



# ThinkSystem SR650 V3 User Guide



**Machine Type:** 7D75, 7D76, 7D77

**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/](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>

**Eleventh Edition (April 2024)**

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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་ཐུག་འདི་བདེ་སྤྱད་མ་བྱས་གོང་། སྐྱོར་གྱི་ཡིད་གཟབ་  
བྱ་འདྲ་མིན་ཡིད་པའི་འོད་ཟེར་བལྟ་དགོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

Youq mwngz yungh canjbinj neix gaxgonq, itdingh aeu doeg aen  
canjbinj soengq cungj vahgangj ancien siusik.

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## 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.





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## Chapter 1. Introduction

The ThinkSystem SR650 V3 server (7D75, 7D76, 7D77) is a 2-socket 2U rack server, based on the 4th Gen (Sapphire Rapids, SPR) or 5th Gen (Emerald Rapids, EMR) Intel Xeon Scalable processor family. With a very configuration-rich offering, it is a great choice for enterprises of all sizes that need industry-leading reliability, management, and security, as well as maximizing performance and flexibility for future growth.

Figure 1. ThinkSystem SR650 V3



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### Features

Performance, ease of use, reliability, and expansion capabilities are 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>

Intel® On Demand is a feature that allows user to customize processor capabilities according to workload and tasks at hand. For more information, see “[Enable Intel® On Demand](#)” on page 698.

- **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 server 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://pubs.lenovo.com/lxcc-overview/>.

- **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 32 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](#).

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

The server models support front, middle, and rear drive bays, scalable up to 20 x 3.5-inch hot-swap drives or 40 x 2.5-inch hot-swap drives. See [“Technical specifications” on page 3](#) for more information.

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

- **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 711](#).

- **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, supporting RAID levels 0, 1, 5, 6, 10, 50, and 60.

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## 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 navigate to the support page for your server.
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.

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## 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](https://datacentersupport.lenovo.com/product_security/home)

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## 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.

Specification category	"Technical specifications" on page 3	"Mechanical specifications" on page 10	"Environmental specifications" on page 11
Content	<ul style="list-style-type: none"><li>• Processor</li><li>• Memory</li><li>• Internal drives</li><li>• Expansion slots</li><li>• RAID adapter</li><li>• Host bus adapter (HBA)/ Expander</li><li>• Graphics processing units (GPU)</li><li>• Integrated functions and I/O connectors</li><li>• Network</li><li>• System fan</li><li>• Power supplies</li><li>• Operating systems</li><li>• Minimal configuration for debugging</li></ul>	<ul style="list-style-type: none"><li>• Dimension</li><li>• Weight</li></ul>	<ul style="list-style-type: none"><li>• Acoustical noise emissions</li><li>• Environment</li><li>• Water requirements</li><li>• Particulate contamination</li></ul>

## 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 for your server model.

## Processor

Supports multi-core Intel Xeon processors, with integrated memory controller and Intel Mesh UPI (Ultra Path Interconnect) topology.

- Up to two 4th Gen (Sapphire Rapids, SPR) or 5th Gen (Emerald Rapids, EMR) Intel Xeon scalable processors with the new LGA 4677 socket
- Up to 60 cores per socket for SPR and 64 cores per socket for EMR
- Up to 4 UPI links at up to 16 GT/s for SPR and 20 GT/s for EMR
- Thermal Design Power (TDP): up to 350 watts for SPR and 385 watts for EMR

For a list of supported processors, see <https://serverproven.lenovo.com>.

## Memory

- Slots: 32 dual inline memory module (DIMM) connectors that support up to 32 TruDDR5 DIMMs
- Memory module types for SPR:
  - TruDDR5 4800 MHz 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)
- Memory module types for EMR:
  - TruDDR5 5600 MHz RDIMM: 16 GB (1Rx8), 24 GB (1Rx8), 32 GB (2Rx8), 48 GB (2Rx8)
  - TruDDR5 5600 MHz 10x4 RDIMM: 32 GB (1Rx4), 48 GB (1Rx4), 64 GB (2Rx4), 96 GB (2Rx4)
  - TruDDR5 5600 MHz 3DS RDIMM: 128 GB (4Rx4)
  - TruDDR5 5600 MHz Performance + RDIMM: 32 GB (2Rx8), 64 GB (2Rx4 10x4)
- Speed: Operating speed depends on processor model and UEFI settings.
  - 4800 MHz RDIMMs:
    - 1 DPC: 4800 MT/s
    - 2 DPC: 4400 MT/s
  - 5600 MHz RDIMMs:
    - 1 DPC: 5600 MT/s
    - 2 DPC:
      - 4800 MT/s for Performance + RDIMMs
      - 4400 MT/s
- Minimum memory: 16 GB
- Maximum memory: 8 TB: 32 x 256 GB 3DS RDIMMs

For a list of supported memory modules, see <https://serverproven.lenovo.com>.

### Internal drives

- Front drive bays:
  - Up to 24 x 2.5-inch hot-swap SAS/SATA/NVMe drives
  - Up to 12 x 3.5-inch hot-swap SAS/SATA drives
  - Up to 4 x 3.5-inch hot-swap NVMe drives
- Middle drive bays:
  - Up to 8 x 2.5-inch hot-swap SAS/SATA/NVMe drives
  - Up to 4 x 3.5-inch hot-swap SAS/SATA drives
- Rear drive bays:
  - Up to 8 x 2.5-inch hot-swap SAS/SATA drives
  - Up to 4 x 3.5-inch hot-swap SAS/SATA drives
  - Up to 4 x 2.5-inch hot-swap NVMe drives
  - Up to two 7mm drives
- Up to two internal M.2 drives

### Expansion slots

- Up to ten PCIe slots in the rear and two PCIe slots in the front
- One OCP module slot

PCIe slot availability is based on riser selection and rear drive bay selection. See [“Rear view” on page 29](#) and [“PCIe slots and PCIe adapters” on page 68](#).

## RAID adapter

- Onboard SATA ports with software RAID support (Intel VROC SATA RAID, supporting RAID levels 0, 1, 5, and 10)
- Onboard NVMe ports with software RAID support (Intel VROC NVMe RAID)
  - Intel VROC standard: requires an activation key and supports RAID levels 0, 1, and 10
  - Intel VROC Premium: requires an activation key and supports RAID levels 0, 1, 5, and 10
  - Intel VROC Boot (for 5th Gen processors except 4510T, 4510, 4509Y, and 3508U): requires an activation key and supports RAID level 1 only
- Hardware RAID levels 0, 1, 10:
  - ThinkSystem RAID 540-8i PCIe Gen4 12Gb Adapter
  - ThinkSystem RAID 540-16i PCIe Gen4 12Gb Adapter
- Hardware RAID levels 0, 1, 5, 10:
  - ThinkSystem RAID 5350-8i PCIe 12Gb Adapter
  - ThinkSystem RAID 5350-8i PCIe 12Gb Internal Adapter\*
- Hardware RAID levels 0, 1, 5, 6, 10, 50, 60:
  - ThinkSystem RAID 9350-8i 2GB Flash PCIe 12Gb Adapter
  - ThinkSystem RAID 9350-8i 2GB Flash PCIe 12Gb Internal Adapter\*
  - ThinkSystem RAID 9350-16i 4GB Flash PCIe 12Gb Adapter
  - ThinkSystem RAID 9350-16i 4GB Flash PCIe 12Gb Internal 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 940-32i 8GB Flash PCIe Gen4 12Gb Adapter
  - ThinkSystem RAID 940-8e 4GB Flash PCIe Gen4 12Gb Adapter

### Notes:

- \*Custom form factor (CFF) adapters that are supported only for server models with 2.5-inch front drive bays.
- Processors 4510T, 4510, 4509Y, and 3508U support Intel VROC standard and Intel VROC Premium.
- For more information about the RAID/HBA adapters, see [Lenovo ThinkSystem RAID Adapter and HBA Reference](#).

## Host bus adapter (HBA)/Expander

- 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 48 port 12Gb Internal Expander\*

### Notes:

- \*Custom form factor (CFF) adapters that are supported only for server models with 2.5-inch front drive bays.
- For more information about the RAID/HBA adapters, see [Lenovo ThinkSystem RAID Adapter and HBA Reference](#).

## Graphics processing unit (GPU)

Your server supports the following GPUs:

- Double-wide: NVIDIA® A16, A30, A40, A100, A800, H100, H800, L40, L40S, RTX A2000, RTX A4500, RTX A6000, RTX 6000 Ada; AMD® Instinct MI210
- Single-wide: NVIDIA A2, T1000, T400, L4

### Notes:

- For GPU supporting rules, see “[Thermal rules](#)” on page 75.
- To prevent potential thermal issues, change the **Misc** setting in the BIOS from **Option3** (default value) to **Option1** if the following two conditions are met:
  - The server is equipped with a GPU adapter.
  - The UEFI firmware version is ESE122T or later.

For the method of changing the **Misc** setting, see <https://support.lenovo.com/us/en/solutions/TT1832>.

## 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://pubs.lenovo.com/xcc-overview/>.
- Front connectors:
  - One VGA connector (optional)
  - One USB 3.2 Gen1 (5 Gbps) connector
  - One USB 2.0 connector with XCC system management function
  - One external diagnostics connector
  - One integrated diagnostics panel (optional)
- Rear connectors:
  - One VGA connector
  - Three USB 3.2 Gen1 (5 Gbps) connectors
  - One XCC system management port
  - Two or four Ethernet connectors on the OCP module (optional)
  - One serial port (optional)

## Network

- OCP module in the front or rear of the server, which provides two or four Ethernet connectors for network support

**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.

System fan
<ul style="list-style-type: none"> <li>Supported fan types: <ul style="list-style-type: none"> <li>Standard fan (60 x 60 x 36 mm, single-rotor, 17000 RPM)</li> <li>Performance fan (60 x 60 x 56 mm, dual-rotor, 21000 RPM)</li> </ul> </li> <li>Fan redundancy: N+1 redundancy, one redundant fan rotor <ul style="list-style-type: none"> <li>One processor: five hot-swap system fans (one redundant fan rotor)</li> <li>One processor with middle/rear bay or Riser 3, or two processors: six hot-swap system fans (one redundant fan rotor)</li> </ul> </li> </ul> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>Single-rotor hot-swap fans cannot be mixed with dual-rotor hot-swap fans.</li> <li>The redundant cooling by the fans in the server enables continued operation if one rotor of a fan fails.</li> <li>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.</li> </ul>

Power supplies				
The server supports up to two hot-swap power supplies for redundancy.				
Power supply	100–127 V ac	200–240 V ac	240 V dc	-48 V dc
750W Platinum	√	√	√	
750W Titanium		√	√	
1100W Platinum	√	√	√	
1100W Titanium		√	√	
1800W Platinum		√	√	
1800W Titanium		√	√	
2400W Platinum		√	√	
2600W Titanium		√	√	
1100W -48V DC				√
<p><b>CAUTION:</b></p> <ul style="list-style-type: none"> <li><b>240 V dc input (input range: 180-300 V dc) is supported in Chinese Mainland ONLY.</b></li> <li><b>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.</b></li> </ul>				



## Operating systems

Supported and certified operating systems:

- Microsoft Windows Server
- Microsoft Windows
- Red Hat Enterprise Linux
- SUSE Linux Enterprise Server
- VMware ESXi
- Canonical Ubuntu

References:

- Complete list of available operating systems: <https://lenovopress.com/osig>.
- OS deployment instructions: “[Deploy the operating system](#)” on page 697.

**Notes:** VMware ESXi does not support the following SSDs:

- ThinkSystem 2.5 U.3 6500 ION 30.72TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
- ThinkSystem 2.5" U.2 P5336 7.68TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
- ThinkSystem 2.5" U.2 P5336 15.36TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
- ThinkSystem 2.5" U.2 P5336 30.72TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
- ThinkSystem 2.5" U.2 P5336 61.44TB Read Intensive NVMe PCIe 4.0 x4 HS SSD

## Minimal configuration for debugging

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

## 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
<ul style="list-style-type: none"><li>• Form factor: 2U</li><li>• Height: 86.5 mm (3.4 inches)</li><li>• Width:<ul style="list-style-type: none"><li>– With rack latches: 482.0 mm (19.0 inches)</li><li>– Without rack latches: 444.6 mm (17.5 inches)</li></ul></li><li>• Depth: 763.7 mm (30.1 inches)</li></ul> <p><b>Note:</b> The depth is measured with rack latches installed, but without the security bezel installed.</p>
Weight
Up to 39 kg (86 lb), depending on the server configuration

## 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.

### Acoustical noise emissions

Acoustical noise emissions			
The server has the following acoustic noise emissions declaration.			
Configuration	Typical	Storage	GPU
<b>Sound power levels (L<sub>WAd</sub>)</b>	<ul style="list-style-type: none"> <li>Idling: 5.6 Bel</li> <li>Operating: 5.6 Bel</li> </ul>	<ul style="list-style-type: none"> <li>Idling: 7.3 Bel</li> <li>Operating: 7.3 Bel</li> </ul>	<ul style="list-style-type: none"> <li>Idling: 7.3 Bel</li> <li>Operating: 8.9 Bel</li> </ul>
<b>Sound pressure level (L<sub>pAm</sub>)</b>	<ul style="list-style-type: none"> <li>Idling: 41.5 dBA</li> <li>Operating: 41.5 dBA</li> </ul>	<ul style="list-style-type: none"> <li>Idling: 60.2 dBA</li> <li>Operating: 60.2 dBA</li> </ul>	<ul style="list-style-type: none"> <li>Idling: 60.2 dBA</li> <li>Operating: 74.1 dBA</li> </ul>
The declared sound levels are based on the following configurations, which may change depending on configurations or conditions.			
Component	Typical configuration	Storage configuration	GPU configuration
<b>Chassis (2U)</b>	8 x 2.5-inch front drive bays	12 x 3.5-inch front drive bays	16 x 2.5-inch front drive bays
<b>Fan</b>	6 x standard fans	6 x high performance fans	6 x high performance fans
<b>Processor</b>	2 x 205 W CPUs	2 x 205 W CPUs	2 x 205 W CPUs
<b>Memory</b>	8 x 64 GB RDIMMs	16 x 64 GB RDIMMs	32 x 64 GB RDIMMs
<b>Drive</b>	8 x 2.4 TB SAS HDDs	20 x 14 TB SAS HDDs	16 x 2.4 TB SAS HDDs
<b>RAID adapter</b>	1 x RAID 940-8i	1 x RAID 940-32i	1 x RAID 940-16i
<b>OCP adapter</b>	1 x Intel X710-T2L 10GBASE-T 2-port OCP		
<b>Power supply</b>	2 x 750 W PSUs	2 x 1100 W PSUs	2 x 1800 W PSUs
<b>GPU adapter</b>	None	None	3 x A100
<b>Notes:</b> <ul style="list-style-type: none"> <li>These sound levels were measured in controlled acoustical environments according to procedures specified by ISO7779 and are reported in accordance with ISO 9296.</li> <li>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.</li> </ul>			

## Environment

### Environment

ThinkSystem SR650 V3 complies with ASHRAE Class A2 specifications with most configurations, and depending on the hardware configuration, also complies with ASHRAE Class A3 and Class A4 specifications. System performance may be impacted when the operating temperature is outside ASHRAE A2 specification.

Depending on the hardware configuration, SR650 V3 server also complies with ASHRAE Class H1 specification. System performance may be impacted when the operating temperature is outside ASHRAE H1 specification.

The restrictions to ASHRAE support are as follows (cooling by air):

- The ambient temperature must be limited to 35°C or lower if the server has any of the following components:
  - Broadcom 57416 10GBASE-T 2-port OCP
  - Broadcom 57454 10GBASE-T 4-port OCP
  - PCIe network interface card (NIC) at a rate greater than or equal to 100 GB
  - Part with AOC and at the rate of 40 GB
- The ambient temperature must be limited to 30°C or lower if the server has any of the following components:
  - 24 x 2.5" or 12 x 3.5" front bay with middle bay or rear bay
  - GPU adapters
  - 256 GB 3DS RDIMM
  - 350 W processor
  - part with AOC and at a rate greater than 40 GB
  - 5600 MHz RDIMMs with capacity greater than or equal to 96 GB
  - ThinkSystem 96GB TruDDR5 4800MHz (2Rx4) RDIMM
  - ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM v1
  - 4800 MHz 256 GB RDIMMs (except ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1)
- The ambient temperature must be limited to 25°C or lower if the server has any of the following components or configurations:
  - 350 W processor installed in the chassis with 24 x 2.5" or 12 x 3.5" front drives
  - 350 W processor installed in the 16 x 2.5" + FIO non-GPU configuration
  - processor (270 W <=TDP <= 300 W) installed in the chassis with middle or rear drives
  - GPU adapter installed in the chassis with 24 x 2.5" front drives
  - GPU adapter and processor with TDP rating greater than 300 W installed in the chassis with 16 x 2.5" or 8 x 3.5" front drives
  - drives larger than 3.84 TB installed in Gen 5 rear or middle NVMe drive bays
  - 36 NVMe configuration
  - 16 x 2.5" + FIO GPU configuration
  - ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1
  - ThinkSystem 96GB TruDDR5 4800MHz (2Rx4) RDIMM installed in the following configurations:
    - 12 x 3.5" configurations including processors with TDP less than or equal to 300 W
    - 12 x 3.5" + middle/rear drive bay configurations including processors with TDP less than or equal to 270 W
  - the following NVMe SSDs installed in the front 12 x 3.5" SAS/SATA + middle 8 x 2.5" NVMe or front 12 x 3.5" SAS/SATA + rear 4 x 2.5" NVMe configuration:
    - ThinkSystem 2.5" U.2 P5336 61.44TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
    - ThinkSystem 2.5" U.2 P5336 30.72TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
    - ThinkSystem 2.5" U.2 P5336 15.36TB Read Intensive NVMe PCIe 4.0 x4 HS SSD

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

- The ambient temperature must be limited to 35°C or lower if the server has any of the following components or configurations:
  - Broadcom 57416 10GBASE-T 2-port OCP
  - Broadcom 57454 10GBASE-T 4-port OCP
  - PCIe network interface card (NIC) at a rate greater than or equal to 100 GB
  - Part with AOC and at the rate of 40 GB
  - GPU adapters (< 300 W) installed in 8 x 3.5" or 16 x 2.5" configurations
  - 64 GB < DIMM < 256 GB
  - 8 x 2.5" GPU configuration
  - storage configuration without middle or rear NVMe backplane
- The ambient temperature must be limited to 30°C or lower if the server has any of the following components:

## Environment

- 256 GB 3DS RDIMM
- part with AOC and at a rate greater than 40 GB
- GPU adapters (>= 300 W) installed in 8 x 3.5" or 16 x 2.5" configurations
- three A40 GPU adapters installed in 24 x 2.5" configurations
- storage configuration with middle or rear NVMe backplane
- 5600 MHz RDIMMs with capacity greater than or equal to 96 GB
- ThinkSystem 96GB TruDDR5 4800MHz (2Rx4) RDIMM
- ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM v1
- 4800 MHz 256 GB RDIMMs (except ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1)
- The ambient temperature must be limited to 25°C or lower if the server has any of the following components:
  - three H800/H100 GPU adapters installed in 24 x 2.5" configurations
  - three H800/H100 GPU adapters installed in 16 x 2.5" + FIO configurations
  - ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1
  - the following NVMe SSDs installed in the front 12 x 3.5" SAS/SATA + middle 8 x 2.5" NVMe or front 12 x 3.5" SAS/SATA + rear 4 x 2.5" NVMe configuration:
    - ThinkSystem 2.5" U.2 P5336 61.44TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
    - ThinkSystem 2.5" U.2 P5336 30.72TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
    - ThinkSystem 2.5" U.2 P5336 15.36TB Read Intensive NVMe PCIe 4.0 x4 HS SSD

For detailed thermal information, see [“Thermal rules” on page 75](#).

**Note:** When the ambient temperature is greater than the supported max 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.

- **Air temperature:**
  - Operating:
    - ASHRAE class H1: 5°C to 25°C (41°F to 77°F)  
  
The maximum ambient temperature decreases by 1°C for every 500 m (1640 ft) increase in altitude above 900 m (2,953 ft)
    - ASHRAE 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)
    - ASHRAE class A3: 5°C to 40°C (41°F to 104°F)  
  
The maximum ambient temperature decreases by 1°C for every 175 m (574 ft) increase in altitude above 900 m (2,953 ft)
    - ASHRAE class A4: 5°C to 45°C (41°F to 113°F)  
  
The maximum ambient temperature decreases by 1°C for every 125 m (410 ft) increase in altitude above 900 m (2,953 ft)
  - Server off: -10°C to 60°C (14°F to 140°F)
  - Shipment/storage: -40°C to 70°C (-40°F to 158°F)
- **Maximum altitude:** 3,050 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: 20%–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/storage: 8% to 90%

## Water requirements

Water requirements	
ThinkSystem SR650 V3 is supported in the following environment:	
<ul style="list-style-type: none"><li>• Maximum pressure: 3 bars</li><li>• Water inlet temperature and flow rates:</li></ul>	
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.

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 71.04-1985<sup>1</sup>:</p> <ul style="list-style-type: none"> <li>The copper reactivity level shall be less than 200 Angstroms per month (<math>\text{\AA}/\text{month} \approx 0.0035 \mu\text{g}/\text{cm}^2\text{-hour weight gain}</math>).<sup>2</sup></li> <li>The silver reactivity level shall be less than 200 Angstroms per month (<math>\text{\AA}/\text{month} \approx 0.0035 \mu\text{g}/\text{cm}^2\text{-hour weight gain}</math>).<sup>3</sup></li> <li>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.</li> </ul>
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"> <li>The room air might be continuously filtered with MERV 8 filters.</li> <li>Air entering a data center might be filtered with MERV 11 or preferably MERV 13 filters.</li> </ul> <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"> <li>The deliquescent relative humidity of the particulate contamination should be more than 60% RH.<sup>4</sup></li> <li>Data centers must be free of zinc whiskers.<sup>5</sup></li> </ul>
<p><sup>1</sup> 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><sup>2</sup> The derivation of the equivalence between the rate of copper corrosion growth in the thickness of the corrosion product in <math>\text{\AA}/\text{month}</math> and the rate of weight gain assumes that <math>\text{Cu}_2\text{S}</math> and <math>\text{Cu}_2\text{O}</math> grow in equal proportions.</p> <p><sup>3</sup> The derivation of the equivalence between the rate of silver corrosion growth in the thickness of the corrosion product in <math>\text{\AA}/\text{month}</math> and the rate of weight gain assumes that <math>\text{Ag}_2\text{S}</math> is the only corrosion product.</p> <p><sup>4</sup> 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><sup>5</sup> 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>	

## 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><b>Interface</b></p> <ul style="list-style-type: none"> <li>• CLI application</li> <li>• Web GUI interface</li> <li>• Mobile application</li> <li>• Redfish API</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://pubs.lenovo.com/lxcc-overview/">https://pubs.lenovo.com/lxcc-overview/</a></p>
Lenovo XCC Logger Utility	<p>Application that reports the XCC events to local OS system log.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• CLI application</li> </ul> <p><b>Usage and downloads</b></p> <ul style="list-style-type: none"> <li>• <a href="https://pubs.lenovo.com/lxcc-logger-linux/">https://pubs.lenovo.com/lxcc-logger-linux/</a></li> <li>• <a href="https://pubs.lenovo.com/lxcc-logger-windows/">https://pubs.lenovo.com/lxcc-logger-windows/</a></li> </ul>
Lenovo XClarity Administrator	<p>Centralized interface for multi-server management.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• Web GUI interface</li> <li>• Mobile application</li> <li>• REST API</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://pubs.lenovo.com/lxca/">https://pubs.lenovo.com/lxca/</a></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><b>Interface</b></p> <ul style="list-style-type: none"> <li>• <b>OneCLI:</b> CLI application</li> <li>• <b>Bootable Media Creator:</b> CLI application, GUI application</li> <li>• <b>UpdateXpress:</b> GUI application</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://pubs.lenovo.com/lxce-overview/">https://pubs.lenovo.com/lxce-overview/</a></p>



Options	Description
Lenovo XClarity Provisioning Manager	<p>UEFI-based embedded GUI tool on a single server that can simplify management tasks.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• Web interface (BMC remote access)</li> <li>• GUI application</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://pubs.lenovo.com/lxpm-overview/">https://pubs.lenovo.com/lxpm-overview/</a></p> <p><b>Important:</b> 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 <a href="https://pubs.lenovo.com/lxpm-overview/">https://pubs.lenovo.com/lxpm-overview/</a>.</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><b>Interface</b></p> <ul style="list-style-type: none"> <li>• GUI application</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://pubs.lenovo.com/lxci-overview/">https://pubs.lenovo.com/lxci-overview/</a></p>
Lenovo XClarity Energy Manager	<p>Application that can manage and monitor server power and temperature.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• Web GUI Interface</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://datacentersupport.lenovo.com/solutions/Invo-lxem">https://datacentersupport.lenovo.com/solutions/Invo-lxem</a></p>
Lenovo Capacity Planner	<p>Application that supports power consumption planning for a server or rack.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• Web GUI Interface</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://datacentersupport.lenovo.com/solutions/Invo-lcp">https://datacentersupport.lenovo.com/solutions/Invo-lcp</a></p>

## Functions

Options		Functions						
		Multi-system mgmt	OS deployment	System configuration	Firmware updates <sup>1</sup>	Events/alert monitoring	Inventory/logs	Power mgmt
Lenovo XClarity Controller				√	√ <sup>2</sup>	√	√ <sup>4</sup>	
Lenovo XCC Logger Utility						√		
Lenovo XClarity Administrator		√	√	√	√ <sup>2</sup>	√	√ <sup>4</sup>	
Lenovo XClarity Essentials toolset	OneCLI	√		√	√ <sup>2</sup>	√	√	
	Bootable Media Creator			√	√ <sup>2</sup>		√ <sup>4</sup>	
	UpdateXpress			√	√ <sup>2</sup>			
Lenovo XClarity Provisioning Manager			√	√	√ <sup>3</sup>		√ <sup>5</sup>	
Lenovo XClarity Integrator		√	√ <sup>6</sup>	√	√	√	√	√ <sup>7</sup>
Lenovo XClarity Energy Manager		√				√		√
Lenovo Capacity Planner								√ <sup>8</sup>

### 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. The Lenovo XClarity Integrator deployment check for System Center Configuration Manager (SCCM) supports Windows operating system deployment.
7. Power management function is supported only by Lenovo XClarity Integrator for VMware vCenter.
8. 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.

### 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:

- “Front view with eight 2.5-inch front drive bays (model 1)” on page 19
- “Front view with eight 2.5-inch front drive bays (model 2)” on page 20
- “Front view with sixteen 2.5-inch front drive bays (model 1)” on page 20
- “Front view with sixteen 2.5-inch front drive bays (model 2)” on page 21
- “Front view with sixteen 2.5-inch front drive bays (model 3)” on page 21
- “Front view with twenty-four 2.5-inch front drive bays” on page 22
- “Front view with 2.5-inch front drive bays (backplane-less)” on page 22
- “Front view with eight 3.5-inch front drive bays” on page 22
- “Front view with twelve 3.5-inch front drive bays” on page 23
- “Front view with 3.5-inch front drive bays (backplane-less)” on page 23

#### Front view with eight 2.5-inch front drive bays (model 1)

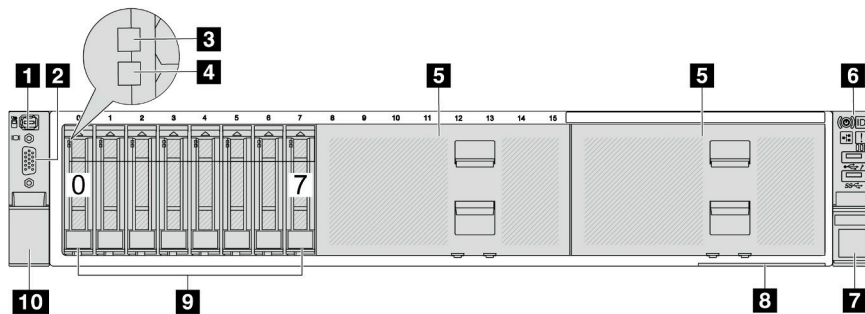


Table 2. Components on the front of the server

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 24	<b>2</b> “VGA connector (optional)” on page 25
<b>3</b> “Drive activity LED” on page 24	<b>4</b> “Drive status LED” on page 24
<b>5</b> “Drive bay fillers” on page 24	<b>6</b> “Front I/O module (on rack latch)” on page 25
<b>7</b> “Rack latch (right)” on page 25	<b>8</b> “Pull-out information tab” on page 25
<b>9</b> “Drive bays” on page 24	<b>10</b> “Rack latch (left)” on page 25

### Front view with eight 2.5-inch front drive bays (model 2)

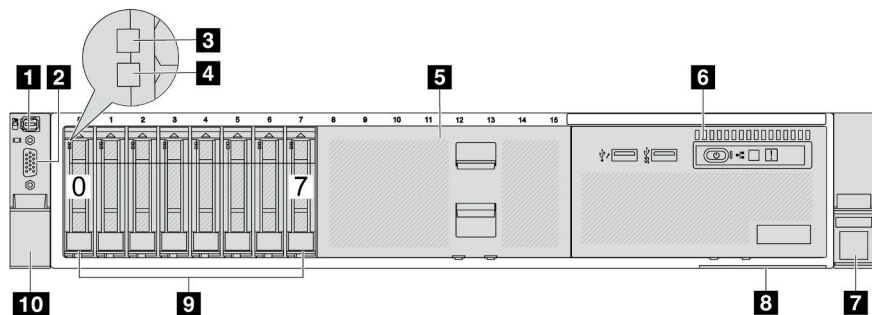


Table 3. Components on the front of the server

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 24	<b>2</b> “VGA connector (optional)” on page 25
<b>3</b> “Drive activity LED” on page 24	<b>4</b> “Drive status LED” on page 24
<b>5</b> “Drive bay filler” on page 24	<b>6</b> “Front I/O module (on media bay)” on page 25
<b>7</b> “Rack latch (right)” on page 25	<b>8</b> “Pull-out information tab” on page 25
<b>9</b> “Drive bays” on page 24	<b>10</b> “Rack latch (left)” on page 25

### Front view with sixteen 2.5-inch front drive bays (model 1)

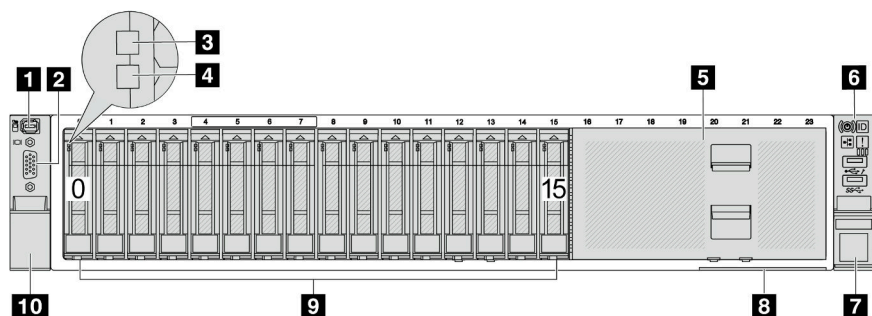


Table 4. Components on the front of server models

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 24	<b>2</b> “VGA connector (optional)” on page 25
<b>3</b> “Drive activity LED” on page 24	<b>4</b> “Drive status LED” on page 24
<b>5</b> “Drive bay filler” on page 24	<b>6</b> “Front I/O module (on rack latch)” on page 25
<b>7</b> “Rack latch (right)” on page 25	<b>8</b> “Pull-out information tab” on page 25
<b>9</b> “Drive bays” on page 24	<b>10</b> “Rack latch (left)” on page 25

### Front view with sixteen 2.5-inch front drive bays (model 2)

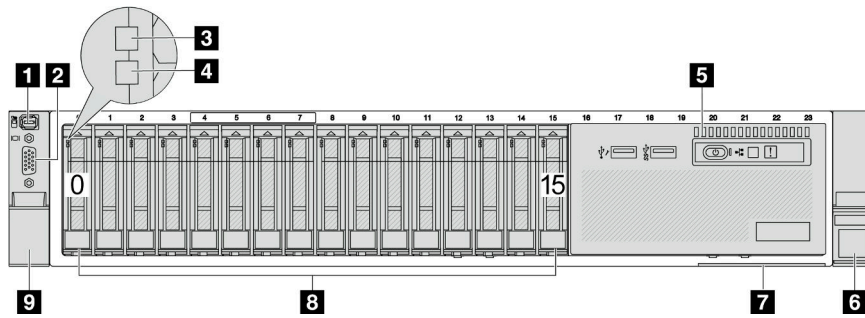


Table 5. Components on the front of the server

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 24	<b>2</b> “VGA connector (optional)” on page 25
<b>3</b> “Drive activity LED” on page 24	<b>4</b> “Drive status LED” on page 24
<b>5</b> “Front I/O module (on media bay)” on page 25	<b>6</b> “Rack latch (right)” on page 25
<b>7</b> “Pull-out information tab” on page 25	<b>8</b> “Drive bays” on page 24
<b>9</b> “Rack latch (left)” on page 25	

### Front view with sixteen 2.5-inch front drive bays (model 3)

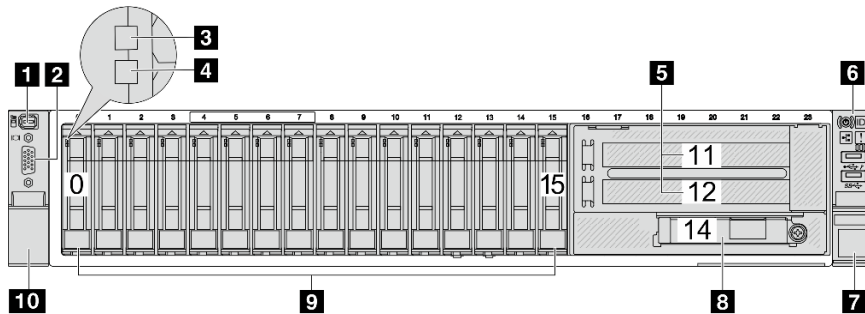


Table 6. Components on the front of server models

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 24	<b>2</b> “VGA connector (optional)” on page 25
<b>3</b> “Drive activity LED” on page 24	<b>4</b> “Drive status LED” on page 24
<b>5</b> “PCIe slots (x2)” on page 25	<b>6</b> “Front I/O module (on rack latch)” on page 25
<b>7</b> “Rack latch (right)” on page 25	<b>8</b> “Ethernet connectors on OCP module (optional)” on page 25
<b>9</b> “Drive bays” on page 24	<b>10</b> “Rack latch (left)” on page 25

## Front view with twenty-four 2.5-inch front drive bays

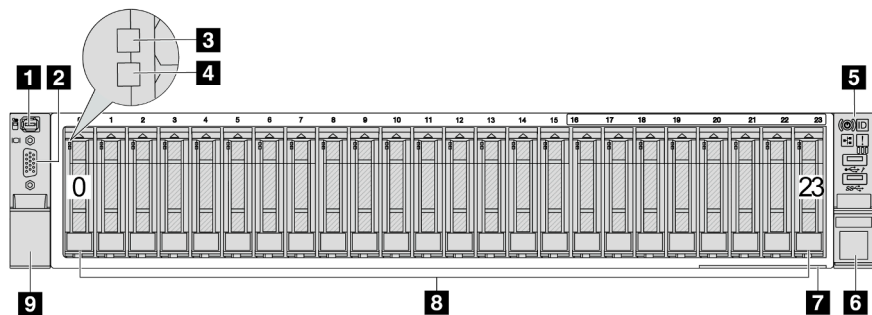


Table 7. Components on the front of server models

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 24	<b>2</b> “VGA connector (optional)” on page 25
<b>3</b> “Drive activity LED” on page 24	<b>4</b> “Drive status LED” on page 24
<b>5</b> “Front I/O module (on rack latch)” on page 25	<b>6</b> “Rack latch (right)” on page 25
<b>7</b> “Pull-out information tab” on page 25	<b>8</b> “Drive bays” on page 24
<b>9</b> “Rack latch (left)” on page 25	

## Front view with 2.5-inch front drive bays (backplane-less)

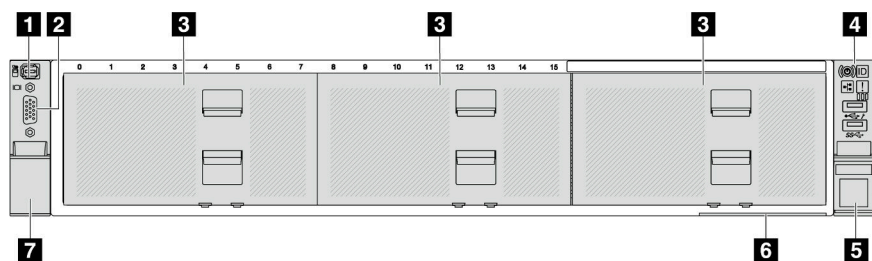


Table 8. Components on the front of server models

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 24	<b>2</b> “VGA connector (optional)” on page 25
<b>3</b> “Drive bay fillers” on page 24	<b>4</b> “Front I/O module (on rack latch)” on page 25
<b>5</b> “Rack latch (right)” on page 25	<b>6</b> “Pull-out information tab” on page 25
<b>7</b> “Rack latch (left)” on page 25	

## Front view with eight 3.5-inch front drive bays

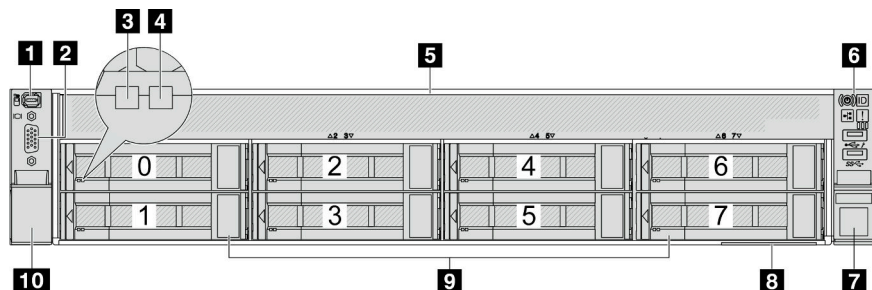


Table 9. Components on the front of server models

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 24	<b>2</b> “VGA connector (optional)” on page 25
<b>3</b> “Drive activity LED” on page 24	<b>4</b> “Drive status LED” on page 24
<b>5</b> “Drive bay filler” on page 24	<b>6</b> “Front I/O module (on rack latch)” on page 25
<b>7</b> “Rack latch (right)” on page 25	<b>8</b> “Pull-out information tab” on page 25
<b>9</b> “Drive bays” on page 24	<b>10</b> “Rack latch (left)” on page 25

Front view with twelve 3.5-inch front drive bays

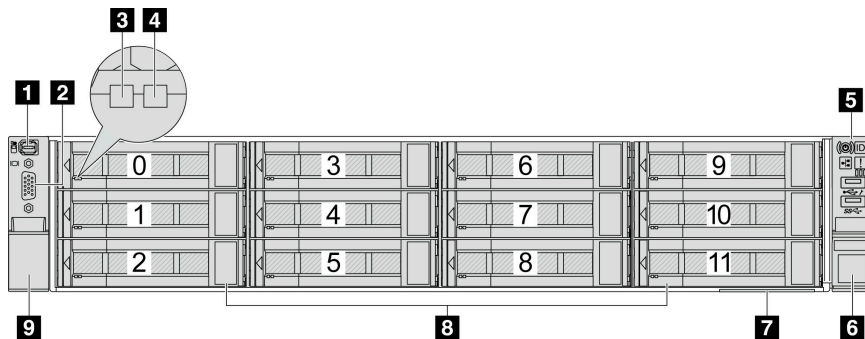


Table 10. Components on the front of server models

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 24	<b>2</b> “VGA connector (optional)” on page 25
<b>3</b> “Drive activity LED” on page 24	<b>4</b> “Drive status LED” on page 24
<b>5</b> “Front I/O module (on rack latch)” on page 25	<b>6</b> “Rack latch (right)” on page 25
<b>7</b> “Pull-out information tab” on page 25	<b>8</b> “Drive bays” on page 24
<b>9</b> “Rack latch (left)” on page 25	

Front view with 3.5-inch front drive bays (backplane-less)

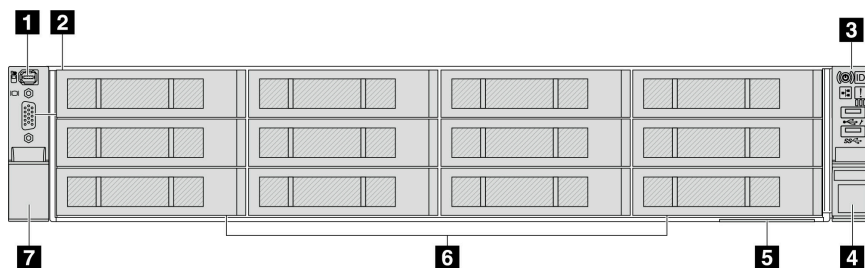


Table 11. Components on the front of server models

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 24	<b>2</b> “VGA connector (optional)” on page 25
<b>3</b> “Front I/O module (on rack latch)” on page 25	<b>4</b> “Rack latch (right)” on page 25

Table 11. Components on the front of server models (continued)

Callout	Callout
<b>5</b> “Pull-out information tab” on page 25	<b>6</b> “Drive bay fillers” on page 24
<b>7</b> “Rack latch (left)” on page 25	

## Front components overview

### 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.

### Drive bay filler

The drive bay filler is used to cover a vacant drive bay. The EMI integrity and cooling of the server are protected by having all drive bays occupied. The vacant drive bays must be occupied by drive bay fillers or drive fillers.

### Drive LEDs

Each hot-swap drive comes with an activity LED and status LED and the signals are controlled by the backplanes. Different colors and speeds indicate different activities or status of the drive. The following illustration shows the LEDs on a hard disk drive or solid-state drive.

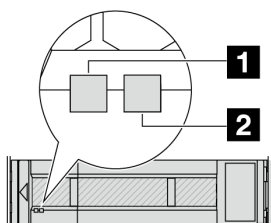


Figure 2. Drive LEDs

Drive LED	Status	Description
<b>1</b> Drive activity LED (left)	Solid green	The drive is powered but not active.
	Blinking green	The drive is active.
<b>2</b> 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 drive is being identified.

### External diagnostics connector

The connector is for connecting an External Diagnostics Handset. For more about its functions, see [“External diagnostics handset” on page 718](#)



## Front I/O module

The front IO module provides controls, connectors, and LEDs. The front I/O module varies by model. For more information, see [“Front I/O module” on page 26](#).

## PCIe slots

The PCIe slots are on the rear or front of the server, and your server supports up to 12 PCIe slots. For more information, see [“PCIe slots and PCIe adapters” on page 68](#).

## 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.

For more information, see [Set the network connection for the Lenovo XClarity Controller](#).

## Rack latch

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.

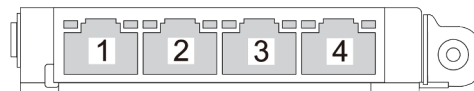
## VGA connector

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.

## Ethernet connectors



*Figure 3. OCP module (two connectors)*



*Figure 4. OCP module (four connectors)*

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

By default, one of the Ethernet connectors on the OCP module can also function as a management connector using the shared management capacity.

## Front I/O module

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

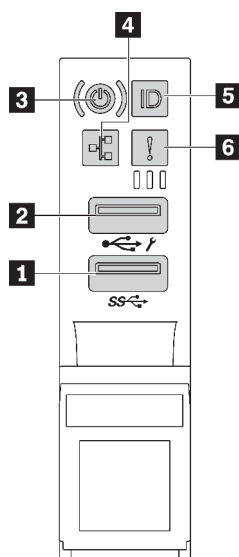


Figure 5. Front I/O module (on rack latch)

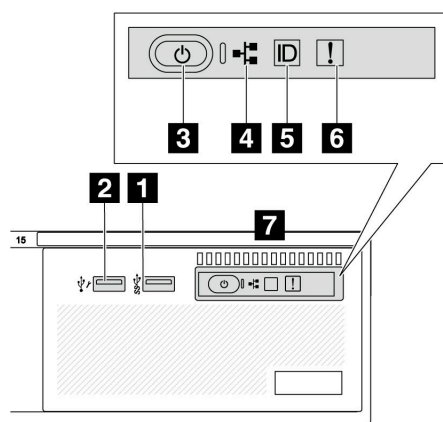


Figure 6. Front I/O module (on media bay)

Table 12. Components on the front I/O module

Callout	Callout
<b>1</b> USB 3 (5 Gbps) connector	<b>2</b> USB 2.0 connector with XClarity Controller management
<b>3</b> Power button with power status LED	<b>4</b> Network activity LED (for OCP module)
<b>5</b> System ID button with system ID LED	<b>6</b> System error LED
<b>7</b> Front operator panel	

### 1 USB 3 (5 Gbps) connector

The USB 3.2 Gen 1 (5 Gbps) connector can be used to attach a USB-compatible device, such as a USB keyboard, USB mouse, or USB storage device.

### 2 USB 2.0 connector with XClarity Controller management

Depending on the setting, this connector supports USB 2.0 function, XClarity Controller management function, or both. It is the only USB port that supports USB automation update of the firmware and RoT security module.

- If the connector is set for USB 2.0 function, it can be used to attach a USB-compatible device, such as a USB keyboard, USB mouse, or USB storage device.
- If the connector is set for XClarity Controller management function, it can 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](https://pubs.lenovo.com/lxca/lxca_usemobileapp)

- If the connector is set to have both functions, you can press the system ID button for three seconds to switch between the two functions.

### 3 Power button with power status LED

You can press this button to turn the server on and off manually. The power status LED helps you determine the current power status.

Status	Color	Description
Off	None	Power is not present, or the power supply has failed.
Fast blinking (about four flashes per second)	Green	<ul style="list-style-type: none"><li>• The server is off, but the XClarity Controller is initializing, and the server is not ready to be powered on.</li><li>• System-board-assembly power has failed.</li></ul>
Slow blinking (about one flash per second)	Green	The server is off and is ready to be powered on (standby state).
Solid on	Green	The server is on and running.

### 4 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	The server is disconnected from the network. <b>Note:</b> If the network activity LED is off when an OCP module is installed, check the network ports in the rear of your server to determine which port is disconnected.

### 5 System ID button with system ID LED

Use this system ID button and the blue system ID LED to visually locate the server. Each time you press the system ID button, the state of the system ID LED changes. The LED 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 LED 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.

## 6 System error LED

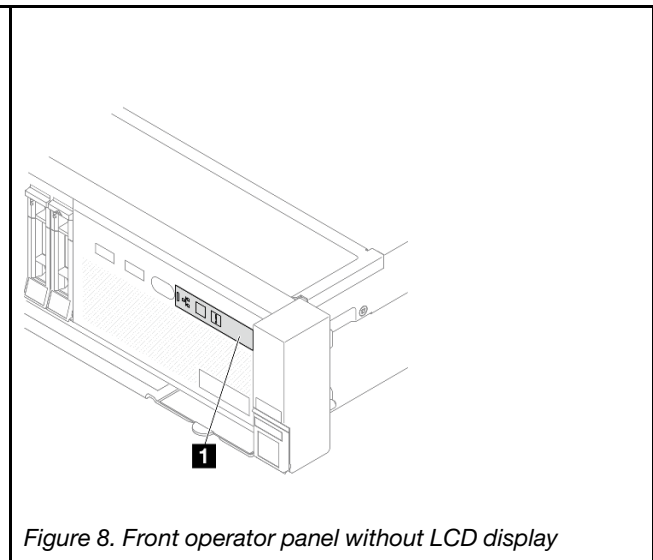
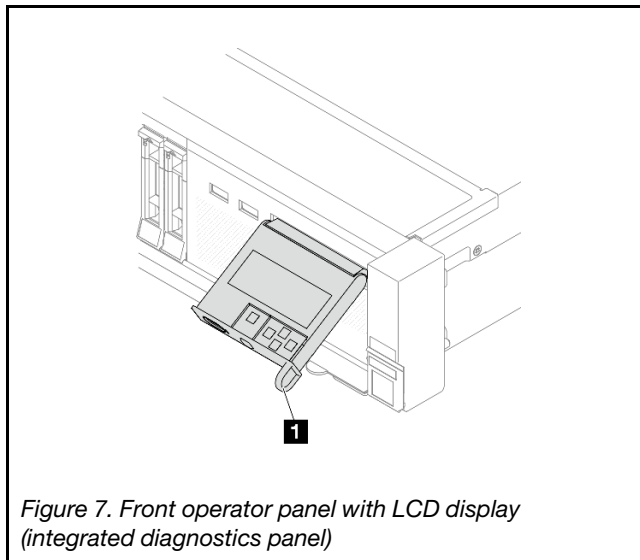
The system error LED provides basic diagnostic functions for your server. If the system error LED is lit, one or more LEDs elsewhere in the server might also be lit to direct you to the source of the error.

Status	Color	Description	Action
On	Yellow	An error has been detected on the server. Causes might include but are not limited to the following errors: <ul style="list-style-type: none"><li>• A fan failure</li><li>• A memory error</li><li>• A storage failure</li><li>• A PCIe device failure</li><li>• A power supply failure</li><li>• A processor error</li><li>• A system I/O board or processor board error</li></ul>	<ul style="list-style-type: none"><li>• Check the Lenovo XClarity Controller event log and the system event log to determine the exact cause of the error.</li><li>• Check if additional LEDs elsewhere in the server are also lit that will direct you to the source of the error. See <a href="#">“Troubleshooting by system LEDs and diagnostics display”</a> on page 711.</li><li>• Save the log if necessary.</li></ul>
Off	None	The server is off, or the server is on and is working correctly.	None.

## 7 Front operator panel

Depending on the server model, the server comes with the front operator panel with LCD display (called integrated diagnostics panel) or the front operator panel without LCD display.

The integrated diagnostics panel provides an LCD display to quickly access system information such as active errors, system status, firmware information, network information, and health information. For details, see [“Integrated diagnostics panel”](#) on page 713.



## Rear view

The rear of the server provides access to several connectors and components.

Refer to the following rear view for different server models:

- “Rear view with eight PCIe slots” on page 29
- “Rear view with ten PCIe slots” on page 29
- “Rear view with four 2.5-inch rear drive bays and six PCIe slots” on page 30
- “Rear view with eight 2.5-inch rear drive bays and four PCIe slots” on page 30
- “Rear view with two 3.5-inch rear drive bays and four PCIe slots” on page 31
- “Rear view with four 3.5-inch rear drive bays and two PCIe slots” on page 31
- “Rear view with seven PCIe slots and a DWCM” on page 32
- “Rear view with nine PCIe slots and a DWCM” on page 32
- “Rear view with four 2.5-inch rear drive bays, five PCIe slots, and a DWCM” on page 33
- “Rear view with eight 2.5-inch rear drive bays, three PCIe slots, and a DWCM” on page 33
- “Rear view with two 3.5-inch rear drive bays, three PCIe slots, and a DWCM” on page 34
- “Rear view with four 3.5-inch rear drive bays, one PCIe slot, and a DWCM” on page 34

### Rear view with eight PCIe slots

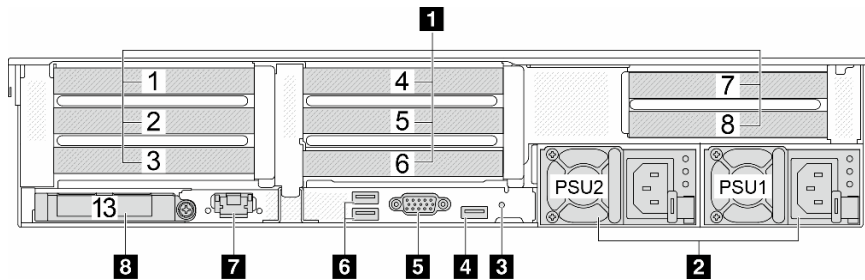


Table 13. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 35	<b>2</b> “Power supplies” on page 35
<b>3</b> “NMI button” on page 35	<b>4</b> “USB 3 (5 Gbps) connector” on page 35
<b>5</b> “VGA connector” on page 35	<b>6</b> “USB 3 (5 Gbps) connectors” on page 35
<b>7</b> “XCC system management port” on page 35	<b>8</b> “Ethernet connectors on OCP module (optional)” on page 36

### Rear view with ten PCIe slots

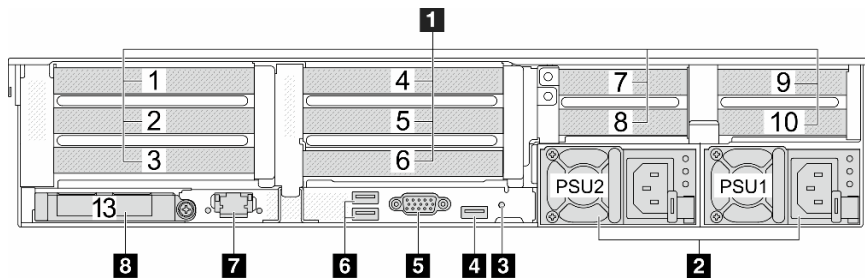


Table 14. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 35	<b>2</b> “Power supplies” on page 35
<b>3</b> “NMI button” on page 35	<b>4</b> “USB 3 (5 Gbps) connector” on page 35
<b>5</b> “VGA connector” on page 35	<b>6</b> “USB 3 (5 Gbps) connectors” on page 35
<b>7</b> “XCC system management port” on page 35	<b>8</b> “Ethernet connectors on OCP module (optional)” on page 36

Rear view with four 2.5-inch rear drive bays and six PCIe slots

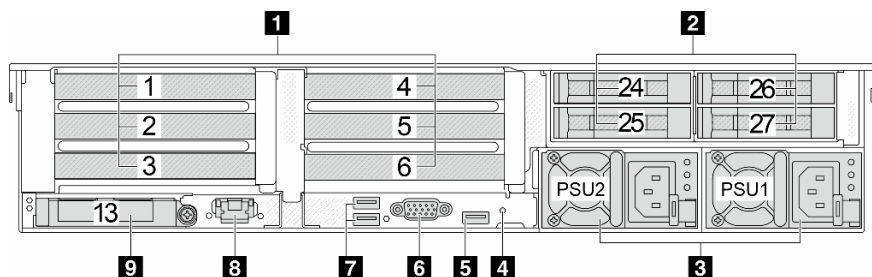


Table 15. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 35	<b>2</b> “Rear 2.5-inch drive bays (4)” on page 35
<b>3</b> “Power supplies” on page 35	<b>4</b> “NMI button” on page 35
<b>5</b> “USB 3 (5 Gbps) connector” on page 35	<b>6</b> “VGA connector” on page 35
<b>7</b> “USB 3 (5 Gbps) connector” on page 35	<b>8</b> “XCC system management port” on page 35
<b>9</b> “Ethernet connectors on OCP module (optional)” on page 36	

Rear view with eight 2.5-inch rear drive bays and four PCIe slots

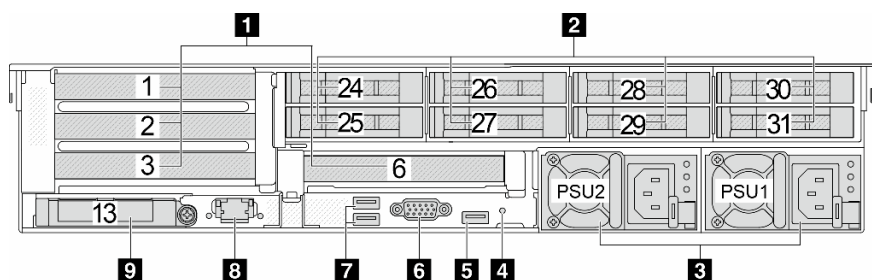


Table 16. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 35	<b>2</b> “Rear 2.5-inch drive bays (8)” on page 35
<b>3</b> “Power supplies” on page 35	<b>4</b> “NMI button” on page 35
<b>5</b> “USB 3 (5 Gbps) connector” on page 35	<b>6</b> “VGA connector” on page 35

Table 16. Components on the rear of the server (continued)

Callout	Callout
<b>7</b> “USB 3 (5 Gbps) connector” on page 35	<b>8</b> “XCC system management port” on page 35
<b>9</b> “Ethernet connectors on OCP module (optional)” on page 36	

**Rear view with two 3.5-inch rear drive bays and four PCIe slots**

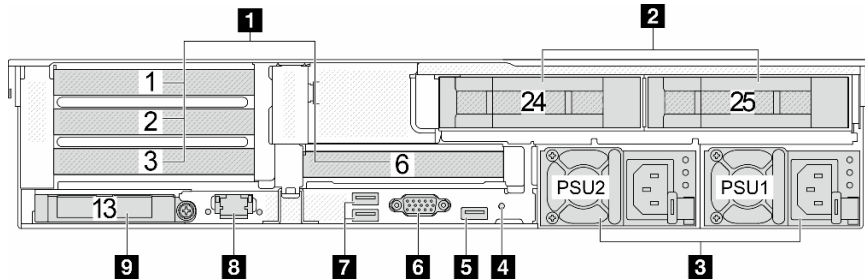


Table 17. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 35	<b>2</b> “Rear 3.5-inch drive bays (2)” on page 35
<b>3</b> “Power supplies” on page 35	<b>4</b> “NMI button” on page 35
<b>5</b> “USB 3 (5 Gbps) connector” on page 35	<b>6</b> “VGA connector” on page 35
<b>7</b> “USB 3 (5 Gbps) connector” on page 35	<b>8</b> “XCC system management port” on page 35
<b>9</b> “Ethernet connectors on OCP module (optional)” on page 36	

**Rear view with four 3.5-inch rear drive bays and two PCIe slots**

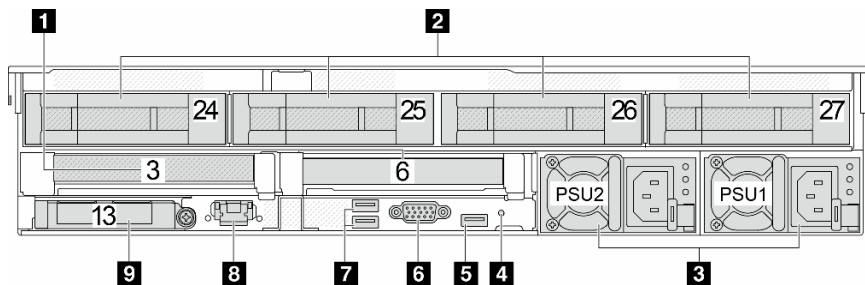


Table 18. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 35	<b>2</b> “Rear 3.5-inch drive bays (4)” on page 35
<b>3</b> “Power supplies” on page 35	<b>4</b> “NMI button” on page 35
<b>5</b> “USB 3 (5 Gbps) connector” on page 35	<b>6</b> “VGA connector” on page 35
<b>7</b> “USB 3 (5 Gbps) connector” on page 35	<b>8</b> “XCC system management port” on page 35
<b>9</b> “Ethernet connectors on OCP module (optional)” on page 36	

## Rear view with seven PCIe slots and a DWCM

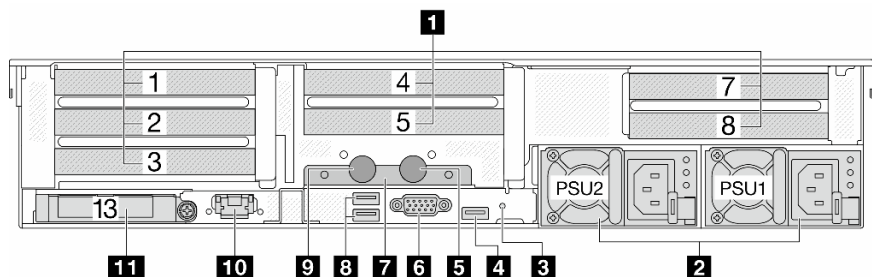


Table 19. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 35	<b>2</b> “Power supplies” on page 35
<b>3</b> “NMI button” on page 35	<b>4</b> “USB 3 (5 Gbps) connector” on page 35
<b>5</b> Outlet hose	<b>6</b> “VGA connector” on page 35
<b>7</b> Hose holder	<b>8</b> “USB 3 (5 Gbps) connectors” on page 35
<b>9</b> Inlet hose	<b>10</b> “XCC system management port” on page 35
<b>11</b> “Ethernet connectors on OCP module (optional)” on page 36	

## Rear view with nine PCIe slots and a DWCM

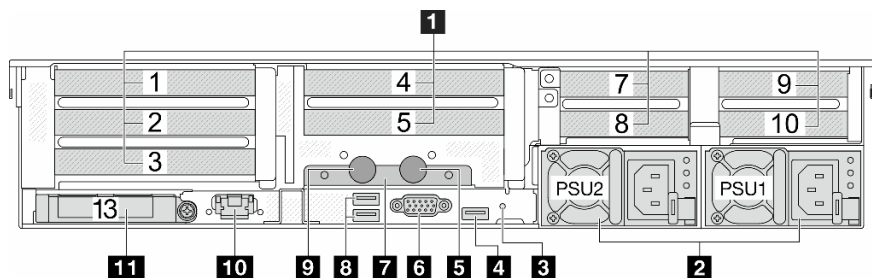


Table 20. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 35	<b>2</b> “Power supplies” on page 35
<b>3</b> “NMI button” on page 35	<b>4</b> “USB 3 (5 Gbps) connector” on page 35
<b>5</b> Outlet hose	<b>6</b> “VGA connector” on page 35
<b>7</b> Hose holder	<b>8</b> “USB 3 (5 Gbps) connectors” on page 35
<b>9</b> Inlet hose	<b>10</b> “XCC system management port” on page 35
<b>11</b> “Ethernet connectors on OCP module (optional)” on page 36	



### Rear view with four 2.5-inch rear drive bays, five PCIe slots, and a DWCM

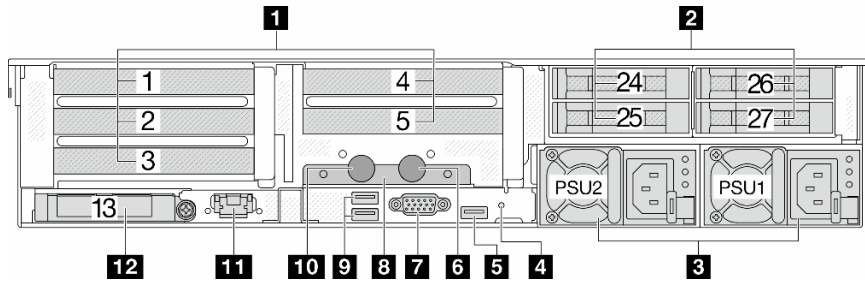


Table 21. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 35	<b>2</b> “Rear 2.5-inch drive bays (4)” on page 35
<b>3</b> “Power supplies” on page 35	<b>4</b> “NMI button” on page 35
<b>5</b> “USB 3 (5 Gbps) connector” on page 35	<b>6</b> Outlet hose
<b>7</b> “VGA connector” on page 35	<b>8</b> Hose holder
<b>9</b> “USB 3 (5 Gbps) connectors” on page 35	<b>10</b> Inlet hose
<b>11</b> “XCC system management port” on page 35	<b>12</b> “Ethernet connectors on OCP module (optional)” on page 36

### Rear view with eight 2.5-inch rear drive bays, three PCIe slots, and a DWCM

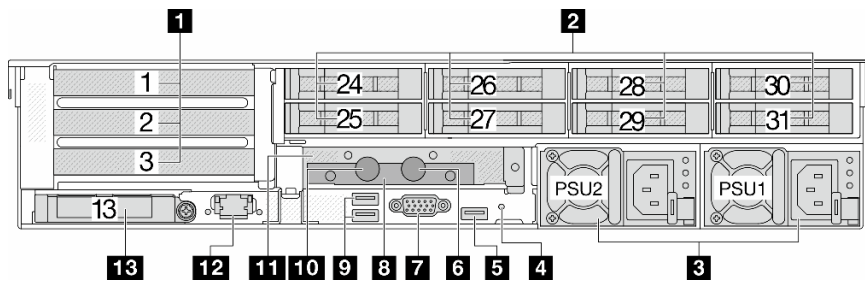


Table 22. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 35	<b>2</b> “Rear 2.5-inch drive bays (8)” on page 35
<b>3</b> “Power supplies” on page 35	<b>4</b> “NMI button” on page 35
<b>5</b> “USB 3 (5 Gbps) connector” on page 35	<b>6</b> Outlet hose
<b>7</b> “VGA connector” on page 35	<b>8</b> Hose holder
<b>9</b> “USB 3 (5 Gbps) connectors” on page 35	<b>10</b> Inlet hose
<b>11</b> 1FH riser cage for DWCM	<b>12</b> “XCC system management port” on page 35
<b>13</b> “Ethernet connectors on OCP module (optional)” on page 36	

## Rear view with two 3.5-inch rear drive bays, three PCIe slots, and a DWCM

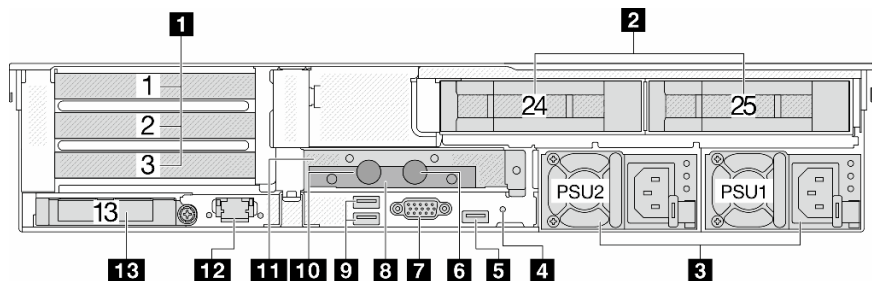


Table 23. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 35	<b>2</b> “Rear 3.5-inch drive bays (2)” on page 35
<b>3</b> “Power supplies” on page 35	<b>4</b> “NMI button” on page 35
<b>5</b> “USB 3 (5 Gbps) connector” on page 35	<b>6</b> Outlet hose
<b>7</b> “VGA connector” on page 35	<b>8</b> Hose holder
<b>9</b> “USB 3 (5 Gbps) connectors” on page 35	<b>10</b> Inlet hose
<b>11</b> 1FH riser cage for DWCM	<b>12</b> “XCC system management port” on page 35
<b>13</b> “Ethernet connectors on OCP module (optional)” on page 36	

## Rear view with four 3.5-inch rear drive bays, one PCIe slot, and a DWCM

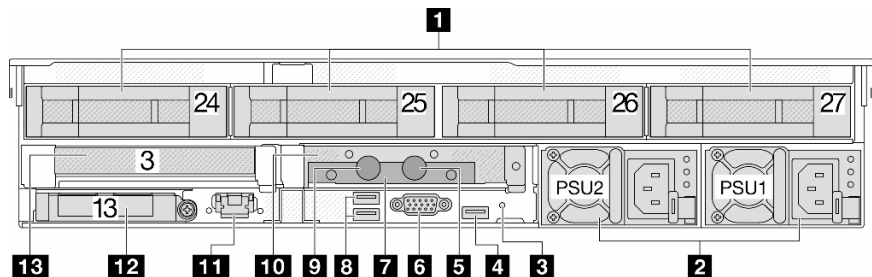


Table 24. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 35	<b>2</b> “Rear 3.5-inch drive bays (4)” on page 35
<b>3</b> “Power supplies” on page 35	<b>4</b> “NMI button” on page 35
<b>5</b> “USB 3 (5 Gbps) connector” on page 35	<b>6</b> Outlet hose
<b>7</b> “VGA connector” on page 35	<b>8</b> Hose holder
<b>9</b> “USB 3 (5 Gbps) connectors” on page 35	<b>10</b> Inlet hose
<b>11</b> 1FH riser cage for DWCM	<b>12</b> “XCC system management port” on page 35
<b>13</b> “Ethernet connectors on OCP module (optional)” on page 36	

## Rear components overview

### PCIe slots

The PCIe slots are on the rear or front of the server, and your server supports up to 12 PCIe slots. For more information, see [“PCIe slots and PCIe adapters” on page 68](#).

### 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.

### Power supplies

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 [“Power supply LEDs” on page 725](#).

### NMI button

Use this button only when you are directed to do so by Lenovo Support. 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.

### USB 3 (5 Gbps) connectors

The USB 3.2 Gen 1 (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

The server has a 1 Gb RJ-45 connector dedicated to Lenovo XClarity Controller (XCC) functions. Through the system management port, you can access the Lenovo XClarity Controller directly by connecting your laptop to the management port using an Ethernet cable. Make sure that you modify the IP settings on the laptop so that it is on the same network as the server default settings. A dedicated management network provides additional security by physically separating the management network traffic from the production network.

For more information, see:

- [Set the network connection for the Lenovo XClarity Controller](#)
- [“XCC system management port LEDs” on page 725](#)

## Ethernet connectors

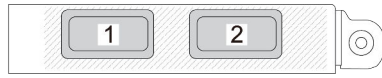


Figure 9. OCP module (two connectors)

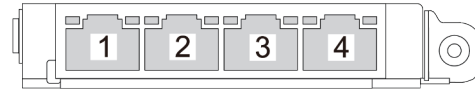


Figure 10. OCP module (four connectors)

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

By default, one of the Ethernet connectors on the OCP module can also function as a management connector using the shared management capacity.

## Inlet and outlet hoses

The Direct Water Cooling Module (DWCM) spreads two hoses out to connect to the manifolds. The inlet hose conveys warm water from the facility to the cold plates to cool down the processors, and the outlet hose conducts hot water out of the DWCM to realize system cooling.

## Top view

This section contains information on the top view of the server with standard heat sinks or a direct water cooling module (DWCM).

### Notes:

- The following illustrations show the top view of the server without any air baffle, middle cage, or rear cage installed.
- The following illustrations show the server rear configuration with three riser assemblies. The server rear configurations vary by server model. For details, see [“Rear view” on page 29](#).

### Top view with standard heat sinks

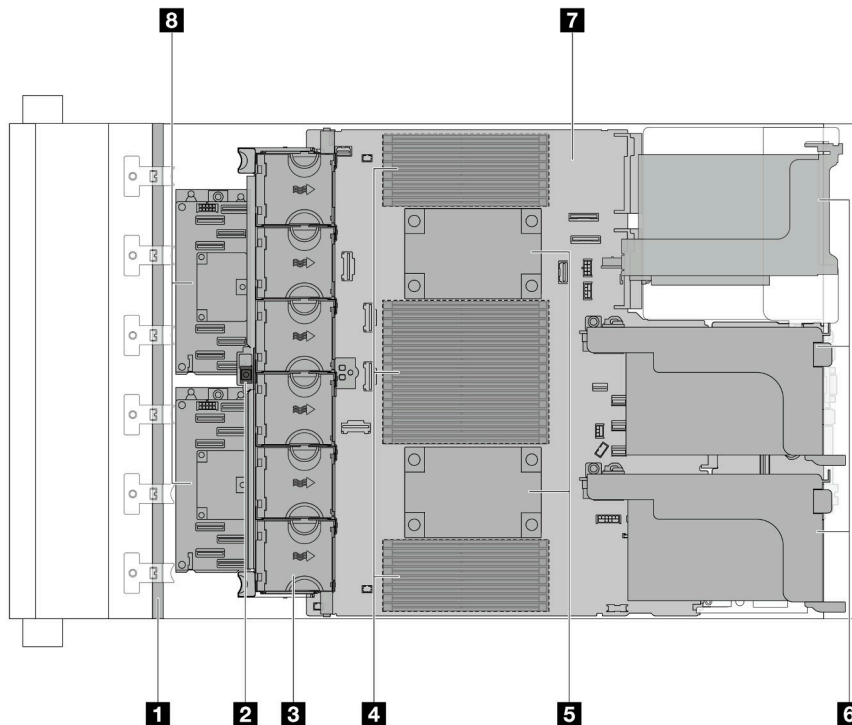


Figure 11. Top view with standard heat sinks

Table 25. Component identification (top view with standard heat sinks)

<b>1</b> Front backplane(s)	<b>2</b> Intrusion switch
<b>3</b> System fans	<b>4</b> Memory modules
<b>5</b> Processor and heat sink modules (PHM)	<b>6</b> Riser assemblies
<b>7</b> System board assembly	<b>8</b> CFF RAID adapter/expander

**Note:** The illustration shows the server with CFF adapters which are available only in the 2.5-inch chassis. In some configurations, there might be installed with a RAID flash power module. For details, see [Table 38 “Location of RAID flash power modules” on page 290](#).

## Top view with DWCM

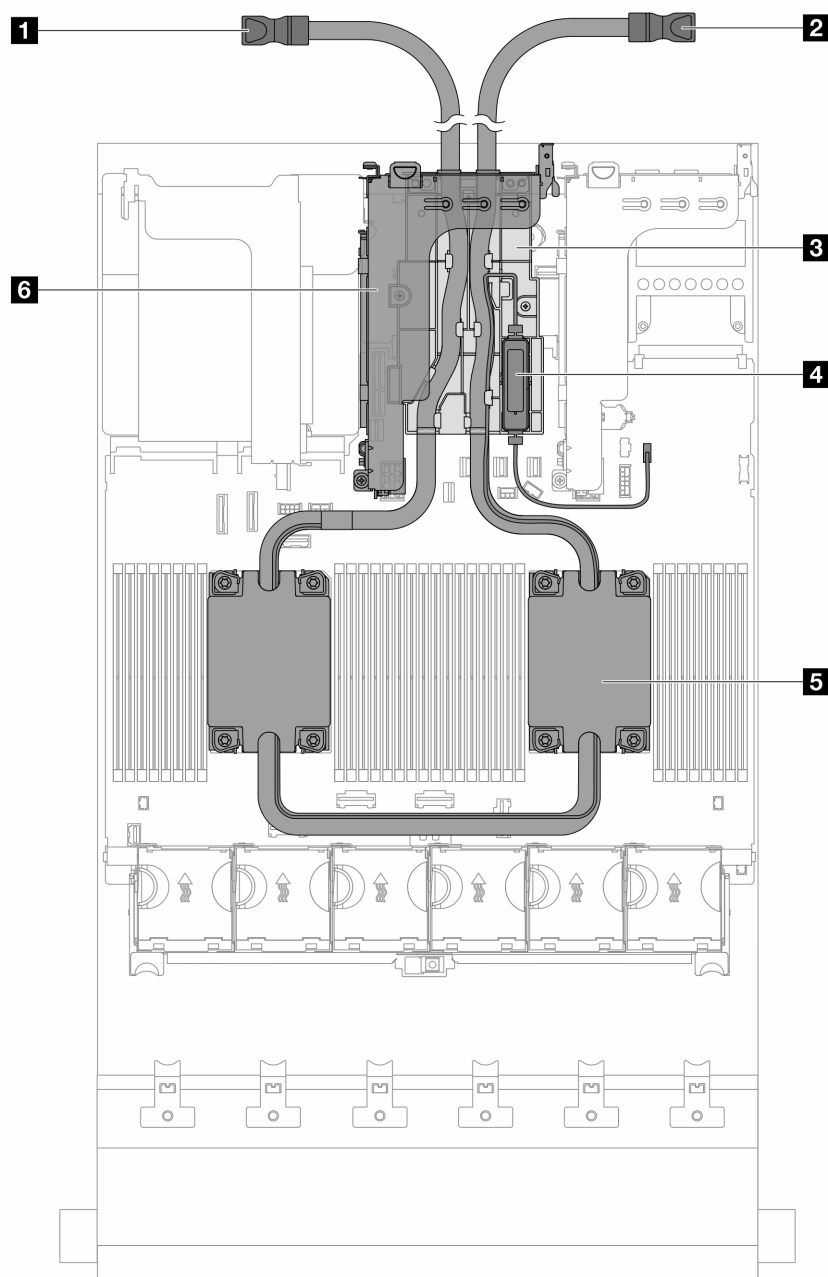


Figure 12. Top view with DWCM

Table 26. Components identification (top view of DWCM)

<b>1</b> Outlet hose	<b>2</b> Inlet hose
<b>3</b> Hose holder	<b>4</b> Liquid detection sensor module
<b>5</b> Cold plate assembly	<b>6</b> Riser cage for DWCM

## System-board-assembly layout

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

The following illustration shows the layout of the system board assembly which contains the firmware and RoT security module, system I/O board, and processor board.

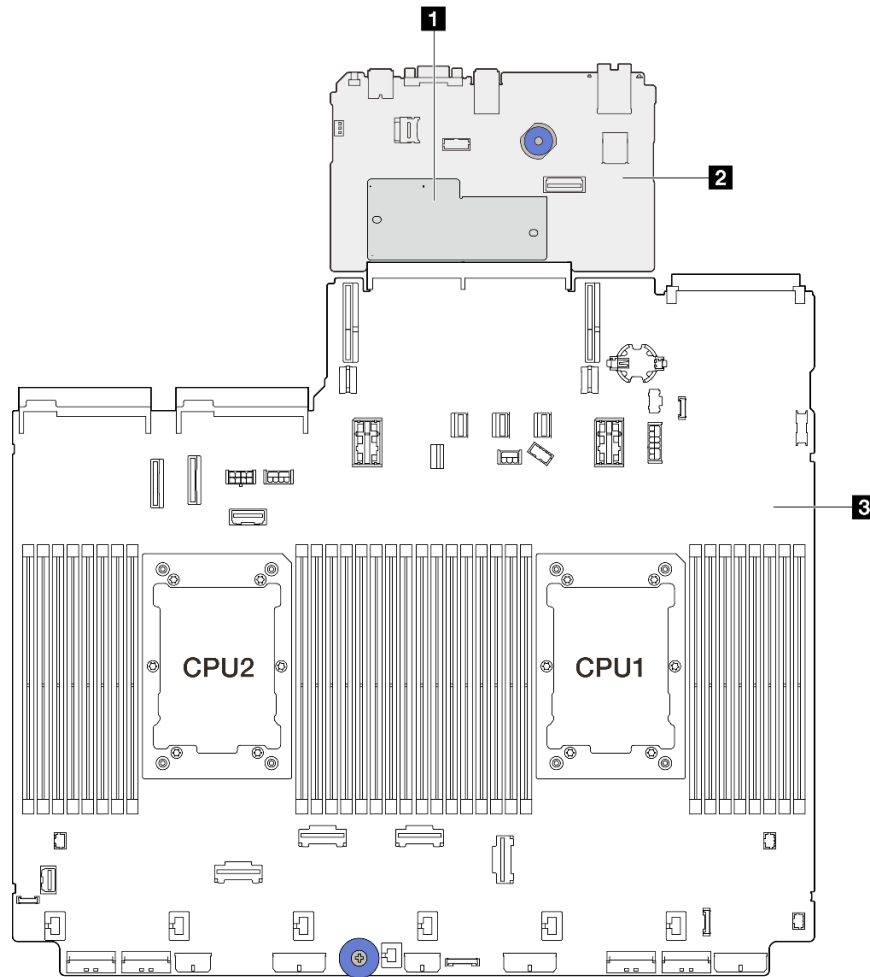


Figure 13. System-board-assembly layout

<b>1</b> Firmware and RoT security module	<b>2</b> System I/O board	<b>3</b> Processor board
---	---------------------------	--------------------------

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

- [“System-board-assembly connectors” on page 40](#)
- [“System-board-assembly switches” on page 41](#)
- [“System-board-assembly LEDs” on page 726](#)
- [“LEDs on the firmware and RoT security module” on page 729](#)

## System-board-assembly connectors

The following illustration shows the internal connectors on the system board assembly which contains the system I/O board and processor board.

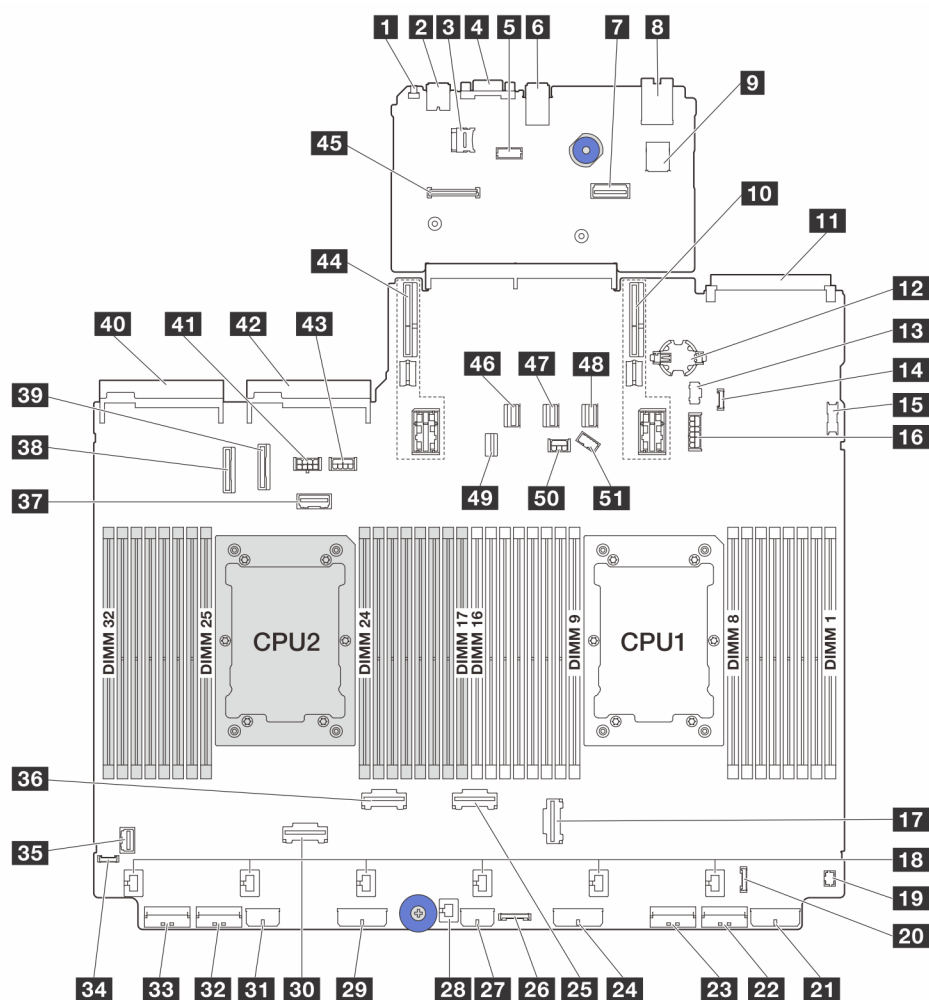


Figure 14. System-board-assembly connectors

<b>1</b> NMI button	<b>2</b> Rear USB connector
<b>3</b> MicroSD socket	<b>4</b> VGA connector
<b>5</b> Serial port connector	<b>6</b> Rear USB connectors
<b>7</b> Second management Ethernet connector	<b>8</b> XCC system management port
<b>9</b> Internal USB connector	<b>10</b> Riser 1 slot
<b>11</b> OCP 3.0 slot	<b>12</b> CMOS battery (CR2032)
<b>13</b> M.2 power connector	<b>14</b> Leak detection connector
<b>15</b> Front USB connector	<b>16</b> 7mm backplane power connector
<b>17</b> PCIe connector 3	<b>18</b> Fan connectors
<b>19</b> Front I/O connector (for Y cable)	<b>20</b> Front I/O connector



<b>21</b> Backplane 3 power connector	<b>22</b> PCIe connector 1
<b>23</b> PCIe connector 2	<b>24</b> Backplane 2 power connector
<b>25</b> PCIe connector 4	<b>26</b> CFF Retimer connector
<b>27</b> CFF expander power connector	<b>28</b> Intrusion switch connector
<b>29</b> Backplane 1 power connector	<b>30</b> PCIe connector 6
<b>31</b> CFF RAID/HBA power connector	<b>32</b> PCIe connector 7
<b>33</b> PCIe connector 8	<b>34</b> External diagnostics connector
<b>35</b> Front VGA connector	<b>36</b> PCIe connector 5
<b>37</b> Riser 3 sideband connector	<b>38</b> PCIe connector 9
<b>39</b> PCIe connector 10	<b>40</b> Power supply 1 connector
<b>41</b> Riser 3 power connector	<b>42</b> Power supply 2 connector
<b>43</b> GPU power connector	<b>44</b> Riser 2 slot
<b>45</b> Firmware and RoT security module connector	<b>46</b> SATA connector 0
<b>47</b> SATA connector 1	<b>48</b> SATA connector 2
<b>49</b> M.2/7mm backplane signal connector	<b>50</b> Backplane power connector
<b>51</b> Backplane sideband connector	

#### Notes:

- The front I/O module on rack latch is connected to connector **20**. See [“Front I/O connectors” on page 394](#).
- The front I/O module on media bay with an integrated diagnostics panel (an LCD diagnostics display) is connected to connector **20**. See [“Front I/O connectors” on page 394](#).
- The front I/O module on media bay without LCD diagnostics display is connected to connectors **19** and **20** using a Y cable. See [“Front I/O connectors” on page 394](#).

## System-board-assembly switches

The following illustrates locations and functions of the switch block on the on the system board assembly which contains the system I/O board and processor board.

#### Important:

1. 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/](https://pubs.lenovo.com/safety_documentation/)
  - [“Installation Guidelines” on page 57](#)
  - [“Handling static-sensitive devices” on page 60](#)
  - [“Power off the server” on page 88](#)
2. Any system-board switch or jumper block that is not shown in the illustrations in this document are reserved.

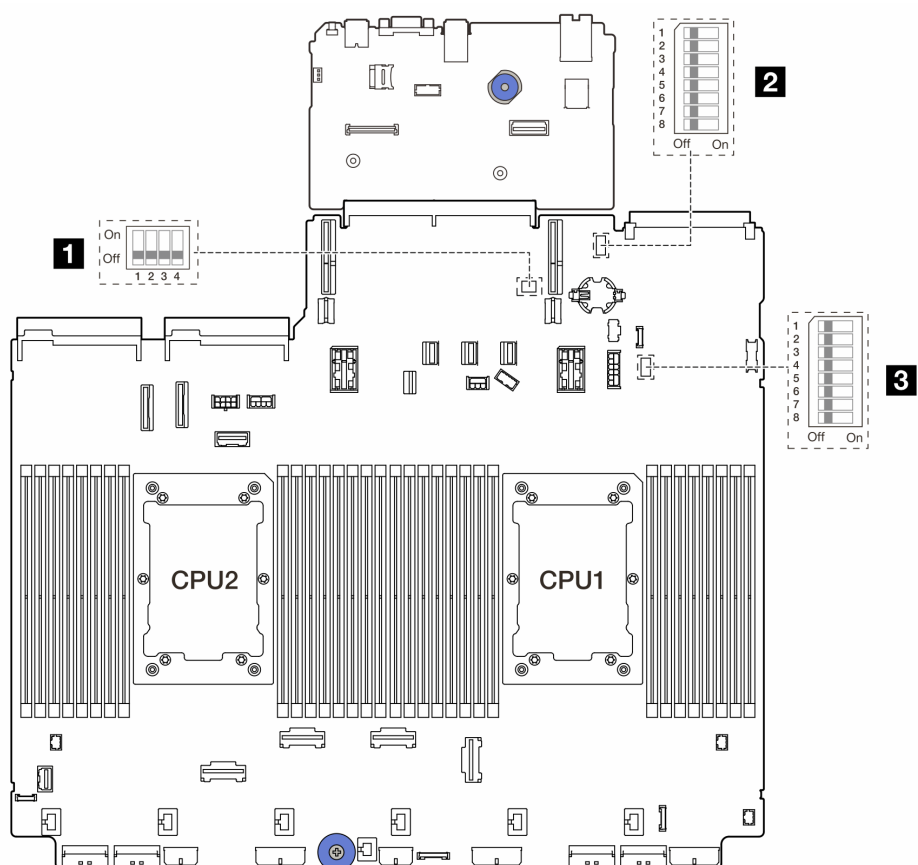
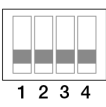


Figure 15. System-board-assembly switch blocks

<b>1</b> SW2	<b>2</b> SW6	<b>3</b> SW7
--------------	--------------	--------------


## SW2 switch block

Table 27. SW2 switch block

Switch block	Switch number	Switch name	Default position	Description
On Off 	SW2-1	FPGA reset	OFF	Forces FPGA into reset when changing it to the ON position.
	SW2-2	Force BMC CPU reset	OFF	Forces BMC and CPU into reset when changing it to the ON position.
	SW2-3	Reserved	OFF	Reserved
	SW2-4	BIOS image swap	OFF	Enables BIOS image swap when changing it to the ON position.


## SW6 switch block

Table 28. SW6 switch block

Switch block	Switch number	Switch name	Default position	Description
	SW6-1	ME security override	OFF	Disables ME Security checks when changing it to the ON position.
	SW6-2	Clear CMOS	OFF	Clears the real-time clock (RTC) registry when changing it to the ON position.
	SW6-3	Password override	OFF	Overrides the power-on password when changing it to the ON position.
	SW6-4	ME recovery	OFF	Boots ME into recovery mode when changing it to the ON position.
	SW6-5	BIOS recovery	OFF	Boots BIOS into recovery mode when changing it to the ON position.
	SW6-6	Reserved	OFF	Reserved
	SW6-7	Reserved	OFF	Reserved
	SW6-8	Reserved	OFF	Reserved

## SW7 switch block

Table 29. SW7 switch block

Switch block	Switch number	Switch name	Default position	Description
	SW7-1	XCC boot primary	OFF	XCC boots from upper half of flash region when switched to ON.
	SW7-2	XCC force update	OFF	XCC boots from kernel code only when switched to ON.
	SW7-3	Power permission override	OFF	Ignores Power Permission and allows system to power-on when switched to ON.
	SW7-4	Force XCC reset	OFF	Forces XCC into reset when switched to ON.
	SW7-5	Reserved	OFF	Reserved
	SW7-6	Reserved	OFF	Reserved
	SW7-7	Reserved	OFF	Reserved
	SW7-8	Reserved	OFF	Reserved

## System LEDs and diagnostics display

See the following section for information on available system LEDs and diagnostics display.

For more information, refer to [“Troubleshooting by system LEDs and diagnostics display” on page 711](#).



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## Chapter 3. Parts list

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

- “2.5-inch drive bay chassis” on page 45
- “3.5-inch drive bay chassis” on page 49

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### 2.5-inch drive bay chassis

Use the parts list in this section to identify each of the components that are available for server models with 2.5-inch front drive bays.

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. Some parts are available only on some models.

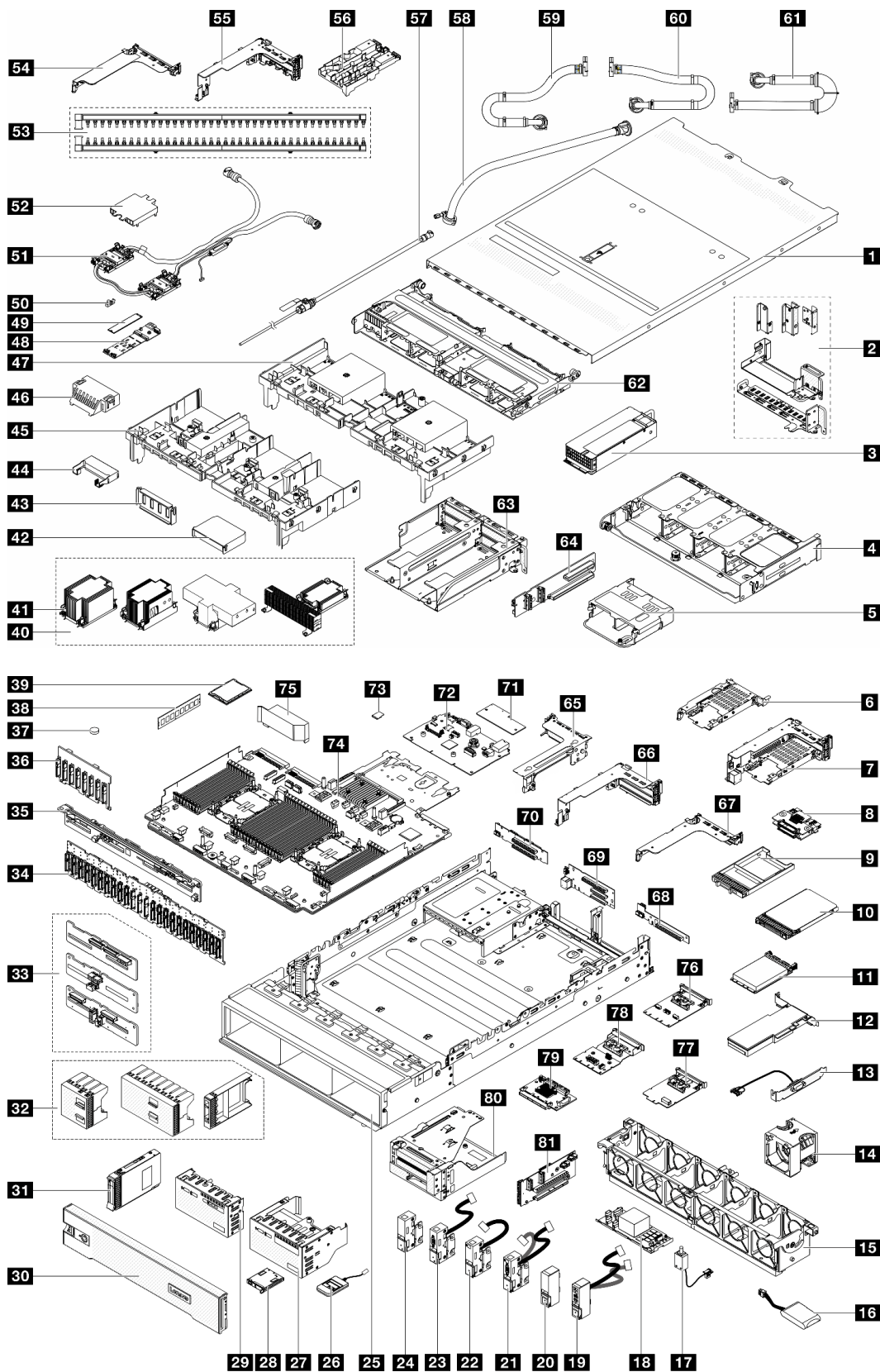


Figure 16. Server components (2.5-inch drive bay chassis)

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
<b>1</b> Top cover	T1	<b>2</b> Rear wall brackets	T1
<b>3</b> Power supply unit	T1	<b>4</b> Rear 8 x 2.5-inch drive cage	T1
<b>5</b> Rear 4 x 2.5-inch drive cage	T1	<b>6</b> 7mm drive cage (1U)	T1
<b>7</b> 7mm drive cage (2FH + 7mm)	T1	<b>8</b> 7mm drive backplanes	T2
<b>9</b> 7mm drive bay filler	C	<b>10</b> 7mm drive	T1
<b>11</b> OCP module	T1	<b>12</b> PCIe adapter	T1
<b>13</b> Serial port module	T1	<b>14</b> System fan	T1
<b>15</b> System fan cage	T1	<b>16</b> RAID flash power module	T1
<b>17</b> Intrusion switch	T1	<b>18</b> CFF RAID adapter/expander	T2
<b>19</b> Right rack latch with front I/O module	T1	<b>20</b> Standard right rack latch	T1
<b>21</b> Left rack latch with VGA and external diagnostics ports	T1	<b>22</b> Left rack latch with external diagnostics port	T1
<b>23</b> Left rack latch with VGA port	T1	<b>24</b> Standard left rack latch	T1
<b>25</b> Chassis	F	<b>26</b> External diagnostics handset	T1
<b>27</b> Front I/O module with integrated diagnostics panel	T1	<b>28</b> Integrated diagnostics panel	T1
<b>29</b> Front I/O module with front operator panel	T1	<b>30</b> Security bezel	C
<b>31</b> 2.5-inch drive	T1	<b>32</b> 2.5-inch drive fillers (1-bay, 4-bay, or 8-bay)	C
<b>33</b> Middle/Rear 4 x 2.5-inch drive backplane	T1	<b>34</b> Front 24 x 2.5-inch expander backplane	T1
<b>35</b> Rear 8 x 2.5-inch drive backplane	T1	<b>36</b> Front 8 x 2.5-inch drive backplane	T1
<b>37</b> CMOS battery (CR2032)	C	<b>38</b> Memory module	T1
<b>39</b> Processor	F	<b>40</b> Heat sinks	F
<b>41</b> Heat sink PEEK nuts	T2	<b>42</b> Add-on air baffle (for GPU air baffle)	T1
<b>43</b> Air baffle filler (for GPU air baffle)	C	<b>44</b> Add-on air baffle (for GPU air baffle)	T1
<b>45</b> GPU air baffle	T1	<b>46</b> Air baffle filler (for standard air baffle)	C
<b>47</b> Standard air baffle	T1	<b>48</b> M.2 drive backplane	T2
<b>49</b> M.2 drive	T1	<b>50</b> M.2 retainer clip	T1
<b>51</b> Direct water cooling module	F	<b>52</b> Cold plate cover	C
<b>53</b> Manifolds	FRU	<b>54</b> 1FH riser cage for DWCM	C

Description	Type	Description	Type
<b>55</b> 3FH riser cage for DWCM	C	<b>56</b> Hose holder	C
<b>57</b> Bleeder kit	FRU	<b>58</b> 42U in-row hose kit	FRU
<b>59</b> 42U/48U in-rack connection hose (return side)	FRU	<b>60</b> 48U in-rack connection hose (supply side)	FRU
<b>61</b> 42U in-rack connection hose (supply side)	FRU	<b>62</b> Middle drive cage	T1
<b>63</b> 4LP riser 3/4 cage	T1	<b>64</b> Riser 3/4 card	T1
<b>65</b> Riser 3 cage	T1	<b>66</b> Riser 1 or riser 2 cage	T1
<b>67</b> 1U riser cage	T1	<b>68</b> Riser card (LP)	T1
<b>69</b> Riser 1 or riser 2 card	T1	<b>70</b> Riser 3 card	T2
<b>71</b> Firmware and RoT security module	F	<b>72</b> System I/O board	F
<b>73</b> MicroSD card	T1	<b>74</b> Processor board	F
<b>75</b> PSU air baffle	T1	<b>76</b> OCP enablement kit for vSphere DSE	T1
<b>77</b> Management NIC adapter	T1	<b>78</b> Rear OCP interposer card	T1
<b>79</b> Front OCP interposer card	T1	<b>80</b> Front adapter cage	T1
<b>81</b> Riser 5 card	T2		



---

## 3.5-inch drive bay chassis

Use the parts list in this section to identify each of the components that are available for server models with 3.5-inch front drive bays.

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. Some parts are available only on some models.

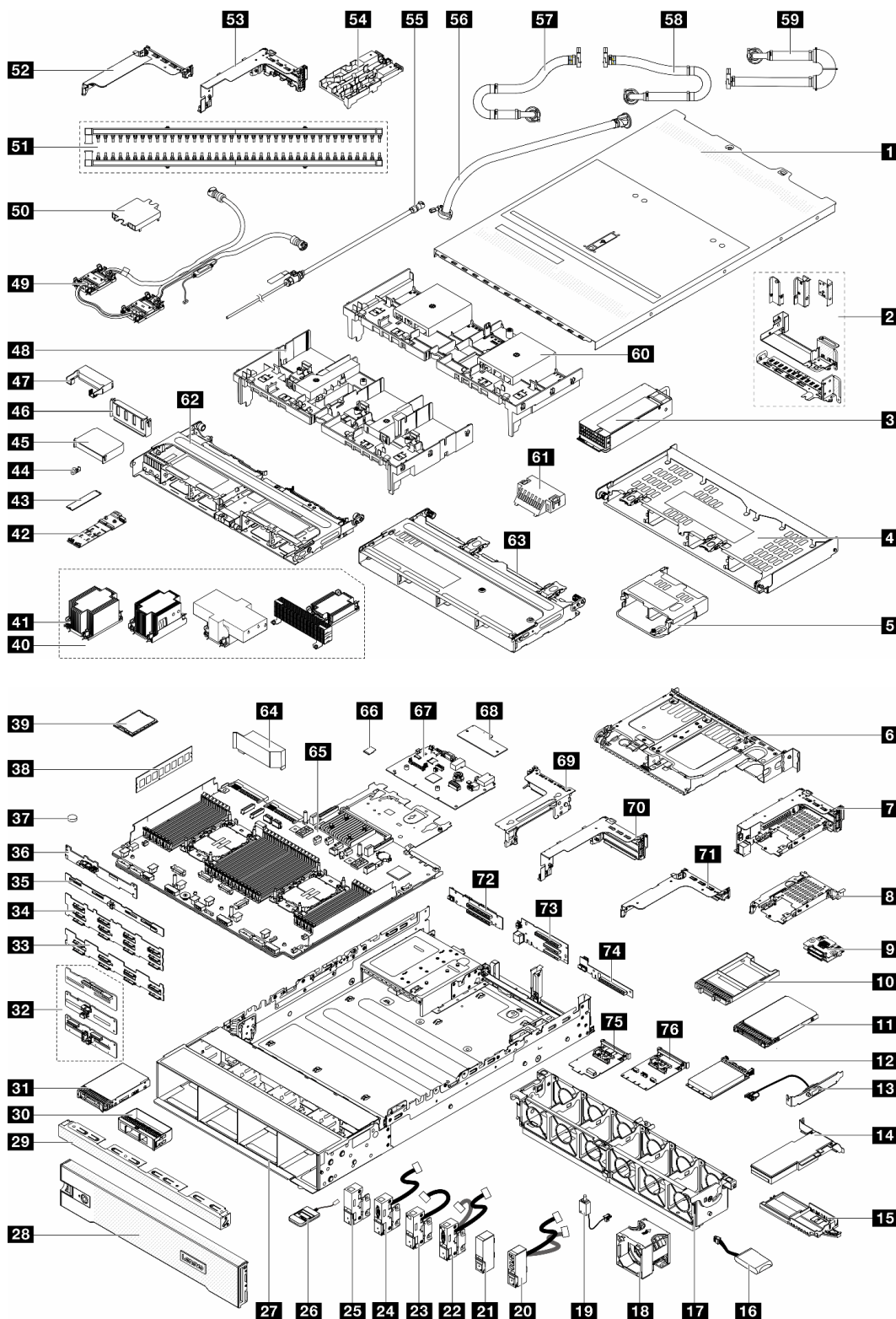


Figure 17. Server components (3.5-inch drive bay chassis)

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
<b>1</b> Top cover	T1	<b>2</b> Rear wall brackets	T1
<b>3</b> Power supply unit	T1	<b>4</b> Rear 4 x 3.5-inch drive cage	T1
<b>5</b> Rear 4 x 2.5-inch drive cage	T1	<b>6</b> Rear 2 x 3.5-inch drive cage	T1
<b>7</b> 7mm drive cage (2FH + 7mm)	T1	<b>8</b> 7mm drive cage (1U)	T1
<b>9</b> 7mm drive backplanes	T2	<b>10</b> 7mm drive bay filler	C
<b>11</b> 7mm drive	T1	<b>12</b> OCP module	T1
<b>13</b> Serial port module	T1	<b>14</b> PCIe adapter	T1
<b>15</b> RAID flash power module holder	T1	<b>16</b> RAID flash power module	T1
<b>17</b> System fan cage	T1	<b>18</b> System fan	T1
<b>19</b> Intrusion switch	T1	<b>20</b> Right rack latch with front I/O module	T1
<b>21</b> Standard right rack latch	T1	<b>22</b> Left rack latch with VGA and external diagnostic connector	T1
<b>23</b> Left rack latch with external diagnostic connector	T1	<b>24</b> Left rack latch with VGA	T1
<b>25</b> Standard left rack latch	T1	<b>26</b> External diagnostics handset	T1
<b>27</b> Chassis	F	<b>28</b> Security bezel	C
<b>29</b> 3.5-inch drive fillers (4-bay)	C	<b>30</b> 3.5-inch drive fillers (1-bay)	C
<b>31</b> 3.5-inch drive	T1	<b>32</b> Middle/Rear 4 x 2.5-inch drive backplane	T1
<b>33</b> Front 8 x 3.5-inch drive backplane	T1	<b>34</b> Front 12 x 3.5-inch drive backplane	T1
<b>35</b> Rear 4 x 3.5-inch drive backplane	T1	<b>36</b> Rear 2 x 3.5-inch drive backplane	T1
<b>37</b> CMOS battery (CR2032)	C	<b>38</b> Memory module	T1
<b>39</b> Processor	F	<b>40</b> Heat sinks	F
<b>41</b> Heat sink PEEK nuts	T2	<b>42</b> M.2 drive backplane	T2
<b>43</b> M.2 drive	T1	<b>44</b> M.2 retainer clip	T1
<b>45</b> Add-on air baffle (for GPU air baffle)	T1	<b>46</b> Air baffle filler (for GPU air baffle)	C
<b>47</b> Add-on air baffle (for GPU air baffle)	T1	<b>48</b> GPU air baffle	T1
<b>49</b> Direct water cooling module	F	<b>50</b> Cold plate cover	C
<b>51</b> Manifolds	FRU	<b>52</b> 1FH riser cage for DWCM	C
<b>53</b> 3FH riser cage for DWCM	C	<b>54</b> Hose holder	C
<b>55</b> Bleeder kit	FRU	<b>56</b> 42U in-row hose kit	FRU
<b>57</b> 42U/48U in-rack connection hose (return side)	FRU	<b>58</b> 48U in-rack connection hose (supply side)	FRU

Description	Type	Description	Type
<b>59</b> 42U in-rack connection hose (supply side)	FRU	<b>60</b> Standard air baffle	T1
<b>61</b> Air baffle filler (for standard air baffle)	C	<b>62</b> Middle 8 x 2.5-inch drive cage	T1
<b>63</b> Middle 4 x 3.5-inch drive cage	T1	<b>64</b> PSU air baffle	T1
<b>65</b> Processor board	F	<b>66</b> MicroSD card	T1
<b>67</b> System I/O board	F	<b>68</b> Firmware and RoT security module	F
<b>69</b> Riser 3 cage	T1	<b>70</b> Riser 1 or riser 2 cage	T1
<b>71</b> 1U riser cage	T1	<b>72</b> Riser 3 card	T1
<b>73</b> Riser 1 or riser 2 card	T1	<b>74</b> Riser card (LP)	T2
<b>75</b> Management NIC adapter	T1	<b>76</b> OCP enablement kit for vSphere DSE	T1

## 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.

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## 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 55](#) 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.

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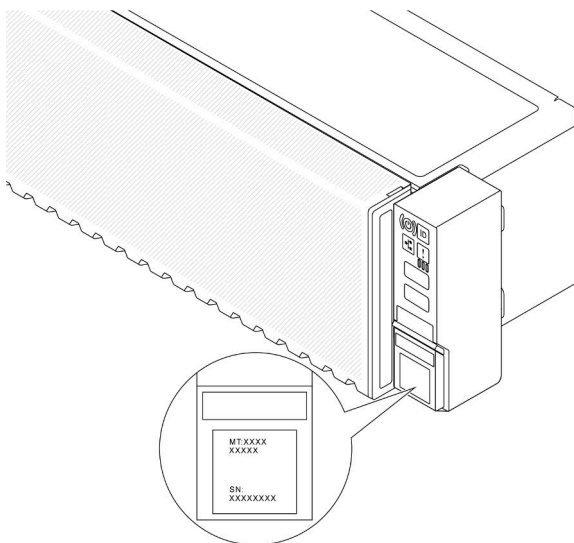
### Identify the server and access the Lenovo XClarity Controller

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 helps support technicians to identify your server and provide faster service.

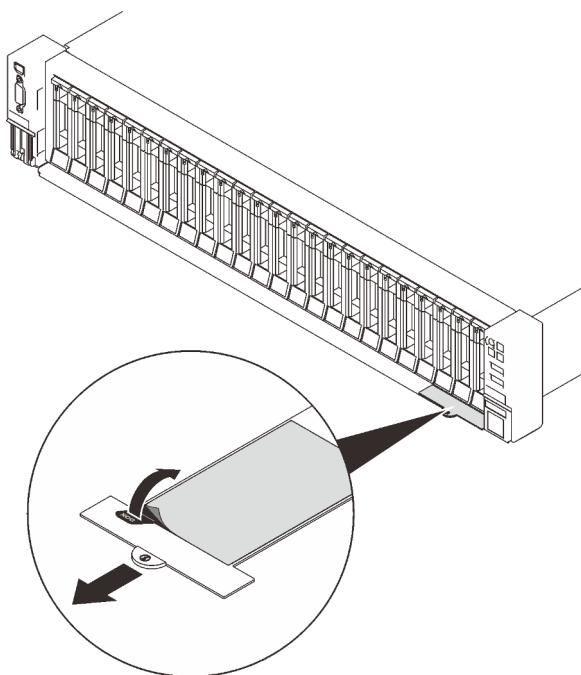
The illustration below shows the location of the ID label which contains the model number, machine type, and serial number of the server.



*Figure 18. Location of the ID label*

### **Lenovo XClarity Controller network access label**

In addition, the Lenovo XClarity Controller (XCC) network access label is attached to the pull-out information tab 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*

### **Service Label and QR code**

In addition, the system Service Label, which is on the top cover, provides a quick response (QR) code for mobile access to service information. You can scan the QR code with a mobile device using a QR code reader application and get quick access to the Service Information web page. The Service Information web

page provides additional information for parts installation and replacement videos, and error codes for solution support.

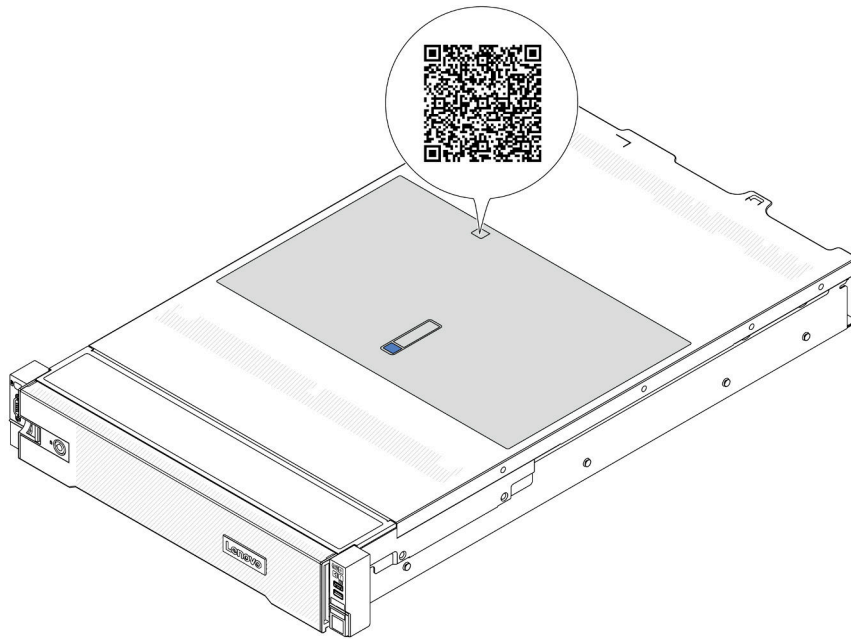


Figure 20. QR code

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## 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 53](#).
2. Install any required hardware or server options. See the related topics in [Chapter 5 “Hardware replacement procedures” on page 57](#).
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 91](#).
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.

