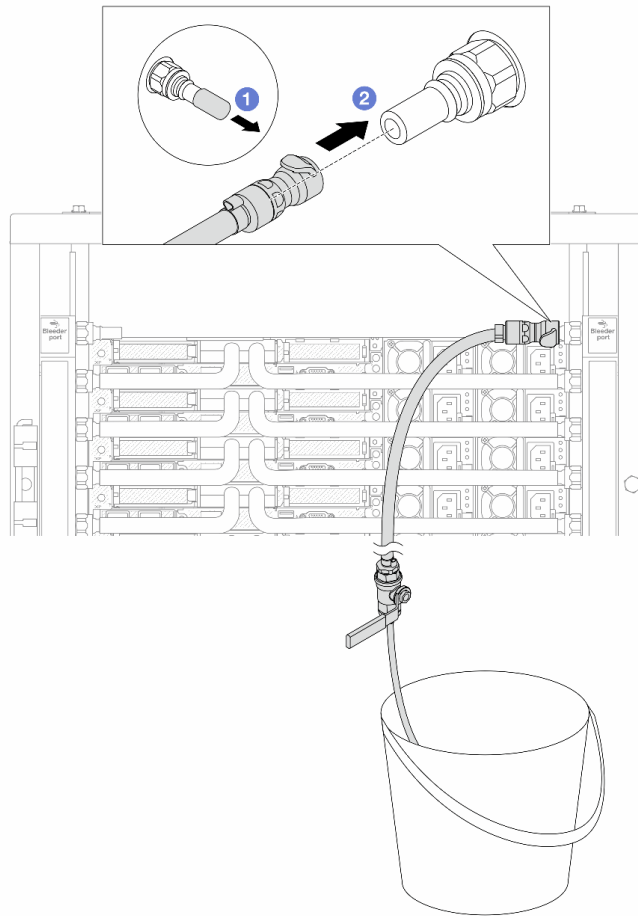


Figure 138. Installing the bleeder kit on the return side

- a. ① Remove the rubber quick connect plug covers from the ports on the manifold.
- b. ② Plug the bleeder kit to the manifold.

Step 16. Slowly open the bleeder valve to conduct the air out of the hose. Close the bleeder valve once a steady stream of water flows into the bucket or there are only minimal bubbles in the bleeder hose.

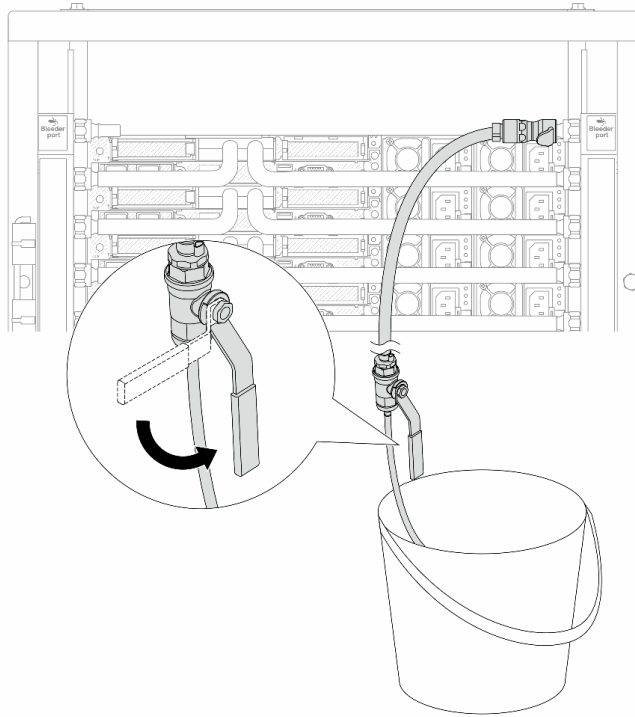


Figure 139. Opening the bleeder valve on the return side

Step 17. (For precaution) To make sure that the air inside is as little as possible, re-install the bleeder kit back to manifold supply side and do it one more time. Close the bleeder valve once a steady stream of water flows into the bucket or there are only minimal bubbles in the bleeder hose.

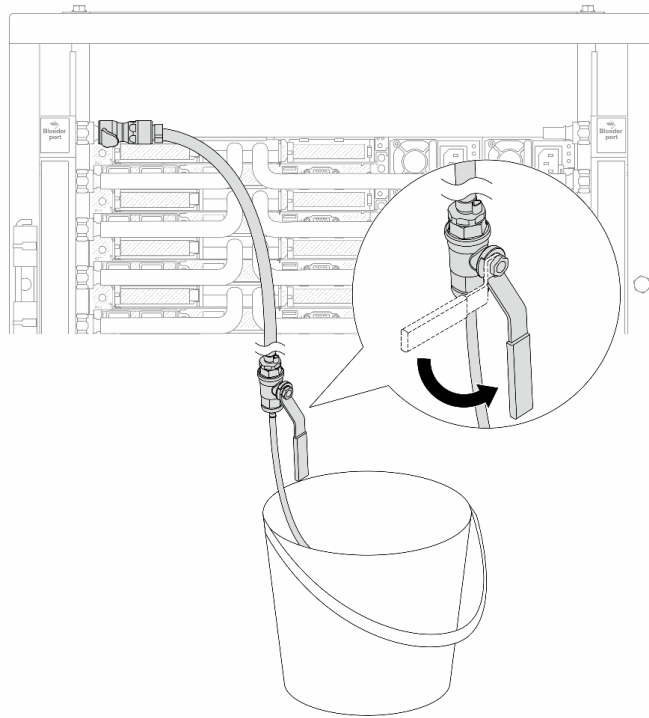


Figure 140. Opening the bleeder valve on the supply side

Step 18. Once completed, pay close attention to the front display of CDU and maintain the system pressure at **one bar**. For more information about coolant temperature and system pressure requirements, see [“Water requirements” on page .](#)

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322.](#)

Demo video

https://www.youtube.com/watch?v=_e7P1KHHGaY

Remove the manifold (in-row system)

Use this information to remove the manifold in an in-row direct water cooling system.

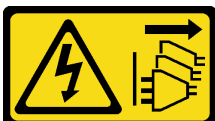
About this task

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

CAUTION:

The coolant might cause irritation to the skin and eyes. Avoid direct contact with the coolant.

S002



CAUTION:

The power-control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

S011



CAUTION:

Sharp edges, corners, or joints nearby.

S038



CAUTION:

Eye protection should be worn for this procedure.

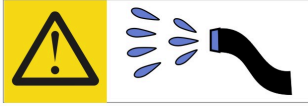
S040



CAUTION:

Protective gloves should be worn for this procedure.

L016



خطر: قد يتم التعرض لخطر الصدمة الكهربائية بسبب الماء أو المحلول المائي الذي يوجد بهذا المنتج.
تجنب العمل في أو بالقرب من أي جهاز فعال بأيدي مبللة أو عند وجود تسرب للماء. (L016)

AVISO: Risco de choque elétrico devido à presença de água ou solução aquosa no produto. Evite trabalhar no equipamento ligado ou próximo a ele com as mãos molhadas ou quando houver a presença de água derramada. (L016)

ОПАСНО: Риск от токов удар поради вода или воден разтвор, присъстващи в продукта.
Избягвайте работа по или около оборудване под напрежение,
докато сте с мокри ръце или когато наоколо има разляна вода.
(L016)

DANGER : Risque de choc électrique lié à la présence d'eau ou d'une solution aqueuse dans ce produit. Évitez de travailler avec ou à proximité d'un équipement sous tension avec des mains mouillées ou lorsque de l'eau est renversée. (L016)

危险: 由于本产品中存在水或者水溶液, 因此存在电击风险。请避免使用潮湿的手在带电设备或者有水溅出的环境附近工作。 (L016)

危險: 本產品中有水或水溶液, 會造成電擊的危險。手濕或有潑濺的水花時, 請避免使用或靠近帶電的設備。 (L016)

OPASNOST: Rizik od električnog udara zbog vode ili tekućine koja postoji u ovom proizvodu.
Izbjegavajte rad u
blizini opreme pod naponom s mokrim rukama ili kad je u blizini prolivena
tekućina.
(L016)

NEBEZPEČÍ: Riziko úrazu elektrickým proudem v důsledku vody nebo vodního roztoku přítomného v tomto produktu. Dejte pozor, abyste při práci s aktivovaným vybavením nebo v jeho blízkosti neměli mokré ruce a vyvarujte se potřísnění nebo polití produktu vodou. (L016)

Fare! Risiko for stød på grund af vand eller en vandig opløsning i produktet. Undgå at arbejde med eller i nærheden af strømførende udstyr med våde hænder, eller hvis der er spildt vand. (L016)

GEVAAR: Risico op elektrische schok door water of waterachtige oplossing die aanwezig is in dit product. Vermijd werken aan of naast apparatuur die onder spanning staat als u natte handen hebt of als gemorst water aanwezig is. (L016)

DANGER: Risk of electric shock due to water or a water solution which is present in this product. Avoid working on or near energized equipment with wet hands or when spilled water is present. (L016)

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NEBEZPEČENSTVO: Riziko úrazu elektrickým prúdom v dôsledku prítomnosti vody alebo vodného roztoku v tomto produkte. Vyhnite sa práci na zapnutom zariadení alebo v jeho blízkosti s vlhkými rukami, alebo keď je prítomná rozliata voda. (L016)

NEVARNOST: Nevarnost električnega udara zaradi vode ali vodne raztopine, prisotne v izdelku. Ne delajte na opremi ali poleg opreme pod energijo z mokrimi rokami ali ko je prisotna razlita voda. (L016)

PELIGRO: Existe riesgo de choque eléctrico por agua o por una solución de agua que haya en este producto. Evite trabajar en equipos bajo tensión o cerca de los mismos con las manos húmedas o si hay agua derramada. (L016)

Fara: Risk för elektriska stötar på grund av vatten eller vattenbaserat medel i denna produkt. Arbeta inte med eller i närheten av elektriskt laddad utrustning om du har våta händer eller vid vattenspill. (L016)

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خەتەرلىك: بۇ مەھسۇلاتتا سۇ ياكى ئېرىتمە بولغاچقا، شۇڭا توك سوقۇۋېتىش خەۋپى مەۋجۇتدۇر. قول ھۆل ھالەتتە ۋە ياكى سۇ سىرغىپ چىققان ھالەتتە، توكلۇق ئۇسكۇنىگە قارىتا ۋە ياكى توكلۇق ئۇسكۇنىنىڭ ئەتراپىدا مەشغۇلات ئېلىپ بارغىلى بولمايدۇ. (L016)

Yungyiemy: Youzyiz aen canjbinj miz raemx roxnaeuz raemx yungzyiz, sojyij miz yungyiemy bungqden. Mboujndaej fwngz miz raemx seiz youq ndaw sezbi roxnaeuz youq henzgyawj guhhong. (L016)

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.
- Ensure proper handling procedures are followed when working with any chemically treated coolant used in the rack cooling system. Ensure that material safety data sheets (MSDS) and safety information are provided by the coolant chemical treatment supplier and that proper personal protective equipment (PPE) is available as recommended by the coolant chemical treatment supplier. Protective gloves and eyewear may be recommended as a precaution.
- This task requires two or more people.

Procedure

Step 1. Close both ball valves.

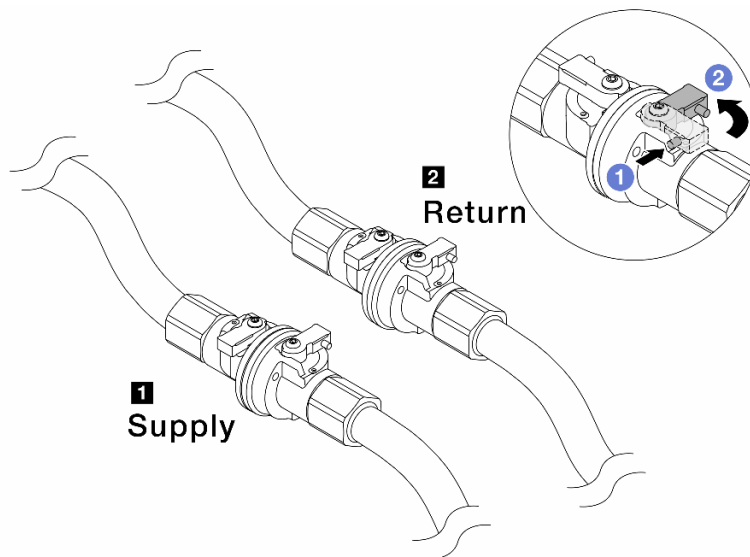


Figure 141. Closing ball valves

Note:

1 Manifold supply connects to facility supply	2 Manifold return connects to facility return
--	--

- a. ① Press the button on the ball valve switch.
- b. ② Rotate the switches to close the valves as illustrated above.

Step 2. Remove the quick connect plugs to separate the DWCM hoses from the manifold.

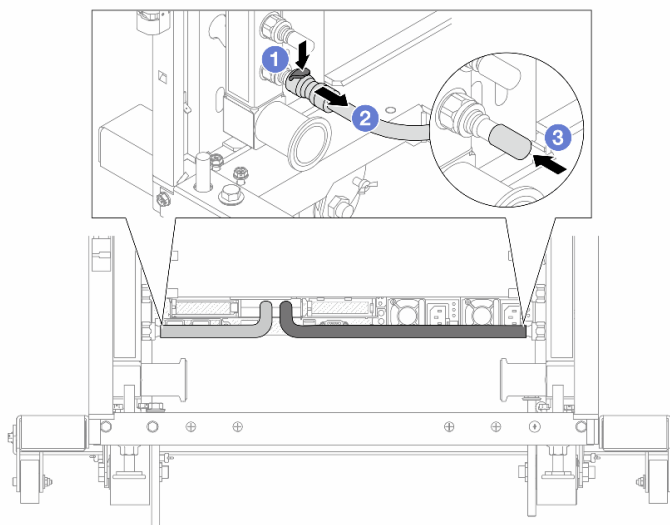


Figure 142. Quick connect plug removal

- a. ① Press the latch down to unlock the hose.
- b. ② Pull the hose off.
- c. ③ Re-install the rubber quick connect plug covers to the ports on the manifold.

- Step 3. Repeat [Step 2 step 2 on page 185](#) to the other manifold.
- Step 4. Remove the manifold with the hose kit attached.

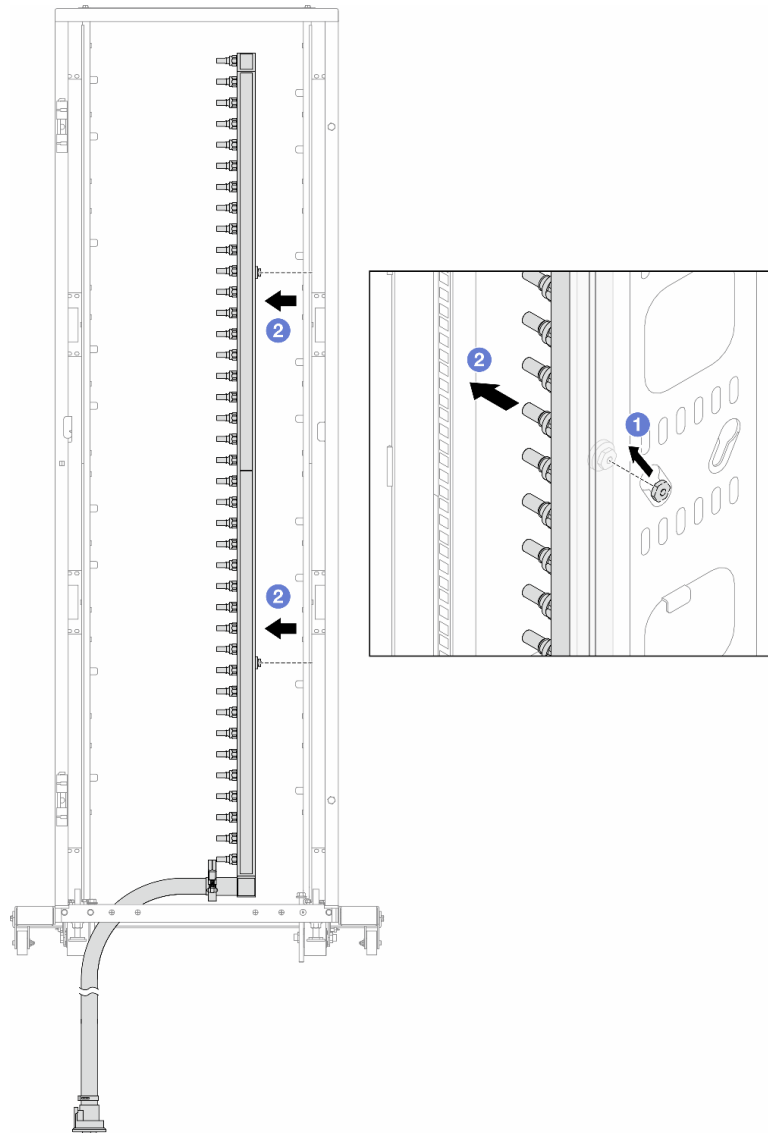


Figure 143. Removing the manifold

- 1 Hold the manifold with both hands, and lift it upward to relocate the spools from the small openings to large ones on the rack cabinet.
- 2 Remove the manifold with the hose kit attached.

- Step 5. Repeat [Step 4 step 4 on page 186](#) to the other manifold.

Notes:

- There is remaining coolant inside the manifold and the hose kit. Remove both together and leave the further draining to the next step.
- For more information about the rack cabinet, see [ThinkSystem Heavy Duty Full Depth Rack Cabinets User Guide](#).

- Step 6. Install the bleeder kit to the manifold supply side.

Note: This step drains the coolant with the help of a pressure difference inside and outside the supply manifold.

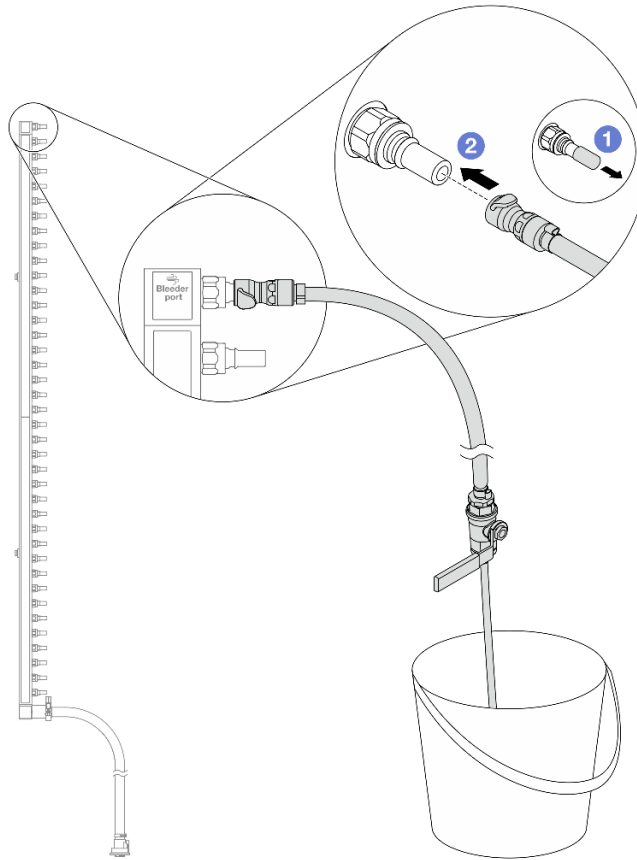


Figure 144. Installing the bleeder kit to the supply side

- a. ① Remove the rubber quick connect plug covers from the ports on the manifold.
- b. ② Plug the bleeder kit to the manifold.

Step 7. Slowly open the bleeder valve to allow a steady stream of coolant to drain. Close the bleeder valve once coolant stops flowing.

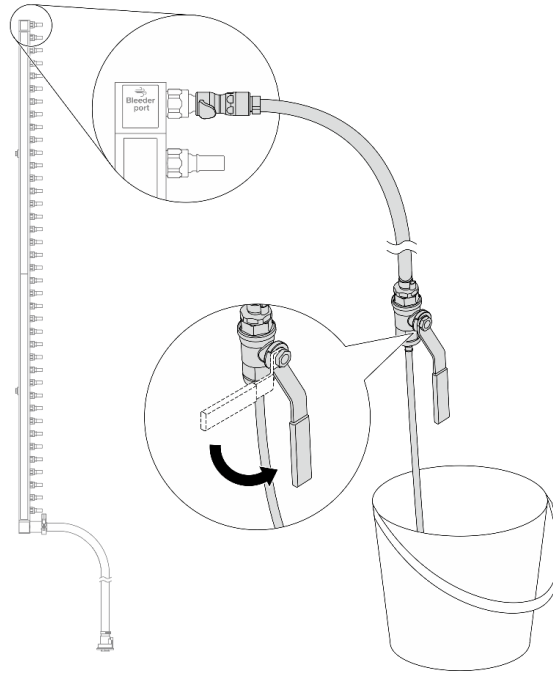


Figure 145. Opening the bleeder valve

Step 8. Install the bleeder kit to the manifold return side.

Note: This step drains the coolant with the help of a pressure difference inside and outside the return manifold.

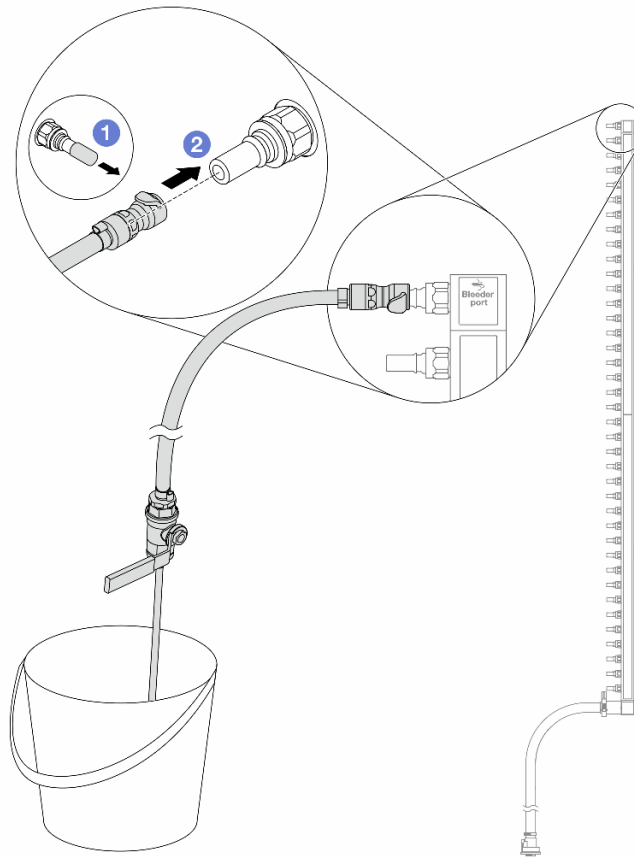


Figure 146. Installing the bleeder kit to the return side

- a. ❶ Remove the rubber quick connect plug covers from the ports on the manifold.
 - b. ❷ Plug the bleeder kit to the manifold.
- Step 9. Slowly open the bleeder valve to allow a steady stream of coolant to drain. Close the bleeder valve once coolant stops flowing.

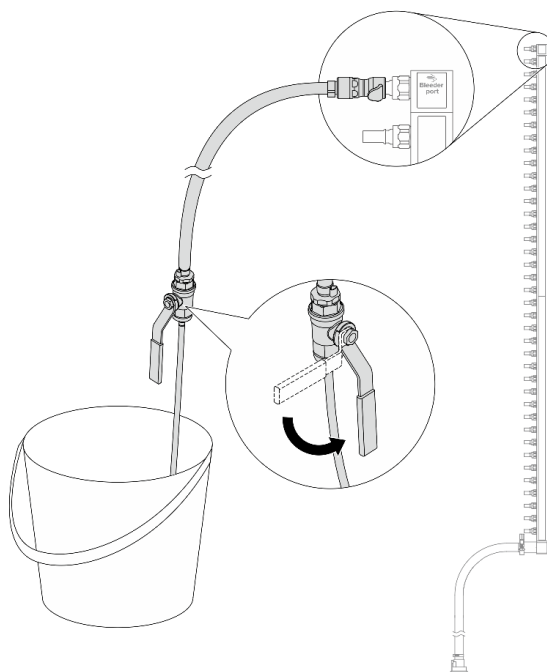


Figure 147. Opening the bleeder valve

Step 10. Separate the manifold from the hose kit in a dry and clean work area, and keep a bucket and absorbent cloths around to collect any coolant that may drain out.

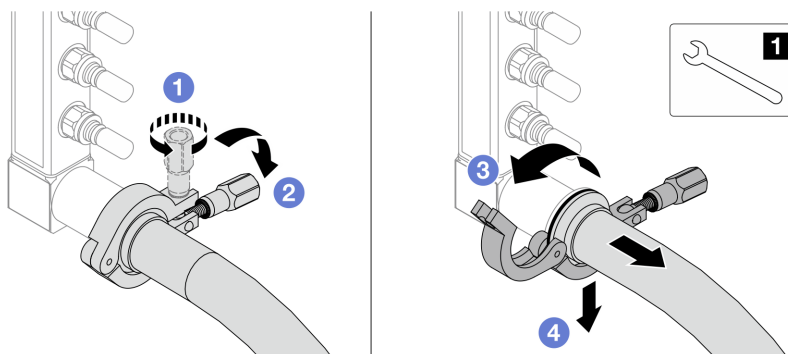


Figure 148. Separating the manifold from the hose kit

1 17 mm wrench

- a. **1** Loosen the screw that locks the ferrule.
- b. **2** Put the screw down.
- c. **3** Open the clamp.
- d. **4** Remove the ferrule and hose kit from the manifold.

Step 11. Repeat [Step 10](#) [step 10 on page 190](#) to the other manifold.

Step 12. For better sanitation, keep the manifold ports and hose kits dry and clean. Re-install quick connect plug covers or any covers that protect hose kits and manifold ports.

Step 13. To remove the server from the rack, see [“Remove the server from rack” on page 65](#).

Step 14. To remove the Direct Water Cooling Module (DWCM), see [“Remove the Lenovo Neptune® Processor Direct Water Cooling Module” on page 142.](#)

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=Mbw7erXaz30>

Install the manifold (in-row system)

Use this information to install the manifold in an in-row direct water cooling system.

About this task

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

CAUTION:

The coolant might cause irritation to the skin and eyes. Avoid direct contact with the coolant.

S002



CAUTION:

The power-control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

S011



CAUTION:

Sharp edges, corners, or joints nearby.

S038



CAUTION:

Eye protection should be worn for this procedure.

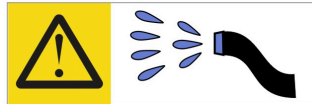
S040



CAUTION:

Protective gloves should be worn for this procedure.

L016



خطر: قد يتم التعرض لخطر الصدمة الكهربائية بسبب الماء أو المحلول المائي الذي يوجد بهذا المنتج.
تجنب العمل في أو بالقرب من أي جهاز فعال بأيدي مبللة أو عند وجود تسرب للماء. (L016)

AVISO: Risco de choque elétrico devido à presença de água ou solução aquosa no produto. Evite trabalhar no equipamento ligado ou próximo a ele com as mãos molhadas ou quando houver a presença de água derramada. (L016)

ОПАСНО: Риск от токов удар поради вода или воден разтвор, присъстващи в продукта.
Избягвайте работа по или около оборудване под напрежение,
докато сте с мокри ръце или когато наоколо има разляна вода.
(L016)

DANGER : Risque de choc électrique lié à la présence d'eau ou d'une solution aqueuse dans ce produit. Évitez de travailler avec ou à proximité d'un équipement sous tension avec des mains mouillées ou lorsque de l'eau est renversée. (L016)

危险：由于本产品中存在水或者水溶液，因此存在电击风险。请避免使用潮湿的手在带电设备或者有水溅出的环境附近工作。(L016)

危險：本產品中有水或水溶液，會造成電擊的危險。手濕或有潑濺的水花時，請避免使用或靠近帶電的設備。(L016)

OPASNOST: Rizik od električnog udara zbog vode ili tekućine koja postoji u ovom proizvodu.
Izbjegavajte rad u
blizini opreme pod naponom s mokrim rukama ili kad je u blizini prolivena
tekućina.
(L016)

NEBEZPEČÍ: Riziko úrazu elektrickým proudem v důsledku vody nebo vodního roztoku přítomného v tomto produktu. Dejte pozor, abyste při práci s aktivovaným vybavením nebo v jeho blízkosti neměli mokré ruce a vyvarujte se potřísnění nebo polití produktu vodou. (L016)

Fare! Risiko for stød på grund af vand eller en vandig opløsning i produktet. Undgå at arbejde med eller i nærheden af strømførende udstyr med våde hænder, eller hvis der er spildt vand. (L016)

GEVAAR: Risico op elektrische schok door water of waterachtige oplossing die aanwezig is in dit product. Vermijd werken aan of naast apparatuur die onder spanning staat als u natte handen hebt of als gemorst water aanwezig is. (L016)

DANGER: Risk of electric shock due to water or a water solution which is present in this product. Avoid working on or near energized equipment with wet hands or when spilled water is present.
(L016)

ОПАСНО: Риск поражения электрическим током вследствие присутствия в этом продукте воды или водного раствора. Избегайте выполнения работ на оборудовании, находящемся под напряжением, или рядом с таким оборудованием влажными руками или при наличии пролитой воды. (L016)

NEBEZPEČENSTVO: Riziko úrazu elektrickým prúdom v dôsledku prítomnosti vody alebo vodného roztoku v tomto produkte. Vyhnite sa práci na zapnutom zariadení alebo v jeho blízkosti s vlhkými rukami, alebo keď je prítomná rozliata voda. (L016)

NEVARNOST: Nevarnost električnega udara zaradi vode ali vodne raztopine, prisotne v izdelku. Ne delajte na opremi ali poleg opreme pod energijo z mokrimi rokami ali ko je prisotna razlita voda. (L016)

PELIGRO: Existe riesgo de choque eléctrico por agua o por una solución de agua que haya en este producto. Evite trabajar en equipos bajo tensión o cerca de los mismos con las manos húmedas o si hay agua derramada. (L016)

Fara: Risk för elektriska stötar på grund av vatten eller vattenbaserat medel i denna produkt. Arbete inte med eller i närheten av elektriskt laddad utrustning om du har våta händer eller vid vattenspill. (L016)

ཉེན་བརྒྱུ: རྩིས་ལྷན་འདྲིའི་ནང་དུ་ཆུ་འཕྲ་ཆུ་འཕྲ་གཞིར་གཟུགས་འདུས་ཡོད་པ་སྟེ། དེ་ལས་སློག་ཆུག་པའི་ཉེན་ཁ་ཡོད། ལག་པའི་ཐག་ཆུ་ཡོད་པའམ་ཆུ་ཐིག་མར་བཞུར་བའི་གནས་ཚུལ་འགྲོག་ཡོད་པའི་སློག་ཆས་ལ་བཞག་སྟེ་བྱེད་མི་ཉེན་པོ། (L016)

خەتەرلىك: بۇ مەھسۇلاتتا سۇ ياكى ئېرىتمە بولغاچقا، شۇڭا توك سوقۇۋېتىش خەۋپى مەۋجۇتدۇر. قول ھۆل ھالەتتە ۋە ياكى سۇ سىرغىپ چىققان ھالەتتە، توكلۇق ئۇسكۇنىگە قارىتا ۋە ياكى توكلۇق ئۇسكۇنىنىڭ ئەتراپىدا مەشغۇلات ئېلىپ بارغىلى بولمايدۇ. (L016)

Yungyiemy: Youzyiz aen canjbinj miz raemx roxnaeuz raemx yungzyiz, sojyij miz yungyiemy bungqden. Mboujndaej fwngz miz raemx seiz youq ndaw sezbi roxnaeuz youq henzgyawj guhhong. (L016)

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.
- Ensure proper handling procedures are followed when working with any chemically treated coolant used in the rack cooling system. Ensure that material safety data sheets (MSDS) and safety information are provided by the coolant chemical treatment supplier and that proper personal protective equipment (PPE) is available as recommended by the coolant chemical treatment supplier. Protective gloves and eyewear may be recommended as a precaution.
- This task requires two or more people.

Procedure

- Step 1. To install the Direct Water Cooling Module (DWCM), see [“Install the Lenovo Neptune® Processor Direct Water Cooling Module” on page 146](#).
- Step 2. To install the server into the rack, see [“Install the server to rack” on page 68](#).
- Step 3. Install the manifold.

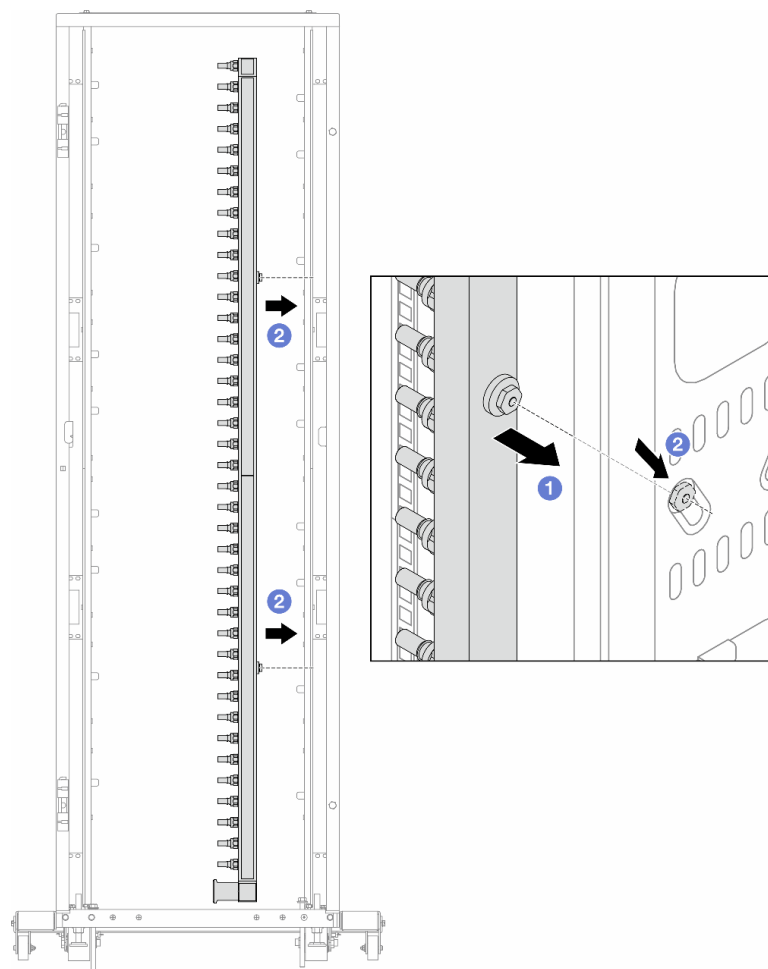


Figure 149. Installing the manifold

- a. ① Hold the manifold with both hands, and mount it onto the rack cabinet.
- b. ② Align the spools with holes, and clutch the cabinet.

Note: For more information about the rack cabinet, see [ThinkSystem Heavy Duty Full Depth Rack Cabinets User Guide](#).

Step 4. Repeat [Step 3 step 3 on page 194](#) to the other manifold.

Step 5. Install the quick connect plug to the manifolds.

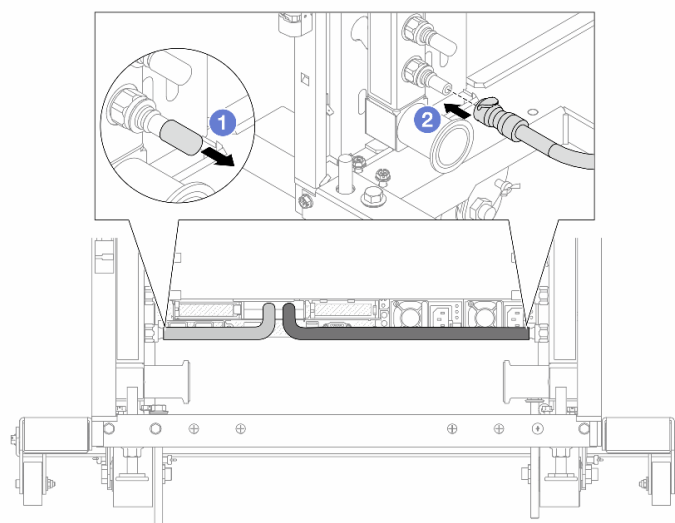


Figure 150. Installing the quick connect plug

- a. ① Remove the rubber quick connect plug covers from the ports on the manifold.
- b. ② Connect the plug to the manifold port.

Step 6. Install the hose kit to the manifold.

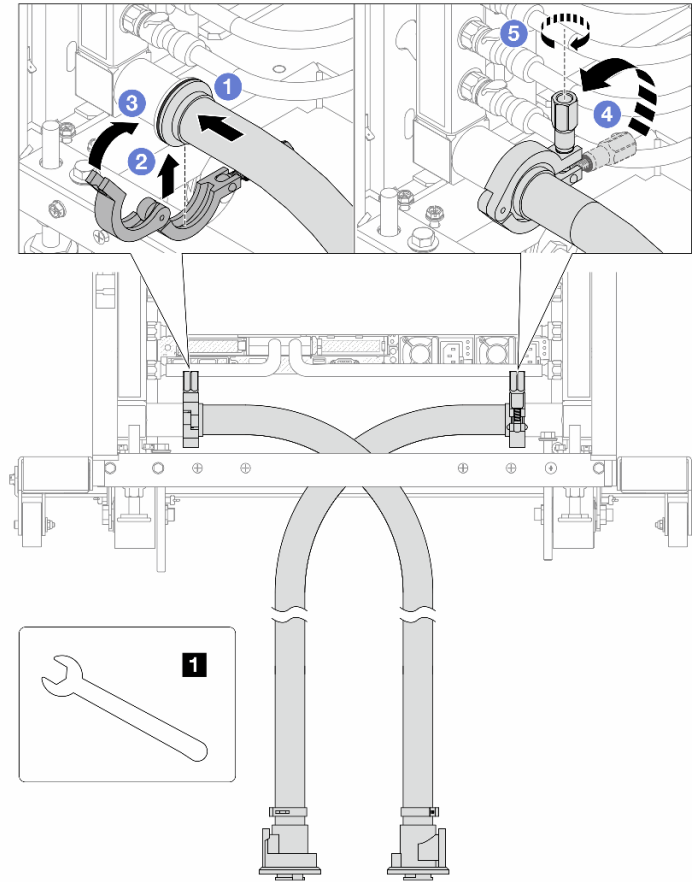


Figure 151. Installing the hose kit

1 17 mm wrench

- a. **1** Connect the hose kits to both manifolds.
- b. **2** Wrap the interface around with the clamp.
- c. **3** Close the clamp.
- d. **4** Lift the screw upright.
- e. **5** Tighten the screw and make sure that it is secured.

Step 7. Install the bleeder kit to the manifold supply side.

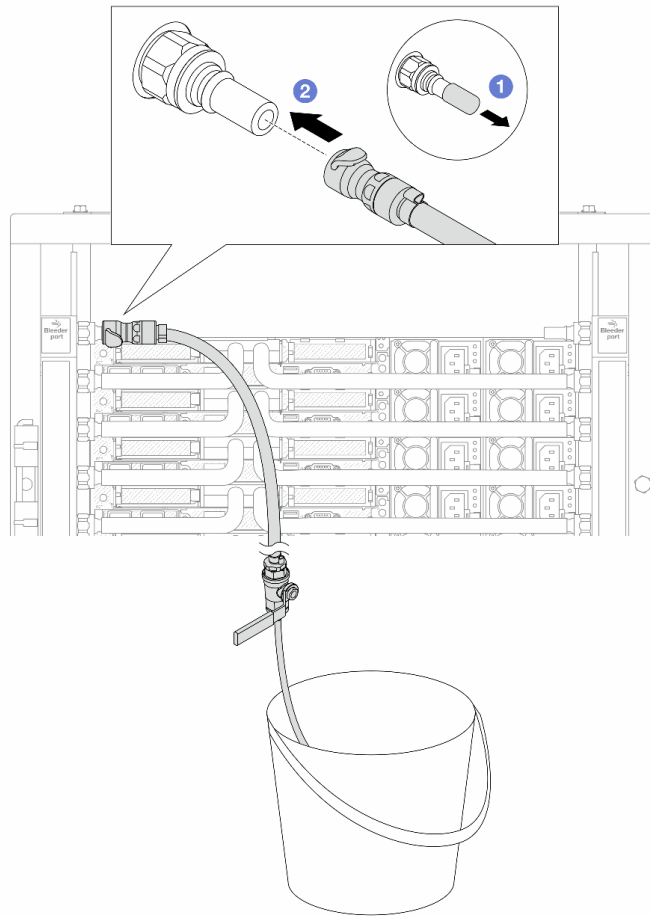


Figure 152. Installing the bleeder kit to the supply side

- a. ① Remove the rubber quick connect plug covers from the ports on the manifold.
- b. ② Plug the bleeder kit to the manifold.

Step 8. To push the air out of the manifold supply side, connect **facility supply** to **manifold return**.

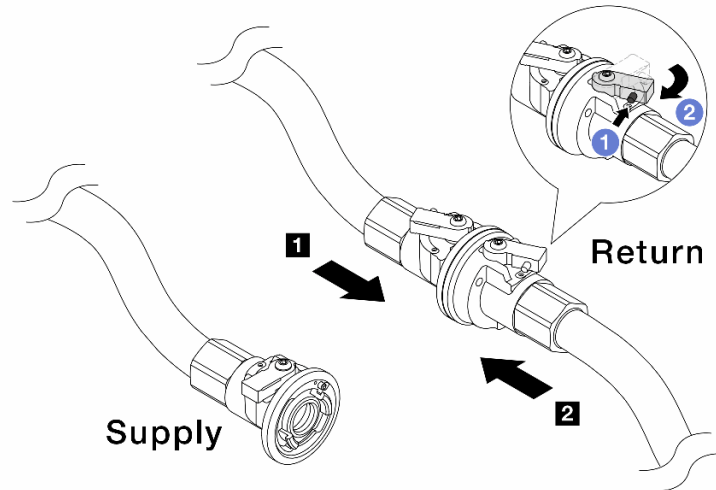


Figure 153. Facility supply to manifold return

- a. ① Press the button on the ball valve switch.
- b. ② Rotate both switches open and stop at around 1/4 of 90 degrees.

Attention:

- Open the ball valves on ① manifold return side and ② facility supply side, while keep manifold supply side closed.
- Do not fully open the ball valves, or the water flow gets too rapid to contain.

Step 9. Slowly open the bleeder valve to conduct the air out of the hose. Close the bleeder valve once a steady stream of water flows into the bucket or there are only minimal bubbles in the bleeder hose.

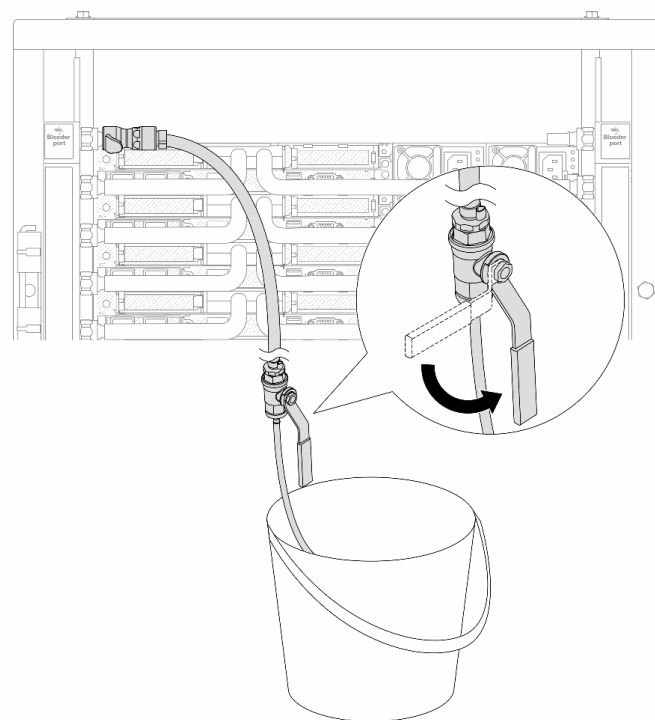


Figure 154. Opening the bleeder valve on the supply side

Step 10. Install the bleeder kit to the manifold return side.

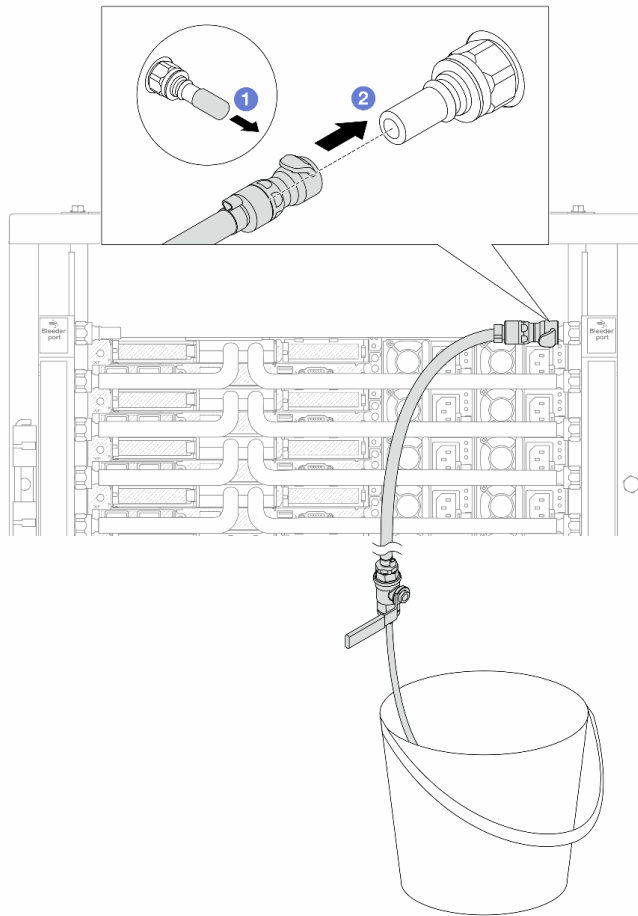


Figure 155. Installing the bleeder kit on the return side

- a. ① Remove the rubber quick connect plug covers from the ports on the manifold.
- b. ② Plug the bleeder kit to the manifold.

Step 11. To push the air out of the manifold return side, connect **facility supply** to **manifold supply**.

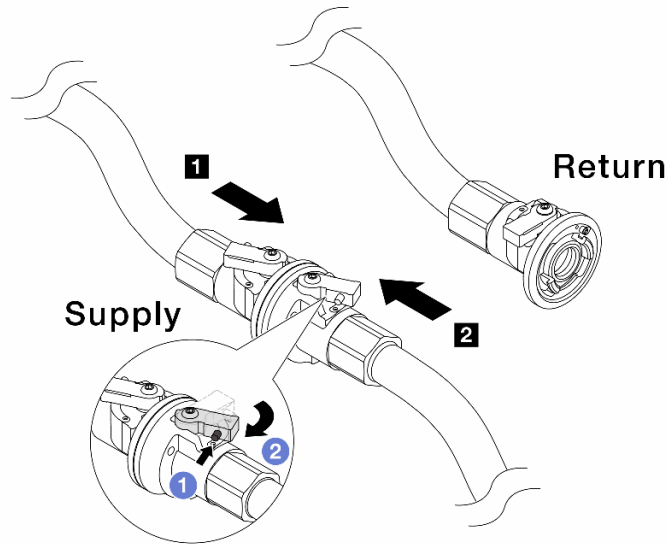


Figure 156. Facility supply to manifold supply

- a. ① Press the button on the ball valve switch.
- b. ② Rotate both switches open and stop at around 1/4 of 90 degrees.

Attention:

- Open the ball valves on ① manifold supply side and ② facility supply side, while keep manifold return side closed.
- Do not fully open the ball valves, or the water flow gets too rapid to contain.

Step 12. Slowly open the bleeder valve to conduct the air out of the hose. Close the bleeder valve once a steady stream of water flows into the bucket or there are only minimal bubbles in the bleeder hose.

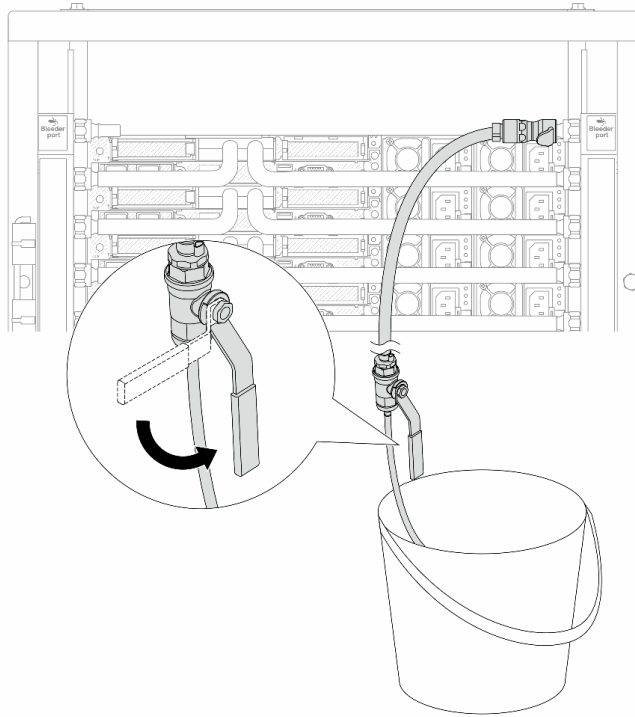


Figure 157. Opening the bleeder valve on the return side

- Step 13. (For precaution) To make sure that the air inside is as little as possible, re-install the bleeder kit back to manifold supply side and do it one more time. Close the bleeder valve once a steady stream of water flows into the bucket or there are only minimal bubbles in the bleeder hose.

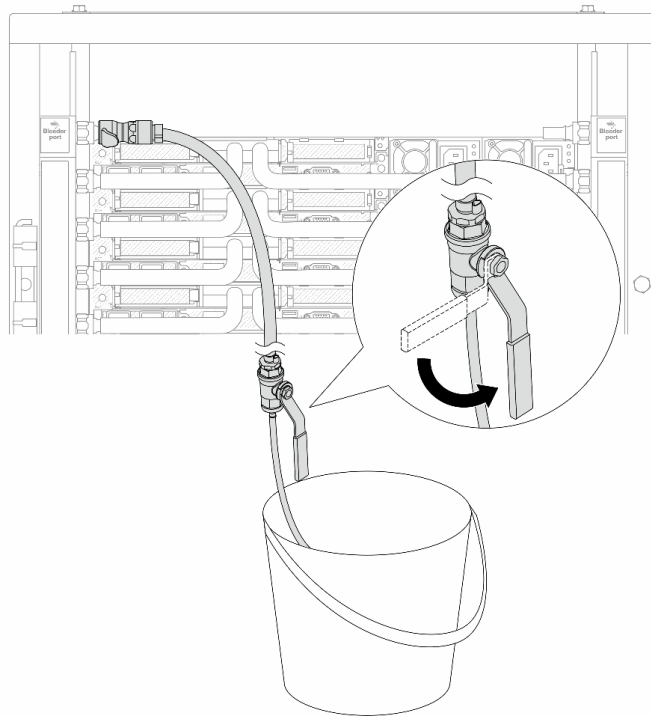


Figure 158. Opening the bleeder valve on the supply side

Step 14. Once completed, connect the supply and return of manifold and facility correspondingly. Fully open all connections on both supply and return sides.

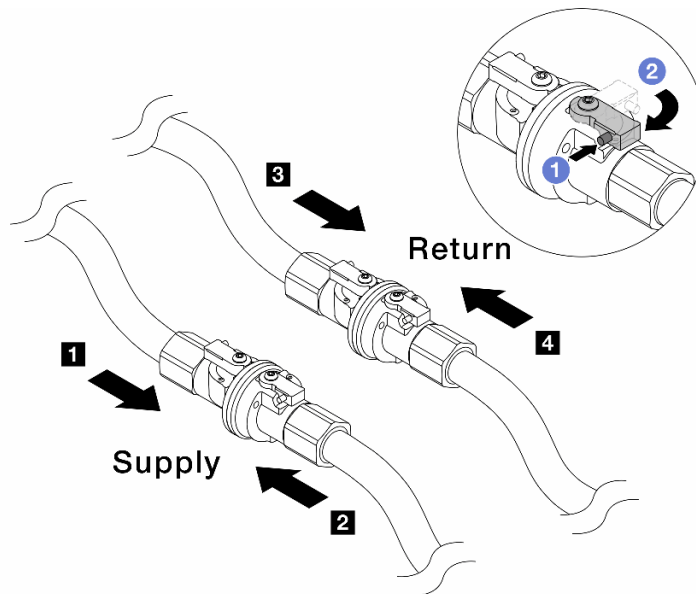


Figure 159. Opening ball valves

Note:

1 Manifold supply connects to 2 facility supply	3 Manifold return connects to 4 facility return
---	---

- a. ① Press the button on the ball valve switch.
- b. ② Rotate the switch to fully open the valves as illustrated above.

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=aYmM8iY592U>

Memory module replacement

Use the following procedures to remove and install a memory module.

- [“Remove a memory module” on page 205](#)
- [“Install a memory module” on page 207](#)

Remove a memory module

Use this information to remove a memory module.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Make sure to remove or install memory module 20 seconds after disconnecting power cords from the system. It allows the system to be completely discharged of electricity and safe for handling memory module.
- If the server is installed in a rack, slide the server out on its rack slide rails to gain access to the top cover, or remove the server from the rack. See [“Remove the server from rack” on page 65](#).
- If you are not installing a replacement memory module to the same slot, make sure you have memory module filler available.
- Memory modules are sensitive to static discharge and require special handling. Refer to the standard guidelines for [“Handling static-sensitive devices” on page 52](#).
 - Always wear an electrostatic-discharge strap when removing or installing memory modules. Electrostatic-discharge gloves can also be used.
 - Never hold two or more memory modules together so that they do not touch each other. Do not stack memory modules directly on top of each other during storage.
 - Never touch the gold memory module connector contacts or allow these contacts to touch the outside of the memory module connector housing.
 - Handle memory modules with care: never bend, twist, or drop a memory module.
 - Do not use any metal tools (such as jigs or clamps) to handle the memory modules, because the rigid metals may damage the memory modules.
 - Do not insert memory modules while holding packages or passive components, which can cause package cracks or detachment of passive components by the high insertion force.

Important: Remove or install memory modules for one processor at a time.

Procedure

Attention: Make sure to remove or install memory module 20 seconds after disconnecting power cords from the system. It allows the system to be completely discharged of electricity and safe for handling memory module.

Step 1. Power off the server and disconnect all power cords.

Step 2. Remove the top cover. See “Remove the top cover” on page 318.

Step 3. Remove the memory module from the slot.

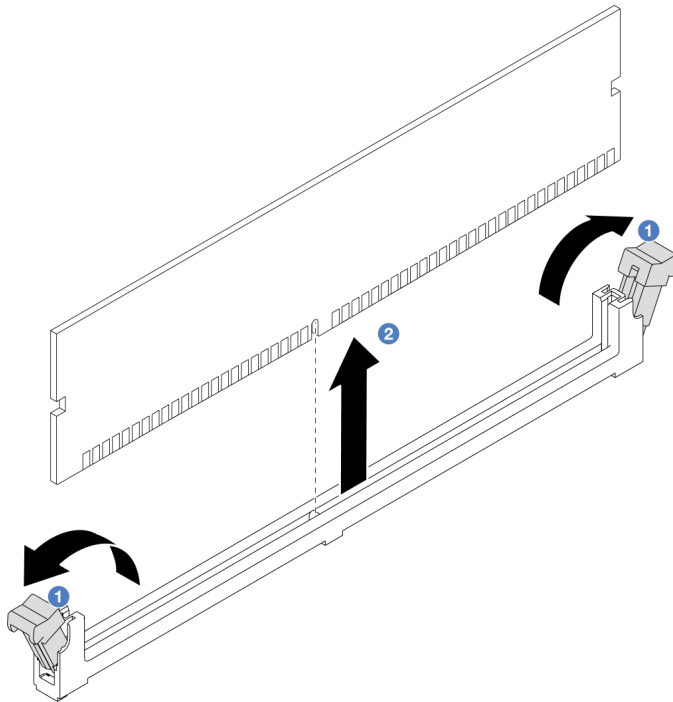


Figure 160. Memory module removal

- a. ① Open the retaining clip on each end of the memory module slot.

Attention: To avoid breaking the retaining clips or damaging memory module slots, handle the clips gently.

- b. ② Grasp the memory module at both ends and carefully lift it out of the slot.

After you finish

1. A memory module slot must be installed with a memory module or a memory module filler. See “Install a memory module” on page 207.
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=5J25gvB5JmM>

Install a memory module

Use this information to install a memory module.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Make sure to remove or install memory module 20 seconds after disconnecting power cords from the system. It allows the system to be completely discharged of electricity and safe for handling memory module.
- Make sure to adopt one of the supported configurations listed in [“Memory module installation rules and order” on page 52](#).
- Memory modules are sensitive to static discharge and require special handling. Refer to the standard guidelines at [“Handling static-sensitive devices” on page 52](#):
 - Always wear an electrostatic-discharge strap when removing or installing memory modules. Electrostatic-discharge gloves can also be used.
 - Never hold two or more memory modules together so that they do not touch each other. Do not stack memory modules directly on top of each other during storage.
 - Never touch the gold memory module connector contacts or allow these contacts to touch the outside of the memory module connector housing.
 - Handle memory modules with care: never bend, twist, or drop a memory module.
 - Do not use any metal tools (such as jigs or clamps) to handle the memory modules, because the rigid metals may damage the memory modules.
 - Do not insert memory modules while holding packages or passive components, which can cause package cracks or detachment of passive components by the high insertion force.

Important: Remove or install memory modules for one processor at a time.

Firmware and driver download: You might need to update the firmware or driver after replacing a component.

- Go to <https://datacentersupport.lenovo.com/tw/en/products/servers/thinksystem/sr645v3/7d9c/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to [“Update the firmware” on page 489](#) for more information on firmware updating tools.

Procedure

Attention: Make sure to remove or install memory module 20 seconds after disconnecting power cords from the system. It allows the system to be completely discharged of electricity and safe for handling memory module.

Step 1. Power off the server and disconnect all power cords.

Step 2. Touch the static-protective package that contains the memory module to any unpainted surface on the outside of the server. Then, take the memory module out of the package and place it on a static-protective surface.

Step 3. Locate the required memory module slot on the system board (system board assembly).

Note: Ensure that you observe the installation rules and sequence in [“Memory module installation rules and order” on page 52](#).

Step 4. Install the memory module into the slot.

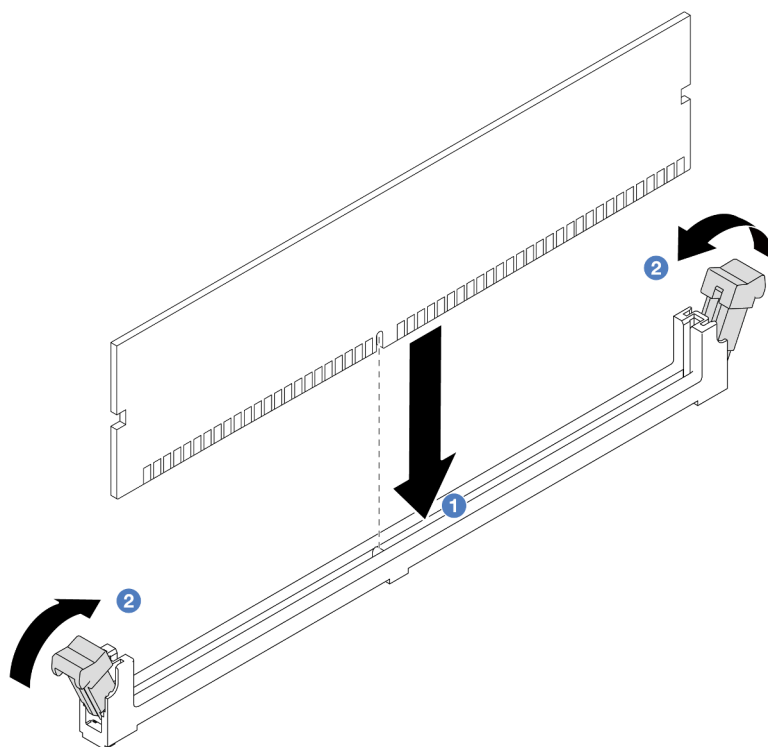


Figure 161. Memory module installation

Attention:

- Before you install a memory module into the slot, make sure that the clips are on open position, and the slot is clear of any debris.
 - To avoid breaking the retaining clips or damaging the memory module slots, open and close the clips gently.
- a. **1** Identify the key on the memory module and then align the key to the slot, and gently place the memory module into the slot with both hands.
 - b. **2** Firmly press both ends of the memory module straight down into the slot until the retaining clips snap into the locked position.

Note: If there is a gap between the memory module and the retaining clips, the memory module has not been correctly inserted. In this case, open the retaining clips, remove the memory module, and then reinsert it.

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322.](#)

Demo video

<https://www.youtube.com/watch?v=MaToyWBsvVw>

MicroSD card replacement

Follow the instructions in this section to remove and install the MicroSD card.

- [“Remove the MicroSD card” on page 209](#)
- [“Install the MicroSD card” on page 210](#)

Remove the MicroSD card

Follow the instructions in this section to remove the MicroSD card.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Step 1. Prepare your server.

- a. Remove the top cover. See [“Remove the top cover” on page 318](#).
- b. If your server comes with riser assemblies, remove them first, see [“Remove a PCIe adapter” on page 226](#).
- c. If your server comes with a rear drive assembly, remove it first. See [“Remove the rear 2.5" drive assembly” on page 261](#).
- d. If your server comes with a 7mm rear drive assembly, remove it first. See [“Remove the 7mm rear drive assembly” on page 264](#).
- e. Record where the cables are connected to the system board assembly; then, disconnect all the cables.

Attention: Disengage all latches, cable clips, release tabs, or locks on cable connectors beforehand. Failing to release them before removing the cables will damage the cable connectors on the system board assembly. Any damage to the cable connectors may require replacing the system board assembly.

Step 2. Remove the MicroSD card.

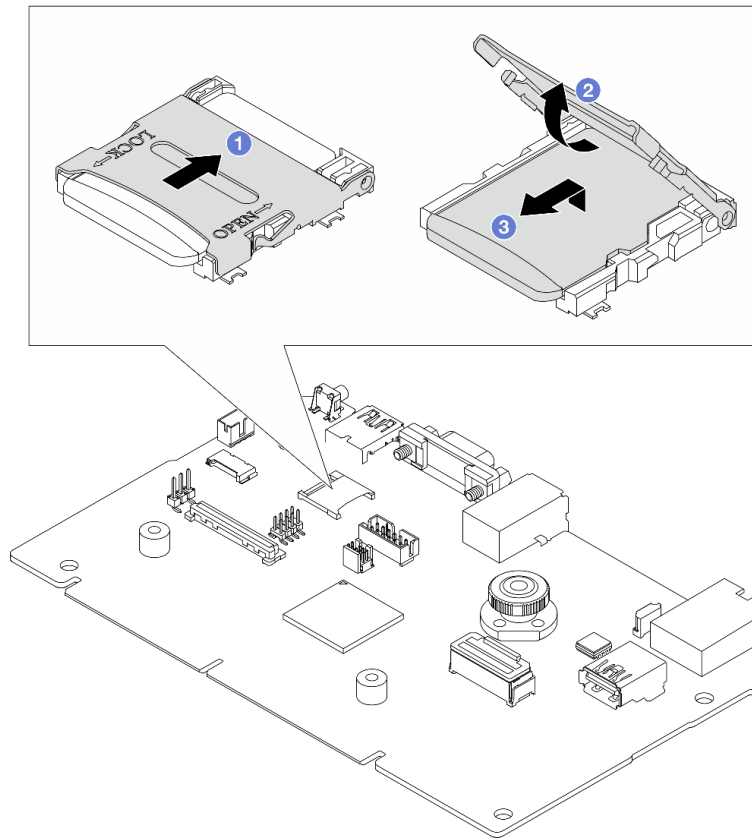


Figure 162. Removing MicroSD card

- a. ① Slide the socket lid to OPEN position.
- b. ② Lift open the socket lid.
- c. ③ Remove the MicroSD card from the socket.

Note: After the MicroSD card is removed, the historical data of the firmware and user data uploaded through Remote Disc On Card (RDOC) will be lost, and the firmware rollback function and extended RDOC space will not be supported. To enable the two features, it will need to install a new MicroSD card.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=SPMtyOLoxzE>

Install the MicroSD card

Follow the instructions in this section to install the MicroSD card.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Step 1. Install the MicroSD card.

Notes:

- If replacing with a new MicroSD card, the firmware historical data and user data stored in the defective MicroSD card would be lost. After a new MicroSD card is installed, subsequent firmware update history will be saved to the new card.
- To update firmware, refer to “Updating Server Firmware” section in [Lenovo XClarity Controller 2](#).

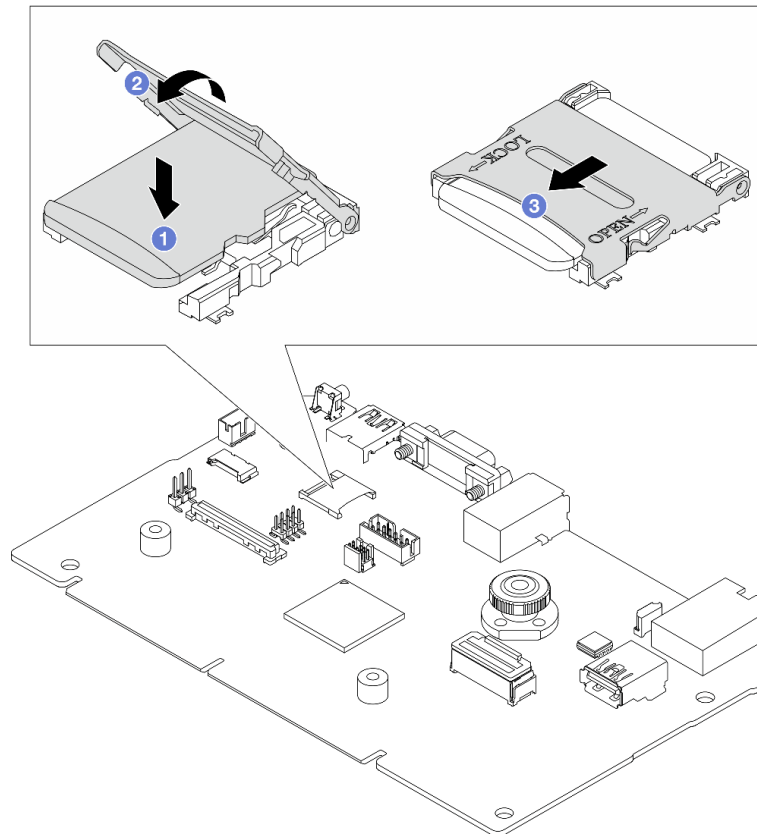


Figure 163. Installing MicroSD card

- a. ① Place the MicroSD card into the socket.
- b. ② Close the socket lid.
- c. ③ Slide the socket lid to LOCK position.

After you finish

1. Install any components that you have removed:

- a. [“Install a PCIe adapter” on page 228](#)
 - b. [“Install the 7mm rear drive assembly” on page 265](#)
 - c. [“Install the rear 2.5” drive assembly” on page 262](#)
 - d. [“Install the top cover” on page 320](#)
2. Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

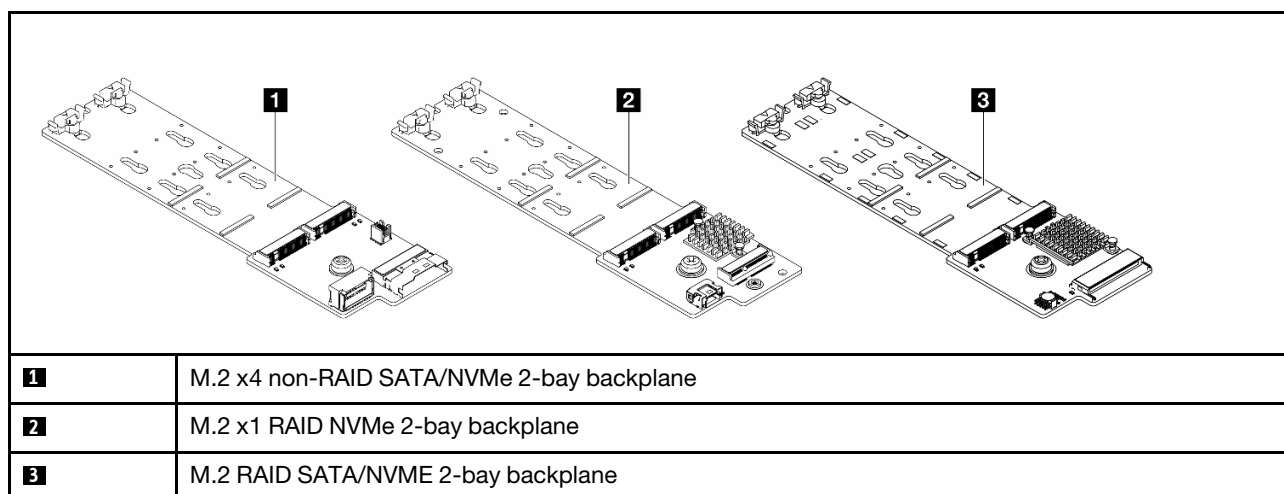
<https://www.youtube.com/watch?v=qgQMcsFZTCo>

M.2 backplane and M.2 drive replacement

Use this information to remove and install the M.2 backplane and M.2 drive (an assembled M.2 backplane and M.2 drive is also known as M.2 module).

The server supports two types of M.2 backplanes. The removal and installation methods are similar.

Note: The M.2 adapters and modules are also referred to as enablement kits. In this publication, they are referred to as M.2 backplanes. These terms are interchangeable.



- [“Remove the M.2 backplane and M.2 drive” on page 212](#)
- [“Adjust the retainer on the M.2 backplane” on page 215](#)
- [“Install the M.2 backplane and M.2 drive” on page 216](#)
- [“Remove the M.2 cage and M.2 backplane \(16-EDSFF chassis\)” on page 220](#)
- [“Install the M.2 cage and M.2 backplane \(16-EDSFF chassis\)” on page 221](#)

Remove the M.2 backplane and M.2 drive

Use this information to remove the M.2 backplane and M.2 drive.

About this task

Attention:

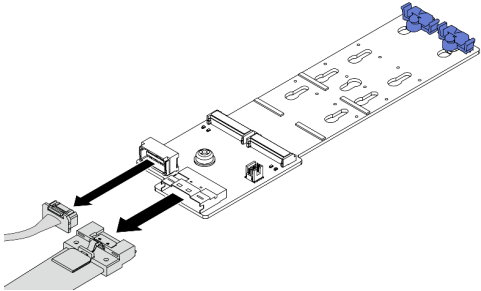
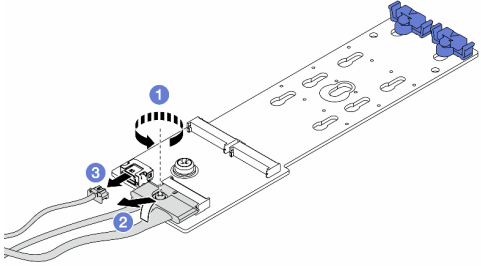
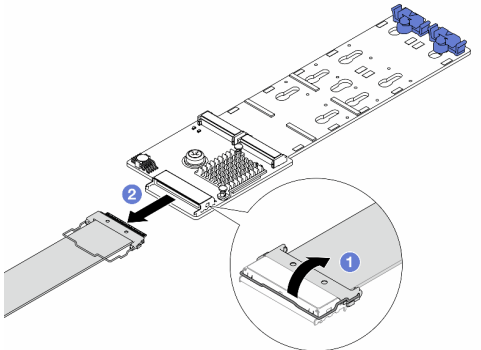
- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).

- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).

Step 2. Disconnect the M.2 cables from the M.2 backplane.

 <p><i>Figure 164. M.2 x4 non-RAID SATA/NVMe 2-bay backplane</i></p>	<p>Disconnect the M.2 cables from the M.2 backplane.</p>
 <p><i>Figure 165. M.2 x1 RAID NVMe 2-bay backplane</i></p>	<ol style="list-style-type: none"> 1. Loosen the screw on the M.2 backplane. 2. Tilt the connector and remove it. 3. Remove the power cable.
 <p><i>Figure 166. M.2 RAID SATA/NVMe 2-bay backplane</i></p>	<ol style="list-style-type: none"> 1. Pull up the latch on the M.2 cable. 2. Disconnect the M.2 cable from the M.2 backplane.

Step 3. Remove the M.2 drive from the M.2 backplane.

Note: The M.2 backplane you want to remove might be different from the following illustrations, but the removal method is the same.

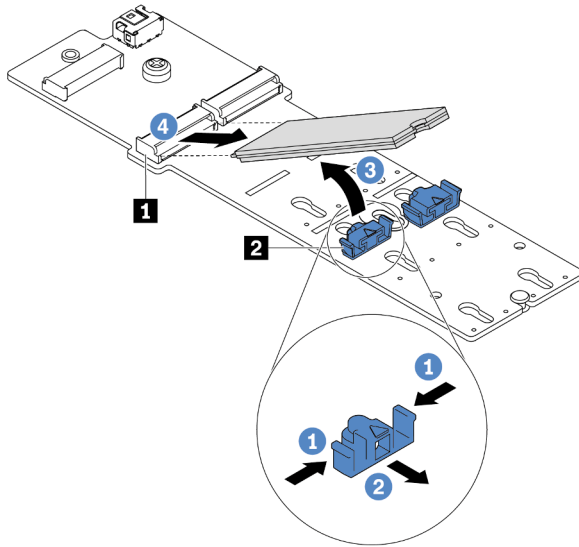


Figure 167. M.2 drive removal

- a. ① Press both sides of the retainer ②.
- b. ② Slide the retainer backward to loosen the M.2 drive from the M.2 backplane.
- c. ③ Rotate the M.2 drive away from the M.2 backplane.
- d. ④ Pull the M.2 drive away from the connector ① at an angle of approximately 30 degrees.

Step 4. Remove the M.2 module from the chassis.

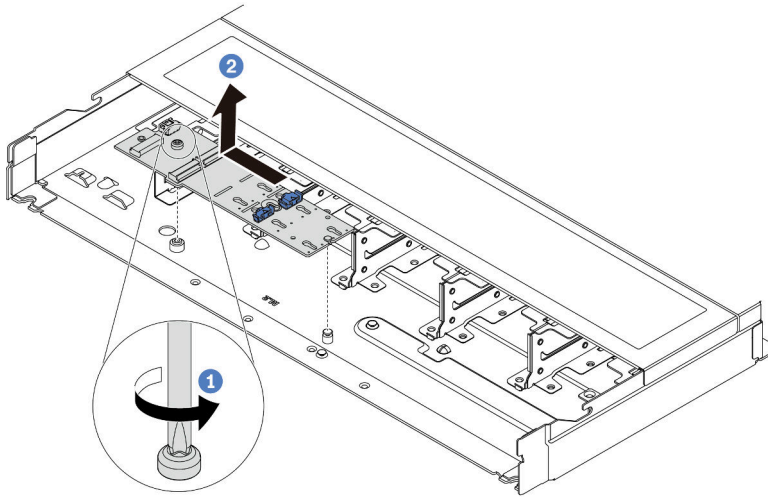


Figure 168. M.2 module removal

- a. 1 Loosen the screw.
- b. 2 Release the M.2 backplane from the pin and carefully lift the M.2 backplane out from the chassis.

Step 5. Disconnect all M.2 cables from the processor board.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=7IARQfLFk6Q>

Adjust the retainer on the M.2 backplane

Use this information to adjust the retainer on the M.2 backplane.

About this task

Attention:

- Read “Installation Guidelines” on page 49 and “Safety inspection checklist” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Note: The M.2 backplane you want to adjust might be different from the following illustrations, but the adjustment method is the same.

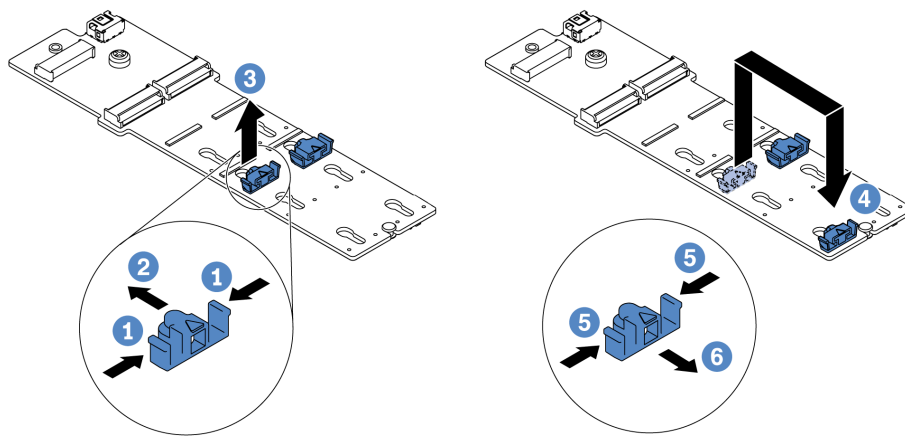


Figure 169. M.2 retainer adjustment

- Step 1. **1** Press both sides of the retainers.
- Step 2. **2** Move the retainer forward until it is in the large opening of the keyhole.
- Step 3. **3** Take the retainer out of the keyhole.
- Step 4. **4** Insert the retainer into the correct keyhole into which the retainer should be installed to accommodate the particular size of the M.2 drive you wish to install.
- Step 5. **5** Press both sides of the retainer.
- Step 6. **6** Slide the retainer backwards until it is seated in place.

Demo video

<https://www.youtube.com/watch?v=92ZproaVNV0>

Install the M.2 backplane and M.2 drive

Use this information to install the M.2 backplane and M.2 drive.

About this task

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “[Power off the server](#)” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the M.2 backplane and M.2 drive to any unpainted surface on the outside of the server. Then, take the M.2 backplane and M.2 drive out of the package and place them on a static-protective surface.

Note: The M.2 backplane you want to install might be different from the following illustrations, but the installation method is the same.

- Step 2. (Optional) Adjust the retainer on the M.2 backplane to accommodate the particular size of the M.2 drive you wish to install. See [“Adjust the retainer on the M.2 backplane”](#) on page 215.
- Step 3. Locate the M.2 drive slot on the M.2 backplane.

Note: For some M.2 backplanes that support two identical M.2 drives, install the M.2 drive in slot 0 first.

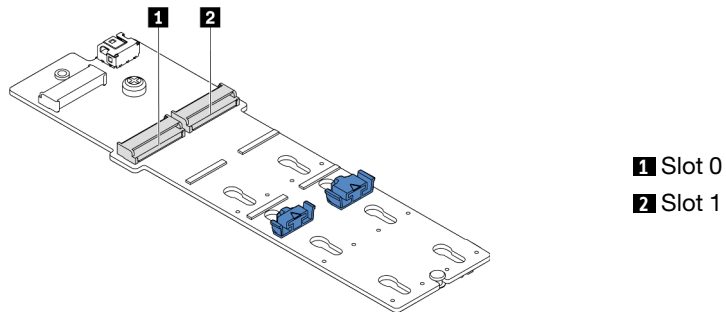


Figure 170. M.2 drive slot

- Step 4. Install the M.2 backplane onto the chassis.

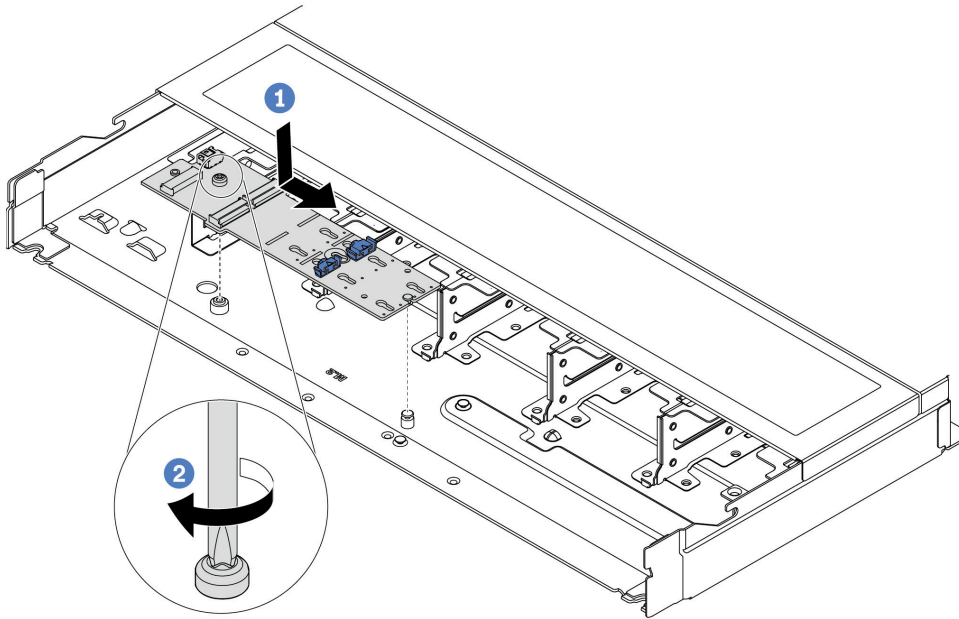


Figure 171. M.2 backplane installation

- 1 Align the notch of the M.2 backplane with the pin on the chassis, and then place down the M.2 backplane.
- 2 Tighten the screw to secure the M.2 backplane.

Step 5. Install the M.2 drive on the M.2 backplane.

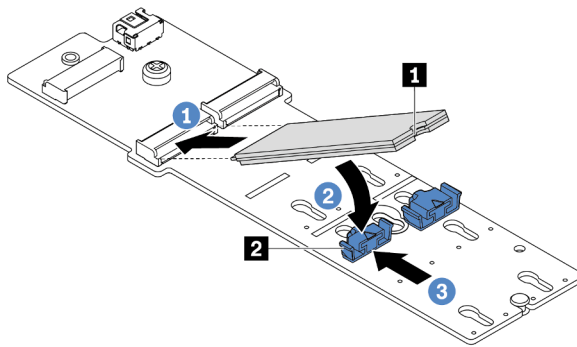
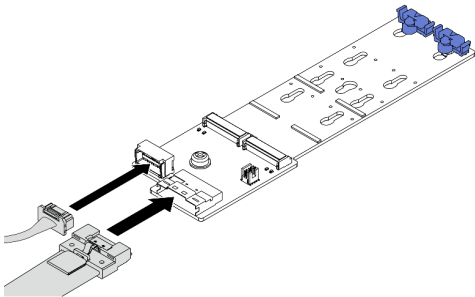
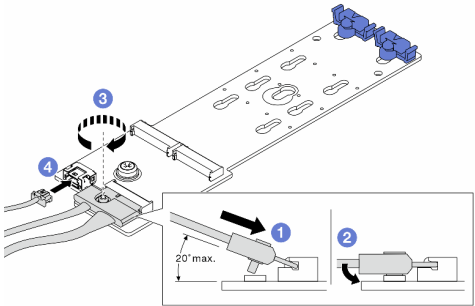
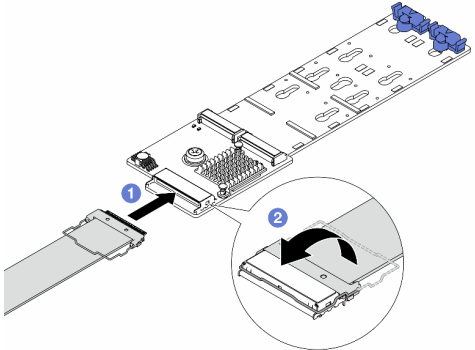


Figure 172. M.2 drive installation

- a. ① Insert the M.2 drive at an angle of approximately 30 degrees into the connector.
- b. ② Rotate the M.2 drive down until the notch ❶ catches on the lip of the retainer ❷.
- c. ③ Slide the retainer forward (toward the connector) to secure the M.2 drive into place.

Step 6. Disconnect the M.2 cables from the M.2 backplane.

 <p><i>Figure 173. M.2 x4 non-RAID SATA/NVMe 2-bay backplane</i></p>	<p>Connect the M.2 cables from the M.2 backplane.</p>
 <p><i>Figure 174. M.2 x1 RAID NVMe 2-bay backplane</i></p>	<ol style="list-style-type: none"> 1. Tilt the connector at an angle of 20 degrees or lower, and insert it until its bottom surface reaches the ramp. 2. Press the connector down flat. 3. Tighten the screw on the signal cable. 4. Connect the power cable.
 <p><i>Figure 175. M.2 RAID SATA/NVMe 2-bay backplane</i></p>	<ol style="list-style-type: none"> 1. Connect the M.2 cable to the M.2 backplane. 2. Rotate the latch on the cable as illustrated, and press the latch down until it clicks into place.

After you finish

1. Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).
2. Use the Lenovo XClarity Provisioning Manager to configure the RAID. For more information, see: https://sysmgt.lenovofiles.com/help/topic/ixpm_frontend/ixpm_product_page.html

Demo video

<https://www.youtube.com/watch?v=Q4iaG2nfwKg>

Remove the M.2 cage and M.2 backplane (16-EDSFF chassis)

Use the information in this topic to remove the M.2 cage and M.2 backplane from the 16-EDSFF chassis.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 2. Disconnect the cables routed to the M.2 backplane. See [“M.2 drive backplane” on page 344](#) for more details.
- Step 3. Remove the M.2 cage from the chassis.

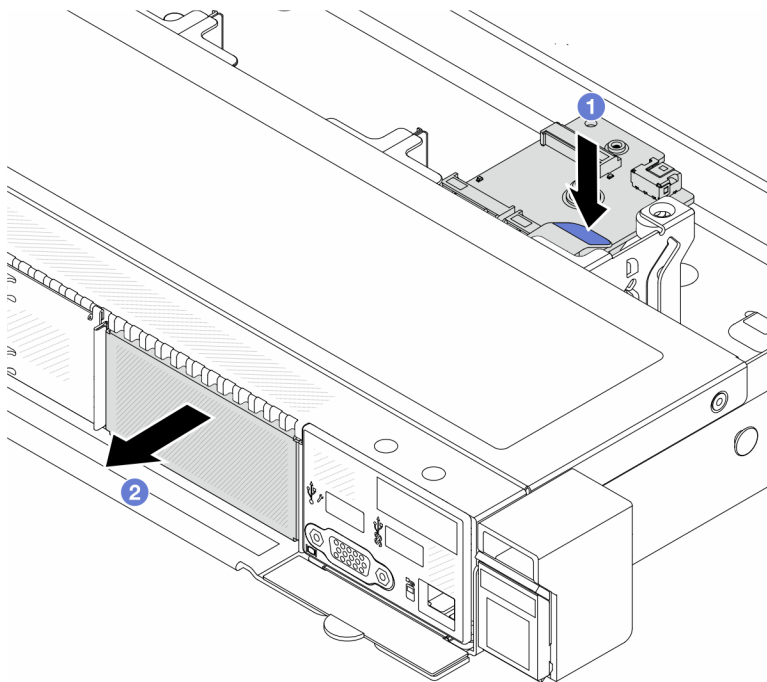


Figure 176. M.2 cage removal

- 1 Press down the blue touch point on release latch of the M.2 cage.
- 2 Push the cage to the direction as shown to disengage the cage from the chassis.

- Step 4. Remove the M.2 backplane from the M.2 cage.

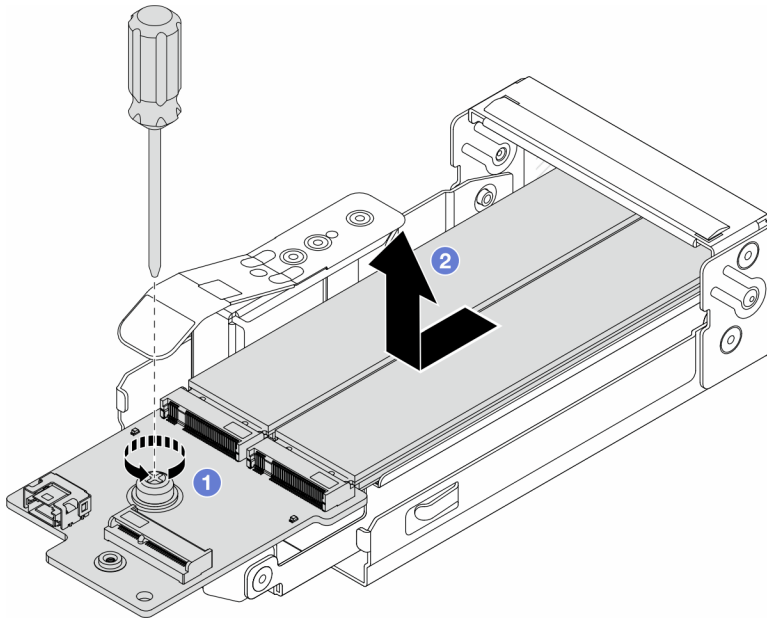


Figure 177. M.2 backplane removal

- a. ① Loosen the captive screw on the M.2 backplane.
- b. ② Slide the backplane out and take it out of the cage.

Step 5. Remove the M.2 drives if necessary, see “[Remove the M.2 backplane and M.2 drive](#)” on page 212.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=nNaFqnomLOU>

Install the M.2 cage and M.2 backplane (16-EDSFF chassis)

Use the information in this topic to install the M.2 cage and M.2 backplane to the 16-EDSFF chassis.

About this task

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “[Power off the server](#)” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Step 1. Touch the static-protective package that contains the M.2 backplane, M.2 drive and M.2 cage to any unpainted surface on the outside of the server. Then, take the M.2 backplane, M.2 drive and M.2 cage out of the package and place them on a static-protective surface.

Note: The M.2 backplane you want to install might be different from the following illustrations, but the installation method is the same.

Step 2. To install the M.2 drives to M.2 backplane, see [“Install the M.2 backplane and M.2 drive” on page 216](#).

Step 3. Install the M.2 backplane to M.2 cage.

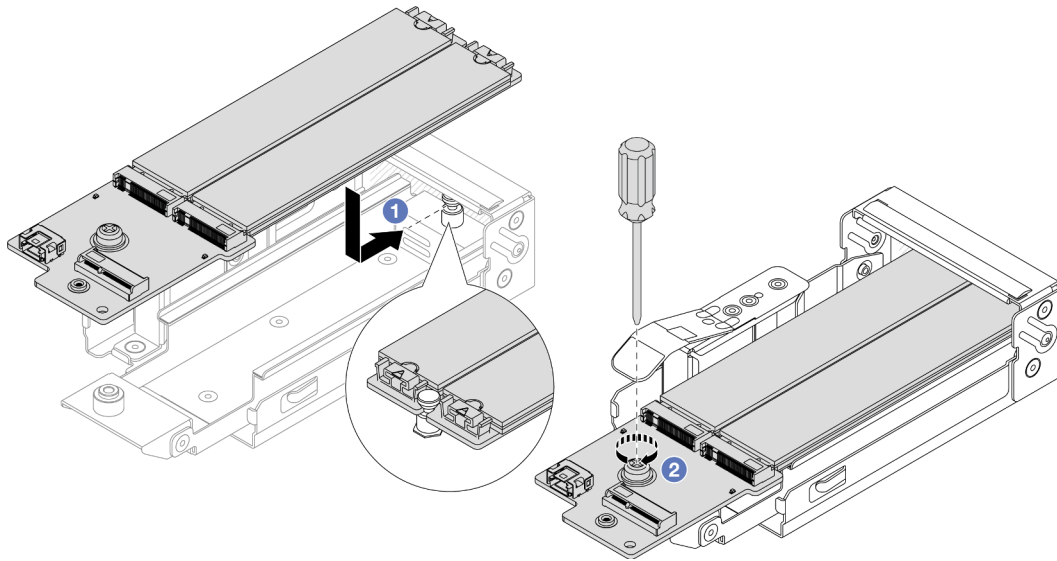


Figure 178. M.2 backplane installation

- a. ① Place the M.2 backplane evenly to the rails on the M.2 cage, and slide the backplane into the cage until the notch on the backplane mounts the groove on the standoff.
- b. ② Tighten the captive screw on the backplane, and make sure that the backplane is secured in place.

Step 4. Install the M.2 cage to the chassis.

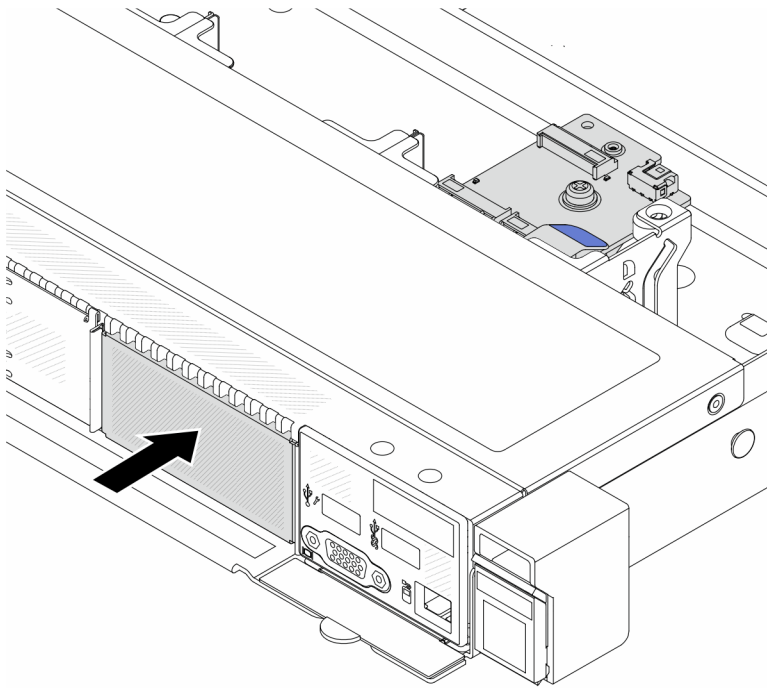


Figure 179. M.2 cage installation

Push the M.2 cage into the chassis until the release latch clicks into place.

Step 5. Reconnect the cables to the M.2 backplane. See “M.2 drive backplane” on page 344.

Step 6. Install the top cover. See “Install the top cover” on page 320.

After you finish

1. Complete the parts replacement. See “Complete the parts replacement” on page 322.
2. Use the Lenovo XClarity Provisioning Manager to configure the RAID. For more information, see: https://sysmgt.lenovofiles.com/help/topic/ixpm_frontend/ixpm_product_page.html.

Demo video

<https://www.youtube.com/watch?v=Uxo-8UPyDIQ>

OCP module replacement

Use this information to remove and install the OCP module.

Notes:

- The OCP module is available only on some models.
- If ThinkSystem V3 Management NIC Adapter Kit is installed on the server, it will not be displayed on the PCIe card list of system management software, such as XCC, LXPM, and so on.
- “Remove the OCP module” on page 223
- “Install the OCP module” on page 224

Remove the OCP module

Use this information to remove the OCP module.

About this task

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “[Power off the server](#)” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

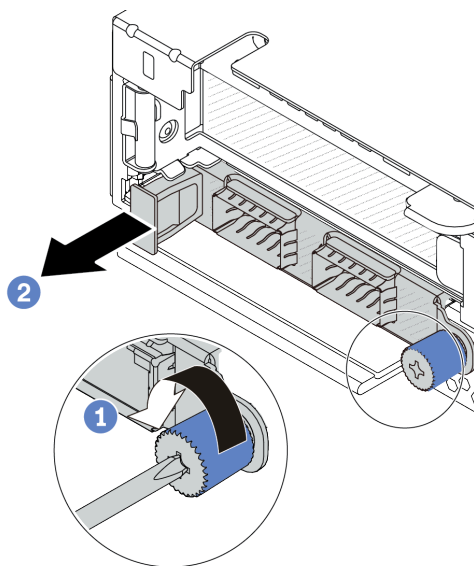
Procedure

Figure 180. OCP module removal

- Step 1. ① Loosen the thumbscrew that secures the module.
- Step 2. ② Pull out the OCP module by its handle on the left as shown.

After you finish

1. Install a new OCP module or a card filler. See “[Install the OCP module](#)” on page 224.
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=MNeW-QatPd8>

Install the OCP module

Use this information to install the OCP module.

About this task**Attention:**

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the OCP module to any unpainted surface on the outside of the server. Then, take the OCP module out of the package and place it on a static-protective surface.
- Step 2. Install the OCP module.

Notes:

- Ensure that the Ethernet adapter is fully seated and the thumbscrew is securely tightened. Otherwise, the OCP module will not get full connection and may not function.
- If there is an OCP module installed, when the system is powered off but still plugged in to AC power, system fan 1 and fan 2 will continue to spin at a much lower speed. This is the system design to provide proper cooling for the OCP module.

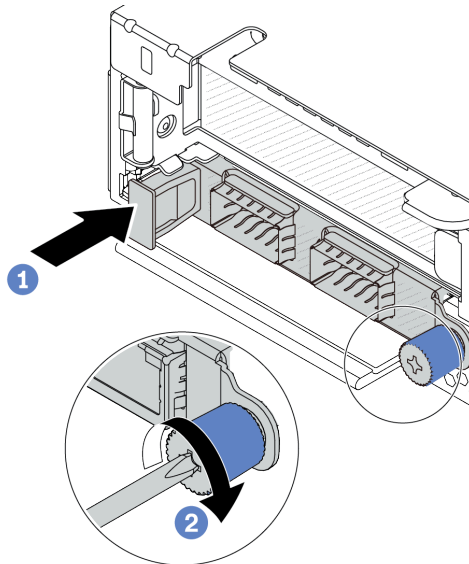


Figure 181. OCP module installation

- 1** Push the OCP module by its handle on the left until it is fully inserted into the connector on the processor board.
- 2** Fully tighten the thumbscrew to secure the adapter.

Notes:

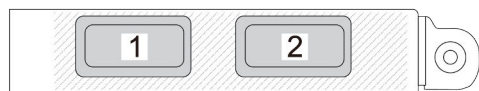


Figure 182. OCP module (two connectors)

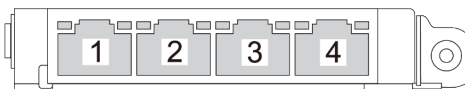


Figure 183. OCP module (four connectors)

- The OCP module provides two or four extra Ethernet connectors for network connections.
- By default, any Ethernet connector on the OCP module can also function as a management connector using the shared management capacity.

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=OZ27njlsFA>

PCIe adapter replacement

Use this information to remove and install a PCIe adapter.

The PCIe adapter can be an Ethernet adapter, a host bus adapter (HBA), a PCIe RAID adapter, a PCIe interposer adapter, a PCIe solid-state drive, a PCIe GPU, and any other supported PCIe adapter.

Notes:

- Depending on the specific type, the PCIe adapter might look different from the illustrations in this topic.
- Use any documentation that comes with the PCIe adapter, and follow the instructions and those in this topic.
- [“Remove a PCIe adapter” on page 226](#)
- [“Install a PCIe adapter” on page 228](#)

Remove a PCIe adapter

Use this information to remove a PCIe adapter.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).

Step 2. Remove the riser assembly. See [“Remove the rear riser card” on page 281](#).

- Step 3. Disconnect cables from the PCIe adapter in the riser assembly.
- Step 4. Remove the PCIe adapter from the riser assembly.

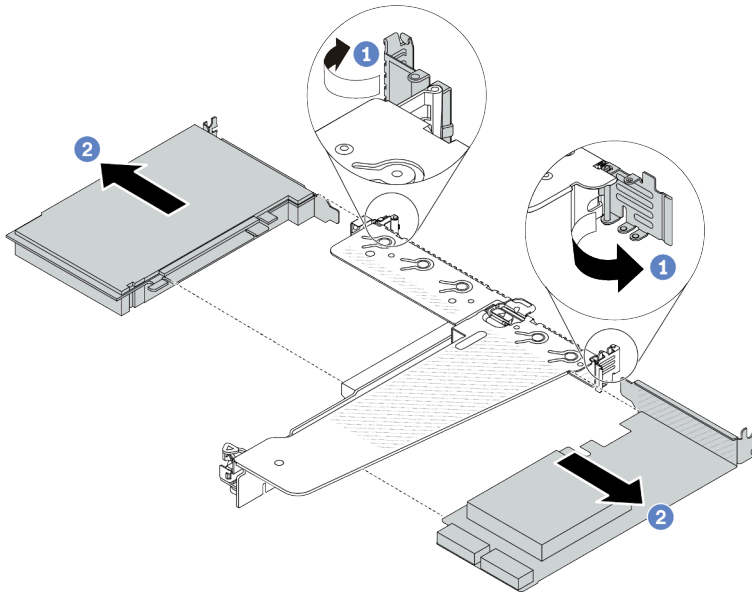


Figure 184. PCIe adapter removal from the rear LP-FH riser assembly

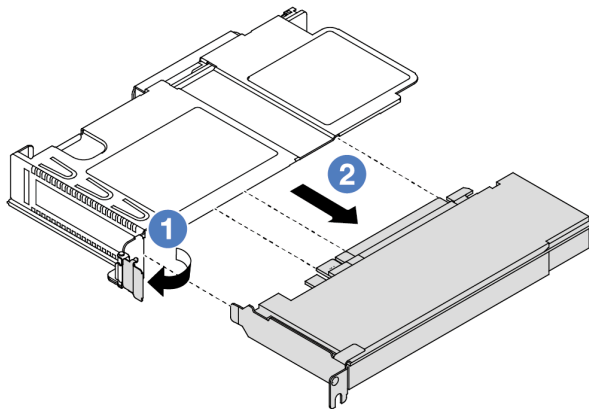


Figure 185. PCIe adapter removal from the front LP riser assembly

- 1** Rotate the latch on the riser bracket to open position.
- 2** Grasp the PCIe adapter by its edges and carefully pull it out of the PCIe adapter slot on the riser card.

Note: The procedure for removing a PCIe adapter is similar for different types of riser assembly. In this topic, the LP-FH riser assembly is used as an example.

After you finish

1. Install a PCIe adapter or PCIe adapter filler. See [“Install a PCIe adapter” on page 228](#).
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=9s2HdZJV-a8>

Install a PCIe adapter

Use this information to install a PCIe adapter.

About this task

Attention:

- Read “Installation Guidelines” on page 49 and “Safety inspection checklist” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the PCIe adapter to any unpainted surface on the outside of the server. Then, take the PCIe adapter out of the package and place it on a static-protective surface.
- Step 2. Locate the correct PCIe slot for the PCIe adapter. For information about the PCIe slots and supported PCIe adapters, see “Rear view” on page 29.
- Step 3. Install the PCIe adapter and secure it to the riser assembly.

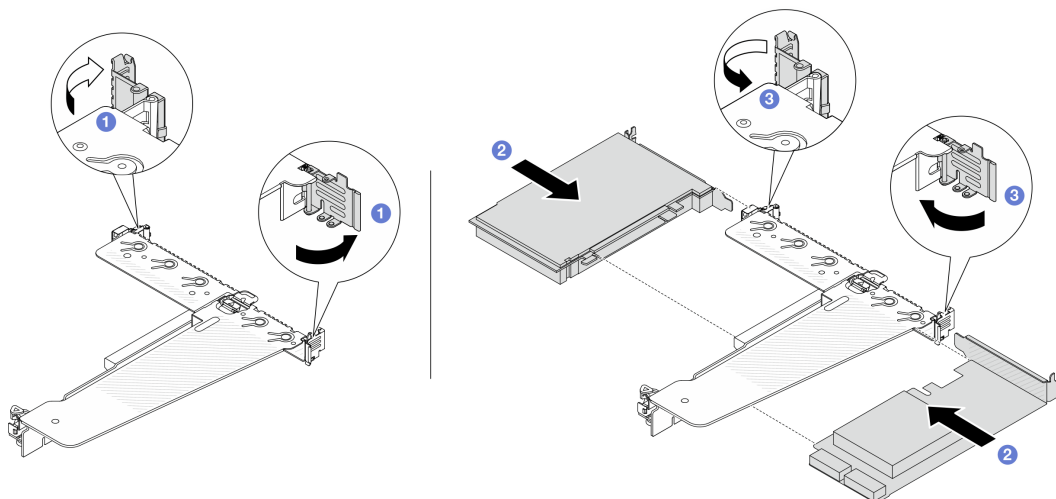


Figure 186. PCIe adapter installation into the rear LP-FH riser assembly

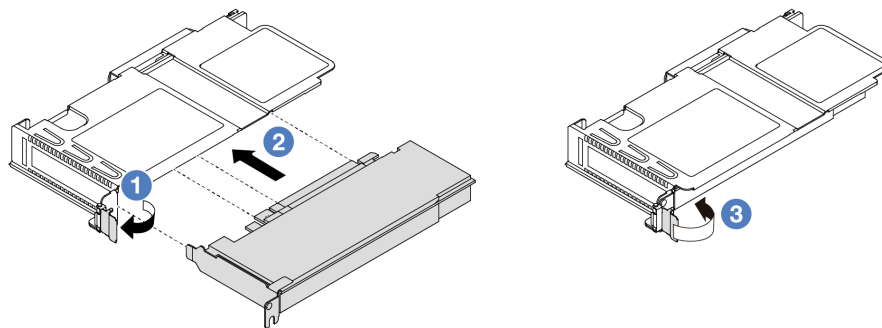


Figure 187. PCIe adapter installation into the front LP riser assembly

- a. ① Rotate the latch on the riser bracket to open position.
- b. ② Align the PCIe adapter with the PCIe slot on the riser card. Then, carefully press the PCIe adapter straight into the slot until it is securely seated and its bracket is secured.
- c. ③ Rotate the latch on the riser bracket to closed position.

Notes:

- Ensure that PCIe adapter installation meets the rules in “[PCIe slots and adapters](#)” on page 54
- The procedure for installing a PCIe adapter is similar for different types of riser assembly. In this topic, the LP-FH riser assembly is used as an example.

Step 4. Connect cables to the PCIe adapter in the riser assembly. See [Chapter 6 “Internal cable routing” on page 325](#).

After you finish

1. Reinstall the riser assembly. See “[Install the rear riser card](#)” on page 283.
2. Complete the parts replacement. See “[Complete the parts replacement](#)” on page 322.

Demo video

<https://www.youtube.com/watch?v=f1re0t3euFU>

Power supply unit replacement

Use this information to remove and install a power supply unit.

- “[Remove a power supply unit](#)” on page 229
- “[Install a power supply unit](#)” on page 234

Remove a power supply unit

Use this information to remove a power supply unit.

About this task

If the power supply unit to be removed is the only one installed, the power supply unit is not hot-swappable. Before removing it, you must turn off the server first. To support redundancy mode or hot-swap, install an additional hot-swap power supply unit.

Safety information for AC power supplies

S035



CAUTION:

Never remove the cover on a power supply or any part that has this label attached. Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

S002



CAUTION:

The power-control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

S001



Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- Connect all power cords to a properly wired and grounded electrical outlet/source.
- Connect any equipment that will be attached to this product to properly wired outlets/sources.
- When possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- The device might have more than one power cord, to remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

Safety information for DC power supplies

CAUTION:

240 V dc input (input range: 180-300 V dc) is supported in Chinese Mainland ONLY. Power supply with 240 V dc input cannot support hot plugging power cord function. Before removing the power supply

with dc input, please turn off server or disconnect dc power sources at the breaker panel or by turning off the power source. Then, remove the power cord.



NEVER CONNECT AND DISCONNECT THE POWER SUPPLY CABLE AND EQUIPMENT WHILE YOUR EQUIPMENT IS POWERED ON WITH DC SUPPLY (hot-plugging). Otherwise you may damage the equipment and result in data loss, the damages and losses result from incorrect operation of the equipment will not be covered by the manufacturers' warranty.

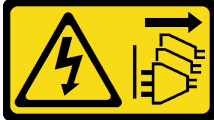
S035



CAUTION:

Never remove the cover on a power supply or any part that has this label attached. Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

S019



CAUTION:

The power-control button on the device does not turn off the electrical current supplied to the device. The device also might have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals.



**For -48V dc power supply, electrical current from power cords is hazardous.
To avoid a shock hazard:**

- **To connect or disconnect -48V dc power cords when you need to remove/install redundancy power supply unit(s).**

To Connect:

1. Turn OFF subject dc power source(s) and equipment (s) that are attached to this product.
2. Install the power supply unit(s) into the system housing.
3. Attach dc power cord(s) to the product.
 - Ensure correct polarity of -48 V dc connections: RTN is + and -Vin (typical -48 V) dc is -. Earth ground should be connected very well.
4. Connect dc power cord(s) to subject power source (s).
5. Turn ON all the power source(s).

To Disconnect:

1. Disconnect or turn off the subject dc power source(s) (at the breaker panel) before removing the power supply unit(s).
2. Remove the subject dc cord(s) and make sure the wire terminal of power cord(s) is insulated.
3. Unplug the subject power supply unit(s) from the system housing.

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-CTkyVDu-5Lhy1r9G-4PQGI>.

Procedure

- Step 1. If the server is in a rack, adjust the cable management arm (CMA) to gain access to the power supply bay.

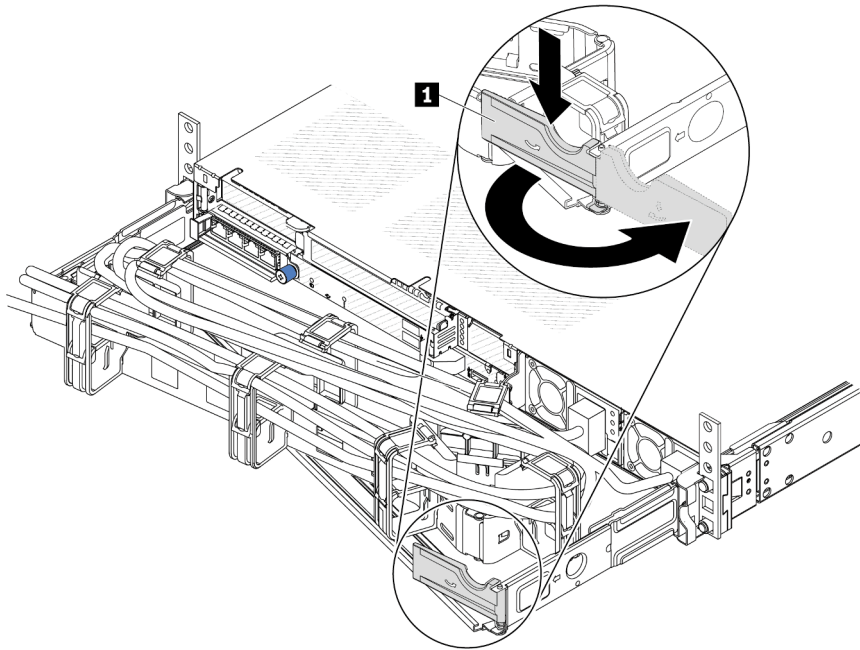


Figure 188. CMA adjustment

1. Press down the stop bracket **1** and rotate it to the open position.
 2. Rotate the CMA out of the way to gain access to the power supply.
- Step 2. Disconnect the power cord from the hot-swap power supply.
- For 240 V DC power supply units, turn off the server, and then, disconnect both ends of the power cord and keep it in an ESD-safe place.
 - For AC power supply units, disconnect both ends of the power cord and keep it in an ESD-safe place.
 - For –48V DC power supply units:
 1. Disconnect the power cords from the electrical outlet.
 2. Use a slotted screwdriver to loosen the captive screws on the power supply terminal block.
 3. Disconnect the power cords from the power supply unit, make the wire terminal insulated, and keep them in an ESD-safe place.

Note: If you are replacing two power supplies, replace them one by one to ensure that the power supply to the server is not interrupted. Do not disconnect the power cord from the secondly replaced power supply until the power output LED for the firstly replaced power supply is lit. For the location of the power output LED, refer to [“LEDs on the power supply unit” on page 514](#).

- Step 3. Press the release tab toward the handle and carefully pull the handle at the same time to slide the hot-swap power supply out of the chassis.

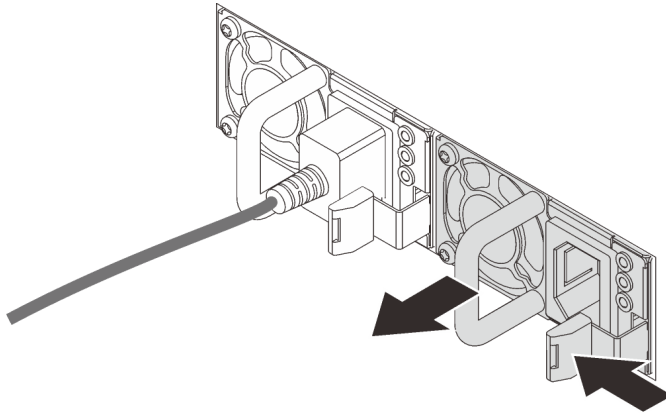


Figure 189. Hot-swap power supply removal

After you finish

1. Install a new power supply or install the power-supply filler to cover the power supply bay. See “[Install a power supply unit](#)” on page 234.

Important: To ensure proper cooling during normal server operation, both power supply bays must be occupied. This means that each bay must have a power supply installed; or one has a power supply installed and the other has a power supply filler installed.

2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=wPF6zj22FFU>

Install a power supply unit

Use this information to install a power supply unit.

About this task

The following describes the information that you must consider when installing a power supply:

- If the power supply unit to be removed is the only one installed, the power supply unit is not hot-swappable. Before removing it, you must turn off the server first. To support redundancy mode or hot-swap, install an additional hot-swap power supply unit.
- If you are replacing the existing power supply with a new power supply:
 - Use Lenovo Capacity Planner to calculate the required power capacity for what is configured for your server. More information about Lenovo Capacity Planner is available at: <https://datacentersupport.lenovo.com/solutions/lnvo-lcp>
 - Ensure that the devices that you are installing are supported. For a list of supported optional devices for the server, go to: <https://serverproven.lenovo.com/>
 - Attach the power information label that comes with this option on the existing label near the power supply.



Figure 190. Example power supply unit label on the top cover

Safety information for AC power supplies

S035



CAUTION:

Never remove the cover on a power supply or any part that has this label attached. Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

S002



CAUTION:

The power-control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

S001



Electrical current from power, telephone, and communication cables is hazardous.
To avoid a shock hazard:

- Connect all power cords to a properly wired and grounded electrical outlet/source.
- Connect any equipment that will be attached to this product to properly wired outlets/sources.
- When possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- The device might have more than one power cord, to remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

Safety information for DC power supplies

CAUTION:

240 V dc input (input range: 180-300 V dc) is supported in Chinese Mainland **ONLY**. Power supply with 240 V dc input cannot support hot plugging power cord function. Before removing the power supply with dc input, please turn off server or disconnect dc power sources at the breaker panel or by turning off the power source. Then, remove the power cord.



NEVER CONNECT AND DISCONNECT THE POWER SUPPLY CABLE AND EQUIPMENT WHILE YOUR EQUIPMENT IS POWERED ON WITH DC SUPPLY (hot-plugging). Otherwise you may damage the equipment and result in data loss, the damages and losses result from incorrect operation of the equipment will not be covered by the manufacturers' warranty.

S035



CAUTION:

Never remove the cover on a power supply or any part that has this label attached. Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

S019



CAUTION:

The power-control button on the device does not turn off the electrical current supplied to the device. The device also might have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals.

S029



**For -48V dc power supply, electrical current from power cords is hazardous.
To avoid a shock hazard:**

- **To connect or disconnect -48V dc power cords when you need to remove/install redundancy power supply unit(s).**

To Connect:

1. Turn OFF subject dc power source(s) and equipment (s) that are attached to this product.
2. Install the power supply unit(s) into the system housing.
3. Attach dc power cord(s) to the product.
 - Ensure correct polarity of -48 V dc connections: RTN is + and -Vin (typical -48 V) dc is -. Earth ground should be connected very well.
4. Connect dc power cord(s) to subject power source (s).
5. Turn ON all the power source(s).

To Disconnect:

1. Disconnect or turn off the subject dc power source(s) (at the breaker panel) before removing the power supply unit(s).
2. Remove the subject dc cord(s) and make sure the wire terminal of power cord(s) is insulated.
3. Unplug the subject power supply unit(s) from the system housing.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the hot-swap power supply to any unpainted surface on the outside of the server. And then, take the hot-swap power supply out of the package and place it on a static-protective surface.
- Step 2. If there is a power-supply filler installed, remove it.

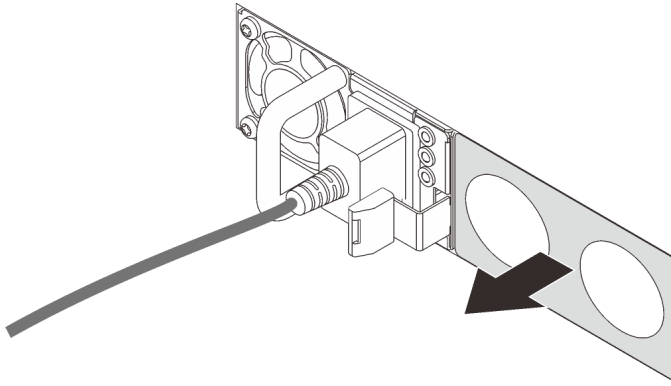


Figure 191. Hot-swap power supply filler removal

Step 3. Slide the new hot-swap power supply into the bay until it snaps into position.

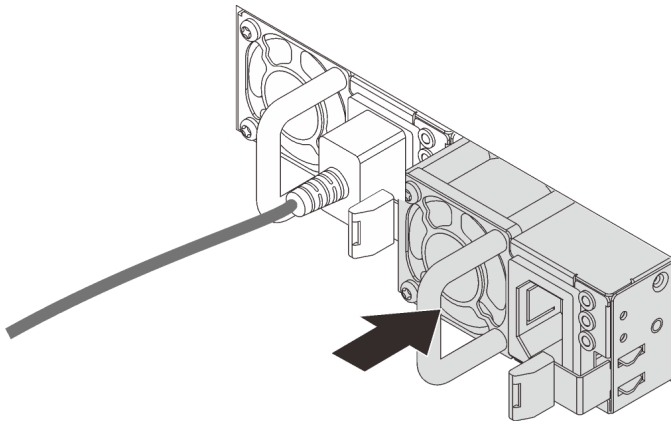



Figure 192. Hot-swap power supply installation

- Step 4. Connect the power supply unit to a properly grounded electrical outlet.
- For 240 V DC power supply units:
 1. Turn off the server.
 2. Connect one end of the power cord to the power connector on the power supply unit.
 3. Connect the other end of the power cord to a properly grounded electrical outlet.
 - For AC power supply units:
 1. Connect one end of the power cord to the power connector on the power supply unit.
 2. Connect the other end of the power cord to a properly grounded electrical outlet.
 - For -48V DC power supply units:
 1. Use a slotted screwdriver to loosen the 3 captive screws on the power supply terminal block.
 2. Check the type label on the power supply block and each power cord.

Type	PSU terminal block	Power cord
Input	-Vin	-Vin

Ground		GND
Input	RTN	RTN

3. Face the groove side of each power cord pin upwards, and then plug the pins into corresponding holes on the power block. Use the table above for guidance to ensure that the pins find correct slots.
4. Tighten the captive screws on the power block. Ensure that the screws and cord pins are secured in place and no bare metal parts are shown.
5. Connect the other end of the cables to a properly grounded electrical outlet. Ensure that the cable ends find correct outlets.

After you finish

1. If you have adjusted the CMA to gain access to the power supply bay, readjust the CMA back in place.
2. If the server is turned off, turn on the server. Ensure that both the power input LED and the power output LED on the power supply are lit, indicating that the power supply is operating properly.

Demo video

<https://www.youtube.com/watch?v=dTOi5WLBO5M>

Power-supply-unit air baffle replacement

Use this information to remove and install a power-supply-unit air baffle.

Note: The power-supply-unit air baffle should be installed when two processors and TruDDR5 4800 MHz 128 GB (4Rx4) / 256 GB (8Rx4) 3DS RDIMM are installed.

- “Remove a power-supply-unit air baffle” on page 239
- “Install a power-supply-unit air baffle” on page 240

Remove a power-supply-unit air baffle

Use this information to understand how to remove a power-supply-unit air baffle.

About this task

Attention: Read “Installation Guidelines” on page 49 and “Safety inspection checklist” on page 50 to ensure that you work safely.

Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

S033



CAUTION:

Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in spattered metal, burns, or both.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 2. Remove the rear drive cage. See [“Remove the rear 2.5” drive assembly” on page 261](#) or [“Remove the 7mm rear drive assembly” on page 264](#).
- Step 3. Disconnect the cables adjacent to the power-supply-unit air baffle. For proper operation guidelines, see [Chapter 6 “Internal cable routing” on page 325](#).
- Step 4. Remove the power-supply-unit air baffle.

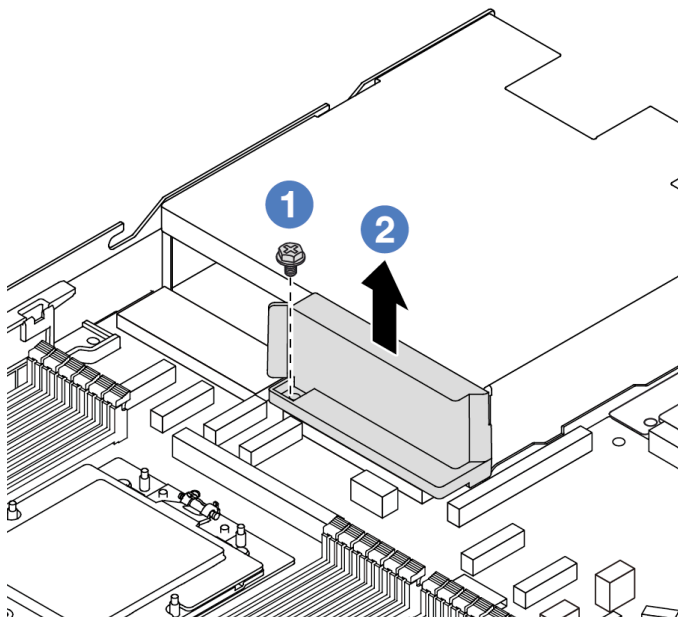


Figure 193. Power-supply-unit air baffle removal

- a. ① Loosen the screw on the air baffle.
- b. ② Lift the air baffle out of the chassis.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=ayTi05m9f-I>

Install a power-supply-unit air baffle

Use this information to understand how to install a power-supply-unit air baffle.

About this task

S014

**CAUTION:**

Hazardous voltage, current, and energy levels might be present. Only a qualified service technician is authorized to remove the covers where the label is attached.

Attention: Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.

Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).

Step 2. Install the power-supply-unit air duct.

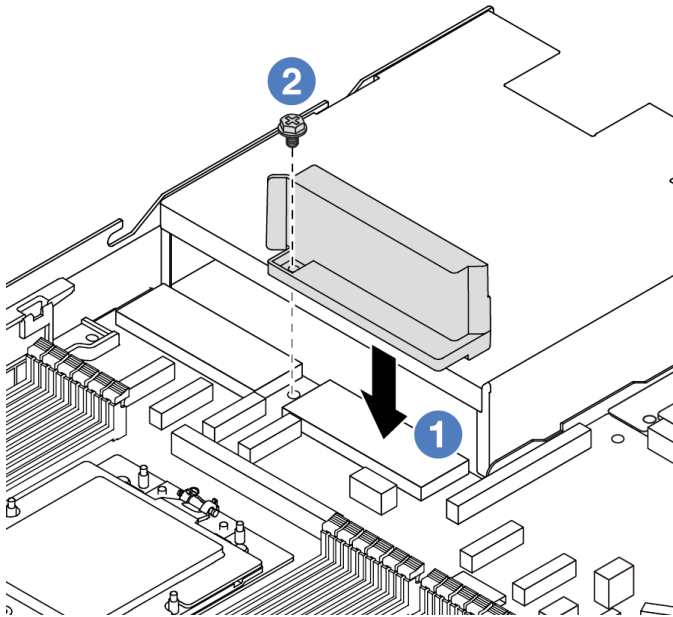


Figure 194. Power-supply-unit air duct installation

- a. ① Align the screw holes on the air duct and the chassis, and put the air duct down.
- b. ② Tighten the screw and ensure that the air duct is secured in place.

After you finish

- Properly route and secure the cables in the server. Refer to detailed cable routing information for each component in [Chapter 6 “Internal cable routing” on page 325](#).
- Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=Mp8Aplhd88w>

Processor and heat sink replacement (trained technicians only)

Use this information to remove and install a processor or a heat sink.

Important:

- This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.
- Before replacing a processor, check the current PSB fuse policy. See *Service process before replacement* at [Service process for updating PSB fuse state](#) (Lenovo service technicians only).
- After replacing a processor, ensure that the processor fuse status is expected without unexpected XCC event logs. See *Service process after replacing a processor* at [Service process for updating PSB fuse state](#) (Lenovo service technicians only). The fuse status must be the same as the original fuse status of the server.
- When the server has a L2AM (The Lenovo Neptune Liquid to Air Module) installed, you must apply for a L2AM module handle (LACM heat sink bracket) first if you need to install or remove the system board assembly or processor. However, while replacing the old L2AM with a new one, you do not need to apply for a module handle (LACM heat sink bracket) as the new L2AM package contains it.

Attention:

- Before reusing a processor or heat sink, make sure you use Lenovo proven alcohol cleaning pad and thermal grease.
- Each processor socket must always contain a cover or a processor. When replacing a processor, protect the empty processor socket with a cover.
- Do not touch the processor socket or processor contacts. Processor-socket contacts are very fragile and easily damaged. Contaminants on the processor contacts, such as oil from your skin, can cause connection failures.
- Do not allow the thermal grease on the processor or heat sink to come in contact with anything. Contact with any surface can compromise the thermal grease, rendering it ineffective. Thermal grease can damage components, such as the electrical connectors in the processor socket.
- This section is for processor and heat sink replacement. For the replacement of the L2AM (The Lenovo Neptune Liquid to Air Module), refer to [“The Lenovo Neptune® Liquid to Air Module replacement \(trained technicians only\)” on page 134](#).

The following illustration shows the components of the processor and heat sink.

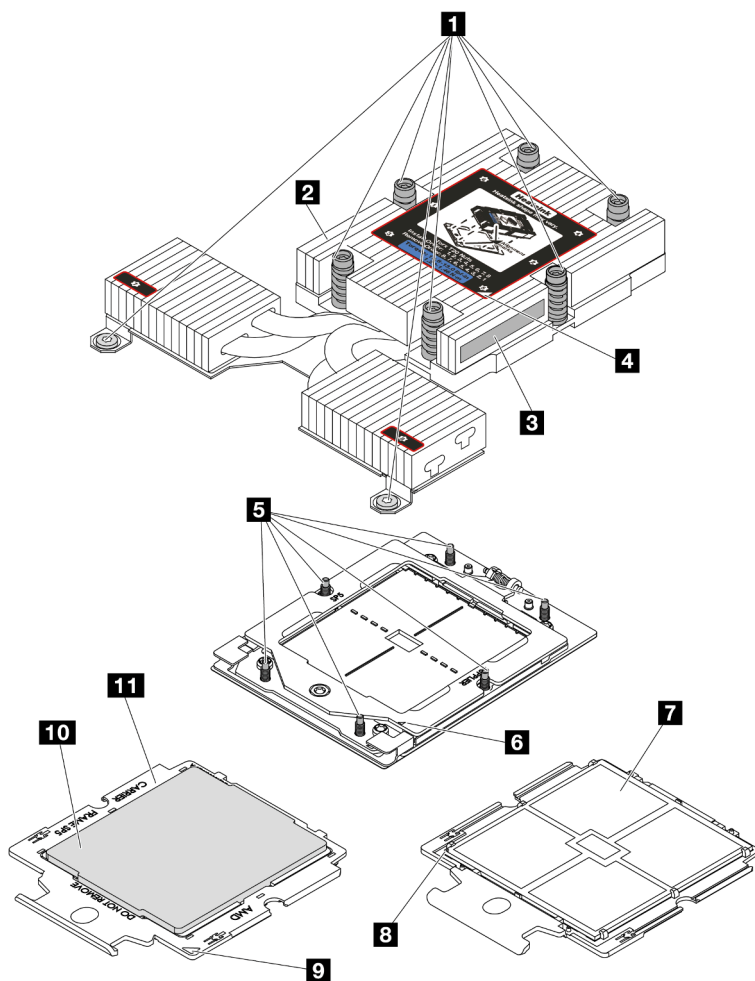


Figure 195. Process and heat sink components

1 Captive screws (8)	2 Heat sink
3 Processor identification label	4 Heat sink triangular mark
5 Screw bolts (6)	6 Retention frame triangular mark
7 Processor contacts	8 Processor triangular mark
9 Carrier triangular mark	10 Processor carrier
11 Processor heat spreader	

- [“Remove a heat sink” on page 244](#)
- [“Remove a processor” on page 246](#)
- [“Install a processor” on page 247](#)
- [“Install a heat sink” on page 249](#)

Remove a heat sink

Use this information to remove a heat sink. This task requires a Torx T20 screwdriver. This procedure must be executed by a trained technician.

About this task

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Prepare the following screwdriver to ensure to install and remove the corresponding screws properly.

Torque screwdriver type list	Screw Type
Torx T20 screwdriver	Torx T20 screw

Procedure

Step 1. Make preparations for this task.

- a. If the server is installed in a rack, slide the server out on its rack slide rails to gain access to the top cover, or remove the server from the rack. See [“Remove the server from rack” on page 65](#).
- b. Remove the top cover. See [“Remove the top cover” on page 318](#).

Step 2. Remove the heat sink.

Notes:

- Do not touch the contacts on the bottom of the processor.
- Keep the processor socket clean from any object to prevent possible damages.

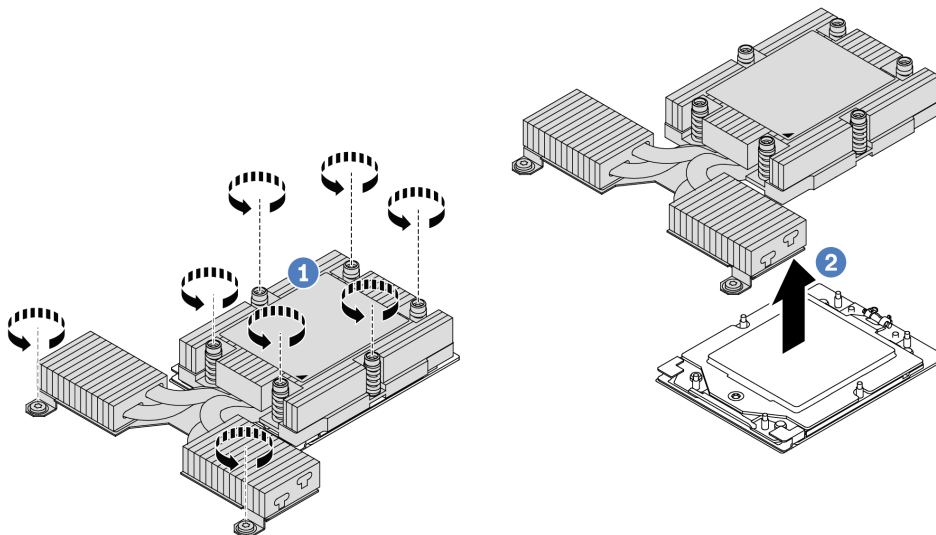


Figure 196. Removing a performance heat sink

- a. ① Fully loosen all the screws on the heat sink **in the removal sequence shown** on the heat-sink label.
- b. ② Carefully lift the heat sink from the processor socket.

After you finish

- If you are replacing a heat sink, install a new heat sink. See [“Install a heat sink” on page 249](#).
- If you are replacing a processor, remove the processor. See [“Remove a processor” on page 246](#).
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=HLIADlwVpwU>

Remove a processor

Use this information to remove a processor. This task requires a Torx T20 screwdriver. The procedure must be executed by a trained technician.

About this task

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Note: The system will load factory default UEFI settings when Processor 1 is removed. In this case, make sure to back up the UEFI settings before processor removal.

Procedure

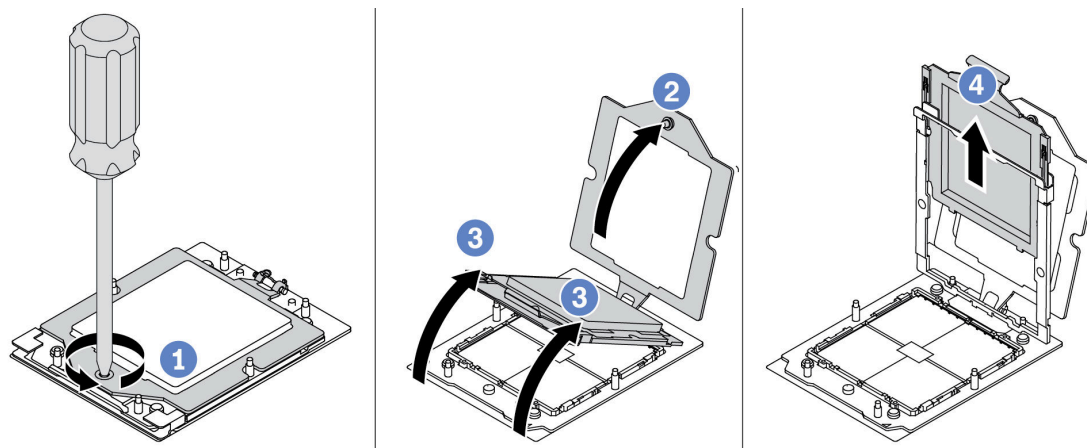


Figure 197. Processor removal

- Step 1. Use a Torx T20 screwdriver to loosen the captive screw.
- Step 2. Slightly lift up the retention frame in the direction shown.
- Step 3. Slightly lift up the rail frame in the direction shown. The processor in the rail frame is spring-loaded.

Step 4. Hold the blue tab of the processor carrier and slide the processor carrier out of the rail frame.

After you finish

- If you are going to install a new processor, see [“Install a processor” on page 247](#).
- If you are not going to install a processor, cover the processor socket with the socket cover and install a processor filler.

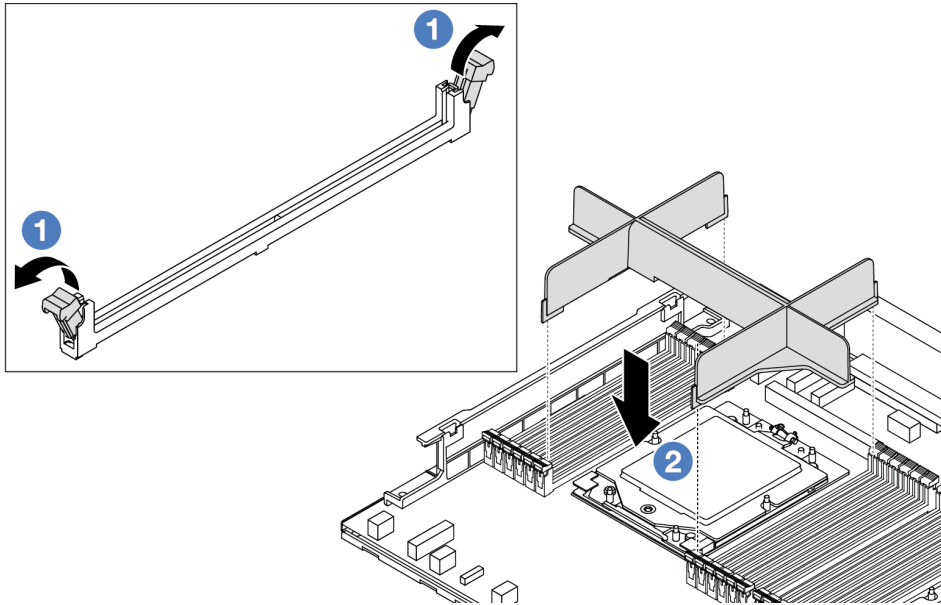


Figure 198. Installing a processor filler

1. Gently open the retaining clip on each end of the memory module slots next to the left and right sides of the processor.
 2. Align the processor filler with the slots, and place the processor filler on the slots with both hands. Firmly press the processor filler straight down into the slots until the retaining clips snap into the locked position.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=HLIADlwVpwU>

Install a processor

Use this information to install a processor. This task requires a Torx T20 screwdriver. The procedure must be executed by a trained technician.

About this task

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Notes:

- See <https://serverproven.lenovo.com/> for a list of processors supported for your server. All processors on the system board (system board assembly) must have the same speed, number of cores, and frequency.
- Before you install a new processor or replacement processor, update your system firmware to the latest level. See [“Update the firmware” on page 489](#).

Firmware and driver download: You might need to update the firmware or driver after replacing a component.

- Go to <https://datacentersupport.lenovo.com/tw/en/products/servers/thinksystem/sr645v3/7d9c/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to [“Update the firmware” on page 489](#) for more information on firmware updating tools.

Procedure

Step 1. (Optional) If a processor filler is installed on the processor socket, remove the processor filler.

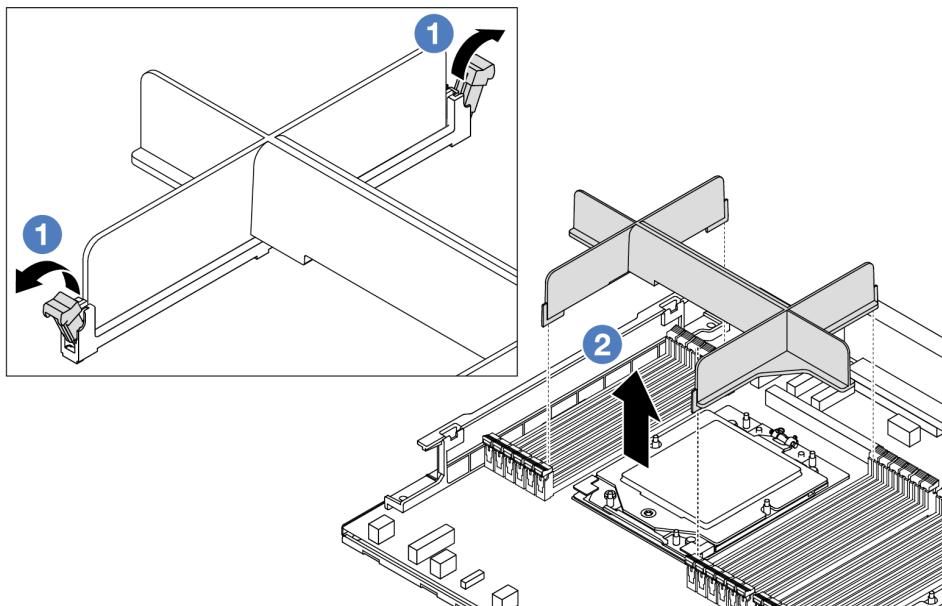


Figure 199. Removing a processor filler

- 1 Gently open the retaining clip on each end of the memory module slots next to the left and right sides of the processor.
- 2 Grasp the processor filler with both hands and carefully lift it out of the slots.

Step 2. (Optional) Remove the processor socket cover.

The procedure of removing the processor socket cover is the same as that of removing a processor. See [“Remove a processor” on page 246](#).

Step 3. Install the processor.

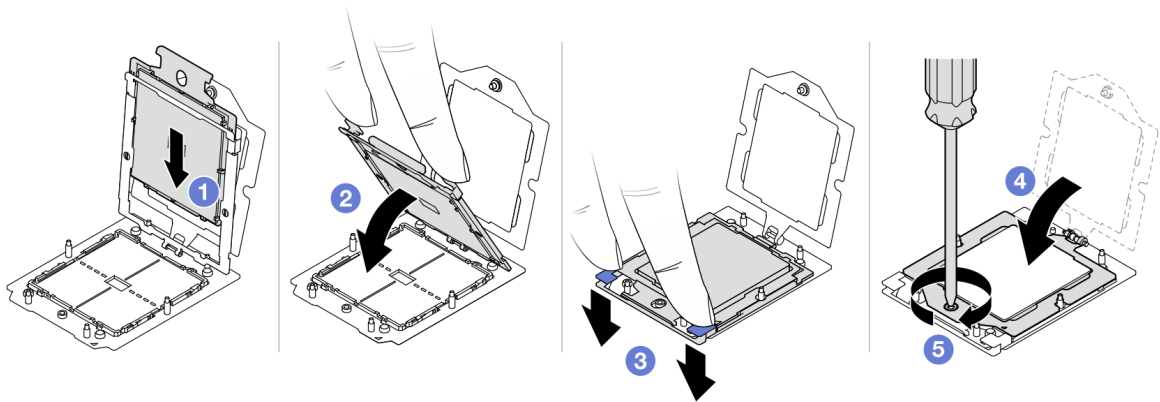


Figure 200. Installing a processor

1. ① Slide the processor carrier into the rail frame.

Attention:

- Make sure the processor carrier is well seated inside the rail frame.
 - Make sure the rear of processor carrier does not float above the rail frame.
2. ② Use the index finger of both hands to press down the rail frame.
 3. ③ Use the index finger of both hands to push the rail frame down until the blue latches lock into place.
 4. ④ Close the retention frame.
 5. ⑤ Close the retention frame.

After you finish

Install the heat sink. See “[Install a heat sink](#)” on page 249.

Demo video

https://www.youtube.com/watch?v=gy9Q_kR9Q4w

Install a heat sink

Follow the instructions in this section to install a heat sink. This task requires a Torx T20 screwdriver. The procedure must be executed by a trained technician.

About this task

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “[Power off the server](#)” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Prepare the following screwdriver to ensure to install and remove the corresponding screws properly.

Torque screwdriver type list	Screw Type
Torx T20 screwdriver	Torx T20 screw

Procedure

Step 1. Do the following according to the actual scenario.

If you are replacing a processor and reusing the heat sink:

1. Remove the processor identification label from the heat sink and replace it with the new label that comes with the replacement processor.
2. Wipe off old thermal grease on the heat sink with an alcohol cleaning pad.

If you are replacing a heat sink and reusing the processor:

1. Remove the processor identification label from the old heat sink and place it on the new heat sink in the same location.

Note: If you are unable to remove the label and place it on the new heat sink, or if the label is damaged during transfer, write the processor serial number from the processor identification label on the new heat sink in the same location as the label would be placed using a permanent marker.

2. Wipe off old thermal grease on the processor with an alcohol cleaning pad.
3. Check whether the manufacturing date on the new heat sink exceeds two years.
 - If yes, wipe off the thermal grease on the new heat sink with an alcohol cleaning pad, and go to [Step 2 on page 250](#).
 - If no, go to [Step 3 on page 250](#).

Step 2. Apply new thermal grease on the top of the processor with a syringe by forming four uniformly spaced dots, while each dot consists of about 0.1 ml of thermal grease.

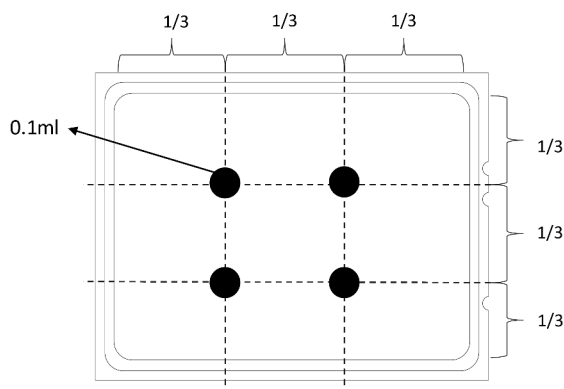


Figure 201. Applying thermal grease

Step 3. Install the heat sink.

Note: For reference, the torque required for the fasteners to fully tighten is 1.22-1.46 newton-meters (10.8-13.0 inch-pounds).

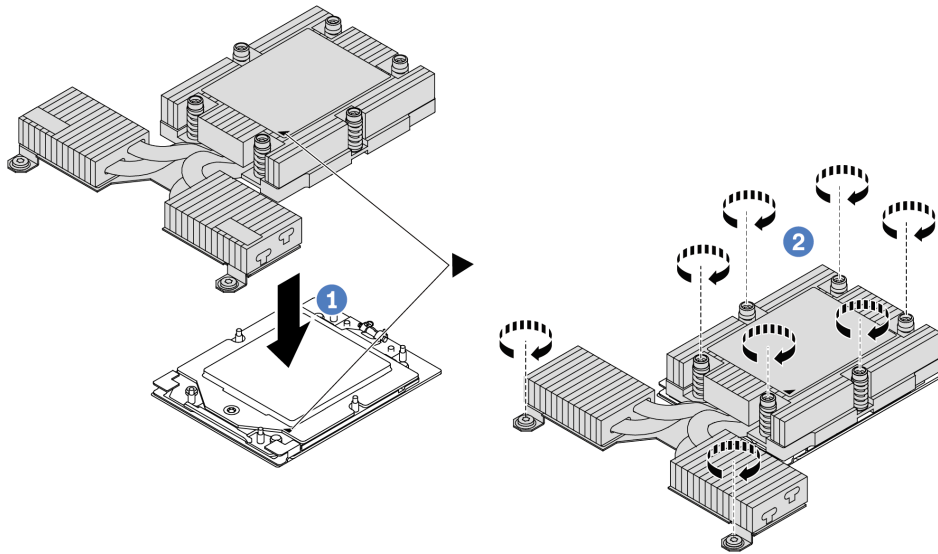


Figure 202. Installing a performance heat sink

- a. ① Align the triangular mark and screws on the heat sink with the triangular mark and threaded posts on the processor socket; then install the heat sink onto the processor carrier.
- b. ② Fully tighten all the screws **in the installation sequence shown** on the heat-sink label.

After you finish

1. Install any parts that you have removed.
2. Complete the parts replacement. See “Complete the parts replacement” on page 322.

Demo video

https://www.youtube.com/watch?v=gy9Q_kR9Q4w

Rack latches replacement

Use this information to remove and install the rack latches.

- “Remove the rack latches” on page 251
- “Install the rack latches” on page 252

Remove the rack latches

Use this information to remove the rack latches.

About this task

Attention: Read “Installation Guidelines” on page 49 and “Safety inspection checklist” on page 50 to ensure that you work safely.

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-CTkyVDu-5Lhy1r9G-4PQGI>.

Procedure

- Step 1. If the server is installed with the security bezel, remove it first. See [“Remove the security bezel” on page 284](#).
- Step 2. Remove the rack latch.

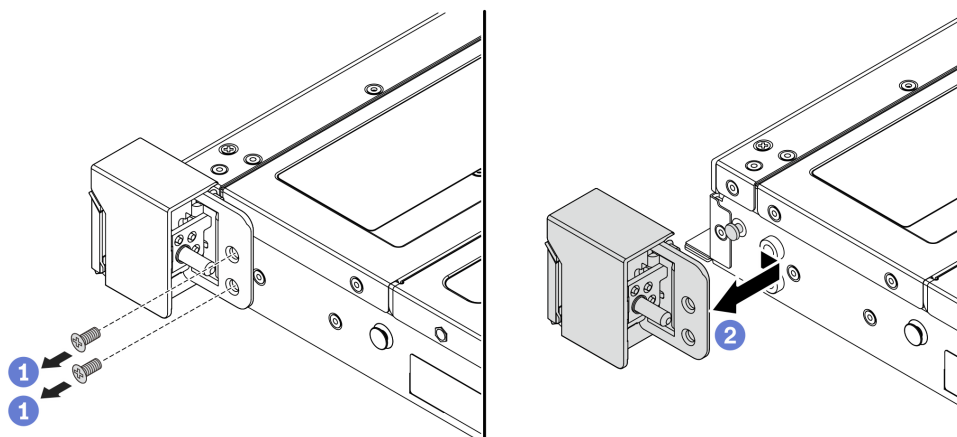


Figure 203. Rack latch removal

- a. 1 On each side of the server, remove the two screws that secure the rack latch.
- b. 2 On each side of the server, remove the rack latch from the chassis as shown.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

https://www.youtube.com/watch?v=JvMgE-cSy_c

Install the rack latches

Use this information to install the rack latches.

About this task

Attention: Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.

Procedure

- Step 1. Touch the static-protective package that contains the rack latches to any unpainted surface on the outside of the server. Then, take the rack latches out of the package and place them on a static-protective surface.
- Step 2. Install the rack latch.

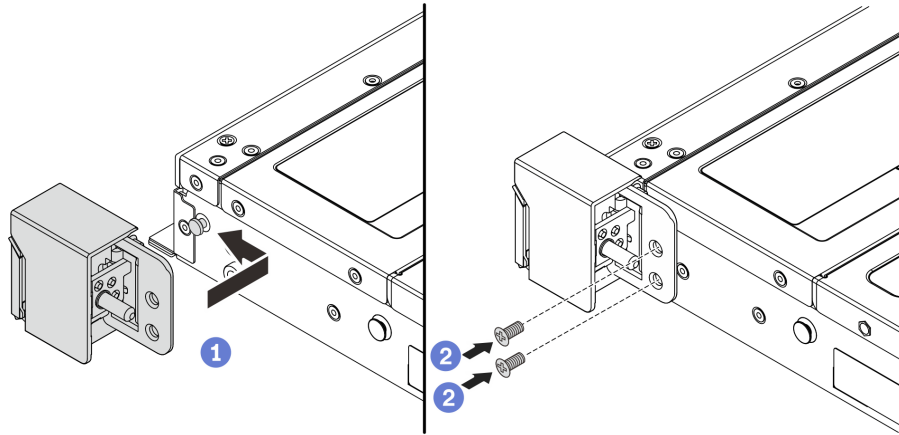


Figure 204. Rack latch installation

- a. ① On each side of the server, align the rack latch with the pin on the chassis. Then, press the rack latch onto the chassis and slightly slide it forward as shown.
- b. ② Install the two screws to secure the rack latch on each side of the server.

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

https://www.youtube.com/watch?v=pCE1-3NS_M4

RAID flash power module replacement

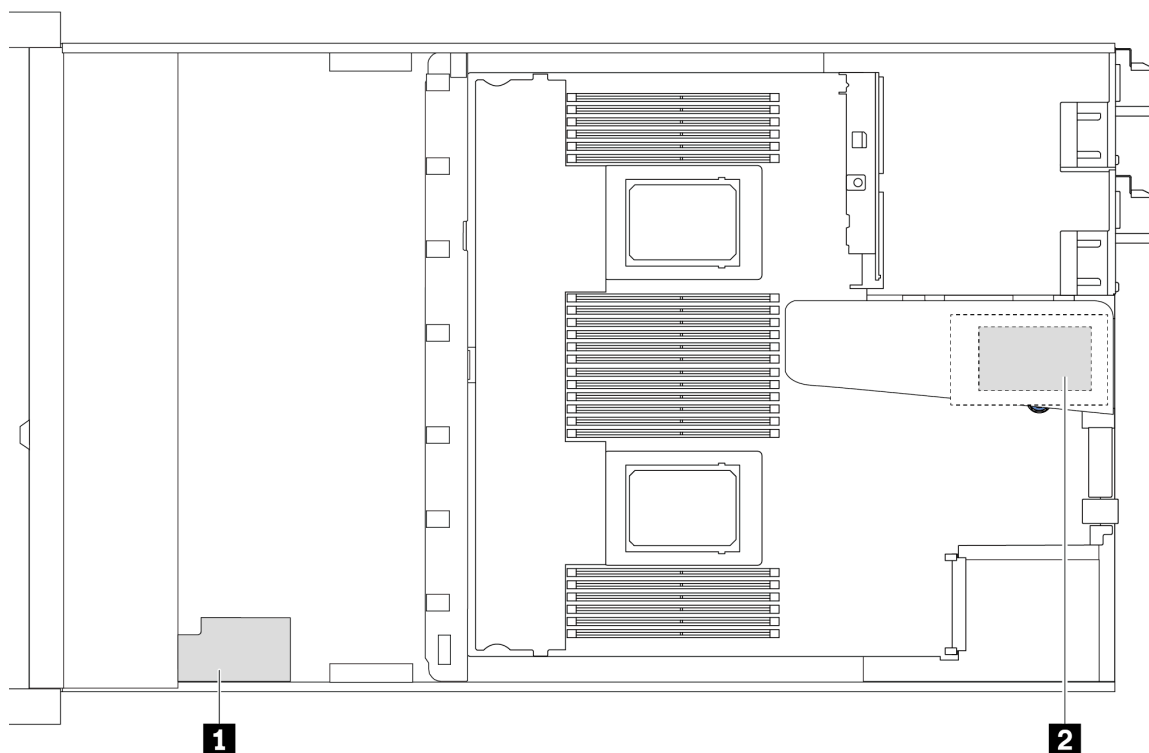
The RAID flash power module protects the cache memory on the installed RAID adapter. You can purchase a RAID flash power module from Lenovo. Use this information to remove and install a RAID flash power module (also called super capacitor).

For a list of supported options, see:

<https://serverproven.lenovo.com/>

RAID flash power module can be installed on the chassis or on one riser slot.

RAID flash power modules in the chassis



No.	Location	Scenario
1	RAID flash power module on the chassis	2.5" chassis installed with a performance heat sink
2	RAID flash power module on riser 1 slot	<ul style="list-style-type: none">3.5" chassis installed with a performance heat sink2.5" chassis installed with the Lenovo Neptune Liquid to Air Module

- [“Remove the RAID flash power module on the chassis” on page 254](#)
- [“Install the RAID flash power module on the chassis” on page 256](#)
- [“Remove the RAID flash power module on the riser” on page 258](#)
- [“Install the RAID flash power module on the riser” on page 259](#)

Remove the RAID flash power module on the chassis

Use this information to remove the RAID flash power module on the chassis.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 2. Disconnect the cable of the RAID flash power module.
- Step 3. Remove the RAID flash power module on the chassis.

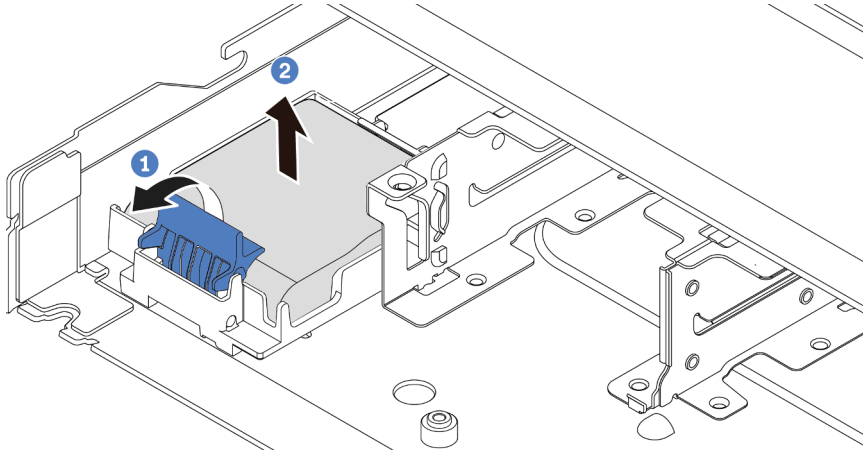


Figure 205. Removal of the RAID flash power module on the chassis

- a. ① Open the retention clip on the holder of the RAID flash power module.
 - b. ② Take the RAID flash power module out of the holder.
- Step 4. Remove the RAID flash power module holder as shown if necessary.

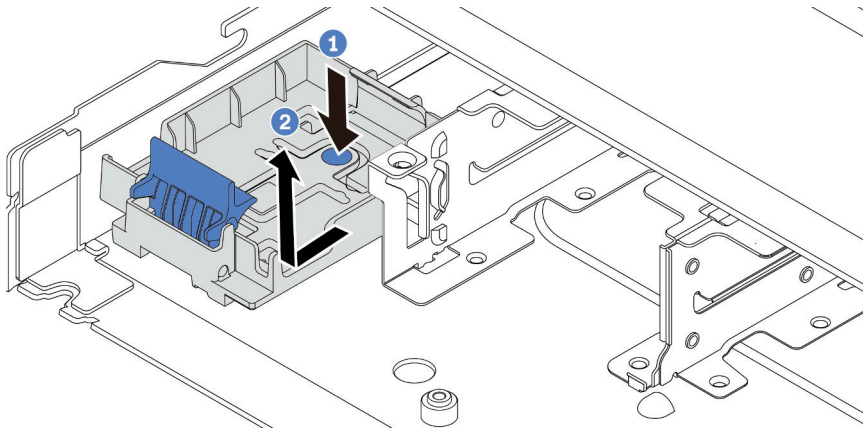


Figure 206. RAID flash power module holder removal

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=sLoydFNTE7c>

Install the RAID flash power module on the chassis

Use this information to install the RAID flash power module on the chassis.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the RAID flash power module to any unpainted surface on the outside of the server. Then, take the RAID flash power module out of the package and place it on a static-protective surface.
- Step 2. If the server comes with a tray that covers the place of the RAID flash power module on the chassis, remove it first.

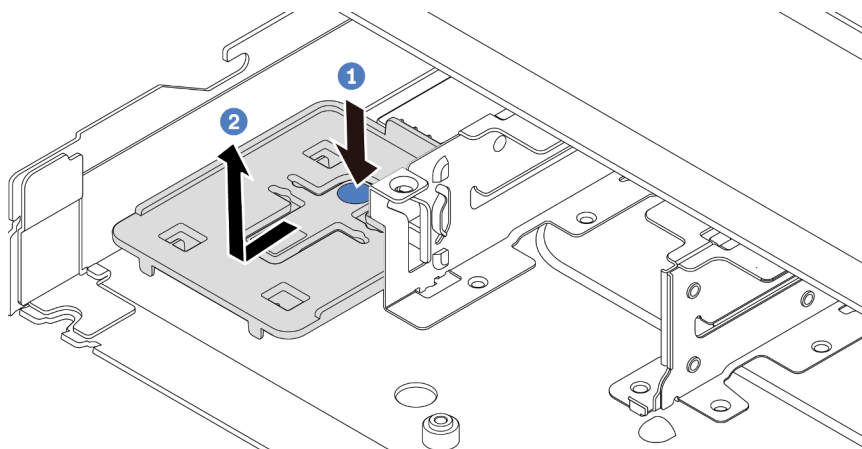


Figure 207. Tray removal

- a. ① Press the blue touch point to disengage the tray from the chassis.
- b. ② Move the tray to the direction as shown and lift it out of the chassis.

- Step 3. If the server does not have a RAID flash power module holder on the chassis, install one first. Put the holder down, and move it to the direction as shown to lock the holder onto the chassis.

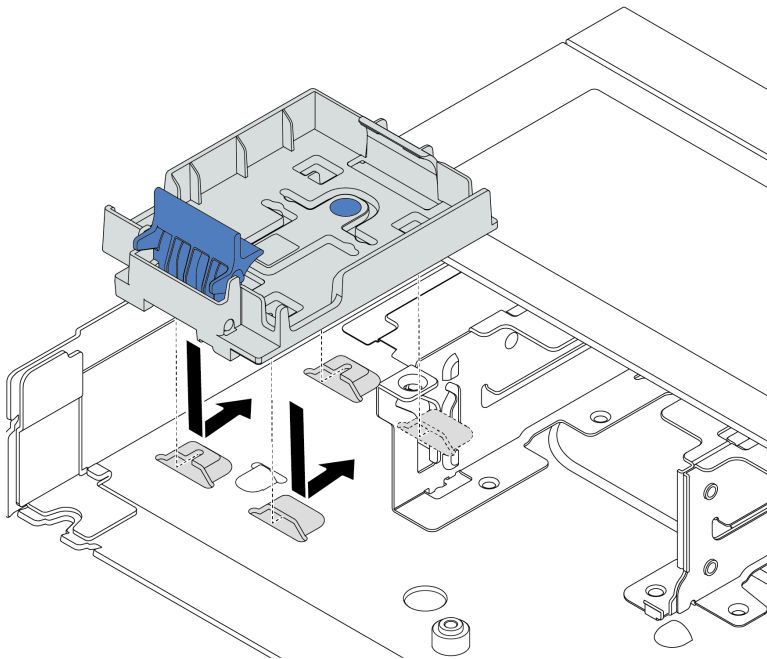


Figure 208. RAID flash power module holder installation

- Step 4. Install the RAID flash power module on the chassis.

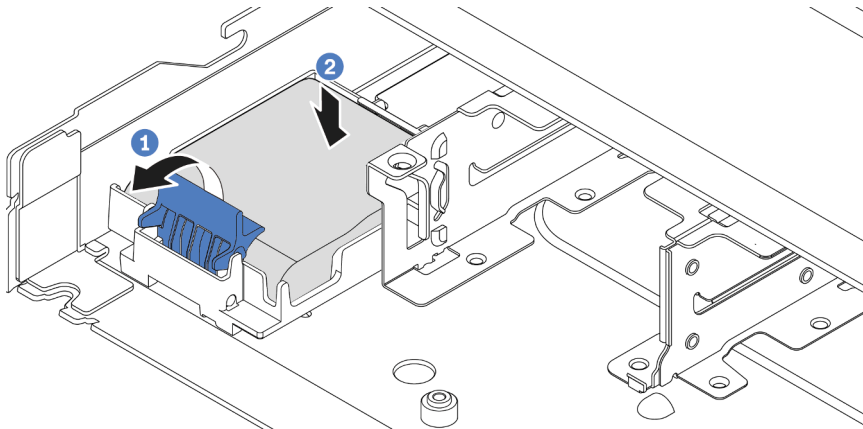


Figure 209. Installation of the RAID flash power module on the chassis

- a. ① Open the retention clip on the holder.
- b. ② Put the RAID flash power module into the holder and press it down to secure it into the holder.

After you finish

1. Connect the RAID flash power module to an adapter with the extension cable that comes with the flash power module. See [“RAID flash power modules” on page 350](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=X1VZgNyBVO4>

Remove the RAID flash power module on the riser

Use this information to remove the RAID flash power module on the riser.

About this task

Attention:

- Read “Installation Guidelines” on page 49 and “Safety inspection checklist” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See “Remove the top cover” on page 318.
- Step 2. Disconnect the cable of the RAID flash power module.
- Step 3. Remove the riser assembly. See “Remove the rear riser card” on page 281.
- Step 4. Remove the RAID flash power module from the riser.

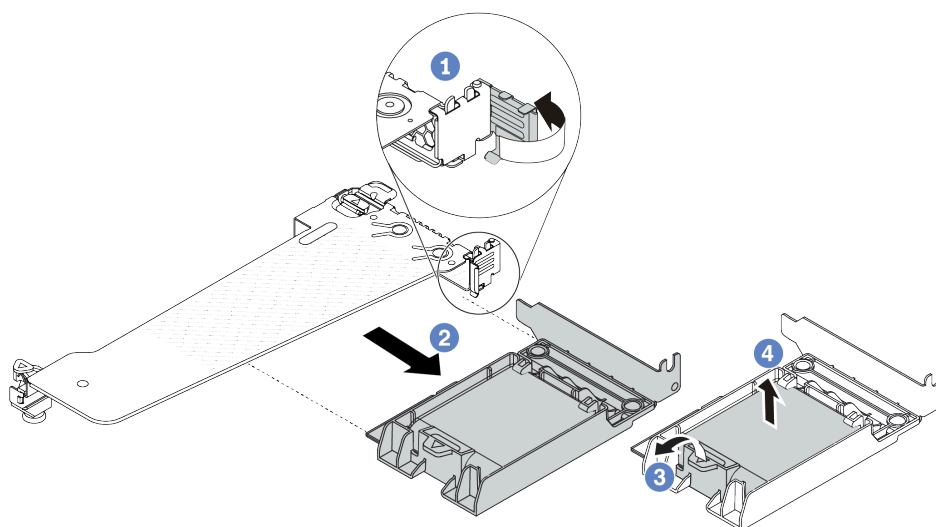


Figure 210. Removal of the RAID flash power module assembly from the riser

- a. ① Rotate the latch on the riser bracket to the open position.
- b. ② Remove the RAID flash power assembly from the riser.
- c. ③ Open the retention clip on the holder of the RAID flash power module.
- d. ④ Take the RAID flash power module out of the holder.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=m0q19MA5VUE>

Install the RAID flash power module on the riser

Use this information to install the RAID flash power module on the riser.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the RAID flash power module to any unpainted surface on the outside of the server. Then, take the RAID flash power module out of the package and place it on a static-protective surface.

Step 2. Install the RAID flash power module on the riser.

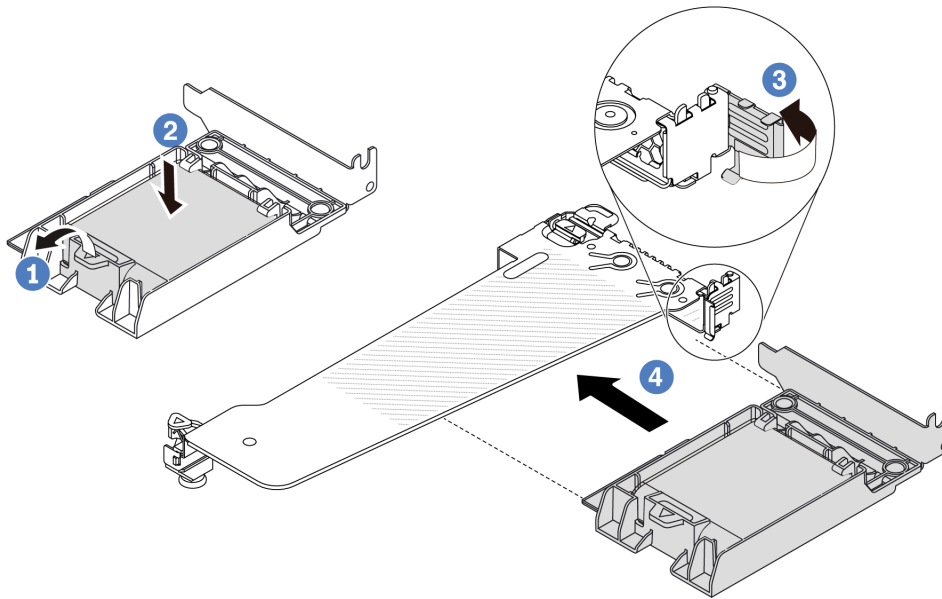


Figure 211. Installation of the RAID flash power module on the riser

- a. 1 Open the retention clip on the holder.
- b. 2 Put the RAID flash power module into the holder and press it down to secure it into the holder.
- c. 3 Rotate the latch on the riser bracket to the open position.
- d. 4 Align the RAID flash power assembly with the slot on the riser card. Then, carefully press the RAID flash power assembly straight into the slot until it is securely seated and its bracket is secured. Rotate the latch on the riser bracket to the close position.

After you finish

1. Install the riser assembly on the chassis. See [“Install the rear riser card” on page 283](#).
2. Connect the flash power module to an adapter with the extension cable that comes with the flash power module. See [“RAID flash power modules” on page 350](#).
3. Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

https://www.youtube.com/watch?v=a_yI3RMfQVk

Rear drive assembly replacement

Use this information to remove and install the rear drive assembly.

- [“Remove the rear 2.5” drive assembly” on page 261](#)
- [“Install the rear 2.5” drive assembly” on page 262](#)
- [“Remove the 7mm rear drive assembly” on page 264](#)
- [“Install the 7mm rear drive assembly” on page 265](#)

Remove the rear 2.5" drive assembly

Use this information to remove the rear 2.5" drive assembly.

About this task

The following illustrates how to remove the rear 2.5" drive assembly.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 2. Remove the drives or drive fillers installed in the hot-swap rear drive cage. See [“Remove a 2.5"/3.5" hot-swap drive” on page 119](#).
- Step 3. Disconnect the hot-swap rear drive cage cables from the processor board or the PCIe adapter. See [Chapter 6 “Internal cable routing” on page 325](#).
- Step 4. Hold the two blue touch points and directly lift the hot-swap rear drive cage out of the chassis.

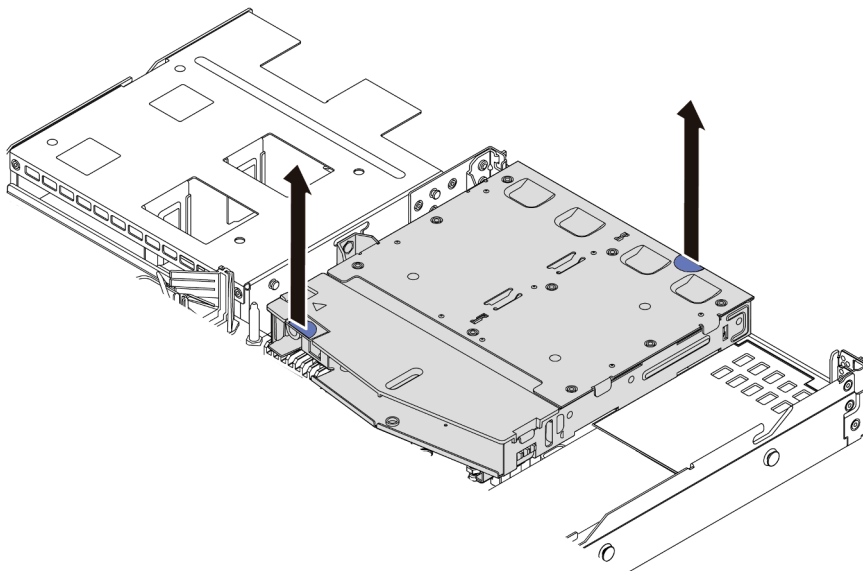


Figure 212. Hot-swap rear drive cage removal

- Step 5. If the rear backplane is reused, remove the rear backplane. See [“Remove the rear 2.5" drive backplane” on page 267](#).

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=0S3iaLMhB70>

Install the rear 2.5" drive assembly

Use this information to install the rear 2.5" drive assembly.

About this task

The following illustrates how to install the rear 2.5" drive assembly.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the hot-swap rear drive cage to any unpainted surface on the outside of the server. And then, take the hot-swap rear drive cage out of the package and place it on a static-protective surface.
- Step 2. Gently press and hold the tab on the hot-swap rear drive cage as shown and remove the air baffle from the hot-swap rear drive cage.

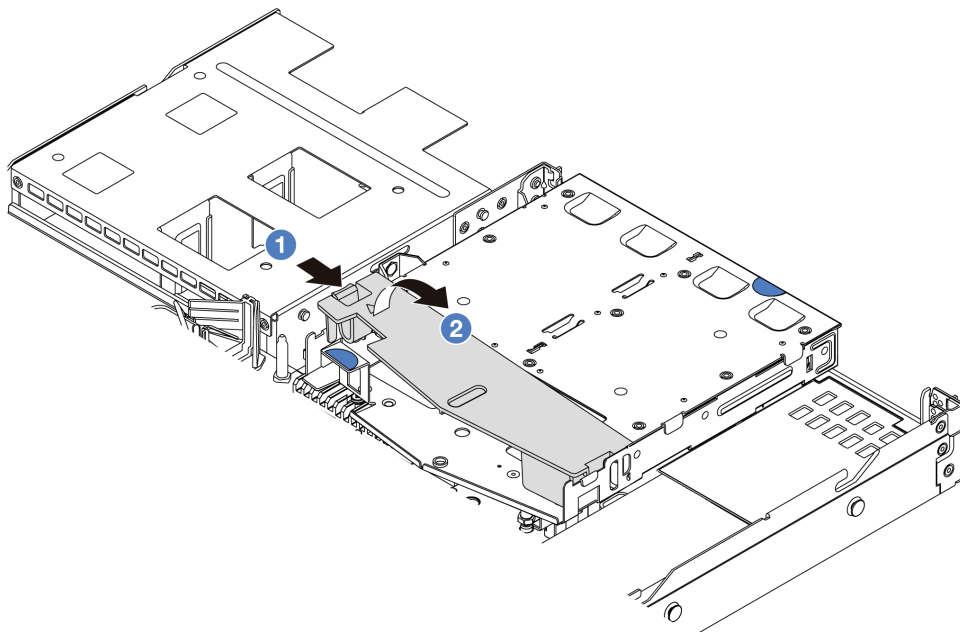


Figure 213. Air baffle removal

- a. **1** Press the tab on one side to disengage the air baffle.
- b. **2** Lift the air baffle to remove it from drive cage.

Step 3. Align the rear backplane with the hot-swap rear drive cage and lower it into the hot-swap rear drive cage.

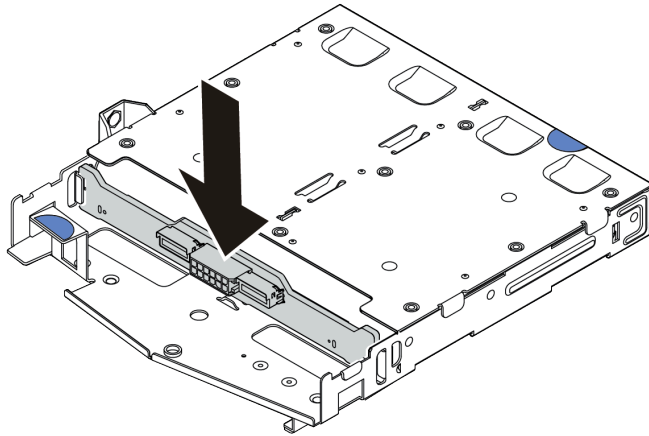


Figure 214. Rear backplane installation

Step 4. Connect the cables to the backplane.

Step 5. Install the air baffle into the hot-swap rear drive cage as shown.

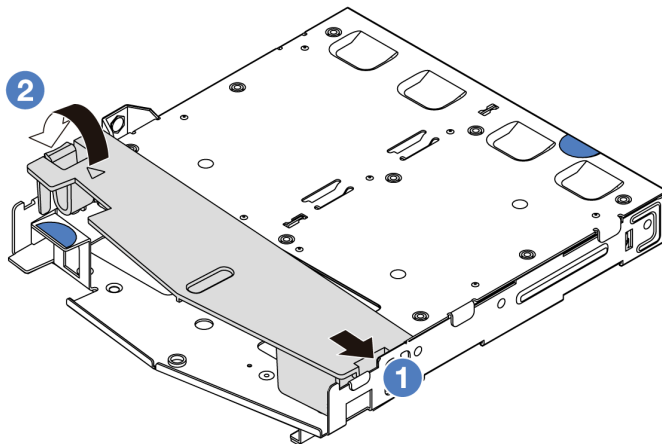


Figure 215. Air baffle installation

- a. ① Align the air baffle edge with the notch on the drive cage.
- b. ② Press the air baffle down and make sure that it is seated in place.

Step 6. Align the pins on the hot-swap rear drive cage with the corresponding hole and slot in the chassis. Then, lower the hot-swap rear drive cage into the chassis until it is fully seated.

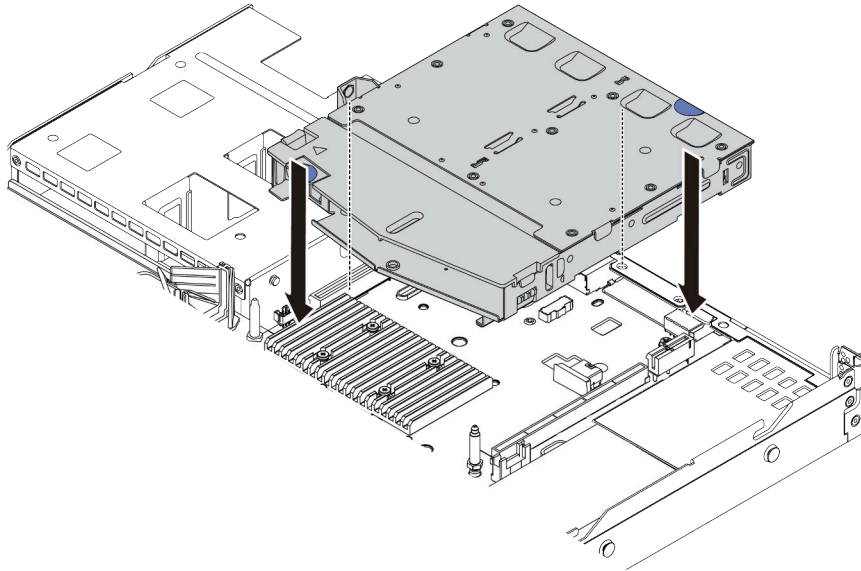


Figure 216. Hot-swap rear drive cage installation

Step 7. Connect the cables to the system board (system board assembly) or expansion slots. See [Chapter 6 “Internal cable routing” on page 325](#).

After you finish

1. Reinstall the drives or drive fillers into the hot-swap rear drive cage. See [“Install a 2.5"/3.5" hot-swap drive” on page 121](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=vT-l-EBiY4o>

Remove the 7mm rear drive assembly

Use this information to remove the rear drive assembly.

About this task

The following illustrates how to remove the 7mm rear drive assembly.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-CTkyVDu-5Lhy1r9G-4PQGI>.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 2. Remove the 7mm drives or drive fillers installed in the hot-swap rear drive cage. The removal method is the same as 2.5/3.5 inch hot-swap drive. See [“Remove a 2.5"/3.5" hot-swap drive” on page 119](#).
- Step 3. Disconnect the hot-swap rear drive cage cables from the processor board or the PCIe adapter.
- Step 4. Lift the hot-swap rear drive cage out of the chassis.

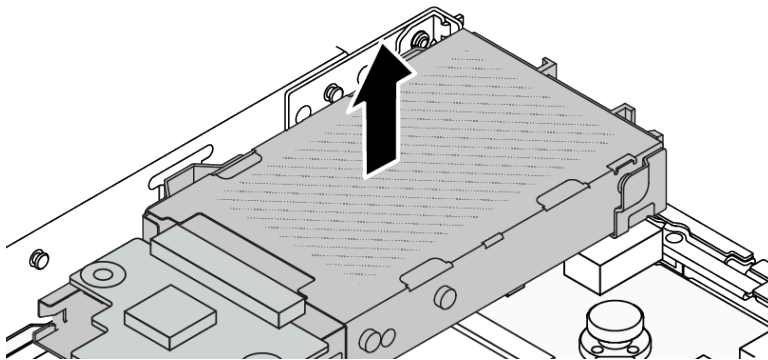


Figure 217. Hot-swap rear drive cage removal

- Step 5. If the rear backplane is reused, remove the rear backplane. See [“Remove the 7mm drive backplanes” on page 270](#).

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=1ojkhtx2Ujc>

Install the 7mm rear drive assembly

Use this information to install the rear drive assembly.

About this task

The following illustrates how to install the 7mm rear drive assembly.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the hot-swap rear drive cage to any unpainted surface on the outside of the server. And then, take the hot-swap rear drive cage out of the package and place it on a static-protective surface.
- Step 2. Install the 7mm backplane, see [“Install the 7mm drive backplanes” on page 271](#).
- Step 3. Align the pins on the hot-swap 7mm rear drive cage with the corresponding pin and slot in the chassis. Then, lower the hot-swap rear drive cage into the chassis until it is fully seated.

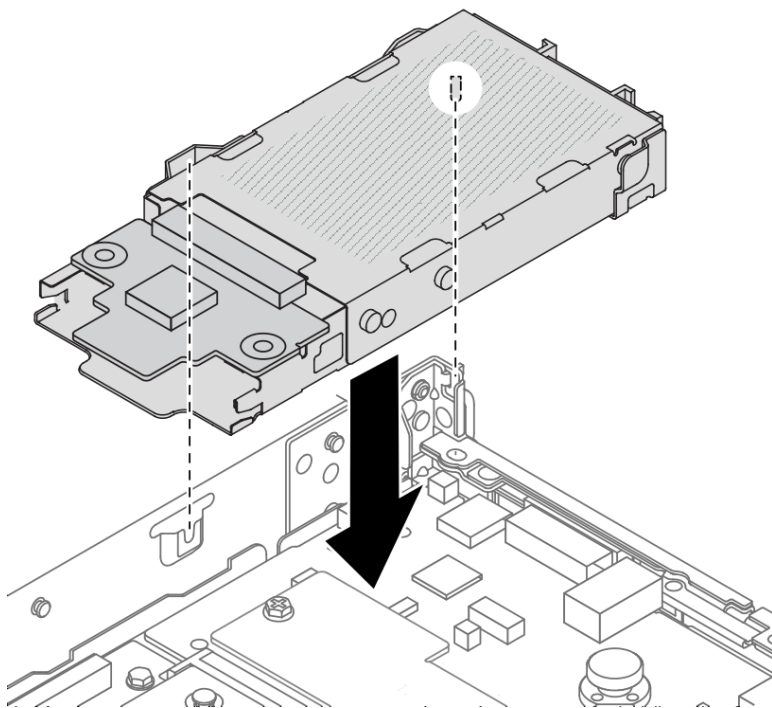


Figure 218. Hot-swap rear drive cage installation

- Step 4. Connect the cables from the backplanes to the processor board and riser slot. See [Chapter 6 “Internal cable routing” on page 325](#).

After you finish

1. Reinstall the drives or drive fillers into the hot-swap rear drive cage. See [“Install a 2.5"/3.5" hot-swap drive” on page 121](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

https://www.youtube.com/watch?v=UMeIBPRJ_dM

Rear drive backplane replacement

Use this information to remove and install a rear drive backplane.

- [“Remove the rear 2.5" drive backplane” on page 267](#)
- [“Install the rear 2.5" drive backplane” on page 268](#)
- [“Remove the 7mm drive backplanes” on page 270](#)
- [“Install the 7mm drive backplanes” on page 271](#)

Remove the rear 2.5" drive backplane

Use this information to remove the rear 2.5" drive backplane.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Step 1. Prepare your server.

- a. Remove the top cover. See [“Remove the top cover” on page 318](#).
- b. Remove all installed drives and fillers (if any) from the drive bays. See [“Remove a 2.5"/3.5" hot-swap drive” on page 119](#).

Step 2. Gently press and hold the tab on the rear hot-swap drive cage as shown and remove the air baffle from the rear hot-swap drive cage.

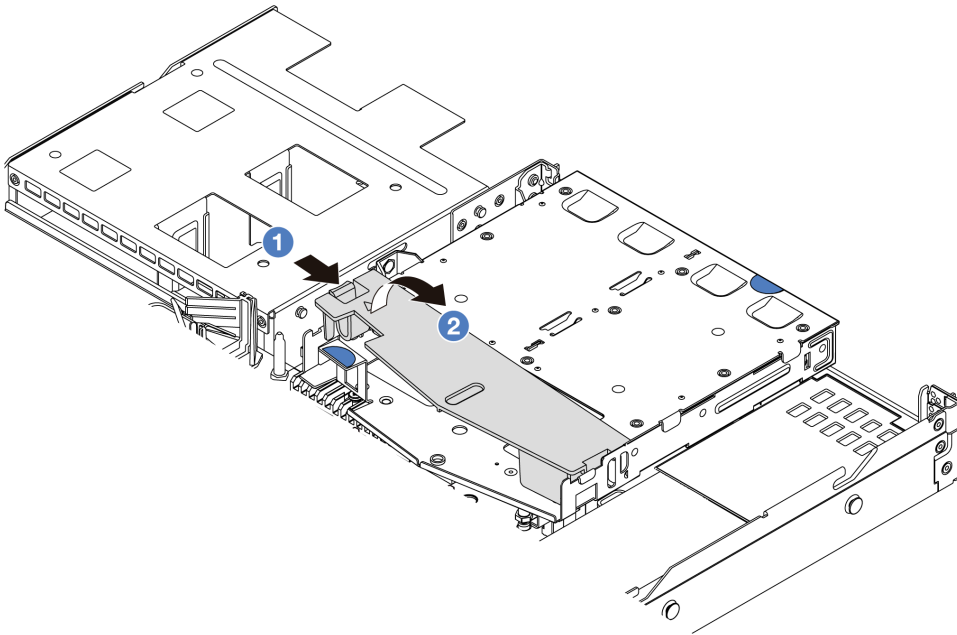


Figure 219. Air baffle removal

- a. ① Press the tab on one side to disengage the air baffle.
- b. ② Lift the air baffle to remove it from drive cage.

Step 3. Record the cable connections for 2.5" rear drive and then disconnect all cables from the backplanes. For information about the backplane cable routing, see [Chapter 6 “Internal cable routing” on page 325](#).

Step 4. Carefully lift the rear 2.5" drive backplane out of the rear hot-swap drive cage.

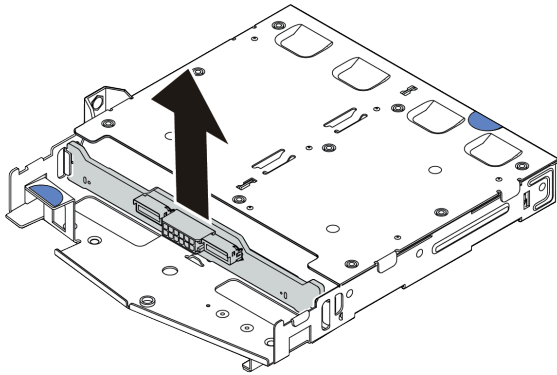


Figure 220. Rear 2.5" drive backplane removal

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=qpE3meycUBM>

Install the rear 2.5" drive backplane

Use this information to install the rear 2.5" drive backplane.

About this task

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “[Power off the server](#)” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the rear backplane to any unpainted surface on the outside of the server. Then, take the rear backplane out of the package and place it on a static-protective surface.

- Step 2. Align the rear backplane with the rear hot-swap drive cage and lower it into the rear hot-swap drive cage.

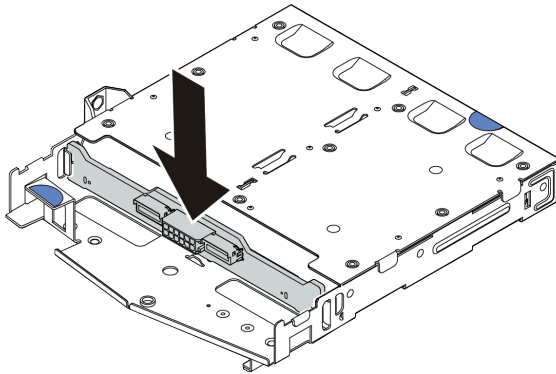


Figure 221. Rear backplane installation

- Step 3. Connect the cables to the system board assembly and the backplane. See [Chapter 6 “Internal cable routing” on page 325](#). If the cable connectors come with protective dust caps, make sure to remove them before plugging in.
- Step 4. Install the air baffle into the rear hot-swap drive cage as shown.

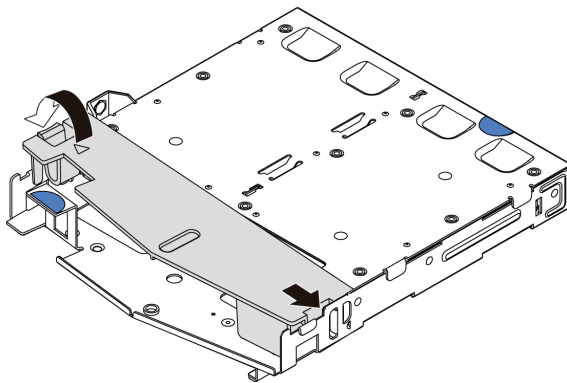


Figure 222. Air baffle installation

- a. ① Align the air baffle edge with the notch on the drive cage.
- b. ② Press the air baffle down and make sure that it is seated in place.

After you finish

1. Reinstall drives or drive fillers into the rear hot-swap drive cage. See [“Install a 2.5"/3.5" hot-swap drive” on page 121](#).
2. Reinstall the drive assembly to the server. See [“Install the rear 2.5" drive assembly” on page 262](#).
3. Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=l1v7bwRFlxw>

Remove the 7mm drive backplanes

Use this information to remove the 7mm drive backplanes.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Note: Depending on the specific type, your backplanes might look different from the illustration in this topic.

Step 1. Prepare your server.

- a. Remove the top cover. See [“Remove the top cover” on page 318](#).
- b. Remove all installed drives and fillers (if any) from the drive bays. See [“Remove a 2.5"/3.5" hot-swap drive” on page 119](#).
- c. Record the cable connections for 7mm drives and then disconnect all cables from the backplanes. For information about the backplane cable routing, See [“7mm drive backplane” on page 355](#). If the cable connectors come with protective dust caps, make sure to put them back on.
- d. Remove the 7mm drive assembly (if any) from the rear chassis. See [“Remove the rear 2.5" drive assembly” on page 261](#).

Step 2. Remove the 7mm drive backplane on the top.

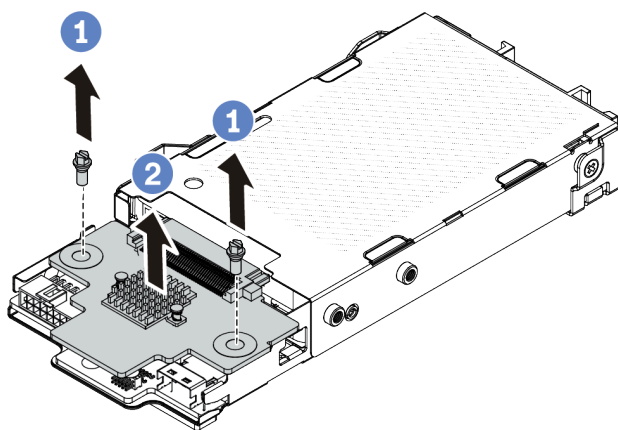


Figure 223. 7mm drive backplane removal (top)

- a. **1** Remove the two screws as shown.
- b. **2** Vertically lift the backplane up and put it aside.

Step 3. Remove the 7mm drive backplane at the bottom.

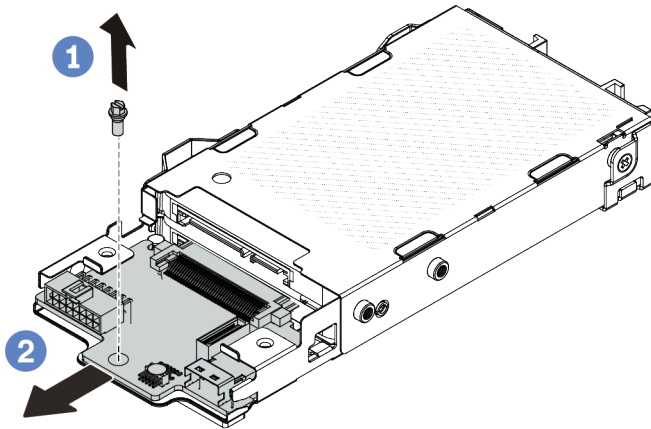


Figure 224. 7mm drive backplane removal (bottom)

- a. 1 Remove the screw as shown.
- b. 2 Remove the backplane horizontally from the cage as shown.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=zcW4kg97qZ4>

Install the 7mm drive backplanes

Use this information to install the 7mm drive backplanes.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains new backplanes to any unpainted surface on the outside of the server. And then, take new backplanes out of the package and place them on a static-protective surface.
- Step 2. Install the 7mm drive backplane at the bottom.

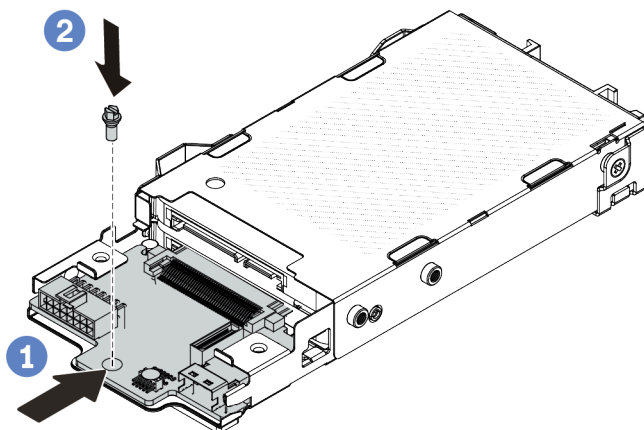


Figure 225. 7mm drive backplane installation (bottom)

- a. **1** Align the pin on the cage and slightly slide the backplane into the cage until it is fully seated.
- b. **2** Install the screw as shown.

Step 3. Install the 7mm drive backplane on the top.

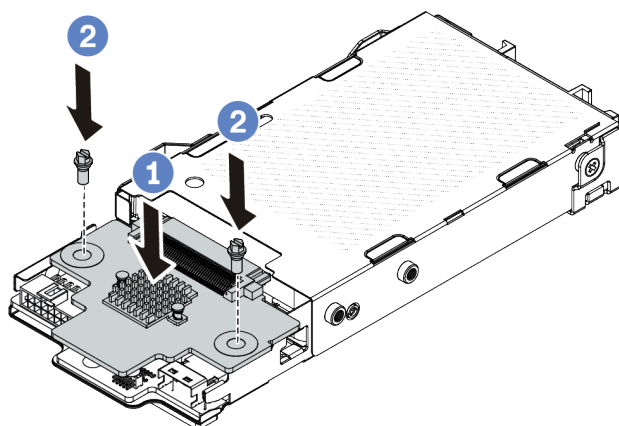


Figure 226. 7mm drive backplane installation (top)

- a. **1** Put the backplane down on the cage as shown.
- b. **2** Install the two screws to secure the backplane in place.

Step 4. Connect the cables to the system board assembly and the backplane. See [Chapter 6 “Internal cable routing” on page 325](#). If the cable connectors come with protective dust caps, make sure to remove them before plugging in.

After you finish

1. Install the 7mm drive cage assembly on the rear chassis. See [“Install the 7mm rear drive assembly” on page 265](#).
2. Reinstall the 7mm drives and fillers into the drive bays. The installation method is the same as 2.5/3.5 inch hot-swap drive. See [“Install a 2.5"/3.5" hot-swap drive” on page 121](#).
3. Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=XVF3TpitGSc>

Rear riser assembly replacement

Use this information to remove and install the riser assembly.

- [“Server rear configuration and riser assemblies” on page 273](#)
- [“The overview of riser brackets” on page 277](#)
- [“The overview of riser cards” on page 277](#)

Server rear configuration and riser assemblies

See this section to identify the correlations between the rear/front configuration and riser assemblies.

Table 31. Server rear configuration and riser assemblies¹

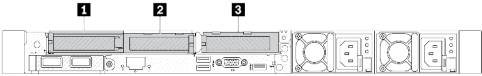
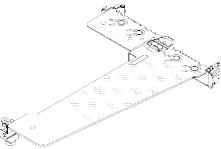
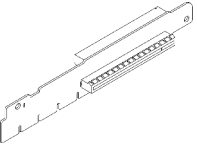
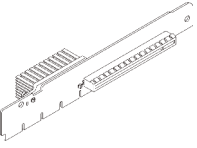
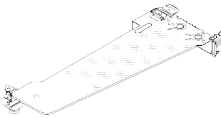
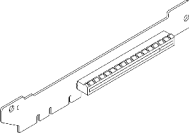
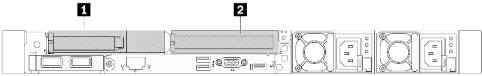
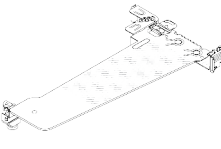
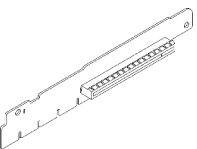
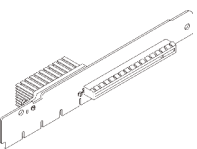
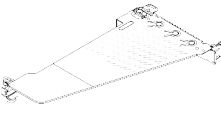
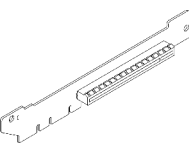
Server rear configuration	Riser 1 assembly	Riser 2 assembly
 <p>Figure 227. Three PCIe slots</p>	 <p>Figure 228. Riser 1 LP-LP bracket</p>  <p>Figure 229. Riser 1 BF ² card</p>  <p>Figure 230. Riser 1 card³</p>	 <p>Figure 231. Riser 2 bracket</p>  <p>Figure 232. Riser 2 card</p>
 <p>Figure 233. Two PCIe slots</p>	 <p>Figure 234. Riser 1 LP-filler bracket</p>  <p>Figure 235. Riser 1 card</p>  <p>Figure 236. Riser 1 card³</p>	 <p>Figure 237. Riser 2 FH bracket</p>  <p>Figure 238. Riser 2 card</p>

Table 31. Server rear configuration and riser assemblies¹ (continued)

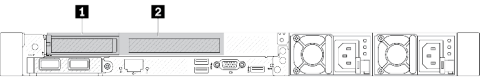
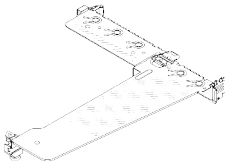
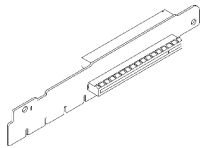
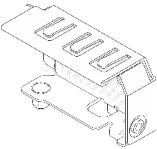
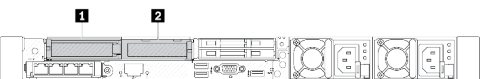
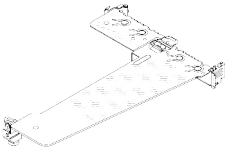
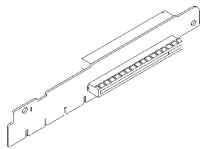
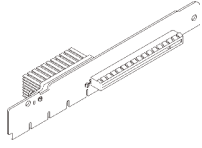
Server rear configuration	Riser 1 assembly	Riser 2 assembly
 <p>Figure 239. Two PCIe slots</p>	 <p>Figure 240. Riser 1 LP-FH bracket</p>  <p>Figure 241. Riser 1 BF card</p>	<p>Riser 2 assembly is not supported.</p> <p>A rear wall bracket is required for this configuration.</p>  <p>Figure 242. A rear wall bracket</p>
 <p>Figure 243. Two PCIe slots</p>	 <p>Figure 244. Riser 1 LP-LP bracket</p>  <p>Figure 245. Riser 1 BF card</p>  <p>Figure 246. Riser 1 card³</p>	<p>Riser 2 assembly is not supported.</p>

Table 31. Server rear configuration and riser assemblies¹ (continued)

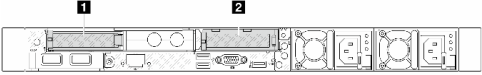
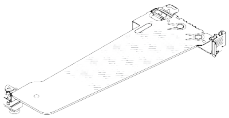
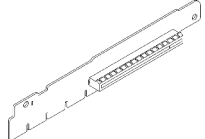
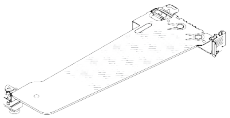
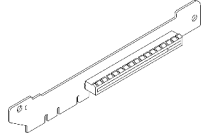
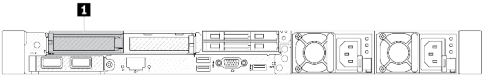
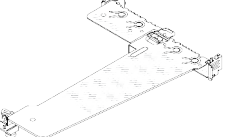
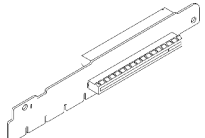
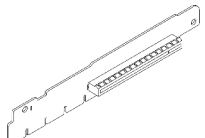
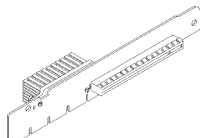
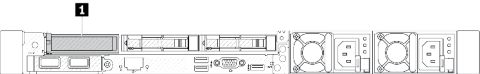
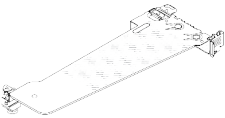
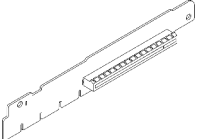
Server rear configuration	Riser 1 assembly	Riser 2 assembly
 <p>Figure 247. Two PCIe slots</p>	 <p>Figure 248. Riser 1 LP bracket</p>  <p>Figure 249. Riser 1 card</p>	 <p>Figure 250. Riser 2 bracket</p>  <p>Figure 251. Riser 2 card</p>
 <p>Figure 252. One PCIe slot</p>	 <p>Figure 253. Riser 1 LP-LP bracket</p> <p>Choose either one below to assemble:</p> <ul style="list-style-type: none">  <p>Figure 254. Riser 1 BF card</p>  <p>Figure 255. Riser 1 card</p>  <p>Figure 256. Riser 1 card⁸</p> 	<p>Riser 2 assembly is not supported.</p>

Table 31. Server rear configuration and riser assemblies¹ (continued)

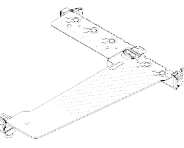
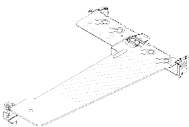
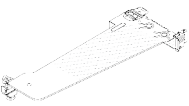
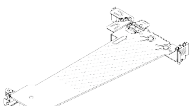
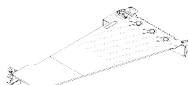
Server rear configuration	Riser 1 assembly	Riser 2 assembly
 <p>Figure 257. One PCIe slot</p>	 <p>Figure 258. Riser 1 LP bracket</p>  <p>Figure 259. Riser 1 card</p>	<p>Riser 2 assembly is not supported.</p>

Notes:

1. The illustrations of riser brackets and cards may look slightly different from the physical ones.
2. BF: “butterfly”, a riser card with slots on both sides.
3. This riser cannot be used when the Lenovo Neptune(TM) Processor Direct Water Cooling Module is installed.

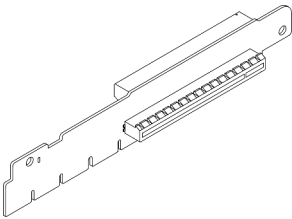
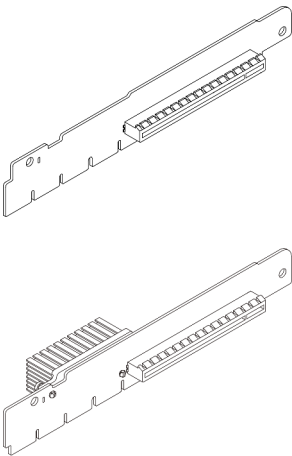
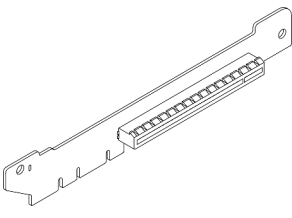
The overview of riser brackets

See this section to identify different riser brackets.

 <p>Figure 260. Riser 1 LP-FH bracket</p>	 <p>Figure 261. Riser 1 LP-LP bracket</p>	 <p>Figure 262. Riser 1/2 LP bracket</p>	 <p>Figure 263. Riser 1 LP-filler bracket</p>	 <p>Figure 264. Riser 2 FH bracket</p>
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The overview of riser cards

See this section to identify different riser cards.

Riser card	Notes
 <p>Figure 265. A Gen 4/5 BF riser card</p>	<ul style="list-style-type: none"> Depending on the server configuration or specific orders, the riser card can be a Gen 4 or Gen 5 card. This section only breaks down how to match the cards with the brackets as the appearance and the installation methods are the same for the Gen 4 and Gen 5 BF cards.
 <p>Figure 266. A Gen 4/5 riser card</p>	<p>This card can be:</p> <ul style="list-style-type: none"> A Gen 4 riser 1 card A Gen 5 BF riser 1 card with one slot removed
 <p>Figure 267. A Gen 4/5 riser card</p>	<p>Gen 4/5 riser 2 card</p>

- [“Remove the rear riser bracket” on page 278](#)
- [“Install the rear riser bracket” on page 280](#)
- [“Remove the rear riser card” on page 281](#)
- [“Install the rear riser card” on page 283](#)

Rear riser bracket replacement

Follow instructions in this section to remove and install the rear riser bracket.

- [“Remove the rear riser bracket” on page 278](#)
- [“Install the rear riser bracket” on page 280](#)

Remove the rear riser bracket

Use this information to remove the rear riser bracket.

About this task

For more riser brackets supported, see [“The overview of riser bracket types” on page 273](#).

The riser bracket you want to remove might be different from the following illustrations, but the removal method is the same. The following takes the rear LP-FH riser bracket as an example.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 2. If there is any PCIe adapter installed on the riser card, record the cable connections first. Then, disconnect all cables from the riser card.
- Step 3. Remove the rear riser bracket.

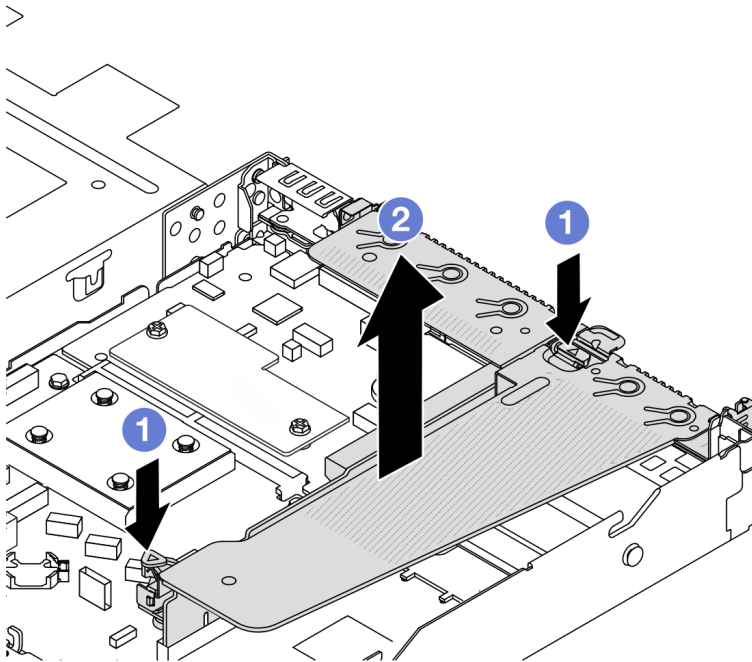


Figure 268. Rear riser bracket removal

- a. ① Press the two latches on both ends at the same time.
- b. ② Carefully lift it out of the chassis by the two latches.

After you finish

1. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.
2. Remove the rear wall bracket if you would like to install a non-LP-FH riser bracket.

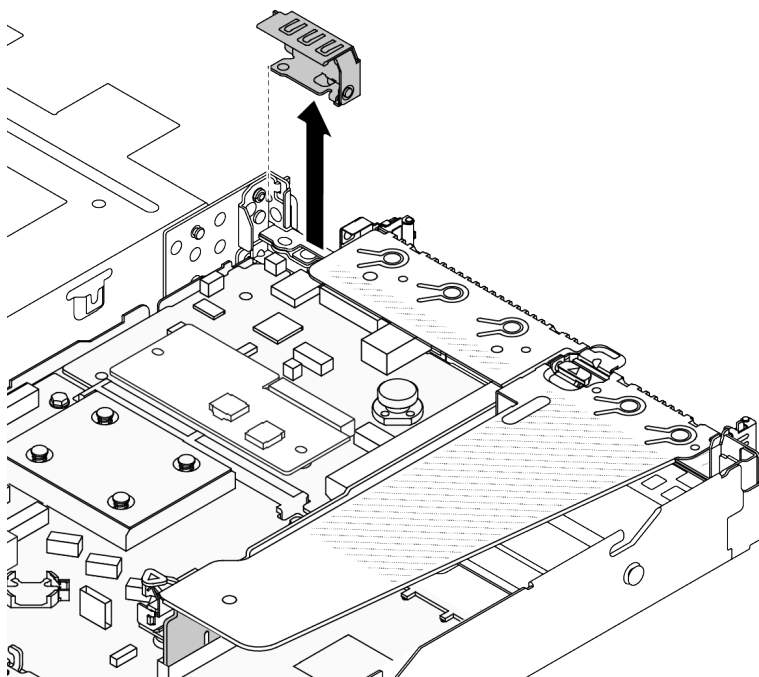


Figure 269. Rear wall bracket removal

Demo video

<https://www.youtube.com/watch?v=j8WyMn9FMGU>

Install the rear riser bracket

Use this information to install the rear riser bracket.

About this task

For more riser brackets supported, see [“The overview of riser bracket types” on page 273](#).

The riser bracket you want to install might be different from the following illustrations, but the installation method is the same. The following takes the rear LP-FH riser bracket as an example.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Position the riser bracket on the chassis. Align the plastic clip and two pins on the bracket with the guide pin and two holes on the chassis, and align the riser card with the riser slot on the system board. Then, carefully press the riser bracket straight down into the slot until it is fully seated.

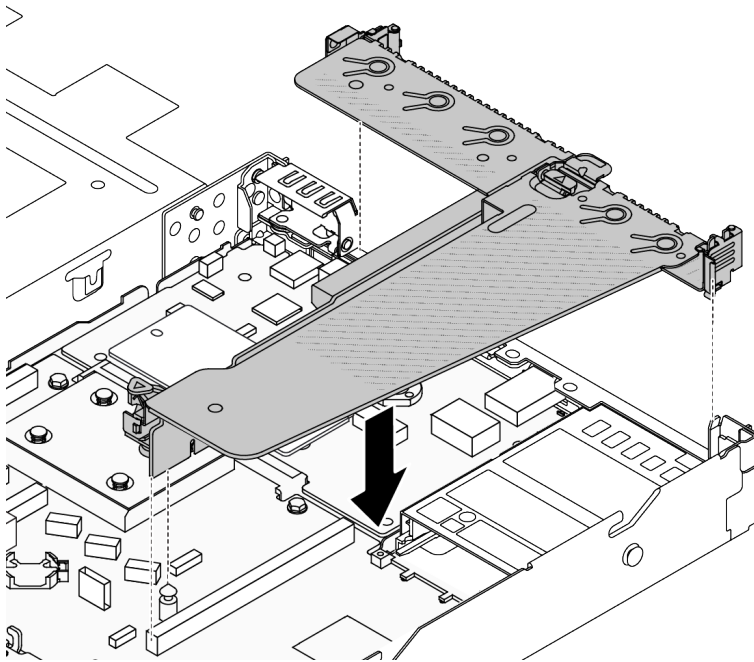


Figure 270. Rear riser bracket installation

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=jgG0z4Xn9cY>

Rear riser card replacement

Follow instructions in this section to remove and install the rear riser card.