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 711.](#)

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://pubs.lenovo.com/lxcc-overview/>.

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 711](#) 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 689](#).

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.



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## 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/](https://pubs.lenovo.com/safety_documentation/)
  - The following guidelines are available as well: “Working inside the server with the power on” on page 60 and “Handling static-sensitive devices” on page 60.
- 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/products/servers/thinksystem/sr650v3/downloads/driver-list/> 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 the latest Best Recipe code level menu for cluster supported firmware and driver 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 691.
- 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, a Torx T8 screwdriver, and a Torx T30 screwdriver available.
- To view the error LEDs on the 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.
- 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.
- 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:

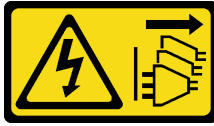
**This equipment must be installed or serviced by trained personnel, as defined by the NEC, IEC 62368-1 & IEC 60950-1, the standard for Safety of Electronic Equipment within the Field of Audio/Video, Information Technology and Communication Technology. Lenovo assumes that you are qualified in the servicing 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

This topic provides technical rules for the server.

- “Memory module installation rules and order” on page 61
- “PCIe slots and PCIe adapters” on page 68
- “Thermal rules” on page 75

## 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.

Your server has 32 memory slots with 16 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](https://dcsc.lenovo.com/#/memory_configuration)

### Memory modules and processors layout

The memory-channel configuration table below shows the relationship between the processors, memory controllers, memory channels, and memory module slot numbers.

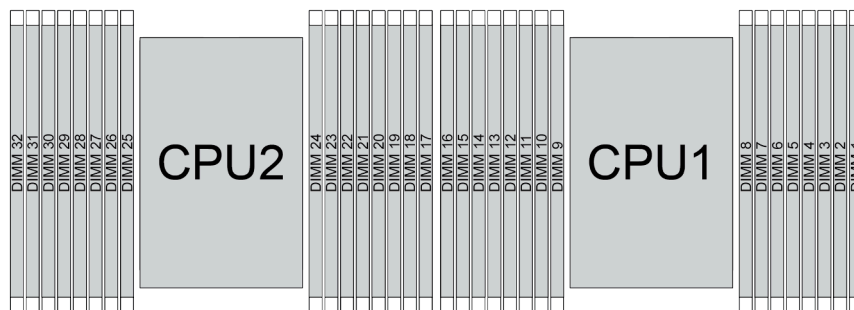


Figure 21. Memory modules and processors layout

Table 30. Memory slot and channel identification

Processor	CPU 1															
Controller	iMC3				iMC2				iMC0				iMC1			
Channel	CH1		CH0		CH1		CH0		CH0		CH1		CH0		CH1	
Slot No.	0	1	0	1	0	1	0	1	1	0	1	0	1	0	1	0
DIMM No.	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Processor	CPU 2															
Controller	iMC3				iMC2				iMC0				iMC1			

Table 30. Memory slot and channel identification (continued)

Channel	CH1		CH0		CH1		CH0		CH0		CH1		CH0		CH1	
Slot No.	0	1	0	1	0	1	0	1	1	0	1	0	1	0	1	0
DIMM No.	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

- Slot No.: DIMM slot number in each memory channel. Each memory channel has two DIMM slots: slot 0 (furthest from the processor) and slot 1 (closest to the processor).
- DIMM No.: DIMM slot number on the system board assembly. Each processor has 16 DIMM slots.

### Memory module installation guideline

- For the installation rules and population sequence, see [“TruDDR5 DIMMs installation order” on page 62](#).
- At least one DIMM is required for each processor. Install at least eight DIMMs per processor for good performance.
- When you replace a DIMM, the server provides automatic DIMM enablement capability without requiring you to use the Setup utility to enable the new DIMM manually.

### TruDDR5 DIMMs installation order

This section contains information of how to install TruDDR5 DIMMs (RDIMMs, 9x4 RDIMMs, 10x4 RDIMMs, or 3DS RDIMMs) properly.

For RDIMMs, 10x4 RDIMMs and 3DS RDIMMs, the following two memory modes are available. For 9x4 RDIMMs, only independent mode is available.

- [“Independent mode installation order” on page 62](#)
- [“Mirroring mode installation order” on page 66](#)

### Independent mode installation order

In independent mode, memory channels can be populated with DIMMs in any order and you can populate all channels for each processor in any order with no matching requirements. Independent mode provides the highest level of memory performance, but lacks failover protection. The DIMM installation order for independent mode varies based on the number of processors and memory modules installed in the server.

Follow the rules below when installing memory modules in independent mode:

- There should be at least one TruDDR5 DIMM per processor.
- Memory population must be identical between processors.
- All TruDDR5 memory modules must operate at the same speed in the same system.
- Memory modules from different vendors are supported.
- x8 DIMMs and x4 DIMMs cannot be mixed in a system.
- All memory modules to be installed must be of the same type.
  - 9x4 RDIMM cannot be mixed with non-9x4 RDIMMs in a system.
  - 3DS RDIMM cannot be mixed with non-3DS RDIMMs in a system.
- All memory modules in a system must have the same number of ranks, except for below conditions:
  - Single-rank RDIMMs can be mixed with dual-rank RDIMMs when there are 16 DIMMs populated for each processor.
  - Quad-rank 3DS RDIMMs can be mixed with octal-rank 3DS RDIMMs when there are 16 DIMMs populated for each processor.

**Note:** System hang on POST may occur on a server operating in this configuration. In this case, contact Lenovo service to replace the failed DIMM for proper operation.

- See [“Independent memory mode with mixing ranks” on page 65](#) for more information on the installation sequence when installing memory modules with different ranks.
- The 4800 MHz 48 GB and 96 GB RDIMMs are supported only by the 4th Gen (Sapphire Rapids, SPR) XCC processors.
- The 24 Gb DRAM (48 GB/96 GB) RDIMMs cannot be mixed with 16 Gb DRAM (16 GB/32 GB/64 GB) RDIMMs in a system.
- Before installing 24 Gb DRAM RDIMMs in a system with SPR XCC processors, make sure to apply the UEFI firmware version ESE120K or later to the server first and remove all existing 16 Gb DRAM RDIMMs.

For optimal performance, you are recommended to install DIMMs in [“Standard DIMM installation order” on page 63](#). The [“Optional DIMM installation order” on page 64](#) is used only for special requirements.

- [“Standard DIMM installation order” on page 63](#)
- [“Optional DIMM installation order” on page 64](#)

### Standard DIMM installation order

The following tables show the standard orders of populating memory modules for independent mode.

Table 31. Standard installation order for one processor

Total DIMMs	Processor 1															
	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1 DIMM <sup>1</sup>										7						
2 DIMMs <sup>2</sup>			14							7						
4 DIMMs <sup>2</sup>			14				10			7				3		
6 DIMMs <sup>1,2</sup>			14		12		10			7				3		1
8 DIMMs <sup>1,2,3,4,5</sup>	16		14		12		10			7		5		3		1
12 DIMMs <sup>2,6</sup>	16		14	13	12		10	9	8	7		5	4	3		1
16 DIMMs <sup>2,3,4,6,7</sup>	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

### Notes:

1. The DIMM configurations support 5600 MHz 24 GB, 48 GB, and 96 GB RDIMMs.
2. The DIMM configurations support the Sub NUMA Clustering (SNC) feature, which can be enabled via UEFI. SNC is not supported if DIMM population does not follow the sequence indicated by the table above.
3. The DIMM configurations support Software Guard Extensions (SGX). See [“Enable Software Guard Extensions \(SGX\)” on page 696](#) to enable this feature.
4. The DIMM configurations support 4800 MHz 96 GB RDIMMs.
5. The DIMM configuration supports 4800 MHz 48 GB RDIMMs.
6. The DIMM configurations support 5600 MHz 96 GB RDIMMs.
7. Rank mixing is supported between single-rank and dual-rank RDIMMs, or between quad-rank and octal-rank 3DS RDIMMs when there are 16 DIMMs populated for each processor. See [“Independent memory mode with mixing ranks” on page 65](#) for more information on the installation sequence when installing memory modules with different ranks.

Table 32. Standard installation order for two processors

Total DIMMs	Processor 1															
	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
2 DIMMs <sup>1</sup>										7						
4 DIMMs <sup>2</sup>			14							7						
8 DIMMs <sup>2</sup>			14				10			7				3		
12 DIMMs <sup>1,2</sup>			14		12		10			7				3		1
16 DIMMs <sup>1,2,3,4,5</sup>	16		14		12		10			7		5		3		1
24 DIMMs <sup>2,6</sup>	16		14	13	12		10	9	8	7		5	4	3		1
32 DIMMs <sup>2,3,4,6,7</sup>	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Total DIMMs	Processor 2															
	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
2 DIMMs <sup>1</sup>										23						
4 DIMMs <sup>2</sup>			30							23						
8 DIMMs <sup>2</sup>			30				26			23				19		
12 DIMMs <sup>1,2</sup>			30		28		26			23				19		17
16 DIMMs <sup>1,2,3,4,5</sup>	32		30		28		26			23		21		19		17
24 DIMMs <sup>2,6</sup>	32		30	29	28		26	25	24	23		21	20	19		17
32 DIMMs <sup>2,3,4,6,7</sup>	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

#### Notes:

1. The DIMM configurations support 5600 MHz 24 GB, 48 GB, and 96 GB RDIMMs.
2. The DIMM configurations support the Sub NUMA Clustering (SNC) feature, which can be enabled via UEFI. SNC is not supported if DIMM population does not follow the sequence indicated by the table above.
3. The DIMM configurations support Software Guard Extensions (SGX). See [“Enable Software Guard Extensions \(SGX\)” on page 696](#) to enable this feature.
4. The DIMM configurations support 4800 MHz 96 GB RDIMMs.
5. The DIMM configuration supports 4800 MHz 48 GB RDIMMs.
6. The DIMM configurations support 5600 MHz 96 GB RDIMMs.
7. Rank mixing is supported between single-rank and dual-rank RDIMMs, or between quad-rank and octal-rank 3DS RDIMMs when there are 16 DIMMs populated for each processor. See [“Independent memory mode with mixing ranks” on page 65](#) for more information on the installation sequence when installing memory modules with different ranks.

#### Optional DIMM installation order

The following table shows the optional orders of populating memory modules for independent mode.



Table 33. Optional installation order

Processor	Total DIMMs	Optional installation order
Processor 1	1 DIMM	<ul style="list-style-type: none"> <li>Slot 12</li> <li>Slot 10</li> <li>Slot 5</li> </ul>
	2 DIMMs <sup>1,2</sup>	<ul style="list-style-type: none"> <li>Slots 10, 3</li> </ul>
	6 DIMMs <sup>1</sup>	<ul style="list-style-type: none"> <li>Slots 16, 14, 10, 7, 5, 3</li> <li>Slots 16, 12, 10, 5, 3, 1</li> <li>Slots 16, 14, 12, 7, 5, 1</li> </ul>
	12 DIMMs <sup>1,3</sup>	<ul style="list-style-type: none"> <li>Slots 16, 15, 14, 12, 11, 10, 7, 6, 5, 3, 2, 1</li> </ul>
Processors 1 and 2	2 DIMMs	<ul style="list-style-type: none"> <li>Slots 26, 10</li> <li>Slots 21, 5</li> <li>Slots 28, 12</li> </ul>
	4 DIMMs <sup>1,2</sup>	<ul style="list-style-type: none"> <li>Slots 26, 19, 10, 3</li> </ul>
	12 DIMMs <sup>1</sup>	<ul style="list-style-type: none"> <li>Slots 32, 30, 26, 23, 21, 19, 16, 14, 10, 7, 5, 3</li> <li>Slots 32, 28, 26, 21, 19, 17, 16, 12, 10, 5, 3, 1</li> <li>Slots 32, 30, 28, 23, 21, 17, 16, 14, 12, 7, 5, 1</li> </ul>
	24 DIMMs <sup>1,3</sup>	<ul style="list-style-type: none"> <li>Slots 32, 31, 30, 28, 27, 26, 23, 22, 21, 19, 18, 17, 16, 15, 14, 12, 11, 10, 7, 6, 5, 3, 2, 1</li> </ul>

**Notes:**

1. The DIMM configurations support the Sub NUMA Clustering (SNC) feature, which can be enabled via UEFI. SNC is not supported if DIMM population does not follow the sequence indicated by the table above.
2. The DIMM configuration does not support 5600 MHz 24 GB, 48 GB, and 96 GB RDIMMs.
3. The DIMM configuration does not support 5600 MHz 24 GB and 48 GB RDIMMs.

**Independent memory mode with mixing ranks**

Follow the memory module installation sequence in this section when installing memory modules with different ranks in independent memory mode.

- Single-rank RDIMMs can be mixed with dual-rank RDIMMs when there are 16 DIMMs populated for each processor.
- Quad-rank 3DS RDIMMs can be mixed with octal-rank 3DS RDIMMs when there are 16 DIMMs populated for each processor.
- If a memory channel has two DIMMs with different ranks, populate the DIMM with a higher number of ranks in slot 0 (furthest from the processor) first.

**DIMM slot installation sequence for one processor**

When installing DIMMs with different ranks with only one processor (Processor 1) installed, follow the sequence below and install higher rank DIMMs first; then, install the lower rank DIMMs into the remaining slots.

Table 34. DIMM slot installation sequence for one processor

Processor 1																
DIMM slot	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Sequence	8	16	7	15	4	12	3	11	9	1	10	2	13	5	14	6

## DIMM slot installation sequence for two processors

When installing DIMMs with different ranks with two processors installed, follow the sequence below and install higher rank DIMMs first; then, install the lower rank DIMMs into the remaining slots.

Table 35. DIMM slot installation sequence for two processors

Processor 1																
DIMM slot	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Sequence	15	31	13	29	7	23	5	21	17	1	19	3	25	9	27	11
Processor 2																
DIMM slot	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Sequence	16	32	14	30	8	24	6	22	18	2	20	4	26	10	28	12

## Mirroring mode installation order

Mirroring mode provides full memory redundancy while reducing the total system memory capacity in half. Memory channels are grouped in pairs with each channel receiving the same data. If a failure occurs, the memory controller switches from the DIMMs on the primary channel to the DIMMs on the backup channel. The DIMM installation order for memory mirroring varies based on the number of processors and DIMMs installed in the server.

In mirroring mode, each memory module in a pair must be identical in size and architecture. The channels are grouped in pairs with each channel receiving the same data. One channel is used as a backup of the other, which provides redundancy.

Follow the rules below when installing memory modules in mirroring mode:

- All memory modules to be installed must be of the same type with the same capacity, frequency, voltage, and ranks.
- Mirroring can be configured across channels in the same iMC, and the total TruDDR5 memory size of the primary and secondary channels must be the same.
- 9x4 RDIMMs do not support mirroring mode.
- Partial Memory Mirroring is a sub-function of memory mirroring. It requires following the memory installation order of memory mirroring mode.

## With one processor

The following table shows the sequence of populating memory modules for mirroring mode when only one processor is installed.

Table 36. Mirroring mode with one processor

Total DIMMs	Processor 1															
	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
8 DIMMs <sup>1,2</sup>	16		14		12		10			7		5		3		1
16 DIMMs <sup>1,2</sup>	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

## Notes:

1. The DIMM configurations support the Sub NUMA Clustering (SNC) feature, which can be enabled via UEFI. SNC is not supported if DIMM population does not follow the sequence indicated by the table above.

2. 5600 MHz 24 GB and 48 GB RDIMMs are supported in 8 DIMMs mirroring mode, and all other RDIMMs are supported in 8 and 16 DIMMs mirroring mode.

## Two processors

The following table shows the sequence of populating memory modules for mirroring mode when two processors are installed.

Table 37. Mirroring mode with two processors

Total DIMMs	Processor 1															
	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
16 DIMMs <sup>1,2</sup>	16		14		12		10			7		5		3		1
32 DIMMs <sup>1,2</sup>	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Total DIMMs	Processor 2															
	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
16 DIMMs <sup>1,2</sup>	32		30		28		26			23		21		19		17
32 DIMMs <sup>1,2</sup>	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

1. The DIMM configurations support the Sub NUMA Clustering (SNC) feature, which can be enabled via UEFI. SNC is not supported if DIMM population does not follow the sequence indicated by the table above.
2. 5600 MHz 24 GB and 48 GB RDIMMs are supported in 16 DIMMs mirroring mode, and all other RDIMMs are supported in 16 and 32 DIMMs mirroring mode.

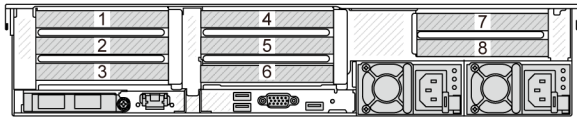
## PCIe slots and PCIe adapters

This topic provides installation rules for PCIe adapters.

### Slot configurations without DWCM

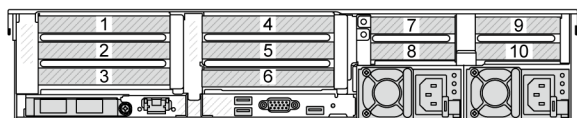
The following tables list the PCIe slot configurations for each server view without a Direct Water Cooling Module (DWCM).

\*E: empty

PCIe slots						
<p>Figure 22. Rear view with 8 PCIe slots</p> 						
<b>Riser 1/2</b>	x16/x8/x8 (Gen 4/5)	x16/x16/E (Gen 4/5)	E/x16/x16	<b>Riser 3</b>	x16/x16 (Gen 4/5)	x8/x8 (Gen 4/5)
<b>Slot 1/4</b>	PCIe x16	PCIe x16	Empty	<b>Slot 7</b>	PCIe x16	PCIe x8
<b>Slot 2/5</b>	PCIe x8	PCIe x16	PCIe x16 (Gen 4/5)	<b>Slot 8</b>	PCIe x16	PCIe x8
<b>Slot 3/6</b>	PCIe x8	Empty	PCIe x16 (Gen 4)			

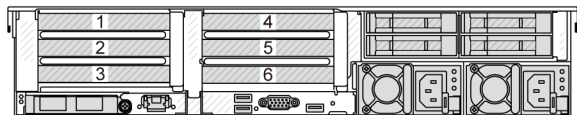
## PCIe slots

Figure 23. Rear view with 10 PCIe slots



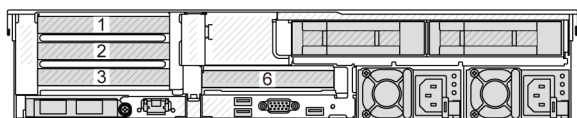
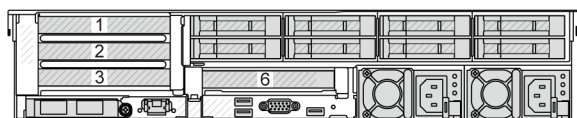
<b>Riser 1/2</b>	x16/x8/x8 (Gen 4/5)	x16/x16/E (Gen 4/5)	E/x16/x16	<b>Riser 3/4</b>	x16/x8 (Gen 4 for riser 3)	x16/x8 (Gen 5 for riser 4)
<b>Slot 1/4</b>	PCIe x16	PCIe x16	Empty	<b>Slot 7/9</b>	PCIe4 x8	PCIe5 x8
<b>Slot 2/5</b>	PCIe x8	PCIe x16	PCIe x16 (Gen 4/5)	<b>Slot 8/10</b>	PCIe4 x8	PCIe5 x8
<b>Slot 3/6</b>	PCIe x8	Empty	PCIe x16 (Gen 4)			

Figure 24. Rear view with 6 PCIe slots

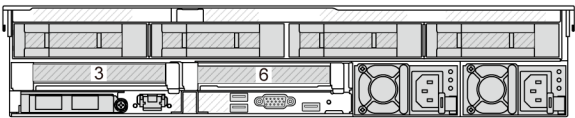
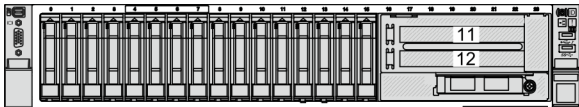


<b>Riser 1/2</b>	x16/x8/x8 (Gen 4/5)	x16/x16/E (Gen 4/5)	E/x16/x16			
<b>Slot 1/4</b>	PCIe x16	PCIe x16	Empty			
<b>Slot 2/5</b>	PCIe x8	PCIe x16	PCIe x16 (Gen 4/5)			
<b>Slot 3/6</b>	PCIe x8	Empty	PCIe x16 (Gen 4)			

Figure 25. Rear view with 4 PCIe slots



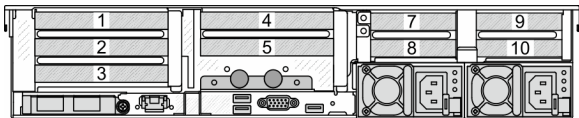
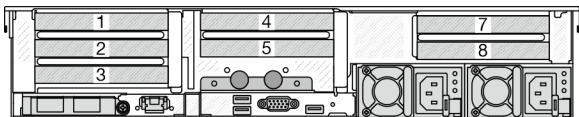
<b>Riser 1</b>	x16/x8/x8 (Gen 4/5)	x16/x16/E (Gen 4/5)	E/x16/x16	<b>Riser 2</b>	x16 (Gen 4)	
<b>Slot 1</b>	PCIe x16	PCIe x16	Empty	<b>Slot 6</b>	PCIe x16	
<b>Slot 2</b>	PCIe x8	PCIe x16	PCIe x16 (Gen 4/5)			
<b>Slot 3</b>	PCIe x8	Empty	PCIe x16 (Gen 4)			

PCIe slots						
<p>Figure 26. Rear view with 2 PCIe slots</p> 						
<b>Riser 1</b>	x16 (Gen 4)	<b>Riser 2</b>	x16 (Gen 4)			
<b>Slot 3</b>	PCIe x16	<b>Slot 6</b>	PCIe x16			
<p>Figure 27. Front view with 2 PCIe slots</p> 						
<b>Riser 5</b>	x16/x16 (Gen4)					
<b>Slot 11</b>	PCIe x16					
<b>Slot 12</b>	PCIe x16					

### Slot configurations with DWCM

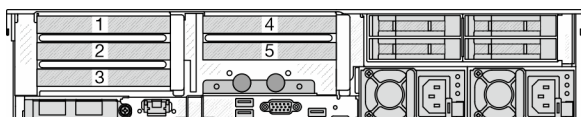
The following tables list the PCIe slot configurations for each server view with a DWCM.

\*E: empty

PCIe slots						
<p>Figure 28. Rear view with 9 PCIe slots</p> 						
<b>Riser 1/2</b>	x16/x8/x8 (Gen 4/5)	x16/x16/E (Gen 4/5)	E/x16/x16	<b>Riser 3/4</b>	x16/x8 (Gen 4 for riser 3)	x16/x8 (Gen 5 for riser 4)
<b>Slot 1/4</b>	PCIe x16	PCIe x16	Empty	<b>Slot 7/9</b>	PCIe4 x8	PCIe5 x8
<b>Slot 2/5</b>	PCIe x8	PCIe x16	PCIe x16 (Gen 4/5)	<b>Slot 8/10</b>	PCIe4 x8	PCIe5 x8
<b>Slot 3</b>	PCIe x8	Empty	PCIe x16 (Gen 4)			
<p>Figure 29. Rear view with 7 PCIe slots</p> 						

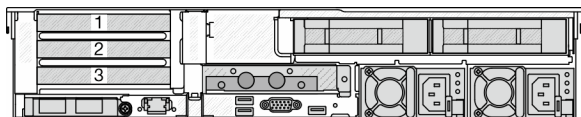
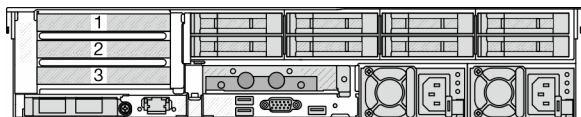
PCIe slots						
<b>Riser 1/2</b>	x16/x8/x8 (Gen 4/5)	x16/x16/E (Gen 4/5)	E/x16/x16	<b>Riser 3</b>	x16/x16 (Gen 4/5)	x8/x8 (Gen 4/5)
<b>Slot 1/4</b>	PCIe x16	PCIe x16	Empty	<b>Slot 7</b>	PCIe x16	PCIe x8
<b>Slot 2/5</b>	PCIe x8	PCIe x16	PCIe x16 (Gen 4/5)	<b>Slot 8</b>	PCIe x16	PCIe x8
<b>Slot 3</b>	PCIe x8	Empty	PCIe x16 (Gen 4)			

Figure 30. Rear view with 5 PCIe slots



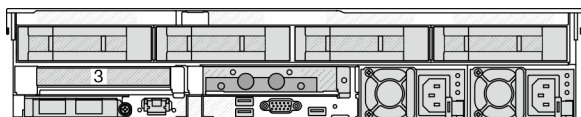
<b>Riser 1/2</b>	x16/x8/x8 (Gen 4/5)	x16/x16/E (Gen 4/5)	E/x16/x16			
<b>Slot 1/4</b>	PCIe x16	PCIe x16	Empty			
<b>Slot 2/5</b>	PCIe x8	PCIe x16	PCIe x16 (Gen 4/5)			
<b>Slot 3</b>	PCIe x8	Empty	PCIe x16 (Gen 4)			

Figure 31. Rear view with 3 PCIe slots



<b>Riser 1</b>	x16/x8/x8 (Gen 4/5)	x16/x16/E (Gen 4/5)	E/x16/x16			
<b>Slot 1</b>	PCIe x16	PCIe x16	Empty			
<b>Slot 2</b>	PCIe x8	PCIe x16	PCIe x16 (Gen 4/5)			
<b>Slot 3</b>	PCIe x8	Empty	PCIe x16 (Gen 4)			

Figure 32. Rear view with 1 PCIe slots



PCIe slots						
Riser 1	x16 (Gen 4)					
Slot 3	PCIe x16					

#### Notes:

- The server supports Gen 4 and Gen 5 PCIe riser cards, but not both in the same system.
- Gen 4 riser cards support Gen 4 and Gen 5 PCIe adapters (except Gen 5 retimer cards), but not both in the same system.
- Gen 5 riser cards support Gen 4 and Gen 5 PCIe adapters, but not both in the same system.
- Slots 2 and 5 on the E/x16/x16 riser card cannot support retimer cards.
- **7mm drive cage installation rules:**
  - For server models with 8 PCIe slots or 10 PCIe slots, a 2FH+7mm SSD drive cage can be installed on slot 3 or slot 6, but not both at the same time.
  - For server models with an 8 x 2.5-inch/2 x 3.5-inch rear drive cage, one of the 7mm drive cages can be installed:
    - 2FH+7mm SSD drive cage: slot 3
    - 7mm SSD drive cage: slot 6
  - For server models with a 4 x 3.5-inch rear drive cage or a GPU installed, a low-profile 7mm drive cage can be installed only on slot 6.
  - For server models with a 4 x 2.5-inch rear drive cage, no 7mm drive cage is supported.
- **Serial port module installation rules:**
  - For server models with 8 PCIe slots, 10 PCIe slots, or a 4 x 2.5-inch rear drive cage:
    - If both riser 1 and riser 2 use the x16/x16/E riser card and a 7mm drive cage is installed on slot 6, then a serial port module can be installed on slot 3. If no 7mm drive cage is installed, then a serial port module can be installed on slot 6.
    - If riser 1 uses the x16/x16/E riser card but riser 2 is not installed or not the x16/x16/E riser card, a serial port module can be installed on slot 3 when no 7mm drive cage is installed.
    - If riser 1 does not use the x16/x16/E riser card but riser 2 uses the x16/x16/E riser card, a serial port module can be installed on slot 6 when no 7mm drive cage is installed.
    - If both riser 1 and riser 2 do not use the x16/x16/E riser card, no serial port module is supported.
  - For server models with an 8 x 2.5-inch/2 x 3.5-inch rear drive cage:
    - If riser 1 uses the x16/x16/E riser card, a serial port module can be installed on slot 3 and a 7mm SSD cage can be installed on slot 6.
    - If riser 1 does not use the x16/x16/E riser card, a 7mm drive cage and a serial port module cannot be installed at the same time. If no 7mm drive cage is installed, then a serial port module can be installed on slot 6.
  - For server models with a 4 x 3.5-inch rear drive cage, a 7mm drive cage and a serial port module cannot be installed at the same time. If no 7mm drive cage is installed, then a serial port module can be installed on slot 6.
  - For server models with a double-wide GPU, the serial port module can be installed only on slot 6 when no 7mm drive cage is installed.

#### Supported PCIe adapters and slot priorities

The following table lists the recommended slot installation priority for common PCIe adapters.

PCIe adapter	Maximum supported	Suggested slot priority
<b>GPU adapter<sup>1</sup></b>		
Double-wide GPU	3	<ul style="list-style-type: none"> <li>• 1 CPU: 2, 7</li> <li>• 2 CPUs: 2, 5, 7</li> </ul>
Single-wide GPU: T400, T1000	8	<ul style="list-style-type: none"> <li>• 1 CPU: 1, 2, 3, 7</li> <li>• 2 CPUs: 1, 4, 2, 5, 7, 8, 3, 6</li> </ul>



PCIe adapter	Maximum supported	Suggested slot priority
Single-wide GPU: A2	8	<ul style="list-style-type: none"><li>1 CPU: 1, 2, 3, 7, 8, 12</li><li>2 CPUs: 1, 4, 7, 8, 2, 5, 6, 3, 11, 12</li></ul>
Single-wide GPU: L4	8	<ul style="list-style-type: none"><li>1 CPU: 1, 2, 3, 7</li><li>2 CPUs: 1, 4, 7, 8, 2, 5, 6, 3</li></ul>
PCIe Retimer card		
ThinkSystem PCIe Gen 4 x16 Retimer Adapter	4	<ul style="list-style-type: none"><li>1 CPU: 1, 2, 3</li><li>2 CPUs: 1, 2, 4, 5, 3, 6</li></ul>
ThinkSystem SR630/SR650 V3 PCIe Gen 5 x16 Retimer Adapter		
Internal custom form factor (CFF) RAID/HBA/Expander		
5350-8i, 9350-8i, 9350-16i	1	Not installed in PCIe slots.
440-16i, 940-16i		The CFF RAID/HBA/Expander adapter is supported only in the 2.5-inch drive bay chassis, which is installed between the front backplane and the system board assembly.
ThinkSystem 48 port 12Gb Internal Expander		
Internal standard form factor (SFF) RAID/HBA adapter <sup>2</sup>		
4350-8i, 5350-8i	4	<ul style="list-style-type: none"><li>1 CPU: 2, 3, 1</li><li>2 CPUs: 2, 3, 5, 6, 1, 4</li></ul>
4350-16i	2	
440-8i, 540-8i, 940-8i	4	
440-16i, 540-16i, 940-16i	2	
940-32i	1	
9350-8i	4	<ul style="list-style-type: none"><li>1 CPU:<ul style="list-style-type: none"><li>With other SFF RAID adapters: 2, 3, 1</li><li>Without other SFF RAID adapters: 3, 2, 1</li></ul></li><li>2 CPUs:<ul style="list-style-type: none"><li>With other SFF RAID adapters: 2, 3, 5, 6, 1, 4</li><li>Without other SFF RAID adapters: 3, 2, 5, 6, 1, 4</li></ul></li></ul>
9350-16i	2	
External RAID/HBA adapter		
440-8e, 440-16e	12	<ul style="list-style-type: none"><li>1 CPU: 1, 2, 3, 7, 8, 12</li><li>2 CPUs: 1, 4, 7, 8, 2, 5, 3, 6, 9, 10, 11, 12</li></ul>
940-8e	4	<ul style="list-style-type: none"><li>1 CPU: 1, 2, 3, 7, 8, 12</li><li>2 CPUs: 1, 4, 7, 8, 2, 5, 3, 6, 9, 10, 11, 12</li></ul>
FC HBA adapter		
All supported FC HBA adapters	12	<ul style="list-style-type: none"><li>1 CPU: 1, 2, 3, 7, 8, 12</li><li>2 CPUs: 1, 4, 7, 8, 2, 5, 3, 6, 9, 10, 11, 12</li></ul>
NIC adapter		
ThinkSystem NVIDIA BlueField-2 25GbE SFP56 2-Port PCIe Ethernet DPU w/BMC & Crypto	1	<ul style="list-style-type: none"><li>1 CPU: 1, 2, 3</li><li>2 CPUs: 1, 4, 2, 5, 3, 6</li></ul>

PCIe adapter	Maximum supported	Suggested slot priority
ThinkSystem AMD X3522 10/25GbE DSFP28 2-port PCIe Ethernet Adapter	6	<ul style="list-style-type: none"> <li>1 CPU: 1, 2, 3</li> <li>2 CPUs: 1, 4, 2, 5, 3, 6</li> </ul>
ThinkSystem Broadcom 57504 10/25GbE SFP28 4-port PCIe Ethernet Adapter  ThinkSystem Broadcom 57508 100GbE QSFP56 2-port PCIe 4 Ethernet Adapter V2  ThinkSystem Mellanox ConnectX-6 Dx 100GbE QSFP56 2-port PCIe Ethernet Adapter  Mellanox MCX623106AC-CDAT Dx 100GbE QSFP56 2-port PCIe NIC -CSP I4	6	<ul style="list-style-type: none"> <li>1 CPU: 1, 2, 3, 7, 12</li> <li>2 CPUs: 1, 4, 2, 5, 7, 8, 3, 6, 11, 12</li> </ul>
ThinkSystem Intel E810-DA4 10/25GbE SFP28 4-port PCIe Ethernet Adapter	10	<ul style="list-style-type: none"> <li>1 CPU: 1, 2, 3, 7, 8, 12</li> <li>2 CPUs: 1, 4, 7, 8, 2, 5, 3, 6, 11, 12</li> </ul>
All other supported NIC adapters	12	<ul style="list-style-type: none"> <li>1 CPU: 1, 2, 3, 7, 8, 12</li> <li>2 CPUs: 1, 4, 7, 8, 2, 5, 3, 6, 9, 10, 11, 12</li> </ul>
<b>InfiniBand adapter</b>		
Mellanox ConnectX-6 HDR100 IB/100GbE VPI 1-port x16 PCIe 3.0 HCA w/ Tall Bracket  Mellanox ConnectX-6 HDR100 IB/100GbE VPI 2-port x16 PCIe 3.0 HCA w/ Tall Bracket  ThinkSystem Mellanox ConnectX-6 HDR IB/200GbE Single Port x16 PCIe Adapter (without auxiliary adapter)  ThinkSystem Nvidia ConnectX-7 NDR200/ HDR QSFP112 2-port PCIe Gen5 x16 InfiniBand Adapter  ThinkSystem NVIDIA ConnectX-7 NDR400 OSFP 1-port PCIe Gen5 Adapter	6	<ul style="list-style-type: none"> <li>1 CPU: 1, 2, 3, 7, 12</li> <li>2 CPUs: 1, 4, 2, 5, 7, 8, 3, 6, 11, 12</li> </ul>

#### Notes:

##### 1. Rules for GPU adapters:

- All installed GPU adapters must be identical. For thermal requirement on GPUs, see [“Thermal rules” on page 75](#).
- The air baffles for GPU adapters vary according to the GPU type. For detailed information, see [“GPU replacement” on page 152](#).
- If GPU adapters are installed, no middle drive cage, rear drive cage, or PCIe SSD cards are supported.
- Only a maximum of six T400 and T1000 GPU adapters are not supported. The T400 and T1000 GPU adapters are not supported on a Gen 5 riser card.
- If a double-wide GPU adapter is installed in slot 2, 5 or 7, the adjacent slot 1, 4, or 8 respectively is not available.
- When there are three or more SFF RAID/HBA adapters installed, only a maximum of two double-wide GPU adapters are supported.

## 2. Rules for the internal SFF RAID/HBA adapters:

- RAID 940 series or 9350 series adapters require a RAID flash power module.
- The RAID/HBA 4350/5350/9350 adapters cannot be mixed with the following adapters in the same system:
  - Intel E810-DA2 OCP/PCIe Ethernet adapter
  - Intel E810-DA4 OCP/PCIe Ethernet adapter
- The RAID 940-8i or RAID 940-16i adapter supports Tri-mode. When Tri-mode is enabled, the server supports SAS, SATA and U.3 NVMe drives at the same time. NVMe drives are connected via a PCIe x1 link to the controller.

**Note:** To support Tri-mode with U.3 NVMe drives, **U.3 x1 mode** must be enabled for the selected drive slots on the backplane through the XCC Web GUI. Otherwise, the U.3 NVMe drives cannot be detected. For more information, see [“U.3 NVMe drive can be detected in NVMe connection, but cannot be detected in Tri-mode” on page 751](#).

- The virtual RAID on CPU (VROC) key and Tri-mode are not supported at the same time.
- ThinkSystem AMD X3522 10/25GbE DSFP28 2-port PCIe Ethernet Adapter must be installed on x16 slot for weight reason.

## Thermal rules

This topic provides thermal rules the server.

- [“Thermal rules for server without DWCM” on page 75](#)
- [“Thermal rules for server with DWCM” on page 84](#)

### Thermal rules for server without DWCM

This topic provides thermal rules for the server without a Direct Water Cooling Module (DWCM).

- [“Standard configurations” on page 76](#)
- [“Storage configurations with SPR processors” on page 77](#)
- [“Storage configurations with EMR processors” on page 79](#)
- [“GPU configurations without FIO” on page 81](#)
- [“GPU Configurations with FIO” on page 82](#)
- [“None-GPU Configurations with FIO or 4LP” on page 83](#)
- [“Configuration with 2U winged heat sinks” on page 83](#)

Abbreviations used in tables below are defined as follows:

- Max.Temp.: Maximum ambient temperature at sea level
- FIO = riser 5 + front OCP
- 4LP = riser 3/4
- S/S: SAS/SATA
- Any: AnyBay
- E: entry
- S: standard
- P: performance
- SW: single-wide
- DW: double-wide
- NA: not applicable
- Y: yes
- N: no

#### Notes:

- Performance heat sinks and performance fans are needed for the server having 195 W processors 6434/6434H/6534 or rear 4LP riser.

- Standard heat sinks and standard fans are needed for the server having 165 W 5515+ processors.
- Performance heat sinks are needed for the server having a GPU adapter installed on the front riser.
- Performance fans are needed for the server having any of the following components:
  - front PCIe and OCP adapters
  - OCP module installed in the chassis with 12 x 3.5-inch front drives
  - rear 7mm NVMe drives installed in the chassis with 12 x 3.5-inch front drives
  - internal CFF RAID/HBA/expander
  - parts with active optical cable (AOC) installed in storage configurations
  - ThinkSystem 96GB TruDDR5 4800MHz (2Rx4) RDIMM
  - ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM v1
  - ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1
  - the following special network cards installed in storage configurations
    - Mellanox ConnectX-6 HDR100 IB/100GbE VPI 1-port x16 PCIe 3.0 HCA w/ Tall Bracket L1/SBB with Active Fiber cables
    - Mellanox ConnectX-6 HDR100 IB/100GbE VPI 2-port x16 PCIe 3.0 HCA w/ Tall Bracket L1/SBB with Active Fiber cables
    - Mellanox ConnectX-6 HDR IB/200GbE Single Port x16 PCIe Adapter w/ Tall Bracket with Active Fiber cables
    - Mellanox MCX623106AC-CDAT Dx 100GbE QSFP56 2-port PCIe NIC -CSP I4
    - ThinkSystem Mellanox ConnectX-6 Dx 100GbE QSFP56 2-port PCIe Ethernet Adapter with Active Fiber cables
    - ThinkSystem NVIDIA BlueField-2 25GbE SFP56 2-Port PCIe Ethernet DPU w/BMC & Crypto
    - ThinkSystem NVIDIA ConnectX-7 NDR400 OSFP 1-port PCIe Gen5 Adapter with Active Fiber cables
    - ThinkSystem NVIDIA ConnectX-7 NDR200/HDR QSFP112 2-port PCIe Gen5 x16 InfiniBand Adapter with Active Fiber cables
    - ThinkSystem Broadcom 57508 100GbE QSFP56 2-port PCIe 4 Ethernet Adapter V2 with Active Fiber cables
    - ThinkSystem Broadcom 57454 10GBASE-T 4-port OCP Ethernet Adapter
    - ThinkSystem Broadcom 57416 10GBASE-T 2-port OCP Ethernet Adapter
    - ThinkSystem Broadcom 57508 100GbE QSFP56 2-Port OCP Ethernet Adapter
- ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1 is supported only on servers installed with the following components at a maximum ambient temperature of 25°C:
  - 8 x 2.5"/16 x 2.5"/8 x 3.5" front drive bay
  - processors with TDP less than or equal to 250 W
  - 2U entry or standard heat sinks
  - performance fans
- When ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1 is installed, the server supports a maximum of six HHL GPU adapters in slot 1/2/4/5/7/8, and does not support FHFL GPU adapters.
- The ambient temperature is limited to 30°C or lower when any of the following types of RDIMMs are used:
  - 5600 MHz RDIMMs with capacity greater than or equal to 96 GB
  - ThinkSystem 96GB TruDDR5 4800MHz (2Rx4) RDIMM
  - ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM v1
  - 4800 MHz 256 GB RDIMMs (except ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1)

## Standard configurations

This section provides thermal information for standard configurations.

Front drive bays	Max. Temp.	CPU TDP (watts)	Heat sink	Air baffle	Fan type	Max. DIMM Qty.
8 x 2.5"	45°C	125 <= TDP <= 185	T-shape (P)	S	P	32
16 x 2.5"	40°C	<= 205	T-shape (P)	S	P	32
8 x 3.5"						

Front drive bays	Max. Temp.	CPU TDP (watts)	Heat sink	Air baffle	Fan type	Max. DIMM Qty.
	35°C	125 ≤ TDP ≤ 185	2U (E)	S	S	32
	35°C	≤ 250	2U (S)	S	S	32
	35°C	270 ≤ TDP ≤ 330	T-shape (P)	S	P	32
	30°C	350	T-shape (P)	S	P	32

**Notes:**

- The DIMM supporting has the following conditions:
  - When the capacity of each RDIMM is less than or equal to 64 GB, standard fans are used.
  - When the capacity of each RDIMM is greater than 64 GB, performance fans are used.
- The maximum ambient temperatures of 45°C and 40°C are supported under the following conditions:
  - The capacity of each RDIMM must be less than or equal to 64 GB.
  - The server supports only low profile PCIe cards with performance dropping.
  - The following processors are not used:
    - 195 W processors 6434/6434H/6534
    - 165 W processor 5515+

**Storage configurations with SPR processors**

This section provides thermal information for storage configurations with 4th Gen (Sapphire Rapids, SPR) processors.

Front drive bays	Middle drive bays	Rear drive bays	Max. Temp.	CPU TDP (watts)	Heat sink	Air baffle	Fan type	Max. DIMM Qty.
24 x 2.5"	NA	NA	30°C	125 ≤ TDP ≤ 185	2U (E)	S	S	32
			30°C	195 ≤ TDP ≤ 205	2U (S)	S	S	32
			30°C	225 ≤ TDP ≤ 250	2U (S)	S	P	32
			30°C	270 ≤ TDP ≤ 330	T-shape (P)	S	P	32
			25°C	350	T-shape (P)	S	P	32
	NA	4 x 2.5" S/S	30°C	≤ 250	T-shape (P)	S	P	32
		2 x 3.5" S/S 4 x 2.5" NVMe	25°C	270 ≤ TDP ≤ 300	T-shape (P)	S	P	32

Front drive bays	Middle drive bays	Rear drive bays	Max. Temp.	CPU TDP (watts)	Heat sink	Air baffle	Fan type	Max. DIMM Qty.
	8 x 2.5" NVMe	NA	30°C	<= 250	T-shape (P)	NA	P	32
			25°C	270 <= TDP <= 300	T-shape (P)	NA	P	32
	8 x 2.5" S/S 4 x 3.5" S/S	4 x 2.5" S/S 8 x 2.5" S/S	30°C	<= 250	T-shape (P)	NA	P	32
			25°C	270 <= TDP <= 300	T-shape (P)	NA	P	32
	8 x 2.5" NVMe	4 x 2.5" NVMe	25°C	<= 300	T-shape (P)	NA	P	32
12 x 3.5"	NA	NA	30°C	125 <= TDP <= 185	2U (E)	S	S	32
			30°C	195 <= TDP <= 205	2U (S)	S	S	32
			30°C	225 <= TDP <= 250	2U (S)	S	P	32
			30°C	270 <= TDP <= 330	T-shape (P)	S	P	32
			25°C	350	T-shape (P)	S	P	32
	NA	2 x 3.5" S/S 4 x 3.5" S/S 4 x 2.5" S/S 4 x 2.5" NVMe	30°C	<= 250	T-shape (P)	S	P	32
			25°C	270 <= TDP <= 300	T-shape (P)	S	P	32
	8 x 2.5" NVMe	NA	30°C	<= 250	T-shape (P)	NA	P	32
			25°C	270 <= TDP <= 300	T-shape (P)	NA	P	32
	4 x 3.5" S/S	4 x 3.5" S/S 4 x 2.5" S/S	30°C	<= 250	T-shape (P)	NA	P	32
			25°C	270 <= TDP <= 300	T-shape (P)	NA	P	32

**Notes:**

1. The DIMM supporting has the following conditions:

- When the capacity of each RDIMM is less than or equal to 32 GB, standard fans are used.
- When the capacity of each RDIMM is greater than 32 GB, performance fans are used.

- The ambient temperature is limited to 25°C or lower when ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM v1 is used in 8 x 2.5" AnyBay + 16 x 2.5" SAS/SATA, 16 x 2.5" AnyBay + 8 x 2.5" SAS/SATA, or 24 x 2.5" AnyBay configurations.
  - The ambient temperature is limited to 30°C or lower when ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM v1 is used in 12 x 3.5" configurations under the following conditions:
    - No middle or rear drive bay is installed.
    - Standard or Entry heat sinks are used.
    - Processor TDP is less than or equal to 250 W.
  - The ambient temperature is limited to 25°C or lower when ThinkSystem 96GB TruDDR5 4800MHz (2Rx4) RDIMM is installed in the following configurations:
    - 12 x 3.5" configurations including processors with TDP less than or equal to 300 W
    - 12 x 3.5" + middle/rear drive bay configurations including processors with TDP less than or equal to 270 W
  - ThinkSystem 96GB TruDDR5 4800MHz (2Rx4) RDIMM is not supported in 12 x 3.5" configurations including processors with TDP greater than 300 W.
2. For the chassis with 12 x 3.5-inch front drives, a part with AOC is not supported in slot 3.
  3. For better performance, it is not recommended to block the air vent on the top cover of a server with storage configuration.
  4. When the ambient temperature is 30°C, Gen 5 NVMe rear or middle drive bays do not support the drives larger than 3.84 TB.
  5. The ambient temperature is limited to 25°C or lower when the following NVMe SSDs are installed in the front 12 x 3.5" SAS/SATA + middle 8 x 2.5" NVMe or front 12 x 3.5" SAS/SATA + rear 4 x 2.5" NVMe configuration:
    - ThinkSystem 2.5" U.2 P5336 61.44TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
    - ThinkSystem 2.5" U.2 P5336 30.72TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
    - ThinkSystem 2.5" U.2 P5336 15.36TB Read Intensive NVMe PCIe 4.0 x4 HS SSD

### Storage configurations with EMR processors

This section provides thermal information for storage configurations with 5th Gen (Emerald Rapids, EMR) processors.

Front drive bays	Middle drive bays	Rear drive bays	Max. Temp.	CPU TDP (watts)	Heat sink	Air baffle	Fan type	Max. DIMM Qty.
24 x 2.5"	NA	NA	30°C	125 <= TDP <= 185	2U (E)	S	P	32
			30°C	185 < TDP <= 250	2U (S)	S	P	32
			30°C	270 <= TDP <= 330	T-shape (P)	S	P	32
			25°C	350	T-shape (P)	S	P	32

Front drive bays	Middle drive bays	Rear drive bays	Max. Temp.	CPU TDP (watts)	Heat sink	Air baffle	Fan type	Max. DIMM Qty.
	NA	4 x 2.5" S/S	30°C	<= 250	T-shape (P)	S	P	32
		2 x 3.5" S/S 4 x 2.5" NVMe	25°C	270 <= TDP <= 300	T-shape (P)	S	P	32
	8 x 2.5" NVMe	NA	30°C	<= 250	T-shape (P)	NA	P	32
			25°C	270 <= TDP <= 300	T-shape (P)	NA	P	32
	8 x 2.5" S/S 4 x 3.5" S/S	4 x 2.5" S/S	30°C	<= 250	T-shape (P)	NA	P	32
		8 x 2.5" S/S	25°C	270 <= TDP <= 300	T-shape (P)	NA	P	32
	8 x 2.5" NVMe	4 x 2.5" NVMe	25°C	<= 300	T-shape (P)	NA	P	32
12 x 3.5"	NA	NA	30°C	125 <= TDP <= 185	2U (E)	S	P	32
			30°C	185 < TDP <= 250	2U (S)	S	P	32
			30°C	270 <= TDP <= 330	T-shape (P)	S	P	32
			25°C	350	T-shape (P)	S	P	32
	NA	2 x 3.5" S/S	30°C	<= 250	T-shape (P)	S	P	32
		4 x 3.5" S/S 4 x 2.5" S/S 4 x 2.5" NVMe	25°C	270 <= TDP <= 300	T-shape (P)	S	P	32
		8 x 2.5" NVMe	30°C	<= 250	T-shape (P)	NA	P	32
			25°C	270 <= TDP <= 300	T-shape (P)	NA	P	32
	4 x 3.5" S/S	4 x 3.5" S/S	30°C	<= 250	T-shape (P)	NA	P	32
		4 x 2.5" S/S	25°C	270 <= TDP <= 300	T-shape (P)	NA	P	32

**Notes:**

1. The DIMM supporting has the following conditions:



- The ambient temperature is limited to 25°C or lower when ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM v1 is used in 8 x 2.5" AnyBay + 16 x 2.5" SAS/SATA, 16 x 2.5" AnyBay + 8 x 2.5" SAS/SATA, or 24 x 2.5" AnyBay configurations.
  - The ambient temperature is limited to 30°C or lower when ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM v1 is used in 12 x 3.5" configurations under the following conditions:
    - No middle or rear drive bay is installed.
    - Standard or Entry heat sinks are used.
    - Processor TDP is less than or equal to 250 W.
2. For the chassis with 12 x 3.5-inch front drives, a part with AOC is not supported in slot 3.
  3. In 12 x 3.5" configurations, the server supports the maximum temperature of 30°C for processors with TDP greater than 300 W and less than or equal to 330 W and 25°C for 350 W processors only when the capacity of DIMM is less than or equal to 48 GB.
  4. For better performance, it is not recommended to block the air vent on the top cover of a server with storage configuration.
  5. When the ambient temperature is 30°C or higher, Gen 5 NVMe rear or middle drive bays do not support the drives larger than 3.84 TB.
  6. The ambient temperature is limited to 25°C or lower when the following NVMe SSDs are installed in the front 12 x 3.5" SAS/SATA + middle 8 x 2.5" NVMe or front 12 x 3.5" SAS/SATA + rear 4 x 2.5" NVMe configuration:
    - ThinkSystem 2.5" U.2 P5336 61.44TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
    - ThinkSystem 2.5" U.2 P5336 30.72TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
    - ThinkSystem 2.5" U.2 P5336 15.36TB Read Intensive NVMe PCIe 4.0 x4 HS SSD

### GPU configurations without FIO

This section provides thermal information for GPU configurations without FIO.

- Single-wide GPU: NVIDIA A2, T1000, T400, L4
- Double-wide GPU: NVIDIA A16, A30, A40, A100, A800, H100, H800, L40, L40S, RTX A2000, RTX A4500, RTX A6000, RTX 6000 Ada; AMD Instinct MI210

Front drive bays	Max. Temp.	CPU TDP (watts)	Heat sink	Air baffle	Fan type	Max. GPU Qty.		Max. DIMM Qty.
						SW	DW	
8 x 2.5"	30°C	125 <= TDP <= 185	2U (E)	S	P	8	NA	32
	30°C	225 <= TDP <= 250	2U (S)	S	P	8	NA	32
	30°C	270 <= TDP <= 350	T-shape (P)	S	P	8	NA	32
	30°C	<= 350	T-shape (P)	GPU	P	NA	3	32
8 x 3.5"	30°C	125 <= TDP <= 185	2U (E)	S	P	8	NA	32
16 x 2.5"	30°C	225 <= TDP <= 250	2U (S)	S	P	8	NA	32

Front drive bays	Max. Temp.	CPU TDP (watts)	Heat sink	Air baffle	Fan type	Max. GPU Qty.		Max. DIMM Qty.
						SW	DW	
	30°C	270 ≤ TDP ≤ 300	T-shape (P)	S	P	8	NA	32
	30°C	≤ 300	T-shape (P)	GPU	P	NA	3	32
	25°C	300 < TDP ≤ 350	T-shape (P)	S	P	8	NA	32
	25°C	300 < TDP ≤ 350	T-shape (P)	GPU	P	NA	3	32
24 x 2.5"	25°C	125 ≤ TDP ≤ 185	2U (E)	S	P	6	NA	32
	25°C	225 ≤ TDP ≤ 250	2U (S)	S	P	6	NA	32
	25°C	270 ≤ TDP ≤ 300	T-shape (P)	S	P	6	NA	32
	25°C	≤ 300	T-shape (P)	GPU	P	NA	2	32

#### Notes:

1. For the chassis with 16 x 2.5-inch front drives, a maximum of two A40, H100, H800, or L40S GPU adapters are supported in PCIe slot 2 and slot 5 at a maximum ambient temperature of 30°C.
2. A40 is not supported by the chassis with 24 x 2.5-inch front drives.
3. A maximum of three RTX A2000 and RTX 6000 Ada GPU adapters are supported by the chassis with 24 x 2.5-inch front drives.

#### GPU Configurations with FIO

This section provides thermal information for the GPU configurations with FIO.

- Single-wide GPU: NVIDIA A2, T1000, T400, L4
- Double-wide GPU: NVIDIA A16, A30, A40, A100, A800, H100, H800, L40, L40S, RTX A2000, RTX A4500, RTX A6000, RTX 6000 Ada; AMD Instinct MI210

Front drive bays	Max. Temp.	CPU TDP (watts)	Heat sink	Air baffle	Fan type	Max. GPU Qty.			Max. DIMM Qty.
						T1000/T400	A2/L4	DW	
8 x 2.5" + FIO	30°C	≤ 300	T-shape (P)	S	P	8	10	NA	32
	25°C	300 < TDP ≤ 350	T-shape (P)	S	P	8	10	NA	32
	30°C	≤ 300	T-shape (P)	GPU	P	NA	NA	2	32
	25°C	300 < TDP ≤ 350	T-shape (P)	GPU	P	NA	NA	2	32

Front drive bays	Max. Temp.	CPU TDP (watts)	Heat sink	Air baffle	Fan type	Max. GPU Qty.			Max. DIMM Qty.
						T1000/T400	A2/L4	DW	
16 x 2.5" + FIO	25°C	<= 300	T-shape (P)	S	P	8	10	NA	32
	25°C	<= 300	T-shape (P)	GPU	P	NA	NA	2	32

**Notes:**

1. The front riser (riser 5) supports only passive SW GPU adapters.
2. A40 is not supported in the 16 x 2.5" + FIO GPU configurations.

**None-GPU Configurations with FIO or 4LP**

This section provides thermal information for non-GPU configurations with FIO or rear 4LP riser.

Front drive bays	Max. Temp.	CPU TDP (watts)	Heat sink	Air baffle	Fan type	Max. DIMM Qty.
8 x 2.5" + FIO	35°C	125 <= TDP <= 185	2U (E)	S	P	32
	35°C	205 <= TDP <= 250	2U (S)	S	P	32
	35°C	270 <= TDP <= 330	T-shape (P)	S	P	32
	30°C	350	T-shape (P)	S	P	32
16 x 2.5" + FIO	30°C	125 <= TDP <= 185	2U (E)	S	P	32
	30°C	205 <= TDP <= 250	2U (S)	S	P	32
	30°C	270 <= TDP <= 330	T-shape (P)	S	P	32
	25°C	350	T-shape (P)	S	P	32
8 x 2.5" + 4LP	35°C	<= 330	T-shape (P)	S	P	32
16 x 2.5" + 4LP	30°C	350	T-shape (P)	S	P	32

**Note:** The ambient temperature must be limited to 25°C or lower when ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM v1 is installed in the 8 x 2.5" SAS/SATA + 8 x 2.5" AnyBay + FIO configuration or 16 x 2.5" AnyBay + FIO configuration.

**Configuration with 2U winged heat sinks**

This section provides thermal information for the currently available configuration with 2U winged heat sinks.

Front drive bays	Max. Temp.	CPU	Air baffle	Fan type	Max. DIMM Qty.
8 x 2.5" NVMe Gen5	30°C	6558Q	NA	P	32 x 5600 MHz 16 GB DIMM

**Notes:**

1. The 8 x 2.5" backplane is installed in the position of backplane 2. For the position of backplane 2, see ["Install the 2.5-inch front drive backplane" on page 140.](#)
2. For the 8 x 2.5" NVMe configuration, the drive capacity must be less than or equal to 7.68 TB.
3. For other configuration requests with 2U winged heat sink for 6558Q, 6458Q or 8470Q liquid cooling processors, reach Lenovo sales representative to investigate through Lenovo special bid process.

## Thermal rules for server with DWCM

This topic provides thermal rules for the server with a Direct Water Cooling Module (DWCM).

- ["Standard configurations" on page 85](#)
- ["Storage configurations" on page 85](#)
- ["GPU configurations without FIO and 4LP" on page 86](#)
- ["GPU Configurations with FIO" on page 87](#)
- ["Non-GPU Configurations with FIO or 4LP" on page 87](#)

Abbreviations used in tables below are defined as follows:

- Max.Temp.: Maximum ambient temperature at sea level
- FIO = riser 5 + front OCP
- 4LP = riser 3/4
- S/S: SAS/SATA
- Any: AnyBay
- E: entry
- S: standard
- P: performance
- SW: single-wide
- DW: double-wide
- NA: not applicable
- Y: yes
- N: no

## Notes:

- Performance fans are needed for the server having any of the following components:
  - front PCIe and OCP adapters
  - OCP module installed in the chassis with 12 x 3.5-inch front drives
  - rear 7mm NVMe drives installed in the chassis with 12 x 3.5-inch front drives
  - internal CFF RAID/HBA/expander
  - parts with active optical cable (AOC) installed in storage configurations
  - ThinkSystem 96GB TruDDR5 4800MHz (2Rx4) RDIMM
  - ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM v1
  - ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1
  - the following special network cards installed in storage configurations
    - Mellanox ConnectX-6 HDR100 IB/100GbE VPI 1-port x16 PCIe 3.0 HCA w/ Tall Bracket L1/SBB with Active Fiber cables
    - Mellanox ConnectX-6 HDR100 IB/100GbE VPI 2-port x16 PCIe 3.0 HCA w/ Tall Bracket L1/SBB with Active Fiber cables
    - Mellanox ConnectX-6 HDR IB/200GbE Single Port x16 PCIe Adapter w/ Tall Bracket with Active Fiber cables
    - Mellanox MCX623106AC-CDAT Dx 100GbE QSFP56 2-port PCIe NIC -CSP I4
    - ThinkSystem Mellanox ConnectX-6 Dx 100GbE QSFP56 2-port PCIe Ethernet Adapter with Active Fiber cables

- ThinkSystem NVIDIA BlueField-2 25GbE SFP56 2-Port PCIe Ethernet DPU w/BMC & Crypto
- ThinkSystem NVIDIA ConnectX-7 NDR400 OSFP 1-port PCIe Gen5 Adapter with Active Fiber cables
- ThinkSystem NVIDIA ConnectX-7 NDR200/HDR QSFP112 2-port PCIe Gen5 x16 InfiniBand Adapter with Active Fiber cables
- ThinkSystem Broadcom 57508 100GbE QSFP56 2-port PCIe 4 Ethernet Adapter V2 with Active Fiber cables
- ThinkSystem Broadcom 57454 10GBASE-T 4-port OCP Ethernet Adapter
- ThinkSystem Broadcom 57416 10GBASE-T 2-port OCP Ethernet Adapter
- ThinkSystem Broadcom 57508 100GbE QSFP56 2-Port OCP Ethernet Adapter
- The ambient temperature is limited to 30°C or lower when any of the following types of RDIMMs are used:
  - 5600 MHz RDIMMs with capacity greater than or equal to 96 GB
  - ThinkSystem 96GB TruDDR5 4800MHz (2Rx4) RDIMM
  - ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM v1
  - 4800 MHz 256 GB RDIMMs (except ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1)

### Standard configurations

This section provides thermal information for standard configurations with a DWCM.

Front drive bays	Max. Temp.	CPU TDP (watts)	Air baffle	Fan type	Max. DIMM Qty.
8 x 2.5" 16 x 2.5" 8 x 3.5"	35°C	All supported	S	S	32

**Note:** The ambient temperature is limited to 25°C when ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1 is used.

### Storage configurations

This section provides thermal information for storage configurations with a DWCM.

Front drive bays	Middle drive bays	Rear drive bays	Max. Temp.	Air baffle	Fan type	Max. DIMM Qty.
16 x 2.5" S/S + 8 x 2.5" Any	NA	NA	35°C	S	S	32
8 x 2.5" S/S + 16 x 2.5" Any	NA	4 x 2.5" S/S 2 x 3.5" S/S	35°C	S	P	32
24 x 2.5" S/S	8 x 2.5" NVMe	NA	30°C	NA	P	32
24 x 2.5" Any	8 x 2.5" S/S 4 x 3.5" S/S	4 x 2.5" S/S 8 x 2.5" S/S	35°C	NA	P	32
24 x 2.5" S/S 24 x 2.5" Any	NA	4 x 2.5" NVMe	30°C	S	P	32
24 x 2.5" NVMe	8 x 2.5" NVMe	4 x 2.5" NVMe	30°C	NA	P	32

Front drive bays	Middle drive bays	Rear drive bays	Max. Temp.	Air baffle	Fan type	Max. DIMM Qty.
12 x 3.5" S/S 12 x 3.5" Any	NA	NA	35°C	S	S	32
	NA	2 x 3.5" S/S 4 x 3.5" S/S 4 x 2.5" S/S	35°C	S	P	32
	8 x 2.5" NVMe	NA	30°C	NA	P	32
	4 x 3.5" S/S	4 x 3.5" S/S 4 x 2.5" S/S	35°C	NA	P	32
12 x 3.5" S/S	NA	4 x 2.5" NVMe	30°C	S	P	32

#### Notes:

1. When the capacity of each RDIMM is less than 64 GB, standard fans are used.
2. When the capacity of each RDIMM is greater than or equal to 64 GB, performance fans are used.
3. Storage configurations with a DWCM does not support ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1.
4. The ambient temperature is limited to 25°C or lower when the following NVMe SSDs are installed in the front 12 x 3.5" SAS/SATA + middle 8 x 2.5" NVMe or front 12 x 3.5" SAS/SATA + rear 4 x 2.5" NVMe configuration:
  - ThinkSystem 2.5" U.2 P5336 61.44TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
  - ThinkSystem 2.5" U.2 P5336 30.72TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
  - ThinkSystem 2.5" U.2 P5336 15.36TB Read Intensive NVMe PCIe 4.0 x4 HS SSD

#### GPU configurations without FIO and 4LP

This section provides thermal information for GPU configurations without FIO and 4LP.

- Single-wide GPU: NVIDIA A2, T1000, T400, L4
- Double-wide GPU: NVIDIA A16, A30, A40, A100, A800, H100, H800, L40, L40S, RTX A2000, RTX A4500, RTX A6000, RTX 6000 Ada; AMD Instinct MI210

Front drive bays	Max. Temp.	CPU TDP (watts)	Air baffle	Fan type	Max. GPU Qty.		Max. DIMM Qty.
					SW	DW	
8 x 2.5"	35°C	All supported	S	P	8	NA	32
8 x 3.5" 16 x 2.5"	35°C	All supported	GPU	P	NA	3	32
24 x 2.5"	35°C	All supported	S	P	6	NA	32
	35°C	All supported	GPU	P	NA	3	32

#### Notes:

1. The ambient temperature must be limited to 30°C or lower when three A40 GPU adapters are installed in 24 x 2.5" configurations or three 300 W GPU adapters are installed in 8 x 3.5" or 16 x 2.5" configurations.
2. The ambient temperature must be limited to 25°C or lower in the following cases:
  - Three H100/H800/L40S GPU adapters are installed in 24 x 2.5" configurations.

- The server is equipped with ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1.
3. The 24 x 2.5" configurations do not support ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1.

### GPU Configurations with FIO

This section provides thermal information for the GPU configurations with FIO.

- Single-wide GPU: NVIDIA A2, T1000, T400, L4
- Double-wide GPU: NVIDIA A16, A30, A40, A100, A800, H100, H800, L40, L40S, RTX A2000, RTX A4500, RTX A6000, RTX 6000 Ada; AMD Instinct MI210

Front drive bays	Max. Temp.	CPU TDP (watts)	Air baffle	Fan type	Max. GPU Qty.			Max. DIMM Qty.
					T1000/T400	A2/L4	DW	
8 x 2.5" + FIO	35°C	All supported	GPU	P	NA	NA	3	32
16 x 2.5" + FIO	30°C	All supported	S	P	8	10	NA	32

#### Notes:

1. The front riser (riser 5) supports only passive SW GPU adapters.
2. The ambient temperature must be limited to 30°C or lower when three 300 W GPU adapters are installed in 8 x 2.5" + FIO configurations or three A40 GPU adapters are installed in 16 x 2.5" + FIO configurations.
3. The ambient temperature must be limited to 25°C or lower when three H100/H800/L40S GPU adapters are installed in 16 x 2.5" + FIO configurations.
4. The 16 x 2.5" + FIO configurations do not support ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1.

### Non-GPU Configurations with FIO or 4LP

This section provides thermal information for non-GPU configurations with FIO or rear 4LP riser.

Front drive bays	Max. Temp.	CPU TDP (watts)	Air baffle	Fan type	Max. DIMM Qty.
8 x 2.5" + FIO/4LP 16 x 2.5" + FIO/4LP	35°C	All supported	S	P	32

**Note:** The non-GPU configurations with FIO do not support ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM v1.

## 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).

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 711](#)

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 88](#).

## 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 711](#)

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 87](#).

---

## Server replacement

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

### 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.**

#### R006





**CAUTION:**

Do not place any object on top of a rack-mounted device unless that rack-mounted device is intended for use as a shelf.

**CAUTION:**

- Potential stability hazards exist. The rack might tip over and cause serious personal injury.
- Before extending the rack to the installation position, read the [“Installation Guidelines” on page 57](#). Do not put any load on the slide-rail mounted equipment in the installation position. Do not leave the slide-rail mounted equipment in the installation position.

## About this task

**Attention:**

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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:**

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

## Procedure

Step 1. Loosen the two thumbscrews located on the front of the server to disengage it from the rack.

### Rack front

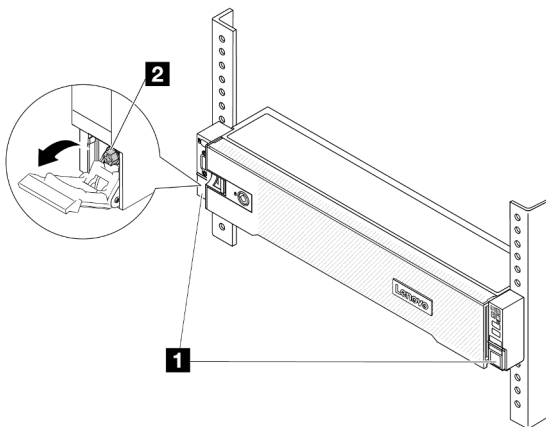


Figure 33. Disengaging server from the rack

<b>1</b>	Rack latch
<b>2</b>	Screw

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

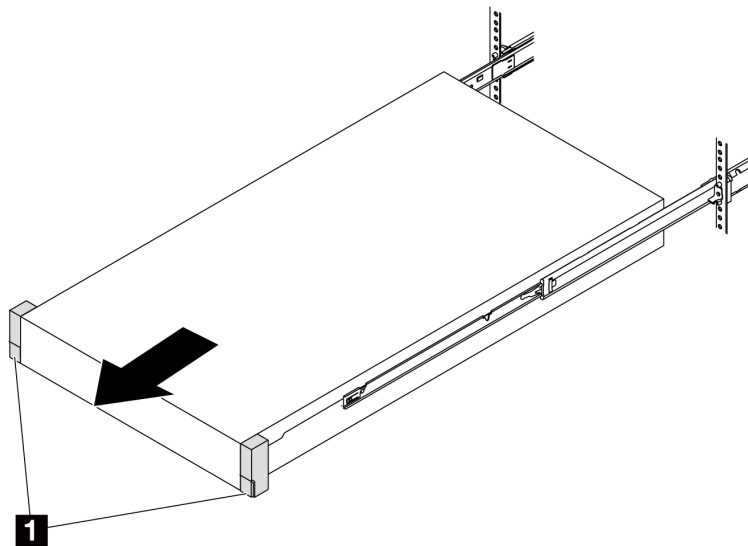


Figure 34. Pulling out the server

<b>1</b>	Rack latch (Mounting ear)
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Step 3. Remove the server from the rack.

**CAUTION:**

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

## Rack front

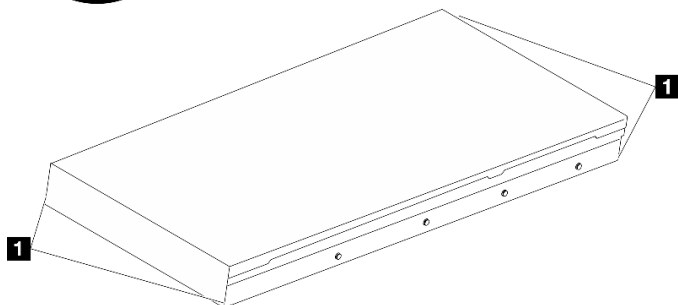


Figure 35. Lifting up the server

**1**

Lift point

## Rack Front

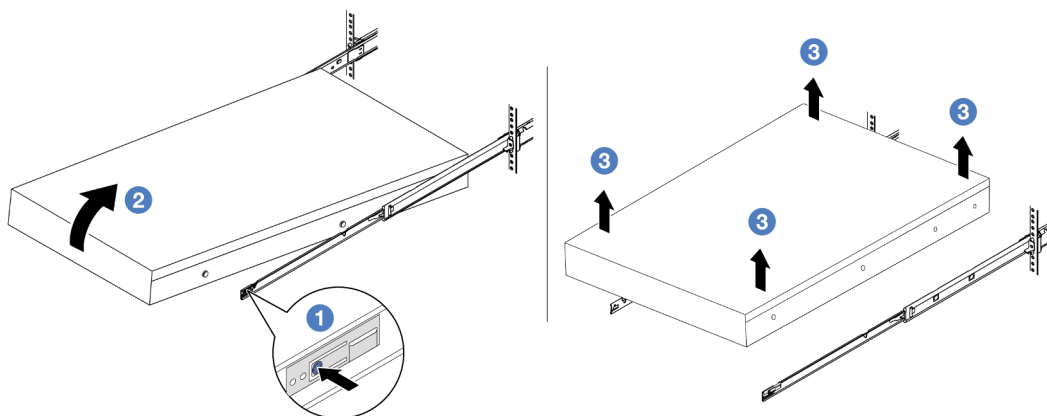


Figure 36. Removing the server from the rack.

**1**

Release tab

- 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** 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

[Watch the procedure on YouTube](#)

### 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.

## R006



### CAUTION:

Do not place any object on top of a rack-mounted device unless that rack-mounted device is intended for use as a shelf.

### CAUTION:

- Potential stability hazards exist. The rack might tip over and cause serious personal injury.
- Before extending the rack to the installation position, read the [“Installation Guidelines” on page 57](#). Do not put any load on the slide-rail mounted equipment in the installation position. Do not leave the slide-rail mounted equipment in the installation position.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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:

**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/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to [“Update the firmware” on page 691](#) 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

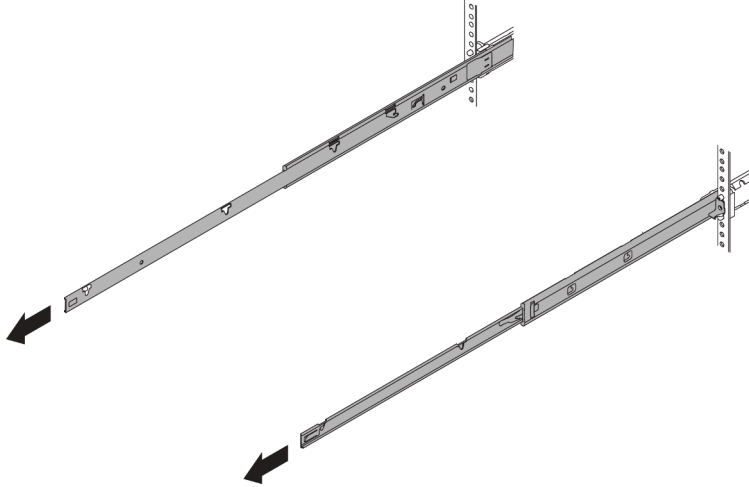


Figure 37. Pulling out the rails

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

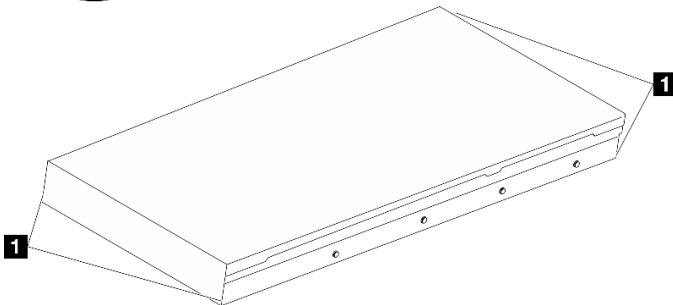


Figure 38. Lifting up the server

<b>1</b>	Lift point
----------	------------

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.

## Rack front

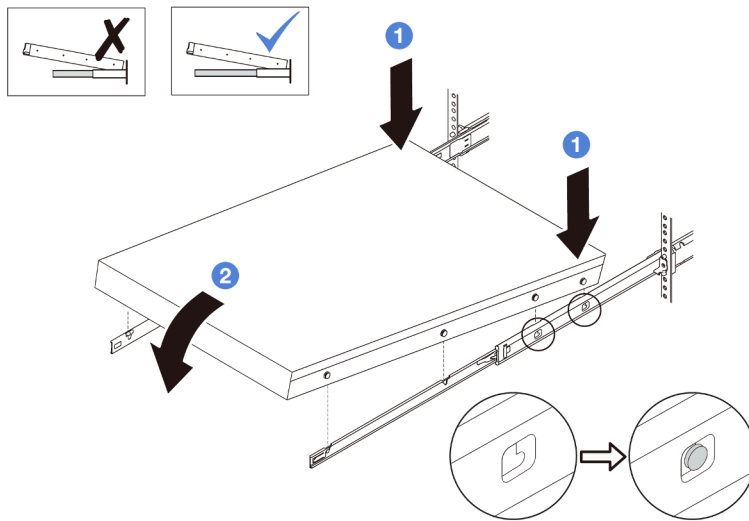


Figure 39. Installing the server into the rails

- a. 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.
- b. ② Slowly lower the server down and make sure the other 3 nailheads on server's left and right sides slip into corresponding slots.

**Note:** Inspect the sides of the rails to make sure the nailheads are placed in the slots.

Step 4. Slide the server into rack.

- 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.

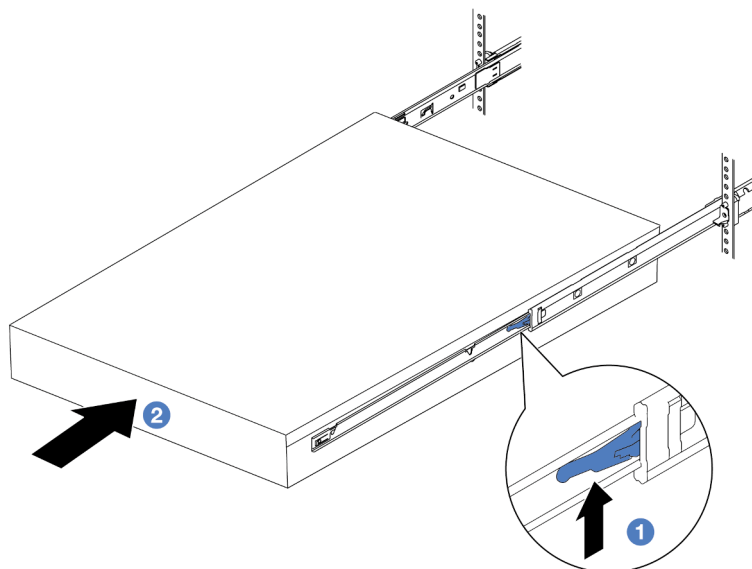


Figure 40. Installing the server into the rack

<b>1</b>	Latch
----------	-------

- 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

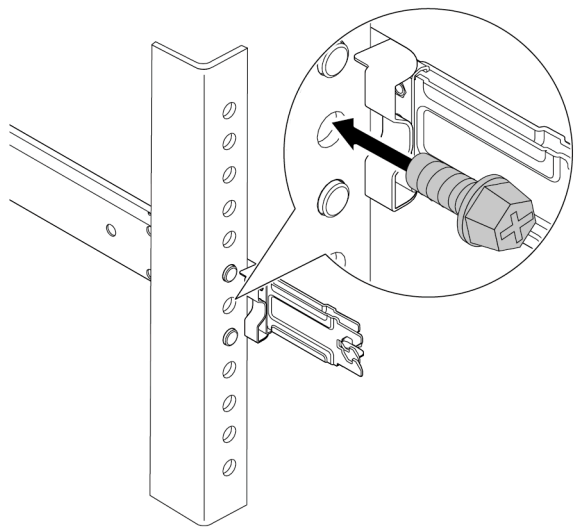


Figure 41. Securing the server to the rear of the rack

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

## Rack front

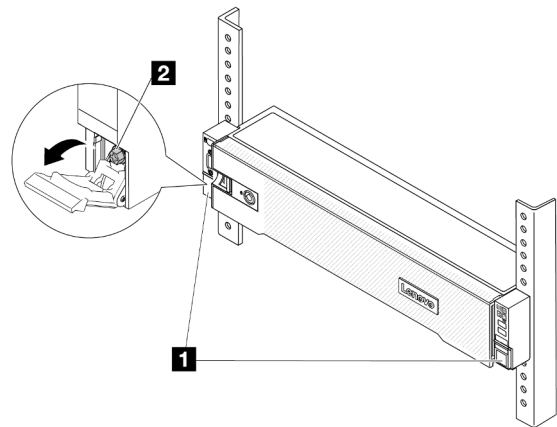


Figure 42. Securing the server to the front of the rack

<b>1</b>	Rack latch
<b>2</b>	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 87](#).
3. Update the server configuration. See [“Complete the parts replacement” on page 383](#).

### Demo video

[Watch the procedure on YouTube](#)

---

## 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.

- [“Remove a hot-swap drive” on page 96](#)
- [“Install a hot-swap drive” on page 98](#)

### 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 those instructions in addition to the instructions in this topic. Ensure that you have all the cables and other equipment that are specified in the documentation that comes with the drive.
- 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 the removed drive filler in case that you later remove the drive and need the drive filler to cover the place.
- 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 hot-swap drive

Use this information to remove a hot-swap drive.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) to ensure that you work safely.
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.
- If one or more NVMe solid-state drives are to be removed, it is recommended to disable them beforehand via the operating 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.



**Note:** Make sure you have the drive bay fillers available if some drive bays will be left empty after the removal.

## Procedure

- Step 1. If the security bezel is installed, remove it first. See [“Remove the security bezel” on page 352](#).
- Step 2. Slide the release latch to unlock the drive handle.

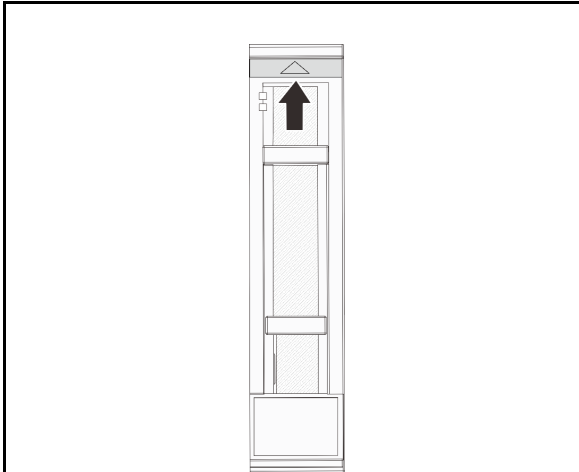


Figure 43. 2.5-inch hot-swap drive

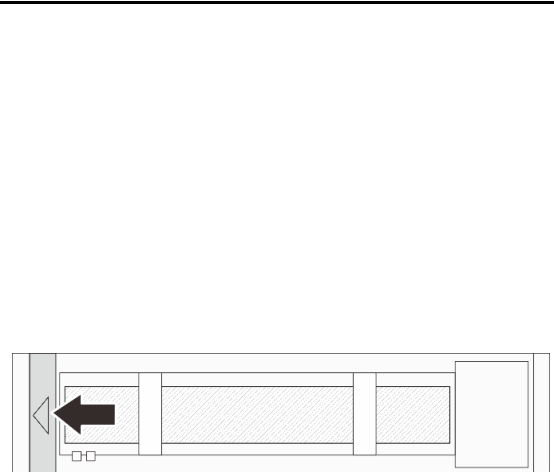


Figure 44. 3.5-inch hot-swap drive

- Step 3. Grasp the handle and slide the drive out of the drive bay.

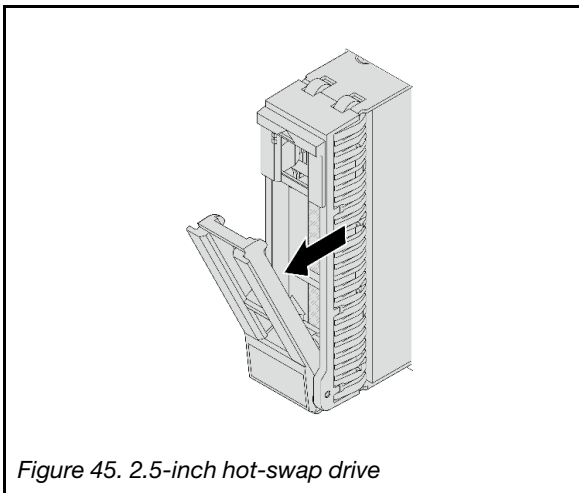


Figure 45. 2.5-inch hot-swap drive

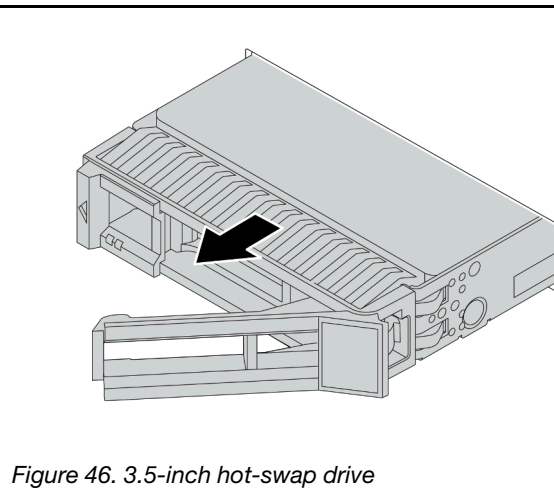


Figure 46. 3.5-inch hot-swap drive

## After you finish

1. Install a new drive or drive filler to cover the drive bay. See [“Install a hot-swap drive” on page 98](#).
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 a hot-swap drive

Use this information to install a hot-swap drive.

### About this task

#### Attention:

- Read “[Installation Guidelines](#)” on page 57 and “[Safety inspection checklist](#)” on page 58 to ensure that you work safely.
- To avoid damage to the drive connectors, make sure that the server top cover is in place and fully closed whenever you install or remove a drive.
- To make sure that there is adequate system cooling, do not operate the server for more than two minutes without either a drive or a drive bay filler installed in each bay.
- Before you make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes, or drive cables, back up all important data that is stored on drives.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.

For a list of supported drives, see <https://serverproven.lenovo.com>.

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

- Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to “[Update the firmware](#)” on page 691 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. Install the drive in the drive bay.
- 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.

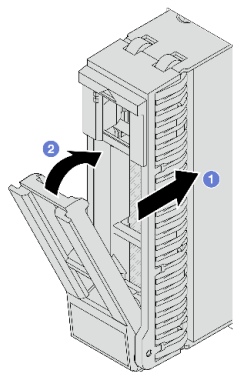


Figure 47. 2.5-inch hot-swap drive

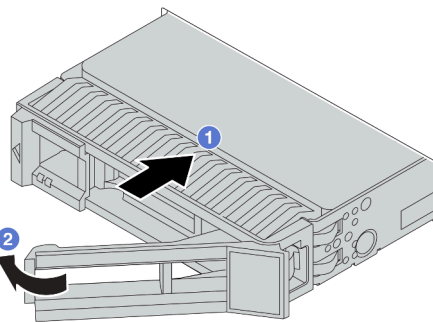


Figure 48. 3.5-inch hot-swap drive

- Step 3. Check the drive status LED to verify that the drive is operating correctly.
- If the yellow drive status LED is lit continuously, that drive is faulty and must be replaced.
  - If the green drive activity LED is flashing, the drive is being accessed.
- Step 4. Continue to install additional hot-swap drives if necessary.

## After you finish

- Reinstall the security bezel if you have removed it. See [“Install the security bezel” on page 353](#).
- If the server is configured for RAID operation through a ThinkSystem RAID adapter, you might have to reconfigure your disk arrays after you install drives. See the ThinkSystem RAID adapter documentation for additional information about RAID operation and complete instructions for using ThinkSystem RAID adapter.

## Demo video

[Watch the procedure on YouTube](#)

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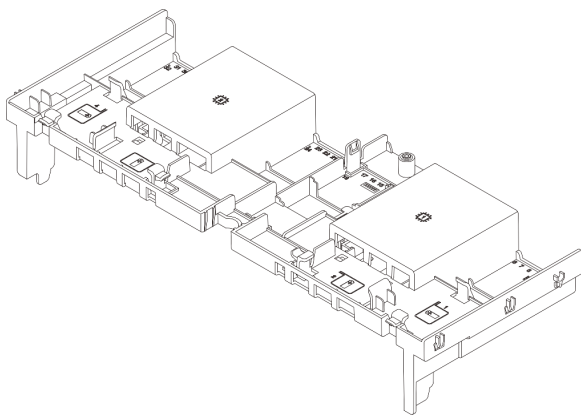
## Air baffle replacement

Follow instructions in this section to remove and install the air baffle.

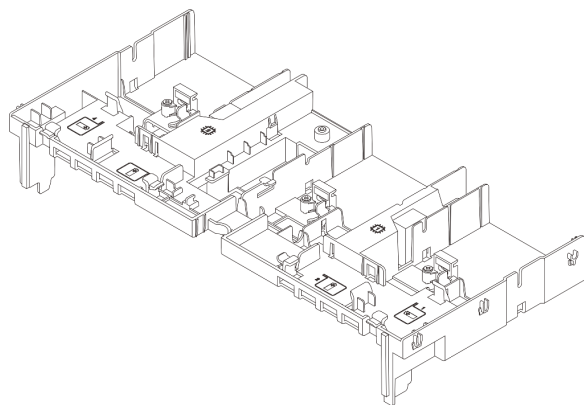
The air baffle varies by the server hardware configuration. Refer to [“Thermal rules” on page 75](#) to select the appropriate air baffle for your server. This topic uses the standard air baffle as an example for illustration. For information about the GPU air baffle, see [“GPU replacement” on page 152](#).

- [“Remove the air baffle” on page 99](#)
- [“Install the air baffle” on page 101](#)

*Figure 49. Standard air baffle*



*Figure 50. GPU air baffle*



## Remove the air baffle

Follow instructions in this section to remove the air baffle.

## 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 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).

## **Procedure**

**Note:** The illustrated air baffle is the standard air baffle. The removal procedure is the same for the GPU air baffle.

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 88](#).
- b. Remove the top cover. See [“Remove the top cover” on page 381](#).
- c. If there is a RAID flash power module installed on the air baffle, disconnect the cable of the RAID flash power module first.
- d. If there is an M.2 drive installed on the air baffle, disconnect M.2 backplane cables from the system board assembly.
- e. If there is a GPU installed on the air baffle, remove the GPU first. See [“Remove a GPU adapter” on page 154](#).

Step 2. Grasp the air baffle and carefully lift it out of the chassis.

**Attention:** For proper cooling and airflow, reinstall the air baffle before you turn on the server. Operating the server with the air baffle removed might damage server components.

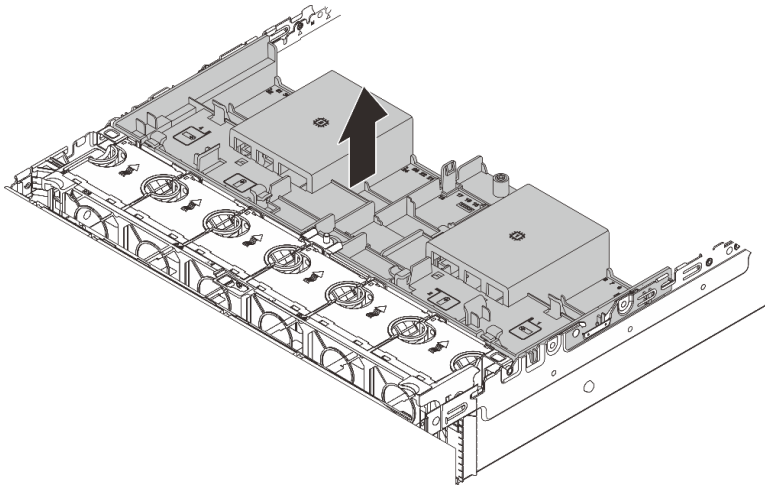


Figure 51. Removing the air baffle

Step 3. (Optional) Remove the filler from the air baffle if you are using the T-shape performance heat sink or Direct Water Cooling Module (DWCM) and need to change to 2U standard or entry heat sink.

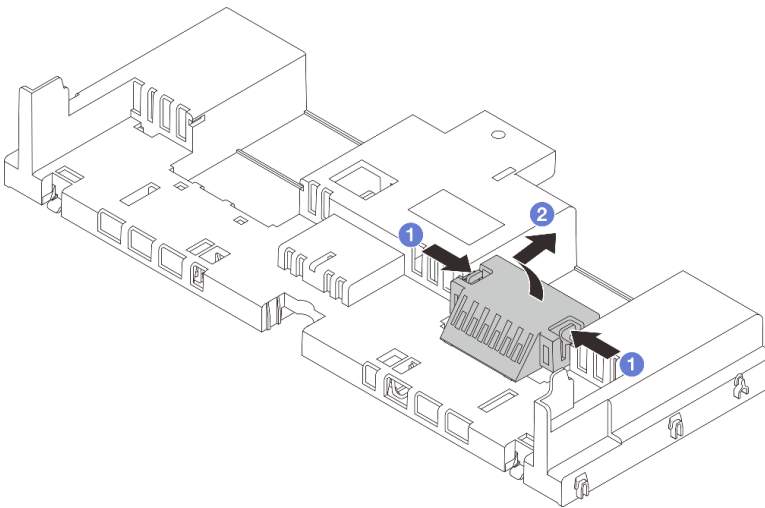


Figure 52. Air baffle filler removal

## 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

[Watch the procedure on YouTube](#)

## Install the air baffle

Follow instructions in this section to install the air baffle.

## 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 57](#) and [“Safety inspection checklist” on page 58](#) to ensure that you work safely.
- For proper cooling and airflow, reinstall the air baffle before you turn on the server. Operating the server with the air baffle removed might damage server components.

## Procedure

**Note:** The illustrated air baffle is a standard air baffle. The installation method is the same for the GPU air baffle.

- Step 1. Refer to [“Thermal rules” on page 75](#) to select the appropriate air baffle for your server.
- Step 2. (Optional) If the T-shape performance heat sink or Direct Water Cooling Module (DWCM) is installed, install the air baffle filler to fill the gap between the heat sink and the air baffle.

**Note:** The following illustration shows the air baffle upside down.

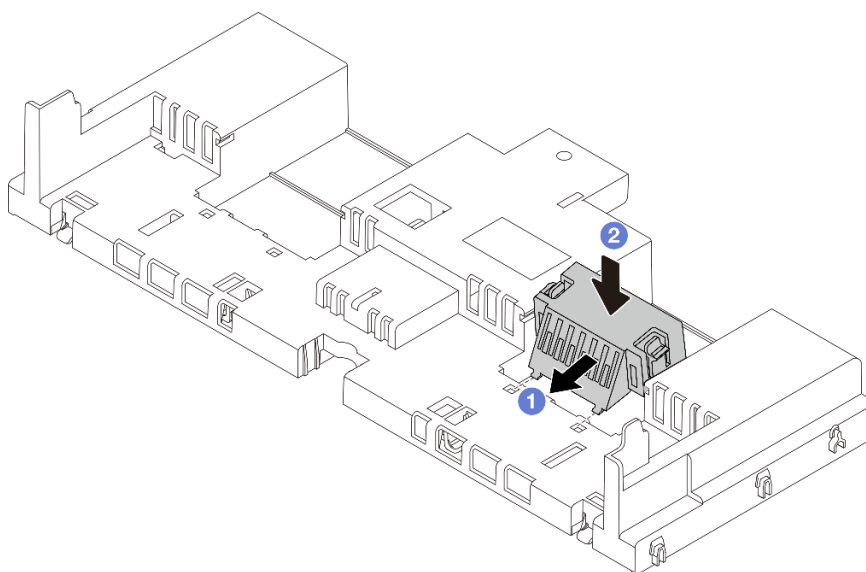


Figure 53. Air baffle filler installation

- Step 3. Align the tabs on both sides of the air baffle with the corresponding slots on both sides of the chassis. Then, lower the air baffle into the chassis and press the air baffle down until it is securely seated.

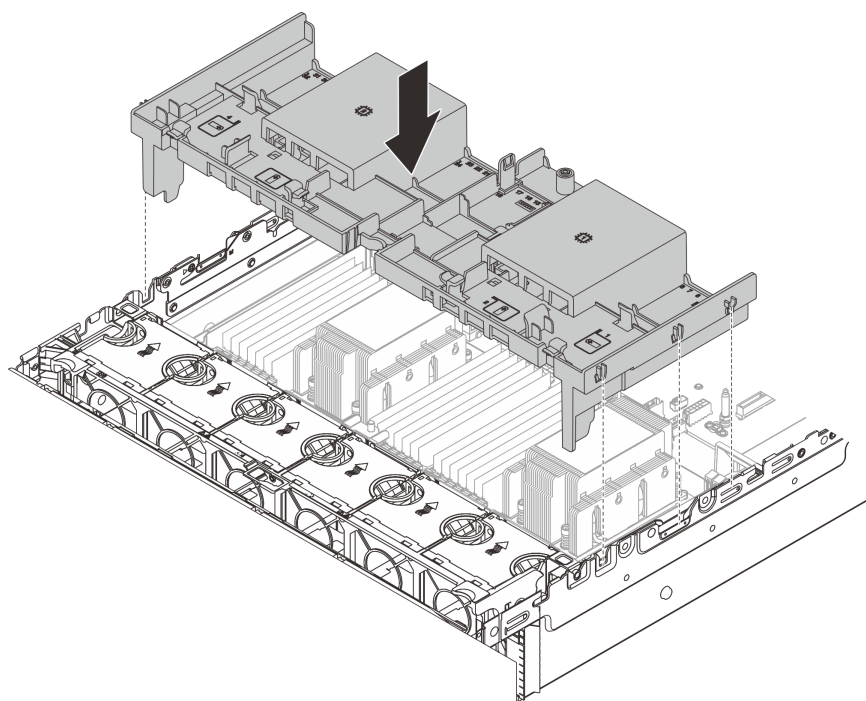


Figure 54. Installation of the standard air baffle

## After you finish

1. Reconnect cables of RAID flash power modules if you have disconnected them. See [Chapter 6 “Internal cable routing” on page 385](#).

2. Reconnect cables of the M.2 backplane if you have disconnected them. See [Chapter 6 “Internal cable routing” on page 385](#).
3. If you have removed a GPU adapter, reinstall it. See [“Install a GPU adapter” on page 157](#).
4. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### Demo video

[Watch the procedure on YouTube](#)

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## CMOS battery (CR2032) replacement

Use this information to remove and install the CMOS battery.

- [“Remove the CMOS battery” on page 104](#)
- [“Install the CMOS battery” on page 106](#)

## 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 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).

## Procedure

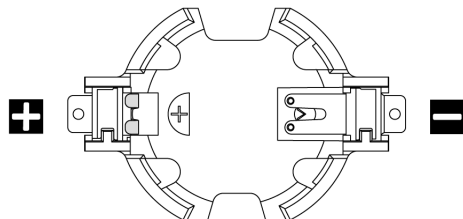
Step 1. Make preparation for the task.

- 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 88](#).
- Remove the top cover. See [“Remove the top cover” on page 381](#).
- Remove any parts and disconnect any cables that might impede your access to the CMOS battery.

Step 2. Locate the CMOS battery. See [“System-board-assembly connectors” on page 40](#).

Step 3. Remove the CMOS battery.

**Note:** Before you remove or install the CMOS battery from or into the socket, differentiate between the positive and negative ends.



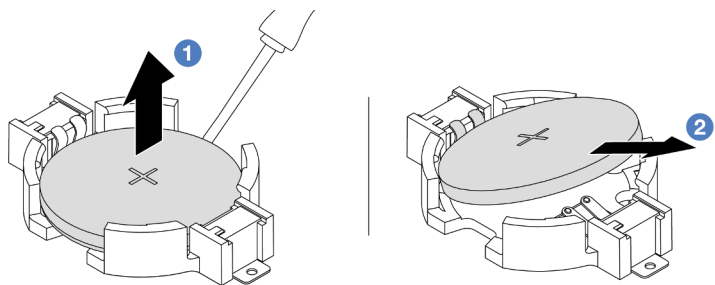


Figure 55. CMOS battery removal

**Attention:** Do not tilt or push the CMOS battery by using excessive force. Failing to remove the CMOS battery properly might damage the socket on the system board assembly. Any damage to the socket might require replacing the system board assembly.

- a. ① Pry the CMOS battery from the socket with a flat-blade screwdriver.
- b. ② Carefully take the CMOS battery out of the socket.

### After you finish

1. Install a new one. See [“Install the CMOS battery” on page 106](#).
2. Dispose of the CMOS battery as required by local ordinances or regulations.

### Demo video

[Watch the procedure on YouTube](#)

## Install the CMOS battery

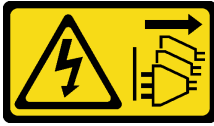
Use this information to install the CMOS battery.

### 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 install the CMOS battery, you must reconfigure the server and reset the system date and time.

**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 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).

**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. 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.

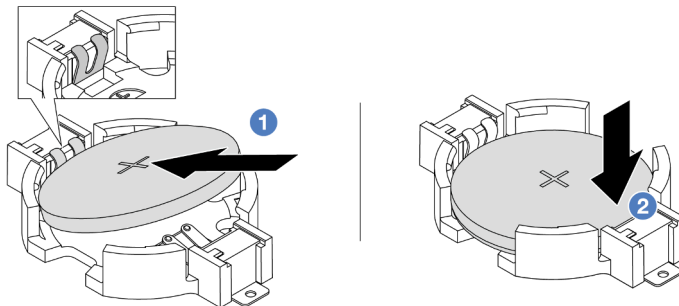


Figure 56. CMOS battery installation

- 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 Press the battery down until it clicks into the socket.

**After you finish**

1. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).
2. Use the Setup utility to set the date, time, and any passwords.

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

## Demo video

[Watch the procedure on YouTube](#)

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## Front adapter cage replacement

Follow instructions in this section to remove and install the front adapter cage, including the riser 5 cage at the top and the front OCP cage at the bottom.

- [“Remove the front adapter cage” on page 108](#)
- [“Install the front adapter cage” on page 112](#)

## Remove the front adapter cage

Follow instructions in this section to remove the front adapter cage, including the riser 5 cage at the top and the front OCP cage at the bottom.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.

### 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 88](#).
- b. Remove the top cover. See [“Remove the top cover” on page 381](#).
- c. If your server comes with a riser 1 assembly, remove it first. See [“Remove a rear riser assembly” on page 334](#). Then disconnect the cables from the rear OCP interposer card.
- d. Record the cable connections, and disconnect all cables from the system board assembly.

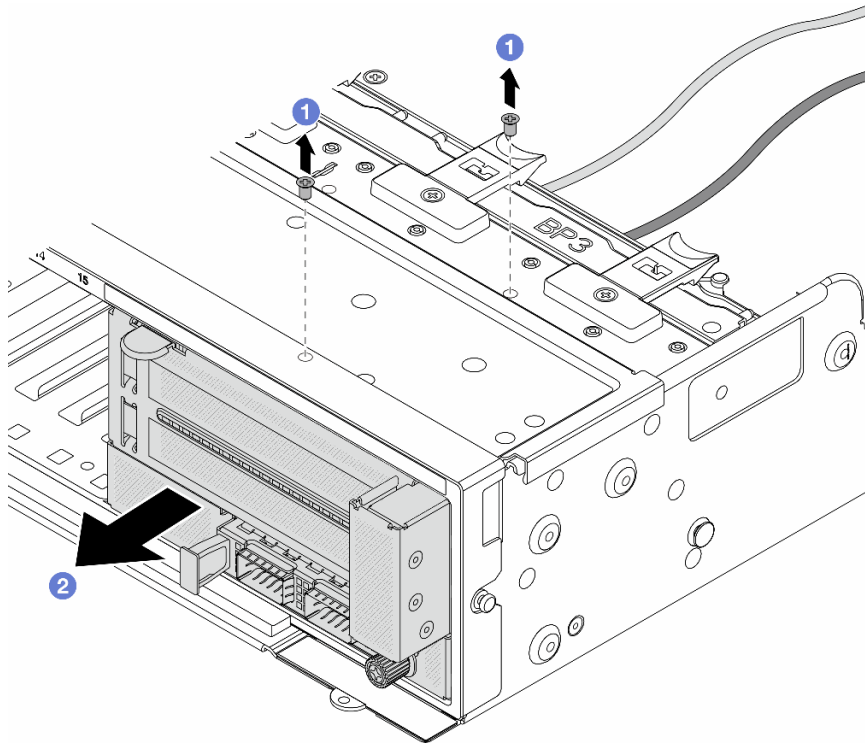
#### Notes:

- 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.
- e. Remove system fans. See [“Remove a system fan” on page 369](#).

f. Remove the system fan cage. See [“Remove the system fan cage”](#) on page 373.

Step 2. Remove the front adapter assembly.

**Note:** The number of cables varies according to the configuration.



*Figure 57. Removing the front adapter assembly*

a. ① Remove the screws that secure the assembly.

b. ② Slide the assembly out of the front chassis.

Step 3. Lift the riser 5 assembly up off the front OCP assembly, and disconnect cables from the front OCP interposer card.

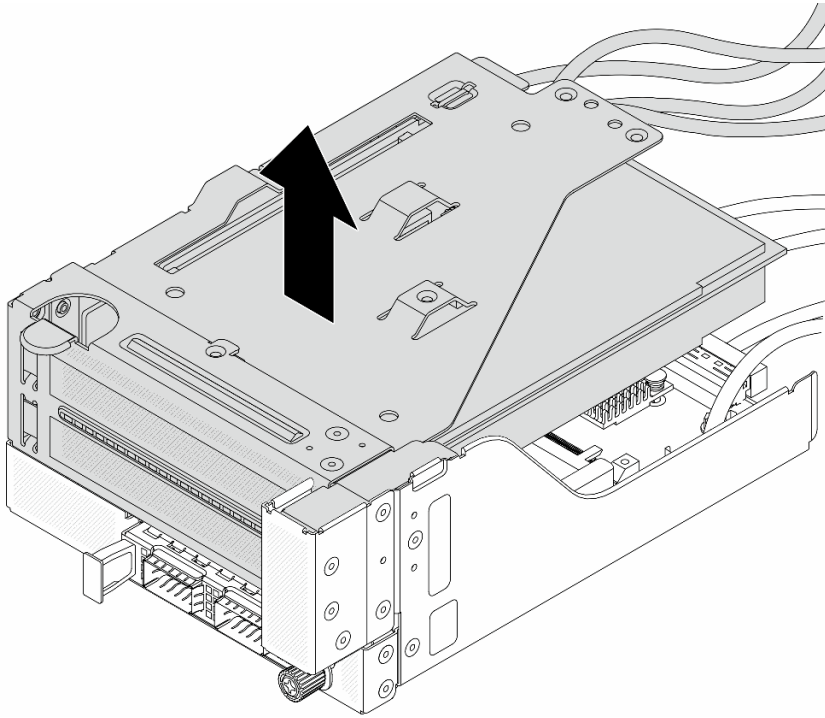


Figure 58. Lifting the riser 5 assembly

Step 4. Remove the PCIe adapter from the riser 5 cage.

**Note:** For ThinkSystem AMD X3522 10/25GbE DSFP28 2-port PCIe Ethernet Adapter, remove the screw that secures the adapter first.

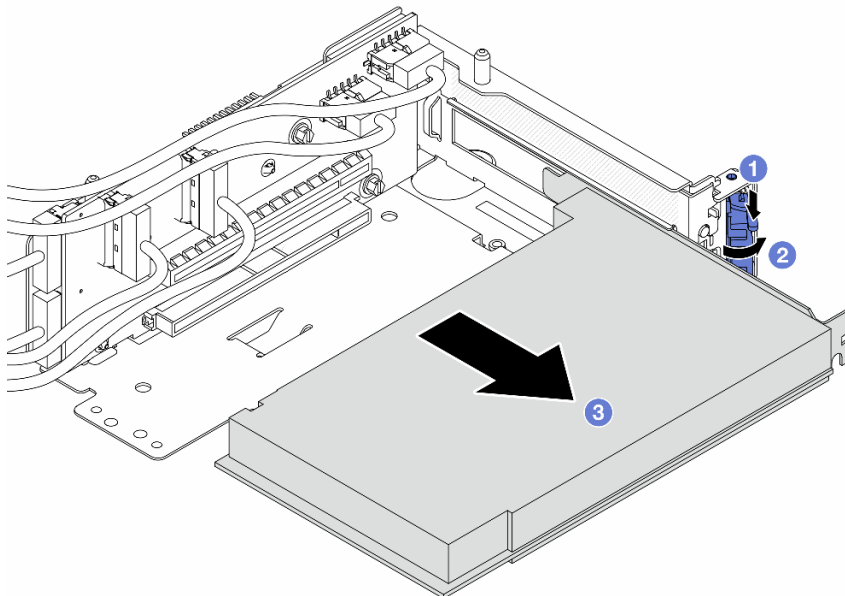


Figure 59. Removing the PCIe adapter from the riser 5 cage

- a. ① Press the retainer clip downward.
- b. ② Rotate the retention latch to the open position.

- c. ③ Grasp the PCIe adapter by its edges and carefully pull it out of the PCIe slot.

Step 5. Disconnect the cables from the riser card, and remove the riser card from the riser 5 cage.

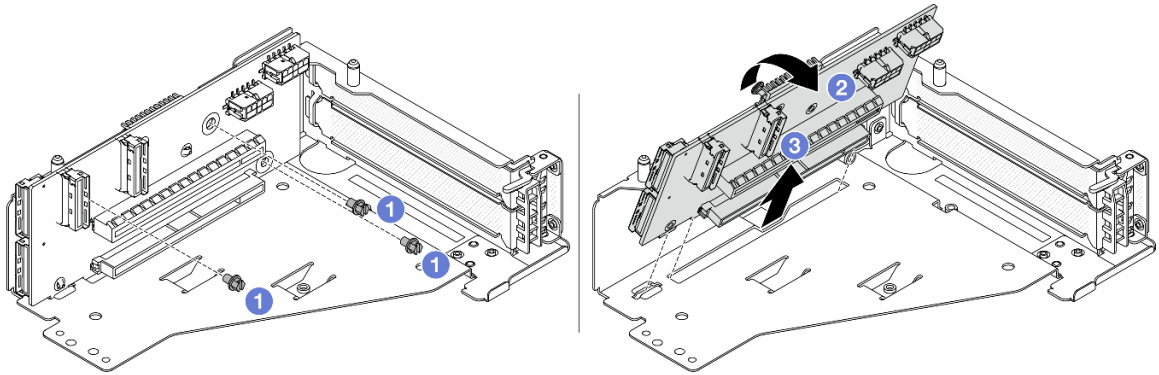


Figure 60. Removing the riser card from the riser 5 cage

- a. ① Remove the screws that secure the riser card.
- b. ② Rotate the riser card from the top to disengage it from the screw holes on the riser cage.
- c. ③ Lift the riser card out of the riser cage.

Step 6. Remove the OCP module from the front OCP cage.

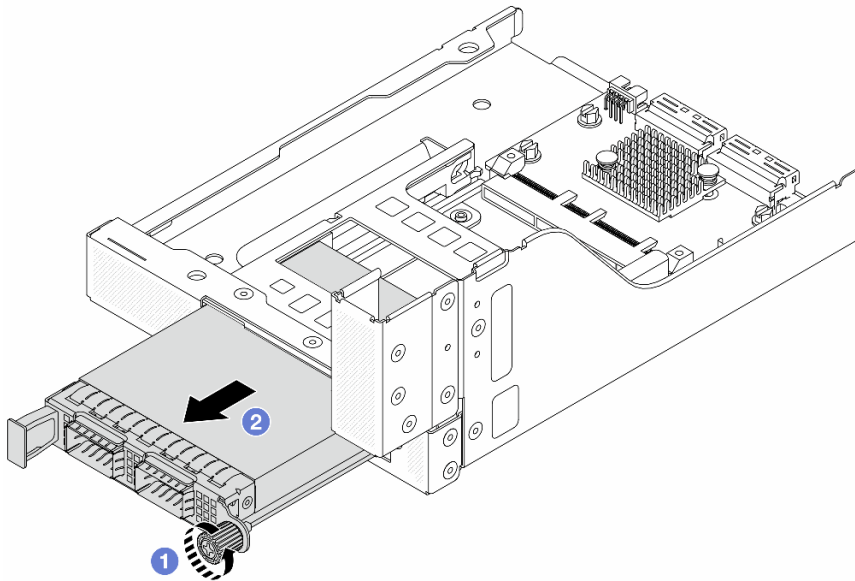


Figure 61. Removing the OCP module

- a. ① Loosen the thumbscrew that secures the OCP module.
- b. ② Pull out the OCP module.

Step 7. Remove the front OCP interposer card.