- [“Remove the rear riser card” on page 281](#)
- [“Install the rear riser card” on page 283](#)

Remove the rear riser card

Use this information to remove the rear riser card.

About this task

For more riser brackets supported, see [“The overview of riser bracket types” on page 273](#).

The riser card you want to remove might be different from the following illustrations, but the removal method is the same. The following takes the rear LP-FH riser card as an example.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).
- Step 2. If there is any PCIe adapter installed on the riser card, record the cable connections first. Then, disconnect all cables from the riser card.
- Step 3. Remove the rear riser card. Refer to [“Remove the rear riser bracket” on page 278](#).
- Step 4. If necessary, remove the PCIe adapters that are installed on the riser card. See [“Remove a PCIe adapter” on page 226](#).
- Step 5. Remove the riser card from the bracket.

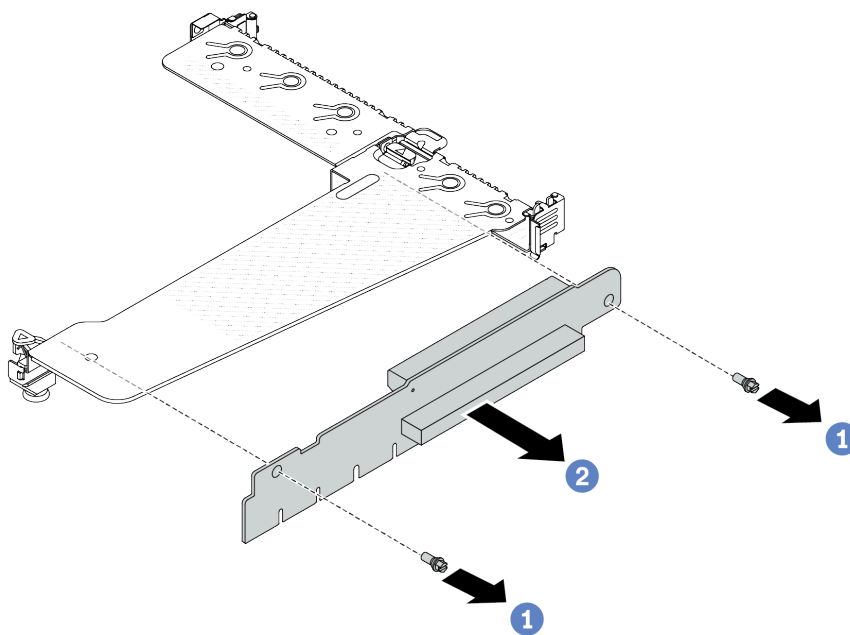


Figure 271. Riser card removal

- a. ① Remove the two screws that secure the riser card to the bracket.
- b. ② Remove the riser card.

After you finish

1. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.
2. Remove the rear wall bracket if you would like to install a non-LP-FH riser assembly.

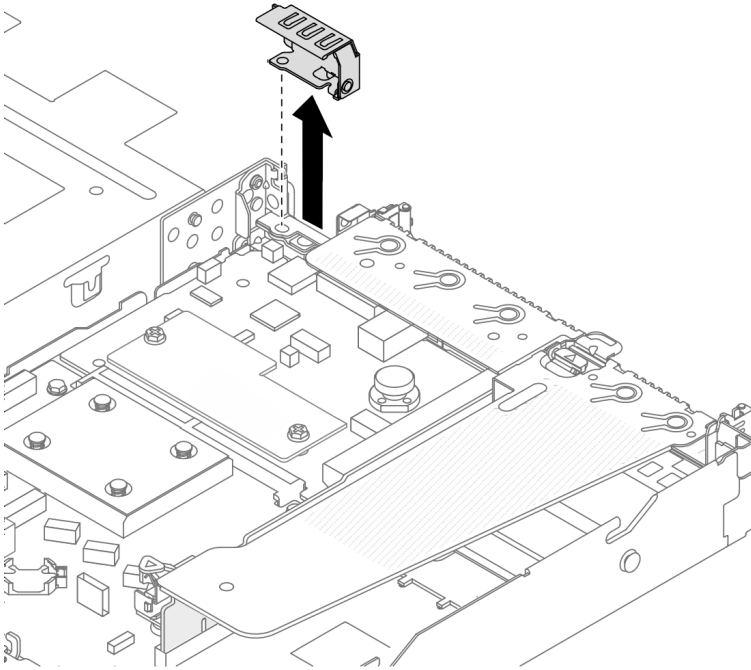


Figure 272. Rear wall bracket removal

Demo video

<https://www.youtube.com/watch?v=g1Wuj56bsM4>

Install the rear riser card

Use this information to install the rear riser card.

About this task

For more riser brackets supported, see [“The overview of riser bracket types” on page 273](#).

The riser card you want to install might be different from the following illustrations, but the installation method is the same. The following takes the rear LP-FH riser card as an example.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the riser card to any unpainted surface on the outside of the server. Then, take the riser card out of the package and place it on a static-protective surface.

Step 2. Install the riser card and secure it to the bracket.

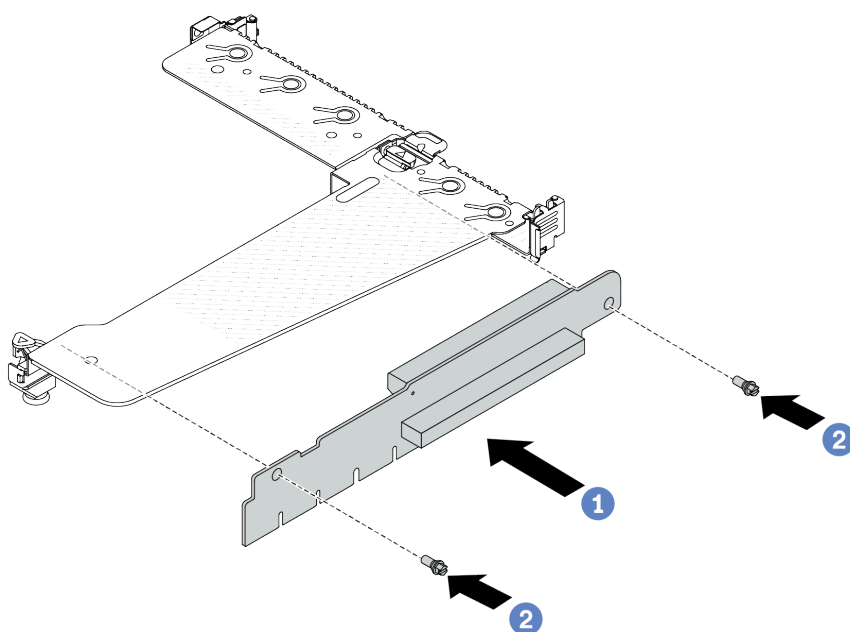


Figure 273. Riser card installation

1. ① Align the screw holes in the riser card with the corresponding ones in the bracket.
2. ② Install the two screws to secure the riser card to the bracket.

Step 3. If necessary, reinstall the PCIe adapters on the riser card. See [“Install a PCIe adapter” on page 228](#). Then, refer to your note to reconnect any cables of the PCIe adapters on the riser card. Or you can refer to the [Chapter 6 “Internal cable routing” on page 325](#) and locate the cable routing information for your configuration options.

Step 4. Install the rear riser assembly. Refer to [“Install the rear riser bracket” on page 280](#).

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=zISs-VLi8Ys>

Security bezel replacement

Use this information to remove and install the security bezel.

Note: The security bezel is available on some models.

- [“Remove the security bezel” on page 284](#)
- [“Install the security bezel” on page 286](#)

Remove the security bezel

Use this information to remove the security bezel.

About this task

Attention: Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.

Procedure

Step 1. Use the key to unlock the security bezel.

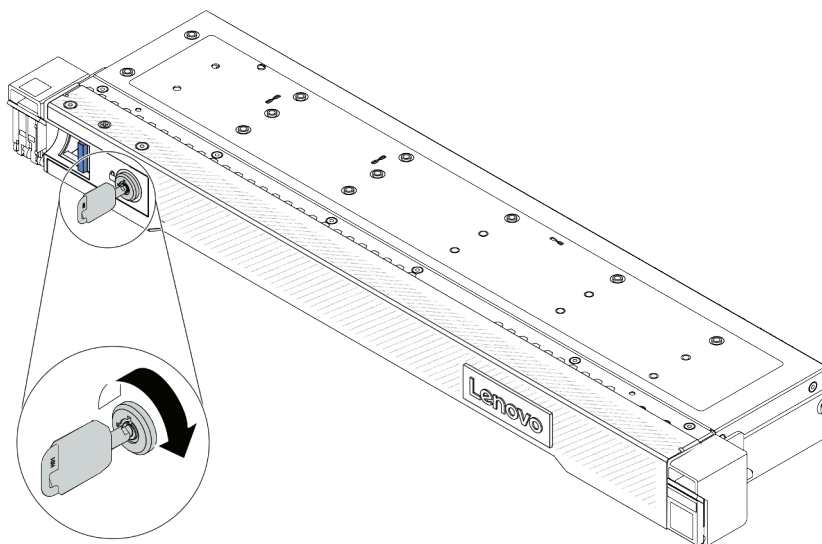


Figure 274. Unlocking the security bezel

Step 2. Remove the security bezel.

Attention: Before you ship the rack with the server installed, reinstall and lock the security bezel into place.

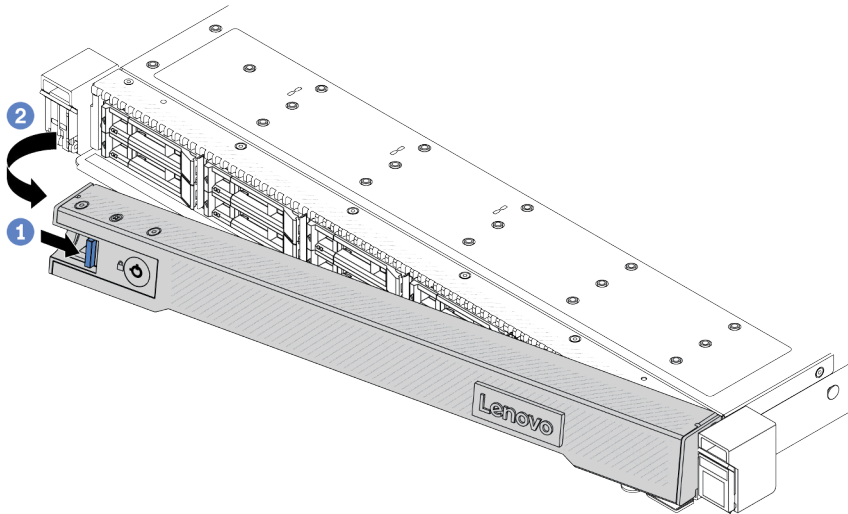


Figure 275. Security bezel removal

- a. 1 Press the release latch.
- b. 2 Rotate the security bezel outward to remove it from the chassis.

Demo video

<https://www.youtube.com/watch?v=o0zHcHIXgfg>

Install the security bezel

Use this information to install the security bezel.

About this task

Attention: Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.

Procedure

Step 1. If you have removed the rack latches, reinstall them. See “[Install the rack latches](#)” on page 252.

Step 2. If the key is held inside the security bezel, remove it out of the security bezel.

- a. ① Press the latch to release the key.
- b. ② Remove the key from the retaining clip in the shown direction.

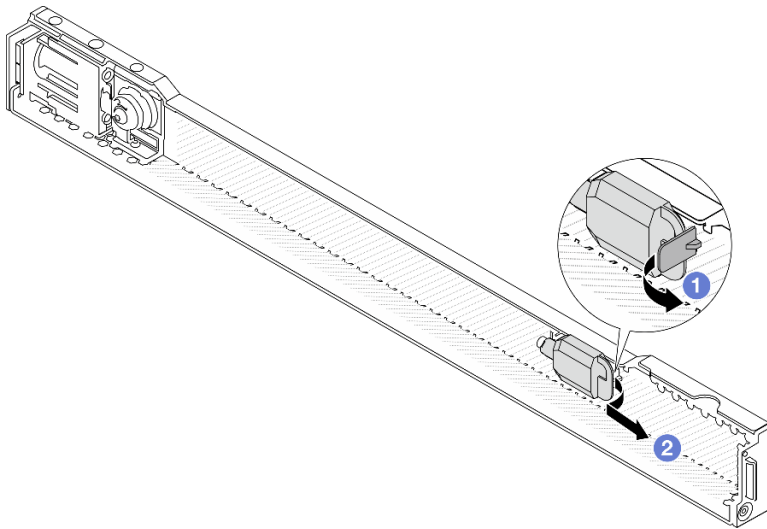


Figure 276. Key removal

Step 3. Install the security bezel to the chassis.

- a. ① Insert the tab on the security bezel into the slot on the right rack latch.
- b. ② Press and hold the blue release latch.
- c. ③ Rotate the security bezel inward until the left side clicks into place.

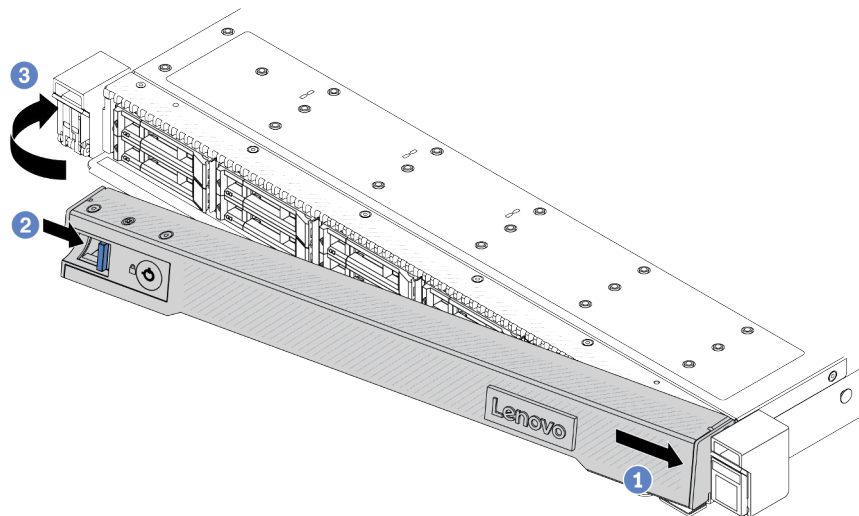


Figure 277. Security bezel installation

Step 4. Use the key to lock the security bezel to the closed position.

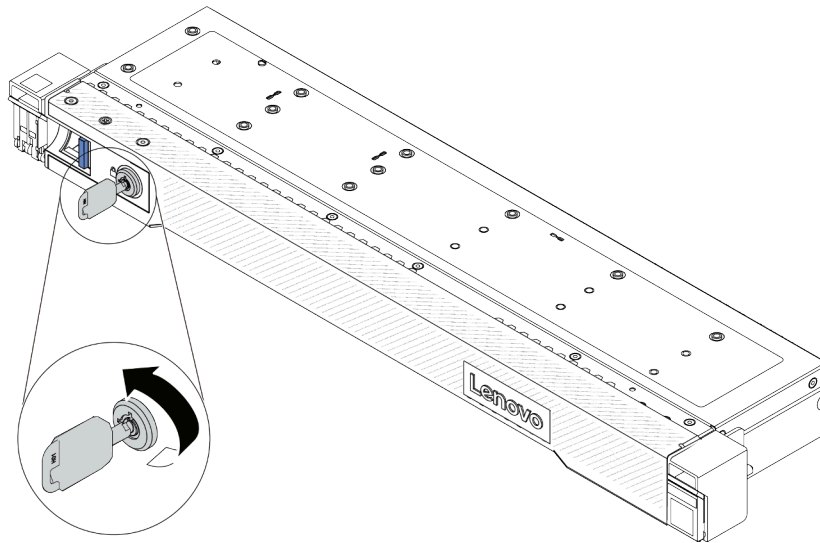


Figure 278. Locking the security bezel

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

https://www.youtube.com/watch?v=RsaTB_7KJdM

Serial port module replacement

Use this information to remove and install a serial port module.

- [“Remove a serial port module” on page 288](#)
- [“Install a serial port module” on page 290](#)

Remove a serial port module

Use this information to remove a serial port module.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-CTkyVDu-5Lhy1r9G-4PQGI>.

Procedure

- Step 1. Remove the top cover. See “Remove the top cover” on page 318.
- Step 2. Disconnect the cable of the serial port module from the system board (system board assembly).
- Step 3. Press the two latches on both ends at the same time, and carefully lift the riser cage out of the chassis by two latches.

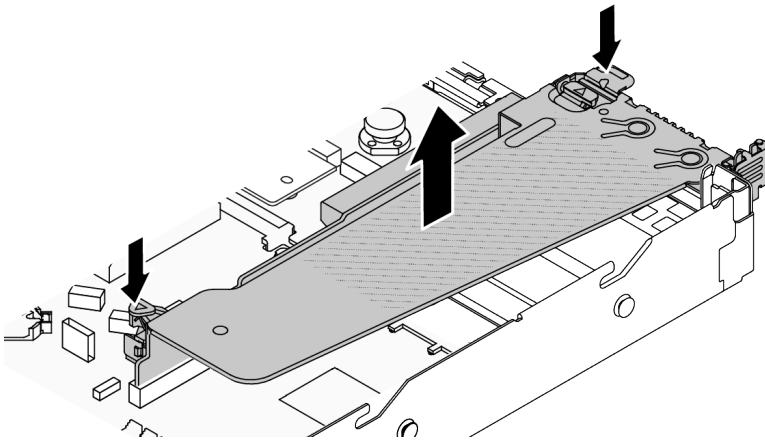


Figure 279. Removing the riser bracket

- Step 4. Open the retention latch and remove the serial port module from the riser bracket.

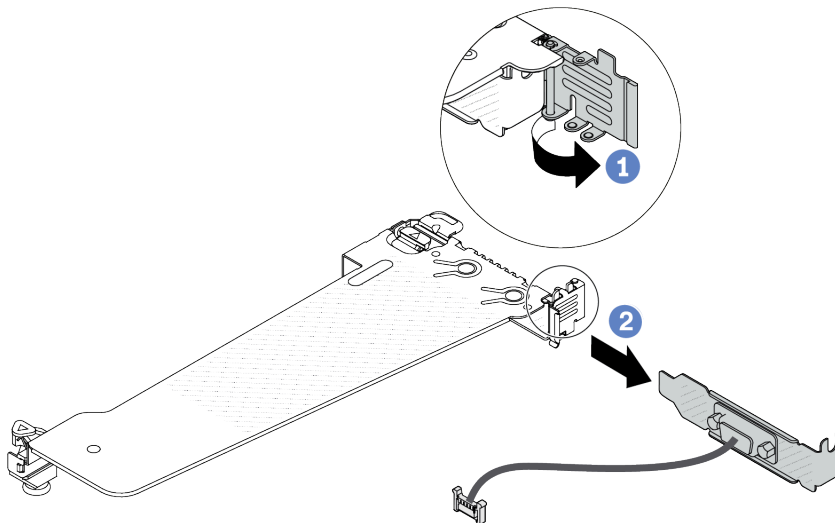


Figure 280. Removing the riser bracket

- a. ① Open the retention latch.
 - b. ② Remove the serial port module from the riser bracket.
- Step 5. (Optional) If you need to replace the serial port bracket, use a 5 mm wrench to disassemble the serial port cable from the bracket.

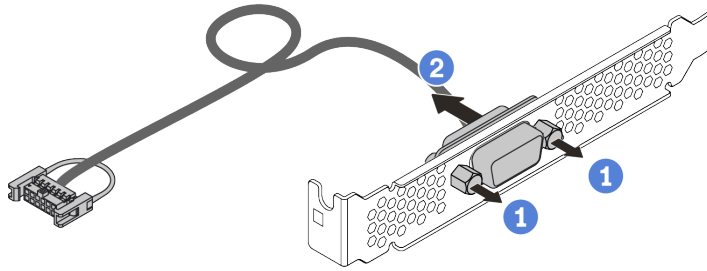


Figure 281. Disassembling the serial port module

- a. 1 Loosen the two screws.
- b. 2 Pull out the serial port cable from the bracket.

After you finish

1. Install a new serial port module, a PCIe adapter, or a PCIe slot bracket to cover the place. See [“Install a serial port module” on page 290](#) and [“Install a PCIe adapter” on page 228](#).
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=MeCEpeteLPs>

Install a serial port module

Use this information to install a serial port module.

About this task

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-CTkyVDu-5Lhy1r9G-4PQGI>.

Procedure

- Step 1. Touch the static-protective package that contains the component to any unpainted surface on the outside of the server. Then, take the component out of the package and place it on a static-protective surface.
- Step 2. Use a 5 mm wrench to install the serial port cable into the bracket.

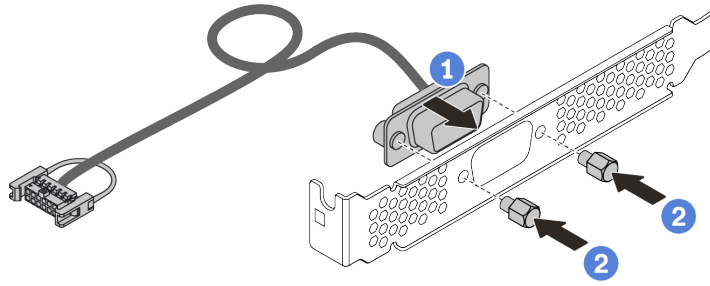


Figure 282. Assembling the serial port module

- a. ① Align the two screw holes on the cable connector to the bracket.
- b. ② Install the two screws to the bracket.

Step 3. Install the serial port module to the riser bracket.

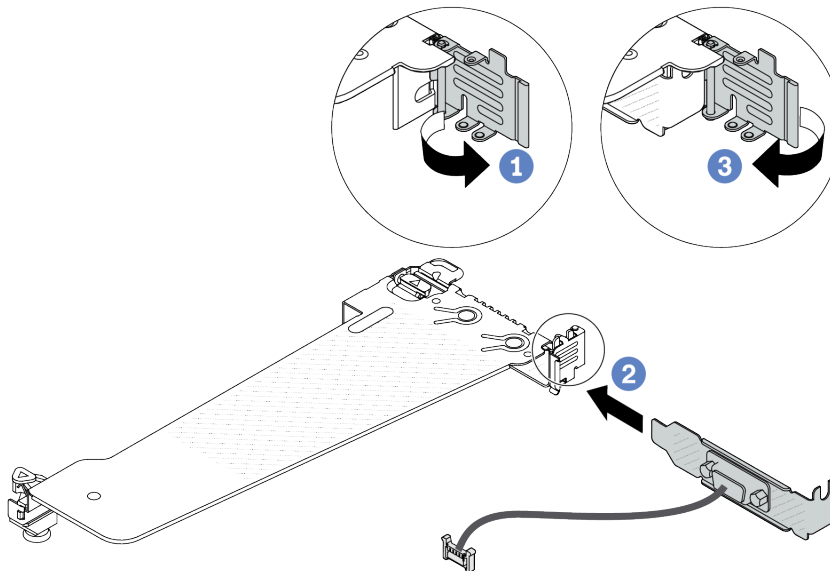


Figure 283. Installing the serial port module

- a. ① Open the retention latch on the riser cage.
- b. ② Install the serial port module to the riser bracket.
- c. ③ Close the retention latch and ensure that the serial port module is securely installed.

Step 4. Install the riser assembly to the server.

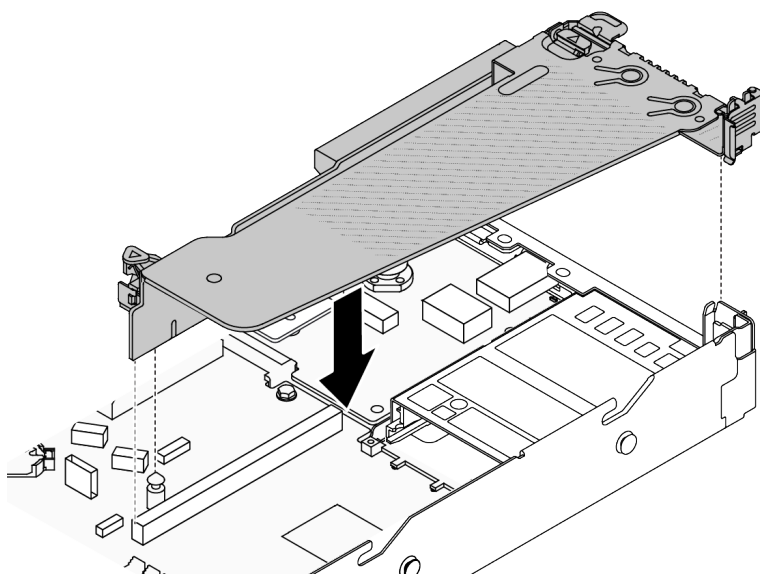


Figure 284. Installing the riser assembly

- Step 5. Connect the cable of the serial port module to the serial-port-module connector on the system board (system board assembly). For the location of the serial-port-module connector, refer to [“System-board-assembly connectors” on page 36](#).

After you finish

1. Complete the parts replacement. See [“Complete the parts replacement” on page 322](#).
2. From the UEFI Setup page, click **System Settings → Devices and I/O Ports → Console Redirection Settings**. Change both **Console Redirection** and **SP Redirection** setting to **Enabled**.
3. To enable the serial port module on Linux or Microsoft Windows, do one of the followings according to the installed operating system:

Note: If the Serial over LAN (SOL) or Emergency Management Services (EMS) feature is enabled, the serial port will be hidden on Linux and Microsoft Windows. Therefore, it is required to disable SOL and EMS to use the serial port on operating systems for serial devices.

- For Linux:

Open the ipmitool and enter the following command to disable the Serial over LAN (SOL) feature:

```
-I lanplus -H IP -U USERID -P PASSWORD sol deactivate
```

- For Microsoft Windows:

- a. Open the ipmitool and enter the following command to disable the SOL feature:

```
-I lanplus -H IP -U USERID -P PASSWORD sol deactivate
```

- b. Open Windows PowerShell and enter the following command to disable the Emergency Management Services (EMS) feature:

```
Bcdedit /ems off
```

- c. Restart the server to ensure that the EMS setting takes effect.

Demo video

<https://www.youtube.com/watch?v=9XXivrfKd0>

System board (system board assembly) replacement (trained technicians only)

Follow instructions in this section to remove and install the system I/O board and processor board, which assembled as a system board (system board assembly).

Important:

- This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.
- When the server has a L2AM (The Lenovo Neptune Liquid to Air Module) installed, you must apply for a L2AM module handle (LACM heat sink bracket) first if you need to install or remove the system board assembly or processor. However, while replacing the old L2AM with a new one, you do not need to apply for a module handle (LACM heat sink bracket) as the new L2AM package contains it.
- If you need to replace a processor board and a firmware and RoT security module together, do the following:
 - Check the current PSB fuse policy before replacement. See *Service process before replacement* at [Service process for updating PSB fuse state](#) (Lenovo service technicians only).
 - Ensure that the processor fuse status is expected without unexpected XCC event logs after replacement. See *Service process after replacing a processor board and a firmware and RoT security module together* at [Service process for updating PSB fuse state](#) (Lenovo service technicians only). The fuse status must be the same as the original fuse status of the server.

The following illustration shows the layout of the system board (system board assembly) which contains the system I/O board and processor board.

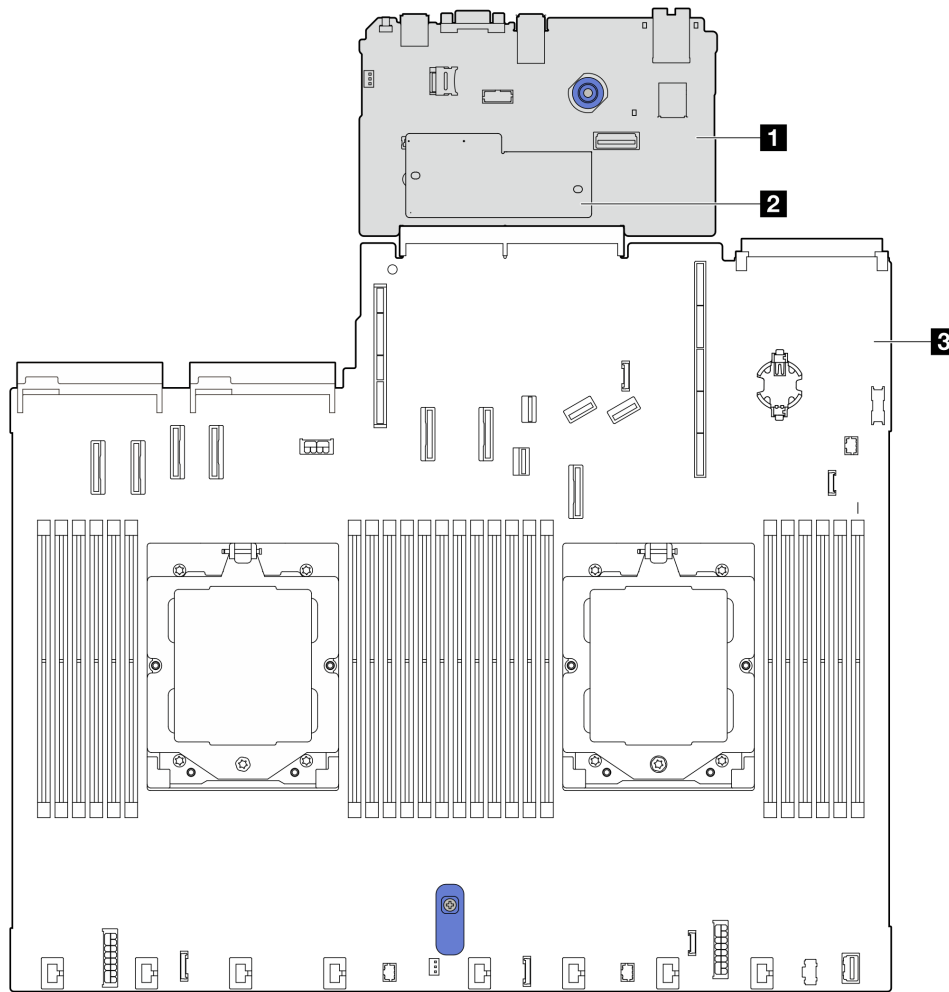


Figure 285. System-board-assembly layout

1 System I/O board	3 Processor board
2 Firmware and RoT security module	

- [“Remove the firmware and RoT security module” on page 294](#)
- [“Install the firmware and RoT security module” on page 296](#)
- [“Remove the system I/O board” on page 300](#)
- [“Install the system I/O board” on page 305](#)

Firmware and RoT Security Module replacement (Lenovo trained technicians only)

Use this information to remove and install the ThinkSystem V3 Firmware and Root of Trust Security Module.

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

Remove the firmware and RoT security module

Follow instructions in this section to remove the ThinkSystem V3 Firmware and Root of Trust Security Module (firmware and RoT security module).

About this task

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install it without proper training and qualification.

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “[Power off the server](#)” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.
- After replacing the firmware and RoT security module, update the firmware to the specific version supported by the server. Make sure that you have the required firmware or a copy of the pre-existing firmware before you proceed.

Firmware and driver download: You might need to update the firmware or driver after replacing a component.

- Go to <https://datacentersupport.lenovo.com/tw/en/products/servers/thinksystem/sr645v3/7d9c/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to “[Update the firmware](#)” on page 489 for more information on firmware updating tools.

Procedure

Step 1. Prepare your server.

- a. Perform OneCLI commands to back up the UEFI settings. See https://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_save_command.html.
- b. Perform both OneCLI commands and XCC actions to back up the XCC settings. See https://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_save_command.html and https://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc2.doc/NN1ia_c_backupthexcc.html.
- c. Remove the top cover. See “[Remove the top cover](#)” on page 318.
- d. If your server comes with a rear drive assembly, remove it first. See “[Remove the rear 2.5" drive assembly](#)” on page 261.
- e. If your server comes with a 7mm rear drive assembly, remove it first. See “[Remove the 7mm rear drive assembly](#)” on page 264
- f. If your server comes with riser assemblies, remove them first, see “[Riser assemblies](#)” on page 273.

Step 2. Remove the firmware and RoT security module.

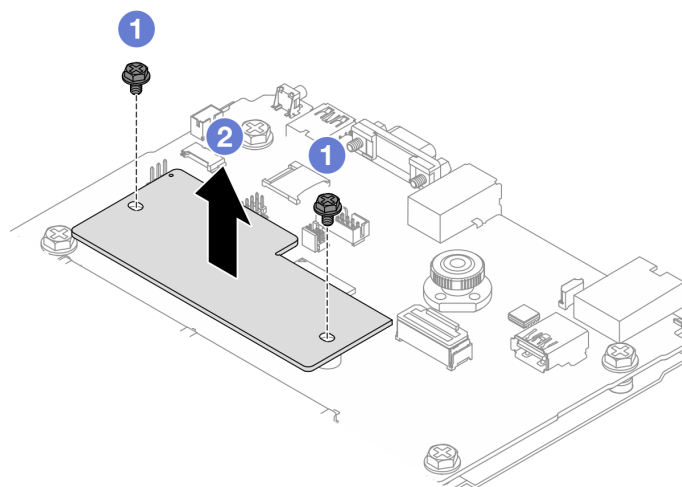


Figure 286. Firmware and RoT security module removal

- a. ① Loosen the two screws on the firmware and RoT security module.
- b. ② Lift the firmware and RoT security module out of the chassis.

After you finish

If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

https://www.youtube.com/watch?v=9uCOXTan_fs

Install the firmware and RoT security module

Follow instructions in this section to install the ThinkSystem V3 Firmware and Root of Trust Security Module (firmware and RoT security module).

About this task

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install it without proper training and qualification.

(Lenovo trained technician only) After replacing the firmware and RoT security module, update the UEFI firmware to the specific version supported by the server. For detailed information on how to update the firmware, see [Tip for replacing a firmware and RoT security module](#).

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “[Power off the server](#)” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Firmware and driver download: You might need to update the firmware or driver after replacing a component.

- Go to <https://datacentersupport.lenovo.com/tw/en/products/servers/thinksystem/sr645v3/7d9c/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to “Update the firmware” on page 489 for more information on firmware updating tools.

Procedure

- Step 1. Touch the static-protective package that contains the firmware and RoT security module to any unpainted surface on the outside of the server. Then, take the firmware and RoT security module out of the package and place it on a static-protective surface.
- Step 2. Install the firmware and RoT security module to the server.

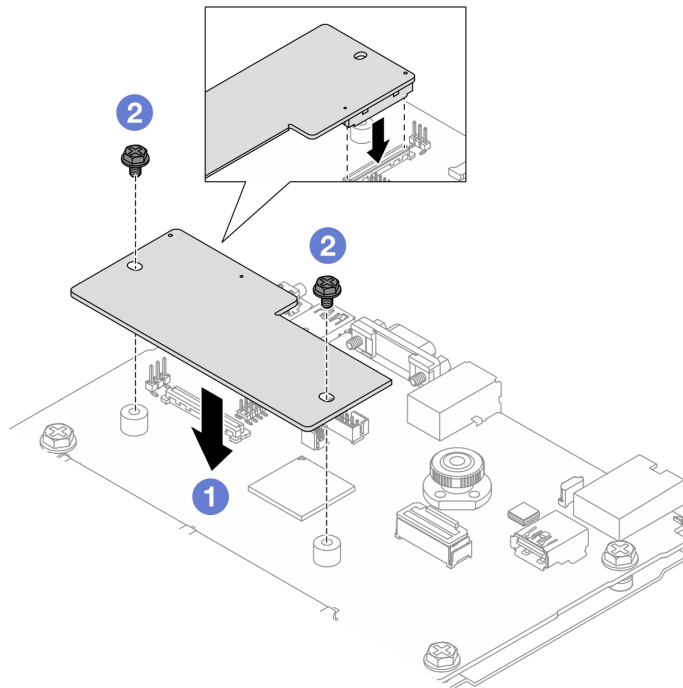


Figure 287. Installing the firmware and RoT security module

- a. ① Lower the firmware and RoT security module onto the system I/O board and ensure that the connector on the module is correctly inserted into the slot on the system I/O board.
- b. ② Tighten the two screws to secure the firmware and RoT security module in place.

After you finish

1. Complete the parts replacement. See “Complete the parts replacement” on page 322.
2. Update the UEFI, XCC and LXPM firmware to the specific version supported by the server. See <https://glosse4lenovo.lenovo.com/wiki/glosse4lenovo/view/How%20To/System%20related/How%20to%20do%20RoT%20Module%20FW%20update%20on%20ThinkSystem%20V3%20machines/>.
3. Perform OneCLI commands to restore the UEFI settings. See https://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_restore_command.html.
4. Perform both OneCLI commands and XCC actions to restore the XCC settings. See https://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_restore_command.html and https://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc2.doc/NN1ia_c_restorethexcc.html.

5. Optionally, do the following if needed:
 - Hide TPM. See “Hide/observe TPM” on page 298.
 - Update the TPM firmware. See “Update the TPM firmware” on page 299.
 - Enable UEFI Secure Boot. See “Enable UEFI Secure Boot” on page 299.

Demo video

<https://www.youtube.com/watch?v=eu7uHszmKA8>

Hide/observe TPM

TPM is enabled by default to encrypt data transfer for system operation. Optionally, you can disable TPM using Unified Extensible Firmware Interface (UEFI) or Lenovo XClarity Essentials OneCLI.

Using UEFI

For details, see “Hide TPM from OS” in *UEFI User Guide* at https://thinksystem.lenovofiles.com/help/topic/dcg_uefi/overview_dcg_uefi.html.

Using Lenovo XClarity Essentials OneCLI

To disable TPM, do the following:

1. Download and install Lenovo XClarity Essentials OneCLI.

To download Lenovo XClarity Essentials OneCLI, go to the following site:

<https://datacentersupport.lenovo.com/solutions/HT116433>

2. Run the following command:

```
OneCli.exe config set TrustedComputingGroup.HideTPMfromOS "Yes" -bmc <userid>:<password>@<ip_address>
```

where:

- <userid>:<password> are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSWORD (zero, not an uppercase o)
- <ip_address> is the IP address of the BMC.

Example:

```
D:\onecli>OneCli.exe config set UEFI.TrustedComputingGroup_TPMDevice "Disabled" --bmc USERID:PASSWORD@10.245.38.64
[Is]Certificate check finished [100%][=====>]
Start to connect BMC at 10.245.38.64 to apply config set
Invoking SET command ...
UEFI.TrustedComputingGroup_TPMDevice=Disabled
Changes completed successfully, but these changes will not take effect until next reboot.
Succeed.
```

3. Reboot the system.

If you want to enable TPM again, run the following command and reboot the system:

```
OneCli.exe config set TrustedComputingGroup.HideTPMfromOS "No" -bmc <userid>:<password>@<ip_address>
```

Example:

```
D:\onecli>OneCli.exe config set UEFI.TrustedComputingGroup_TPMDevice "Enabled" --bmc USERID:PASSWORD@10.245.38.64
[Is]Certificate check finished [100%][=====>]
Start to connect BMC at 10.245.38.64 to apply config set
Invoking SET command ...
UEFI.TrustedComputingGroup_TPMDevice=Enabled
Changes completed successfully, but these changes will not take effect until next reboot.
Succeed.
```

Update the TPM firmware

Optionally, you can update the TPM firmware using Lenovo XClarity Essentials OneCLI.

Note: TPM firmware update is irreversible. After update, the TPM firmware cannot be downgraded to earlier versions.

TPM firmware version

Follow the procedure below to see the TPM firmware version:

From Lenovo XClarity Provisioning Manager

1. Start the server and press the key specified in the on-screen instructions to display the Lenovo XClarity Provisioning Manager interface. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.)
2. If the power-on Administrator password is required, enter the password.
3. From the UEFI Setup page, click **System Settings → Security → Trusted Platform Module → TPM 2.0 → TPM Firmware Version**.

Update the TPM firmware

To update the TPM firmware, do the following:

1. Download and install Lenovo XClarity Essentials OneCLI.

To download Lenovo XClarity Essentials OneCLI, go to the following site:

<https://datacentersupport.lenovo.com/solutions/HT116433>

2. Run the following command:

```
OneCli.exe config set TrustedComputingGroup.DeviceOperation "Update to TPM 2.0 firmware version <x.x.x.x>" --bmc <userid>:<password>@<ip_address>
```

where:

- <x.x.x.x> is the target TPM version.

e.g. TPM 2.0 (7.2.1.0) -> TPM 2.0 (7.2.2.0):

```
OneCli.exe config set TrustedComputingGroup.DeviceOperation "Update to TPM 2.0 firmware version 7.2.2.0" --bmc <userid>:<password>@<ip_address>
```

- <userid>:<password> are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSWORD (zero, not an uppercase o).
- <ip_address> is the IP address of the BMC.

Enable UEFI Secure Boot

Optionally, you can enable UEFI Secure Boot.

There are two methods available to enable UEFI Secure Boot:

- From Lenovo XClarity Provisioning Manager

To enable UEFI Secure Boot from Lenovo XClarity Provisioning Manager:

1. Start the server and press the key specified in the on-screen instructions to display the Lenovo XClarity Provisioning Manager interface. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.)

2. If the power-on Administrator password is required, enter the password.
3. From the UEFI Setup page, click **System Settings → Security → Secure Boot Configuration → Secure Boot Setting**.
4. Enable Secure Boot and save the settings.

Note: If disabling UEFI secure boot is needed, select Disable in step 4.

- From Lenovo XClarity Essentials OneCLI

To enable UEFI Secure Boot from Lenovo XClarity Essentials OneCLI:

1. Download and install Lenovo XClarity Essentials OneCLI.

To download Lenovo XClarity Essentials OneCLI, go to the following site:

<https://datacentersupport.lenovo.com/solutions/HT116433>

2. Run the following command to enable Secure Boot:

```
OneCli.exe config set UEFI.SecureBootConfiguration_SecureBootSetting Enabled --bmc  
<userid>:<password>@<ip_address>
```

where:

- <userid>:<password> are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSWORD (zero, not an uppercase o)
- <ip_address> is the IP address of the BMC.

For more information about the Lenovo XClarity Essentials OneCLI `set` command, see:

http://sysmgmt.lenovofiles.com/help/topic/toolctr_cli_lenovo/onecli_r_set_command.html

Note: If disabling UEFI secure boot is needed, run the following command:

```
OneCli.exe config set UEFI.SecureBootConfiguration_SecureBootSetting Disabled --bmc <userid>:<password>@<ip_<br>address>
```

System I/O board replacement (trained technicians only)

Use this section to remove and install the system I/O board from the system board assembly.

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

When the server has a L2AM (The Lenovo Neptune Liquid to Air Module) installed, you must apply for a L2AM module handle (LACM heat sink bracket) first if you need to install or remove the system board assembly or processor. However, while replacing the old L2AM with a new one, you do not need to apply for a module handle (LACM heat sink bracket) as the new L2AM package contains it.

Remove the system I/O board

Follow instructions in this section to remove the system I/O board.

About this task

Important:

- This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.
- When removing the memory modules, label the slot number on each memory module, remove all the memory modules from the system board (system board assembly), and set them aside on a static-protective surface for reinstallation.

- When disconnecting cables, make a list of each cable and record the connectors the cable is connected to, and use the record as a cabling checklist after installing the new system board (system board assembly).
- When the server has an LACM module (close-loop cooling module) installed, you must apply for a handle first if you need to install or remove the processor board, I/O board, and processor. However, while replacing the old LACM module with a new one, you do not need to apply for a handle as the new LACM module contains it.

Attention:

- Read “Installation Guidelines” on page 49 and “Safety inspection checklist” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

CAUTION:

Hazardous moving parts. Keep fingers and other body parts away.



CAUTION:



The heat sinks and processors might be very hot. Turn off the server and wait several minutes to let the server cool before removing the server cover.

S002



CAUTION:

The power-control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

Procedure

Step 1. Make preparation for this task.

- Record all system configuration information, such as Lenovo XClarity Controller IP addresses, vital product data, and the machine type, model number, serial number, Universally Unique Identifier, and asset tag of the server.

- b. Save the system configuration to an external device with Lenovo XClarity Essentials.
- c. Save the system event log to external media.
- d. Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- e. If the server is installed in a rack, slide the server out on its rack slide rails to gain access to the top cover, or remove the server from the rack.
- f. Remove the top cover. See [“Remove the top cover” on page 318](#).
- g. If your server has an CFF adapter or a RAID flash power module installed on the front of the chassis, remove it first.
 - [“Remove the internal CFF HBA/RAID adapter” on page 127](#)
 - [“Remove the RAID flash power module on the chassis” on page 254](#)
- h. Record where the cables are connected to the system board (system board assembly); then, disconnect all the cables.
- i. Remove any of the following components that are installed on the system board (system board assembly) and put them in a safe, static-protective place.
 - [“Remove a system fan” on page 315](#)
 - [“Remove a memory module” on page 205](#)
 - [“Processor and heat sink replacement \(trained technicians only\)” on page 243](#)
 - [“Remove the CMOS battery” on page 74](#)
 - [“Remove the rear riser card” on page 281](#)
 - [“Remove the OCP module” on page 223](#)
- j. Pull out the power supplies slightly. Ensure that they are disconnected from the system board (system board assembly).

Step 2. Remove the Firmware and RoT Security Module, see [“Remove the firmware and RoT security module” on page 294](#).

Step 3. Remove the MicroSD card.

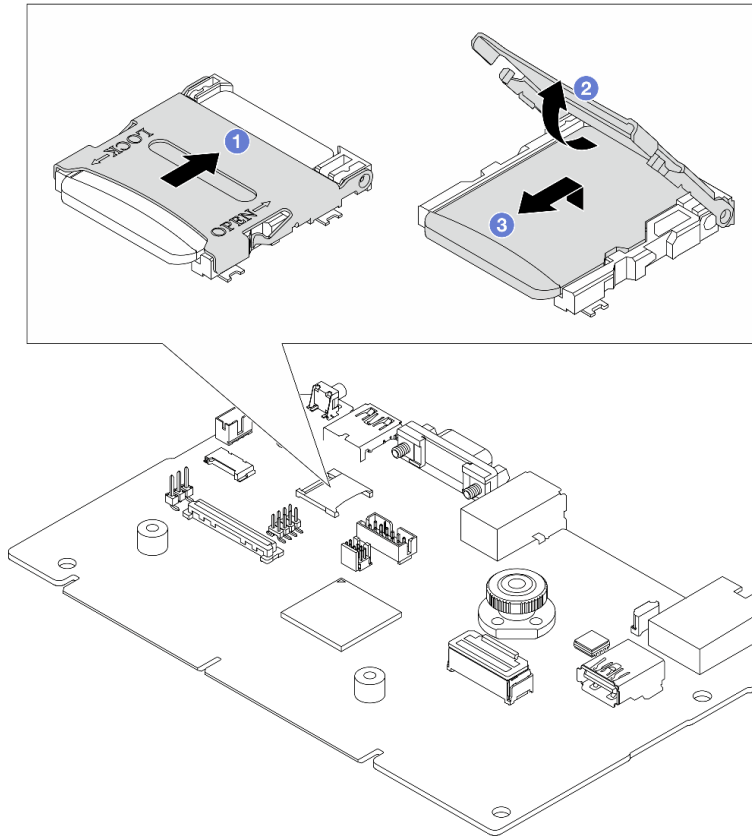


Figure 288. Removing the MicroSD card

1. ① Slide the shell to OPEN direction.
2. ② Flip the socket hinge up.
3. ③ Remove the MicroSD card.

Note: After the MicroSD card is removed, the historical data of the firmware and user data uploaded through Remote Disc On Card (RDOC) will be lost, and the firmware rollback function and extended RDOC space will not be supported. To enable the two features, it will need to install a new MicroSD card.

Step 4. Remove the system board (system board assembly).

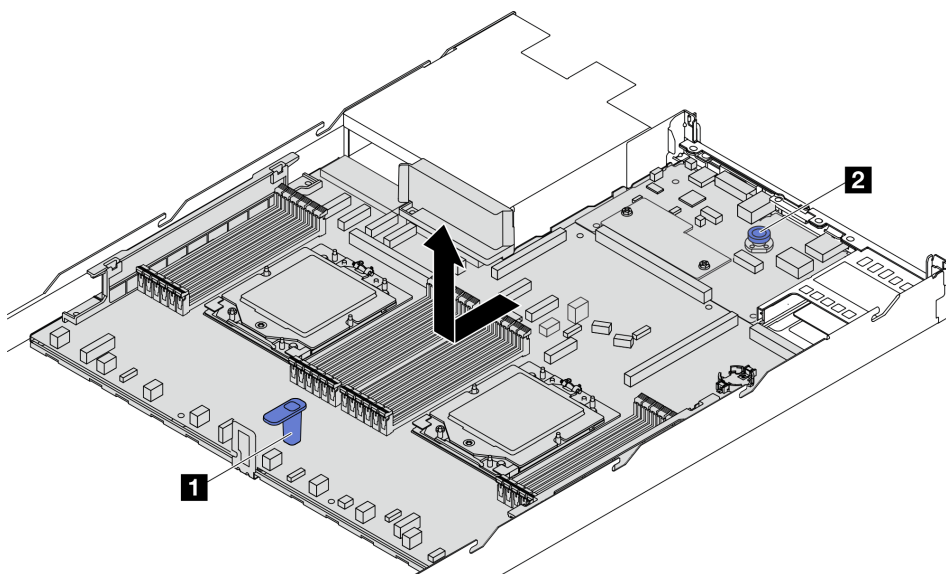


Figure 289. System board (system board assembly) removal

- a. Hold the lift handle **1** and lift the release pin **2** at the same time and slide the system board (system board assembly) toward the front of the server.
- b. Lift the system board (system board assembly) out of the chassis.

Step 5. Separate the system I/O board from the processor board.

Note: To prevent the contact of the system I/O board from damage, pinch and lift the plunger on the system I/O board upward a little and pull the system I/O board outward. During the entire pulling action, ensure that the system I/O board remains as horizontal as possible.

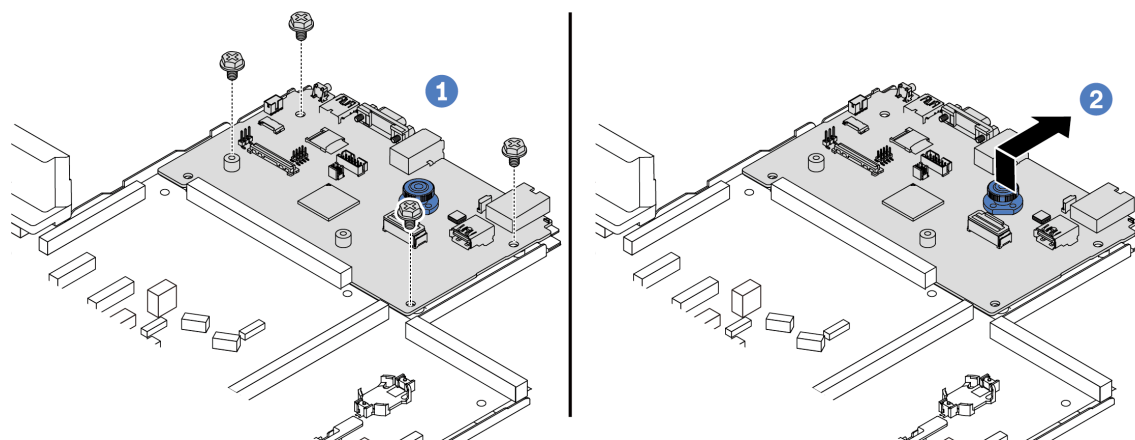


Figure 290. Separating the system I/O board from the processor board

- a. **1** Remove the screws that secure the system I/O board.

- b. ② Lift and hold the release pin and slide the system I/O board towards the rear to disengage it from the processor board.

After you finish

- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Important: Before you return the processor board, make sure that you install the processor socket covers from the new processor board. To replace a processor socket cover:

1. Slide the cover out from the processor socket of the new processor board.
 2. Install the cover on the processor socket of the removed processor board.
- If you plan to recycle the component, see “Disassemble the system board (system board assembly) for recycle” on page 539.

Demo video

<https://www.youtube.com/watch?v=LG--hccwfc4>

Install the system I/O board

Follow instructions in this section to install the system I/O board.

About this task

Important:

- This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.
- When the server has an LACM module (close-loop cooling module) installed, you must apply for a handle first if you need to install or remove the processor board, I/O board, and processor. However, while replacing the old LACM module with a new one, you do not need to apply for a handle as the new LACM module contains it.

Attention:

- Read “Installation Guidelines” on page 49 and “Safety inspection checklist” on page 50 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 65.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Firmware and driver download: You might need to update the firmware or driver after replacing a component.

- Go to <https://datacentersupport.lenovo.com/tw/en/products/servers/thinksystem/sr645v3/7d9c/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to “Update the firmware” on page 489 for more information on firmware updating tools.

Procedure

- Step 1. Touch the static-protective package that contains the new part to any unpainted surface on the outside of the server. Then, take the new part out of the package and place it on a static-protective surface.
- Step 2. Depending on your need, do one of the following:
 - If you are going to replace the system I/O board and reuse the processor board, install a new system I/O board onto the processor board.

- If you are going to replace the processor board and reuse the system I/O board, install the existing system I/O board onto a new processor board.

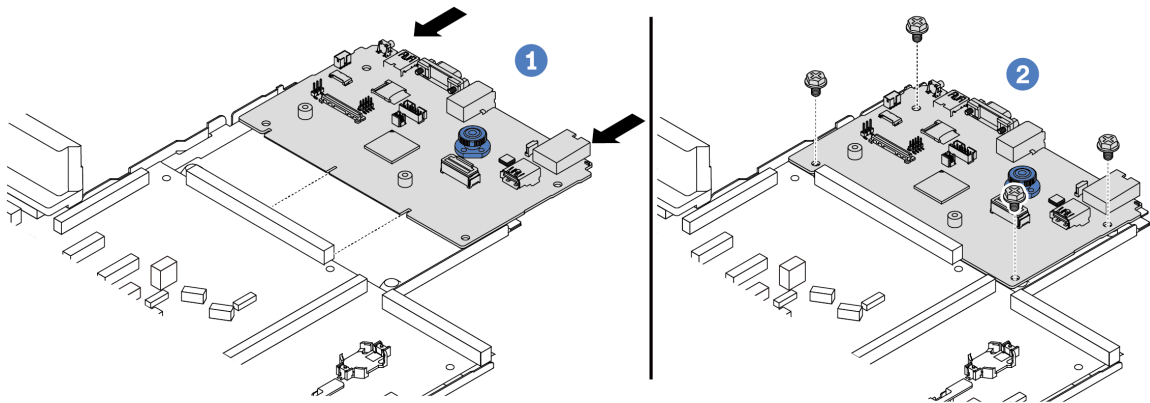
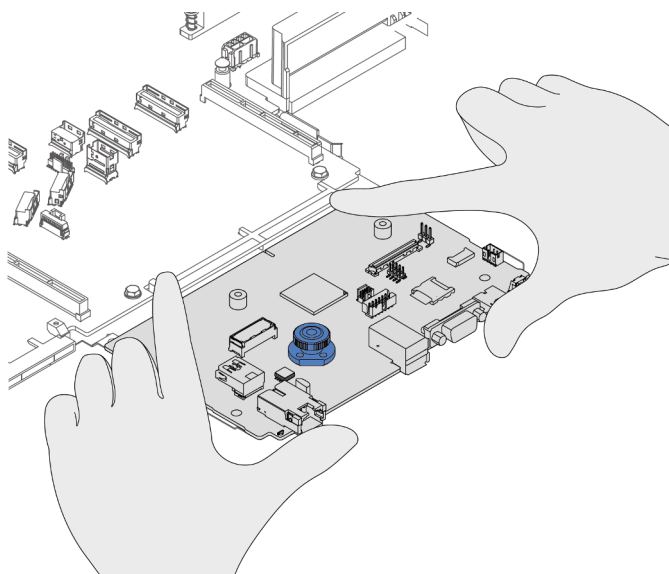


Figure 291. Installing the system I/O board onto the processor board

- 1 Align the system I/O board with the connector on the processor board, and use both hands to push the system I/O board and slightly insert it into the connector.

Note: To prevent the contact of the system I/O board from damage, ensure that the system I/O board is aligned correctly with the connector on the processor board, and remains as horizontal as possible during the insertion.



- 2 Install the screws to fix the system I/O board into place.

Step 3. Install the firmware and RoT security module, see [“Install the firmware and RoT security module” on page 296](#).

Step 4. Install the MicroSD card.

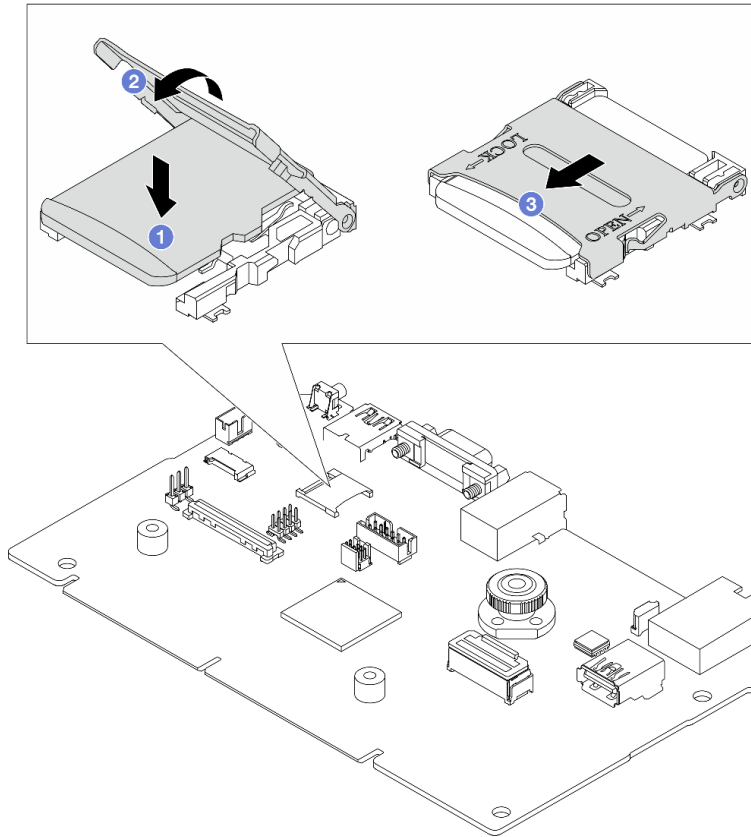


Figure 292. Installing the MicroSD card

1. ① Place the card onto the socket with the contacts of the MicroSD card facing downwards.
2. ② Close the socket hinge.
3. ③ Slide the shell to LOCK direction.

After you finish

1. Install any components that you have removed from the failing system board (system board assembly).
 - [“Install a processor” on page 247](#)
 - [“Install a heat sink” on page 249](#)
 - [“Install a memory module” on page 207](#)
 - [“Install the CMOS battery” on page 77](#)
 - [“Install the internal CFF HBA/RAID adapter” on page 128](#)
 - [“Install the RAID flash power module on the chassis” on page 256](#)
 - [“Install a system fan” on page 317](#)
 - [“Install the rear riser card” on page 283](#)
 - [“Install the OCP module” on page 224](#)
 - [“Install a power supply unit” on page 234](#)
 - [“Rear drive assembly replacement” on page 260](#)
 - [“Rear drive backplane replacement” on page 266](#)
2. Reconnect all the required cables to the same connectors on the system board (system board assembly). See [Chapter 6 “Internal cable routing” on page 325](#).
3. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside the server.
4. Reinstall the top cover. See [“Install the top cover” on page 320](#).

5. If the server was installed in a rack, reinstall the server into the rack. See “Install the server to rack” on page 68.
6. Reconnect the power cords and any cables that you removed.
7. Power on the server and any peripheral devices. See “Power on the server” on page 64.
8. Reset the UEFI password if you set the password before. See “Reset the UEFI password” on page 308

Demo video

<https://www.youtube.com/watch?v=KXo6-4HWRH8>

Reset the UEFI password

Use this topic to reset the UEFI password after replacing the system I/O board.

Recommended tool:

- Lenovo XClarity Essentials OneCLI commands

Using Lenovo XClarity Essentials OneCLI commands

1. Clear the UEFI password.
 - To clear the power-on password, run the following command:

```
OneCli.exe config set IMM.UefiPowerOnPassword "" -imm <userid>:<password>@<ip_address>
```
 - To clear the admin password, run the following command:

```
OneCli.exe config set IMM.UefiAdminPassword "" -imm <userid>:<password>@<ip_address>
```
2. Set a new UEFI password.
 - To set a new power-on password, run the following command:

```
OneCli.exe config set IMM.UefiPowerOnPassword "<new_password>" -imm <userid>:<password>@<ip_address>
```
 - To set a new admin password, run the following command:

```
OneCli.exe config set IMM.UefiAdminPassword "<new_password>" -imm <userid>:<password>@<ip_address>
```

where:

- `<userid>:<password>` are the credentials used to access the Lenovo XClarity Controller interface of your server. The default user ID is USERID, and the default password is PASSWORD (zero, not an uppercase o).
- `<ip_address>` is the IP address of the Lenovo XClarity Controller.
- `<new_password>` is the new password that you need to set.

Processor board replacement (trained technicians only)

Use this section to remove and install the processor board from the system board assembly.

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

When the server has a L2AM (The Lenovo Neptune Liquid to Air Module) installed, you must apply for a L2AM module handle (LACM heat sink bracket) first if you need to install or remove the system board assembly or processor. However, while replacing the old L2AM with a new one, you do not need to apply for a module handle (LACM heat sink bracket) as the new L2AM package contains it.

Remove the processor board

Follow instructions in this section to remove the processor board.

About this task

Important:

- This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.
- When removing the memory modules, label the slot number on each memory module, remove all the memory modules from the system board (system board assembly), and set them aside on a static-protective surface for reinstallation.
- **When disconnecting cables, make a list of each cable and record the connectors the cable is connected to, and use the record as a cabling checklist after installing the new system board (system board assembly).**
- When the server has an LACM module (close-loop cooling module) installed, you must apply for a handle first if you need to install or remove the processor board, I/O board, and processor. However, while replacing the old LACM module with a new one, you do not need to apply for a handle as the new LACM module contains it.

Attention:

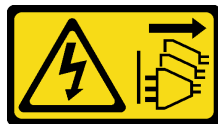
- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

CAUTION:

Hazardous moving parts. Keep fingers and other body parts away.

**CAUTION:**

The heat sinks and processors might be very hot. Turn off the server and wait several minutes to let the server cool before removing the server cover.

S002**CAUTION:**

The power-control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

Procedure

Step 1. Make preparation for this task.

- a. Record all system configuration information, such as Lenovo XClarity Controller IP addresses, vital product data, and the machine type, model number, serial number, Universally Unique Identifier, and asset tag of the server.
- b. Save the system configuration to an external device with Lenovo XClarity Essentials.
- c. Save the system event log to external media.
- d. Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- e. If the server is installed in a rack, slide the server out on its rack slide rails to gain access to the top cover, or remove the server from the rack.
- f. Remove the top cover. See [“Remove the top cover” on page 318](#).
- g. If your server has an CFF adapter or a RAID flash power module installed on the front of the chassis, remove it first.
 - [“Remove the internal CFF HBA/RAID adapter” on page 127](#)
 - [“Remove the RAID flash power module on the chassis” on page 254](#)
- h. Record where the cables are connected to the system board (system board assembly); then, disconnect all the cables.
- i. Remove any of the following components that are installed on the system board (system board assembly) and put them in a safe, static-protective place.
 - [“Remove a system fan” on page 315](#)
 - [“Remove a memory module” on page 205](#)
 - [“Processor and heat sink replacement \(trained technicians only\)” on page 243](#)
 - [“Remove the CMOS battery” on page 74](#)
 - [“Remove the rear riser card” on page 281](#)
 - [“Remove the OCP module” on page 223](#)
- j. Pull out the power supplies slightly. Ensure that they are disconnected from the system board (system board assembly).

Step 2. Remove the system board (system board assembly).

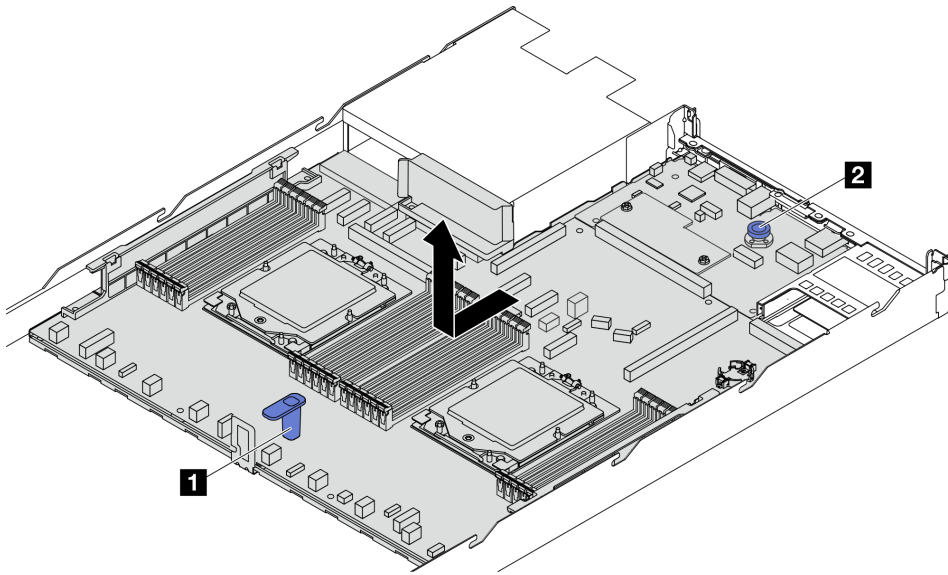


Figure 293. System board (system board assembly) removal

- a. Hold the lift handle **1** and lift the release pin **2** at the same time and slide the system board (system board assembly) toward the front of the server.
- b. Lift the system board (system board assembly) out of the chassis.

Step 3. Remove the firmware and RoT security module, see [“Remove the firmware and RoT security module” on page 294](#).

Step 4. Remove the system I/O board, see [“Remove the system I/O board” on page 300](#).

After you finish

- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Important: Before you return the processor board, make sure that you install the processor socket covers from the new processor board. To replace a processor socket cover:

1. Slide the cover out from the processor socket of the new processor board.
2. Install the cover on the processor socket of the removed processor board.

- If you plan to recycle the component, see [“Disassemble the system board \(system board assembly\) for recycle” on page 539](#).

Demo video

<https://www.youtube.com/watch?v=LG--hccwfc4>

Install the processor board

Follow instructions in this section to install the processor board.

About this task

Important:

- This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

- When the server has an LACM module (close-loop cooling module) installed, you must apply for a handle first if you need to install or remove the processor board, I/O board, and processor. However, while replacing the old LACM module with a new one, you do not need to apply for a handle as the new LACM module contains it.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Firmware and driver download: You might need to update the firmware or driver after replacing a component.

- Go to <https://datacentersupport.lenovo.com/tw/en/products/servers/thinksystem/sr645v3/7d9c/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to [“Update the firmware” on page 489](#) for more information on firmware updating tools.

Procedure

- Step 1. Touch the static-protective package that contains the new part to any unpainted surface on the outside of the server. Then, Then, take the new part out of the package and place it on a static-protective surface.
- Step 2. Install the system I/O board, see [“Install the system I/O board” on page 305](#).
- Step 3. Install the Firmware and RoT Security Module, see [“Install the firmware and RoT security module” on page 296](#).
- Step 4. Install the system-board assembly into the server.

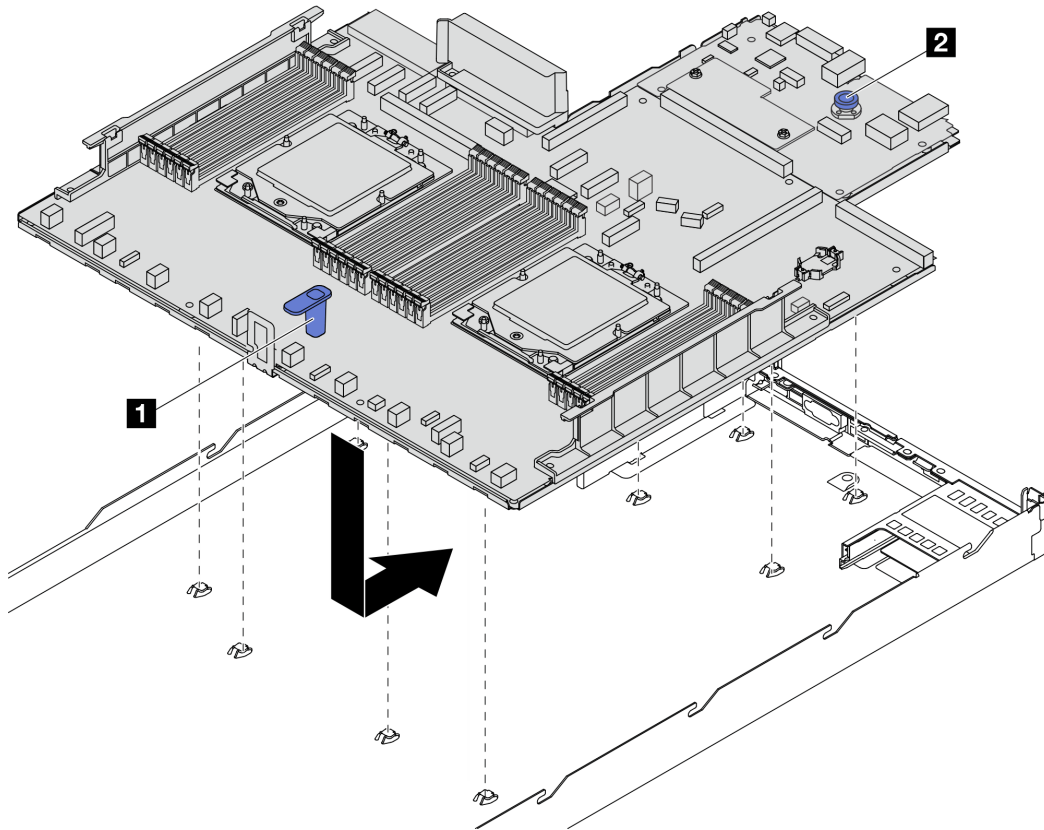


Figure 294. System board (system board assembly) installation

- a. Hold the lift handle **1** and the release pin **2** at the same time to lower the system board (system board assembly) into the chassis.
- b. Slide the system board (system board assembly) to the rear of the server until the system board (system board assembly) snaps into position. Ensure that:
 - The rear connectors on the new system board (system board assembly) are inserted into the corresponding holes in the rear panel.
 - The release pin **2** secures the system board (system board assembly) in place.

After you finish

1. Install any components that you have removed from the failing system board (system board assembly).
 - “Install a processor” on page 247
 - “Install a heat sink” on page 249
 - “Install a memory module” on page 207
 - “Install the CMOS battery” on page 77
 - “Install the internal CFF HBA/RAID adapter” on page 128
 - “Install the RAID flash power module on the chassis” on page 256
 - “Install a system fan” on page 317
 - “Install the rear riser card” on page 283
 - “Install the OCP module” on page 224
 - “Install a power supply unit” on page 234
 - “Rear drive assembly replacement” on page 260
 - “Rear drive backplane replacement” on page 266
2. Reconnect all the required cables to the same connectors on the system board (system board assembly). See [Chapter 6 “Internal cable routing” on page 325](#).

3. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside the server.
4. Reinstall the top cover. See [“Install the top cover” on page 320](#).
5. If the server was installed in a rack, reinstall the server into the rack. See [“Install the server to rack” on page 68](#).
6. Reconnect the power cords and any cables that you removed.
7. Power on the server and any peripheral devices. See [“Power on the server” on page 64](#).
8. Update the vital product data (VPD). See [“Update the Vital Product Data \(VPD\)” on page 314](#).

Machine type number and serial number can be found on the ID label, see [“Identify the server and access the Lenovo XClarity Controller” on page 45](#).

Demo video

<https://www.youtube.com/watch?v=KXo6-4HWRH8>

Update the Vital Product Data (VPD)

Use this topic to update the Vital Product Data (VPD).


- **(Required)** Machine type
- **(Required)** Serial number
- **(Required)** System model
- (Optional) Asset tag
- (Optional) UUID

Recommended tools:

- Lenovo XClarity Provisioning Manager
- Lenovo XClarity Essentials OneCLI commands

Using Lenovo XClarity Provisioning Manager

Steps:

1. Start the server and press the key according to the on-screen instructions. The Lenovo XClarity Provisioning Manager interface is displayed by default.
2. Click  on the top right corner of the Lenovo XClarity Provisioning Manager main interface.
3. Click **Update VPD**; then, follow on-screen instructions to update the VPD.

Using Lenovo XClarity Essentials OneCLI commands

- Updating **machine type**
`onecli config set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model> [access_method]`
- Updating **serial number**
`onecli config set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n> [access_method]`
- Updating **system model**
`onecli config set SYSTEM_PROD_DATA.SysInfoProdIdentifier <system model> [access_method]`
- Updating **asset tag**
`onecli config set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag> [access_method]`
- Updating **UUID**
`onecli config createuuid SYSTEM_PROD_DATA.SysInfoUUID [access_method]`

Variable	Description
<code><m/t_model></code>	The server machine type and model number. Type xxxxyyyyyy, where xxxx is the machine type and yyyyyy is the server model number.
<code><s/n></code>	The serial number on the server. Type zzzzzzzz (length 8-10 characters), where zzzzzzzz is the serial number.
<code><system model></code>	The system model on the server. Type system yyyyyyyy, where yyyyyyyy is the product identifier.
<code><asset_tag></code>	The server asset tag number. Type aaaaaaaaaaaaaaaaaaaaaaaaaaaaaa, where aaaaaaaaaaaaaaaaaaaaaaaaaaaaaa is the asset tag number.
<code>[access_method]</code>	<p>The access method that you select to access the target server.</p> <ul style="list-style-type: none"> Online KCS (unauthenticated and user restricted): You can directly delete <code>[access_method]</code> from the command. Online authenticated LAN: In this case, specify below LAN account information at the end of the OneCLI command: --bmc-username <code><user_id></code> --bmc-password <code><password></code> Remote WAN/LAN: In this case, specify below XCC account information and IP address at the end of the OneCLI command: --bmc <code><bmc_user_id>:<bmc_password>@<bmc_external_IP></code> <p>Notes:</p> <ul style="list-style-type: none"> -- <code><bmc_user_id></code> The BMC account name (1 of 12 accounts). The default value is USERID. -- <code><bmc_password></code> The BMC account password (1 of 12 accounts).

System fan replacement

Use this information to remove and install a system fan.

- [“Remove a system fan” on page 315](#)
- [“Install a system fan” on page 317](#)

Remove a system fan

Use this information to remove a system fan. You can remove a hot-swap fan without powering off the server, which helps you avoid significant interruption to the operation of the system.

About this task

S033



CAUTION:

Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in spattered metal, burns, or both.

S017



CAUTION:

Hazardous moving fan blades nearby. Keep fingers and other body parts away.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Step 1. Remove the top cover. See [“Remove the top cover” on page 318](#).

Step 2. Grasp the fan tabs on both ends of the system fan and carefully lift the system fan out of the server.

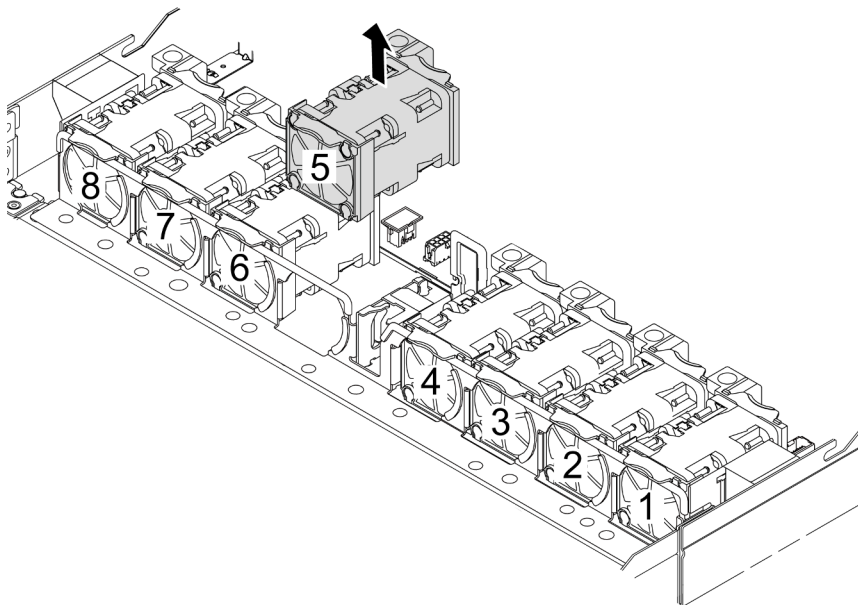


Figure 295. System fan removal

After you finish

1. Install a new system fan or install a fan filler to cover the place. See “[Install a system fan](#)” on page 317.
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=ca-gwOouN8U>

Install a system fan

Use this information to install a system fan. You can install a hot-swap fan without powering off the server, which helps you avoid significant interruption to the operation of the system.

About this task

S033



CAUTION:

Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in spattered metal, burns, or both.

S017



CAUTION:

Hazardous moving fan blades nearby. Keep fingers and other body parts away.

Attention:

- Read “[Installation Guidelines](#)” on page 49 and “[Safety inspection checklist](#)” on page 50 to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the system fan to any unpainted surface on the outside of the server. Then, take the system fan out of the package and place it on a static-protective surface.

Step 2. Install the system fan.

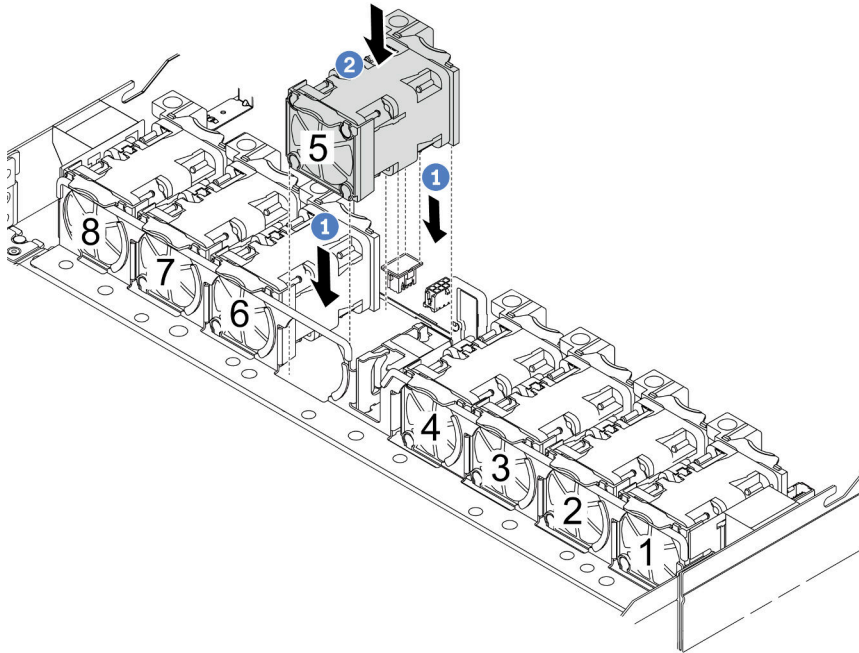


Figure 296. System fan installation

- 1** Align the four corners of the fan to fan module socket and put it down.
- 2** Press the fan latch down to ensure that it is plugged in the connector.

After you finish

Complete the parts replacement. See “Complete the parts replacement” on page 322.

Demo video

<https://www.youtube.com/watch?v=56e4yXhfNus>

Top cover replacement

Follow instructions in this section to remove and install the top cover.

- “Remove the top cover” on page 318
- “Install the top cover” on page 320

Remove the top cover

Follow instructions in this section to remove the top cover.

About this task

S033



CAUTION:

Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in spattered metal, burns, or both.

S014



CAUTION:

Hazardous voltage, current, and energy levels might be present. Only a qualified service technician is authorized to remove the covers where the label is attached.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. If the server is installed in a rack, slide the server out on its rack slide rails to gain access to the top cover, or remove the server from the rack. See the Rack Installation Guide that comes with the rail kit for your server.

Step 2. Remove the top cover.

Attention: Handle the top cover carefully. Dropping the top cover with the cover latch open might damage the cover latch.

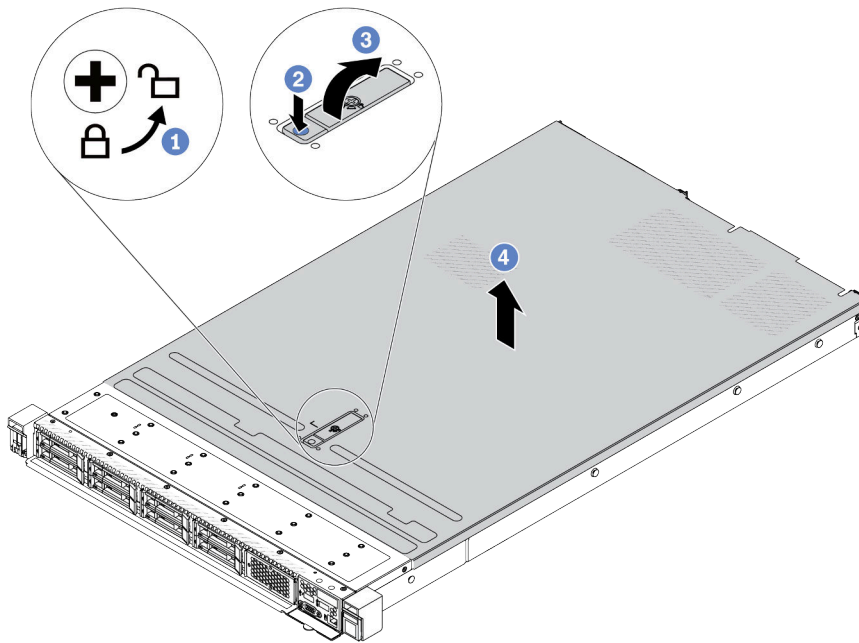


Figure 297. Top cover removal

- a. ① Use a screwdriver to turn the cover lock to the unlocked position as shown.
- b. ② Press the release button on the cover latch. The cover latch then gets released to some extent.
- c. ③ Fully open the cover latch as shown.
- d. ④ Slide the top cover to the rear until it is disengaged from the chassis. Then, lift the top cover off the chassis and place the top cover on a flat clean surface.

After you finish

1. Replace any options as required or install a new top cover. See [“Install the top cover” on page 320](#).
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

<https://www.youtube.com/watch?v=Jatuk6DAci0>

Install the top cover

Follow instructions in this section to install the top cover.

About this task

S033



CAUTION:

Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in spattered metal, burns, or both.

S014



CAUTION:

Hazardous voltage, current, and energy levels might be present. Only a qualified service technician is authorized to remove the covers where the label is attached.

Attention:

- Read [“Installation Guidelines” on page 49](#) and [“Safety inspection checklist” on page 50](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 65](#).
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Operating the server with the top cover removed might damage server components. For proper cooling and airflow, install the top cover before you turn on the server.

Procedure

Step 1. Check your server and ensure that:

- All cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server.
- All internal cables are connected and routed correctly. See [Chapter 6 “Internal cable routing” on page 325](#).

Step 2. Install the top cover to your server.

Attention: Handle the top cover carefully. Dropping the top cover with the cover latch open might damage the cover latch.

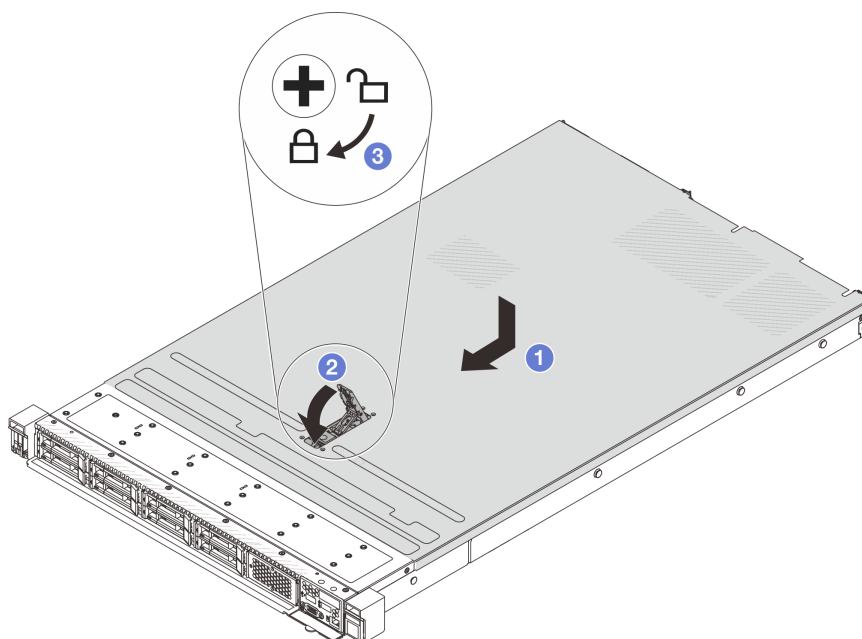


Figure 298. Top cover installation

- a. **1** Ensure that the cover latch is in the open position. Lower the top cover onto the chassis until both sides of the top cover engage the guides on both sides of the chassis. Then, slide the top cover to the front of the chassis.

Note: Before you slide the top cover forward, ensure that all the tabs on the top cover engage the chassis correctly.

- b. **2** Press down the cover latch and ensure that the cover latch is completely closed.
- c. **3** Use a screwdriver to turn the cover lock to the locked position.

After you finish

After installing the top cover, complete the parts replacement. See [“Complete the parts replacement” on page 322](#).

Demo video

<https://www.youtube.com/watch?v=6l4lgc5OeVw>

Complete the parts replacement

Go through the checklist to complete parts replacement

To complete the parts replacement, do the following:

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your server.

2. Properly route and secure the cables in the server. Refer to detailed cable routing information for each component in [Chapter 6 “Internal cable routing” on page 325](#).
3. If you have removed the top cover, reinstall it. See [“Install the top cover” on page 320](#).
4. Reconnect external cables and power cords to the server.

Attention: To avoid component damage, connect the power cords last.

5. Update the server configuration if necessary.
 - Download and install the latest device drivers: <http://datacentersupport.lenovo.com>
 - Update the system firmware. See [“Update the firmware” on page 489](#).
 - Reconfigure the disk arrays if you have installed or removed a hot-swap drive or a RAID adapter. See the Lenovo XClarity Provisioning Manager User Guide, which is available for download at: <http://datacentersupport.lenovo.com>

Chapter 6. Internal cable routing

See this section to do cable routing for specific components.

Notes: Follow below guidelines when connecting cables:

- Turn off the server before you connect or disconnect any internal cables.
- See the documentation that comes with any external devices for additional cabling instructions. It might be easier for you to route cables before you connect the devices to the server.
- Cable identifiers of some cables are printed on the cables that come with the server and optional devices. Use these identifiers to connect the cables to the correct connectors.
- Ensure that the cable is not pinched and does not cover any connectors or obstruct any components on the system board assembly.
- Ensure that the relevant cables pass through the cable clips.
- If the cable to be routed goes through the cable walls, make sure that the sponge cable clips are on open position.

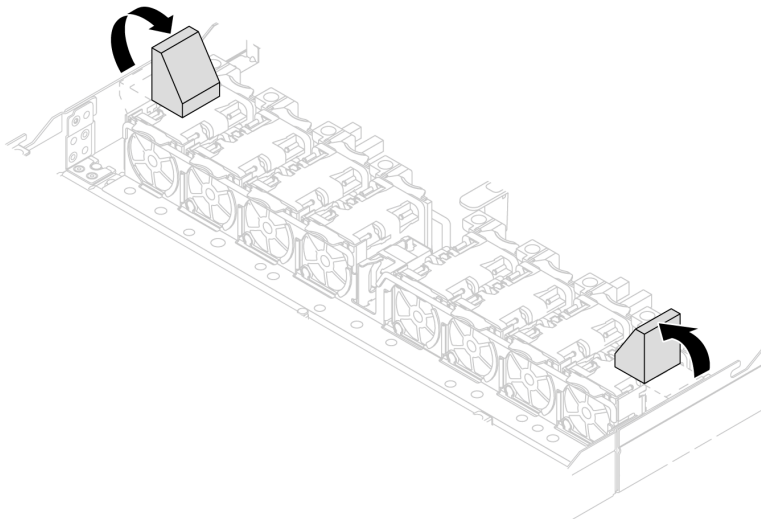
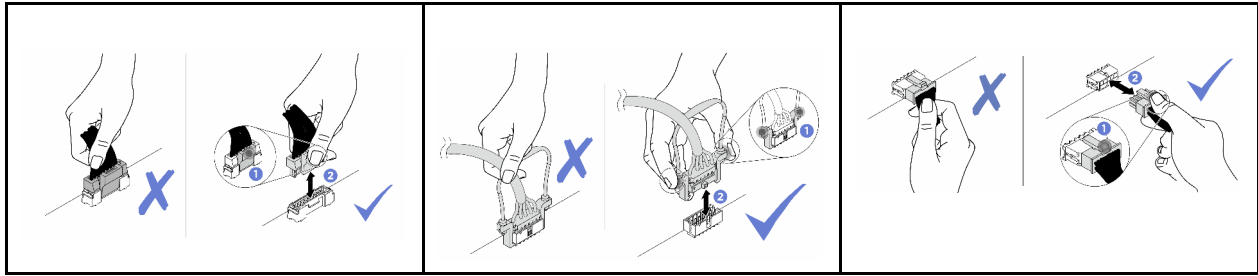


Figure 299. Open the sponge cable clips

Attention: Strictly observe the following instructions to avoid damaging cable sockets on the system board. Any damage to the cable sockets might require replacing the system board.

- Connect cable connectors vertically or horizontally in alignment with the orientations of the corresponding cable sockets, avoiding any tilt.
- To disconnect cables from the system board, do as follows:
 1. Press and hold all latches, release tabs, or locks on cable connectors to release the cable connectors.
 2. Remove the cable connectors vertically or horizontally in alignment with the orientations of the corresponding cable sockets, avoiding any tilt.

Note: The cable connectors might look different from those in the illustration, but the removal procedure is the same.



Identifying connectors

See this section to locate and identify the connectors on the electric boards.

Drive backplane connectors

See this section to locate the connectors on the drive backplanes.

- “10 x 2.5" SAS/SATA/AnyBay backplane” on page 326
- “8 x 2.5" SAS/SATA backplane” on page 327
- “4 x 3.5" SAS/SATA/AnyBay backplane” on page 327
- “4 x 2.5" SAS/SATA/NVMe/AnyBay backplane” on page 328
- “16 x EDSFF backplane” on page 329
- “Rear 7mm SAS/SATA/NVMe backplane” on page 329
- “Rear 2 x 2.5" SAS/SATA/NVMe backplane” on page 329
- “M.2 drive backplane” on page 330

10 x 2.5" SAS/SATA/AnyBay backplane

See this section to locate the connectors on the 10 x 2.5" drive backplane.

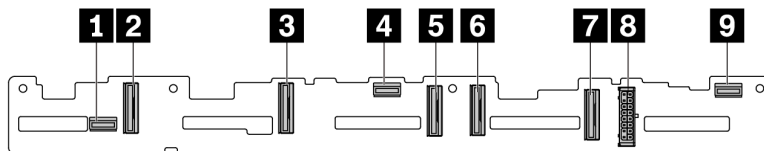


Figure 300. 10 x 2.5 AnyBay backplane

1 SAS 2	2 NVMe 8–9
3 NVMe 6–7	4 SAS 1
5 NVMe 4–5	6 NVMe 2–3
7 NVMe 0–1	8 Power
9 SAS 0	

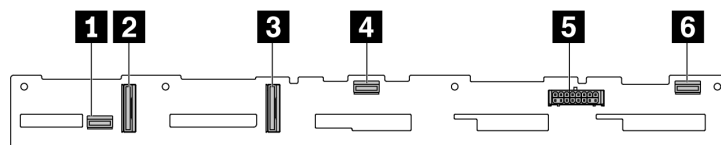


Figure 301. 6 x SAS/SATA + 4 x NVMe backplane

1 SAS 2	2 NVMe 2–3
3 NVMe 0–1	4 SAS 1
5 Power	6 SAS 0

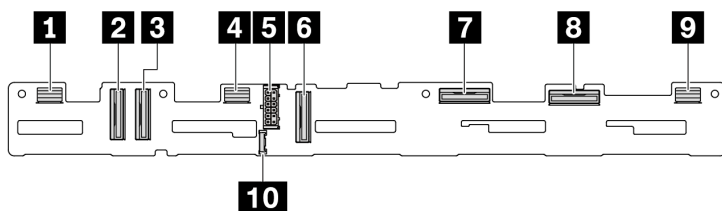


Figure 302. 10 x 2.5 AnyBay backplane (Gen 5)

1 SAS 8–9	2 NVMe 8–9
3 NVMe 6–7	4 SAS 4–7
5 Power	6 NVMe 4–5
7 NVMe 2–3	8 NVMe 0–1
9 SAS 0–3	10 Sideband connector

8 x 2.5" SAS/SATA backplane

See this section to locate the connectors on the 8 x 2.5" drive backplane.

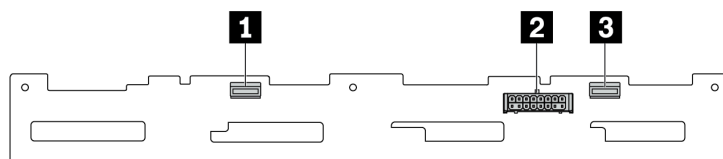


Figure 303. 8 x 2.5" SAS/SATA backplane

1 SAS 1	2 Power
3 SAS 0	

4 x 3.5" SAS/SATA/AnyBay backplane

See this section to locate the connectors on the 4 x 3.5" drive backplane.

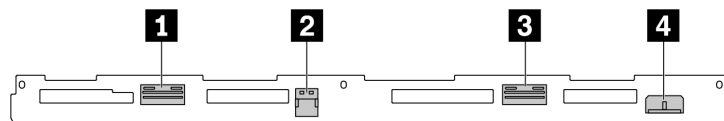


Figure 304. 4 x 3.5" AnyBay backplane

1 NVMe 2–3	2 SAS
3 NVMe 0–1	4 Power

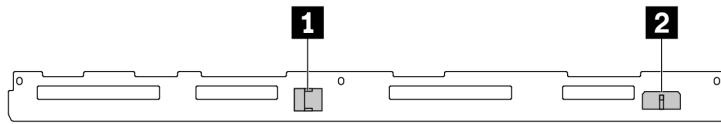


Figure 305. 4 x 3.5 SAS/SATA backplane

1 SAS	2 Power
--------------	----------------

4 x 2.5" SAS/SATA/NVMe/AnyBay backplane

See this section to locate the connectors on the 4 x 2.5" drive backplane.

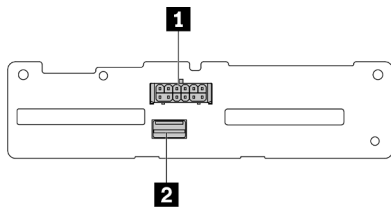


Figure 306. 4 x 2.5" SAS/SATA backplane

1 Power	2 SAS
----------------	--------------

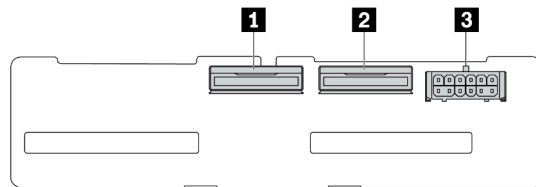


Figure 307. 4 x 2.5 NVMe backplane

1 NVMe 2-3	2 NVMe 0-1
3 Power	

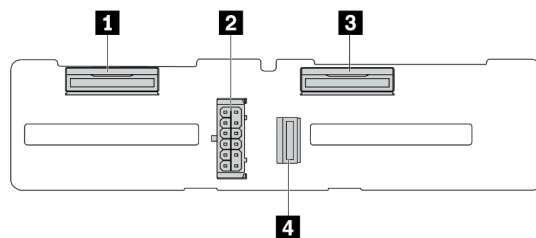
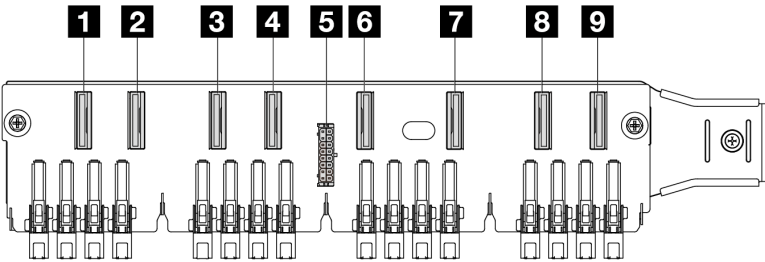


Figure 308. 4 x 2.5 AnyBay backplane

1 NVMe 2-3	2 Power
3 NVMe 0-1	4 SAS

16 x EDSFF backplane

See this section to locate the connectors on the 16 x EDSFF drive backplane.



1 EDSFF 0–1	2 EDSFF 2–3
3 EDSFF 4–5	4 EDSFF 6–7
5 Power	6 EDSFF 8–9
7 EDSFF 10–11	8 EDSFF 12–13
9 EDSFF 14–15	

Rear 7mm SAS/SATA/NVMe backplane

See this section to locate the connectors on the rear 7mm drive backplane.

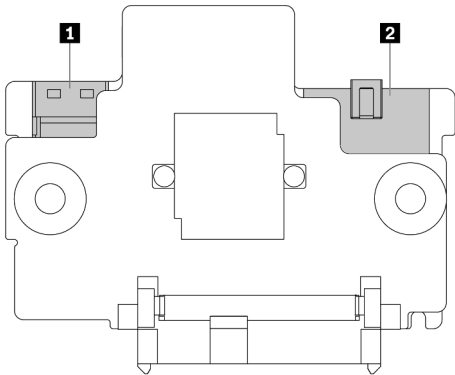


Figure 309. 7mm SAS/SATA/NVMe backplane (top + bottom)

1 Power	2 Signal
---------	----------

Rear 2 x 2.5" SAS/SATA/NVMe backplane

See this section to locate the connectors on the rear 2 x 2.5" drive backplane.

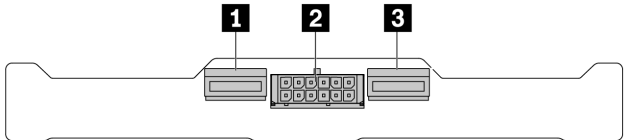


Figure 310. Rear 2 x 2.5" NVMe backplane

1 NVMe 1	2 Power
3 NVMe 0	

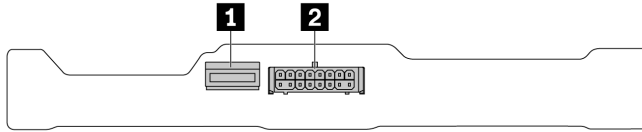


Figure 311. Rear 2 x 2.5 SAS/SATA backplane

1 SAS	2 Power
--------------	----------------

M.2 drive backplane

To locate the connectors on the M.2 drive backplanes, see [“M.2 backplane and M.2 drive replacement” on page 212](#) for details.

Backplane power cable routing

Use the section to understand the power cable routing for both front and rear drive backplanes.

- The backplanes your server supports require power connection. This section singles out the power connection from signal connection for better understanding.
- For the locations of backplane power connectors the processor board, see [“System-board-assembly connectors” on page 36](#) for details.
- For more information about backplanes supported and their connectors, see [“Drive backplane connectors” on page 326](#).

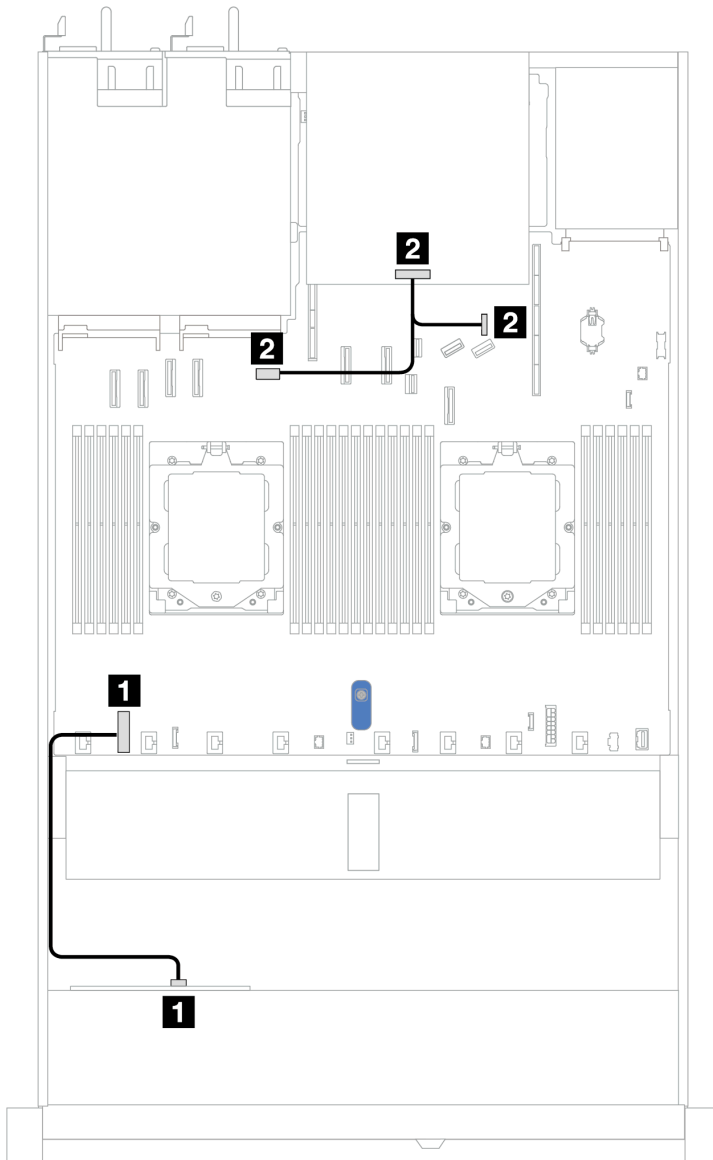


Figure 312. Backplane power cable connection

From	To
1 Power connector on the front drive backplane	1 Front backplane power connector on the processor board
2 Power connector on the rear drive backplane	<ul style="list-style-type: none"> 2 Left: GPU/7mm/Rear backplane power connector on the processor board 2 Right: 7mm/Rear backplane sideband connector on the processor board

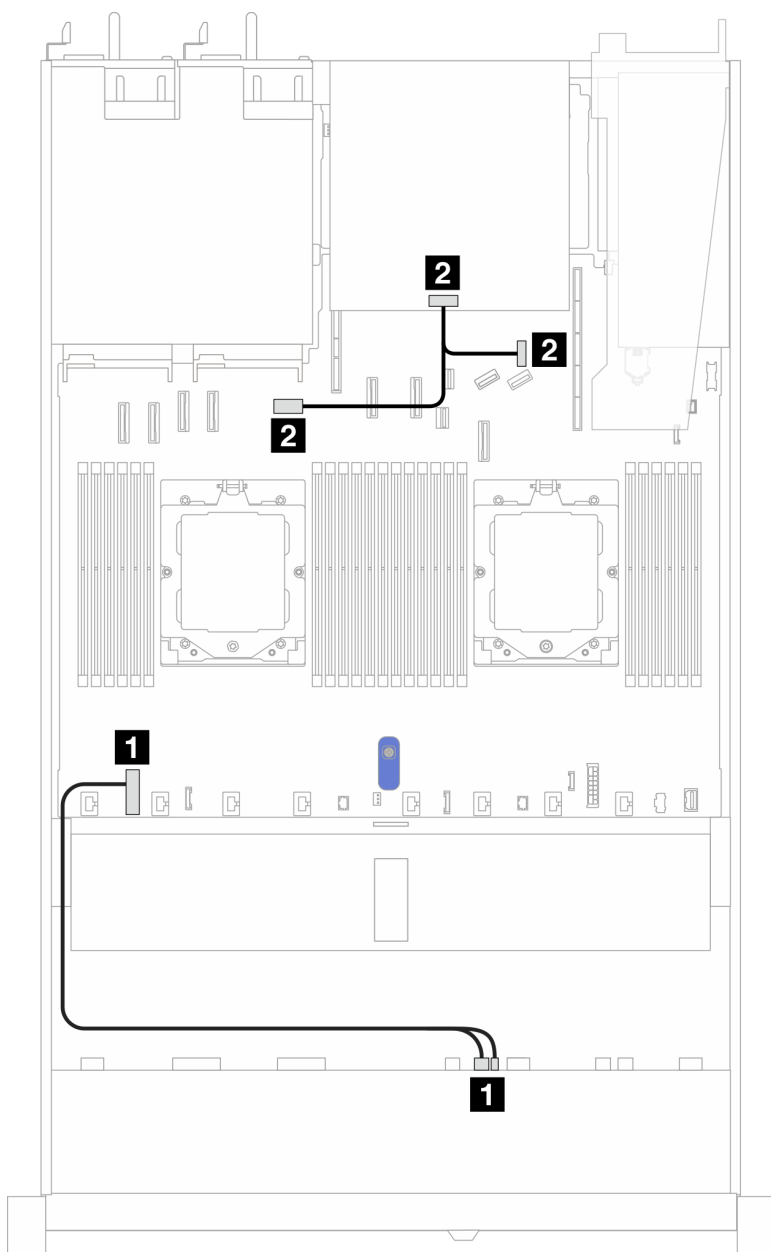


Figure 313. Backplane power cable connection (Gen 5)

From	To
1 Power connector and sideband connector on the front drive backplane	1 Front backplane power connector on the processor board
2 Power connector on the rear drive backplane	<ul style="list-style-type: none"> 2 Left: GPU/7mm/Rear backplane power connector on the processor board 2 Right: 7mm/Rear backplane sideband connector on the processor board

CFF RAID adapter

Use the section to understand the power cable and signal input cable routing for CFF RAID adapters.

Cable routing for CFF RAID adapters

- The following illustrations are for Gen 4 adapters. For Gen 3 adapters, the illustration might be slightly different.
- For the locations of connectors on CFF RAID adapters and the processor board, see “[System-board-assembly connectors](#)” on page 36 for details.
- The table below presents that how the power cables and MB input cables are connected with one and two processors installed. Find more connections in different configuration at “[Cable routing for backplane signals \(one processor\)](#)” on page 387 and “[Cable routing for backplane signals \(two processors\)](#)” on page 422.

Table 32. Cable routing for 8i or 16i CFF RAID adapters

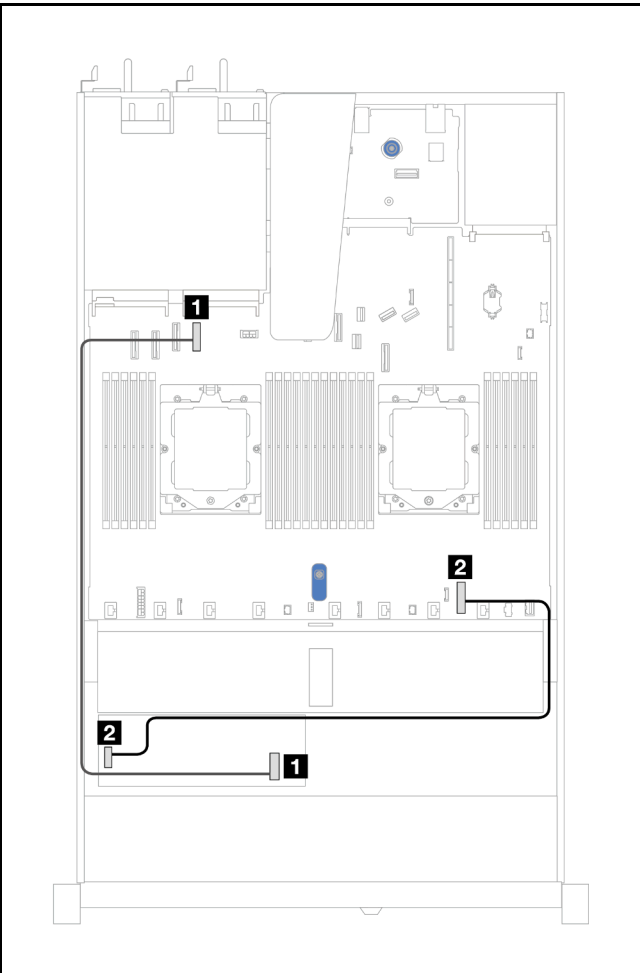
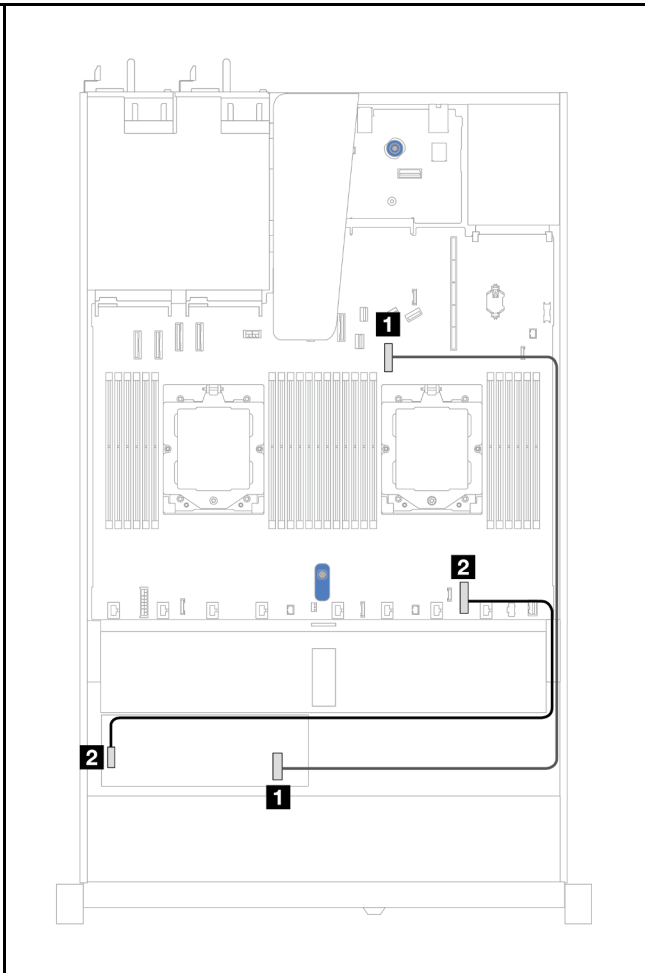
			
From	To	From	To

Table 32. Cable routing for 8i or 16i CFF RAID adapters (continued)

1 MB input connector of CFF RAID adapter	1 PCIe connector 4 of processor board	1 MB input connector of CFF RAID adapter	1 PCIe connector 7 of processor board
2 Power connector of CFF RAID adapter	2 Internal RAID power connector of processor board	2 Power connector of CFF RAID adapter	2 Internal RAID power connector of processor board

Front I/O module

Use the section to understand the cable routing for front I/O module.

Note: The illustration shows the cabling scenario for server models with 2.5" and 3.5" front drive bays. Location of each connector on the front of the server varies by models. For detailed location of front I/O components for different models, see "Front view" in *User Guide*.

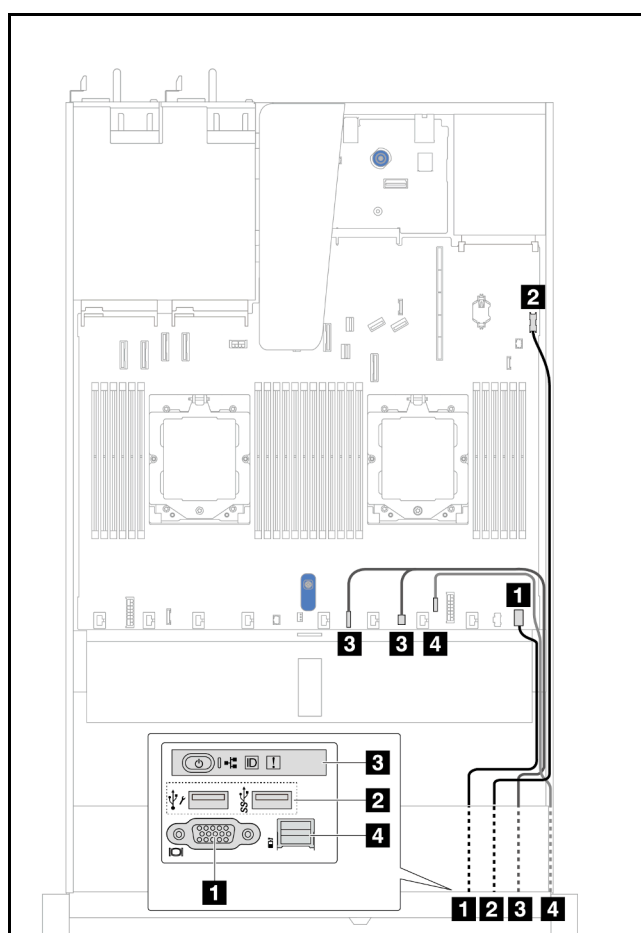


Figure 316. Cable routing for a front I/O module on 2.5" chassis

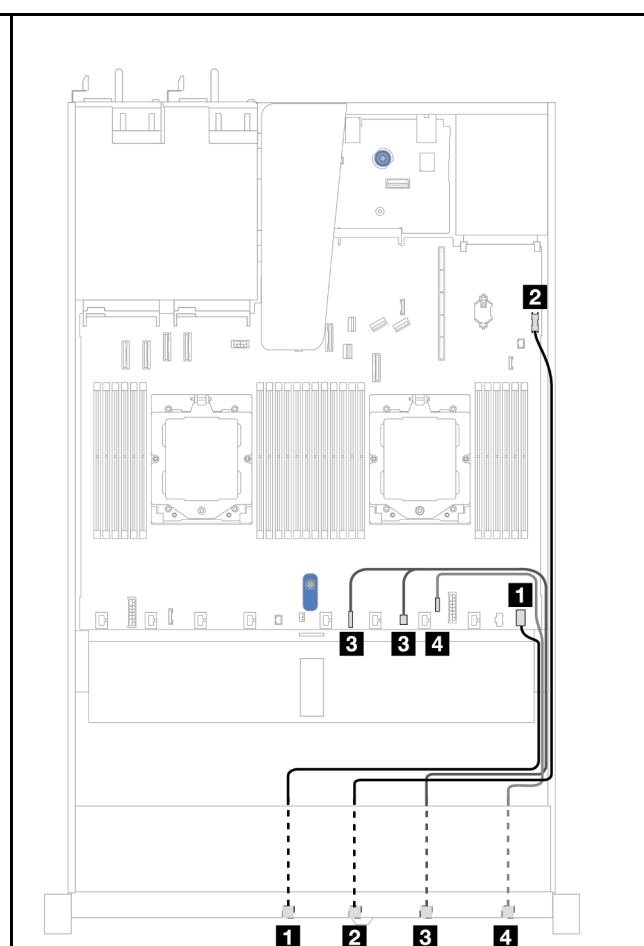


Figure 317. Cable routing for a front I/O module on 3.5" chassis

From	To	From	To
1 VGA connector	1 Front VGA connector on the processor board	1 VGA connector	1 Front VGA connector on the processor board
2 Front USB connector	2 Front USB connector on the processor board	2 Front USB connector	2 Front USB connector on the processor board

3 Front operator panel	3 FIO_Y cable connector and FIO connector on the processor board	3 Front operator panel	3 FIO_Y cable connector and FIO connector on the processor board
4 External diagnostics connector ^{Note}	4 External diagnostics connector on the processor board	4 External diagnostics connector	4 External diagnostics connector on the processor board
Note: The external diagnostics connector is not available on certain front I/O modules of 10 x 2.5" server models.			

Front riser assembly

Use the section to understand the cable routing for front riser assembly.

Gen4 riser card

Use the section to understand the cable routing for front riser assembly (Gen4).

- For the locations of front PCIe adapter connector on the processor board, see [“System-board-assembly connectors” on page 36](#) for details.
- The following illustrations and tables list the front PCIe adapters supported:
 - [“Cable routing with one x8 PCIe riser card and one x16 PCIe riser card” on page 336](#)
 - [“Cable routing with two x8 PCIe riser cards” on page 337](#)
 - [“Cable routing with one x16 PCIe riser card” on page 338](#)

Cable routing with one x8 PCIe riser card and one x16 PCIe riser card

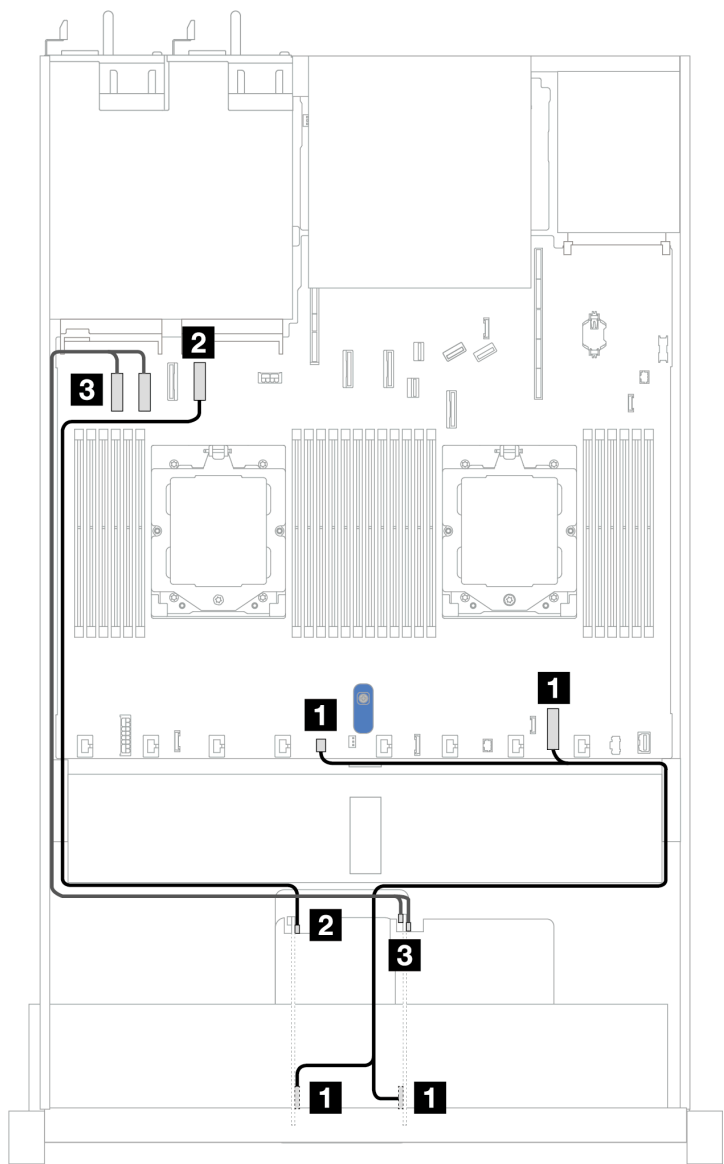


Figure 318. Cable routing with one x8 PCIe riser card and one x16 PCIe riser card

From	To
1 Power connectors on Risers 3 and 4	1 Internal RAID power connector and pump 2 connector on the processor board
2 MCIO 1 connector on Riser 3	2 PCIe connector 4 on the processor board
3 MCIO 1 and MCIO 2 connectors on Riser 4	3 PCIe connectors 1 and 2 on the processor board

Cable routing with two x8 PCIe riser cards

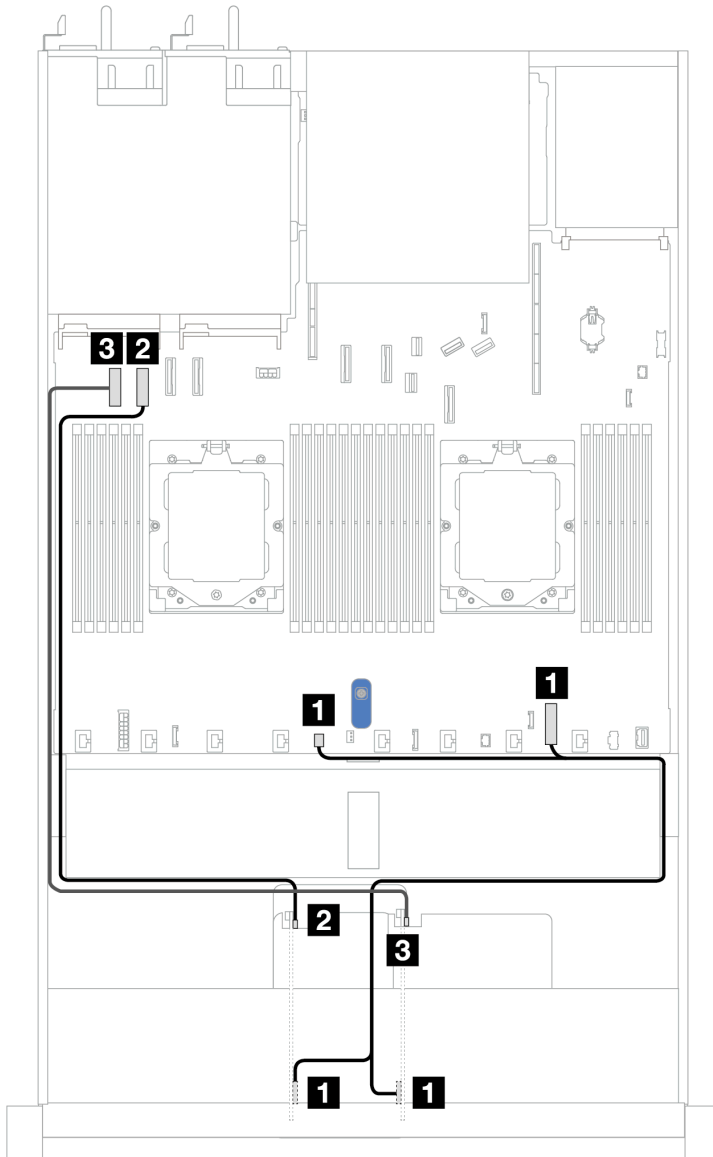


Figure 319. Cable routing with two x8 PCIe riser cards

From	To
1 Power connectors on Risers 3 and 4	1 Internal RAID power connector and pump 2 connector on the processor board
2 MCIO 1 connector on Riser 3	2 PCIe connector 2 on the processor board
3 MCIO 1 connector on Riser 4	3 PCIe connector 1 on the processor board

Cable routing with one x16 PCIe riser card

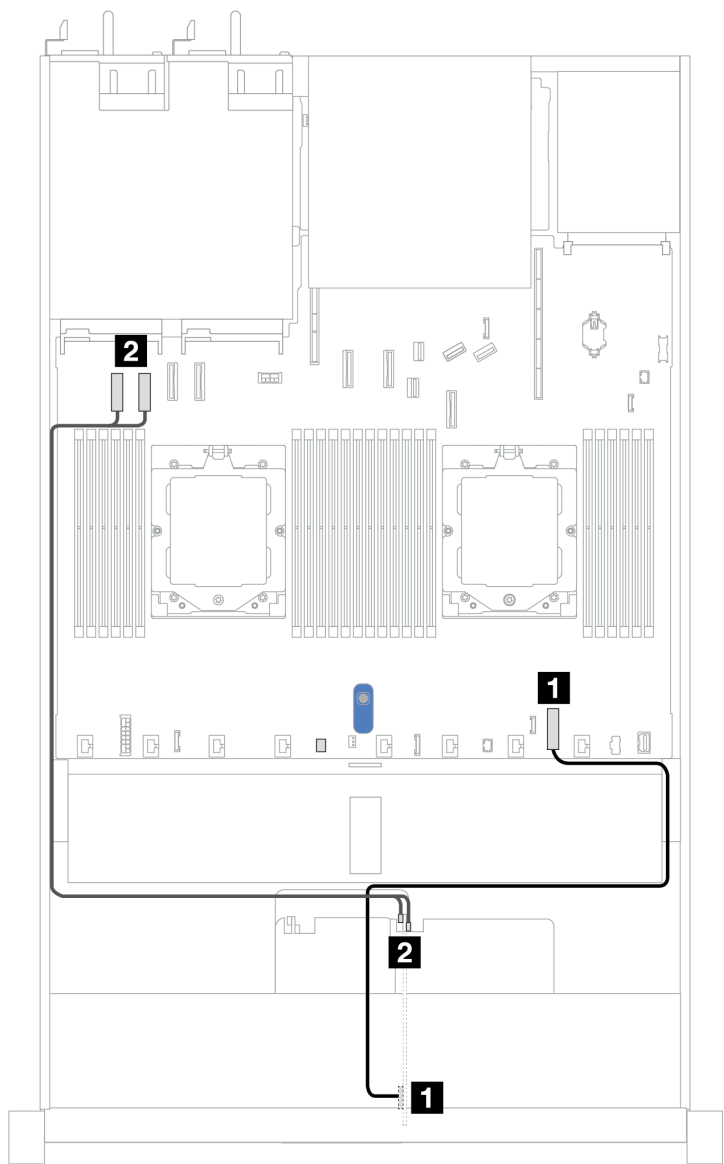


Figure 320. Cable routing with one x16 PCIe riser card

From	To
1 Power connector on Riser 4	1 Internal RAID power connector on the processor board
2 MCIO 1 and MCIO 2 connectors on Riser 4	2 PCIe connectors 1 and 2 on the processor board

Gen5 riser card

Use the section to understand the cable routing for front riser assembly (Gen5).

- For the locations of front PCIe adapter connector on the processor board, see [“System-board-assembly connectors” on page 36](#) for details.
- The following illustrations and tables list the front PCIe adapters supported:

- “Cable routing with one x8 PCIe riser card and one x16 PCIe riser card” on page 339
- “Cable routing with two x8 PCIe riser cards” on page 340
- “Cable routing with one x16 PCIe riser card” on page 341

Cable routing with one x8 PCIe riser card and one x16 PCIe riser card

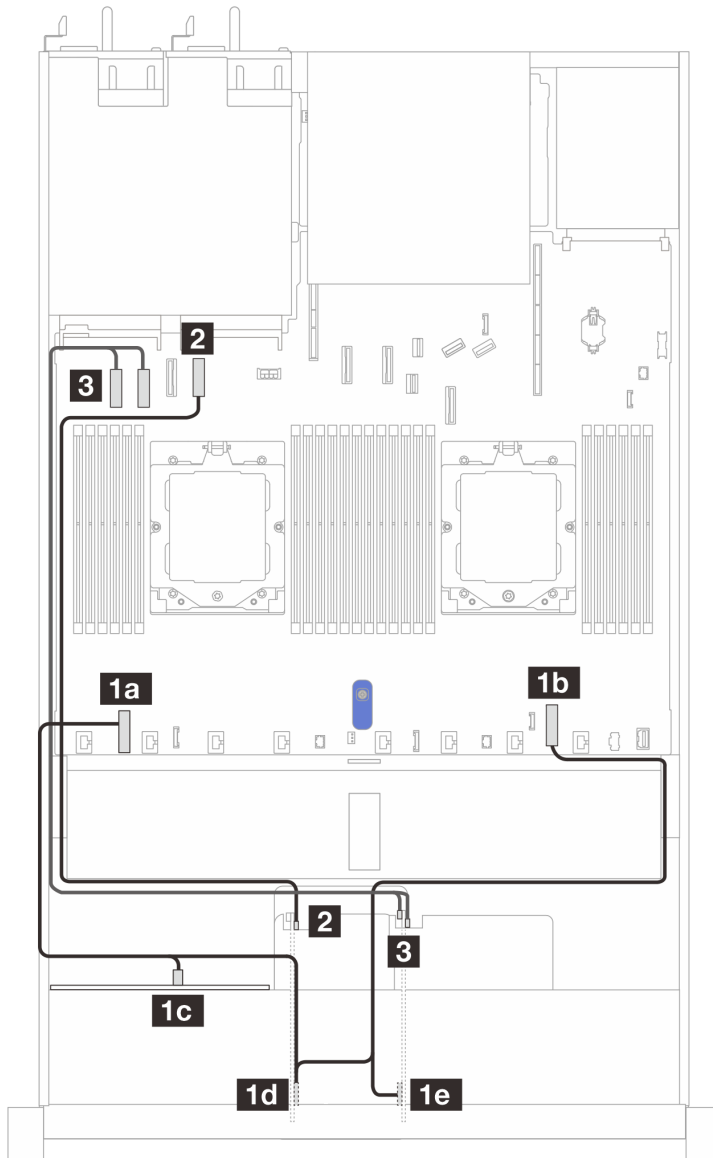


Figure 321. Cable routing with one x8 PCIe riser card and one x16 PCIe riser card

From	To
1 Power connectors on Risers 3 and 4	1 Internal RAID power connector and backplane power connector on the processor board, and power connector on the front backplane
2 MCIO 1 connector on Riser 3	2 PCIe connector 4 on the processor board
3 MCIO 1 and MCIO 2 connectors on Riser 4	3 PCIe connectors 1 and 2 on the processor board

Cable routing with two x8 PCIe riser cards

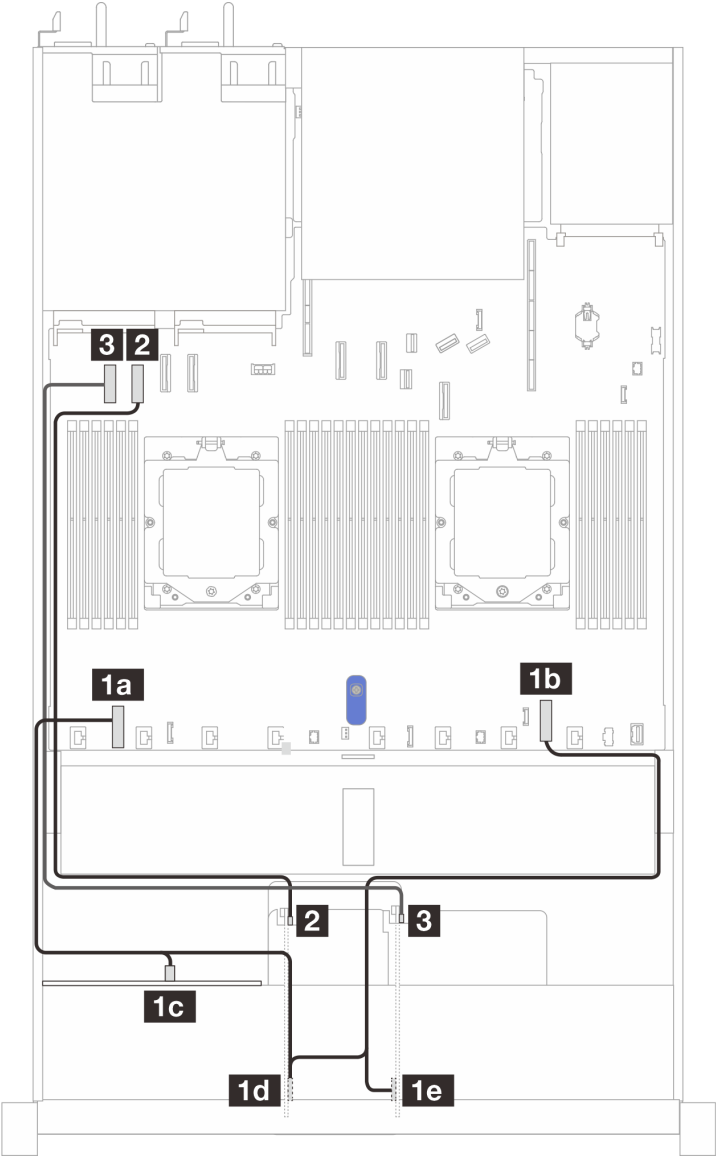


Figure 322. Cable routing with two x8 PCIe riser cards

From	To
1 Power connectors on Risers 3 and 4	1 Internal RAID power connector and backplane power connector on the processor board, and power connector on the front backplane
2 MCIO 1 connector on Riser 3	2 PCIe connector 2 on the processor board
3 MCIO 1 connector on Riser 4	3 PCIe connectors 1 and 2 on the processor board

Cable routing with one x16 PCIe riser card

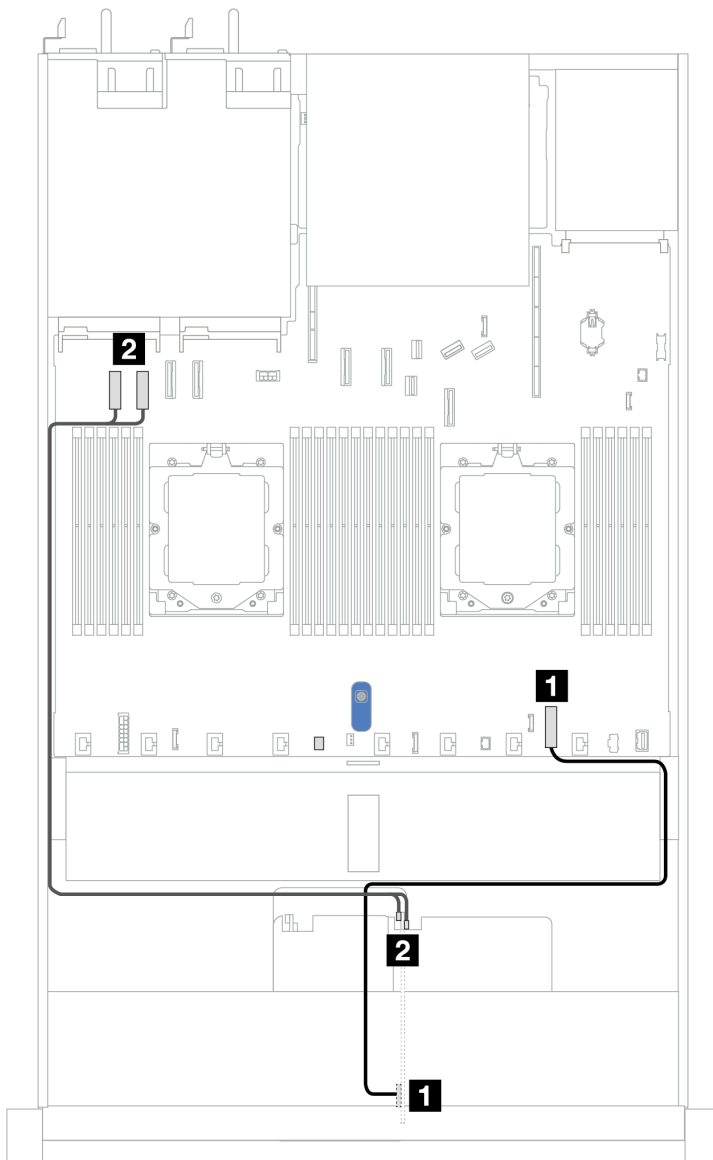


Figure 323. Cable routing with one x16 PCIe riser card

From	To
1 Power connector on Riser 4	1 Internal RAID power connector on the processor board
2 MCIO 1 and MCIO 2 connectors on Riser 4	2 PCIe connectors 1 and 2 on the processor board

GPU adapter (optional)

Use the section to understand the cable routing for GPU adapters. The GPU(s) your server support may not need to connect power cables.

For the locations of GPU power connector on the processor board, see [“System-board-assembly connectors” on page 36](#) for details.

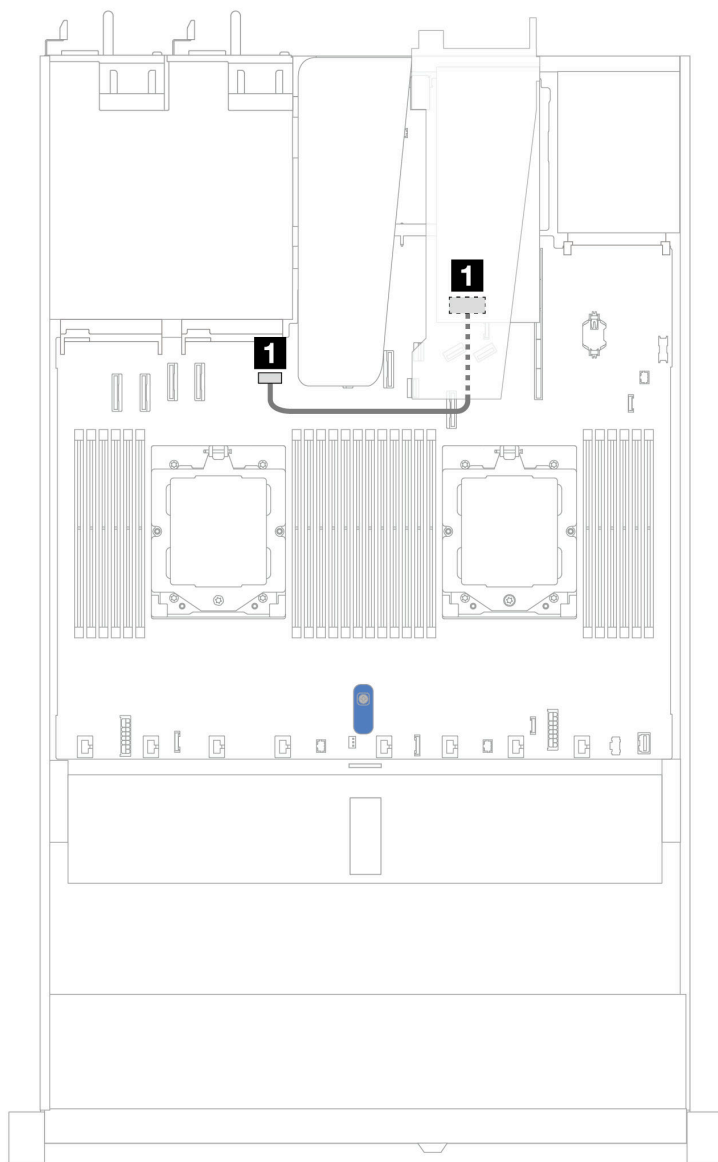


Figure 324. GPU adapter cable routing

From	To
1 GPU power connector	1 GPU power connector on the processor board

Intrusion switch

Use the section to understand the cable routing for the intrusion switch.

For the locations of intrusion switch connector on the processor board, see [“System-board-assembly connectors” on page 36](#) for details.

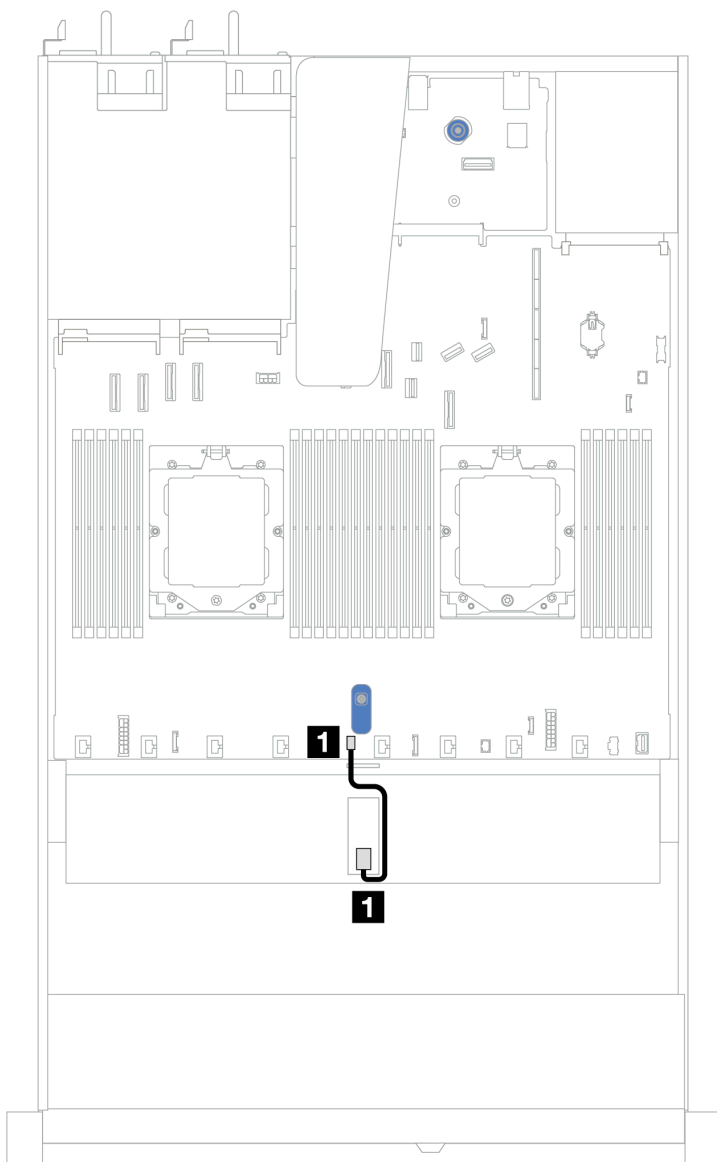


Figure 325. Intrusion switch cable routing

From	To
1 Intrusion switch cable	1 Intrusion switch connector on the processor board

Management NIC adapter

Use the section to understand the cable routing for the ThinkSystem V3 Management NIC Adapter Kit (management NIC adapter).

For the locations of intrusion switch connector on the processor board, see [“System-board-assembly connectors” on page 36](#) for details.

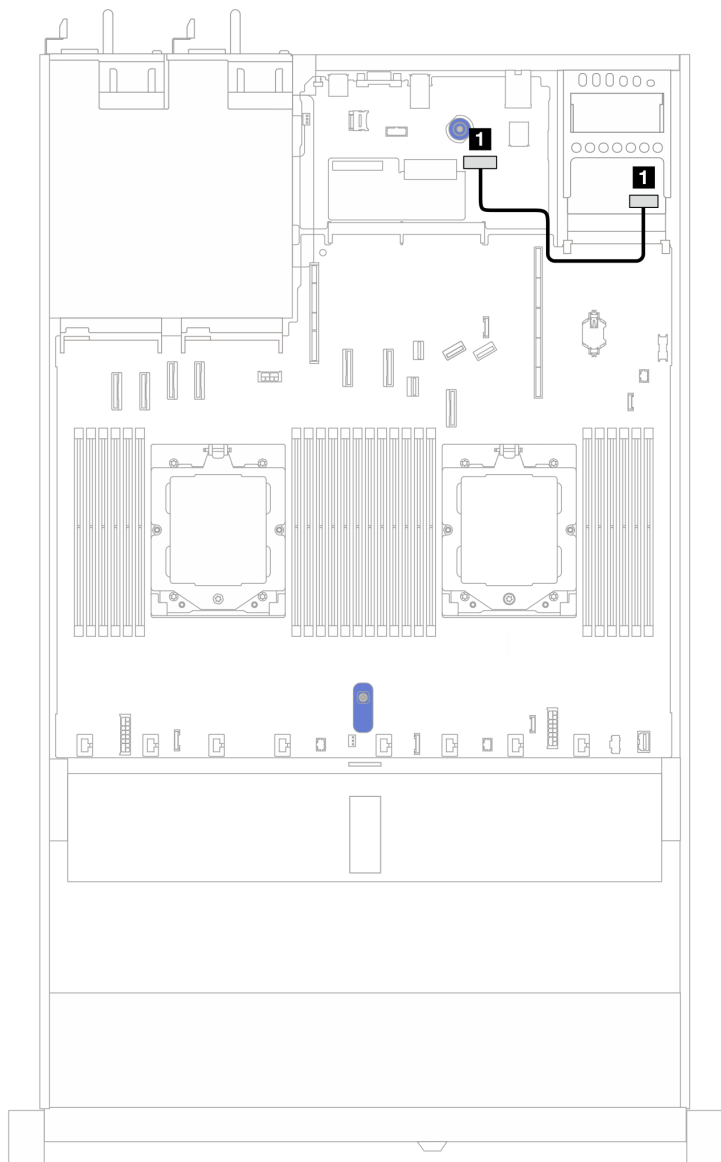


Figure 326. Management NIC adapter cable routing

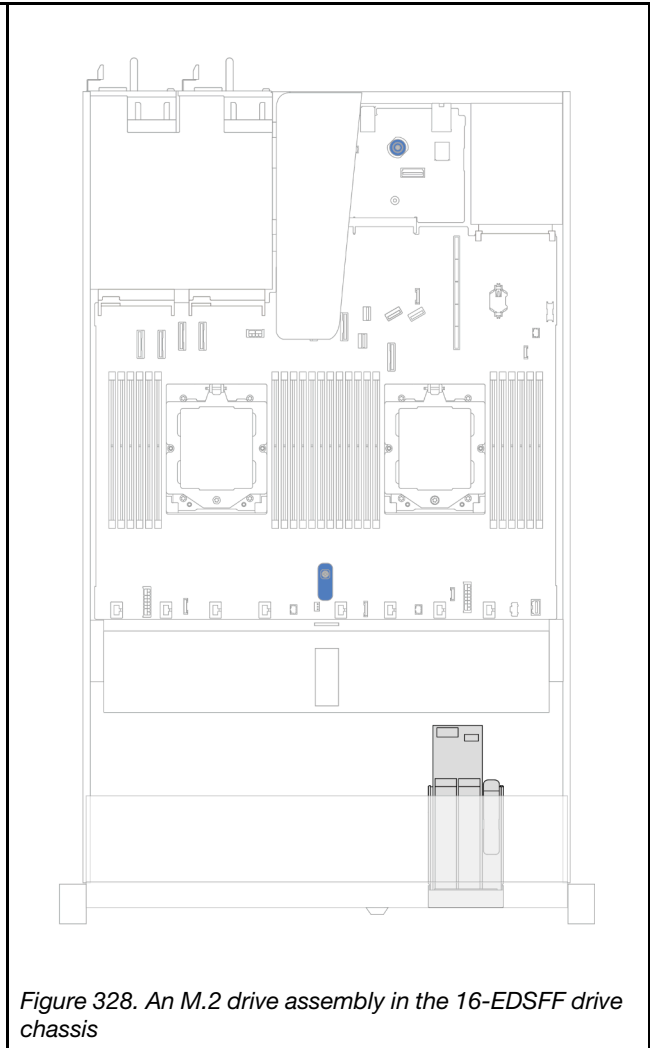
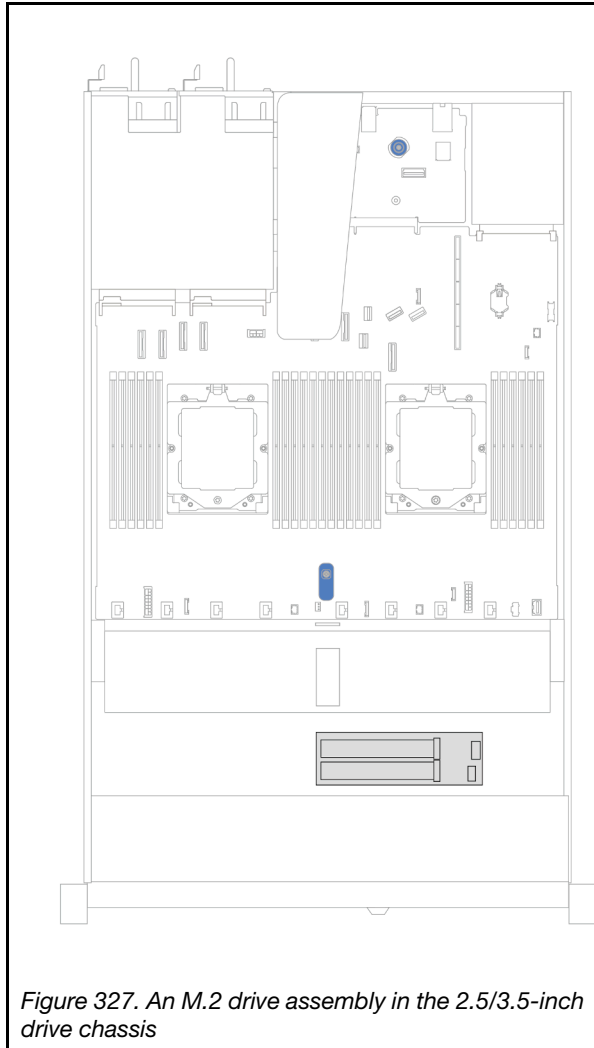
From	To
1 Connector on management NIC adapter	1 Second management Ethernet connector on the system I/O board

M.2 drive backplane

This section provides cable routing information for the M.2 drives. Your server supports M.2 SATA/NVMe drive backplanes.

Locations of M.2 drive assemblies

The locations of M.2 drive assemblies vary in different configuration. The server has two locations for M.2 drive assemblies.



Cable routing of the M.2 drive backplanes

- For the locations of M.2 connectors on the backplanes and the processor board, see [“M.2 backplane and M.2 drive replacement”](#) on page 212 and [“System-board-assembly connectors”](#) on page 36 for details.
- The following illustrations and tables list the M.2 drive backplanes supported:
 - [“M.2 x4 non-RAID SATA/NVMe 2-bay backplanes”](#) on page 346
 - [“M.2 x1 RAID NVMe 2-bay backplanes”](#) on page 347
 - [“M.2 RAID SATA/NVMe 2-bay backplanes”](#) on page 348
 - [“M.2 backplane to SFF RAID adapters”](#) on page 348

M.2 x4 non-RAID SATA/NVMe 2-bay backplanes

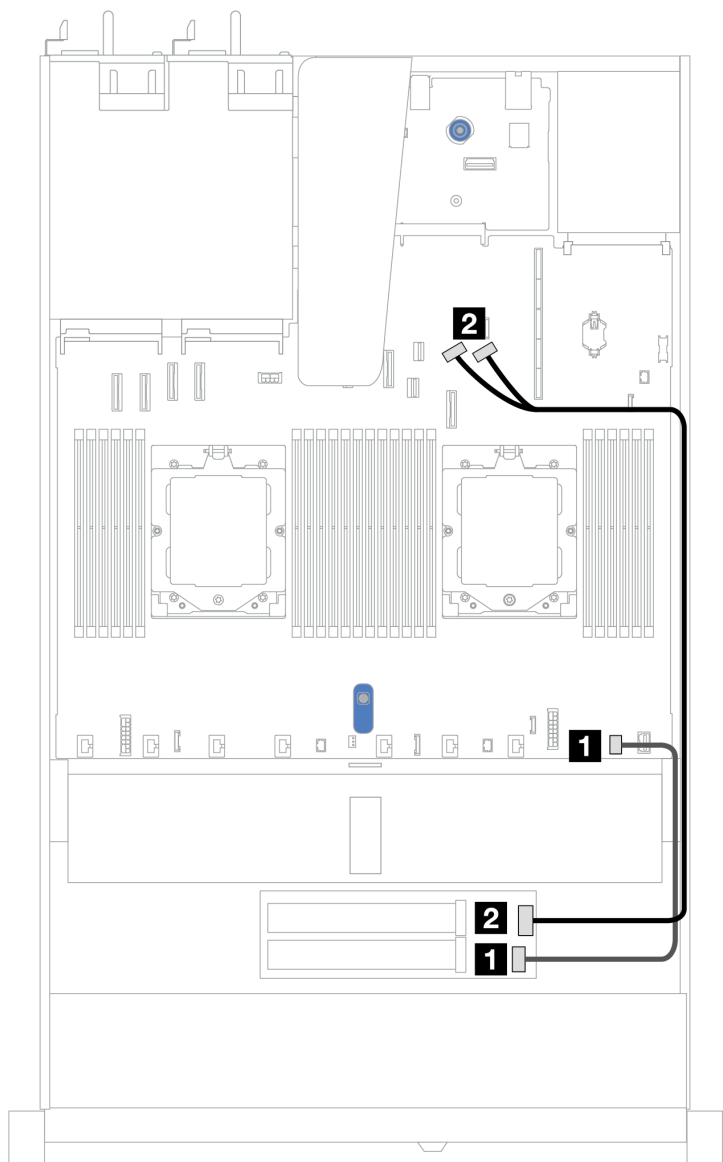


Figure 329. Cable routing for M.2 x4 non-RAID SATA/NVMe 2-bay backplanes

From	To
1 M.2 power connector	1 M.2 power connector on the processor board
2 M.2 signal connector	2 PCIe connectors 8 and 9 on the processor board

M.2 x1 RAID NVMe 2-bay backplanes

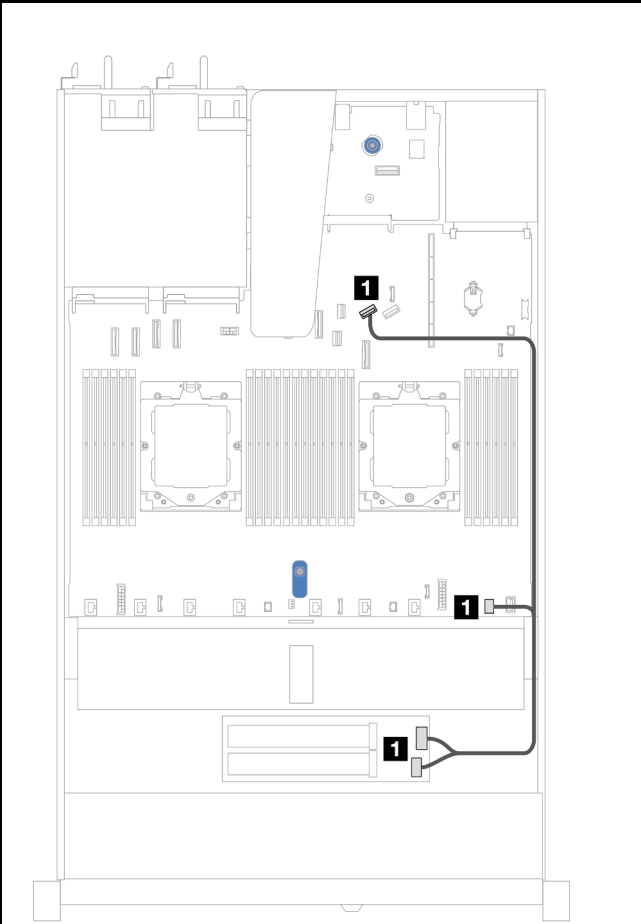


Figure 330. M.2 x1 RAID NVMe 2-bay configuration

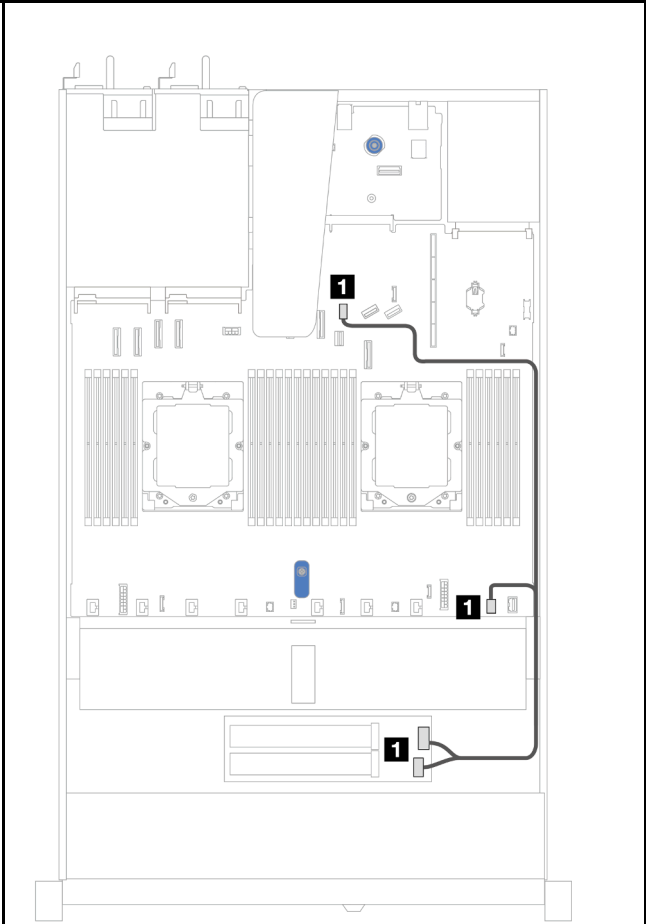


Figure 331. M.2 x1 RAID NVMe 2-bay configuration

From	To	From	To
1 M.2 signal connector and power connector	1 PCIe connector 8 and M.2 power connector on the processor board	1 M.2 signal connector and power connector	1 M.2 signal connector and M.2 power connector on the processor board

M.2 RAID SATA/NVME 2-bay backplanes

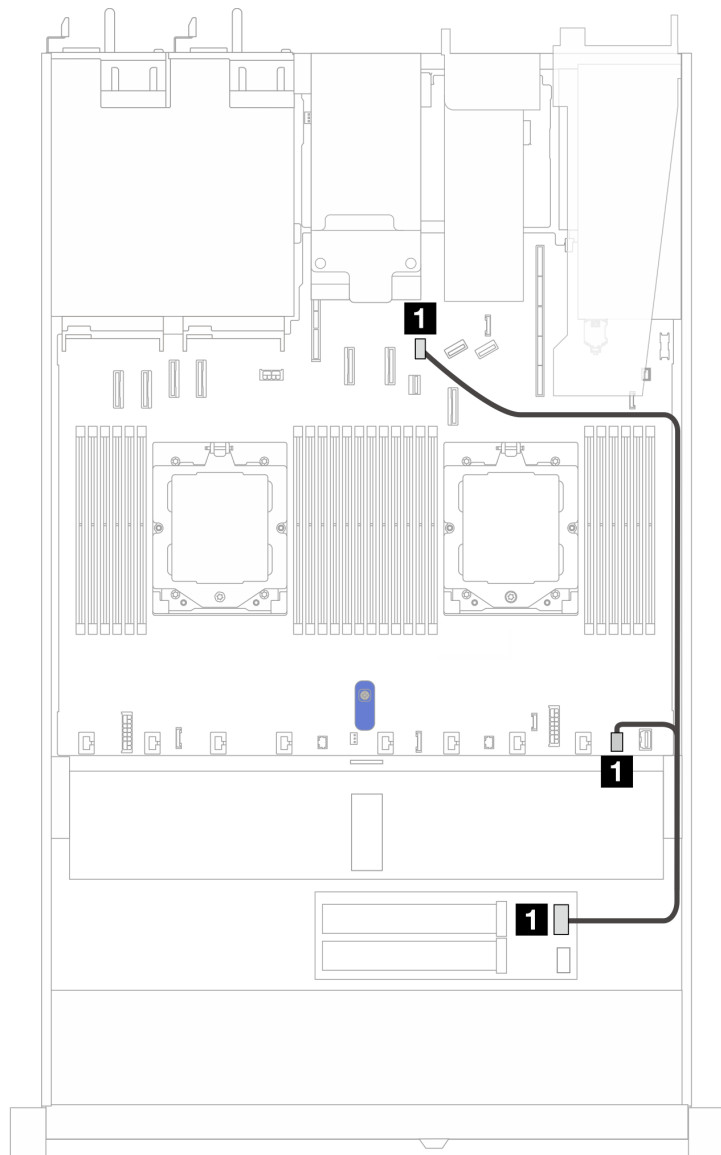


Figure 332. Cable routing for M.2 RAID SATA/NVME 2-bay backplanes

From	To
1 M.2 backplane	1 M.2 signal connector and M.2 power connector on the processor board

M.2 backplane to SFF RAID adapters

Notes: This cable routing is only applicable to the following backplanes:

- M.2 x4 non-RAID SATA/NVMe 2-bay backplanes
- M.2 x1 RAID NVMe 2-bay backplanes

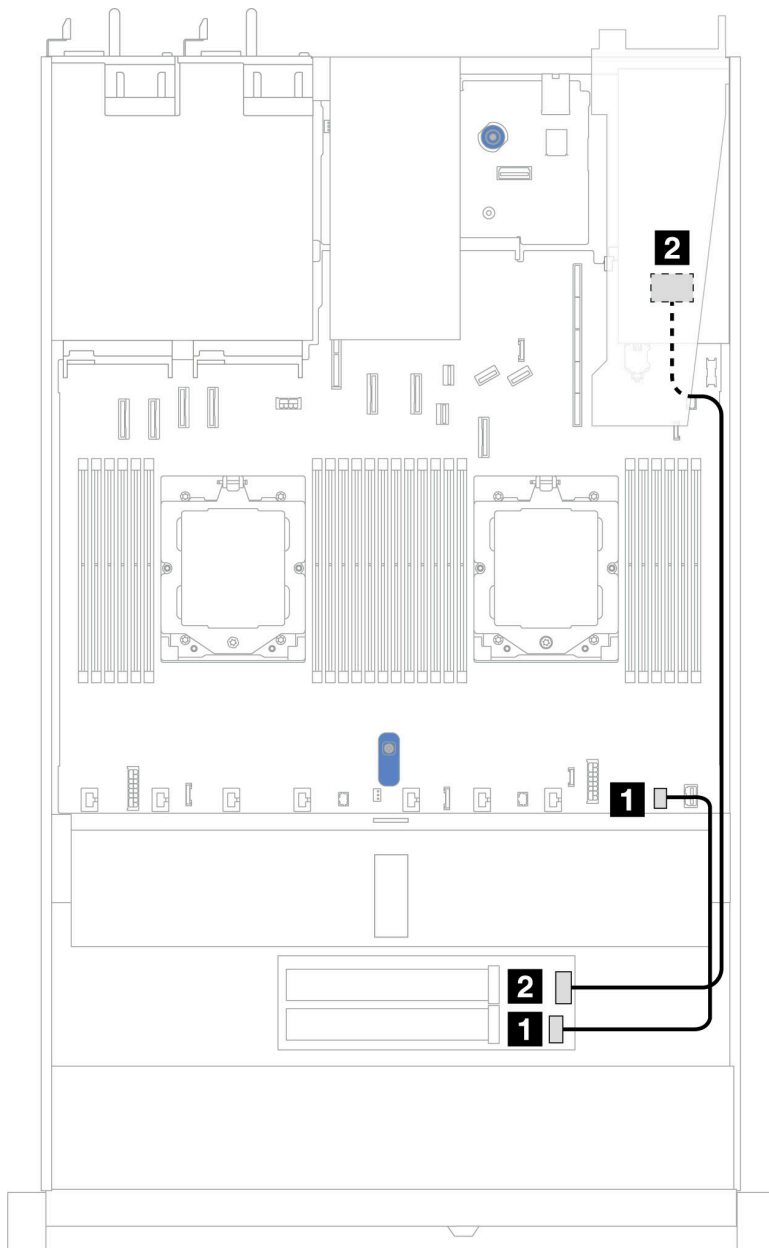


Figure 333. Cable routing for M.2 backplane to an 8i SFF RAID adapter (Gen 3 or Gen 4)

From	To
1 M.2 power connector	1 M.2 power connector on the processor board
2 M.2 signal connector	2 SFF RAID connector <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0

OCP interposer

Use the section to understand the cable routing for OCP interposers.

For the locations of OCP interposer connector on the processor board, see [“System-board-assembly connectors” on page 36](#) for details.

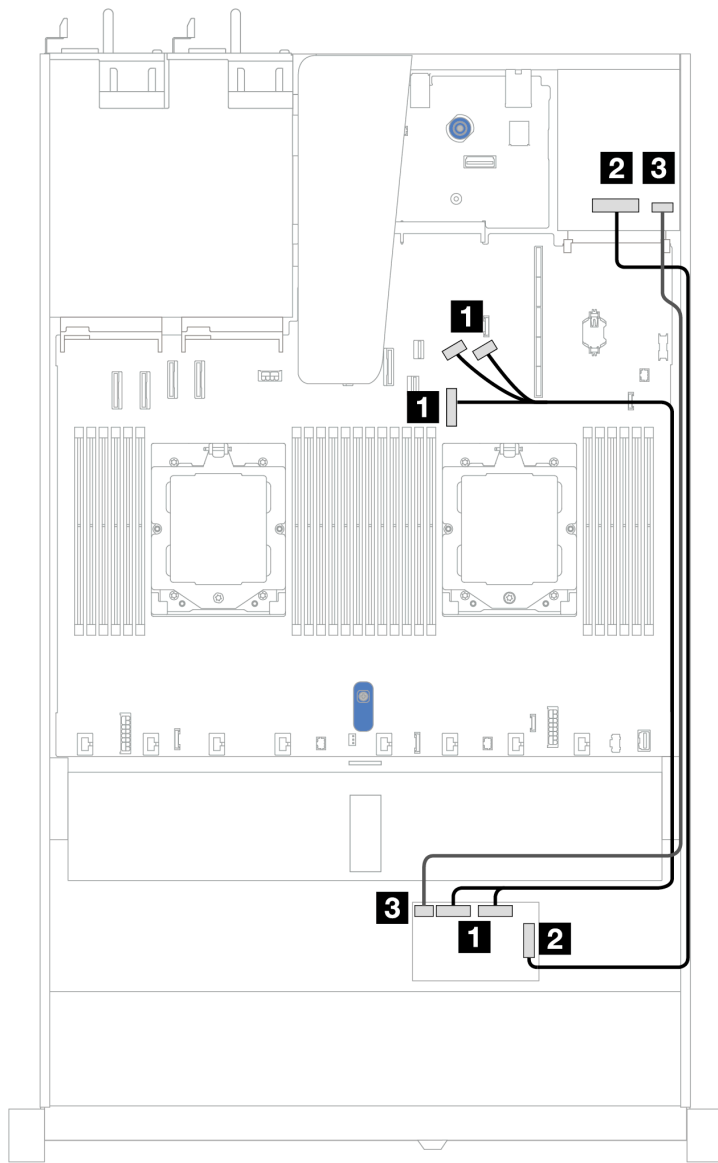


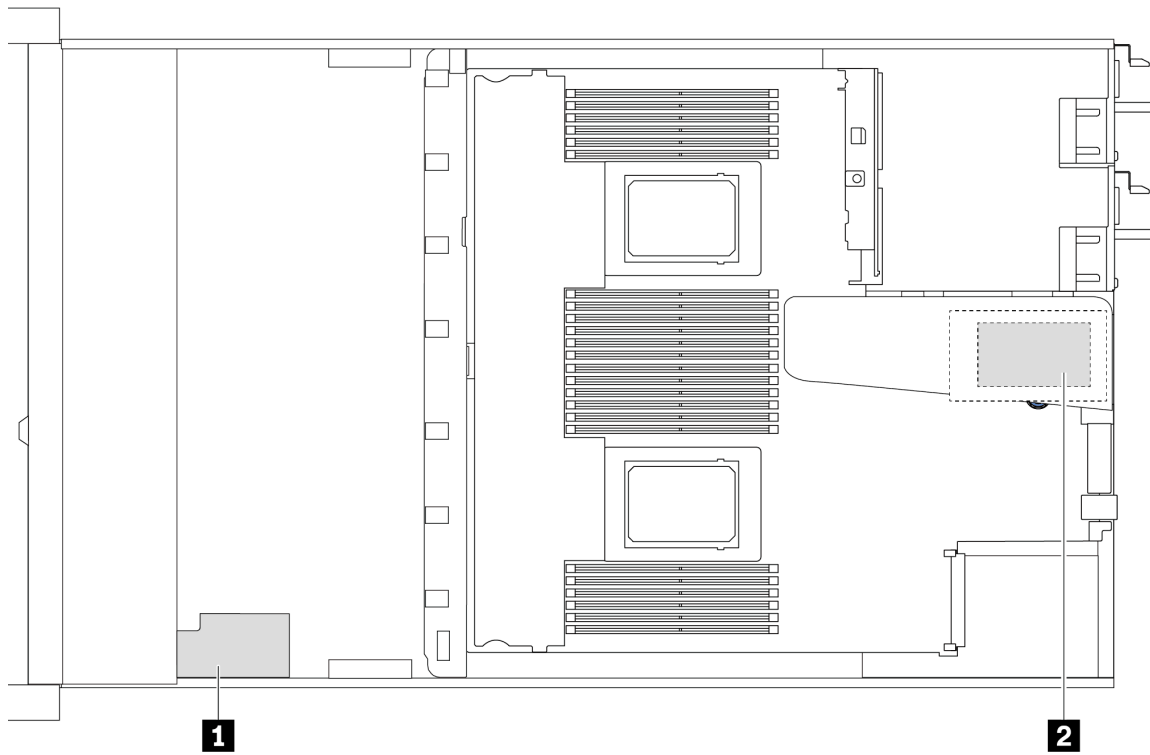
Figure 334. OCP interposer cable routing

From	To
1 Front OCP interposer card: MCIO 1, MCIO 2	1 Onboard: PCIe connectors 7, 8, and 9
2 Front OCP interposer card: F-SWIFT	2 Rear OCP interposer card: R-SWIFT
3 Front OCP interposer card: PWR	3 Rear OCP interposer card: PWR

RAID flash power modules

Use the section to understand the cable routing for RAID flash power modules.

RAID flash power modules in the chassis



No.	Location	Scenario
1	RAID flash power module on the chassis	2.5" chassis installed with a performance heat sink
2	RAID flash power module on riser 1 slot	<ul style="list-style-type: none">3.5" chassis installed with a performance heat sink2.5" chassis installed with the Lenovo Neptune Liquid to Air Module

Cable routing of the RAID flash power modules

The following illustrations show the cable routing of the RAID flash power modules on different locations:

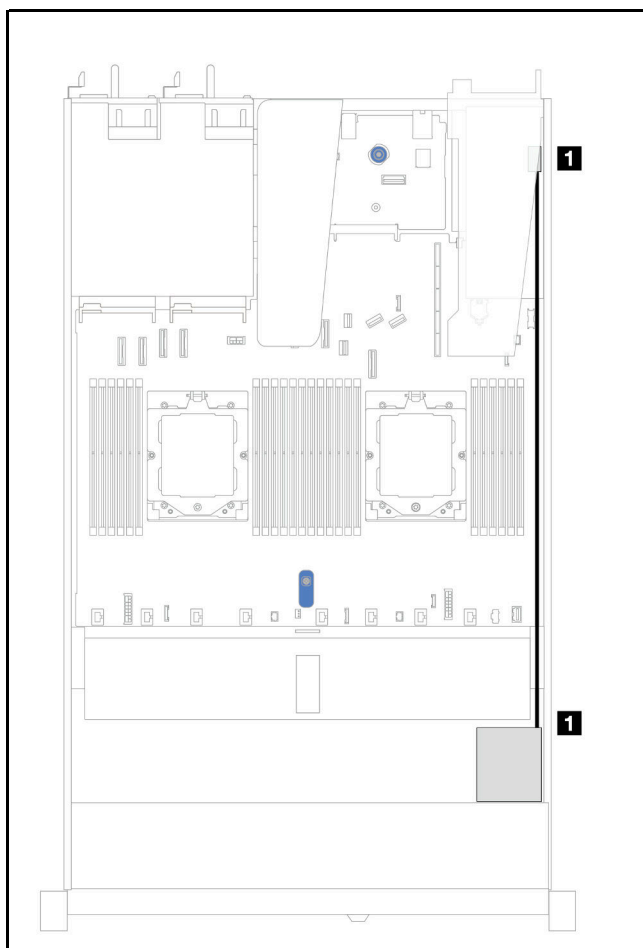


Figure 335. On the chassis

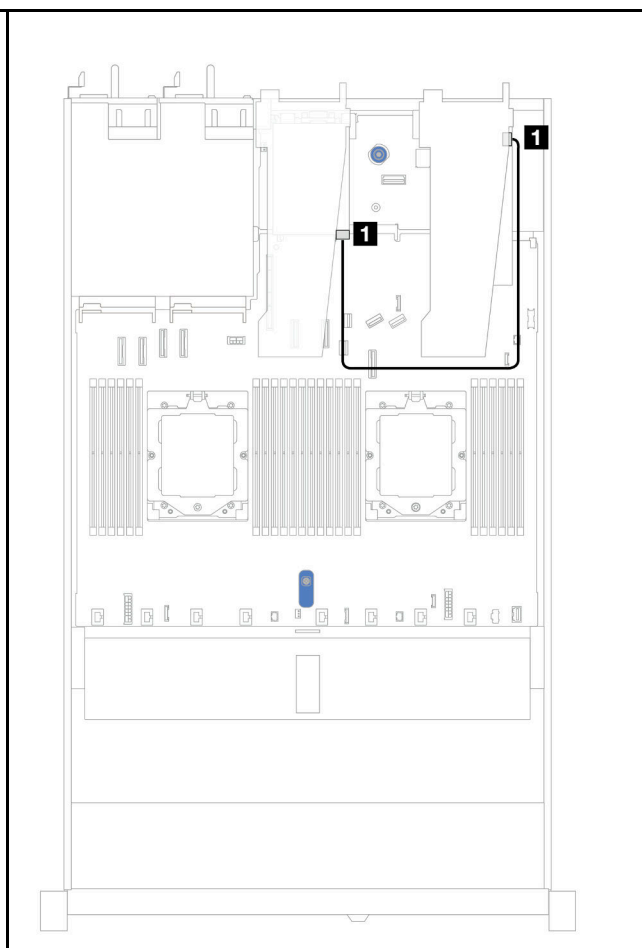


Figure 336. On riser 1 slot

From	To	From	To
1 RAID flash power module on the chassis	1 RAID flash power port on the RAID/HBA adapter	1 RAID flash power module on the PCIe slot 1 on riser 1 assembly	1 RAID flash power port on the RAID/HBA adapter

An extension cable is provided for each RAID flash power module for connection. Connect the RAID flash power module cable to the RAID flash power module connector on the corresponding RAID adapter as shown.

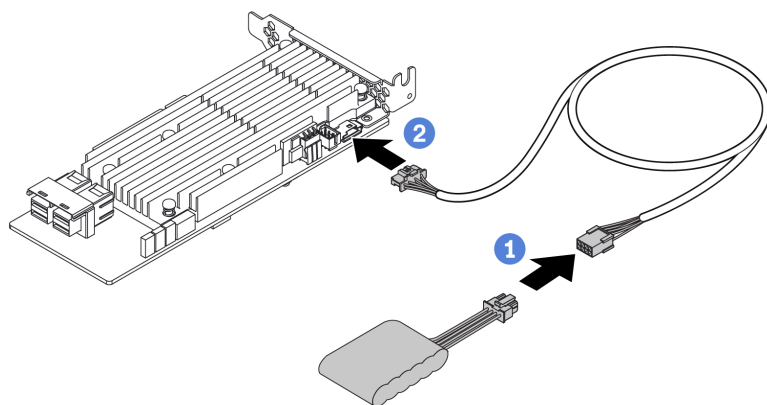


Figure 337. Power cable routing for RAID flash power module

Rear NVMe/SAS/SATA drive backplane

Use this section to understand the cable routing of rear NVMe/SAS/SATA backplanes with both one and two processors installed.

- The onboard connection of rear NVMe/SAS/SATA drive backplane are different based on whether one or two processors installed.
- The following illustrations and tables list the rear NVMe/SAS/SATA drive backplanes supported:
 - [“Rear 2 x 2.5” NVMe drive backplane” on page 354](#)
 - [“Rear 2 x 2.5” SAS/SATA drive backplane” on page 355](#)

Rear 2 x 2.5" NVMe drive backplane

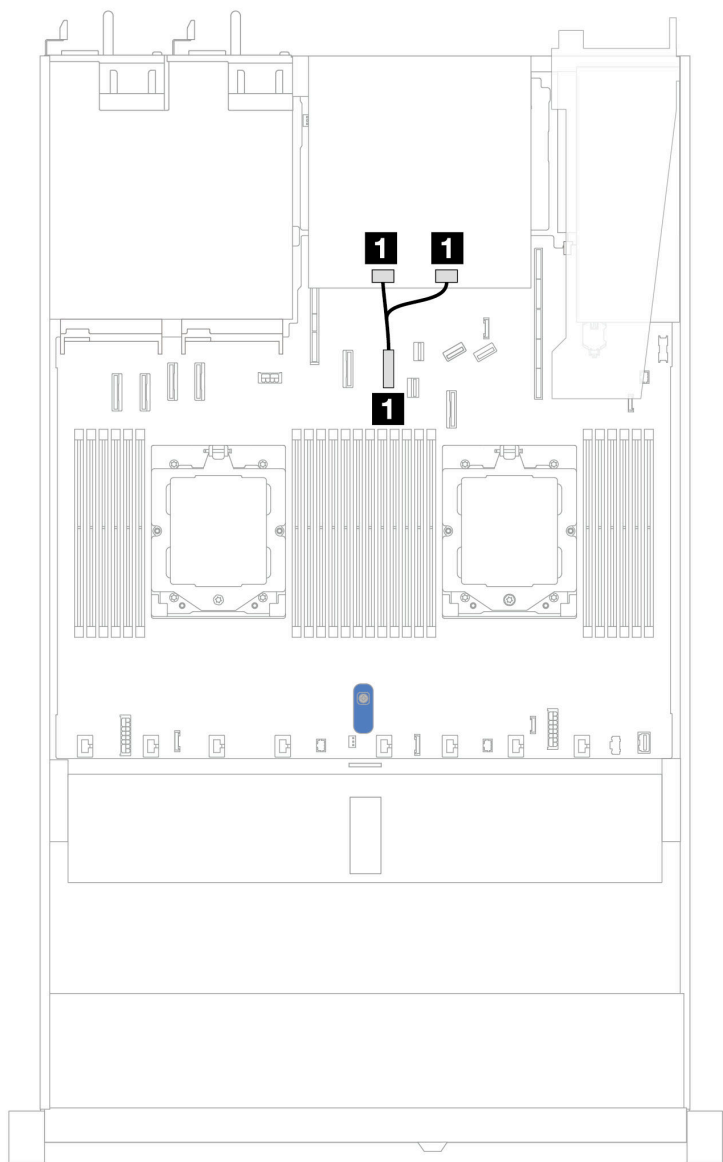


Figure 338. Rear 2 x 2.5" NVMe drive backplane cable routing with two processors installed

From	To
1 NVMe 0 connector and NVMe 1 connector on the rear backplane	1 PCIe connector 6 on the processor board

Rear 2 x 2.5" SAS/SATA drive backplane

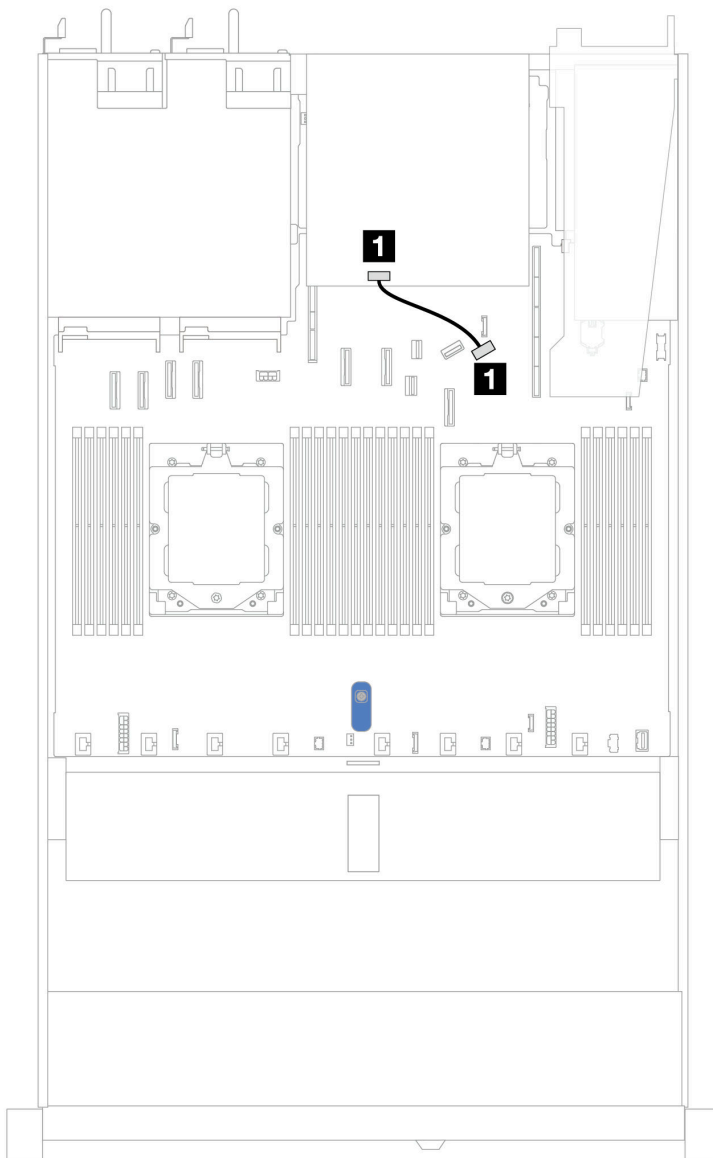


Figure 339. Rear 2 x 2.5" SAS/SATA drive backplane cable routing with one processor or two processors installed

From	To
1 SAS connector on the rear backplane	1 PCIe connector 9 on the processor board

7mm drive backplane

This section provides cable routing information for the 7mm drives.

For the locations of 7mm drive connectors on the processor board, see [“System-board-assembly connectors” on page 36](#) for details.

- [“7mm non-RAID SATA/NVMe 2-bay backplanes” on page 356](#)
- [“7mm RAID NVMe 2-bay backplanes” on page 357](#)

- “7mm RAID SATA/NVMe 2-bay backplanes” on page 358
- “7mm SATA/NVMe drives to SFF RAID adapter” on page 358

7mm non-RAID SATA/NVMe 2-bay backplanes

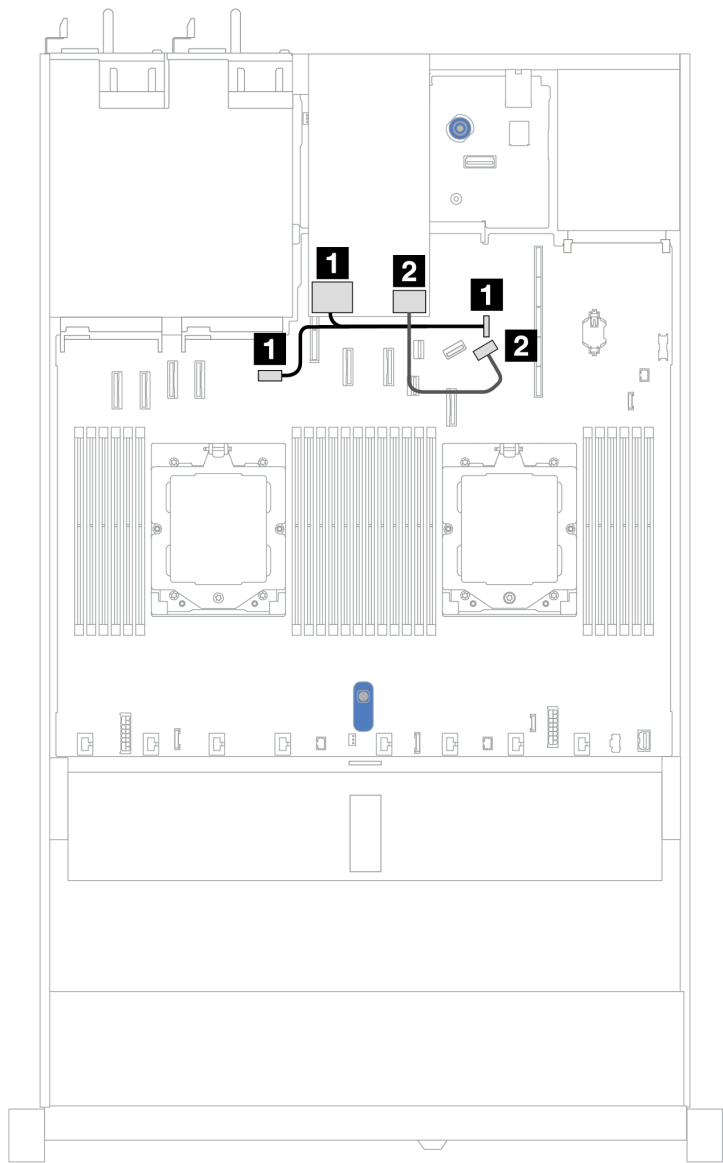


Figure 340. Cable routing for 7mm non-RAID SATA/NVMe 2-bay backplanes

From	To
1 Power connector on the 7mm drive backplane	<ul style="list-style-type: none"> 1 Left: GPU/7mm/Rear backplane power connector on the processor board 1 Right: 7mm/Rear backplane sideband connector on the processor board
2 Signal connector on the 7mm drive backplane	2 PCIe connector 9 on the processor board

7mm RAID NVMe 2-bay backplanes

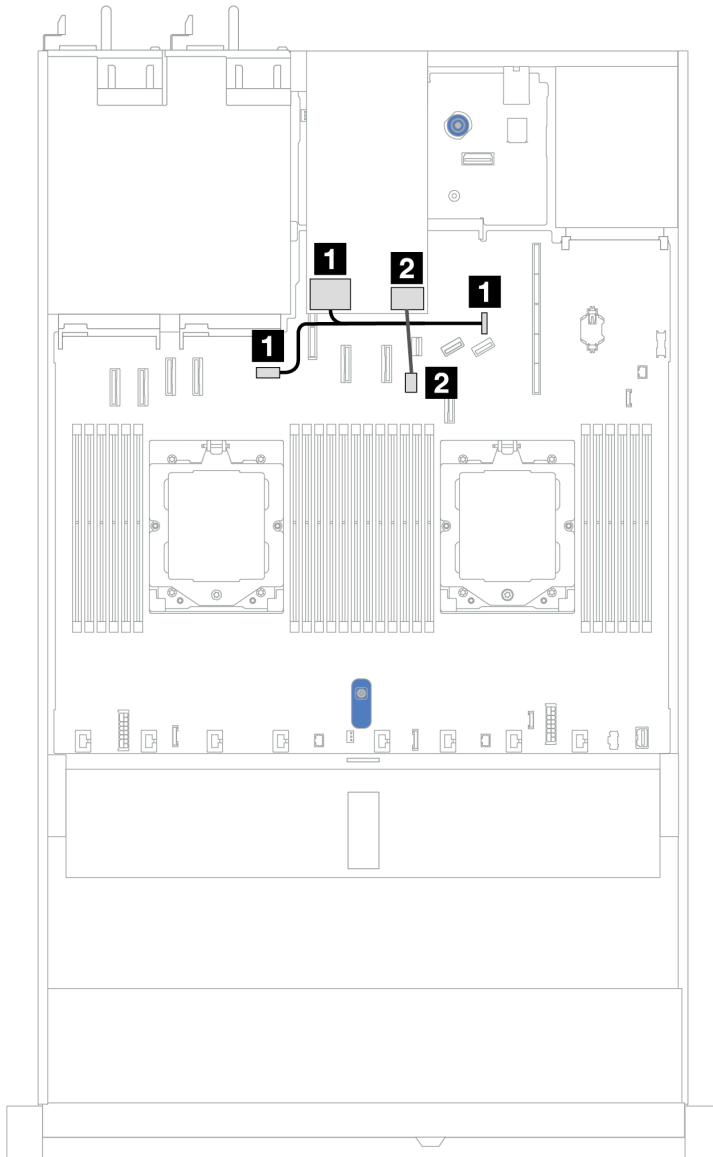


Figure 341. Cable routing for 7mm RAID NVMe 2-bay backplanes

From	To
1 Power connector on the 7mm drive backplane	<ul style="list-style-type: none"> 1 Left: GPU/7mm/Rear backplane power connector on the processor board 1 Right: 7mm/Rear backplane sideband connector on the processor board
2 Signal connector on the 7mm drive backplane	2 7mm backplane signal connector on the processor board

7mm RAID SATA/NVMe 2-bay backplanes

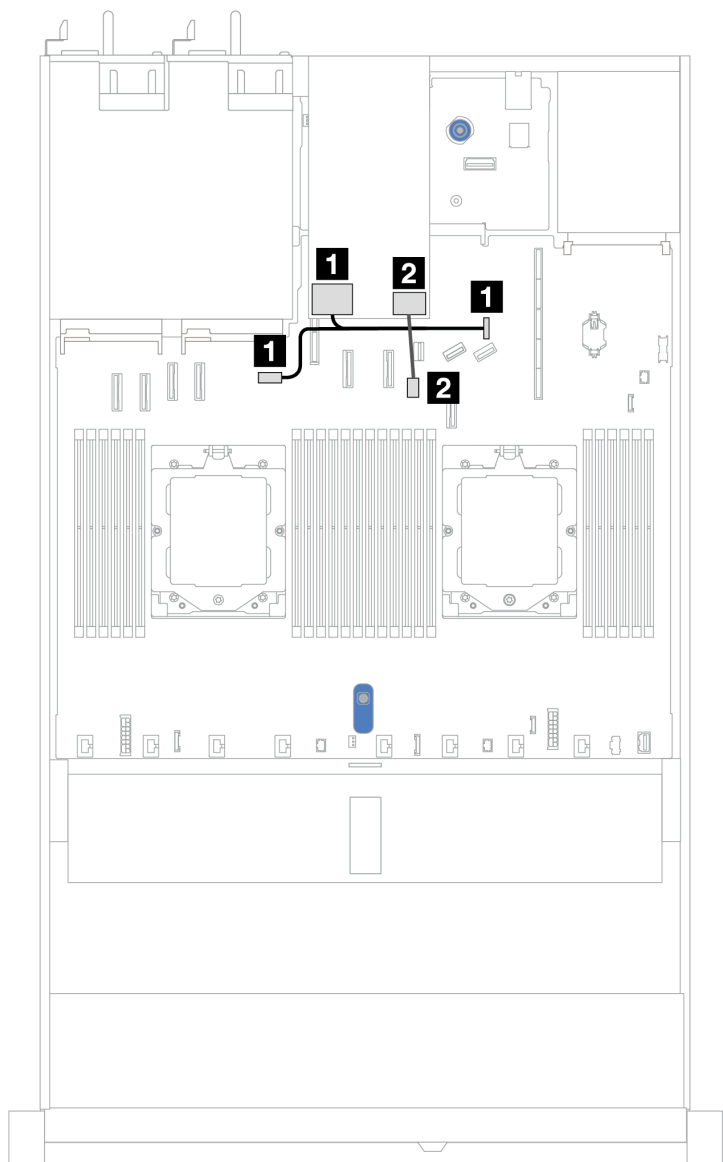


Figure 342. Cable routing for 7mm RAID SATA/NVMe 2-bay backplanes

From	To
1 Power connector on the 7mm drive backplane	<ul style="list-style-type: none">1 Left: GPU/7mm/Rear backplane power connector on the processor board1 Right: 7mm/Rear backplane sideband connector on the processor board
2 Signal connector on the 7mm drive backplane	2 7mm backplane signal connector on the processor board

7mm SATA/NVMe drives to SFF RAID adapter

Notes: This cable routing is only applicable to the following backplanes:

- 7mm non-RAID SATA/NVMe 2-bay backplanes

- 7mm RAID NVMe 2-bay backplanes

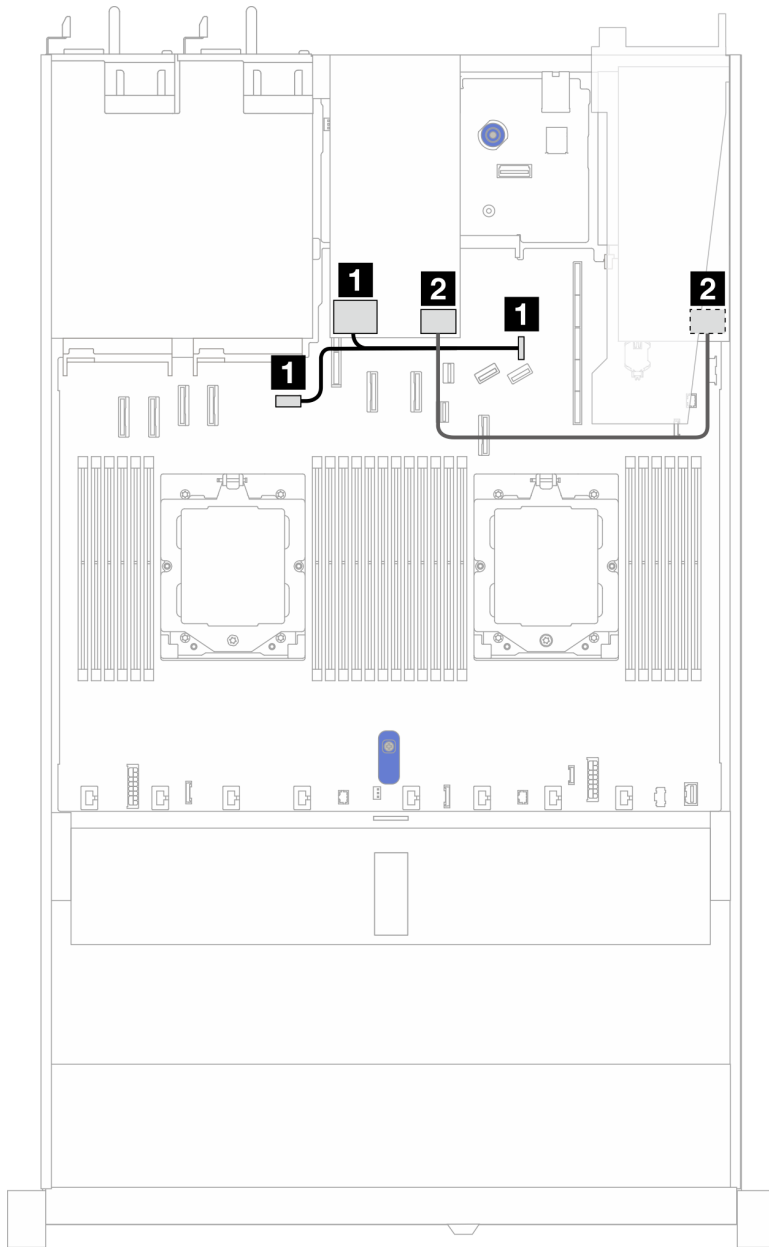


Figure 343. Cable routing for 7mm SATA/NVMe drives and an 8i SFF RAID adapter (Gen 3 or Gen 4)

From	To
1 Power connector on the 7mm drive backplane	<ul style="list-style-type: none"> • 1 Left: GPU/7mm/Rear backplane power connector on the processor board • 1 Right: 7mm/Rear backplane sideband connector on the processor board
2 Signal connector on the 7mm drive backplane	2 SFF RAID connector <ul style="list-style-type: none"> • Gen 3: C0, C1 (connected to 7mm SATA drives) • Gen 4: C0 (connected to 7mm NVMe drives)

Direct water cooling module

Use this section to understand the cable routing of the Direct Water Cooling Module (DWCM).

For the locations of the liquid detection sensor module connector on the processor board, see [“System-board-assembly connectors” on page 36](#) for details.

Note: For better cable arrangement, it is required to install the hoses and liquid detection sensor module to a designated holder, and make sure that the module is secured in holder clips. Use the illustration below or [“Install the Lenovo Neptune® Processor Direct Water Cooling Module” on page 146](#) for details.

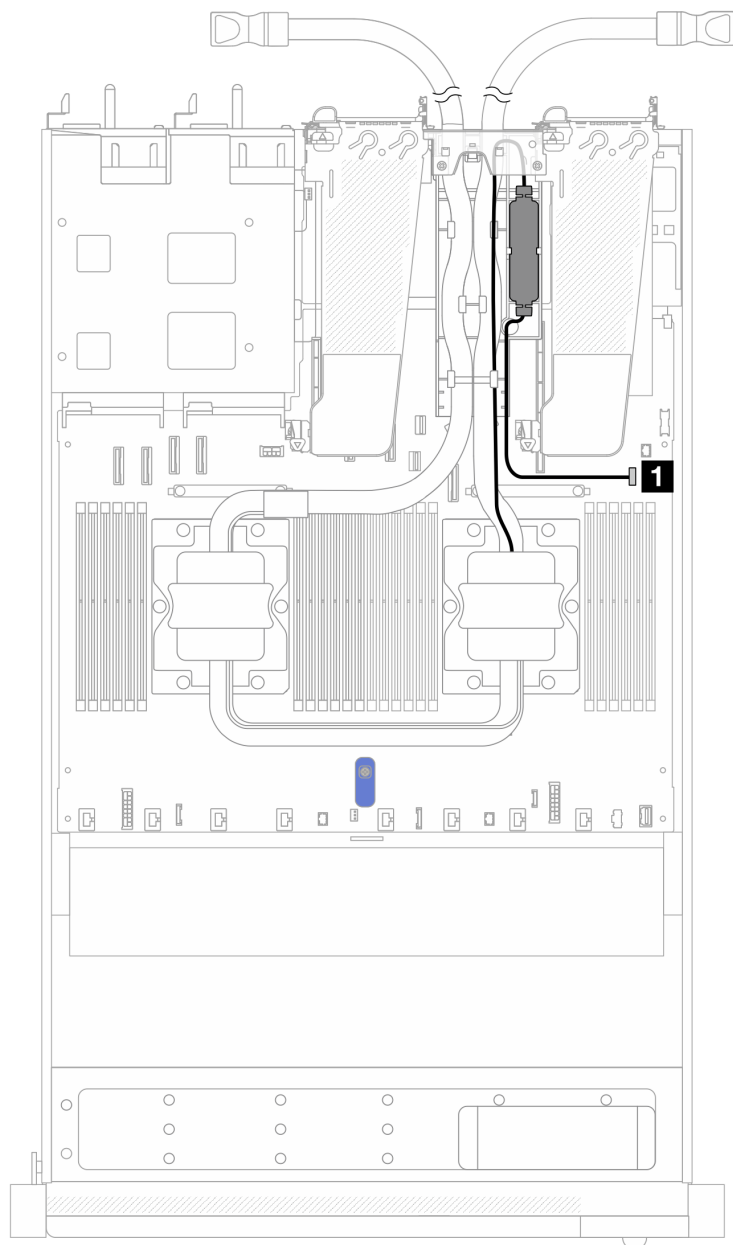


Figure 344. Direct water cooling module cable routing

Cable	From	To
1 Leak detection	Leak detection cable	Leak detection connector

The Lenovo Neptune® Liquid to Air Module

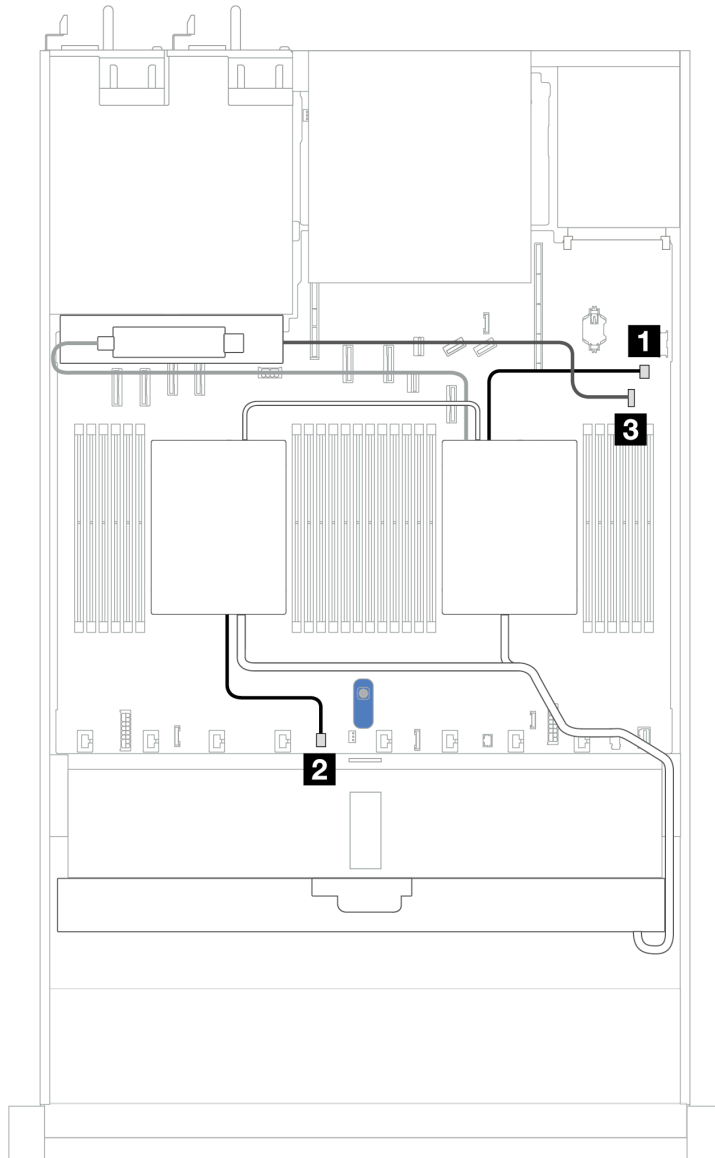
Use this section to understand the cable routing of the Lenovo Neptune Liquid to Air Module (L2AM).

- For the locations of the L2AM connectors on the processor board, see [“System-board-assembly connectors” on page 36](#) for details.
- The two pump cables and one cable for the leakage detection sensor module are integrated to the L2AM, make sure that all three cables are connected.

Notes:

- Before you start cable routing for the L2AM, make sure that you have put on gloves.
- For better cable arrangement, it is required to install the liquid detection sensor module to a designated holder, and make sure that the module is secured in holder clips. Use the illustration below or [“Install the Lenovo Neptune® Liquid to Air Module” on page 138](#) for details.

The Lenovo Neptune Liquid to Air Module cable routing



Cable	From	To
1 Pump 1	Pump 1 cable of the L2AM	Pump 1 connector on the processor board
2 Pump 2	Pump 2 cable of the L2AM	Pump 2 connector on the processor board
3 Leak detection	Leak detection cable of the L2AM	Leak detection connector on the processor board

4 x 2.5" front drives (liquid cooling)

Use the section to understand the cable routing for signal cable connections for 4 x 2.5" front drive backplanes for liquid assisted cooling module.

4 x 2.5" NVMe backplane (Gen 4)

Use this section to understand the NVMe backplane cable routing for server model with four 2.5" front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connect signal cables for a backplane for standard 4 x 2.5" front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing for onboard configuration” on page 363](#)

Cable routing for onboard configuration

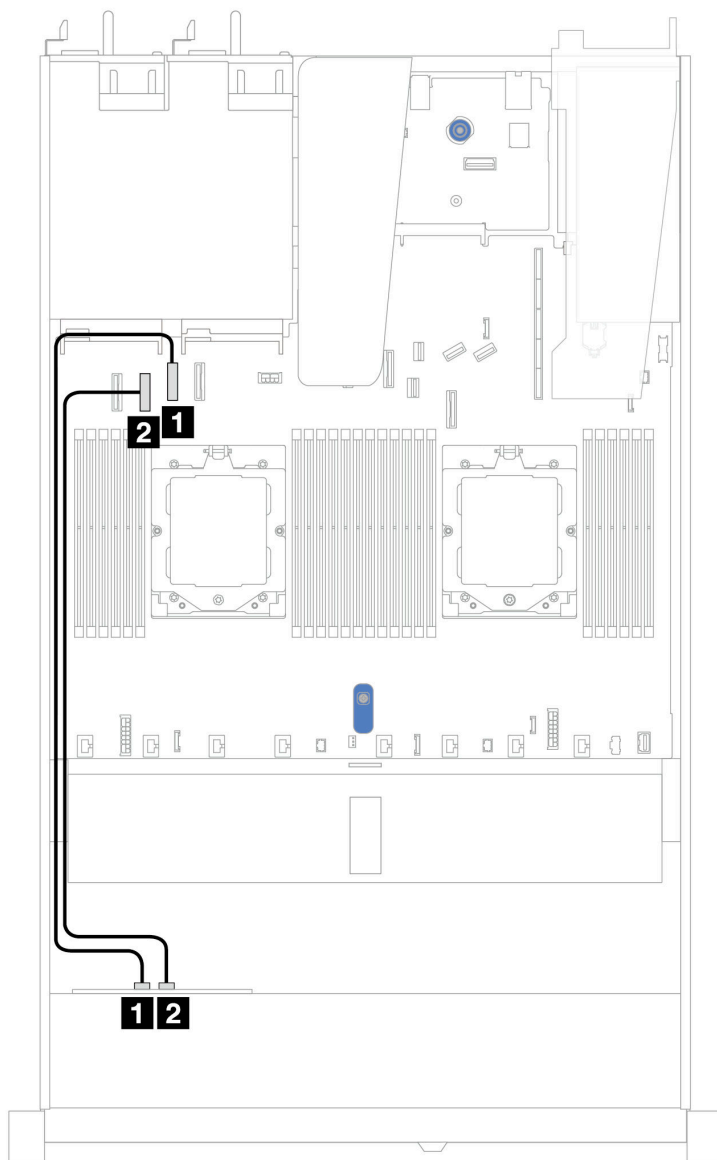


Figure 345. Cable routing for onboard configuration of 4 x 2.5" front NVMe drive bays (Gen 4)

Table 33. Mapping between backplane connectors and system board connectors for onboard configuration

Backplane	From	To
Front BP (NVMe)	1 NVMe 2–3	1 PCIe connector 2
	2 NVMe 0–1	2 PCIe connector 3

4 x 2.5" NVMe backplane (Gen 5)

Use this section to understand the NVMe backplane cable routing for server model with four 2.5" front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connect signal cables for a backplane for standard 4 x 2.5" front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing for onboard configuration” on page 365](#)

Cable routing for onboard configuration

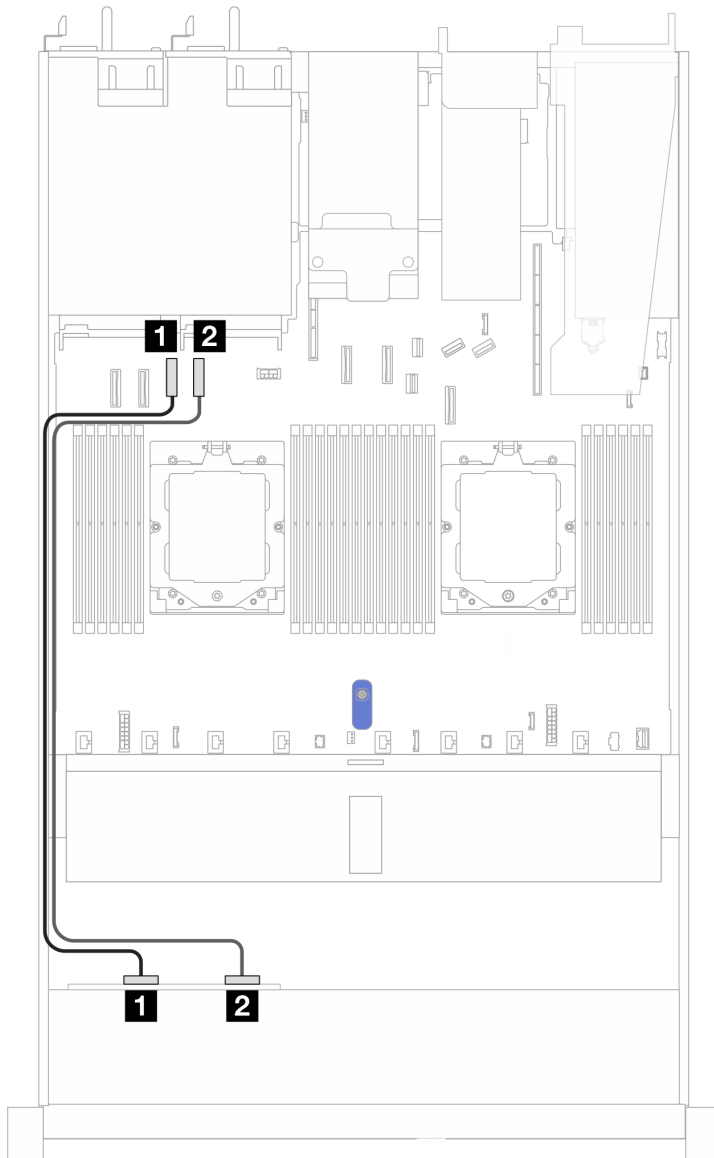


Figure 346. Cable routing for onboard configuration of 4 x 2.5" front NVMe drive bays (Gen 5)

Table 34. Mapping between backplane connectors and system board connectors for onboard configuration

Backplane	From	To
Front BP (NVMe)	1 NVMe 0–1	1 PCIe connector 3
	2 NVMe 2–3	1 PCIe connector 4

4 x 2.5" SAS/SATA backplane

Use this section to understand the SAS/SATA backplane cable routing for server model with four 2.5" front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables for a backplane for standard 4 x 2.5" front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing for onboard configuration” on page 367](#)
- [“Cable routing with an SFF HBA/RAID adapter” on page 367](#)

Cable routing for onboard configuration

The following table shows the mapping relationship between backplane connectors and system board connectors for onboard configuration.