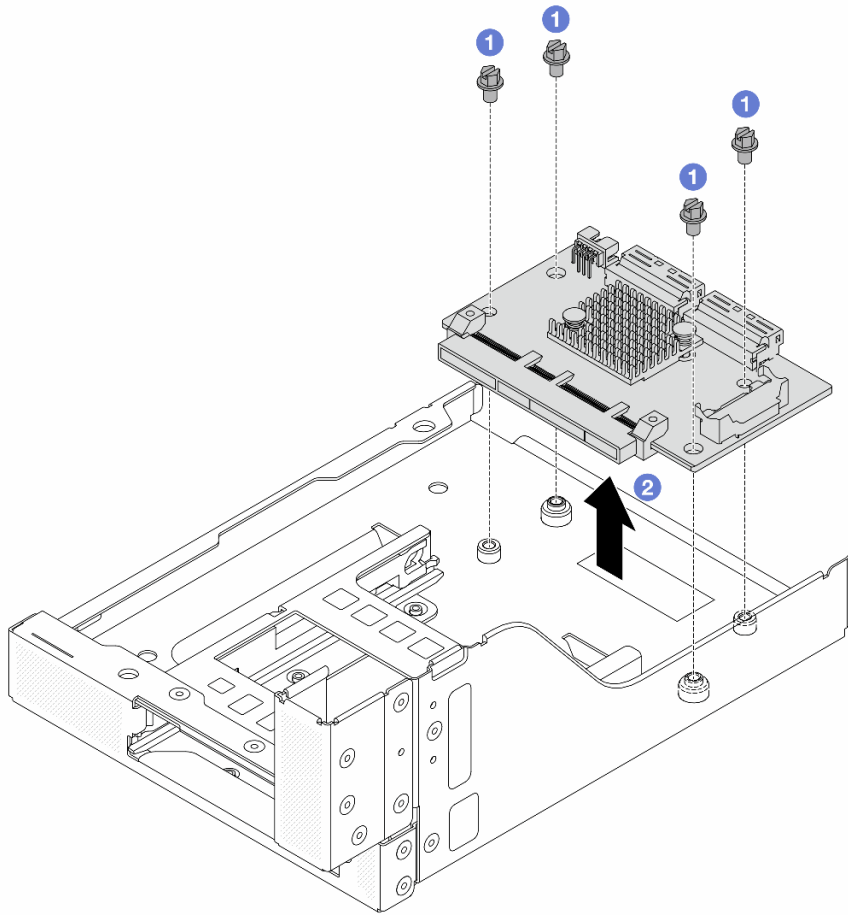


Figure 62. Removing the front OCP interposer card

- a. 1 Loosen the screws that secure the front OCP interposer card.
- b. 2 Lift the front OCP interposer card up off the front OCP cage.

## After you finish

1. Install the new front adapter cage. See [“Install the front adapter cage” on page 112](#).
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 adapter cage

Follow instructions in this section to install the front adapter cage, including the riser 5 cage at the top and the front OCP cage at the bottom.

## About this task

### Attention:



- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 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. Install the front OCP interposer card on the front OCP cage, and connect cables to the card. See [Chapter 6 “Internal cable routing” on page 385](#).

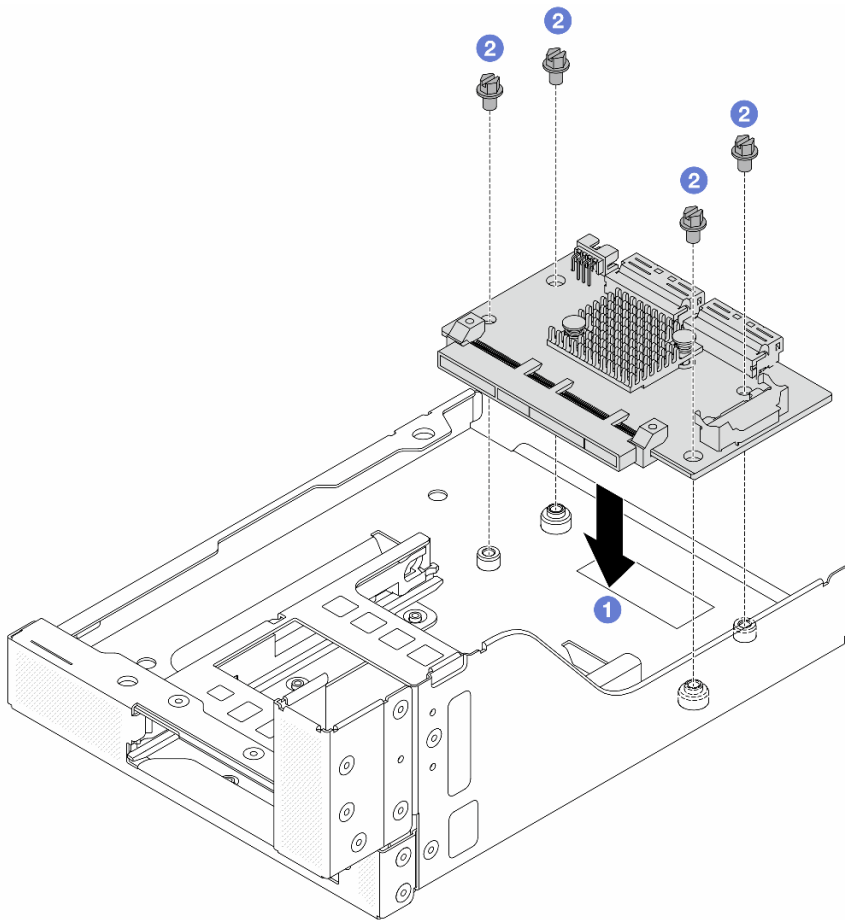


Figure 63. Installing the front OCP interposer card

- 1 Lower the front OCP interposer card onto the front OCP cage.
- 2 Tighten the screws to secure the front OCP interposer card.

Step 3. Install the OCP module.

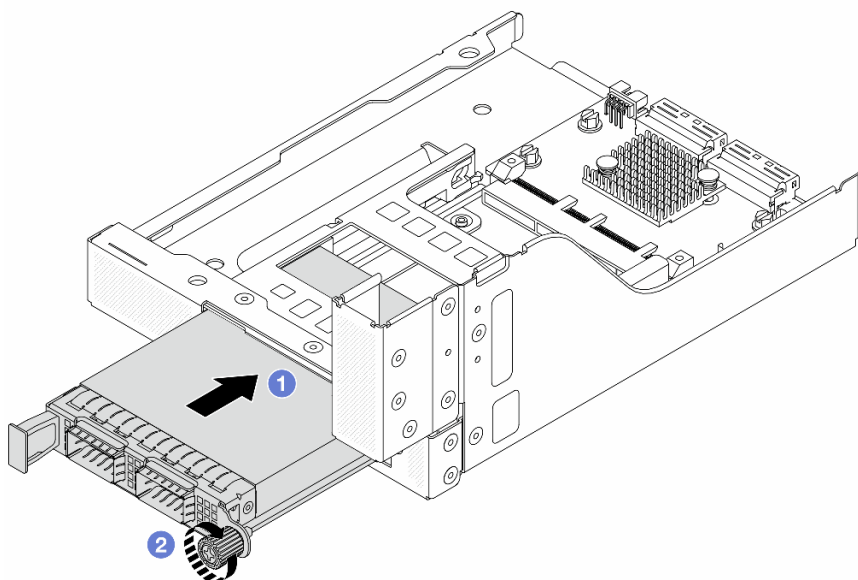


Figure 64. Installing the OCP module

- a. ① Push the OCP module into the slot until it is fully seated.
- b. ② Tighten the thumbscrew to secure the OCP module.

Step 4. Install the riser card and connect the cables to the riser card. See [Chapter 6 “Internal cable routing” on page 385](#).

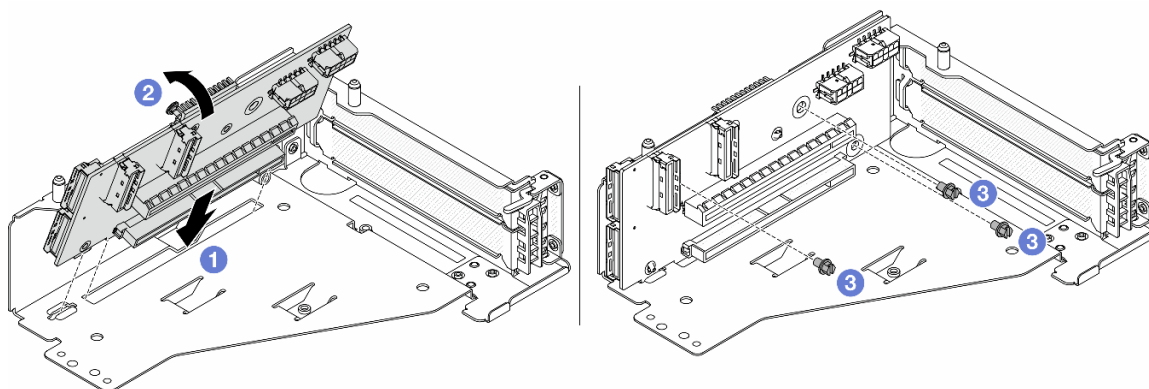


Figure 65. Installing the riser card

- a. ① Insert the riser card into the slots in the riser cage.
- b. ① Push the top of the riser card towards the riser cage so that the holes in the riser card engage with the holes on the riser cage.
- c. ② Install the screws to secure the riser card into place.

Step 5. Install the PCIe adapter to the riser 5 cage.

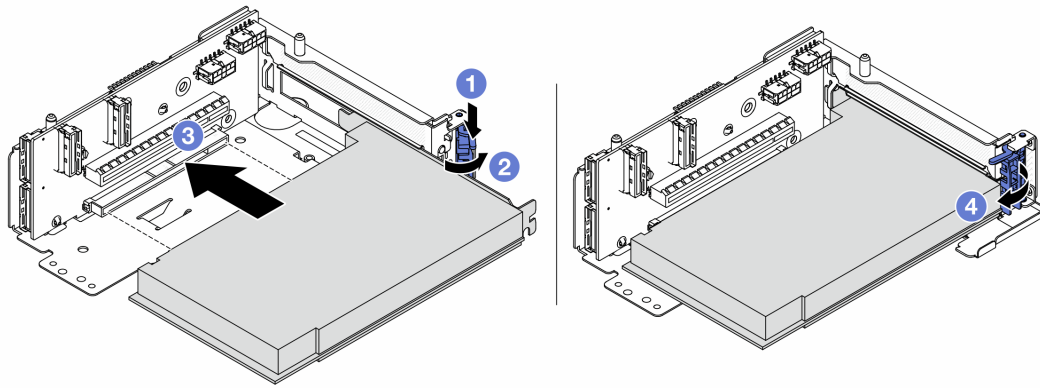
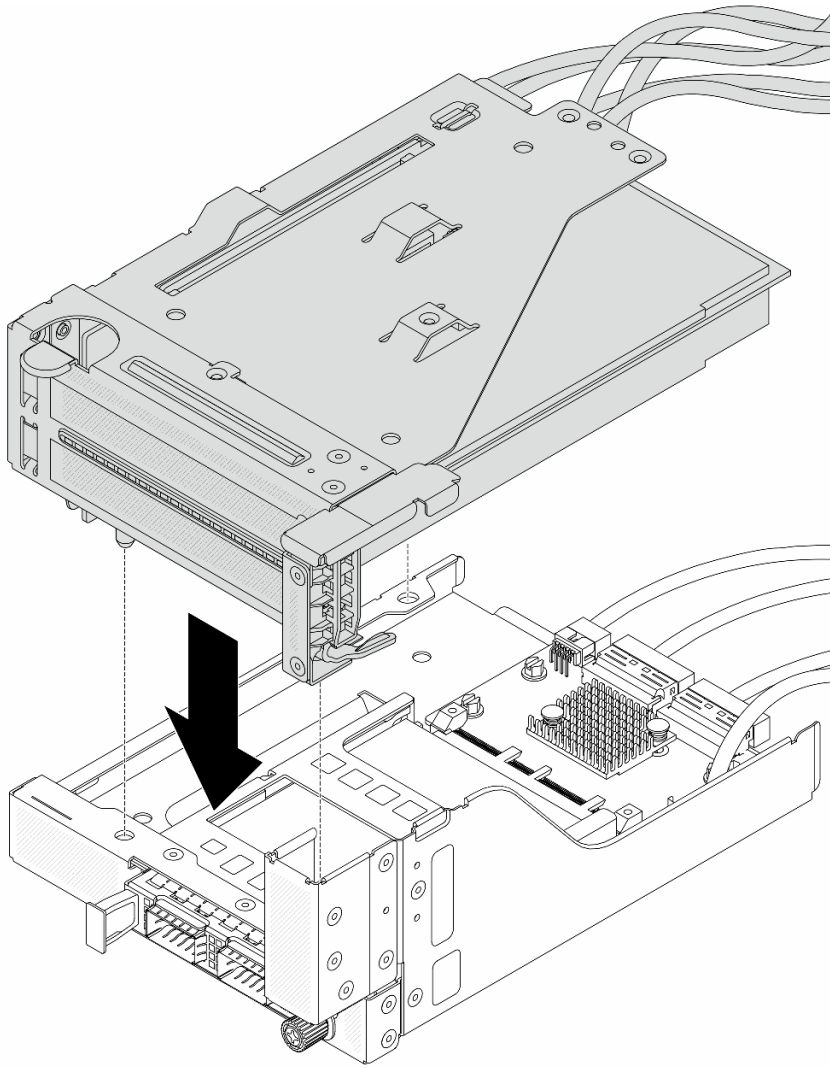


Figure 66. Installing the PCIe adapter to the riser 5 cage

- a. ① Press the retainer clip downward.
- b. ② Rotate the PCIe adapter retention latch to the open position.
- c. ③ Align the PCIe adapter with the PCIe slot on the riser card. Carefully press the PCIe adapter straight into the slot until it is securely seated and its bracket also is secured.
- d. ④ Close the retention latch.

**Note:** For ThinkSystem AMD X3522 10/25GbE DSFP28 2-port PCIe Ethernet Adapter, install the screw to secure the adapter before closing the retention latch if the server needs to be shipped.

Step 6. Install the riser 5 assembly on the front OCP assembly.



*Figure 67. Installing the riser 5 assembly on the front OCP assembly*

Step 7. Install the front adapter assembly.

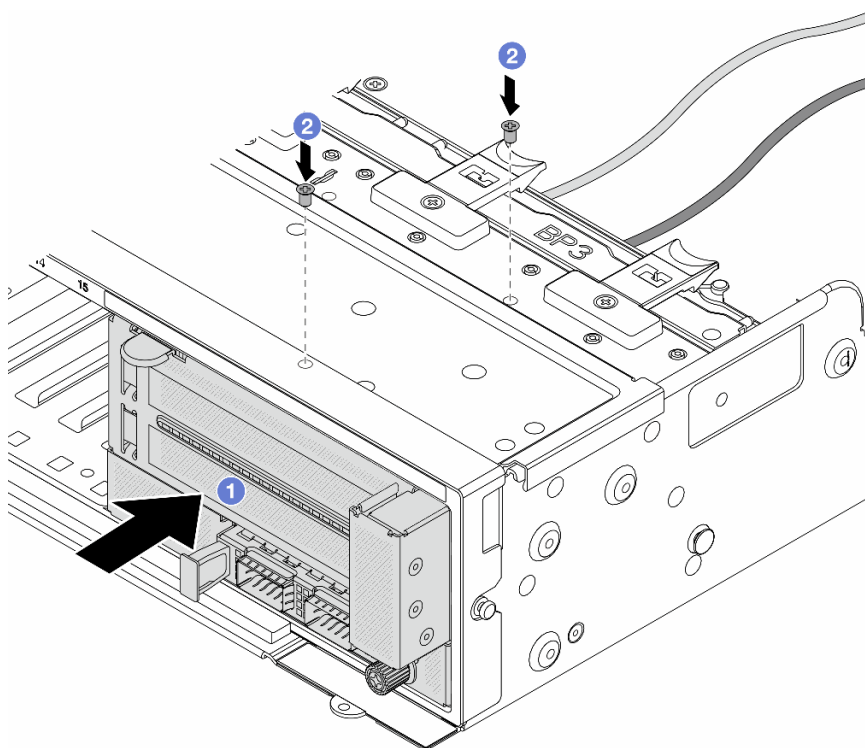


Figure 68. Installing the front adapter assembly

- a. ① Insert the front adapter assembly into the front chassis.
- b. ② Install the screws to secure the front adapter assembly in place.

Step 8. Connect the cables to the system board assembly and the rear OCP interposer card. See [Chapter 6 “Internal cable routing” on page 385](#).

Step 9. Install the system fan cage. See [“Install the system fan cage” on page 374](#).

Step 10. Install system fans. See [“Install a system fan” on page 370](#).

Step 11. Install the riser 1 assembly if you have removed it. See [“Install a rear riser assembly” on page 346](#).

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## 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 118](#)
- [“OCP interposer card replacement” on page 120](#)

## Front OCP module replacement

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

- [“Remove the front OCP module” on page 118](#)
- [“Install the front OCP module” on page 119](#)

### Remove the front OCP module

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

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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

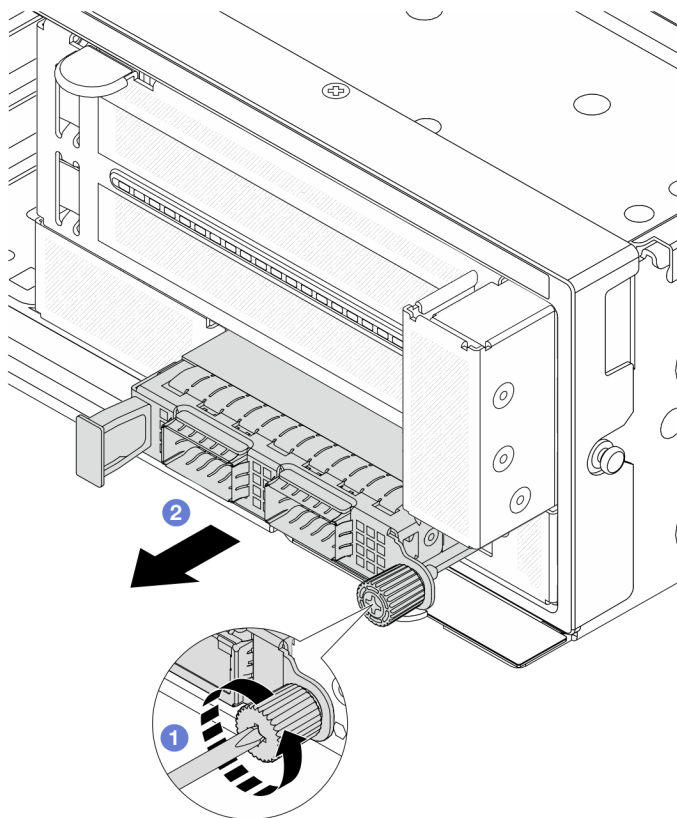


Figure 69. Removing the front OCP module

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

## After you finish

1. Install a new front OCP module or an OCP module filler. See [“Install the front OCP module” on page 119](#).
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 instructions in this section to install the front OCP module.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 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. Remove the OCP module filler if there is.
- Step 3. Install the front OCP module.

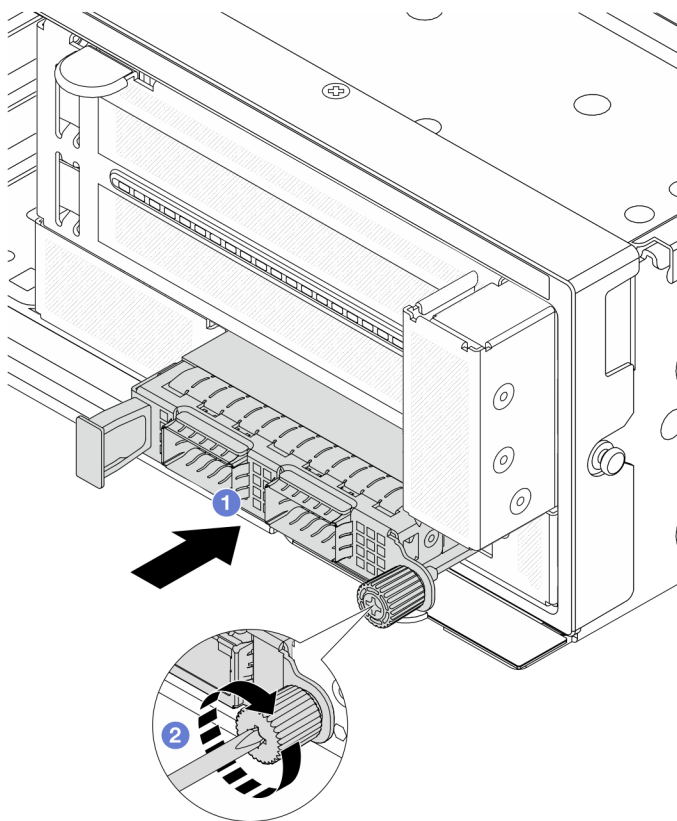


Figure 70. Installing the front OCP module

- a. ① Push the OCP module into the slot until it is fully seated.
- b. ② Tighten the thumbscrew to secure the OCP module. Use a screwdriver if needed.

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

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## OCP interposer card replacement

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

- [“Remove the front OCP interposer card” on page 120](#)
- [“Install the front OCP interposer card” on page 124](#)
- [“Remove the rear OCP interposer card” on page 128](#)
- [“Install the rear OCP interposer card” on page 129](#)

## Remove the front OCP interposer card

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



## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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. 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 88](#).
- b. Remove the top cover. See [“Remove the top cover” on page 381](#).
- c. If your server comes with a riser 1 assembly, remove it first. See [“Remove a rear riser assembly” on page 334](#). Then disconnect the cables from the rear OCP interposer card.
- d. Record the cable connections, and disconnect all cables from the system board assembly.

### 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.
- e. Remove system fans. See [“Remove a system fan” on page 369](#).
- f. Remove the system fan cage. See [“Remove the system fan cage” on page 373](#).

Step 2. Remove the front adapter assembly.

**Note:** The number of cables varies according to the configuration.

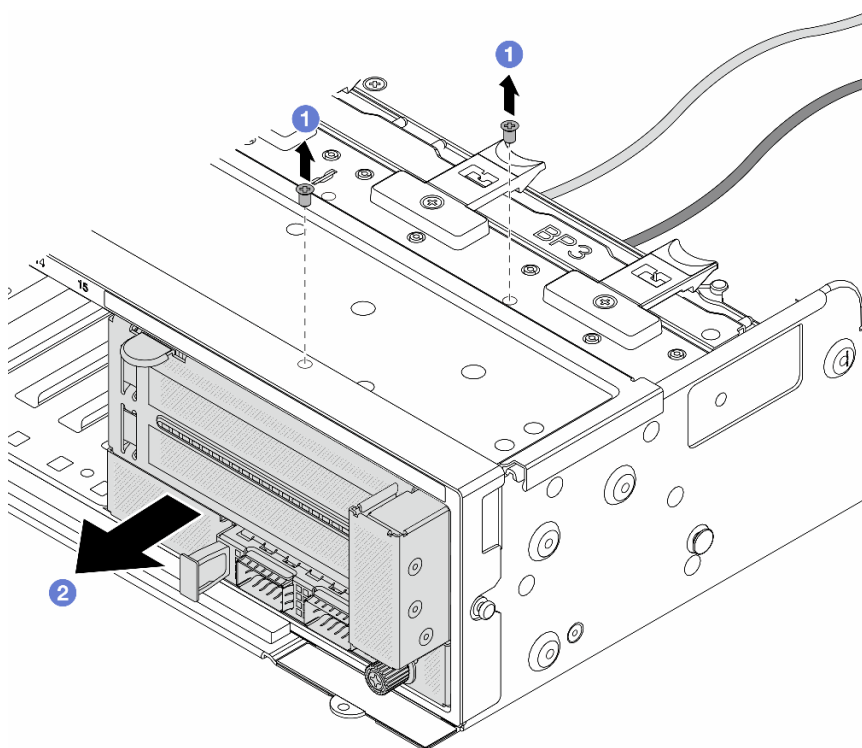


Figure 71. Removing the front adapter assembly

- a. ① Remove the screws that secure the assembly.
- b. ② Slide the assembly out of the front chassis.

Step 3. Lift the riser 5 assembly up off the front OCP assembly, and disconnect cables from the front OCP interposer card.

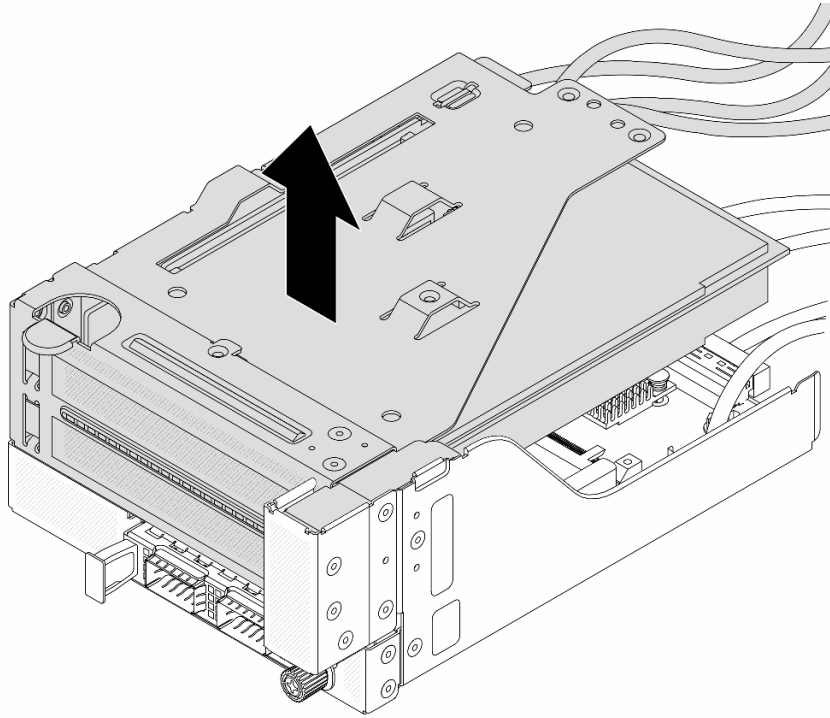


Figure 72. Lifting the riser 5 assembly

Step 4. Remove the OCP module from the front OCP cage.

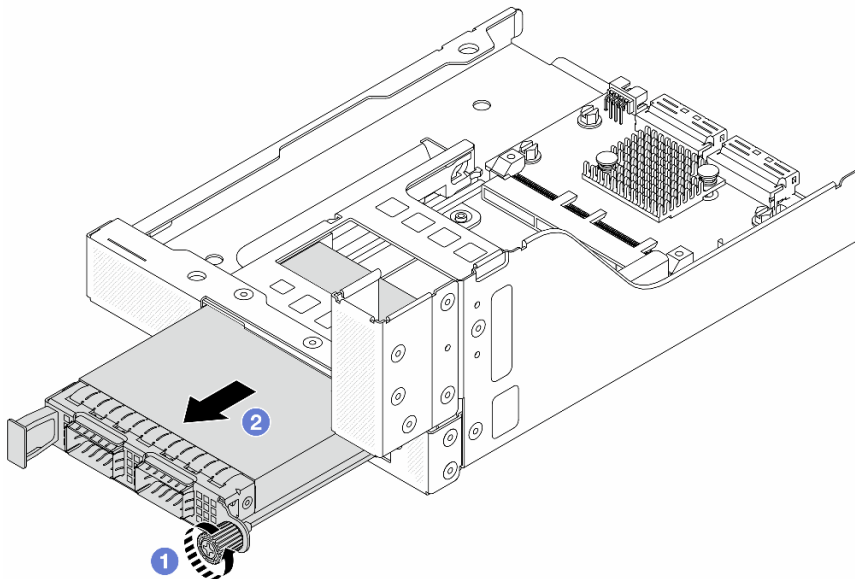


Figure 73. Removing the OCP module

- a. ① Loosen the thumbscrew that secures the OCP module.
- b. ② Pull out the OCP module.

Step 5. Remove the front OCP interposer card.

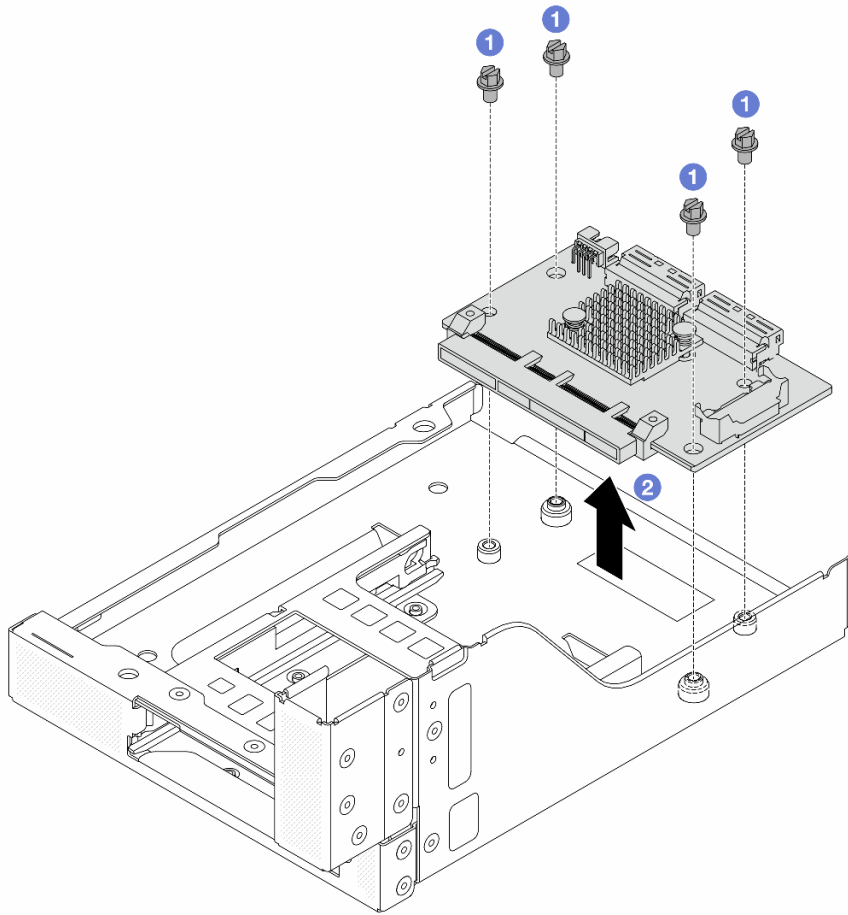


Figure 74. Removing the front OCP interposer card

- a. ① Loosen the screws that secure the front OCP interposer card.
- b. ② Lift the front OCP interposer card up off the front OCP cage.

## After you finish

1. Install a new front OCP interposer card. See [“Install the front OCP interposer card” on page 124](#).
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 instructions in this section to install the front OCP interposer card.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 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. Install the front OCP interposer card on the front OCP cage, and connect cables to the card. See [Chapter 6 “Internal cable routing” on page 385](#).

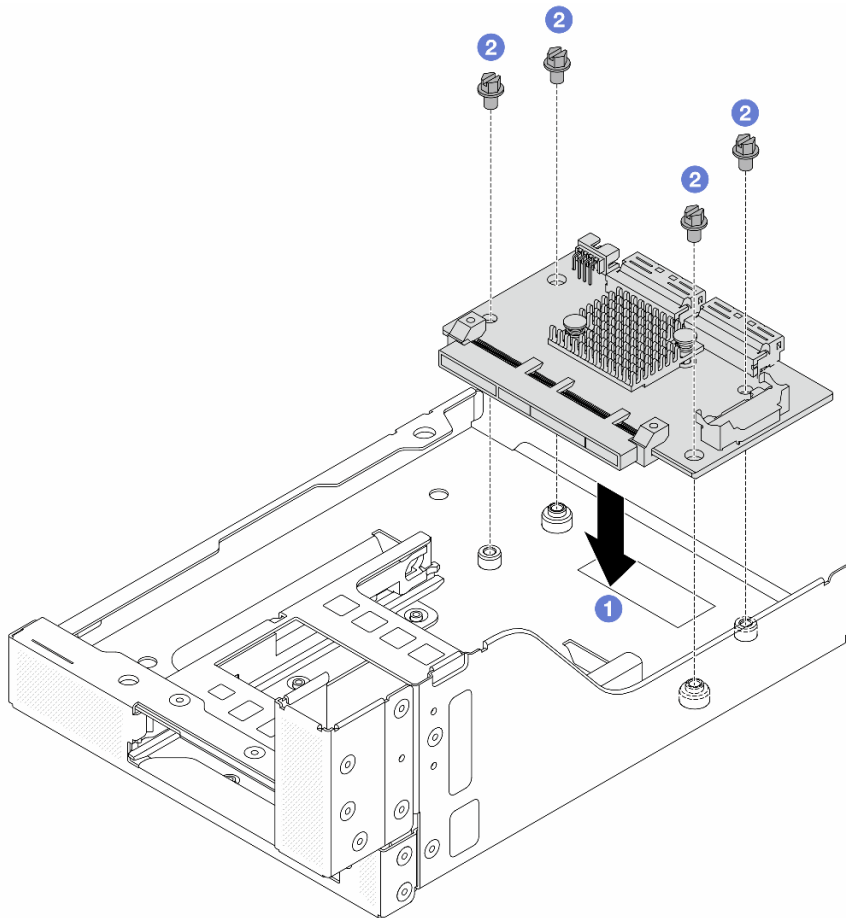
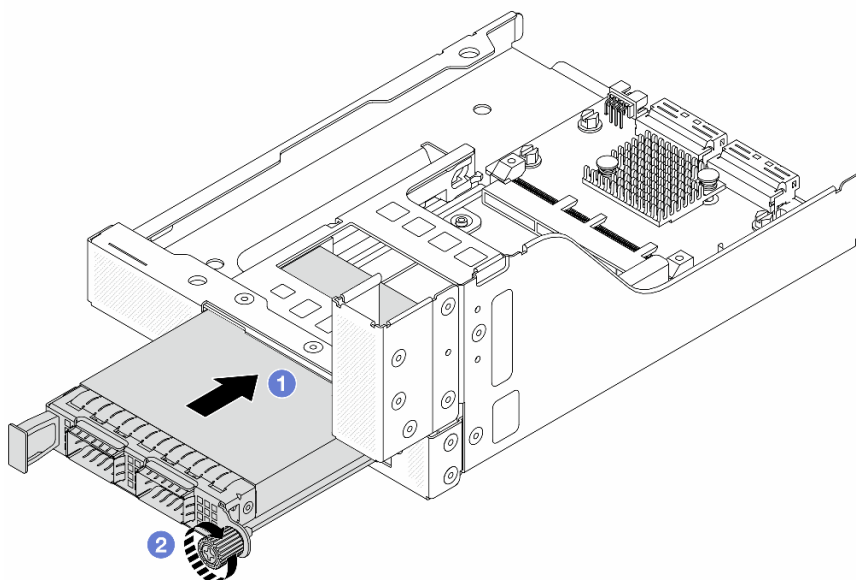


Figure 75. Installing the front OCP interposer card

- 1 Lower the front OCP interposer card onto the front OCP cage.
- 2 Tighten the screws to secure the front OCP interposer card.

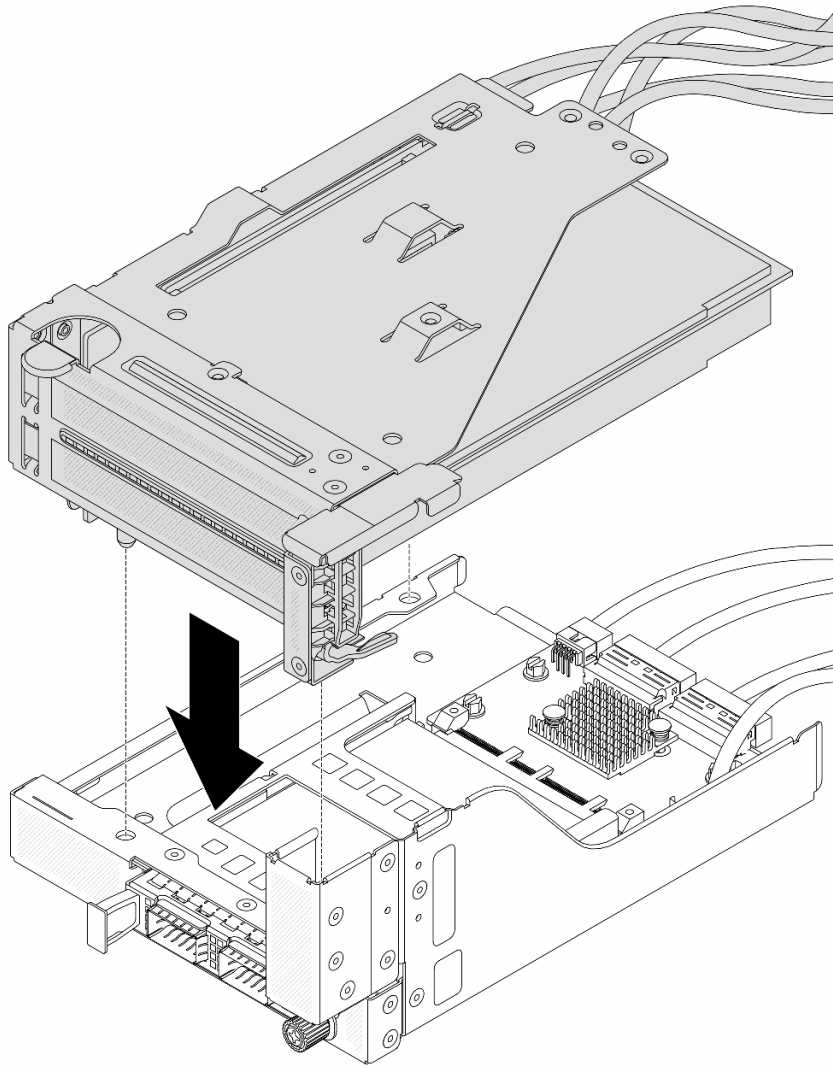
- Step 3. Install the OCP module.



*Figure 76. Installing the OCP module*

- a. ① Push the OCP module into the slot until it is fully seated.
- b. ② Tighten the thumbscrew to secure the OCP module.

Step 4. Install the riser 5 assembly on the front OCP assembly.



*Figure 77. Installing the riser 5 assembly on the front OCP assembly*

Step 5. Install the front adapter assembly.

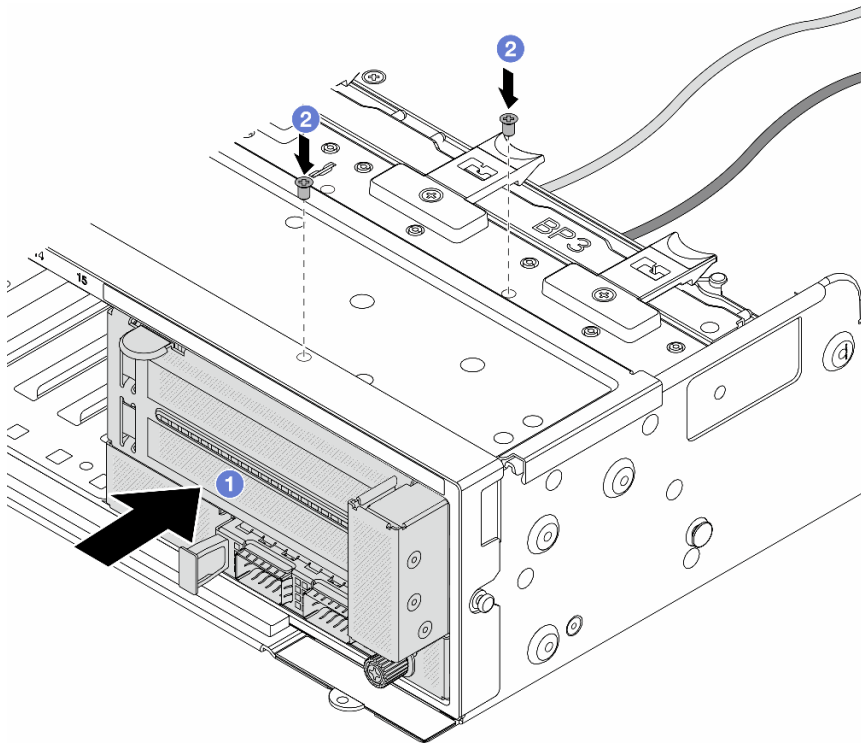


Figure 78. Installing the front adapter assembly

- a. ① Insert the front adapter assembly into the front chassis.
- b. ② Install the screws to secure the front adapter assembly in place.

Step 6. Connect the cables to the system board assembly and the rear OCP interposer card. See [Chapter 6 “Internal cable routing” on page 385](#).

Step 7. Install the system fan cage. See [“Install the system fan cage” on page 374](#).

Step 8. Install system fans. See [“Install a system fan” on page 370](#).

Step 9. Install the riser 1 assembly if you have removed it. See [“Install a rear riser assembly” on page 346](#).

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## Remove the rear OCP interposer card

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

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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. Make preparation for the task.

- 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 88](#).
- Remove the top cover. See [“Remove the top cover” on page 381](#).
- If your server comes with a riser 1 assembly, remove it first. See [“Remove a rear riser assembly” on page 334](#). Then disconnect the cables from the rear OCP interposer card.

Step 2. Remove the rear OCP interposer card.

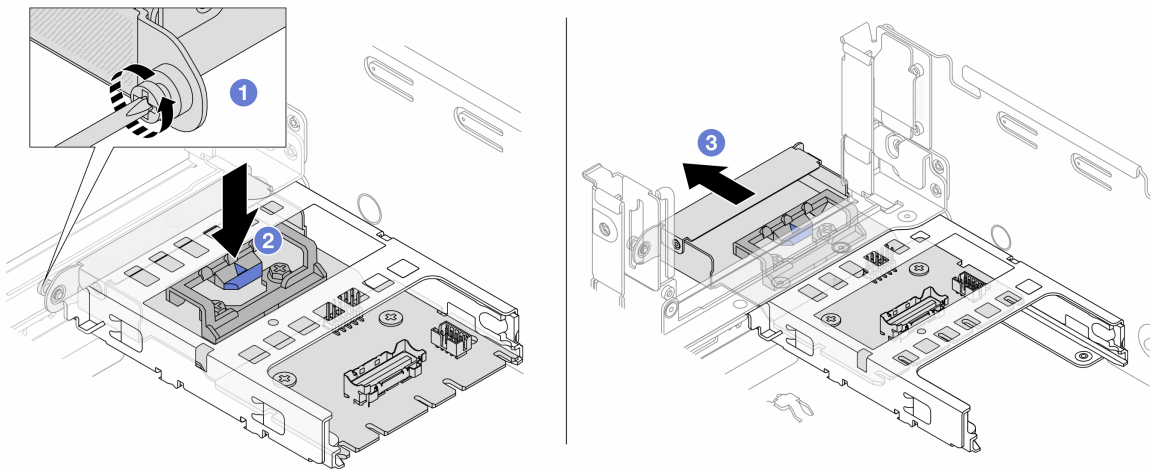


Figure 79. Removing the rear OCP interposer card

- ① Loosen the thumbscrew that secures the rear OCP interposer card.
- ② Press and hold the blue latch.
- ③ Pull out the rear OCP interposer card.

## After you finish

1. Install a new rear OCP interposer card. See [“Install the rear OCP interposer card” on page 129](#).
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 instructions in this section to install the rear OCP interposer card.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 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. Install the rear OCP interposer card.

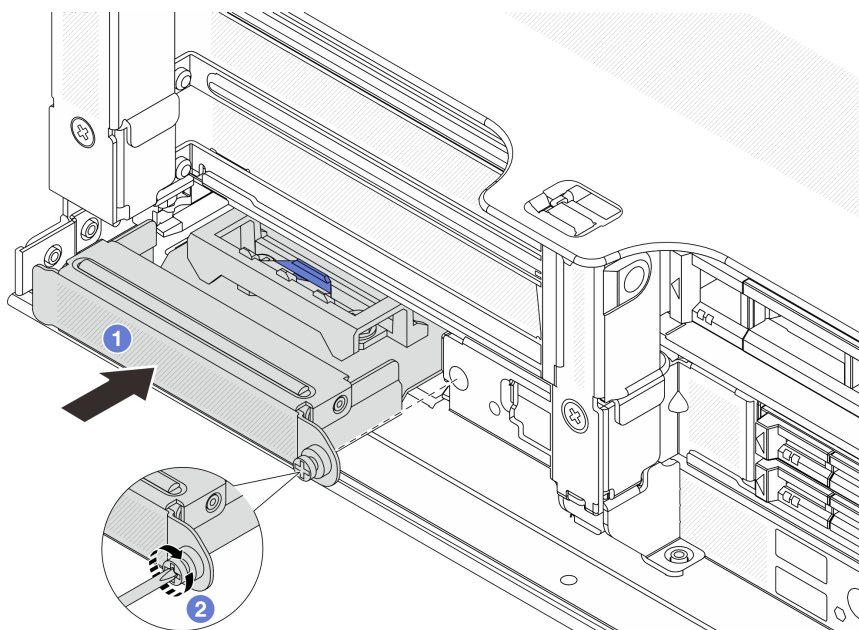


Figure 80. Installing the rear OCP interposer card

- a. **1** Push the rear OCP interposer card into the slot until it is fully seated.
- b. **2** Tighten the thumbscrew to secure the card.

**Note:** Ensure that the card is fully seated and the thumbscrew is securely tightened. Otherwise, the card will not get full connection and may not function.

- Step 3. Connect the cables to the rear OCP interposer card. See [Chapter 6 “Internal cable routing” on page 385](#).
- Step 4. Install the riser 1 assembly if you have removed it. See [“Install a rear riser assembly” on page 346](#).

### After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

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## Front PCIe adapter and riser card replacement

Follow instructions in this section to remove and install the front PCIe adapter and riser 5 card.

- [“Remove the front PCIe adapter and riser card” on page 131](#)
- [“Install the front PCIe adapter and riser card” on page 134](#)

## Remove the front PCIe adapter and riser card

Follow instructions in this section to remove the front PCIe adapter and riser 5 card.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.

### 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 88](#).
- b. Remove the top cover. See [“Remove the top cover” on page 381](#).
- c. If your server comes with a riser 1 assembly, remove it first. See [“Remove a rear riser assembly” on page 334](#). Then disconnect the cables from the rear OCP interposer card.
- d. Record the cable connections, and disconnect all cables from the system board assembly.

#### 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.
- e. Remove system fans. See [“Remove a system fan” on page 369](#).
- f. Remove the system fan cage. See [“Remove the system fan cage” on page 373](#).

Step 2. Remove the front adapter assembly.

**Note:** The number of cables varies according to the configuration.

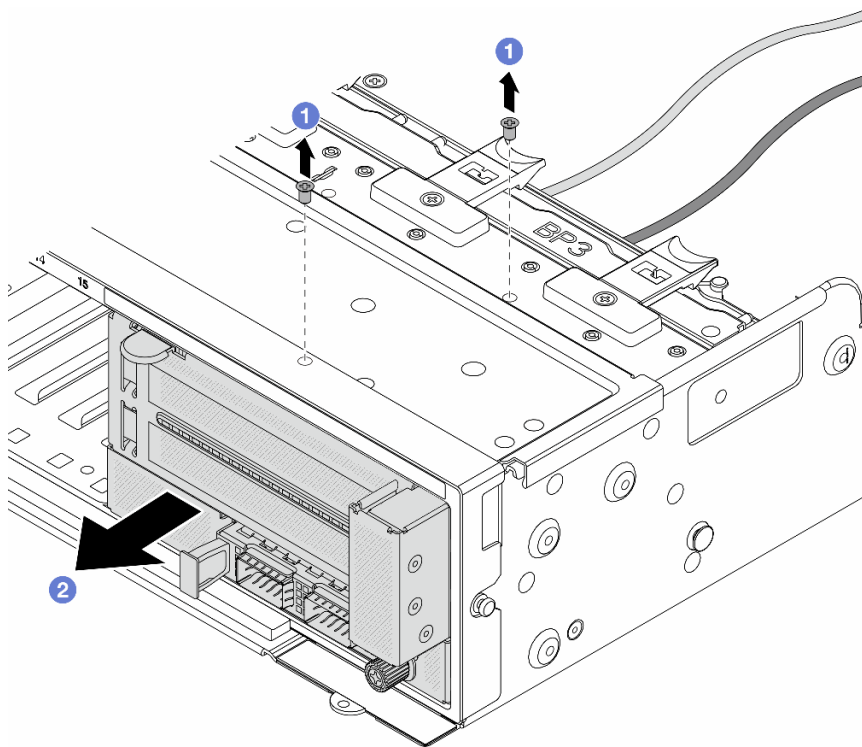


Figure 81. Removing the front adapter assembly

- a. ① Remove the screws that secure the assembly.
- b. ② Slide the assembly out of the front chassis.

Step 3. Lift the riser 5 assembly up off the front OCP assembly, and disconnect cables from the front OCP interposer card.

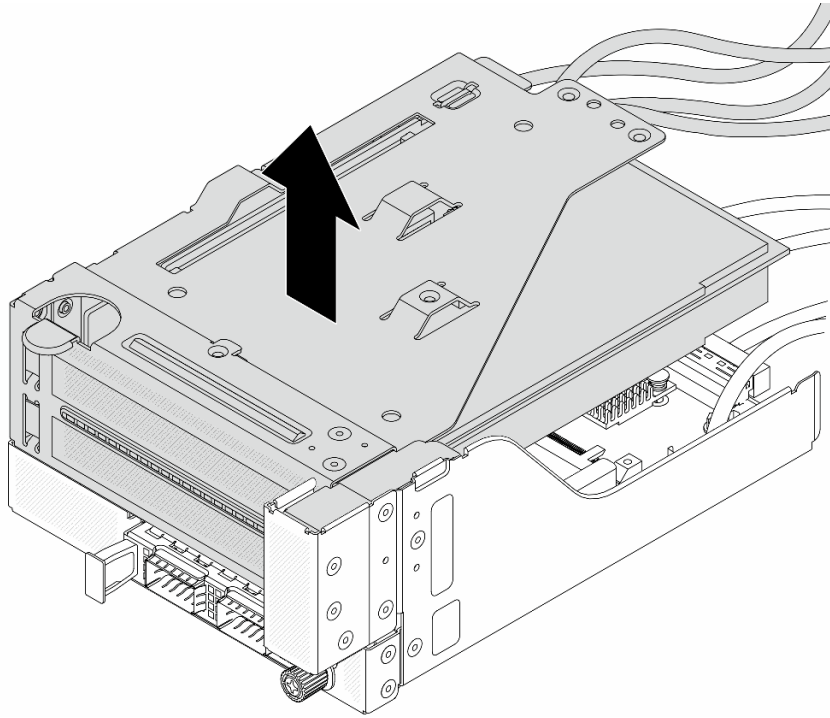


Figure 82. Lifting the riser 5 assembly

Step 4. Remove the PCIe adapter from the riser 5 cage.

**Note:** For ThinkSystem AMD X3522 10/25GbE DSFP28 2-port PCIe Ethernet Adapter, remove the screw that secures the adapter first.

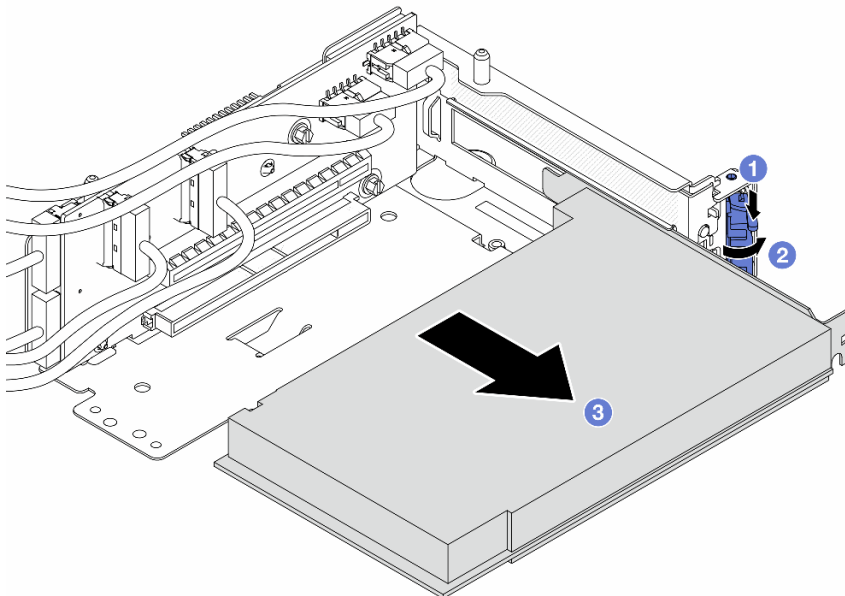


Figure 83. Removing the PCIe adapter from the riser 5 cage

- a. ① Press the retainer clip downward.
- b. ② Rotate the retention latch to the open position.

- c. ③ Grasp the PCIe adapter by its edges and carefully pull it out of the PCIe slot.

Step 5. Disconnect the cables from the riser card, and remove the riser card from the riser 5 cage.

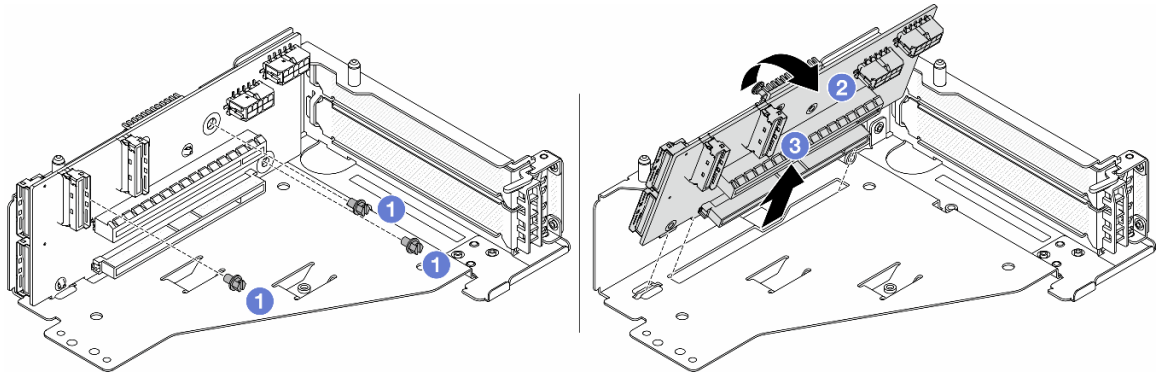


Figure 84. Removing the riser card from the riser 5 cage

- a. ① Remove the screws that secure the riser card.
- b. ② Rotate the riser card from the top to disengage it from the screw holes on the riser cage.
- c. ③ Lift the riser card out of the riser cage.

## 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 PCIe adapter and riser card

Follow instructions in this section to install the front PCIe adapter and riser 5 card.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 PCIe adapter installation rules, see [“PCIe slots and PCIe adapters” on page 68](#).

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

- Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.



- Go to [“Update the firmware” on page 691](#) 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. Install the riser card and connect the cables to the riser card. See [Chapter 6 “Internal cable routing” on page 385](#).

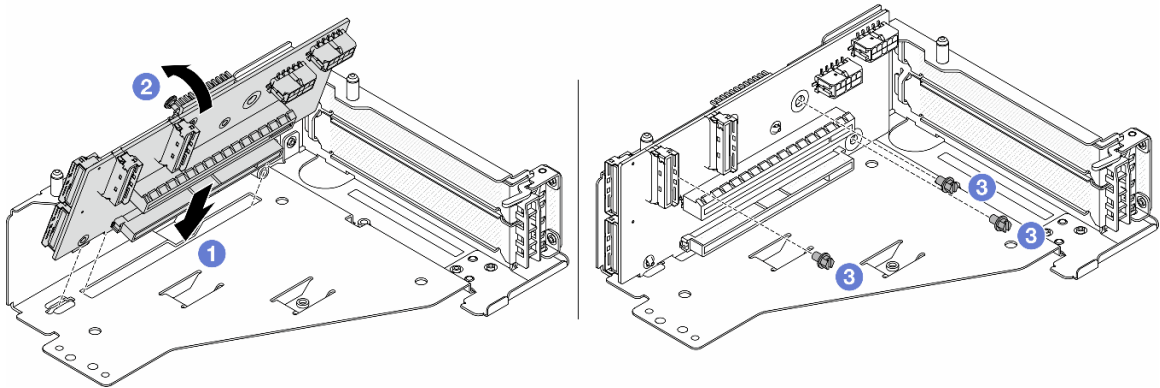


Figure 85. Installing the riser card

- 1 Insert the riser card into the slots in the riser cage.
  - 1 Push the top of the riser card towards the riser cage so that the holes in the riser card engage with the holes on the riser cage.
  - 2 Install the screws to secure the riser card into place.
- Step 3. Install the PCIe adapter to the riser 5 cage.

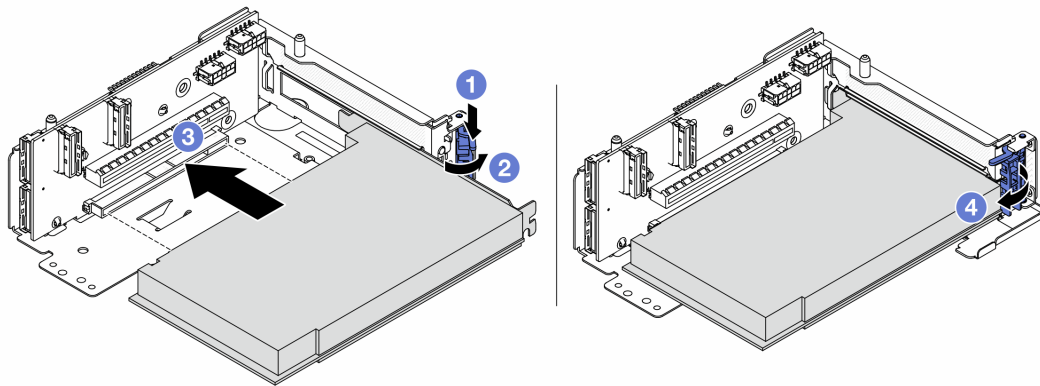
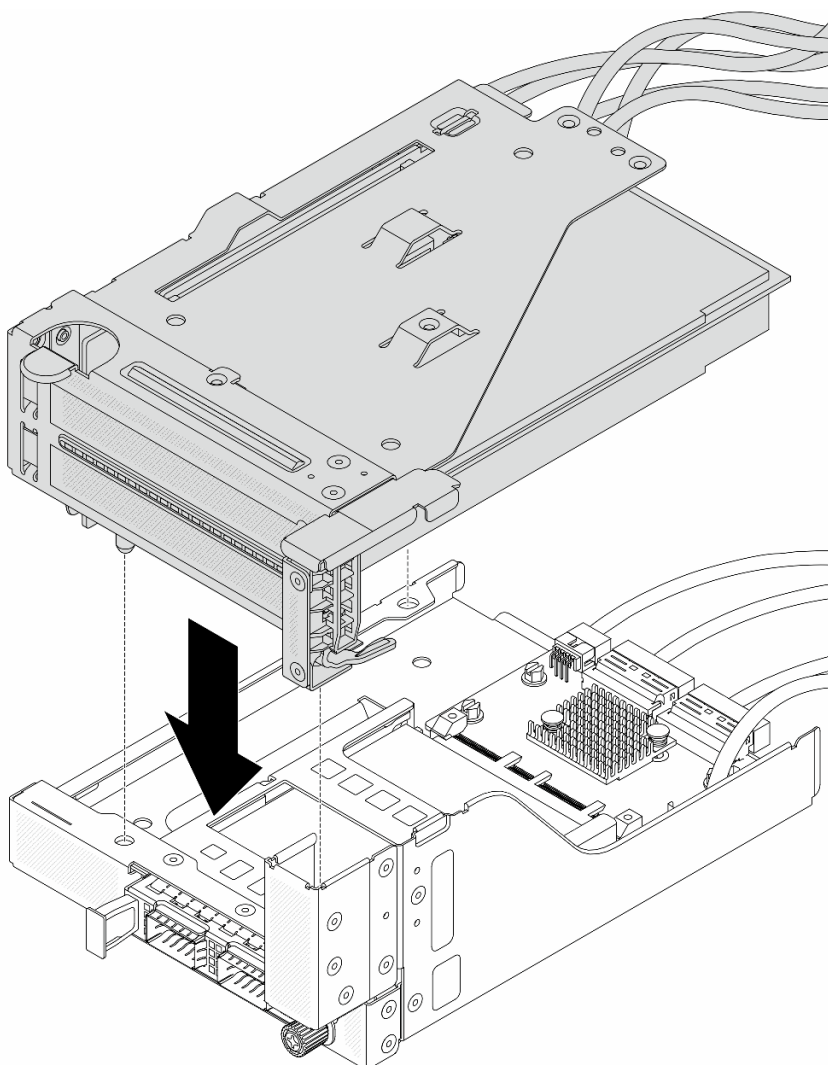


Figure 86. Installing the PCIe adapter to the riser 5 cage

- 1 Press the retainer clip downward.
- 2 Rotate the PCIe adapter retention latch to the open position.
- 3 Align the PCIe adapter with the PCIe slot on the riser card. Carefully press the PCIe adapter straight into the slot until it is securely seated and its bracket also is secured.
- 4 Close the retention latch.

**Note:** For ThinkSystem AMD X3522 10/25GbE DSFP28 2-port PCIe Ethernet Adapter, install the screw to secure the adapter before closing the retention latch if the server needs to be shipped.

Step 4. Install the riser 5 assembly on the front OCP assembly.



*Figure 87. Installing the riser 5 assembly on the front OCP assembly*

Step 5. Install the front adapter assembly.



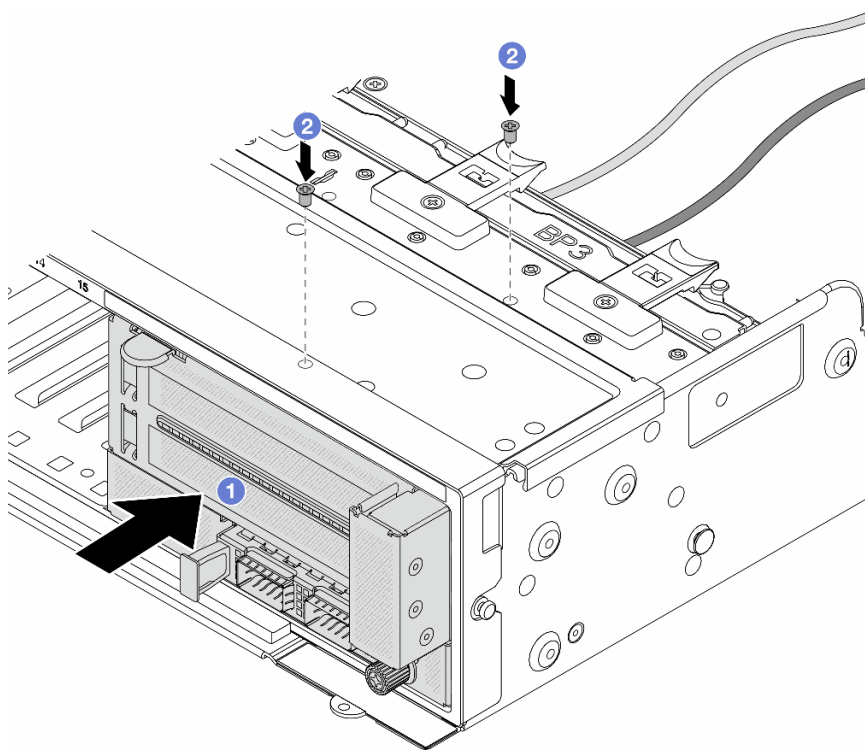


Figure 88. Installing the front adapter assembly

- a. ① Insert the front adapter assembly into the front chassis.
- b. ② Install the screws to secure the front adapter assembly in place.

Step 6. Connect the cables to the system board assembly and the rear OCP interposer card. See [Chapter 6 “Internal cable routing” on page 385](#).

Step 7. Install the system fan cage. See [“Install the system fan cage” on page 374](#).

Step 8. Install system fans. See [“Install a system fan” on page 370](#).

Step 9. Install the riser 1 assembly if you have removed it. See [“Install a rear riser assembly” on page 346](#).

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

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## Front drive backplane replacement

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

- [“Remove the 2.5-inch front drive backplane” on page 138](#)
- [“Install the 2.5-inch front drive backplane” on page 140](#)
- [“Remove the 3.5-inch front drive backplane” on page 143](#)
- [“Install the 3.5-inch front drive backplane” on page 145](#)

## Remove the 2.5-inch front drive backplane

Use this information to remove the front 2.5-inch drive backplane.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.
- If one or more NVMe solid-state drives are to be removed, it is recommended to disable them beforehand via the operating 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

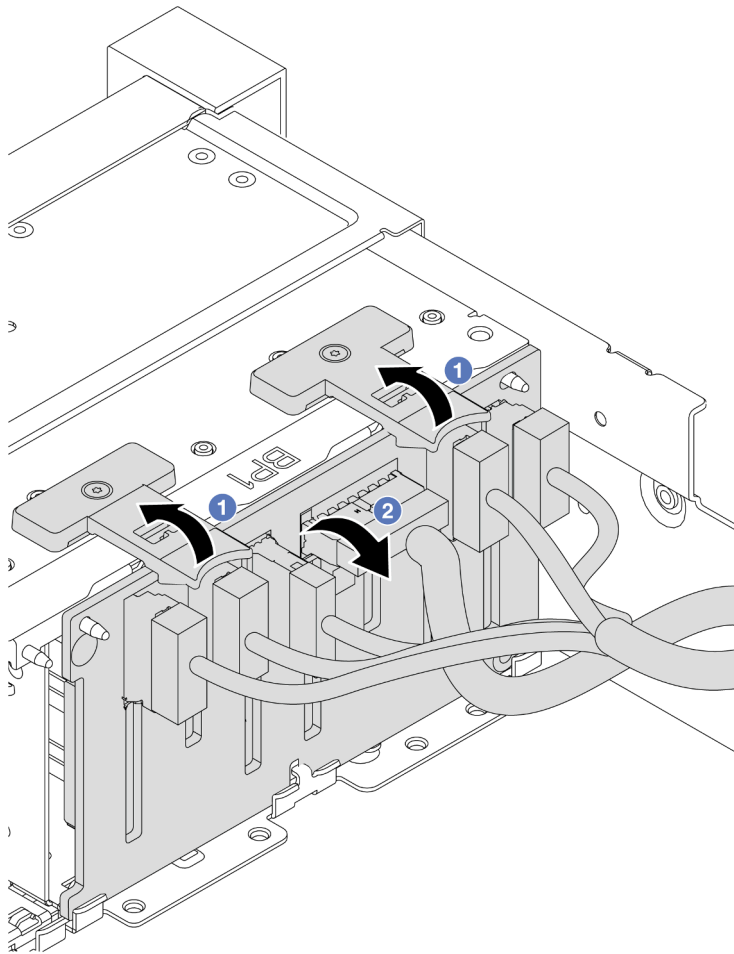
Step 1. Make preparation for the task.

- a. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 96](#).
- b. 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 88](#).
- c. Remove the top cover. See [“Remove the top cover” on page 381](#).
- d. Remove the system fan cage for easier operation. See [“Remove the system fan cage” on page 373](#).
- e. Remove the air baffle if needed. See [“Remove the air baffle” on page 99](#).

Step 2. Remove the 2.5-inch drive backplane.

**Note:** Depending on the specific type, your backplane might look different from the illustration. Some cables might need to be removed or moved to the side to remove the backplane. If needed, record the cable connections on the backplane and then disconnect the cables from the backplane first.

- **8-bay drive backplane**



*Figure 89. Removing the 8-bay drive backplane*

1. ① Lift the release tabs.
  2. ② Rotate the backplane from the top to disengage it from the two pins on the chassis.
- **24-bay drive backplane with expander**

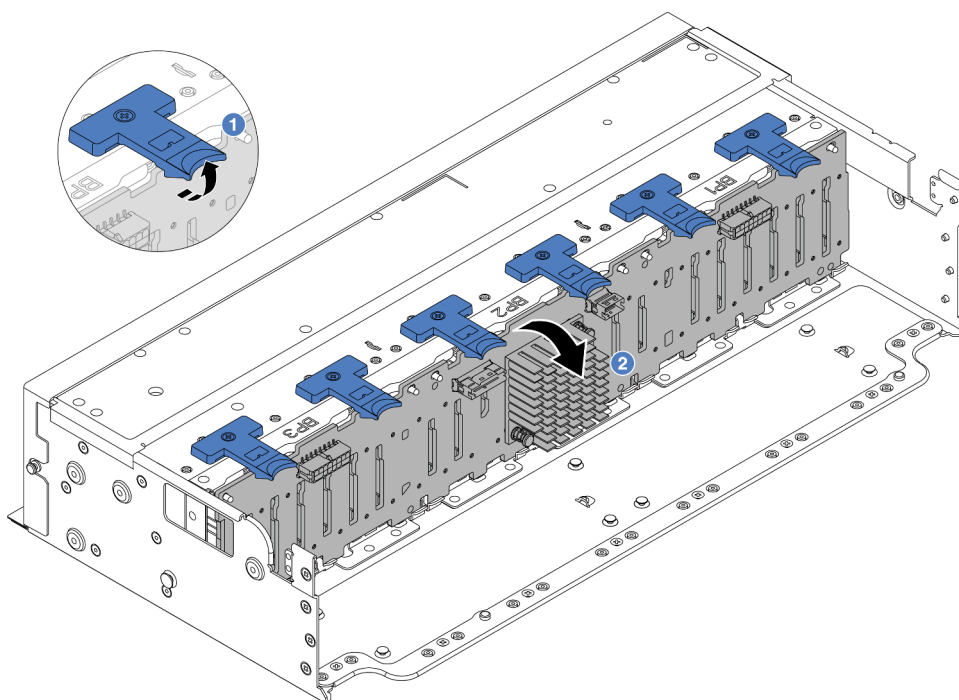


Figure 90. Removing the 24-bay drive backplane with expander

1. 1 Lift all the six release tabs.
2. 2 Rotate the backplane from the top to disengage it from the pins on 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

[Watch the procedure on YouTube](#)

## Install the 2.5-inch front drive backplane

Use this information to install the 2.5-inch front drive backplane.

## About this task

The server supports up to three 2.5-inch drive backplanes of below types. Depending on the backplane type and quantity, the installation location of the backplanes varies.

- 2.5-inch SAS/SATA 8-bay backplane
- 2.5-inch AnyBay 8-bay backplane
- 2.5-inch NVMe 8-bay backplane
- 2.5-inch 24-bay backplane with expander

**Note:** The AnyBay backplane and NVMe backplane listed above use the same physical circuit board. The difference is which connectors on the backplane are cabled: NVMe and SAS/SATA, or just NVMe.

The following table lists the supported backplane combinations. Install the backplane according to your server configuration.

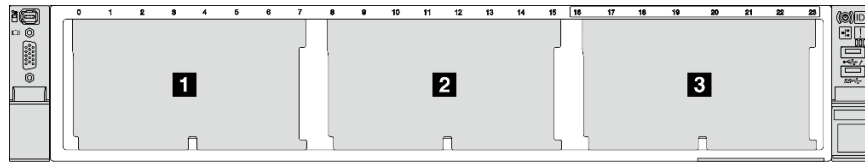


Figure 91. Drive backplane numbering

Back-plane quantity	Backplane 1	Backplane 2	Backplane 3
1	<ul style="list-style-type: none"> <li>8-bay SAS/SATA</li> <li>8-bay NVMe</li> <li>8-bay AnyBay</li> </ul>		
2	8-bay SAS/SATA	8-bay SAS/SATA	
	8-bay NVMe	8-bay NVMe	
	8-bay AnyBay	8-bay AnyBay	
	8-bay SAS/SATA	<ul style="list-style-type: none"> <li>8-bay NVMe</li> <li>8-bay AnyBay</li> </ul>	
	8-bay AnyBay	8-bay NVMe	
3	8-bay SAS/SATA	8-bay SAS/SATA	8-bay SAS/SATA
	8-bay NVMe	8-bay NVMe	8-bay NVMe
	8-bay AnyBay	8-bay AnyBay	8-bay AnyBay
	8-bay SAS/SATA	8-bay SAS/SATA	<ul style="list-style-type: none"> <li>8-bay AnyBay</li> <li>8-bay NVMe</li> </ul>
	8-bay SAS/SATA	8-bay NVMe	8-bay NVMe
1	24-bay backplane with expander		

**Attention:**

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) to ensure that you work safely.
- To avoid damage to the drive connectors, make sure that the server top cover is in place and fully closed whenever you install or remove a drive.
- To make sure that there is adequate system cooling, do not operate the server for more than two minutes without either a drive or a drive bay filler installed in each bay.
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.

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

- Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to “Update the firmware” on page 691 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. Install the 2.5-inch drive front backplane.

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

- **8-bay drive backplane**

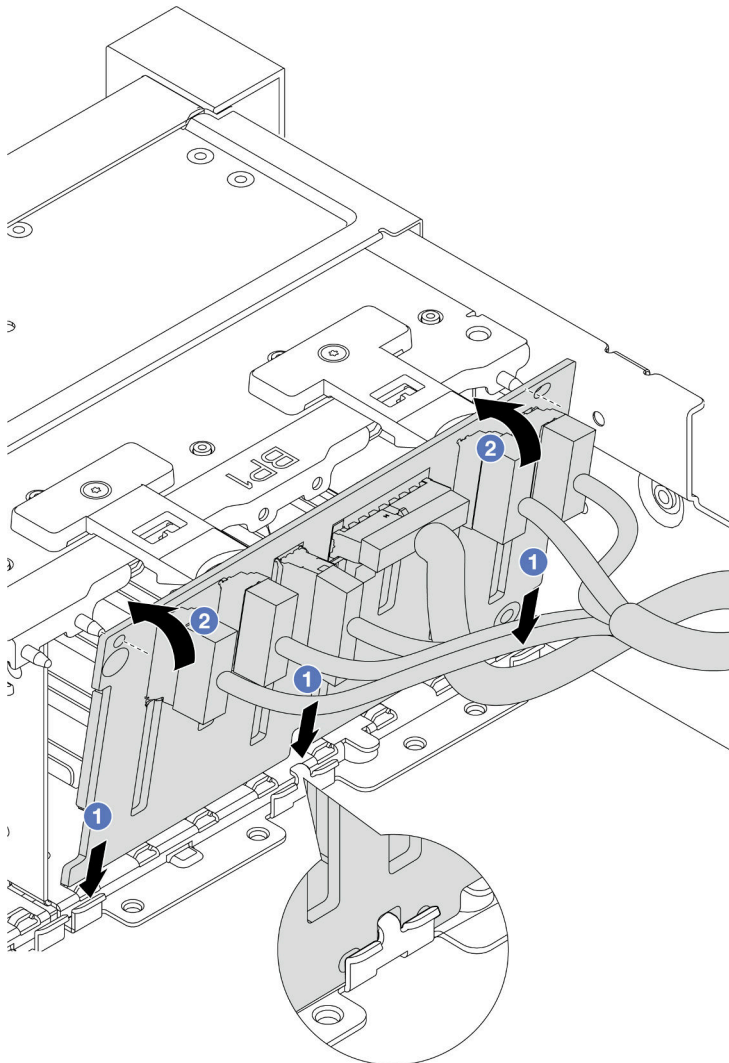


Figure 92. Installing the 8-bay drive backplane

1. 1 Align the bottom of the backplane with the slots on of the chassis.

2. ② Rotate the backplane to the vertical position and align the holes in the backplane with the pins on the chassis and press the backplane into position. The release tabs will secure the backplane in place.

- **24-bay drive backplane with expander**

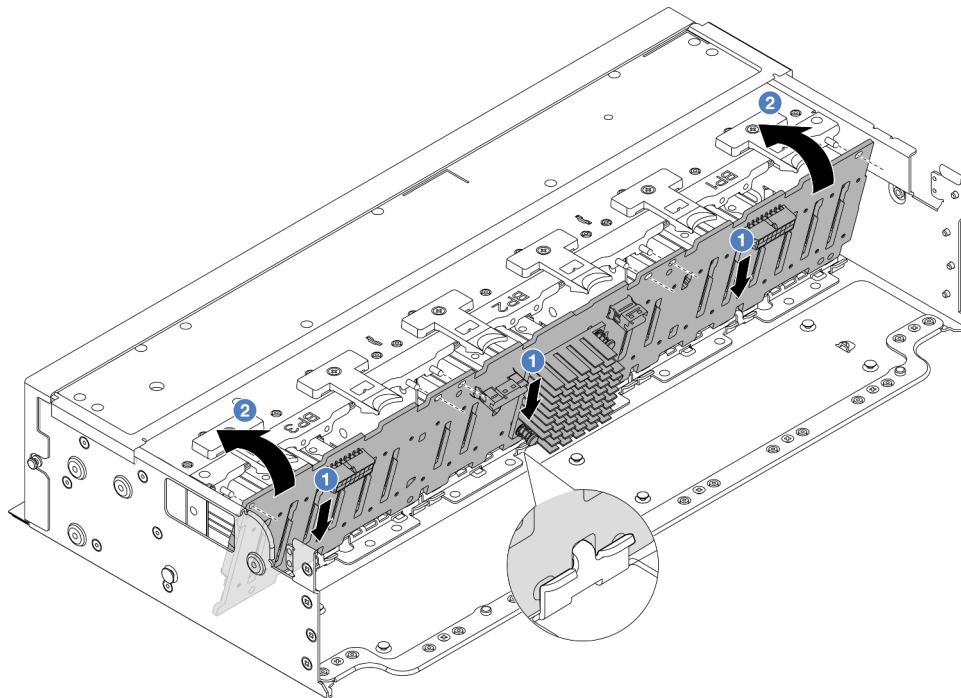


Figure 93. Installing the 24-bay drive backplane with expander

1. ① Align the bottom of the backplane with the slots on of the chassis.
2. ② Rotate the backplane to the vertical position and align the holes in the backplane with the pins on the chassis and press the backplane into position. The release tabs will secure the backplane in place.

Step 3. If you have disconnected cables from the backplane, reconnect cables back to the backplane, and then connect the cables to the system board assembly or RAID adapters. See [Chapter 6 “Internal cable routing” on page 385](#).

## After you finish

1. Reinstall all the drives and fillers (if any) into the drive bays. See [“Install a hot-swap drive” on page 98](#).
2. Reinstall the fan cage. See [“Install the system fan cage” on page 374](#).
3. Reinstall the air baffle if you have removed it. See [“Install the air baffle” on page 101](#).
4. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## Remove the 3.5-inch front drive backplane

Use this information to remove the 3.5-inch front drive backplane.

## About this task

The server supports the following types of 3.5-inch front drive backplanes:

- 3.5-inch SAS/SATA 8-bay backplane
- 3.5-inch SAS/SATA 12-bay backplane
- 3.5-inch AnyBay 12-bay backplane
- 3.5-inch 12-bay backplane with expander

The following uses the 3.5-inch SAS/SATA 12-bay backplane as an example for illustration. The procedure is the same for the other backplanes.

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.
- If one or more NVMe solid-state drives are to be removed, it is recommended to disable them beforehand via the operating 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. Make preparation for the task.

- a. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 96](#).
- b. 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 88](#).
- c. Remove the top cover. See [“Remove the top cover” on page 381](#).
- d. Remove the system fan cage for easier operation. See [“Remove the system fan cage” on page 373](#).
- e. Remove the air baffle if needed. See [“Remove the air baffle” on page 99](#).

Step 2. Remove the 3.5-inch drive backplane.

**Note:** Depending on the specific type, your backplane might look different from the illustration. Some cables might need to be removed or moved to the side to remove the backplane. If needed, record the cable connections on the backplane and then disconnect the cables from the backplane first.



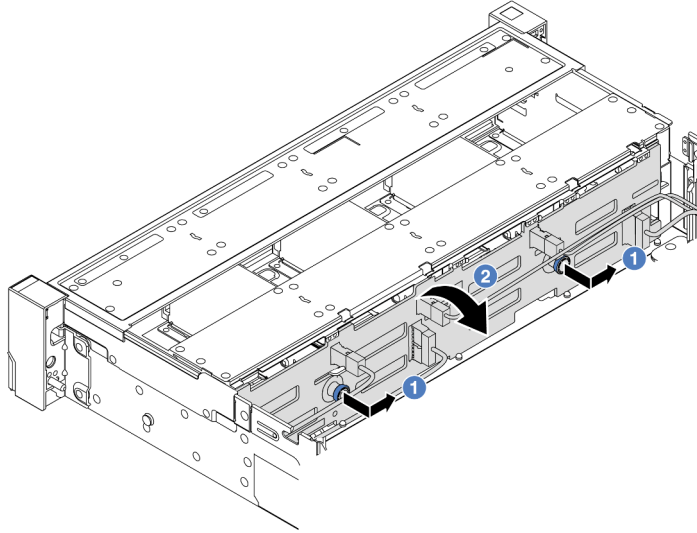


Figure 94. 3.5-inch drive backplane removal

- a. ① Pull out the plungers and slightly slide the backplane to the side as shown.
- b. ② Rotate the backplane down to release it from the four hooks on the chassis. Then, carefully lift 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

[Watch the procedure on YouTube](#)

## Install the 3.5-inch front drive backplane

Use this information to install the 3.5-inch front drive backplane.

## About this task

The server supports the following types of 3.5-inch front drive backplanes:

- 3.5-inch SAS/SATA 8-bay backplane
- 3.5-inch SAS/SATA 12-bay backplane
- 3.5-inch AnyBay 12-bay backplane
- 3.5-inch 12-bay backplane with expander

The following uses the 3.5-inch SAS/SATA 12-bay backplane as an example for illustration. The procedure is the same for the other backplanes.

## Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) to ensure that you work safely.

- To avoid damage to the drive connectors, make sure that the server top cover is in place and fully closed whenever you install or remove a drive.
- To make sure that there is adequate system cooling, do not operate the server for more than two minutes without either a drive or a drive bay filler installed in each bay.
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.

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

- Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to [“Update the firmware” on page 691](#) 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. Install the 3.5-inch drive backplane.

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

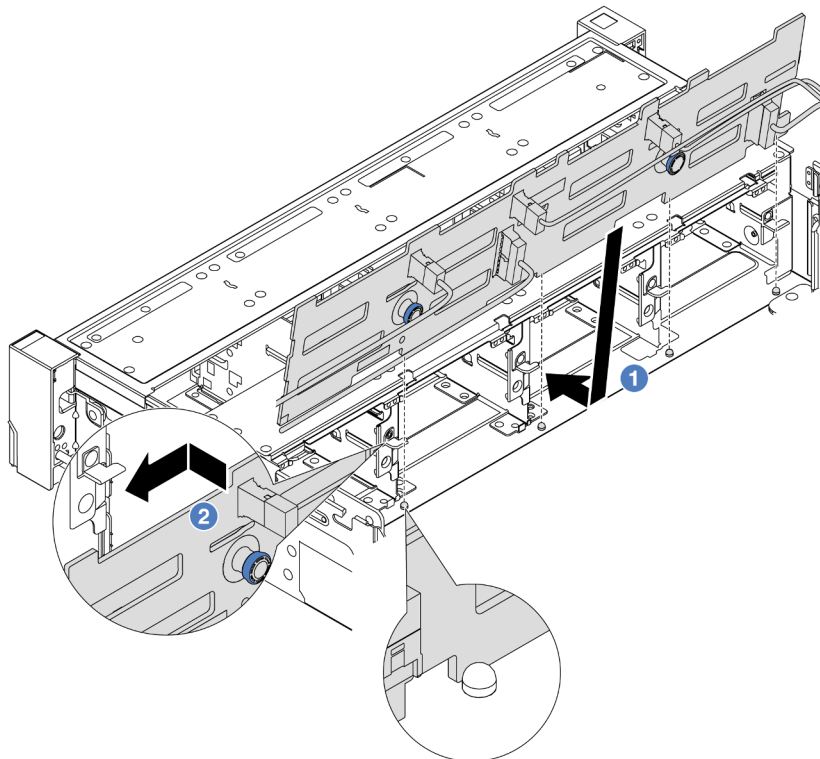


Figure 95. 3.5-inch drive backplane installation

- 1 Align the backplane with the chassis and lower it into the chassis. Then, put the backplane into place with it leaning backward slightly.

- b. ② Rotate the backplane to vertical position to ensure that the four hooks on the chassis pass through the corresponding holes in the backplane. Then, slide the new backplane as shown until it is secured into place.

Step 3. If you have disconnected cables from the backplane, reconnect cables back to the backplane, and then connect the cables to the system board assembly or RAID adapters. See [Chapter 6 “Internal cable routing” on page 385](#).

## After you finish

1. Reinstall all the drives and fillers (if any) into the drive bays. See [“Install a hot-swap drive” on page 98](#).
2. Reinstall the fan cage. See [“Install the system fan cage” on page 374](#).
3. Reinstall the air baffle if you have removed it. See [“Install the air baffle” on page 101](#).
4. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

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## Front I/O module replacement

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

The front I/O module varies by model. The front I/O module for most models is on right rack latch. The front I/O module on media bay is supported only in the following server models:

- Server models with eight 2.5-inch front drive bays
- Server models with sixteen 2.5-inch front drive bays

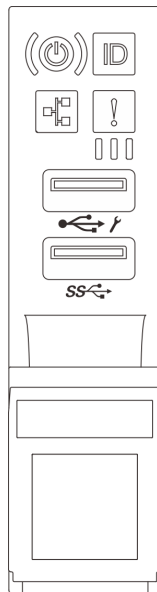


Figure 96. Front I/O module (on rack latch)

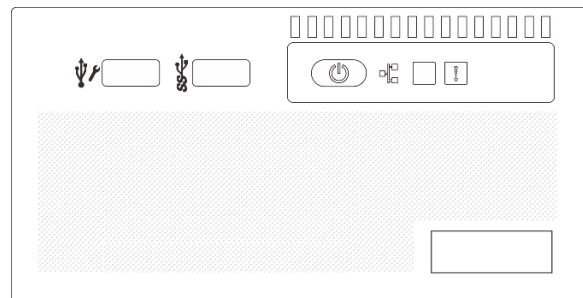


Figure 97. Front I/O module (on media bay)

To replace the front I/O module on the rack latch, see [“Rack latches replacement” on page 284](#).

To replace the front I/O module on the media bay:

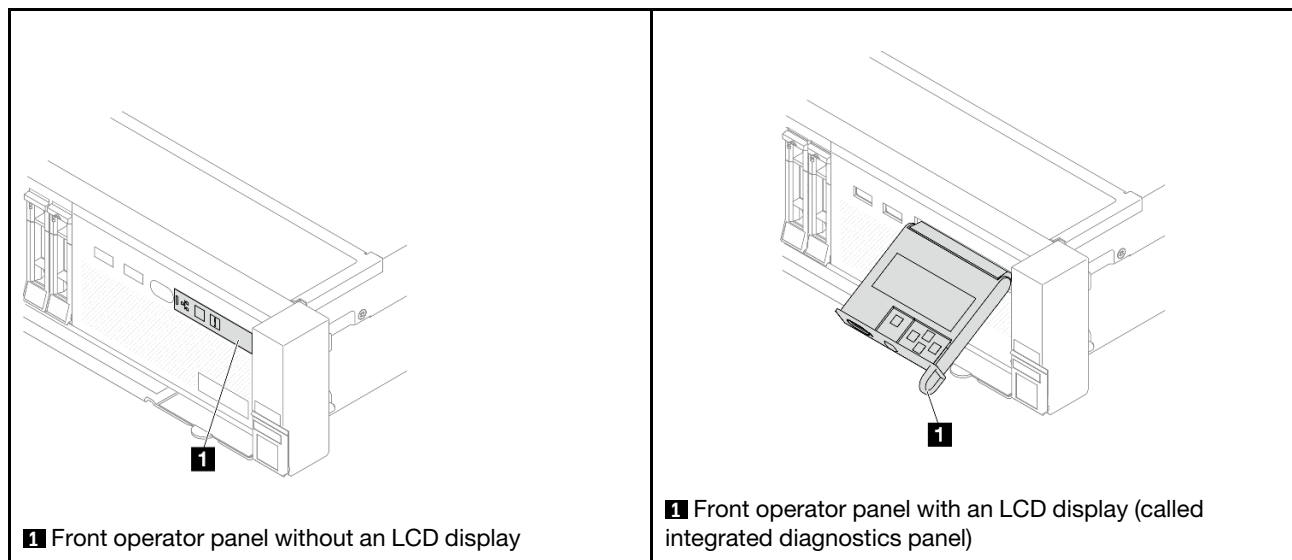
- [“Remove the front I/O module” on page 148](#)
- [“Install the front I/O module” on page 150](#)

## Remove the front I/O module

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

### About this task

Depending on the server model, the server might come with one of the following front operator panels:



### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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. Make preparation for the task.

- a. If the security bezel is installed, remove it. See [“Remove the security bezel” on page 352](#).
- b. 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 88](#).
- c. Remove the top cover. See [“Remove the top cover” on page 381](#).
- d. Remove the air baffle. See [“Remove the air baffle” on page 99](#).

Step 2. Disconnect the cables of the front I/O module from the system board assembly.

### 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.

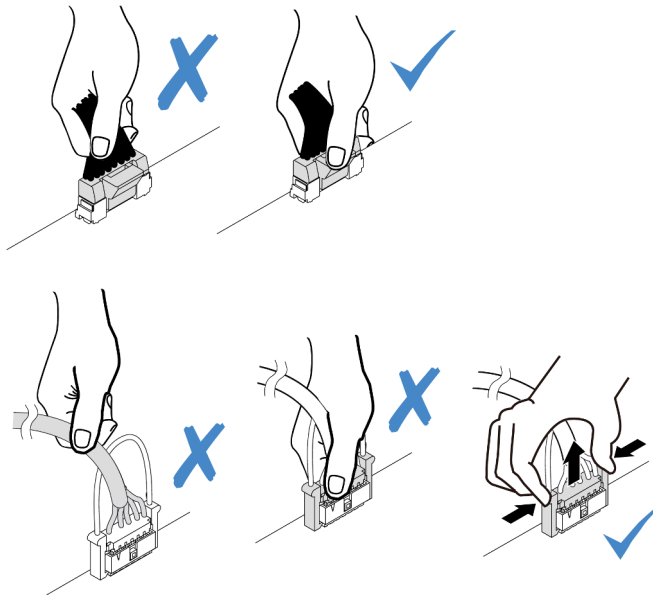


Figure 98. Disconnecting cables from the system board assembly

Step 3. Remove the front I/O module from the front chassis.

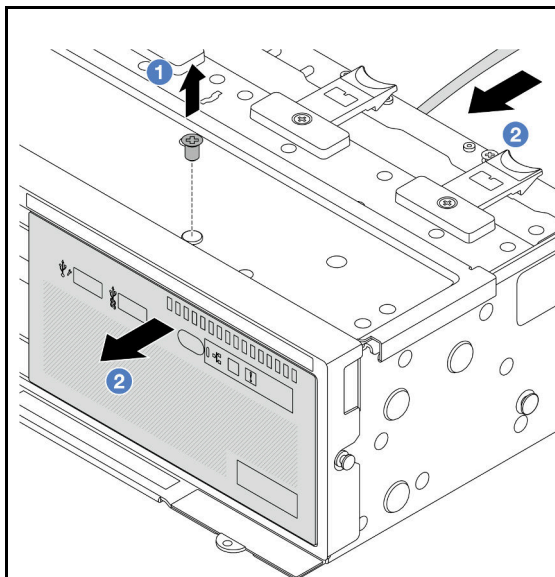


Figure 99. Front I/O module without the LCD display

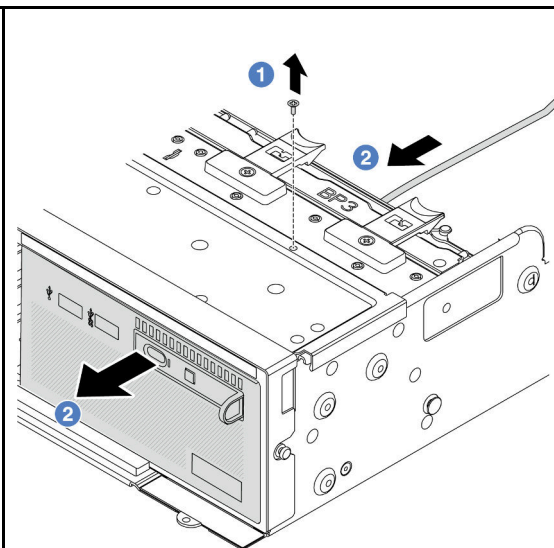


Figure 100. Front I/O module with the LCD display (integrated diagnostics panel)

- a. ① Remove the screw that secures the front I/O module.
- b. ② Slide the media bay out of the front chassis.

Step 4. (Optional) If you are replacing the integrated diagnostics panel, remove the diagnostics panel from the front I/O module.

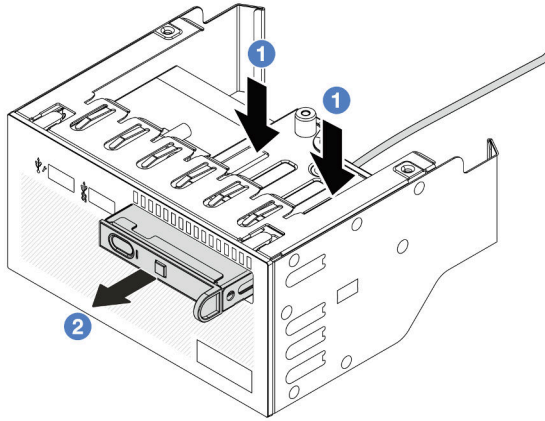


Figure 101. Diagnostics panel removal

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

## 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

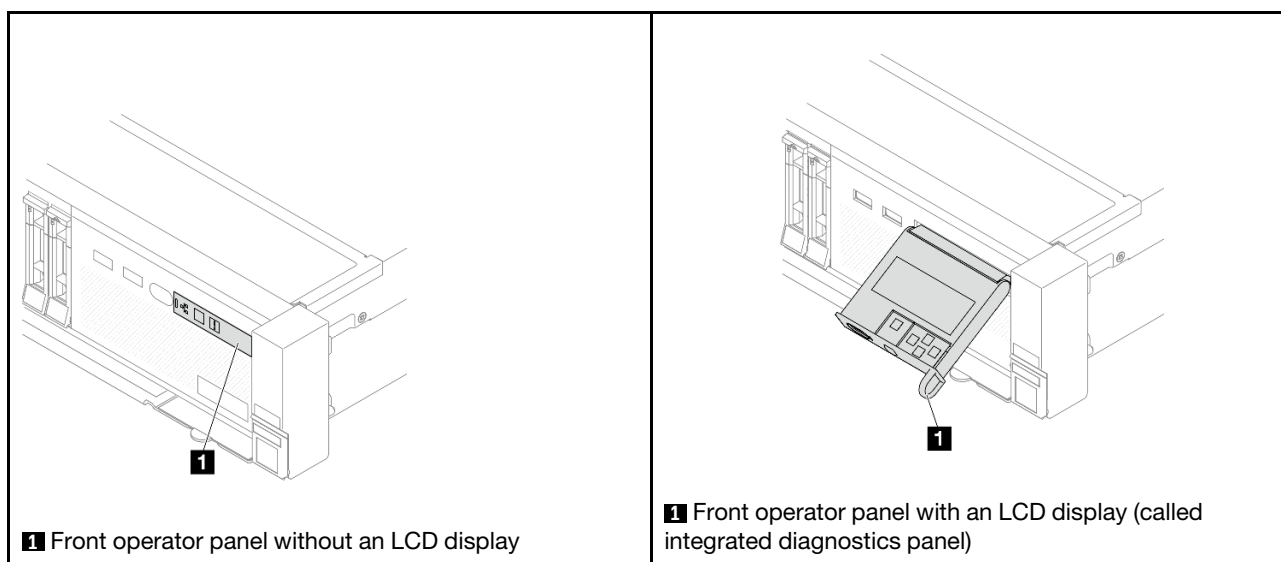
[Watch the procedure on YouTube](#)

## Install the front I/O module

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

## About this task

Depending on the server model, the server might come with one of the following front operator panels:



### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 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. (Optional) If you are replacing the integrated diagnostics panel, insert the diagnostics panel into the front I/O module. Ensure that the panel is fully seated into the assembly.

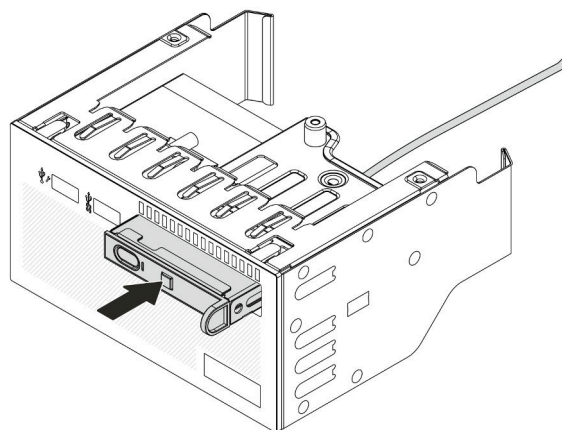


Figure 102. Diagnostics panel installation



Step 3. Install the front I/O module.

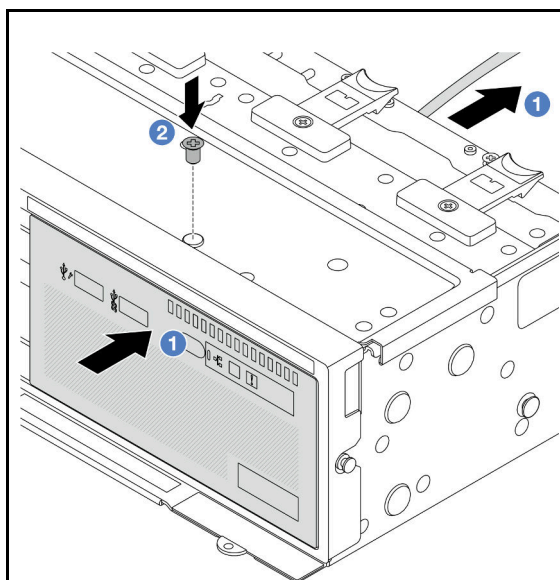


Figure 103. Front I/O module without the LCD display

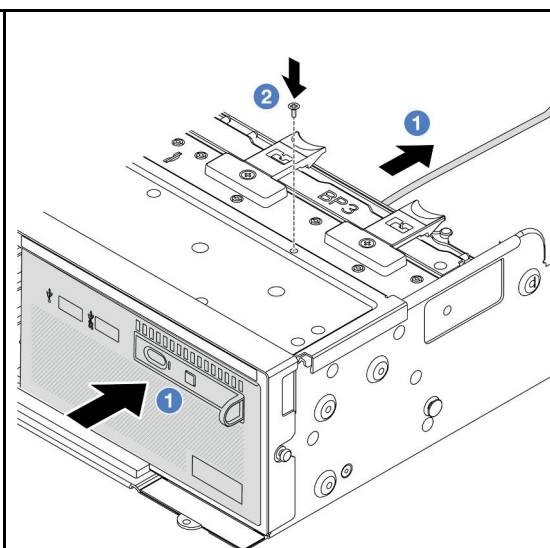


Figure 104. Front I/O module with the LCD display (integrated diagnostics panel)

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

## After you finish

1. Connect the cables of the front I/O module to the system board assembly. See [Chapter 6 “Internal cable routing” on page 385](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

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## GPU replacement

Use this information to remove and install a GPU adapter.

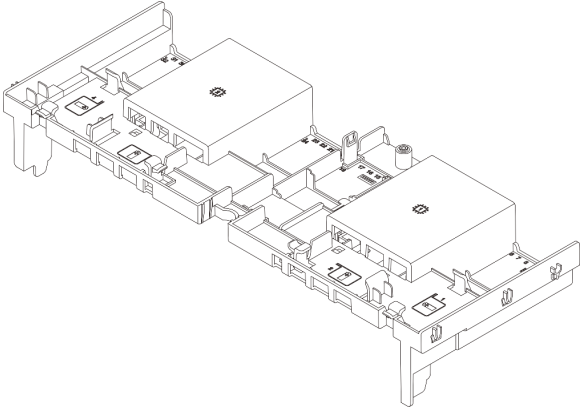
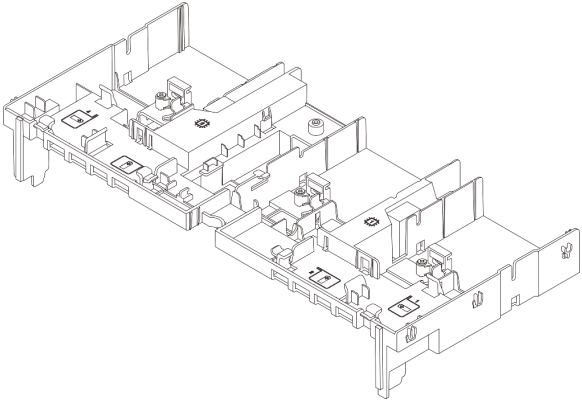
**Notes:** To prevent potential thermal issues, change the **Misc** setting in the BIOS from **Option3** (default value) to **Option1** if the following two conditions are met:

- The server is equipped with a GPU adapter.
- The UEFI firmware version is ESE122T or later.

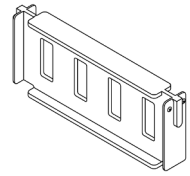
For the method of changing the **Misc** setting, see <https://support.lenovo.com/us/en/solutions/TT1832>.

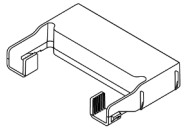
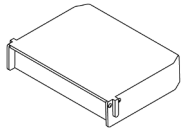
- [“Remove a GPU adapter” on page 154](#)
- [“Install a GPU adapter” on page 157](#)



Air baffle	Supported GPU adapters
 <p><i>Figure 105. Standard air baffle</i></p>	<p>Half length, single-wide GPUs</p>
 <p><i>Figure 106. GPU air baffle</i></p>	<ul style="list-style-type: none"> <li>• Full length, full height, single-wide GPUs</li> <li>• Full length, full height, double-wide GPUs</li> </ul>

Depending on your usage scenario, you might need to install one of below GPU air baffle filler or add-on GPU air baffle:

GPU air baffle filler/Add-on air baffle	Scenario
 <p><i>Figure 107. GPU air baffle filler</i></p>	<p>When the GPU air baffle is used, but a riser card is not installed with a GPU adapter, install this filler on the GPU air baffle.</p>

 <p>Figure 108. Add-on GPU air baffle</p>	<p>If a single-wide FHFL GPU adapter is to be installed on slot 1, 4, or 7, but the adjacent slot (2, 5, or 8) is left empty or installed with a half-length adapter, install this add-on air baffle on the GPU air baffle first.</p> <p><b>Note:</b> If the adjacent slot (2, 5, or 8) is installed with a low-profile Ethernet adapter that use an active optical cable (AOC), the power of the AOC cable must be limited to 2.5 W or lower.</p>
 <p>Figure 109. Add-on GPU air baffle</p>	<p>If the riser card (E/x16/x16) is used and a single-wide FHFL GPU adapter is installed on slot 2 or 5, install this add-on air baffle on the GPU air baffle after installing the GPU adapter.</p>

## Remove a GPU adapter

Use this information to remove a GPU adapter.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.

- 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 88](#).
- Remove the top cover. See [“Remove the top cover” on page 381](#).
- For easier operation, remove the adjacent riser assembly if needed. See [“Remove a rear riser assembly” on page 334](#).

Step 2. Remove the riser assembly that has the GPU adapter installed.

- **GPU adapter on riser 1 or 2 assembly**

**Note:** The following uses riser 1 assembly as an example for illustration. The replacement procedure is the same for riser 2 assembly.

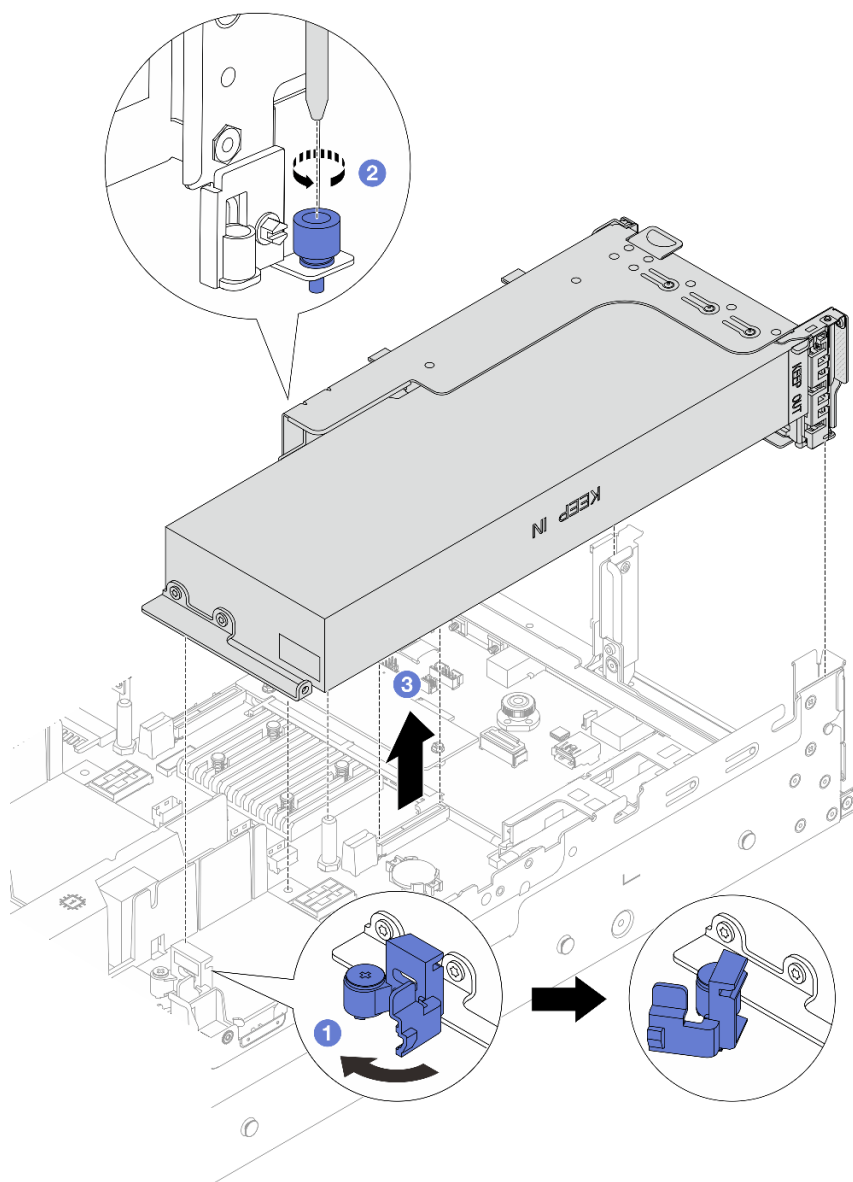


Figure 110. Removing the riser assembly

1. ① Open the blue latch on the GPU air baffle.
2. ② Loosen the screw that secures the riser assembly.
3. ③ Grasp the riser assembly by its edges and carefully lift it straight up and off the chassis.

- **GPU adapter on riser 3 assembly**

1. Open the blue latch on the GPU air baffle, slightly lift the riser assembly up, and remove the air baffle.
2. Disconnect the GPU power cable and riser 3 cables from the system board assembly.

**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.
  - a. Press the release tab to release the connector.
  - b. Disengage the connector from the cable socket.

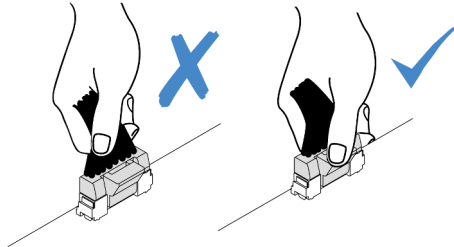


Figure 111. Disconnecting cables from the system board assembly

3. Grasp the riser assembly by its edges and carefully lift it straight up and off the chassis. See [“Remove a rear riser assembly” on page 334](#).

Step 3. If the GPU adapter is on riser 1 or 2 assembly, disconnect the power cable from the riser card.

Step 4. Remove the GPU adapter from the riser bracket.

**Note:** The following uses riser 1 or 2 assembly as an example for illustration. The procedure is the same for riser 3 assembly.

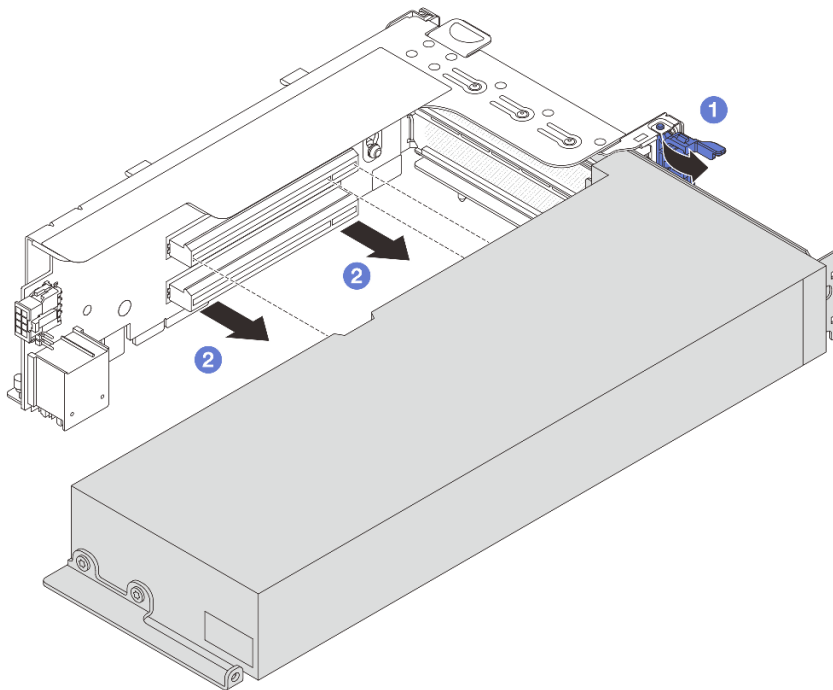


Figure 112. Removing the GPU adapter

- 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

[Watch the procedure on YouTube](#)

## Install a GPU adapter

Use this information to install a GPU adapter.

### About this task

Higher GPU power requires higher PSU power. Use Lenovo Capacity Planner to calculate the required power capacity for what is configured for the server. More information about Lenovo Capacity Planner is available at:

<https://datacentersupport.lenovo.com/solutions/Invo-lcp>

### Attention:

- Read “[Installation Guidelines](#)” on page 57 and “[Safety inspection checklist](#)” on page 58 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 88.
- 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 75.
- All installed GPU adapters must be identical.

### 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. Locate the appropriate PCIe slot for the new GPU adapter. See “[PCIe slots and PCIe adapters](#)” on page 68
- Step 3. Install the GPU adapter into the PCIe slot on the riser card.

**Note:** The following uses riser 1 or 2 assembly as an example for illustration. The procedure is the same for riser 3 assembly.

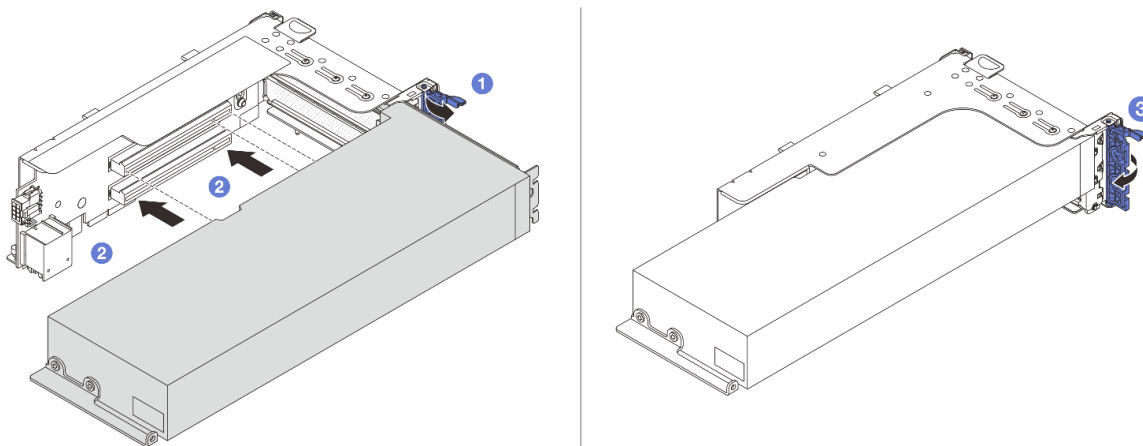


Figure 113. Installing the GPU adapter

- a. ① Open the blue latch on the riser cage.
- b. 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.
- c. ③ Close the blue latch.

Step 4. Install the riser assembly with the GPU adapter.

- **GPU adapter on riser 1 or 2 assembly**

1. Install the GPU air baffle.

(Optional) If a single-wide FHFL GPU adapter is to be installed on slot 1, 4, or 7, but the adjacent slot will be left empty or installed with a half-length adapter, install an add-on air baffle 1 on the GPU air baffle first.

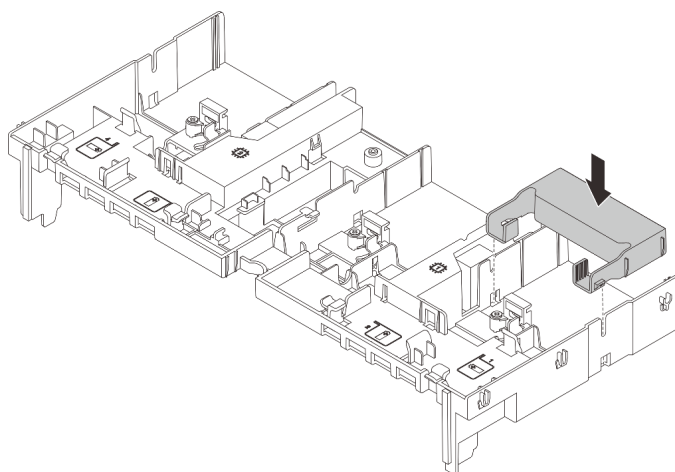


Figure 114. Installing an add-on air baffle 1

2. Connect the GPU power cable. See [Chapter 6 “Internal cable routing” on page 385](#).
3. Install the riser assembly with the GPU adapter.

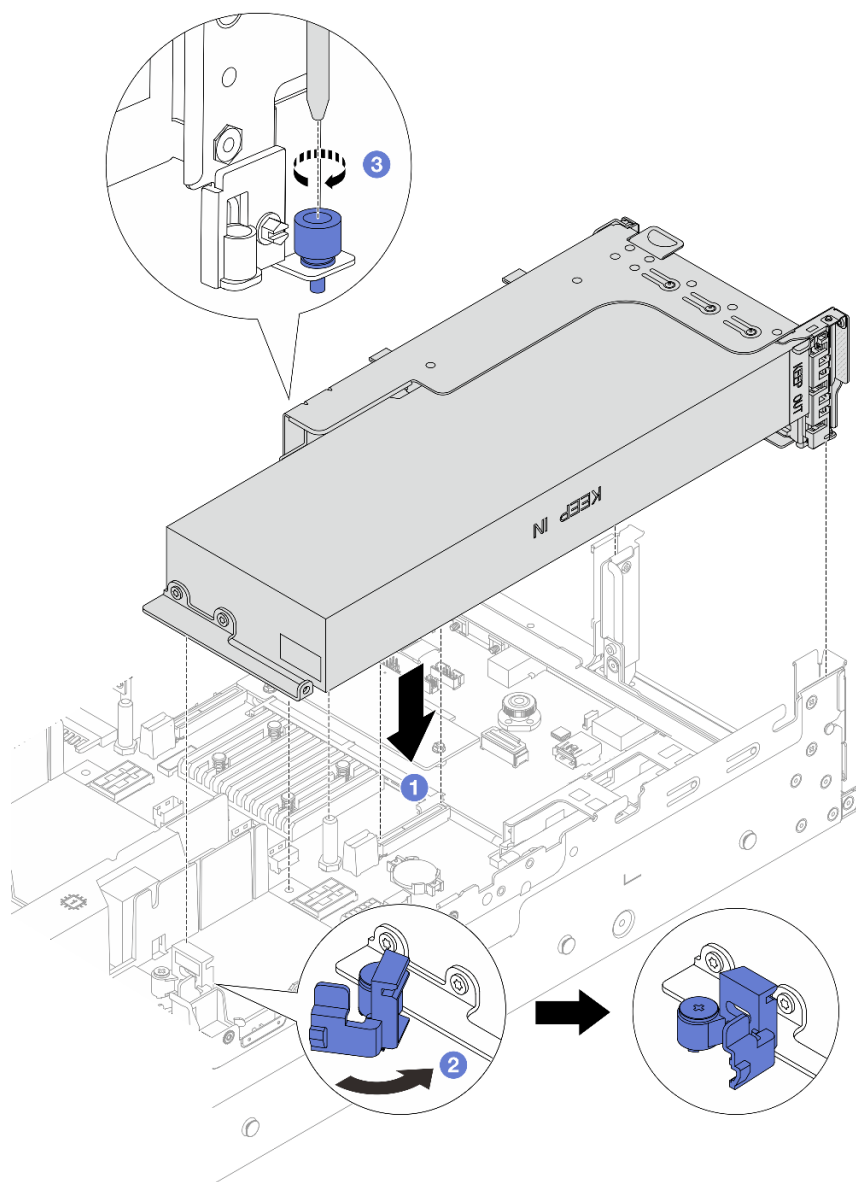


Figure 115. Installing the riser assembly

- a. ① Align the riser card with the PCIe slot on the system board assembly. Carefully press the riser card straight into the slot until it is securely seated.
  - b. ② Open the blue latch on the GPU air baffle and fix the end of the GPU adapter. Then, close the blue latch.
  - c. ③ Tighten the screw to fix the riser cage.
4. (Optional) If the riser card (E/x16/x16) is used and a single-wide FHFL GPU adapter is installed on slot 2 or 5, install an add-on air baffle on the GPU air baffle after installing the GPU adapter.

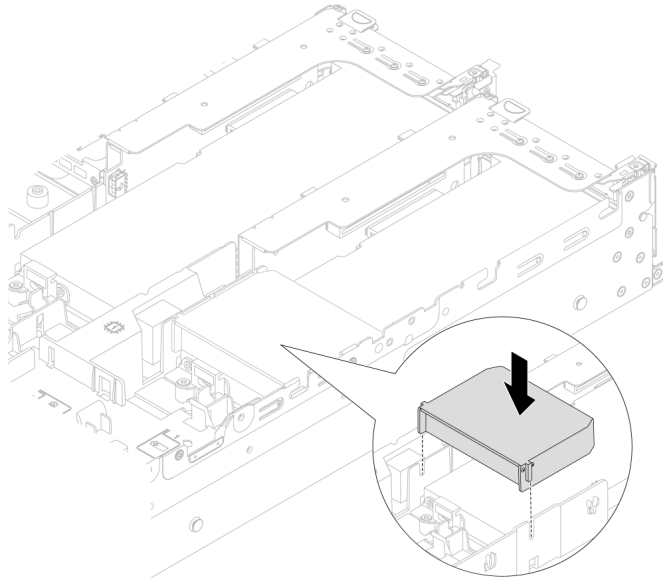


Figure 116. Installing an add-on air baffle 2

- **GPU adapter on riser 3 assembly**

1. Connect cables from the riser 3 and GPU adapter to the system board assembly. See [Chapter 6 “Internal cable routing” on page 385](#).
2. Install the GPU air baffle.
3. Install riser 3 assembly. See [“Install a rear riser assembly” on page 346](#).
4. Open the blue latch on the GPU air baffle and fix the end of the GPU adapter. Then, close the blue latch.

Step 5. (Optional) If a riser card is not installed with a GPU adapter, install a filler on the GPU air baffle.

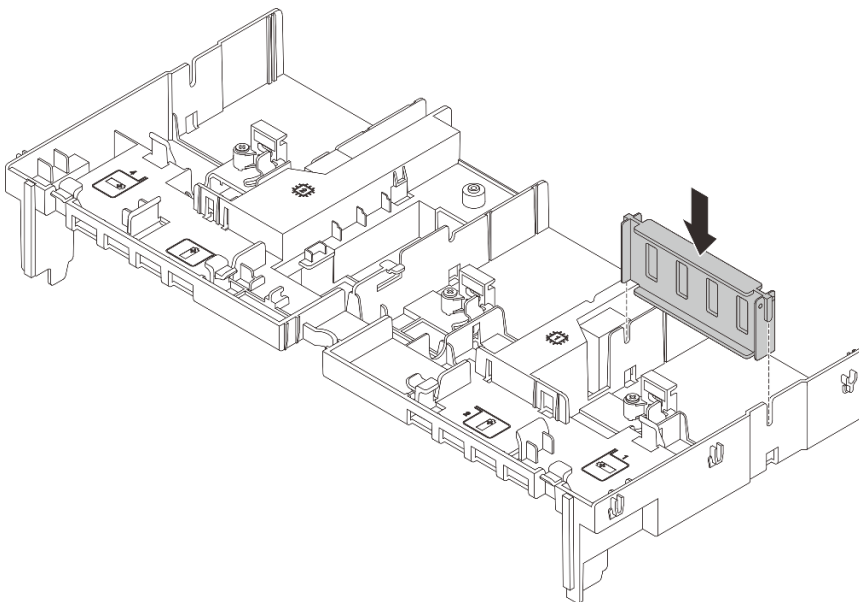


Figure 117. Installing the GPU air baffle filler



## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### Demo video

[Watch the procedure on YouTube](#)

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## Heat sink Torx T30 nut replacement

Use this information to remove and install a heat sink Torx T30 nut.

### Remove a heat sink Torx T30 nut

This task has instructions for removing a PEEK (Polyether ether ketone) Torx T30 nut on the heat sink.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Do not touch the processor contacts. Contaminants on the processor contacts, such as oil from your skin, can cause connection failures.

**Note:** The heat sink, processor, and processor carrier for your system might be different from those shown in the illustrations.

### 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 88](#).
- b. Remove the top cover. See [“Remove the top cover” on page 381](#).
- c. If your server comes with an air baffle or a middle cage, remove it first.
  - [“Remove the air baffle” on page 99](#)
  - [“Remove the middle drive cage and drive backplanes” on page 255](#)
- d. Remove the system fan cage if needed. [“Remove the system fan cage” on page 373](#).
- e. Remove the PHM. See [“Remove a processor and heat sink” on page 267](#).

Step 2. Remove the Torx T30 nut.

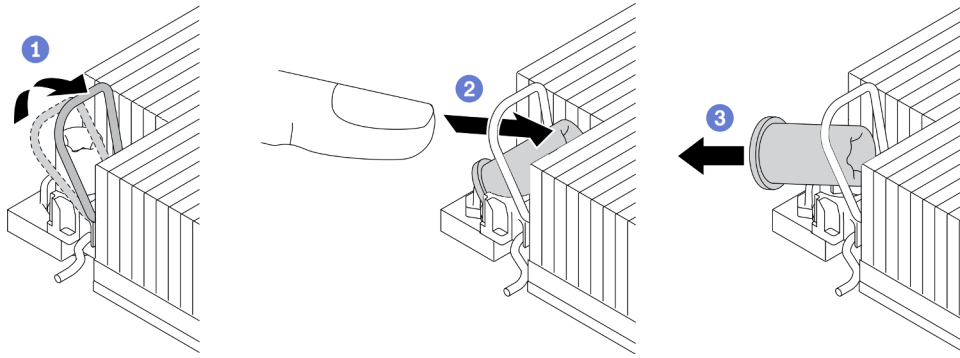


Figure 118. Removing a Torx T30 nut from the heat sink

**Note:** Do not touch the gold contacts on the bottom of the processor.

- a. ① Rotate the anti-tilt wire bail inwards.
- b. ② Push the upper edge of the Torx T30 nut towards the center of the heat sink until it disengages.
- c. ③ Remove the Torx T30 nut.

**Attention:** Visually inspect the removed Torx T30 nut, if the nut is cracked or damaged, make sure no debris or broken pieces are left inside your server.

## After you finish

1. Install a new Torx T30 nut. See [“Install a heat sink Torx T30 nut” on page 162](#).
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 a heat sink Torx T30 nut

This task has instructions for installing a PEEK (Polyether ether ketone) Torx T30 nut on the heat sink.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Do not touch the processor contacts. Contaminants on the processor contacts, such as oil from your skin, can cause connection failures.

**Note:** The heat sink, processor, and processor carrier for your system might be different from those shown in the illustrations.

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

- Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to “[Update the firmware](#)” on page 691 for more information on firmware updating tools.

## Procedure

Step 1. Install the Torx T30 nut.

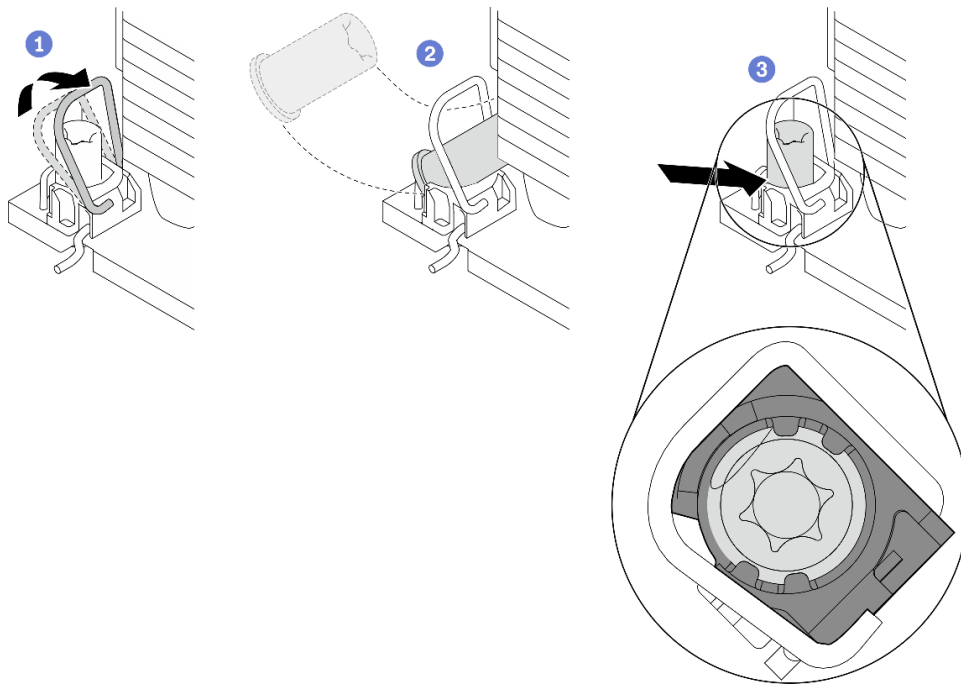


Figure 119. Installing a Torx T30 nut into the heat sink

**Note:** Do not touch the gold contacts on the bottom of the processor.

- a. ① Rotate the anti-tilt wire bail inwards.
- b. ② Orient the Torx T30 nut under the anti-tilt wire bail; then, align the Torx T30 nut with the socket at an angle as shown.
- c. ③ Push the lower edge of the Torx T30 nut into the socket until it clicks into place. Make sure the Torx T30 nut is secured under the four clips in the socket.

## After you finish

1. Reinstall the PHM. See “[Install a processor and heat sink](#)” on page 274.
2. Complete the parts replacement. See “[Complete the parts replacement](#)” on page 383.

## Demo video

[Watch the procedure on YouTube](#)

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## Internal RAID/HBA/expander adapter replacement

Use this information to remove and install an internal customer form factor (CFF) RAID adapter, internal CFF HBA adapter, or internal CFF RAID expander adapter.

The server supports RAID/HBA adapters in two form factors:

- Customer form factor (CFF): RAID/HBA adapters in this form factor are supported only when two processors are installed. CFF RAID/HBA adapters are installed between the front backplane and fan cage.
- Standard form factor (SFF): RAID/HBA adapters in this form factor are installed in the PCIe expansion slots, see [“Rear PCIe adapter and riser assembly replacement” on page 331](#).

## Remove an internal RAID/HBA/expander adapter

Use this information to remove an internal CFF RAID adapter, internal CFF HBA adapter, or internal CFF RAID expander adapter.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.

### 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 88](#).
- b. Remove the top cover. See [“Remove the top cover” on page 381](#).
- c. Record the cable connections for cables from or crossing over the adapter; then, disconnect all the cables.

#### 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.

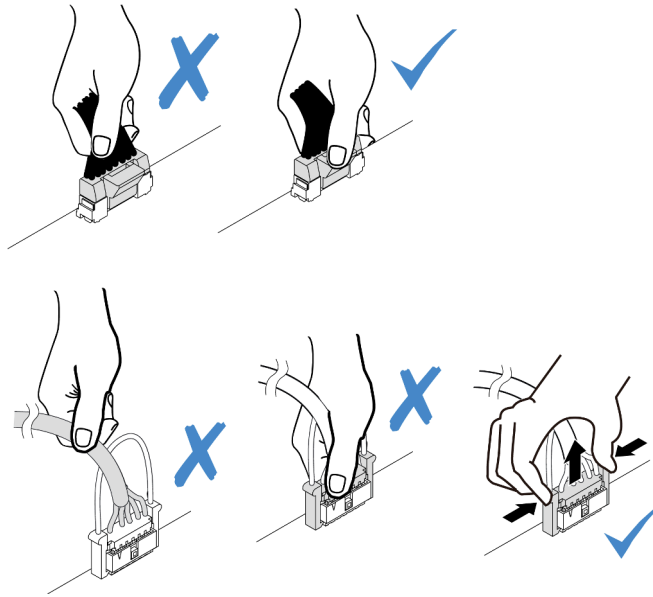


Figure 120. Disconnecting cables from the system board assembly

Step 2. Lift the blue touch point, slightly slide the adapter as shown, and carefully lift it out of the chassis.

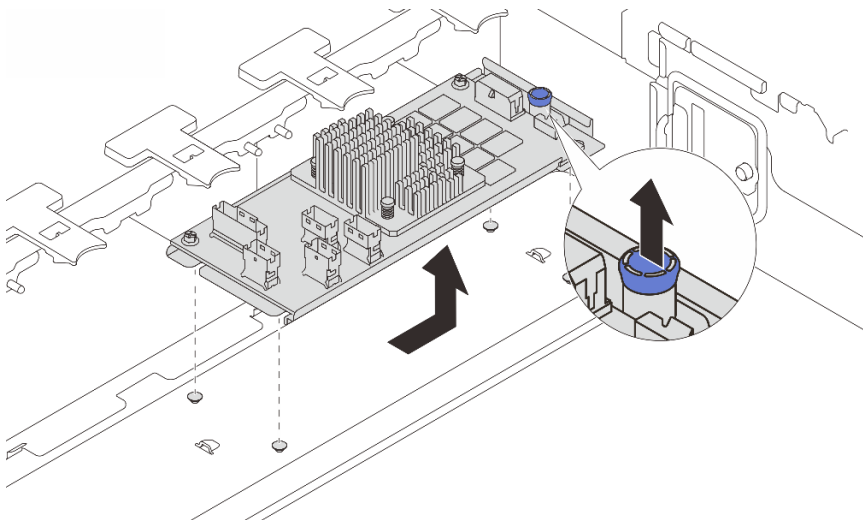


Figure 121. Internal CFF adapter removal

## 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

[Watch the procedure on YouTube](#)

## Install an internal RAID/HBA/expander adapter

Use this information to install an internal CFF RAID adapter, internal CFF HBA adapter, or internal CFF RAID expander adapter.

### About this task

#### Attention:

- Read “[Installation Guidelines](#)” on page 57 and “[Safety inspection checklist](#)” on page 58 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 88.
- 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.
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.
- The CFF adapter is supported only in the 2.5-inch drive bay chassis.

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

- Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to “[Update the firmware](#)” on page 691 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.

**Note:** The adapter is shipped with and preinstalled on a mounting bracket, check and ensure that the adapter is fixed in place. If there are any loosen screws, tighten the screws using a No.1 Phillips torque screwdriver. The maximum torque value is  $4.8 \pm 0.5$  inch-pounds.

- Step 2. Align the notches on the mounting bracket with the pins on the chassis, place down the adapter, and slightly slide it as shown to secure it on the chassis.

**Note:** The illustration shows installing the CFF adapter on the left side (viewed from the front of the server). When the 24 x 2.5-inch drive backplane with expander is installed, the CFF adapter can be installed only on the other side (right side viewed from the front of the server).

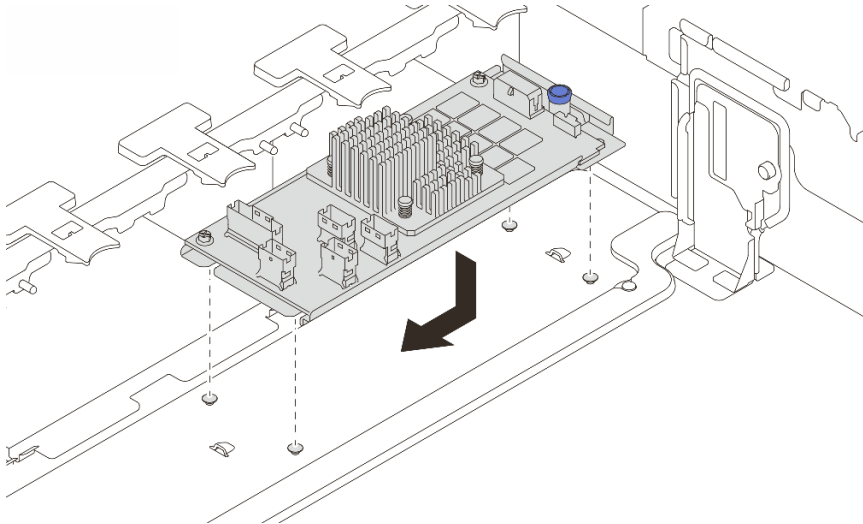


Figure 122. Internal CFF adapter installation

Step 3. Connect cables to the adapter. See [Chapter 6 “Internal cable routing” on page 385](#).

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

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## Intrusion switch replacement

Use this information to remove and install the 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).

- [“Remove the intrusion switch” on page 167](#)
- [“Install the intrusion switch” on page 169](#)

## Remove the intrusion switch

Use this information to remove the intrusion switch.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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. 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 88](#).
- b. Remove the top cover. See [“Remove the top cover” on page 381](#).
- c. Remove the fan cage from the system board assembly. See [“Remove the system fan cage” on page 373](#).
- d. Remove the system fans from the fan cage. See [“Remove a system fan” on page 369](#).

Step 2. Remove the intrusion switch assembly from the fan cage.

**Note:** The blowup in the illustration shows the fan cage upside down.

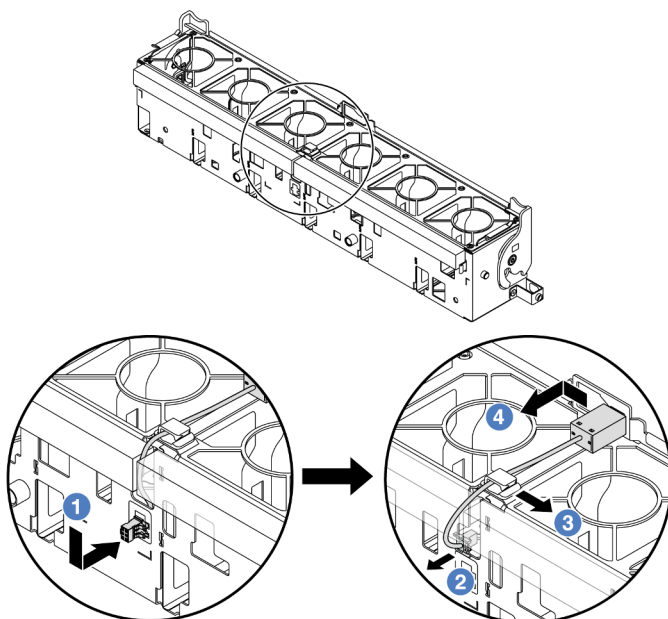


Figure 123. Intrusion switch removal

- a. ① Move the intrusion switch connector in the direction as shown to disengage it from the keyhole.
- b. ② Release the intrusion switch cable from the pre-cut slots on the foam and fan cage bottom.
- c. ③ Release the intrusion switch cable from the cable clip.
- d. ④ Slide and pull the intrusion switch to remove it from the holder.

## After you finish

1. Install a new intrusion switch. See [“Install the intrusion switch” on page 169](#).
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 intrusion switch

Use this information to install the intrusion switch.

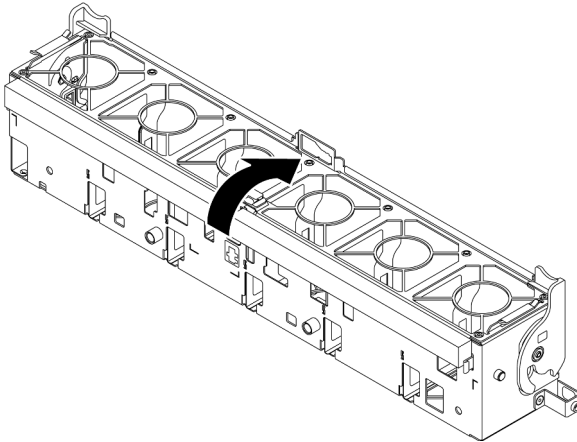
### About this task

#### Attention:

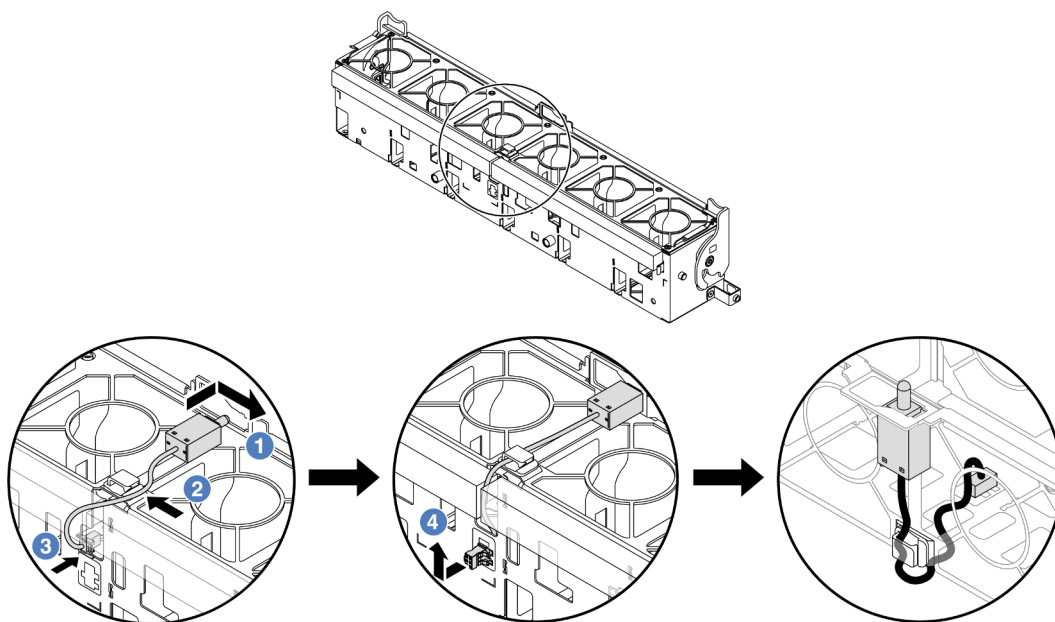
- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 88](#).
- Prevent exposure to static 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

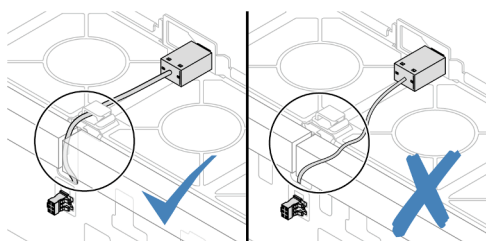
- Step 1. Touch the static-protective package that contains the new part to any unpainted surface on the outside of the server. Then, take the new part out of the package and place it on a static-protective surface.
- Step 2. Rotate the fan cage by 90 degrees in the direction shown in the picture.



- Step 3. Install the intrusion switch onto the fan cage.



**Note:** Ensure that the intrusion switch cable is routed through the cable clip and the pre-cut slot. Otherwise, the cable may slide under the fan cage, the contact surface between the fan cage and the system board assembly may get uneven, and the fan connection may get loose.



- a. ① Insert the intrusion switch onto the holder on the fan cage and push it in the direction as shown until it is fully seated.
- b. ② Fix the intrusion switch cable into the cable clip.
- c. ③ Route the cable into the fan cage through the pre-cut slot on the fan cage bottom.
- d. ④ Insert the intrusion switch connector into the connector keyhole, and move it in the shown direction until it is fully seated.

Step 4. Install the fan cage back into the chassis. See [“Install the system fan cage” on page 374](#).

Step 5. Install system fans into the fan cage. [“Install a system fan” on page 370](#).

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

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## Lenovo Neptune(TM) 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.

- [“Remove the Lenovo Neptune\(TM\) Processor Direct Water Cooling Module” on page 171](#)
- [“Install the Lenovo Neptune\(TM\) Processor Direct Water Cooling Module” on page 175](#)

## Remove the Lenovo Neptune(TM) 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 liquid detection sensor module cable

##### S011



**CAUTION:**  
Sharp edges, corners, or joints nearby.

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 T30 head screwdriver	Torx T30 screw

## Procedure

Step 1. Make preparations for this task.

- a. Remove the quick connect plugs from the manifolds. See [“Remove the manifold \(in-rack system\)” on page 200](#) or [“Remove the manifold \(in-row system\)” on page 222](#).

- b. Remove the server from the rack, see [“Remove the server from rack”](#) on page 88.
- c. Remove the top cover. See [“Remove the top cover”](#) on page 381.
- d. Remove the air baffle or middle drive cage. See [“Remove the air baffle”](#) on page 99 or [“Remove the middle drive cage and drive backplanes”](#) on page 255.
- e. 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 392.

Step 2. Remove the riser cage.

- **1FH riser cage**

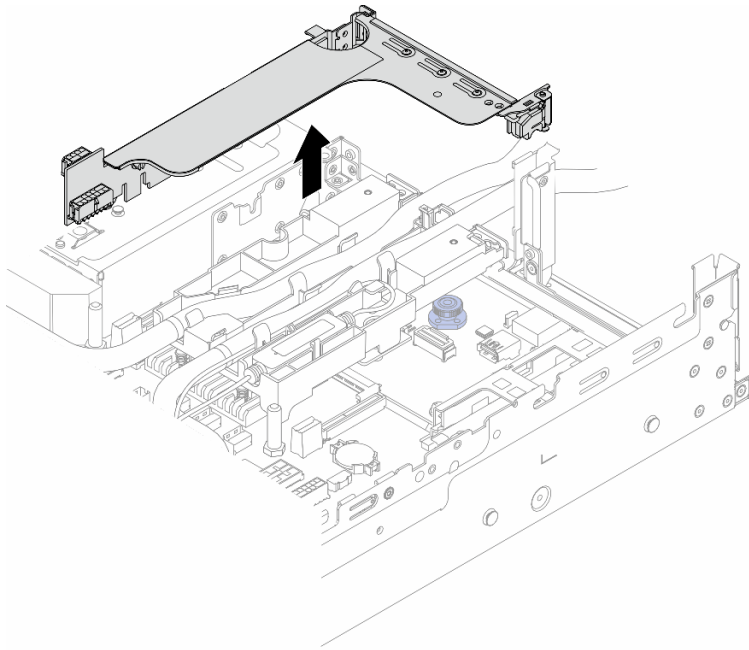


Figure 124. Removing the 1FH riser cage

- **3FH riser cage**

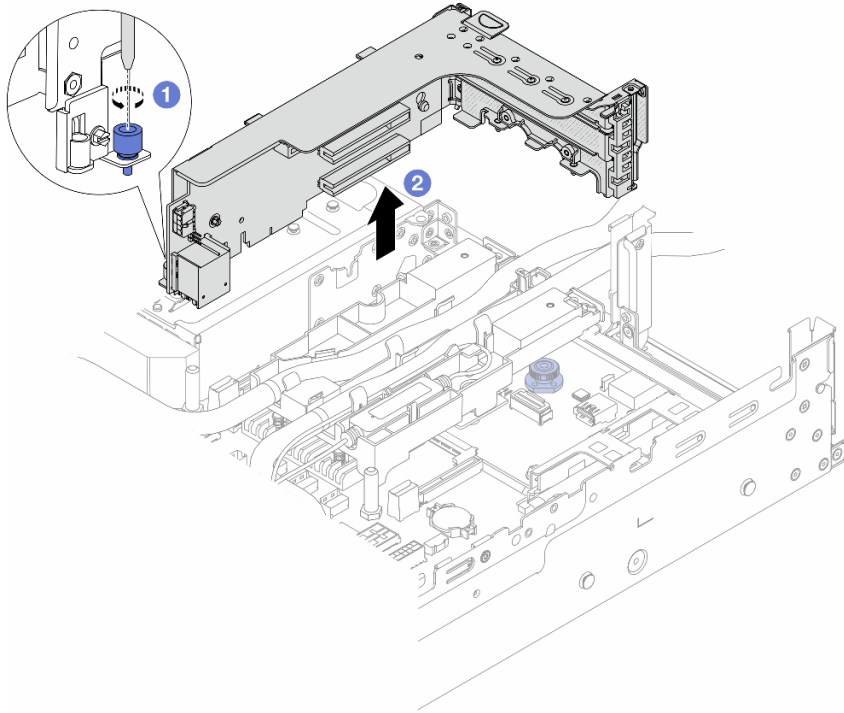


Figure 125. Removing the 3FH riser cage

- a. ① Loosen the screw that secures the riser cage.
- b. ② Grasp the riser cage by its edges and carefully lift it straight up and off the chassis.

Step 3. Disengage the hoses and liquid detection sensor module.

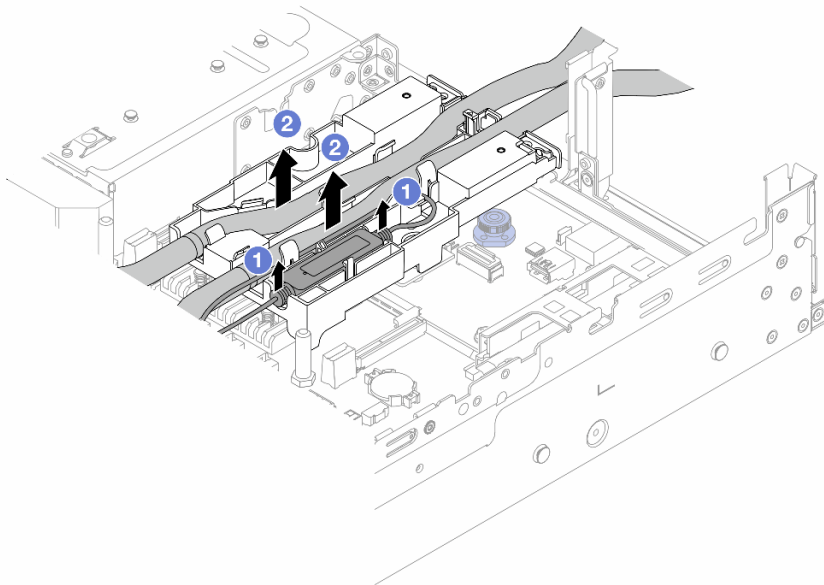


Figure 126. Disengaging the hoses and module

- a. ① Lift the liquid detection sensor module up from the hose holder.
- b. ② Disengage the hoses from the hose holder.

Step 4. Remove the DWCM from the processor board.

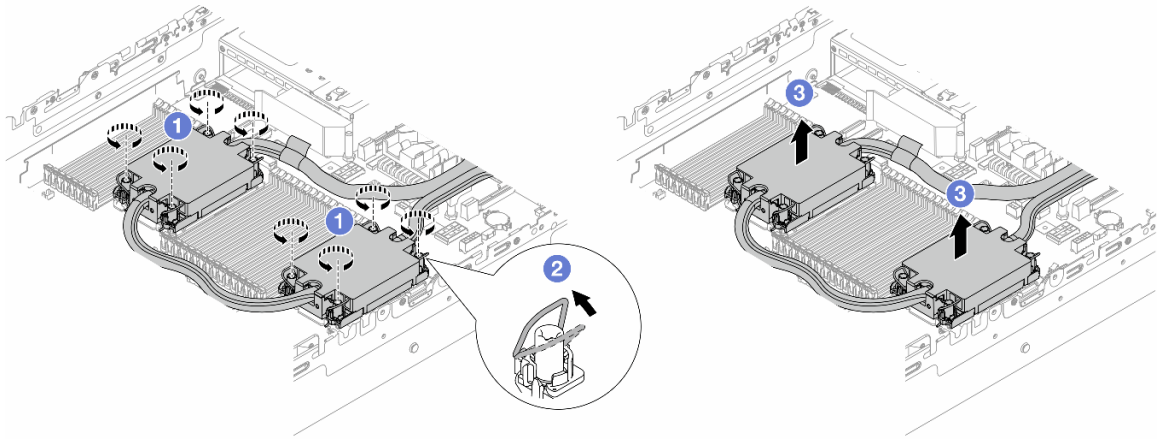


Figure 127. Removing the DWCM

- a. ① Fully loosen the Torx T30 nuts on the cold plate assembly.
- b. ② Rotate the anti-tilt wire bails inward.
- c. ③ Carefully lift the DWCM from the processor sockets. If the DWCM cannot be fully lifted out of the socket, further loosen the Torx T30 nuts and try lifting the DWCM again.

Step 5. 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 6. Separate the processor from the DWCM. Refer to [“Separate the processor from carrier and heat sink” on page 272](#).

Step 7. Remove the hose holder.

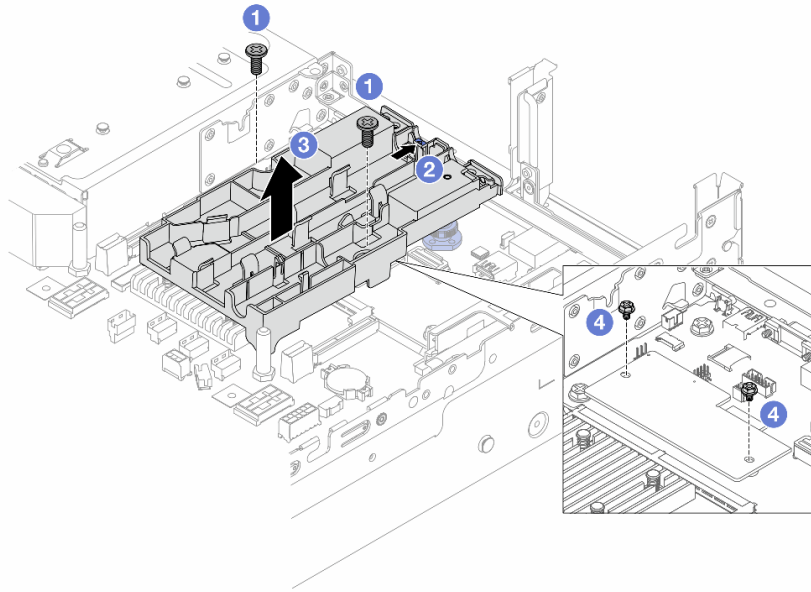


Figure 128. Removing the hose holder

- a. ① Loosen the screws that lock the holder to the system I/O board.
- b. ② Move the blue latch towards the rear of the server.
- c. ③ Lift the hose holder out of the chassis.
- d. ④ Install the screws to secure the firmware and RoT security module if needed.

## 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 Lenovo Neptune(TM) 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

### S011



**CAUTION:**

**Sharp edges, corners, or joints nearby.**

**Attention:**

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 T30 head screwdriver	Torx T30 screw

**Procedure**

Step 1. Install the hose holder to the chassis.



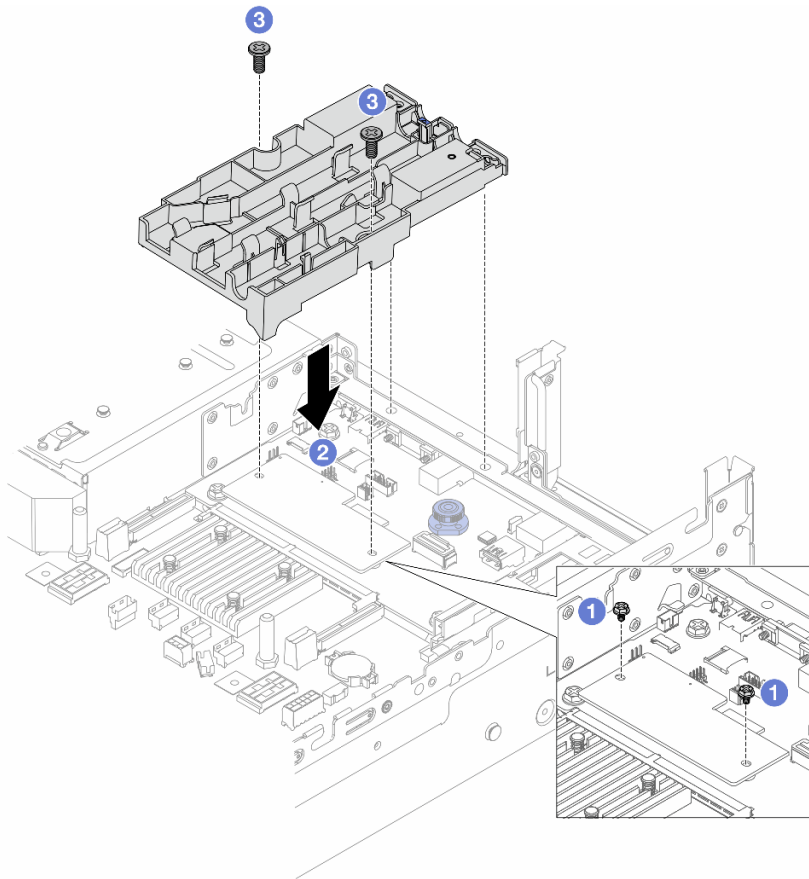
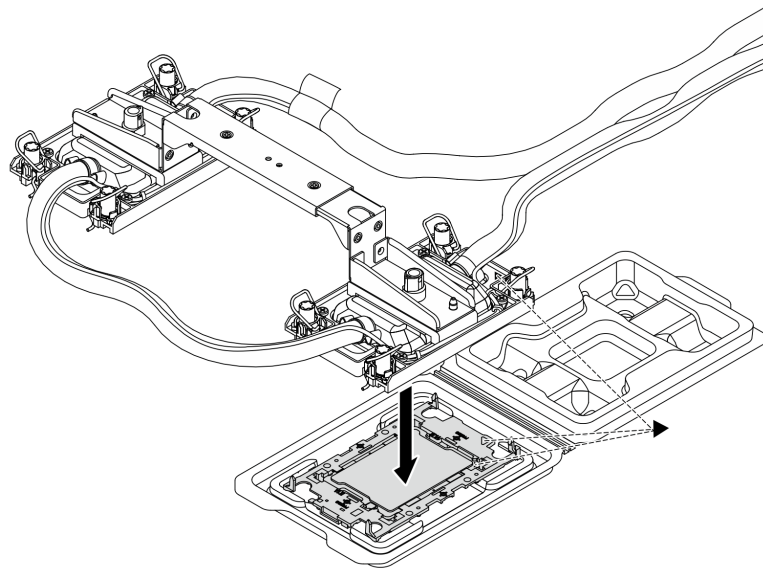


Figure 129. Installing the hose holder

- a. ① Remove the screws that secure the firmware and RoT security module if needed.
- b. ② Align the screw holes on the hose holder with the screw holes on the firmware and RoT security module, and the guiding pins of the holder with the holes on the rear wall.
- c. ③ Tighten the screws to secure the hose holder to the system I/O board.

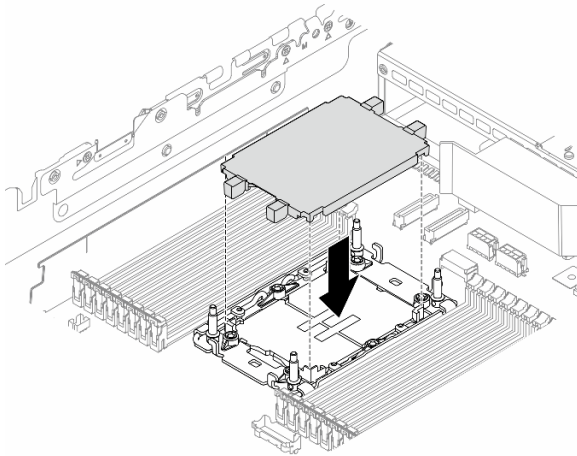
Step 2. Install the processor to the DWCM. See [“Install a processor and heat sink” on page 274](#).



*Figure 130. Installing the processor*

1. Align the triangular mark on the cold plate assembly label with the triangular mark on the processor carrier and processor.
2. Install the DWCM onto the processor-carrier.
3. Press the carrier into place until the clips at all four corners engage.

**Note:** If the server has only one processor installed, generally processor 1, it is required to install a cover to the empty socket of processor 2 before proceeding with further installation.



*Figure 131. Install the processor socket cover*

Step 3. Install the processor-DWCM to the system board assembly.

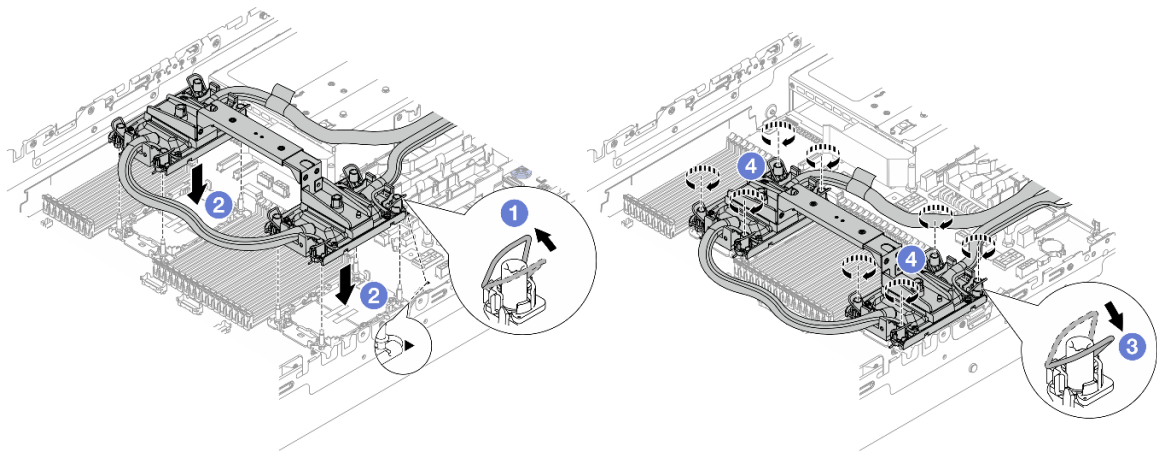


Figure 132. Installing the processor-DWCM

1. ① Rotate the anti-tilt wire bails inward.
2. ② Align the triangular mark and four Torx T30 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.
3. ③ Rotate the anti-tilt wire bails outward until they engage with the hooks in the socket.
4. ④ Fully tighten the Torx T30 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 0.9-1.3 newton-meters, 8-12 inch-pounds.)

Step 4. Remove the module handle from the DWCM.

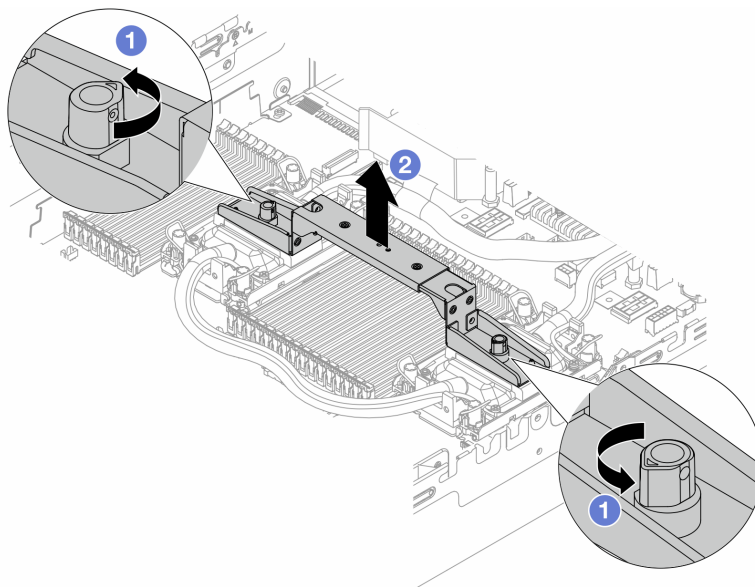


Figure 133. Removing the module handle

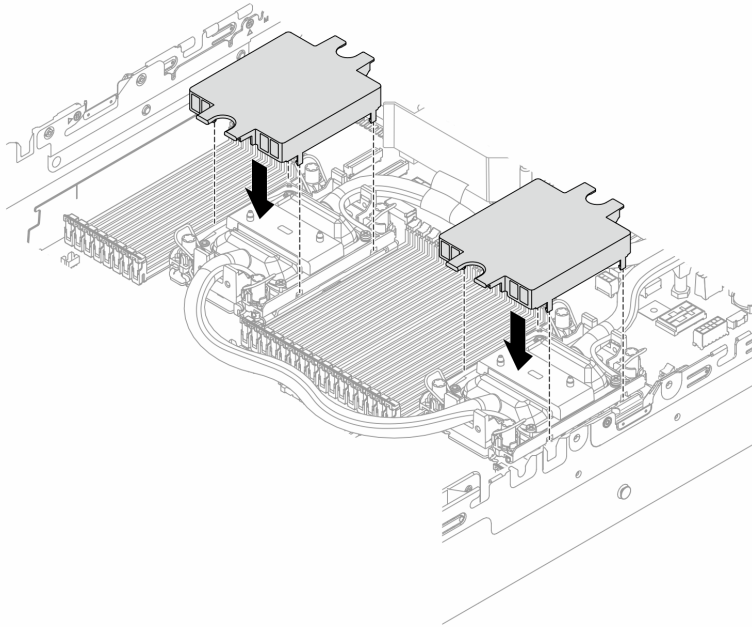
- a. ① Rotate the screws as illustrated above to unlock the handle.

- b. ② Separate the handle from the 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 4 step 4 on page 179](#) and proceed with further installation.

Step 5. Install the cold plate covers. Press the cover down as illustrated below.



*Figure 134. Installing cold plate covers*

Step 6. Place the hoses and the liquid detection sensor module on the hose holder.

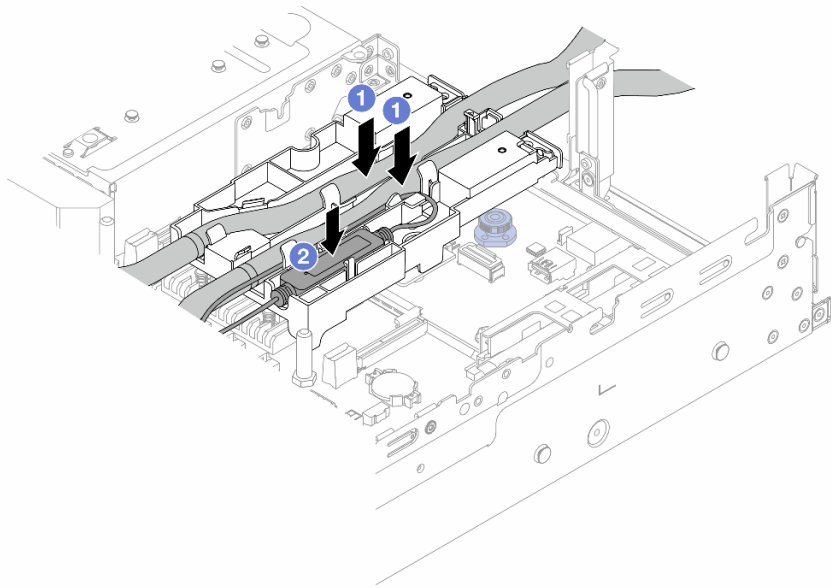


Figure 135. Placing the hoses and module

- a. ① Place the hoses on the hose holder.
- b. ② Place the liquid detection sensor module on the hose holder.

**Notes:**

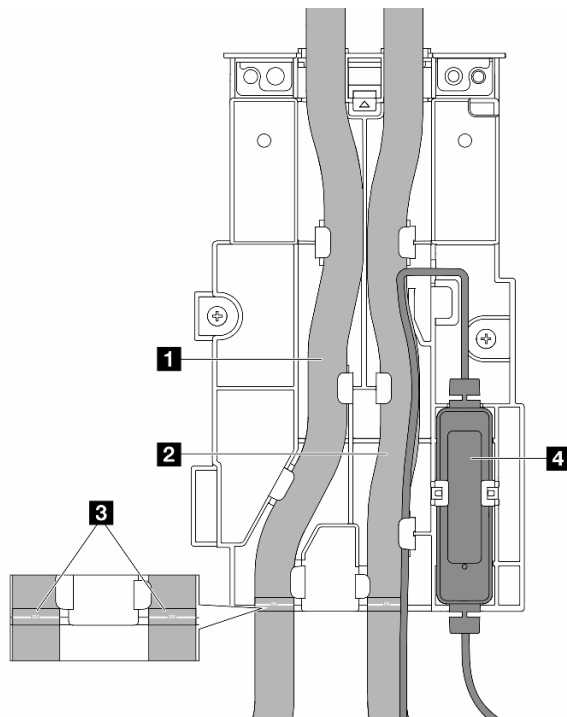


Figure 136. Installation details

- Place the middle part of the hose against the blue latch, and insert the outlet hose **1** and the inlet hose **2** into the holder.
- Check the guiding labels **3** on the hoses before installation, and align the labels with the front edge of the hose holder. Otherwise, the hoses might obstruct open connectors on the system board assembly.
- Insert the liquid detection sensor module **4** to the holder beside the hoses. 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 liquid detection sensor module” on page 730](#).

Step 7. Install the riser cage.

- **1FH riser cage**

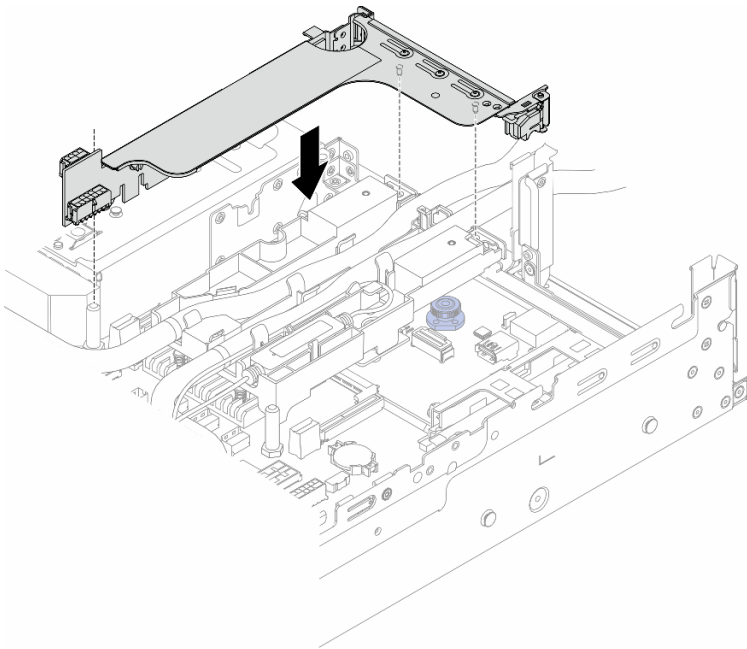


Figure 137. Installing the 1FH riser cage

- **3FH riser cage**

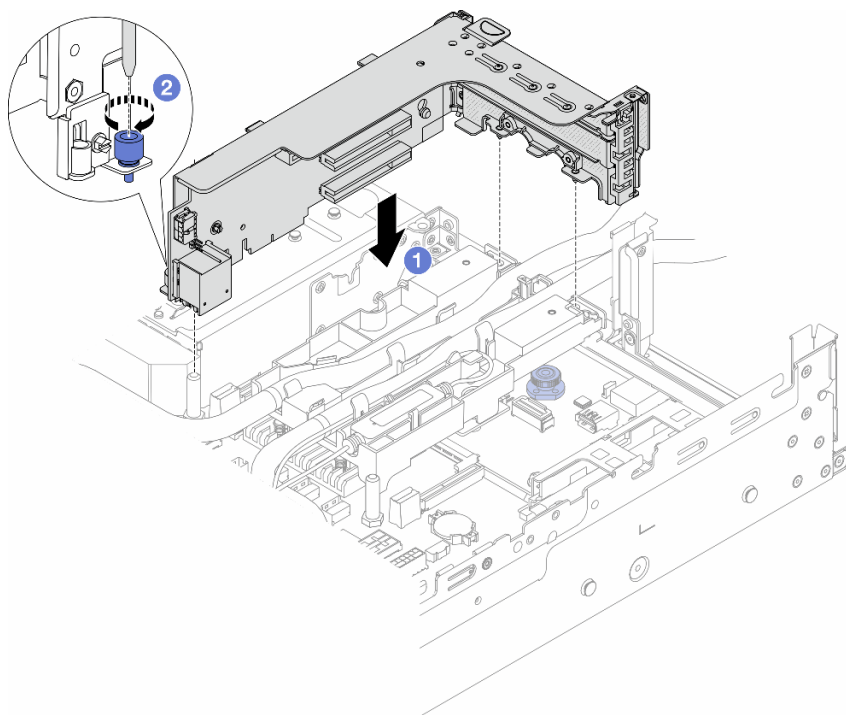


Figure 138. Installing the 3FH riser cage

- a. ① Align the riser card with the riser slot on the system board assembly. Carefully press the riser card straight into the slot until it is securely seated.
  - b. ② Tighten the screw to secure the riser cage.
- Step 8. Connect the cable of the liquid detection sensor module to the connector on the system board assembly. See [“Direct water cooling module” on page 392](#).
- Step 9. Install the air baffle or middle drive cage. See [“Install the air baffle” on page 101](#) or [“Install the middle drive backplanes and drive cage” on page 258](#).
- Step 10. Install the top cover. See [“Install the top cover” on page 382](#).
- Step 11. Install the server into the rack. See [“Install the server to rack” on page 91](#).
- Step 12. Install the quick connect plugs to the manifolds. See [“Install the manifold \(in-rack system\)” on page 209](#) or [“Install the manifold \(in-row system\)” on page 233](#).

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

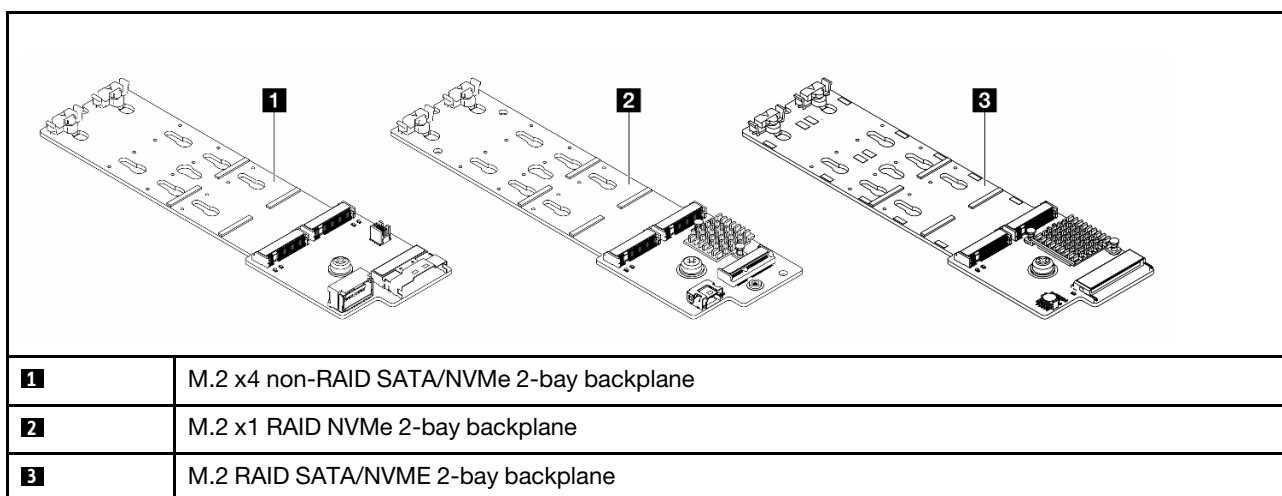
[Watch the procedure on YouTube](#)

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## M.2 drive and M.2 drive backplane replacement

Use this information to remove and install the M.2 drive and M.2 drive backplane.

The server supports the following M.2 backplanes. This section uses the M.2 x4 non-RAID SATA/NVMe 2-bay backplane as an example for illustration. The replacement procedure for other M.2 backplanes is similar.



**Note:** The M.2 x4 non-RAID SATA/NVMe 2-bay backplane is not supported on the 4 x 3.5-inch middle drive cage.

- [“Remove an M.2 drive” on page 184](#)
- [“Install an M.2 drive” on page 185](#)
- [“Remove the M.2 backplane” on page 187](#)
- [“Install the M.2 backplane” on page 191](#)

## Remove an M.2 drive

Use this information to remove an M.2 drive.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.
- If one or more NVMe solid-state drives are to be removed, it is recommended to disable them beforehand via the operating 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 [“Remove the server from rack” on page 88](#).
- Step 2. Remove the top cover. See [“Remove the top cover” on page 381](#).
- Step 3. Remove the M.2 drive.



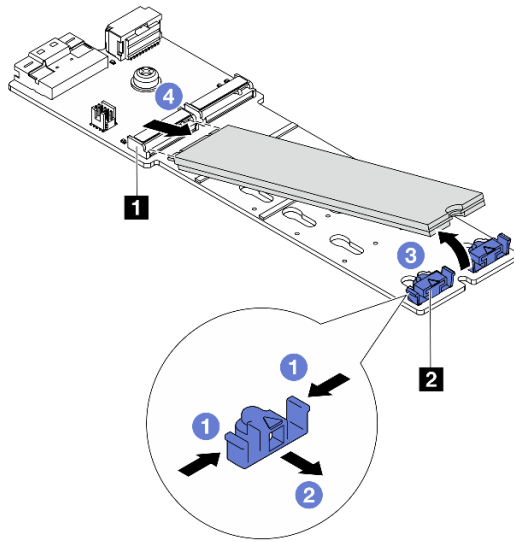


Figure 139. M.2 drive removal

- a. ① Press both sides of the retainer ②.
- b. ② Slide the retainer away from the M.2 drive.
- c. ③ Rotate the rear end of M.2 drive to an angle of approximately 30 degrees.
- d. ④ Pull the M.2 drive away from the connector ①.

## After you finish

1. Install a new M.2 drive. See [“Install an M.2 drive” on page 185](#).
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 an M.2 drive

Use this information to install an M.2 drive.

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.

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

- Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to “Update the firmware” on page 691 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. (Optional) Adjust the retainer on the M.2 backplane to accommodate the particular size of the M.2 drive you wish to install.

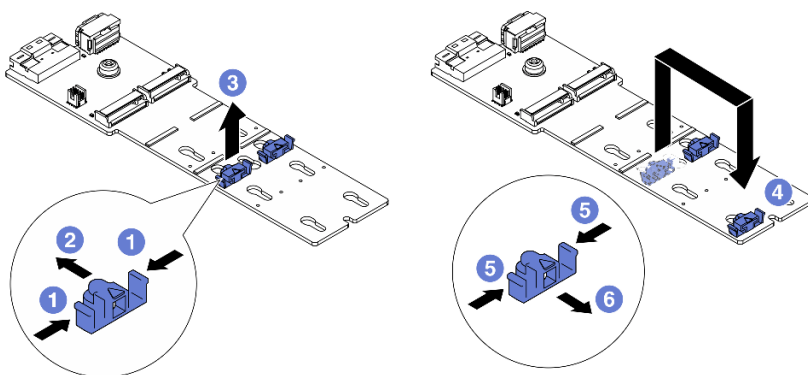


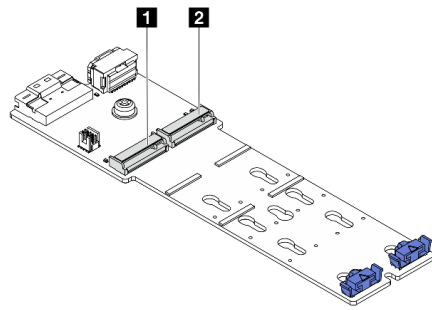
Figure 140. M.2 retainer adjustment

- a. 1 Press both sides of the retainer.
- b. 2 Move the retainer forward until it is in the large opening of the keyhole.
- c. 3 Take the retainer out of the keyhole.
- d. 4 Insert the retainer into the correct keyhole.
- e. 5 Press both sides of the retainer.
- f. 6 Slide the retainer backwards (toward the small opening of the keyhole) until it is seated in place.

- Step 3. Locate the connector on the M.2 backplane.

### Notes:

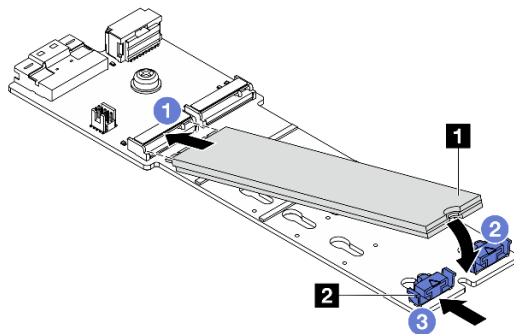
- Your M.2 backplane might look different from the following illustrations, but the installation method is the same.
- Some M.2 backplanes support two identical M.2 drives. Install the M.2 drive in slot 0 first.



- 1** Slot 0
- 2** Slot 1

**Figure 141. M.2 drive slot**

Step 4. Install the M.2 drive on the M.2 backplane.



**Figure 142. M.2 drive installation**

- a. **1** Hold the M.2 drive at an angle, and insert it into the M.2 slot.
- b. **2** Rotate the M.2 drive down until the notch **1** catches on the lip of the retainer **2**.
- c. **3** Slide the retainer toward the M.2 drive to secure it in place.

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## Remove the M.2 backplane

Use this information to remove the M.2 backplane.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.

## 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 [“Remove the server from rack” on page 88](#).
- Step 2. Remove the top cover. See [“Remove the top cover” on page 381](#).
- Step 3. Disconnect the M.2 cables from the M.2 backplane.

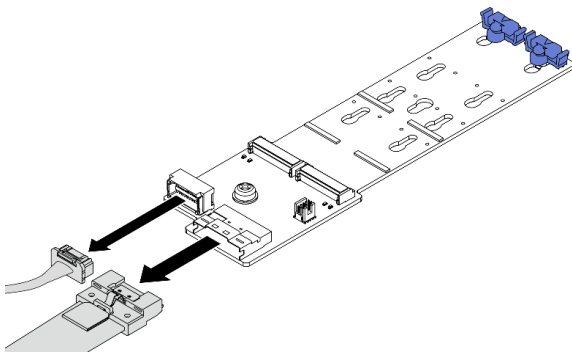


Figure 143. Disconnecting cables from M.2 x4 non-RAID SATA/NVMe 2-bay backplane

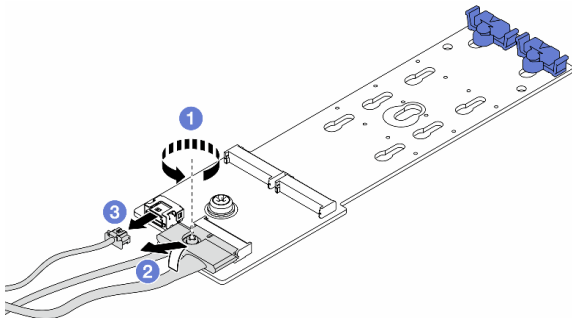


Figure 144. Disconnecting cables from M.2 x1 RAID NVMe 2-bay backplane

1. **1** Loosen the screw on the signal cable.
2. **2** Tilt the connector and remove it.
3. **3** Remove the power cable.

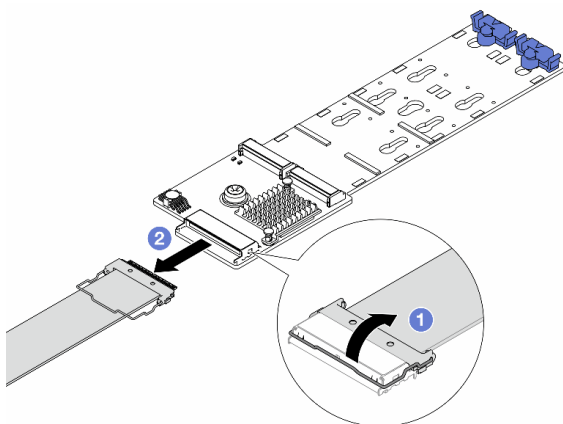


Figure 145. Disconnecting cable from M.2 RAID SATA/NVME 2-bay backplane

1. **1** Pull up the latch on the M.2 cable.
2. **2** Disconnect the M.2 cable from the M.2 backplane.

Step 4. Remove the M.2 backplane.

#### M.2 backplane on the air baffle

1. Remove the M.2 drive from the M.2 backplane. See [“Remove an M.2 drive” on page 184](#).
2. Remove the M.2 backplane from the air baffle.

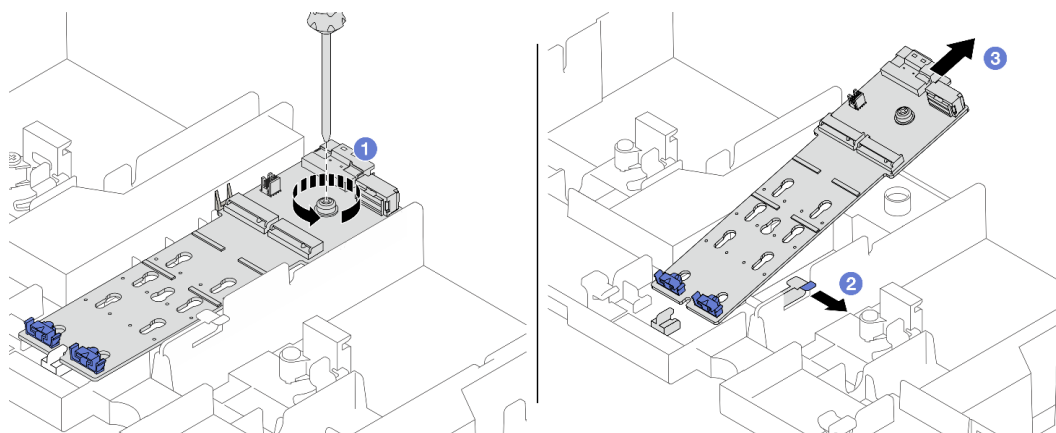


Figure 146. Removing the M.2 backplane from the air baffle

- a. **1** Unfasten the screw that secures the M.2 backplane to the air baffle.
- b. **2** Slide and hold the retention clip on the air baffle.
- c. **3** Remove the M.2 backplane from the air baffle, and release the retention clip.

#### M.2 backplane on the middle drive cage

1. Open the drive cage handle.

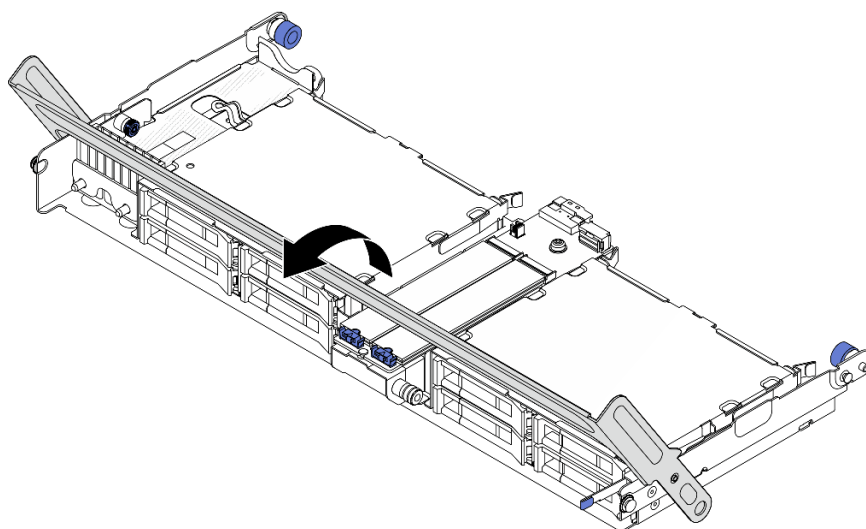


Figure 147. Opening the handle of the middle drive cage

2. Remove the M.2 drive from the M.2 backplane. See [“Remove an M.2 drive” on page 184](#).
3. Remove the M.2 backplane from the middle drive cage.

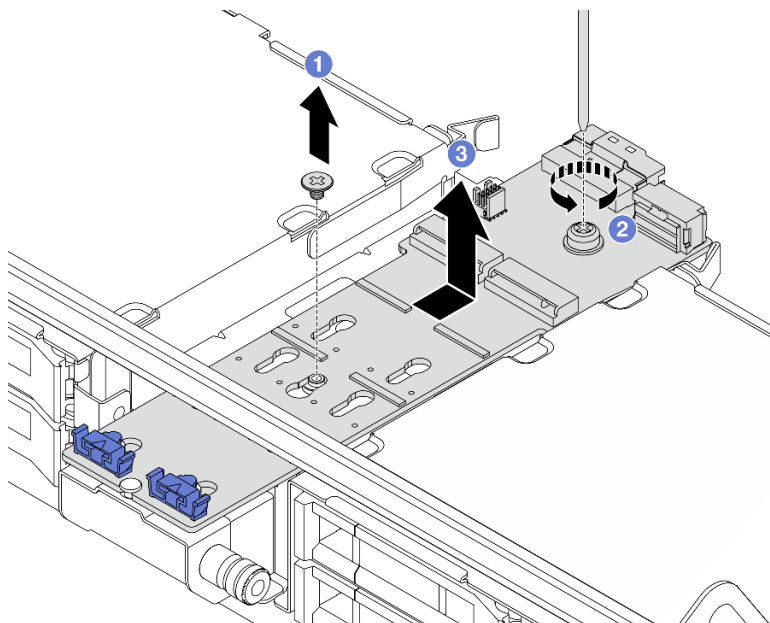


Figure 148. Removing the M.2 backplane from the middle drive cage

- a. ① Unfasten the screw on the middle of M.2 backplane.
- b. ② Unfasten the screw on the end of the M.2 backplane.
- c. ③ Remove the M.2 backplane from the middle drive cage.

## After you finish

1. Install a new M.2 backplane. See [“Install the M.2 backplane” on page 191](#).

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 M.2 backplane

Use this information to install the M.2 backplane.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.

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

- Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to [“Update the firmware” on page 691](#) 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. Install the M.2 backplane.

#### M.2 backplane on the air baffle

1. Install the M.2 backplane on the air baffle.

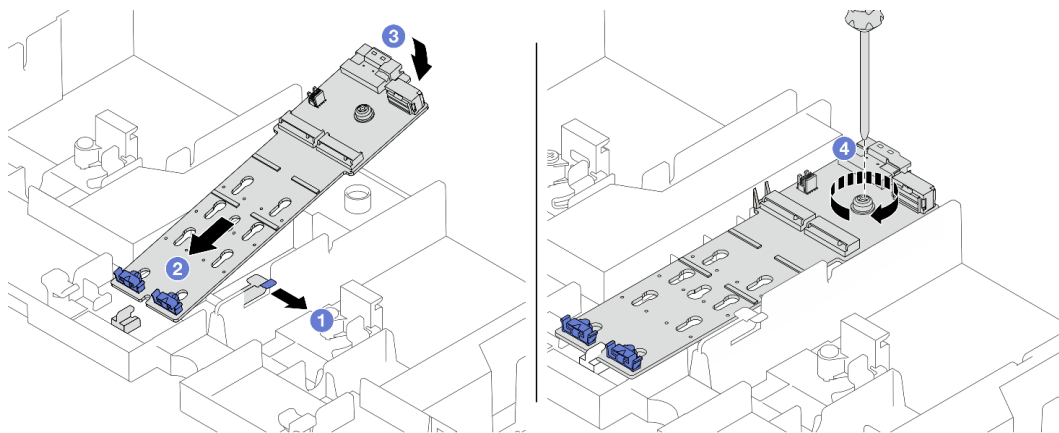


Figure 149. Installing the M.2 backplane on the air baffle

- a. ① Open the retention clip on the air baffle.
  - b. ② Align the guide holes on the M.2 backplane with the guide pins on the air baffle, and insert the backplane into the air baffle.
  - c. ③ Rotate the M.2 backplane downward into place.
  - d. ④ Tighten the screw to secure the M.2 backplane.
2. Install the M.2 drive on the M.2 backplane. See [“Install an M.2 drive” on page 185](#).

#### M.2 backplane on the middle drive cage

1. Install the M.2 backplane on the middle drive cage.

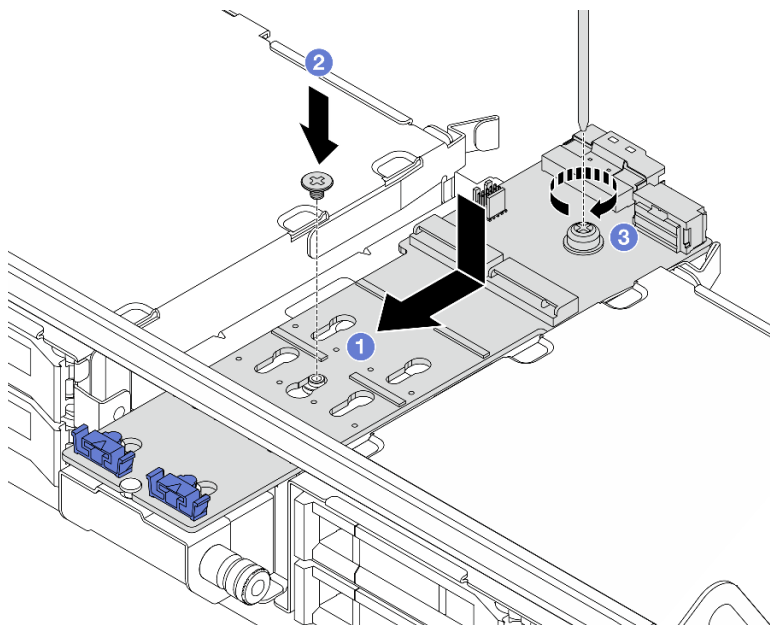


Figure 150. Installing the M.2 backplane on the middle drive cage

- a. ① Align the screws on the M.2 backplane with the screw holes on the drive cage, and insert the backplane into the drive cage.
- b. ② Tighten the screw on the middle of the M.2 backplane.



- c. 3 Tighten the screw on the end of the M.2 backplane.
2. Install the M.2 drive on the M.2 backplane. See [“Install an M.2 drive” on page 185](#).
3. Press the latch as shown and close the handle.

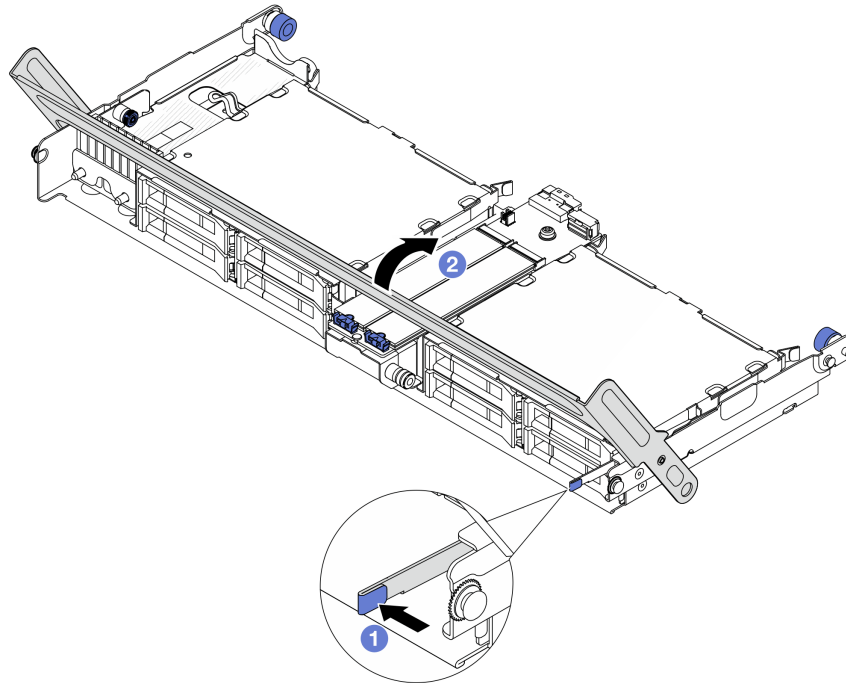


Figure 151. Closing the handle of the middle drive cage

Step 3. Connect the M.2 backplane cables to M.2 backplane.

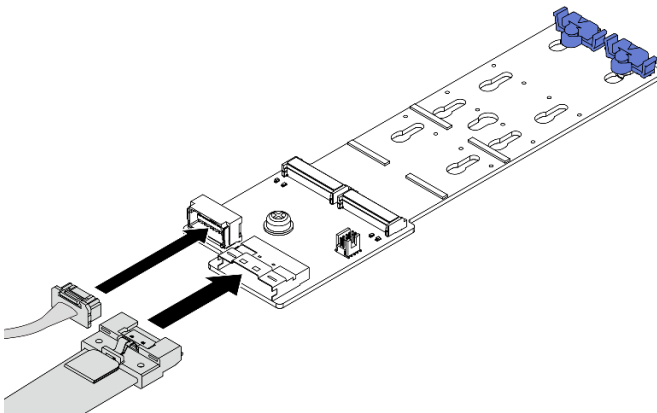


Figure 152. Connecting M.2 cables to M.2 x4 non-RAID SATA/NVMe 2-bay backplane

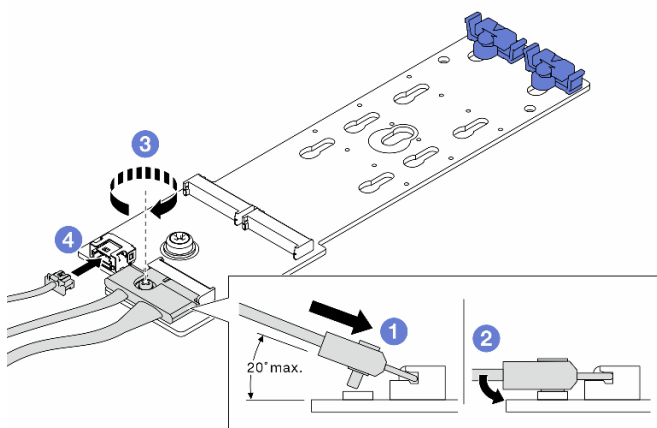


Figure 153. Connecting M.2 cables to M.2 x1 RAID NVMe 2-bay backplane

1. **1** Tilt the connector at an angle of 20 degrees or lower, and insert it until its bottom surface reaches the ramp.
2. **2** Press the connector down flat.
3. **3** Tighten the screw on the signal cable.
4. **4** Connect the power cable.

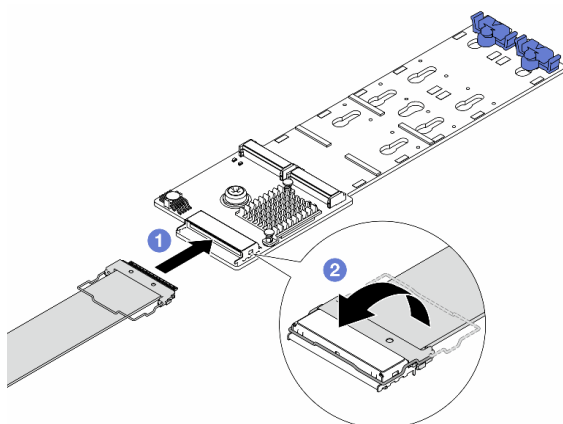


Figure 154. Connecting M.2 cables to M.2 RAID SATA/NVMe 2-bay backplane

1. **1** Connect the M.2 cable to the M.2 backplane.
2. **2** Rotate the latch on the cable as illustrated, and press the latch down until it clicks into place.

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

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## Management NIC adapter replacement

Follow instructions in this section to remove and install 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 195](#)
- [“Install the management NIC adapter” on page 196](#)

## Remove the management NIC adapter

Follow instructions in this section to remove the management NIC adapter.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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. Make preparation 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, 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 88](#).
- c. Remove the top cover. See [“Remove the top cover” on page 381](#).
- d. If your server comes with a riser 1 assembly, remove it first. See [“Remove a rear riser assembly” on page 334](#).

Step 2. Disconnect the cable on the management NIC adapter.

Step 3. Remove the management NIC adapter.

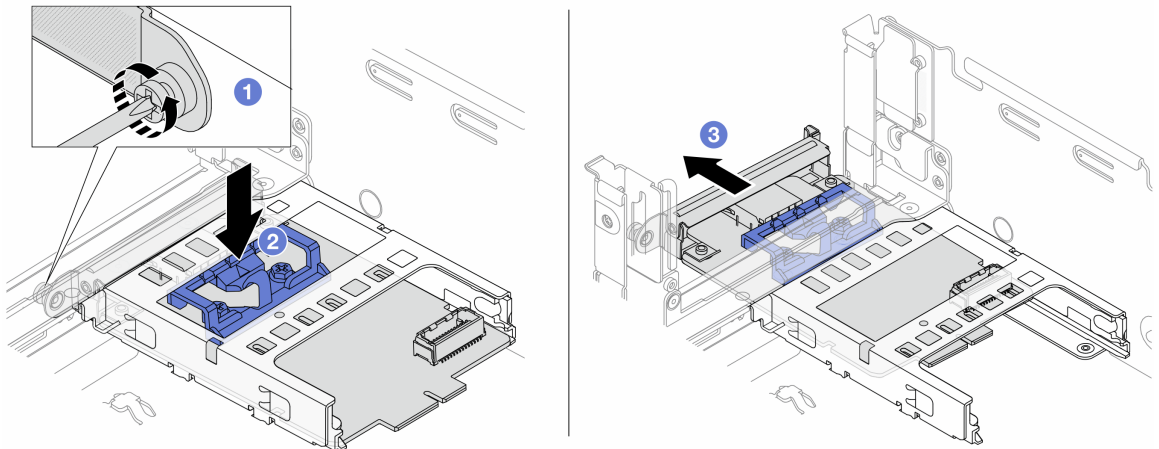


Figure 155. Removing the management NIC adapter

- a. ① Loosen the screw that secures the management NIC adapter.
- b. ② Press and hold the blue latch.
- c. ③ Push 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 196](#).
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 management NIC adapter.

## About this task

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.

- Go to [“Update the firmware” on page 691](#) for more information on firmware updating tools.

## Procedure

- Step 1. If a filler is installed, remove it.
- Step 2. Install the management NIC adapter.

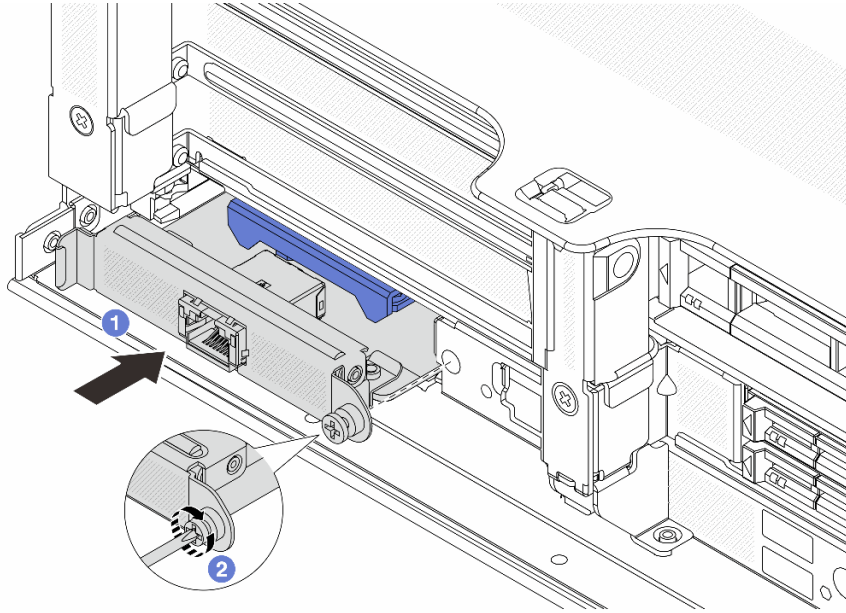


Figure 156. Installing the management NIC adapter

- 1 Slide the management NIC adapter into the slot until it is fully seated.
  - 2 Tighten the screw to secure the management NIC adapter.
- Step 3. Connect the cable to the management NIC adapter. See [Chapter 6 “Internal cable routing” on page 385](#).
- Step 4. Install the riser 1 assembly if you have removed it. See [“Install a rear riser assembly” on page 346](#).

## After you finish

1. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).
2. Access the Lenovo XClarity Controller; then, select **Network** in **BMC Configuration** and enable **Ethernet Port 2**.

## Demo video

[Watch the procedure on YouTube](#)

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## Manifold replacement (trained technicians only)

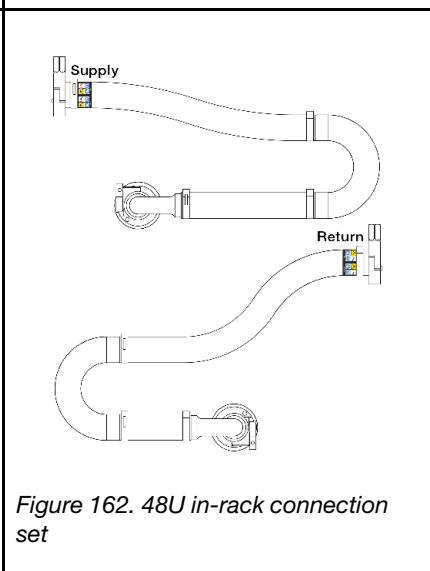
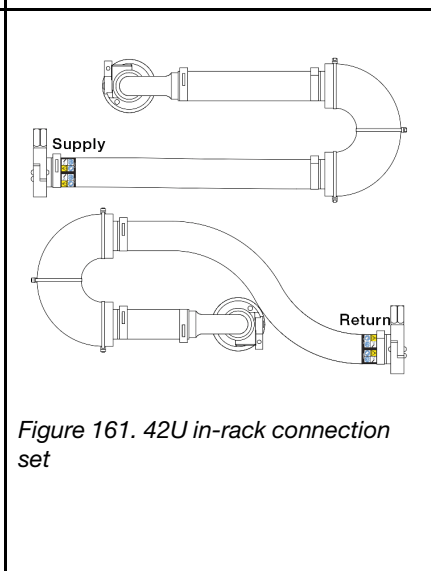
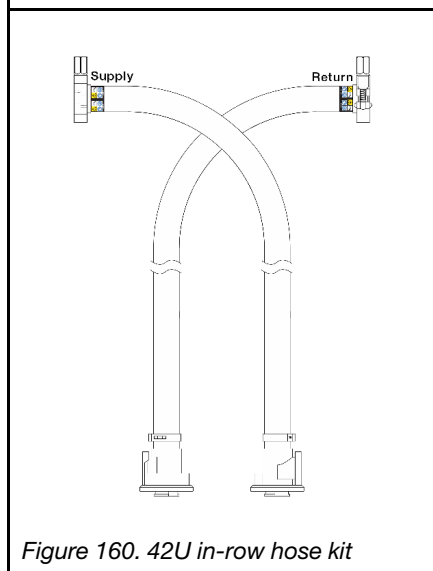
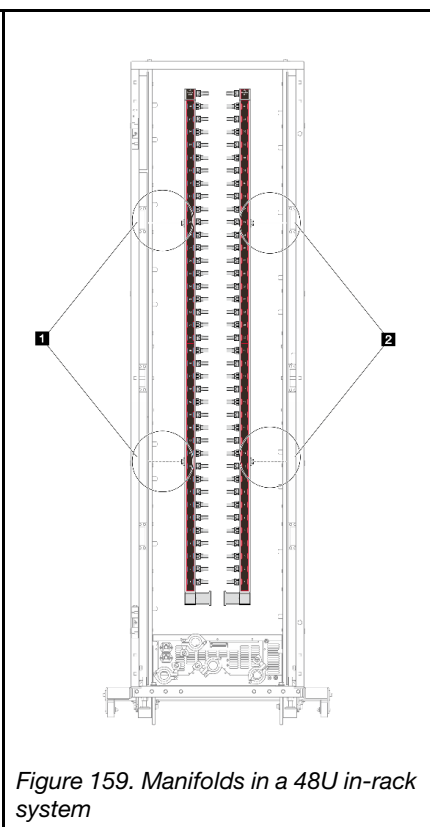
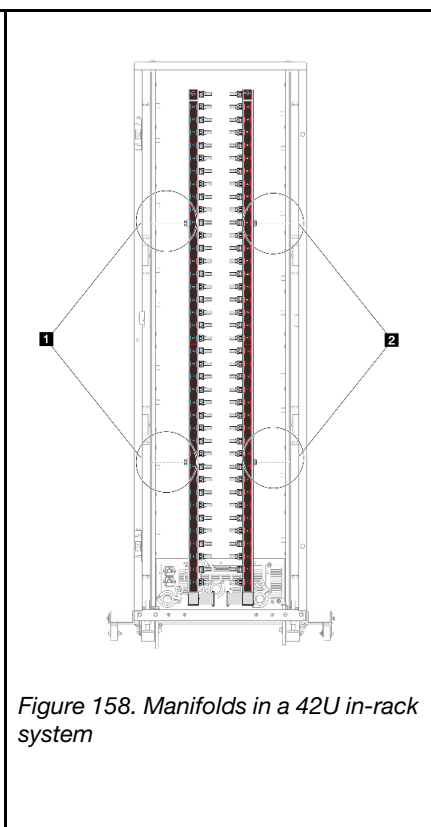
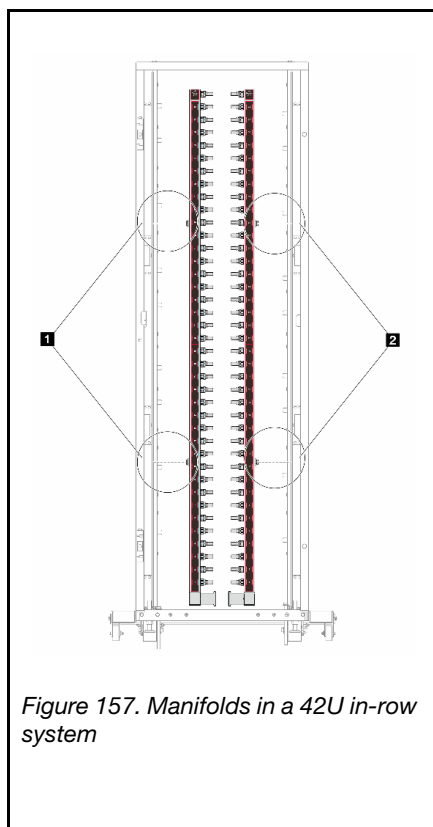
Use the following procedures to remove and install the manifolds.

### 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 14](#).
- 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.



- **1** Two left spools on supply manifold
- **2** Two right spools on return manifold
- [“Remove the manifold \(in-rack system\)” on page 200](#)
- [“Install the manifold \(in-rack system\)” on page 209](#)
- [“Remove the manifold \(in-row system\)” on page 222](#)
- [“Install the manifold \(in-row system\)” on page 233](#)

## Remove the manifold (in-rack system)

Use this information to remove the manifold in an in-rack direct water cooling system.

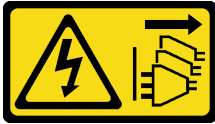
### About this task

**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

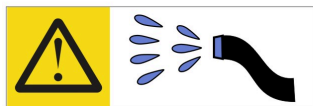


#### CAUTION:

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)

**Gefahr:** Aufgrund von Wasser oder wässriger Lösung in diesem Produkt besteht die Gefahr eines elektrischen Schlags. Nicht mit nassen Händen oder in der Nähe von Wasserlachen an oder in unmittelbarer Nähe von Bauteilen arbeiten, die unter Strom stehen. (L016)

**VESZÉLY:** A víz vagy a termékben lévő vizes alapú hűtőfolyadék miatt fennáll az elektromos áramütés veszélye. Ne dolgozzon áram alatt lévő berendezésen és közelében nedves kézzel, illetve amikor folyadék kerül a berendezésre.  
(L016)

危険：この製品内に存在する水または水溶液によって、電気ショックの危険があります。手が濡れている場合やこぼれた水が周囲にある場合は、電圧が印加された装置またはその周辺での作業は行わないでください。(L016)

**ОПАСНОСТ:** Опасност од струен удар поради присаство на вода или на воден раствор во овој производ. Избегнувајте работење на опрема вклучена во струја или во близина на опрема вклучена во струја со влажни раце или кога има истурено вода.  
(L016)

[illegible]

**NIEBEZPIECZEŃSTWO:** Ryzyko porażenia prądem elektrycznym z powodu występowania w produkcie wody lub roztworu wodnego. Nie należy pracować przy podłączonym do źródła zasilania urządzeniu lub w jego pobliżu z mokrymi dłońmi lub kiedy rozlano wodę.  
(L016)

202 ThinkSystem SR650 V3 User Guide

**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 proudem v důsledku přítomnosti 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་བརྒྱ: རྩིས་འདིའི་ནང་འཇུག་ཆུ་ལྷན་པུགས་འདུས་ཡོད་པས། རྟེན་ལས་སྒྲིག་ཆུག་པའི་ཉེན་ཁ་ཡོད། ལག་པའི་ཐོག་ཆུ་ཡོད་པའམ་ཆུ་ཐིག་མར་བཞུར་བའི་གནས་ཚུལ་འོག་སྒྲིག་ཡོད་པའི་སྒྲིག་ཆས་ལ་བཞོལ་སྤྱད་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)

Yungyiernj: Youzyiz aen canjbinj miz raemx roxaeuz raemx yungzyiz, sojyij miz yungyiernj bungqden. Mboujndaej fwngz miz raemx seiz youq ndaw sezbi roxaeuz youq henzgyawj guhhong. (L016)

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 systems.
- 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. Power off the in-rack CDU and disconnect all power cords.

Step 2. Close both ball valves.

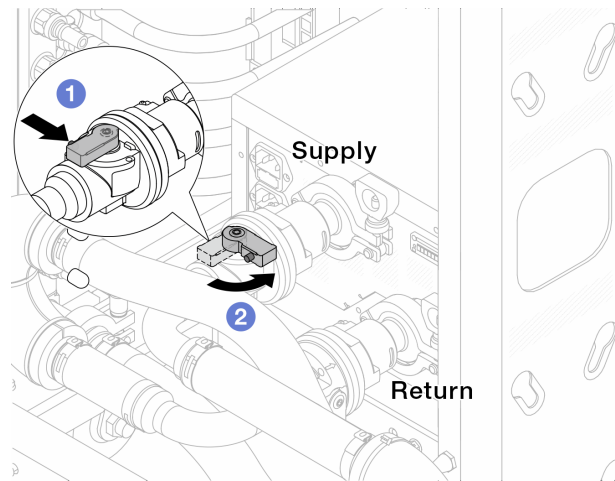


Figure 163. Closing ball valves

- 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.

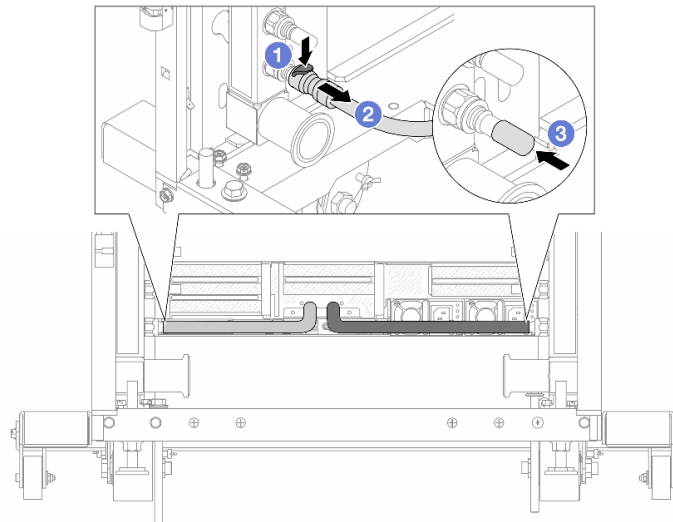


Figure 164. Quick connect plug removal

- 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 204](#) to the other manifold.

Step 5. Disengage the connection set from ball valves.

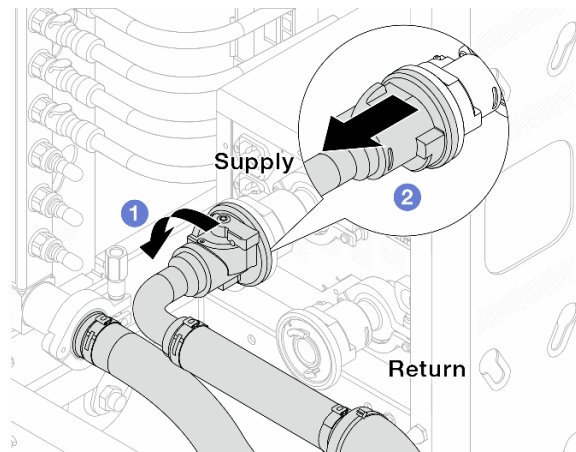


Figure 165. Removing the connection set

- 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.

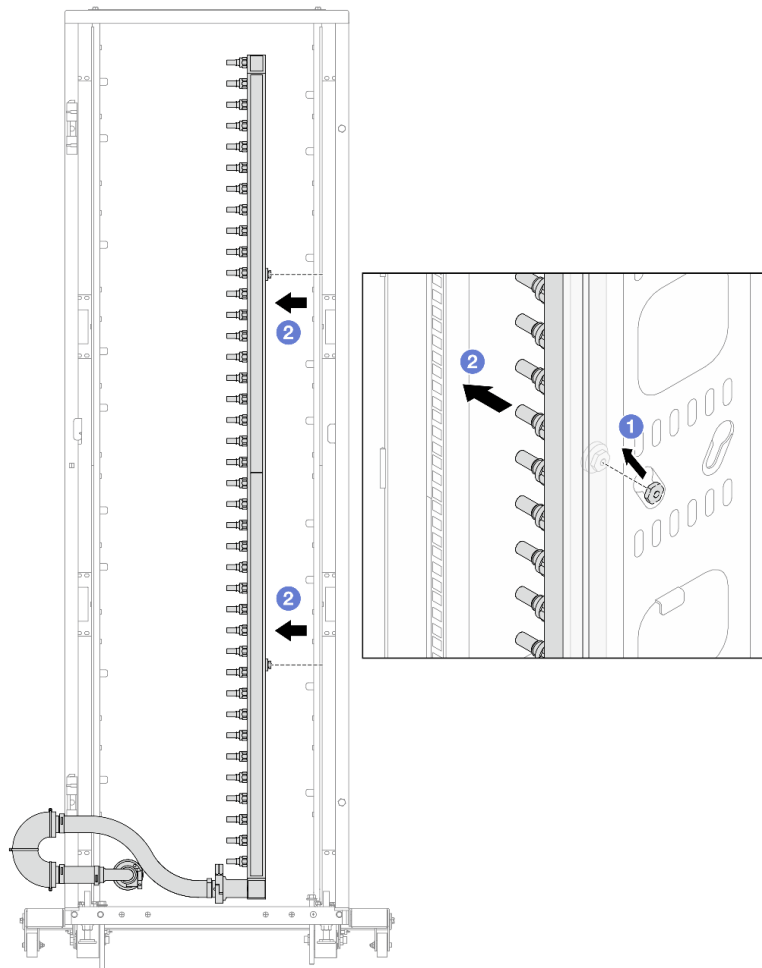


Figure 166. Removing the manifold

- 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 205](#) to the other 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.

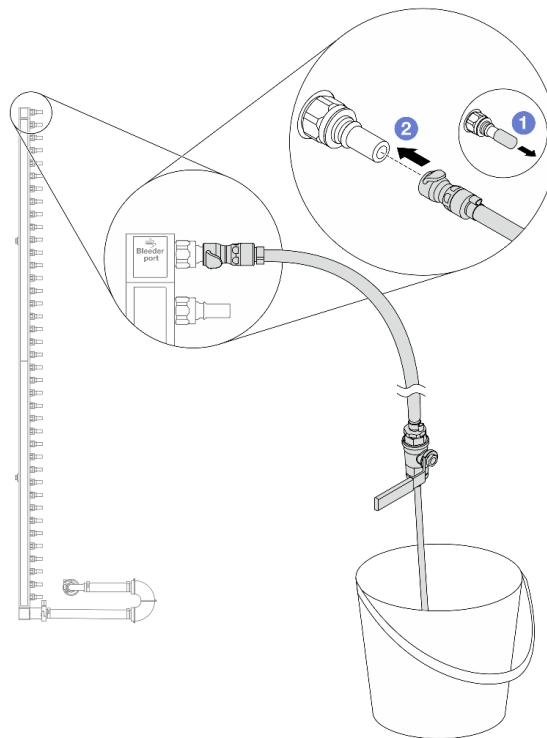
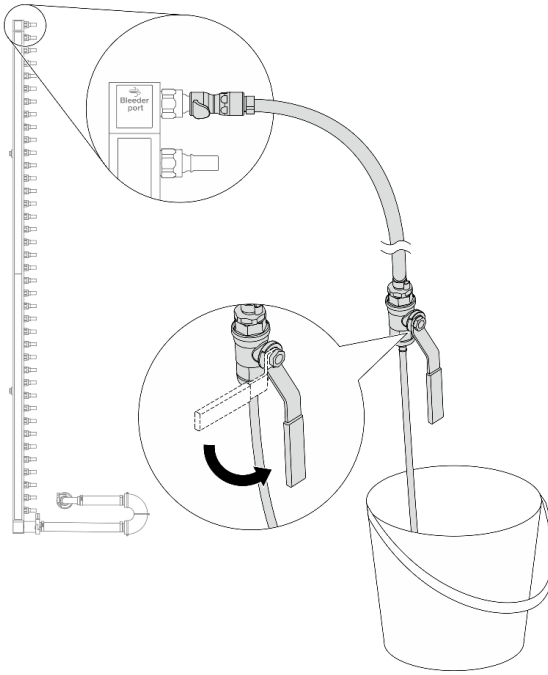


Figure 167. Installing the bleeder kit to the supply side

- 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 168. 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.

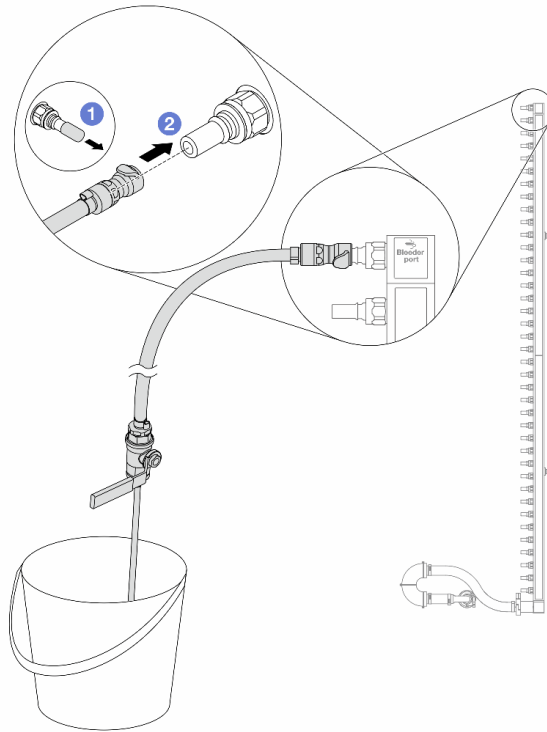


Figure 169. Installing the bleeder kit to the return side

- 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.

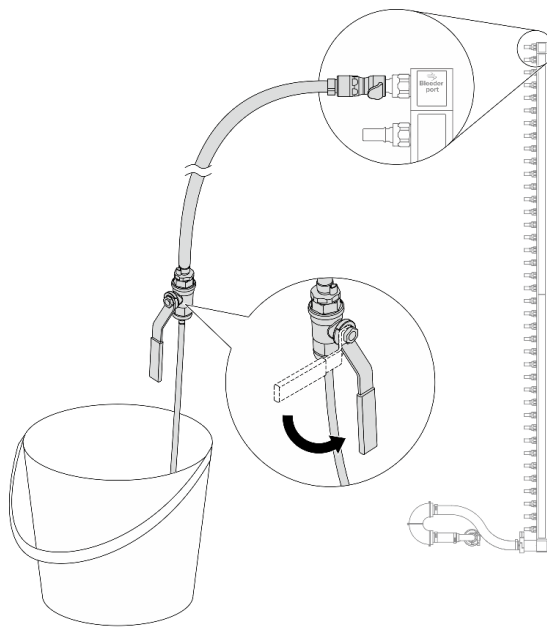


Figure 170. Opening the bleeder valve



Step 12. Separate the 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.

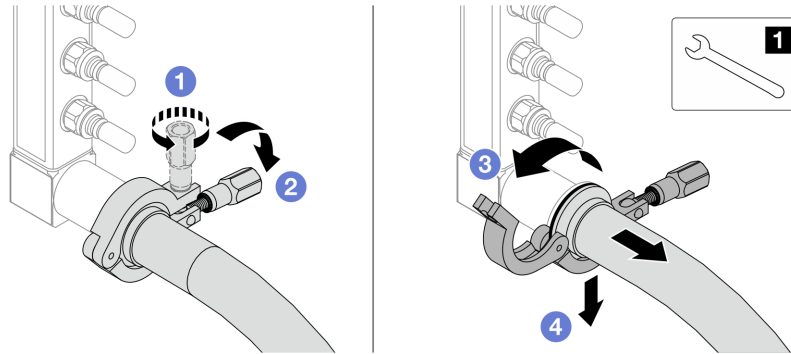


Figure 171. Separating the manifold from the connection set

**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 209](#) 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 88](#).