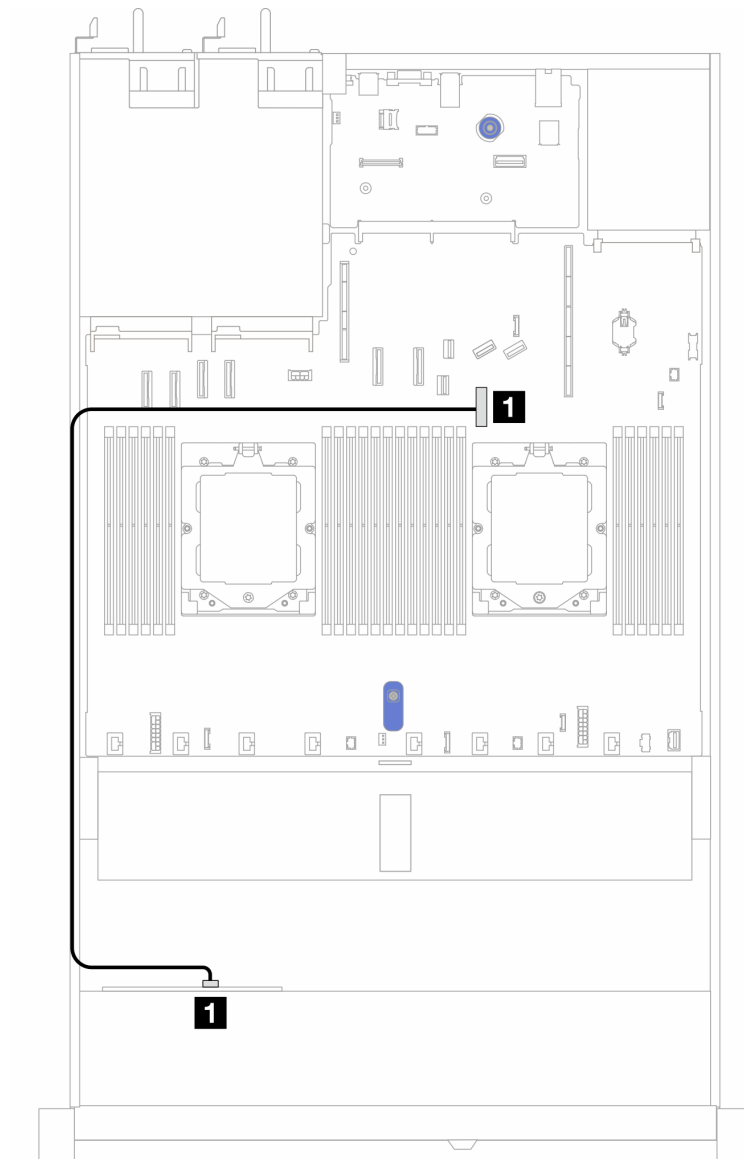


Figure 347. Cable routing for onboard configuration of 4 x 2.5" front SAS/SATA drive bays

Table 35. Mapping between backplane connectors and system board connectors for onboard configuration

Backplanes	From	To
Front BP (SAS)	SAS	PCIe connector 8

Note: If the cable PN is SC17B32993, connect it to PCIe connector 4 instead.

Cable routing with an SFF HBA/RAID adapter

The following table shows the mapping relationship between backplane connectors and system board/adapter connectors when an 8i SFF HBA/RAID adapter (Gen 3 or Gen 4) is installed.

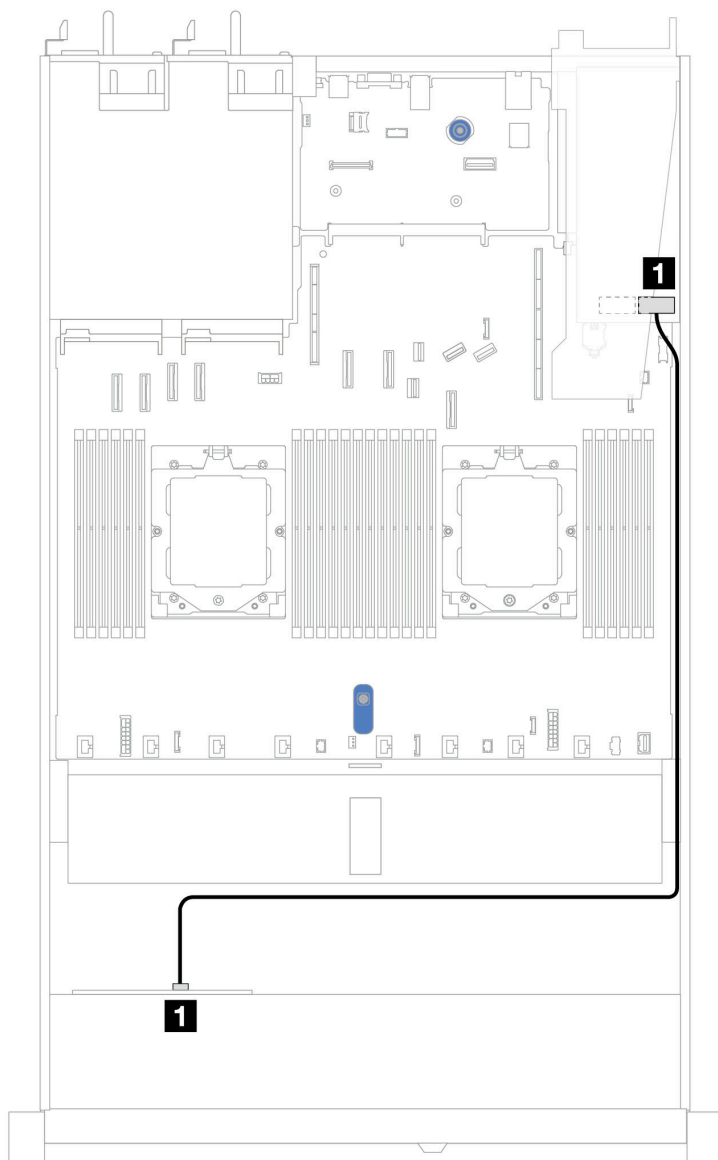


Figure 348. Cable routing for 4 x 2.5" front AnyBay drive bays with an 8i SFF RAID adapter

Table 36. Mapping between backplane connectors and system board/adaptor connectors when an SFF HBA/RAID adapter is installed

Backplanes	From	To
Front BP (SAS)	SAS	C0

Notes:

- Gen 3 and Gen 4 SFF HBA/RAID adapters are slightly different in their connectors, but the cable routing method is similar.
- To connect cables for RAID flash power module, refer to [“RAID flash power modules” on page 350](#).

8 x 2.5" front drives (liquid cooling)

Use the section to understand the cable routing for signal cable connections for 8 x 2.5" front drive backplanes for liquid assisted cooling module.

8 x 2.5" SAS/SATA backplane

Use this section to understand the cable routing of 8 SAS/SATA front drives for liquid cooling configuration with 10 x 2.5" AnyBay front backplane installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables for a backplane for standard 4 x 3.5" front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing for onboard configuration” on page 369](#)
- [“Cable routing with an SFF HBA/RAID adapter” on page 370](#)

Cable routing for onboard configuration

The following illustrations and tables show the mapping relationship between backplane connectors and system board connectors for onboard configuration.

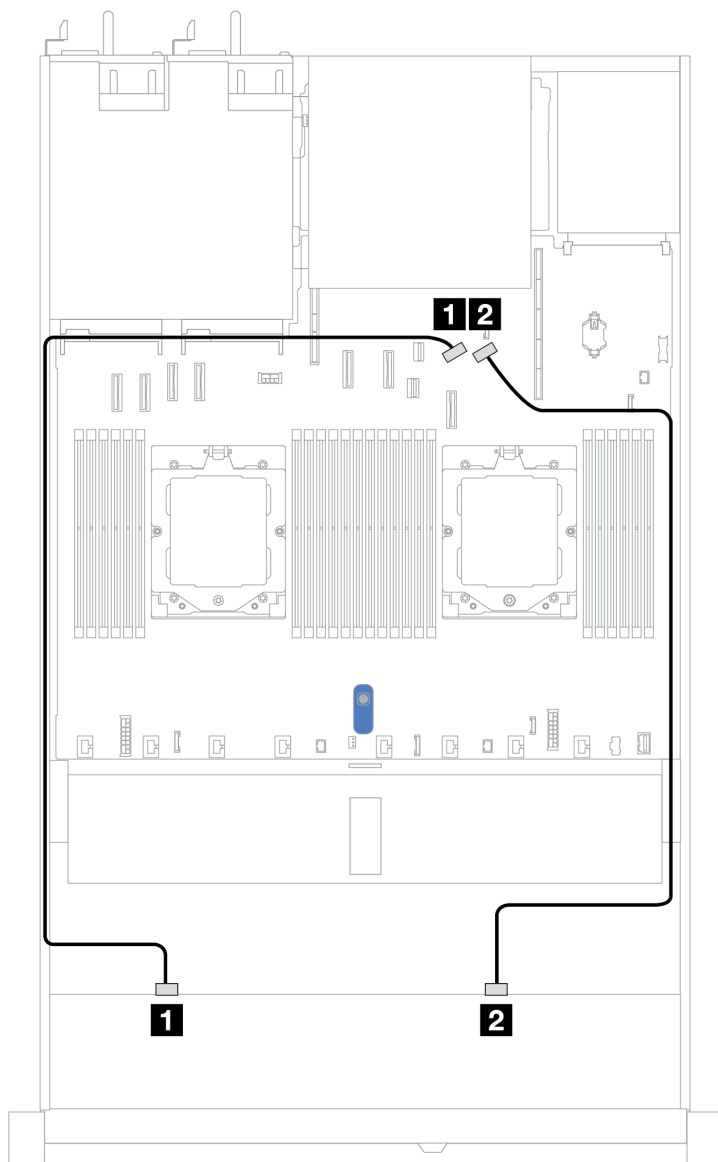


Figure 349. Cable routing for onboard configuration

Table 37. Cable routing for onboard configuration of 8 x 2.5 SAS/SATA front drives

Backplane	From	To
Front BP (SAS)	1 SAS 0	1 PCIe connector 8
	2 SAS 1	2 PCIe connector 9

Cable routing with an SFF HBA/RAID adapter

The following illustrations and tables show the mapping relationship between backplane connectors and an 8i or 16i SFF HBA/RAID adapter (Gen 3 or Gen 4).

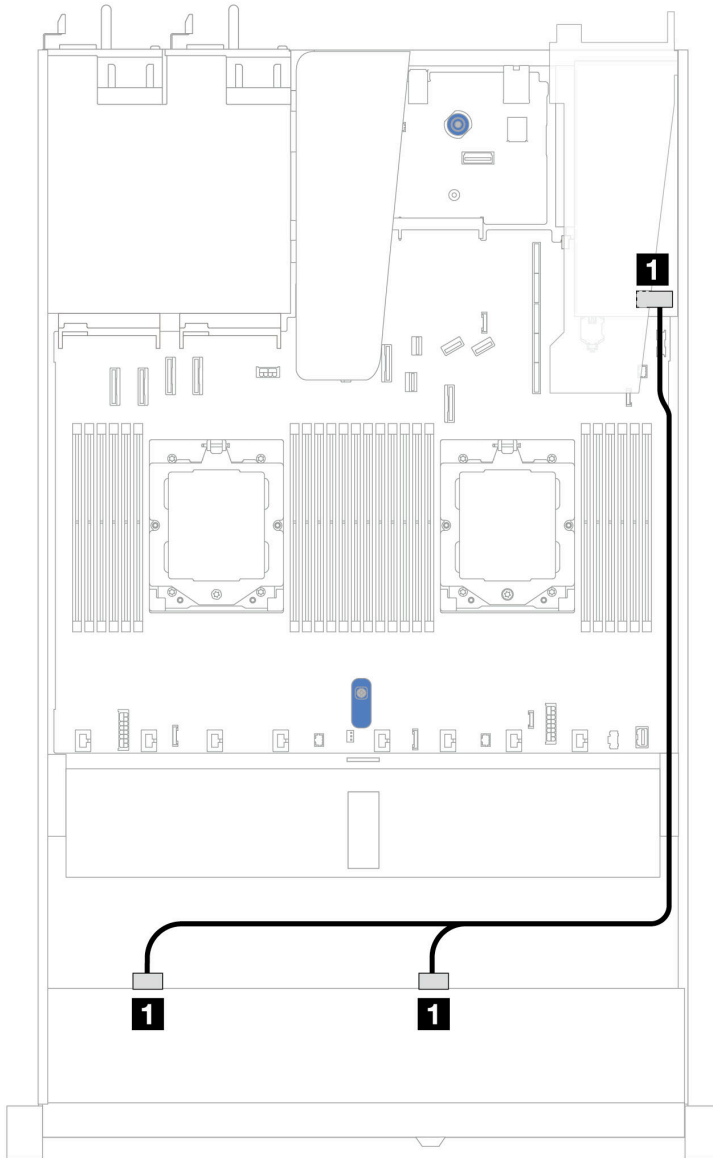


Figure 350. Cable routing for 8 x 2.5" front SAS/SATA drive bays with an 8i or 16i SFF RAID adapter (Gen 3 or Gen 4)

Table 38. Mapping between one front SAS/SATA backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 <ul style="list-style-type: none"> Gen 3: C0, C1 Gen 4: C0

10 x 2.5" front drives (liquid cooling)

Use the section to understand the cable routing for signal cable connections for 10 x 2.5" front drive backplanes for liquid assisted cooling module.

6 x 2.5" SAS/SATA + 4 x 2.5" AnyBay backplane

Use this section to understand the cable routing of six SAS/SATA front drives and four AnyBay front drives for liquid cooling configuration with 10 x 2.5" AnyBay front backplane installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables, refer to the following cable routing scenario:

- [“Cable routing with an SFF HBA/RAID adapter” on page 372](#)

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4).

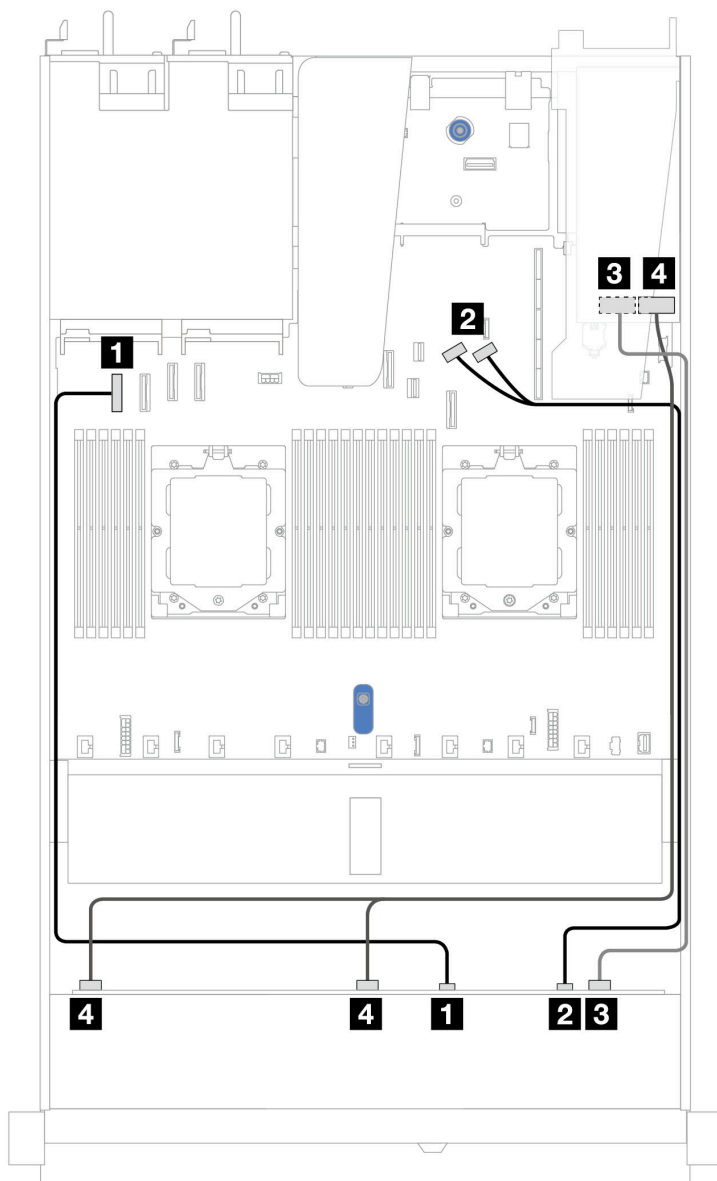


Figure 351. Cable routing for 6 front SAS/SATA drives and 4 front AnyBay drives bays with a 16i SFF RAID adapter (Gen 3 or Gen 4)

Table 39. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (NVMe)	1 NVMe 0–1	1 PCIe connector 1
	2 NVMe 2–3	2 PCIe connectors 8 and 9
Front BP (SAS)	3 SAS 2	3 <ul style="list-style-type: none"> • Gen 3: C2 • Gen 4: C1
	4 SAS 0, SAS 1	4 <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0

6 x 2.5" SAS/SATA + 2 x 2.5" AnyBay + 2 x 2.5" NVMe backplane

See this section to understand the cable routing of 8 front 2.5" SAS/SATA drives and 2 front 2.5" NVMe drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables for a backplane for standard 6 front 2.5" SAS/SATA drives and 4 front 2.5" NVMe drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing with an SFF HBA/RAID adapter” on page 374](#)

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and an SFF HBA/RAID adapter.

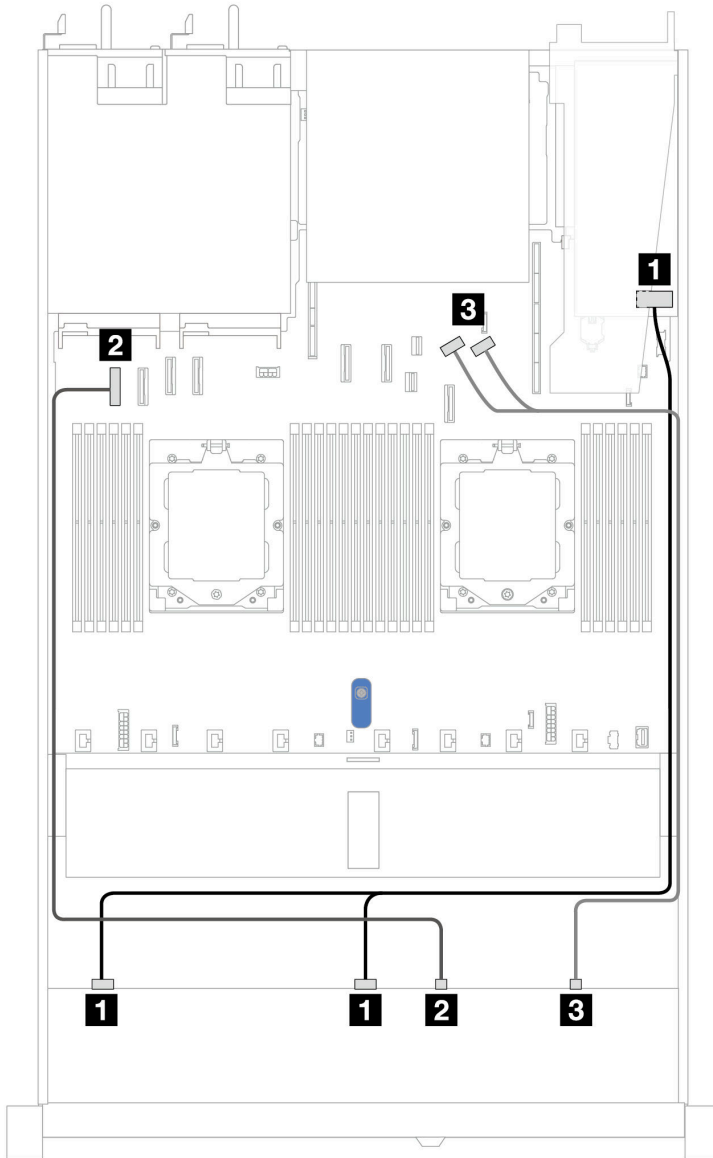


Figure 352. Cable routing for 6 x 2.5" SAS/SATA drives and 2 x 2.5" AnyBay drives and 2 x 2.5" NVMe front drive bays with an 8i SFF RAID/HBA adapter (Gen 3 or Gen 4)

Table 40. Cable routing for 6 x 2.5" SAS/SATA drives and 2 x 2.5" AnyBay drives and 2 x 2.5" NVMe front drive bays with an 8i SFF RAID/HBA adapter (Gen 3 or Gen 4)

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 C0, C1
Front BP (NVMe)	2 NVMe 0–1	2 PCIe connector 1
	3 NVMe 2–3	3 PCIe connectors 8 and 9

8 x 2.5"/10 x 2.5" U.3 drives with 10 x 2.5 AnyBay backplane

Use this section to understand the cable routing for eight or ten U.3 drives with 10 x 2.5 AnyBay backplane.

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

Cable routing with an SFF HBA/RAID adapter

The following illustrations and tables show the mapping relationship between backplane connectors and an 8i or 16i SFF RAID adapter (Gen 4).

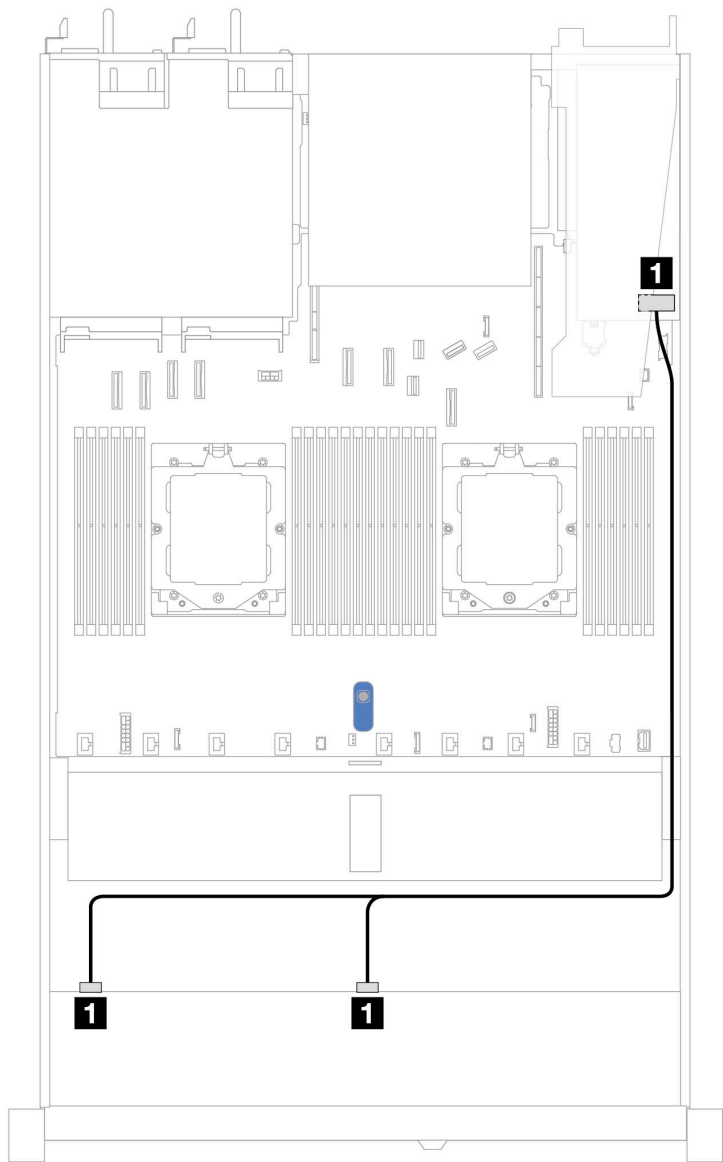


Figure 353. Cable routing for 8 x 2.5" front U.3 drives with an 8i SFF RAID adapter (Gen 4)

Table 41. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 C0

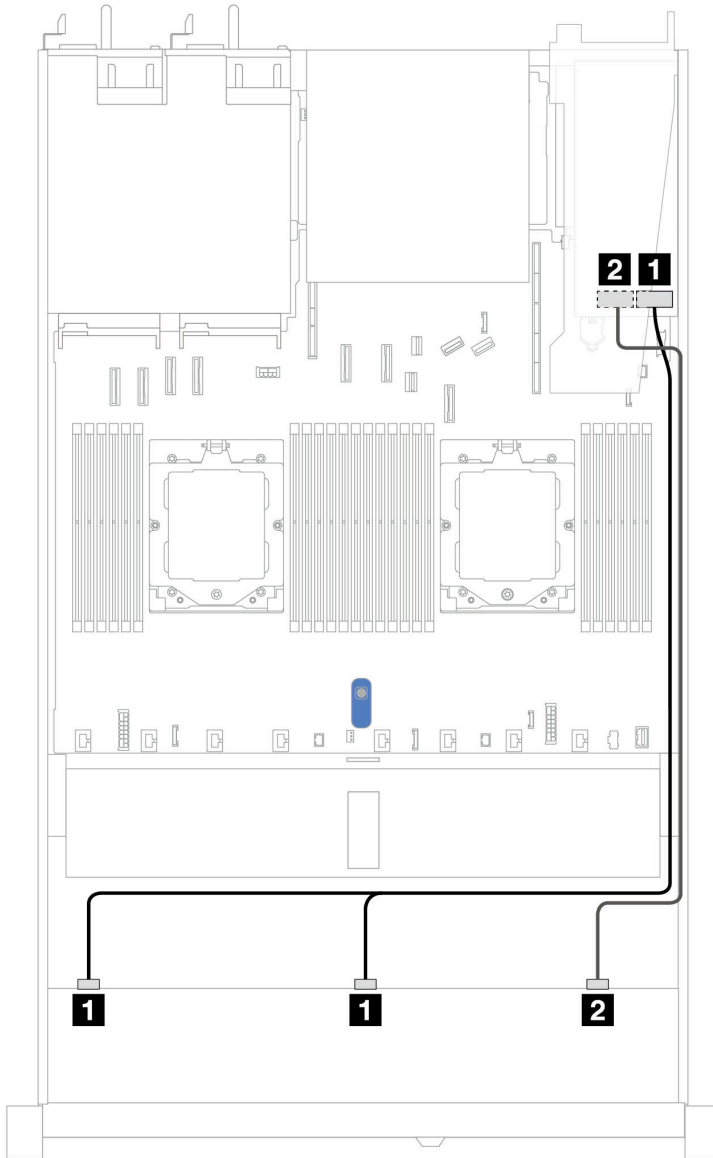


Figure 354. Cable routing for 10 x 2.5" front U.3 drives with an 16i SFF RAID adapter (Gen 4)

Table 42. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 C0
	2 SAS2	2 C1

10 x 2.5" NVMe backplane (Gen 4)

Use this section to understand the cable routing of 10 NVMe front drives for liquid cooling configuration with 10 x 2.5 AnyBay front backplane installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

The following illustration and table show the cabling between backplane and processor board for onboard configuration.

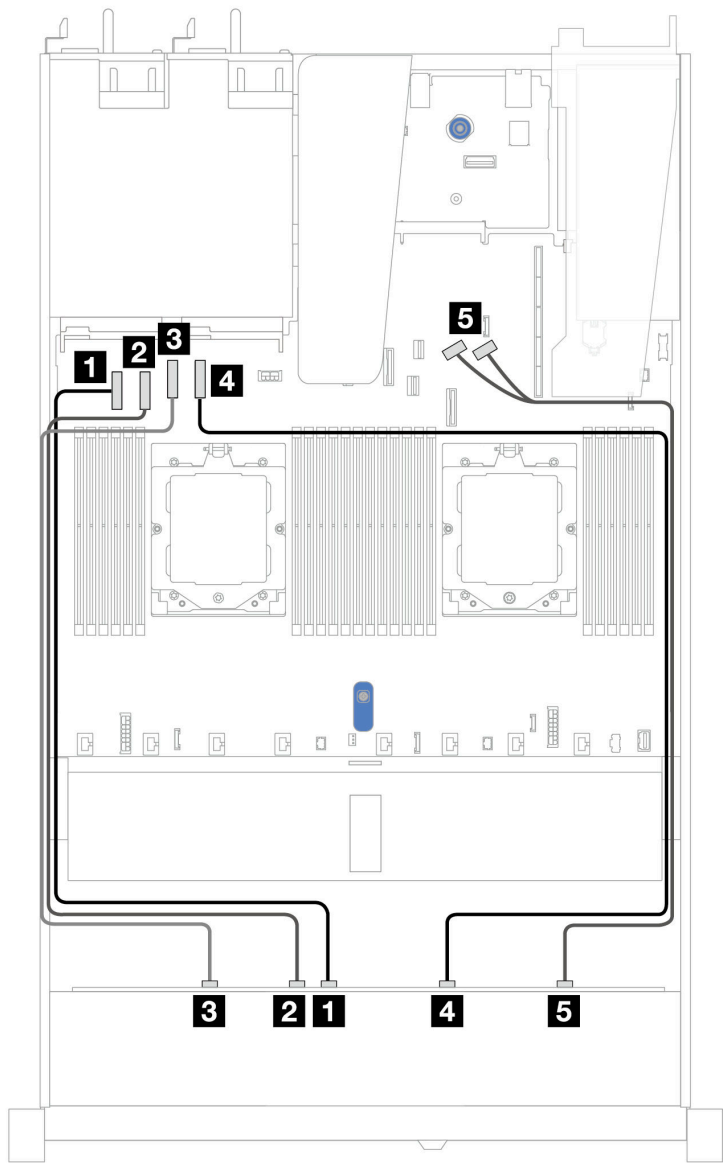


Figure 355. Onboard cabling of 10 NVMe drives for liquid cooling

Table 43. Mapping between one front AnyBay backplane and processor board for onboard configuration

Backplane	From	To
Front BP (NVMe)	1 NVMe 4–5	1 PCIe connector 1
	2 NVMe 2–3	2 PCIe connector 2
	3 NVMe 0–1	3 PCIe connector 3
	4 NVMe 6–7	4 PCIe connector 4
	5 NVMe 8–9	5 PCIe connectors 8 and 9

10 x 2.5" SAS/SATA backplane

Use this section to understand the cable routing of 10 SAS/SATA front drives for liquid cooling configuration with 10 x 2.5 AnyBay front backplane installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables, refer to the following cable routing scenarios:

- [“Cable routing for onboard configuration” on page 379](#)
- [“Cable routing with an SFF HBA/RAID adapter” on page 380](#)

Cable routing for onboard configuration

The following illustrations and tables show the mapping relationship between backplane connectors and system board (system board assembly) connectors for onboard configuration.

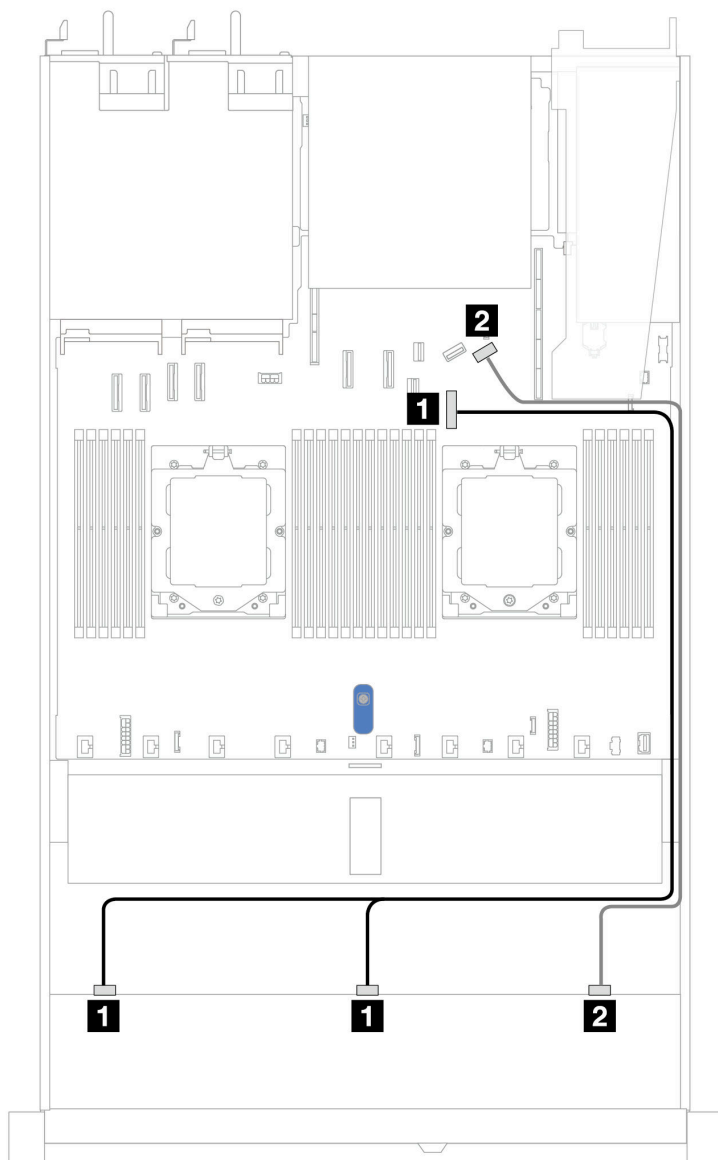


Figure 356. Cable routing for onboard configuration of 10 x 2.5" SAS/SATA front drives

Table 44. Mapping between one front AnyBay backplane and system board for onboard configuration

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 PCIe connector 7
	2 SAS 2	2 PCIe connector 9

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4).

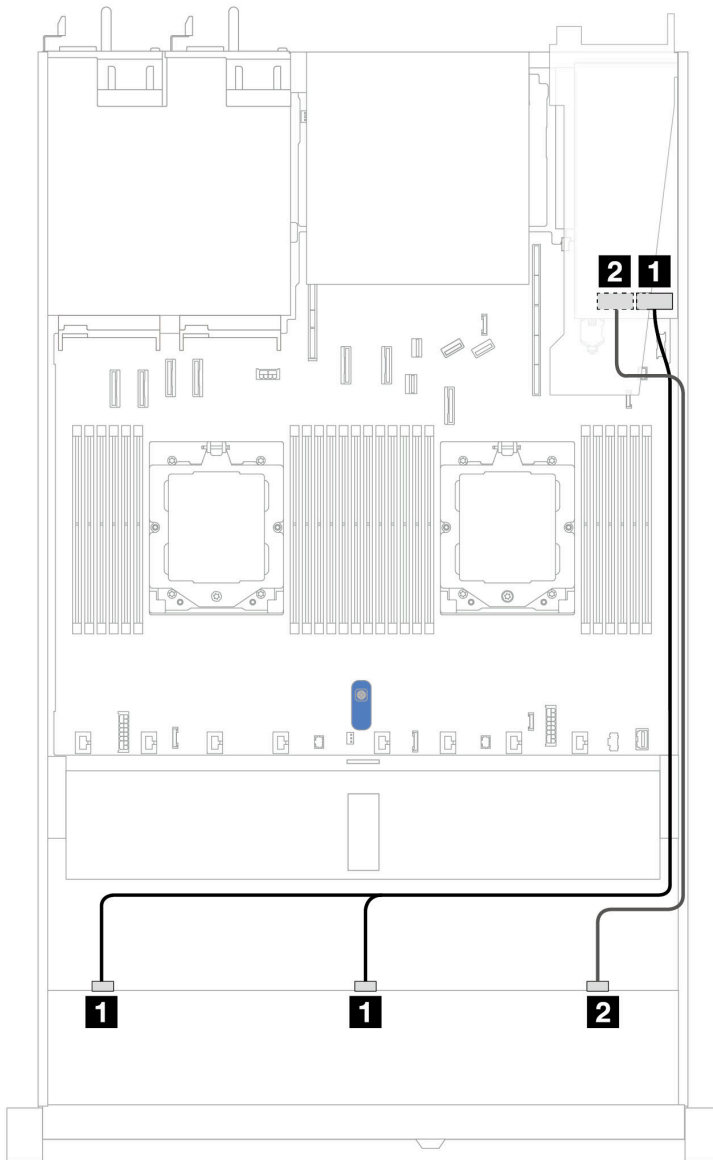


Figure 357. Cable routing for 10 front SAS/SATA drives bays with a 16i SFF RAID adapter (Gen 3 or Gen 4)

Table 45. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0
	2 SAS 2	2 <ul style="list-style-type: none"> • Gen 3: C2 • Gen 4: C1

10 x 2.5 AnyBay backplane (Gen 5)

Use this section to understand the alternatives that a 10 x 2.5 AnyBay backplane (Gen 5) offers.

With a 10 x 2.5 AnyBay backplane (Gen 5), following front drive combinations are supported:

Note: M.2 SATA Non-RAID, M.2 X4 NVMe Non-RAID, and 7mm SATA Non-RAID configurations are not supported.

6 x 2.5" SAS/SATA + 4 x 2.5" AnyBay backplane

Use this section to understand the cable routing of six SAS/SATA front drives and four AnyBay front drives for liquid cooling configuration with 10 x 2.5" AnyBay front backplane (Gen 5) installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables, refer to the following cable routing scenario:

- [“Cable routing with an SFF HBA/RAID adapter” on page 382](#)

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4).

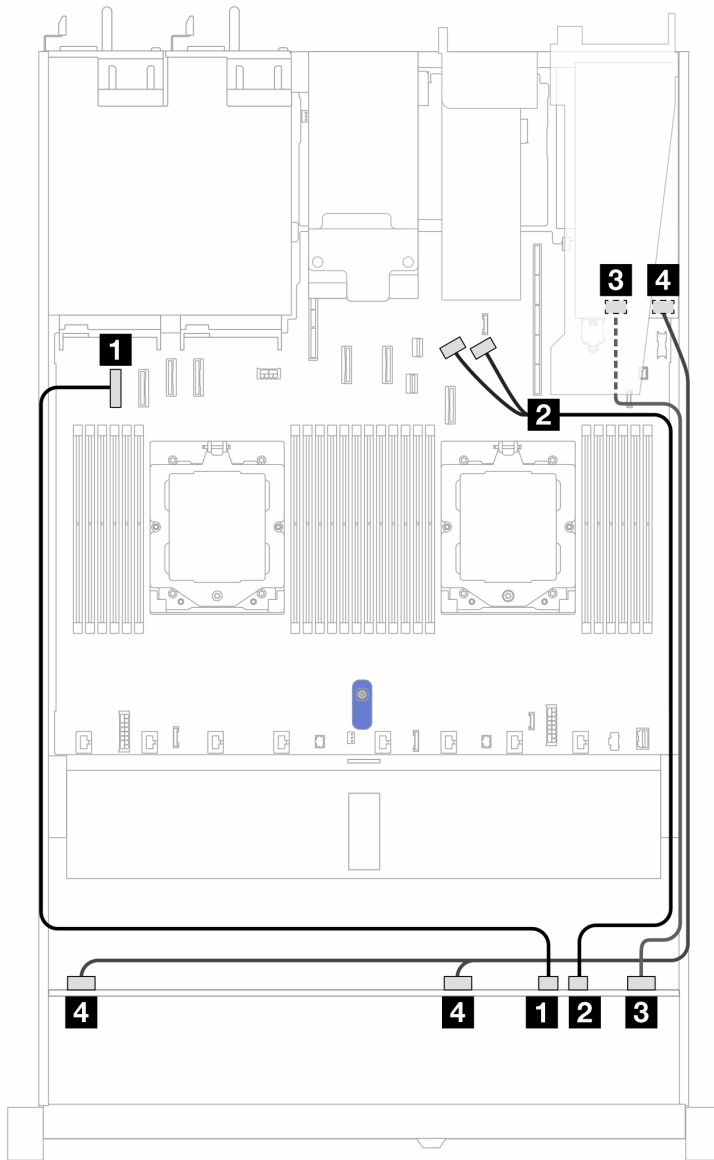


Figure 358. Cable routing for 6 front SAS/SATA drives and 4 front AnyBay drives bays with a 16i SFF RAID adapter (Gen 3 or Gen 4)

Table 46. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (NVMe)	1 NVMe 6–7	1 PCIe connector 1
	2 NVMe 8–9	2 PCIe connectors 8 and 9
Front BP (SAS)	3 SAS 8–9	3 <ul style="list-style-type: none"> • Gen 3: C2 • Gen 4: C1
	4 SAS 0–3, SAS 4–7	4 <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0

6 x 2.5" SAS/SATA + 2 x 2.5" AnyBay + 2 x 2.5" NVMe backplane

See this section to understand the cable routing of 6 front 2.5" SAS/SATA drives, 2 front 2.5" AnyBay drives, and 2 front 2.5" NVMe drives with 10 x 2.5 backplane (Gen 5) installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables , refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing with an SFF HBA/RAID adapter” on page 384](#)

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and an 8i SFF HBA/RAID adapter (Gen 3 or Gen 4).

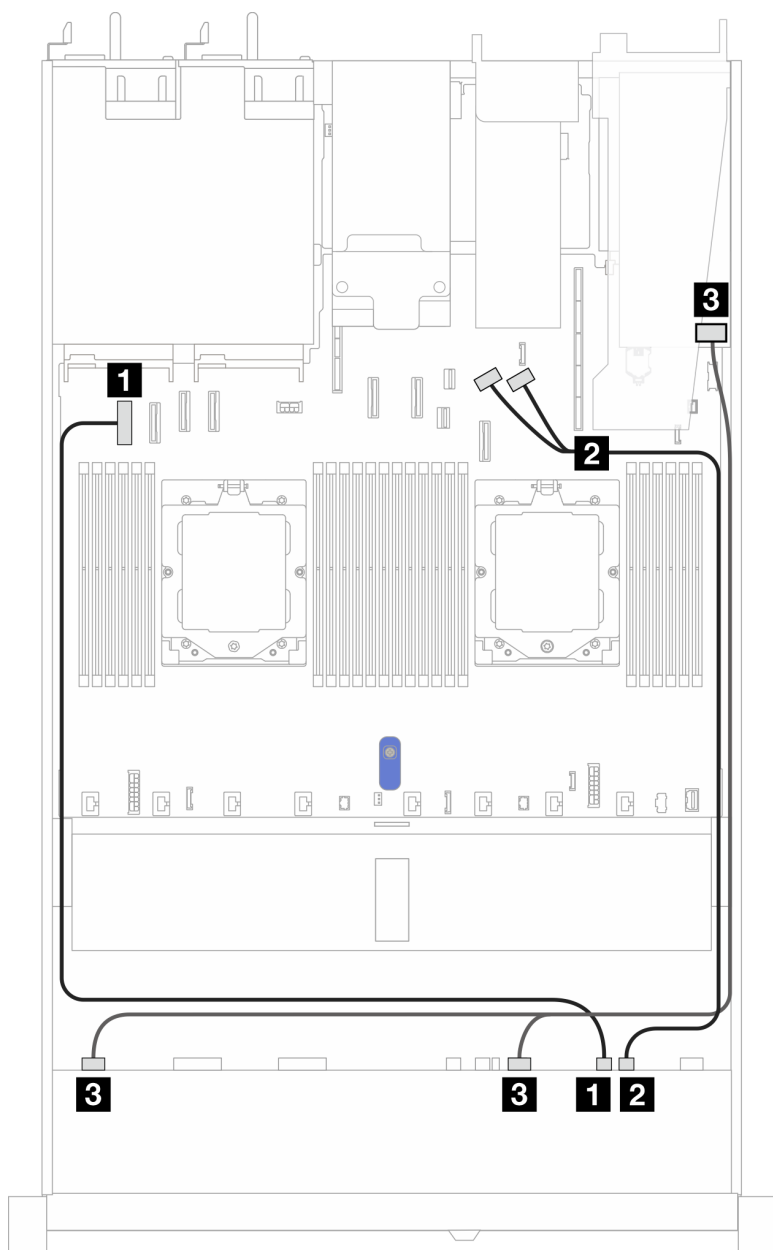


Figure 359. Cable routing for one front AnyBay backplane and an 8i SFF HBA/RAID adapter (Gen 3 or Gen 4)

Table 47. Mapping between one front AnyBay backplane and an 8i SFF HBA/RAID adapter

Backplane	From	To
Front BP (NVMe)	❶ NVMe 6–7	❶ PCIe connector 1
	❷ NVMe 8–9	❷ PCIe connectors 8 and 9
Front BP (SAS)	❸ SAS 0–3, SAS 4–7	❸ <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0

The following tables show the mapping relationship between backplane connectors and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4).

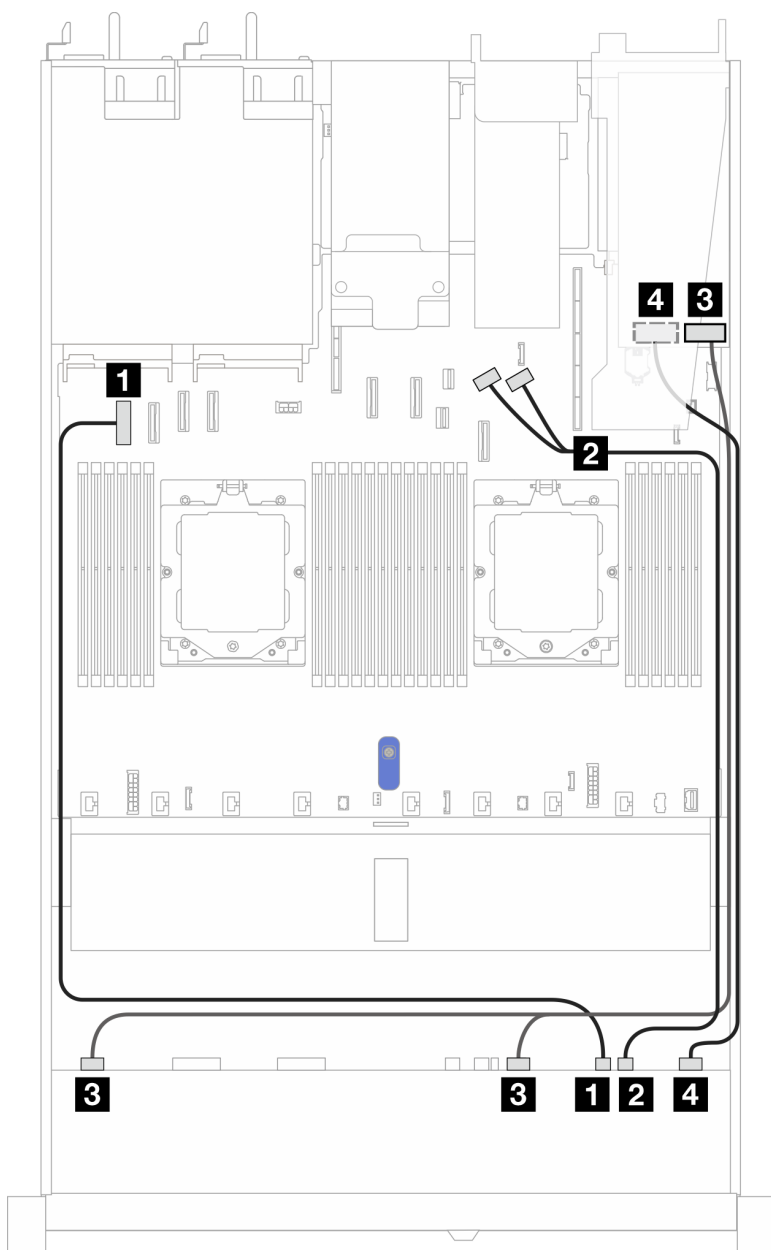


Figure 360. Cable routing for one front AnyBay backplane and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4)

Table 48. Mapping between one front AnyBay backplane and a 16i SFF HBA/RAID adapter

Backplane	From	To
Front BP (NVMe)	1 NVMe 6–7	1 PCIe connector 1
	2 NVMe 8–9	2 PCIe connectors 8 and 9
Front BP (SAS)	3 SAS 0–3, SAS 4–7	3 <ul style="list-style-type: none"> Gen 3: C0, C1 Gen 4: C0
	4 SAS 8–9	4 <ul style="list-style-type: none"> Gen 3: C2, C3 Gen 4: C1

Cable routing for backplane signals (one processor)

In this section, you can find cable routing of backplane signals when only one processor installed.

- Each backplane your server supports offers multiple signal connections. This section singles out the signal connection from power connection for better understanding. For backplane power connection, see [“Backplane power cable routing” on page 330](#).
- For the locations of backplane signal connectors on the processor board and adapters, see [“System-board-assembly connectors” on page 36](#) for details.
- For more information about backplanes supported and their connectors, see [“Drive backplane connectors” on page 326](#).

4 x 3.5" front drives (one processor)

Use the section to understand the cable routing for signal cable connections for 4 x 3.5" front drive backplanes when one processor installed.

4 x 3.5" SAS/SATA backplane

Use this section to understand the SAS/SATA backplane cable routing for server model with four 3.5" front drives.

To connect cables for a rear NVMe/SAS/SATA drive backplane, refer to [“Rear NVMe/SAS/SATA drive backplane” on page 353](#).

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connect cables for RAID flash power module, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing for onboard configuration” on page 388](#)
- [“Cable routing with an SFF HBA/RAID adapter” on page 389](#)

Cable routing for onboard configuration

The following table shows the mapping relationship between backplane connectors and system board connectors for onboard configuration.

The following figure illustrates the cable routing for the onboard configuration of 4 x 3.5" front SAS/SATA drive bays. Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n.

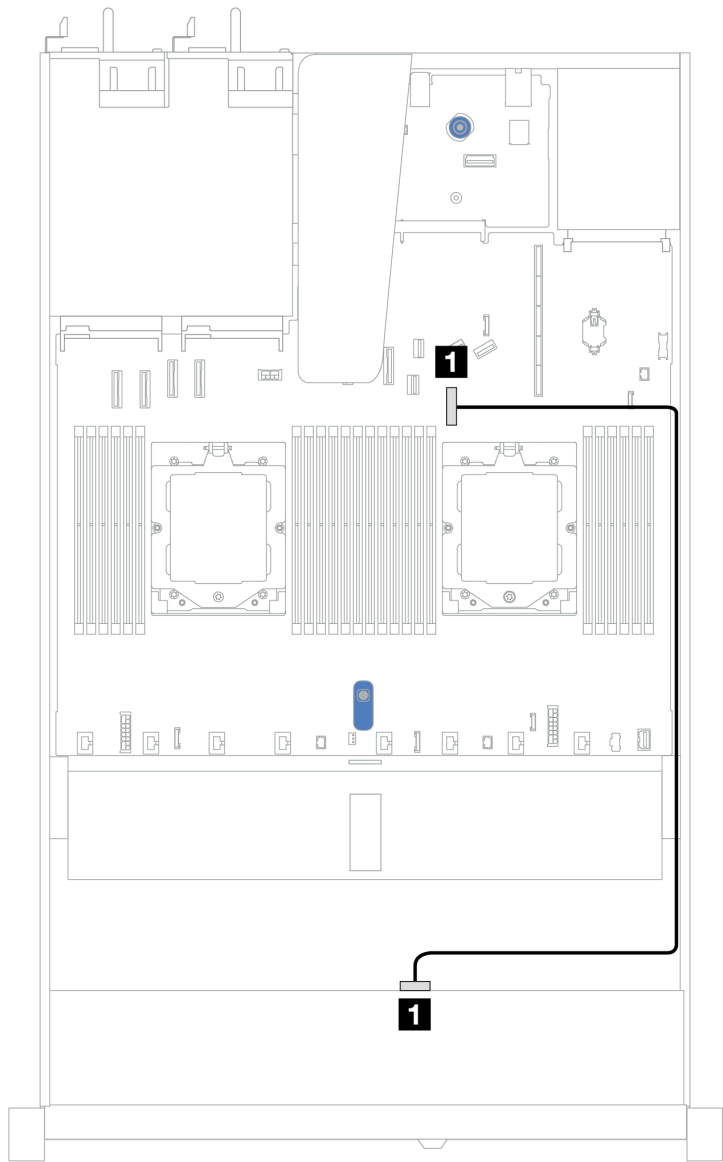


Figure 361. Cable routing for onboard configuration of 4 x 3.5" front SAS/SATA drive bays

Table 49. Cable routing for onboard configuration of 4 x 3.5" front SAS/SATA drive bays

Backplane	From	To
Front BP (SAS)	1 SAS	1 PCIe connector 7

Cable routing with an SFF HBA/RAID adapter

The following table shows the mapping relationship between backplane connectors and system board/adapter connectors when an 8i SFF HBA/RAID adapter (Gen 3 or Gen 4) is installed.

The following figure illustrates the cable routing for the configuration of 4 x 3.5" front SAS/SATA drive bays with an 8i SFF RAID adapter. Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**.

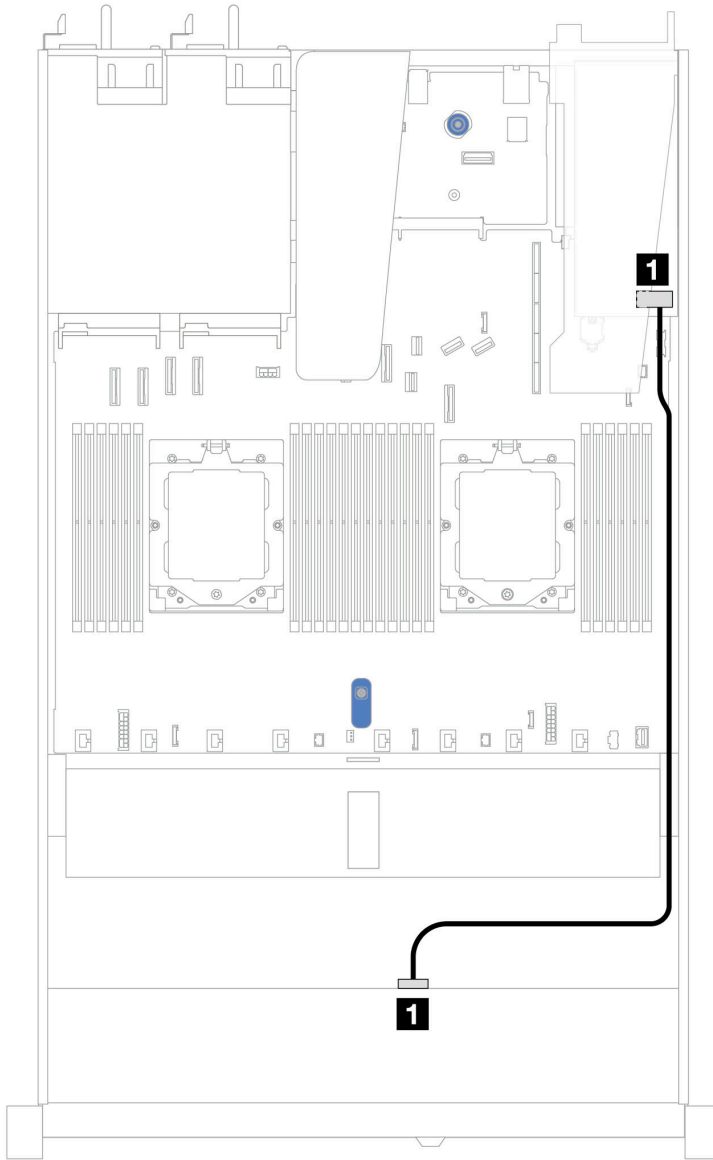


Figure 362. Cable routing for 4 x 3.5" front SAS/SATA drive bays with an 8i SFF RAID adapter (Gen 3 or Gen 4)

Table 50. Mapping between backplane connectors and system board/adapter connectors when an SFF HBA/RAID adapter is installed

Backplane	From	To
Front BP (SAS)	1 SAS	1 C0

Note: Gen 3 and Gen 4 SFF HBA/RAID adapters are slightly different in their connectors, but the cable routing method is similar.

The following table shows the mapping relationship between backplane connectors and system board/adapter connectors when an 8i SFF HBA/RAID adapter (Gen 3) is installed.

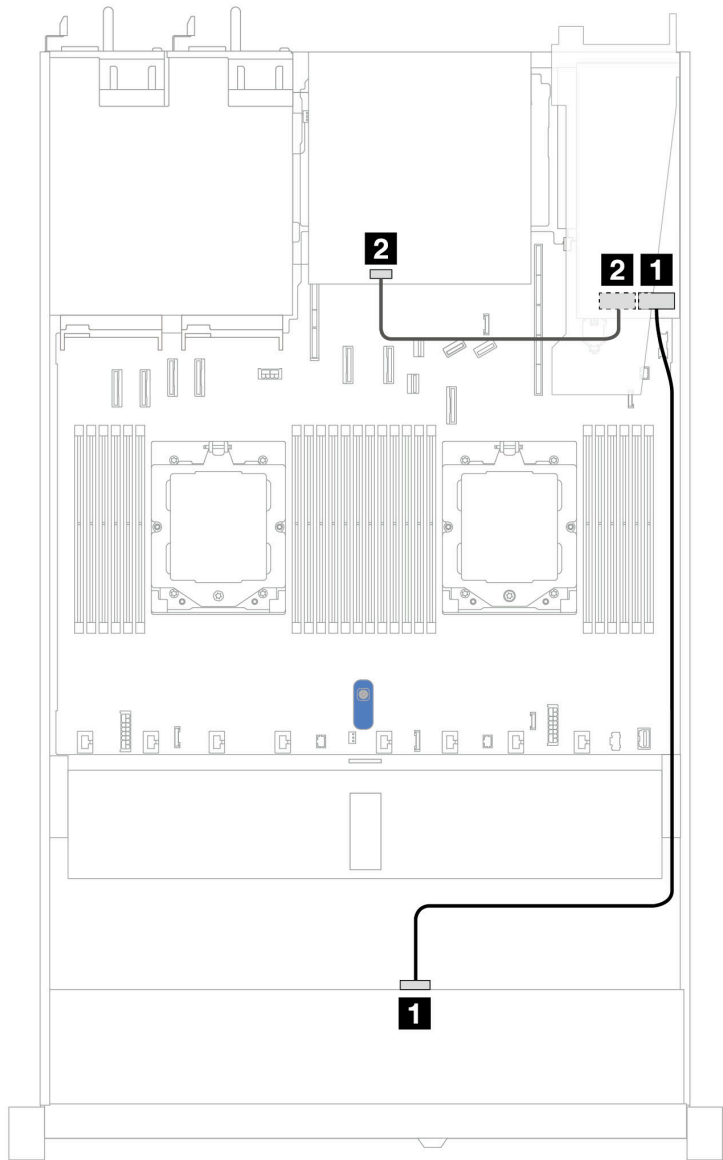


Figure 363. Cable routing for 4 x 3.5" front SAS/SATA drive bays with an 8i SFF RAID adapter (Gen 3) and rear 2 x 2.5-inch SAS/SATA drives

Table 51. Mapping between backplane connectors and system board/adapter connectors when an SFF HBA/RAID adapter is installed

Backplane	From	To
Front BP (SAS)	1 SAS	1 C0
Rear BP (SAS)	2 SAS	2 C1

The following table shows the mapping relationship between backplane connectors and system board/adapter connectors when an 8i SFF HBA/RAID adapter (Gen 4) is installed.

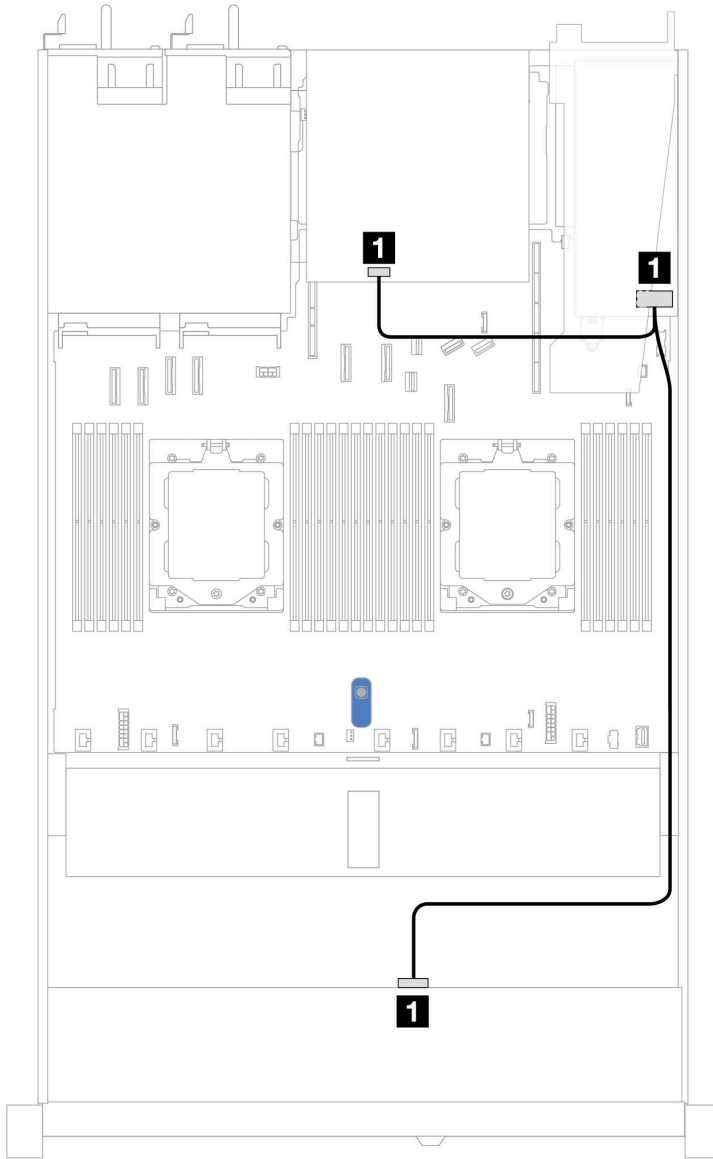


Figure 364. Cable routing for 4 x 3.5" front SAS/SATA drive bays with an 8i SFF RAID adapter (Gen 4) and rear 2 x 2.5-inch SAS/SATA drives

Table 52. Mapping between backplane connectors and system board/adapter connectors when an SFF HBA/RAID adapter is installed

Backplane	From	To
Front and Rear BP (SAS)	1 SAS	1 C0

4 x 3.5" AnyBay backplane

Use this section to understand the AnyBay backplane cable routing for server model with four 3.5" front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables for a backplane for standard 4 x 3.5" front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing with an SFF HBA/RAID adapter” on page 393](#)

Cable routing with an SFF HBA/RAID adapter

The following table shows the mapping relationship between backplane connectors and system board/adapter connectors when an 8i SFF HBA/RAID adapter (Gen 3 or Gen 4) is installed.

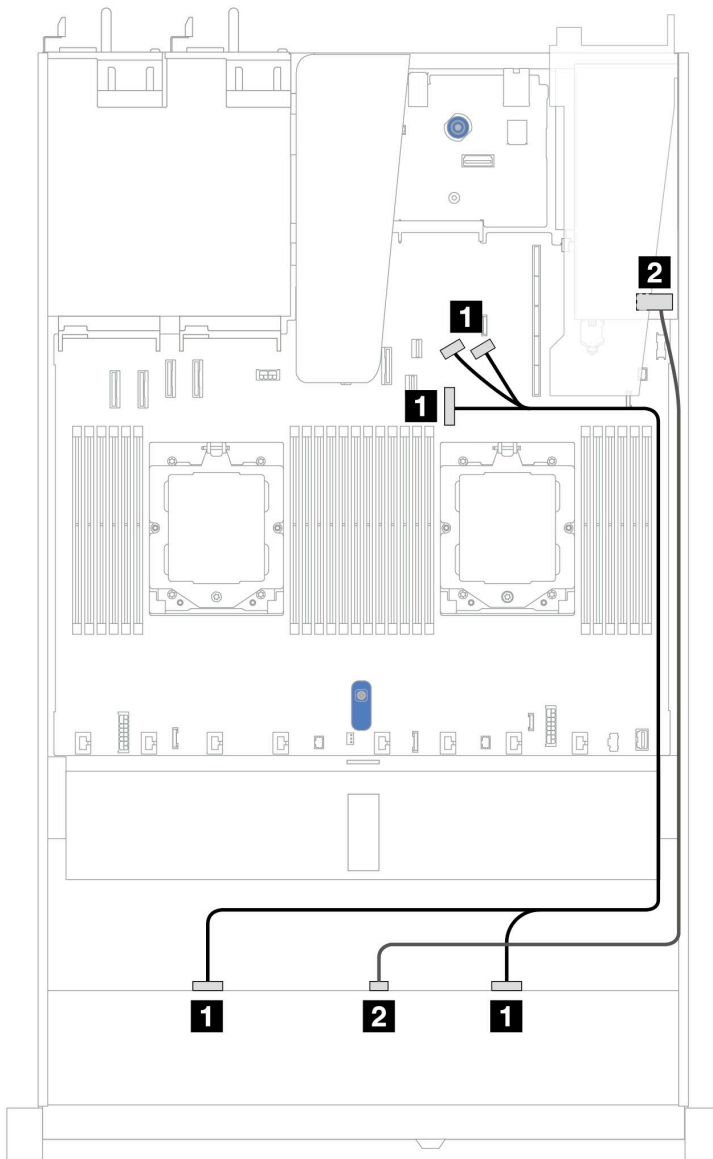


Figure 365. Cable routing for 4 x 3.5" front AnyBay drive bays with an 8i SFF RAID adapter (Gen 3 or Gen 4)

Backplane	From	To
Front BP (NVMe)	1 NVMe 0-1, NVMe 2-3	1 PCIe connectors 7, 8, and 9
Front BP (SAS)	2 SAS	2 C0

4 x 3.5" U.3 drives with 4 x 3.5 AnyBay backplane

Use this section to understand the cable routing for eight U.3 drives with 4 x 3.5" AnyBay backplane and one processor installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect the signal cable, refer to the following cable routing scenario:

- [“Cable routing with an SFF HBA/RAID adapter” on page 394](#)

Cable routing with an SFF HBA/RAID adapter

The following illustrations and tables show the mapping relationship between backplane connectors and an 8i or 16i SFF RAID adapter (Gen 4).

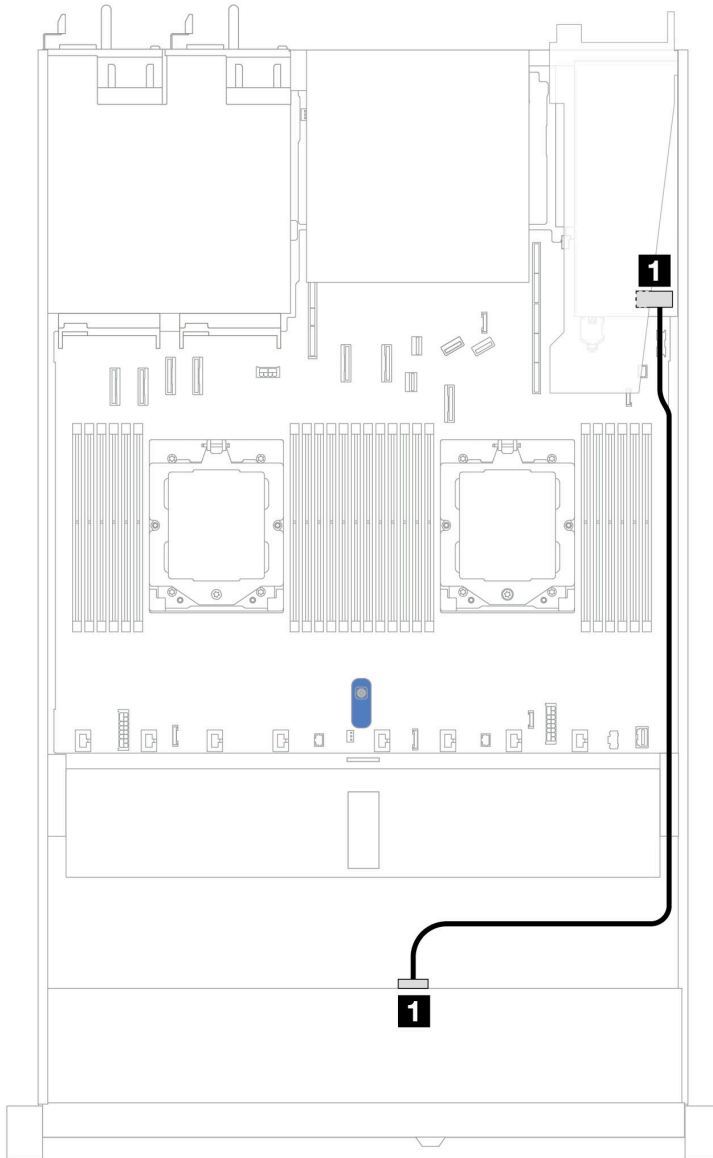


Figure 366. Cable routing for 4 x 3.5" front U.3 drives with an 8i SFF RAID adapter (Gen 4)

Table 53. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS	1 C0

4 x 2.5" front drives (one processor)

Use the section to understand the cable routing for signal cable connections for 4 x 2.5" front drive backplanes when one processor installed.

4 x 2.5" SAS/SATA backplane

Use this section to understand the SAS/SATA backplane cable routing for server model with four 2.5" front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables for a backplane for standard 4 x 2.5" front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing for onboard configuration” on page 397](#)
- [“Cable routing with an SFF HBA/RAID adapter” on page 398](#)

Cable routing for onboard configuration

The following table shows the mapping relationship between backplane connectors and system board connectors for onboard configuration.

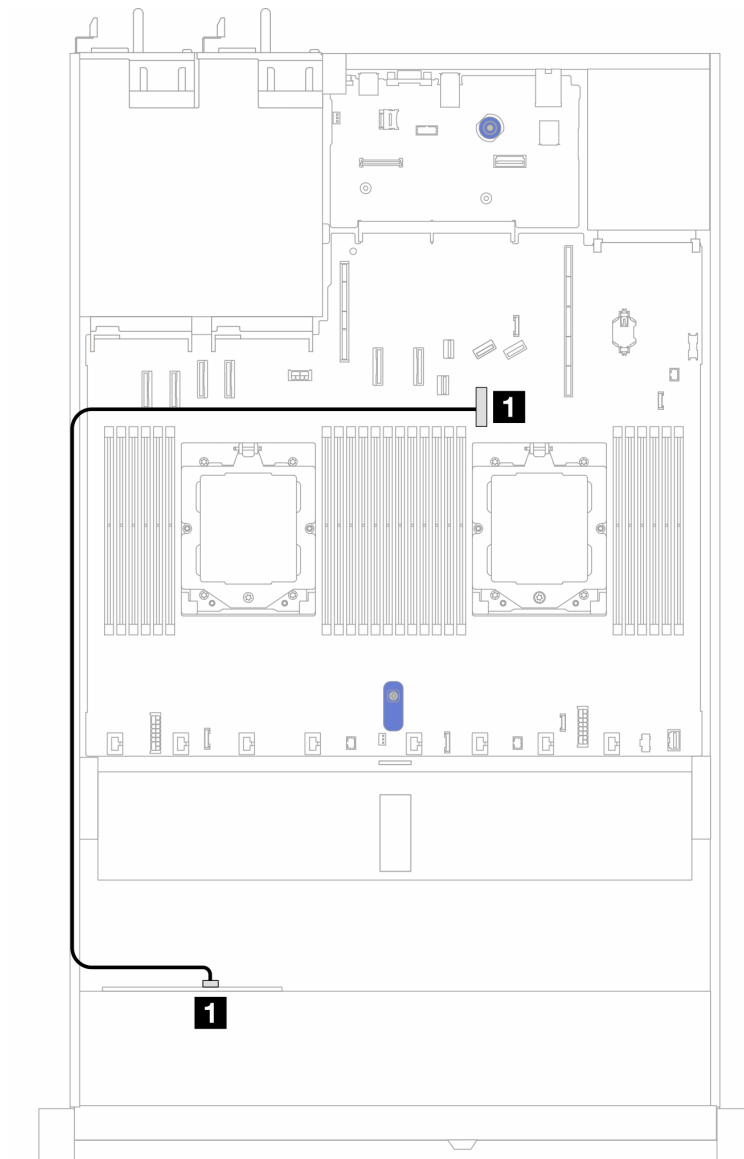


Figure 367. Cable routing for onboard configuration of 4 x 2.5" front SAS/SATA drive bays

Table 54. Mapping between backplane connectors and system board connectors for onboard configuration

Backplanes	From	To
Front BP (SAS)	SAS	PCIe connector 7

Cable routing with an SFF HBA/RAID adapter

The following table shows the mapping relationship between backplane connectors and system board/adapter connectors when an 8i SFF HBA/RAID adapter (Gen 3 or Gen 4) is installed.

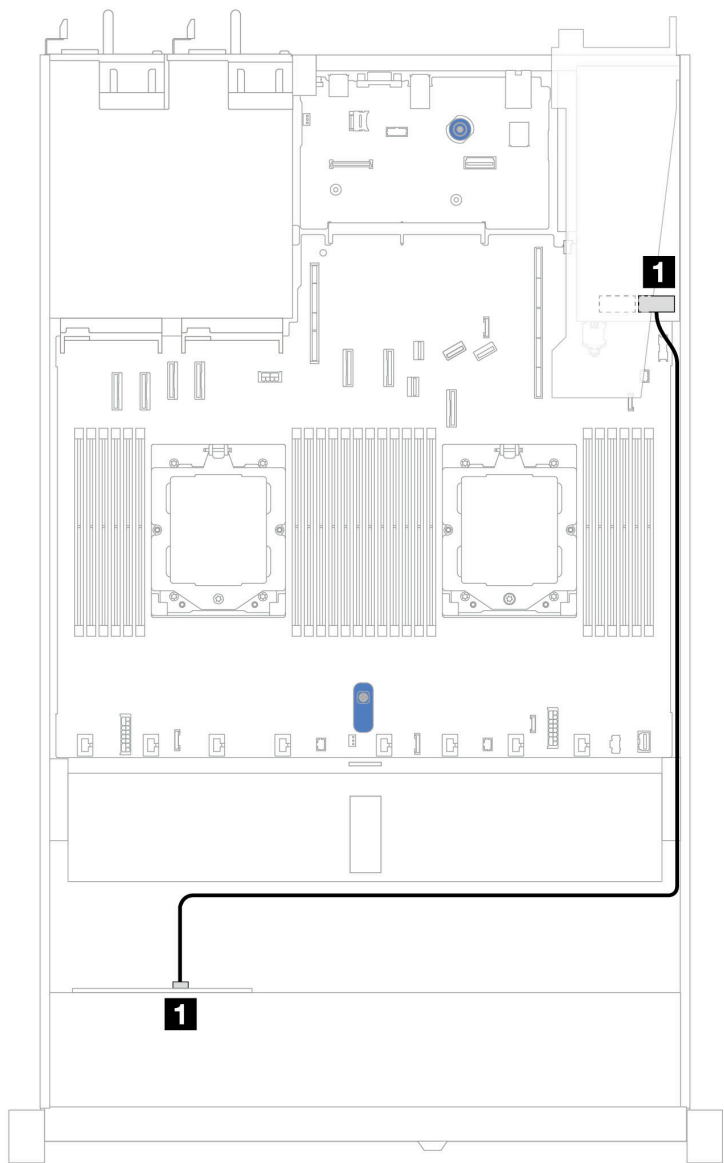


Figure 368. Cable routing for 4 x 2.5" front AnyBay drive bays with an 8i SFF RAID adapter (Gen 3 or Gen 4)

Table 55. Mapping between backplane connectors and system board/adapter connectors when an SFF HBA/RAID adapter is installed

Backplanes	From	To
Front BP (SAS)	SAS	C0

Notes:

- Gen 3 and Gen 4 SFF HBA/RAID adapters are slightly different in their connectors, but the cable routing method is similar.

- To connect cables for RAID flash power module, refer to [“RAID flash power modules” on page 350](#).

4 x 2.5" NVMe backplane (Gen 4)

Use this section to understand the NVMe backplane (Gen 4) cable routing for server model with four 2.5" front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connect cables for intrusion switch, refer to [“Intrusion switch” on page 342](#).

Cable routing for onboard configuration with one processor

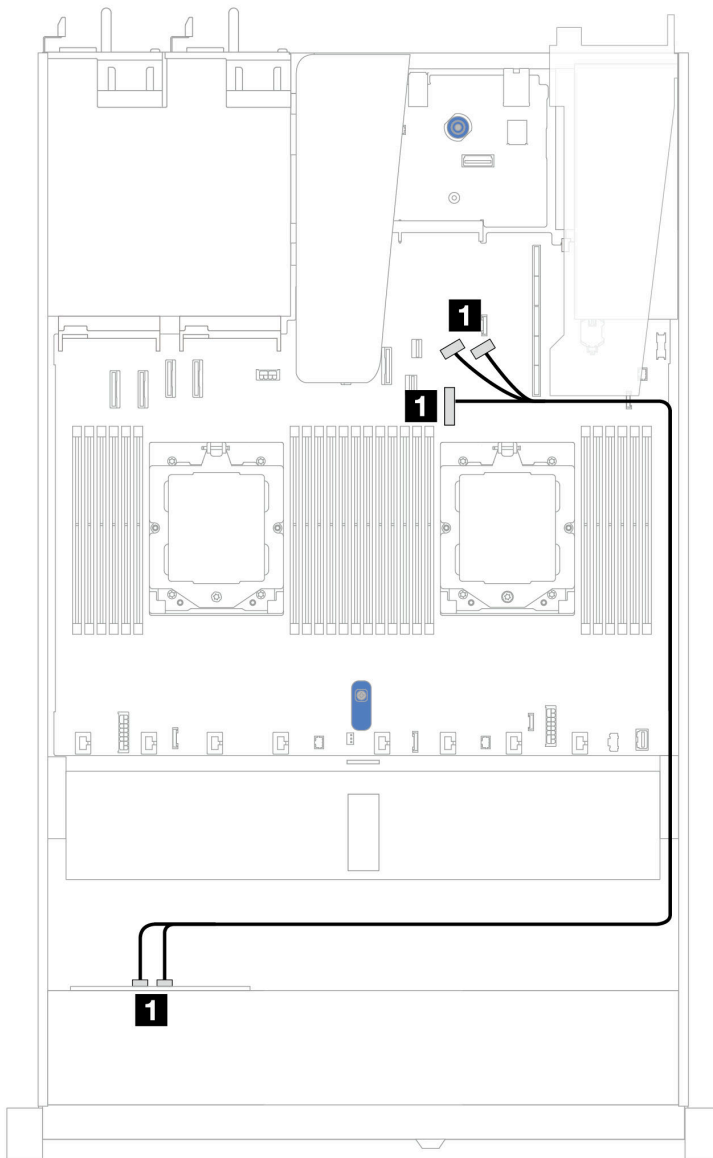


Figure 369. Mapping between 4 x 2.5" front NVMe drive backplane and system board for onboard configuration with one processor (Gen 4)

Note: This cable routing is for the configuration without M.2 SATA/NVMe drive PCIe 4.0 backplane and front I/O module.

Table 56. Mapping between 4 x 2.5" front NVMe drive backplane and system board for onboard configuration with one processor (Gen 4)

Backplane	From	To
Front BP (NVMe)	1 NVMe 0–1, NVMe 2–3	1 PCIe connectors 7, 8, and 9

4 x 2.5" NVMe backplane (Gen 5)

Use this section to understand the NVMe backplane (Gen 5) cable routing for server model with four 2.5" front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connect cables for intrusion switch, refer to [“Intrusion switch” on page 342](#).

Cable routing for onboard configuration with one processor

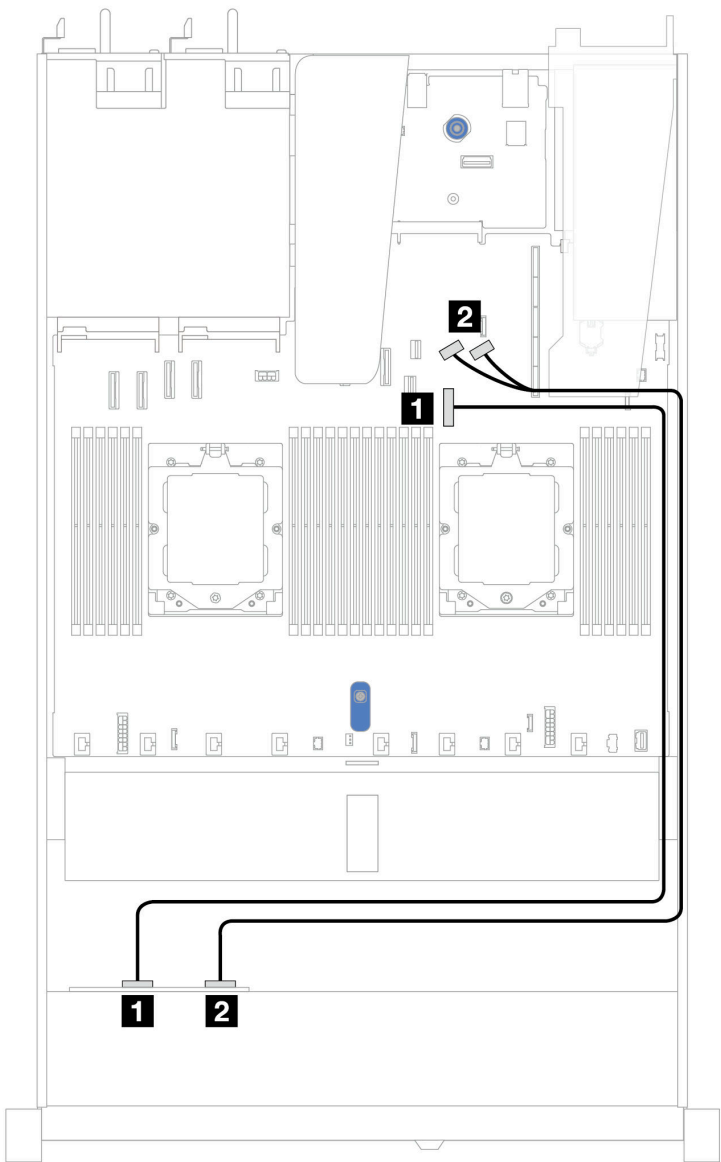


Figure 370. Mapping between 4 x 2.5" front NVMe drive backplane and system board for onboard configuration with one processor (Gen 5)

Table 57. Mapping between 4 x 2.5" front NVMe drive backplane and system board for onboard configuration with one processor (Gen 5)

Backplane	From	To
Front BP (NVMe)	1 NVMe 0–1	1 PCIe connector 7
	2 NVMe 2–3	1 PCIe connectors 8 and 9

8 x 2.5" front drives (one processor)

Use the section to understand the cable routing for signal cable connections for 8 x 2.5" front drive backplanes when one processor installed.

8 x 2.5" SAS/SATA backplane

Use this section to understand the SAS/SATA backplane cable routing for server model with eight 2.5" front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connect cables for M.2 drive backplane, refer to [“M.2 drive backplane” on page 344](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect intrusion switch cable, refer to [“Intrusion switch” on page 342](#).

To connect power cable for CFF RAID adapter, refer to [“CFF RAID adapter” on page 333](#).

To connect signal cables for a backplane for standard 8 x 2.5" front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing for onboard configuration” on page 402](#)
- [“Cable routing with an SFF HBA/RAID adapter” on page 403](#)
- [“Cable routing with a CFF RAID adapter” on page 404](#)

Cable routing for onboard configuration

The following illustrations and tables show the mapping relationship between backplane connectors and system board connectors for onboard configuration.

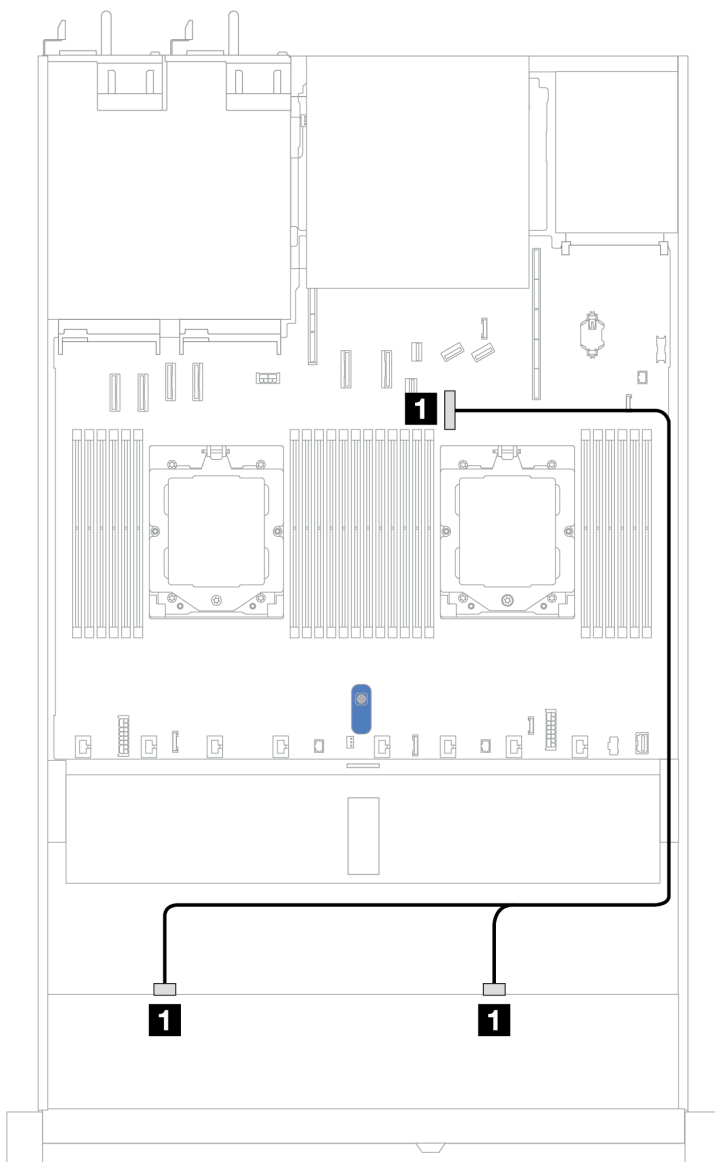


Figure 371. Cable routing for onboard configuration of 8 x 2.5 SAS/SATA front drives

Table 58. Cable routing for onboard configuration of 8 x 2.5 SAS/SATA front drives

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 PCIe connector 7

Cable routing with an SFF HBA/RAID adapter

The following illustrations and tables show the mapping relationship between backplane connectors and an 8i or 16i SFF HBA/RAID adapter (Gen 3 or Gen 4).

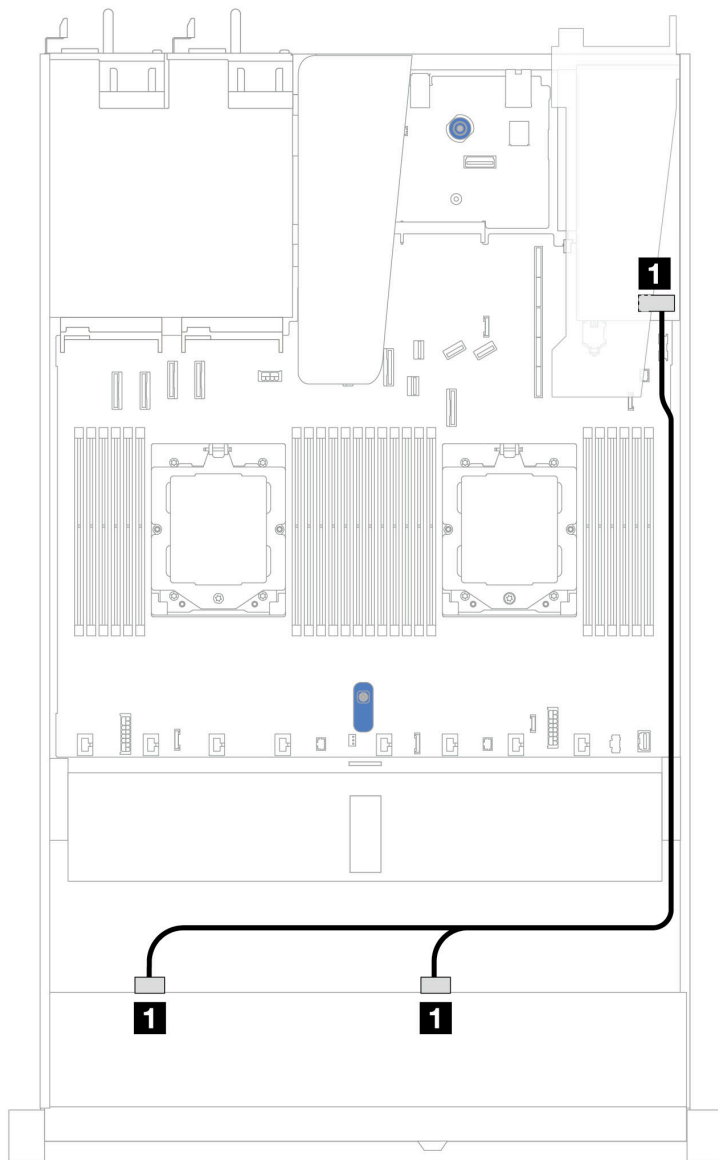


Figure 372. Cable routing for 8 x 2.5" front SAS/SATA drive bays with an 8i or 16i SFF RAID adapter (Gen 3 or Gen 4)

Table 59. Mapping between one front SAS/SATA backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0

Cable routing with a CFF RAID adapter

The following illustration and table show the mapping relationship between backplane connectors and an 8i or 16i CFF RAID adapter (Gen 3 or Gen 4).

Note: The following illustration is for Gen 4 adapters. For Gen 3 adapters, the illustration might be slightly different.

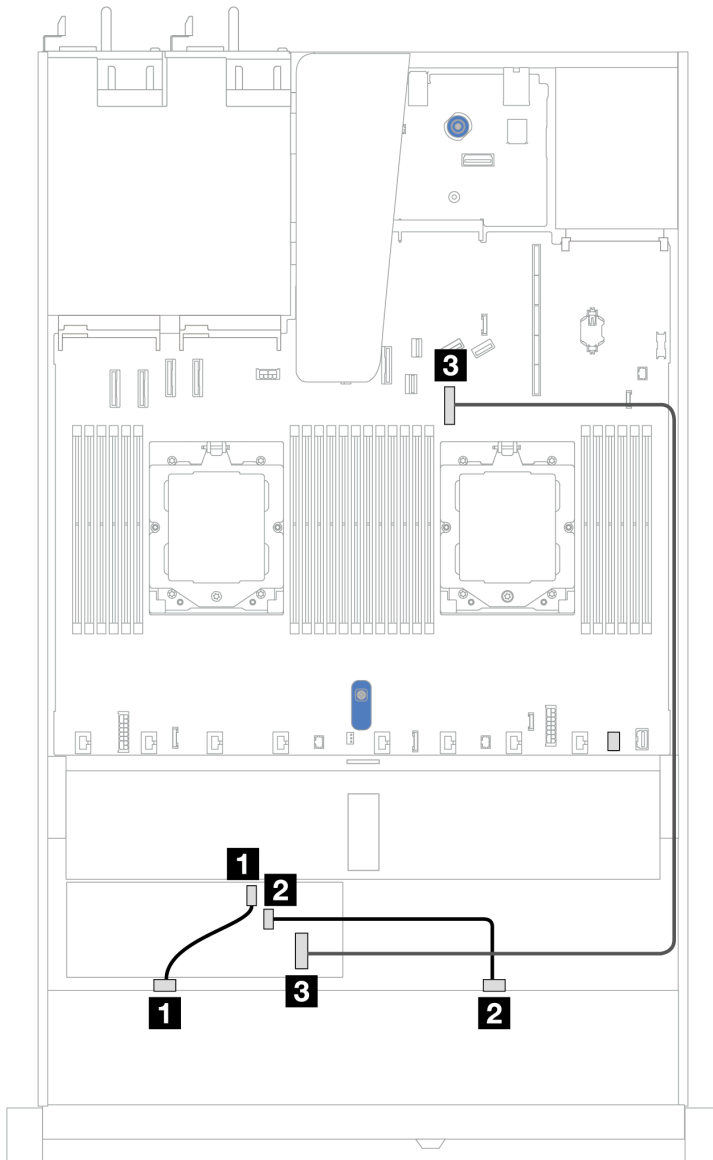


Figure 373. Cable routing for 8 x 2.5" front SAS/SATA drive bays with an 8i or 16i CFF RAID adapter (Gen 3 or Gen 4)

Table 60. Mapping between one front SAS/SATA backplane and a CFF RAID adapter

Backplane/adapter	From	To
Front BP (SAS)	1 SAS 0	1 C0
	2 SAS 1	2 C1
CFF RAID adapter	3 MB input	3 PCIe connector 7

10 x 2.5" front drives (one processor)

Use the section to understand the cable routing for signal cable connections for 10 x 2.5" front drive backplanes when one processor installed.

6 x 2.5" SAS/SATA + 4 x 2.5" AnyBay backplane

See this section to understand the cable routing of 6 front SAS/SATA drives and 4 front AnyBay drives with 10 x 2.5" backplane (Gen 4) installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables, refer to the following cable routing scenario:

- [“Cable routing with an SFF HBA/RAID adapter” on page 406](#)

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4).

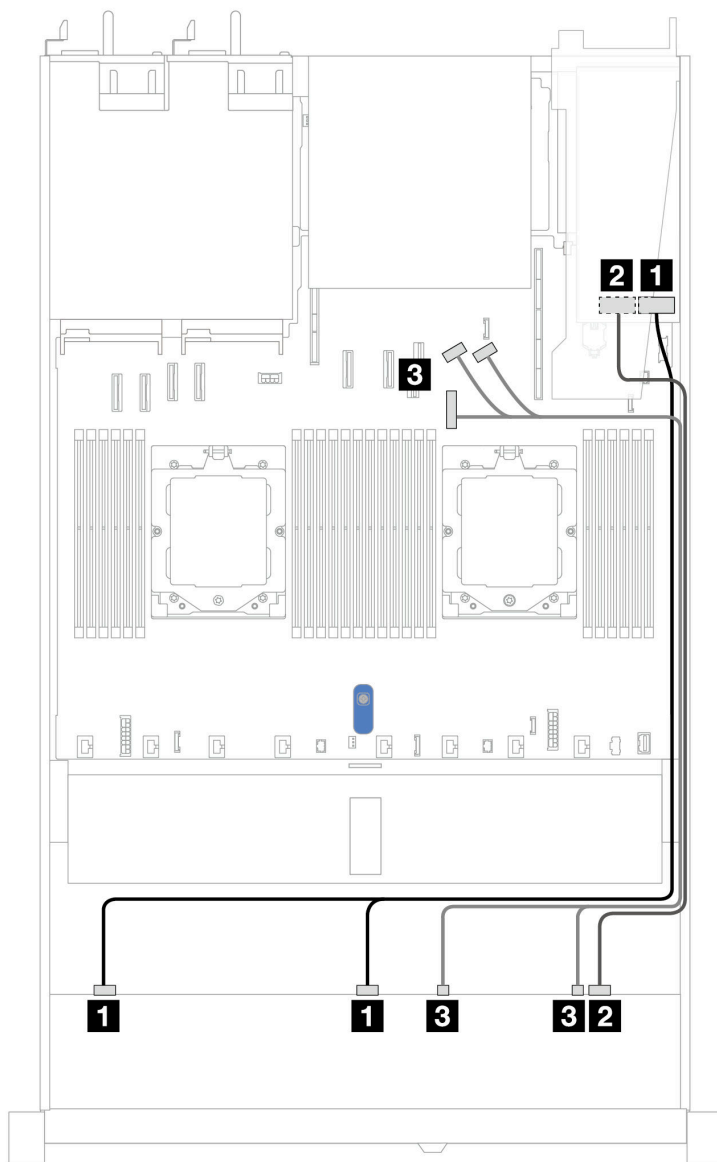


Figure 374. Cable routing for 6 front SAS/SATA drives and 4 front AnyBay drives bays with a 16i SFF RAID adapter (Gen 3 or Gen 4)

Table 61. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0
	2 SAS 2	2 <ul style="list-style-type: none"> • Gen 3: C2 • Gen 4: C1
Front BP (NVMe)	3 NVMe 0–1, 2–3	3 PCIe connector 7, 8, 9

6 x 2.5" SAS/SATA + 2 x 2.5" AnyBay + 2 x 2.5" NVMe backplane

See this section to understand the cable routing of 6 front SAS/SATA drives, 2 front AnyBay drives and 2 front NVMe drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect the signal cables, refer to the following cable routing scenario:

- [“Cable routing with an SFF HBA/RAID adapter” on page 408](#)

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and an SFF HBA/RAID adapter.

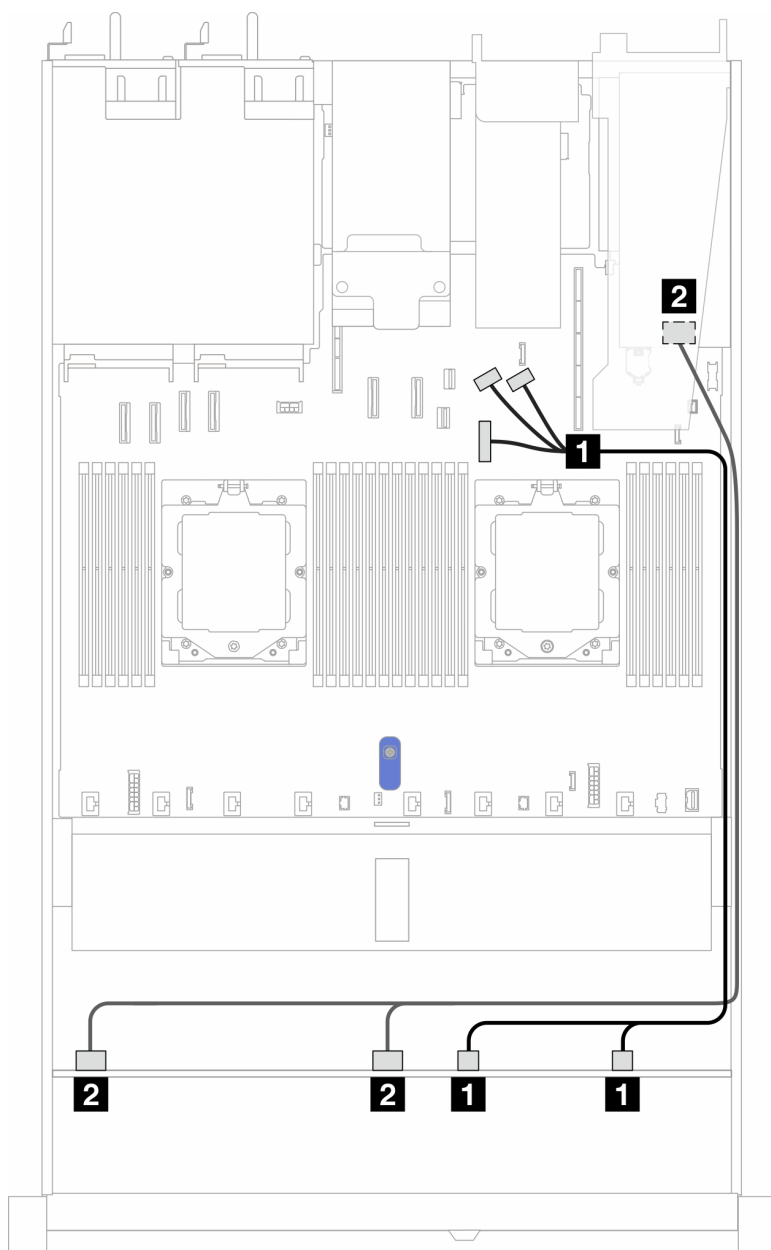


Figure 375. Cable routing for 6 SAS/SATA drives, 2 AnyBay drives, and 2 NVMe drive bays with an 8i SFF RAID/HBA adapter (Gen3 or Gen 4)

Table 62. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (NVMe)	1 NVMe 0–1, NVMe 2–3	1 PCIe connectors 7, 8, and 9
Front BP (SAS)	2 SAS 0, SAS 1	2 <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0

8 x 2.5"/10 x 2.5" U.3 drives with 10 x 2.5" AnyBay backplane

Use this section to understand the cable routing for eight or ten U.3 drives with 10 x 2.5" AnyBay backplane and one processor installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables for a backplane for standard 6 front SAS/SATA drives and 4 front AnyBay drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing with an SFF HBA/RAID adapter” on page 410](#)

Cable routing with an SFF HBA/RAID adapter

The following illustrations and tables show the mapping relationship between backplane connectors and an 8i or 16i SFF RAID adapter (Gen 4).

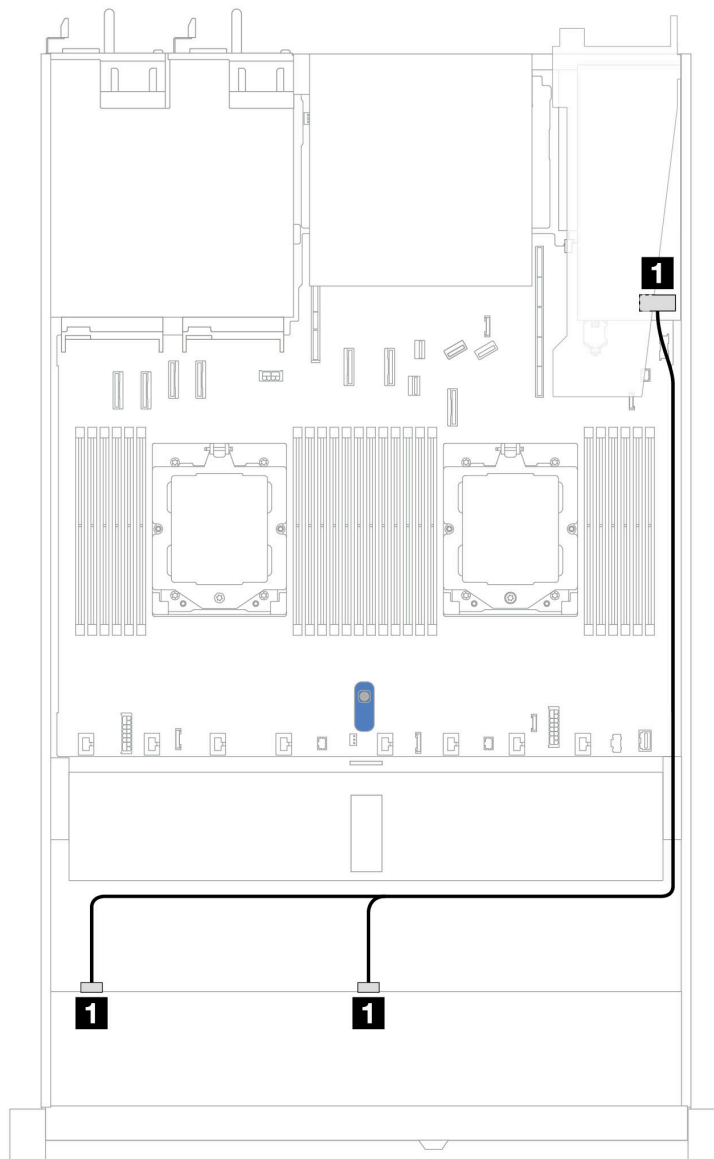


Figure 376. Cable routing for 8 x 2.5" front U.3 drives with an 8i SFF RAID adapter (Gen 4)

Table 63. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 C0

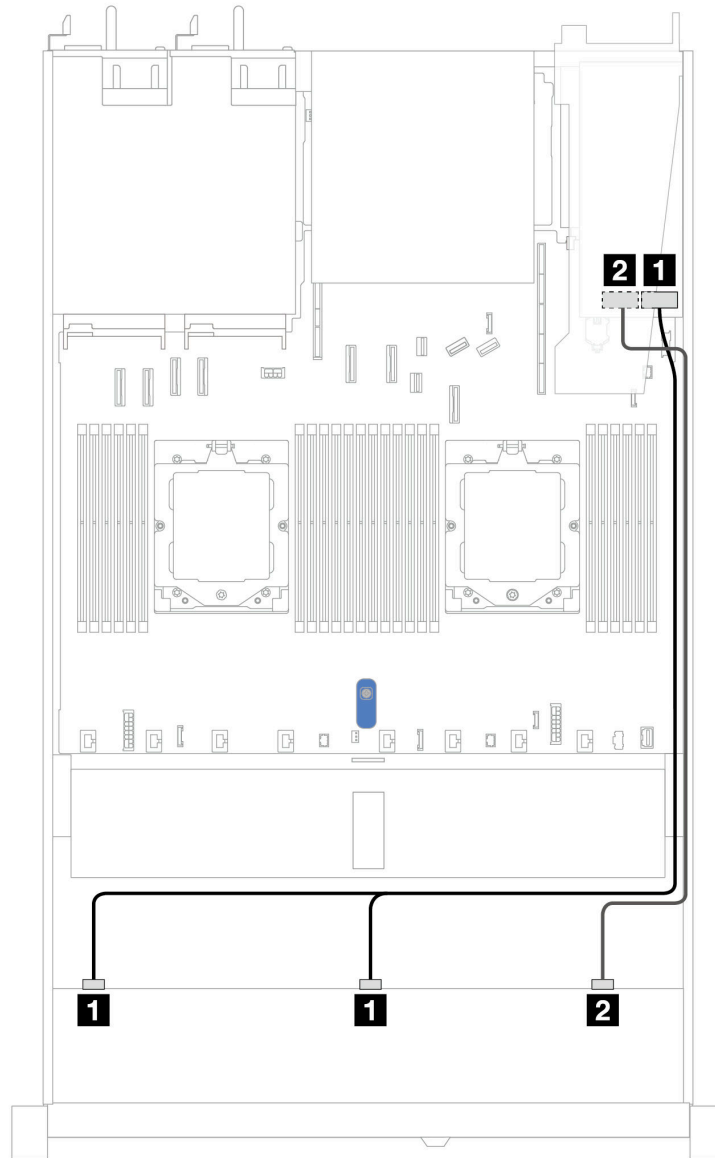


Figure 377. Cable routing for 10 x 2.5" front U.3 drives with an 16i SFF RAID adapter (Gen 4)

Table 64. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 C0
	2 SAS 2	2 C1

10 x 2.5" SAS/SATA backplane

See this section to understand the cable routing of 10 front SAS/SATA drives with the 10 x 2.5 AnyBay backplane (Gen 4) installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect cables for a CFF RAID adapter, refer to [“CFF RAID adapter” on page 333](#)

To connect signal cables, refer to the following cable routing scenarios:

- [“Cable routing for onboard configuration” on page 412](#)
- [“Cable routing with an SFF HBA/RAID adapter” on page 413](#)
- [“Cable routing with a CFF RAID adapter” on page 416](#)

Cable routing for onboard configuration

The following illustrations and tables show the mapping relationship between backplane connectors and system board connectors for onboard configuration.