Step 16. To remove the Direct Water Cooling Module (DWCM), see [“Remove the Lenovo Neptune\(TM\) Processor Direct Water Cooling Module” on page 171](#).

## 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.

## Install the manifold (in-rack system)

Use this information to install the manifold in an in-rack direct water cooling system.

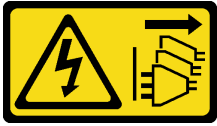
### About this task

**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.

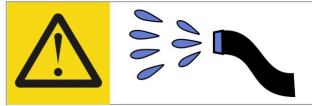
**S040**



**CAUTION:**

Protective gloves should be worn for this procedure.

## L016



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)

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докато сте с мокри ръце или когато наоколо има разляна вода.  
(L016)

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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)

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Izbjegavajte rad u  
blizini opreme pod naponom s mokrim rukama ili kad je u blizini prolivena  
tekućina.  
(L016)

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**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)

**Gefahr:** Aufgrund von Wasser oder wässriger Lösung in diesem Produkt besteht die Gefahr eines elektrischen Schlags. Nicht mit nassen Händen oder in der Nähe von Wasserlachen an oder in unmittelbarer Nähe von Bauteilen arbeiten, die unter Strom stehen. (L016)

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(L016)

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(L016)

[illegible]

**NIEBEZPIECZEŃSTWO:** Ryzyko porażenia prądem elektrycznym z powodu występowania w produkcie wody lub roztworu wodnego. Nie należy pracować przy podłączonym do źródła zasilania urządzeniu lub w jego pobliżu z mokrymi dłońmi lub kiedy rozlano wodę.  
(L016)

212 ThinkSystem SR650 V3 User Guide

**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 proudem v důsledku přítomnosti 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: རྩིས་འདི་ནི་ནང་དུ་ཆུ་ལྷན་སྒྲིལ་གྱི་གཞིར་གཟུགས་འདུས་ཡོད་པ་སྟེ། དེ་ལས་སློག་ཆུག་པའི་ཉེན་ཁ་ཡོད། ལག་པའི་སློག་ཆུ་ཡོད་པའམ་ཆུ་ཐིག་མའི་བཟུང་བའི་གནས་ཚུལ་འོག་སློག་ཆུ་ཡོད་པའི་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)

Yungyiemi: Youzyiz aen canjbinj miz raemx roxaeuz raemx yungzyiz, sojyij miz yungyiemi bungqden. Mboujndaej fwngz miz raemx seiz youq ndaw sezbi roxaeuz youq henzgyawj guhhong. (L016)

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 systems.
- 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\(TM\) Processor Direct Water Cooling Module” on page 175](#).
- Step 3. To install the server into the rack, see [“Install the server to rack” on page 91](#).
- Step 4. Install the manifold.

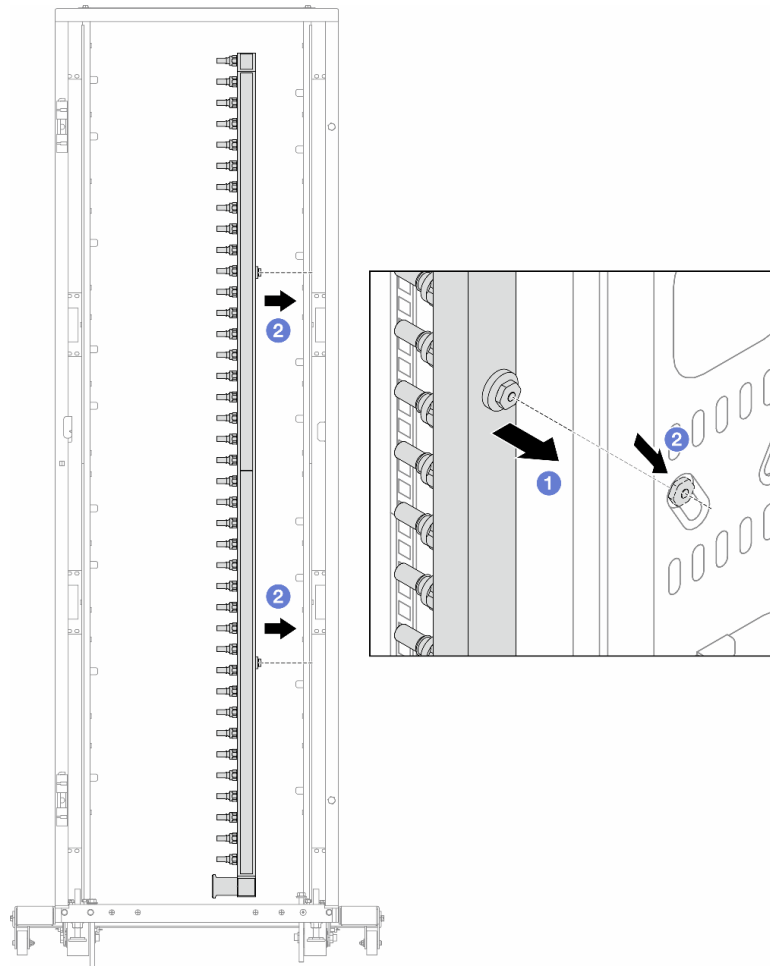


Figure 172. Installing the manifold

- 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 213](#) to the other manifold.

Step 6. Install ball valves to CDU.

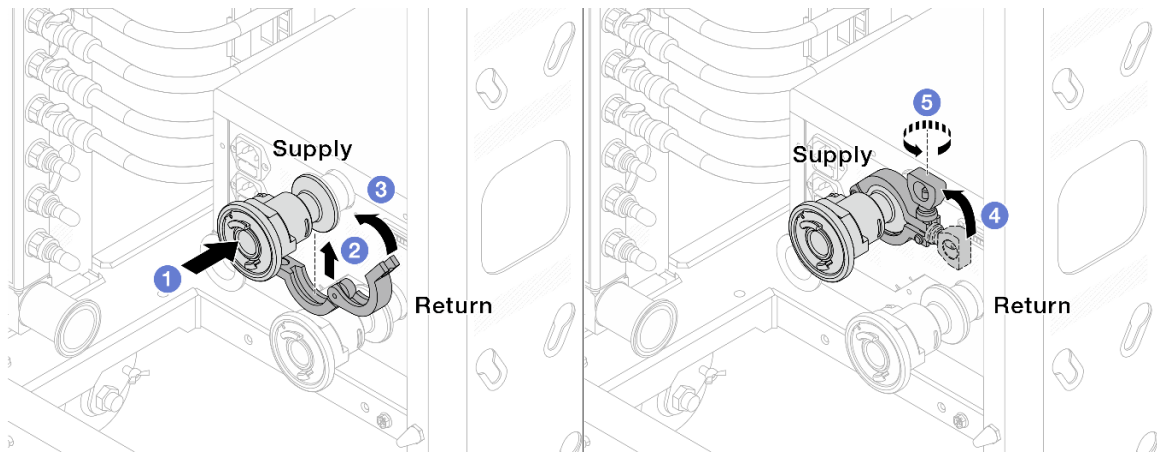


Figure 173. Installing ball valves

- 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 7. Install the connection set to manifolds.

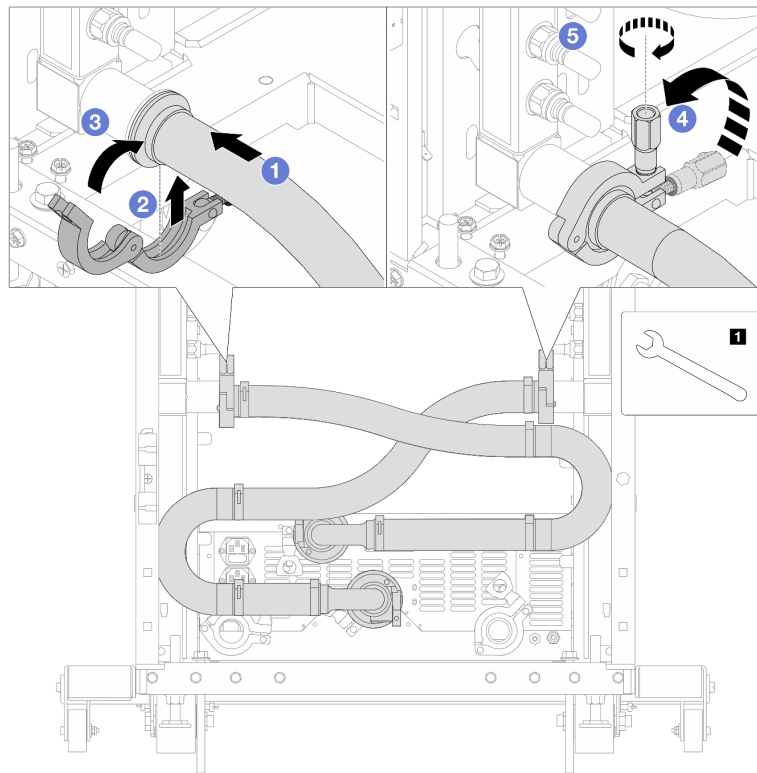


Figure 174. Installing the connection set

**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 8. Install the connection set to ball valves.

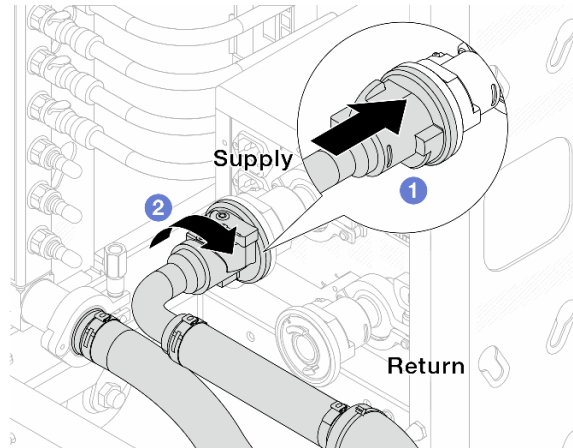


Figure 175. Connecting ball valves

- a. **1** Connect ball valves.
- b. **2** Rotate to the right to lock the two valves.

Step 9. Prepare the in-rack CDU.

- a. Connect the feed hose to inlet port on the front.

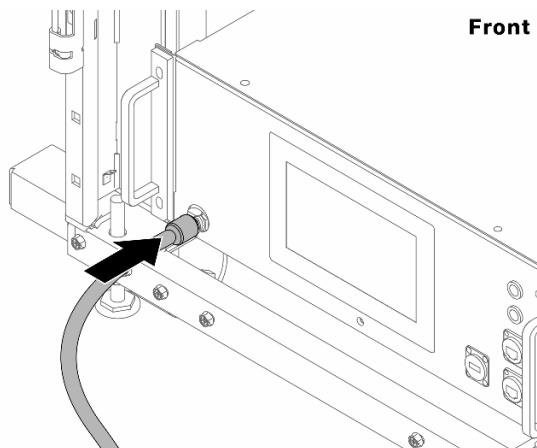


Figure 176. The front of CDU

- b. Connect hoses to the drain port and bleeder ports on the rear.



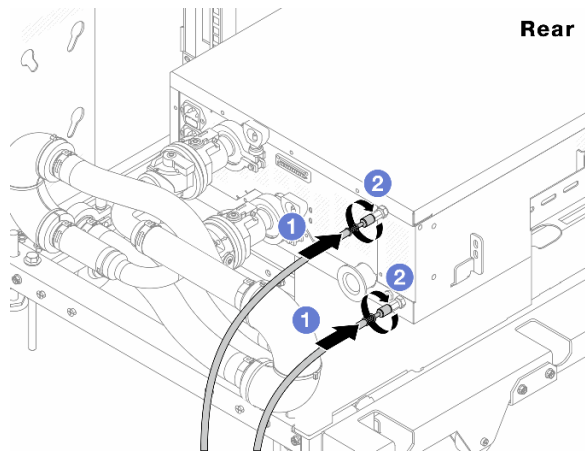


Figure 177. The rear of CDU

- 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](mailto:cdusupport@lenovo.com).

Step 10. Install the quick connect plug to the manifolds.

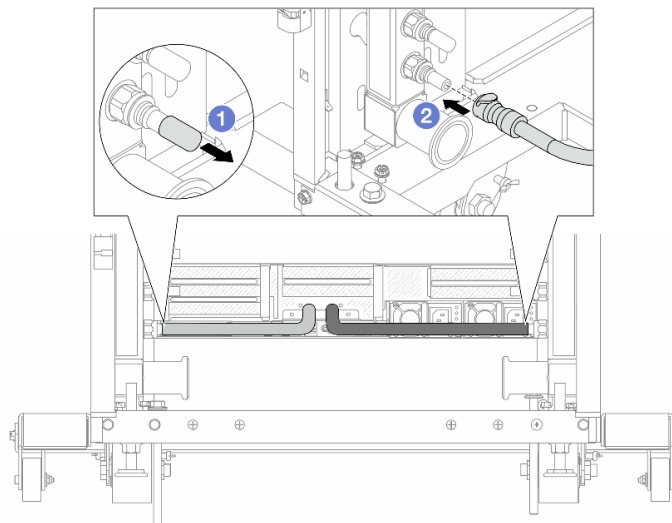


Figure 178. Installing the quick connect plug

- 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 11. Install the bleeder kit to the manifold supply side.

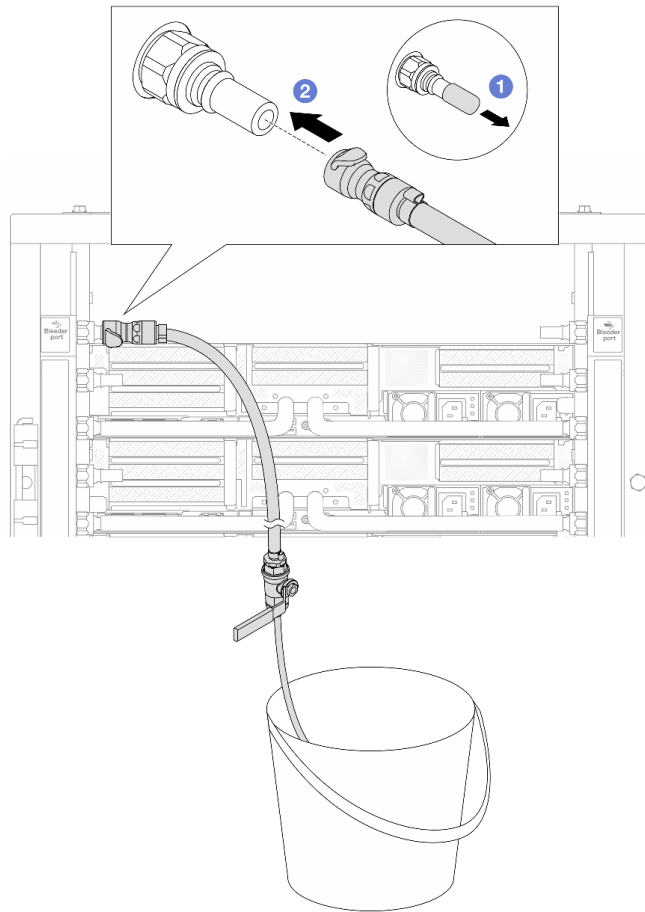


Figure 179. Installing the bleeder kit to the supply side

- 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 12. To push the air out of the manifolds, open ball valve switches to let coolant fill the system.

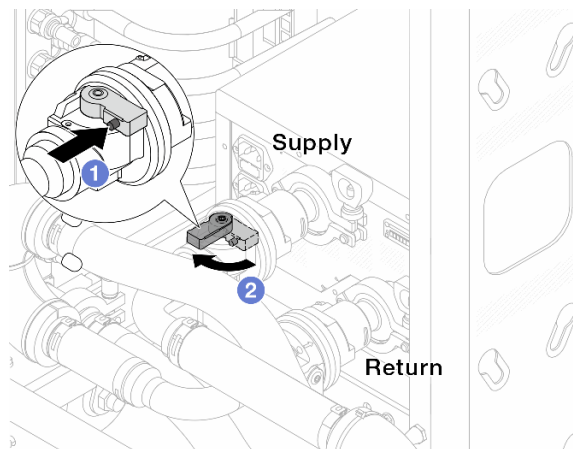


Figure 180. Opening ball valves

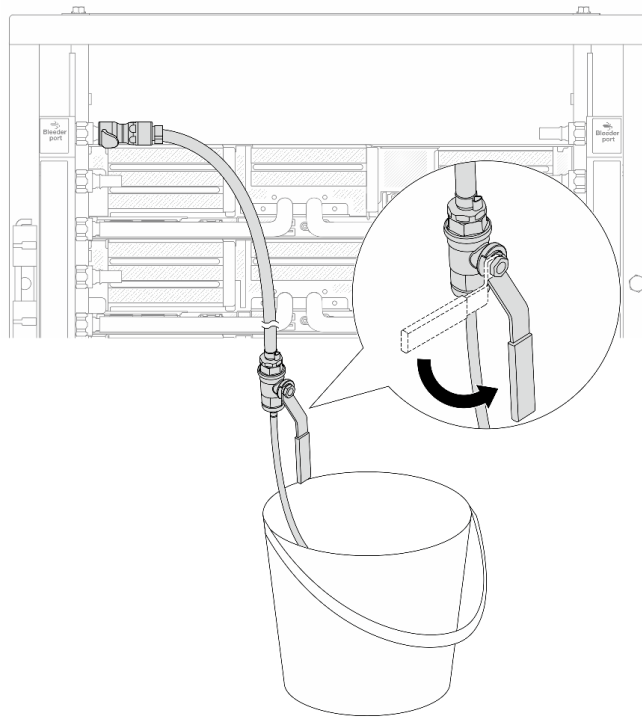
- a. ① Press the button on the ball valve switch.

- b. ② Rotate the switch to fully open the valves as illustrated above.

**Attention:**

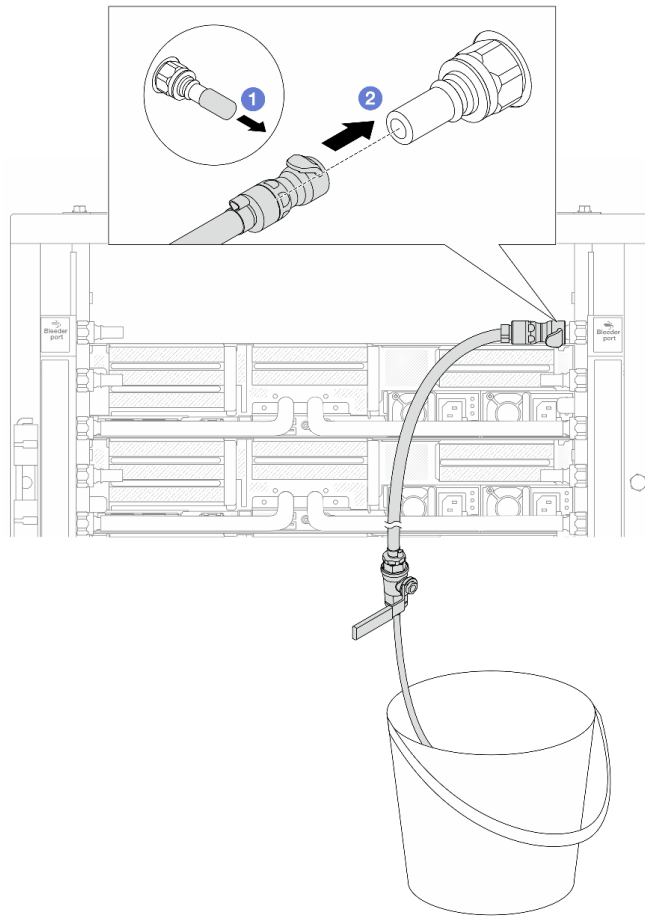
- Pay close attention to the front display of CDU and maintain the system pressure at **one bar**.
- For more information about coolant temperature and system pressure requirements, see [“Water requirements” on page 14](#).

Step 13. 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 181. Opening the bleeder valve on the supply side*

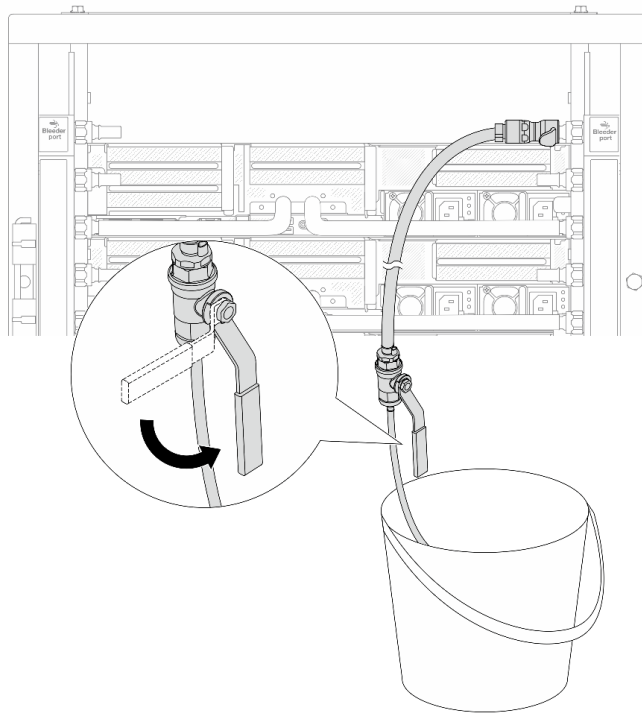
Step 14. Install the bleeder kit to the manifold return side.



*Figure 182. 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 15. 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 183. Opening the bleeder valve on the return side*

- Step 16. (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.

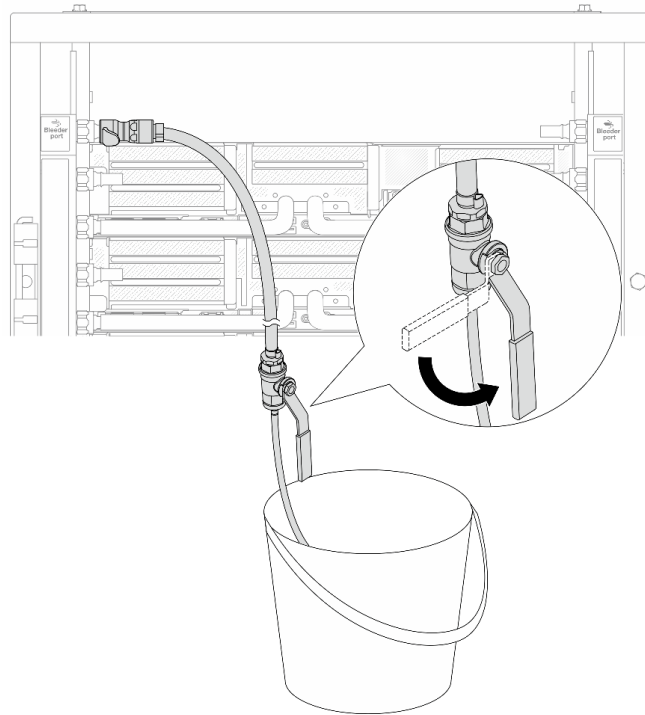


Figure 184. Opening the bleeder valve on the supply side

Step 17. 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 flow rate requirements, see [“Water requirements” on page 14](#).

### After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## 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.

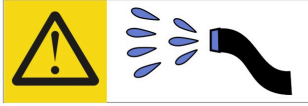
**S040**



**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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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)

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ཉེན་བརྒྱ: རྩིས་ལྷན་འདྲིའི་ནང་དུ་ཆུ་འཕྲ་ཆུ་འཕྲ་གཤེར་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་འོག་སློག་ཆུ་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 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 systems.
- 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.

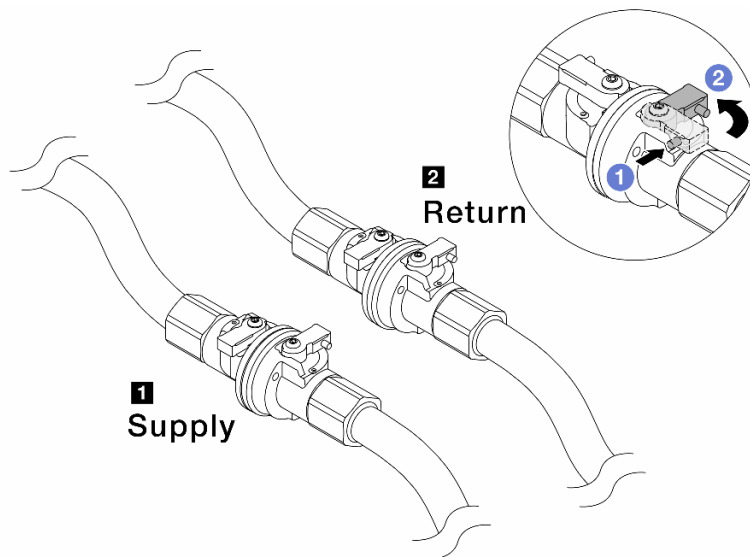


Figure 185. Closing ball valves

**Note:**

<b>1</b> Manifold supply connects to facility supply	<b>2</b> Manifold return connects to facility return
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- 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.

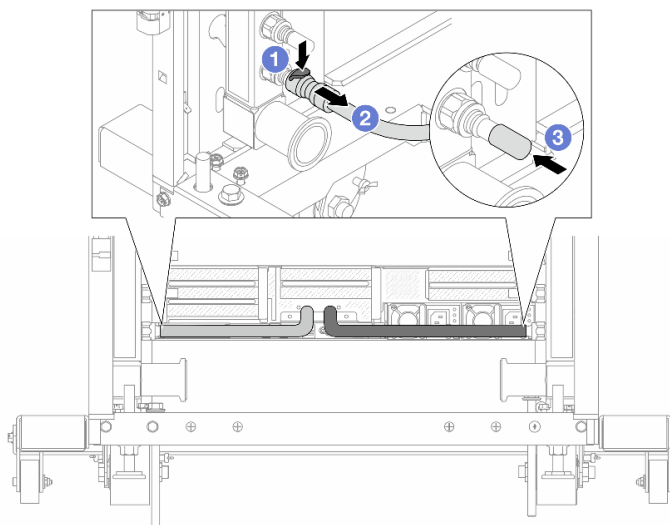


Figure 186. Quick connect plug removal

- 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 227](#) to the other manifold.
- Step 4. Remove the manifold with the hose kit attached.

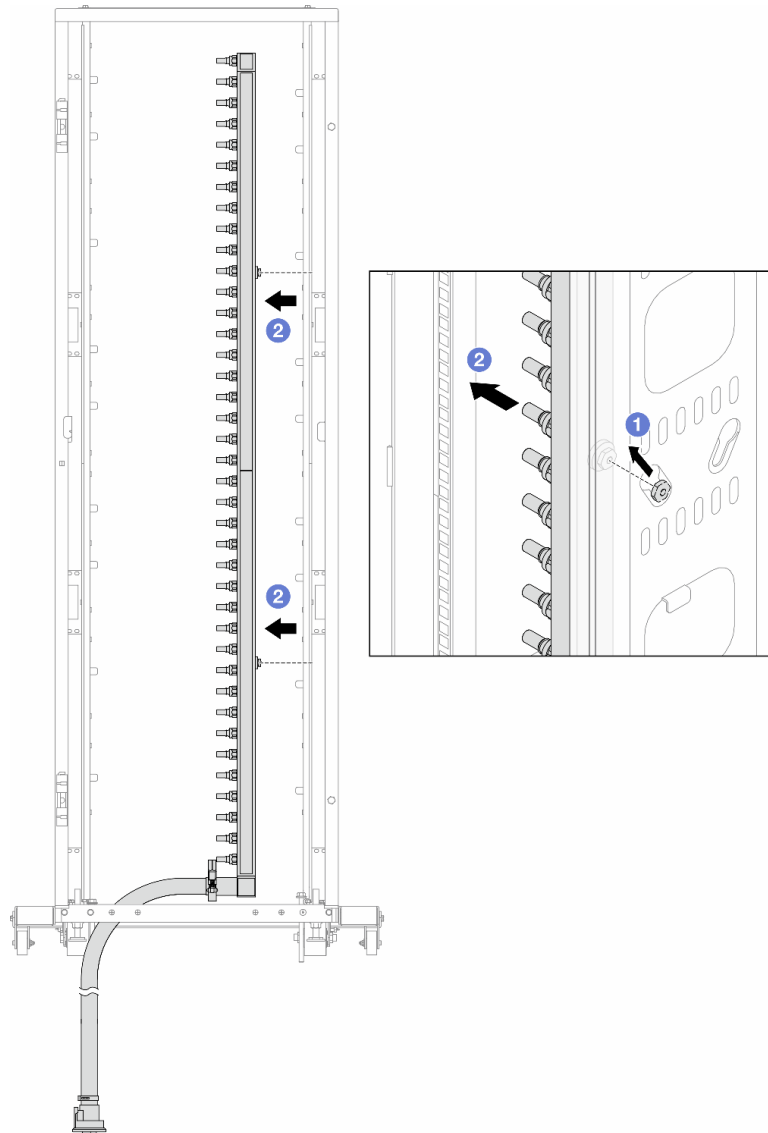


Figure 187. Removing the manifold

- 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.

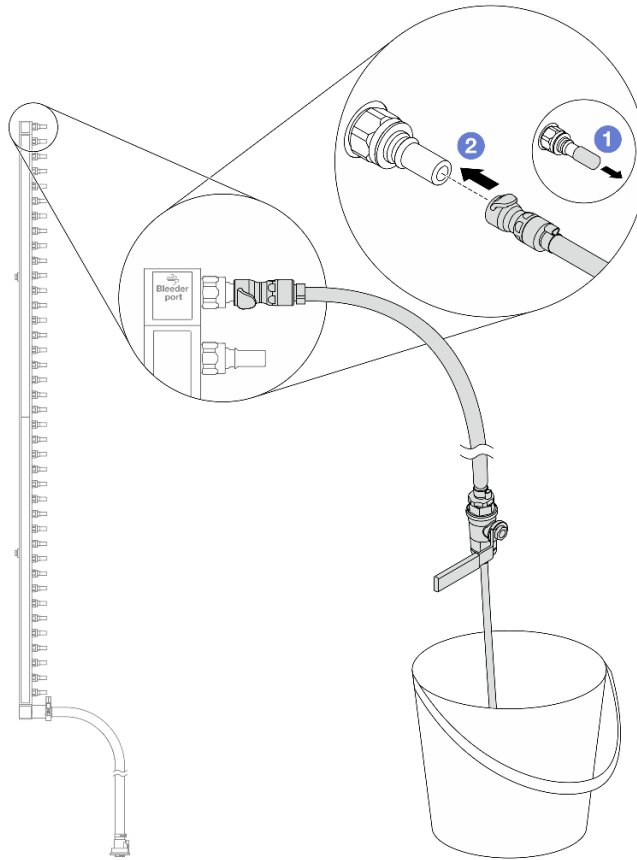
- Step 5. Repeat [Step 4 step 4 on page 228](#) to the other manifold.

**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.

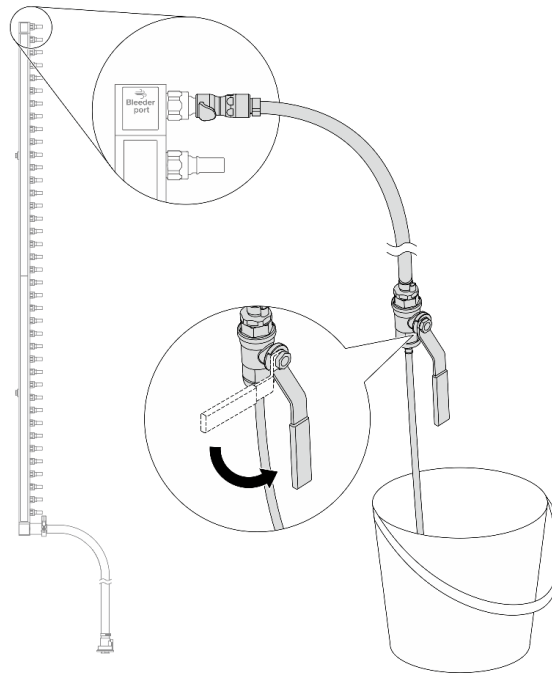
**Note:** This step drains the coolant with the help of a pressure difference inside and outside the supply manifold.



*Figure 188. 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 189. 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.

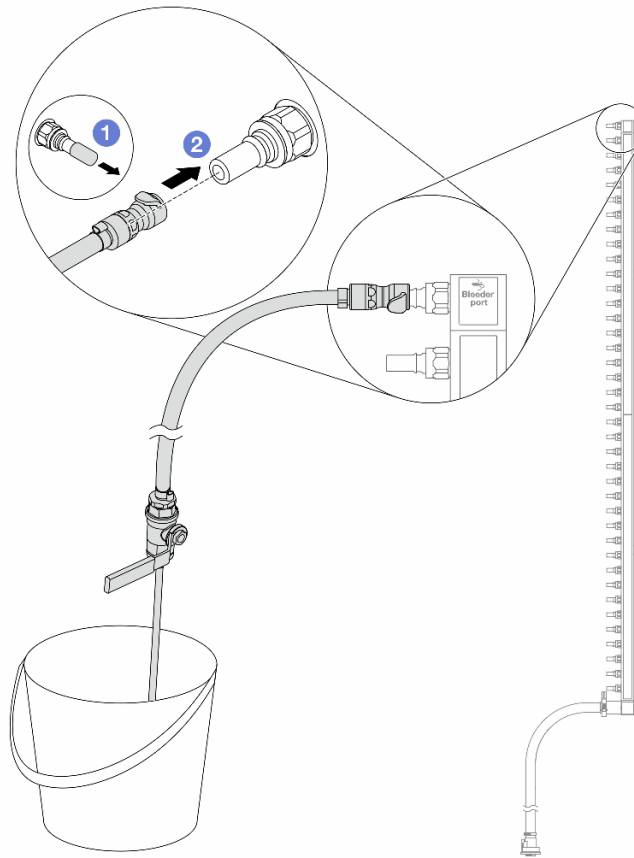


Figure 190. Installing the bleeder kit to the return side

- 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 9. Slowly open the bleeder valve to allow a steady stream of coolant to drain. Close the bleeder valve once coolant stops flowing.

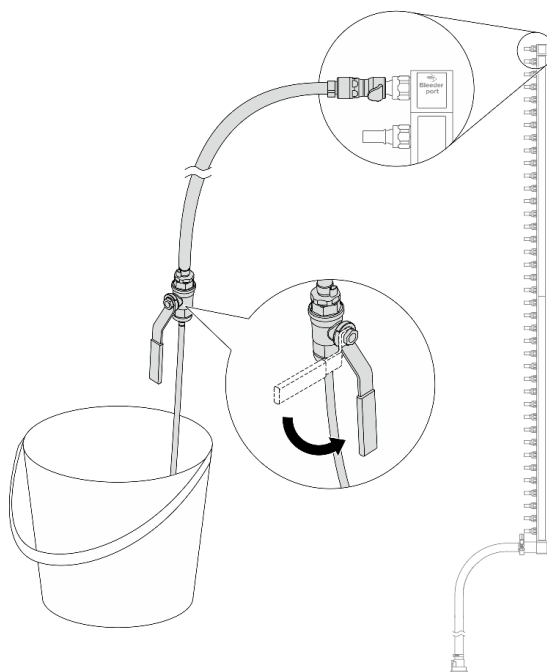


Figure 191. Opening the bleeder valve

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.

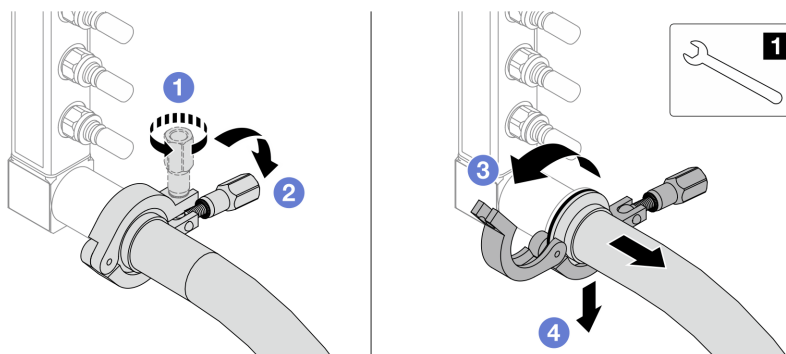


Figure 192. Separating the manifold from the hose kit

**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 232](#) 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 88](#).



Step 14. To remove the Direct Water Cooling Module (DWCM), see [“Remove the Lenovo Neptune\(TM\) Processor Direct Water Cooling Module” on page 171.](#)

## 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 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.

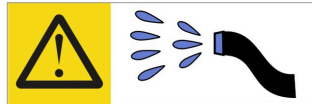
## S040



### 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. 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་ལྷན་གྱི་ཤེར་གཟུགས་འདུས་ཡོད་པ་སྟེ། དེ་ལས་སློག་ཆུག་པའི་ཉེན་ཁ་ཡོད། ལག་པའི་ཐིག་ཆུ་ཡོད་པའམ་ཆུ་ཐིག་མར་བཞུར་བའི་གནས་ཚུལ་འོག་སློག་ཆས་པའི་སློག་ཆས་ལ་བཞོལ་སྤྱད་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 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 systems.
- 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\(TM\) Processor Direct Water Cooling Module” on page 175](#).
- Step 2. To install the server into the rack, see [“Install the server to rack” on page 91](#).
- Step 3. Install the manifold.

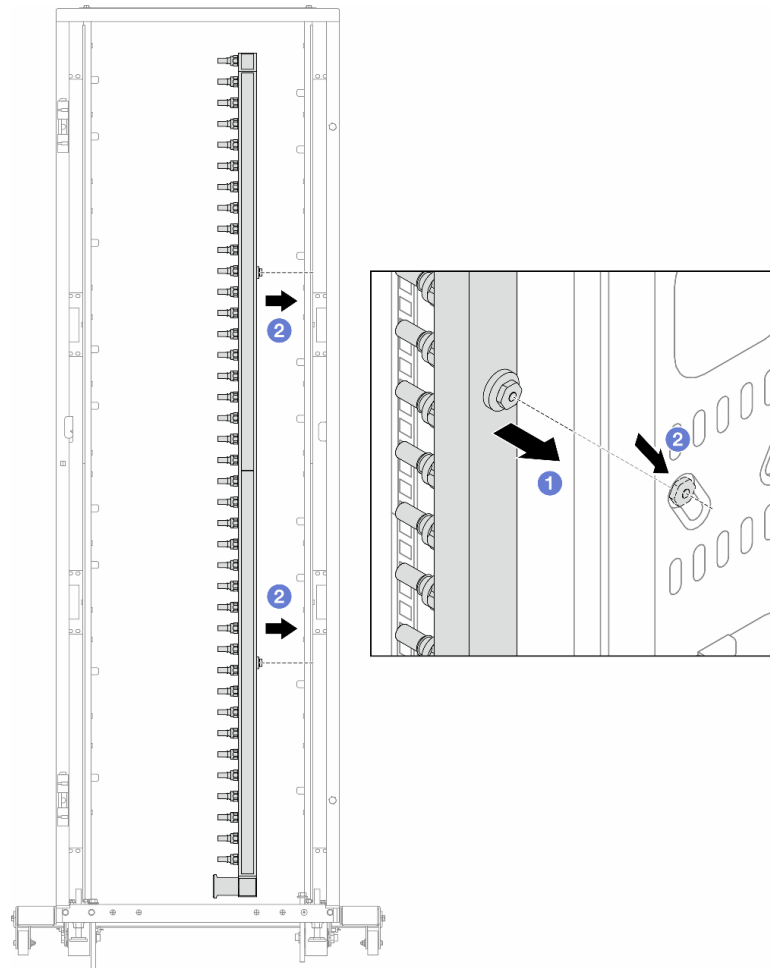


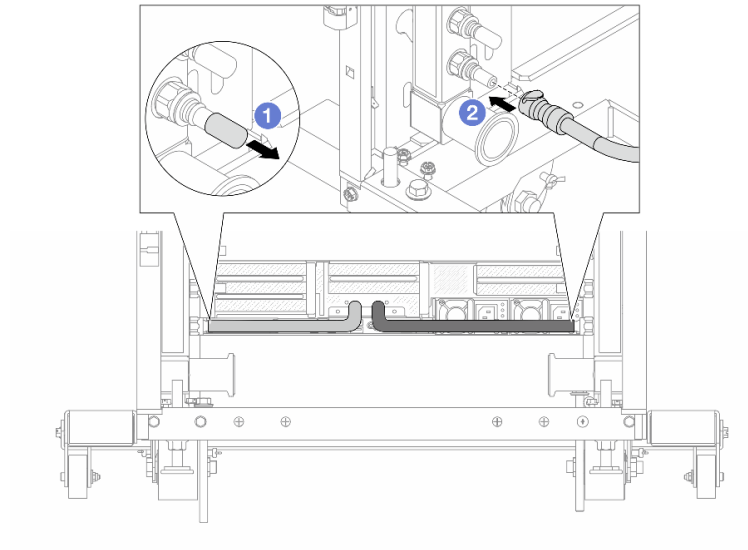
Figure 193. Installing the manifold

- 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 236](#) to the other manifold.

Step 5. Install the quick connect plug to the manifolds.



*Figure 194. 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.

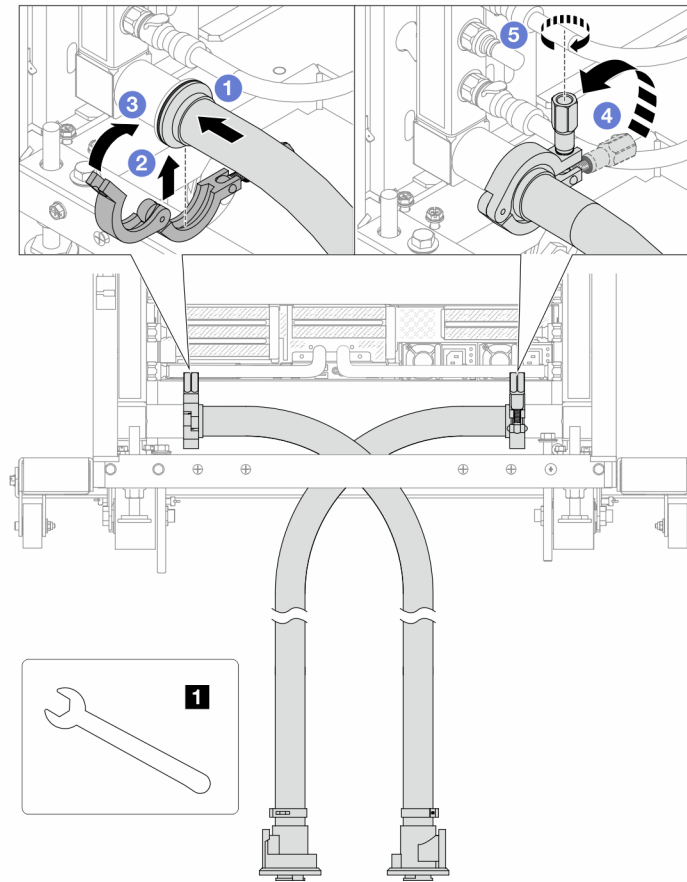


Figure 195. Installing the hose kit

**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.

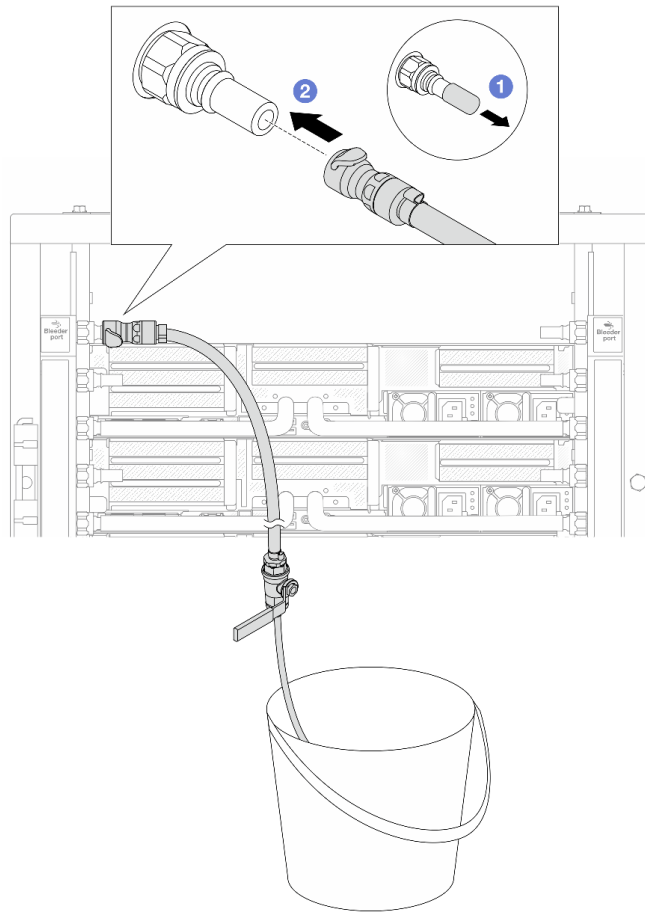


Figure 196. Installing the bleeder kit to the supply side

- 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**.



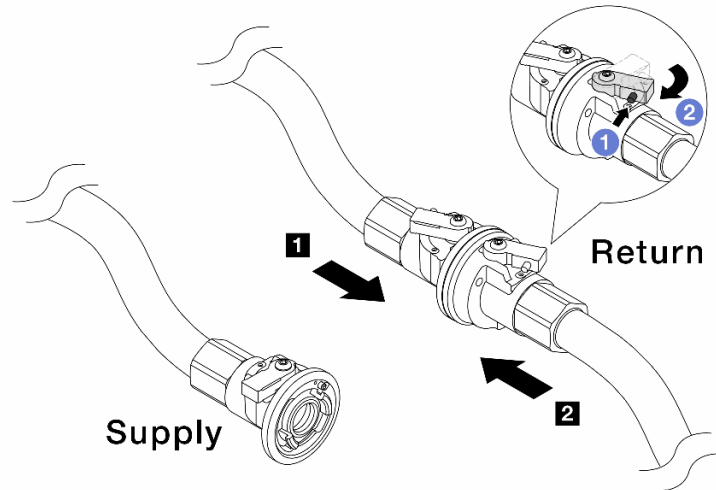


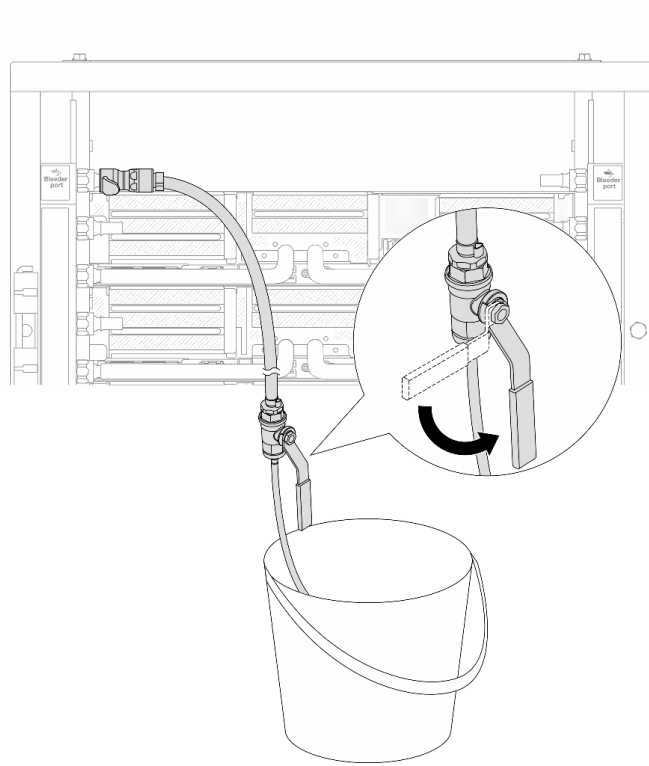
Figure 197. Facility supply to manifold return

- 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 198. Opening the bleeder valve on the supply side*

Step 10. Install the bleeder kit to the manifold return side.

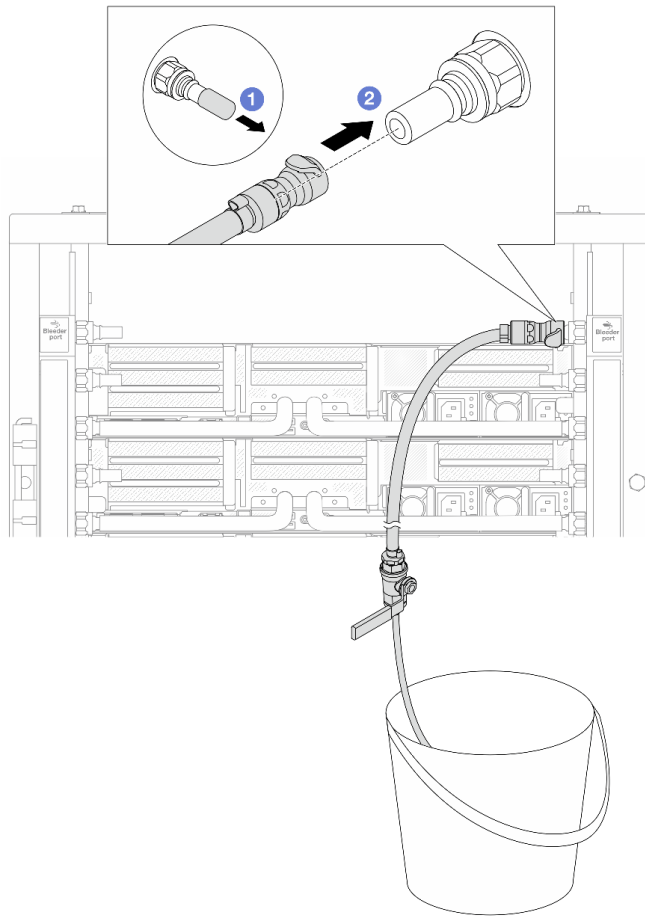


Figure 199. Installing the bleeder kit on the return side

- 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**.

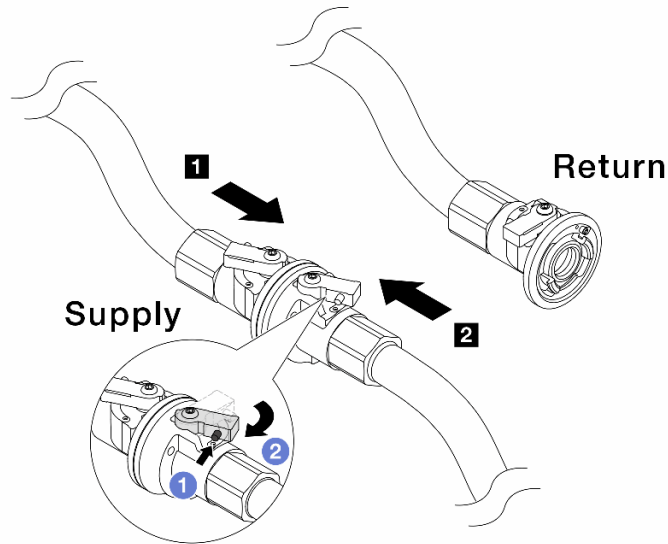


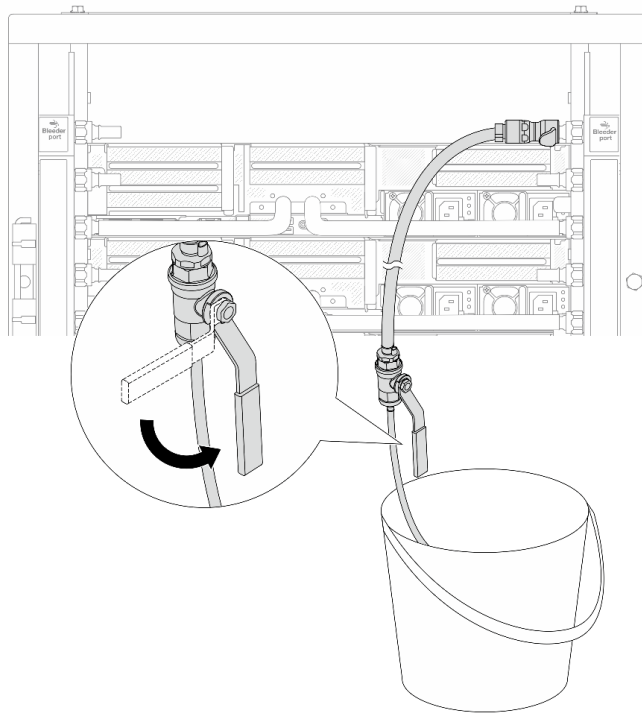
Figure 200. Facility supply to manifold supply

- 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:**

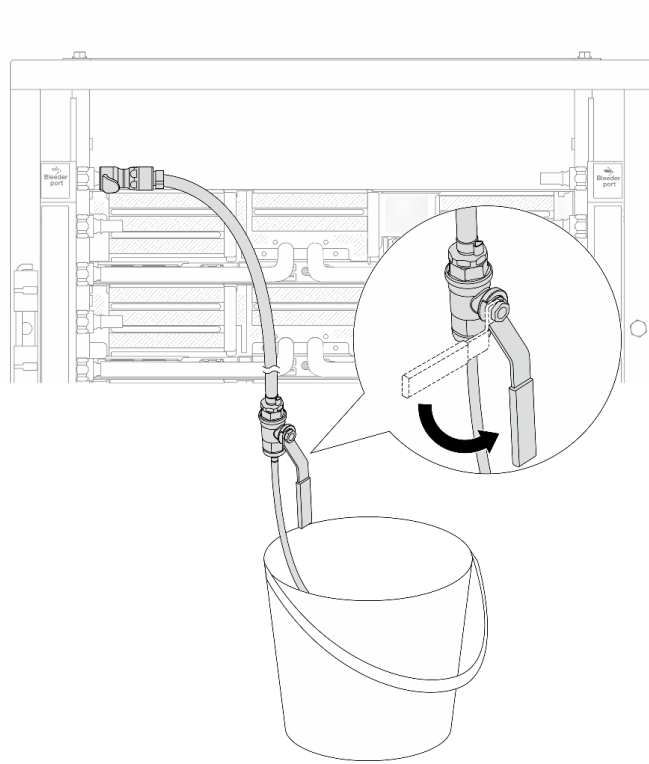
- Open the ball valves on ① manifold supply side and ② facility supply side, while keep manifold return side closed.
- Do not fully open the ball valves, or the water flow gets too rapid to contain.

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 201. 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 202. 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.

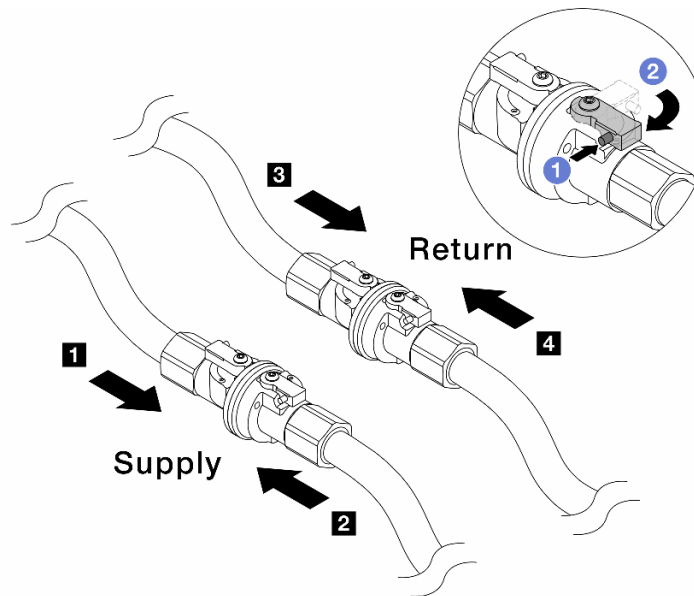


Figure 203. Opening ball valves

**Note:**

<b>1</b> Manifold supply connects to <b>2</b> facility supply	<b>3</b> Manifold return connects to <b>4</b> 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 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## Memory module replacement

Use the following procedures to remove and install a memory module.

### Remove a memory module

Use this information to remove a memory module.

### About this task

**Attention:**

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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.

- Memory modules are sensitive to static discharge and require special handling. Refer to the standard guidelines for [“Handling static-sensitive devices” on page 60](#).
  - 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.
- In the case of processor board replacement, keep records of the slots in which the modules are installed, and make sure to install them back to the exact same slots after processor board replacement.
- If you are not installing a replacement memory module to the same slot, make sure you have memory module filler available.

## 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. Make preparation for the task.

- a. Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 88](#).
- b. 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 88](#).
- c. Remove the top cover. See [“Remove the top cover” on page 381](#).
- d. If your server comes with an air baffle or a middle cage, remove it. See [“Remove the air baffle” on page 99](#) or [“Remove the middle drive cage and drive backplanes” on page 255](#).
- e. Locate the memory module slots and determine which memory module you want to remove from the server.

Step 2. Remove the memory module from the slot.

**Attention:** To avoid breaking the retaining clips or damaging the memory module slots, handle the clips gently.



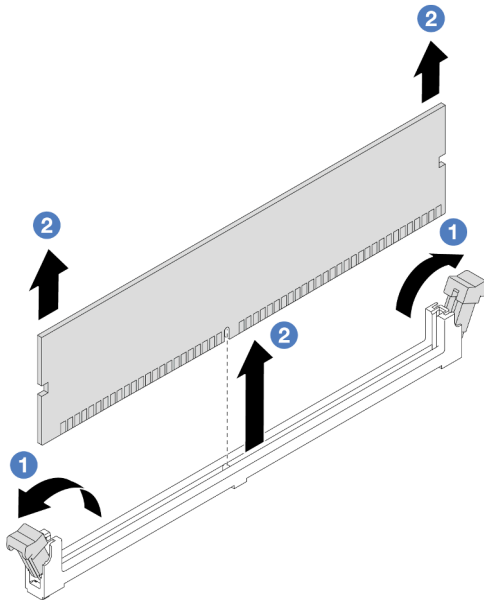


Figure 204. Memory module removal

- a. 1 Gently open the retaining clip on each end of the memory module slot.
- 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 249](#).
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 a memory module

Follow instructions in this section to install a memory module.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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.
- Memory modules are sensitive to static discharge and require special handling. Refer to the standard guidelines at [“Handling static-sensitive devices” on page 60](#):
  - 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.

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

- Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to [“Update the firmware” on page 691](#) 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. Make preparation for the task.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 88](#).
- 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 88](#).
- Remove the top cover. See [“Remove the top cover” on page 381](#).
- If your server comes with an air baffle or a middle cage, remove it. See [“Remove the air baffle” on page 99](#) or [“Remove the middle drive cage and drive backplanes” on page 255](#).
- Locate the required memory module slot on the system board assembly. Ensure that you observe the installation rules and sequence in [“Memory module installation rules and order” on page 61](#).

Step 2. 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 3. Install the memory module into the slot.

**Attention:**

- To avoid breaking the retaining clips or damaging the memory module slots, open and close the clips gently.
- 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.

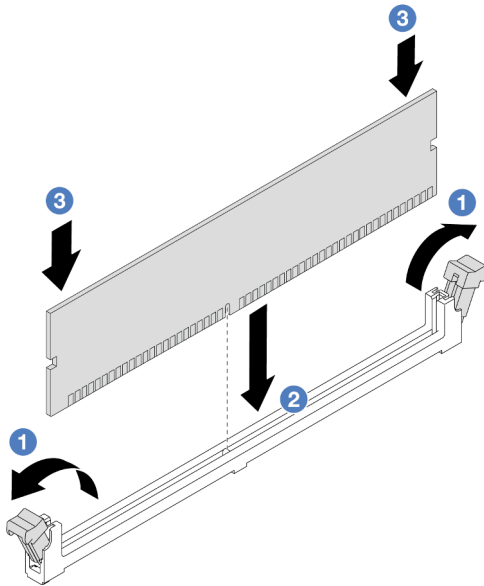


Figure 205. Memory module installation

- a. ① Gently open the retaining clip on each end of the memory module slot.
- b. ② Align the memory module with the slot, and gently place the memory module on the slot with both hands.
- c. ③ Firmly press both ends of the memory module straight down into the slot until the retaining clips snap into the locked position.

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

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## MicroSD card replacement

Follow the instructions in this section to remove and install the MicroSD card.

- [“Remove the MicroSD card” on page 251](#)
- [“Install the MicroSD card” on page 253](#)

## Remove the MicroSD card

Follow the instructions in this section to remove the MicroSD card.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.

- Remove the top cover. See [“Remove the top cover” on page 381](#).
- If your server comes with riser assemblies, remove them first, see [“Remove a rear riser assembly” on page 334](#).
- If your server comes with a rear drive assembly, remove it first. See [“Rear drive backplane and drive cage replacement” on page 312](#).
- If your server comes with a 7mm rear drive assembly, remove it first. See [“Remove the 7mm drive cage” on page 304](#).
- 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.

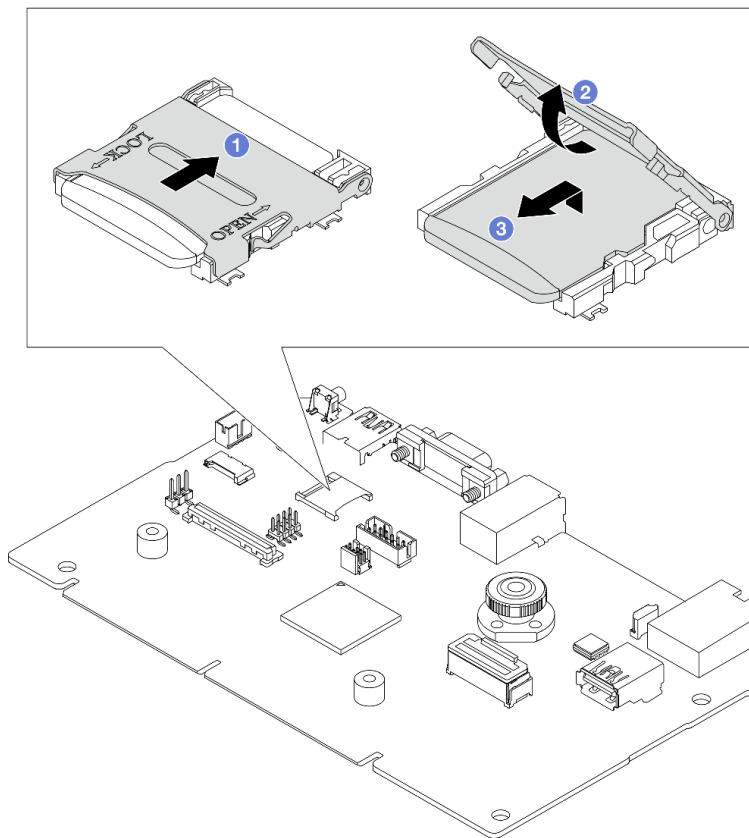


Figure 206. Removing MicroSD card

- 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

[Watch the procedure on YouTube](#)

## Install the MicroSD card

Follow the instructions in this section to install the MicroSD card.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 will 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](#).

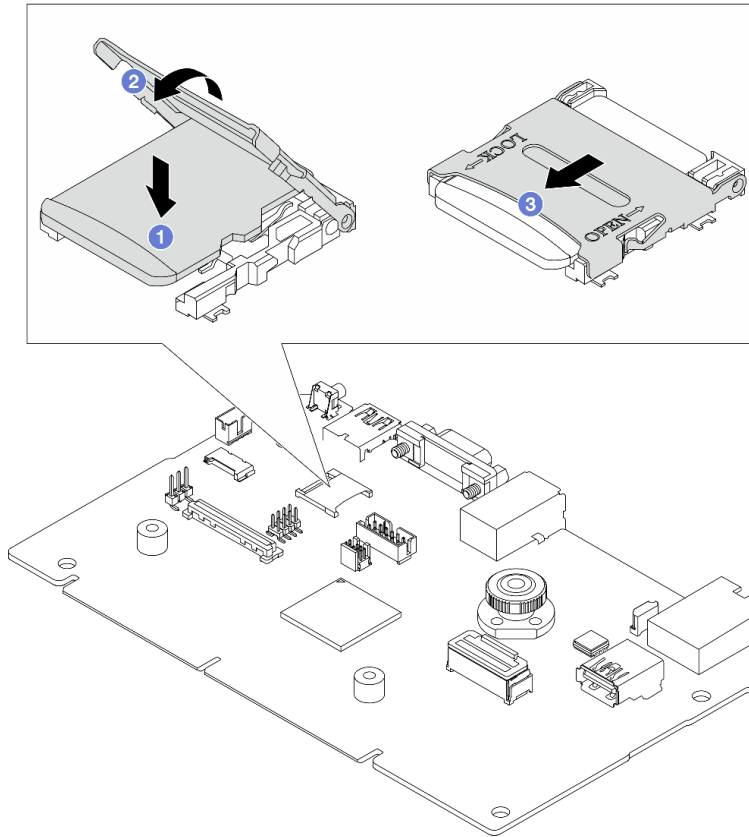


Figure 207. Installing MicroSD card

- 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 rear riser assembly” on page 346](#)
  - b. [“Install the 7mm drive cage” on page 310](#)
  - c. [“Rear drive backplane and drive cage replacement” on page 312](#)
  - d. [“Install the top cover” on page 382](#)
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

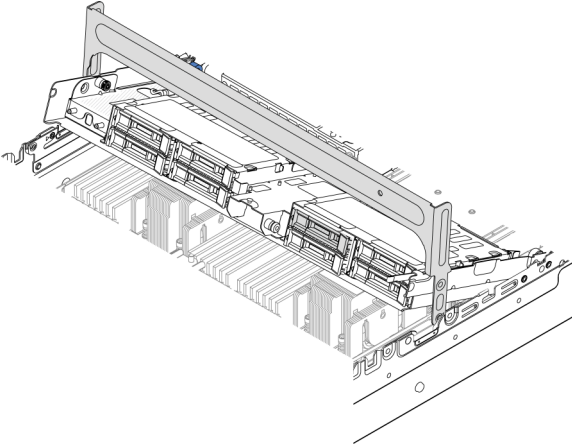
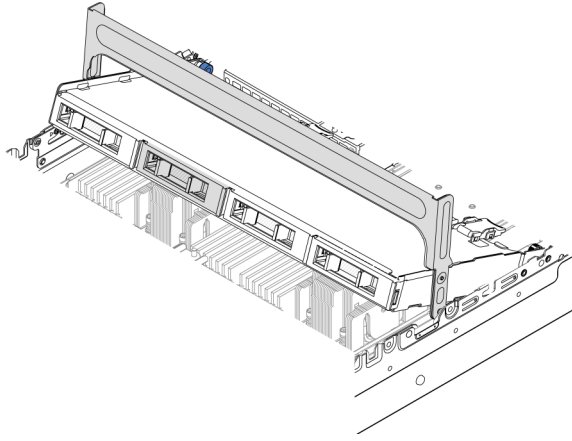
## Demo video

[Watch the procedure on YouTube](#)

## Middle drive cage and drive backplane replacement

Use this information to remove and install the middle drive cages and drive backplanes.

Depending on the server configurations, the server supports one of the following middle drive cages. For detailed information, see [“Technical rules” on page 61](#).

Drive cage type	Backplane type
<p>Middle 2.5-inch 8-bay drive cage</p> 	<ul style="list-style-type: none"> <li>• Two 2.5-inch SAS/SATA 4-bay backplanes</li> <li>• Two 2.5-inch NVMe 4-bay backplanes</li> </ul>
<p>Middle 3.5-inch 4-bay drive cage</p> 	<p>One 3.5-inch SAS/SATA 4-bay backplane</p>

- [“Remove the middle drive cage and drive backplanes” on page 255](#)
- [“Install the middle drive backplanes and drive cage” on page 258](#)

## Remove the middle drive cage and drive backplanes

Use this information to remove the middle drive cage and drive backplanes.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.

- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.
- If one or more NVMe solid-state drives are to be removed, it is recommended to disable them beforehand via the operating system.

## Procedure

Step 1. Make preparation for the task.

- 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 88](#).
- Remove the top cover. See [“Remove the top cover” on page 381](#).
- Remove the system fan cage for easier operation. See [“Remove the system fan cage” on page 373](#).
- Disconnect cables from the middle drive backplanes.

Step 2. Remove the middle drive cage.

**Note:** The illustration shows removing the 2.5-inch middle drive cage. The procedure is the same for removing the 3.5-inch middle drive cage.

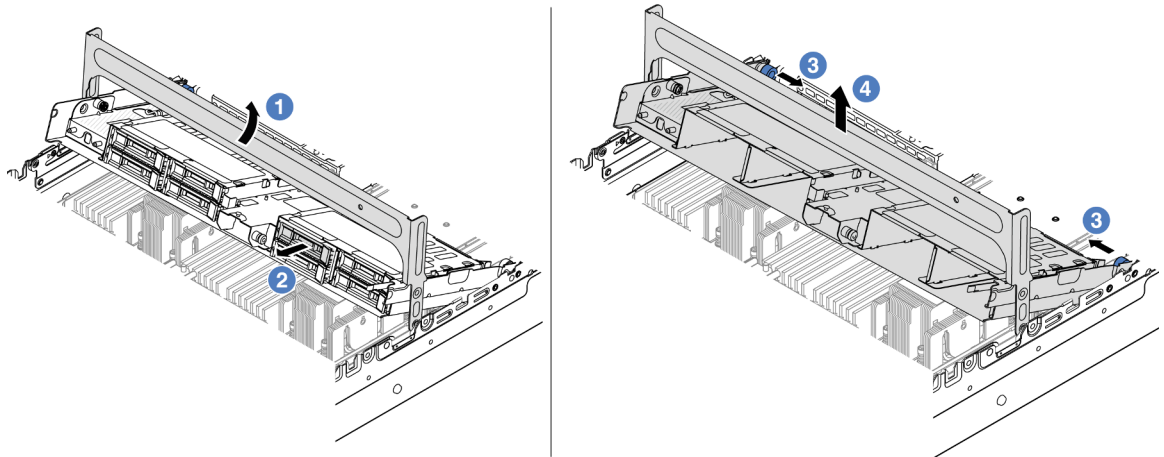


Figure 208. Removing the middle drive cage

- 1 Rotate the drive cage handle to open it.
- 2 Remove the drives from the drive cage.
- 3 Pull and twist plunger pins to release the drive cage.
- 4 Carefully lift the drive cage up from the chassis.

Step 3. Remove the middle drive backplane.

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



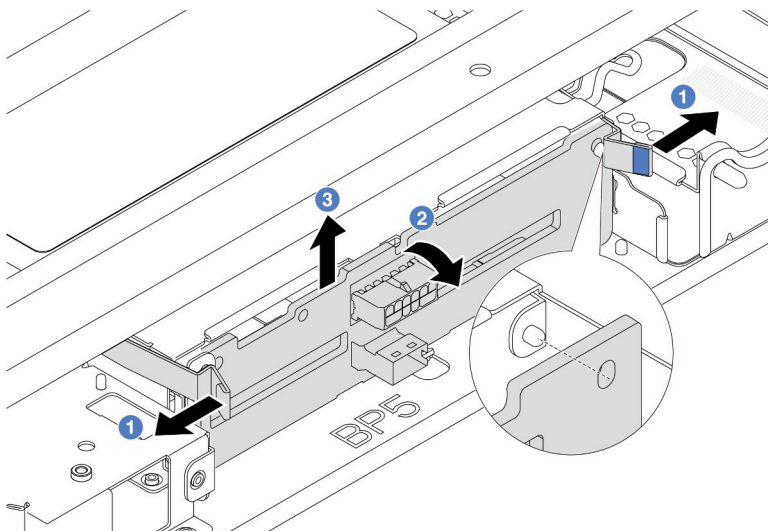


Figure 209. Removing the 2.5-inch middle drive backplane

- a. ① Slightly pivot the release latches outwards in the direction as shown.
- b. ② Rotate the backplane from the top to disengage it from the pins on the drive cage.
- c. ③ Carefully lift the backplane out of the drive cage.

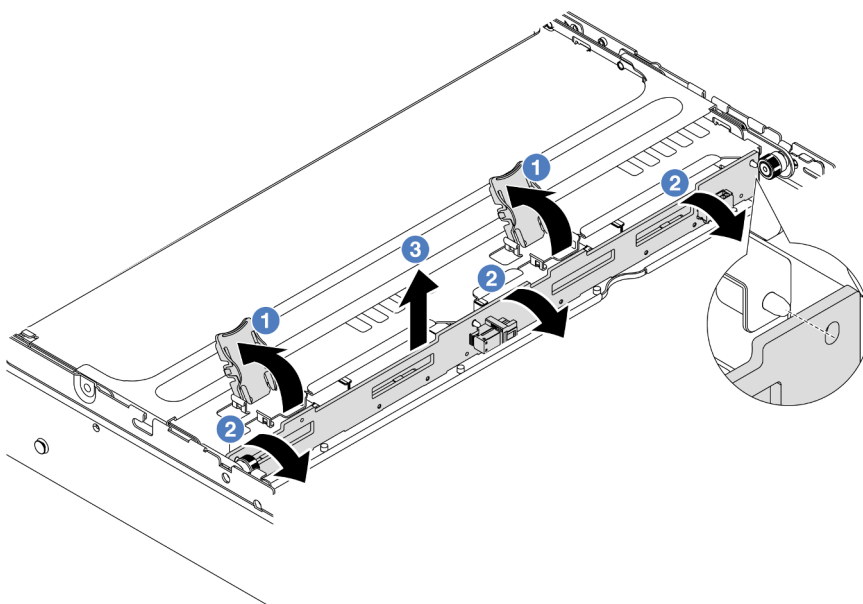


Figure 210. Removing the 3.5-inch middle drive backplane

- a. ① Open the release latches in the direction as shown.
- b. ② Rotate the backplane from the top to disengage it from the pins on the drive cage.
- c. ③ Carefully lift the backplane out of the drive cage.

## 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 middle drive backplanes and drive cage

Use this information to install the middle drive backplanes and drive cage.

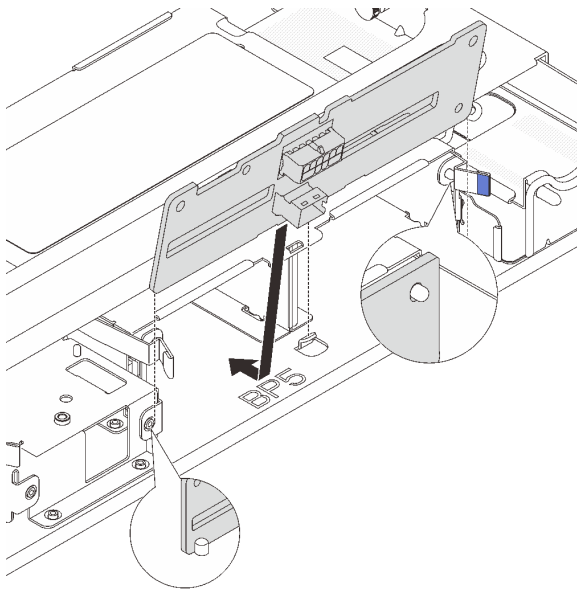
### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- The middle drive cage is supported on some server models with thermal requirements. See [“Thermal rules” on page 75](#) to ensure that the server is under permitted ambient temperature and the correct heat sink and system fans are used. If needed, replace your heat sink or system fan first.
  - [“Processor and heat sink replacement \(trained technician only\)” on page 267](#)
  - [“System fan replacement” on page 368](#)

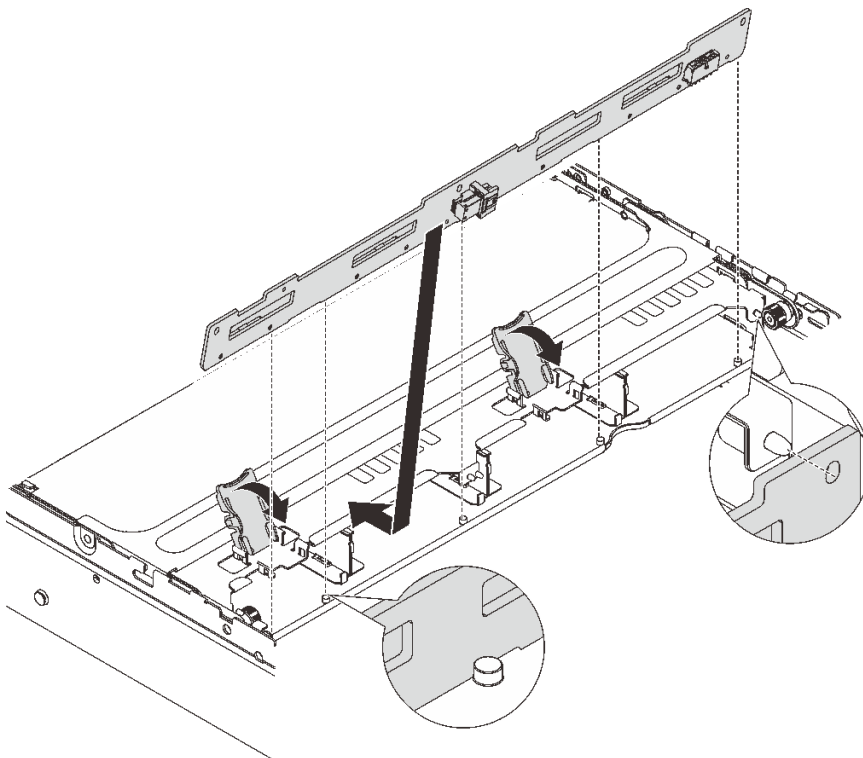
### Procedure

- 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. Connect the cables to the drive backplane. See [Chapter 6 “Internal cable routing” on page 385](#).
- Step 3. Install the drive backplane into the middle drive cage.



*Figure 211. Installing the 2.5-inch middle drive backplane*

- a. Align the bottom of the backplane with the studs at the bottom of the drive cage, and lower the backplane into the drive cage.
- b. Push the top of the backplane forward until it clicks in place. Ensure that the holes in the backplane pass through the pins on the drive cage, and the release latches secure the backplane in position.



*Figure 212. Installing the 3.5-inch middle drive backplane*

- a. Align the bottom of the backplane with the studs at the bottom of the drive cage, and lower the backplane into the drive cage.
- b. Push the top of the backplane forward so that the holes in the backplane pass through the pins on the drive cage, and close the release latches to secure the backplane in position.

Step 4. Install the middle drive cage and drives.

**Notes:**

- The illustration shows installing the 2.5-inch middle drive cage. The procedure is the same for installing the 3.5-inch middle drive cage.
- If any cables need to go through beneath the middle drive cage, route the cables before installing the cage.

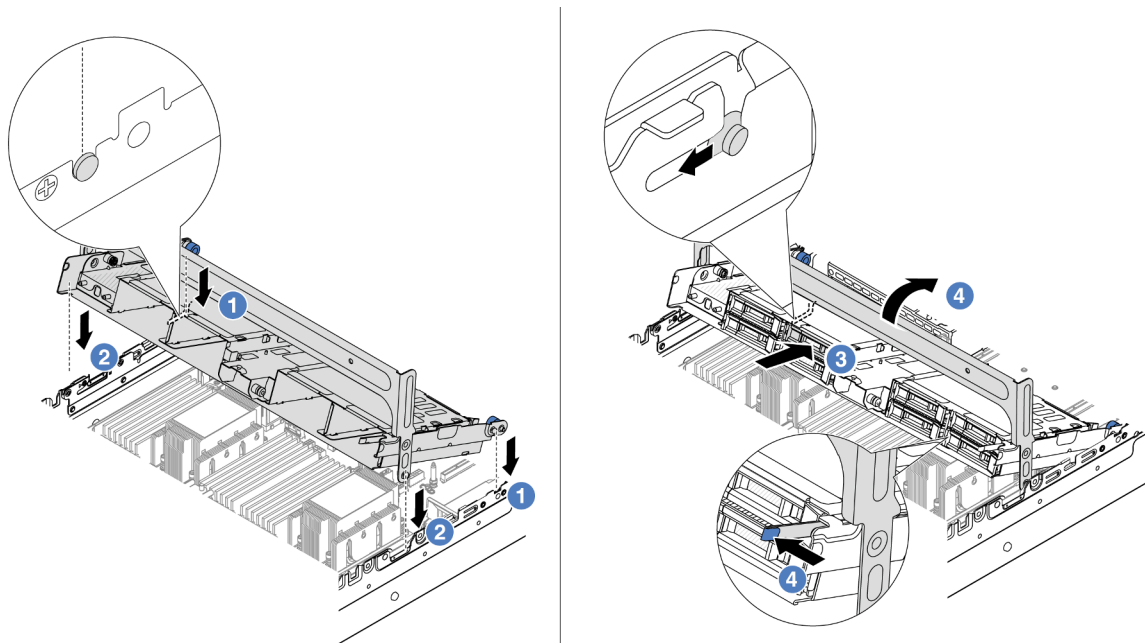


Figure 213. Installing the middle drive cage and drives

- a. ① Align the pins on the middle cage with the corresponding slots on the chassis.
- b. ② Lower the drive cage down into place.
- c. ③ Install drives into the middle drive cage.
- d. ④ Press the latch as shown and close the handle.

Step 5. Connect cables from the drive backplanes to the system board assembly or RAID/HBA adapters. See [Chapter 6 “Internal cable routing” on page 385](#).

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

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## Power supply unit replacement

Use this information to remove and install a power supply unit.

- [“Remove a power supply unit” on page 263](#)
- [“Install a power supply unit” on page 265](#)

## Safety precautions

The section lists safety precautions that apply to AC and DC power supply units respectively. Understand and apply the safety precautions before removing or installing a power supply unit.

### Safety precautions for AC power supplies

The following tips describe the information that you must consider when you replace an AC power supply.

#### 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 precautions for DC power supplies**

The following tips describe the information that you must consider when you replace a DC power supply.

#### **CAUTION:**



240 V DC input (input range: 180-300 V) is supported in Chinese Mainland **ONLY**.

Perform the following steps to safely remove the power cord of one 240 V DC power supply unit. Otherwise, there can be data loss and other damages to the equipment. Damages and losses resulting from inappropriate operations will not be covered by the manufacturer's warranty.

1. Turn off the server.
2. Disconnect the power cord from the power source.
3. Disconnect the power cord from the power supply unit.

## 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.

## **Remove a power supply unit**

Use this information to remove a power supply unit.

### **About this task**

The following describes the information that you must consider when removing a power supply:

**Note:** If the power supply unit to be removed is the only one installed, the power supply is non-hot-swap and before removing it, you must turn off the server first. To support redundancy mode or hot-swap, install an additional hot-swap power supply.

**Attention:**

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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. If a cable management arm (CMA) is installed, adjust the CMA to gain access to the power supply bay.

- a. Press down the stop bracket **1** and rotate it to the open position.
- b. Rotate the CMA out of the way to gain access to the power supply.

**Note:** Your CMA kit might look different from the illustration.

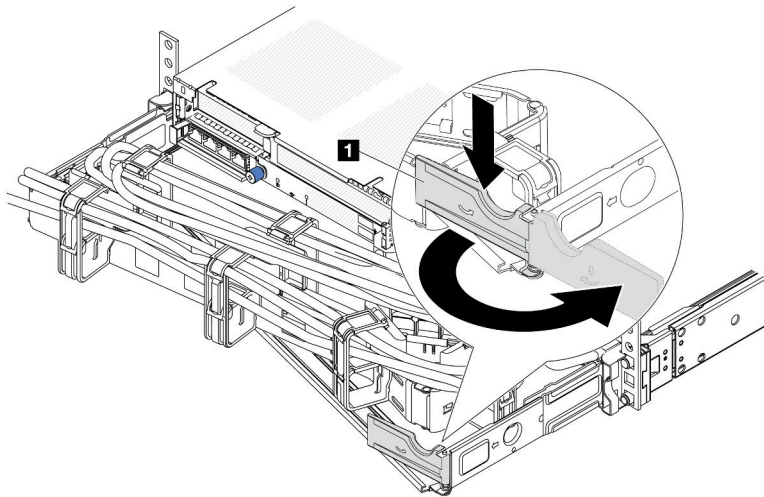


Figure 214. CMA adjustment

Step 2. Disconnect the power cord from the hot-swap power supply and the electrical outlet.

- For AC power input, disconnect both ends of the power cord and keep it in an ESD-safe place.
- For –48V DC power input:
  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 [“Power supply LEDs” on page 725](#).

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.

**Note:** If your CMA kit obstructs in the way, slightly pull the power supply upwards when sliding the power supply out of the chassis.



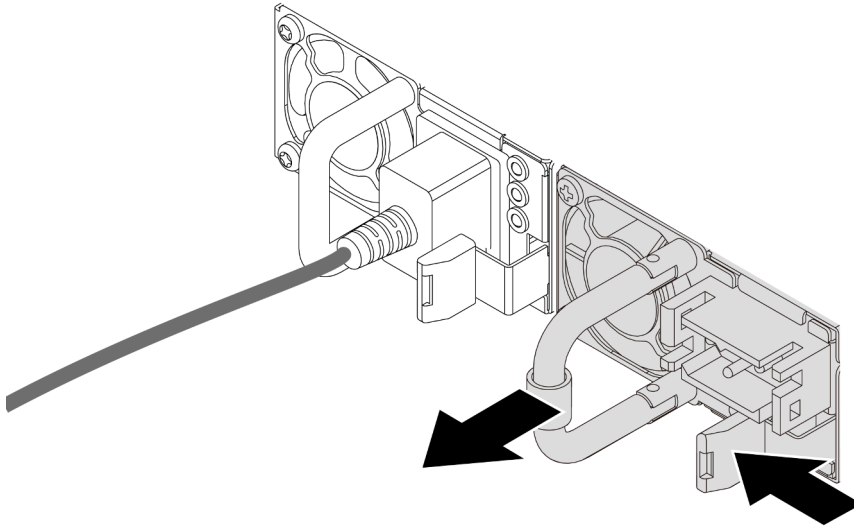


Figure 215. Hot-swap power supply removal

## 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 265](#).

**Important:** To ensure proper cooling during normal server operation, both of the 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

[Watch the procedure on YouTube](#)

## Install a power supply unit

Use this information to install a power supply.

## About this task

The following describes the information that you must consider when installing a power supply:

- The server is shipped with only one power supply by default. In this case, the power supply is non-hot-swap and before removing it, you must turn off the server first. To support redundancy mode or hot-swap, install an additional hot-swap power supply.
- 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/Invo-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 onto the existing label near the power supply.



Figure 216. Example power supply unit label on the top cover

#### Attention:

- Read “[Installation Guidelines](#)” on page 57 and “[Safety inspection checklist](#)” on page 58 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 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. Slide the new hot-swap power supply into the bay until it snaps into position.

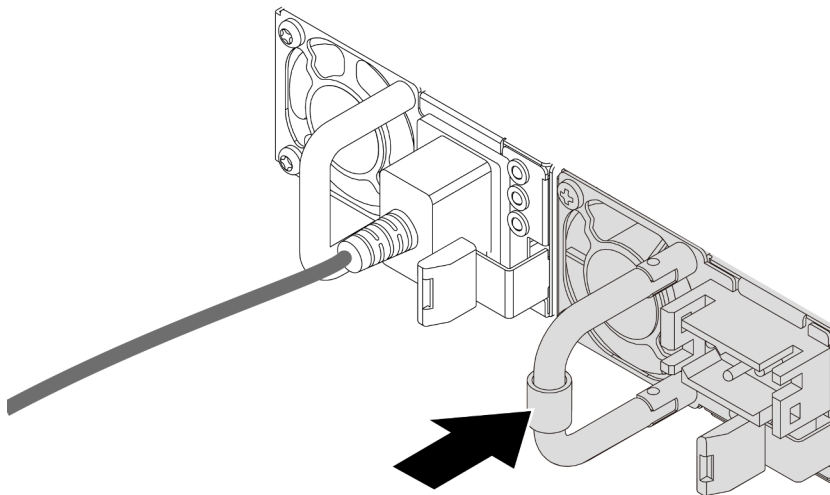



Figure 217. Hot-swap power supply installation

- Step 3. Connect the power supply unit 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, plug the pins into corresponding holes on the power block, use the table above for guidance, and ensure that the pins find correct slots.
4. Tighten the captive screws on the power block, and ensure that the screws and cord pins are secured in place and no bare metal parts show.
5. Connect the other end of the cables to a properly grounded electrical outlet, and ensure that the cable ends find correct outlets.

Step 4. Route the cables and ensure that they are not blocking access to other chassis components.

### After you finish

1. If you have adjusted the CMA to gain access to the power supply bay, properly 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

[Watch the procedure on YouTube](#)

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## Processor and heat sink replacement (trained technician only)

Follow the instruction in this section to replace an assembled processor and heat sink, known as a processor-heat-sink module (PHM), 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.

**Attention:** Before reusing a processor or heat sink, make sure that you use Lenovo proven alcohol cleaning pad and thermal grease.

## Remove a processor and heat sink

This task has instructions for removing an assembled processor and heat sink, known as a processor-heat-sink module (PHM). This task requires a Torx T30 screwdriver. This procedure must be executed by a trained technician.

### About this task

#### 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 57](#) and [“Safety inspection checklist” on page 58](#) to ensure that you work safely.
- To transfer Intel® On Demand Suite from the defective processor to the new processor, read the PPIN of the defective processor before powering off the system. For more information, see [“Enable Intel® On Demand” on page 698](#).
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 88](#).
- 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.
- Each processor socket must always contain a cover or a PHM. When removing or installing a PHM, protect empty processor sockets 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.
- Remove and install only one PHM at a time. If the system supports multiple processors, install the PHMs starting with the first processor socket.

**Note:** The heat sink, processor, and processor carrier for your system might be different from those shown in the illustrations.

The following illustration shows the components of the PHM.

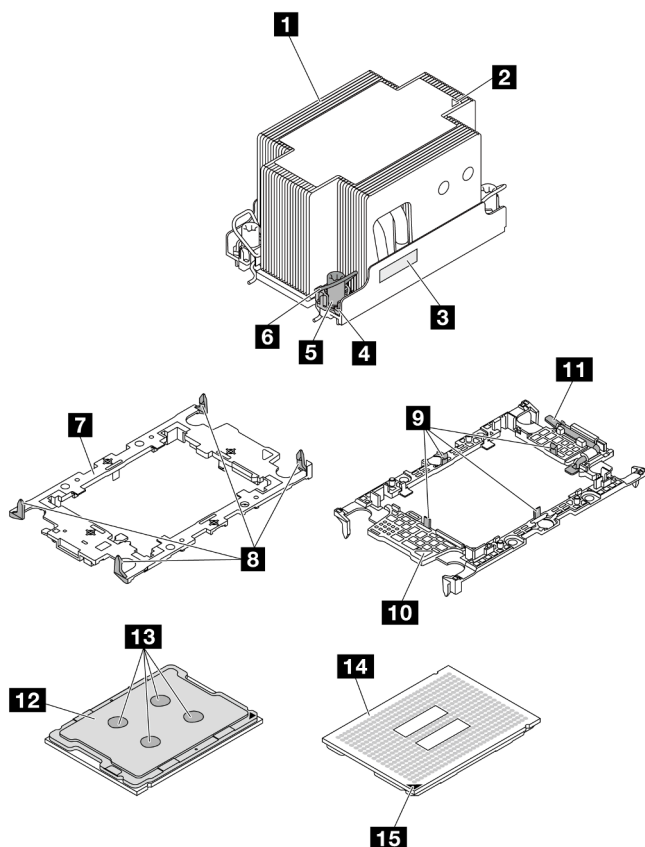


Figure 218. PHM components

<b>1</b> Heat sink	<b>9</b> Clips to secure processor in carrier
<b>2</b> Heat sink triangular mark	<b>10</b> Carrier triangular mark
<b>3</b> Processor identification label	<b>11</b> Processor ejector handle
<b>4</b> Nut and wire bail retainer	<b>12</b> Processor heat spreader
<b>5</b> Torx T30 nut	<b>13</b> Thermal grease
<b>6</b> Anti-tilt wire bail	<b>14</b> Processor contacts
<b>7</b> Processor carrier	<b>15</b> Processor triangular mark
<b>8</b> Clips to secure carrier to heat sink	

## Procedure

Step 1. Make preparations for this task.

- 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 88](#).
- Remove the top cover. See [“Remove the top cover” on page 381](#).
- If your server comes with an air baffle or a middle cage, remove it first.
  - [“Remove the air baffle” on page 99](#)
  - [“Remove the middle drive cage and drive backplanes” on page 255](#)

d. Remove the system fan cage. [“Remove the system fan cage” on page 373.](#)

Step 2. Remove the PHM from the system board assembly.

**Notes:**

- Do not touch the contacts on the bottom of the processor.
- Keep the processor socket clean from any object to prevent possible damages.
- The procedure of replacing an entry PHM is the same as that of replacing a standard PHM.

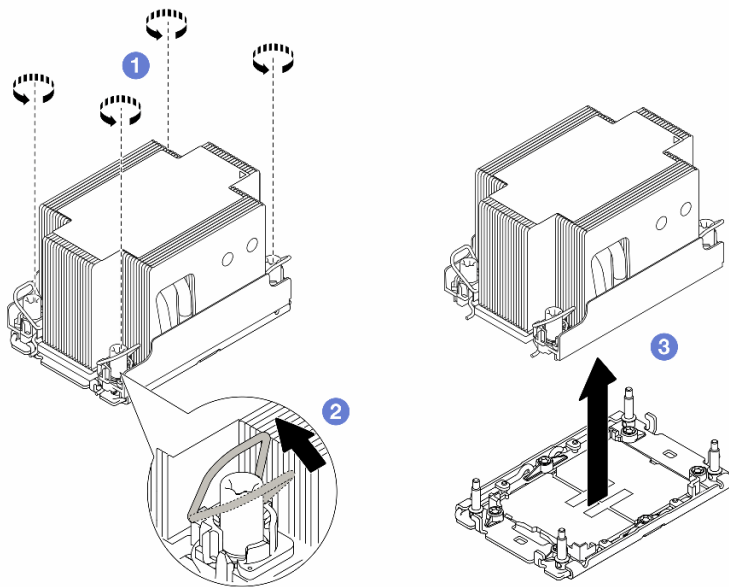


Figure 219. Removing a standard PHM

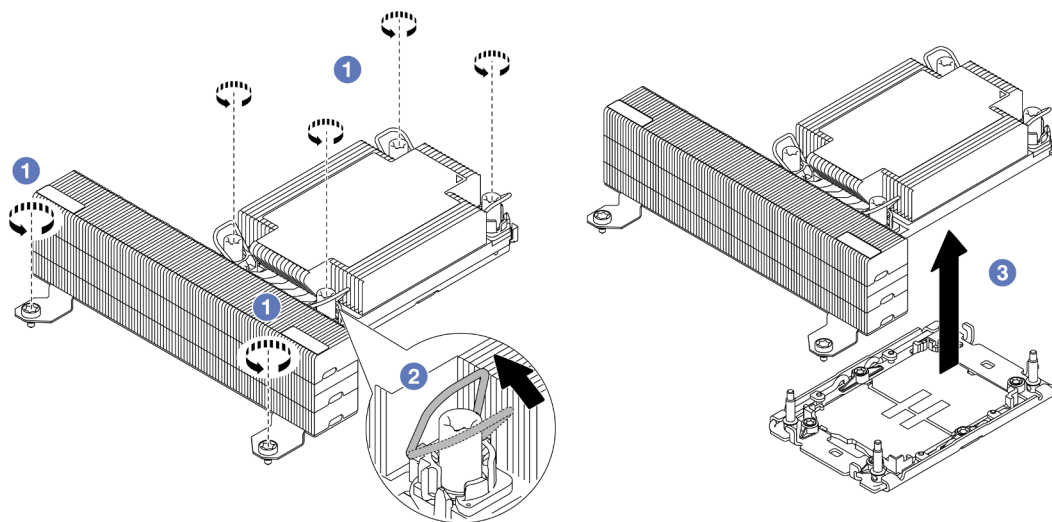


Figure 220. Removing a T-shape performance PHM

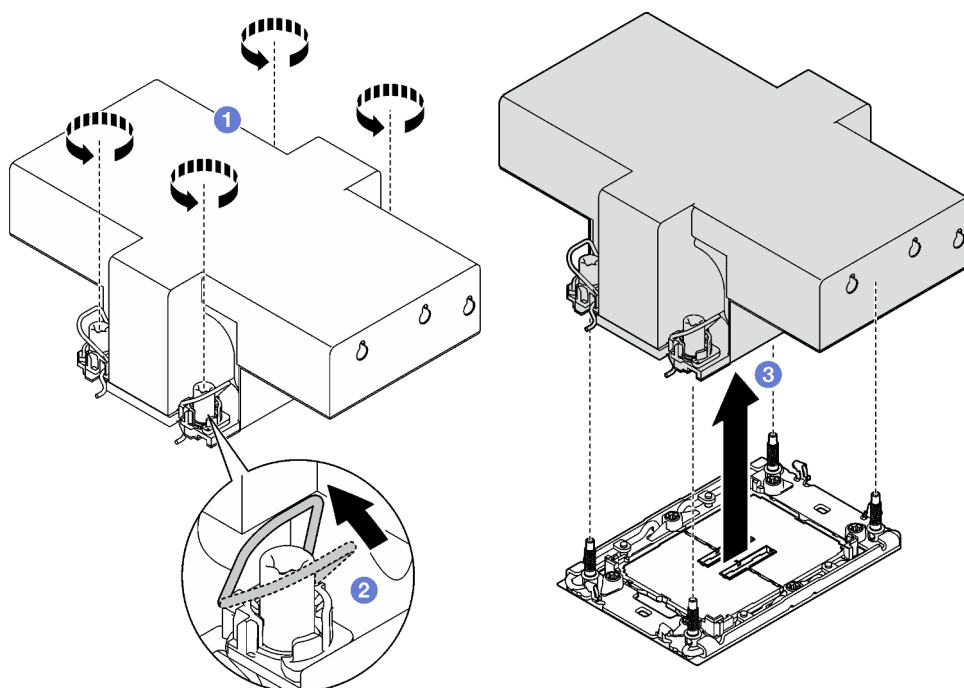


Figure 221. Removing a winged PHM

- a. ① Fully loosen the Torx T30 nuts on the PHM **in the removal sequence shown** on the heat-sink label.
- b. ② Rotate the anti-tilt wire bails inward.
- c. ③ Carefully lift the PHM from the processor socket. If the PHM cannot be fully lifted out of the socket, further loosen the Torx T30 nuts and try lifting the PHM again.

### After you finish

- Each processor socket must always contain a cover or a PHM. Protect empty processor sockets with a cover or install a new PHM.
- If you are not going to install a PHM back, cover the processor socket with the socket cover and install a PHM filler.

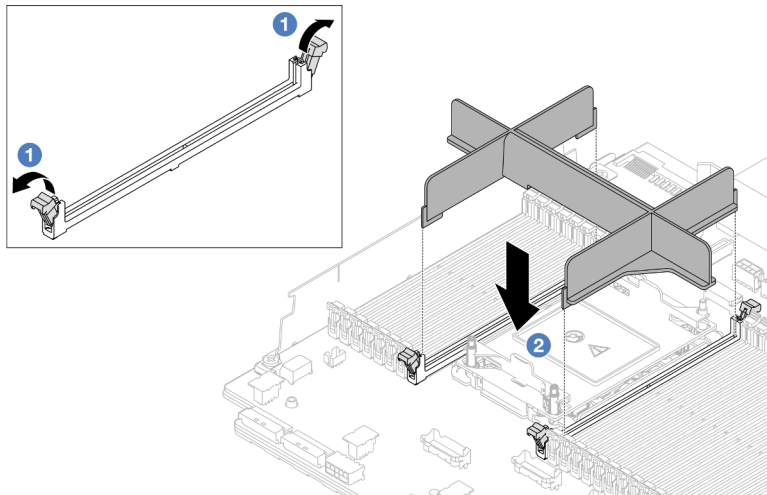


Figure 222. Installing a PHM filler

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 PHM filler with the slots, and place the PHM filler on the slots with both hands. Firmly press the PHM filler straight down into the slots until the retaining clips snap into the locked position.
- If you are removing the PHM as part of a system board assembly replacement, set the PHM aside.
  - If you are reusing the processor or heat sink, separate the processor from its retainer. See [“Separate the processor from carrier and heat sink” on page 272](#).
  - 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.
  - To transfer Intel® On Demand Suite from the defective processor to the new processor, see [“Enable Intel® On Demand” on page 698](#).

## Demo video

[Watch the procedure on YouTube](#)

## Separate the processor from carrier and heat sink

This task has instructions for separating a processor and its carrier from an assembled processor and heat sink, known as a processor-heat-sink module (PHM). This procedure must be executed by a trained technician.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Do not touch the processor contacts. 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.

**Note:** The heat sink, processor, and processor carrier for your system might be different from those shown in the illustrations.

## Procedure

Step 1. Separate the processor from the heat sink and carrier.

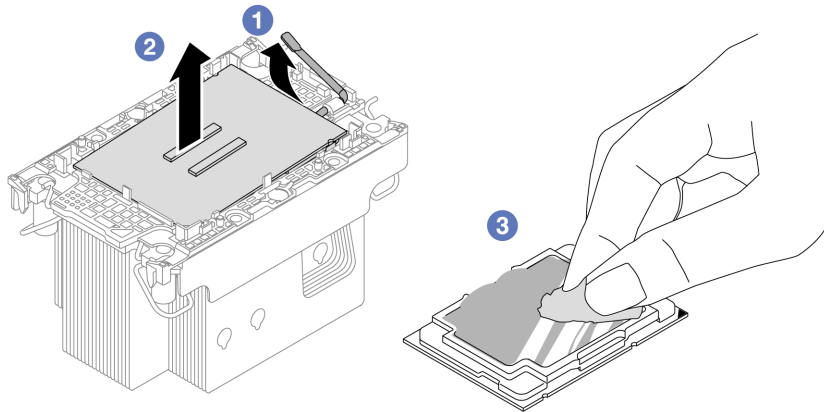


Figure 223. Separating a processor from the heat sink and carrier

**Note:** Do not touch the contacts on the processor.

- 1 Lift the handle to release the processor from the carrier.
- 2 Hold the processor by its edges; then, lift the processor from the heat sink and carrier.
- 3 Without putting the processor down, wipe the thermal grease from the top of the processor with an alcohol cleaning pad; then, place the processor on a static protective surface with the processor-contact side up.

Step 2. Separate the processor carrier from the heat sink.

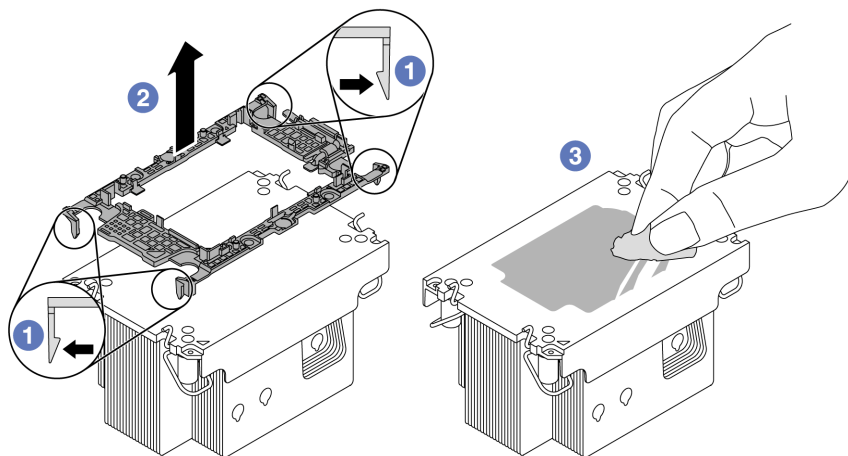


Figure 224. Separating a processor carrier from the heat sink

**Note:** The processor carrier will be discarded and replaced with a new one.

- a. ① Release the retaining clips from the heat sink.
- b. ② Lift the carrier from the heat sink.
- c. ③ Wipe the thermal grease from the bottom of the heat sink with an alcohol cleaning pad.

## 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 a processor and heat sink

This task has instructions for installing an assembled processor and heat sink, known as a processor-heat-sink module (PHM). This task requires a Torx T30 screwdriver. This procedure must be executed by a trained technician.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Each processor socket must always contain a cover or a PHM. When removing a PHM, protect empty processor sockets 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.
- Remove and install only one PHM at a time. If the system supports multiple processors, install the PHMs starting with the first processor socket.

**Notes:**

- The heat sink, processor, and processor carrier for your system might be different from those shown in the illustrations.
- PHMs are keyed for the socket where they can be installed and for their orientation in the socket.
- See <https://serverproven.lenovo.com> for a list of processors supported for your server. All processors must have the same speed, number of cores, and frequency.
- Before you install a new PHM or replacement processor, update your system firmware to the latest level. See “Update the firmware” on page 691.

The following illustration shows the components of the PHM.

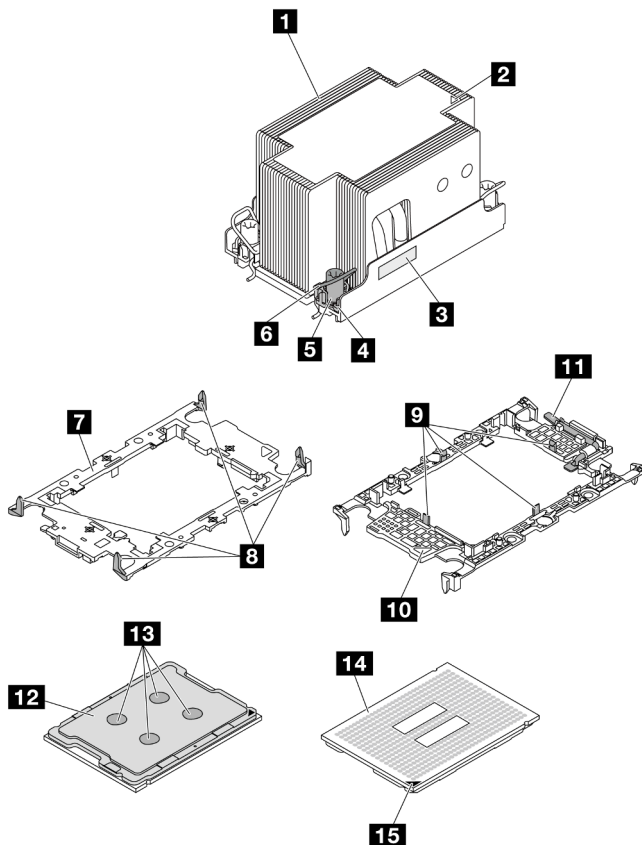


Figure 225. PHM components

<b>1</b> Heat sink	<b>9</b> Clips to secure processor in carrier
<b>2</b> Heat sink triangular mark	<b>10</b> Carrier triangular mark
<b>3</b> Processor identification label	<b>11</b> Processor ejector handle
<b>4</b> Nut and wire bail retainer	<b>12</b> Processor heat spreader
<b>5</b> Torx T30 nut	<b>13</b> Thermal grease
<b>6</b> Anti-tilt wire bail	<b>14</b> Processor contacts
<b>7</b> Processor carrier	<b>15</b> Processor triangular mark
<b>8</b> Clips to secure carrier to heat sink	

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

- Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to [“Update the firmware” on page 691](#) for more information on firmware updating tools.

## Procedure

Step 1. Record the processor identification label.

- If you are replacing a processor and reusing the heat sink, remove the processor identification label from the heat sink and replace it with the new label that comes with the replacement processor.
- If you are replacing a heat sink and reusing the processor, 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.

Step 2. Install the processor in the new carrier.

- If you are replacing the processor and reusing the heat sink, use the new carrier that comes with the new processor.
- If you are replacing the heat sink and reusing the processor, and if the new heat sink comes with two processor carriers, make sure to use the same type of carrier as the one you discarded.

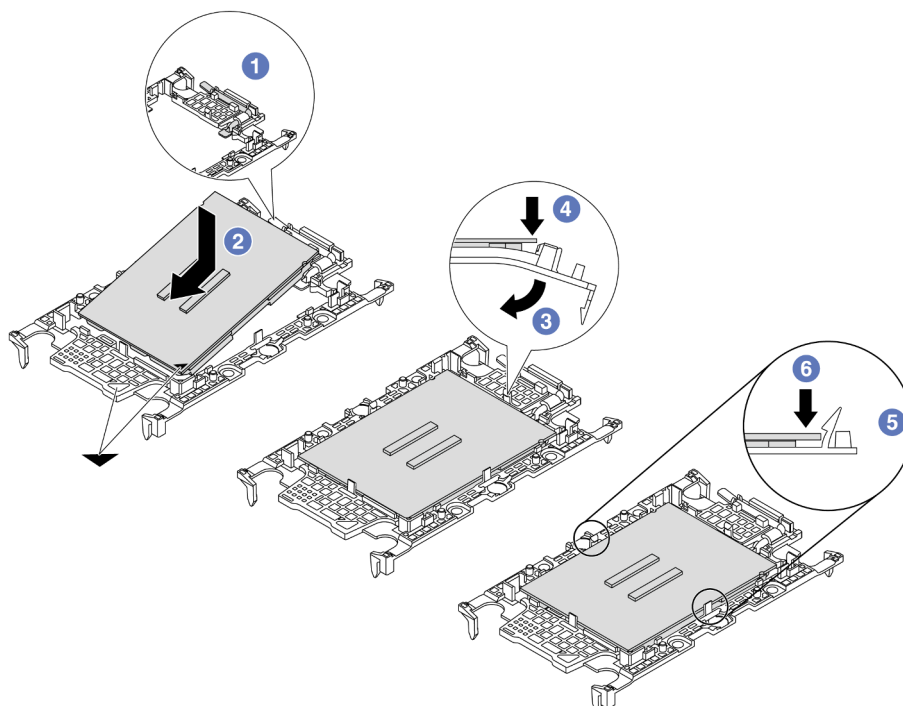


Figure 226. Installing a processor carrier

1. ① Make sure the handle on the carrier is in the closed position.
2. ② Align the processor on the new carrier so that the triangular marks align; then, insert the marked end of the processor into the carrier.
3. ③ Hold the inserted end of the processor in place; then, pivot the unmarked end of the carrier down and away from the processor.
4. ④ Press the processor and secure the unmarked end under the clip on the carrier.
5. ⑤ Carefully pivot the sides of the carrier down and away from the processor.
6. ⑥ Press the processor and secure the sides under the clips on the carrier.

**Note:** To prevent the processor from falling out of the carrier, keep the processor-contact side up and hold the processor-carrier assembly by the sides of the carrier.

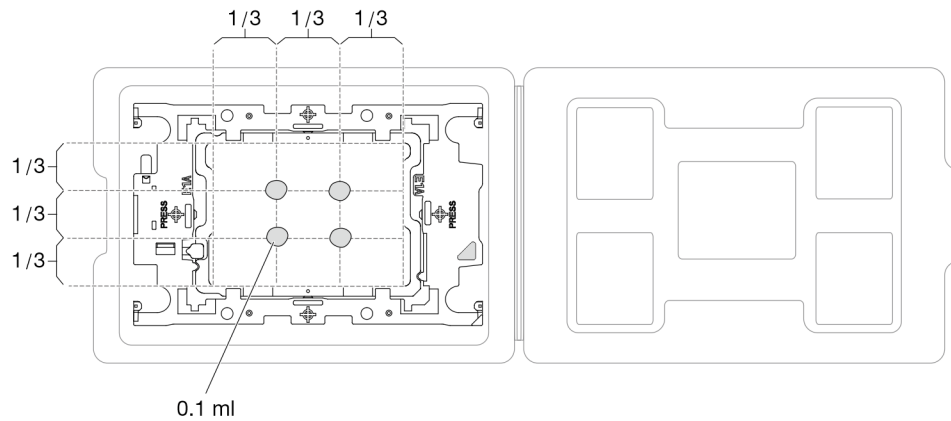
### Step 3. Apply thermal grease.

- If you are replacing the heat sink and reusing the processor, a new heat sink comes with thermal grease and you do not need to apply new thermal grease.

**Note:** To ensure the best performance, check the manufacturing date on the new heat sink and make sure it does not exceed two years. Otherwise, wipe off the existing thermal grease and apply new thermal grease.

- If you are replacing the processor and reusing the heat sink, do the following steps to apply thermal grease:
  1. If there is any old thermal grease on the heat sink, wipe off the thermal grease with an alcohol cleaning pad.

2. Carefully place the processor and carrier in the shipping tray with the processor-contact side down. Make sure the triangular mark on the carrier is oriented in the shipping tray as shown below.
3. Apply the thermal grease on the top of the processor with syringe by forming four uniformly spaced dots, while each dot consists of about 0.1 ml of thermal grease.



*Figure 227. Thermal grease application with processor in shipping tray*

Step 4. Assemble the processor and heat sink.

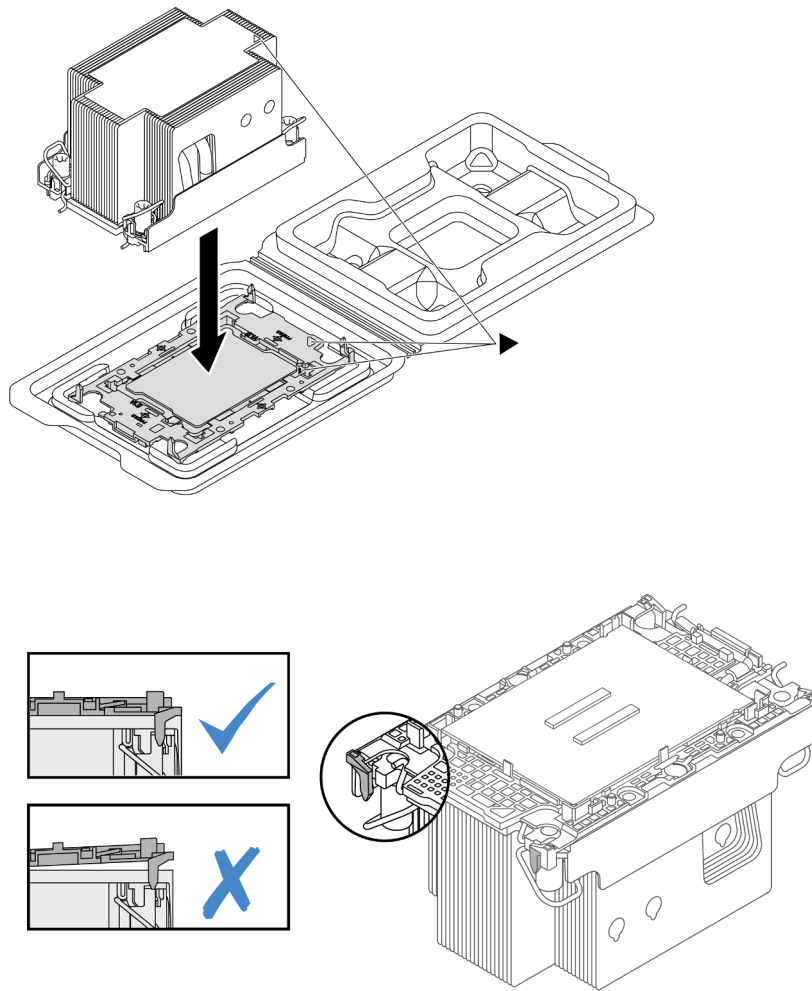


Figure 228. Assembling the PHM with processor in shipping tray

- a. Align the triangular mark on the heat sink label with the triangular mark on the processor carrier and processor.
- b. Install the heat sink onto the processor-carrier.
- c. Press the carrier into place until the clips at all four corners engage. Visually inspect to make sure that there is no gap between the processor carrier and the heat sink.

Step 5. Install the processor-heat-sink module into the processor socket.

**Notes:**

- Do not touch the contacts on the bottom of the processor.
- If the processor socket is covered with a PHM filler and socket cover, remove them first. Keep the processor socket clean from any object to prevent possible damages.

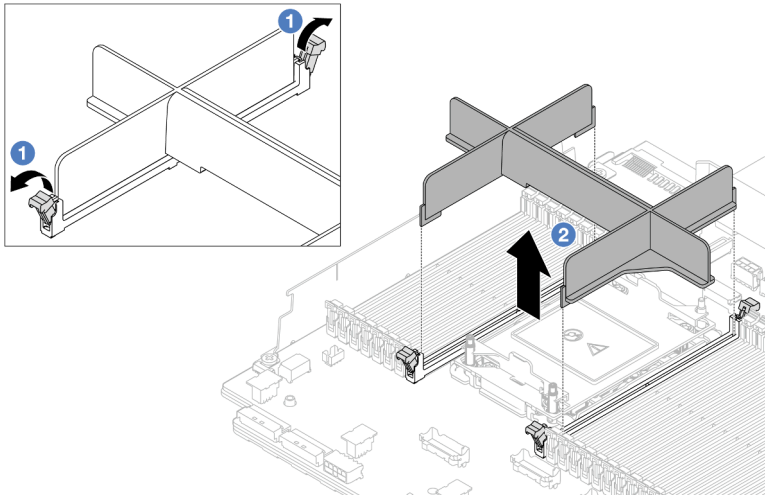


Figure 229. Removing a PHM filler

- The procedure of replacing an entry PHM is the same as that of replacing a standard PHM.

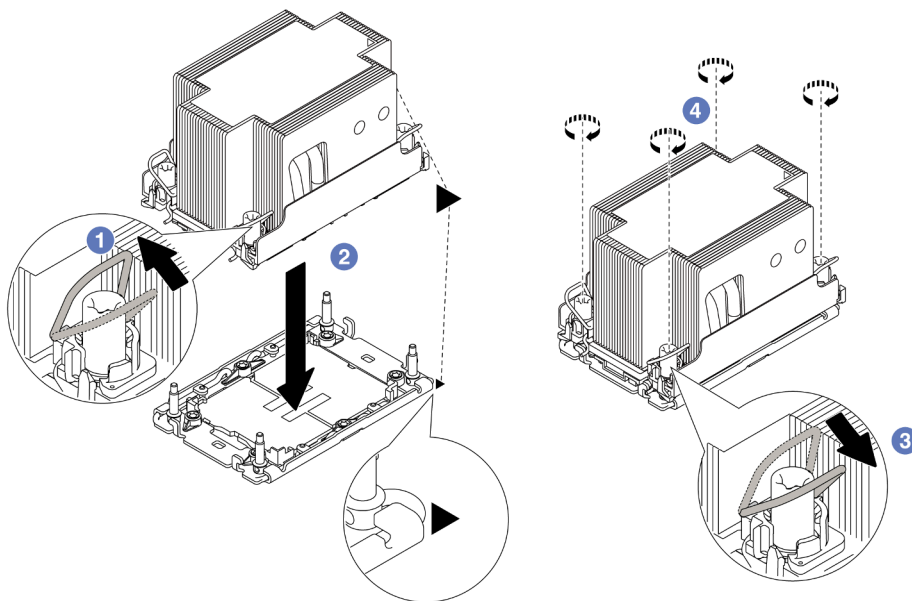


Figure 230. Installing a standard PHM



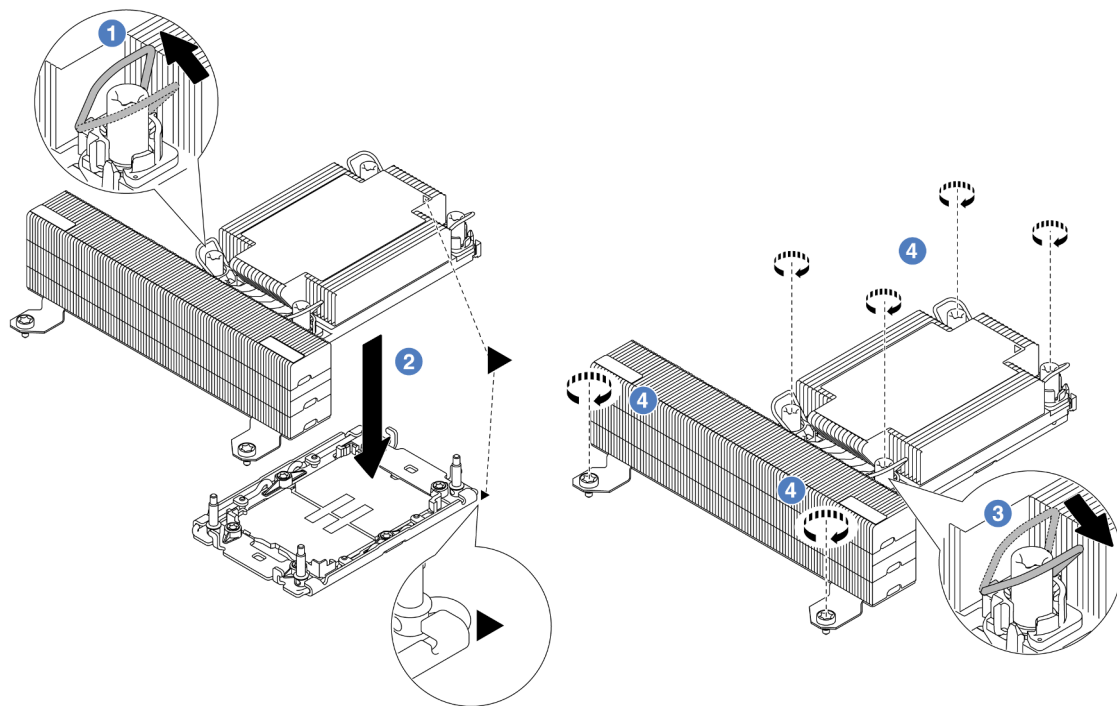


Figure 231. Installing a T-shape performance PHM

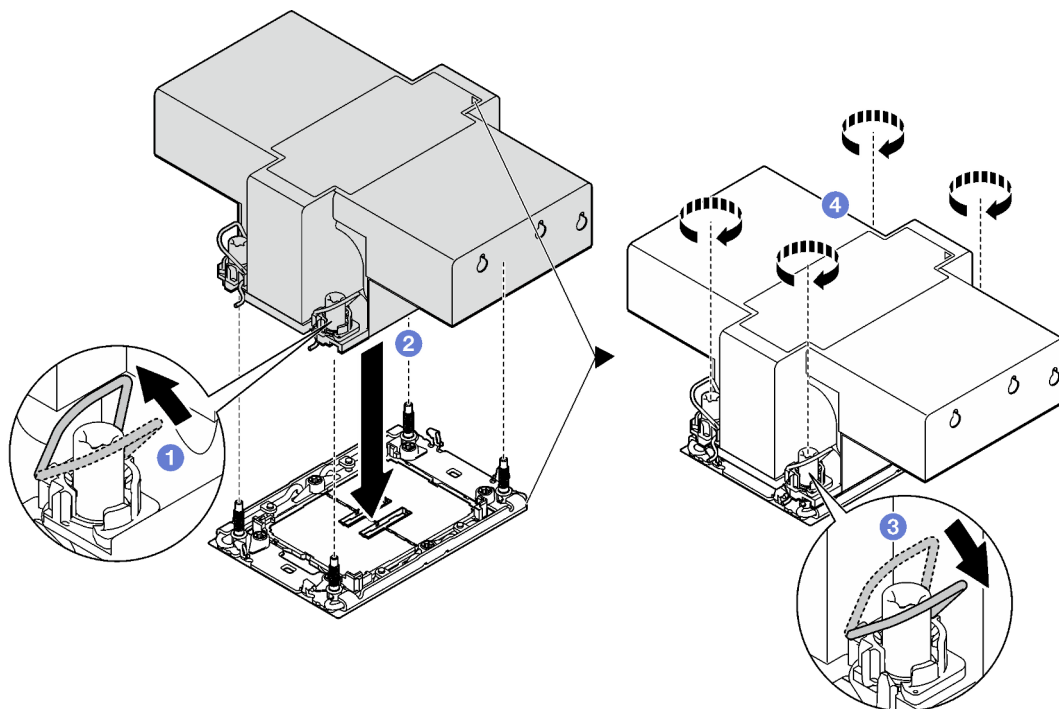


Figure 232. Installing a winged heat sink

- a. ① Rotate the anti-tilt wire bails inward.
- b. ② Align the triangular mark and four Torx T30 nuts on the PHM with the triangular mark and threaded posts of the processor socket; then, insert the PHM into the processor socket.

- c. ③ Rotate the anti-tilt wire bails outward until they engage with the hooks in the socket.
- d. ④ Fully tighten the Torx T30 nuts *in the installation sequence shown* on the heat-sink label. Tighten the screws until they stop; then, visually inspect to make sure that there is no gap between the screw shoulder beneath the heat sink and the processor socket. (For reference, the torque required for the fasteners to fully tighten is 0.9-1.3 newton-meters, 8-12 inch-pounds).

## After you finish

1. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).
2. To enable Intel® On Demand Suite to the new processor, or to transfer Intel® On Demand Suite from the defective processor to the new processor, refer to [“Enable Intel® On Demand” on page 698](#).

## Demo video

[Watch the procedure on YouTube](#)

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## PSU air baffle replacement

Use this information to remove and install a power-supply-unit (PSU) air baffle.

**Notes:** The PSU air baffle is needed in the following configurations:

- storage configurations or 16 x 2.5" + FIO configurations with two processors and 2U entry or 2U standard heat sinks
- standard or GPU configurations with two processors (TDP > 150 W) and 2U entry or 2U standard heat sinks

FIO = riser 5 + front OCP

- [“Remove a PSU air baffle” on page 282](#)
- [“Install a PSU air baffle” on page 283](#)

## Remove a PSU air baffle

Use this information to remove a PSU air baffle.

## 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.**

**Attention:** Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).

## 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 88](#).
- b. Remove the top cover. See [“Remove the top cover” on page 381](#).
- c. Disconnect the cables adjacent to the PSU air baffle. For proper operation guidelines, see [Chapter 6 “Internal cable routing” on page 385](#).

Step 2. Remove the PSU air baffle.

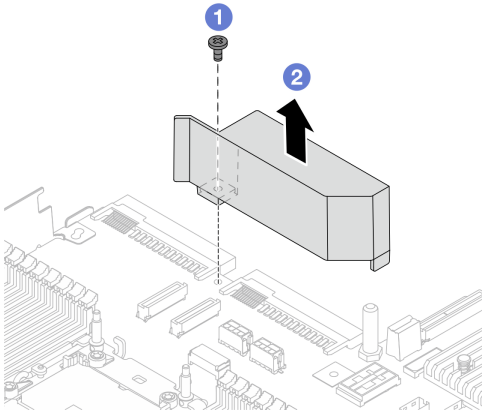


Figure 233. Removing the PSU air baffle

- 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.

## Install a PSU air baffle

Use this information to install a PSU air baffle.

## 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.**

**Attention:** Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).

## Procedure

Step 1. Install the PSU air baffle.

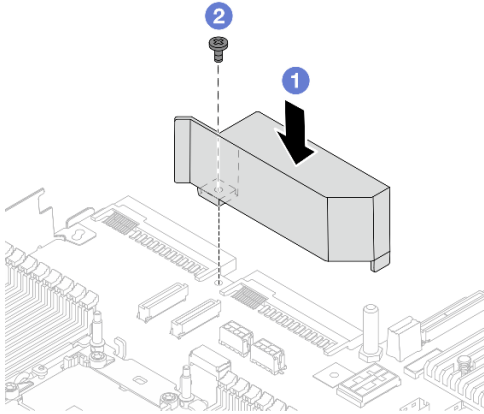


Figure 234. Installing the PSU air baffle

- a. **1** Align the screw holes on the air baffle and the chassis, and put the air baffle down.
- b. **2** Tighten the screw and ensure that the air baffle is secured in place.

Step 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 385](#).

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

---

## Rack latches replacement

Use this information to remove and install the rack latches.

**Note:** Depending on the model, the left rack latch might be assembled with a VGA connector and the right rack latch might be assembled with the front I/O module.

- [“Remove the rack latches” on page 284](#)
- [“Install the rack latches” on page 287](#)

## Remove the rack latches

Use this information to remove the rack latches.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).

- 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 [“Remove the server from rack” on page 88](#).
- Step 2. If the server is installed with the security bezel, remove it first. See [“Remove the security bezel” on page 352](#).
- Step 3. Disconnect the VGA cable, the front-I/O-module cable, or both cables from the system board assembly.

### 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.

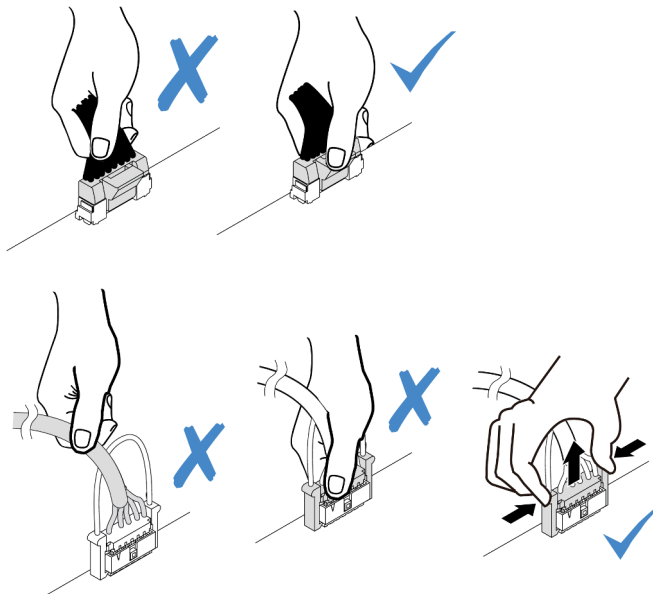
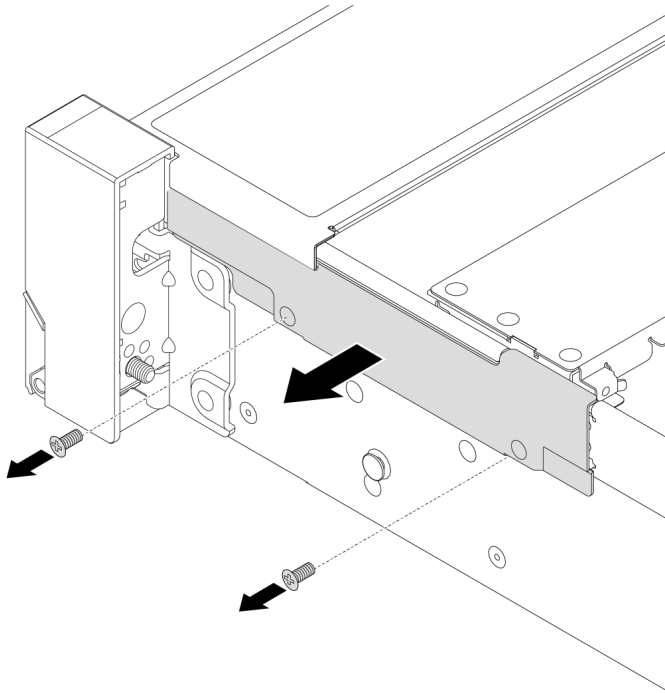


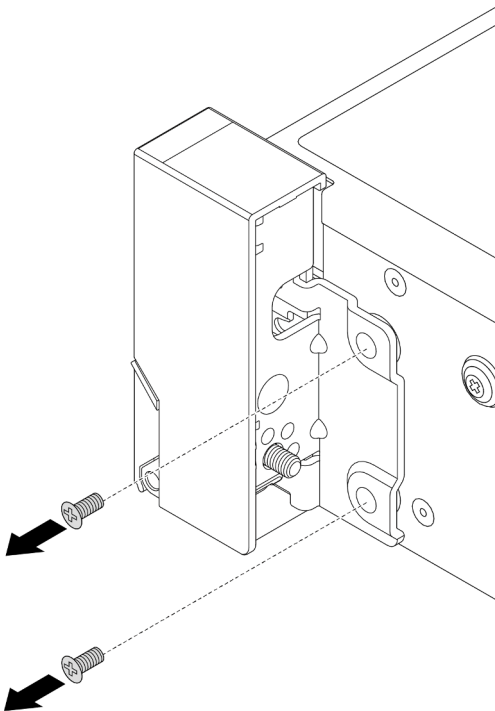
Figure 235. Disconnecting cables from the system board assembly

- Step 4. Remove the screws that secure the cable retainer on the side of the server. Then, remove the cable retainer from the chassis.



*Figure 236. Cable retainer removal*

Step 5. On each side of the server, remove the screws that secure the rack latch.



*Figure 237. Screws removal*

Step 6. On each side of the server, slide the rack latch forward slightly and then remove the rack latch from the chassis.

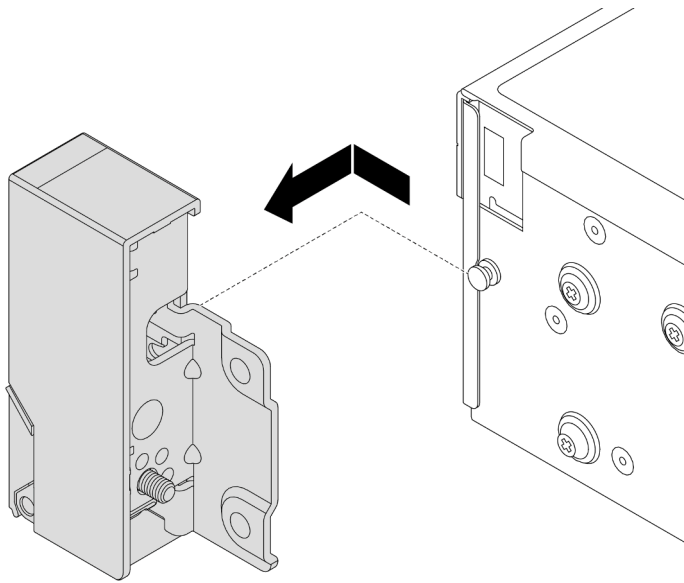


Figure 238. Rack latch removal

## 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

[Watch the procedure on YouTube](#)

## Install the rack latches

Use this information to install the rack latches.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 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. 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 backward.

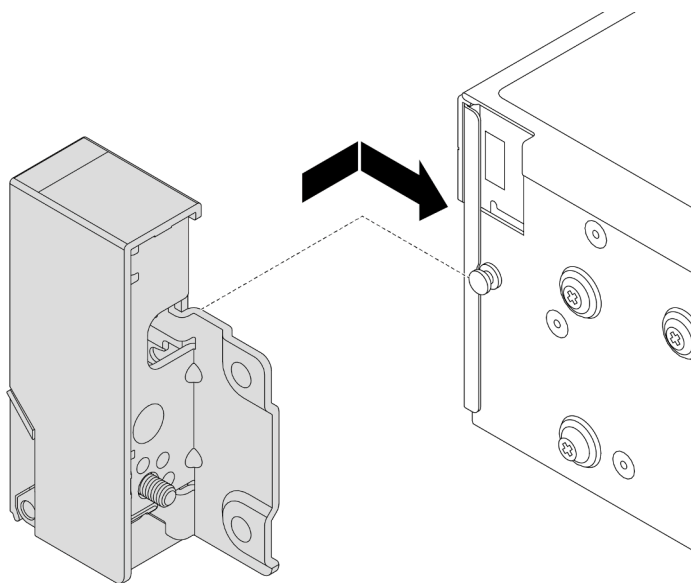


Figure 239. Rack latch installation

Step 3. Install the screws to secure the rack latch on each side of the server.

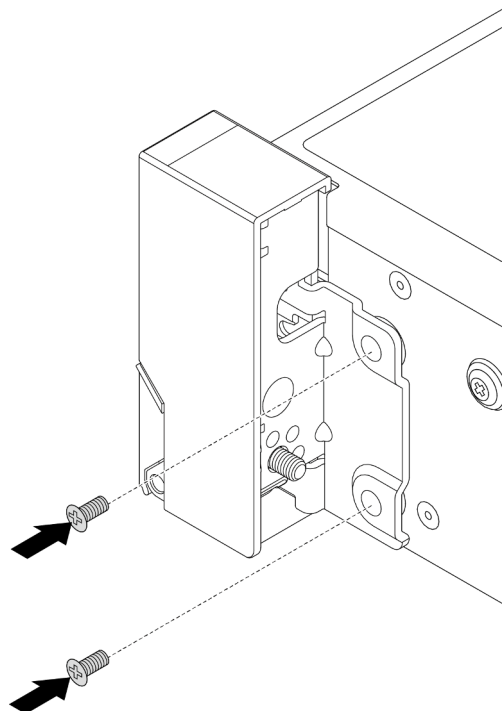


Figure 240. Screws installation

Step 4. Route the bundle cable for I/O connectors on the right or left latches as shown. Then, install the screws to secure the cable retainer.

**Note:** To avoid unnecessary damage to the bundle cable, ensure that it is routed and fixed on the upper frame of the cable retainer and does not cover the screw holes.



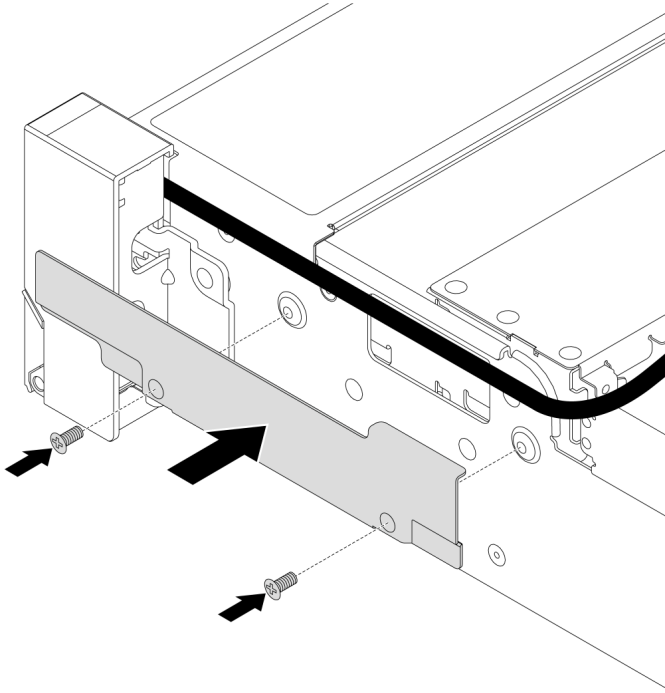


Figure 241. Cable retainer installation

Step 5. Connect the cables to the system board assembly. See [Chapter 6 “Internal cable routing” on page 385](#).

### After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### Demo video

[Watch the procedure on YouTube](#)

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## RAID flash power module replacement

The RAID flash power module protects the cache memory on the installed RAID adapter. Use this information to remove and install a RAID flash power module (also called supercap).

The location of RAID flash power modules varies by the server hardware configurations.

Table 38. Location of RAID flash power modules



- “Remove a RAID flash power module from the chassis” on page 290
- “Install a RAID flash power module on the chassis” on page 292
- “Remove a RAID flash power module from the air baffle” on page 294
- “Install a RAID flash power module on the air baffle” on page 295
- “Remove a RAID flash power module from the middle 2.5-inch drive cage” on page 296
- “Install a RAID flash power module on the middle drive cage” on page 297

## Remove a RAID flash power module from the chassis

Use this information to remove a RAID flash power module (supercap) from the chassis.

### About this task

#### Attention:

- Read “Installation Guidelines” on page 57 and “Safety inspection checklist” on page 58 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 88.

- 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.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.

## Procedure

Step 1. Make preparation for the task.

- 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 88](#).
- Remove the top cover. See [“Remove the top cover” on page 381](#).
- Disconnect the cable of the RAID flash power module.

Step 2. Remove the RAID flash power module.

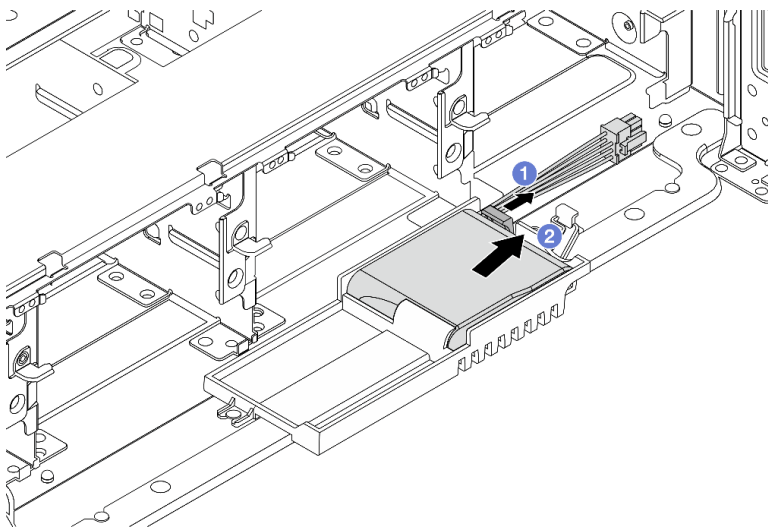


Figure 246. RAID flash power module removal

- ① Open the retention clip on the supercap holder.
- ② Take the RAID flash power module out of the holder.

Step 3. Remove the supercap holder as shown if necessary.

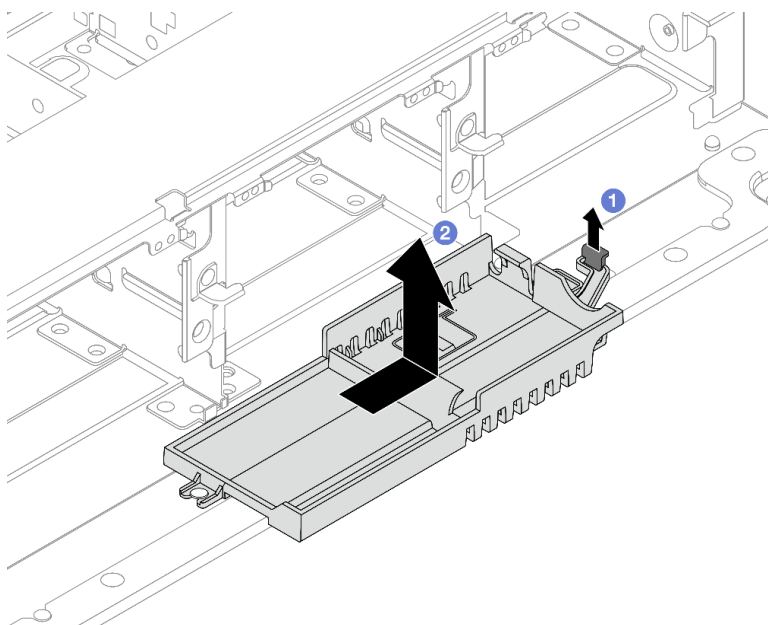


Figure 247. Supercap holder removal

- a. ① Lift the latch.
- b. ② Slide the supercap holder in the shown direction and 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.

## Install a RAID flash power module on the chassis

Use this information to install a RAID flash power module (also called supercap) on the chassis.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 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. Install the supercap holder if you have removed.

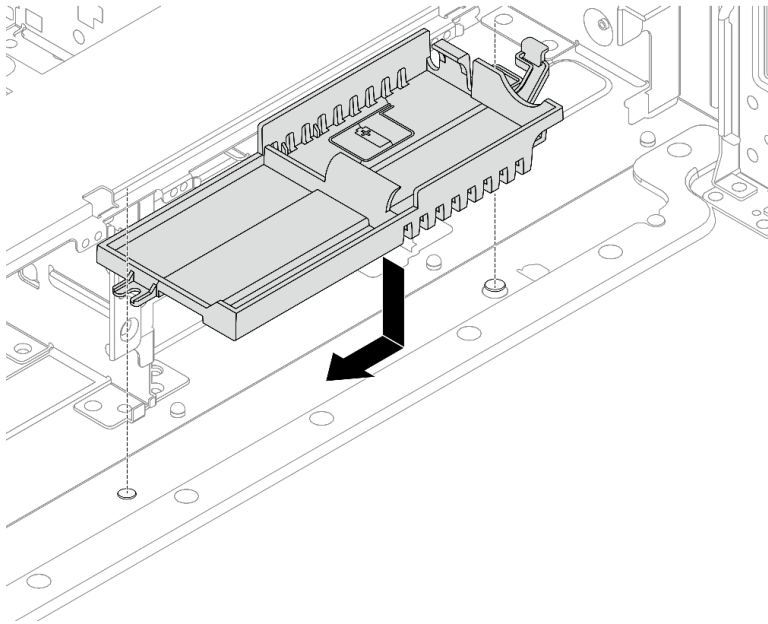


Figure 248. Supercap holder installation

- a. Align the keyhole on the supercap holder with the pin on the chassis, and lower the supercap holder into the chassis.
- b. Slide the supercap holder in the shown direction until it clicks into place.

Step 3. Install the RAID flash power module.

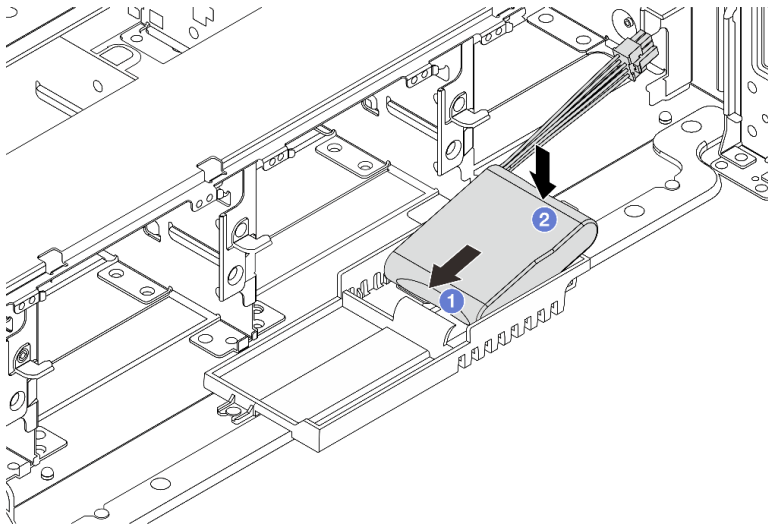


Figure 249. RAID flash power module installation

- a. ① Insert the RAID flash power module into the retaining clip at one side as shown.
- b. ② Press the RAID flash power module down on the other side until it snaps into place.

Step 4. Connect the RAID flash power module to an adapter with the extension cable that comes with the RAID flash power module. See [Chapter 6 “Internal cable routing” on page 385](#).

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#)

## Remove a RAID flash power module from the air baffle

Use this information to remove a RAID flash power module (also called supercap) from the air baffle.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.

### 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 88](#).
- b. Remove the top cover. See [“Remove the top cover” on page 381](#).
- c. Disconnect the cable of the RAID flash power module.

Step 2. Remove the RAID flash power module from the air baffle.

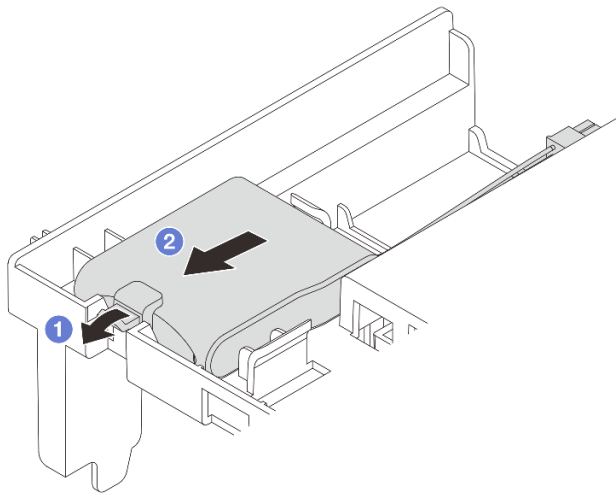


Figure 250. RAID flash power module removal

- 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.

### 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 a RAID flash power module on the air baffle

Use this information to install a RAID flash power module (also called supercap) on the air baffle.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 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. Install the RAID flash power module.

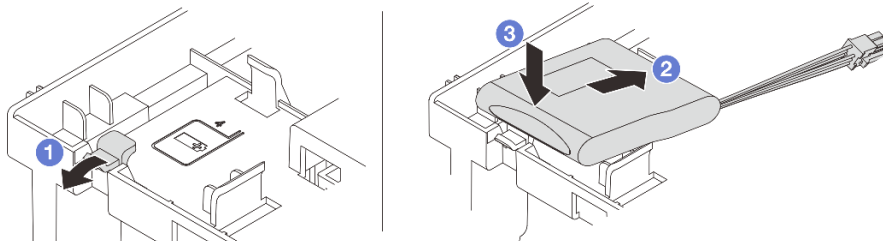


Figure 251. RAID flash power module installation (on the air baffle)

- a. ① Open the retention clip on the holder.
  - b. ② Put a RAID flash power module into the holder.
  - c. ③ Press it down to secure it into the holder.
- Step 3. Connect the RAID flash power module to an adapter with the extension cable that comes with the RAID flash power module. See [Chapter 6 “Internal cable routing” on page 385](#).

### After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### Demo video

[Watch the procedure on YouTube](#)

## Remove a RAID flash power module from the middle 2.5-inch drive cage

Use this information to remove a RAID flash power module (also called supercap) from the middle 2.5-inch drive cage.

### About this task

#### Attention:

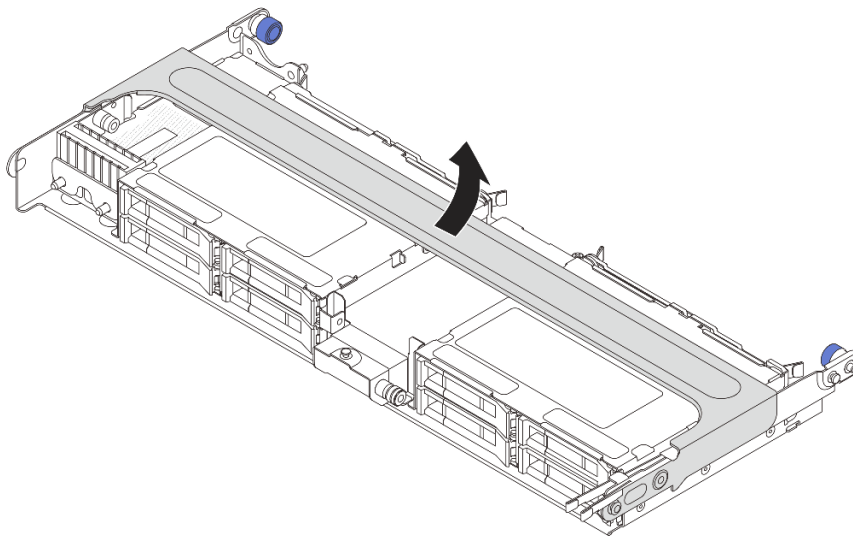
- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See [“Power off the server” on page 88](#).
- Prevent exposure to static 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.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.

### 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 88](#).
- b. Remove the top cover. See [“Remove the top cover” on page 381](#).
- c. Disconnect the cable of the RAID flash power module.

Step 2. Open the drive cage handle.



*Figure 252. Opening the handle of the middle drive cage*

Step 3. Remove the rubber on the cover of the supercap holder.



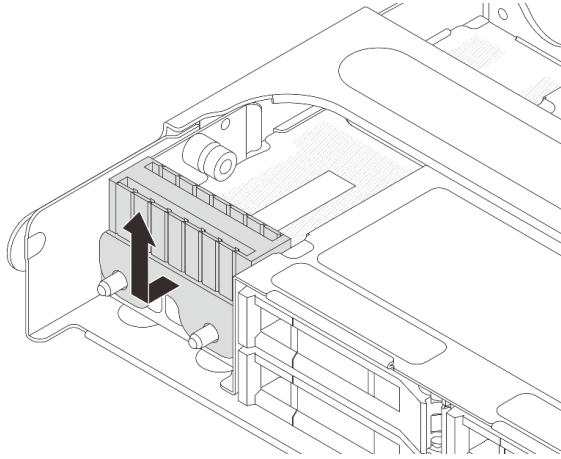


Figure 253. Rubber removal

Step 4. Remove the RAID flash power module from the supercap holder.

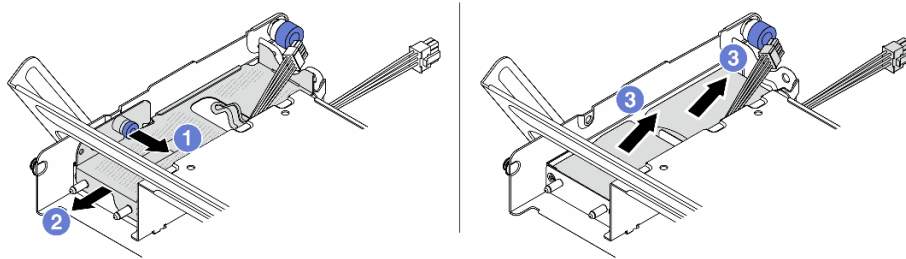


Figure 254. Removing the RAID flash power module

- a. ① Pull out the blue latch on the supercap cover.
- b. ② Slide the cover out of the holder.
- c. ③ 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

[Watch the procedure on YouTube](#)

## Install a RAID flash power module on the middle drive cage

Use this information to install a RAID flash power module (also called supercap) on the middle 2.5-inch drive cage.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 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. Install the RAID flash power module.

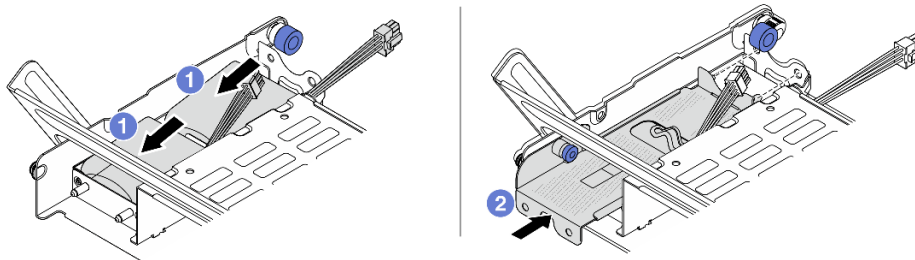


Figure 255. Installing the RAID flash power module

- 1 Put a RAID flash power module into the holder, and press it down to secure it into the holder.
- 2 Align the holes in the metal cover with the pins on the supercap holder, pull out the blue latch on the cover, and slide the cover into the holder until the pins pass through the holes. Then, release the blue latch to lock the cover into place.

Step 3. Install the rubber onto the cover of the supercap holder.

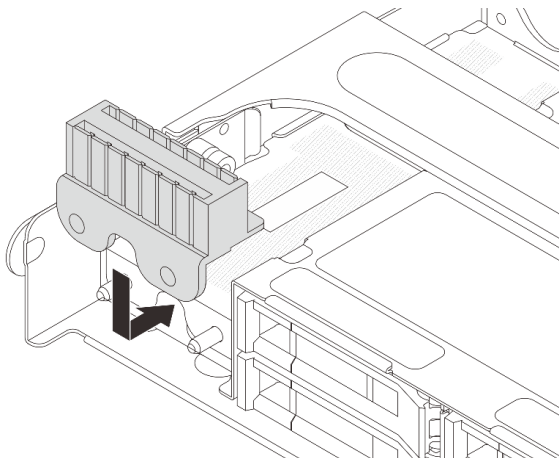


Figure 256. Rubber installation

Step 4. Connect the RAID flash power module to an adapter with the extension cable that comes with the RAID flash power module. See [Chapter 6 “Internal cable routing” on page 385](#).

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### Demo video

[Watch the procedure on YouTube](#)

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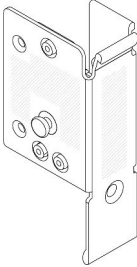
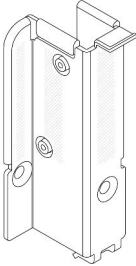
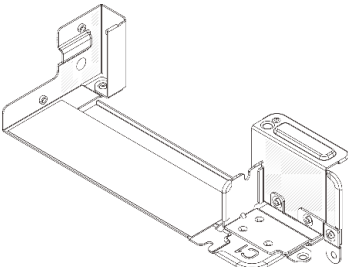
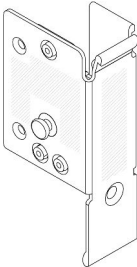
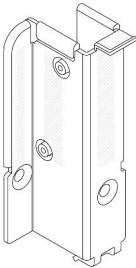
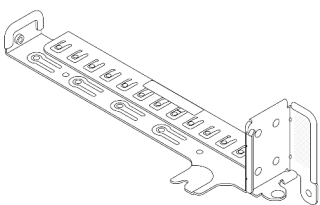
## Rearwall bracket replacement

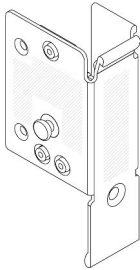
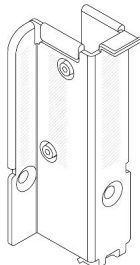
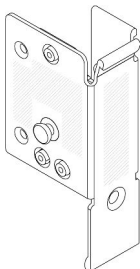
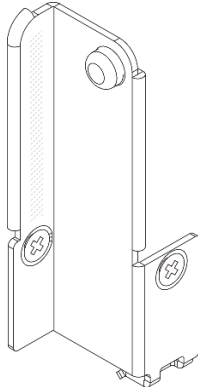
Use this information to remove and install a rearwall bracket.

The rearwall brackets vary by server rear configurations. This topic uses the A1, B1, and C1 brackets as an example for replacement illustration. The replacement procedure is the same for B2 and C2 brackets.

- [“Remove a rearwall bracket” on page 300](#)
- [“Install a rearwall bracket” on page 302](#)

### Rearwall bracket matrix

Server rear config.	Required rearwall brackets		
Configuration with 8 PCIe slots	A1 rearwall bracket on the left 	B1 rearwall bracket on the middle 	C1 rearwall bracket on the right 
Configuration with 4 x 2.5-inch rear drives	A1 rearwall bracket on the left 	B1 rearwall bracket on the middle 	C2 rearwall bracket on the right 

Server rear config.	Required rearwall brackets	
Configuration with 2 x 3.5-inch rear drives	A1 rearwall bracket on the left 	B1 rearwall bracket on the middle 
Configuration with 8 x 2.5-inch rear drives	A1 rearwall bracket on the left 	B2 rearwall bracket on the middle 
Configuration with 4 x 3.5-inch rear drives	The server requires no rearwall brackets	

## Remove a rearwall bracket

Use this information to remove a rearwall bracket.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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. Make preparation for the task.

- 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 88](#).

- b. Remove the top cover. See [“Remove the top cover” on page 381](#).
- c. Remove the riser assembly or rear drive cage.
  - [“Rear PCIe adapter and riser assembly replacement” on page 331](#)
  - [“Rear drive backplane and drive cage replacement” on page 312](#)

Step 2. Remove the rearwall bracket.

- a. ① Remove the screws.
- b. ② Remove the bracket from the chassis as shown.

**Note:** The illustrations show removing the A1, B1, and C1 rearwall brackets. The procedure is the same for removing other rearwall brackets.

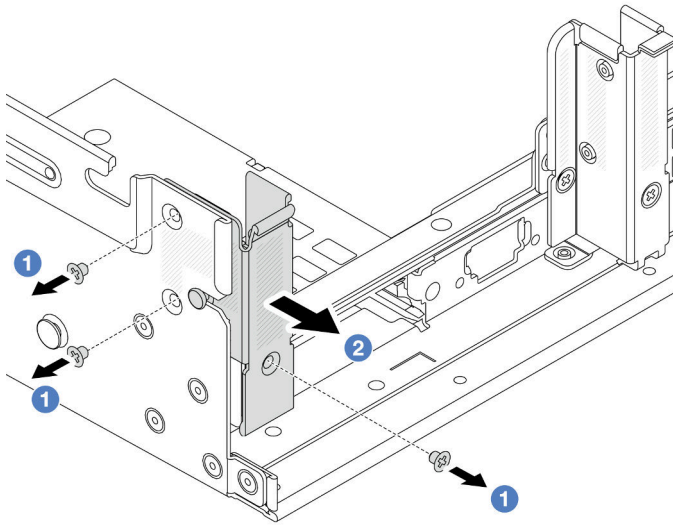


Figure 257. A1 rearwall bracket removal (left)

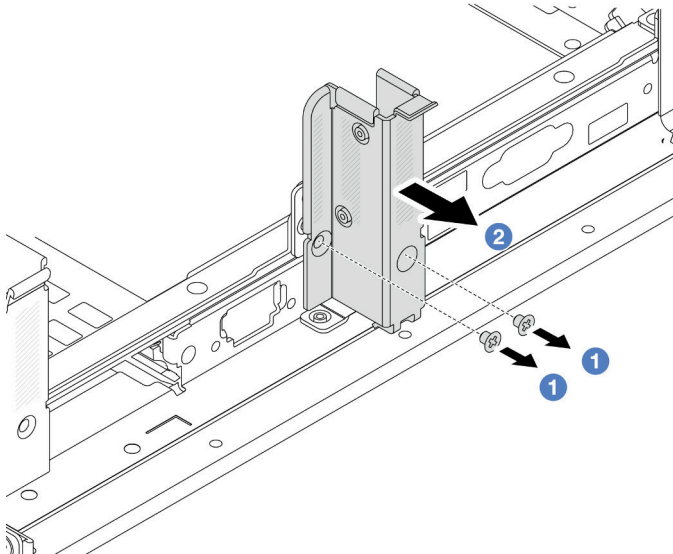


Figure 258. B1 rearwall bracket removal (middle)

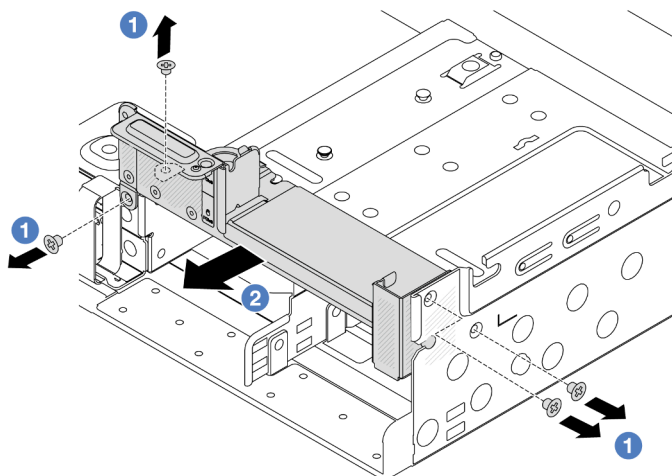


Figure 259. C1 rearwall bracket removal (right)

## After you finish

1. Install required rearwall brackets back to the rear chassis.
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 a rearwall bracket

Use this information to install a rearwall bracket.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 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. Install the rearwall brackets.
  - a. **1** Align the rearwall bracket with the chassis, and insert the bracket into place.
  - b. **2** Install the screws to secure the rearwall bracket.

**Note:** The illustrations show installing the A1, B1, and C1 rearwall brackets. The procedure is the same for installing other rearwall brackets.

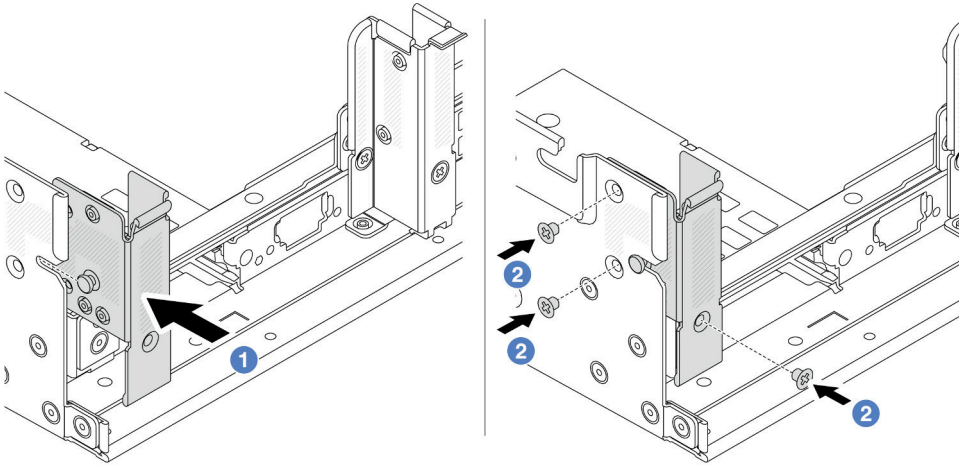


Figure 260. A1 rearwall bracket installation (left)

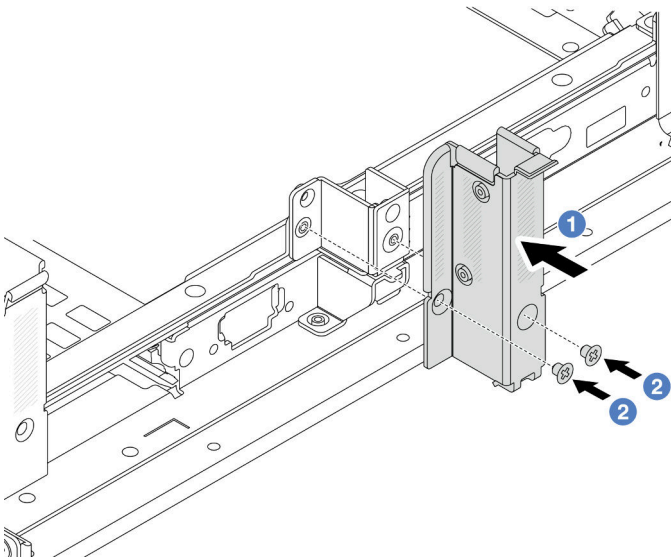


Figure 261. B1 rearwall bracket installation (middle)

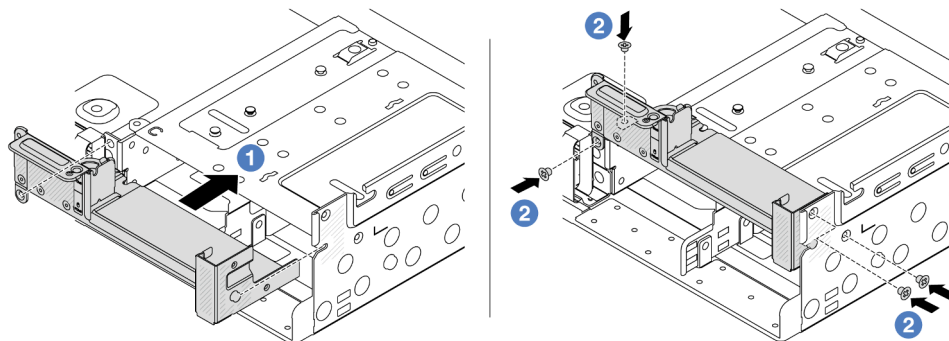


Figure 262. C1 rearwall bracket installation (right)

## After you finish

1. Install a rear drive cage or riser assemblies.
  - [“Rear PCIe adapter and riser assembly replacement” on page 331](#)
  - [“Rear drive backplane and drive cage replacement” on page 312](#)
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

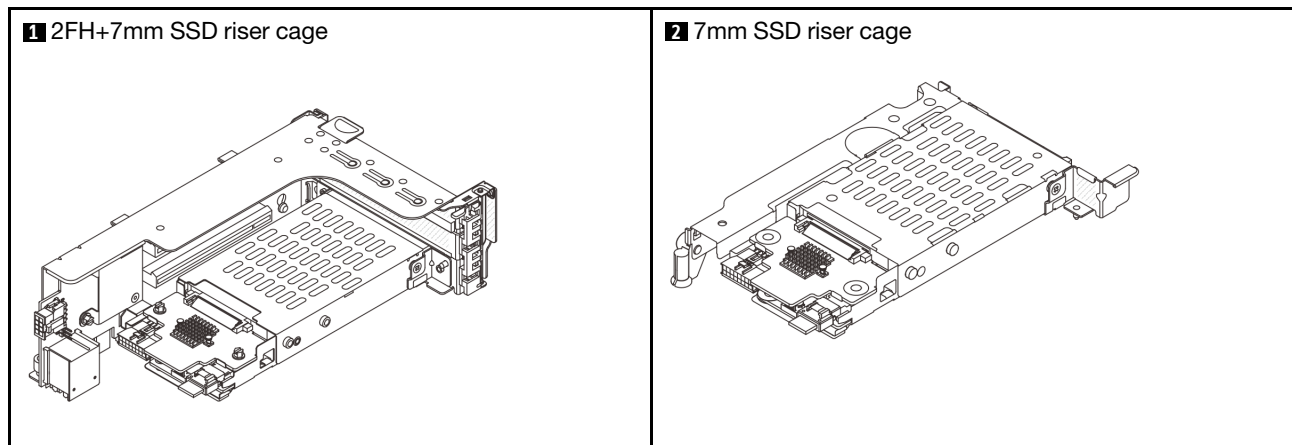
[Watch the procedure on YouTube](#)

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## Rear 7mm drive backplane and drive cage replacement

Use this information to remove and install the rear 7mm drive backplanes and drive cage.

Depending on server configuration, the server supports one of the below rear 7mm drive cages. The replacement procedures for both drive cages and drive backplanes are similar. For 7mm drive cage installation rules, see [“PCIe slots and PCIe adapters” on page 68](#).



- [“Remove the 7mm drive cage” on page 304](#)
- [“Remove the 7mm drive backplanes” on page 307](#)
- [“Install the 7mm drive backplanes” on page 308](#)
- [“Install the 7mm drive cage” on page 310](#)

## Remove the 7mm drive cage

Use this information to remove the 7mm drive cage.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).



- 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.
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.
- If one or more NVMe solid-state drives are to be removed, it is recommended to disable them beforehand via the operating system.

## Procedure

Step 1. Make preparation for the task.

- 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 88](#).
- Remove the top cover. See [“Remove the top cover” on page 381](#).
- Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 96](#).
- Record the cable connections for 7mm drives and then disconnect all cables from the backplanes.

Step 2. Remove the riser assembly with 7mm drive cage from the chassis.

- **2FH+7mm SSD riser cage**

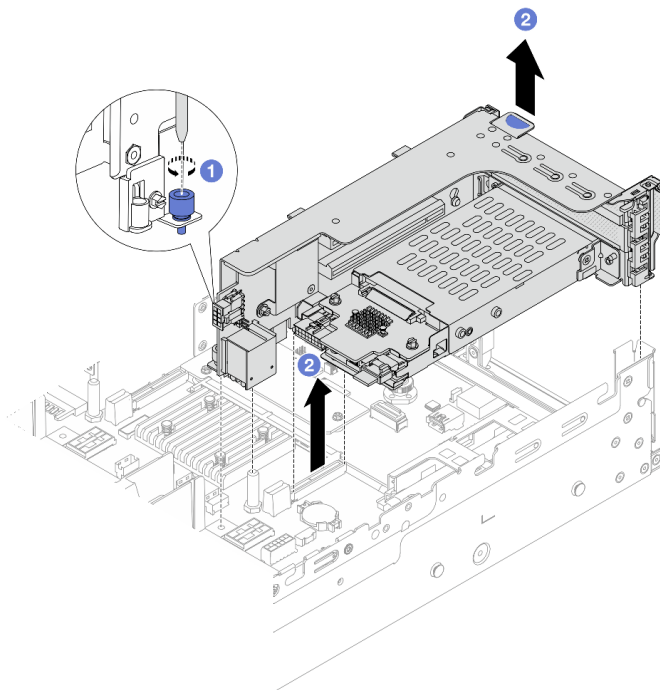


Figure 263. 2FH+7mm SSD riser cage removal

- ① Loosen the screw of the riser cage.
- ② Carefully lift the riser assembly up from the chassis.

- 7mm SSD riser cage

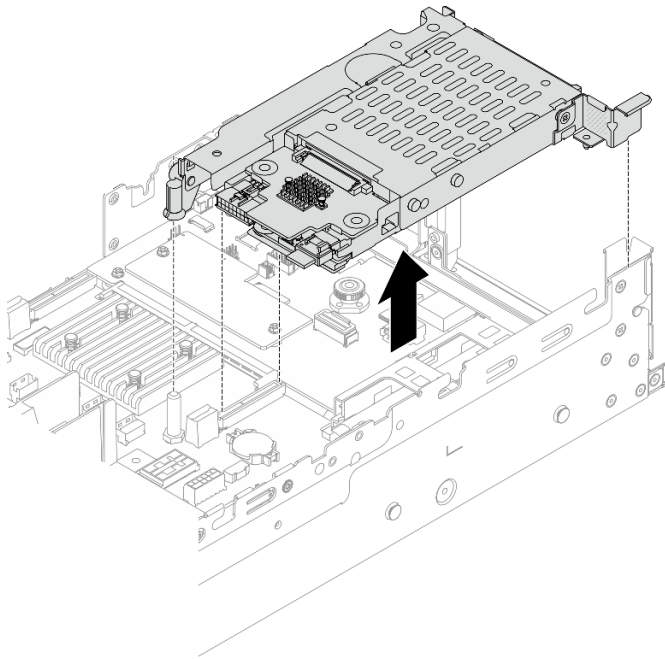


Figure 264. 7mm SSD riser cage removal

Step 3. (Only for the 2FH+7mm SSD riser cage) Remove the 7mm drive cage from the riser assembly.

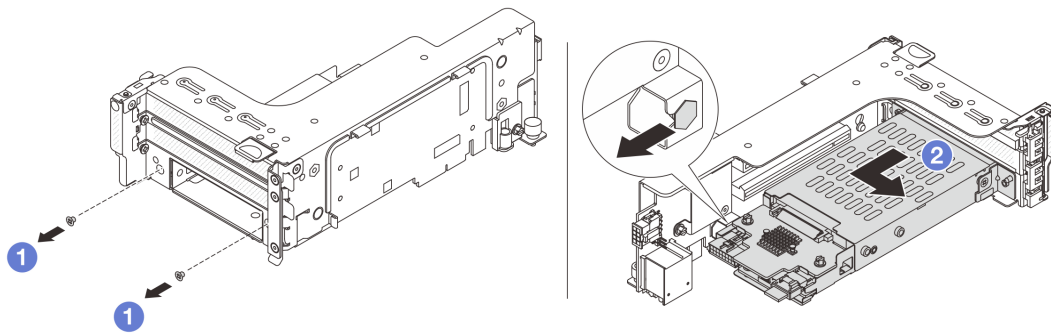


Figure 265. 7mm drive cage removal

- 1 Remove the two screws.
- 2 Slightly and horizontally slide the cage out of the riser cage.

## After you finish

Remove the two 7mm backplanes. See [“Remove the 7mm drive backplanes” on page 307](#).

## Demo video

[Watch the procedure on YouTube](#)

## Remove the 7mm drive backplanes

Use this information to remove the 7mm drive backplanes.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.
- If one or more NVMe solid-state drives are to be removed, it is recommended to disable them beforehand via the operating system.

### Procedure

Step 1. Remove the 7mm drive backplane on the top.

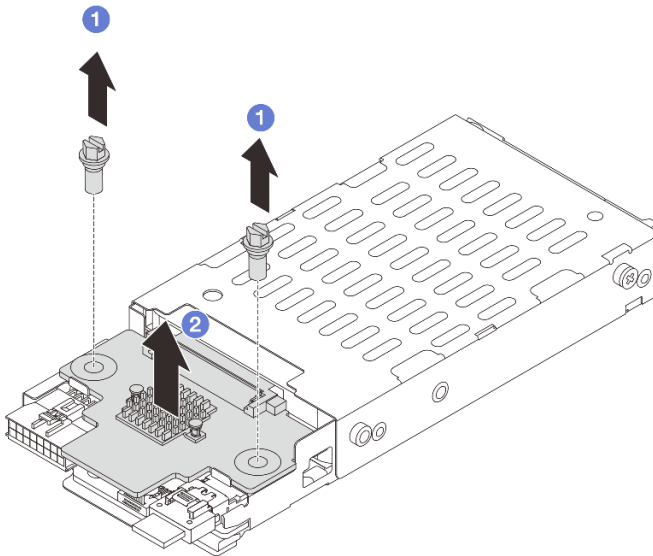


Figure 266. 7mm drive backplane removal (top)

- a. ① Remove the two screws.
- b. ② Vertically lift the backplane up and put it aside.

Step 2. Remove the 7mm drive backplane at the bottom.

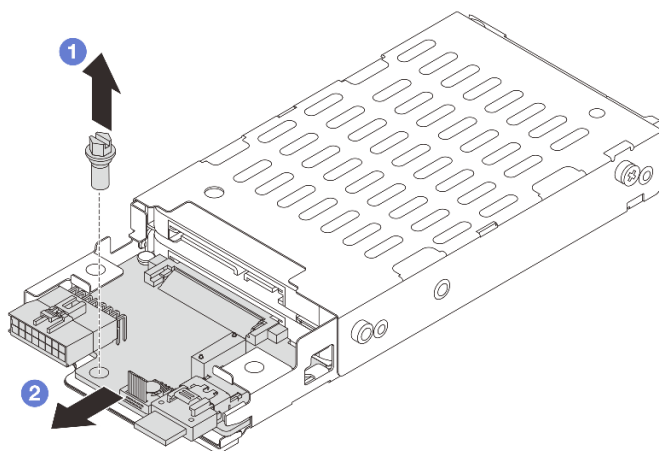


Figure 267. 7mm drive backplane removal (bottom)

- a. ① Remove the screw.
- b. ② Remove the backplane horizontally from the cage as shown.

## After you finish

1. Do one of the following:
  - If you are replacing the backplanes, install new backplanes to the drive cage.
  - If you are replacing the drive cage, install the backplanes to a new drive cage.
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 7mm drive backplanes

Use this information to install the 7mm drive backplanes.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 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. Connect the cables to the backplanes. See [Chapter 6 “Internal cable routing” on page 385](#).
- Step 3. Install the 7mm drive backplane at the bottom.

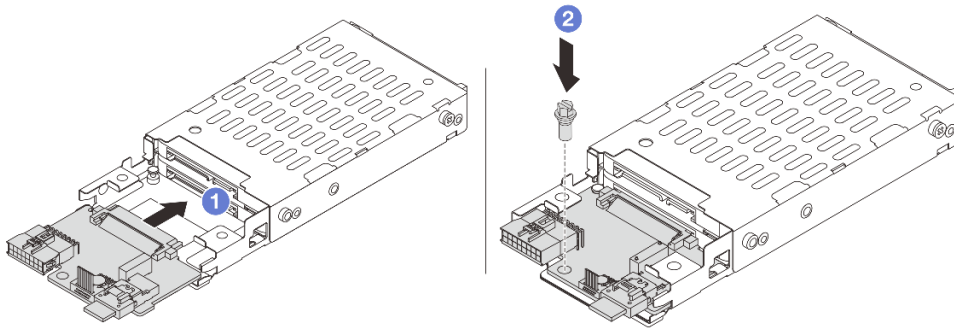


Figure 268. 7mm drive backplane installation (bottom)

- a. ① Align the notch at edge of the backplane with the pin on the cage, and slightly slide the backplane into the cage until it is fully seated.
- b. ② Install the screw to secure it.

- Step 4. Install the 7mm drive backplane on the top.

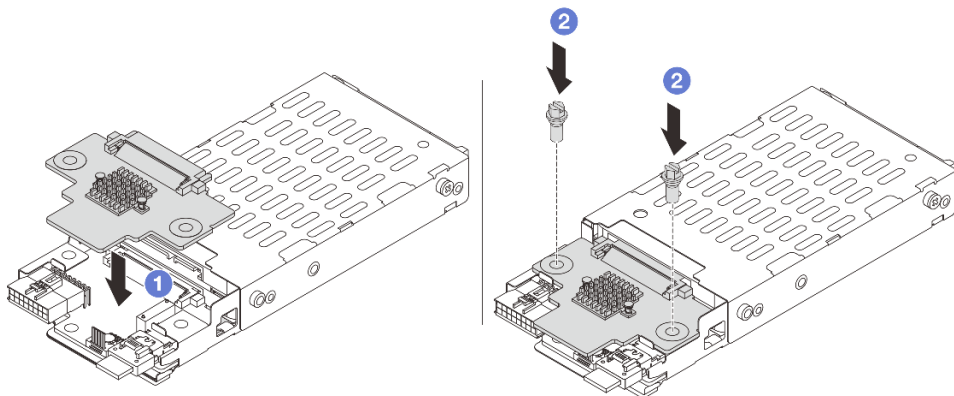


Figure 269. 7mm drive backplane installation (top)

- a. ① Align the holes in the backplane with the holes on the cage, and put the backplane down onto the cage.
- b. ② Install the two screws to secure the backplane in place.

## After you finish

Install the 7mm drive cage. See [“Install the 7mm drive cage” on page 310](#).

### Demo video

[Watch the procedure on YouTube](#)

## Install the 7mm drive cage

Use this information to install the 7mm drive cage.

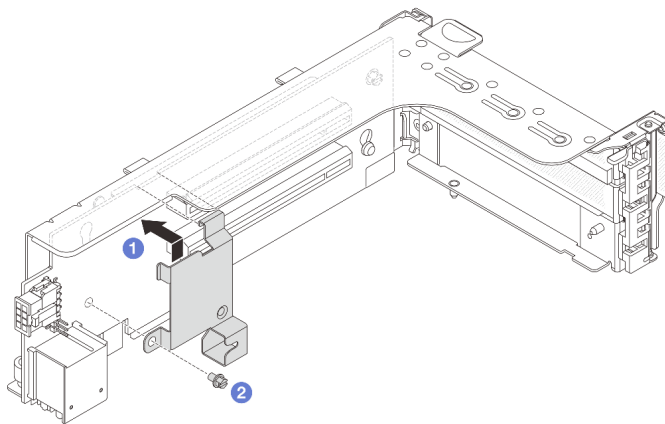
### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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. (Only for the 2FH+7mm SSD riser cage) Hook the securing clip over the riser adapter on the riser cage.



*Figure 270. 7mm drive cage securing clip installation*

Step 2. (Only for the 2FH+7mm SSD riser cage) Install the 7mm drive cage to the riser cage.

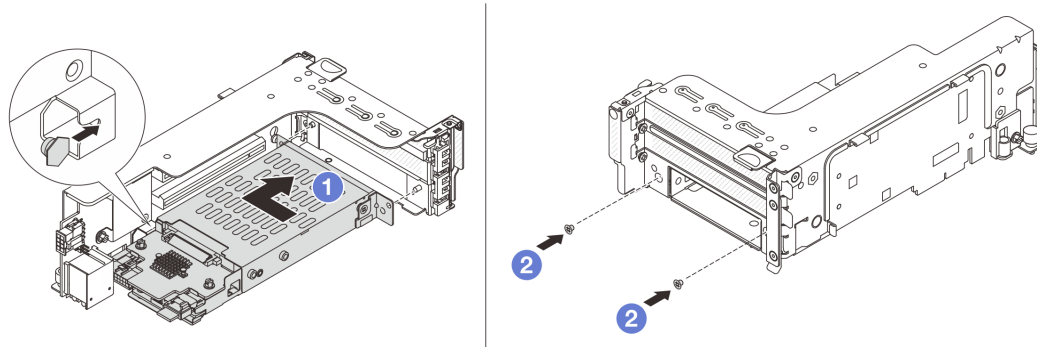


Figure 271. 7mm drive cage installation

- a. ① Align the left-side pin on the 7mm drive cage with the positioning slot on the securing clip, the two holes on the side brackets of the 7mm drive cage with the two holes on the front of the riser cage.
- b. ② Install the two screws to secure the 7mm drive cage in place.

Step 3. Install the 7mm riser assembly to the chassis.

- **2FH+7mm SSD riser cage**

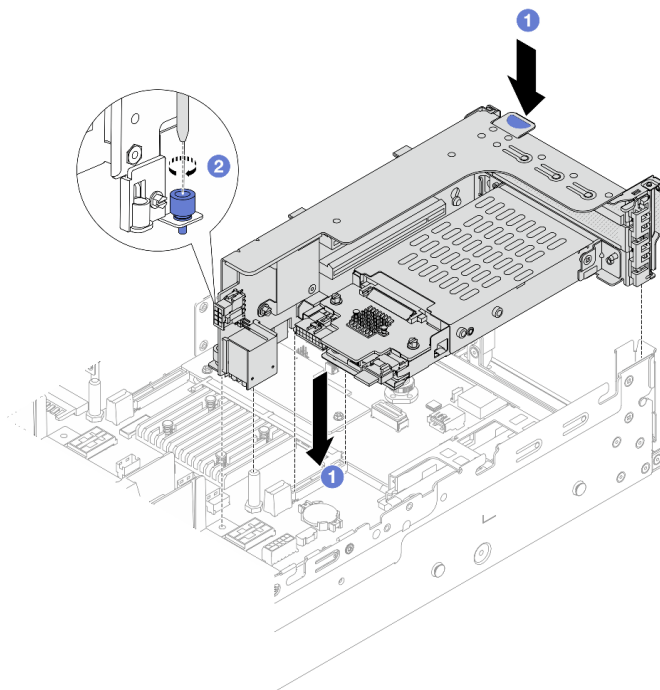


Figure 272. 2FH+7mm SSD riser cage installation

- a. ① Align the riser assembly with the slot on the system board assembly, lower and insert the riser into the riser slot.
- b. ② Tighten the screw to secure the riser assembly in place.

- **7mm SSD riser cage**

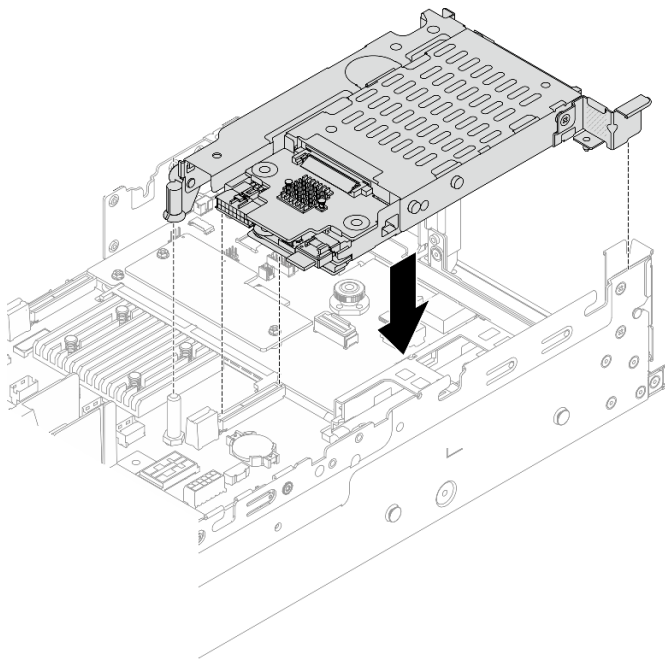


Figure 273. 7mm SSD riser cage installation

Step 4. Connect the cables from the backplanes to the system board assembly. See [Chapter 6 “Internal cable routing” on page 385](#).

### After you finish

1. Reinstall all the drives and fillers (if any) into the drive bays. See [“Install a hot-swap drive” on page 98](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### Demo video

[Watch the procedure on YouTube](#)

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## Rear drive backplane and drive cage replacement

Use this information to remove and install rear drive backplanes and drive cages.

- [“Remove the 4 x 2.5” drive backplane and drive cage” on page 312](#)
- [“Install the 4 x 2.5” drive backplane and drive cage” on page 314](#)
- [“Remove the 8 x 2.5” drive backplane and drive cage” on page 316](#)
- [“Install the 8 x 2.5” drive backplane and drive cage” on page 317](#)
- [“Remove the 2 x 3.5” drive backplane and drive cage” on page 319](#)
- [“Install the 2 x 3.5” drive backplane and drive cage” on page 321](#)
- [“Remove the 4 x 3.5” drive backplane and drive cage” on page 323](#)
- [“Install the 4 x 3.5” drive backplane and drive cage” on page 325](#)

## Remove the 4 x 2.5" drive backplane and drive cage

Use this information to remove the rear 2.5-inch 4-bay drive backplane and drive cage.



## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.
- If one or more NVMe solid-state drives are to be removed, it is recommended to disable them beforehand via the operating system.

### 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 88](#).
- b. Remove the top cover. See [“Remove the top cover” on page 381](#).
- c. Disconnect cables from the rear drive backplane.
- d. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 96](#).

Step 2. Remove the rear drive cage.

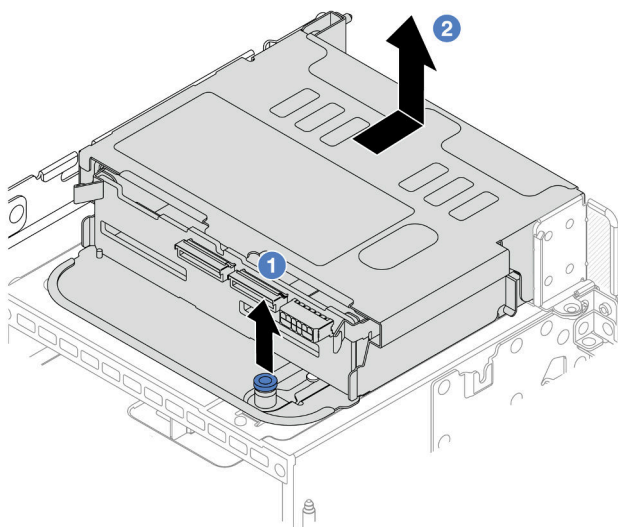


Figure 274. Removing the 4 x 2.5-inch rear drive cage

- a. ① Twist and pull out the blue plungers.
- b. ② Slide the drive cage towards the rear of the chassis to release it.

Step 3. Remove the middle drive backplane.

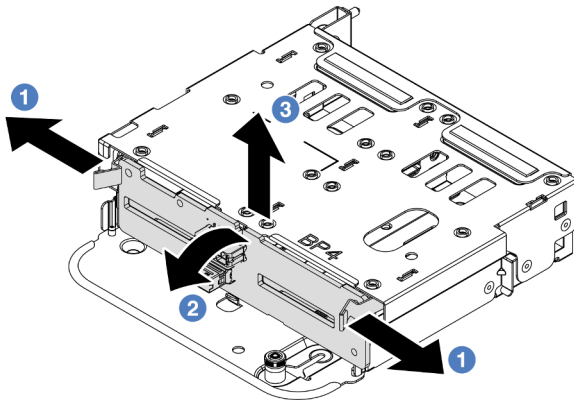


Figure 275. Removing the rear 4 x 2.5-inch drive backplane

- a. ① Open the release latches in the direction as shown.
- b. ② Rotate the backplane from the top to disengage it from the pins on the drive cage.
- c. ③ Carefully lift the backplane out of the drive cage.

## 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 4 x 2.5" drive backplane and drive cage

Use this information to install 2.5-inch 4-bay drive backplane and drive cage.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- The rear drive cage is supported on some server models with thermal requirements. See [“Thermal rules” on page 75](#) to ensure that the server is under permitted ambient temperature and the correct heat sink and system fans are used. If needed, replace your heat sink or system fan first.
  - [“Processor and heat sink replacement \(trained technician only\)” on page 267](#)

- [“System fan replacement” on page 368](#)

## 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. Connect cables to the drive backplane. See [Chapter 6 “Internal cable routing” on page 385](#).
- Step 3. Install the drive backplane into the rear drive cage.

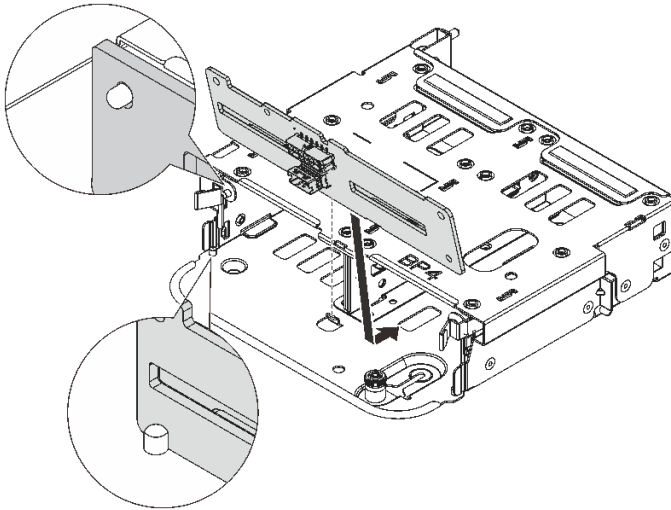


Figure 276. Installing the 4 x 2.5-inch rear drive backplane

- Align the bottom of the backplane with the studs at the bottom of the drive cage.
- Lower the backplane into the drive cage so that the holes in the backplane pass through the pins on the drive cage, and press the backplane into position. The release latches will secure the backplane in place.

- Step 4. Install the rear drive cage.

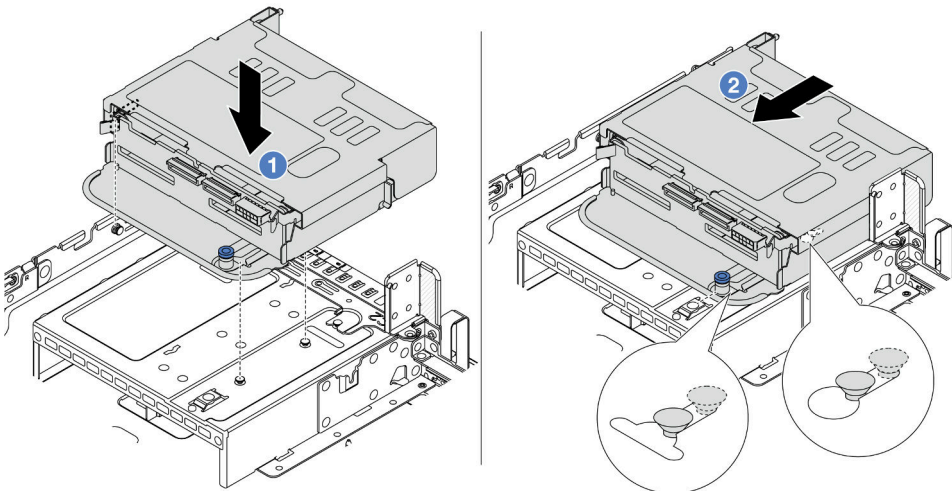


Figure 277. Installing the 4 x 2.5-inch rear drive cage

- a. ① Align the rear drive cage with the chassis, and lower the drive cage into the chassis.
- b. ② Move the rear drive cage forward until it clicks into position.

Step 5. Connect cables from the drive backplanes to the system board or RAID/HBA adapters. See [Chapter 6 “Internal cable routing” on page 385](#).

## After you finish

1. Reinstall the drives or drive fillers into the rear drive cage. See [“Install a hot-swap drive” on page 98](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## Remove the 8 x 2.5" drive backplane and drive cage

Use this information to remove the rear 2.5-inch 8-bay drive backplane and drive cage.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.
- If one or more NVMe solid-state drives are to be removed, it is recommended to disable them beforehand via the operating system.

## 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 88](#).
- b. Remove the top cover. See [“Remove the top cover” on page 381](#).
- c. Disconnect cables from the rear drive backplane.
- d. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 96](#).

Step 2. Remove the rear drive cage.

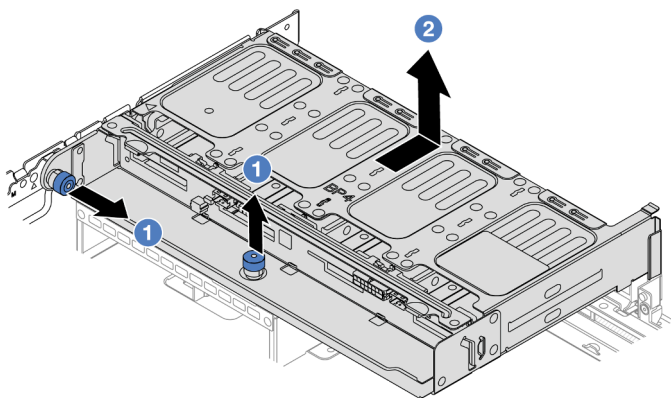


Figure 278. Removing the 8 x 2.5-inch rear drive cage

- a. ① Twist and pull out the blue plungers.
- b. ② Slide the drive cage towards the rear of the chassis to release it.

Step 3. Hold the backplane and carefully lift the backplane out of the drive cage.

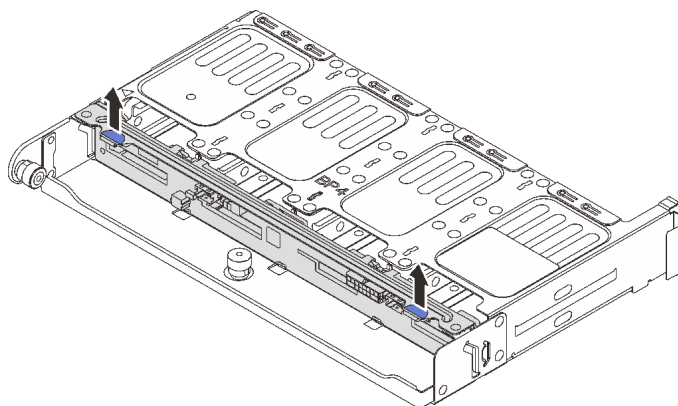


Figure 279. Removing the rear 8 x 2.5-inch drive backplane

## 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 8 x 2.5" drive backplane and drive cage

Use this information to install 2.5-inch 8-bay drive backplane and drive cage.

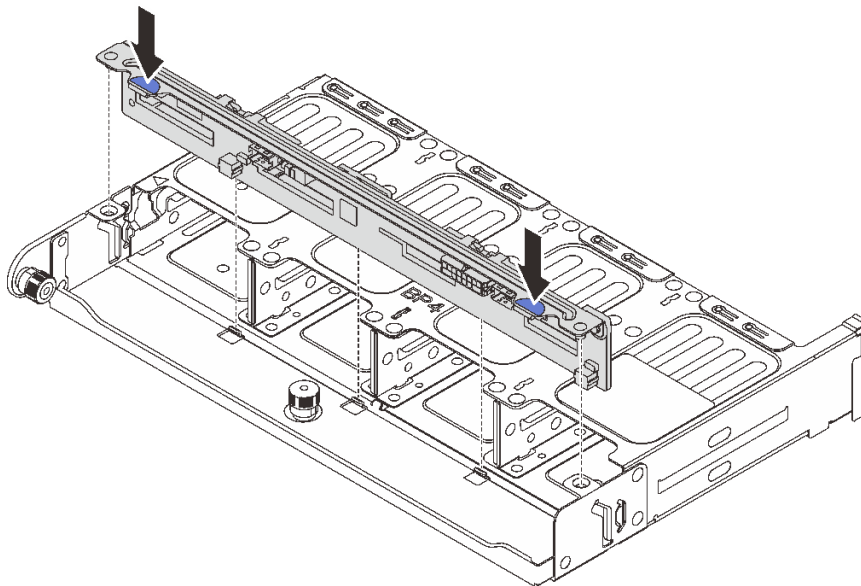
## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- The rear drive cage is supported on some server models with thermal requirements. See [“Thermal rules” on page 75](#) to ensure that the server is under permitted ambient temperature and the correct heat sink and system fans are used. If needed, replace your heat sink or system fan first.
  - [“Processor and heat sink replacement \(trained technician only\)” on page 267](#)
  - [“System fan replacement” on page 368](#)

## 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. Connect cables to the drive backplane. See [Chapter 6 “Internal cable routing” on page 385](#).
- Step 3. Install the drive backplane into the rear drive cage.



*Figure 280. Installing the 8 x 2.5-inch rear drive backplane*

- Align the pins of the backplane with the holes at both sides of the drive cage.
  - Lower the backplane into the drive cage so that the pins of the backplane pass through the holes on the drive cage, and press the backplane into position.
- Step 4. Install the rear drive cage.

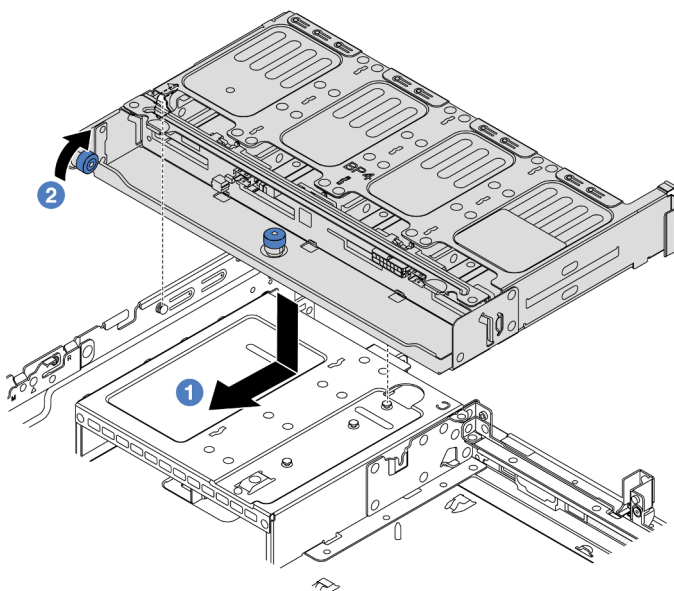


Figure 281. Installing the 8 x 2.5-inch rear drive cage

- a. ① Align the rear drive cage with the chassis, and lower the drive cage into the chassis. Move the rear drive cage forward until it clicks into position.
- b. ② Twist and release the blue plunger to secure the drive cage in place.

Step 5. Connect cables from the drive backplanes to the system board or RAID/HBA adapters. See [Chapter 6 “Internal cable routing” on page 385](#).

## After you finish

1. Reinstall the drives or drive fillers into the rear drive cage. See [“Install a hot-swap drive” on page 98](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## Remove the 2 x 3.5" drive backplane and drive cage

Use this information to remove the rear 3.5-inch 2-bay drive backplane and drive cage.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.



- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.
- If one or more NVMe solid-state drives are to be removed, it is recommended to disable them beforehand via the operating system.

## Procedure

Step 1. Make preparation for the task.

- 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 88](#).
- Remove the top cover. See [“Remove the top cover” on page 381](#).
- Disconnect cables from the rear drive backplane.
- Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 96](#).

Step 2. Remove the rear drive cage.

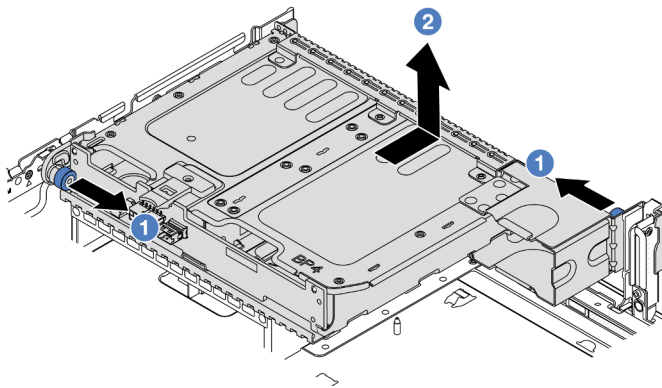


Figure 282. Removing the 2 x 3.5-inch rear drive cage

- 1 Twist and pull out the blue plungers.
- 2 Slide the drive cage towards the rear of the chassis to release it.

Step 3. Hold the backplane and carefully lift the backplane out of the drive cage.



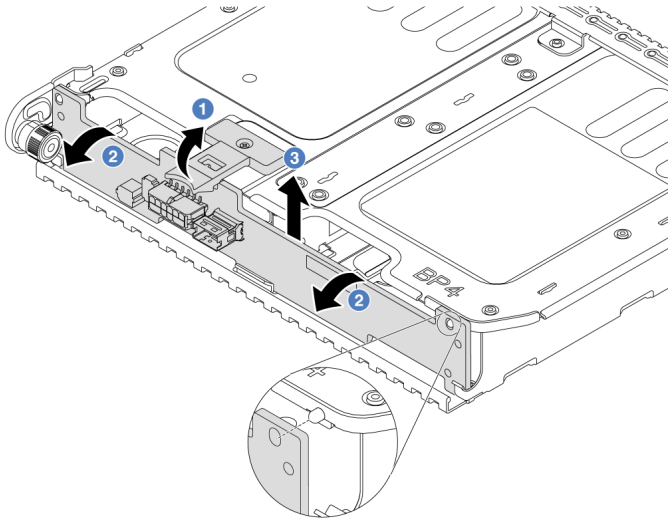


Figure 283. Removing the 2 x 3.5-inch rear drive backplane

- a. ① Open the release latches in the direction as shown.
- b. ② Rotate the backplane from the top to disengage it from the pins on the drive cage.
- c. ③ Carefully lift the backplane out of the drive cage.

## 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 2 x 3.5" drive backplane and drive cage

Use this information to install 3.5-inch 2-bay drive backplane and drive cage.

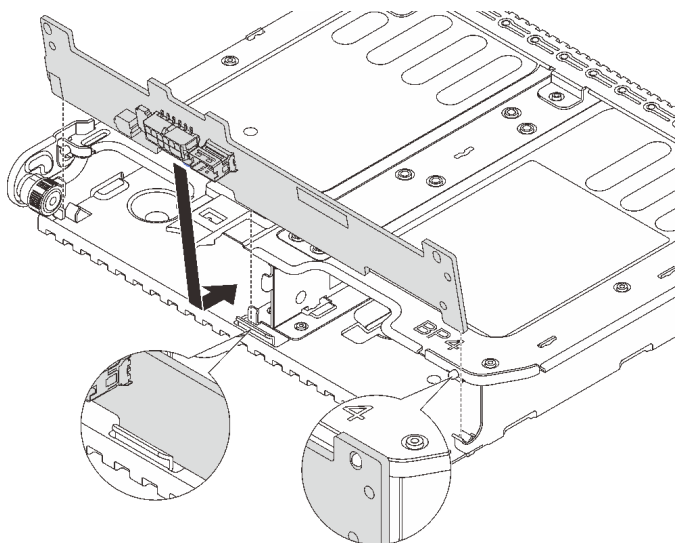
## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- The rear drive cage is supported on some server models with thermal requirements. See [“Thermal rules” on page 75](#) to ensure that the server is under permitted ambient temperature and the correct heat sink and system fans are used. If needed, replace your heat sink or system fan first.
  - [“Processor and heat sink replacement \(trained technician only\)” on page 267](#)
  - [“System fan replacement” on page 368](#)

## 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. Connect cables to the drive backplane. See [Chapter 6 “Internal cable routing” on page 385](#).
- Step 3. Install the drive backplane into the rear drive cage.



*Figure 284. Installing the 2 x 3.5-inch rear drive backplane*

- a. Align the bottom of the backplane with the studs at the bottom of the drive cage.
  - b. Lower the backplane into the drive cage so that the holes in the backplane pass through the pins on the drive cage, and press the backplane into position.
- Step 4. Install the rear drive cage.

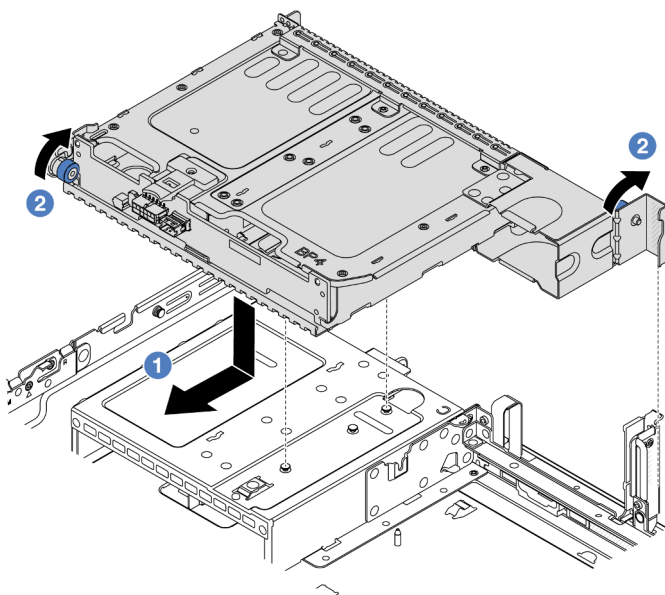


Figure 285. Installing the 2 x 3.5-inch rear drive cage

- a. ① Align the rear drive cage with the chassis, and lower the drive cage into the chassis. Move the rear drive cage forward until it clicks into position.
- b. ② Twist and release the blue plunger to secure the drive cage in place.

Step 5. Connect cables from the drive backplanes to the system board or RAID/HBA adapters. See [Chapter 6 “Internal cable routing” on page 385](#).

## After you finish

1. Reinstall the drives or drive fillers into the rear drive cage. See [“Install a hot-swap drive” on page 98](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## Remove the 4 x 3.5" drive backplane and drive cage

Use this information to remove the rear 3.5-inch 4-bay drive backplane and drive cage.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.

- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.
- If one or more NVMe solid-state drives are to be removed, it is recommended to disable them beforehand via the operating system.

## Procedure

Step 1. Make preparation for the task.

- 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 88](#).
- Remove the top cover. See [“Remove the top cover” on page 381](#).
- Disconnect cables from the rear drive backplane.
- Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 96](#).

Step 2. Remove the rear drive cage.

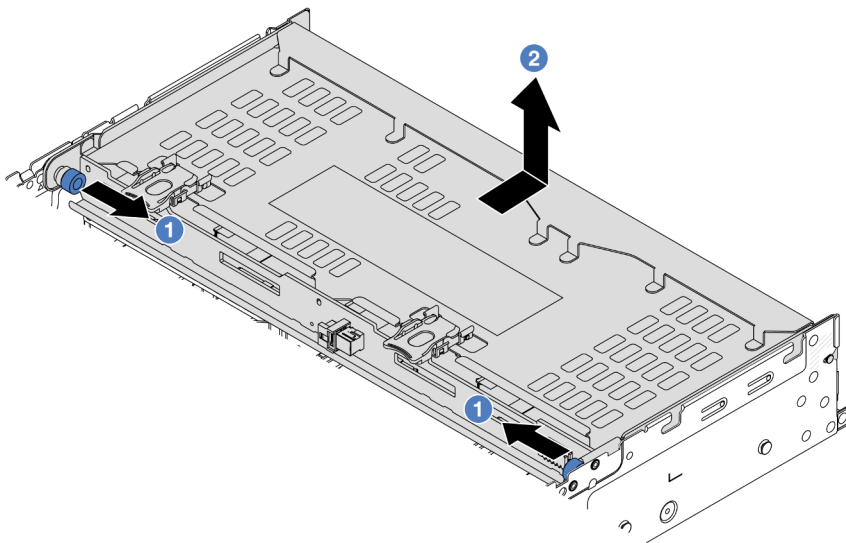


Figure 286. Removing the 4 x 3.5-inch rear drive cage

- 1 Twist and pull out the blue plungers.
- 2 Slide the drive cage towards the rear of the chassis to release it.

Step 3. Hold the backplane and carefully lift the backplane out of the drive cage.

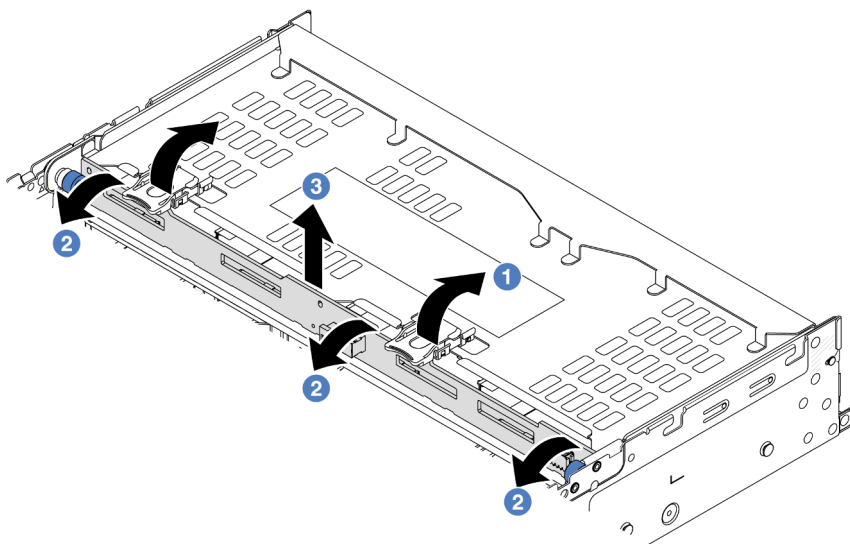


Figure 287. Removing the 2 x 3.5-inch rear drive backplane

- a. ① Open the release latches in the direction as shown.
- b. ② Rotate the backplane from the top to disengage it from the pins on the drive cage.
- c. ③ Carefully lift the backplane out of the drive cage.

## 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 4 x 3.5" drive backplane and drive cage

Use this information to install 3.5-inch 4-bay drive backplane and drive cage.

## About this task

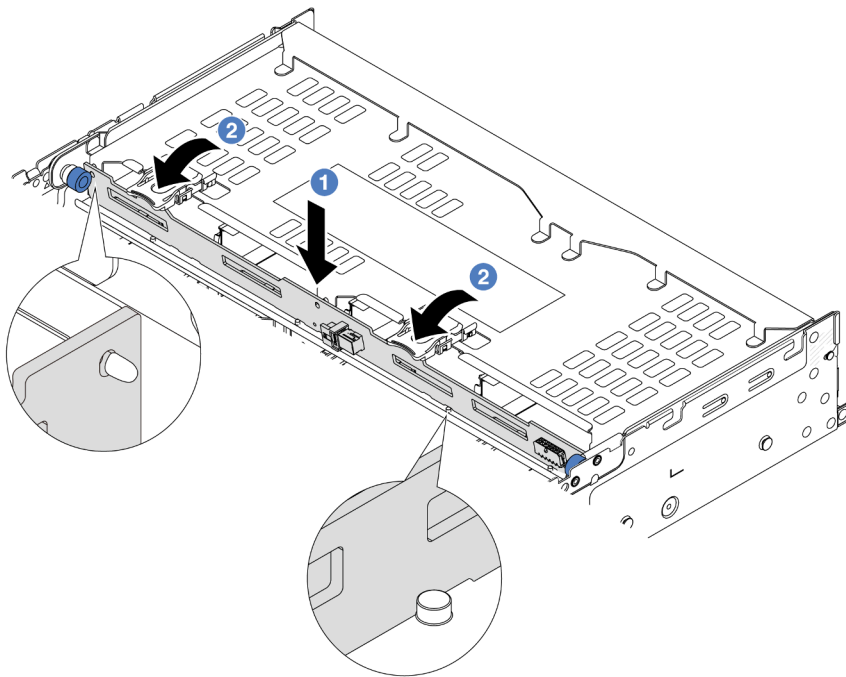
### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- The rear drive cage is supported on some server models with thermal requirements. See [“Thermal rules” on page 75](#) to ensure that the server is under permitted ambient temperature and the correct heat sink and system fans are used. If needed, replace your heat sink or system fan first.

- “Processor and heat sink replacement (trained technician only)” on page 267
- “System fan replacement” on page 368

## 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. Connect cables to the drive backplane. See [Chapter 6 “Internal cable routing” on page 385](#).
- Step 3. Install the drive backplane into the rear drive cage.



*Figure 288. Installing the 4 x 3.5-inch rear drive backplane*

- 1** Align the bottom of the backplane with the studs at the bottom of the drive cage and lower the backplane into the drive cage.
- 2** Push the top of the backplane so that the holes in the backplane pass through the pins on the drive cage, and the release latches secure the backplane in place.

- Step 4. Install the rear drive cage.

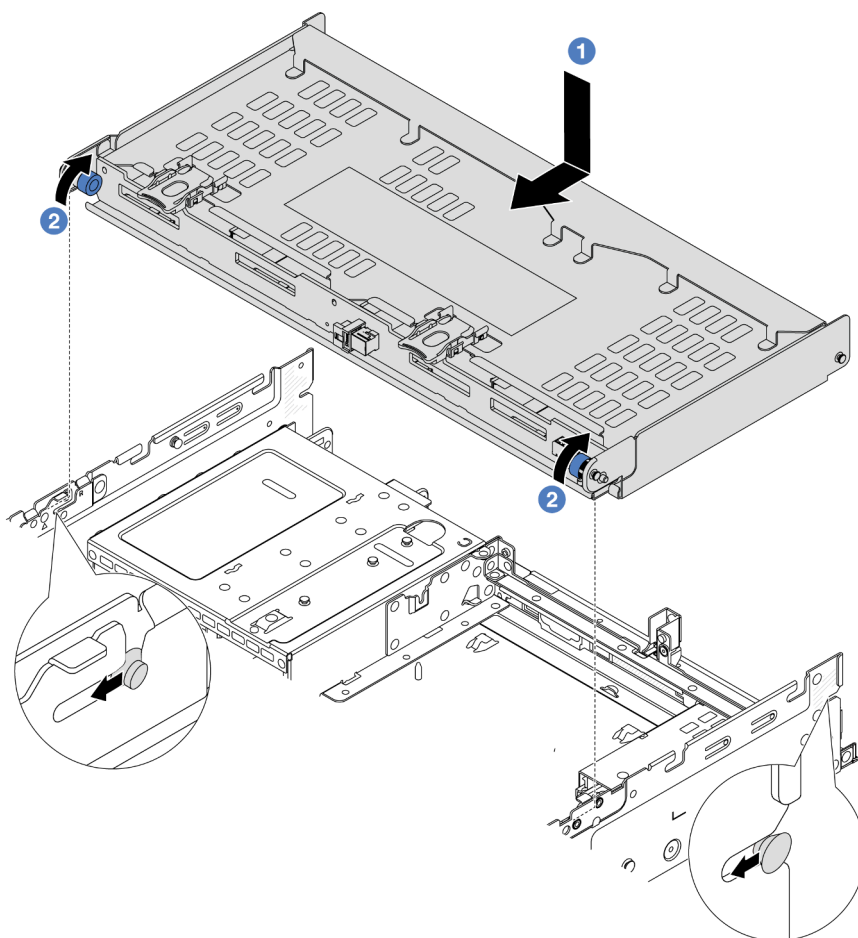


Figure 289. Installing the 4 x 3.5-inch rear drive cage

- a. ① Align the rear drive cage with the chassis, and lower the drive cage into the chassis. Move the rear drive cage forward until it clicks into position.
- b. ② Twist and release the blue plunger to secure the drive cage in place.

Step 5. Connect cables from the drive backplanes to the system board or RAID/HBA adapters. See [Chapter 6 “Internal cable routing” on page 385](#).

Step 6. Install the top cover support bracket.

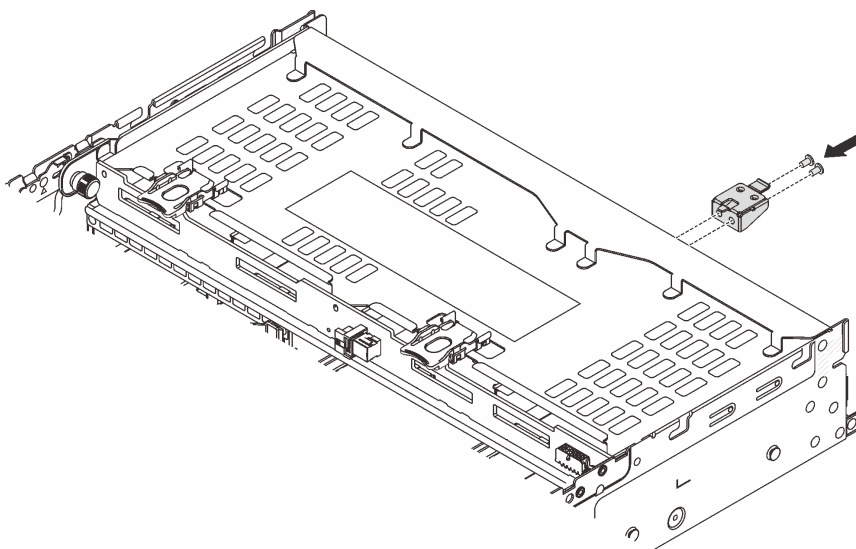


Figure 290. Installing the top cover support bracket

## After you finish

1. Reinstall the drives or drive fillers into the rear drive cage. See [“Install a hot-swap drive” on page 98](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

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## Rear OCP module replacement

Follow instructions in this section to remove and install the rear OCP module.

- [“Remove the rear OCP module” on page 328](#)
- [“Install the rear OCP module” on page 329](#)

## Remove the rear OCP module

Follow instructions in this section to remove the rear OCP module.

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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



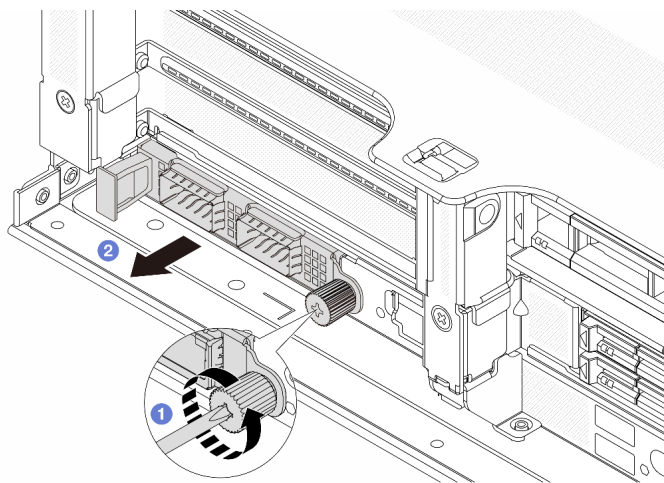


Figure 291. Removing the rear OCP module

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

### After you finish

1. Install a new rear OCP module or an OCP module filler. See [“Install the rear OCP module” on page 329](#).
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 module

Follow instructions in this section to install the rear OCP module.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 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. Remove the OCP module filler if there is.
- Step 3. Install the OCP module.