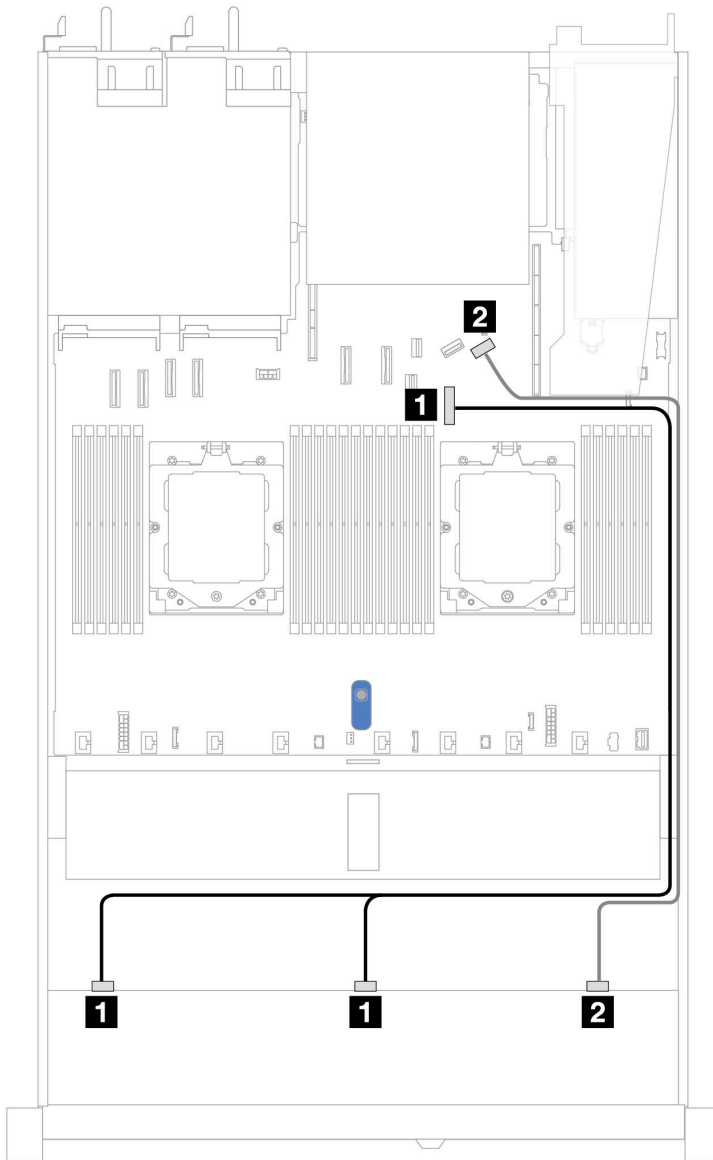


Figure 378. Cable routing for onboard configuration of 10 x 2.5 SAS/SATA front drives

Table 65. Mapping between one front AnyBay backplane and system board for onboard configuration

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 PCIe connector 7
	2 SAS 2	2 PCIe connector 9

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4).

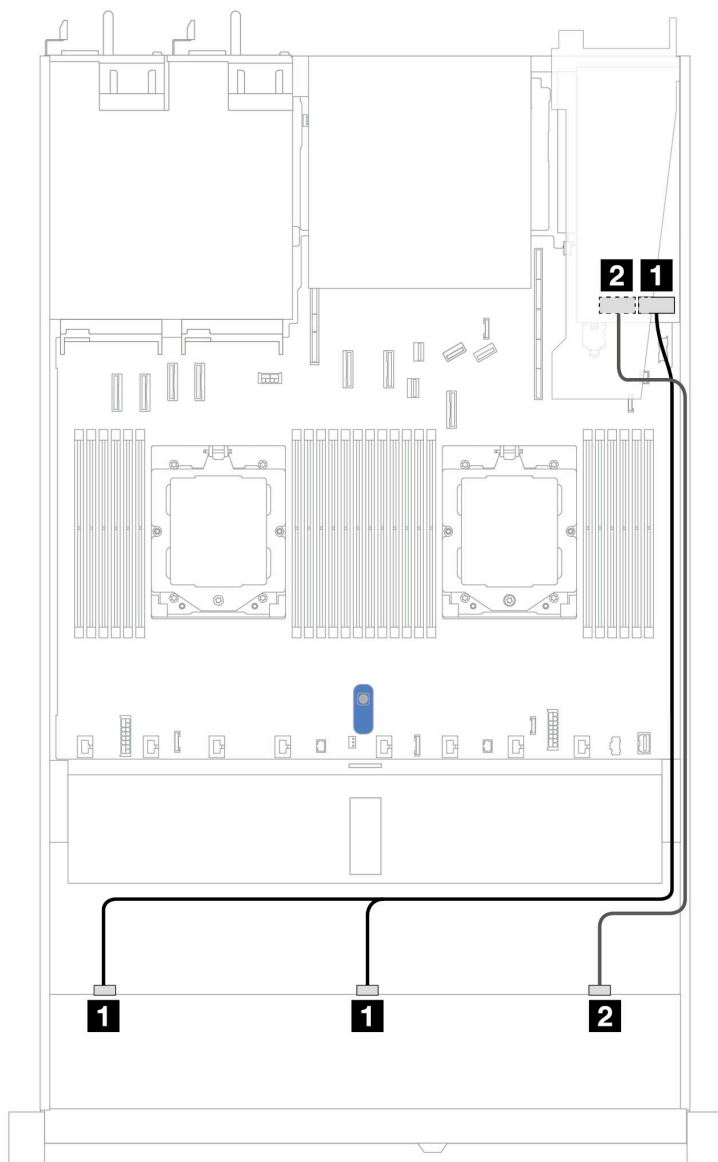


Figure 379. Cable routing for 10 front SAS/SATA drives bays with a 16i SFF RAID adapter (Gen 3 or Gen 4)

Table 66. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0
	2 SAS 2	2 <ul style="list-style-type: none"> • Gen 3: C2 • Gen 4: C1

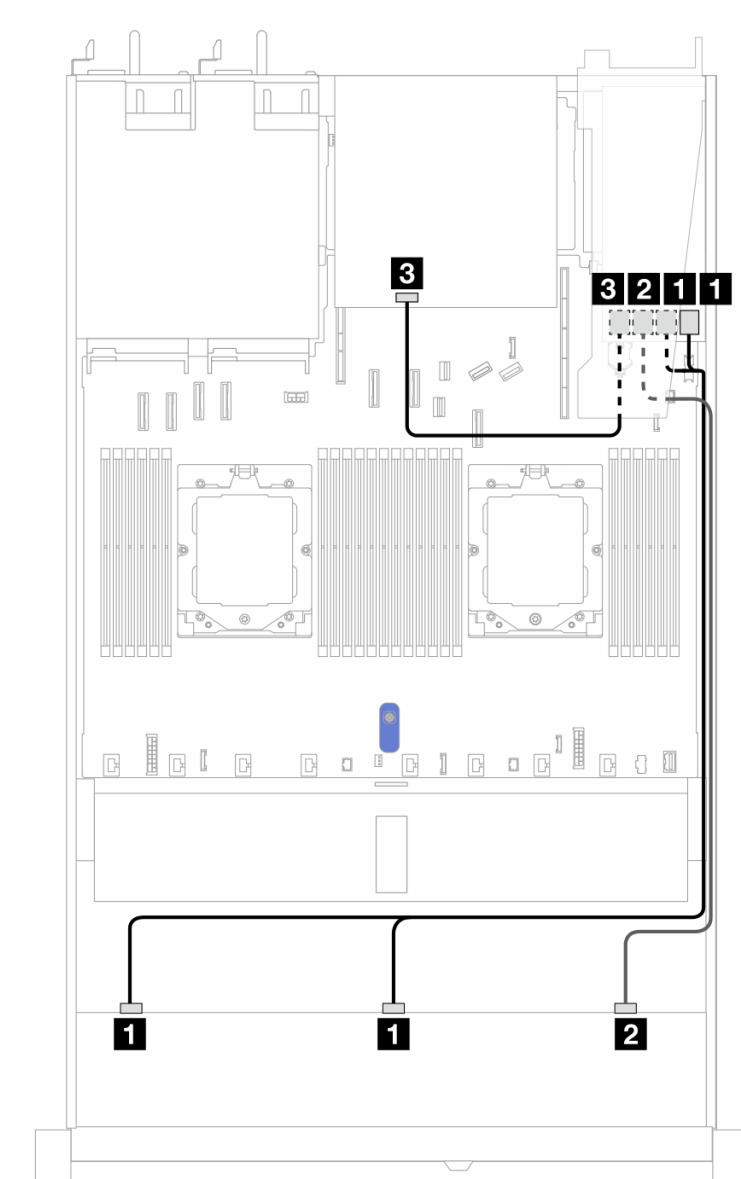


Figure 380. Cable routing for 10 front SAS/SATA drives bays and a 16i SFF RAID adapter (Gen 3) with 2 x 2.5 rear SAS/SATA drives installed

Table 67. Mapping between one front AnyBay and one rear SAS/SATA backplane and an SFF RAID adapter

Backplane/adapter	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 C0, C1
	2 SAS 2	2 C2
Rear BP (SAS)	4 SAS	3 C3

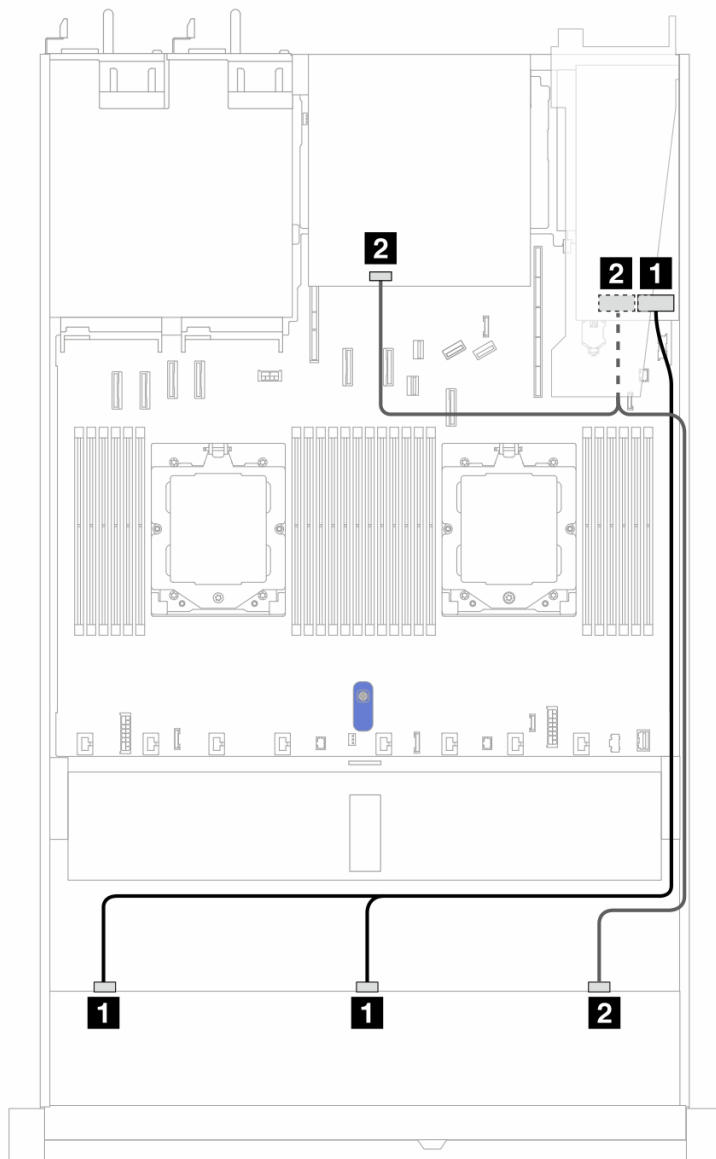


Figure 381. Cable routing for 10 front SAS/SATA drives bays and a 16i SFF RAID adapter (Gen 4) with 2 x 2.5 rear SAS/SATA drives installed

Table 68. Mapping between one front AnyBay and one rear SAS/SATA backplane and an SFF RAID adapter

Backplane/adapter	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 C0
	2 SAS 2	2 C1
Rear BP (SAS)	2 SAS	2 C1

Cable routing with a CFF RAID adapter

The following tables show the mapping relationship between backplane connectors and an 8i or 16i CFF RAID adapter (Gen 3 or Gen 4).

Note: The following illustrations are for Gen 4 adapters. For Gen 3 adapters, the illustration might be slightly different.

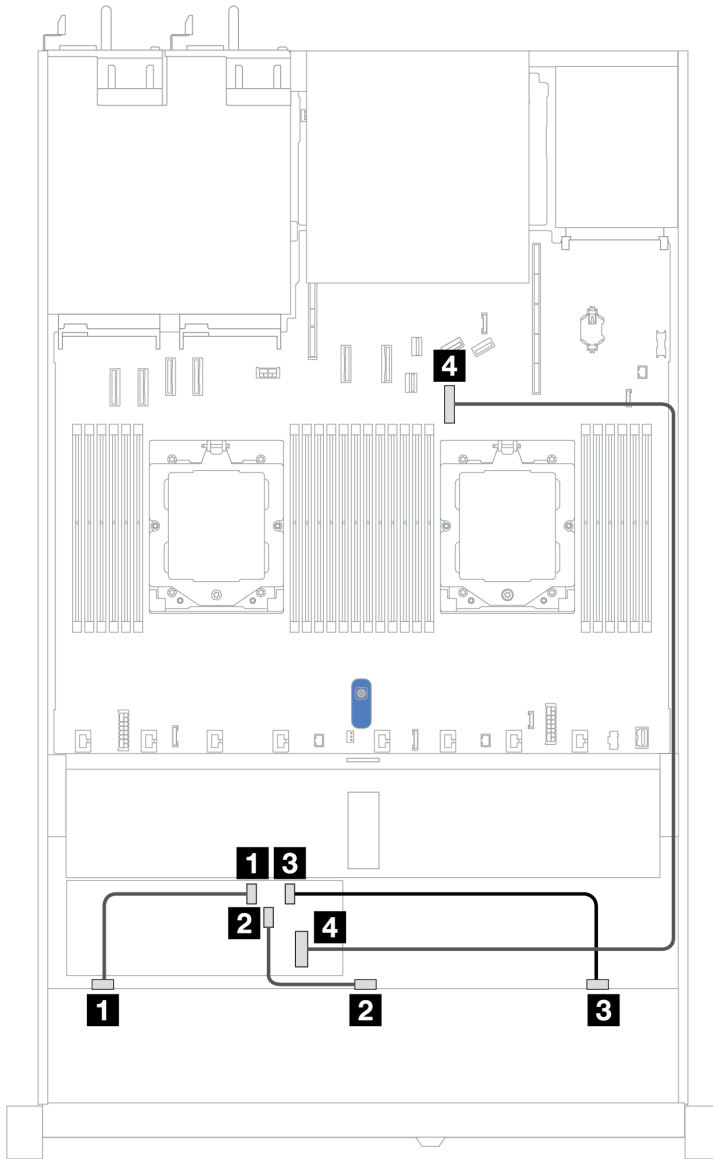


Figure 382. Cable routing for 10 front SAS/SATA drives bays with an 8i or 16i CFF RAID adapter (Gen 3 or Gen 4)

Table 69. Mapping between one front AnyBay and a CFF RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0	1 C0
	2 SAS 1	2 C1
	3 SAS 2	3 C2
CFF RAID adapter	4 MB input	4 PCIe connector 7

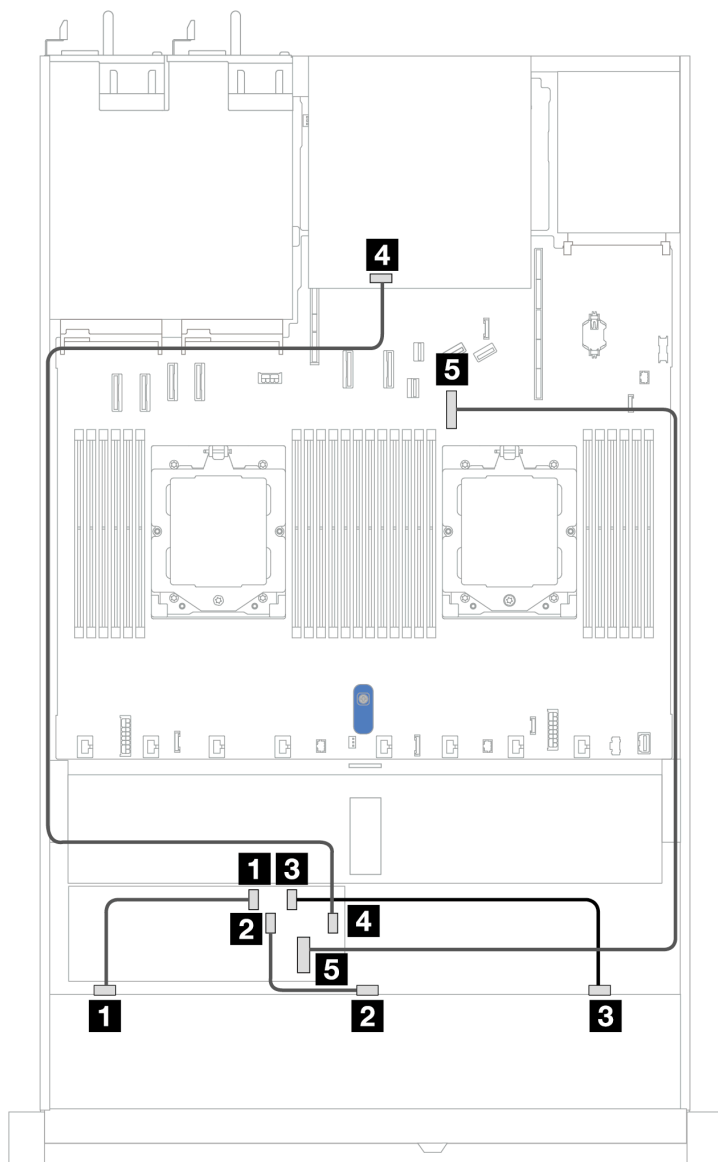


Figure 383. Cable routing for 10 front SAS/SATA drives bays and an 8i or 16i CFF RAID adapter (Gen 3 or Gen 4) with 2 x 2.5 rear SAS/SATA drives installed

Table 70. Mapping between one front AnyBay and one rear NVMe backplane and a CFF RAID adapter

Backplane/adapter	From	To
Front BP (SAS)	1 SAS 0	1 C0
	2 SAS 1	2 C1
	3 SAS 2	3 C2
Rear BP (SAS)	4 SAS	4 C3
CFF RAID adapter	5 MB input	5 PCIe connector 7

10 x 2.5 AnyBay backplane (Gen 5)

Use this section to understand the alternatives that a 10 x 2.5 AnyBay backplane (Gen 5) offers.

With a 10 x 2.5 AnyBay backplane (Gen 5), following front drive combinations are supported:

Note: M.2 SATA Non-RAID, M.2 X4 NVMe Non-RAID, and 7mm SATA Non-RAID configurations are not supported.

6 x 2.5" SAS/SATA + 4 x 2.5" AnyBay backplane

See this section to understand the cable routing of 6 front SAS/SATA drives and 4 front AnyBay drives with 10 x 2.5" backplane (Gen 5) installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables, refer to the following cable routing scenario:

- [“Cable routing with an SFF HBA/RAID adapter” on page 419](#)

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4).

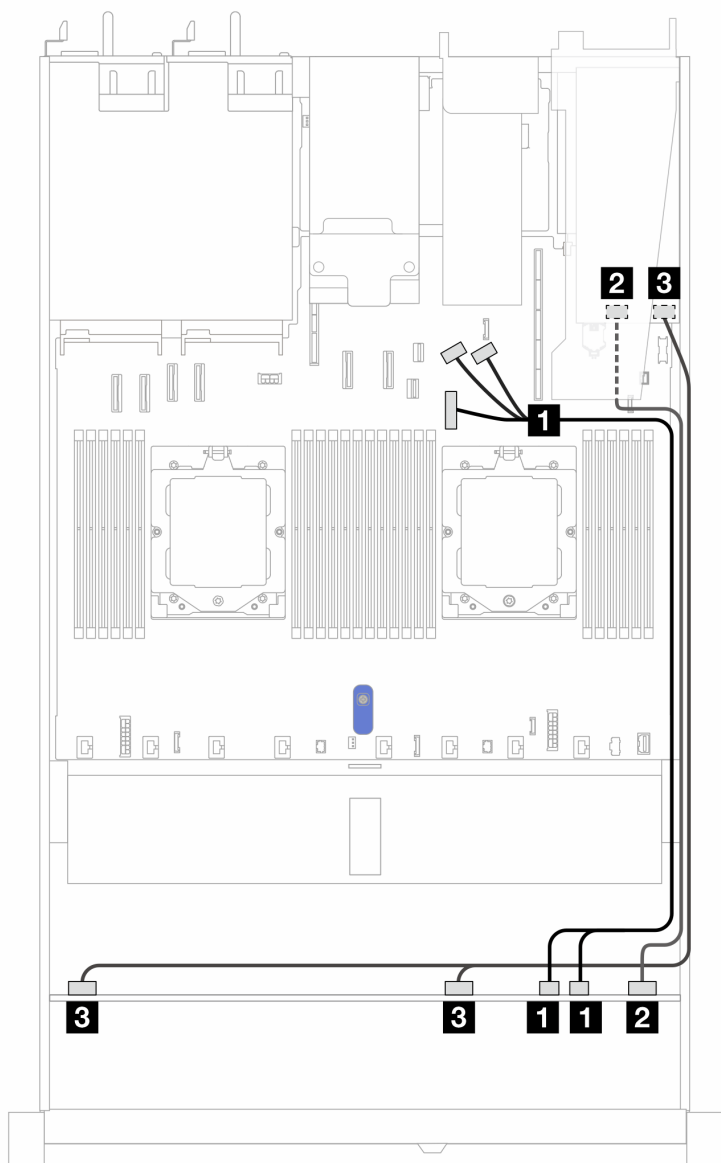


Figure 384. Cable routing for 6 front SAS/SATA drives and 4 front AnyBay drives bays with a 16i SFF RAID adapter (Gen 3 or Gen 4)

Table 71. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (NVMe)	1 NVMe 6–7, 8–9	1 PCIe connectors 7, 8, 9
Front BP (SAS)	2 SAS 8–9	2 <ul style="list-style-type: none"> • Gen 3: C2 • Gen 4: C1
	3 SAS 0–3, 4–7	3 <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0

6 x 2.5" SAS/SATA + 2 x 2.5" AnyBay + 2 x 2.5" NVMe backplane

See this section to understand the cable routing of 6 front SAS/SATA drives, 2 front AnyBay drives, and 2 front NVMe drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect the cables for rear NVMe/SAS/SATA drive backplane, refer to [“Rear NVMe/SAS/SATA drive backplane” on page 353](#).

To connect signal cables, refer to the following cable routing scenario:

- [“Cable routing with an SFF HBA/RAID adapter” on page 421](#)

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and an 8i SFF HBA/RAID adapter.

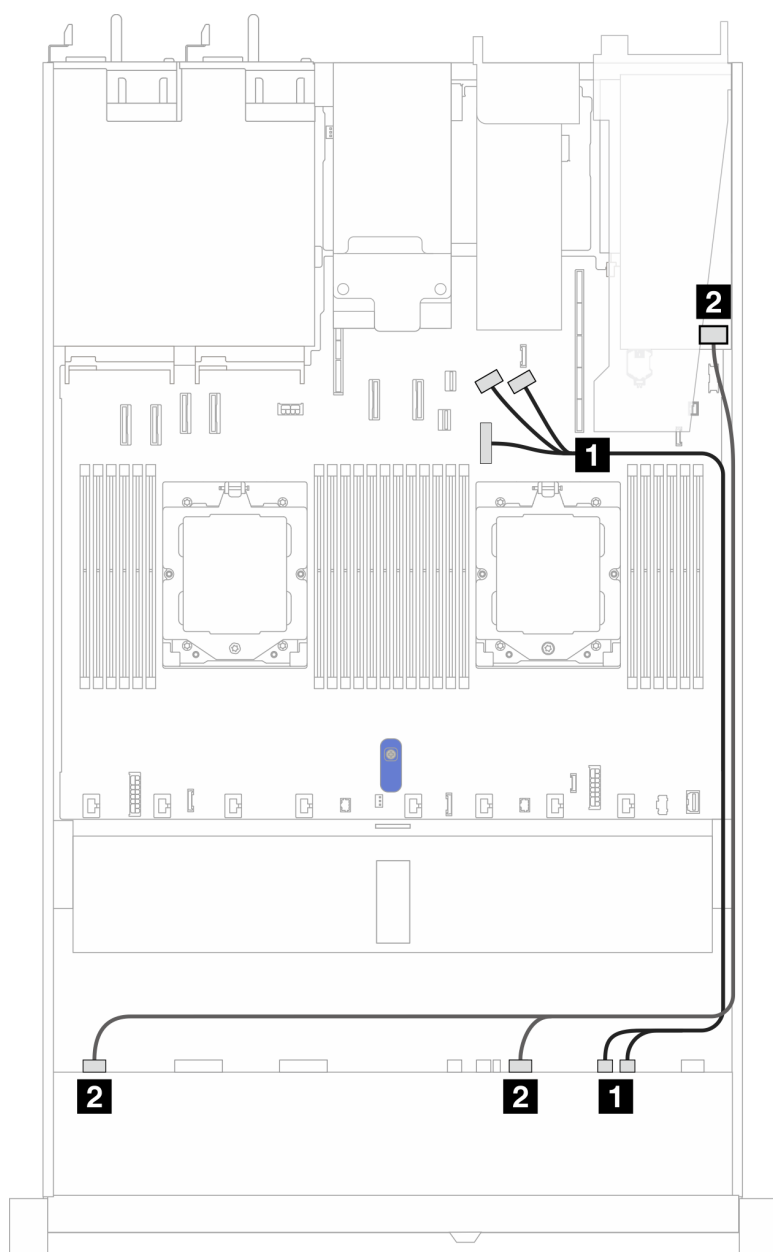


Figure 385. Cable routing with an 8i SFF HBA/RAID adapter

Table 72. Mapping between one front AnyBay backplane and an 8i SFF HBA/RAID adapter

Backplane	From	To
Front BP (NVMe)	1 NVMe 6–7, NVMe 8–9	1 PCIe connectors 7, 8, and 9
Front BP (SAS)	2 SAS 0–3, SAS 4–7	2 <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0

Cable routing for backplane signals (two processors)

In this section, you can find cable routings of backplane signals when two processors installed.

- Each backplane your server supports offers multiple signal connections. This section singles out the signal connection from power connection for better understanding. For backplane power connection, see [“Backplane power cable routing” on page 330](#).
- For the locations of backplane signal connectors on the processor board and adapters, see [“System-board-assembly connectors” on page 36](#) for details.
- For more information about backplanes supported and their connectors, see [“Drive backplane connectors” on page 326](#).

4 x 3.5" front drives (two processors)

Use the section to understand the cable routing for signal cable connections for 4 x 3.5" drive backplanes.

Under the configuration of 4 x 3.5" front drives, your server supports the following front backplanes:

4 x 3.5" SAS/SATA backplane

Use this section to understand the SAS/SATA backplane cable routing for server model with four 3.5" front drives.

To connect cables for a rear NVMe/SAS/SATA drive backplane, refer to [“Rear NVMe/SAS/SATA drive backplane” on page 353](#).

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connect cables for RAID flash power module, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables for a SAS/SATA backplane for standard 4 x 3.5" front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing for onboard configuration” on page 424](#)
- [“Cable routing with an SFF HBA/RAID adapter” on page 425](#)

Cable routing for onboard configuration

The following table shows the mapping relationship between backplane connectors and system board connectors for onboard configuration.

The following figure illustrates the cable routing for the onboard configuration of 4 x 3.5" front SAS/SATA drive bays. Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n.

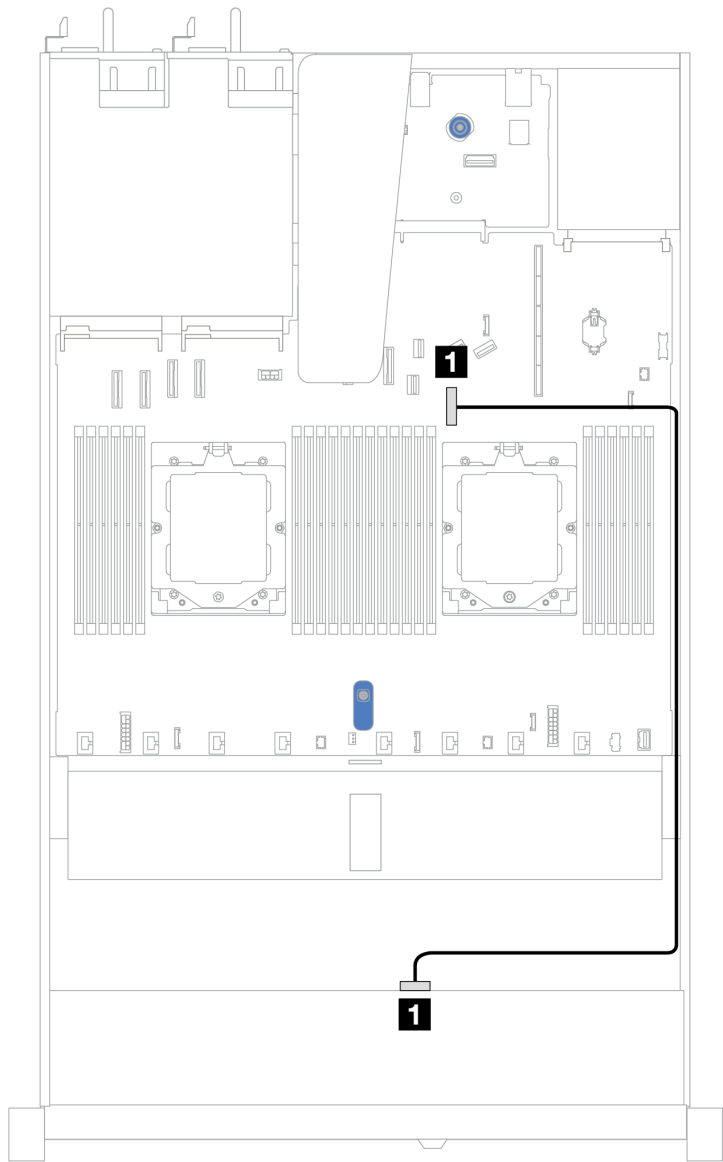


Figure 386. On-board configuration of 4 x 3.5" front SAS/SATA drive bays

Table 73. Cable routing for onboard configuration of 4 x 3.5" front SAS/SATA drive bays

Backplane	From	To
Front BP (SAS)	1 SAS	1 PCIe connector 7

Cable routing with an SFF HBA/RAID adapter

The following table shows the mapping relationship between backplane connectors and system board/adapter connectors when an 8i SFF HBA/RAID adapter (Gen 3 or Gen 4) is installed.

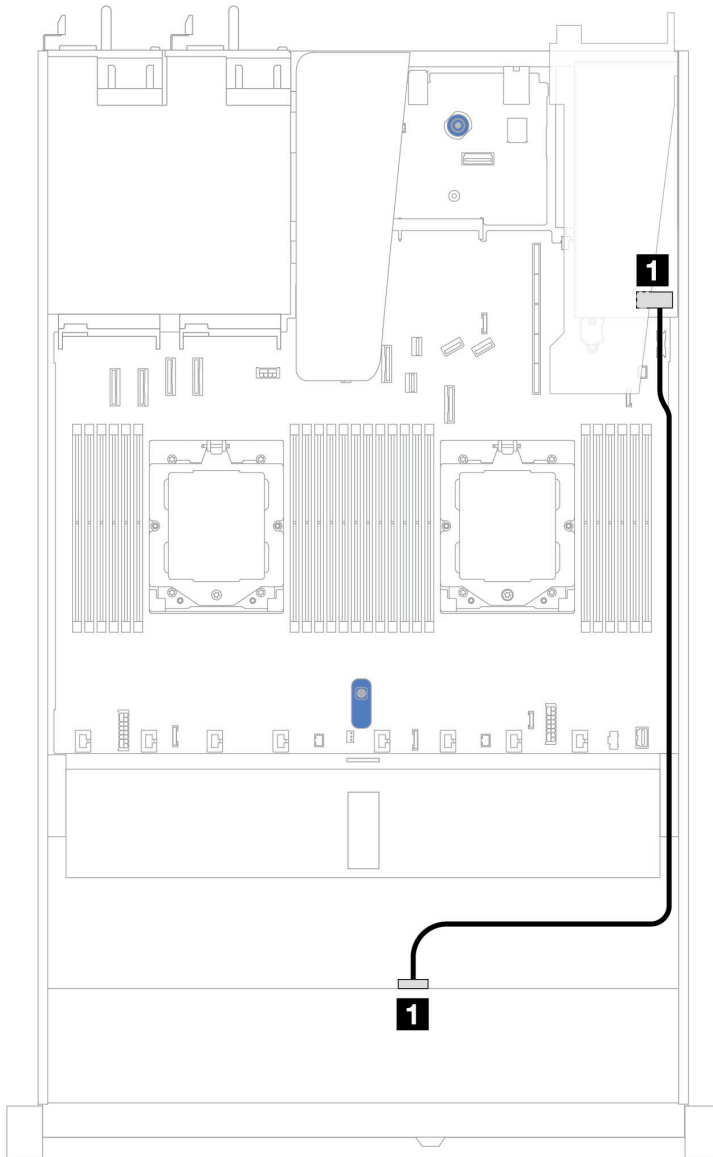


Figure 387. Cable routing for 4 x 3.5" front SAS/SATA drive bays with an 8i SFF RAID adapter (Gen 3 or Gen 4)

Table 74. Mapping between backplane connectors and system board/adapter connectors when an SFF HBA/RAID adapter is installed

Backplane	From	To
Front BP (SAS)	1 SAS	1 C0

Note: Gen 3 and Gen 4 SFF HBA/RAID adapters are slightly different in their connectors, but the cable routing method is similar.

The following table shows the mapping relationship between backplane connectors and system board/ adapter connectors when an 8i SFF HBA/RAID adapter (Gen 3) is installed.

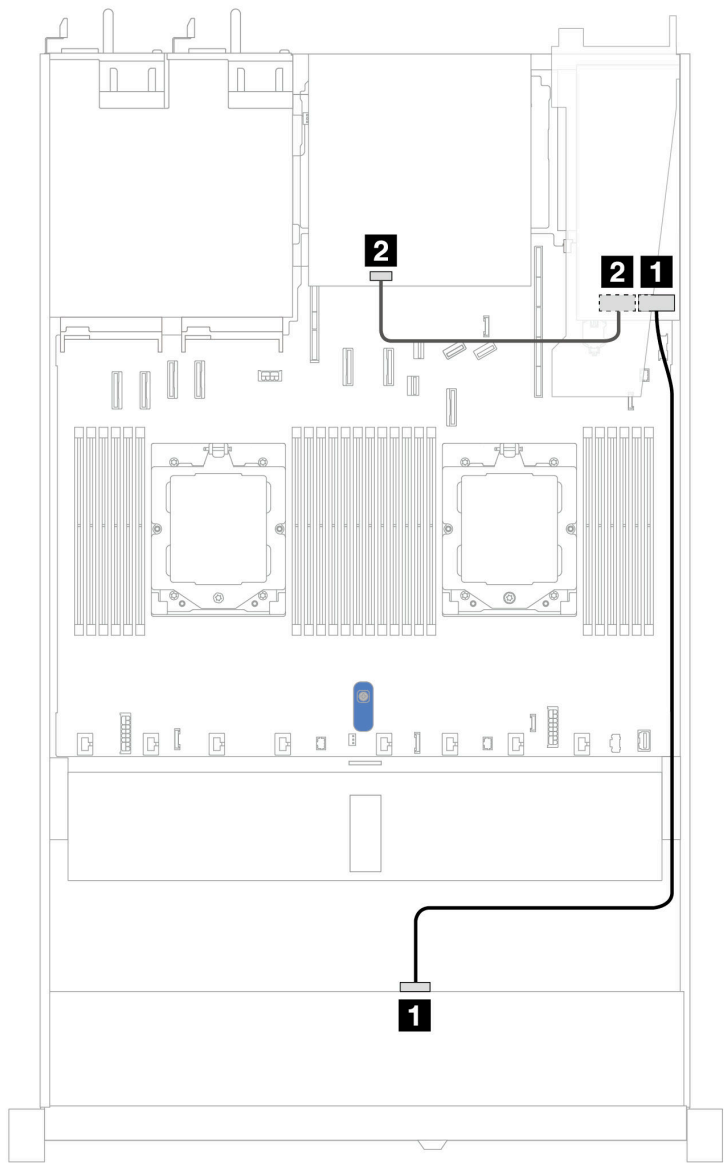


Figure 388. Cable routing for 4 x 3.5" front SAS/SATA drive bays with an 8i SFF RAID adapter (Gen 3) and rear 2 x 2.5-inch SAS/SATA drives

Table 75. Mapping between backplane connectors and system board/adapter connectors when an SFF HBA/RAID adapter is installed

Backplane	From	To
Front BP (SAS)	1 SAS	1 C0
Rear BP (SAS)	2 SAS	2 C1

The following table shows the mapping relationship between backplane connectors and system board/ adapter connectors when an 8i SFF HBA/RAID adapter (Gen 4) is installed.

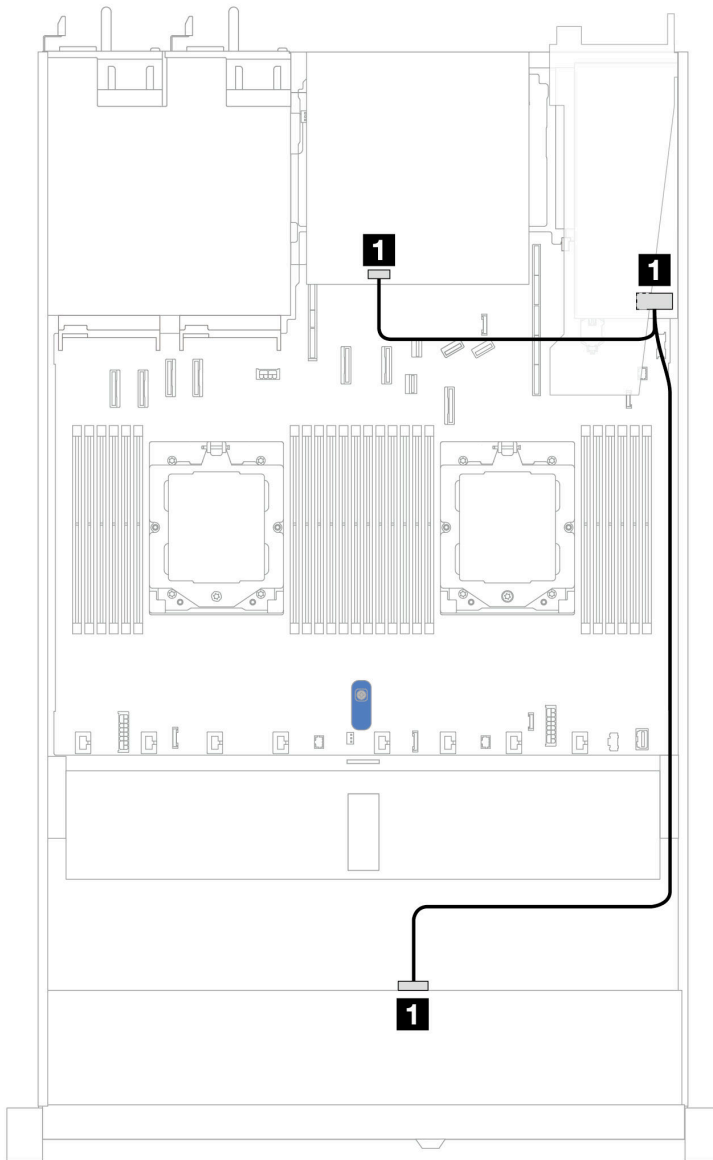


Figure 389. Cable routing for 4 x 3.5" front SAS/SATA drive bays with an 8i SFF RAID adapter (Gen 4) and rear 2 x 2.5-inch SAS/SATA drives

Table 76. Mapping between backplane connectors and system board/adapter connectors when an SFF HBA/RAID adapter is installed

Backplane	From	To
Front and Rear BP (SAS)	1 SAS	1 C0

4 x 3.5" AnyBay backplane

Use this section to understand the AnyBay backplane cable routing for server model with four 3.5" front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing with an SFF HBA/RAID adapter” on page 428](#)

Cable routing with an SFF HBA/RAID adapter

The following table shows the mapping relationship between backplane connectors and system board/ adapter connectors when an 8i SFF HBA/RAID adapter (Gen 3 or Gen 4) is installed.

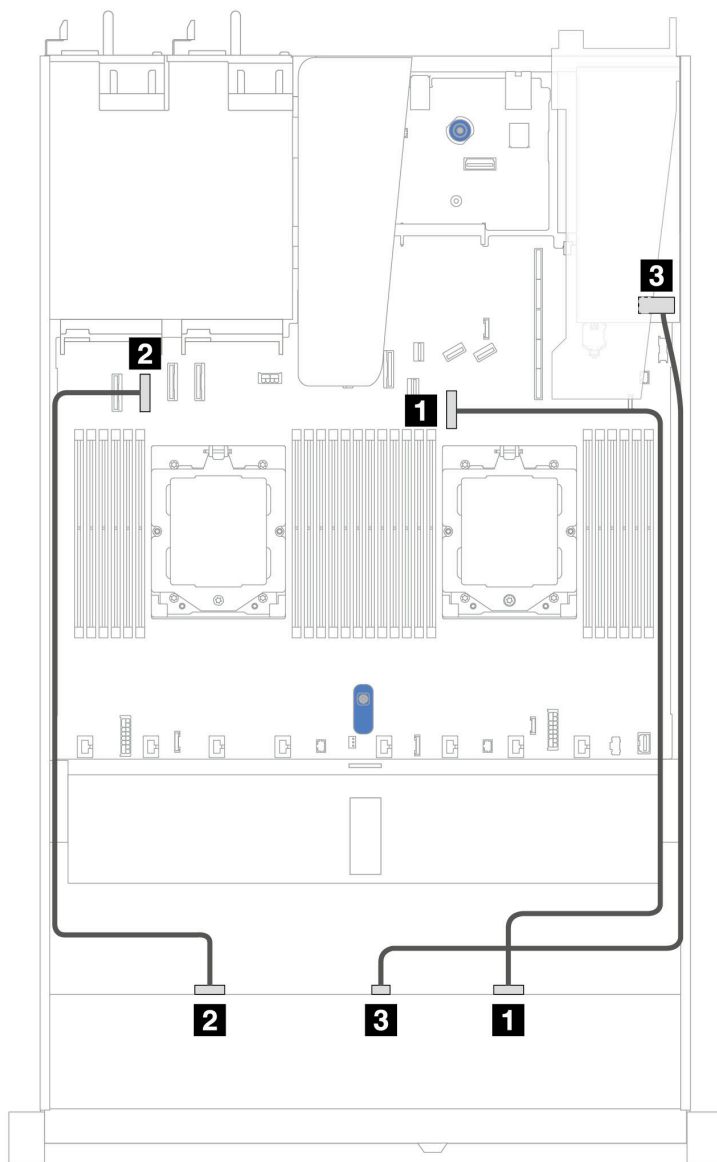


Figure 390. Cable routing for 4 x 3.5" front AnyBay drive bays with an 8i SFF RAID adapter (Gen 3 or Gen 4)

Table 77. Mapping between one front AnyBay backplane and an SFF RAID adapter

Backplane	From	To
Front BP(NVMe)	1 NVMe 2-3	1 PCIe connector 7
	2 NVMe 0-1	2 PCIe connector 2
Front BP(SAS)	3 SAS	3 C0

4 x 3.5" U.3 drives with 4 x 3.5" AnyBay backplane

Use this section to understand the cable routing for eight U.3 drives with 4 x 3.5" AnyBay backplane and two processors installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect the signal cable, refer to the following cable routing scenario:

- [“Cable routing with an SFF HBA/RAID adapter” on page 430](#)

Cable routing with an SFF HBA/RAID adapter

The following illustrations and tables show the mapping relationship between backplane connectors and an 8i or 16i SFF RAID adapter (Gen 4).

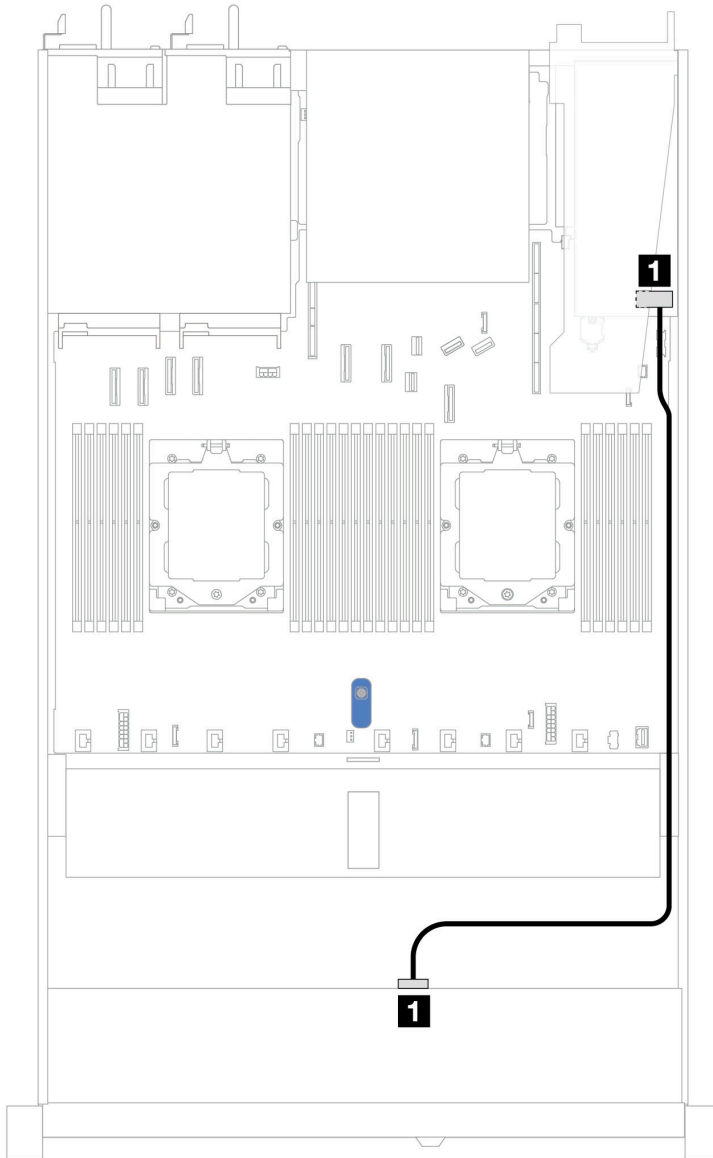


Figure 391. Cable routing for 4 x 3.5" front U.3 drives with an 8i SFF RAID adapter (Gen 4)

Table 78. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS	1 C0

4 x 2.5" front drives (two processors)

Use the section to understand the cable routing for signal cable connections for 4 x 2.5" drive backplanes.

Under the configuration of 4 x 2.5" front drives, your server supports the following front backplanes:

4 x 2.5" SAS/SATA backplane

Use this section to understand the SAS/SATA backplane cable routing for server model with four 2.5" front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables for a backplane for standard 4 x 2.5" front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing for onboard configuration” on page 433](#)
- [“Cable routing with an SFF HBA/RAID adapter” on page 434](#)

Cable routing for onboard configuration

The following table shows the mapping relationship between backplane connectors and system board connectors for onboard configuration.

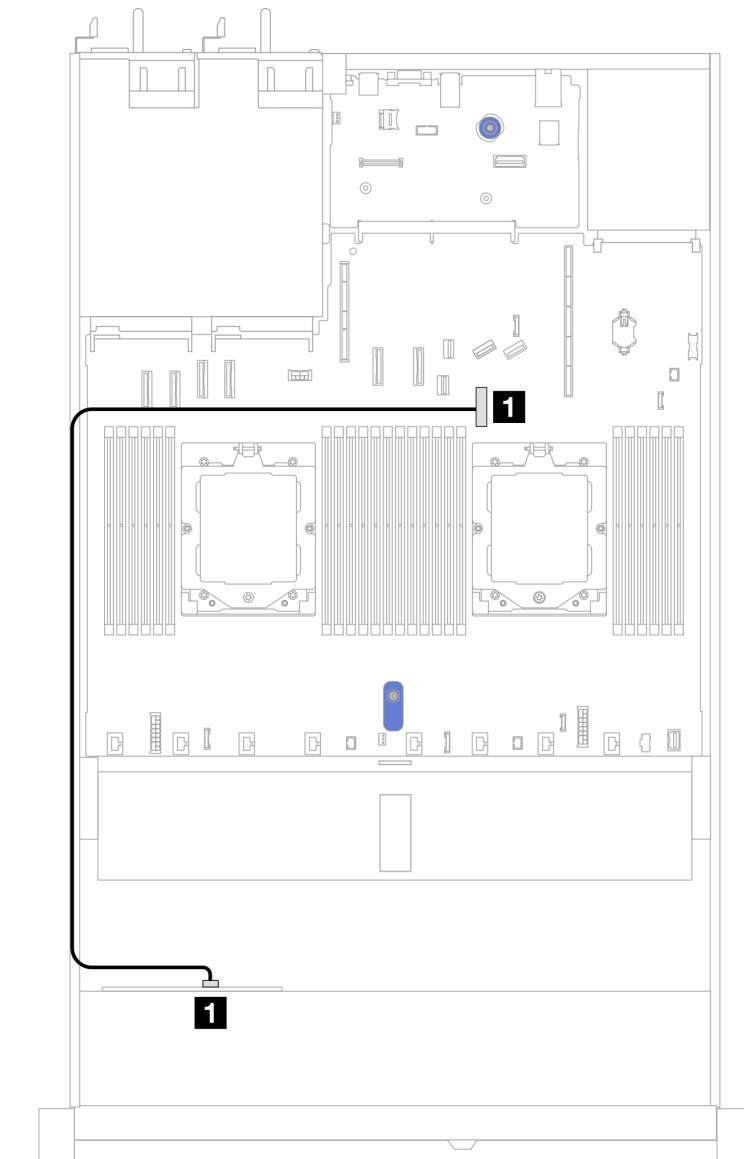


Figure 392. Cable routing for onboard configuration of 4 x 2.5" front SAS/SATA drive bays

Table 79. Mapping between backplane connectors and system board connectors for onboard configuration

Backplanes	From	To
Front BP (SAS)	SAS	PCIe connector 7

Cable routing with an SFF HBA/RAID adapter

The following table shows the mapping relationship between backplane connectors and system board/ adapter connectors when an 8i SFF HBA/RAID adapter (Gen 3 or Gen 4) is installed.

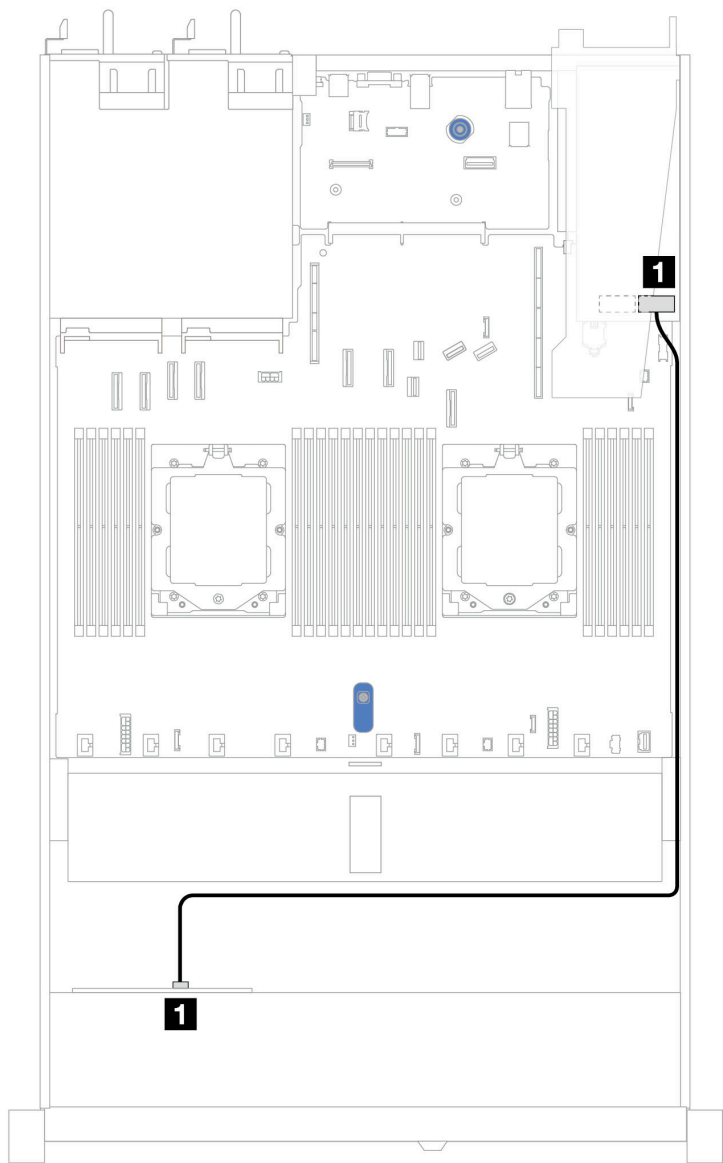


Figure 393. Cable routing for 4 x 2.5" front AnyBay drive bays with an 8i SFF RAID adapter (Gen 3 or Gen 4)

Table 80. Mapping between backplane and system board/adapter when an SFF HBA/RAID adapter is installed

Backplanes	From	To
Front BP (SAS)	1 SAS	1 C0

Note: Gen 3 and Gen 4 SFF HBA/RAID adapters are slightly different in their connectors, but the cable routing method is similar.

4 x 2.5" AnyBay backplane (Gen 5)

Use this section to understand the cable routing for 4 x 2.5" AnyBay backplane (Gen 5) with two processors installed.

To connect cables for backplane power, refer to [“Backplane power cable routing” on page 330](#)

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect cables for front riser assembly, refer to [“Front riser assembly” on page 335](#).

To connect cables for OCP interposer, refer to [“OCP interposer” on page 349](#).

To connect cables for rear 2 x 2.5" NVMe drive backplane, refer to [“Rear NVMe/SAS/SATA drive backplane” on page 353](#)

To connect signal cables for a backplane for standard 4 x 2.5" AnyBay front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing with an SFF HBA/RAID adapter” on page 435](#)
- [“Cable routing with an SFF HBA/RAID adapter and a rear 2 x 2.5 SAS/SATA backplane \(Gen 3 RAID adapter\)” on page 436](#)
- [“Cable routing with an SFF HBA/RAID adapter and a rear 2 x 2.5 SAS/SATA backplane \(Gen 4 RAID adapter\)” on page 438](#)

Cable routing with an SFF HBA/RAID adapter

The following illustrations and tables show the mapping relationship between backplane connectors and an 8i SFF RAID adapter (Gen 3 or Gen 4).

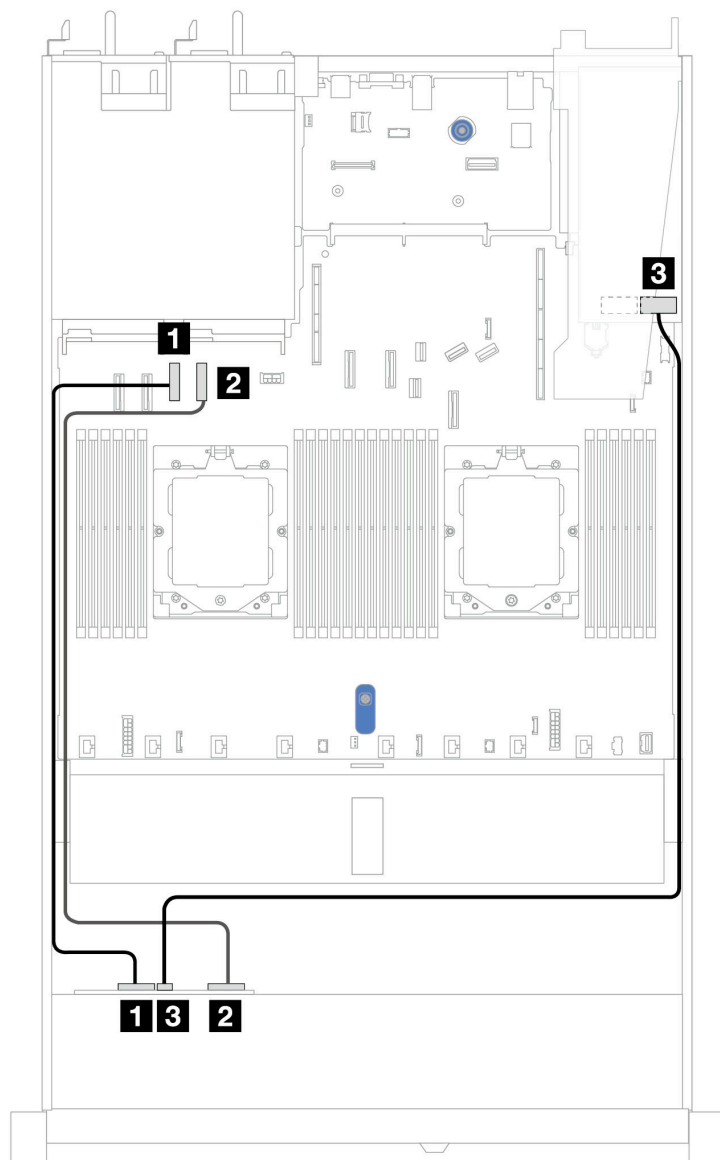


Figure 394. Cable routing for 4 x 2.5" AnyBay backplane drive with an 8i SFF RAID adapter (Gen 3 or Gen 4)

Table 81. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter (Gen 3 or Gen 4)

Backplane	From	To
Front BP (NVMe)	1 NVMe 0–1	1 PCIe connector 3
	2 NVMe 2–3	2 PCIe connector 4
Front BP (SAS)	3 SAS	3 C0

Cable routing with an SFF HBA/RAID adapter and a rear 2 x 2.5 SAS/SATA backplane (Gen 3 RAID adapter)

The following illustrations and tables show the mapping relationship between backplane connectors and an 8i SFF RAID adapter (Gen 3).

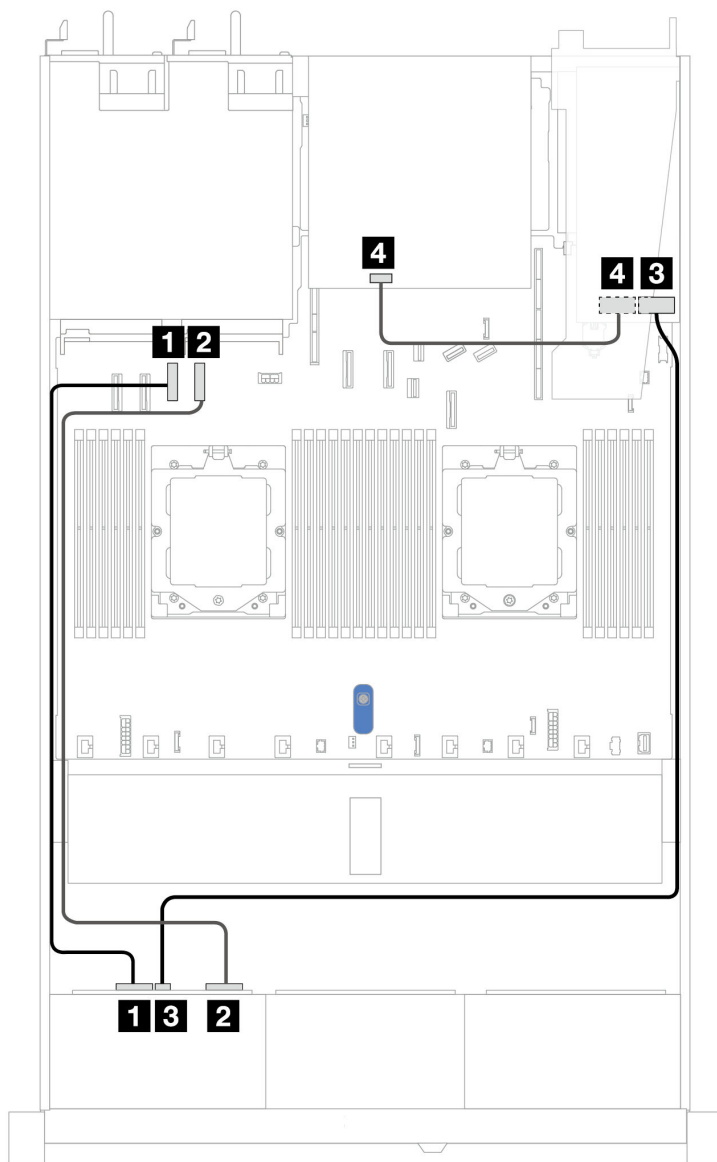


Figure 395. Cable routing for 4 x 2.5" AnyBay backplane drive with an 8i SFF RAID adapter (Gen 3) and a rear 2 x 2.5 SAS/SATA backplane

Table 82. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter (Gen 3)

Backplane	From	To
Front BP (NVMe)	1 NVMe 0–1	1 PCIe connector 3
	2 NVMe 2–3	2 PCIe connector 4
Front BP (SAS)	3 SAS	3 C0
Rear BP (SAS)	4 SAS	4 C1

Cable routing with an SFF HBA/RAID adapter and a rear 2 x 2.5 SAS/SATA backplane (Gen 4 RAID adapter)

The following illustrations and tables show the mapping relationship between backplane connectors and an 8i SFF RAID adapter (Gen 4).

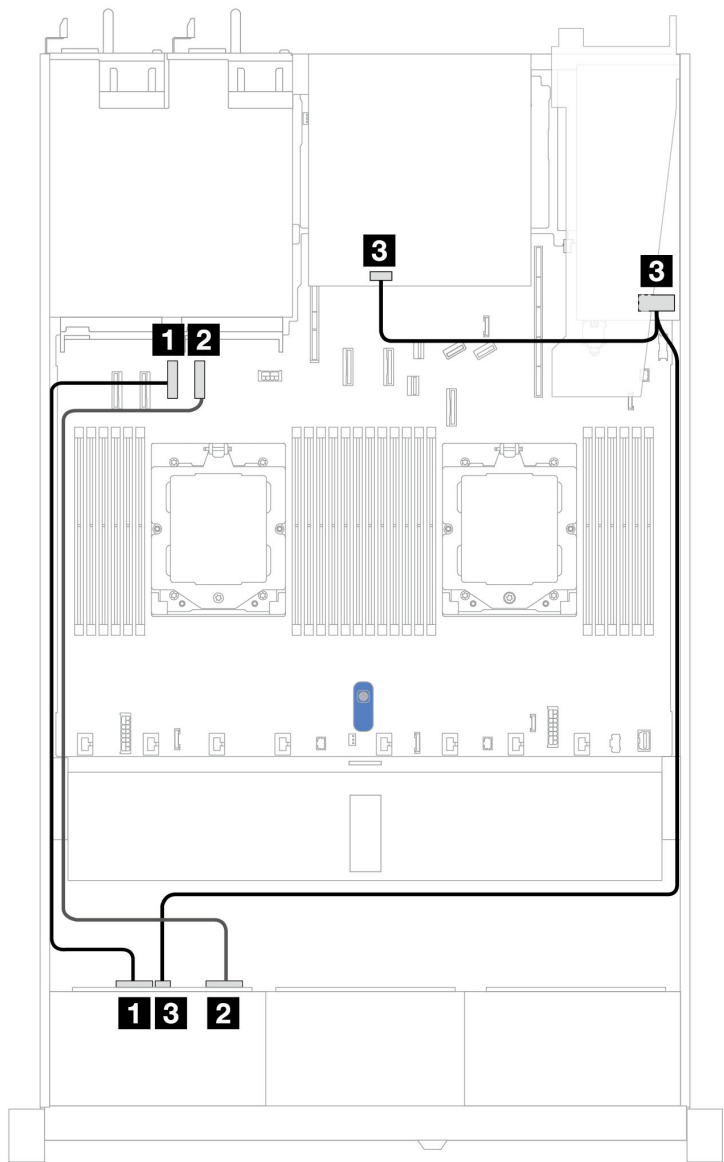


Figure 396. Cable routing for 4 x 2.5" AnyBay backplane drive with an 8i SFF RAID adapter (Gen 4) and a rear 2 x 2.5 SAS/SATA backplane

Table 83. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter (Gen 4)

Backplane	From	To
Front BP (NVMe)	1 NVMe 0–1	1 PCIe connector 3
	2 NVMe 2–3	2 PCIe connector 4
Front BP/Rear BP (SAS)	3 SAS	3 C0

2 x 2.5" NVMe backplane

Use this section to understand the NVMe backplane cable routing for server model with two 2.5" front drives.

To connect cables for backplane power, refer to [“Backplane power cable routing” on page 330](#)

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect cables for front riser assembly, refer to [“Front riser assembly” on page 335](#).

To connect cables for OCP interposer, refer to [“OCP interposer” on page 349](#).

To connect cables for a rear NVMe drive backplane, refer to [“Rear NVMe/SAS/SATA drive backplane” on page 353](#).

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connect cables for intrusion switch, refer to [“Intrusion switch” on page 342](#).

To connect signal cables for a backplane for standard 4 x 2.5" front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing for onboard configuration with two processors” on page 440](#)

Cable routing for onboard configuration with two processors

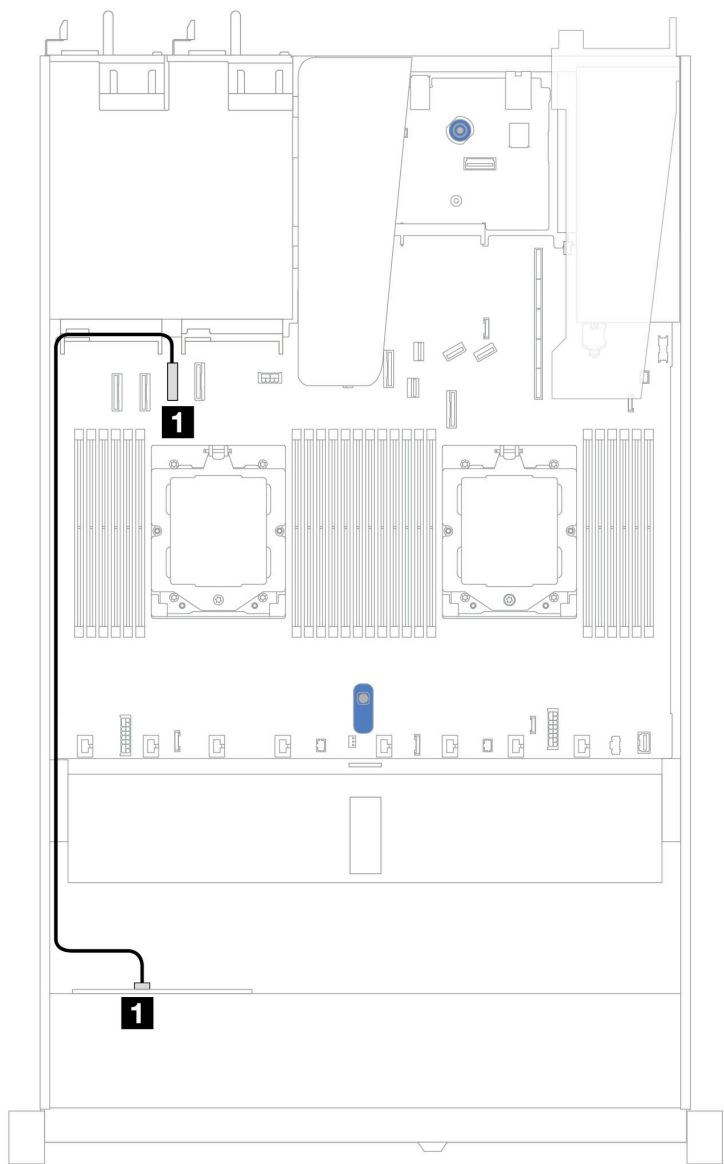


Figure 397. Cable routing for onboard configuration of 2 x 2.5" NVMe front drives

Table 84. Mapping between one front NVMe backplane and system board for onboard configuration

Backplane	From	To
Front BP (NVMe)	1 NVMe 0–1	1 PCIe connector 3

4 x 2.5" NVMe backplane (Gen 4)

Use this section to understand the NVMe backplane (Gen 4) cable routing for server model with four 2.5" front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

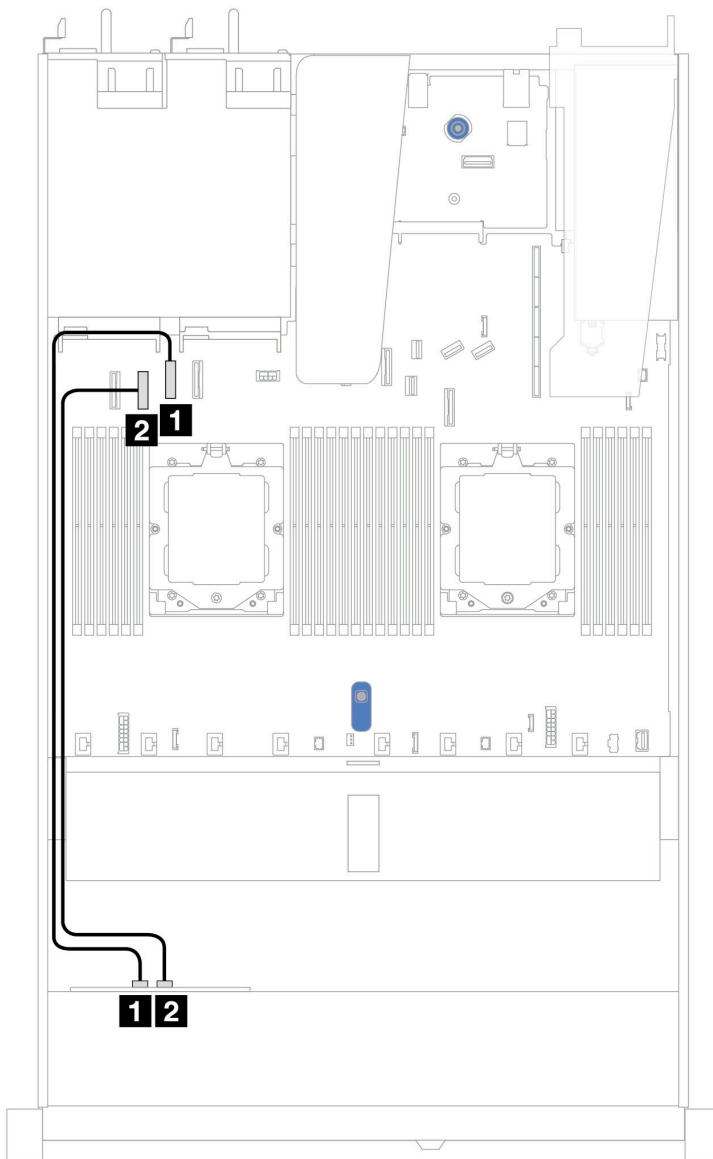
To connect cables for intrusion switch, refer to [“Intrusion switch” on page 342](#).

To connect cables for a rear NVMe drive backplane, refer to [“Rear NVMe/SAS/SATA drive backplane” on page 353](#).

To connect signal cables for a backplane for standard 4 x 2.5" front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing for onboard configuration with two processors” on page 441](#)
- [Cable routing with front riser assembly and OCP interposer](#)

Cable routing for onboard configuration with two processors



Backplane	From	To
Front BP (NVMe)	1 NVMe 2–3	1 PCIe connector 2
	2 NVMe 0–1	2 PCIe connector 3

Cable routing with front riser assembly and OCP interposer

Ensure the following cables are also connected:

- To connect cables for front riser assembly, refer to [“Front riser assembly” on page 335](#).
- To connect cables for OCP interposer, refer to [“OCP interposer” on page 349](#).

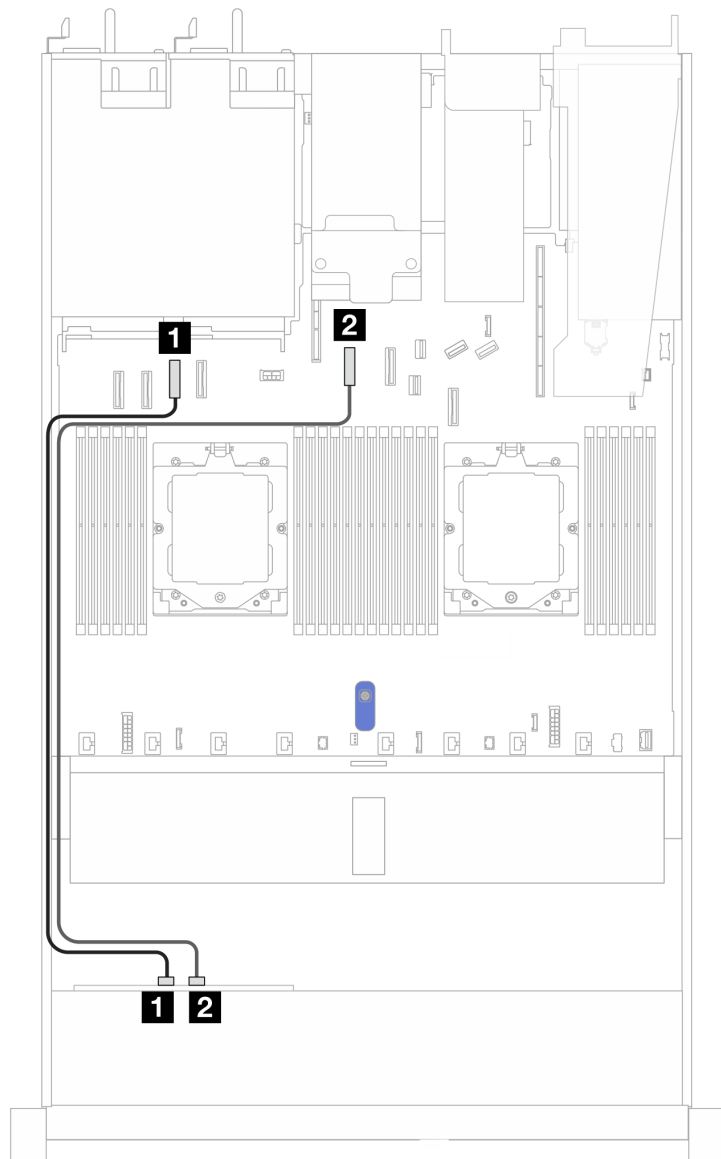


Figure 398. Cable routing for 4 x 2.5" front NVMe drive bays for front riser assembly and OCP interposer configuration

Table 85. Mapping between backplane and system board/adaptor for front riser assembly and OCP interposer configuration

Backplanes	From	To
Front BP (NVMe)	❶ NVMe 0–1	❶ PCIe connector 3
	❷ NVMe 2–3	❷ PCIe connector 5

4 x 2.5" NVMe backplane (Gen 5)

Use this section to understand the NVMe backplane (Gen 5) cable routing for server model with four 2.5" front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connect cables for front riser assembly, refer to [“Front riser assembly” on page 335](#).

To connect cables for OCP interposer, refer to [“OCP interposer” on page 349](#).

To connect cables for a rear NVMe drive backplane, refer to [“Rear NVMe/SAS/SATA drive backplane” on page 353](#).

To connect cables for intrusion switch, refer to [“Intrusion switch” on page 342](#).

To connect signal cables for a backplane for standard 4 x 2.5" front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing for onboard configuration with two processors” on page 444](#)

Cable routing for onboard configuration with two processors

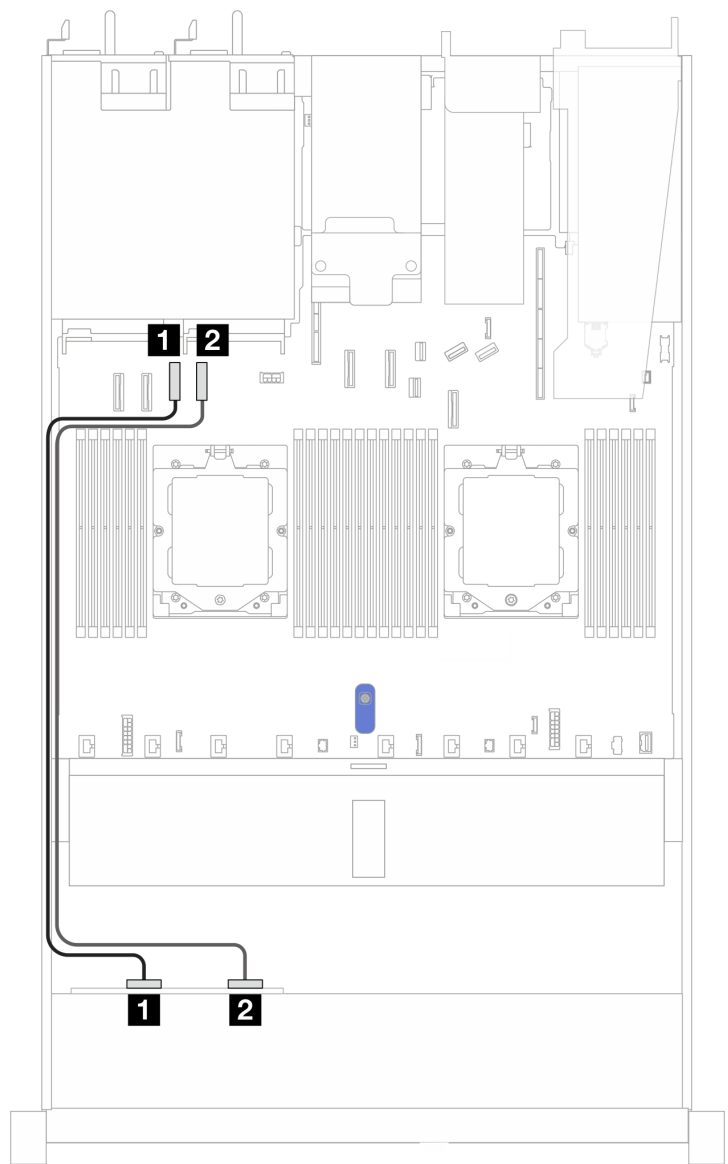


Figure 399. Cable routing for 4 x 2.5" front NVMe drive backplane and system board for onboard configuration with two processors

Table 86. Mapping between backplane and system board/adaptor

Backplanes	From	To
Front BP (NVMe)	1 NVMe 0–1	1 PCIe connector 3
	2 NVMe 2–3	1 PCIe connector 4

8x 2.5" front drives (two processors)

Use the section to understand the cable routing for signal cable connections for 8 x 2.5–inch drive backplanes.

Under the configuration of 8 x 2.5–inch front drives, your server supports the following front backplane:

- [“8 x 2.5" SAS/SATA backplane” on page 445](#)

8 x 2.5" SAS/SATA backplane

Use this section to understand the SAS/SATA backplane cable routing for server model with eight 2.5" front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect cables for M.2 drive backplane, refer to [“M.2 drive backplane” on page 344](#).

To connect intrusion switch cable, refer to [“Intrusion switch” on page 342](#).

To connect power cable for CFF RAID adapter, refer to [“CFF RAID adapter” on page 333](#).

To connect signal cables for a backplane for standard 4 x 3.5" front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing for onboard configuration” on page 445](#)
- [“Cable routing with an SFF HBA/RAID adapter” on page 446](#)
- [“Cable routing with a CFF RAID adapter” on page 447](#)

Cable routing for onboard configuration

The following illustrations and tables show the mapping relationship between backplane connectors and system board connectors for onboard configuration.

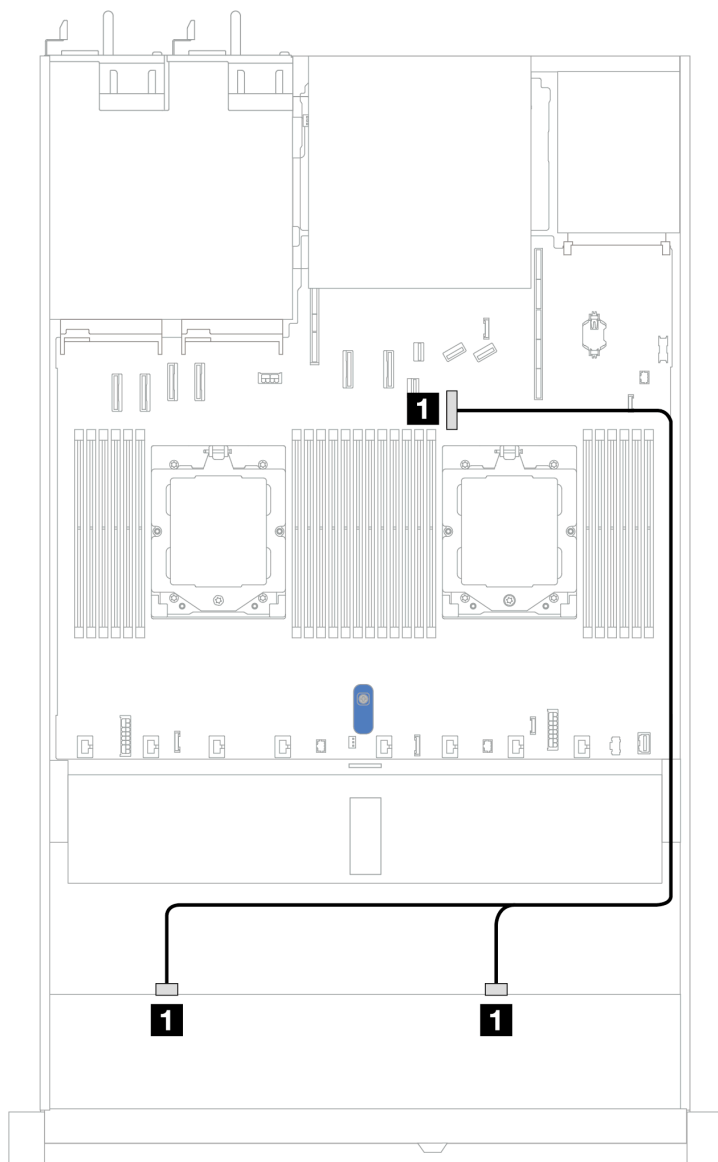


Figure 400. Cable routing for onboard configuration

Table 87. Cable routing for onboard configuration of 8 x 2.5 SAS/SATA front drives

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 PCIe connector 7

Cable routing with an SFF HBA/RAID adapter

The following illustrations and tables show the mapping relationship between backplane connectors and an 8i or 16i SFF HBA/RAID adapter (Gen 3 or Gen 4).

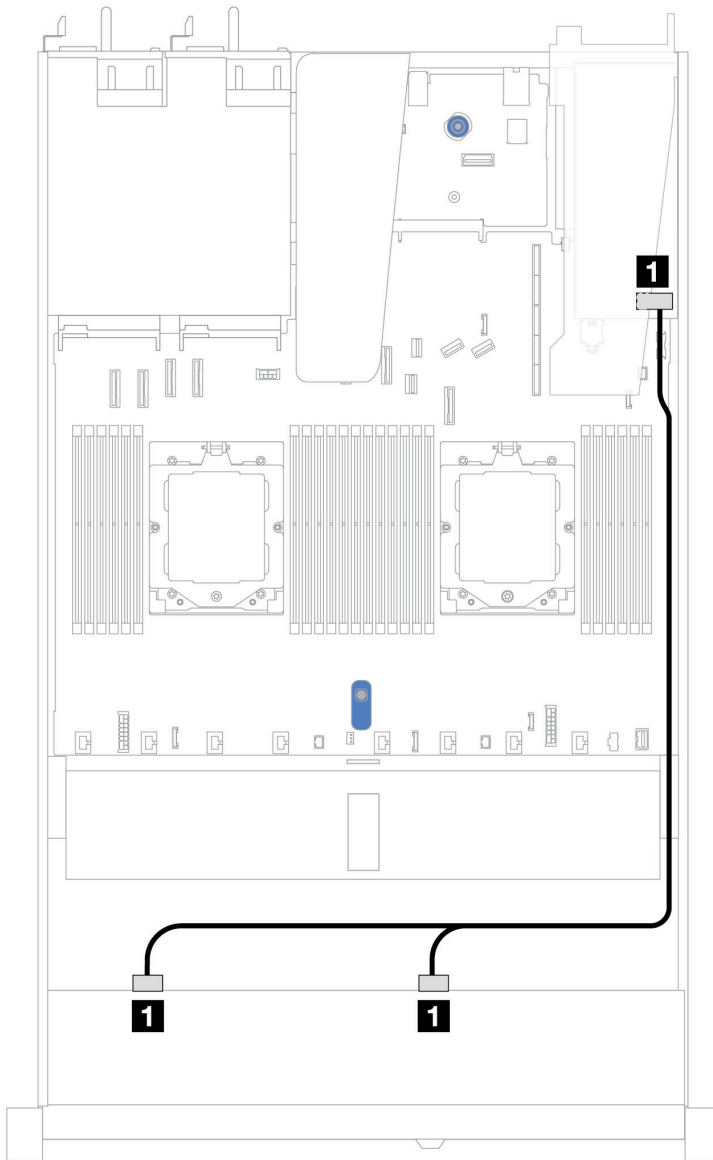


Figure 401. Cable routing for 8 x 2.5" front SAS/SATA drive bays with an 8i or 16i SFF RAID adapter (Gen 3 or Gen 4)

Table 88. Mapping between one front SAS/SATA backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0

Cable routing with a CFF RAID adapter

The following illustrations and tables show the mapping relationship between backplane connectors and an 8i or 16i CFF RAID adapter (Gen 3 or Gen 4).

Note: The following illustration is for Gen 4 adapters. For Gen 3 adapters, the illustration might be slightly different.

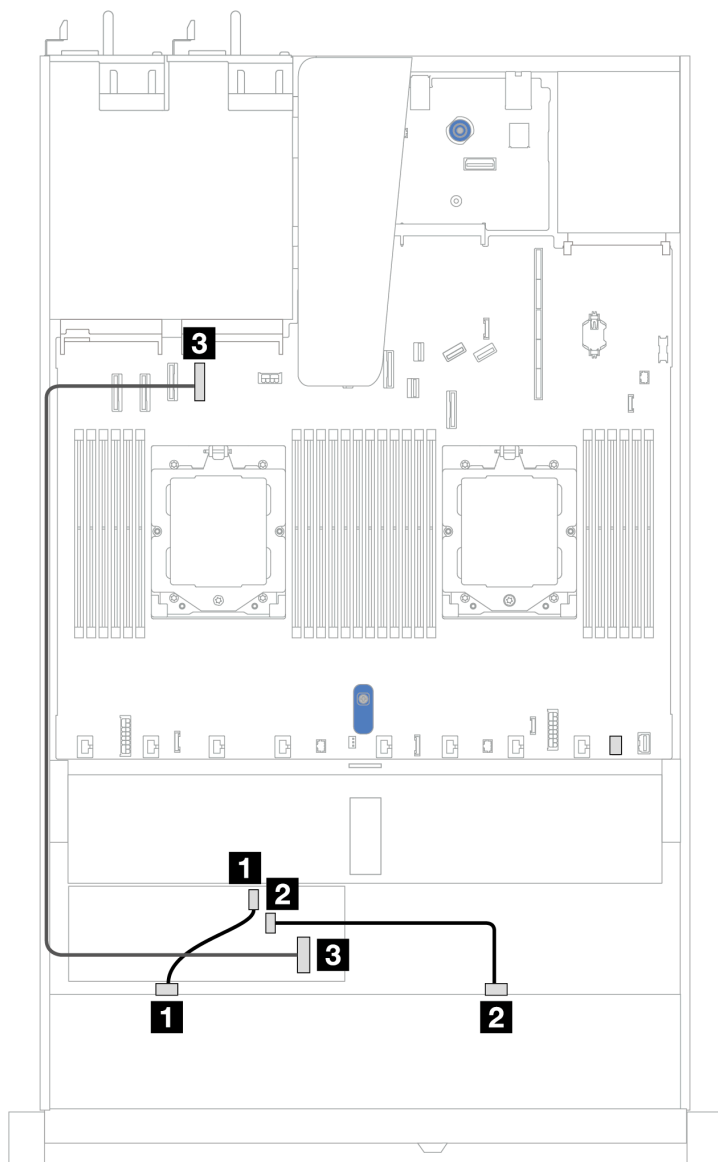


Figure 402. Cable routing for 8 x 2.5" front SAS/SATA drive bays with an 8i or 16i CFF RAID adapter (Gen 3 or Gen 4)

Table 89. Mapping between one front SAS/SATA backplane and a CFF RAID adapter

Backplane/adapter	From	To
Front BP (SAS)	1 SAS 0	1 C0
	2 SAS 1	2 C1
CFF RAID adapter	3 MB input	3 PCIe connector 4

8 x 2.5" NVMe backplane

Use this section to understand the cable routing of 8 NVMe front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connect signal cables, refer to the following cable routing scenario:

- [“Cable routing with an SFF RAID adapter” on page 449](#)

Cable routing with an SFF RAID adapter

The following tables show the mapping relationship between backplane connectors and an SFF HBA/RAID adapter (Gen4).

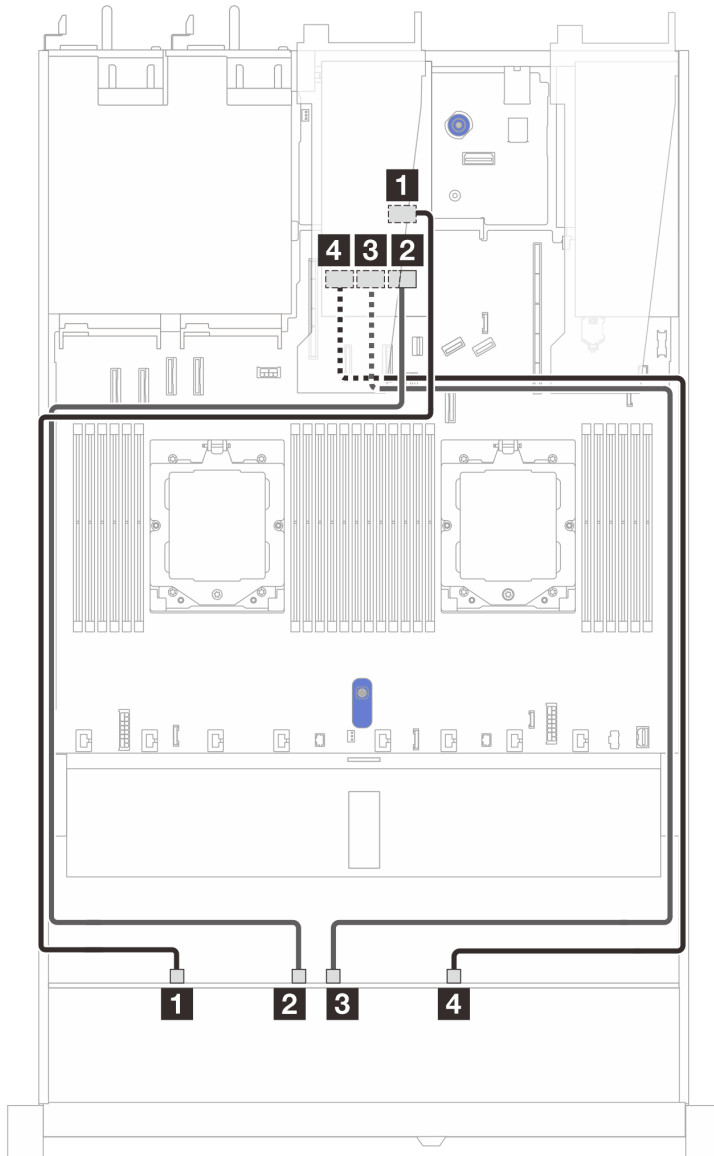


Figure 403. Cable routing for 8 x 2.5'' NVMe drive backplane with a 32i SFF RAID adapter (Gen4)

Table 90. Mapping between one front NVMe backplane and an SFF RAID adapter

Backplane	From	To
Front BP(NVMe)	1 NVMe 0–1	1 C0
	2 NVMe 2–3	2 C1
	3 NVMe 4–5	3 C2

Table 90. Mapping between one front NVMe backplane and an SFF RAID adapter (continued)

Backplane	From	To
	4 NVMe 6–7	4 C3

10 x 2.5" front drives (two processors)

Use the section to understand the cable routing for signal cable connections for 10 x 2.5–inch drive backplanes.

Under the configuration of 10 x 2.5–inch front drives, your server supports the following front backplane:

- [“10 x 2.5" AnyBay backplane” on page 469](#)

6 x 2.5" SAS/SATA + 4 x 2.5" AnyBay backplane

See this section to understand the cable routing of 6 front 2.5" SAS/SATA drives and 4 front 2.5" AnyBay drives with 10 x 2.5 backplane (Gen 4) installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect the power cable for CFF RAID adapter, refer to [“CFF RAID adapter” on page 333](#).

To connect cables for a rear NVMe/SAS/SATA drive backplane, refer to [“Rear NVMe/SAS/SATA drive backplane” on page 353](#).

To connect signal cables for a backplane for standard 6 front 2.5" SAS/SATA drives and 4 front 2.5" AnyBay drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing with an SFF HBA/RAID adapter” on page 450](#)
- [“Cable routing with a CFF RAID adapter” on page 452](#)

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4).

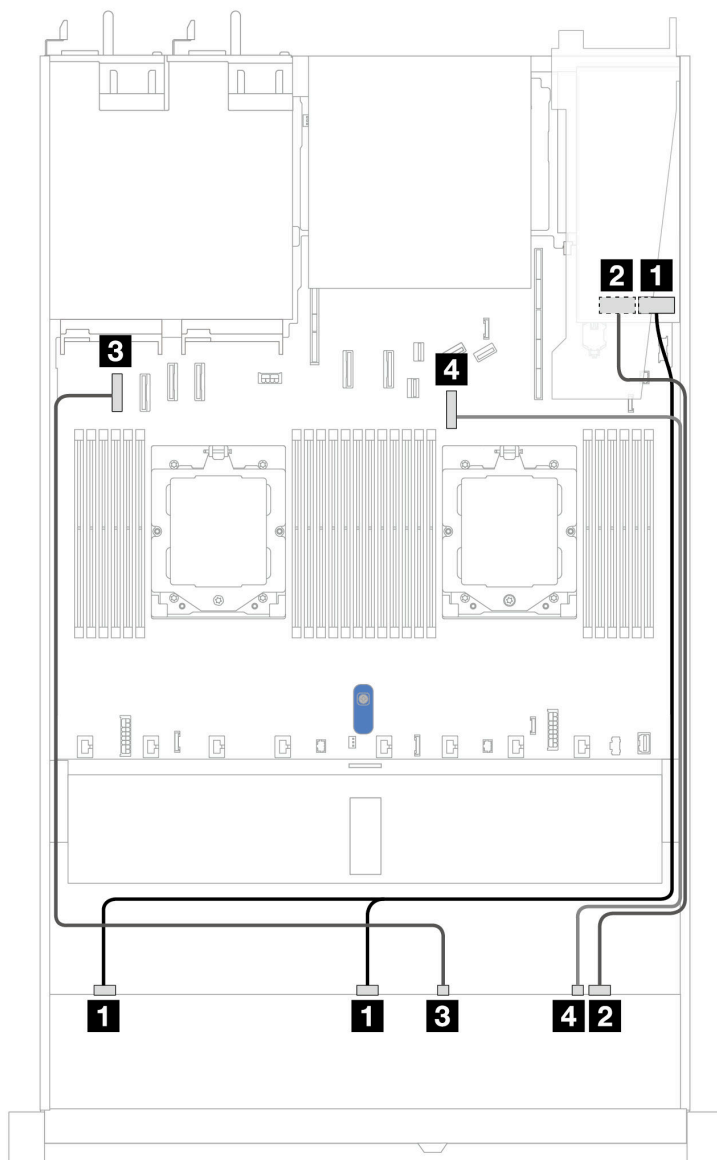


Figure 404. Cable routing for 6 front 2.5'' SAS/SATA drives and 4 front 2.5'' AnyBay drives bays with a 16i SFF RAID adapter (Gen 3 or Gen 4)

Table 91. Cable routing for 6 front 2.5'' SAS/SATA drives and 4 front 2.5'' AnyBay drives bays with a 16i SFF RAID adapter (Gen 3 or Gen 4)

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0
	2 SAS 2	2 <ul style="list-style-type: none"> • Gen 3: C2 • Gen 4: C1
Front BP (NVMe)	3 NVMe 0–1	3 PCIe connector 1
	4 NVMe 2–3	4 PCIe connector 7

Cable routing with a CFF RAID adapter

The following tables show the mapping relationship between backplane connectors and a 16i CFF RAID adapter.

Note: The following illustrations are for Gen 4 adapters. For Gen 3 adapters, the illustration might be slightly different.

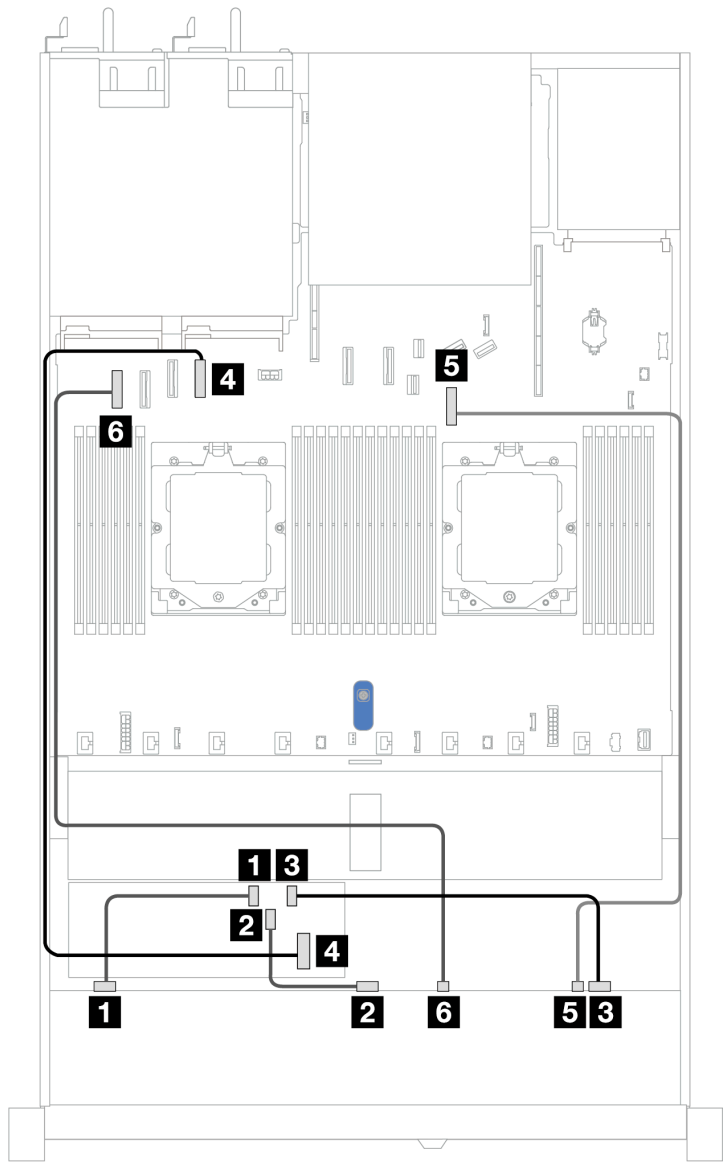


Figure 405. Cable routing for 6 front 2.5" SAS/SATA drives and 4 front 2.5" AnyBay drives bays with a 16i CFF RAID adapter

Table 92. Cable routing for 6 front 2.5" SAS/SATA drives and 4 front 2.5" AnyBay drives bays with a 16i CFF RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0	1 C0

Table 92. Cable routing for 6 front 2.5" SAS/SATA drives and 4 front 2.5" AnyBay drives bays with a 16i CFF RAID adapter (continued)

Backplane	From	To
	2 SAS 1	2 C1
	3 SAS 2	3 C2
CFF RAID adapter	4 MB input	4 PCIe connector 4
Front BP (NVMe)	5 NVMe 2–3	5 PCIe connector 7
	6 NVMe 0–1	6 PCIe connector 1

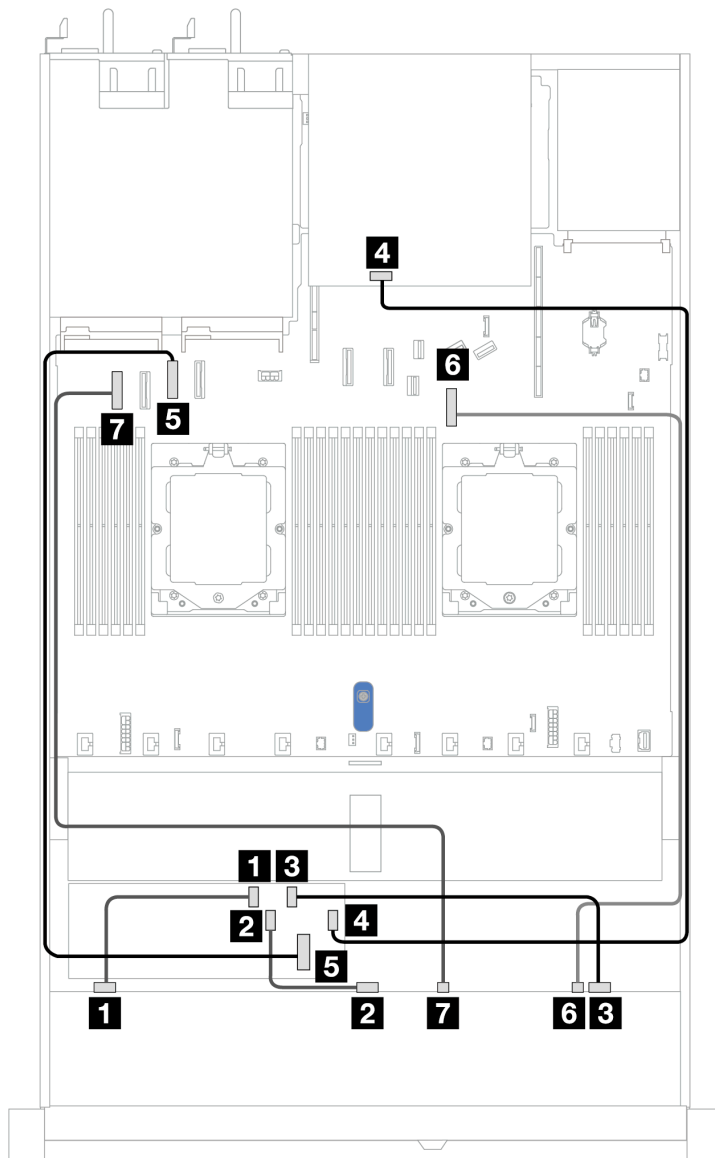


Figure 406. Cable routing for 6 front 2.5" SAS/SATA drives and 4 front 2.5" AnyBay drives bays with an 8i or 16i CFF RAID adapter (Gen 3 or Gen 4) with 2 x 2.5 rear SAS/SATA drives installed

Table 93. Mapping between one front AnyBay and one rear SAS/SATA backplane and a CFF RAID adapter

Backplane/adapter	From	To
Front BP (SAS)	1 SAS 0	1 C0
	2 SAS 1	2 C1
	3 SAS 2	4 C2
Rear BP (SAS)	4 SAS	4 C3
CFF RAID adapter	5 MB input	5 PCIe connector 3
Front BP (NVMe)	6 NVMe 2–3	6 PCIe connector 7
	7 NVMe 0–1	7 PCIe connector 1

6 x 2.5" SAS/SATA + 2 x 2.5" AnyBay + 2 x 2.5" NVMe backplane

See this section to understand the cable routing of 6 front 2.5" SAS/SATA drives, 2 front 2.5" AnyBay drives, and 2 front 2.5" NVMe drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing with an SFF HBA/RAID adapter” on page 454](#)
- [“Cable routing with a CFF HBA/RAID adapter” on page 456](#)

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and an SFF HBA/RAID adapter.