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

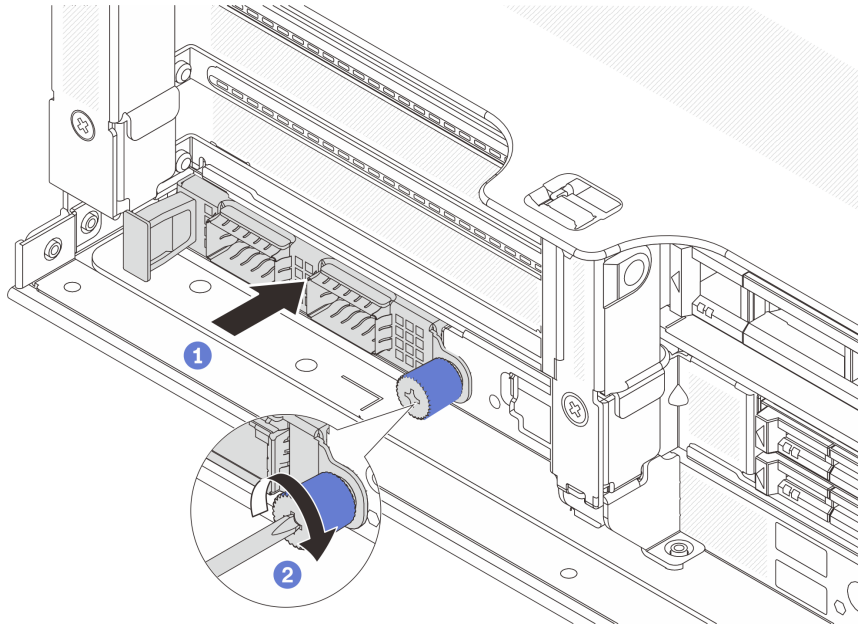


Figure 292. Installing the rear OCP module

- a. ① Push the OCP module into the slot until it is fully seated.
- b. ② Tighten the thumbscrew to secure the OCP module. Use a screwdriver if needed.

**Notes:**



Figure 293. OCP module (two connectors)

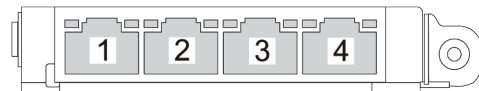


Figure 294. OCP module (four connectors)

- The OCP module provides two or four extra Ethernet connectors for network connections.
- By default, one of the Ethernet connectors 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 383](#).

## Demo video

[Watch the procedure on YouTube](#)

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## Rear PCIe adapter and riser assembly replacement

Use this information to remove and install a rear riser assembly and PCIe adapter. The PCIe adapter can be an Ethernet card, a host bus adapter, a RAID adapter, an add-in PCIe SSD adapter, or any other supported PCIe adapters. PCIe adapters vary by type, but the installation and removal procedures are the same.

- [“Remove a rear riser assembly” on page 334](#)
- [“Remove a rear PCIe adapter” on page 338](#)
- [“Install a rear PCIe adapter” on page 342](#)
- [“Install a rear riser assembly” on page 346](#)

Riser cages vary by server rear configurations.

### Notes:

- The server supports one 7mm drive cage on the location of riser 1 cage or riser 2 cage. For 7mm drive cage installation rules, see [“PCIe slots and PCIe adapters” on page 68](#). To replace a 7mm drive cage, see [“Rear 7mm drive backplane and drive cage replacement” on page 304](#).
- The riser card shown in each riser cage is an example for illustration. Some riser cages support different types of riser cards. For details, see [“PCIe slots and PCIe adapters” on page 68](#).
- The riser 5 cage is located on the front of the server. For replacement of the riser 5 cage, see [“Front adapter cage replacement” on page 108](#).
- For replacement of 1FH and 3FH riser cages for Direct Water Cooling Module (DWCM), see [“Lenovo Neptune\(TM\) Processor Direct Water Cooling Module replacement \(trained technicians only\)” on page 171](#).

Table 39. Riser cages for servers without DWCM

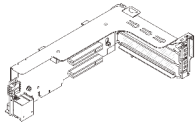
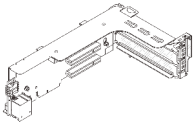
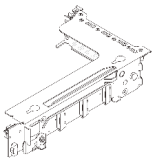
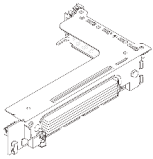
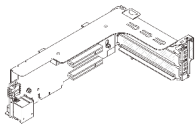
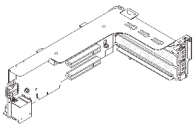
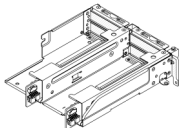
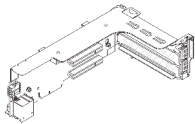
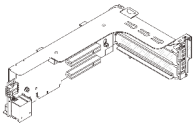
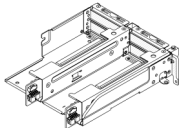
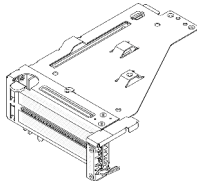
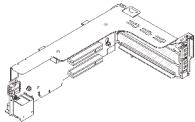
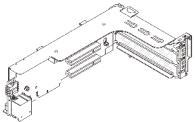
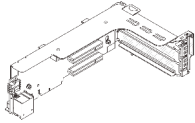
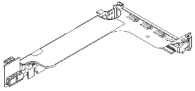
Server configuration	Riser 1 cage	Riser 2 cage	Riser 3 cage or 4LP riser 3/4 cage	Riser 5 cage
Configuration with 8 PCIe slots	<ul style="list-style-type: none"> <li>3-slot riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>3-slot riser cage</li> </ul> 	Riser 3 cage <ul style="list-style-type: none"> <li>Gen 4</li> </ul>  <ul style="list-style-type: none"> <li>Gen 5</li> </ul> 	N/A
Configuration with 10 PCIe slots	<ul style="list-style-type: none"> <li>3-slot riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>3-slot riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>4LP riser 3/4 cage</li> </ul>  <p>LP: low profile</p>	N/A
Configuration with 12 PCIe slots	<ul style="list-style-type: none"> <li>3-slot riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>3-slot riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>4LP riser 3/4 cage</li> </ul>  <p>LP: low profile</p>	<ul style="list-style-type: none"> <li>Riser 5 cage</li> </ul> 
Configuration with a 4 x 2.5-inch rear drive cage	<ul style="list-style-type: none"> <li>3-slot riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>3-slot riser cage</li> </ul> 	N/A	N/A
Configuration with an 8 x 2.5-inch rear drive cage	<ul style="list-style-type: none"> <li>3-slot riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>1-slot riser cage</li> </ul> 	N/A	N/A

Table 39. Riser cages for servers without DWCM (continued)

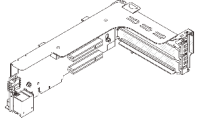
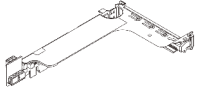
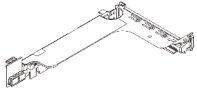
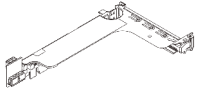
Server configuration	Riser 1 cage	Riser 2 cage	Riser 3 cage or 4LP riser 3/4 cage	Riser 5 cage
Configuration with a 2 x 3.5-inch rear drive cage	<ul style="list-style-type: none"> <li>3-slot riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>1-slot riser cage</li> </ul> 	N/A	N/A
Configuration with a 4 x 3.5-inch rear drive cage	<ul style="list-style-type: none"> <li>1-slot riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>1-slot riser cage</li> </ul> 	N/A	N/A

Table 40. Riser cages for servers with DWCM

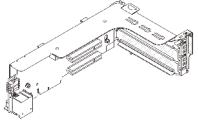
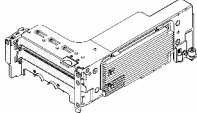
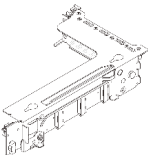
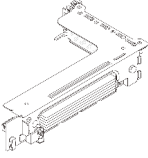
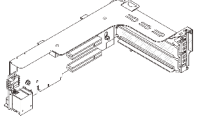
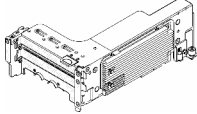
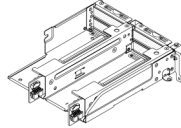
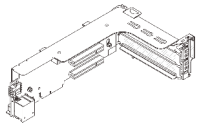
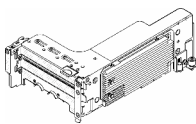
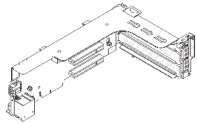
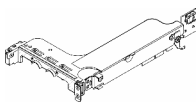
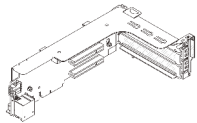
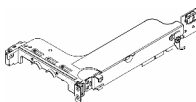
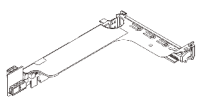
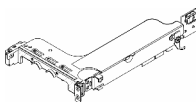
Server configuration	Riser 1 cage	Riser 2 cage	Riser 3 cage or 4LP riser 3/4 cage
Configuration with 7 PCIe slots	<ul style="list-style-type: none"> <li>3-slot riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>3FH riser cage for DWCM</li> </ul> 	Riser 3 cage <ul style="list-style-type: none"> <li>Gen 4</li> </ul>  <ul style="list-style-type: none"> <li>Gen 5</li> </ul> 
Configuration with 9 PCIe slots	<ul style="list-style-type: none"> <li>3-slot riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>3FH riser cage for DWCM</li> </ul> 	<ul style="list-style-type: none"> <li>4LP riser 3/4 cage</li> </ul>  <p>LP: low profile</p>

Table 40. Riser cages for servers with DWCM (continued)

Server configuration	Riser 1 cage	Riser 2 cage	Riser 3 cage or 4LP riser 3/4 cage
Configuration with a 4 x 2.5-inch rear drive cage	<ul style="list-style-type: none"> <li>3-slot riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>3FH riser cage for DWCM</li> </ul> 	N/A
Configuration with an 8 x 2.5-inch rear drive cage	<ul style="list-style-type: none"> <li>3-slot riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>1FH riser cage for DWCM</li> </ul> 	N/A
Configuration with a 2 x 3.5-inch rear drive cage	<ul style="list-style-type: none"> <li>3-slot riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>1FH riser cage for DWCM</li> </ul> 	N/A
Configuration with a 4 x 3.5-inch rear drive cage	<ul style="list-style-type: none"> <li>1-slot riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>1FH riser cage for DWCM</li> </ul> 	N/A

## Remove a rear riser assembly

Use this information to remove a rear riser assembly.

### About this task

#### S011



**CAUTION:**  
Sharp edges, corners, or joints nearby.

The server supports different types of riser cages (see [“Rear PCIe adapter and riser assembly replacement” on page 331](#)).

**Attention:**

- Read “[Installation Guidelines](#)” on page 57 and “[Safety inspection checklist](#)” on page 58 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 88.
- 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.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.

### Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-BmyijyY0-INvapM4fTV5Gf>.

## Procedure

Step 1. Make preparation for the task.

- 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 88.
- Remove the top cover. See “[Remove the top cover](#)” on page 381.
- If there is any PCIe adapter installed on the riser card, record the cable connections first. Then, disconnect all cables from the PCIe adapter.

### 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.

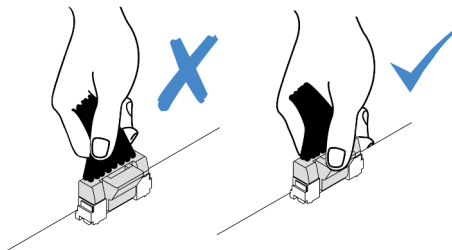


Figure 295. Disconnecting cables from the system board assembly

Step 2. Remove the riser assembly.

- **Riser 1 assembly (same for riser 2 assembly)**

**Note:** The following uses the 3-slot riser cage as an example for illustration. The replacement procedure for the 1-slot riser cage is similar.

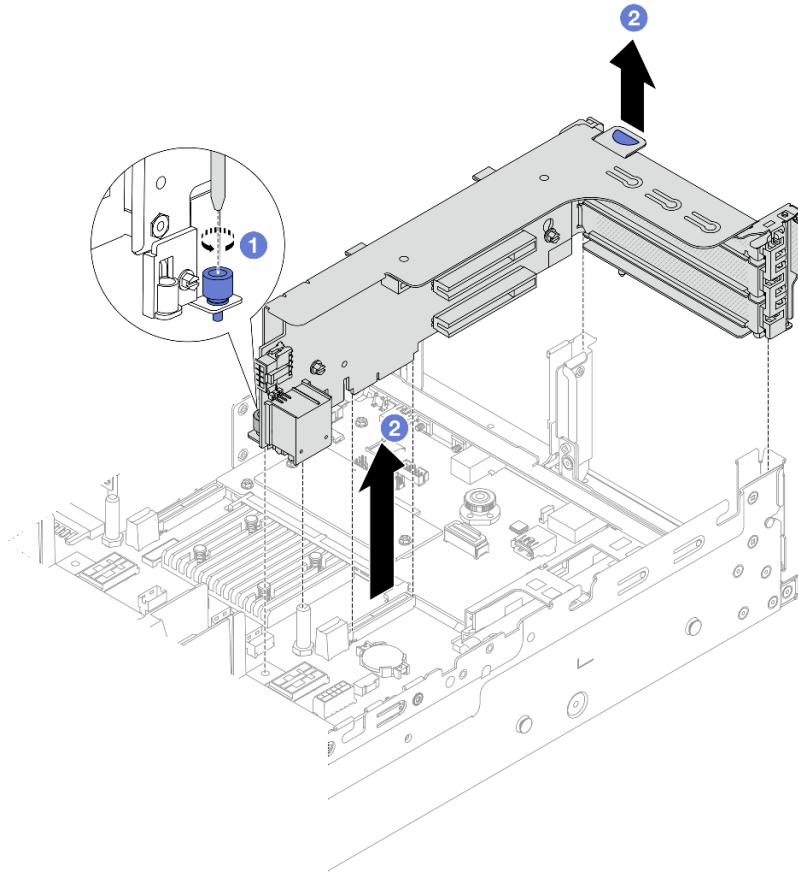


Figure 296. Riser 1 assembly removal

- a. ① Loosen the screw that secures the riser assembly.
- b. ② Grasp the riser assembly by its edges and carefully lift it straight up and off the chassis.

- **Riser 3 assembly**

**Note:** The following uses the Gen 5 riser 3 cage as an example for illustration. The replacement procedure is the same for Gen 4 riser 3 cage.



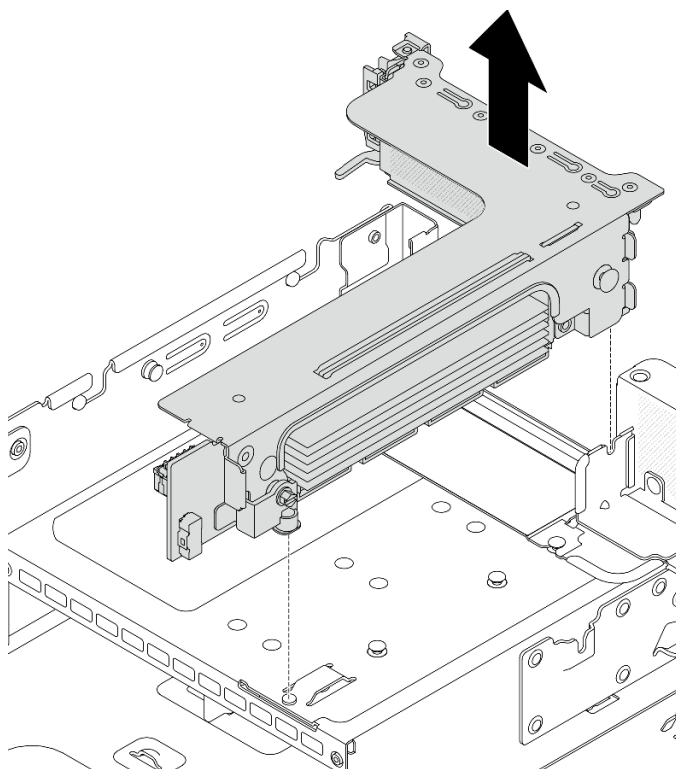


Figure 297. Riser 3 assembly removal

- **4LP riser 3/4 assembly**

1. Remove riser 3 assembly and riser 4 assembly.

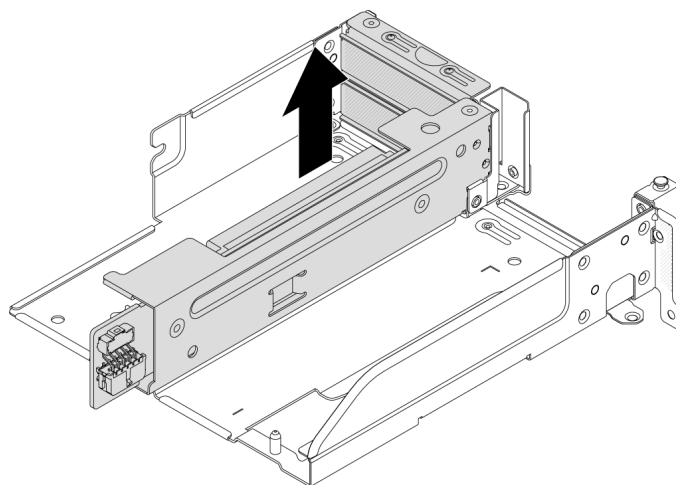


Figure 298. Riser 3/4 assembly removal

2. Remove the riser cage tray.

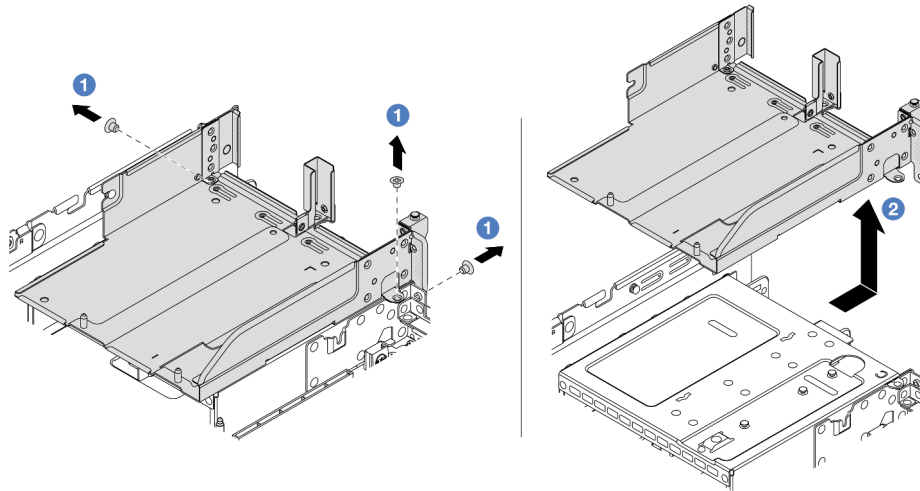


Figure 299. Riser cage tray removal

- a. 1 Remove the screws that secure the riser cage tray.
- b. 2 Slide the riser cage tray backwards and then lift it out the chassis.

## After you finish

1. Remove the PCIe adapter from the riser assembly. See [“Remove a rear PCIe adapter” on page 338](#).
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](#)

## Remove a rear PCIe adapter

Use this information to remove a rear PCIe adapter. The PCIe adapter can be an Ethernet card, a host bus adapter, a RAID adapter, an add-in PCIe SSD adapter, or any other supported PCIe adapters.

## About this task

### S011



**CAUTION:**  
Sharp edges, corners, or joints nearby.

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.
- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board assembly), drive backplanes or drive cables, back up all important data that is stored on drives.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.

## Procedure

Step 1. Make preparation for the task.

- 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 88](#).
- Remove the top cover. See [“Remove the top cover” on page 381](#).
- Remove the riser assembly. See [“Remove a rear riser assembly” on page 334](#).

Step 2. Remove the PCIe adapter from the riser cage.

**Note:** For ThinkSystem AMD X3522 10/25GbE DSFP28 2-port PCIe Ethernet Adapter, remove the screw that secures the adapter first.

- **Riser 1 cage (same for riser 2 cage)**

**Note:** The following uses the 3-slot riser cage as an example for illustration. The replacement procedure for the 1-slot riser cage is similar.

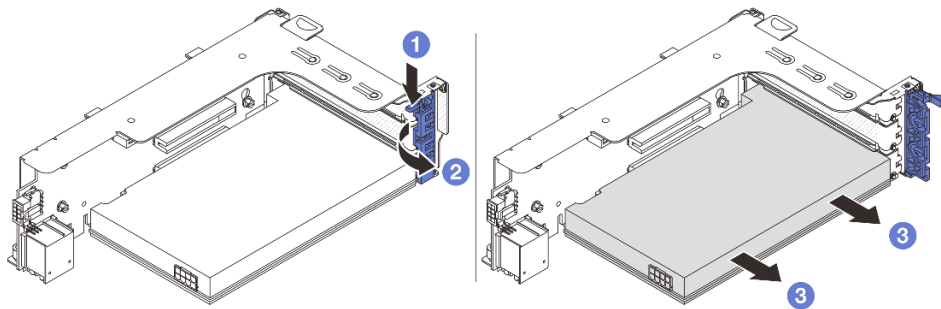


Figure 300. Removing a PCIe adapter from riser 1 cage or riser 2 cage

- ① Press the retainer clip downward.
- ② Rotate the PCIe adapter retention latch to the open position.
- ③ Grasp the PCIe adapter by its edges and carefully pull it out of the PCIe slot.

- **Riser 3 cage**

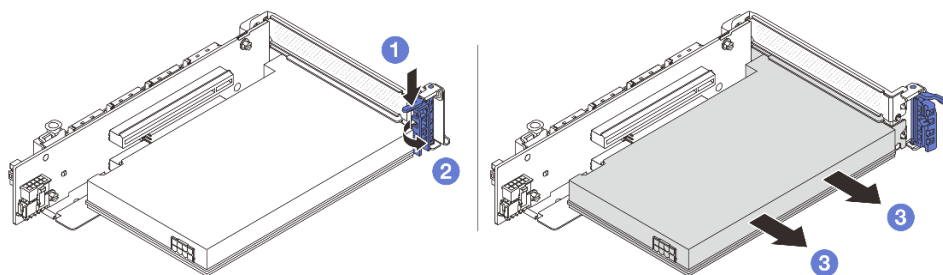


Figure 301. Removing a PCIe adapter from riser 3 cage

- a. ① Press the retainer clip downward.
- b. ② Rotate the PCIe adapter retention latch to the open position.
- c. ③ Grasp the PCIe adapter by its edges and carefully pull it out of the PCIe slot.

- **4LP riser 3/4 cage**

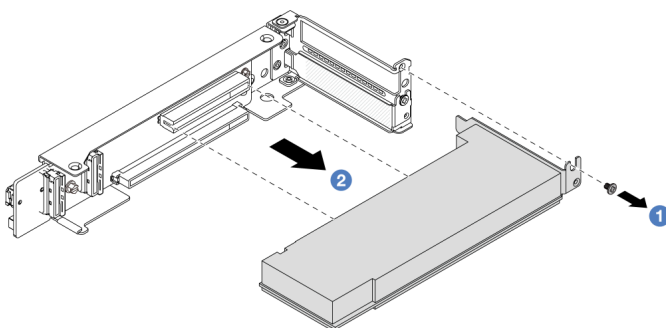


Figure 302. Removing a PCIe adapter from the 4LP riser 3/4 cage

- a. ① Remove the screw that secures the PCIe adapter.
- b. ② Grasp the PCIe adapter by its edges and carefully pull it out of the PCIe slot.

Step 3. (Optional) If you are replacing the riser card, remove the riser card from the riser cage.

- **Riser card 1 (same for riser card 2)**

**Note:** The following uses the 3-slot riser cage as an example for illustration. The replacement procedure for the 1-slot riser cage is similar.

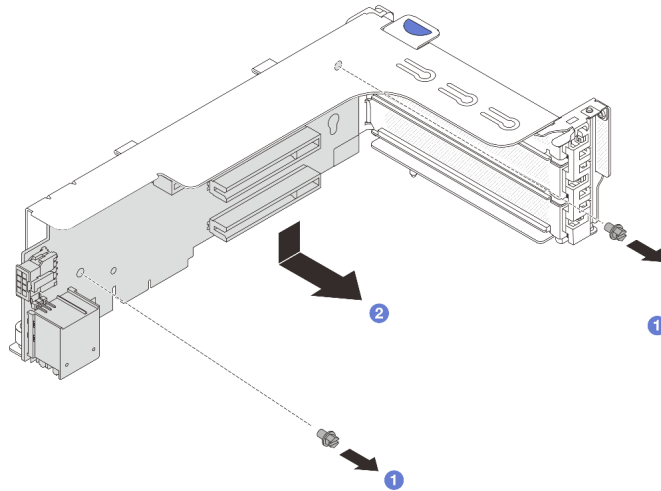


Figure 303. Removing the riser card from riser 1 cage or riser 2 cage

- a. ① Loosen the screw that secures the riser card.
- b. ② Grasp the riser card by its edges and carefully take it out of the riser bracket.

- **Riser card 3**

**Note:** The following uses the Gen 5 riser 3 cage as an example for illustration. The replacement procedure is the same for Gen 4 riser 3 cage.

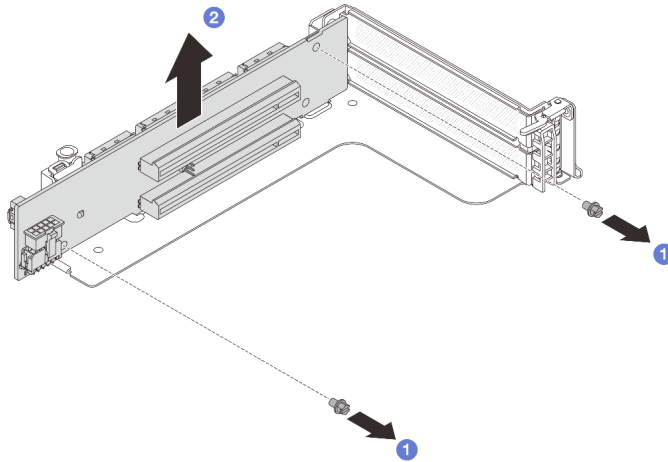


Figure 304. Removing the riser card from riser 3 cage

- a. ① Loosen the screw that secures the riser card.
- b. ② Grasp the riser card by its edges and carefully take it out of the riser bracket.

- **Riser card 3/4**

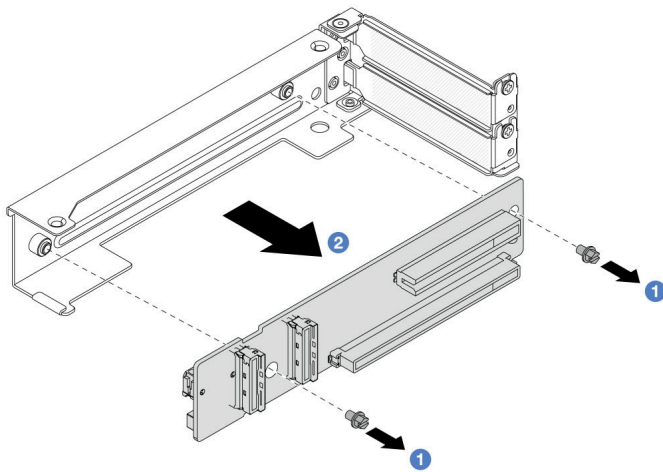


Figure 305. Removing the riser card from 4LP riser 3/4 cage

## After you finish

1. Install a new PCIe adapter to the riser cage. See [“Install a rear PCIe adapter” on page 342](#).
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 a rear PCIe adapter

Use this information to install a rear PCIe adapter. The PCIe adapter can be an Ethernet card, a host bus adapter, a RAID adapter, an add-in PCIe SSD adapter, or any other supported PCIe adapters.

## About this task

### S011



**CAUTION:**  
Sharp edges, corners, or joints nearby.

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 PCIe adapter installation rules, see “[PCIe slots and PCIe adapters](#)” on page 68.

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

- Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to “[Update the firmware](#)” on page 691 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. (Optional) If you have removed the riser card, install the riser card first.

- **Riser card 1 (same for riser card 2)**

**Note:** The following uses the 3-slot riser cage as an example for illustration. The replacement procedure for the 1-slot riser cage is similar.

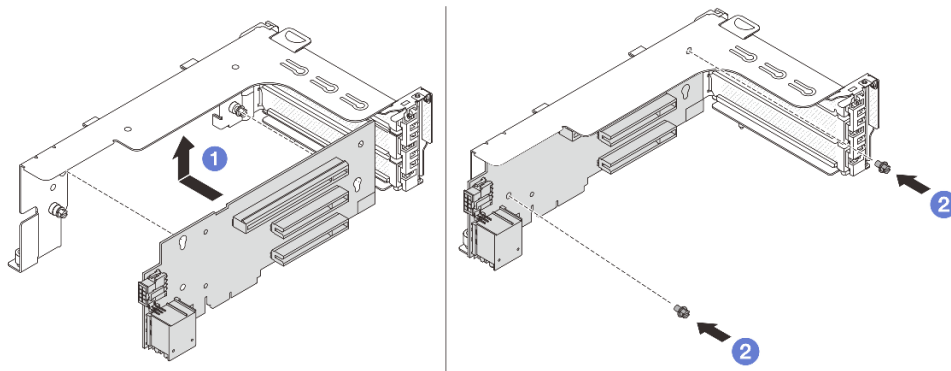


Figure 306. Installing the riser card to riser 1 cage or riser 2 cage

- 1 Align the riser card with the riser cage and put it into the riser cage.
- 2 Install two screws to secure riser card into place.

- **Riser card 3**

**Note:** The following uses the Gen 5 riser 3 cage as an example for illustration. The replacement procedure is the same for Gen 4 riser 3 cage.

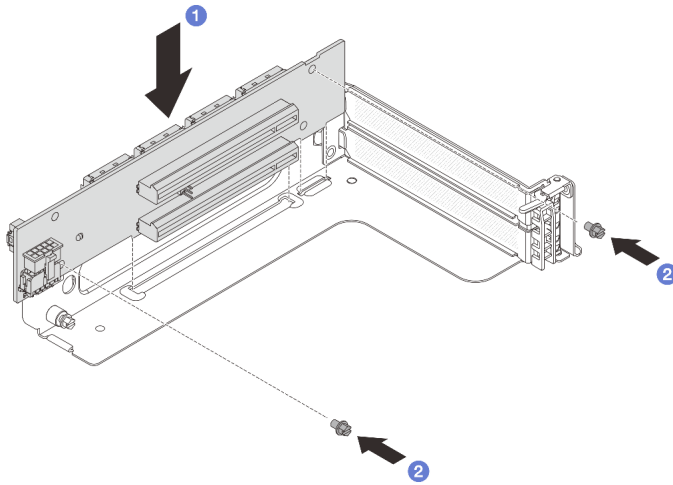


Figure 307. Installing the riser card to riser 3 cage

- a. ① Align the riser card with the riser cage and put it into the riser cage.
- b. ② Install two screws to secure riser card into place.

- **Riser card 3/4**

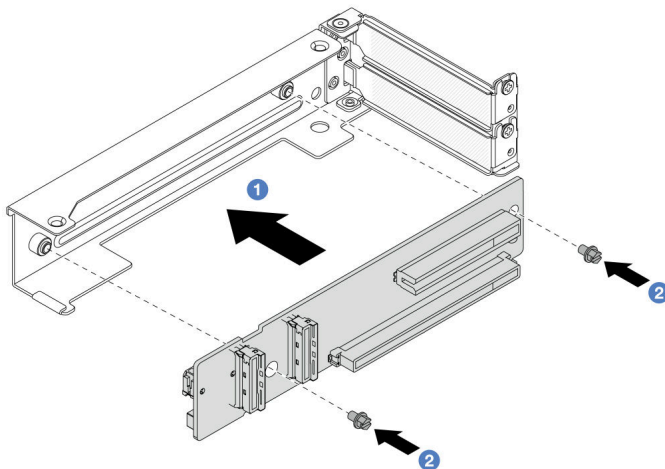


Figure 308. Installing the riser card to the 4LP riser 3/4 cage

- a. ① Align the riser card with the riser cage and put it into the riser cage.
- b. ② Install two screws to secure riser card into place.

Step 3. Install the new PCIe adapter to the riser cage.

- **Riser 1 cage (same for riser 2 cage)**

**Note:** The following uses the 3-slot riser cage as an example for illustration. The replacement procedure for the 1-slot riser cage is similar.



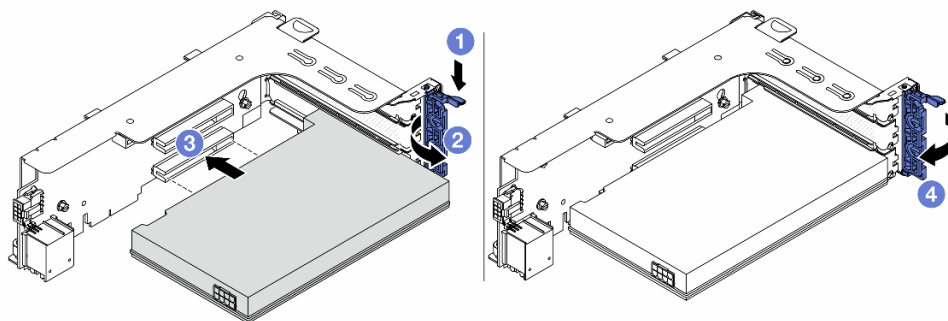


Figure 309. Installing a PCIe adapter to riser 1 cage or riser 2 cage

- a. ① Press the retainer clip downward.
- b. ② Rotate the retention latch to the open position.
- c. ③ Align the PCIe adapter with the PCIe slot on the riser card. Carefully press the PCIe adapter straight into the slot until it is securely seated and its bracket also is secured.
- d. ④ Close the retention latch.

**Note:** For ThinkSystem AMD X3522 10/25GbE DSFP28 2-port PCIe Ethernet Adapter, install the screw to secure the adapter before closing the retention latch if the server needs to be shipped.

- **Riser 3 cage**

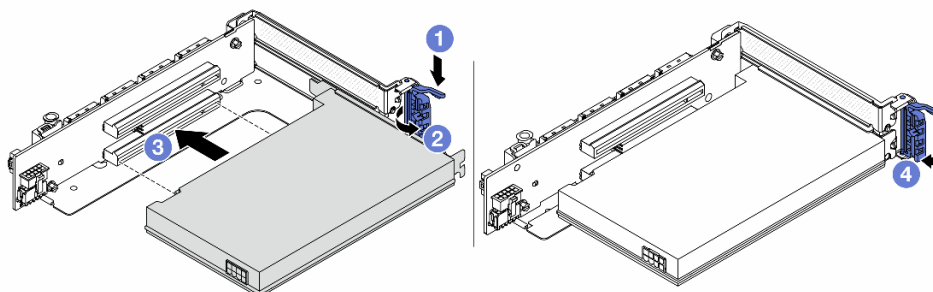


Figure 310. Installing a PCIe adapter to riser 3 cage

- a. ① Press the retainer clip downward.
- b. ② Rotate the retention latch to the open position.
- c. ③ Align the PCIe adapter with the PCIe slot on the riser card. Carefully press the PCIe adapter straight into the slot until it is securely seated and its bracket also is secured.
- d. ④ Close the retention latch.

**Note:** For ThinkSystem AMD X3522 10/25GbE DSFP28 2-port PCIe Ethernet Adapter, install the screw to secure the adapter before closing the retention latch if the server needs to be shipped.

- **4LP riser 3/4 cage**

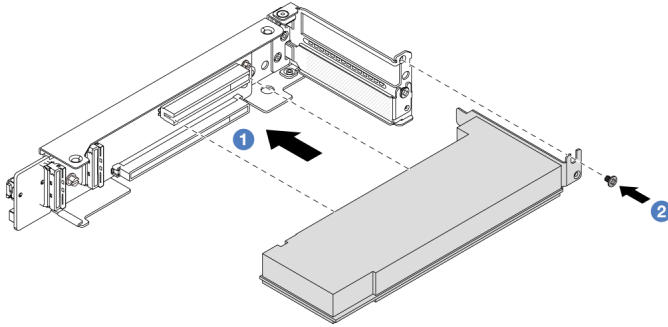


Figure 311. Installing a PCIe adapter to the 4LP riser 3/4 cage

- a. ① Align the PCIe adapter with the PCIe slot on the riser card. Carefully press the PCIe adapter straight into the slot until it is securely seated and its bracket also is secured.
- b. ② Tighten the screw to secure the PCIe adapter into place.

## After you finish

1. Install the riser assembly into chassis. See [“Install a rear riser assembly” on page 346](#).
2. If you have installed a RAID 930 or 940 adapter, install a RAID flash power module. See [“RAID flash power module replacement” on page 289](#).

## Demo video

[Watch the procedure on YouTube](#)

## Install a rear riser assembly

Use this information to install a rear riser assembly.

## About this task

### S011



**CAUTION:**  
Sharp edges, corners, or joints nearby.

The server supports different types of riser cages (see [“Rear PCIe adapter and riser assembly replacement” on page 331](#)).

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).

- 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 riser assembly into chassis.

- **Riser 1 assembly (same for riser 2 assembly)**

**Note:** The following uses the 3-slot riser cage as an example for illustration. The replacement procedure for the 1-slot riser cage is similar.

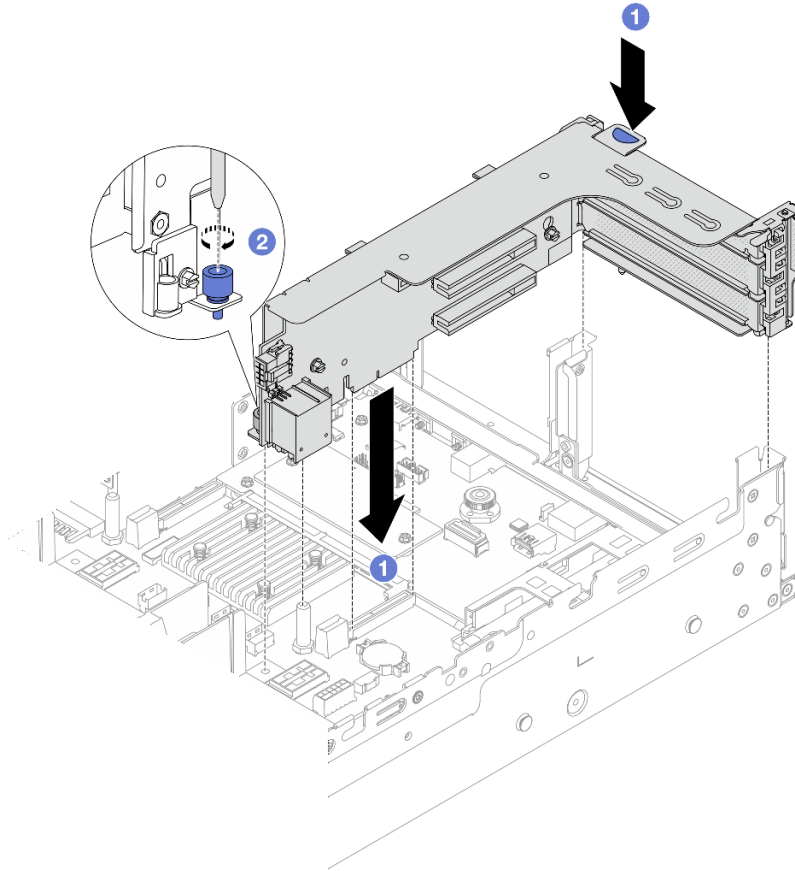


Figure 312. Riser 1 assembly installation

- 1 Align the riser card with the riser slot on the system board assembly. Carefully press the riser card straight into the slot until it is securely seated.
- 2 Tighten the screw to secure the riser cage.

- **Riser 3 assembly**

**Note:** The following uses the Gen 5 riser 3 cage as an example for illustration. The replacement procedure is the same for Gen 4 riser 3 cage.

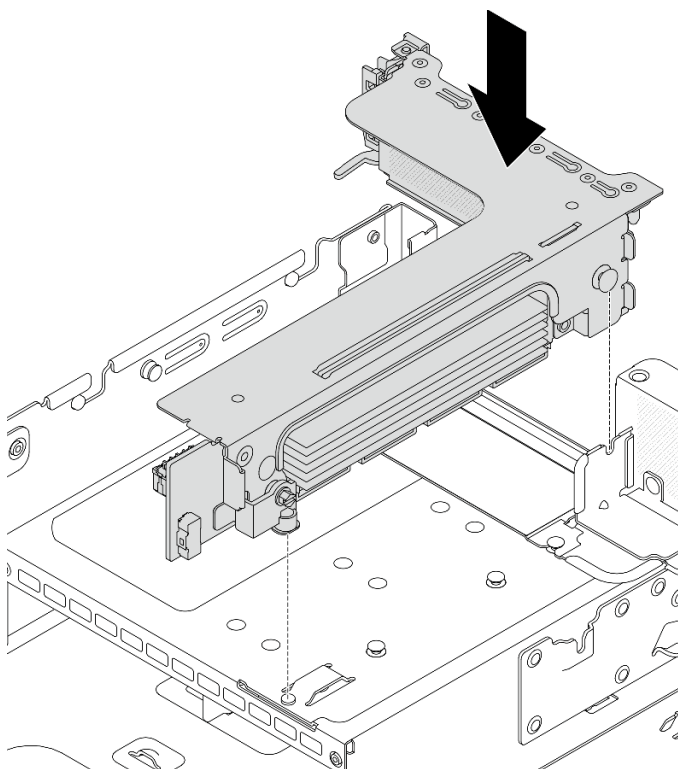


Figure 313. Riser 3 assembly installation

- **4LP Riser 3/4 assembly**

1. Install the riser cage tray.

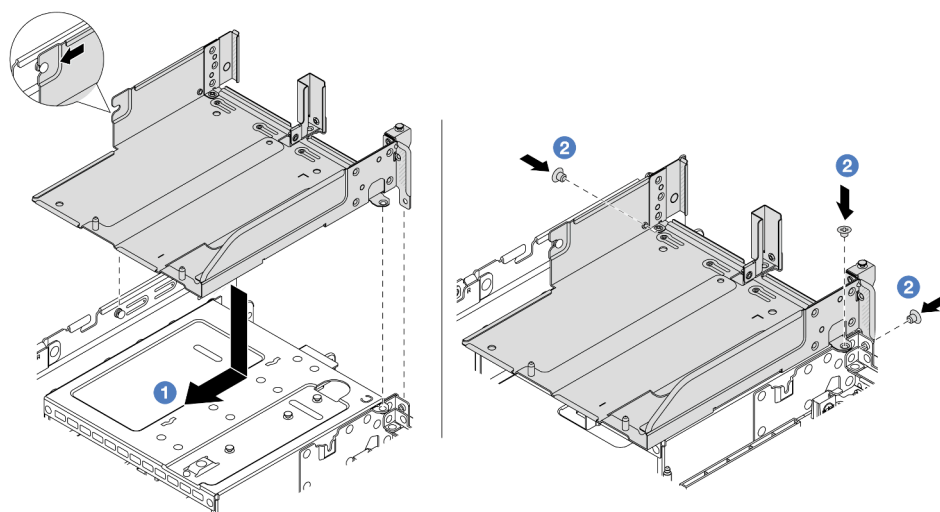


Figure 314. Riser cage tray installation

1. Align the riser cage tray with the pin and screw holes on the chassis.
  2. Install the screws to fix the riser cage tray to the chassis.
2. Install riser 3 assembly and riser 4 assembly into the riser cage.

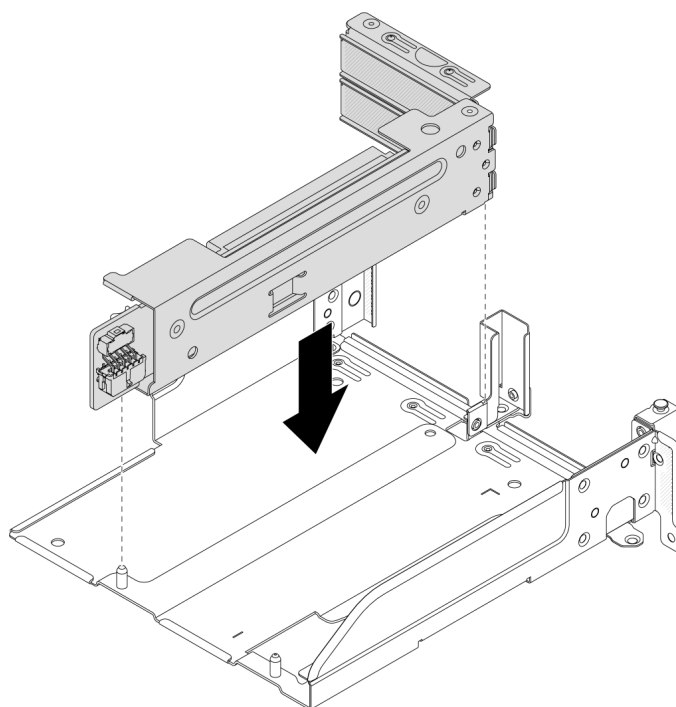


Figure 315. Riser 3/4 assembly installation

Step 2. Connect cables to the riser card and PCIe adapter. See [Chapter 6 “Internal cable routing” on page 385](#).

### After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### Demo video

[Watch the procedure on YouTube](#)

---

## Replacement of OCP enablement kit for vSphere DSE

Follow instructions in this section to remove and install the ThinkSystem OCP Enablement Kit for Distributed Services Engine (OCP enablement kit for vSphere DSE).

**Note:** The OCP enablement kit for vSphere DSE is used in combination with ThinkSystem NVIDIA BlueField-2 25GbE SFP56 2-Port PCIe Ethernet DPU w/BMC & Crypto (DPU adapter). For replacement of the DPU adapter, see [“Rear PCIe adapter and riser assembly replacement” on page 331](#).

- [“Remove the OCP enablement kit for vSphere DSE” on page 349](#)
- [“Install the OCP enablement kit for vSphere DSE” on page 350](#)

## Remove the OCP enablement kit for vSphere DSE

Follow instructions in this section to remove the OCP enablement kit for vSphere DSE.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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. Make preparation for the task.

- 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 88](#).
- Remove the top cover. See [“Remove the top cover” on page 381](#).
- If your server comes with a riser 1 assembly, remove it first. See [“Remove a rear riser assembly” on page 334](#).

Step 2. Disconnect the cable on the OCP enablement kit for vSphere DSE.

Step 3. Remove the OCP enablement kit for vSphere DSE.

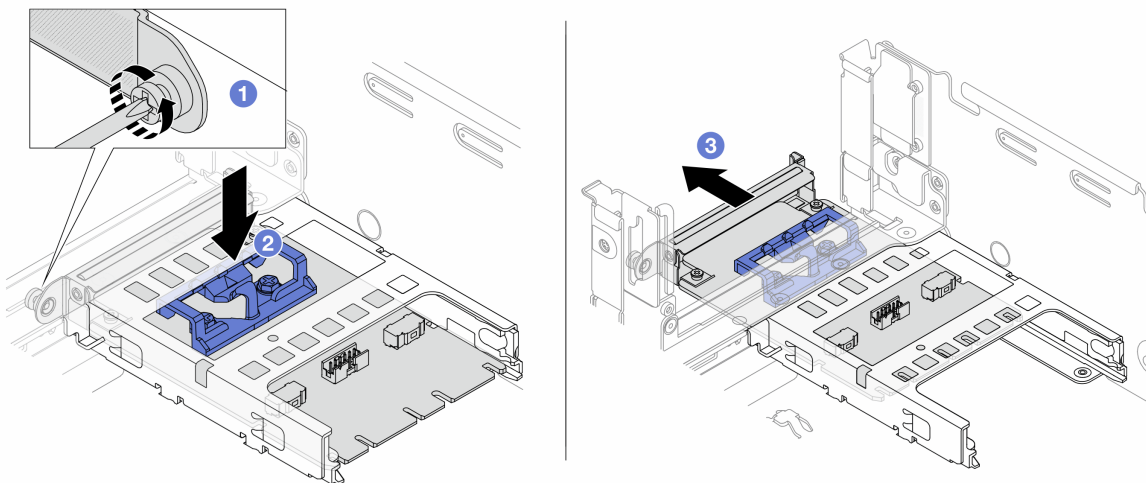


Figure 316. Removing the OCP enablement kit for vSphere DSE

- ① Loosen the screw that secures the OCP enablement kit for vSphere DSE.
- ② Press and hold the blue latch.
- ③ Push the OCP enablement kit for vSphere DSE by the latch out from the chassis.

## After you finish

1. Install a replacement unit or a filler. See [“Install the OCP enablement kit for vSphere DSE” on page 350](#).
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.

## Install the OCP enablement kit for vSphere DSE

Follow instructions in this section to install the OCP enablement kit for vSphere DSE.

## About this task

- Read “[Installation Guidelines](#)” on page 57 and “[Safety inspection checklist](#)” on page 58 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 88.
- 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/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to “[Update the firmware](#)” on page 691 for more information on firmware updating tools.

## Procedure

Step 1. If a filler is installed, remove it.

Step 2. Install the OCP enablement kit for vSphere DSE.

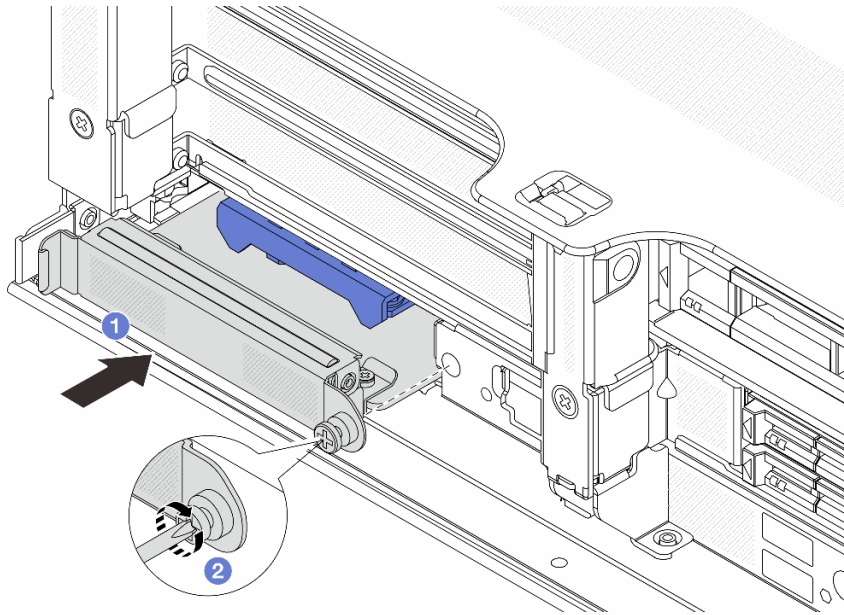


Figure 317. Installing the OCP enablement kit for vSphere DSE

- 1 Slide the OCP enablement kit for vSphere DSE into the slot until it is fully seated.
  - 2 Tighten the screw to secure the OCP enablement kit for vSphere DSE.
- Step 3. Connect the cable to the OCP enablement kit for vSphere DSE. See [Chapter 6 “Internal cable routing” on page 385](#).
- Step 4. Install the riser 1 assembly if you have removed it. See “[Install a rear riser assembly](#)” on page 346.

## After you finish

Complete the parts replacement. See “[Complete the parts replacement](#)” on page 383.

---

## Security bezel replacement

Use this information to remove and install the security bezel.

- [“Remove the security bezel” on page 352](#)
- [“Install the security bezel” on page 353](#)

### Remove the security bezel

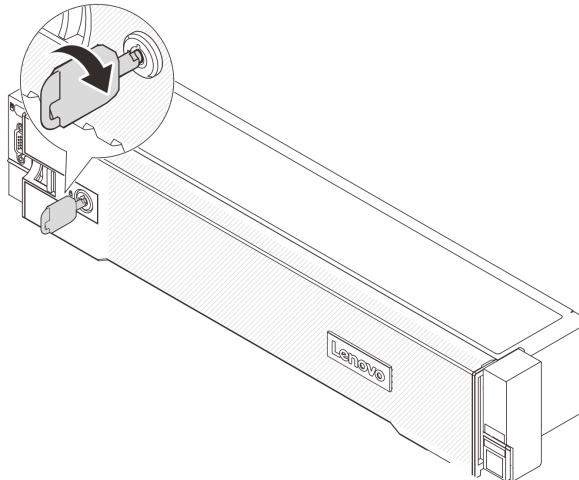
Use this information to remove the security bezel.

#### About this task

**Attention:** Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) to ensure that you work safely.

#### Procedure

Step 1. Use the key to unlock the security bezel.



*Figure 318. Unlocking the security bezel*

Step 2. Press the release latch **1** and rotate the security bezel outward to remove it from the chassis.



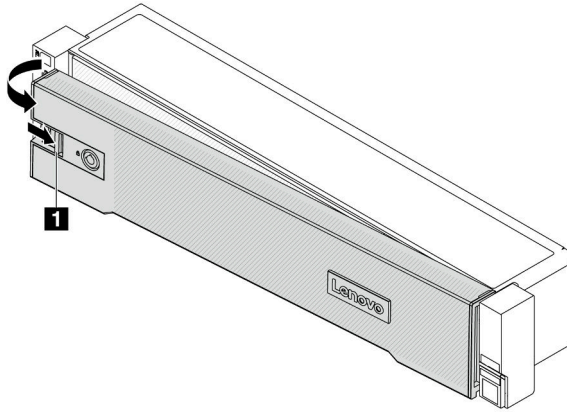


Figure 319. Security bezel removal

## After you finish

**Note:** Before you ship the rack with the server installed, reinstall and lock the security bezel into place.

## Install the security bezel

Use this information to install the security bezel.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) to ensure that you work safely.
- Before you ship the rack with the server installed, reinstall and lock the security bezel into place.

## Procedure

Step 1. If the key is held inside the security bezel, remove it out of the security bezel.

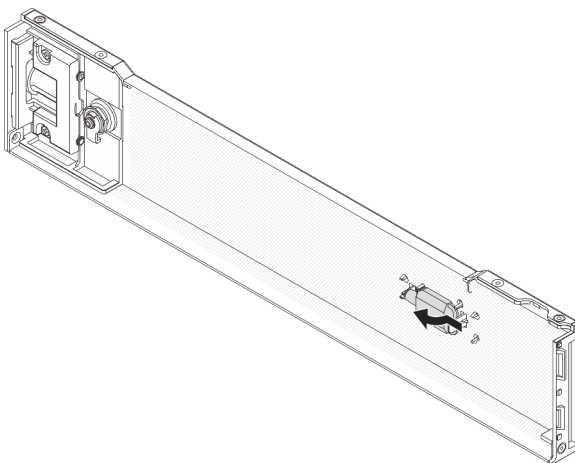


Figure 320. Key removal

Step 2. Carefully insert the tabs on the security bezel into the slots on the right rack latch. Then, press and hold the release latch **1** and rotate the security bezel inward until the other side clicks into place.

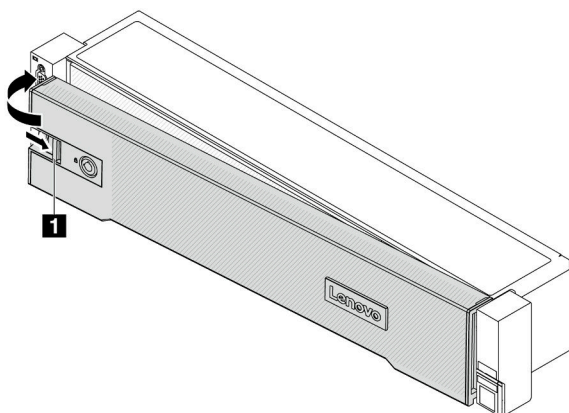


Figure 321. Security bezel installation

Step 3. Use the key to lock the security bezel to the closed position.

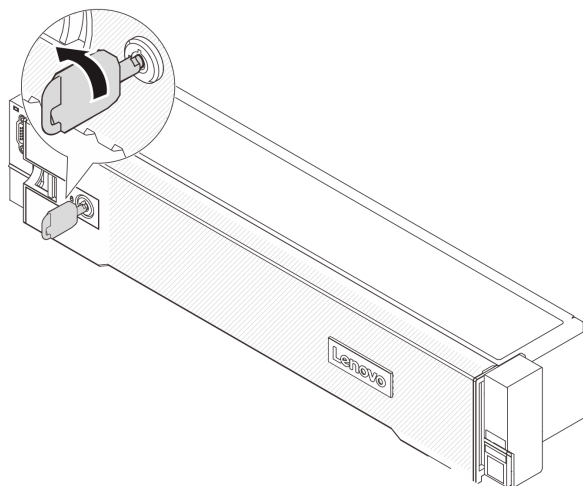


Figure 322. Locking the security bezel

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

---

## System board assembly replacement (trained technician only)

Follow instructions in this section to remove and install 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.

The following illustration shows the layout of the system board assembly which contains the firmware and RoT security module, system I/O board, and processor board.

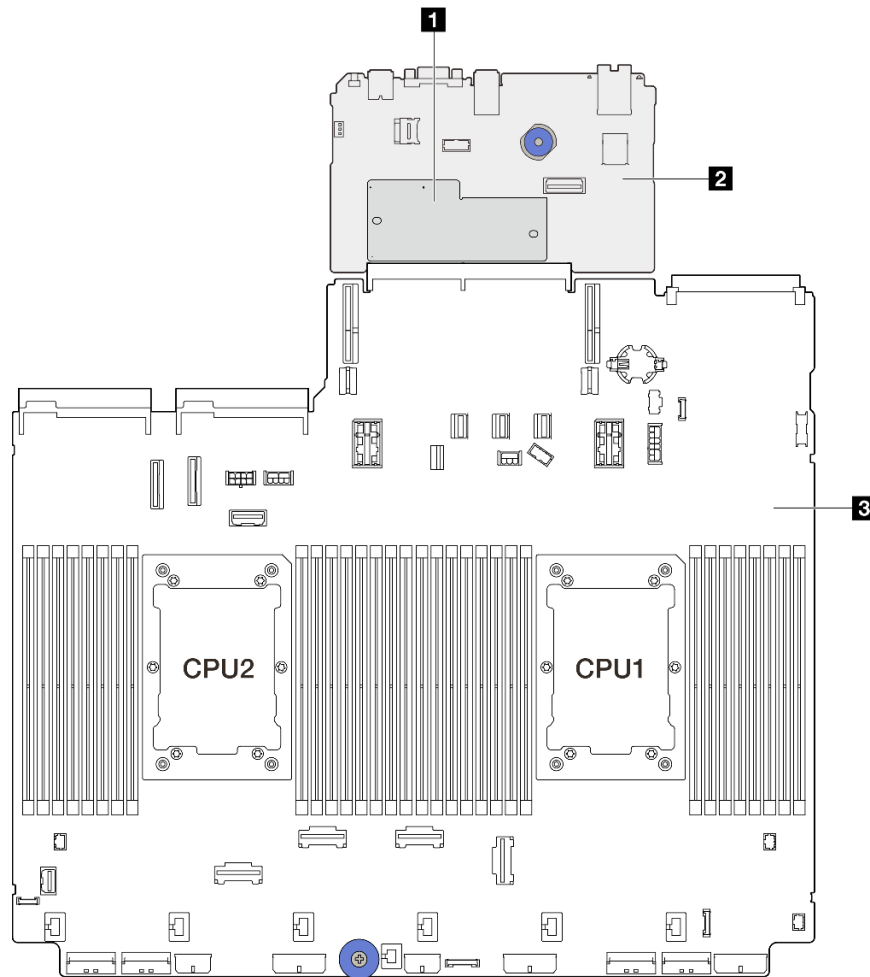


Figure 323. System-board-assembly layout

<b>1</b> Firmware and RoT security module	<b>2</b> System I/O board	<b>3</b> Processor board
---	---------------------------	--------------------------

- [“Remove the firmware and RoT security module” on page 355](#)
- [“Install the firmware and RoT security module” on page 357](#)
- [“Remove the system I/O board or processor board” on page 361](#)
- [“Install the system I/O board or processor board” on page 364](#)

## 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 the part without proper training and qualification.

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to [“Update the firmware” on page 691](#) for more information on firmware updating tools.

## Procedure

Step 1. Make preparation for the task.

- Perform OneCLI commands to back up the UEFI settings. See [https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_save\\_command](https://pubs.lenovo.com/lxce-onecli/onecli_r_save_command).
- Perform both OneCLI commands and XCC actions to back up the XCC settings. See [https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_save\\_command](https://pubs.lenovo.com/lxce-onecli/onecli_r_save_command) and [https://pubs.lenovo.com/xcc2/NN1ia\\_c\\_backupthexcc.html](https://pubs.lenovo.com/xcc2/NN1ia_c_backupthexcc.html).
- 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 88](#).
- Remove the top cover. See [“Remove the top cover” on page 381](#).
- If your server comes with riser assemblies or a rear drive cage, remove it first.
  - [“Remove a rear riser assembly” on page 334](#)
  - [“Remove the 7mm drive cage” on page 304](#)
  - [“Rear drive backplane and drive cage replacement” on page 312](#)

Step 2. Remove the firmware and RoT security module.

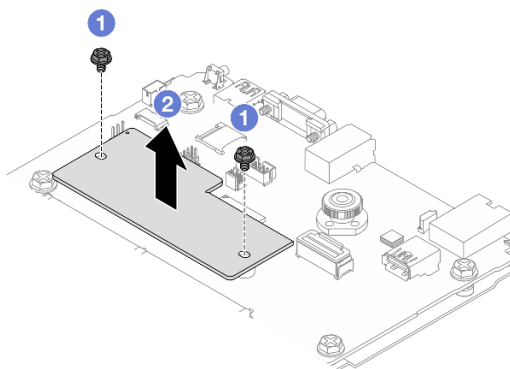


Figure 324. firmware and RoT security module removal

- 1** Loosen the two screws on the firmware and RoT security module.
- 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

[Watch the procedure on YouTube](#)

## 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 the part without proper training and qualification.

(Lenovo trained technician only) After replacing the firmware and RoT security module, update the UEFI, XCC and LXPM 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 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to [“Update the firmware” on page 691](#) 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. Install the firmware and RoT security module to the server.

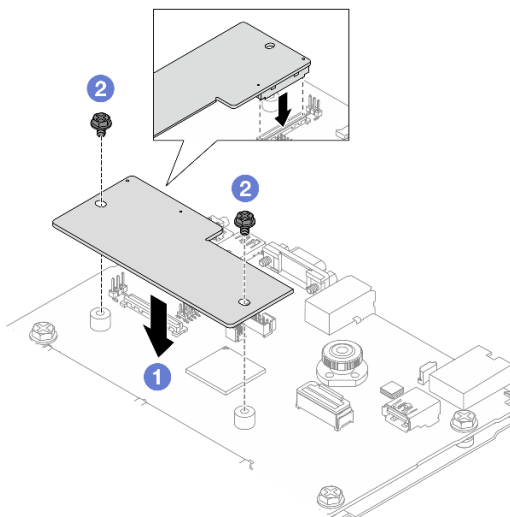


Figure 325. firmware and RoT security module installation

- 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. Install any components that you have removed:
    - “Install a rear riser assembly” on page 346
    - “Install the 7mm drive cage” on page 310
    - “Rear drive backplane and drive cage replacement” on page 312
  2. Complete the parts replacement. See “Complete the parts replacement” on page 383.
  3. 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/>.
  4. Perform OneCLI commands to restore the UEFI settings. See [https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_restore\\_command](https://pubs.lenovo.com/lxce-onecli/onecli_r_restore_command).
  5. Perform both OneCLI commands and XCC actions to restore the XCC settings. See [https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_restore\\_command](https://pubs.lenovo.com/lxce-onecli/onecli_r_restore_command) and [https://pubs.lenovo.com/xcc2/NN1ia\\_c\\_restorethexcc.html](https://pubs.lenovo.com/xcc2/NN1ia_c_restorethexcc.html).
  6. If there is a software (SW) key, for example, XCC FoD key, installed in the system, inject the key again to ensure that the key functions properly. See [Using Lenovo Features on Demand](#).
- Note:** If you need to replace the processor board together with the firmware and RoT security module, update the VPD before injecting the key. See [Update the Vital Product Data \(VPD\)](#).
7. Optionally, do the following if needed:
    - Hide/observe TPM. See “Hide/observe TPM” on page 359.
    - Update the TPM firmware. See “Update the TPM firmware” on page 359.
    - Enable UEFI Secure Boot. See “Enable UEFI Secure Boot” on page 360.

## Demo video

[Watch the procedure on YouTube](#)

## Hide/observe TPM

TPM is enabled by default to encrypt data transfer for system operation. Optionally, you can disable TPM 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" --imm <userid>:<password>@<ip_address> --override
```

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 TrustedComputingGroup.HideTPMfromOS "Yes" --imm USERID:PASSWORD=1@10.245.39.79 --override

Lenovo XClarity Essentials OneCLI 1xce_onecli01p-2.3.0
Licensed Materials - Property of Lenovo
(C) Copyright Lenovo Corp. 2013-2018 All Rights Reserved
If the parameters you input includes password, please Note that:
* The password must consist of a sequence of characters from `0-9a-zA-Z_+.$%!'&*()=` set
* Use "" to quote when password parameters include special characters
* Do not use reserved characters in path name when parameter contains path
Invoking SET command...
Connected to BMC at IP address 10.245.39.79 by IPMI
TrustedComputingGroup.HideTPMfromOS=Yes
Success.
```

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" --imm <userid>:<password>@<ip_address> --override
```

Example:

```
D:\onecli3>OneCli.exe config set TrustedComputingGroup.HideTPMfromOS "No" --imm USERID:PASSWORD=1@10.245.39.79 --override

Lenovo XClarity Essentials OneCLI 1xce_onecli01h-3.0.1
(C) Lenovo 2013-2020 All Rights Reserved

OneCLI License Agreement and OneCLI Legal Information can be found at the following location:
"D:\onecli3\Lic"

[1s]Certificate check finished [100%][=====]

Invoking SET command...
Connected to BMC at IP address 10.245.39.79 by IPMI
TrustedComputingGroup.HideTPMfromOS=No
Configure successfully, please reboot system.
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://pubs.lenovo.com/lxpm-overview/>.)
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://pubs.lenovo.com/lxpm-overview/>.)
2. If the power-on Administrator password is required, enter the password.
3. From the UEFI Setup page, click **System Settings → Security → Secure Boot**.
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 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:

[https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_set\\_command](https://pubs.lenovo.com/lxce-onecli/onecli_r_set_command)

**Note:** If disabling UEFI secure boot is needed, run the following command:

```
OneCli.exe config set SecureBootConfiguration.SecureBootSetting Disabled --bmc <userid>:<password>@<ip_
address>
```

## Remove the system I/O board or processor board

Follow instructions in this section to remove the system I/O board or 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 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 assembly.**

#### Attention:

- Read “[Installation Guidelines](#)” on page 57 and “[Safety inspection checklist](#)” on page 58 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 88.
- 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 88](#).
- 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. See [“Remove the server from rack” on page 88](#).
- f. Remove the top cover. See [“Remove the top cover” on page 381](#).
- g. If your server comes with an air baffle, a middle cage, or a rear cage, remove it first.
  - [“Remove the air baffle” on page 99](#)
  - [“Remove the middle drive cage and drive backplanes” on page 255](#)
  - [“Rear drive backplane and drive cage replacement” on page 312](#)
- h. If your server has a CFF adapter or a RAID flash power module installed on the front of the chassis, remove it first.
  - [“Remove an internal RAID/HBA/expander adapter” on page 164](#)
  - [“Remove a RAID flash power module from the chassis” on page 290](#)

- i. Record where the cables are connected to the system board assembly; then, disconnect all the cables.
- j. Remove any of the following components that are installed on the system board assembly and put them in a safe, static-protective place.
  - “Remove a system fan” on page 369
  - “Remove the system fan cage” on page 373
  - “Remove a memory module” on page 247
  - “Processor and heat sink replacement (trained technician only)” on page 267
  - “Remove the CMOS battery” on page 104
  - “Remove a rear riser assembly” on page 334
  - “Remove the rear OCP module” on page 328
- k. Pull out the power supplies slightly. Ensure that they are disconnected from the system board assembly.

Step 2. Remove the system board assembly.

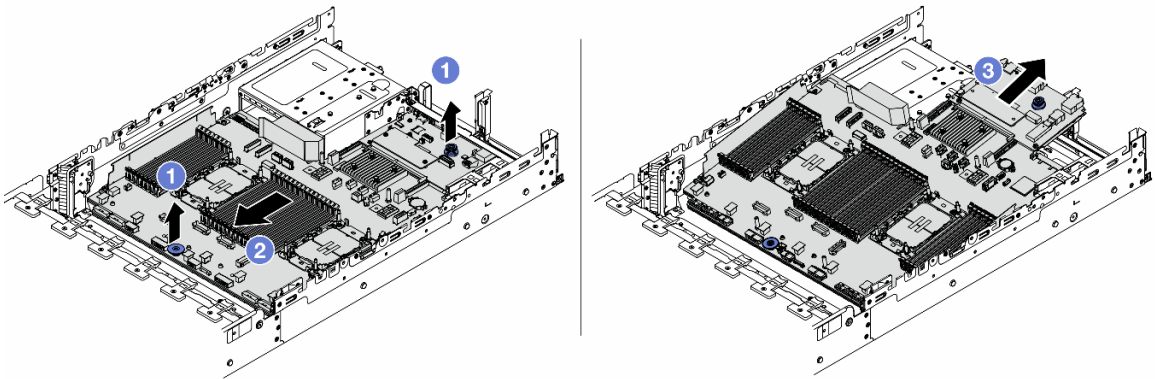


Figure 326. System board assembly removal

- a. ① Lift the two lifting handles at the same time.
- b. ② Slide the system board assembly towards the front of the chassis until it stops.
- c. ③ Tilt and lift the system board assembly out of the chassis.

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 out the system I/O board outward. During the entire pulling action, ensure that the system I/O board remains as horizontal as possible.

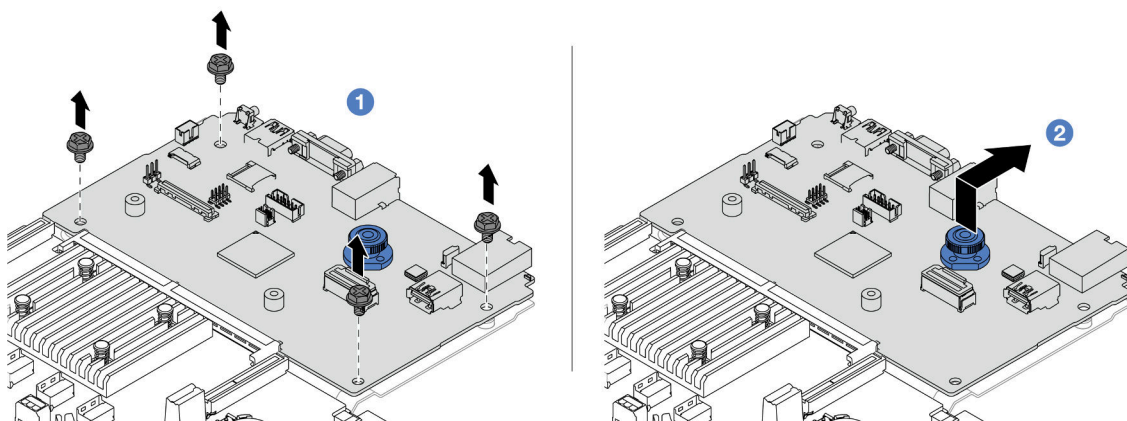


Figure 327. Separating the system I/O board from the processor board

- a. ① Remove the screws that secure the system I/O board.
- b. ② Lift and hold the rear lifting handle and slide the system I/O board towards the rear to disengage it from the processor board.

Step 4. (Optional) If you are going to replace the system I/O board, do the following:

1. Remove the firmware and RoT security module from the system I/O board. See [“Remove the firmware and RoT security module” on page 355](#).
2. Remove the MicroSD card. See [“Remove the MicroSD card” on page 251](#).

## 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. Take a socket cover from the processor socket assembly on the new processor board and orient it correctly above the processor socket assembly on the removed processor board.
  2. Gently press down the socket cover legs to the processor socket assembly, pressing on the edges to avoid damage to the socket pins. You might hear a click on the socket cover is securely attached.
  3. **Make sure** that the socket cover is securely attached to the processor socket assembly.
- If you plan to recycle the component, see [“Disassemble the system board assembly for recycle” on page 753](#).

## Demo video

[Watch the procedure on YouTube](#)

## Install the system I/O board or processor board

Follow instructions in this section to install the system I/O board or 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.

**Attention:**

- Read “[Installation Guidelines](#)” on page 57 and “[Safety inspection checklist](#)” on page 58 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 88.
- 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/products/servers/thinksystem/sr650v3/downloads/driver-list/> to see the latest firmware and driver updates for your server.
- Go to “[Update the firmware](#)” on page 691 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. (Optional) If you are replacing the system I/O board, do the following:
1. Install the firmware and RoT security module removed from the old system I/O board onto the new system I/O board. See “[Install the firmware and RoT security module](#)” on page 357.
  2. Install the MicroSD card removed from the old system I/O board onto the new system I/O board. See “[Install the MicroSD card](#)” on page 253.
- Step 3. 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.

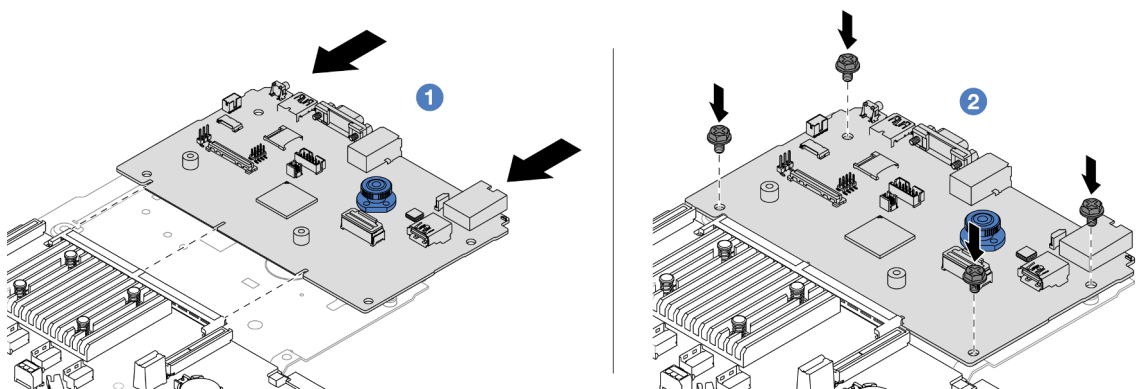
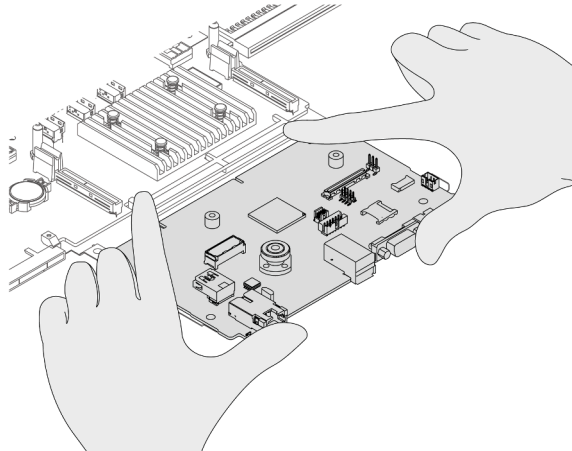


Figure 328. Installing the system I/O board onto the processor board

- a. 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.



- b. ② Install the screws to fix the system I/O board into place.

Step 4. Install the system board assembly into the server.

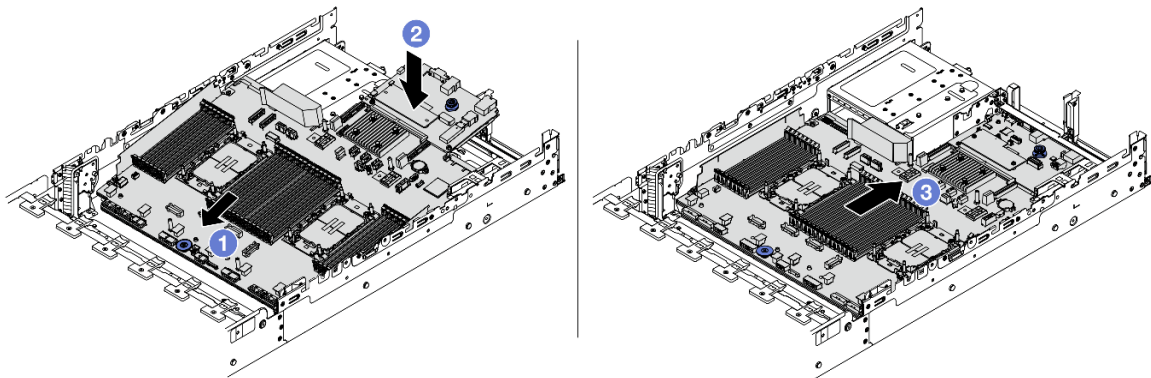


Figure 329. System board assembly installation

- a. ① Insert the front end of the system board assembly towards the front of the chassis until it stops.
- b. ② Lower the other end down into the chassis.
- c. ③ Slide the system board assembly towards the rear of the chassis until it clicks into place. Ensure that rear connectors on the system I/O board are inserted into the corresponding holes in the rear panel.

## After you finish

1. Install any components that you have removed:

- [“Install a processor and heat sink” on page 274](#)
- [“Install a memory module” on page 249](#)
- [“Install the CMOS battery” on page 106](#)
- [“Install an internal RAID/HBA/expander adapter” on page 166](#)
- [“Install a RAID flash power module on the chassis” on page 292](#)

- [“Install a system fan” on page 370](#)
  - [“Install the system fan cage” on page 374](#)
  - [“Install a rear riser assembly” on page 346](#)
  - [“Install the middle drive backplanes and drive cage” on page 258](#)
  - [“Install the rear OCP module” on page 329](#)
  - [“Rear drive backplane and drive cage replacement” on page 312](#)
2. Reconnect all the required cables to the same connectors on the system board assembly. See [Chapter 6 “Internal cable routing” on page 385](#).
  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 382](#).
  5. If the server was installed in a rack, reinstall the server into the rack. See [“Install the server to rack” on page 91](#).
  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 87](#).
  8. Update the vital product data (VPD). See [“Update the Vital Product Data \(VPD\)” on page 367](#).  
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 53](#).
  9. Optionally, enable UEFI Secure Boot. See [“Enable UEFI Secure Boot” on page 360](#).

## Demo video

[Watch the procedure on YouTube](#)

## 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]  
onecli config set SYSTEM\_PROD\_DATA.SysInfoProdIdentifierEx <system model> --override [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
<m/t_model>	The server machine type and model number. Type xxxxyyy, where xxxx is the machine type and yyy is the server model number.
<s/n>	The serial number on the server. Type zzzzzzz, where zzzzzzz is the serial number.
<system model>	The system model on the server. Type system yyyyyyyyy, where yyyyyyyy is the product identifier.
<asset_tag>	The server asset tag number. Type aaaaaaaaaaaaaaaaaaaaaaaaaaaaaa, where aaaaaaaaaaaaaaaaaaaaaaaaaaaaaa is the asset tag number.
[access_method]	<p>The access method that you select to access the target server.</p> <ul style="list-style-type: none"><li>• Online KCS (unauthenticated and user restricted): You can directly delete [access_method] from the command.</li><li>• Online authenticated LAN: In this case, specify below LAN account information at the end of the OneCLI command: --bmc-username &lt;user_id&gt; --bmc-password &lt;password&gt;</li><li>• Remote WAN/LAN: In this case, specify below XCC account information and IP address at the end of the OneCLI command: --bmc &lt;bmc_user_id&gt;:&lt;bmc_password&gt;@&lt;bmc_external_IP&gt;</li></ul> <p><b>Notes:</b></p> <ul style="list-style-type: none"><li>– &lt;bmc_user_id&gt; The BMC account name (1 of 12 accounts). The default value is USERID.</li><li>– &lt;bmc_password&gt; The BMC account password (1 of 12 accounts).</li></ul>

## System fan replacement

Use this information to remove and install a system fan.

- [“Remove a system fan” on page 369](#)



- [“Install a system fan” on page 370](#)

## Remove a system fan

Use this information to remove a system fan.

### 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 57](#) and [“Safety inspection checklist” on page 58](#) 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.
- When removing a hot-swap fan without powering off the server, do not touch the system fan cage. With power on, complete the replacement within 30 seconds to ensure proper operation.

## 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 [“Remove the server from rack” on page 88](#).
- Step 2. Remove the top cover. See [“Remove the top cover” on page 381](#).
- Step 3. Remove the system fan.

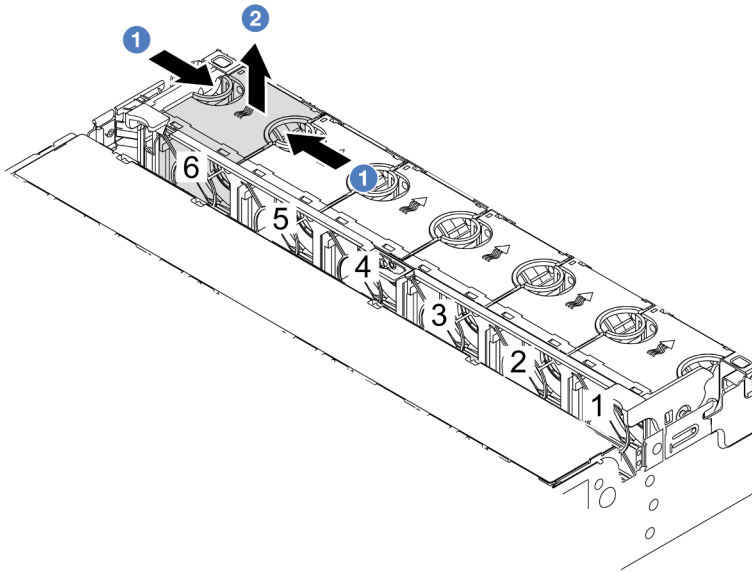


Figure 330. System fan removal

- a. 1 Grasp the top of the system fan with your fingers.
- b. 2 Lift the system fan out of the server.

### 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 370](#).
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 a system fan

Use this information to install a system fan.

### 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 57](#) and [“Safety inspection checklist” on page 58](#) 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.
- When installing a hot-swap fan without powering off the server, do not touch the system fan cage. With power on, complete the replacement within 30 seconds to ensure proper operation.

### 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. Position the system fan above the system fan cage. The system fan connector on the bottom of the system fan should face the rear of the chassis. Press the system fan straight down until it is seated into place.

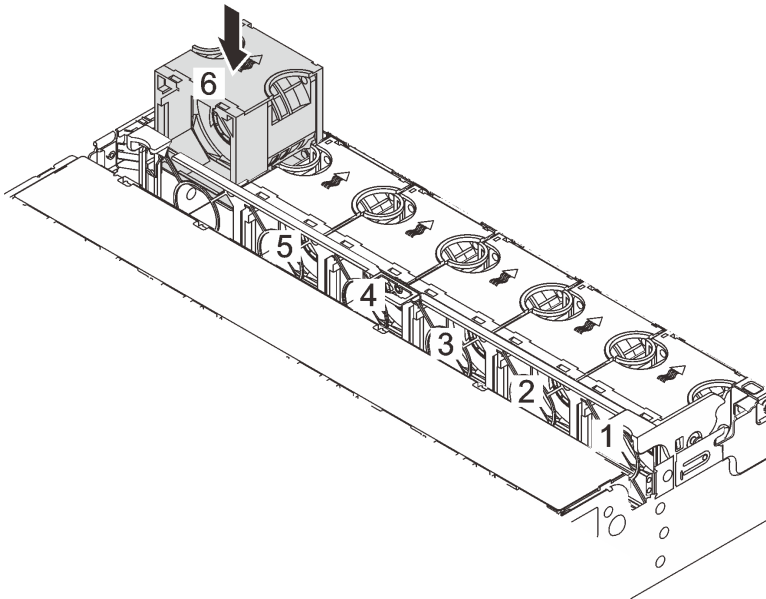


Figure 331. System fan installation

### After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

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## System fan cage replacement

Use this information to remove and install the system fan cage.

- “Remove the system fan cage” on page 373
- “Install the system fan cage” on page 374

## Remove the system fan cage

Use this information to remove the system fan cage.

### About this task

#### Attention:

- Read “Installation Guidelines” on page 57 and “Safety inspection checklist” on page 58 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 88.
- 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-BmyijyY0-INvapM4fTV5Gf>.

### 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 “Remove the server from rack” on page 88.
- Step 2. Remove the top cover. See “Remove the top cover” on page 381.
- Step 3. (Optional) If you are replacing the system fan cage, remove all system fans first. See “Remove a system fan” on page 369. If you are removing the system fan cage to access other components, you can remove it with the system fans installed.
- Step 4. Remove the system fan cage.

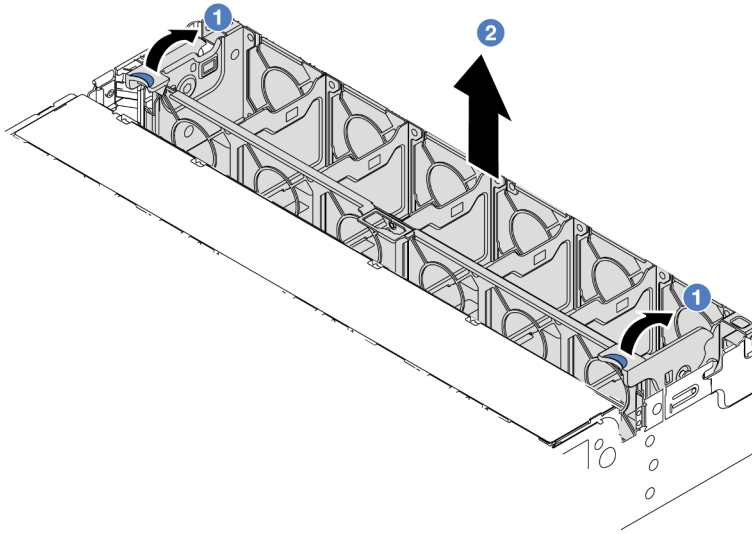


Figure 332. System fan cage removal

- a. ① Rotate the levers of the system fan cage to the rear of the server.
- b. ② Lift the system fan cage straight up and 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

[Watch the procedure on YouTube](#)

## Install the system fan cage

Use this information to install the system fan cage.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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

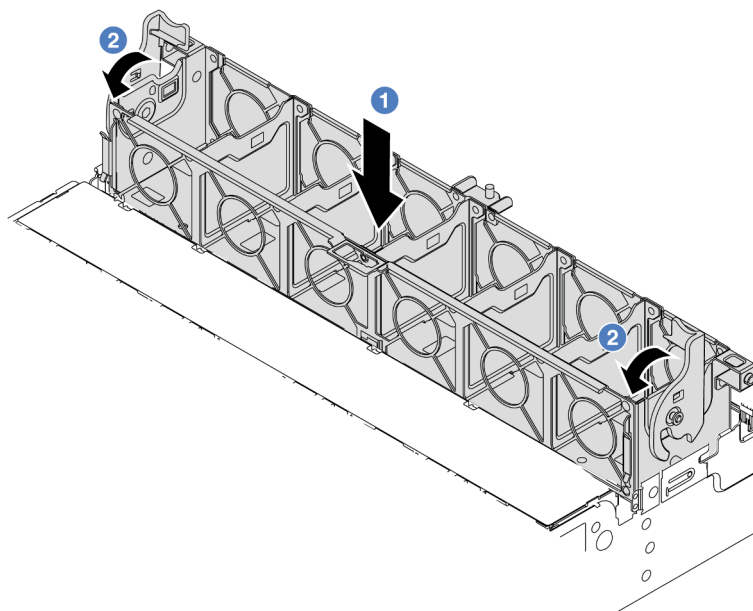


Figure 333. System fan cage installation

- Step 1. Align the system fan cage with the mounting guides on both sides of chassis, and lower it into the chassis.
- Step 2. Rotate the fan cage levers down until the fan cage clicks into place.

**Note:** If there are system fans installed in the system fan cage, ensure that the system fans are correctly connected to the system fan connectors on the system board assembly.

## After you finish

1. If you have removed the system fans, reinstall them. See [“Install a system fan” on page 370](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

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## Serial port module replacement

Use this information to remove and install a serial port module.

### Remove a serial port module

Use this information to remove a serial port module.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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.

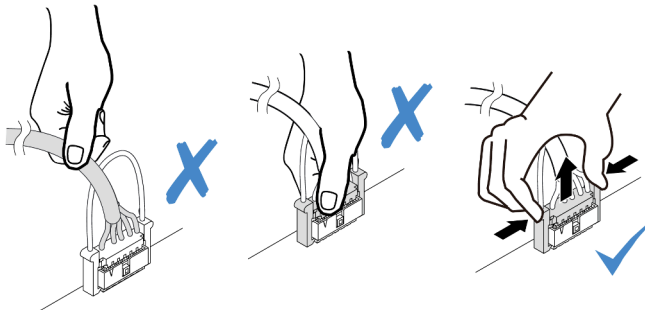
## Procedure

**Note:** The riser bracket in below illustrations might look different from your riser bracket. The removal procedure is the same.

- 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 [“Remove the server from rack” on page 88](#).
- Step 2. Remove the top cover. See [“Remove the top cover” on page 381](#).
- Step 3. Disconnect the cable of the serial port module from the system board assembly.

### 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 334. Disconnecting cables from the system board assembly*

- Step 4. Remove the riser bracket from the server.



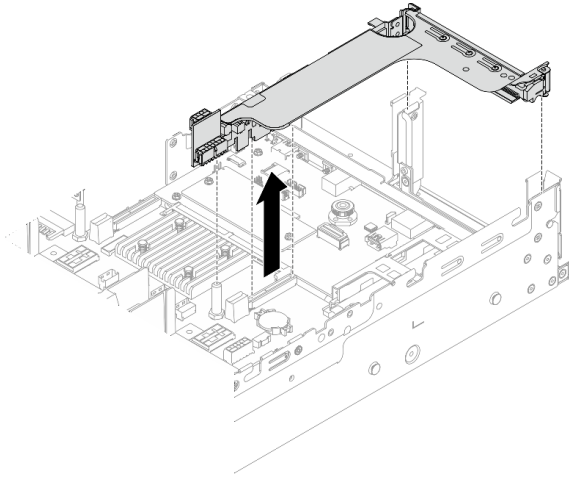


Figure 335. Removing the riser bracket

Step 5. Remove the serial port module out of the riser bracket.

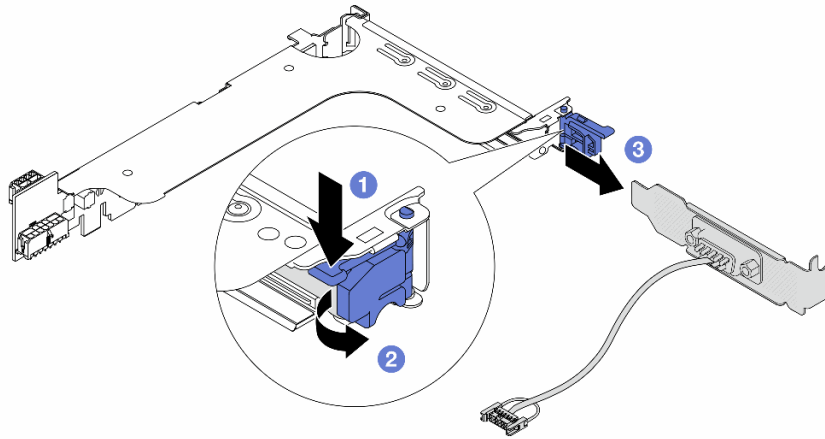


Figure 336. Removing the serial port module

- a. ① Press down the bracket latch.
- b. ② Open the latch.
- c. ③ Slide the serial port module out of the riser bracket.

Step 6. (Optional) If you need to replace the serial port bracket, use a 5 mm wrench to disassemble the serial port cable from the bracket.

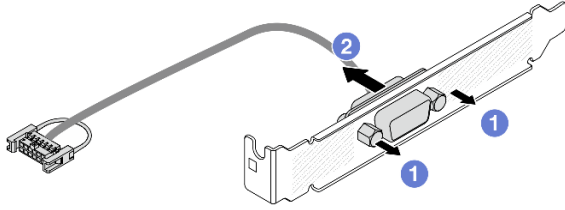


Figure 337. Disassembling the serial port module

## After you finish

1. Install a new serial port module, a PCIe adapter, or a filler to cover the place. See [“Install a serial port module” on page 378](#) and [“Install a rear riser assembly” on page 346](#).
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 a serial port module

Use this information to install a serial port module.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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 riser bracket in below illustrations might look different from your riser bracket. The installation procedure is the same.

- 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. Use a 5 mm wrench to install the serial port cable into the bracket.

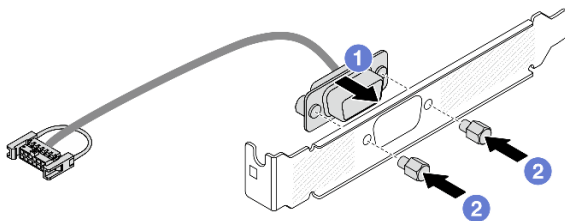


Figure 338. Assembling the serial port module

- a. ① Align the connector of the serial port cable with the holes in the bracket.
- b. ② Install the two screws to secure the cable connector into the bracket.

Step 3. Install the serial port module to the riser bracket.

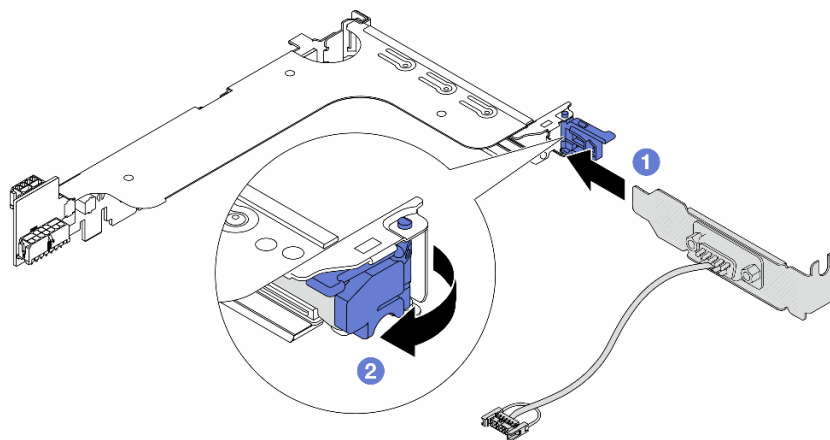


Figure 339. Installing the serial port module

- a. ① Align the serial port module with the riser bracket and insert it into the riser bracket.
- b. ② Close the bracket latch to secure the serial port module.

Step 4. Install the riser assembly back to the server.

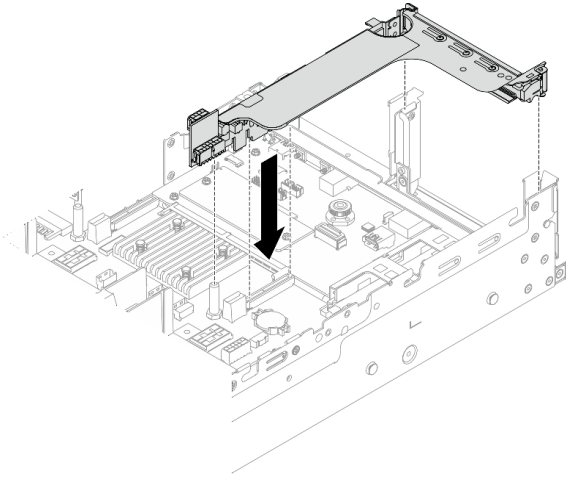


Figure 340. Installing the riser assembly

- Step 5. Connect the cable of the serial port module to the serial-port-module connector on the system board assembly. For the location of the connector, refer to [“System-board-assembly connectors” on page 40](#).

## After you finish

1. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).
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.

## Demo video

[Watch the procedure on YouTube](#)

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## Top cover replacement

Follow instructions in this section to remove and install the top cover.

## Remove the top cover

Follow instructions in this section to remove the top cover.

### 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.

### 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.

## About this task

### **Attention:**

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) 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 88](#).
- 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. 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. Remove the top cover.

**Attention:** Handle the top cover carefully. Dropping the top cover with the cover latch open might damage the cover latch.

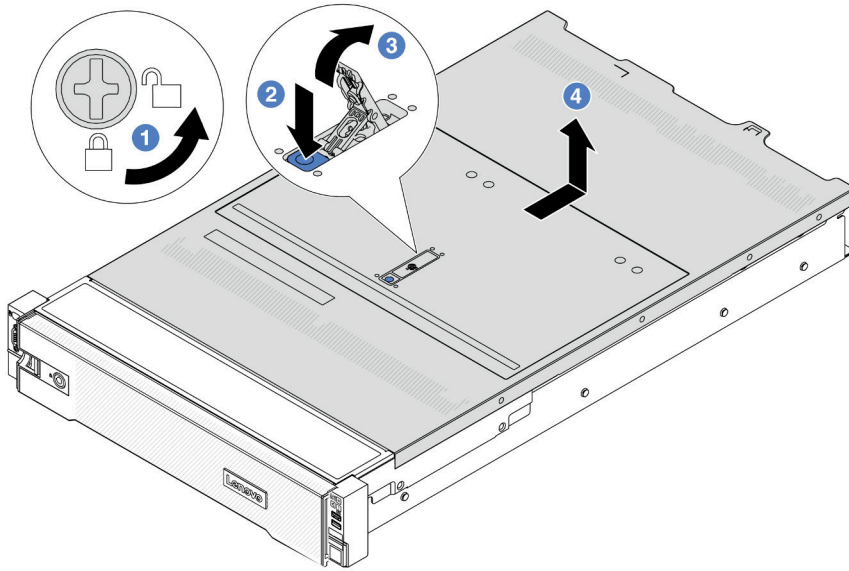


Figure 341. Top cover removal

- 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

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 top cover

Follow instructions in this section to install the top cover.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 57](#) and [“Safety inspection checklist” on page 58](#) to ensure that you work safely.
- Make sure 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.
- Make sure that all internal cables are correctly routed. See [Chapter 6 “Internal cable routing” on page 385](#).

## Procedure

Step 1. 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.

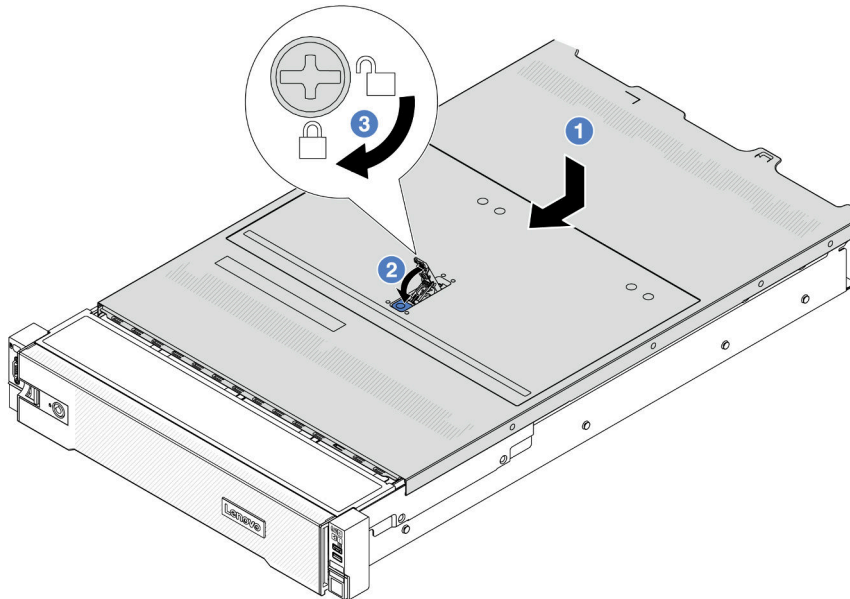


Figure 342. Top cover installation

- 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 Rotate the cover latch until the top cover snaps into position. 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

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### Demo video

[Watch the procedure on YouTube](#)

---

## 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 the cable connecting and routing information for each component.
3. Reinstall the air baffle. See [“Install the air baffle” on page 101](#).

**Attention:** For proper cooling and airflow, reinstall the air baffle before you turn on the server. Operating the server with the air baffle removed might damage server components.

4. Reinstall the top cover. See [“Install the top cover” on page 382](#).
5. If the server was installed in a rack, reinstall the server into the rack. See [“Install the server to rack” on page 91](#).
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 87](#).
8. Update the server configuration.
  - Download and install the latest device drivers: <http://datacentersupport.lenovo.com>.
  - Update the system firmware. See [“Update the firmware” on page 691](#).
  - Update the UEFI configuration. See <https://pubs.lenovo.com/uefi-overview/>.
  - Reconfigure the disk arrays if you have installed or removed a hot-swap drive or a RAID adapter. See <https://pubs.lenovo.com/lxpm-overview/> for the LXPM documentation compatible with your server.



---

## Chapter 6. Internal cable routing

See this section to do cable routing for specific components.

To connect cables, observe the following guidelines:

- 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.

**Note:** Disengage all latches, release tabs, or locks on cable connectors when you disconnect cables from the system board assembly. Failing to release them before removing the cables will damage the cable sockets on the system board assembly, which are fragile. Any damage to the cable sockets might require replacing the system board assembly.

---

### Identifying connectors

See this section to locate and identify the connectors on the electric boards.

- [“Drive backplane connectors” on page 385](#)

For the connectors on system board assembly, see [“System-board-assembly connectors” on page 40](#).

### Drive backplane connectors

See this section to locate the connectors on the drive backplanes.

The server supports the following backplanes depending on server configurations:

- [“8 x 2.5-inch SAS/SATA front backplane” on page 386](#)
- [“8 x 2.5-inch AnyBay front backplane” on page 386](#)
- [“24 x 2.5-inch SAS/SATA front expander backplane” on page 386](#)
- [“8 x 3.5-inch SAS/SATA front backplane” on page 387](#)
- [“12 x 3.5-inch SAS/SATA front backplane” on page 387](#)
- [“12 x 3.5-inch AnyBay front backplane” on page 387](#)
- [“12 x 3.5-inch SAS/SATA front expander backplane” on page 388](#)
- [“4 x 2.5-inch SAS/SATA middle/rear backplane” on page 388](#)
- [“4 x 2.5-inch AnyBay middle/rear backplane” on page 388](#)
- [“4 x 2.5-inch NVMe middle backplane” on page 389](#)
- [“4 x 3.5-inch SAS/SATA middle/rear backplane” on page 389](#)
- [“2 x 3.5-inch SAS/SATA rear backplane” on page 389](#)
- [“8 x 2.5-inch SAS/SATA rear backplane” on page 389](#)

8 x 2.5-inch SAS/SATA front backplane

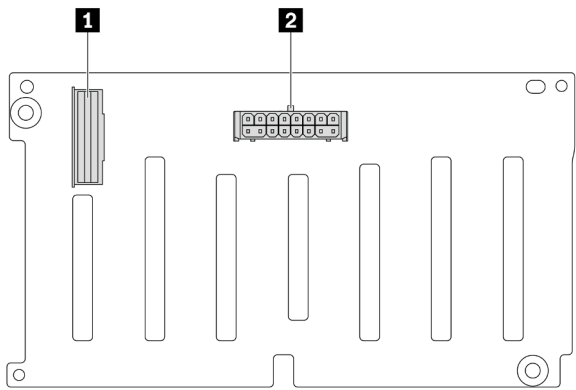


Figure 343. Connectors on the 8 x 2.5-inch SAS/SATA backplane

<b>1</b> SAS connector	<b>2</b> Power connector
------------------------	--------------------------

8 x 2.5-inch AnyBay front backplane

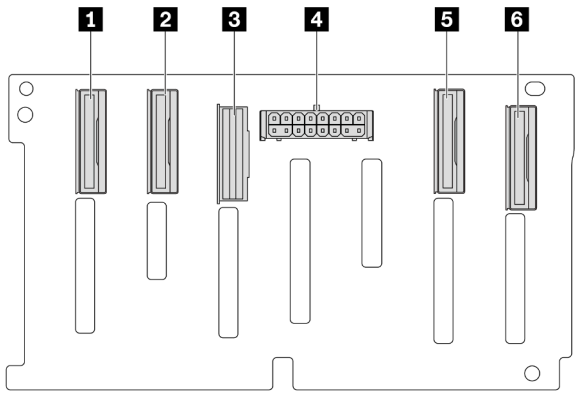


Figure 344. Connectors on the 8 x 2.5-inch AnyBay backplane

<b>1</b> NVMe 6-7 connector	<b>2</b> NVMe 4-5 connector
<b>3</b> SAS connector	<b>4</b> Power connector
<b>5</b> NVMe 2-3 connector	<b>6</b> NVMe 0-1 connector

24 x 2.5-inch SAS/SATA front expander backplane

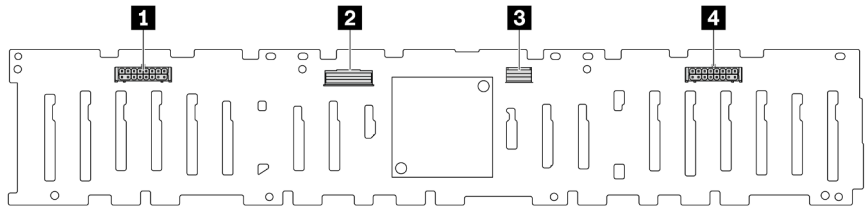


Figure 345. Connectors on the 24 x 2.5-inch SAS/SATA front expander backplane

<b>1</b> Power connector 2	<b>2</b> SAS 0 connector
<b>3</b> SAS 1 connector	<b>4</b> Power connector 1

### 8 x 3.5-inch SAS/SATA front backplane

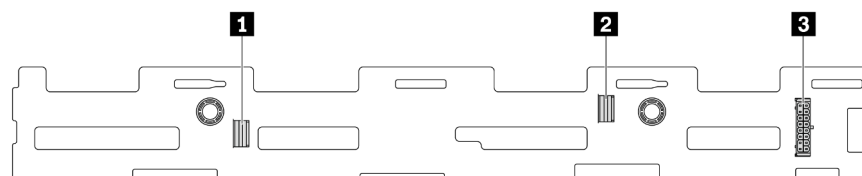


Figure 346. Connectors on the 8 x 3.5-inch SAS/SATA backplane

<b>1</b> SAS 1 connector	<b>2</b> SAS 0 connector
<b>3</b> Power connector	

### 12 x 3.5-inch SAS/SATA front backplane

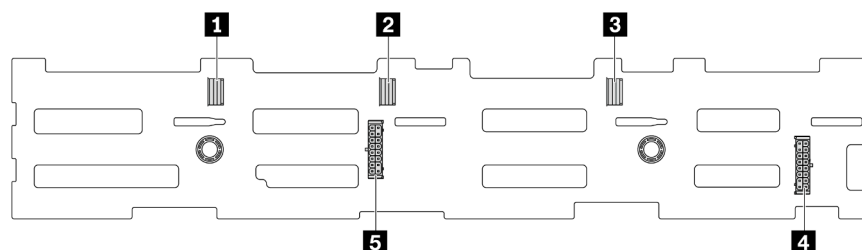


Figure 347. Connectors on the 12 x 3.5-inch SAS/SATA backplane

<b>1</b> SAS 2 connector	<b>2</b> SAS 1 connector
<b>3</b> SAS 0 connector	<b>4</b> Power connector 1
<b>5</b> Power connector 2	

### 12 x 3.5-inch AnyBay front backplane

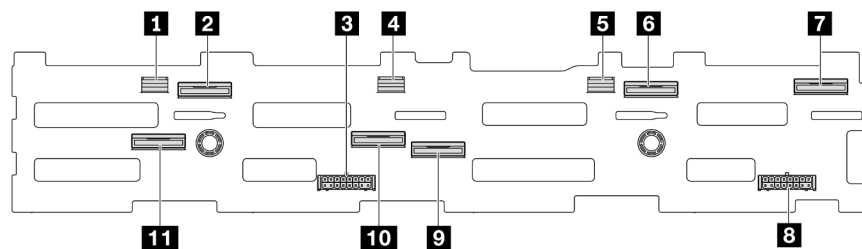


Figure 348. Connectors on the 12 x 3.5-inch AnyBay backplane

<b>1</b> SAS 2 connector	<b>2</b> NVMe 8-9 connector
<b>3</b> Power connector 2	<b>4</b> SAS 1 connector
<b>5</b> SAS 0 connector	<b>6</b> NVMe 2-3 connector
<b>7</b> NVMe 0-1 connector	<b>8</b> Power connector 1

<b>9</b> NVMe 4-5 connector	<b>10</b> NVMe 6-7 connector
<b>11</b> NVMe 10-11 connector	

#### 12 x 3.5-inch SAS/SATA front expander backplane

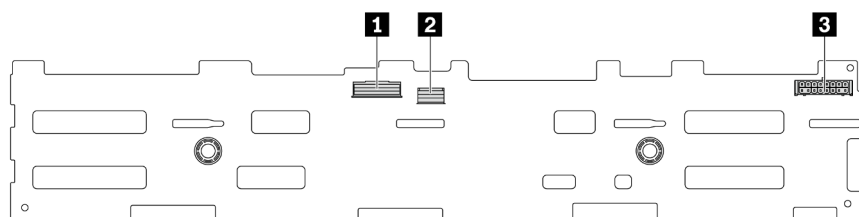


Figure 349. Connectors on the 12 x 3.5-inch SAS/SATA front expander backplane

<b>1</b> SAS 0 connector	<b>2</b> SAS 1 connector
<b>3</b> Power connector	

#### 4 x 2.5-inch SAS/SATA middle/rear backplane

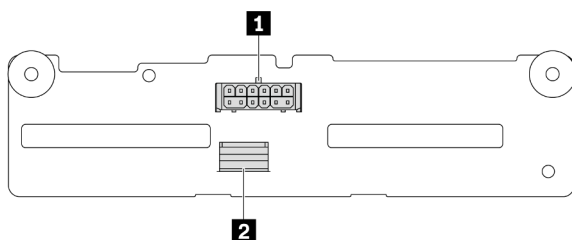


Figure 350. Connectors on the 4 x 2.5-inch SAS/SATA backplane

<b>1</b> Power connector	<b>2</b> SAS connector
--------------------------	------------------------

#### 4 x 2.5-inch AnyBay middle/rear backplane

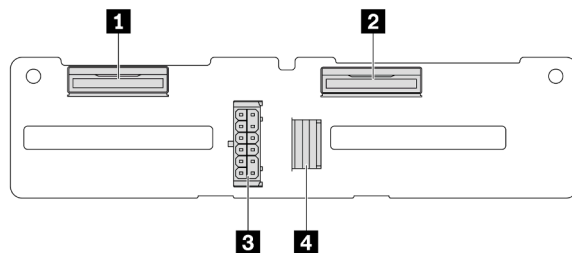


Figure 351. 4 x 2.5-inch AnyBay backplane connectors

<b>1</b> NVMe 2-3 connector	<b>3</b> Power connector
<b>2</b> NVMe 0-1 connector	<b>4</b> SAS connector

#### 4 x 2.5-inch NVMe middle backplane

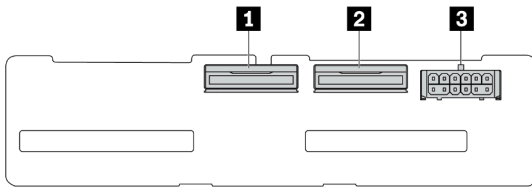


Figure 352. Connectors on the 4 x 2.5-inch NVMe backplane

<b>1</b> NVMe 2-3 connector	<b>2</b> NVMe 0-1 connector
<b>3</b> Power connector	

#### 4 x 3.5-inch SAS/SATA middle/rear backplane

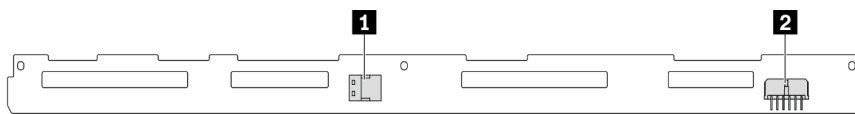


Figure 353. Connectors on the 4 x 3.5-inch SAS/SATA backplane

<b>1</b> SAS connector	<b>2</b> Power connector
------------------------	--------------------------

#### 2 x 3.5-inch SAS/SATA rear backplane

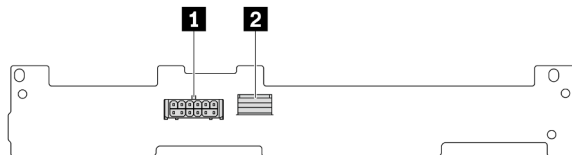


Figure 354. Connectors on the 2 x 3.5-inch SAS/SATA backplane

<b>1</b> Power connector	<b>2</b> SAS connector
--------------------------	------------------------

#### 8 x 2.5-inch SAS/SATA rear backplane

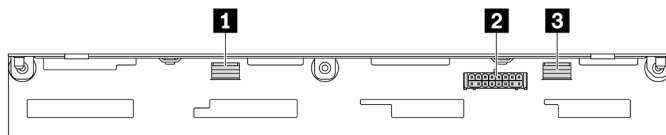


Figure 355. Connectors on the 8 x 2.5-inch SAS/SATA backplane

<b>1</b> SAS 1 connector	<b>2</b> Power connector
<b>3</b> SAS 0 connector	

# 7mm drives

This section provides cable routing information for the 7mm drives.