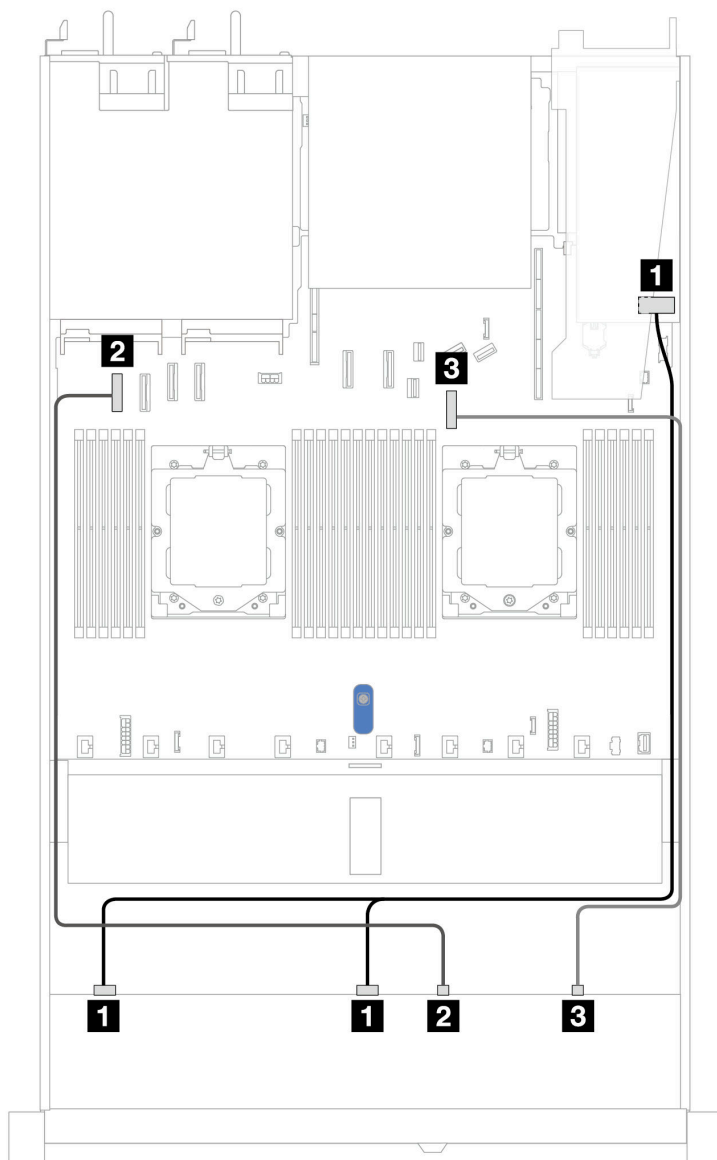


Figure 407. Cable routing for 6 x 2.5'' SAS/SATA drives and 2 x 2.5'' AnyBay drives and 2 x 2.5'' NVMe front drive bays with an 8i SFF RAID/HBA adapter (Gen 3 or Gen 4)

Table 94. Cable routing for 6 x 2.5'' SAS/SATA drives and 2 x 2.5'' AnyBay drives and 2 x 2.5'' NVMe front drive bays with an 8i SFF RAID/HBA adapter (Gen 3 or Gen 4)

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 <ul style="list-style-type: none"> Gen 3: C0, C1 Gen 4: C0
Front BP (NVMe)	2 NVMe 0–1	2 PCIe connector 1
	3 NVMe 2–3	3 PCIe connector 7

Cable routing with a CFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and a CFF HBA/RAID adapter.

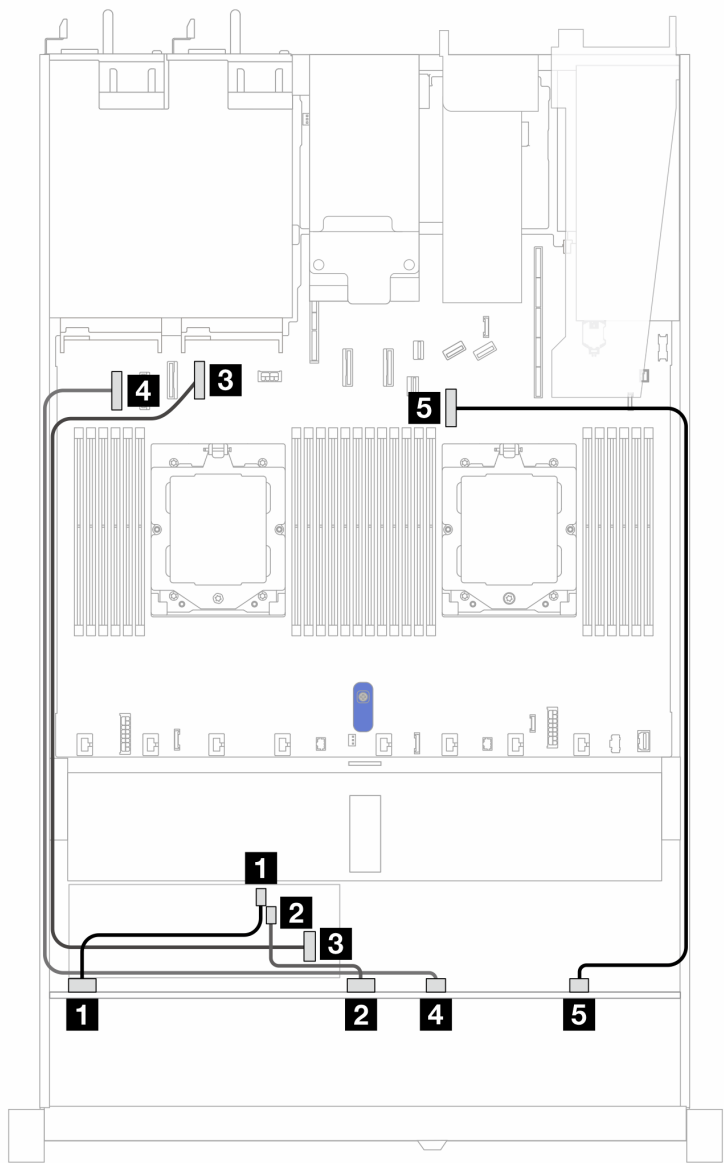


Figure 408. Cable routing for 6 x 2.5" SAS/SATA drives and 2 x 2.5" AnyBay drives and 2 x 2.5" NVMe front drive bays with an 8i CFF RAID/HBA adapter (Gen 3)

Table 95. Cable routing for 6 x 2.5" SAS/SATA drives, 2 x 2.5" AnyBay drives, and 2 x 2.5" NVMe front drive bays with an 8i CFF RAID/HBA adapter (Gen 3)

Backplane	From	To
Front BP (SAS)	1 SAS 0	1 C0
	2 SAS 1	2 C1
CFF RAID adapter	3 MB input	3 PCIe connector 4
Front BP (NVMe)	4 NVMe 0-1	4 PCIe connector 1

Table 95. Cable routing for 6 x 2.5" SAS/SATA drives, 2 x 2.5" AnyBay drives, and 2 x 2.5" NVMe front drive bays with an 8i CFF RAID/HBA adapter (Gen 3) (continued)

Backplane	From	To
	5 NVMe 2–3	5 PCIe connector 7

8 x 2.5"/10 x 2.5" U.3 drives with 10 x 2.5" AnyBay backplane

Use this section to understand the cable routing for eight or ten U.3 drives with 10 x 2.5" AnyBay backplane and two processors installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables for a backplane for standard 8 x 2.5" U.3 drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing with an SFF HBA/RAID adapter” on page 457](#)

Cable routing with an SFF HBA/RAID adapter

The following illustrations and tables show the mapping relationship between backplane connectors and an 8i or 16i SFF RAID adapter (Gen 4).

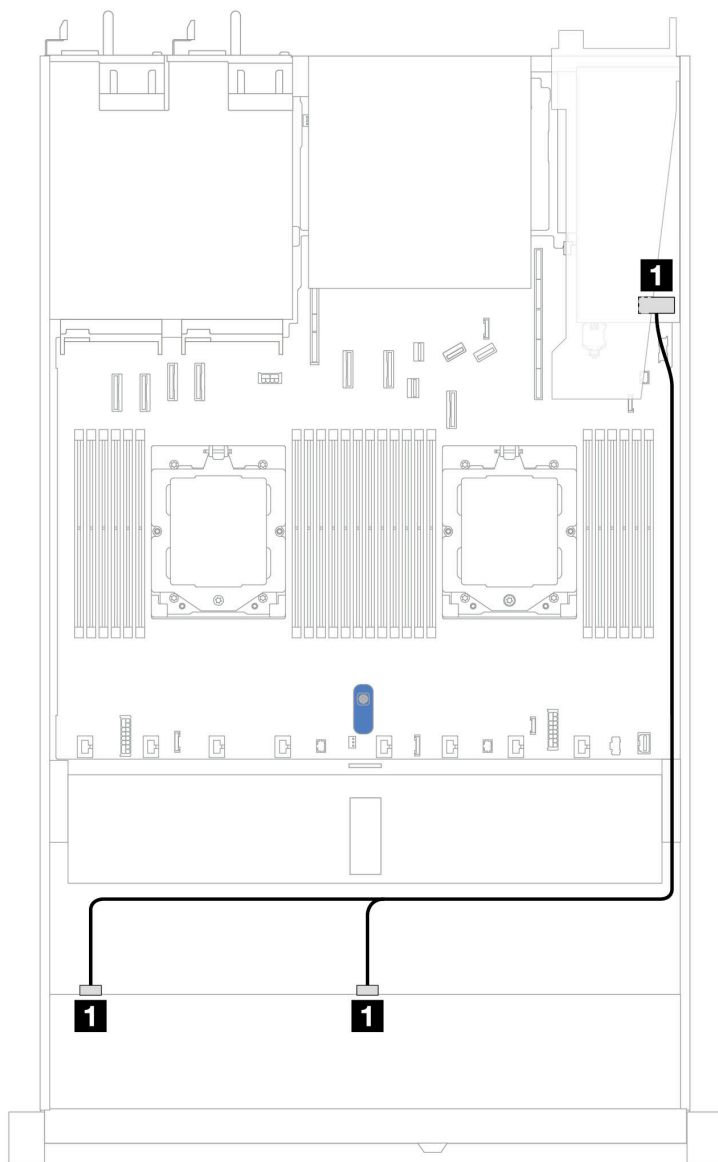


Figure 409. Cable routing for 8 x 2.5" front U.3 drives with an 8i SFF RAID adapter (Gen 4)

Table 96. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 C0

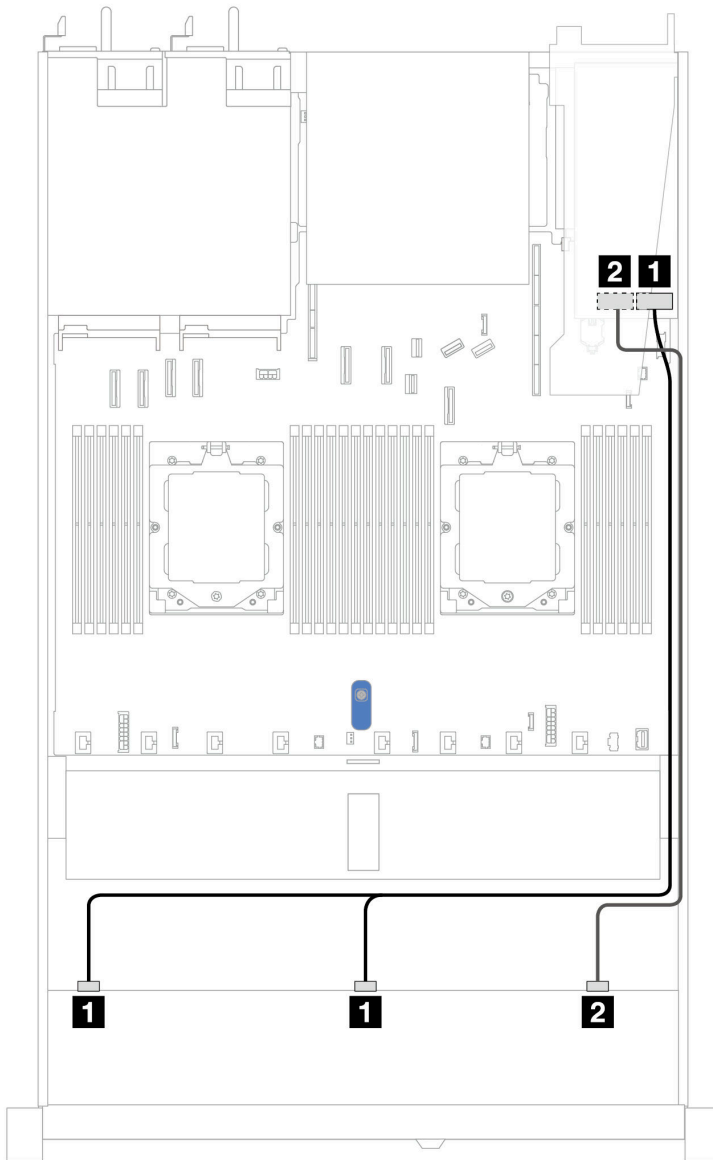


Figure 410. Cable routing for 10 x 2.5" front U.3 drives with an 16i SFF RAID adapter (Gen 4)

Table 97. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 C0
	2 SAS2	2 C1

10 x 2.5" SAS/SATA backplane

See this section to understand the cable routing of 10 front 2.5" SAS/SATA drives with the 10 x 2.5" AnyBay backplane (Gen 4) installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect cables for a rear NVMe/SAS/SATA drive backplane, refer to [“Rear NVMe/SAS/SATA drive backplane” on page 353](#).

To connect cables for a CFF RAID adapter, refer to [“CFF RAID adapter” on page 333](#)

To connect signal cables, refer to the following cable routing scenarios:

- [“Cable routing for onboard configuration” on page 460](#)
- [“Cable routing with an SFF HBA/RAID adapter” on page 463](#)
- [“Cable routing with a CFF RAID adapter” on page 466](#)

Cable routing for onboard configuration

The following illustrations and tables show the mapping relationship between backplane connectors and system board (system board assembly) connectors for onboard configuration.

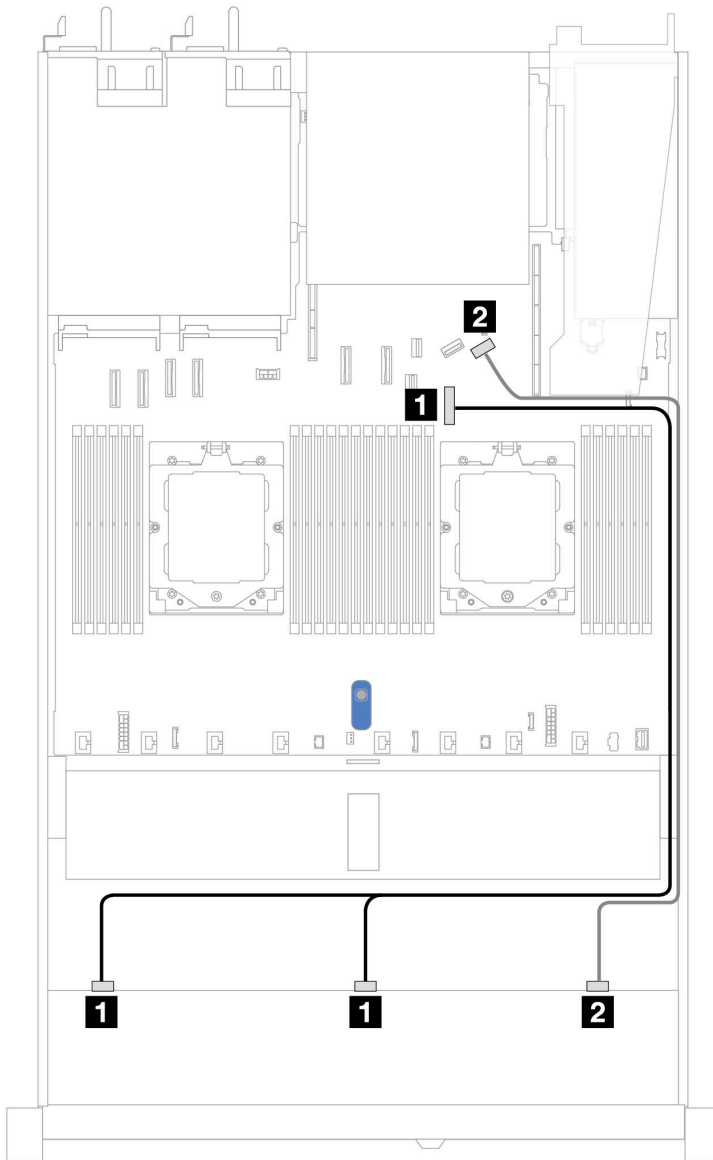


Figure 411. Cable routing for onboard configuration of 10 x 2.5 SAS/SATA front drives

Table 98. Mapping between one front AnyBay backplane and system board for onboard configuration

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 PCIe connector 7
	2 SAS 2	2 PCIe connector 9

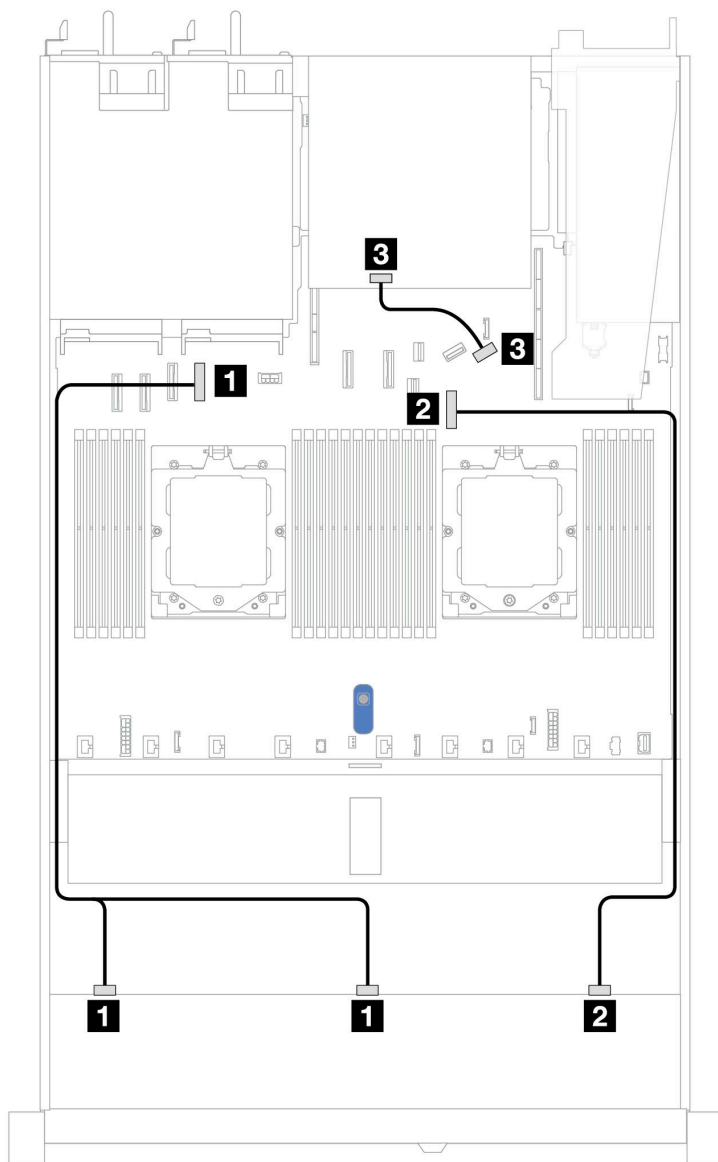


Figure 412. Cable routing for onboard configuration of 10 x 2.5" SAS/SATA front drives and 2 x 2.5" SAS/SATA or 2 x 7mm drive rear drives

Table 99. Mapping between one front AnyBay and one rear SAS/SATA backplanes and processor board for onboard configuration

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 PCIe connector 4
	2 SAS 2	2 PCIe connector 7
Rear BP (SAS)	3 SAS	3 PCIe connector 9

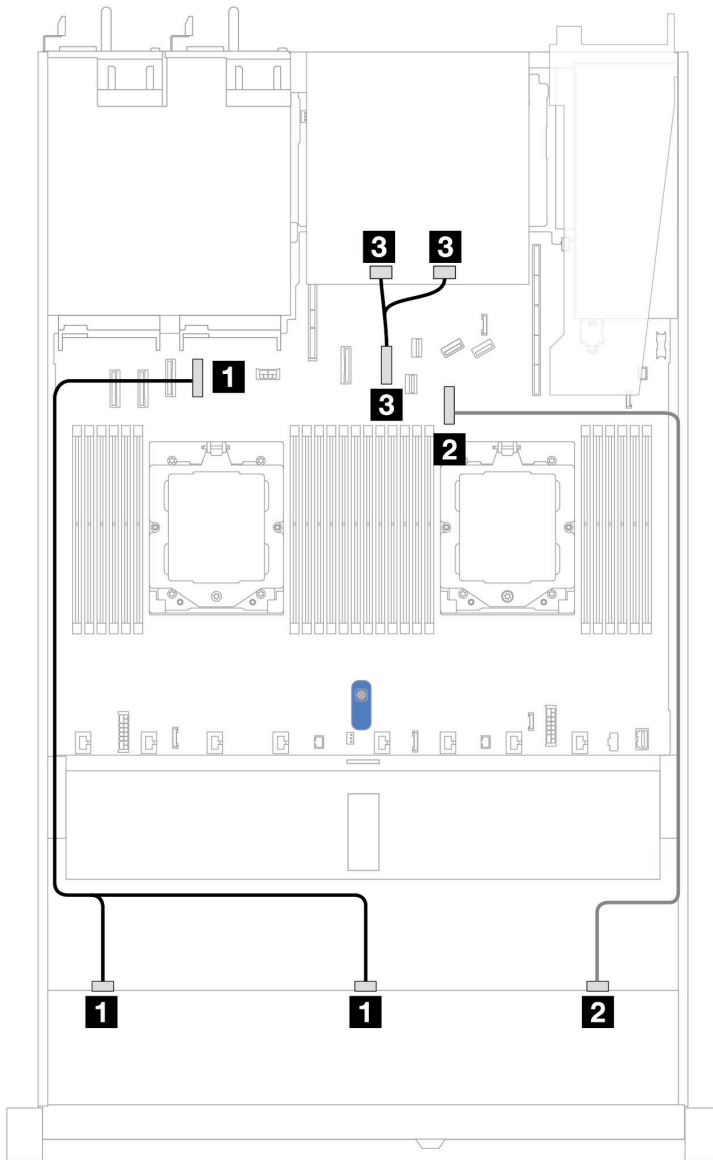


Figure 413. Cable routing for onboard configuration of 10 x 2.5" SAS/SATA front drives and 2 x 2.5" NVMe rear drives

Table 100. Mapping between one front AnyBay and one rear NVMe backplanes and system board (system board assembly) for onboard configuration

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 PCIe connector 4
	2 SAS 2	2 PCIe connector 7
Rear BP (SAS)	3 NVMe 0, NVMe 1	3 PCIe connector 6

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4).

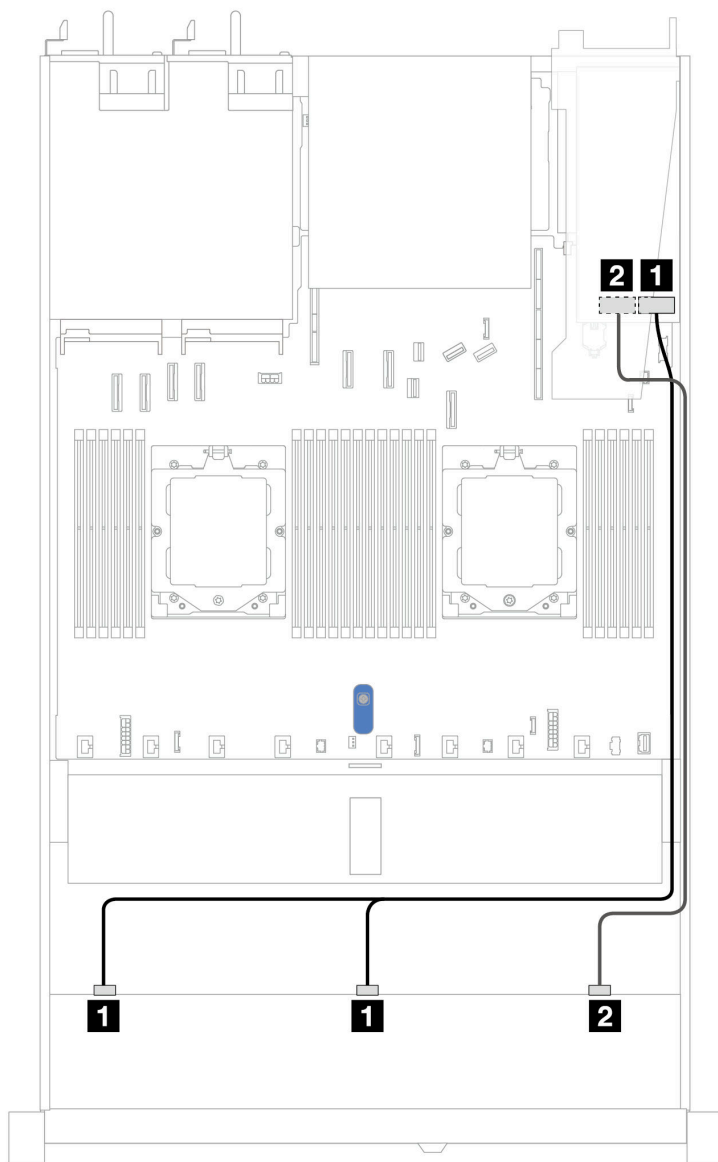


Figure 414. Cable routing for 10 front 2.5" SAS/SATA drives bays with a 16i SFF RAID adapter (Gen 3 or Gen 4)

Table 101. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0
	2 SAS 2	2 <ul style="list-style-type: none"> • Gen 3: C2 • Gen 4: C1

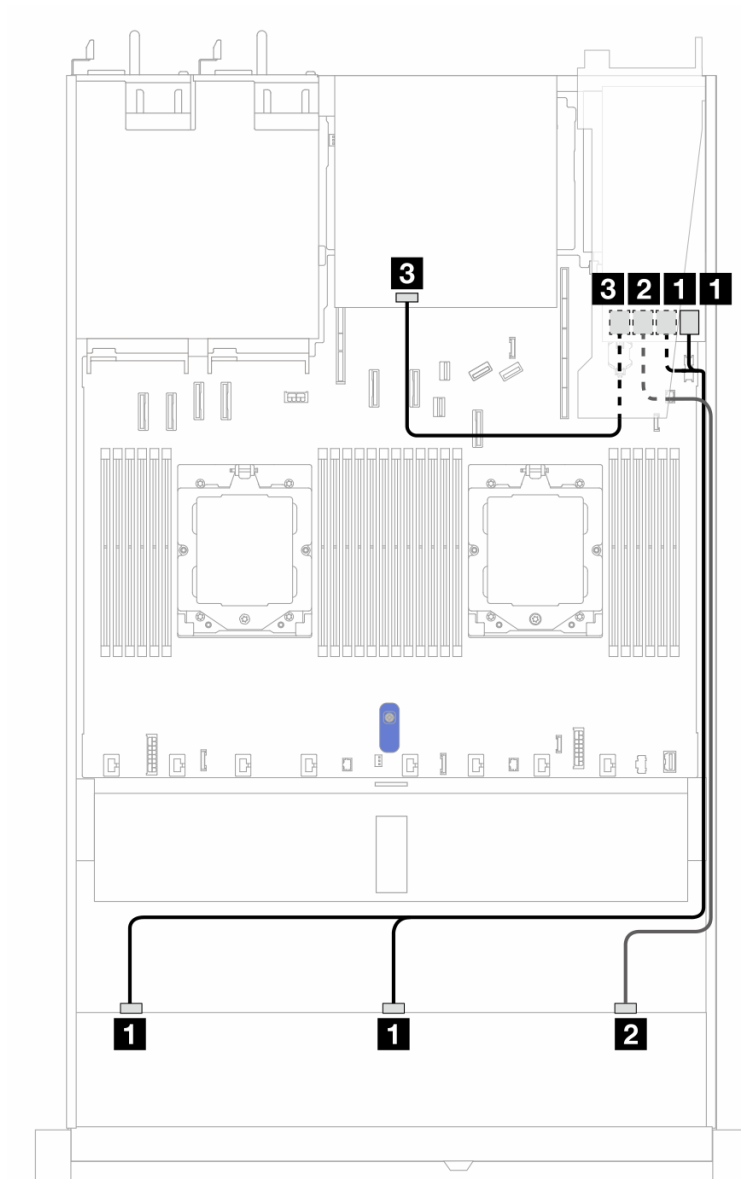


Figure 415. Cable routing for 10 front 2.5'' SAS/SATA drives bays and a 16i SFF RAID adapter (Gen 3) with 2 x 2.5'' rear SAS/SATA drives installed

Table 102. Mapping between one front AnyBay and one rear SAS/SATA backplane and an SFF RAID adapter

Backplane/adapter	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 C0, C1
	2 SAS 2	2 C2
Rear BP (SAS)	4 SAS	3 C3

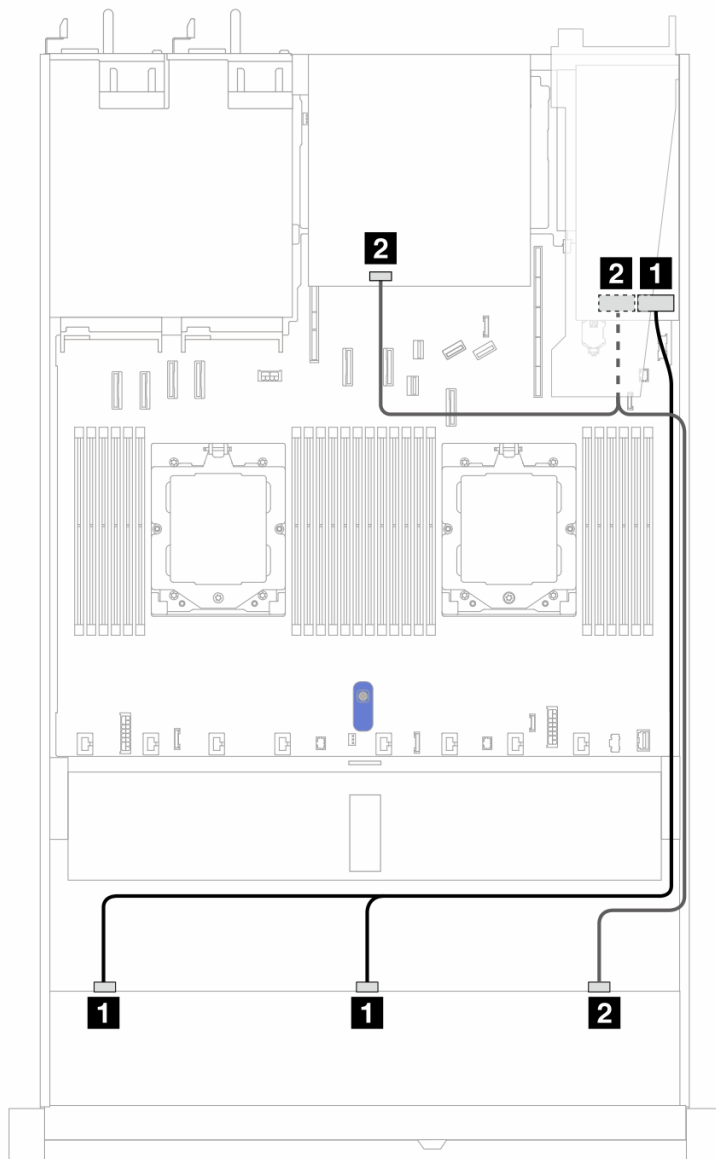


Figure 416. Cable routing for 10 front 2.5" SAS/SATA drives bays and a 16i SFF RAID adapter (Gen 4) with 2 x 2.5" rear SAS/SATA drives installed

Table 103. Mapping between one front AnyBay and one rear SAS/SATA backplane and an SFF RAID adapter

Backplane/adapter	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 C0
	2 SAS 2	2 C1
Rear BP (SAS)	2 SAS	2 C1

Cable routing with a CFF RAID adapter

The following tables show the mapping relationship between backplane connectors and a CFF RAID adapter.

Note: The following illustrations are for Gen 4 adapters. For Gen 3 adapters, the illustration might be slightly different.

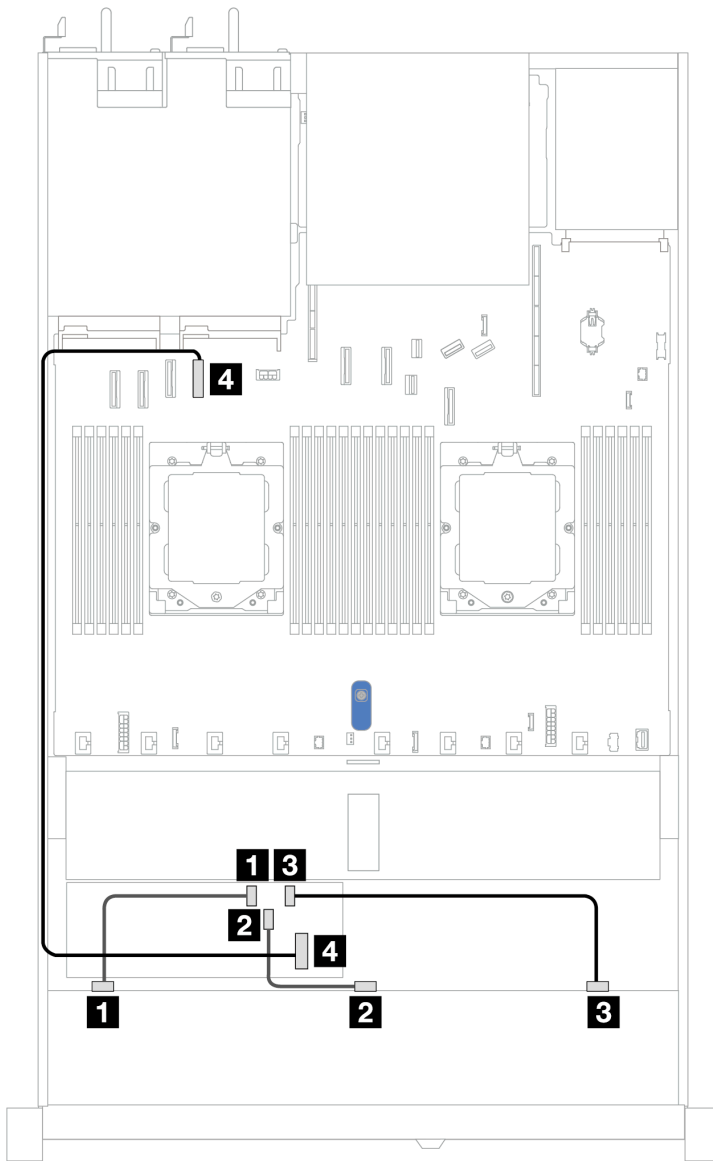


Figure 417. Cable routing for 10 front 2.5" SAS/SATA drives bays with a 16i CFF RAID adapter (Gen 3 or Gen 4)

Table 104. Mapping between one front AnyBay and a CFF RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0	1 C0
	2 SAS 1	2 C1
	3 SAS 2	3 C2
CFF RAID adapter	4 MB input	4 PCIe connector 4

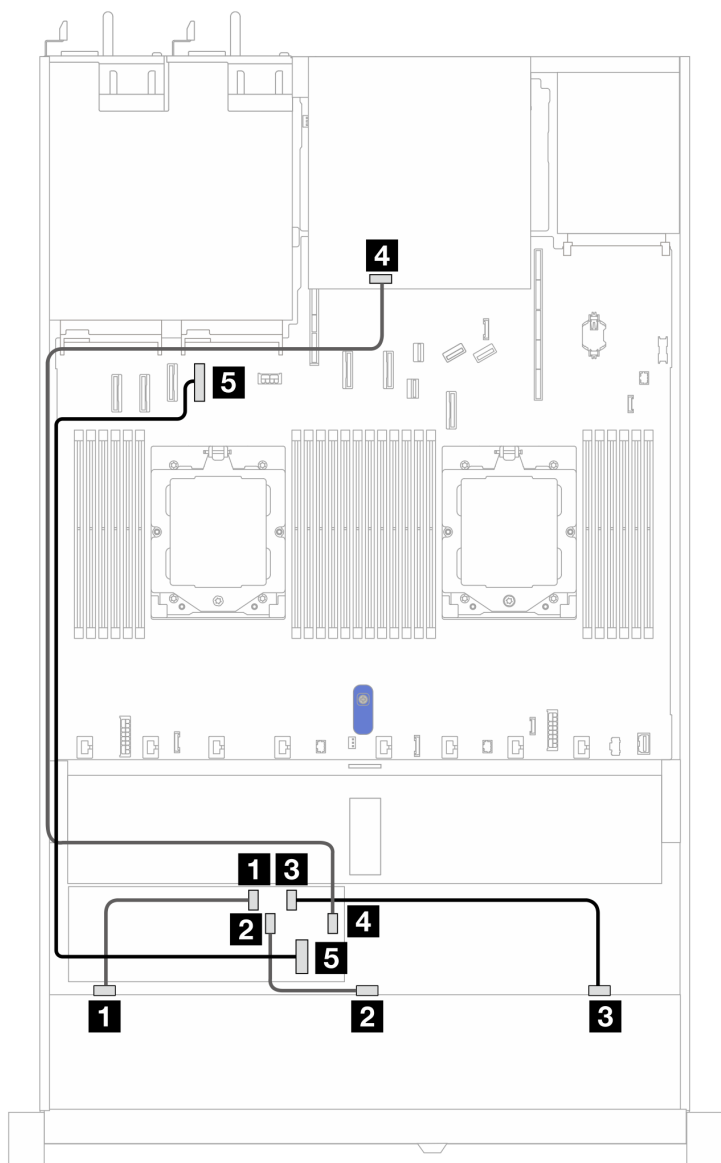


Figure 418. Cable routing for 10 front 2.5'' SAS/SATA drives bays and a 16i CFF RAID adapter (Gen 3 or Gen 4) with 2 x 2.5'' rear SAS/SATA drives installed

Table 105. Mapping between one front AnyBay and one rear NVMe backplane and a CFF RAID adapter

Backplane/adapter	From	To
Front BP (SAS)	1 SAS 0	1 C0
	2 SAS 1	2 C1
	3 SAS 2	3 C2
Rear BP (SAS)	4 SAS	3 C3
CFF RAID adapter	5 MB input	5 PCIe connector 4

10 x 2.5 AnyBay backplane (Gen 4)

Use this section to understand the alternatives that a 10 x 2.5 AnyBay backplane (Gen 4) offers.

With a 10 x 2.5 AnyBay backplane (Gen 4), following front drive combinations are supported:

10 x 2.5" AnyBay backplane

Use this section to understand the AnyBay backplane cable routing for server model with ten 2.5" front drives.

To connect power cables for a backplane for standard 2.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connect cables for M.2 drive backplane, refer to [“M.2 drive backplane” on page 344](#).

To connect intrusion switch cable, refer to [“Intrusion switch” on page 342](#).

To connect cables for RAID flash power modules, refer to [“RAID flash power modules” on page 350](#)

To connect signal cables for a backplane for standard 10 x 2.5" front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing with an SFF HBA/RAID adapter” on page 469](#)

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and an SFF HBA/RAID adapter (Gen 3 or Gen 4).

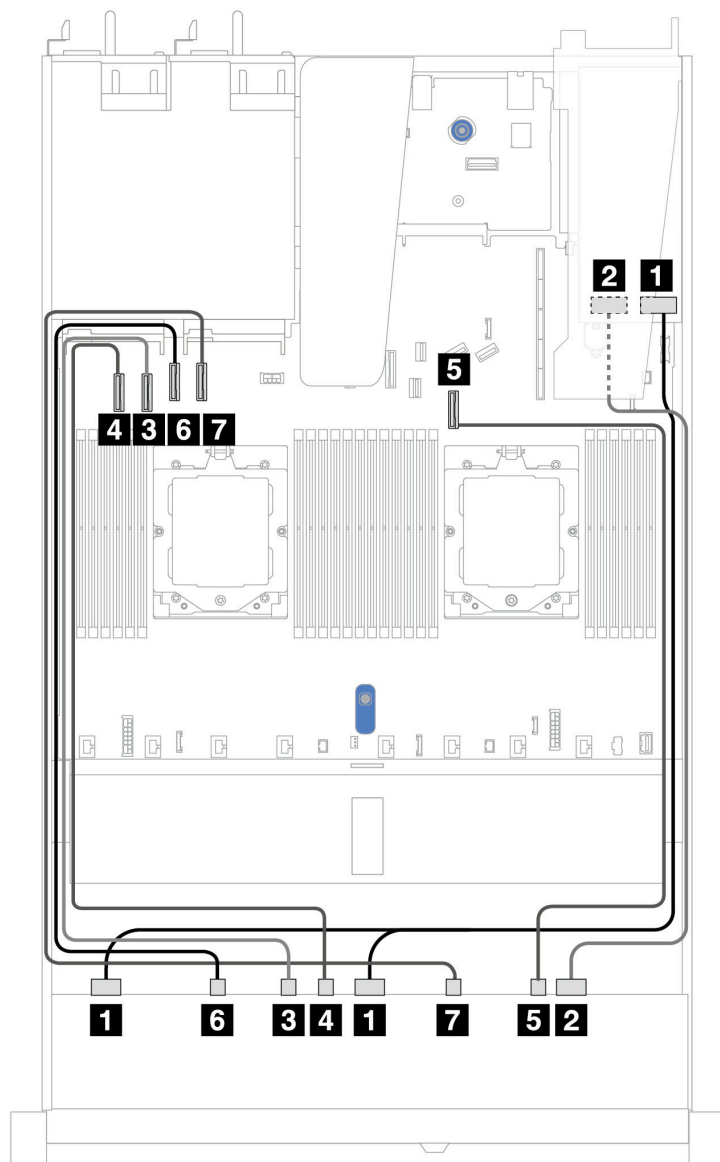


Figure 419. Cable routing for 10 AnyBay drives with a 16i SFF RAID adapter (Gen 3 or Gen 4)

Table 106. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter

Backplane	From	To
Front BP (SAS)	1 SAS 0, SAS 1	1 <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0
	2 SAS 2	2 <ul style="list-style-type: none"> • Gen 3: C2 • Gen 4: C1
Front BP (NVMe)	3 NVMe 2–3	3 PCIe 2
	4 NVMe 4–5	4 PCIe 1
	5 NVMe 8–9	5 PCIe 7

Table 106. Mapping between one front AnyBay backplane and an SFF HBA/RAID adapter (continued)

Backplane	From	To
	6 NVMe 0–1	6 PCIe 3
	7 NVMe 6–7	7 PCIe 4

10 x 2.5" NVMe backplane

Use this section to understand the cable routing of 10 NVMe front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connect cables for a rear NVMe/SAS/SATA drive backplane, refer to [“Rear NVMe/SAS/SATA drive backplane” on page 353](#).

To connect signal cables, refer to the following cable routing scenario:

- [“Cable routing for onboard configuration” on page 471](#)

Cable routing for onboard configuration

The following illustrations and tables show the mapping relationship between backplane connectors and system board connectors for onboard configuration.

The following figure illustrates the cable routing for the configuration of 10 front SAS/SATA drives bays. Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**.

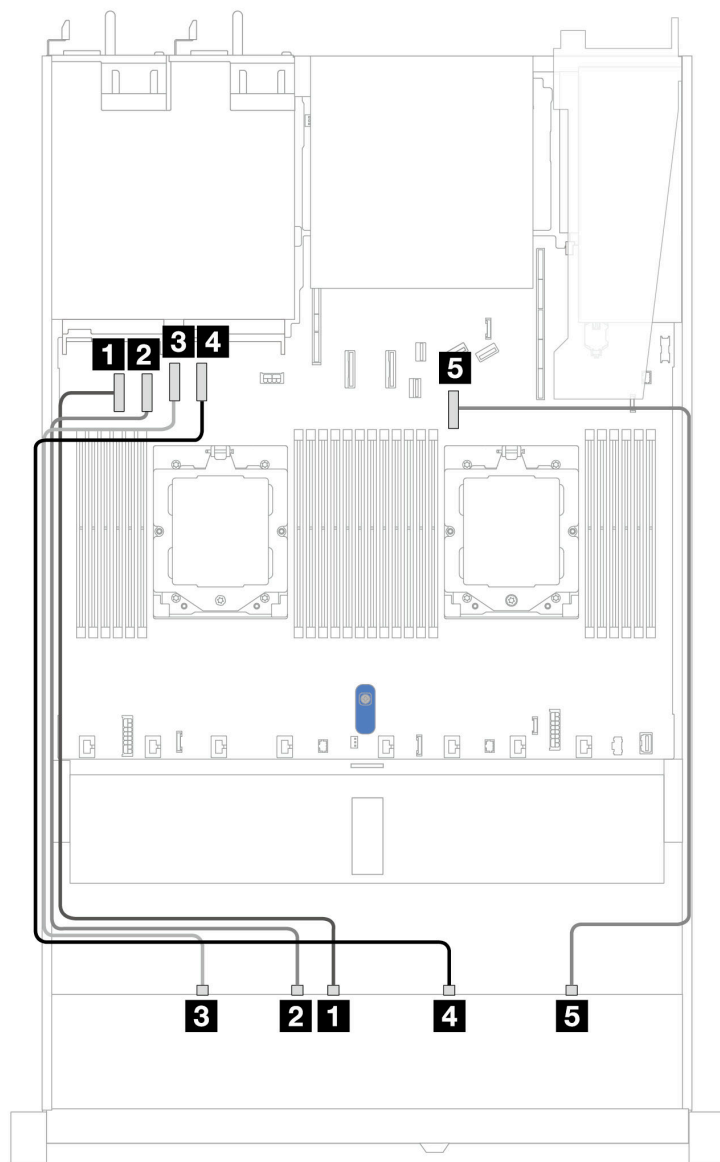


Figure 420. On-board configuration of 10 x 2.5" NVMe drive backplane

Table 107. On-board configuration of 10 x 2.5" NVMe drive backplane

Backplane	From	To
Front BP(NVMe)	1 NVMe 4–5	1 PCIe connector 1
	2 NVMe 2–3	2 PCIe connector 2
	3 NVMe 0–1	3 PCIe connector 3
	4 NVMe 6–7	4 PCIe connector 4
	5 NVMe 8–9	5 PCIe connector 7

10 x 2.5 AnyBay backplane (Gen 5)

Use this section to understand the alternatives that a 10 x 2.5 AnyBay backplane (Gen 5) offers.

With a 10 x 2.5 AnyBay backplane (Gen 5), following front drive combinations are supported:

10 x 2.5" AnyBay backplane

Use this section to understand the AnyBay backplane cable routing for server model with ten 2.5" front drives.

To connect power cables for a backplane for standard 2.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect signal cables for a backplane for standard 10 x 2.5" front drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing with an SFF HBA/RAID adapter” on page 469](#)

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and an SFF HBA/RAID adapter (Gen 3 or Gen 4).

Note: The following illustrations are for Gen 4 adapters. For Gen 3 adapters, the illustration might be slightly different.

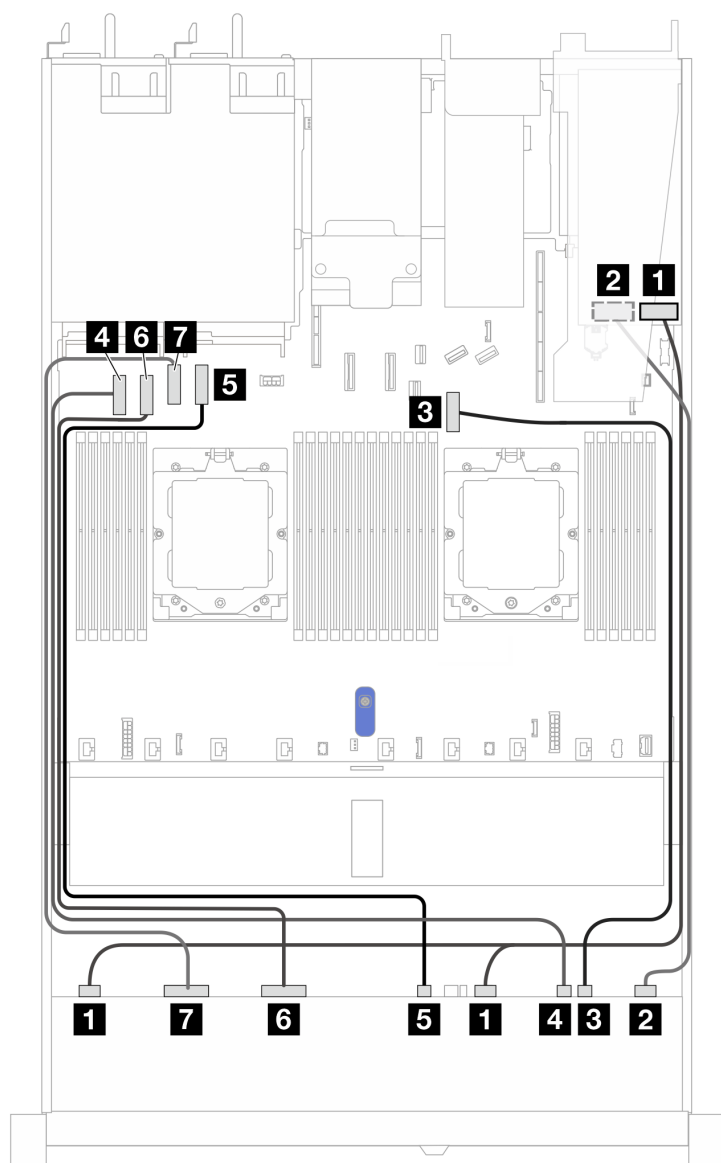


Figure 421. Cable routing for 10 AnyBay drives with a 16i SFF RAID adapter (Gen 3 or Gen 4)

Table 108. Mapping between one front AnyBay backplane and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4)

Backplane	From	To
Front BP (SAS)	1 SAS 0-3, SAS 4-7	1 <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0
	2 SAS 8-9	2 <ul style="list-style-type: none"> • Gen 3: C2 • Gen 4: C1
Front BP (NVMe)	3 NVMe 8-9	3 PCIe connector 7
	4 NVMe 6-7	4 PCIe connector 1
	5 NVMe 4-5	5 PCIe connector 4
	6 NVMe 2-3	6 PCIe connector 2

Table 108. Mapping between one front AnyBay backplane and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4) (continued)

Backplane	From	To
	7 NVMe 0–1	7 PCIe connector 3

10 x 2.5" NVMe backplane

Use this section to understand the cable routing of 10 NVMe front drives.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connect cables for a rear NVMe/SAS/SATA drive backplane, refer to [“Rear NVMe/SAS/SATA drive backplane” on page 353](#).

To connect signal cables, refer to the following cable routing scenario:

- [“Cable routing for onboard configuration” on page 475](#)

Cable routing for onboard configuration

The following illustrations and tables show the mapping relationship between backplane connectors and system board connectors for onboard configuration.

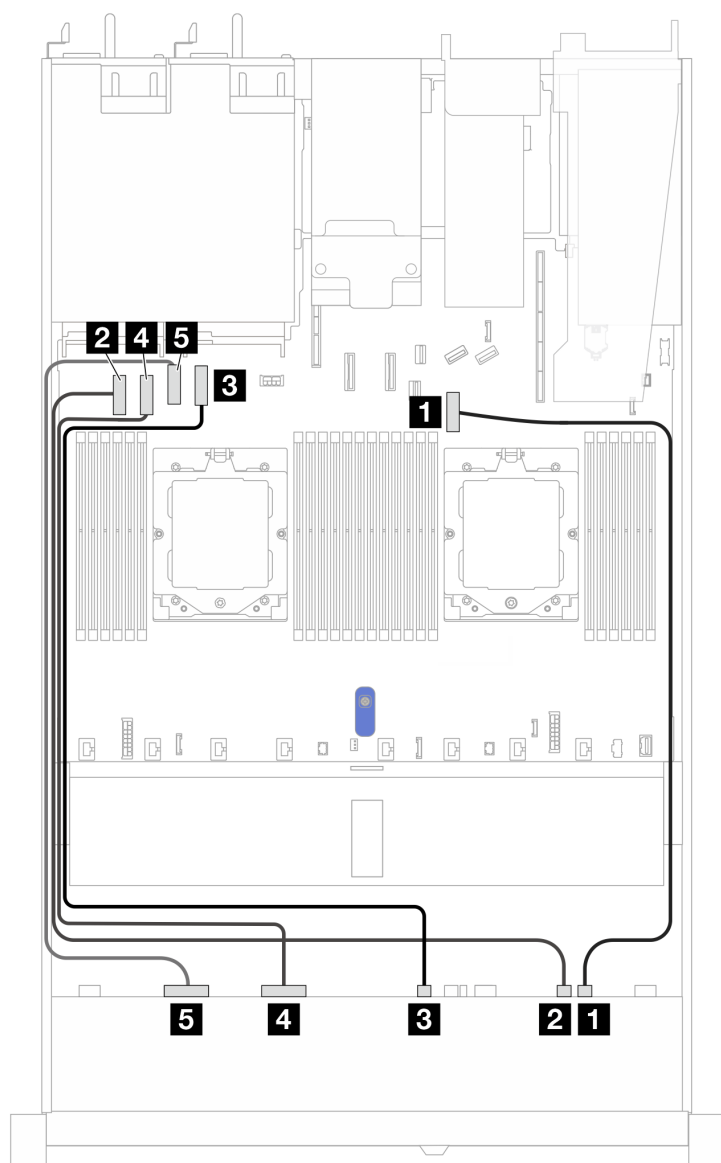


Figure 422. On-board configuration of 10 x 2.5" NVMe drive backplane

Table 109. On-board configuration of 10 x 2.5" NVMe drive backplane

Backplane	From	To
Front BP(NVMe)	1 NVMe 8-9	1 PCIe connector 7
	2 NVMe 6-7	2 PCIe connector 1
	3 NVMe 4-5	3 PCIe connector 4
	4 NVMe 2-3	4 PCIe connector 2
	5 NVMe 0-1	5 PCIe connector 3

6 x 2.5" SAS/SATA + 4 x 2.5" AnyBay backplane

See this section to understand the cable routing of 6 front 2.5" SAS/SATA drives and 4 front 2.5" AnyBay drives with 10 x 2.5 backplane (Gen 5) installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect cables for a rear NVMe/SAS/SATA drive backplane, refer to [“Rear NVMe/SAS/SATA drive backplane” on page 353](#).

To connect signal cables for a backplane for standard 6 front 2.5" SAS/SATA drives and 4 front 2.5" AnyBay drives, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing with an SFF HBA/RAID adapter” on page 477](#)
- [“Cable routing with a CFF HBA/RAID adapter” on page 479](#)

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4).

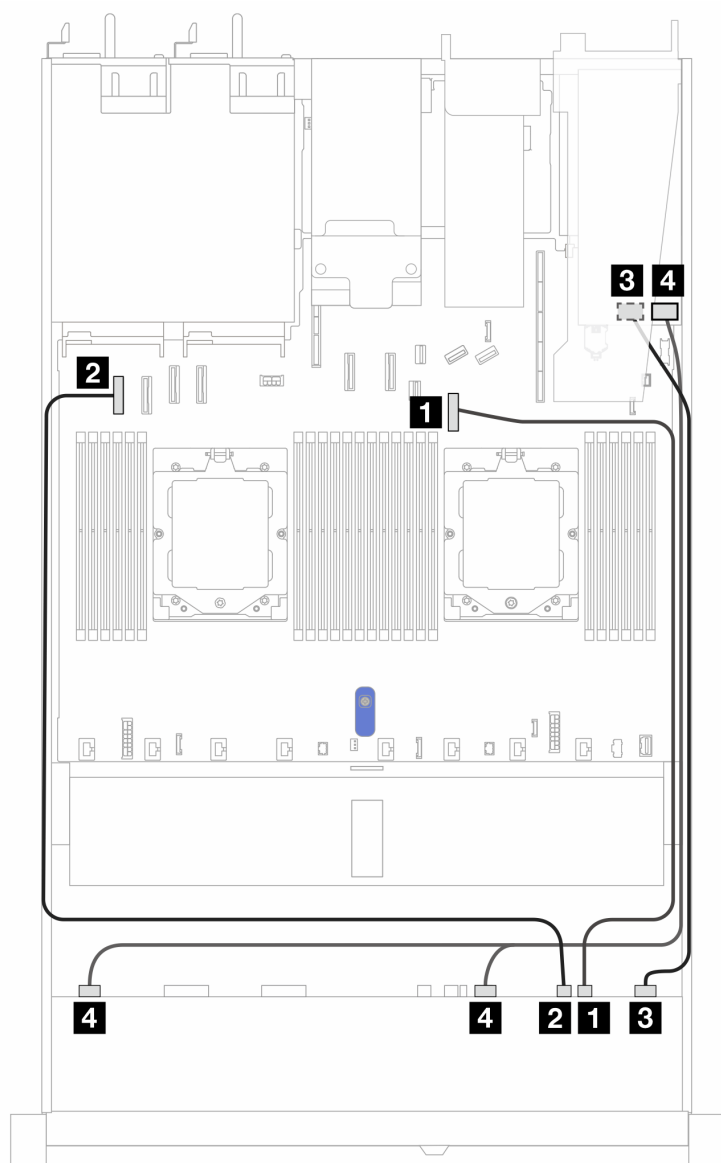


Figure 423. Cable routing for 6 front 2.5'' SAS/SATA drives and 4 front 2.5'' AnyBay drives bays with a 16i SFF RAID adapter (Gen 3 or Gen 4)

Table 110. Mapping between 6 front 2.5'' SAS/SATA drives and 4 front 2.5'' AnyBay drives bays and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4)

Backplane	From	To
Front BP (NVMe)	1 NVMe 8-9	1 PCIe connector 7
	2 NVMe 6-7	2 PCIe connector 1
Front BP (SAS)	3 SAS 0-3, SAS 4-7	3 <ul style="list-style-type: none"> Gen 3: C0, C1 Gen 4: C0
	4 SAS 8-9	4 <ul style="list-style-type: none"> Gen 3: C2 Gen 4: C1

Cable routing with a CFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and a CFF HBA/RAID adapter (Gen 3 or Gen 4).

Note: The following illustrations are for Gen 4 adapters. For Gen 3 adapters, the illustration might be slightly different.

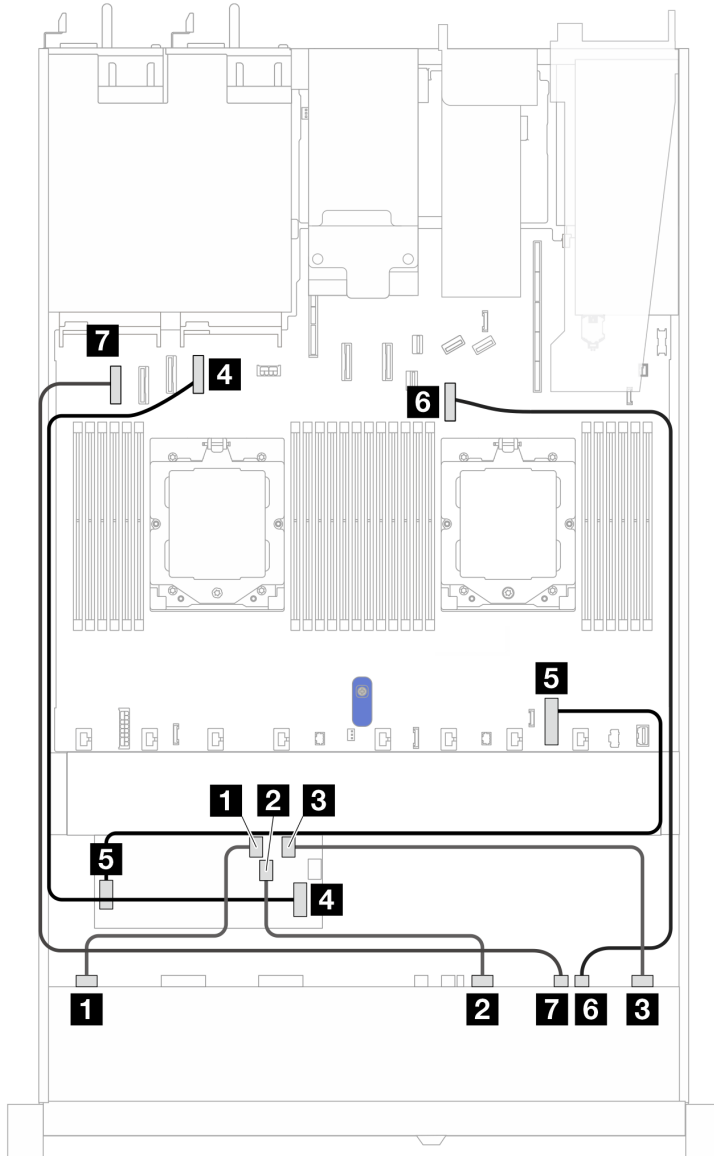


Figure 424. Cable routing for 10 AnyBay drives with a 16i CFF RAID adapter (Gen 3 or Gen 4)

Table 111. Mapping between one front AnyBay backplane and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4)

Backplane	From	To
Front BP (SAS)	1 SAS 0-3	1 C0
	2 SAS 4-7	2 C1
	3 SAS 8-9	3 C2

Table 111. Mapping between one front AnyBay backplane and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4) (continued)

Backplane	From	To
CFF RAID adapter	4 MB input	4 PCIe connector 4
	5 Power connector	5 Internal RAID power connector
Front BP (NVMe)	6 NVMe 8-9	6 PCIe connector 7
	7 NVMe 6-7	7 PCIe connector 1

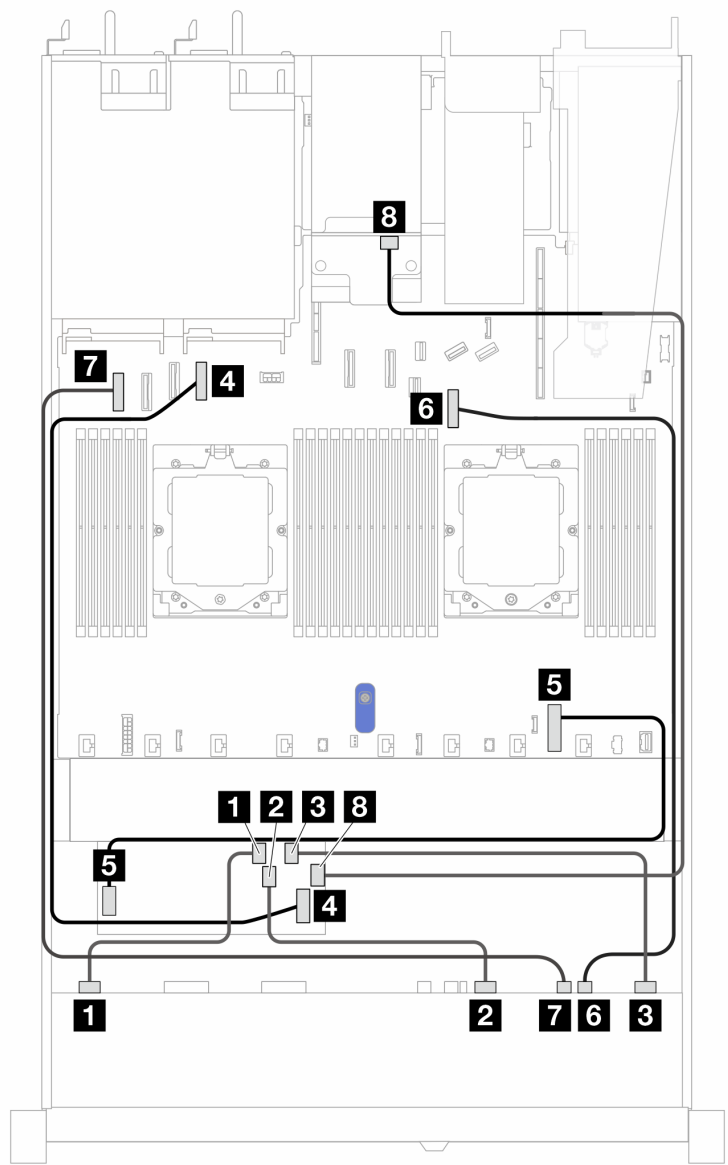


Figure 425. Cable routing for 10 AnyBay drives and 2x2.5" rear SAS/SATA with a 16i CFF RAID adapter (Gen 3 or Gen 4)

Table 112. Mapping between one front AnyBay backplane and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4)

Backplane	From	To
Front BP (SAS)	1 SAS 0-3	1 C0

Table 112. Mapping between one front AnyBay backplane and a 16i SFF HBA/RAID adapter (Gen 3 or Gen 4) (continued)

Backplane	From	To
	2 SAS 4-7	2 C1
	3 SAS 8-9	3 C2
CFF RAID adapter	4 MB input	4 PCIe connector 4
	5 Power connector	5 Internal RAID power connector
Front BP (NVMe)	6 NVMe 8-9	6 PCIe connector 7
	7 NVMe 6-7	7 PCIe connector 1
Rear BP	8 SAS	8 C3

6 x 2.5" SAS/SATA + 2 x 2.5" AnyBay + 2 x 2.5" NVMe backplane

See this section to understand the cable routing of 6 front SAS/SATA drives, 2 front AnyBay drives, and 2 front NVMe drives with 10 x 2.5 backplane (Gen 5) installed.

To connect power cables for a backplane for standard 2.5" or 3.5" drives, refer to [“Backplane power cable routing” on page 330](#).

To connector cables of RAID flash power modules, refer to [“RAID flash power modules” on page 350](#).

To connect cables for a rear NVMe/SAS/SATA drive backplane, refer to [“Rear NVMe/SAS/SATA drive backplane” on page 353](#).

To connect signal cables, refer to the following cable routing scenarios depending on your server configuration:

- [“Cable routing with an SFF HBA/RAID adapter” on page 481](#)
- [“Cable routing with a CFF HBA/RAID adapter” on page 482](#)

Cable routing with an SFF HBA/RAID adapter

The following tables show the mapping relationship between backplane connectors and an 8i SFF HBA/RAID adapter (Gen 3 or Gen 4).

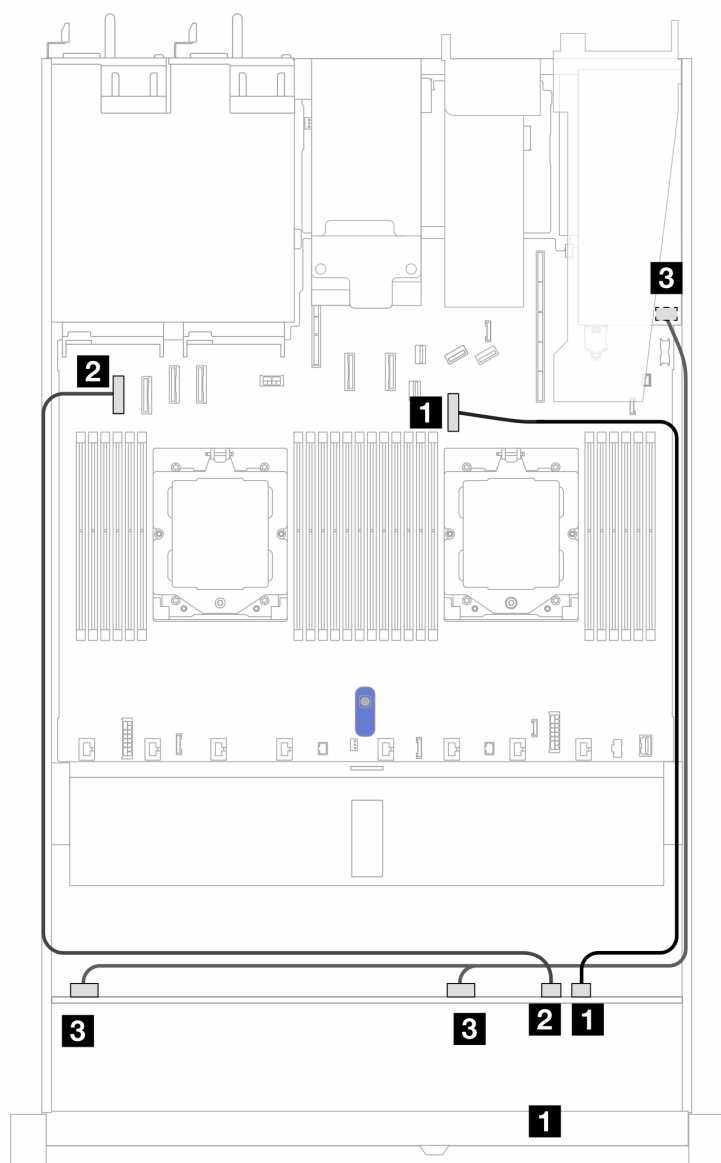


Figure 426. Cable routing for 6 front 2.5" SAS/SATA drives, 2 front 2.5" AnyBay drives, and 2 front 2.5" NVMe drives with an 8i SFF RAID adapter (Gen 3 or Gen 4)

Table 113. Mapping between 6 front 2.5" SAS/SATA drives, 2 front 2.5" AnyBay drives, and 2 front 2.5" NVMe drives with an 8i SFF RAID adapter (Gen 3 or Gen 4)

Backplane	From	To
Front BP (NVMe)	1 NVMe 8-9	1 PCIe connector 7
	2 NVMe 6-7	2 PCIe connector 1
Front BP (SAS)	3 SAS 0-3, SAS 4-7	3 <ul style="list-style-type: none"> • Gen 3: C0, C1 • Gen 4: C0

Cable routing with a CFF HBA/RAID adapter

The following table show the mapping relationship between backplane connectors and an 8i CFF HBA/RAID adapter (Gen 3).

To connector the power cable for CFF RAID adapter, refer to [“CFF RAID adapter” on page 333](#).

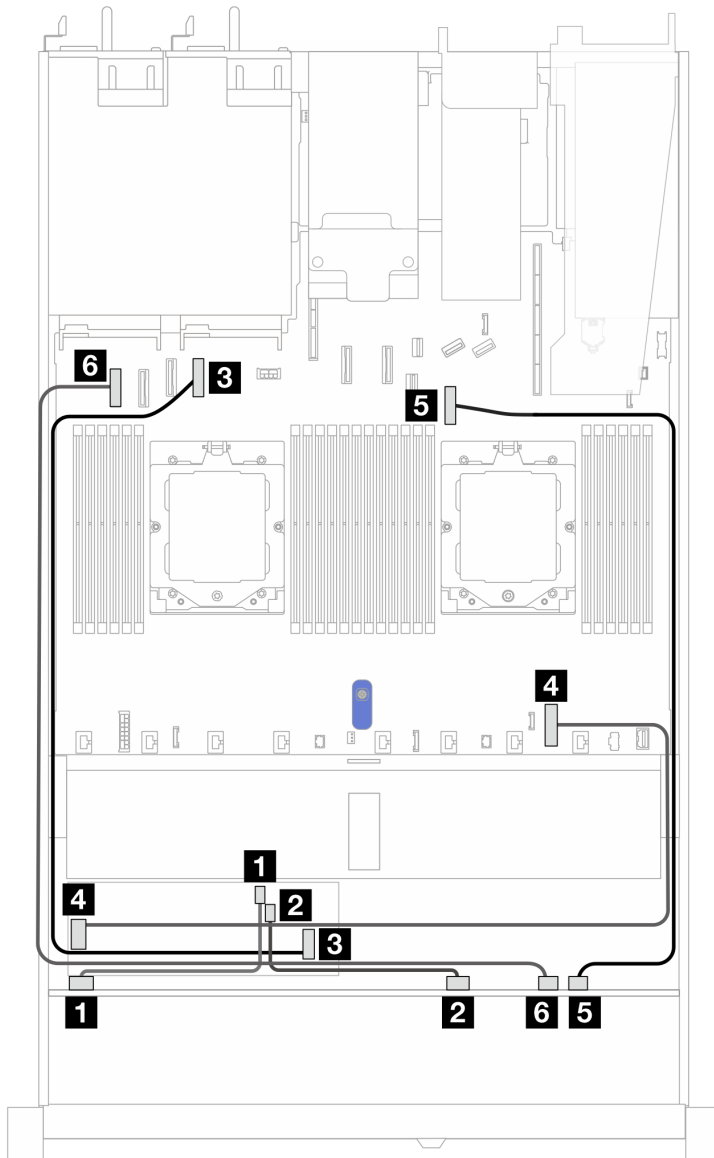


Figure 427. Cable routing for 6 front 2.5" SAS/SATA drives, 2 front 2.5" AnyBay drives, and 2 front 2.5" NVMe drives with an 8i CFF RAID adapter (Gen 3)

Table 114. Mapping between 6 front 2.5" SAS/SATA drives, 2 front 2.5" AnyBay drives, and 2 front 2.5" NVMe drives and an 8i CFF RAID adapter (Gen 3)

Backplane	From	To
Front BP (SAS)	1 SAS 0-3	1 C0
	2 SAS 4-7	2 C1
CFF RAID adapter	3 MB input	3 PCIe connector 4
	4 Power connector	4 Internal RAID power connector
Front BP (NVMe)	5 NVMe 8-9	5 PCIe connector 7

Table 114. Mapping between 6 front 2.5" SAS/SATA drives, 2 front 2.5" AnyBay drives, and 2 front 2.5" NVMe drives and an 8i CFF RAID adapter (Gen 3) (continued)

Backplane	From	To
	6 NVMe 6-7	6 PCIe connector 1

16-EDSFF drive backplane

Use this section to understand the backplane cable routing for server model with 16 E1.S EDSFF front drives.

Cable routing with a re-timer adapter

The following table shows the mapping relationship between backplane, re-timer adapter and system board connectors.

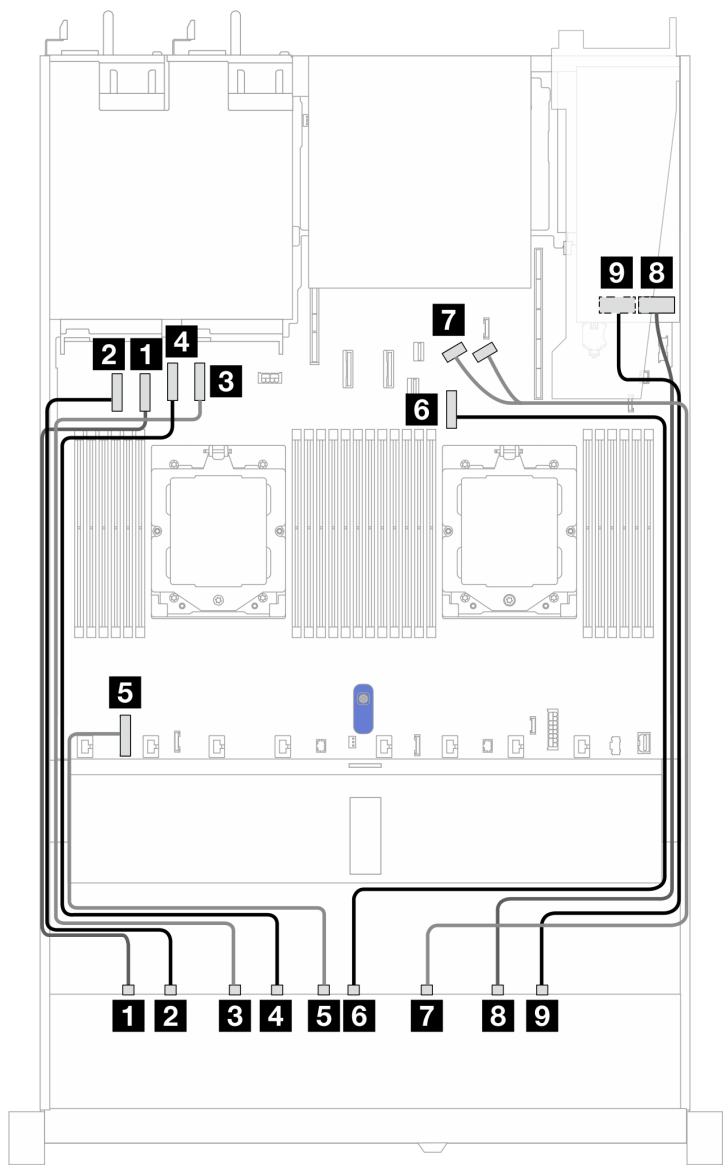


Table 115. Mapping between one front AnyBay backplane and a re-timer adapter with onboard connectors

From	To
1 EDSFF 0–1	1 PCIe connector 2
2 EDSFF 2–3	2 PCIe connector 1
3 EDSFF 4–5	3 PCIe connector 4
4 EDSFF 6–7	4 PCIe connector 3
5 Power	5 Backplane power connector on the system board
6 EDSFF 8–9	6 PCIe connector 7
7 EDSFF 10–11	7 PCIe connector 8 and 9
8 EDSFF 12–13	8 C0
9 EDSFF 14–15	9 C1

Chapter 7. System configuration

Complete these procedures to configure your system.

Set the network connection for the Lenovo XClarity Controller

Before you can access the Lenovo XClarity Controller over your network, you need to specify how Lenovo XClarity Controller will connect to the network. Depending on how the network connection is implemented, you might need to specify a static IP address as well.

The following methods are available to set the network connection for the Lenovo XClarity Controller if you are not using DHCP:

- If a monitor is attached to the server, you can use Lenovo XClarity Provisioning Manager to set the network connection.

Complete the following steps to connect the Lenovo XClarity Controller to the network using the Lenovo XClarity Provisioning Manager.

1. Start the server.
2. Press the key specified in the on-screen instructions to display the Lenovo XClarity Provisioning Manager interface. ((For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.)
3. Go to **LXPM → UEFI Setup → BMC Settings** to specify how the Lenovo XClarity Controller will connect to the network.
 - If you choose a static IP connection, make sure that you specify an IPv4 or IPv6 address that is available on the network.
 - If you choose a DHCP connection, make sure that the MAC address for the server has been configured in the DHCP server.
4. Click **OK** to apply the setting and wait for two to three minutes.
5. Use an IPv4 or IPv6 address to connect Lenovo XClarity Controller.

Important: The Lenovo XClarity Controller is set initially with a user name of USERID and password of PASSWORD (with a zero, not the letter O). This default user setting has Supervisor access. It is required to change this user name and password during your initial configuration for enhanced security.

- If no monitor is attached to the server, you can set the network connection through the Lenovo XClarity Controller interface. Connect an Ethernet cable from your laptop to XCC system management port (10/100/1000 Mbps RJ-45) on your server. For the location of the XCC system management port (10/100/1000 Mbps RJ-45), see [Chapter 2 “Server components” on page 19](#).

Note: Make sure that you modify the IP settings on the laptop so that it is on the same network as the server default settings.

The default IPv4 address and the IPv6 Link Local Address (LLA) is provided on the Lenovo XClarity Controller Network Access label that is affixed to the Pull Out Information Tab. See [“Identify the server and access the Lenovo XClarity Controller” on page 45](#).

- If you are using the Lenovo XClarity Administrator Mobile app from a mobile device, you can connect to the Lenovo XClarity Controller through the Lenovo XClarity Controller USB connector on the server. For the location of the Lenovo XClarity Controller USB connector, see [Chapter 2 “Server components” on page 19](#).

Note: The Lenovo XClarity Controller USB connector mode must be set to manage the Lenovo XClarity Controller (instead of normal USB mode). To switch from normal mode to Lenovo XClarity Controller management mode, hold the ID button on the server for at least 3 seconds until its LED flashes slowly (once every couple of seconds). See [Chapter 2 “Server components” on page 19](#) for the location of the ID button.

To connect using the Lenovo XClarity Administrator Mobile app:

1. Connect the USB cable of your mobile device to the Lenovo XClarity Controller USB connector on the server.
2. On your mobile device, enable USB tethering.
3. On your mobile device, launch the Lenovo XClarity Administrator mobile app.
4. If automatic discovery is disabled, click **Discovery** on the USB Discovery page to connect to the Lenovo XClarity Controller.

For more information about using the Lenovo XClarity Administrator Mobile app, see:

https://pubs.lenovo.com/lxca/lxca_usemobileapp

Set USB port for Lenovo XClarity Controller connection

Before you can access the Lenovo XClarity Controller through the USB port, you need to configure the USB port for Lenovo XClarity Controller connection.

Server support

To see if your server supports accessing Lenovo XClarity Controller through the USB port, check one of the following:

- Refer to [Chapter 2 “Server components” on page 19](#).



- If there is a wrench icon on the USB port of your server, you can set the management USB port to connect to Lenovo XClarity Controller. It is also the only USB port that supports USB automation update of the system I/O board (or firmware and RoT security module).

Setting the USB port for Lenovo XClarity Controller connection

You can switch the USB port between normal and Lenovo XClarity Controller management operation by performing one of the following steps.

- Hold the ID button for at least 3 seconds until its LED flashes slowly (once every couple of seconds). See [Chapter 2 “Server components” on page 19](#) for ID button location.
- From the Lenovo XClarity Controller management controller CLI, run the `usbfp` command. For information about using the Lenovo XClarity Controller CLI, see the “Command-line interface” section in the XCC documentation compatible with your server at https://sysmgmt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.
- From the Lenovo XClarity Controller management controller web interface, click **BMC Configuration → Network → USB Management Port Assignment**. For information about Lenovo XClarity Controller web interface functions, see the “Description of XClarity Controller functions on web interface” section in the XCC documentation compatible with your server at https://sysmgmt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.

Checking USB port current setting

You can also check the current setting of the USB port using the Lenovo XClarity Controller management controller CLI (usbfp command) or the Lenovo XClarity Controller management controller web interface (**BMC Configuration → Network → USB Management Port Assignment**). See the “Command-line interface” and “Description of XClarity Controller functions on web interface” sections in the XCC documentation compatible with your server at https://sysmgmt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.

Update the firmware

Several options are available to update the firmware for the server.

You can use the tools listed here to update the most current firmware for your server and the devices that are installed in the server.

- Best practices related to updating firmware is available at the following site:
 - <http://lenovopress.com/LP0656>
- The latest firmware can be found at the following site:
 - <https://datacentersupport.lenovo.com/tw/en/products/servers/thinksystem/sr645v3/7d9c/downloads/driver-list/>
- You can subscribe to product notification to stay up to date on firmware updates:
 - <https://datacentersupport.lenovo.com/solutions/ht509500>

Update Bundles (Service Packs)

Lenovo typically releases firmware in bundles called Update Bundles (Service Packs). To ensure that all of the firmware updates are compatible, you should update all firmware at the same time. If you are updating firmware for both the Lenovo XClarity Controller and UEFI, update the firmware for Lenovo XClarity Controller first.

Update method terminology

- **In-band update.** The installation or update is performed using a tool or application within an operating system that is executing on the server’s core CPU.
- **Out-of-band update.** The installation or update is performed by the Lenovo XClarity Controller collecting the update and then directing the update to the target subsystem or device. Out-of-band updates have no dependency on an operating system executing on the core CPU. However, most out-of-band operations do require the server to be in the S0 (Working) power state.
- **On-Target update.** The installation or update is initiated from an installed operating system executing on the target server itself.
- **Off-Target update.** The installation or update is initiated from a computing device interacting directly with the server’s Lenovo XClarity Controller.
- **Update Bundles (Service Packs).** Update Bundles (Service Packs) are bundled updates designed and tested to provide the interdependent level of functionality, performance, and compatibility. Update Bundles (Service Packs) are server machine-type specific and are built (with firmware and device driver updates) to support specific Windows Server, Red Hat Enterprise Linux (RHEL) and SUSE Linux Enterprise Server (SLES) operating system distributions. Machine-type-specific firmware-only Update Bundles (Service Packs) are also available.

Firmware updating tools

See the following table to determine the best Lenovo tool to use for installing and setting up the firmware:

Tool	Update Methods Supported	Core System Firmware Updates	I/O Devices Firmware Updates	Drive Firmware Updates	Graphical user interface	Command line interface	Supports Update Bundles (Service Packs)
Lenovo XClarity Provisioning Manager (LXPM)	In-band ² On-Target	✓			✓		
Lenovo XClarity Controller (XCC)	In-band ⁴ Out-of-band Off-Target	✓	Selected I/O devices	✓ ³	✓		✓
Lenovo XClarity Essentials OneCLI (OneCLI)	In-band Out-of-band On-Target Off-Target	✓	All I/O devices	✓ ³		✓	✓
Lenovo XClarity Essentials UpdateXpress (LXCE)	In-band Out-of-band On-Target Off-Target	✓	All I/O devices		✓		✓
Lenovo XClarity Essentials Bootable Media Creator (BoMC)	In-band Out-of-band Off-Target	✓	All I/O devices		✓ (BoMC application)	✓ (BoMC application)	✓
Lenovo XClarity Administrator (LXCA)	In-band ¹ Out-of-band ² Off-Target	✓	All I/O devices	✓	✓		✓
Lenovo XClarity Integrator (LXCI) for VMware vCenter	Out-of-band Off-Target	✓	Selected I/O devices		✓		

Tool	Update Methods Supported	Core System Firmware Updates	I/O Devices Firmware Updates	Drive Firmware Updates	Graphical user interface	Command line interface	Supports Update Bundles (Service Packs)
Lenovo XClarity Integrator (LXCI) for Microsoft Windows Admin Center	In-band Out-of-band On-Target Off-Target	✓	All I/O devices		✓		✓

Notes:

1. For I/O firmware updates.
2. For BMC and UEFI firmware updates.
3. Drive firmware update is only supported by the tools and methods below:
 - XCC Bare Metal Update (BMU): In-band, and requires system reboot.
 - Lenovo XClarity Essentials OneCLI:
 - For OneCLI version earlier than 5.0.0:
 - For drives supported by ThinkSystem V2 and V3 products (legacy drives): In-band, and does not require system reboot.
 - For drives supported only by ThinkSystem V3 products (new drives): Staging to XCC and complete the update with XCC BMU (In-band, and requires system reboot.).
 - For OneCLI 5.0.0 and later versions: In-band, and does not require system reboot.
4. Bare Metal Update (BMU) only.

• **Lenovo XClarity Provisioning Manager**

From Lenovo XClarity Provisioning Manager, you can update the Lenovo XClarity Controller firmware, the UEFI firmware, and the Lenovo XClarity Provisioning Manager software.

Note: By default, the Lenovo XClarity Provisioning Manager Graphical User Interface is displayed when you start the server and press the key specified in the on-screen instructions. If you have changed that default to be the text-based system setup, you can bring up the Graphical User Interface from the text-based system setup interface.

For additional information about using Lenovo XClarity Provisioning Manager to update firmware, see:

“Firmware Update” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html

• **Lenovo XClarity Controller**

If you need to install a specific update, you can use the Lenovo XClarity Controller interface for a specific server.

Notes:

- To perform an in-band update through Windows or Linux, the operating system driver must be installed and the Ethernet-over-USB (sometimes called LAN over USB) interface must be enabled.

For additional information about configuring Ethernet over USB, see:

“Configuring Ethernet over USB” section in the XCC documentation version compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html

- If you update firmware through the Lenovo XClarity Controller, make sure that you have downloaded and installed the latest device drivers for the operating system that is running on the server.

For additional information about using Lenovo XClarity Controller to update firmware, see:

“Updating Server Firmware” section in the XCC documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html

- **Lenovo XClarity Essentials OneCLI**

Lenovo XClarity Essentials OneCLI is a collection of command line applications that can be used to manage Lenovo servers. Its update application can be used to update firmware and device drivers for your servers. The update can be performed within the host operating system of the server (in-band) or remotely through the BMC of the server (out-of-band).

For additional information about using Lenovo XClarity Essentials OneCLI to update firmware, see:

http://sysmgt.lenovofiles.com/help/topic/toolscctr_cli_lenovo/onecli_c_update.html

- **Lenovo XClarity Essentials UpdateXpress**

Lenovo XClarity Essentials UpdateXpress provides most of OneCLI update functions through a graphical user interface (GUI). It can be used to acquire and deploy Update Bundles (Service Packs) update packages and individual updates. Update Bundles (Service Packs) contain firmware and device driver updates for Microsoft Windows and for Linux.

You can obtain Lenovo XClarity Essentials UpdateXpress from the following location:

<https://datacentersupport.lenovo.com/solutions/lnvo-xpress>

- **Lenovo XClarity Essentials Bootable Media Creator**

You can use Lenovo XClarity Essentials Bootable Media Creator to create bootable media that is suitable for firmware updates, VPD updates, inventory and FFDC collection, advanced system configuration, FoD Keys management, secure erase, RAID configuration, and diagnostics on supported servers.

You can obtain Lenovo XClarity Essentials BoMC from the following location:

<https://datacentersupport.lenovo.com/solutions/lnvo-bomc>

- **Lenovo XClarity Administrator**

If you are managing multiple servers using the Lenovo XClarity Administrator, you can update firmware for all managed servers through that interface. Firmware management is simplified by assigning firmware-compliance policies to managed endpoints. When you create and assign a compliance policy to managed endpoints, Lenovo XClarity Administrator monitors changes to the inventory for those endpoints and flags any endpoints that are out of compliance.

For additional information about using Lenovo XClarity Administrator to update firmware, see:

https://pubs.lenovo.com/lxca/update_fw

- **Lenovo XClarity Integrator offerings**

Lenovo XClarity Integrator offerings can integrate management features of Lenovo XClarity Administrator and your server with software used in a certain deployment infrastructure, such as VMware vCenter, Microsoft Admin Center, or Microsoft System Center.

For additional information about using Lenovo XClarity Integrator to update firmware, see:

https://sysmgt.lenovofiles.com/help/topic/lxci/lxci_product_page.html

Configure the firmware

Several options are available to install and set up the firmware for the server.

Note: UEFI **Legacy Mode** is not supported by ThinkSystem V4 products.

- **Lenovo XClarity Provisioning Manager (LXPM)**

From Lenovo XClarity Provisioning Manager, you can configure the UEFI settings for your server.

Notes: The Lenovo XClarity Provisioning Manager provides a Graphical User Interface to configure a server. The text-based interface to system configuration (the Setup Utility) is also available. From Lenovo XClarity Provisioning Manager, you can choose to restart the server and access the text-based interface. In addition, you can choose to make the text-based interface the default interface that is displayed when you start LXPM. To do this, go to **Lenovo XClarity Provisioning Manager → UEFI Setup → System Settings → <F1>Start Control → Text Setup**. To start the server with Graphic User Interface, select **Auto** or **Tool Suite**.

See the following documentations for more information:

- Search for the LXPM documentation version compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html
- *UEFI User Guide* at https://thinksystem.lenovofiles.com/help/topic/dcg_uefi/overview_dcg_uefi.html

- **Lenovo XClarity Essentials OneCLI**

You can use the config application and commands to view the current system configuration settings and make changes to Lenovo XClarity Controller and UEFI. The saved configuration information can be used to replicate or restore other systems.

For information about configuring the server using Lenovo XClarity Essentials OneCLI, see:

http://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_c_settings_info_commands.html

- **Lenovo XClarity Administrator**

You can quickly provision and pre-provision all of your servers using a consistent configuration. Configuration settings (such as local storage, I/O adapters, boot settings, firmware, ports, and Lenovo XClarity Controller and UEFI settings) are saved as a server pattern that can be applied to one or more managed servers. When the server patterns are updated, the changes are automatically deployed to the applied servers.

Specific details about configuring the server using Lenovo XClarity Administrator are available at:

https://pubs.lenovo.com/lxca/server_configuring

- **Lenovo XClarity Controller**

You can configure the management processor for the server through the Lenovo XClarity Controller Web interface, the command-line interface, or Redfish API.

For information about configuring the server using Lenovo XClarity Controller, see:

“Configuring the Server” section in the XCC documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html

Memory module configuration

Memory performance depends on several variables, such as memory mode, memory speed, memory ranks, memory population and processor.

Information about optimizing memory performance and configuring memory is available at the Lenovo Press website:

<https://lenovopress.com/servers/options/memory>

In addition, you can take advantage of a memory configurator, which is available at the following site:

https://dcsc.lenovo.com/#/memory_configuration

RAID configuration

Using a Redundant Array of Independent Disks (RAID) to store data remains one of the most common and cost-efficient methods to increase server's storage performance, availability, and capacity.

RAID increases performance by allowing multiple drives to process I/O requests simultaneously. RAID can also prevent data loss in case of a drive failure by reconstructing (or rebuilding) the missing data from the failed drive using the data from the remaining drives.

RAID array (also known as RAID drive group) is a group of multiple physical drives that uses a certain common method to distribute data across the drives. A virtual drive (also known as virtual disk or logical drive) is a partition in the drive group that is made up of contiguous data segments on the drives. Virtual drive is presented up to the host operating system as a physical disk that can be partitioned to create OS logical drives or volumes.

An introduction to RAID is available at the following Lenovo Press website:

<https://lenovopress.com/lp0578-lenovo-raid-introduction>

Detailed information about RAID management tools and resources is available at the following Lenovo Press website:

<https://lenovopress.com/lp0579-lenovo-raid-management-tools-and-resources>

Deploy the operating system

Several options are available to deploy an operating system on the server.

Available operating systems

- Canonical Ubuntu
- Microsoft Windows
- Microsoft Windows Server
- Red Hat Enterprise Linux
- SUSE Linux Enterprise Server
- VMware ESXi

Complete list of available operating systems: <https://lenovopress.com/osig>.

Tool-based deployment

- **Multi-server**

Available tools:

- Lenovo XClarity Administrator

https://pubs.lenovo.com/lxca/compute_node_image_deployment

- Lenovo XClarity Essentials OneCLI

http://sysmgt.lenovofiles.com/help/topic/toolsetcli_lenovo/onecli_r_uxspi_proxy_tool.html

- **Single-server**

Available tools:

- Lenovo XClarity Provisioning Manager

“OS Installation” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html

- Lenovo XClarity Essentials OneCLI

http://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_uxspi_proxy_tool.html

Manual deployment

If you cannot access the above tools, follow the instructions below, download the corresponding OS *Installation Guide*, and deploy the operating system manually by referring to the guide.

1. Go to <https://datacentersupport.lenovo.com/solutions/server-os>.
2. Select an operating system from the navigation pane and click **Resources**.
3. Locate the “OS Install Guides” area and click the installation instructions. Then, follow the instructions to complete the operation system deployment task.

Back up the server configuration

After setting up the server or making changes to the configuration, it is a good practice to make a complete backup of the server configuration.

Make sure that you create backups for the following server components:

- **Management processor**

You can back up the management processor configuration through the Lenovo XClarity Controller interface. For details about backing up the management processor configuration, see:

“Backing up the BMC configuration” section in the XCC documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.

Alternatively, you can use the `save` command from Lenovo XClarity Essentials OneCLI to create a backup of all configuration settings. For more information about the `save` command, see:

http://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_save_command.html

- **Operating system**

Use your backup methods to back up the operating system and user data for the server.

Chapter 8. Problem determination

Use the information in this section to isolate and resolve issues that you might encounter while using your server.

Lenovo servers can be configured to automatically notify Lenovo Support if certain events are generated. You can configure automatic notification, also known as Call Home, from management applications, such as the Lenovo XClarity Administrator. If you configure automatic problem notification, Lenovo Support is automatically alerted whenever a server encounters a potentially significant event.

To isolate a problem, you should typically begin with the Lenovo XClarity Controller event log.

To isolate a problem, you should typically begin with the event log of the application that is managing the server:

- If you are managing the server from the Lenovo XClarity Administrator, begin with the Lenovo XClarity Administrator event log.
- If you are using some other management application, begin with the Lenovo XClarity Controller event log.

Web resources

- **Tech tips**

Lenovo continually updates the support website with the latest tips and techniques that you can use to solve issues that your server might encounter. These Tech Tips (also called retain tips or service bulletins) provide procedures to work around issues or solve problems related to the operation of your server.

To find the Tech Tips available for your server:

1. Go to <http://datacentersupport.lenovo.com>, and input the model name or machine type of your server in the search bar to navigate to the support page.
2. Click on **How To's** from the navigation pane.
3. Click **Article Type** → **Solution** from the drop-down menu.

Follow the on-screen instructions to choose the category for the problem that you are having.

- **Lenovo Data Center Forum**

- Check https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg to see if someone else has encountered a similar problem.

Event logs

An *alert* is a message or other indication that signals an event or an impending event. Alerts are generated by the Lenovo XClarity Controller or by UEFI in the servers. These alerts are stored in the Lenovo XClarity Controller Event Log. If the server is managed by the Lenovo XClarity Administrator, alerts are automatically forwarded to this management application.

Note: For a listing of events, including user actions that might need to be performed to recover from an event, see the *Messages and Codes Reference*, which is available at https://thinksystem.lenovofiles.com/help/topic/SR645V3/pdf_files.html.

Lenovo XClarity Controller event log

The Lenovo XClarity Controller monitors the physical state of the server and its components using sensors that measure internal physical variables such as temperature, power-supply voltages, fan speeds, and component status. The Lenovo XClarity Controller provides various interfaces to systems management software and to system administrators and users to enable remote management and control of a server.

The Lenovo XClarity Controller monitors all components of the server and posts events in the Lenovo XClarity Controller event log.

Index	Severity	Source	Common ID	Message	Date
0	Information	System	FXQSPNM40111	ENET[CIM:ep1] DHCP-HSTN=XCC-MTM-SN, DN=, IP@=192.168.36.17,...	August 9, 2022 5:18:...
1	Information	System	FXQSPNM40131	LAN: Ethernet[IMM : ep2] interface is no longer active.	August 9, 2022 5:17:...
2	Information	System	FXQSPNM40281	ENET[CIM:ep1] IPv6-LinkLocal-HstName=XCC-MTM-SN, IP@=fe80::922...	August 9, 2022 5:17:...
3	Information	System	FXQSPNM40001	Management Controller SN# 1234567890 Network Initialization Complete.	August 9, 2022 5:17:...
4	Warning	Power	FXQSPPW0104J	Non-redundant:Sufficient Resources from Redundancy Degraded or Fully...	August 9, 2022 5:17:...
5	Information	System	FXQSPUN00261	Device Low Security Jmp has been added.	August 9, 2022 5:17:...
6	Information	System	FXQSPPR00001	front panel board 1 detected as present.	August 9, 2022 5:17:...
7	Error	Cooling	FXQSPCA0016M	Sensor Fan Mismatch has transitioned to critical from a less severe state.	August 9, 2022 5:17:...

Figure 428. Lenovo XClarity Controller event log

For more information about accessing the Lenovo XClarity Controller event log, see:

“Viewing Event Logs” section in the XCC documentation compatible with your server at https://sysmgmt.lenovofiles.com/help/topic/ixcc_frontend/ixcc_overview.html

Lenovo XClarity Administrator event log

If you are using Lenovo XClarity Administrator to manage server, network, and storage hardware, you can view the events from all managed devices through the XClarity Administrator.

Logs

Severity	Serviceability	Date and Time	System	Event	System Type	Source ID
Warning	Support	Jan 30, 2017, 7:49:07 AM	Chassis114:...	Node Node 08 device	Chassis	Jan 30, 20
Warning	Support	Jan 30, 2017, 7:49:07 AM	Chassis114:...	Node Node 02 device	Chassis	Jan 30, 20
Warning	User	Jan 30, 2017, 7:49:07 AM	Chassis114:...	I/O module IO Module	Chassis	Jan 30, 20
Warning	User	Jan 30, 2017, 7:49:07 AM	Chassis114:...	Node Node 08 incom	Chassis	Jan 30, 20

Figure 429. Lenovo XClarity Administrator event log

For more information about working with events from XClarity Administrator, see:

https://pubs.lenovo.com/lxca/events_vieweventlog

Troubleshooting by system LEDs and diagnostics display

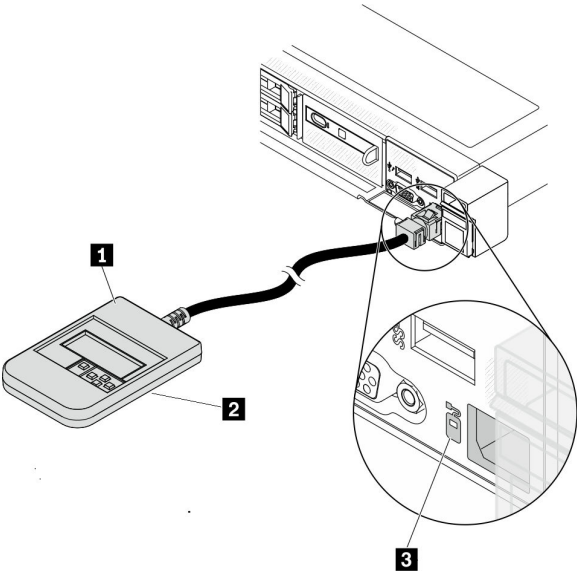
See the following section for information on available system LEDs and diagnostics display.

External diagnostics handset

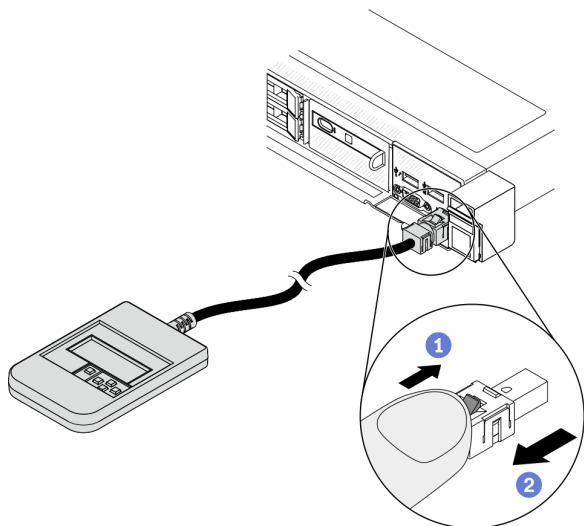
The external diagnostics handset is an external device that is connected to the server with a cable, and it allows quick access to system information such as errors, system status, firmware, network, and health information.

Note: The external diagnostics handset is an optional part that needs to be purchased separately.

Location of the external diagnostics handset

Location	Callouts
The external diagnostics handset is connected to the server with an external cable. 	1 External diagnostics handset
	2 Magnetic bottom With this component, the diagnostic handset can be attached to the top or side of the rack with hands spared for service tasks.
	3 External diagnostics connector This connector is located on the front of the server, and is used to connect an external diagnostics handset.

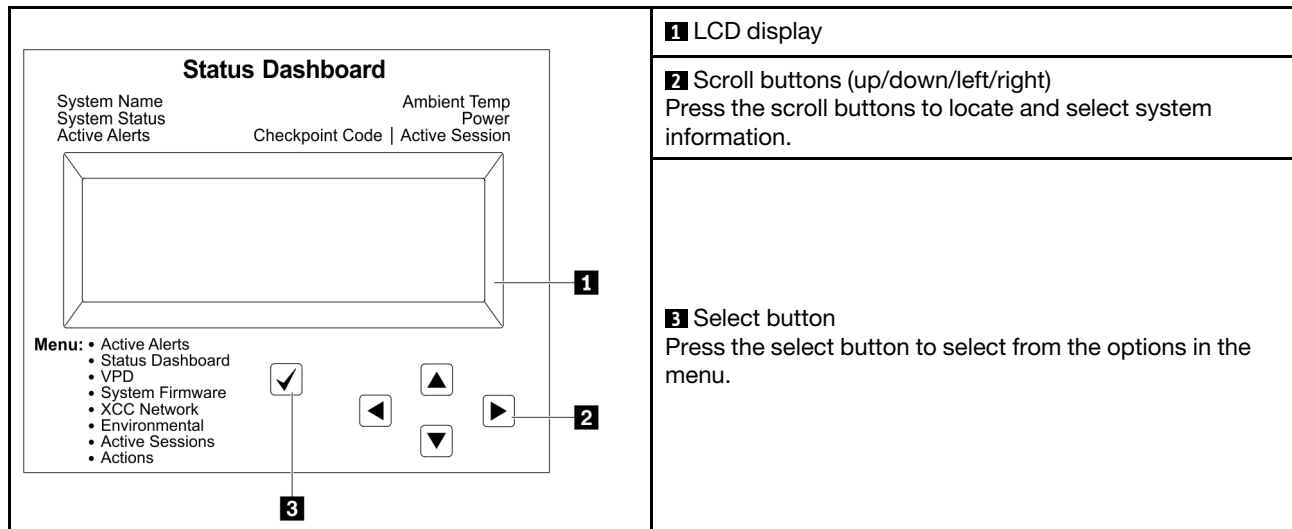
Note: When unplugging the external handset, see the following instructions:



- 1 Press the plastic clip on the plug forward.
- 2 Hold the clip and remove the cable from the connector.

Display panel overview

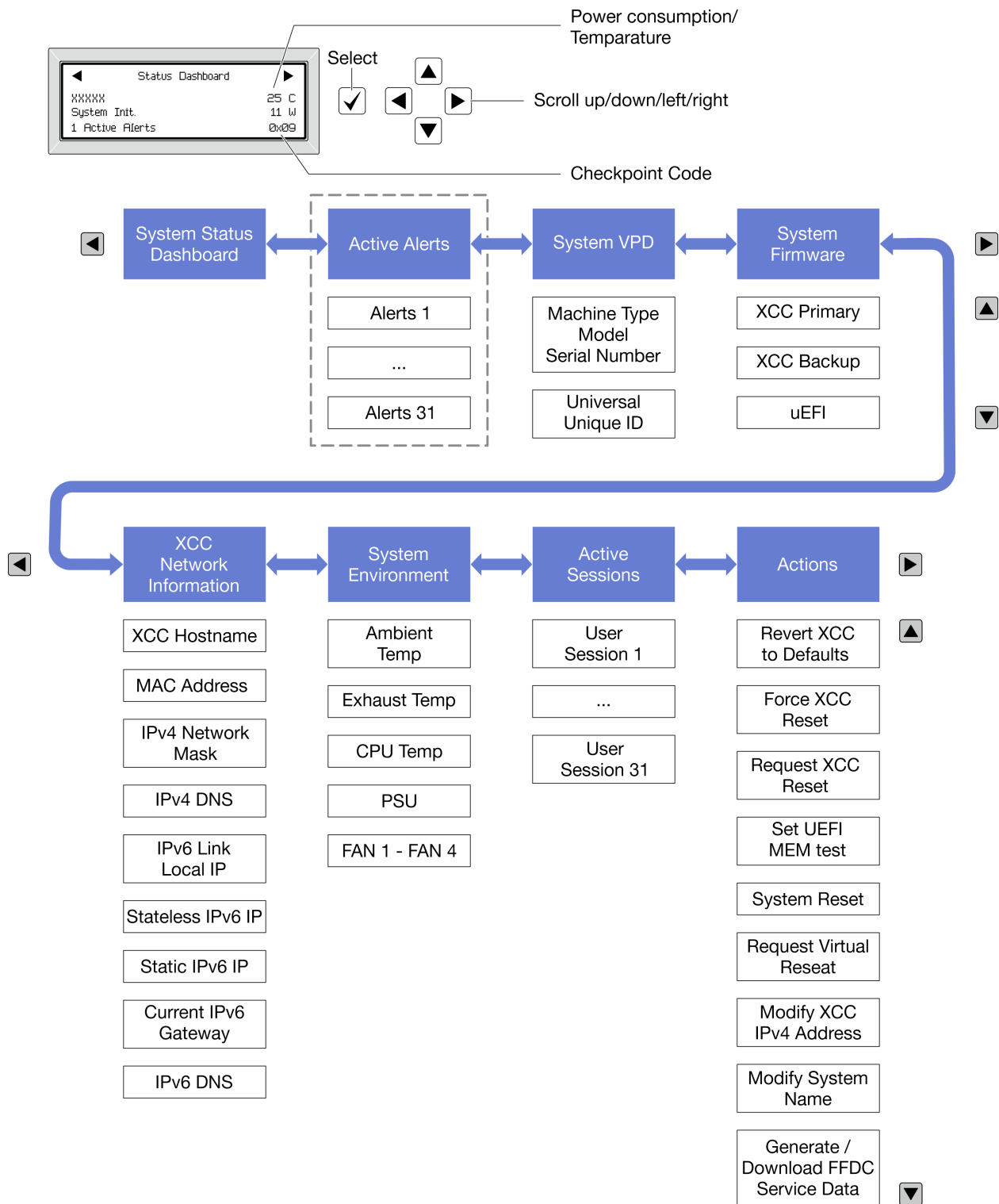
The diagnostics device consists of an LCD display and 5 navigation buttons.



Option flow diagram

The LCD panel displays various system information. Navigate through the options with the scroll keys.

Depending on the model, the options and entries on the LCD display might be different.

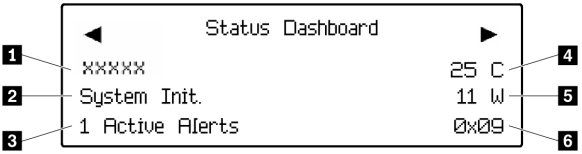


Full menu list

Following is the list of available options. Switch between an option and the subordinate information entries with the select button, and switch among options or information entries with the scroll buttons.

Depending on the model, the options and entries on the LCD display might be different.

Home Menu (System Status Dashboard)

Home Menu	Example
1 System name 2 System status 3 Active alert quantity 4 Temperature 5 Power consumption 6 Checkpoint code	 <p>The screenshot shows a 'Status Dashboard' with the following information: 'xxxxxx' (1), 'System Init.' (2), '1 Active Alerts' (3), '25 C' (4), '11 W' (5), and '0x09' (6).</p>

Active Alerts

Sub Menu	Example
Home screen: Active error quantity Note: The “Active Alerts” menu displays only the quantity of active errors. If no errors occur, the “Active Alerts” menu will not be available during navigation.	1 Active Alerts
Details screen: <ul style="list-style-type: none"> Error message ID (Type: Error/Warning/Information) Occurrence time Possible sources of the error 	Active Alerts: 1 Press ▼ to view alert details FQXSPPU009N(Error) 04/07/2020 02:37:39 PM CPU 1 Status: Configuration Error

System VPD Information

Sub Menu	Example
<ul style="list-style-type: none"> Machine type and serial number Universal Unique ID (UUID) 	Machine Type: xxxx Serial Num: xxxxxx Universal Unique ID: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

System Firmware

Sub Menu	Example
XCC Primary <ul style="list-style-type: none">Firmware level (status)Build IDVersion numberRelease date	XCC Primary (Active) Build: DVI399T Version: 4.07 Date: 2020-04-07
XCC Backup <ul style="list-style-type: none">Firmware level (status)Build IDVersion numberRelease date	XCC Backup (Active) Build: D8BT05I Version: 1.00 Date: 2019-12-30
UEFI <ul style="list-style-type: none">Firmware level (status)Build IDVersion numberRelease date	UEFI (Inactive) Build: D0E101P Version: 1.00 Date: 2019-12-26

XCC Network Information

Sub Menu	Example
<ul style="list-style-type: none">XCC hostnameMAC addressIPv4 Network MaskIPv4 DNSIPv6 Link Local IPStateless IPv6 IPStatic IPv6 IPCurrent IPv6 GatewayIPv6 DNS <p>Note: Only the MAC address that is currently in use is displayed (extension or shared).</p>	XCC Network Information XCC Hostname: XCC-xxxx-SN MAC Address: xx:xx:xx:xx:xx:xx IPv4 IP: xx.xx.xx.xx IPv4 Network Mask: x.x.x.x IPv4 Default Gateway: x.x.x.x

System Environmental Information

Sub Menu	Example
<ul style="list-style-type: none">• Ambient temperature• Exhaust temperature• CPU temperature• PSU status• Spinning speed of fans by RPM	Ambient Temp: 24 C Exhaust Temp: 30 C CPU1 Temp: 50 C PSU1: Vin= 213 w Inlet= 26 C FAN1 Front: 21000 RPM FAN2 Front: 21000 RPM FAN3 Front: 21000 RPM FAN4 Front: 21000 RPM

Active Sessions

Sub Menu	Example
Quantity of active sessions	Active User Sessions: 1

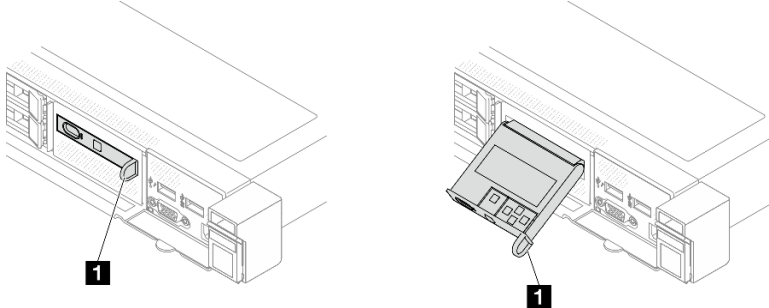
Actions

Sub Menu	Example
Several quick actions are available: <ul style="list-style-type: none">• Revert XCC to Defaults• Force XCC Reset• Request XCC Reset• Set UEFI Memory Test• Clear CMOS• Request Virtual Reseat• Modify XCC Static IPv4 Address/Net mask/Gateway• Modify System Name• Generate/Download FFDC Service Data	Request XCC Reset? This will request the BMC to reboot itself. Hold ✓ for 3 seconds

Integrated Diagnostics Panel

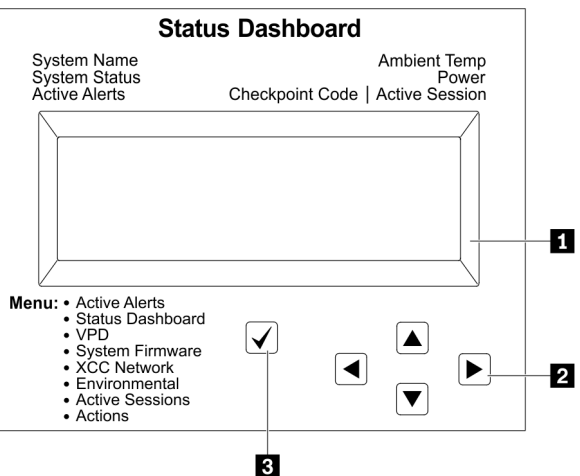
The Integrated Diagnostics Panel is attached to the front of the server, while it allows quick access to system information such as errors, system status, firmware, network, and health information. The Integrated Diagnostics Panel may also provide front operator panel function.

Location of the Integrated Diagnostics Panel

Location	<p>The Integrated Diagnostics Panel is attached to the front of the server.</p> 
Callout	<p>1 The handle with which the panel can be pulled out from the server.</p> <p>Notes:</p> <ul style="list-style-type: none"> • The panel can be pushed in or pulled out regardless of the system power status. • When pulling it out, do it gently to avoid damage.

Display panel overview

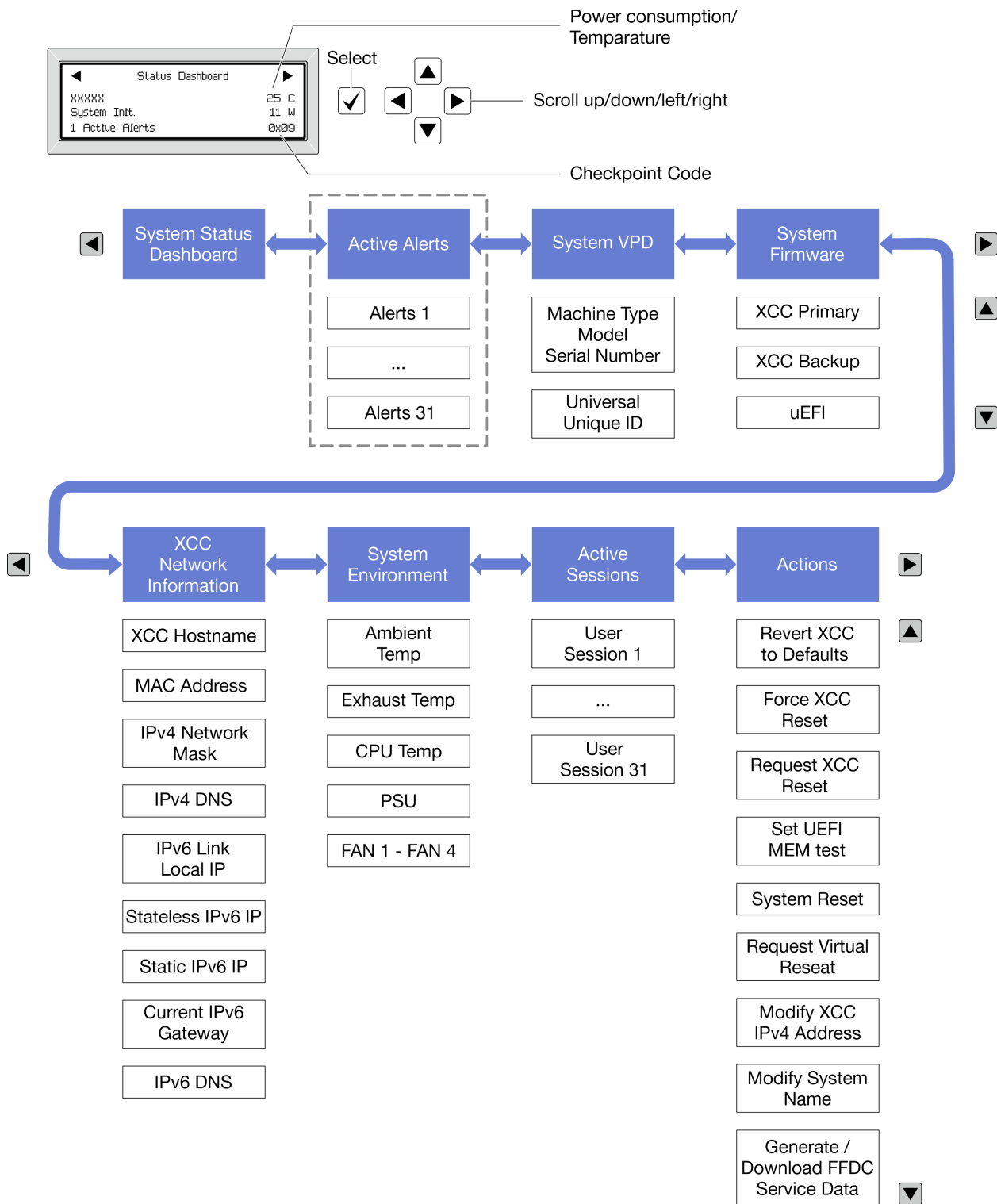
The diagnostics device consists of an LCD display and 5 navigation buttons.

	<p>1 LCD display</p>
	<p>2 Scroll buttons (up/down/left/right) Press the scroll buttons to locate and select system information.</p>
	<p>3 Select button Press the select button to select from the options in the menu.</p>

Option flow diagram

The LCD panel displays various system information. Navigate through the options with the scroll keys.

Depending on the model, the options and entries on the LCD display might be different.

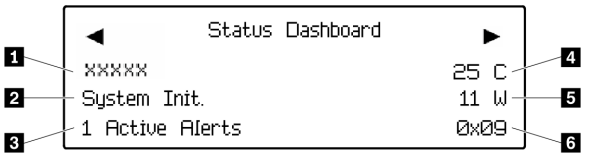


Full menu list

Following is the list of available options. Switch between an option and the subordinate information entries with the select button, and switch among options or information entries with the scroll buttons.

Depending on the model, the options and entries on the LCD display might be different.

Home Menu (System Status Dashboard)

Home Menu	Example
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Active Alerts

Sub Menu	Example
Home screen: Active error quantity Note: The “Active Alerts” menu displays only the quantity of active errors. If no errors occur, the “Active Alerts” menu will not be available during navigation.	1 Active Alerts
Details screen: <ul style="list-style-type: none"> Error message ID (Type: Error/Warning/Information) Occurrence time Possible sources of the error 	Active Alerts: 1 Press ▼ to view alert details FQXSPPU009N(Error) 04/07/2020 02:37:39 PM CPU 1 Status: Configuration Error

System VPD Information

Sub Menu	Example
<ul style="list-style-type: none"> Machine type and serial number Universal Unique ID (UUID) 	Machine Type: xxxx Serial Num: xxxxxx Universal Unique ID: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

System Firmware

Sub Menu	Example
XCC Primary <ul style="list-style-type: none">Firmware level (status)Build IDVersion numberRelease date	XCC Primary (Active) Build: DVI399T Version: 4.07 Date: 2020-04-07
XCC Backup <ul style="list-style-type: none">Firmware level (status)Build IDVersion numberRelease date	XCC Backup (Active) Build: D8BT05I Version: 1.00 Date: 2019-12-30
UEFI <ul style="list-style-type: none">Firmware level (status)Build IDVersion numberRelease date	UEFI (Inactive) Build: D0E101P Version: 1.00 Date: 2019-12-26

XCC Network Information

Sub Menu	Example
<ul style="list-style-type: none">XCC hostnameMAC addressIPv4 Network MaskIPv4 DNSIPv6 Link Local IPStateless IPv6 IPStatic IPv6 IPCurrent IPv6 GatewayIPv6 DNS <p>Note: Only the MAC address that is currently in use is displayed (extension or shared).</p>	XCC Network Information XCC Hostname: XCC-xxxx-SN MAC Address: xx:xx:xx:xx:xx:xx IPv4 IP: xx.xx.xx.xx IPv4 Network Mask: x.x.x.x IPv4 Default Gateway: x.x.x.x

System Environmental Information

Sub Menu	Example
<ul style="list-style-type: none">• Ambient temperature• Exhaust temperature• CPU temperature• PSU status• Spinning speed of fans by RPM	Ambient Temp: 24 C Exhaust Temp: 30 C CPU1 Temp: 50 C PSU1: Vin= 213 w Inlet= 26 C FAN1 Front: 21000 RPM FAN2 Front: 21000 RPM FAN3 Front: 21000 RPM FAN4 Front: 21000 RPM

Active Sessions

Sub Menu	Example
Quantity of active sessions	Active User Sessions: 1

Actions

Sub Menu	Example
Several quick actions are available: <ul style="list-style-type: none">• Revert XCC to Defaults• Force XCC Reset• Request XCC Reset• Set UEFI Memory Test• Clear CMOS• Request Virtual Reseat• Modify XCC Static IPv4 Address/Net mask/Gateway• Modify System Name• Generate/Download FFDC Service Data	Request XCC Reset? This will request the BMC to reboot itself. Hold √ for 3 seconds

LEDs and buttons on the front operator panel

The front operator panel of the server provides controls, connectors, and LEDs.

Note: Diagnostics panel with an LCD display is available for some models. For details, see [“Integrated Diagnostics Panel” on page 504](#) and [“External diagnostics handset” on page 499](#).

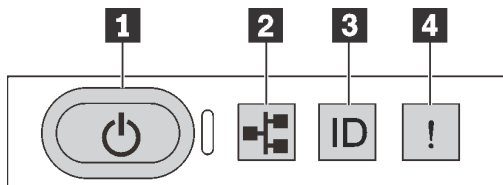


Figure 430. Front operator panel

1 Power button with power status LED

You can press the power button to power on the server when you finish setting up the server. You also can hold the power button for several seconds to power off the server if you cannot shut down the server from the operating system. The power status LED helps you determine the current power status.

Status	Color	Description
Solid on	Green	The server is on and running.
Slow blinking (about one flash per second)	Green	The server is off and is ready to be powered on (standby state).
Fast blinking (about four flashes per second)	Green	<ul style="list-style-type: none"> The server is off, but the XClarity Controller is initializing, and the server is not ready to be powered on. System-board-assembly power has failed.
Off	None	Power is not present, or the power supply has failed.

2 Network activity LED

Compatibility of the NIC adapter and the network activity LED

NIC adapter	Network activity LED
OCP module	Support
PCIe NIC adapter	Not support

When an OCP module is installed, the network activity LED on the front I/O module helps you identify the network connectivity and activity. If no OCP module is installed, this LED is off.

Status	Color	Description
On	Green	The server is connected to a network.
Blinking	Green	The network is connected and active.
Off	None	<p>The server is disconnected from the network.</p> <p>Note: If the network activity LED is off when an OCP 3.0 module is installed, check the network ports in the rear of your server to determine which port is disconnected.</p>

3 System ID button with system ID LED

Use this system ID button and the blue system ID LED to visually locate the server. A system ID LED is also located on the rear of the server. Each time you press the system ID button, the state of both the system ID LEDs changes. The LEDs can be changed to on, blinking, or off. You can also use the Lenovo XClarity Controller or a remote management program to change the state of the system ID LEDs to assist in visually locating the server among other servers.

If the XClarity Controller USB connector is set to have both the USB 2.0 function and XClarity Controller management function, you can press the system ID button for three seconds to switch between the two functions.

4 System error LED

The system error LED helps you to determine if there are any system errors.

Status	Color	Description	Action
On	Yellow	<p>An error has been detected on the server. Causes might include but are not limited to the following errors:</p> <ul style="list-style-type: none"> • The temperature of the server reached the non-critical temperature threshold. • The voltage of the server reached the non-critical voltage threshold. • A fan has been detected to be running at low speed. • A hot-swap fan has been removed. • The power supply has a critical error. • The power supply is not connected to the power. • A processor error. • A system I/O board or processor board error. • Abnormal status is detected on the Liquid to Air Module (L2AM) or Direct Water Cooling Module (DWCM). 	<ul style="list-style-type: none"> • Check the Lenovo XClarity Controller event log and the system event log to determine the exact cause of the error. • Check if additional LEDs in the server are lit. It will direct you to the error source. See “Troubleshooting by system LEDs and diagnostics display” on page 499. • Save the log if necessary. <p>Note: For server models with L2AM installed, it is required to open the top cover to check the status of liquid detection sensor module LED. For more instructions, see “LED on the leak detection sensor module” on page 517.</p>
Off	None	The server is off or the server is on and is working correctly.	None.

LEDs on drives

This topic provides information on drive LEDs.

Each drive comes with an activity LED and a status LED. Different colors and speeds indicate different activities or status of the drive. The following illustrations and tables describe the problems that are indicated by the activity LED and the status LED.

- [“LEDs on hard disk drives or solid-state drives” on page 511](#)
- [“LEDs on EDSFF drives” on page 512](#)

LEDs on hard disk drives or solid-state drives

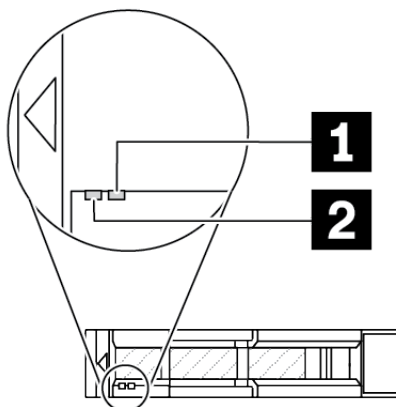


Figure 431. LEDs on hard disk drives or solid-state drives

Drive LED	Status	Description
1 Drive status LED (right)	Solid yellow	The drive has an error.
	Blinking yellow (blinking slowly, about one flash per second)	The drive is being rebuilt.
	Blinking yellow (blinking rapidly, about four flashes per second)	The RAID adapter is locating the drive.
2 Drive activity LED (left)	Solid green	The drive is powered but not active.
	Blinking green	The drive is active.

LEDs on EDSFF drives

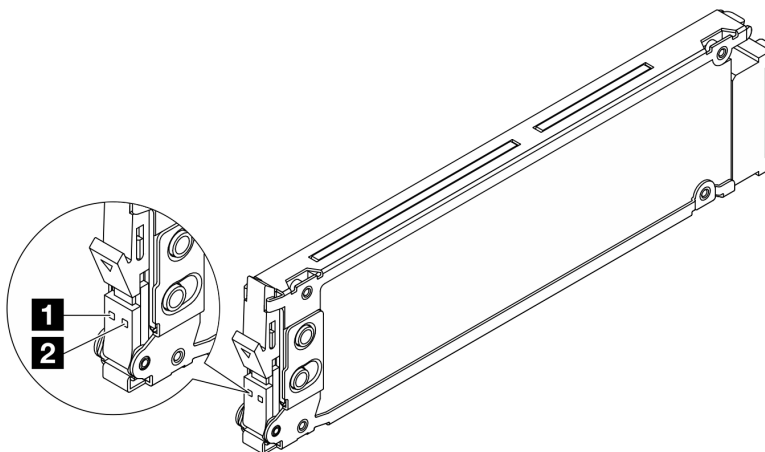


Figure 432. LEDs on EDSFF drives

Drive LED	Status	Description
1 Drive activity LED	Solid green	The drive is powered but not active.
	Blinking green (about four flashed per second)	The drive is active.
	Off	The drive is not powered.
2 Drive status LED	Solid amber	The drive has an error.
	Blinking amber (blinking slowly, about one flash per second)	The drive is being rebuilt.
	Blinking amber (blinking rapidly, about four flashes per second)	The RAID adapter is locating the drive.

LEDs on the firmware and RoT security module

The following illustrations show the light-emitting diodes (LEDs) on the ThinkSystem V3 Firmware and Root of Trust Security Module (firmware and RoT security module).

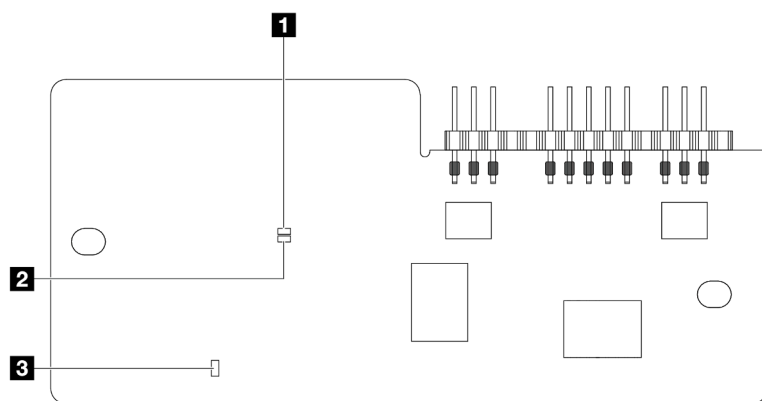


Figure 433. LEDs on the firmware and RoT security module

1 AP0 LED (Green)	2 AP1 LED (Green)	3 Fatal Error LED (Yellow)
--------------------------	--------------------------	-----------------------------------

Table 116. LEDs description

Scenario	AP0 LED	AP1 LED	Fatal Error LED	FPGA heart-beat LED ^{note}	XCC heart-beat LED ^{note}	Actions
RoT security module fatal firmware failure	Off	Off	On	N/A	N/A	Replace the firmware and RoT security module.
	Blink	N/A	On	N/A	N/A	Replace the firmware and RoT security module.
No system power (FPGA heartbeat LED off)	Off	Off	Off	Off	Off	If the AC power is on, but the system board assembly does not have power, then: 1. Check the power supply unit (PSU) or power interposer board (PIB) if any. If the PSU or PIB has any error, replace it. 2. If the PSU or PIB is good, do the following: a. Replace the system I/O board. b. Replace the processor board.
XCC firmware recoverable error	Blink	N/A	Off	N/A	N/A	Information only. No action is required.
XCC firmware is recovered from error	Blink	N/A	Off	N/A	N/A	Information only. No action is required.
UEFI firmware authentication failure	N/A	Blink	Off	N/A	N/A	Information only. No action is required.
UEFI firmware is recovered from authentication failure	N/A	On	Off	N/A	N/A	Information only. No action is required.
System is OK (FPGA heartbeat LED is On)	On	On	Off	On	Blink (1 Hz)	Information only. No action is required.

Note: For locations of the FPGA LED and XCC heartbeat LED, see “LEDs on the system board assembly” on page 515.

LEDs on the power supply unit

This topic provides information about various power supply LED status and corresponding action suggestions.

The following minimal configuration is required for the server to start:

- One processor in processor socket 1
- One memory module in slot 7
- One power supply
- One HDD/SSD drive or one M.2 drive, or one 7mm drive (if OS is needed for debugging)
- Six system fans (with one processor)

The following table describes the problems that are indicated by various combinations of the power-supply LEDs and the power-on LED and suggested actions to correct the detected problems.

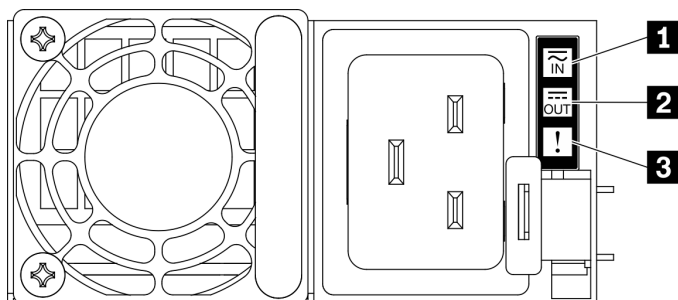
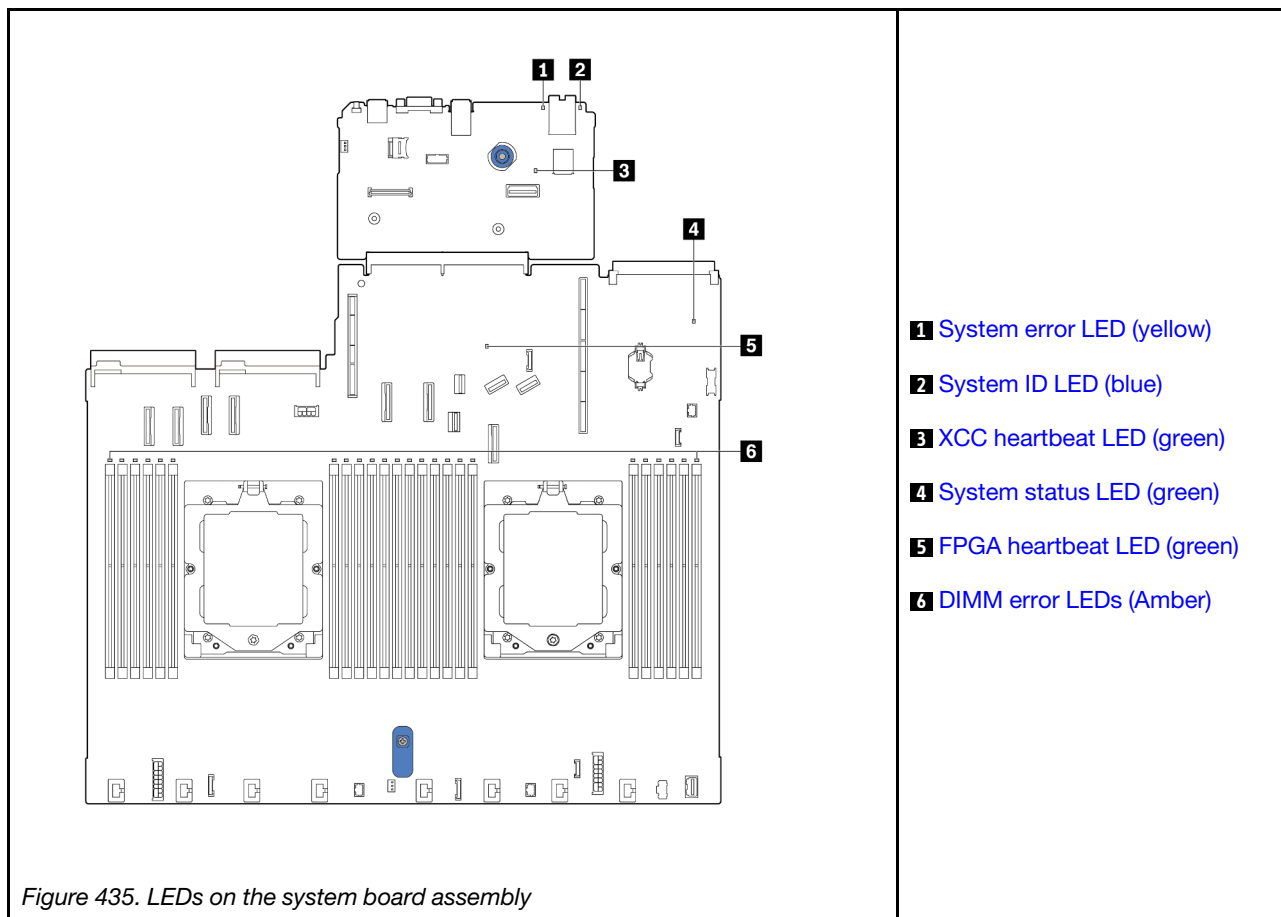


Figure 434. Power supply LEDs

LED	Description
1 Input status	<p>The input status LED can be in one of the following states:</p> <ul style="list-style-type: none"> • Off: The power supply is disconnected from the input power source. • Green: The power supply is connected to the input power source.
2 Output status	<p>The output status LED can be in one of the following states:</p> <ul style="list-style-type: none"> • Off: The server is powered off, or the power supply unit is not working properly. If the server is powered on but the output status LED is off, replace the power supply unit. • Blinking green: The power supply is in zero-output mode (standby). When the server power load is low, one of the installed power supplies enters into the standby state while the other one delivers entire load. When the power load increases, the standby power supply will switch to active state to provide sufficient power to the server. <p>To disable zero-output mode, log in to the Lenovo XClarity Controller web interface, choose Server Configuration → Power Policy, disable Zero Output Mode, and then click Apply. If you disable zero-output mode, both power supplies will be in the active state.</p> <ul style="list-style-type: none"> • Green: The server is on and the power supply unit is working normally. <p>Zero-output mode can be disabled via Lenovo XClarity Controller web interface. If you disable zero-output mode, both power supplies will be in the active state.</p> <ul style="list-style-type: none"> • Log in to the Lenovo XClarity Controller web interface, choose Server Configuration → Power Policy, disable Zero Output Mode, and then click Apply.
3 Fault LED	<ul style="list-style-type: none"> • Off: The power supply unit is working normally. • Yellow: The power supply unit may have failed. Dump the FFDC log from the system and contact Lenovo back end support team for PSU data log reviewing.

LEDs on the system board assembly

The following illustrations show the light-emitting diodes (LEDs) on the system board (system board assembly).



Descriptions of LEDs on the system board assembly

1 System error LED (yellow)	
Description	When this yellow LED is lit, another one or more LEDs in the server might also be lit to direct you to the error source.
Action	Check system logs or internal error LEDs to identify the failed part. For more information, see “LEDs and buttons on the front operator panel” on page 509 .

2 System ID LED (blue)	
Description	The front system ID LED helps you locate the server.
Action	Each time you press the system ID button, the state of both system ID LEDs changes, and the state can be on, blinking, or off.

3 XCC heartbeat LED (green)	
Description	<p>The XCC heartbeat LED helps you identify the XCC status.</p> <ul style="list-style-type: none"> Blinking (1 Hz, about one flash per second) : XCC is working normally. Blinking at other speeds or always on: XCC is at the initial phase or is working abnormally. Off: XCC is not working.
Action	<ul style="list-style-type: none"> If the XCC heartbeat LED is always off or always on, do the following: <ul style="list-style-type: none"> If XCC cannot be accessed: <ol style="list-style-type: none"> Re-plug the power cord. Check and ensure that the system I/O board and the firmware and RoT security module are installed correctly. (Trained technicians only) Reinstall them if needed. (Trained technicians only) Replace the firmware and RoT security module. (Trained technicians only) Replace the system I/O board. If XCC can be accessed, replace the system I/O board. If the XCC heartbeat LED is always blinking fast over 5 minutes, do the following: <ol style="list-style-type: none"> Re-plug the power cord. Check and ensure that the system I/O board and the firmware and RoT security module are installed correctly. (Trained technicians only) Reinstall them if needed. (Trained technicians only) Replace the firmware and RoT security module. (Trained technicians only) Replace the system I/O board. If the XCC heartbeat LED is always blinking slow over 5 minutes, do the following: <ol style="list-style-type: none"> Re-plug the power cord. Check and ensure that the system I/O board and the firmware and RoT security module are installed correctly. (Trained technicians only) Reinstall them if needed. If the problem remains, contact Lenovo Support.

4 System status LED (green)	
Description	<p>The system status LED indicates the working status of the system.</p> <ul style="list-style-type: none"> Fast blinking (about four flashes per second): Power fault or is waiting for XCC power permission ready. Slow blinking (about one flash per second): Power off and is ready to be powered on (standby state). On: Power on.
Action	<ul style="list-style-type: none"> If the system status LED is blinking fast over 5 minutes and cannot power on, check the XCC heartbeat LED and follow the actions for the XCC heartbeat LED. If the system status LED remains off or is blinking fast (about four flashes per second) and the system error LED on the front panel is on (yellow), the system is in a power fault status. Do the following: <ol style="list-style-type: none"> Re-plug the power cord. Remove installed adapters/devices, one at a time, until you reach the minimal configuration for debugging. (Trained technicians only) If the problem remains, capture FFDC log, and replace the processor board. If the problem still remains, contact Lenovo Support.

5 FPGA heartbeat LED (green)	
Description	<p>The FPGA heartbeat LED helps you identify the FPGA status.</p> <ul style="list-style-type: none"> Blinking (about one flash per second): FPGA is working normally. On or off: FPGA is not working.
Action	<p>If FPGA heartbeat LED is always off or always on, do the following:</p> <ol style="list-style-type: none"> Replace the processor board. If the problem remains, contact Lenovo Support.

6 DIMM error LEDs (yellow)	
Description	When a memory module error LED is lit, it indicates that the corresponding memory module has failed.
Action	For more information, see “Memory problems” on page 527 .

LEDs on the XCC system management port

This topic provides information on LEDs of XCC system management port (10/100/1000 Mbps RJ-45).

The following table describes the problems that are indicated by LEDs on XCC system management port (10/100/1000 Mbps RJ-45).

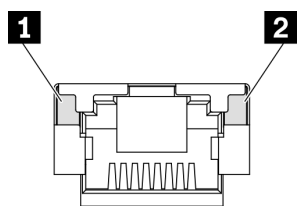


Figure 436. XCC system management port (10/100/1000 Mbps RJ-45) LEDs

LED	Description
1 XCC system management port (10/100/1000 Mbps RJ-45) link LED	Use this green LED to distinguish the network connectivity status: <ul style="list-style-type: none"> Off: The network link is disconnected. Green: The network link is established.
2 XCC system management port (10/100/1000 Mbps RJ-45) activity LED	Use this green LED to distinguish the network activity status: <ul style="list-style-type: none"> Off: The server is disconnected from a LAN. Green: The network is connected and active.

LED on the leak detection sensor module

This topic provides information on the liquid cooling leak detection module LED.

The liquid detection sensor module on the L2AM (The Lenovo Neptune Liquid to Air Module) or Direct Water Cooling Module (DWCM) comes with one LED. The following illustration shows the LED on the module.

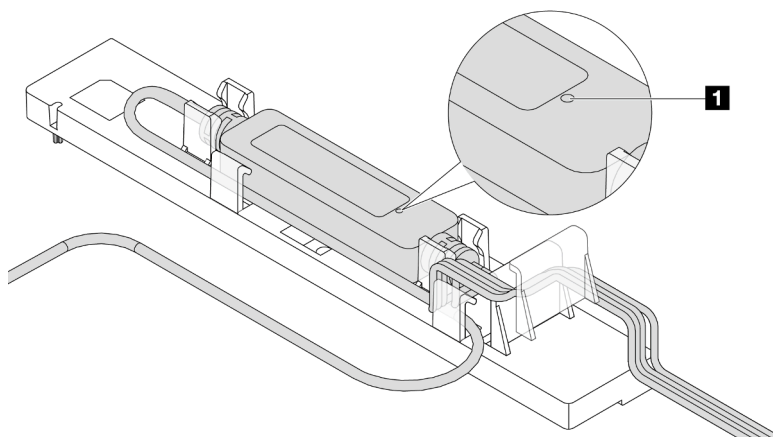


Figure 437. Leak detection LED

The following table describes the status that are indicated by liquid detection sensor module LED.

❗ Leakage detection sensor LED	
Description	<ul style="list-style-type: none">• Solid green: No coolant leakage detected.• Blinking green: Abnormal status detected.
Action	<ul style="list-style-type: none">• For L2AM problem determination and troubleshooting, see “Coolant leak problems (Liquid to Air Module)” on page 522.• For DWCM problem determination and troubleshooting, see “Coolant leak problems (Direct Water Cooling Module)” on page 520.

General problem determination procedures

Use the information in this section to resolve problems if the event log does not contain specific errors or the server is inoperative.

If you are not sure about the cause of a problem and the power supplies are working correctly, complete the following steps to attempt to resolve the problem:

1. Power off the server.
2. Make sure that the server is cabled correctly.
3. Remove or disconnect the following devices if applicable, one at a time, until you find the failure. Power on and configure the server each time you remove or disconnect a device.
 - Any external devices.
 - Surge-suppressor device (on the server).
 - Printer, mouse, and non-Lenovo devices.
 - Each adapter.
 - Hard disk drives.
 - Memory modules until you reach the minimal configuration for debugging that is supported for the server.

To determine the minimal configuration for your server, see “Minimal configuration for debugging” in [“Technical specifications” on page 3](#).

4. Power on the server.

If the problem is solved when you remove an adapter from the server, but the problem recurs when you install the same adapter again, suspect the adapter. If the problem recurs when you replace the adapter with a different one, try a different PCIe slot.

If the problem appears to be a networking problem and the server passes all system tests, suspect a network cabling problem that is external to the server.

Resolving suspected power problems

Power problems can be difficult to solve. For example, a short circuit can exist anywhere on any of the power distribution buses. Usually, a short circuit will cause the power subsystem to shut down because of an overcurrent condition.

Complete the following steps to diagnose and resolve a suspected power problem.

Step 1. Check the event log and resolve any errors related to the power.

Note: Start with the event log of the application that is managing the server. For more information about event logs, see [“Event logs” on page 497](#).

Step 2. Check for short circuits, for example, if a loose screw is causing a short circuit on a circuit board.

- Step 3. Remove the adapters and disconnect the cables and power cords to all internal and external devices until the server is at the minimal configuration for debugging that is required for the server to start. To determine the minimal configuration for your server, see “Minimal configuration for debugging” in [“Technical specifications” on page 3](#).
- Step 4. Reconnect all AC power cords and turn on the server. If the server starts successfully, reseal the adapters and devices one at a time until the problem is isolated.

If the server does not start from the minimal configuration, replace the components in the minimal configuration one at a time until the problem is isolated.

Resolving suspected Ethernet controller problems

The method that you use to test the Ethernet controller depends on which operating system you are using. See the operating-system documentation for information about Ethernet controllers, and see the Ethernet controller device-driver readme file.

Complete the following steps to attempt to resolve suspected problems with the Ethernet controller.

- Step 1. Make sure that the correct device drivers are installed and that they are at the latest level.
- Step 2. Make sure that the Ethernet cable is installed correctly.
- The cable must be securely attached at all connections. If the cable is attached but the problem remains, try a different cable.
 - Make sure that the cable rating is applicable for the network speed selected. For example, an SFP+ cable is only suitable for 10G operation. An SFP25 cable is needed for 25G operation. Likewise for Base-T operation, a CAT5 cable is required for 1G Base-T operation while a CAT6 cable is required for 10G Base-T operation.
- Step 3. Set both the adapter port and the switch port to auto-negotiation. If auto-negotiation is not supported on one of the ports, try configuring both ports manually to match each other.
- Step 4. Check the Ethernet controller LEDs on the server. These LEDs indicate whether there is a problem with the connector, cable, or hub.

Although some adapters may vary, when installed vertically the adapter link LED is typically on the left of the port and the activity LED is typically on the right.

The server front panel LED is described in [“Troubleshooting by system LEDs and diagnostics display” on page 499](#).

- The Ethernet link status LED is lit when the Ethernet controller receives a link indication from the switch. If the LED is off, there might be a defective connector or cable or a problem with the switch.
 - The Ethernet transmit/receive activity LED is lit when the Ethernet controller sends or receives data over the Ethernet network. If the Ethernet transmit/receive activity is off, make sure that the hub and network are operating and that the correct device drivers are installed.
- Step 5. Check the Network activity LED on the server. The Network activity LED is lit when data is active on the Ethernet network. If the Network activity LED is off, make sure that the hub and network are operating and that the correct device drivers are installed.

Network activity LED location is specified in [“Troubleshooting by system LEDs and diagnostics display” on page 499](#).

- Step 6. Check for operating-system-specific causes of the problem, and also make sure that the operating system drivers are installed correctly.
- Step 7. Make sure that the device drivers on the client and server are using the same protocol.

If the Ethernet controller still cannot connect to the network but the hardware appears to be working, the network administrator must investigate other possible causes of the error.

Troubleshooting by symptom

Use this information to find solutions to problems that have identifiable symptoms.

To use the symptom-based troubleshooting information in this section, complete the following steps:

1. Check the event log of the application that is managing the server and follow the suggested actions to resolve any event codes.
 - If you are managing the server from the Lenovo XClarity Administrator, begin with the Lenovo XClarity Administrator event log.
 - If you are using some other management application, begin with the Lenovo XClarity Controller event log.

For more information about event logs (see [“Event logs” on page 497](#)).

2. Review this section to find the symptoms that you are experiencing and follow the suggested actions to resolve the issue.
3. If the problem persists, contact support (see [“Contacting Support” on page 545](#)).

Coolant leak problems (Direct Water Cooling Module)

Use this information to resolve coolant leak problems with the Direct Water Cooling Module (DWCM).

See this section to resolve issues related to the DWCM.

- [“Options to identify coolant leaks” on page 520](#)
- [“Steps to resolve coolant leaks” on page 521](#)

Options to identify coolant leaks

Coolant leaks can be identified through the following practices:

- If the server is on remote maintenance,
 - A Lenovo XClarity Controller event shows:

FQXSPUN0019M: Sensor Ext Liquid Leak has transitioned to critical from a less severe state.

Event Log

Audit Log

Maintenance History

Alert Recipients

Customize Table

Clear Logs

Refresh

Type:

All Event Sources

All Dates

Index	Severity	Source	Common ID	Message	Date
0		System	FQXSPUN2019I	Sensor Ext Liquid Leak has transitioned to a less severe state from critical.	January 25, 2024 1:16:43 PM
1		System	FQXSPUN0019M	Sensor Ext Liquid Leak has transitioned to critical from a less severe state.	January 25, 2024 1:13:22 PM

Health Summary

Active System Events (2)

Others

Sensor Ext Liquid Leak has transitioned to critical from a less severe state.

FQXSPUN0019M

FRU:

January 25, 2024 2:21:16 PM

Others

Sensor RoT Attestation has transitioned from normal to warning state.

FQXSPUN0059J

FRU: 011B

January 25, 2024 1:53:00 PM

- Lenovo XClarity Controller has defined lots of system conditions as IPMI sensors. Users can use IPMI commands to check system running status. Here are examples of executing ipmitool, an open-source

common tool which follows Intel's IPMI standard. Check for coolant leakage status with command lines as shown.

```
zuody2@zuody2-07:~$ ipmitool -H 10.245.50.35 -U USERID -P Aa12345678 -I lanplus -C 17 sel elist
1 | 01/25/2024 | 13:40:30 | Event Logging Disabled SEL Fullness | Log area reset/cleared | Asserted
2 | 01/25/2024 | 13:41:58 | Cooling Device Ext Liquid Leak | Transition to Critical from less severe | Asserted
3 | 01/25/2024 | 13:42:01 | Cooling Device Ext Liquid Leak | Transition to Critical from less severe | Deasserted
```

The event logs shown with the parameter sel elist.

```
zuody2@zuody2-07:~$ ipmitool -H 10.245.50.35 -U USERID -P Aa12345678 -I lanplus -C 17 sdr elist | grep "Ext Liquid Leak"
Ext Liquid Leak | FDh | ok | 30.1 | Transition to Critical from less severe
```

Ext Liquid Leak | FDh | ok | 30.1 | Transition to Critical from less severe

The status of all sensors can be fetched with the parameter sdr elist. If coolant leakage happens, the log above will show up.

- If the server is within reach, and the amber LED is lit on the front operator panel, potential coolant leaks may have occurred. It is required to open the top cover to check the LED status of the liquid detection sensor module. See [“LEDs and buttons on the front operator panel” on page 509](#) and [“LED on the leak detection sensor module” on page 517](#) for more details.

Steps to resolve coolant leaks

If the LED on the liquid detection sensor module is blinking green, follow the procedures to get help.

1. Save and back up data and operations.
2. Power off the server and remove the quick connect plugs from the manifolds.
3. Slide the server out or remove the server from the rack. See [“Remove the server from rack” on page 65](#).
4. Remove the top cover. See [“Remove the top cover” on page 318](#).
5. Check for coolant leaks around the outlet and inlet hoses, system board assembly, and under the cold plate covers:

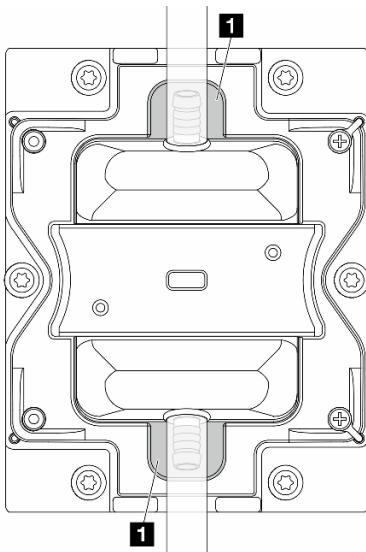


Figure 438. Leak-prone areas

Note: If leak happens, the coolant tends to collect around **1** leak-prone areas.

- a. If coolant found around the hoses and system board assembly, clean up the coolant.
- b. If coolant found under the cold plate covers:
 - 1) As illustrated below, remove at least four DIMMs from both sides to get access to the clips on the cold plate covers. To remove memory modules, see [“Remove a memory module” on page 205](#).

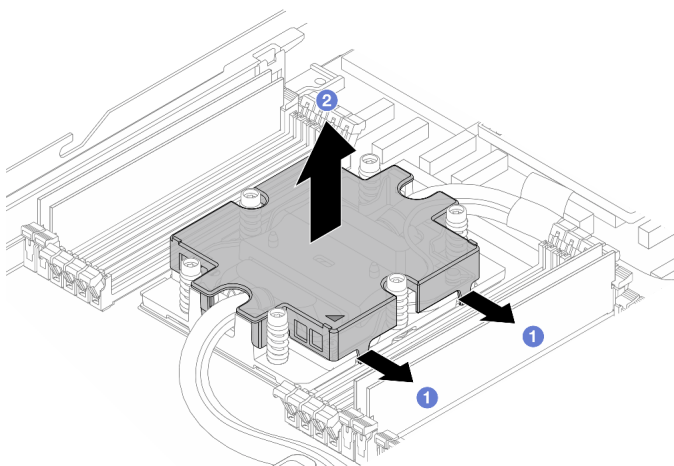


Figure 439. Removing the cold plate cover

- 1 Open the clips.
- 2 Remove the cold plate cover.
- 2) Clean up the coolant on the cold plates.
6. Check for the top cover of the server below to see if dripping happens. If yes, repeat previous steps to servers below.
7. Contact Lenovo Support.

Coolant leak problems (Liquid to Air Module)

Use this information to resolve coolant leak problems with the L2AM (The Lenovo Neptune Liquid to Air Module).

Options to identify coolant leaks

Coolant leaks can be identified through the following practices:

- If the server is on remote maintenance,
 - A Lenovo XClarity Controller event shows:

FQXSPUN0019M: Sensor Liquid Leak has transitioned to critical from a less severe state.

Event Log Audit Log Maintenance History Alert Recipients ?						
<div> <div>Customize Table</div> <div>Clear Logs</div> <div>Type: ✖ ⚠ ℹ</div> <div>All Event Sources</div> <div>All Dates</div> <div>Refresh</div> <div>?</div> </div>						
Index	Severity	Source	Common ID	Message	Date	
0	✖	System	FQXSPUN0019M	Sensor Liquid Leak has transitioned to critical from a less severe state.	December 26, 202...	

Health Summary

Active System Events (1)



Others

Sensor Liquid Leak has transitioned to critical from a less severe state.

FQXSPUN0019M

FRU:

December 26, 2022 10:38:22 AM

[View all event logs](#)

- Lenovo XClarity Controller has defined lots of system conditions as IPMI sensors. Users can use IPMI commands to check system running status. Here are examples of executing ipmitool, an open-source common tool which follows Intel's IPMI standard. Check for coolant leakage status with command lines as shown.

```
sysadmin@Dev-Server:~$ ipmitool -C 17 -I lanplus -H 10.132.225.164 -U USERID -P ***** sel elist
1 | 12/26/2022 | 10:38:17 | Event Logging Disabled SEL Fullness | Log area reset/cleared | Asserted
2 | 12/26/2022 | 10:38:22 | Cooling Device Liquid Leak | Transition to Critical from less severe | Asserted
```

The event logs shown with the parameter sel elist.

```
sysadmin@Dev-Server:~$ ipmitool -C 17 -I lanplus -H 10.132.225.164 -U USERID -P ***** sdr elist |grep "Liquid Leak"
Liquid Leak | EAh | ok | 30.1 | Transition to Critical from less severe
```

Liquid Leak | EAh | ok | 30.1 | Transition to Critical from less severe

The status of all sensors can be fetched with the parameter sdr elist. If coolant leakage happens, the log above will show up.

- If the server is within reach, and the amber LED is lit on the front operator panel, potential coolant leaks may have occurred. It is required to open the top cover to check the LED status of the liquid detection sensor module. See [“LEDs and buttons on the front operator panel” on page 509](#) and [“LED on the leak detection sensor module” on page 517](#) for more details.

Steps to resolve coolant leaks

If the LED on the liquid detection sensor module is blinking green, follow the procedures to get help.

1. Check for green coolant leakage around the radiator, coolant pipes and pumps.
2. If green coolant found, power off the server and remove the L2AM.
3. Clean up the coolant from any components in the chassis. Inspect the server for any signs of moisture in sockets or gaps.
4. Contact Lenovo Support.

Storage drive problems

Use this information to resolve issues related to the storage drives.

- [“Server cannot recognize a drive” on page 524](#)
- [“Multiple drives fail” on page 524](#)
- [“Multiple drives are offline” on page 525](#)
- [“A replacement drive does not rebuild” on page 525](#)
- [“Green drive activity LED does not represent actual state of associated drive” on page 525](#)
- [“Yellow drive status LED does not represent actual state of associated drive” on page 525](#)

Server cannot recognize a drive

Complete the following steps until the problem is solved.

1. Observe the associated yellow drive status LED. If the LED is lit, it indicates a drive fault.
2. If the status LED is lit, remove the drive from the bay, wait 45 seconds, and reinsert the drive, making sure that the drive assembly connects to the drive backplane.
3. Observe the associated green drive activity LED and the yellow status LED and perform corresponding operations in different situations:
 - If the green activity LED is flashing and the yellow status LED is not lit, the drive is recognized by the controller and is working correctly. Run the diagnostics tests for the drives. When you start a server and press the key according to the on-screen instructions, the LXPM is displayed by default. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgmt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.) You can perform drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → Disk Drive Test**.
 - If the green activity LED is flashing and the yellow status LED is flashing slowly, the drive is recognized by the controller and is rebuilding.
 - If neither LED is lit or flashing, check whether the drive backplane is correctly seated. For details, go to step 4.
 - If the green activity LED is flashing and the yellow status LED is lit, replace the drive.
4. Make sure that the drive backplane is correctly seated. When it is correctly seated, the drive assemblies correctly connect to the backplane without bowing or causing movement of the backplane.
5. Reseat the backplane power cable and repeat steps 1 through 3.
6. Reseat the backplane signal cable and repeat steps 1 through 3.
7. Suspect the backplane signal cable or the backplane:
 - Replace the affected backplane signal cable.
 - Replace the affected backplane.
8. Run the diagnostics tests for the drives. When you start a server and press the key according to the on-screen instructions, the LXPM is displayed by default. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgmt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.) You can perform drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → Disk Drive Test**.

Based on those tests:

- If the backplane passes the test but the drives are not recognized, replace the backplane signal cable and run the tests again.
- Replace the backplane.
- If the adapter fails the test, disconnect the backplane signal cable from the adapter and run the tests again.
- If the adapter fails the test, replace the adapter.

Multiple drives fail

Complete the following steps until the problem is solved:

- View the Lenovo XClarity Controller event log for events related to power supplies or vibration issues and resolve those events.
- Make sure that the device drivers and firmware for the drive and server are at the latest level.

Important: Some cluster solutions require specific code levels or coordinated code updates. If the device is part of a cluster solution, verify that the latest level of code is supported for the cluster solution before you update the code.

Multiple drives are offline

Complete the following steps until the problem is solved:

- View the Lenovo XClarity Controller event log for events related to power supplies or vibration issues and resolve those events.
- View the storage subsystem log for events related to the storage subsystem and resolve those events.

A replacement drive does not rebuild

Complete the following steps until the problem is solved:

1. Make sure that the drive is recognized by the adapter (the green drive activity LED is flashing).
2. Review the SAS/SATA RAID adapter documentation to determine the correct configuration parameters and settings.

Green drive activity LED does not represent actual state of associated drive

Complete the following steps until the problem is solved:

1. If the green drive activity LED does not flash when the drive is in use, run the diagnostics tests for the drives. When you start a server and press the key according to the on-screen instructions, the LXPM is displayed by default. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.) You can perform drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → Disk Drive Test**
2. If the drive passes the test, replace the backplane.
3. If the drive fails the test, replace the drive.

Yellow drive status LED does not represent actual state of associated drive

Complete the following steps until the problem is solved:

1. Turn off the server.
2. Reseat the SAS/SATA adapter.
3. Reseat the backplane signal cable and backplane power cable.
4. Reseat the drive.
5. Power on the server and observe the activity of the drive LEDs.

Intermittent problems

Use this information to solve intermittent problems.

- “Intermittent external device problems” on page 525
- “Intermittent KVM problems” on page 526
- “Intermittent unexpected reboots” on page 526

Intermittent external device problems

Complete the following steps until the problem is solved.

1. Update the UEFI and XCC firmware to the latest versions.
2. Make sure that the correct device drivers are installed. See the manufacturer's website for documentation.
3. For a USB device:

- a. Make sure that the device is configured correctly.

Restart the server and press the key according to the on-screen instructions to display the LXPM system setup interface. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.) Then, click **System Settings → Devices and I/O Ports → USB Configuration**.

- b. Connect the device to another port. If using a USB hub, remove the hub and connect the device directly to the server. Make sure that the device is configured correctly for the port.

Intermittent KVM problems

Complete the following steps until the problem is solved.

Video problems:

1. Make sure that all cables and the console breakout cable are properly connected and secure.
2. Make sure that the monitor is working properly by testing it on another server.
3. Test the console breakout cable on a working server to ensure that it is operating properly. Replace the console breakout cable if it is defective.

Keyboard problems:

Make sure that all cables and the console breakout cable are properly connected and secure.

Mouse problems:

Make sure that all cables and the console breakout cable are properly connected and secure.

Intermittent unexpected reboots

Note: Some uncorrectable errors require that the server reboot so that it can disable a device, such as a memory DIMM or a processor to allow the machine to boot up properly.

1. If the reset occurs during POST and the POST watchdog timer is enabled, make sure that sufficient time is allowed in the watchdog timeout value (POST Watchdog Timer).

To check the POST watchdog time, restart the server and press the key according to the on-screen instructions to display the LXPM system setup interface. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.) Then, click **System Settings → Recovery and RAS → System Recovery → POST Watchdog Timer**.

2. If the reset occurs after the operating system starts, do one of the followings:
 - Enter the operating system when the system operates normally and set up operating system kernel dump process (Windows and Linux base operating systems will be using different method). Enter the UEFI setup menus and disable the feature, or disable it with the following OneCli command.

```
OneCli.exe config set SystemRecovery.RebootSystemOnNMI Disable --bmc XCC_USER:XCC_PASSWORD@XCC_IPAddress
```
 - Disable any automatic server restart (ASR) utilities, such as the Automatic Server Restart IPMI Application for Windows, or any ASR devices that are installed.
3. See the management controller event log to check for an event code that indicates a reboot. See “[Event logs](#)” on page 497 for information about viewing the event log. If you are using Linux base operating system, capture all logs back to Lenovo support for further investigation.

Keyboard, mouse, KVM switch or USB-device problems

Use this information to solve problems related to a keyboard, mouse, KVM switch or USB-device problems.

- “[All or some keys on the keyboard do not work](#)” on page 527
- “[Mouse does not work](#)” on page 527
- “[KVM switch problems](#)” on page 527

- “USB-device does not work” on page 527

All or some keys on the keyboard do not work

1. Make sure that:
 - The keyboard cable is securely connected.
 - The server and the monitor are turned on.
2. If you are using a USB keyboard, run the Setup utility and enable keyboardless operation.
3. If you are using a USB keyboard and it is connected to a USB hub, disconnect the keyboard from the hub and connect it directly to the server.
4. Replace the keyboard.

Mouse does not work

1. Make sure that:
 - The mouse cable is securely connected to the server.
 - The mouse device drivers are installed correctly.
 - The server and the monitor are turned on.
 - The mouse option is enabled in the Setup utility.
2. If you are using a USB mouse and it is connected to a USB hub, disconnect the mouse from the hub and connect it directly to the server.
3. Replace the mouse.

KVM switch problems

1. Make sure that the KVM switch is supported by your server.
2. Make sure that the KVM switch is powered on correctly.
3. If the keyboard, mouse or monitor can be operated normally with direct connection to the server, then replace the KVM switch.

USB-device does not work

1. Make sure that:
 - The server is turned on and there is power supplied to the server.
 - The correct USB device driver is installed.
 - The operating system supports the USB device.
2. Make sure that the USB configuration options are set correctly in system setup.

Restart the server and press the key according to the on-screen instructions to display the LXPM system setup interface. ((For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/ixpm_frontend/ixpm_product_page.html.) Then, click **System Settings → Devices and I/O Ports → USB Configuration**.

3. If you are using a USB hub, disconnect the USB device from the hub and connect it directly to the server.
4. If the USB device is still not working, try to use a different USB device, or try to connect the USB device that is being tested to another working USB connector.
5. If the USB device works well on another USB connector, the original USB connector may have a problem.
 - If the USB connector is on the front of the server:
 - a. Remove and reconnect the USB cable. Ensure that the USB cable is correctly connected to the system board (system board assembly). See [Chapter 6 “Internal cable routing” on page 325](#)
 - b. Replace the front panel or front I/O module.
 - If the USB connector is at the rear of the server:
 - a. (Trained technician only) Replace the system I/O board.

Memory problems

See this section to resolve issues related to memory.

Common memory problems

- [“Displayed system memory is less than installed physical memory” on page 528](#)
- [“Invalid memory population detected” on page 528](#)
- [“DIMM PFA issue” on page 528](#)

Displayed system memory is less than installed physical memory

Complete the following procedure to solve the problem.

Note: Each time you install or remove a memory module, you must disconnect the server from the power source.

1. See [“Memory module installation rules and order” on page 52](#) to make sure that the present memory module population sequence is supported and you have installed the correct type of memory module.
2. Check whether any DIMM error LED is lit on the processor board and whether any memory module is not displayed in Setup Utility. If yes, check the customer/L1 actions by following the error event triggered in XCC or UEFI.
3. If the problem persists, replace the failing memory module with one that functions well.
 - If the new memory module still functions well, it indicates that the original memory module is damaged. In this case, replace the memory module with a good one.
 - If the new memory module cannot function well, it indicates that the memory slot is damaged. In this case, replace the processor board (trained technician only).
 - There are few cases in which the memory error is relative to processors. Replace the affected processors if the above actions does not help on customer’s situation (trained technician only).
4. Run the memory module diagnostics. When you start a server and press the key according to the on-screen instructions, the Lenovo XClarity Provisioning Manager interface is displayed by default. From the Diagnostic page, click **Run Diagnostic → Memory Test → Advanced Memory Test**. If any memory module fails the test, repeat steps 2 and 3.

Invalid memory population detected

If this warning message appears, complete the following steps:

Invalid memory population (unsupported DIMM population) detected. Please verify memory configuration is valid.

1. See [“Memory module installation rules and order” on page 52](#) to make sure the present memory module population sequence is supported.
2. If the present sequence is indeed supported, see if any of the modules is displayed as “disabled” in Setup Utility.
3. Reseat the module that is displayed as “disabled,” and reboot the system.
4. If the problem persists, replace the memory module.

DIMM PFA issue

1. Update the UEFI and XCC firmware to the latest version.
2. Reseat the failing memory modules.
3. Swap processors and make sure that there are no damages to processor socket pins.
4. (Train service only) Ensure there is no abnormal material in any memory module slot.
5. Run the memory module diagnostics. When you start a server and press the key according to the on-screen instructions, the Lenovo XClarity Provisioning Manager interface is displayed by default. You can perform memory diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → Memory test → Advanced Memory Test**.
6. Replace the memory modules that fail Memory Test.

Monitor and video problems

Use this information to solve problems related to a monitor or video.

- [“Incorrect characters are displayed” on page 529](#)

- “Screen is blank” on page 529
- “Screen goes blank when you start some application programs” on page 529
- “The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted” on page 529
- “The wrong characters appear on the screen” on page 530
- “Monitor display fails when connected to the VGA connector of the server” on page 530

Incorrect characters are displayed

Complete the following steps:

1. Verify that the language and locality settings are correct for the keyboard and operating system.
2. If the wrong language is displayed, update the server firmware to the latest level. See [“Update the firmware” on page 489](#).

Screen is blank

1. If the server is attached to a KVM switch, bypass the KVM switch to eliminate it as a possible cause of the problem: connect the monitor cable directly to the correct connector on the rear of the server.
2. The management controller remote presence function is disabled if you install an optional video adapter. To use the management controller remote presence function, remove the optional video adapter.
3. If the server is installed with the graphical adapters while turning on the server, the Lenovo logo is displayed on the screen after approximately 3 minutes. This is normal operation while the system loads.
4. Make sure that:
 - The server is turned on and there is power supplied to the server.
 - The monitor cables are connected correctly.
 - The monitor is turned on and the brightness and contrast controls are adjusted correctly.
5. Make sure that the correct server is controlling the monitor, if applicable.
6. Make sure that the video output is not affected by corrupted server firmware; See [“Update the firmware” on page 489](#).
7. If the problem remains, contact Lenovo Support.

Screen goes blank when you start some application programs

1. Make sure that:
 - The application program is not setting a display mode that is higher than the capability of the monitor.
 - You installed the necessary device drivers for the application.

The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted

1. If the monitor self-tests show that the monitor is working correctly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescents, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor.

Attention: Moving a color monitor while it is turned on might cause screen discoloration.

Move the device and the monitor at least 305 mm (12 in.) apart, and turn on the monitor.

Notes:

- a. To prevent diskette drive read/write errors, make sure that the distance between the monitor and any external diskette drive is at least 76 mm (3 in.).
 - b. Non-Lenovo monitor cables might cause unpredictable problems.
2. Reseat the monitor cable.
 3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time:
 - a. Monitor cable
 - b. Video adapter (if one is installed)
 - c. Monitor

The wrong characters appear on the screen

Complete the following steps until the problem is solved:

1. Verify that the language and locality settings are correct for the keyboard and operating system.
2. If the wrong language is displayed, update the server firmware to the latest level. See [“Update the firmware” on page 489](#).

Monitor display fails when connected to the VGA connector of the server

Complete the following steps until the problem is solved:

1. Check and ensure that the server is turned on.
2. If there is a KVM connected between the monitor and server, remove the KVM.
3. Reconnect the monitor cables and ensure that the cables are connected correctly.
4. Try to use a monitor that has been verified without a problem.
5. If the monitor display still fails, do the following:
 - If the VGA connector is on the front of the server:
 - a. Remove and reconnect the internal VGA cable. Ensure that the VGA cable is correctly connected to the system board (system board assembly). See [Chapter 6 “Internal cable routing” on page 325](#)
 - b. Replace the left rack latch with VGA. See [“Rack latches replacement” on page 251](#).
 - c. (Trained technician only) Replace the system I/O board.
 - If the VGA connector is on the rear of the server:
 - a. (Trained technician only) Replace the system I/O board.

Observable problems

Use this information to solve observable problems.

- [“The server immediately displays the POST Event Viewer when it is turned on” on page 530](#)
- [“Server is unresponsive \(POST is complete and operating system is running\)” on page 530](#)
- [“Server is unresponsive \(POST failed and cannot start System Setup\)” on page 531](#)
- [“Voltage planar fault is displayed in the event log” on page 531](#)
- [“Unusual smell” on page 531](#)
- [“Server seems to be running hot” on page 532](#)
- [“Cracked parts or cracked chassis” on page 532](#)

The server immediately displays the POST Event Viewer when it is turned on

Complete the following steps until the problem is solved.

1. Correct any errors that are indicated by the system LEDs and diagnostics display.
2. Make sure that the server supports all the processors and that the processors match in speed and cache size.

You can view processor details from system setup.

To determine if the processor is supported for the server, see <https://serverproven.lenovo.com/>.

3. (Trained technician only) Make sure that processor 1 is seated correctly.
4. (Trained technician only) Remove processor 2 and restart the server.
5. Replace the following components one at a time, in the order shown, restarting the server each time:
 - a. (Trained technician only) Processor
 - b. (Trained technician only) System board (system board assembly)

Server is unresponsive (POST is complete and operating system is running)

Complete the following steps until the problem is solved.

- If you are in the same location as the server, complete the following steps:
 1. If you are using a KVM connection, make sure that the connection is operating correctly. Otherwise, make sure that the keyboard and mouse are operating correctly.
 2. If possible, log in to the server and verify that all applications are running (no applications are hung).
 3. Restart the server.

4. If the problem remains, make sure that any new software has been installed and configured correctly.
5. Contact your place of purchase of the software or your software provider.
- If you are accessing the server from a remote location, complete the following steps:
 1. Make sure that all applications are running (no applications are hung).
 2. Attempt to log out of the system and log back in.
 3. Validate the network access by pinging or running a trace route to the server from a command line.
 - a. If you are unable to get a response during a ping test, attempt to ping another server in the chassis to determine whether it is a connection problem or server problem.
 - b. Run a trace route to determine where the connection breaks down. Attempt to resolve a connection issue with either the VPN or the point at which the connection breaks down.
 4. Restart the server remotely through the management interface.
 5. If the problem remains, verify that any new software has been installed and configured correctly.
 6. Contact your place of purchase of the software or your software provider.

Server is unresponsive (POST failed and cannot start System Setup)

Configuration changes, such as added devices or adapter firmware updates, and firmware or application code problems can cause the server to fail POST (the power-on self-test).

If this occurs, the server responds in either of the following ways:

- The server restarts automatically and attempts POST again.
- The server hangs, and you must manually restart the server for the server to attempt POST again.

After a specified number of consecutive attempts (automatic or manual), the server reverts to the default UEFI configuration and starts System Setup so that you can make the necessary corrections to the configuration and restart the server. If the server is unable to successfully complete POST with the default configuration, there might be a problem with the processor board or system I/O board. Do the following:

1. Remove any newly added devices and revert the system to the default hardware configuration.
2. Try to restart the system and check if it can boot to the System Setup successfully.
 - If no, do the following:
 - a. Replace the processor board.
 - b. Replace the system I/O board.
 - If yes, try to move the suspected device to another system under test (SUT).
 - If the SUT system works normally, the issue maybe is caused by the processor board or system I/O board.
 - If the SUT system works abnormally, there might be a problem with the suspected device.
3. If all the suspected parts are isolated and the issue still remains unchanged, please run the affected system to be minimum configuration for further detail issue isolation and add them back step by step.

Voltage planar fault is displayed in the event log

Complete the following steps until the problem is solved.

1. Revert the system to the minimum configuration. See [“Specifications” on page 3](#) for the minimally required number of processors and DIMMs.
2. Restart the system.
 - If the system restarts, add each of the removed items one at a time and restart the system each time until the error occurs. Replace the item for which the error occurs.
 - If the system does not restart, suspect the processor board first and then the system I/O board.

Unusual smell

Complete the following steps until the problem is solved.

1. An unusual smell might be coming from newly installed equipment.
2. If the problem remains, contact Lenovo Support.

Server seems to be running hot

Complete the following steps until the problem is solved.

Multiple servers or chassis:

1. Make sure that the room temperature is within the specified range (see [“Specifications” on page 3](#)).
2. Make sure that the fans are installed correctly.
3. Update the UEFI and XCC to the latest versions.
4. Make sure that the fillers in the server are installed correctly (see [Chapter 5 “Hardware replacement procedures” on page 49](#) for detailed installation procedures).
5. Use the IPMI command to ramp up the fan speed to the full fan speed to see whether the issue can be resolved.

Note: The IPMI raw command should only be used by trained technician and each system has its own specific PMI raw command.

6. Check the management processor event log for rising temperature events. If there are no events, the server is running within normal operating temperatures. Note that you can expect some variation in temperature.

Cracked parts or cracked chassis

Contact Lenovo Support.

Optional-device problems

Use this information to solve problems related to optional devices.

- [“External USB device is not recognized” on page 532](#)
- [“PCIe adapter is not recognized or is not functioning” on page 532](#)
- [“Insufficient PCIe resources are detected.” on page 533](#)
- [“A Lenovo optional device that was just installed does not work.” on page 533](#)
- [“A Lenovo optional device that worked previously does not work now” on page 533](#)

External USB device is not recognized

Complete the following steps until the problem is resolved:

1. Update the UEFI firmware to the latest version.
2. Make sure that the proper drivers are installed on the server. See the product documentation for the USB device for information about device drivers.
3. Use the Setup utility to make sure that the device is configured correctly.
4. If the USB device is plugged into a hub or the console breakout cable, unplug the device and plug it directly into the USB port on the front of the server.

PCIe adapter is not recognized or is not functioning

Complete the following steps until the problem is resolved:

1. Update the UEFI firmware to the latest version.
2. Check the event log and resolve any issues related to the device.
3. Validate that the device is supported for the server (see <https://serverproven.lenovo.com/>). Make sure that the firmware level on the device is at the latest supported level and update the firmware if applicable.
4. Make sure that the adapter is installed in a correct slot.
5. Make sure that the proper device drivers are installed for the device.
6. Check <http://datacentersupport.lenovo.com> for any tech tips (also known as retain tips or service bulletins) that might be related to the adapter.
7. Ensure any adapter external connections are correct and that the connectors are not physically damaged.
8. Make sure that the PCIe adapter is installed with the supported operating system.

Insufficient PCIe resources are detected.

If you see an error message stating “Insufficient PCI Resources Detected,” complete the following steps until the problem is resolved:

1. Press Enter to access System Setup Utility.
2. Select **System Settings → Devices and I/O Ports → PCI 64-Bit Resource Allocation**, then; modify the setting from **Auto** to **Enable**.
3. Save the settings and restart the system.
4. If the error recurs with the highest device resource setting (1GB), shutdown the system and remove some PCIe devices; then, power on the system.
5. If the reboot failed, repeat step 1 to step 4.
6. If the error recurs, press Enter to access System Setup Utility.
7. Select **System Settings → Devices and I/O Ports → PCI 64-Bit Resource Allocation**, then; modify the setting from **Auto** to **Enable**.
8. DC cycle the system and ensure the system is enter UEFI boot menu or the operating system; then, capture the FFDC log.
9. Contact Lenovo technical support.

A Lenovo optional device that was just installed does not work.

1. Make sure that:
 - The device is supported for the server (see <https://serverproven.lenovo.com/>).
 - You followed the installation instructions that came with the device and the device is installed correctly.
 - You have not loosened any other installed devices or cables.
 - You updated the configuration information in system setup. When you start a server and press the key according to the on-screen instructions to display the Setup Utility. ((For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgmt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html)). Whenever memory or any other device is changed, you must update the configuration.
2. Reseat the device that you have just installed.
3. Replace the device that you have just installed.
4. Reseat the cable connection and check there is no physical damage to the cable.
5. If there is any cable damage, then replace the cable.

A Lenovo optional device that worked previously does not work now

1. Make sure that all of the cable connections for the device are secure.
2. If the device comes with test instructions, use those instructions to test the device.
3. Reseat the cable connection and check if any physical parts have been damaged.
4. Replace the cable.
5. Reseat the failing device.
6. Replace the failing device.

Performance problems

Use this information to solve performance problems.

- “Network performance” on page 533
- “Operating system performance” on page 534

Network performance

Complete the following steps until the problem is solved:

1. Isolate which network is operating slowly (such as storage, data, and management). You might find it helpful to use ping tools or operating-system tools such as ethtool, task manager, or resource manager.
2. Check for traffic congestion on the network.
3. Update the NIC device driver and firmware, or the storage device controller device driver.

4. Use the traffic-diagnostic tools that are provided by the IO-module manufacturer.

Operating system performance

Complete the following steps until the problem is solved:

1. If you have recently made changes to the server (for example, updated device drivers or installed software applications), remove the changes.
2. Check for any networking issues.
3. Check the operating system logs for performance related errors.
4. Check for events related to high temperatures and power issues as the server might be throttled to help with cooling. If it is throttled, reduce the workload on the server to help improve performance.
5. Check for events related to disabled DIMMs. If you do not have enough memory for the application workload, your operating system will have poor performance.
6. Ensure that the workload is not too high for the configuration.

Power on and power off problems

Use this information to resolve issues when powering on or powering off the server.

- [“The power button does not work \(server does not start\)” on page 534](#)
- [“Server does not power on” on page 534](#)
- [“Server does not power off” on page 535](#)

The power button does not work (server does not start)

Note: The power button will not function until approximately 1 to 3 minutes after the server has been connected to ac power to allow time for BMC to initialize.

Complete the following steps until the problem is resolved:

1. Make sure that the power button on the server is working correctly:
 - a. Disconnect the server power cords.
 - b. Reconnect the server power cords.
 - c. Reseat the front operator panel cable, and then repeat steps 1a and 1b.
 - If the server starts, reseat the front operator panel.
 - If the problem remains, replace the front operator panel.
2. Make sure that:
 - The power cords are correctly connected to the server and to a working electrical outlet.
 - The LEDs on the power supply do not indicate a problem.
 - The Power button LED is lit on and is flashing slowly.
 - The push force is enough and with button force response.
3. If the power button LED is not lit on or is not flashing correctly, reseat all the power supplies and make sure AC LED on PSU rear side are lit on.
4. If you have just installed an optional device, remove it, and restart the server.
5. If the issue is still observed or without power button LED lit on, implement the minimum configuration to check whether any specific components lock the power permission. Replace the each power supply and check the power button function after installing the each one.
6. If everything is still done and the issue cannot be resolved, collect the failure information with system logs captured to Lenovo support.

Server does not power on

Complete the following steps until the problem is resolved:

1. Check the event log for any events related to the server not powering on.
2. Check for any LEDs that are blinking amber, yellow, or red.
3. Check the system status LED on the system board (system board assembly). See [“LEDs on the system board assembly” on page 515](#).
4. Check if the power input status LED is off or the yellow LED is lit on the power supply unit.

5. AC cycle the system.
6. Remove the CMOS battery for at least ten seconds, then, reinstall the CMOS battery.
7. Try to power on the system by IPMI command through XCC or by the power button.
8. Implement the minimum configuration (see [“Technical specifications” on page 3](#)).
9. Reseat all power supplies and make sure that AC LEDs on the PSU rear side are lit.
10. Replace the each power supply and check the power button function after installing the each one.
11. If the issue cannot be resolved by above actions, call service to review the issue symptom and see whether the system I/O board or processor board replacement is necessary.

Server does not power off

Complete the following steps until the problem is resolved:

1. Determine whether you are using an Advanced Configuration and Power Interface (ACPI) or a non-ACPI operating system. If you are using a non-ACPI operating system, complete the following steps:
 - a. Press Ctrl+Alt+Delete.
 - b. Turn off the server by pressing the power-control button and holding it down for 5 seconds.
 - c. Restart the server.
 - d. If the server fails POST and the power-control button does not work, disconnect the power cord for 20 seconds; then, reconnect the power cord and restart the server.
2. If the problem remains or if you are using an ACPI-aware operating system, suspect the system board (system board assembly).

Power problems

Use this information to resolve issues related to power.

System error LED is on and event log "Power supply has lost input" is displayed

To resolve the problem, ensure that:

1. The power supply is properly connected to a power cord.
2. The power cord is connected to a properly grounded electrical outlet for the server.
3. Make sure that the power supply AC source is stable within the supported range.
4. Swap the power supply to see if the issue follows the power supply, if it follows the power supply, then replace the failing one.
5. Review the event log and see how the problem it is to follow the event log actions to resolve the problems.

Serial-device problems

Use this information to solve problems with serial ports or devices.

- [“Number of displayed serial ports is less than the number of installed serial ports” on page 535](#)
- [“Serial device does not work” on page 535](#)

Number of displayed serial ports is less than the number of installed serial ports

Complete the following steps until the problem is solved.

1. Make sure that:
 - Each port is assigned a unique address in the Setup utility and none of the serial ports is disabled.
 - The serial-port adapter (if one is present) is seated correctly.
2. Reseat the serial port adapter.
3. Replace the serial port adapter.

Serial device does not work

1. Make sure that:
 - The device is compatible with the server.
 - The serial port is enabled and is assigned a unique address.

- The device is connected to the correct connector (see [“System-board-assembly connectors” on page 36](#)).
2. To enable the serial port module on Linux or Microsoft Windows, do one of the followings according to the installed operating system:

Note: If the Serial over LAN (SOL) or Emergency Management Services (EMS) feature is enabled, the serial port will be hidden on Linux and Microsoft Windows. Therefore, it is required to disable SOL and EMS to use the serial port on operating systems for serial devices.

- For Linux:

Open the ipmitool and enter the following command to disable the Serial over LAN (SOL) feature:

```
-I lanplus -H IP -U USERID -P PASSWORD sol deactivate
```

- For Microsoft Windows:

- a. Open the ipmitool and enter the following command to disable the SOL feature:

```
-I lanplus -H IP -U USERID -P PASSWORD sol deactivate
```

- b. Open Windows PowerShell and enter the following command to disable the Emergency Management Services (EMS) feature:

```
Bcdedit /ems off
```

- c. Restart the server to ensure that the EMS setting takes effect.

3. Reseat the following components:

- a. Failing serial device.
- b. Serial cable.

4. Replace the following components:

- a. Failing serial device.
- b. Serial cable.

5. (Trained technician only) Replace the system board (system board assembly).

Software problems

Use this information to solve software problems.

1. To determine whether the problem is caused by the software, make sure that:
 - The server has the minimum memory that is needed to use the software. For memory requirements, see the information that comes with the software.

Note: If you have just installed an adapter or memory, the server might have a memory-address conflict.

- The software is designed to operate on the server.
 - Other software works on the server.
 - The software works on another server.
2. If you receive any error messages while you use the software, see the information that comes with the software for a description of the messages and suggested solutions to the problem.
 3. Contact your place of purchase of the software.

Storage drive problems

Use this information to resolve issues related to the storage drives.

- [“Server cannot recognize a drive” on page 537](#)
- [“Multiple drives fail” on page 537](#)
- [“Multiple drives are offline” on page 538](#)
- [“A replacement drive does not rebuild” on page 538](#)

- “Green drive activity LED does not represent actual state of associated drive” on page 538
- “Yellow drive status LED does not represent actual state of associated drive” on page 538

Server cannot recognize a drive

Complete the following steps until the problem is solved.

1. Observe the associated yellow drive status LED. If the LED is lit, it indicates a drive fault.
2. If the status LED is lit, remove the drive from the bay, wait 45 seconds, and reinsert the drive, making sure that the drive assembly connects to the drive backplane.
3. Observe the associated green drive activity LED and the yellow status LED and perform corresponding operations in different situations:
 - If the green activity LED is flashing and the yellow status LED is not lit, the drive is recognized by the controller and is working correctly. Run the diagnostics tests for the drives. When you start a server and press the key according to the on-screen instructions, the LXPM is displayed by default. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.) You can perform drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → Disk Drive Test**.
 - If the green activity LED is flashing and the yellow status LED is flashing slowly, the drive is recognized by the controller and is rebuilding.
 - If neither LED is lit or flashing, check whether the drive backplane is correctly seated. For details, go to step 4.
 - If the green activity LED is flashing and the yellow status LED is lit, replace the drive.
4. Make sure that the drive backplane is correctly seated. When it is correctly seated, the drive assemblies correctly connect to the backplane without bowing or causing movement of the backplane.
5. Reseat the backplane power cable and repeat steps 1 through 3.
6. Reseat the backplane signal cable and repeat steps 1 through 3.
7. Suspect the backplane signal cable or the backplane:
 - Replace the affected backplane signal cable.
 - Replace the affected backplane.
8. Run the diagnostics tests for the drives. When you start a server and press the key according to the on-screen instructions, the LXPM is displayed by default. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.) You can perform drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → Disk Drive Test**.

Based on those tests:

- If the backplane passes the test but the drives are not recognized, replace the backplane signal cable and run the tests again.
- Replace the backplane.
- If the adapter fails the test, disconnect the backplane signal cable from the adapter and run the tests again.
- If the adapter fails the test, replace the adapter.

Multiple drives fail

Complete the following steps until the problem is solved:

- View the Lenovo XClarity Controller event log for events related to power supplies or vibration issues and resolve those events.

- Make sure that the device drivers and firmware for the drive and server are at the latest level.

Important: Some cluster solutions require specific code levels or coordinated code updates. If the device is part of a cluster solution, verify that the latest level of code is supported for the cluster solution before you update the code.

Multiple drives are offline

Complete the following steps until the problem is solved:

- View the Lenovo XClarity Controller event log for events related to power supplies or vibration issues and resolve those events.
- View the storage subsystem log for events related to the storage subsystem and resolve those events.

A replacement drive does not rebuild

Complete the following steps until the problem is solved:

1. Make sure that the drive is recognized by the adapter (the green drive activity LED is flashing).
2. Review the SAS/SATA RAID adapter documentation to determine the correct configuration parameters and settings.

Green drive activity LED does not represent actual state of associated drive

Complete the following steps until the problem is solved:

1. If the green drive activity LED does not flash when the drive is in use, run the diagnostics tests for the drives. When you start a server and press the key according to the on-screen instructions, the LXPM is displayed by default. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.) You can perform drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → Disk Drive Test**
2. If the drive passes the test, replace the backplane.
3. If the drive fails the test, replace the drive.

Yellow drive status LED does not represent actual state of associated drive

Complete the following steps until the problem is solved:

1. Turn off the server.
2. Reseat the SAS/SATA adapter.
3. Reseat the backplane signal cable and backplane power cable.
4. Reseat the drive.
5. Power on the server and observe the activity of the drive LEDs.

Appendix A. Hardware disassembling for recycle

Follow the instructions in this section to recycle components with compliance with local laws or regulations.

Disassemble the system board (system board assembly) for recycle

Follow the instructions in this section to disassemble the system board (system board assembly) before recycling.

About this task

The system board (system board assembly) contains the system I/O board and processor board. Before recycling each unit, you need to disassemble the system board (system board assembly).

Procedure

- Step 1. Remove the system board (system board assembly) from the server. See [“Remove the system I/O board” on page 300](#).
- Step 2. Remove the Firmware and RoT Security Module from the system I/O board. See [“Remove the firmware and RoT security module” on page 294](#).
- Step 3. Separate the system I/O board from the processor board.

Note: To prevent the contact of the system I/O board from damage, pinch and lift the plunger on the system I/O board upward a little and pull the system I/O board outward. During the entire pulling action, ensure that the system I/O board remains as horizontal as possible.

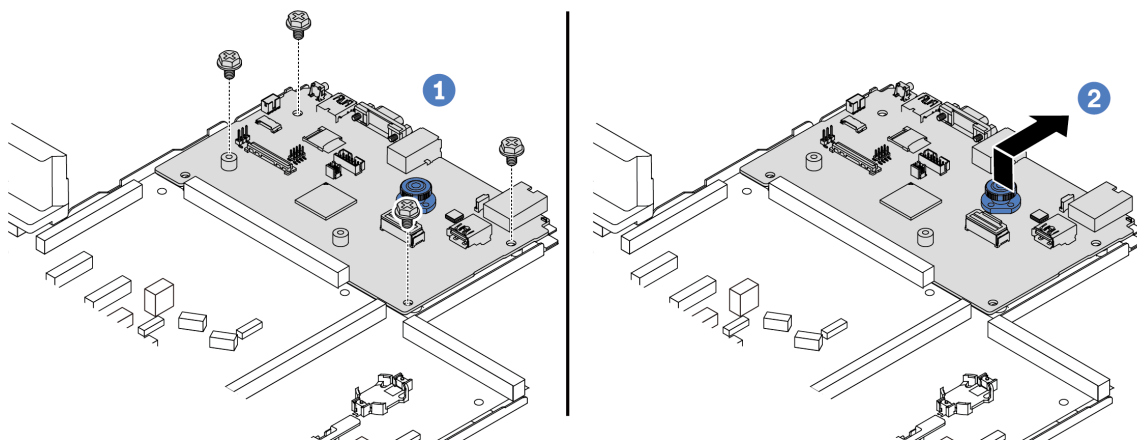


Figure 440. Separating the system I/O board from the processor board

- a. ① Remove the screws that secure the system I/O board.
 - b. ② Lift and hold the release pin and slide the system I/O board towards the rear to disengage it from the processor board.
- Step 4. Remove the screws from the processor board as illustrated.

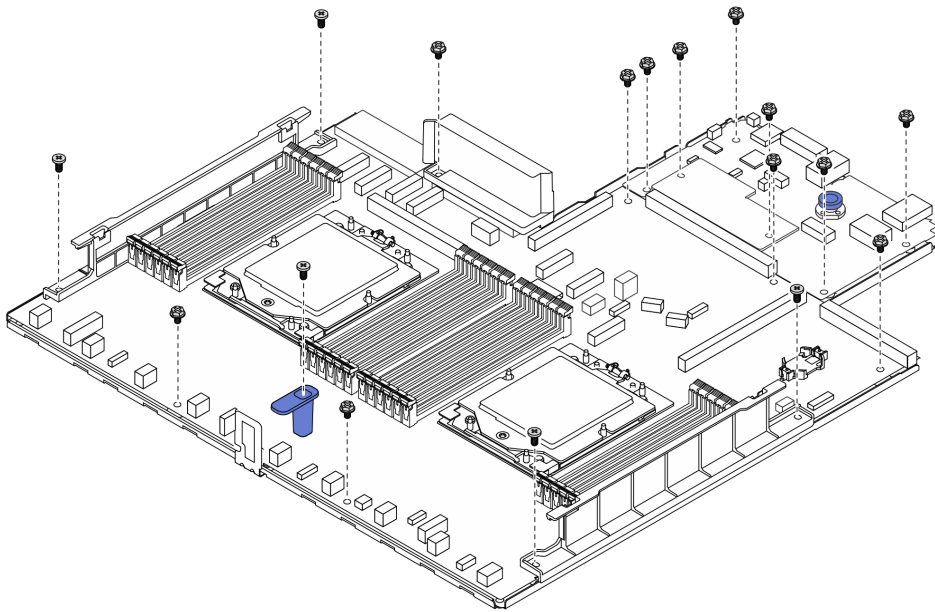




Figure 441. Removing screws from the processor board

Table 117. Screw type

Screw type	Quantity	Tool type
	12	PH2 screwdriver
	5	

Step 5. Remove the following components from the processor board.

- **1** Cable wall (1)
- **2** Power supply unit air duct
- **3** Cable wall (2)
- **4** Handle

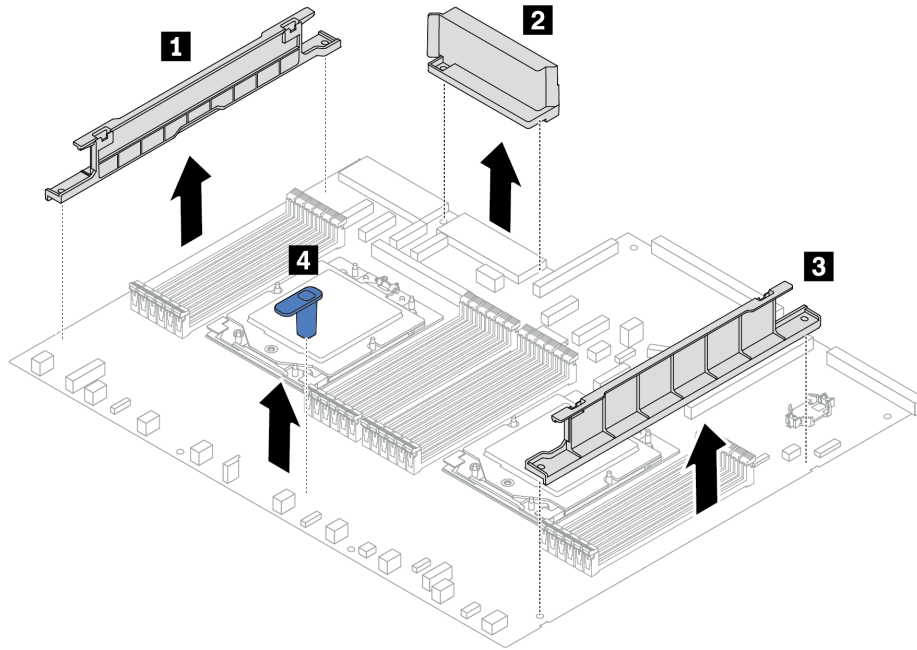


Figure 442. Removing components from the processor board

Step 6. Separate the processor board from the supporting sheet metal.

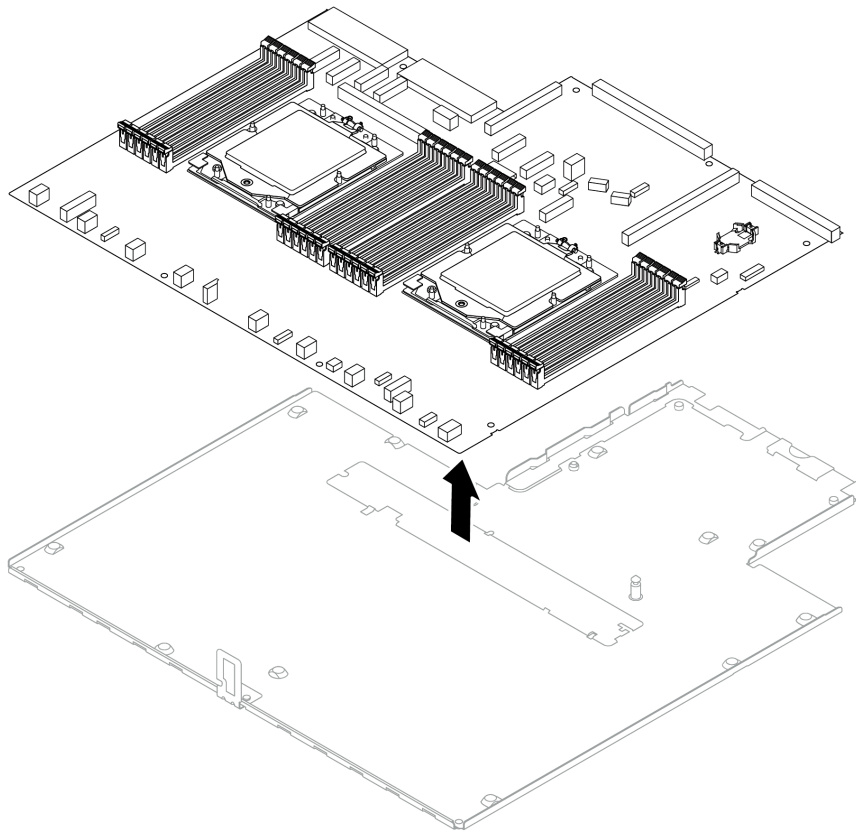


Figure 443. Separating the processor board from the supporting sheet metal

After you finish

After disassembling the system board (system board assembly), recycle the units in compliance with local regulations.

Appendix B. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about Lenovo products, you will find a wide variety of sources available from Lenovo to assist you.

On the World Wide Web, up-to-date information about Lenovo systems, optional devices, services, and support are available at:

<http://datacentersupport.lenovo.com>

Note: IBM is Lenovo's preferred service provider for ThinkSystem.

Before you call

Before you call, there are several steps that you can take to try and solve the problem yourself. If you decide that you do need to call for assistance, gather the information that will be needed by the service technician to more quickly resolve your problem.

Attempt to resolve the problem yourself

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the Lenovo product documentation. The online help also describes the diagnostic tests that you can perform. The documentation for most systems, operating systems, and programs contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

You can find the product documentation for your ThinkSystem products at the following location:

<https://pubs.lenovo.com/>

You can take these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated software, firmware, and operating-system device drivers for your Lenovo product. (See the following links) The Lenovo Warranty terms and conditions state that you, the owner of the Lenovo product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
 - Drivers and software downloads
 - <https://datacentersupport.lenovo.com/tw/en/products/servers/thinksystem/sr645v3/7d9c/downloads/driver-list/>
 - Operating system support center
 - <https://datacentersupport.lenovo.com/solutions/server-os>
 - Operating system installing instructions
 - <https://pubs.lenovo.com/thinksystem#os-installation>
- If you have installed new hardware or software in your environment, check <https://serverproven.lenovo.com/> to make sure that the hardware and software are supported by your product.
- Refer to [Chapter 8 “Problem determination” on page 497](#) for instructions on isolating and solving issues.

- Go to <http://datacentersupport.lenovo.com> and check for information to help you solve the problem.

To find the Tech Tips available for your server:

1. Go to <http://datacentersupport.lenovo.com>, and input the model name or machine type of your server in the search bar to navigate to the support page.
2. Click on **How To's** from the navigation pane.
3. Click **Article Type → Solution** from the drop-down menu.

Follow the on-screen instructions to choose the category for the problem that you are having.

- Check Lenovo Data Center Forum at https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg to see if someone else has encountered a similar problem.

Gathering information needed to call Support

If you require warranty service for your Lenovo product, the service technicians will be able to assist you more efficiently if you prepare the appropriate information before you call. You can also go to <http://datacentersupport.lenovo.com/warrantylookup> for more information about your product warranty.

Gather the following information to provide to the service technician. This data will help the service technician quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.

- Hardware and Software Maintenance agreement contract numbers, if applicable
- Machine type number (Lenovo 4-digit machine identifier). Machine type number can be found on the ID label, see “Identify the server and access the Lenovo XClarity Controller” on page 45.
- Model number
- Serial number
- Current system UEFI and firmware levels
- Other pertinent information such as error messages and logs

As an alternative to calling Lenovo Support, you can go to <https://support.lenovo.com/servicerequest> to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to the service technicians. The Lenovo service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

Collecting service data

To clearly identify the root cause of a server issue or at the request of Lenovo Support, you might need collect service data that can be used for further analysis. Service data includes information such as event logs and hardware inventory.

Service data can be collected through the following tools:

- **Lenovo XClarity Provisioning Manager**

Use the Collect Service Data function of Lenovo XClarity Provisioning Manager to collect system service data. You can collect existing system log data or run a new diagnostic to collect new data.

- **Lenovo XClarity Controller**

You can use the Lenovo XClarity Controller web interface or the CLI to collect service data for the server. The file can be saved and sent to Lenovo Support.

- For more information about using the web interface to collect service data, see the “Backing up the BMC configuration” section in the XCC documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.

- For more information about using the CLI to collect service data, see the “XCC `ffdc` command” section in the XCC documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.

- **Lenovo XClarity Administrator**

Lenovo XClarity Administrator can be set up to collect and send diagnostic files automatically to Lenovo Support when certain serviceable events occur in Lenovo XClarity Administrator and the managed endpoints. You can choose to send diagnostic files to Lenovo Support using Call Home or to another service provider using SFTP. You can also manually collect diagnostic files, open a problem record, and send diagnostic files to the Lenovo Support.

You can find more information about setting up automatic problem notification within the Lenovo XClarity Administrator at https://pubs.lenovo.com/lxca/admin_setupcallhome.

- **Lenovo XClarity Essentials OneCLI**

Lenovo XClarity Essentials OneCLI has inventory application to collect service data. It can run both in-band and out-of-band. When running in-band within the host operating system on the server, OneCLI can collect information about the operating system, such as the operating system event log, in addition to the hardware service data.

To obtain service data, you can run the `getinfor` command. For more information about running the `getinfor`, see http://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_getinfor_command.html.

Contacting Support

You can contact Support to obtain help for your issue.

You can receive hardware service through a Lenovo Authorized Service Provider. To locate a service provider authorized by Lenovo to provide warranty service, go to <https://datacentersupport.lenovo.com/serviceprovider> and use filter searching for different countries. For Lenovo support telephone numbers, see <https://datacentersupport.lenovo.com/supportphonelist> for your region support details.

Appendix C. Documents and supports

This section provides handy documents, driver and firmware downloads, and support resources.

Documents download

This section provides introduction and download link handy documents.

Documents

Download the following product documentations at:

https://thinksystem.lenovofiles.com/help/topic/SR645V3/pdf_files.html

- **Rail Installation Guides**
 - Rail installation in a rack
- **User Guide**
 - Complete overview, system configuration, hardware components replacing, and troubleshooting.
Selected chapters from *User Guide*:
 - **System Configuration Guide** : Server overview, components identification, system LEDs and diagnostics display, product unboxing, setting up and configuring the server.
 - **Hardware Maintenance Guide** : Installing hardware components, cable routing, and troubleshooting.
- **Messages and Codes Reference**
 - XClarity Controller, LXPM, and uEFI events
- **UEFI Manual**
 - UEFI setting introduction

Note: SR645 V3 configured with Direct Water Cooling Module (DWCM) can be installed in the ThinkSystem Heavy Duty Full Depth Rack Cabinets. For ThinkSystem Heavy Duty Full Depth Rack Cabinets User Guide, see https://pubs.lenovo.com/hdc_rackcabinet/.

Support websites

This section provides driver and firmware downloads and support resources.

Support and downloads

- Drivers and Software download website for ThinkSystem SR645 V3
 - <https://datacentersupport.lenovo.com/tw/en/products/servers/thinksystem/sr645v3/7d9c/downloads/driver-list/>
- Lenovo Data Center Forum
 - https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg
- Lenovo Data Center Support for ThinkSystem SR645 V3
 - <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr645v3/7d9c>
- Lenovo License Information Documents
 - <https://datacentersupport.lenovo.com/documents/Invo-eula>
- Lenovo Press website (Product Guides/Datasheets/White papers)
 - <http://lenovopress.com/>
- Lenovo Privacy Statement
 - <https://www.lenovo.com/privacy>
- Lenovo Product Security Advisories
 - https://datacentersupport.lenovo.com/product_security/home
- Lenovo Product Warranty Plans

- <http://datacentersupport.lenovo.com/warrantylookup>
- Lenovo Server Operating Systems Support Center website
 - <https://datacentersupport.lenovo.com/solutions/server-os>
- Lenovo ServerProven website (Options compatibility lookup)
 - <https://serverproven.lenovo.com/>
- Operating System Installation Instructions
 - <https://pubs.lenovo.com/thinksystem#os-installation>
- Submit an eTicket (service request)
 - <https://support.lenovo.com/servicerequest>
- Subscribe to Lenovo Data Center Group product notifications (Stay up to date on firmware updates)
 - <https://datacentersupport.lenovo.com/solutions/ht509500>

Appendix D. Notices

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Important notes

Processor speed indicates the internal clock speed of the processor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1 024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard-disk-drive bays with the largest currently supported drives that are available from Lenovo.

Maximum memory might require replacement of the standard memory with an optional memory module.

Each solid-state memory cell has an intrinsic, finite number of write cycles that the cell can incur. Therefore, a solid-state device has a maximum number of write cycles that it can be subjected to, expressed as total bytes written (TBW). A device that has exceeded this limit might fail to respond to system-generated commands or might be incapable of being written to. Lenovo is not responsible for replacement of a device that has exceeded its maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the device.

Lenovo makes no representations or warranties with respect to non-Lenovo products. Support (if any) for the non-Lenovo products is provided by the third party, not Lenovo.

Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

Additional electronic emissions notices are available at:

Taiwan Region BSMI RoHS declaration

單元 Unit	限用物質及其化學符號 Restricted substances and its chemical symbols					
	鉛Lead (PB)	汞Mercury (Hg)	鎘Cadmium (Cd)	六價鉻 Hexavalent chromium (Cr ⁶⁺)	多溴聯苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
機架	○	○	○	○	○	○
外部蓋板	○	○	○	○	○	○
機械組零件	—	○	○	○	○	○
空氣傳動設備	—	○	○	○	○	○
冷卻組零件	—	○	○	○	○	○
內存模組	—	○	○	○	○	○
處理器模組	—	○	○	○	○	○
電纜組零件	—	○	○	○	○	○
電源供應器	—	○	○	○	○	○
儲備設備	—	○	○	○	○	○
印刷電路板	—	○	○	○	○	○
<p>備考1. “超出0.1 wt %” 及 “超出0.01 wt %” 係指限用物質之百分比含量超出百分比含量基準值。</p> <p>Note1 : “exceeding 0.1wt%” and “exceeding 0.01 wt%” indicate that the percentage content of the restricted substance exceeds the reference percentage value of presence condition.</p> <p>備考2. “○” 係指該項限用物質之百分比含量未超出百分比含量基準值。</p> <p>Note2 : “○” indicates that the percentage content of the restricted substance does not exceed the percentage of reference value of presence.</p> <p>備考3. “—” 係指該項限用物質為排除項目。</p> <p>Note3 : The “—” indicates that the restricted substance corresponds to the exemption.</p>						

Taiwan Region import and export contact information

Contacts are available for Taiwan Region import and export information.

委製商/進口商名稱: 台灣聯想環球科技股份有限公司
進口商地址: 台北市南港區三重路 66 號 8 樓
進口商電話: 0800-000-702