**Note:** The following uses the 7mm drives installed on riser 2 as an example for illustration. The cable routing for 7mm drives installed on riser 1 is similar.

- “7mm non-RAID SATA/NVMe 2-Bay backplanes” on page 390
- “7mm RAID NVMe 2-Bay backplanes” on page 391
- “7mm RAID SATA/NVMe 2-Bay backplanes” on page 391

## 7mm non-RAID SATA/NVMe 2-Bay backplanes

**Note:** The 7mm non-RAID SATA/NVMe 2-Bay backplanes support SATA cable connection, NVMe cable connection, or RAID cable connection.

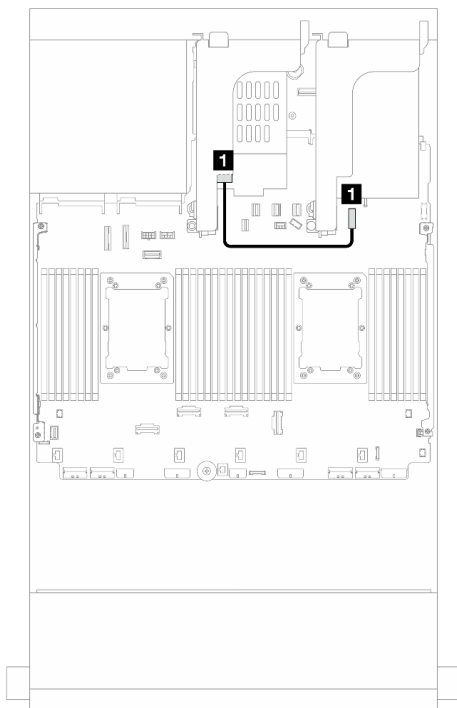


Figure 356. Power cable routing

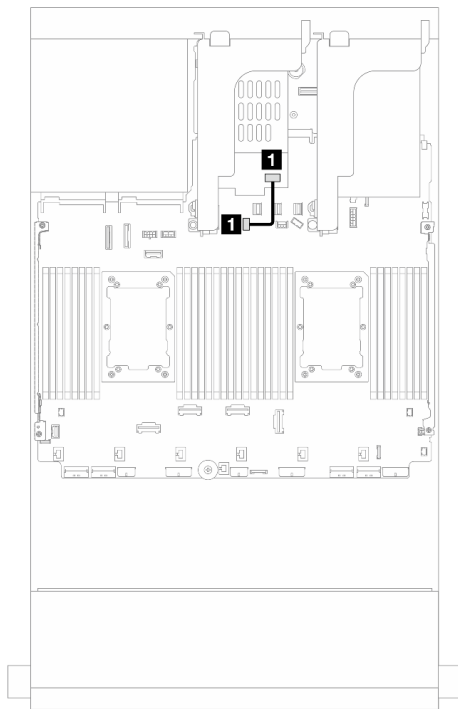


Figure 357. SATA cable routing

From	To	From	To
<b>1</b> Power connector on the 7mm backplane	<b>1</b> 7mm power connector on the system board assembly	<b>1</b> Signal connector on the 7mm drive backplane	<b>1</b> M.2/7mm backplane signal connector on the system board assembly

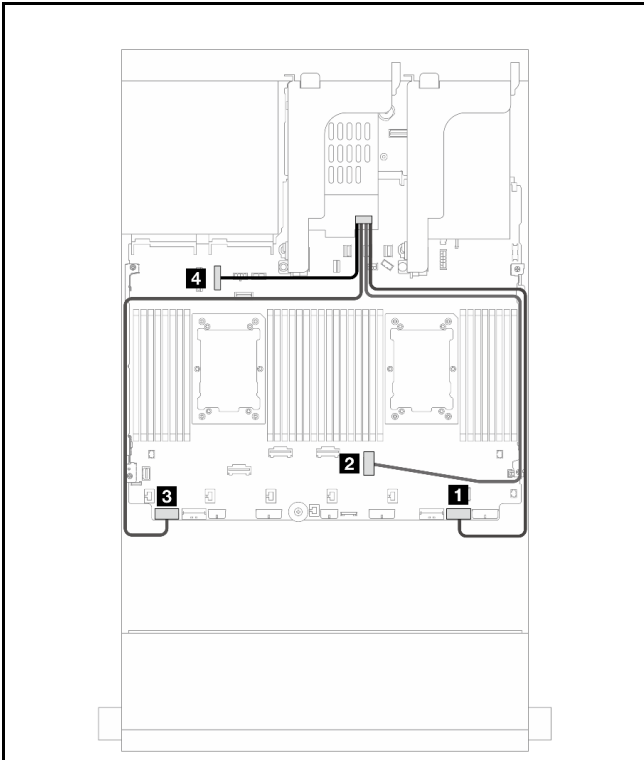


Figure 358. NVMe cable routing

**Note:** The illustration shows four NVMe cable connection options, but the four options are mutually exclusive. Select one of them based on your scenario.

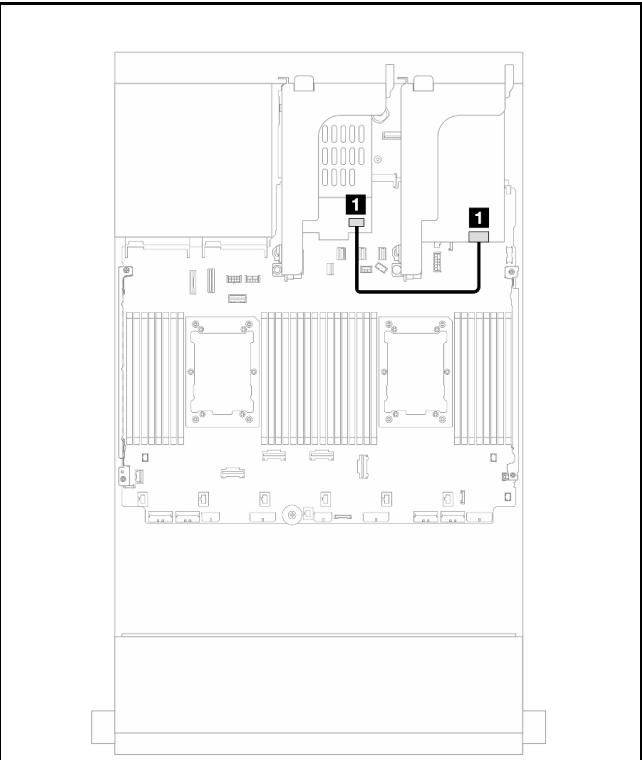


Figure 359. RAID cable routing

From	To	From	To
Signal connector on the 7mm drive backplane	1 PCIe 1	1 Signal connector on the 7mm drive backplane	1 8i adapter: C0
	2 PCIe 3 (one processor installed)		
	3 PCIe 8		
	4 PCIe 10		

7mm RAID NVMe 2-Bay backplanes

7mm RAID SATA/NVMe 2-Bay backplanes

**Note:** The cable routing for 7mm RAID NVMe 2-Bay backplanes is the same as that for 7mm RAID SATA/ NVMe 2-Bay backplanes.

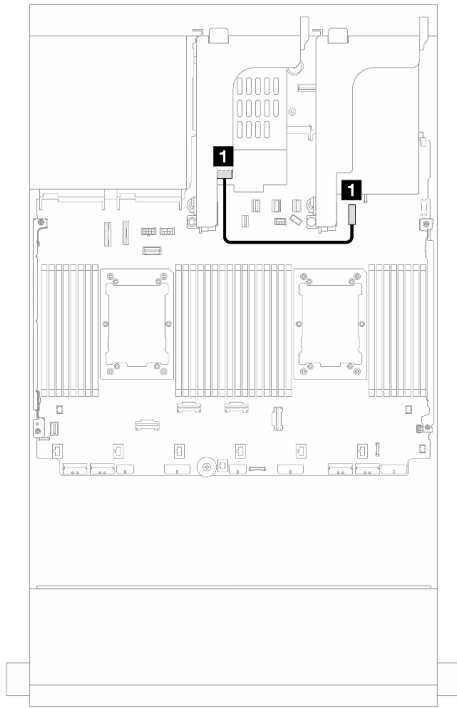


Figure 360. Power cable routing

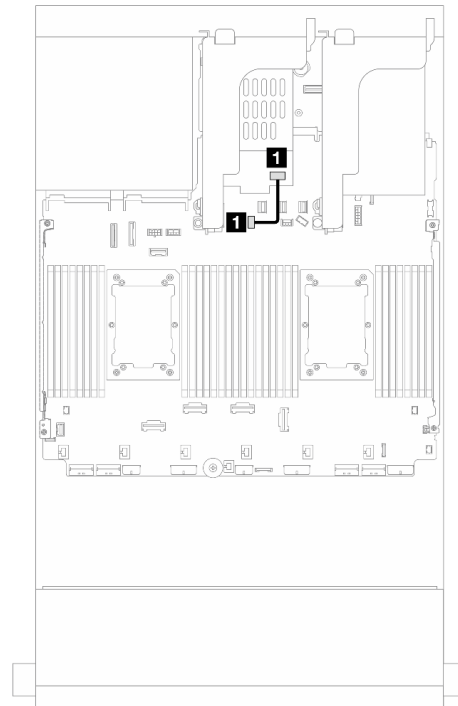


Figure 361. Signal cable routing

From	To	From	To
<b>1</b> Power connector on the 7mm backplane	<b>1</b> 7mm power connector on the system board assembly	<b>1</b> Signal connector on the 7mm drive backplane	<b>1</b> M.2/7mm backplane signal connector on the system board assembly

## Direct water cooling module

Use this section to understand the cable routing of the Direct Water Cooling Module (DWCM).

**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\(TM\) Processor Direct Water Cooling Module” on page 175](#) for details.



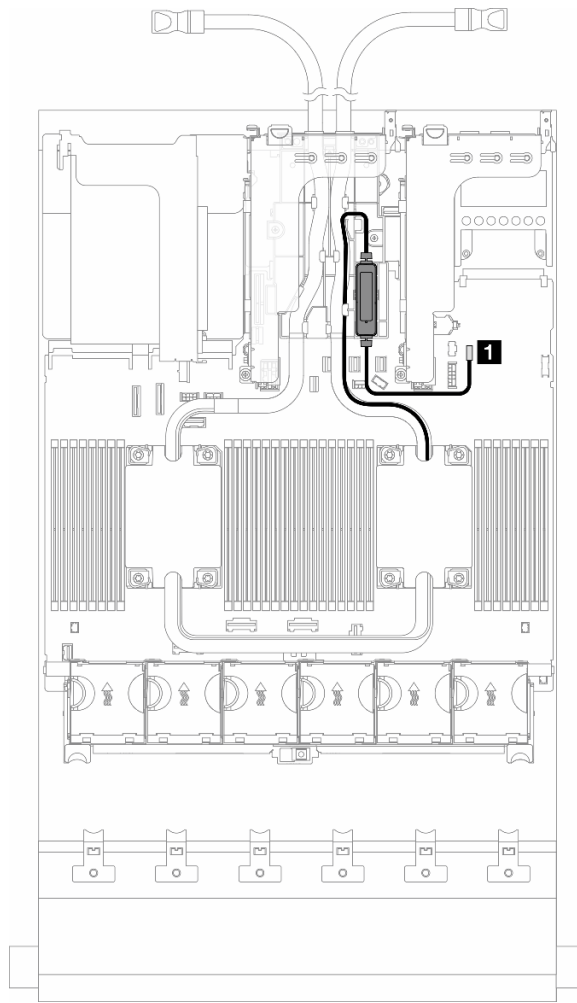


Figure 362. Direct water cooling module cable routing

From	To
Leak detection cable	Leak detection connector

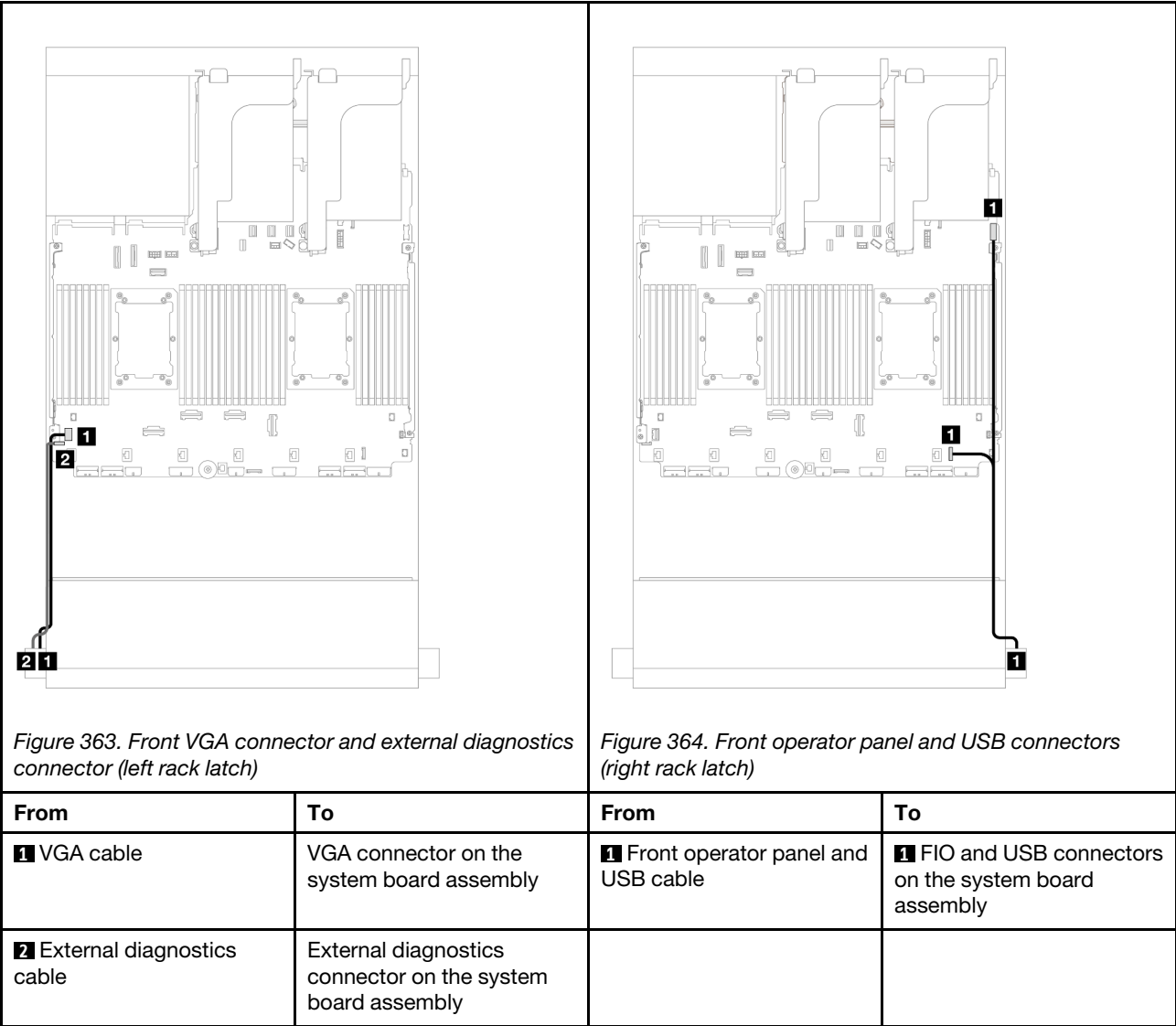
# Front I/O connectors

Use the section to understand the cable routing for the front I/O connectors, including VGA connector, external diagnostics connector, front operator panel connector, and front USB connectors.

- “Front I/O connectors on rack latches” on page 394
- “Front I/O connectors on the media bay” on page 394

## Front I/O connectors on rack latches

**Note:** When routing a cable on the rack latch, ensure that it is fixed on the upper frame of the cable retainer. For details, refer to .



## Front I/O connectors on the media bay

The illustration shows the cable routing for the front operator panel and front USB connectors on the media bay.

Depending on the server model, the server might come with a front operator panel with an LCD display (called integrated diagnostics panel) or a front operator panel without an LCD display.

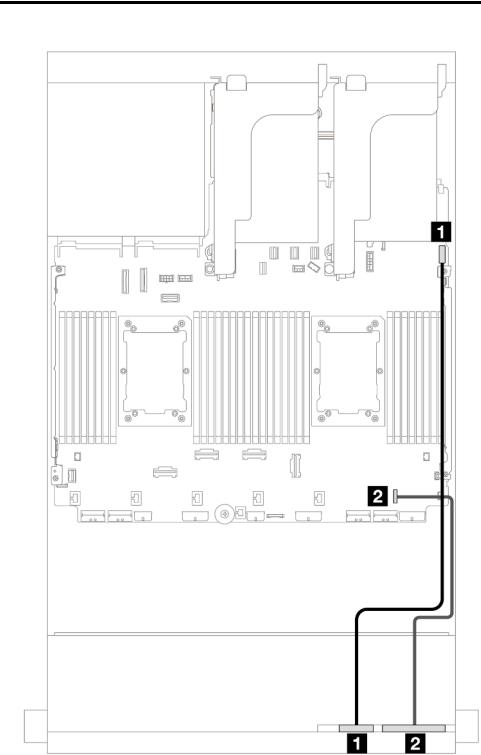


Figure 365. Front operator panel with an LCD display

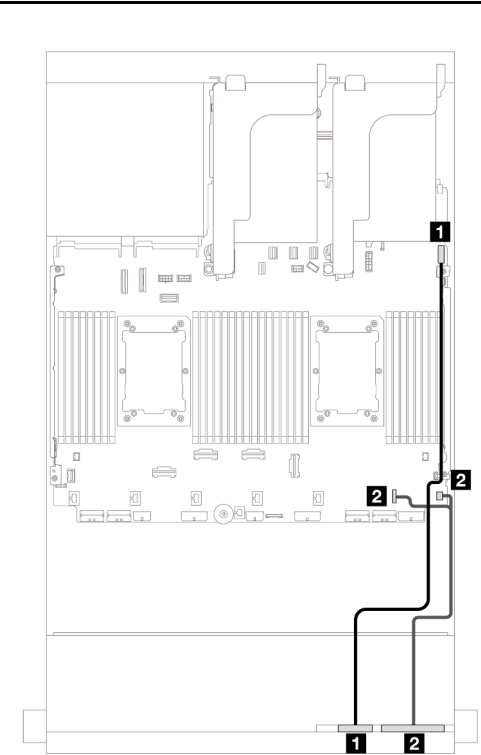
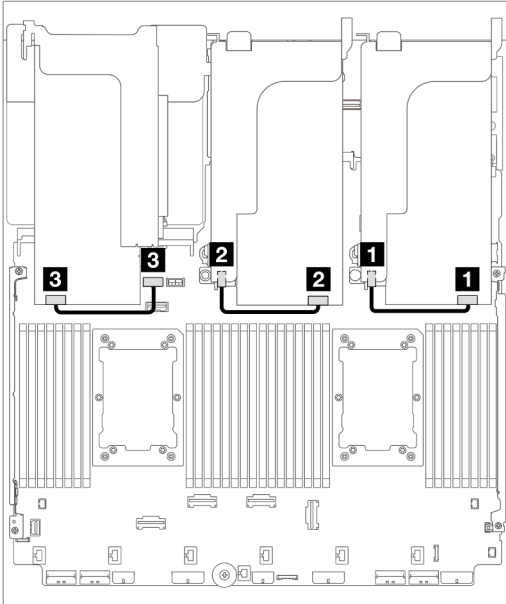


Figure 366. Front operator panel without an LCD display

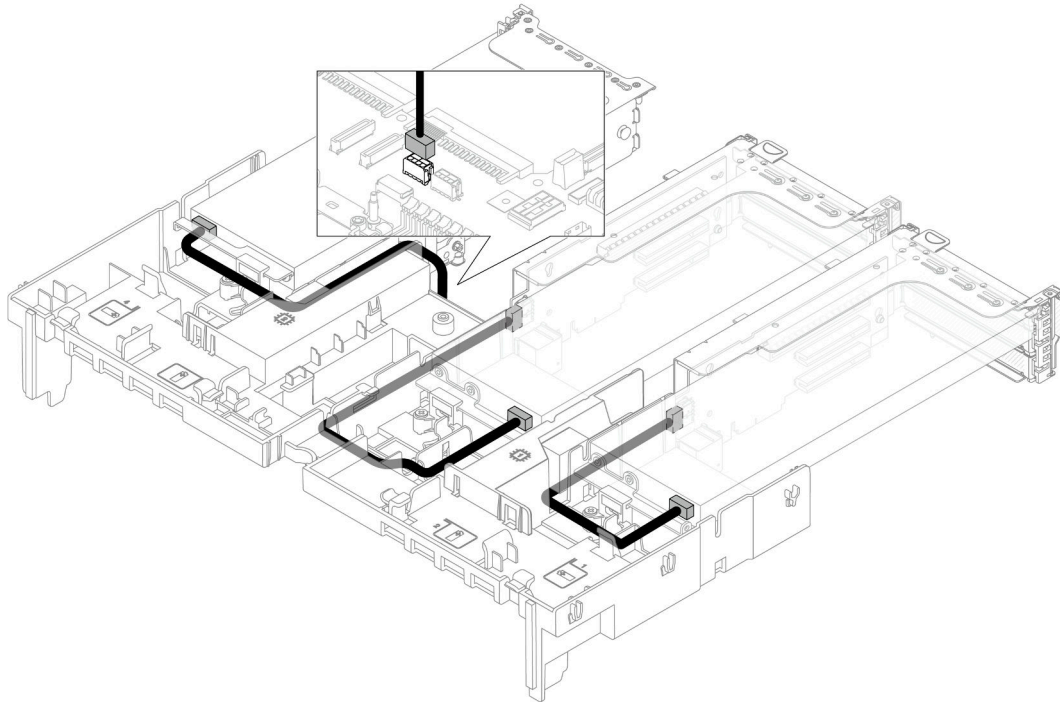
From	To	From	To
1 Front USB cable	Front USB connector on the system board assembly	1 Front USB cable	Front USB connector on the system board assembly
2 Front panel cable	Front I/O connector on the system board assembly	2 Front panel cable	Front I/O connectors on the system board assembly

# GPUs

Use this section to understand the routing for GPUs.

Cable routing	From	To
	1 GPU power cable	Power connector on the riser 1
	2 GPU power cable	Power connector on the riser 2
	3 GPU power cable	GPU power connector on the system board assembly
	<p><b>Notes:</b></p> <ul style="list-style-type: none"><li>• The illustration shows one GPU adapter installed on each riser card. If there are two GPU adapters installed, the GPU power cable is a Y cable.</li><li>• If your GPU adapter TDP is equal to or lower than 75 watts, the adapter can be powered directly by the riser slot. Power cable connection is no needed.</li></ul>	

If you need to install an M.2 backplane on the GPU air baffle, refer to below illustration for cable routing on the air baffle. Route the GPU power cable from riser 2 beneath the M.2 backplane holder to the GPU power connector on the GPU adapter.

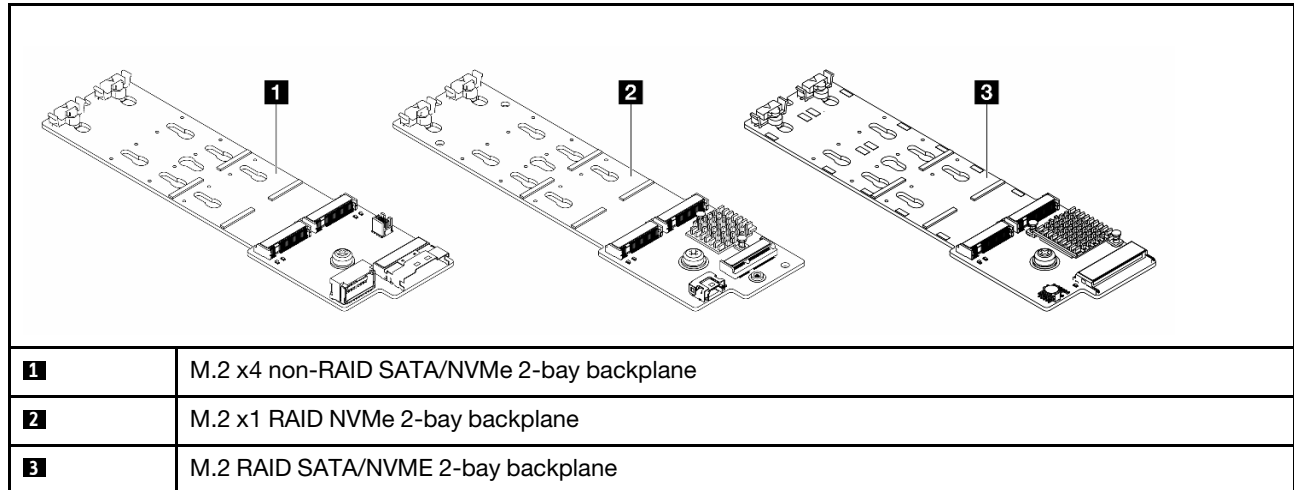


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## M.2 drive backplanes

Use the section to understand the cable routing for the M.2 drive backplanes.

The server supports one of the following M.2 drive backplanes:



- [“M.2 x4 non-RAID SATA/NVMe 2-bay backplane” on page 398](#)
- [“M.2 x1 RAID NVMe 2-bay backplane” on page 403](#)
- [“M.2 RAID SATA/NVME 2-bay backplane” on page 404](#)

### M.2 x4 non-RAID SATA/NVMe 2-bay backplane

#### Power cable routing

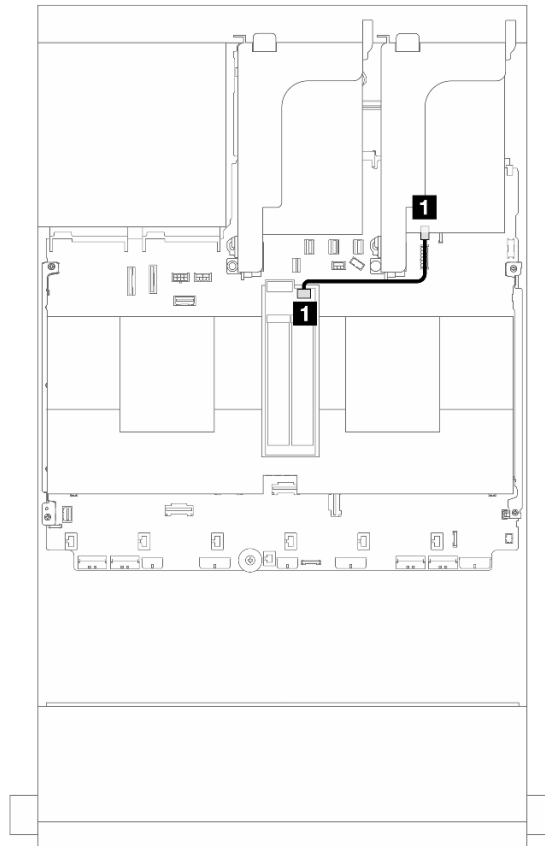


Figure 367. Power cable routing

From	To
1 Power connector on the M.2 drive backplane	1 M.2 power connector on the system board assembly

### Signal cable routing

The M.2 drive backplane supports SATA, NVMe, or RAID cable connection.

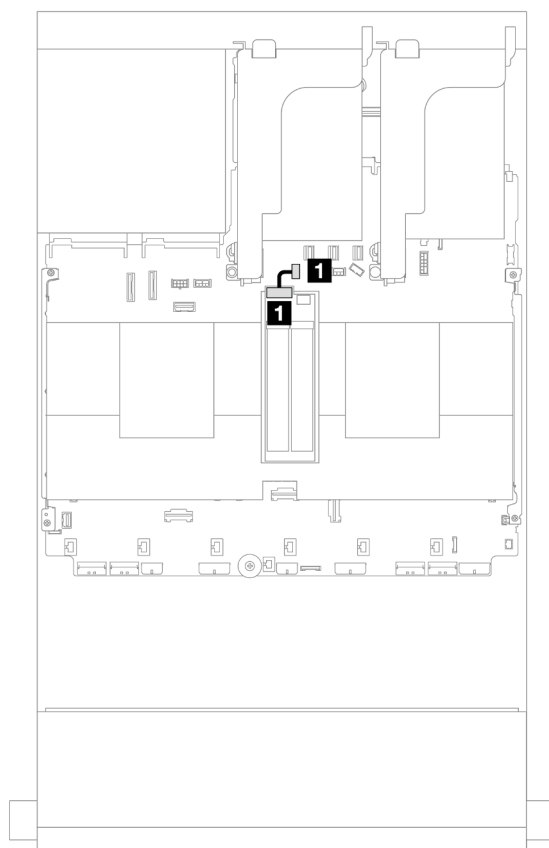


Figure 368. SATA cable routing

From	To
<b>1</b> Signal connector on the M.2 drive backplane	<b>1</b> M.2/7mm backplane signal connector on the system board assembly



**Note:** The following illustration shows four NVMe cable connection options, but the four options are mutually exclusive. Select one of them based on your scenario.

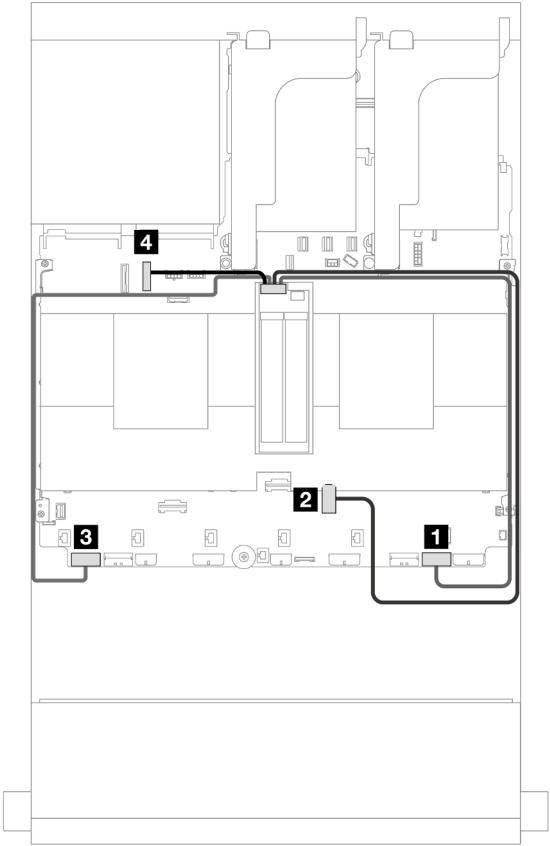


Figure 369. NVMe cable routing

From	To
Signal connector on the M.2 drive backplane	1 PCIe 1
	2 PCIe 3 (one processor installed)
	3 PCIe 8
	4 PCIe 10

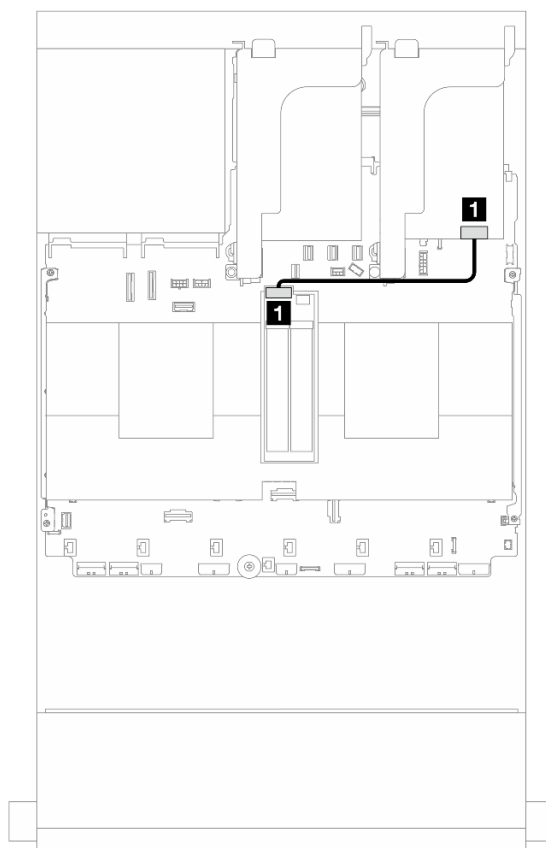


Figure 370. RAID cable routing

From	To
1 Signal connector on the M.2 drive backplane	1 8i adapter: C0

## M.2 x1 RAID NVMe 2-bay backplane

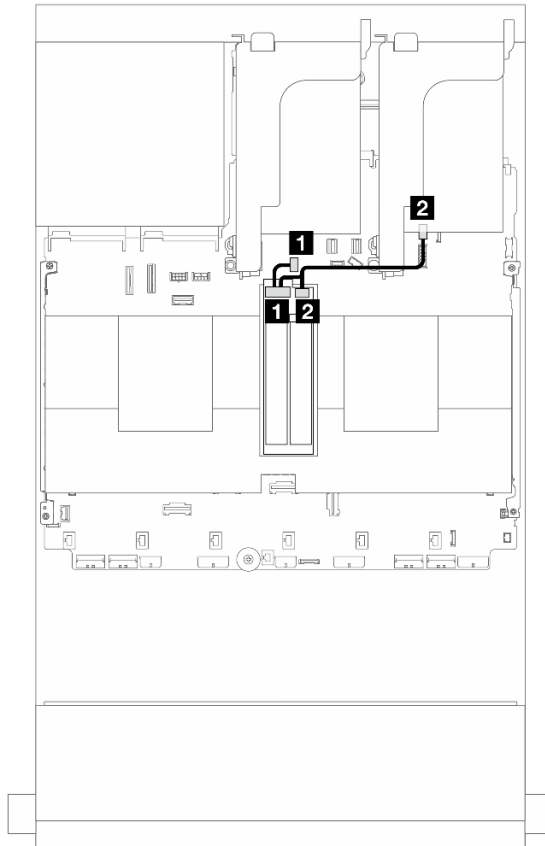


Figure 371. Cable routing for the M.2 x1 RAID NVMe 2-bay backplane

From	To
<b>1</b> Signal connector on the M.2 drive backplane	<b>1</b> M.2/7mm backplane signal connector on the system board assembly
<b>2</b> Power connector on the M.2 drive backplane	<b>2</b> M.2 power connector on the system board assembly

## M.2 RAID SATA/NVME 2-bay backplane

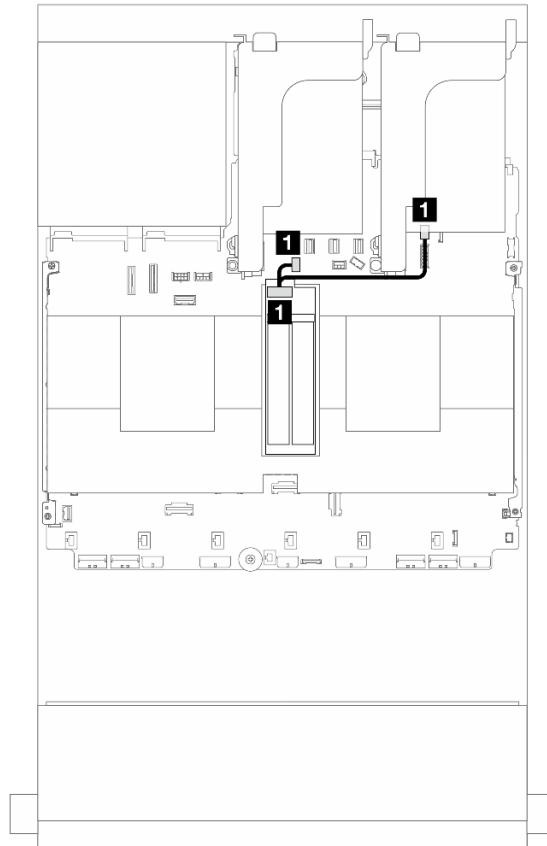


Figure 372. Cable routing for the M.2 RAID SATA/NVME 2-bay backplane

From	To
<b>1</b> Connector on the M.2 drive backplane	<b>1</b> <ul style="list-style-type: none"><li>• M.2 power connector on the system board assembly</li><li>• M.2/7mm backplane signal connector on the system board assembly</li></ul>

## Management NIC adapter

Use the section to understand the cable routing for the ThinkSystem V3 Management NIC Adapter Kit (management NIC adapter).

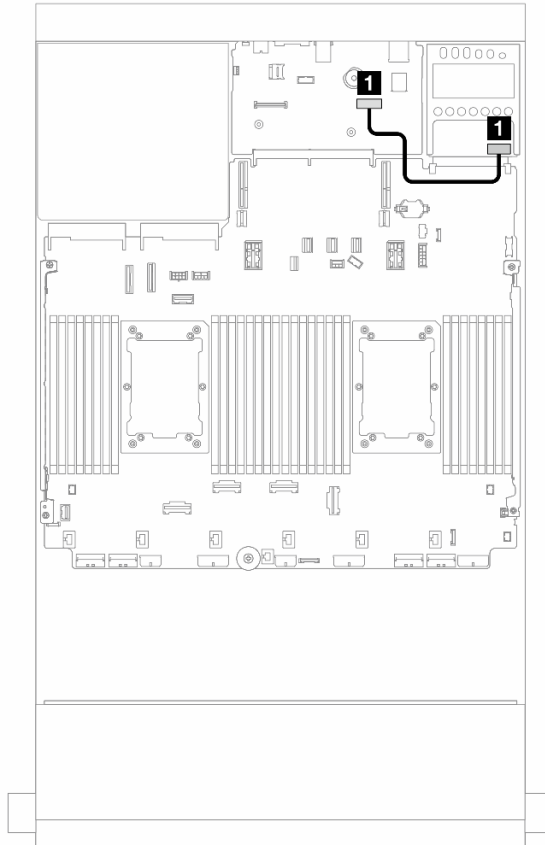


Figure 373. Cable routing for the management NIC adapter

From	To
<b>1</b> Management NIC adapter	Second management Ethernet connector on the system board assembly

---

## DPU adapter

Use the section to understand the cable routing for the ThinkSystem NVIDIA BlueField-2 25GbE SFP56 2-Port PCIe Ethernet DPU w/BMC & Crypto (DPU adapter).

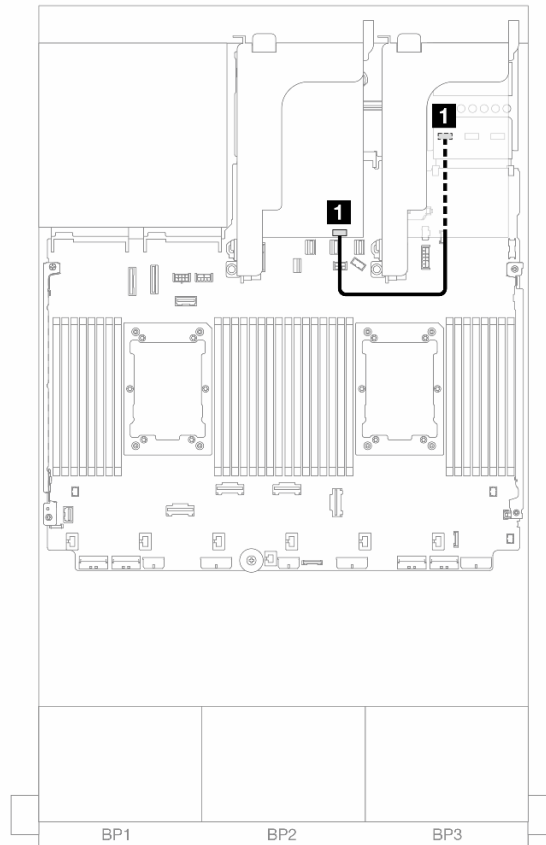


Figure 374. Cable routing for the DPU adapter

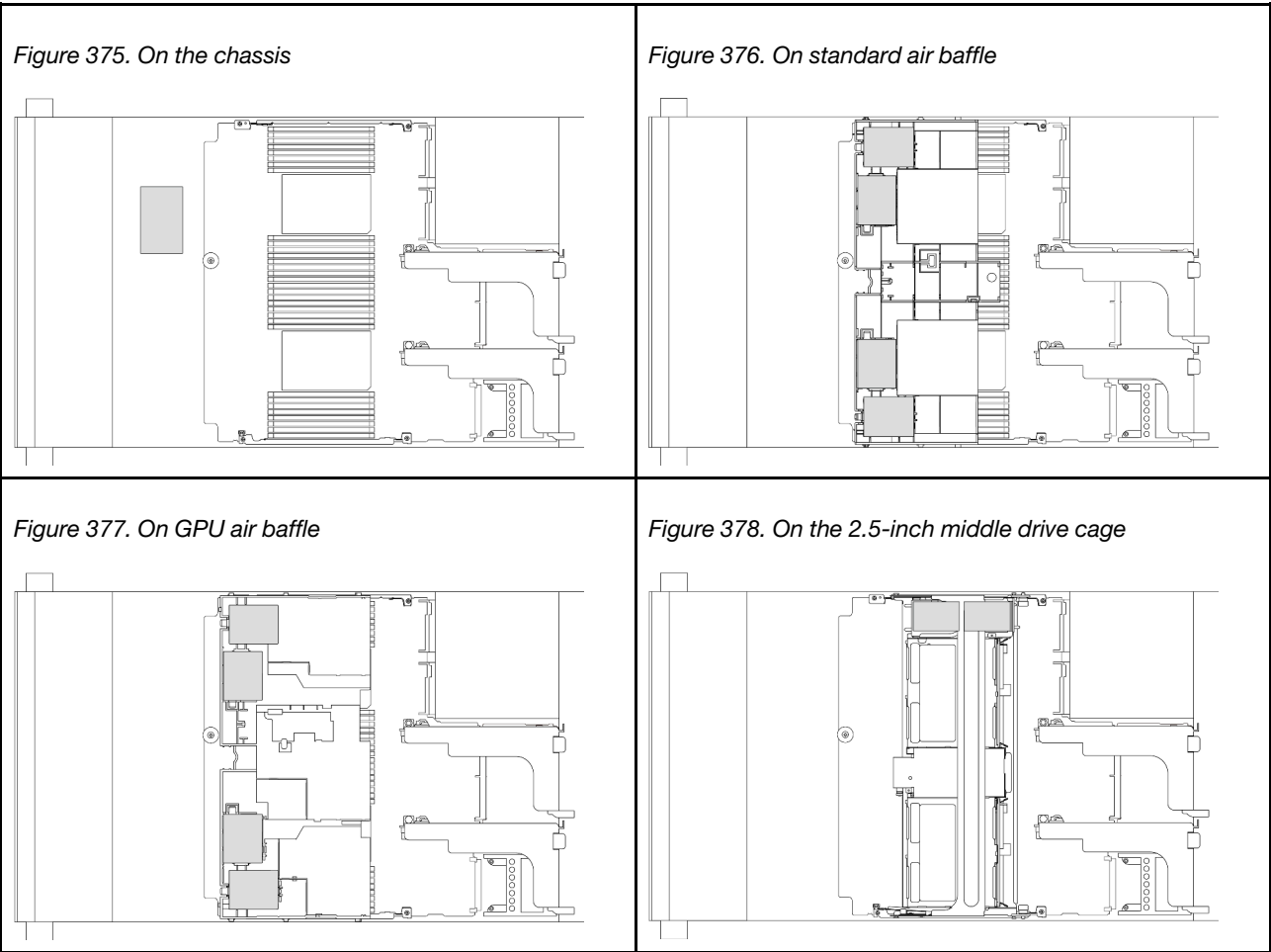
From	To
<b>1</b> DPU adapter: NC-SI connector	OCP enablement kit for vSphere DSE: NC-SI 1 connector

---

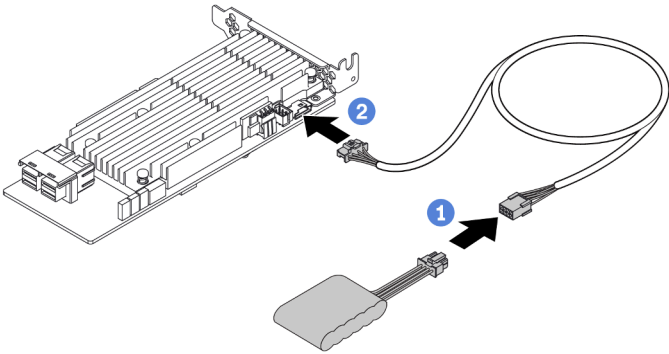
## RAID flash power module

Use this section to understand the cable routing for RAID flash power modules (also called supercap).

Table 41. Location of RAID flash power modules



An extension cable is provided for each RAID flash power module for cable connection. Connect the cable from the RAID flash power module to the corresponding RAID adapter as shown.

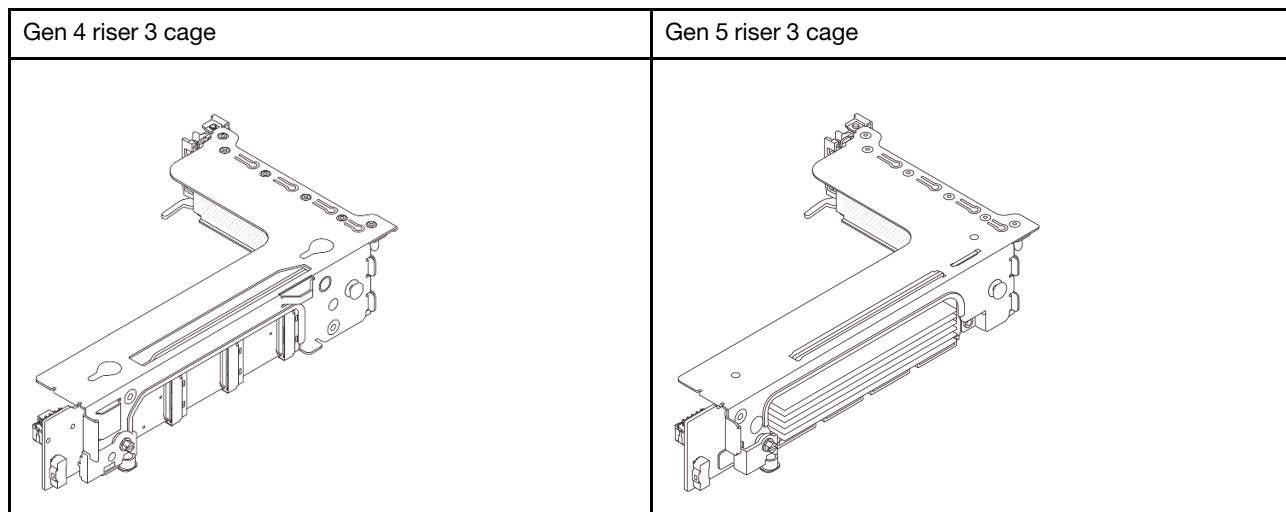


From	To
RAID flash power module	Supercap connector on the RAID adapter

## Riser 3 cage

Use this section to understand the cable routing for riser 3 cage.

The following illustrations show the PCIe riser 3 cages. The riser card types vary by server model. For detailed information, see [“PCIe slots and PCIe adapters” on page 68](#).



- [“Riser card 3 power and sideband connection \(Gen 4/Gen 5\)” on page 409](#)
- [“Riser card 3 \(x8/x8 Gen 4 PCIe\) signal cable connection” on page 410](#)
- [“Riser card 3 \(x16/x16 Gen 4 PCIe\) signal cable connection” on page 411](#)
- [“Riser card 3 \(x8/x8 Gen 5 PCIe\) signal cable connection” on page 413](#)
- [“Riser card 3 \(x16/x16 Gen 5 PCIe\) signal cable connection” on page 414](#)



### Riser card 3 power and sideband connection (Gen 4/Gen 5)

The power and sideband connections for x8/x8 PCIe riser card 3 and x16/x16 PCIe riser card 3 are the same.

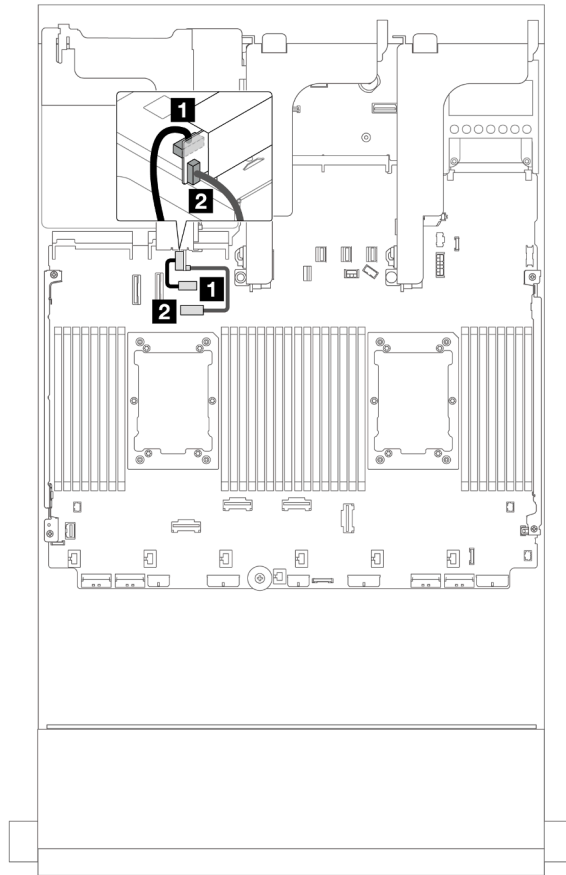
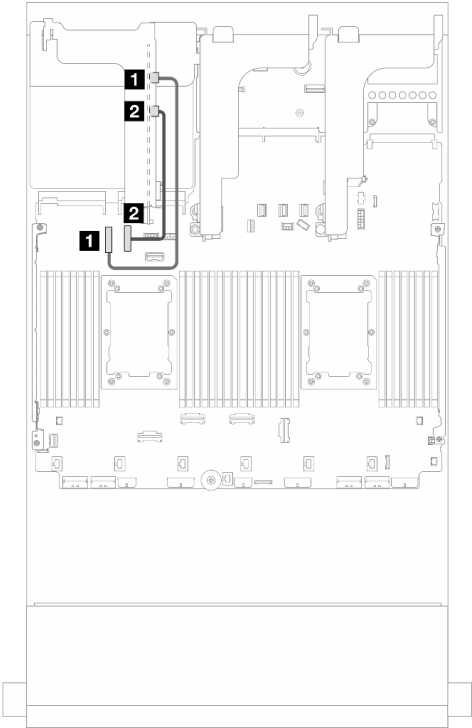
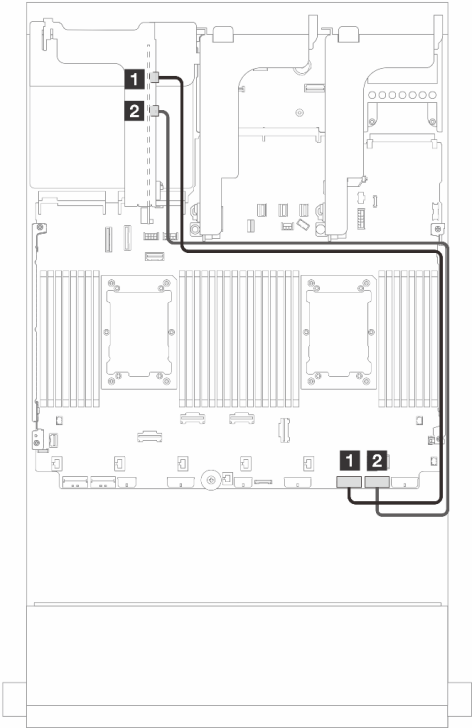


Figure 379. Riser card 3 power and sideband connection

From	To
<b>1</b> Power connector on the riser card	Riser 3 power connector on the system board assembly
<b>2</b> Sideband connector on the riser card	Riser 3 sideband on the system board assembly

**Riser card 3 (x8/x8 Gen 4 PCIe) signal cable connection**

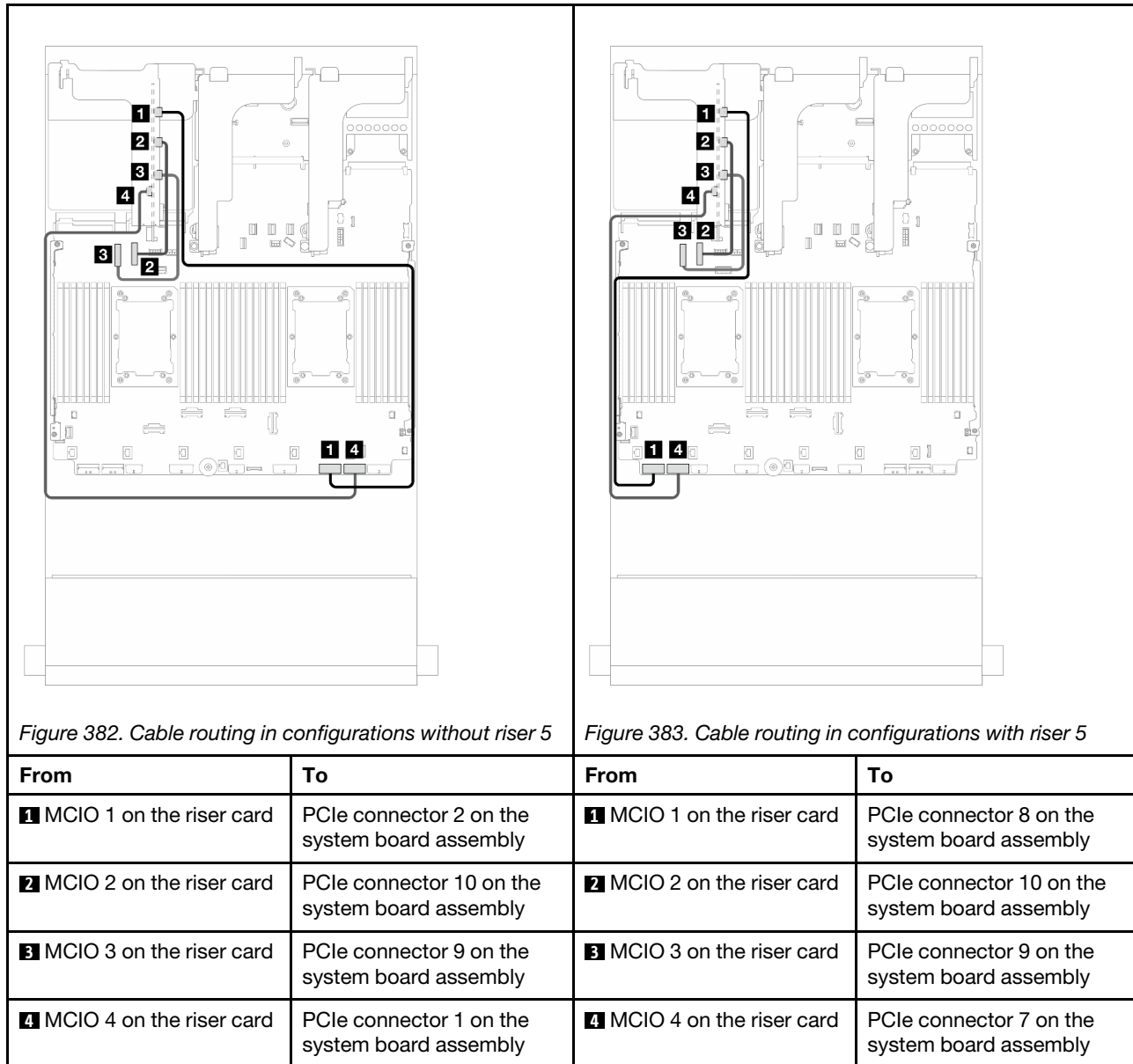
The following illustration shows the signal cable connections for the x8/x8 Gen 4 PCIe riser card 3.

			
<i>Figure 380. Cable routing when two processors installed</i>		<i>Figure 381. Cable routing when one processor installed</i>	
From	To	From	To
<b>1</b> MCIO 1 on the riser card	PCIe connector 9 on the system board assembly	<b>1</b> MCIO 1 on the riser card	PCIe connector 2 on the system board assembly
<b>2</b> MCIO 2 on the riser card	PCIe connector 10 on the system board assembly	<b>2</b> MCIO 2 on the riser card	PCIe connector 1 on the system board assembly

## Riser card 3 (x16/x16 Gen 4 PCIe) signal cable connection

The following illustration shows the signal cable connections for the x16/x16 Gen 4 PCIe riser card 3.

### Cable routing when two processors installed



### Cable routing when one processor installed

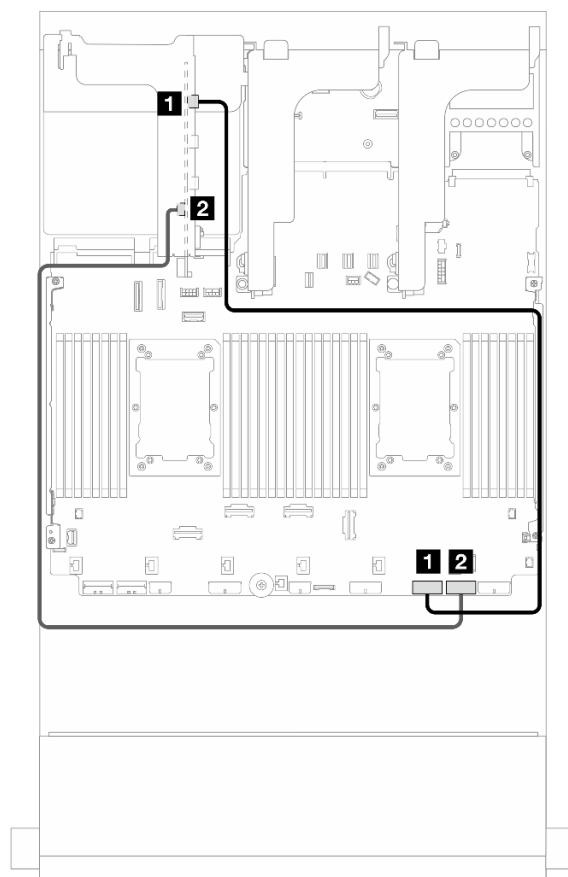
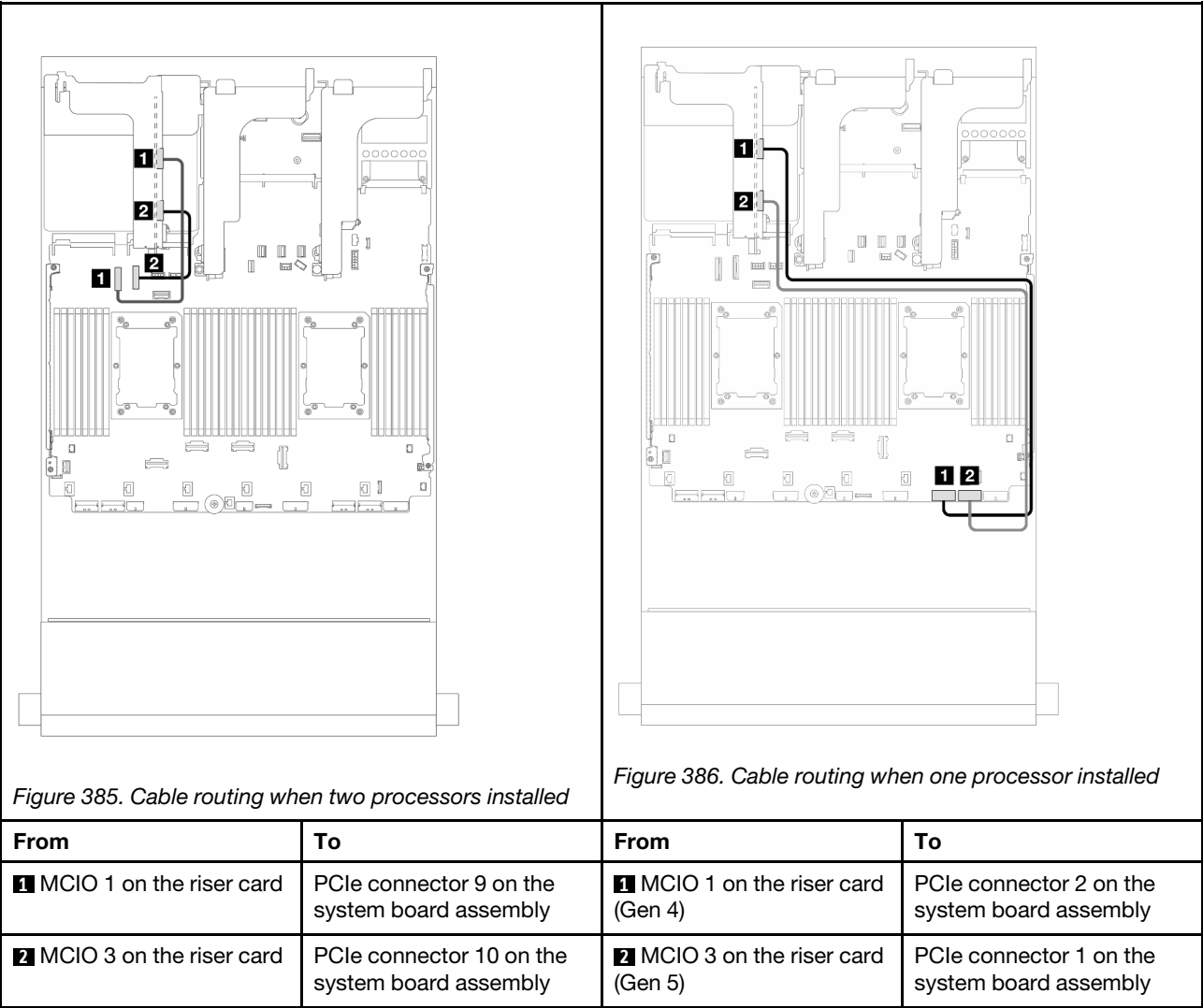


Figure 384. Cable routing when one processor installed

From	To
<b>1</b> MCIO 1 on the riser card	PCIe connector 2 on the system board assembly
<b>2</b> MCIO 4 on the riser card	PCIe connector 1 on the system board assembly

Riser card 3 (x8/x8 Gen 5 PCIe) signal cable connection

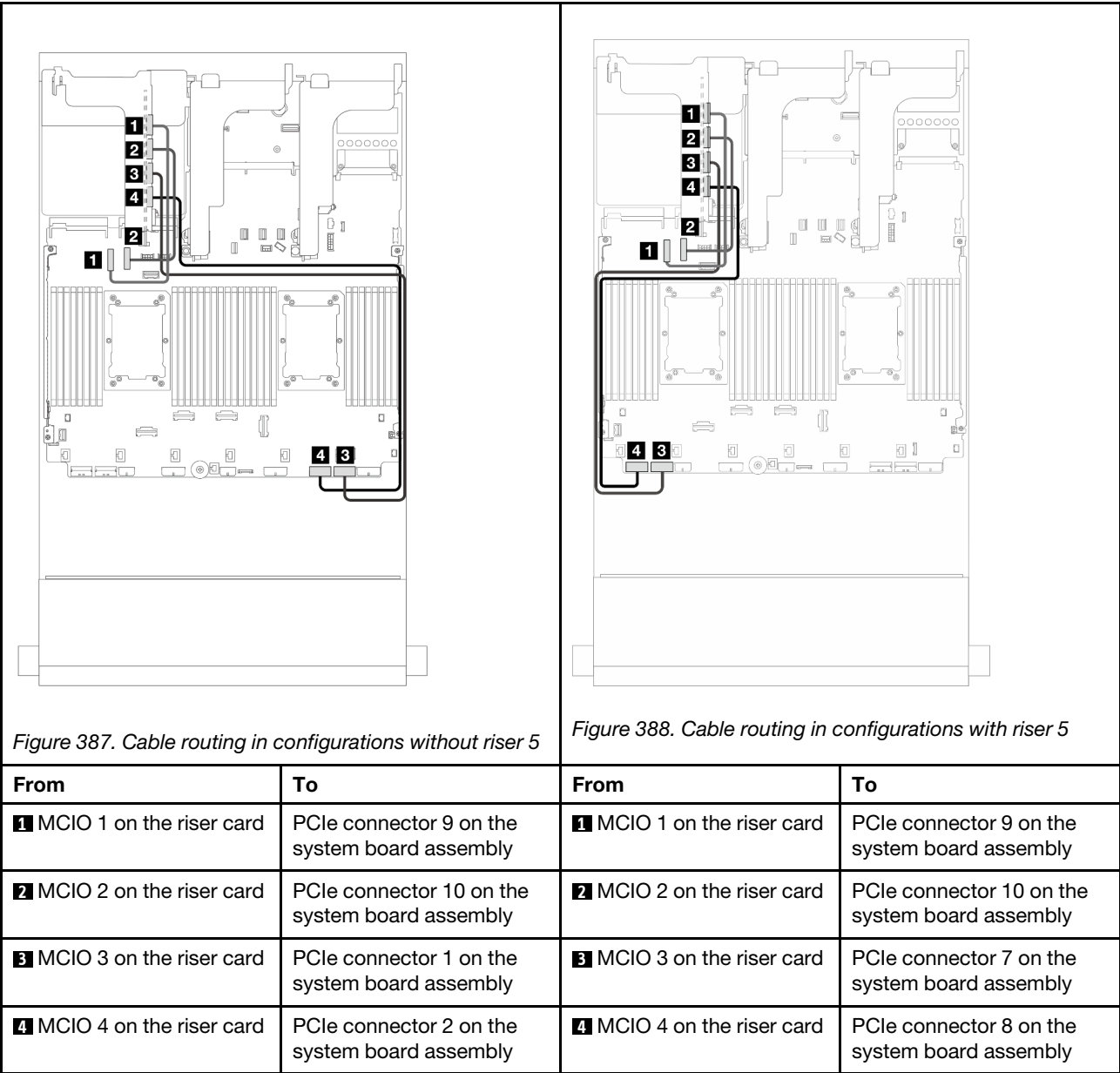
The following illustration shows the signal cable connections for the x8/x8 Gen 5 PCIe riser card 3.



**Riser card 3 (x16/x16 Gen 5 PCIe) signal cable connection**

The following illustration shows the signal cable connections for the x16/x16 Gen 5 PCIe riser card 3.

**Cable routing when two processors installed**



**Cable routing when one processor installed**

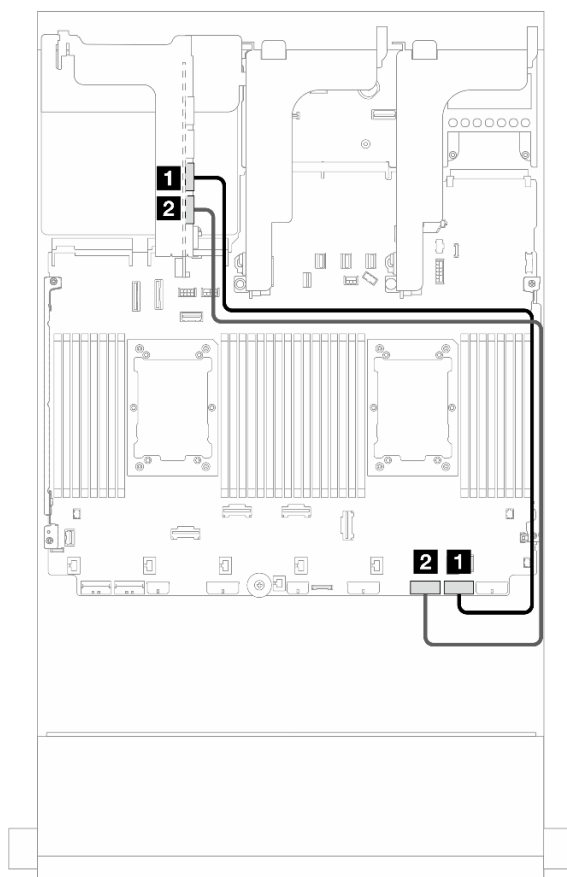


Figure 389. Cable routing when one processor installed

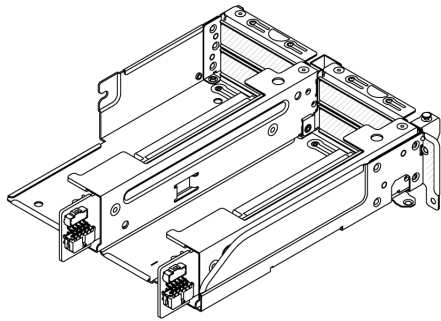
From	To
<b>1</b> MCIO 3 on the riser card	PCIe connector 1 on the system board assembly
<b>2</b> MCIO 4 on the riser card	PCIe connector 2 on the system board assembly

---

## Riser 3/4 cage

Use this section to understand the cable routing for the riser 3/4 cage, which provide four low-profile (4LP) PCIe slots.

The following illustration shows the 4LP PCIe riser 3/4 cage. The riser card types vary by server model. For detailed information, see [“PCIe slots and PCIe adapters” on page 68](#).





## Power and sideband cable routing

The following illustration shows the power and sideband connections for x8/x8 PCIe riser 3 card and x8/x8 PCIe riser 4 card.

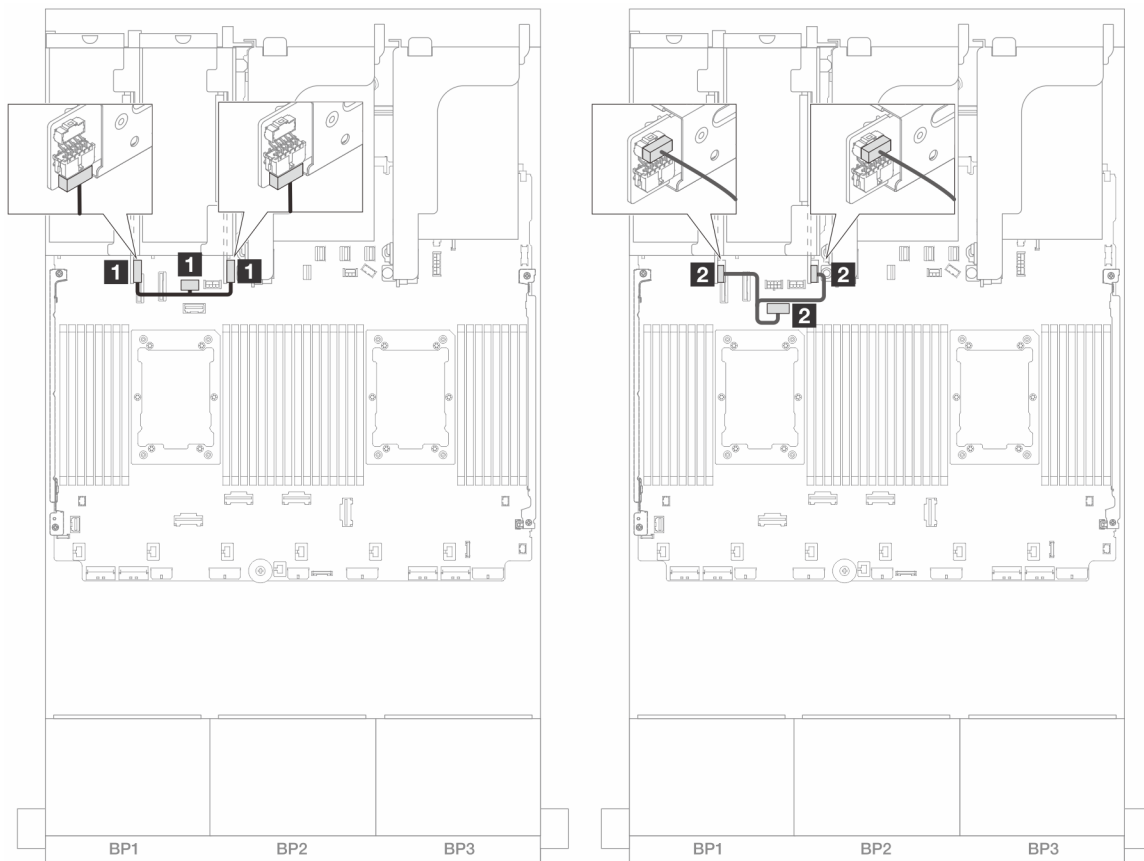


Figure 390. Riser 3/4 card power and sideband cable routing

From	To
<b>1</b> Power connector on the riser cards	Riser 3 power connector on the system board assembly
<b>2</b> Sideband connector on the riser cards	Riser 3 sideband on the system board assembly

## Signal cable connection

The following illustration shows the signal connections for x8/x8 PCIe riser 3 card and x8/x8 PCIe riser 4 card.

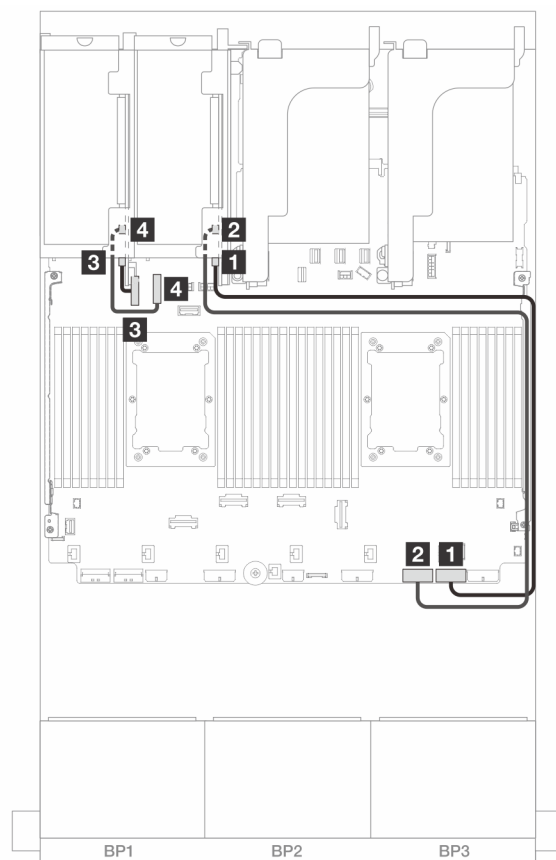


Figure 391. Cable routing in configurations without riser 5 and front OCP module

From	To
<b>1</b> Swift connector 1 on riser 3 card	Onboard: PCIe 1
<b>2</b> Swift connector 2 on riser 3 card	Onboard: PCIe 2
<b>3</b> Swift connector 1 on riser 4 card	Onboard: PCIe 9
<b>4</b> Swift connector 2 on riser 4 card	Onboard: PCIe 10

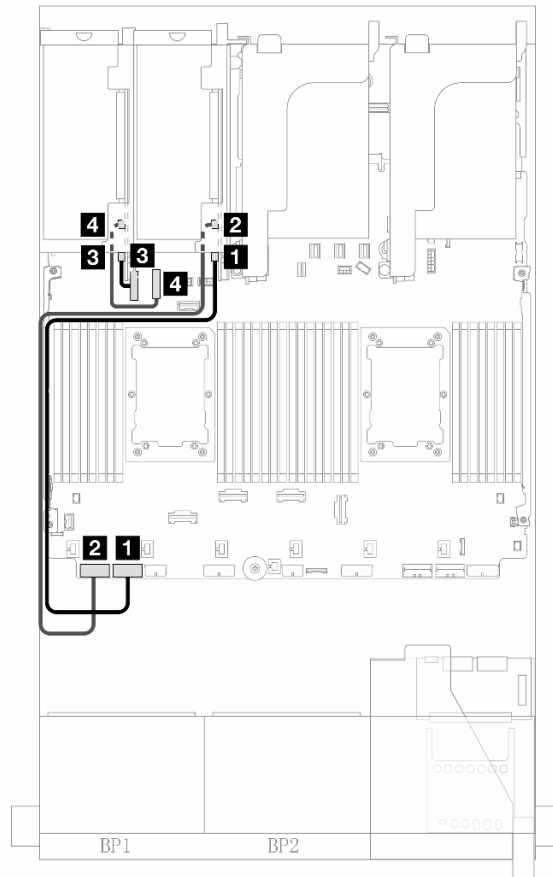


Figure 392. Cable routing in configurations with riser 5 and front OCP module when two processors are installed

From	To
<b>1</b> Swift connector 1 on riser 3 card	Onboard: PCIe 7
<b>2</b> Swift connector 2 on riser 3 card	Onboard: PCIe 8
<b>3</b> Swift connector 1 on riser 4 card	Onboard: PCIe 9
<b>4</b> Swift connector 2 on riser 4 card	Onboard: PCIe 10

## Riser 5 card + OCP interposer cards

This section provides cable routing information for the riser 5 card and front and rear OCP interposer cards.

### Riser 5 card cable routing

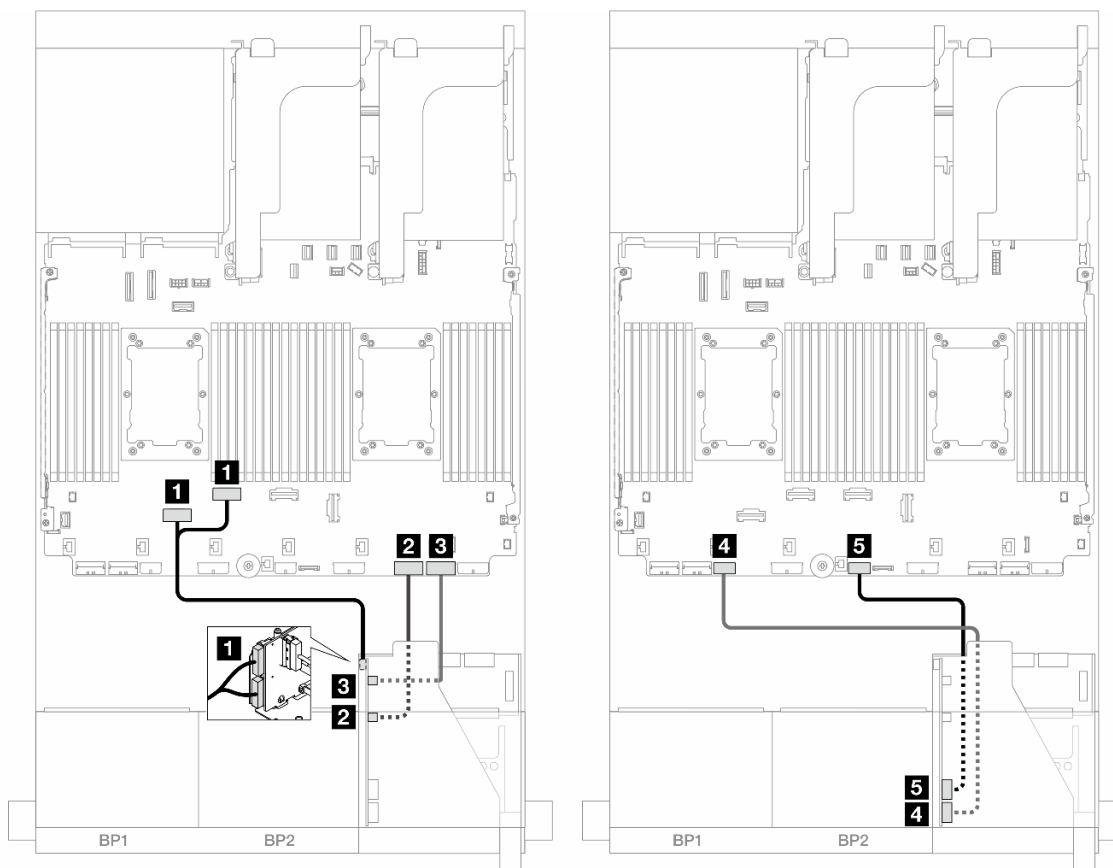


Figure 393. Riser 5 card cable routing

From	To
<b>1</b> Riser 5 card: MCIO 1, MCIO 2	<b>1</b> Onboard: PCIe 6, 5
<b>2</b> Riser 5 card: MCIO 3	<b>2</b> Onboard: PCIe 2
<b>3</b> Riser 5 card: MCIO 4	<b>3</b> Onboard: PCIe 1
<b>4</b> Riser 5 card: RAID PWR	<b>4</b> Onboard: CFF RAID/HBA PWR
<b>5</b> Riser 5 card: EXP PWR	<b>5</b> Onboard: CFF EXP PWR

## OCP interposer card cable routing

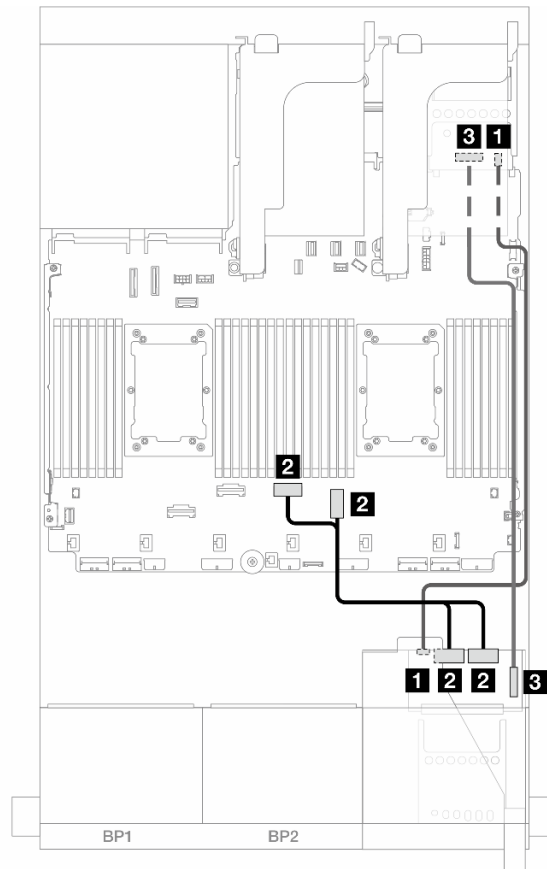


Figure 394. OCP interposer card cable routing

From	To
<b>1</b> Front OCP interposer card: PWR	<b>1</b> Rear OCP interposer card: PWR
<b>2</b> Front OCP interposer card: MCIO 1, MCIO 2	<b>2</b> Onboard: PCIe 3, 4
<b>3</b> Front OCP interposer card: F-SWIFT	<b>3</b> Rear OCP interposer card: R-SWIFT

# Backplanes: server models with 2.5-inch front drive bays

This section provides backplane cable connection information for server models with 2.5-inch front drive bays.

## Before you start

Ensure below parts are removed before starting cable routing for front backplanes.

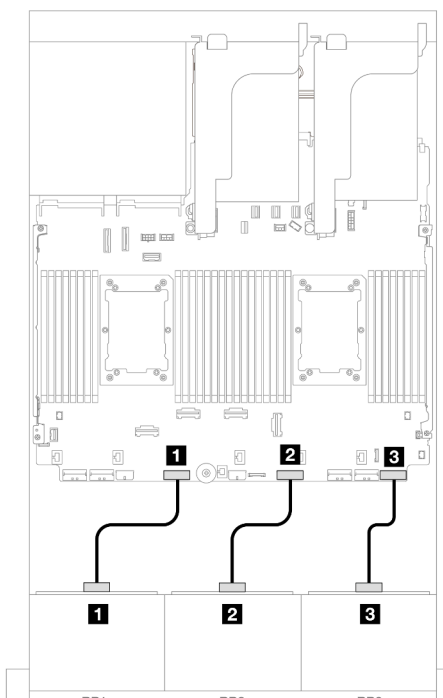
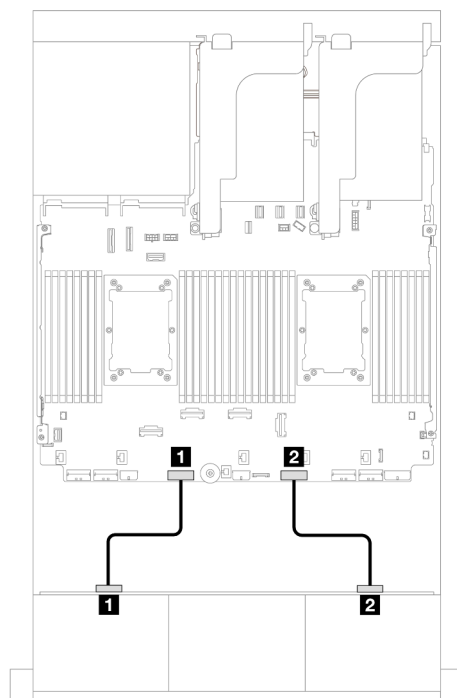
- Top cover (see [“Remove the top cover” on page 381](#))
- Air baffle (see [“Remove the air baffle” on page 99](#))
- Fan cage (see [“Remove the system fan cage” on page 373](#))

## Power cable connections

The server supports the following 2.5-inch drive backplanes:

- 8 x 2.5-inch SAS/SATA backplane
- 8 x 2.5-inch AnyBay backplane (also used as a an 8 x 2.5-inch NVMe backplane when only NVMe connectors on the backplane are cabled)
- 24 x 2.5-inch SAS/SATA expander backplane

For connectors on each drive backplane, see [“Drive backplane connectors” on page 385](#).

			
<i>Figure 395. Power cable connections for the 8 x 2.5-inch SAS/SATA/AnyBay/NVMe backplanes</i>		<i>Figure 396. Power cable connections for the 24 x 2.5-inch expander backplane</i>	
From	To	From	To
<b>1</b> Power connector on backplane 1	Backplane 1 power connector	<b>1</b> Power connector 1 on backplane	Backplane 1 power connector

<b>2</b> Power connector on backplane 2	Backplane 2 power connector	<b>2</b> Power connector 2 on backplane	Backplane 2 power connector
<b>3</b> Power connector on backplane 3	Backplane 3 power connector		

## Signal cable connections

Refer to the specific topic for signal cable connections depending on the backplanes you have installed.

- One front backplane:
  - “One 8 x SAS/SATA backplane” on page 424
  - “One 8 x AnyBay backplane (Gen 4)” on page 426
  - “One 8 x AnyBay backplane (Gen 5)” on page 431
  - “One 8 x NVMe backplane (Gen 4)” on page 442
  - “One 8 x NVMe backplane (Gen 5)” on page 444
- Two front backplanes:
  - “Two 8 x SAS/SATA backplanes” on page 449
  - “Two 8 x AnyBay backplanes (Gen 4)” on page 454
  - “Two 8 x AnyBay backplanes (Gen 5)” on page 458
  - “Two 8 x NVMe backplanes (Gen 4)” on page 467
  - “Two 8 x NVMe backplanes (Gen 5)” on page 470
  - “One 8 x SAS/SATA and one 8 x AnyBay (Gen 4) backplanes” on page 474
  - “One 8 x SAS/SATA and one 8 x AnyBay (Gen 5) backplanes” on page 482
  - “One 8 x SAS/SATA and one 8 x NVMe (Gen 4) backplanes” on page 490
  - “One 8 x SAS/SATA and one 8 x NVMe (Gen 5) backplanes” on page 498
  - “One 8 x AnyBay and one 8 x NVMe backplanes (Gen 4)” on page 506
  - “One 8 x AnyBay and one 8 x NVMe backplanes (Gen 5)” on page 510
- Three front backplanes:
  - “Three 8 x SAS/SATA backplanes” on page 516
  - “Three 8 x AnyBay backplanes” on page 570
  - “Three 8 x NVMe backplanes (Gen 4)” on page 572
  - “Three 8 x NVMe backplanes (Gen 5)” on page 579
  - “One 8 x AnyBay and two 8 x NVMe backplanes (Gen 4)” on page 588
  - “One 8 x AnyBay and two 8 x NVMe backplanes (Gen 5)” on page 590
  - “One 8 x SAS/SATA and two 8 x NVMe (Gen 4) backplanes” on page 595
  - “One 8 x SAS/SATA and two 8 x NVMe (Gen 5) backplanes” on page 596
  - “One 8 x SAS/SATA and two 8 x AnyBay backplanes” on page 600
  - “Two 8 x SAS/SATA and one 8 x AnyBay (Gen 4) backplanes” on page 601
  - “Two 8 x SAS/SATA and one 8 x AnyBay (Gen 5) backplanes” on page 617
  - “Two 8 x SAS/SATA and one 8 x NVMe (Gen 4) backplanes” on page 642
  - “Two 8 x SAS/SATA and one 8 x NVMe (Gen 5) backplanes” on page 645
  - “24 x 2.5" SAS/SATA expander backplane” on page 650

## One 8 x SAS/SATA backplane

This section provides cable routing information for the server model with one 8 x 2.5-inch SAS/SATA front drive backplane.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“Onboard connectors” on page 424](#)
- [“8i/16i RAID/HBA adapter” on page 425](#)
- [“CFF 8i/16i RAID/HBA adapter” on page 426](#)

### Onboard connectors

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA configuration with onboard connectors.

To connect riser 3/4 cables, see [“Riser 3/4 cage” on page 416](#).

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

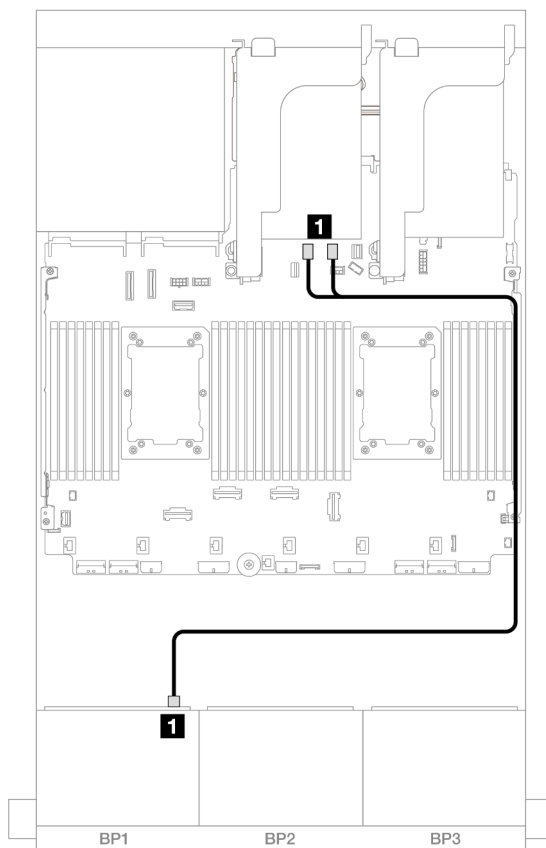


Figure 397. SAS/SATA cable routing to onboard SATA connectors



From	To
<b>1</b> Backplane 1: SAS	Onboard: SATA 0, SATA 1

### 8i/16i RAID/HBA adapter

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA configuration with one 8i/16i RAID/HBA adapter.

To connect riser 3/4 cables, see [“Riser 3/4 cage” on page 416](#).

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

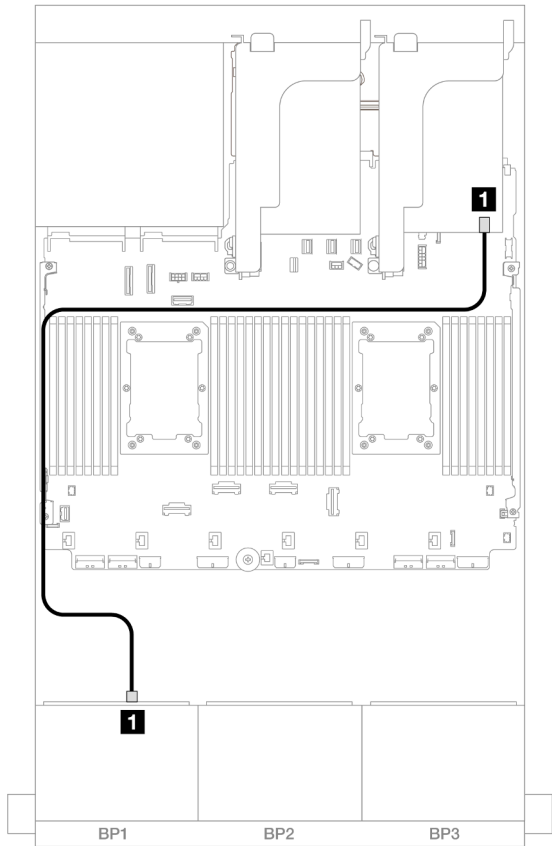


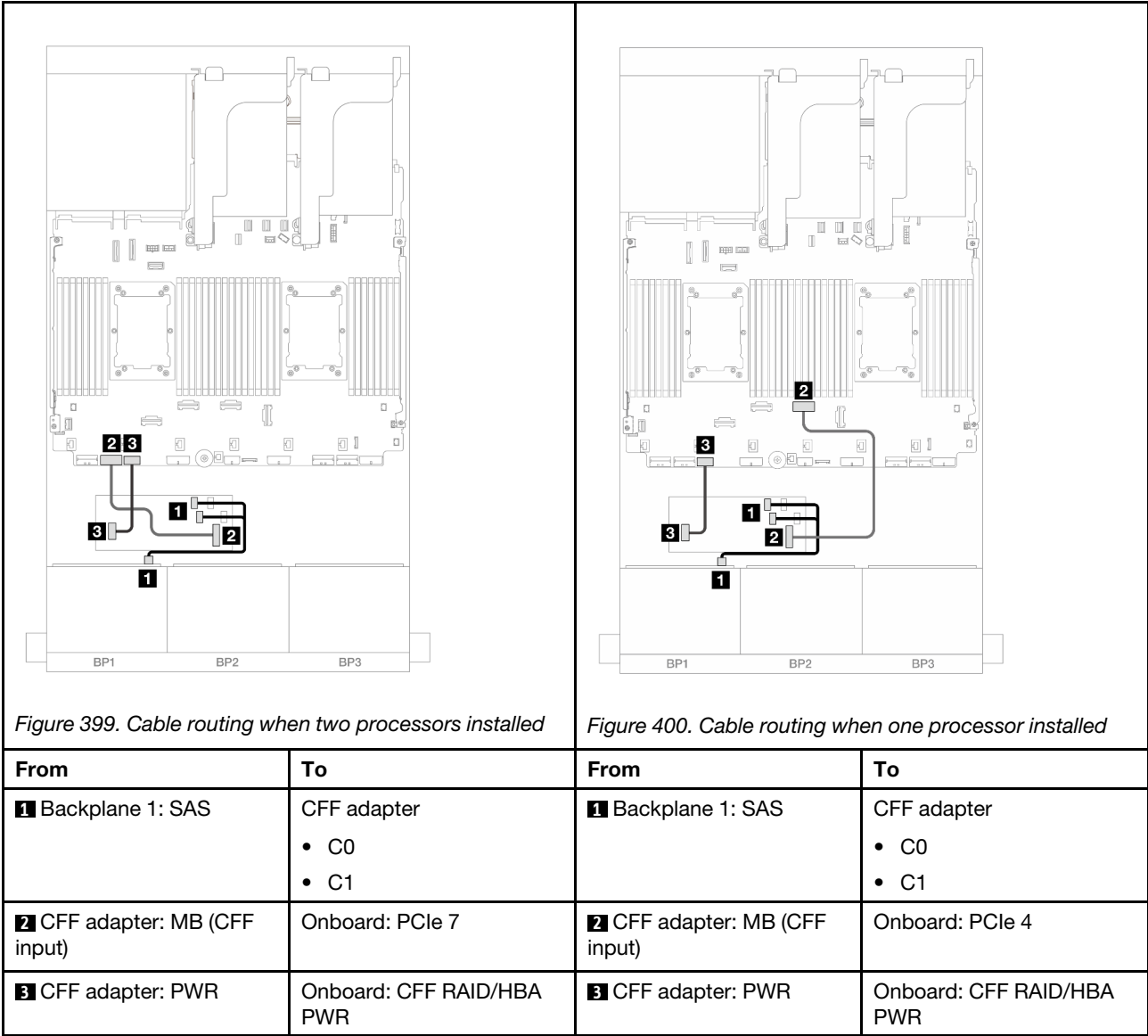
Figure 398. SAS/SATA cable routing to 8i/16i RAID/HBA adapter

From	To
<b>1</b> Backplane 1: SAS	8i/16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>

### CFF 8i/16i RAID/HBA adapter

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA configuration with one CFF 8i/16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



### One 8 x AnyBay backplane (Gen 4)

This section provides cable routing information for the server model with one 8 x 2.5-inch AnyBay front drive backplane (Gen 4).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“8i/16i RAID/HBA adapter” on page 427](#)

- “CFF 8i/16i RAID/HBA adapter” on page 428
- “Riser 5 + OCP interposer cards + 8i/16i RAID/HBA adapter” on page 430

### 8i/16i RAID/HBA adapter

The following shows the cable connections for the 8 x 2.5-inch AnyBay (Gen 4) configuration with one 8i/16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

### SAS/SATA cable routing

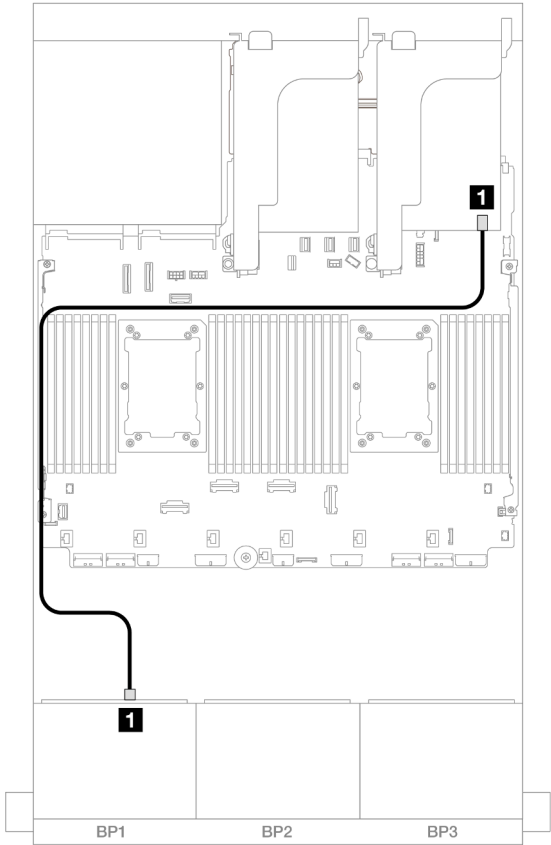
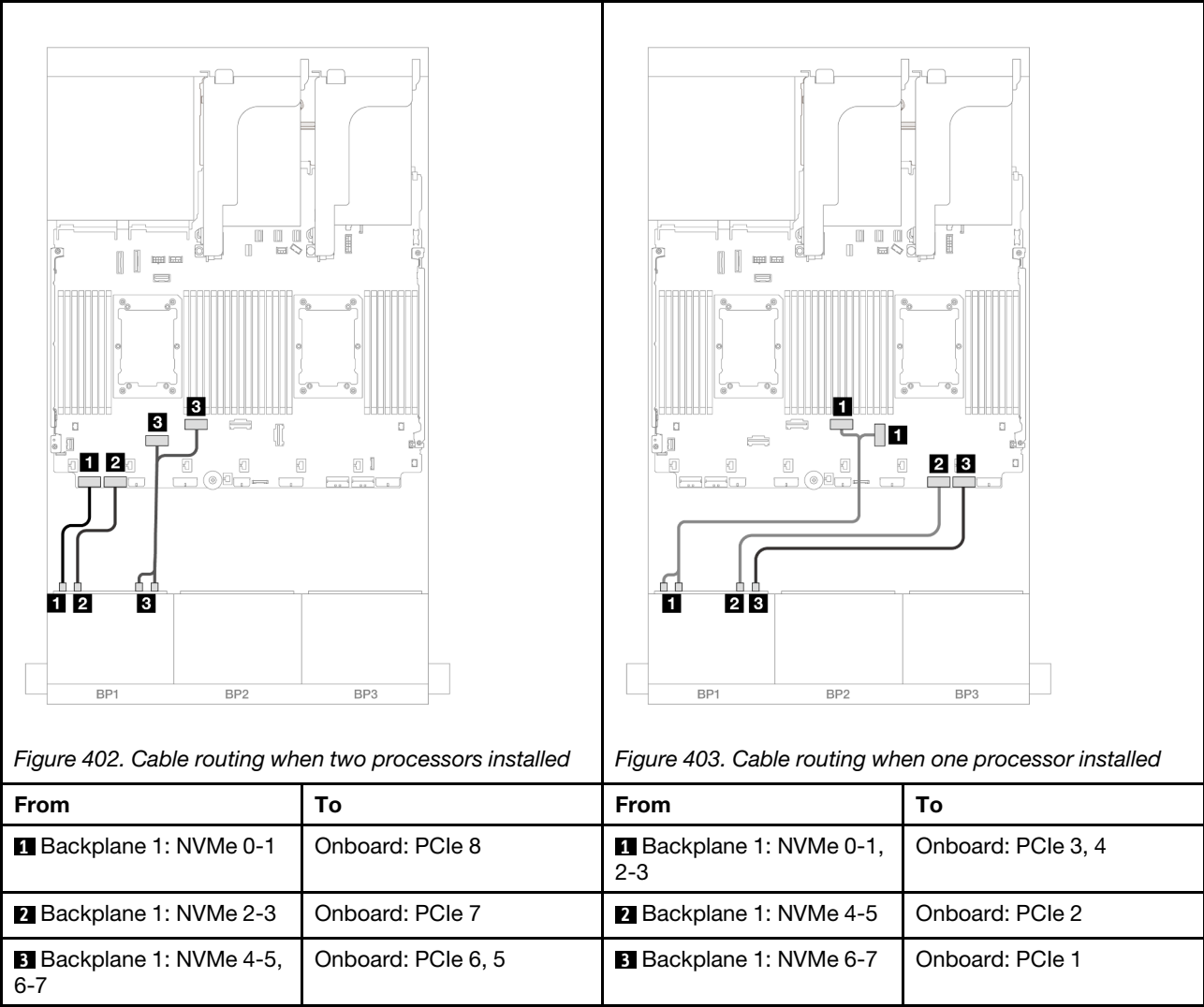


Figure 401. SAS/SATA cable routing to 8i/16i RAID/HBA adapter

From	To
<b>1</b> Backplane 1: SAS	8i/16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>

NVMe cable routing



CFF 8i/16i RAID/HBA adapter

The following shows the cable connections for the 8 x 2.5-inch AnyBay (Gen 4) configuration with one CFF 8i/16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

## SAS/SATA cable routing

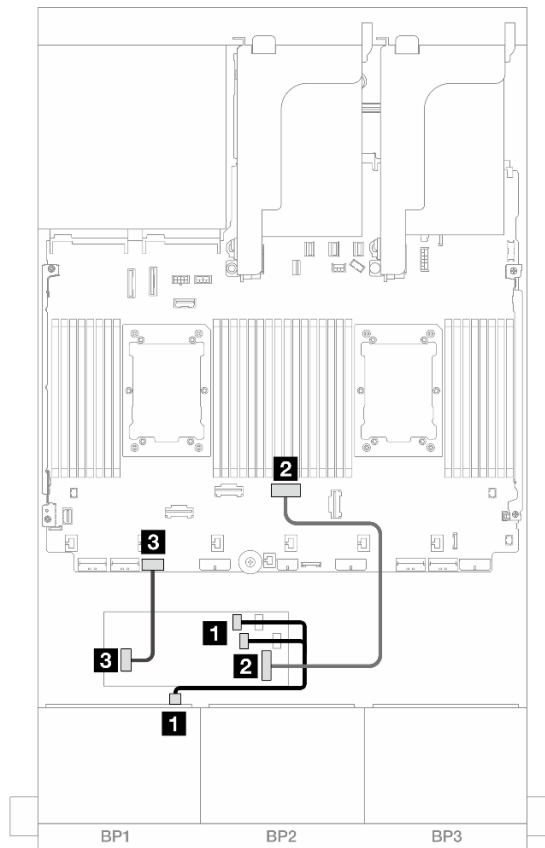


Figure 404. SAS/SATA cable routing to CFF RAID/HBA adapter

From	To
<b>1</b> Backplane 1: SAS	CFF adapter <ul style="list-style-type: none"><li>• C0</li><li>• C1</li></ul>
<b>2</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4
<b>3</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR

NVMe cable routing

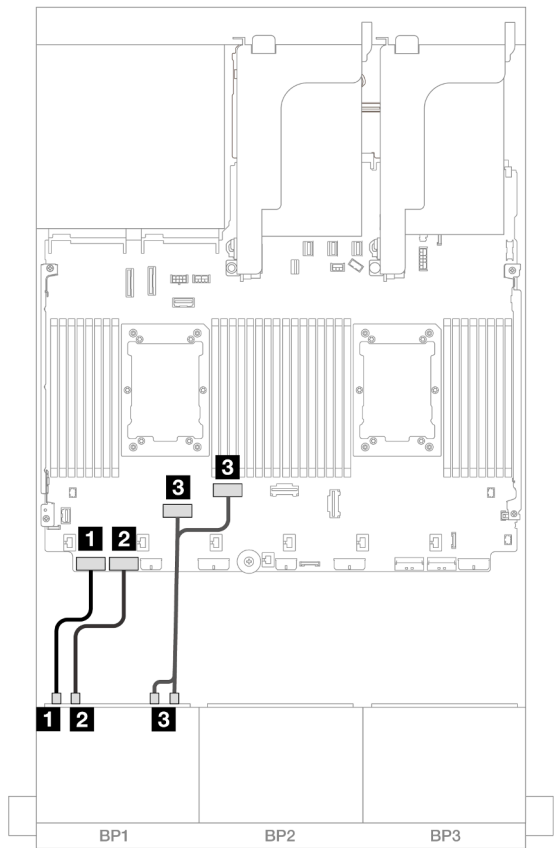


Figure 405. NVMe cable routing to onboard PCIe connectors

From	To
1 Backplane 1: NVMe 0-1	Onboard: PCIe 8
2 Backplane 1: NVMe 2-3	Onboard: PCIe 7
3 Backplane 1: NVMe 4-5, 6-7	Onboard: PCIe 6, 5

Riser 5 + OCP interposer cards + 8i/16i RAID/HBA adapter

The following shows the cable connections for the 8 x 2.5-inch AnyBay configuration with riser 5, front and rear OCP interposer cards, and one 8i/16i RAID/HBA adapter.

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

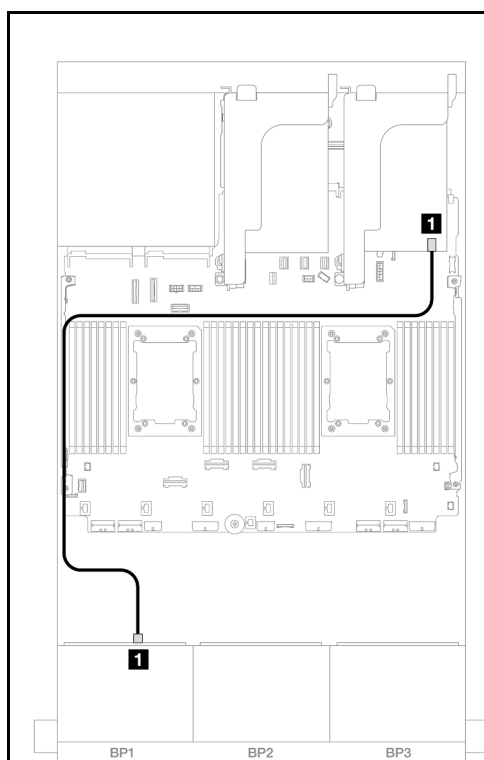


Figure 406. SAS/SATA cable routing

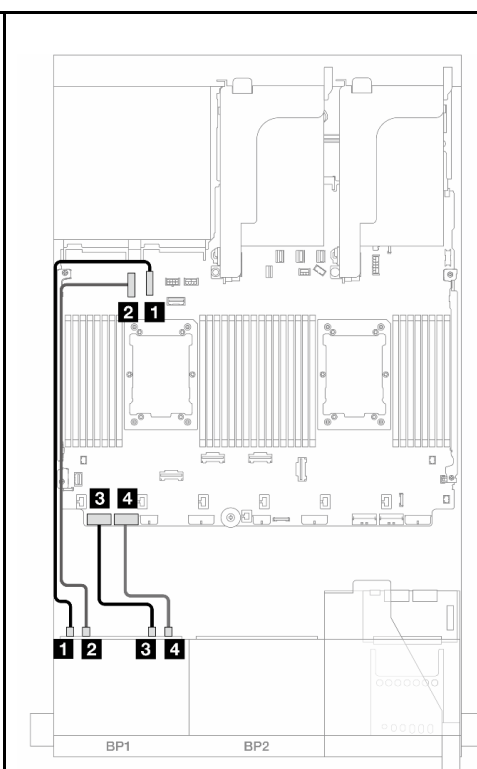


Figure 407. NVMe cable routing

From	To	From	To
<b>1</b> Backplane 1: SAS	8i/16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>	<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
		<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
		<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
		<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7

## One 8 x AnyBay backplane (Gen 5)

This section provides cable routing information for the server model with one 8 x 2.5-inch AnyBay front drive backplane (Gen 5).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“8i/16i RAID/HBA adapter” on page 432](#)
- [“CFF 8i/16i RAID/HBA adapter” on page 436](#)
- [“Trimode 8i RAID/HBA adapter” on page 440](#)
- [“Riser 5 + OCP interposer cards + 8i/16i RAID/HBA adapter” on page 430](#)

8i/16i RAID/HBA adapter

The following shows the cable connections for the 8 x 2.5-inch AnyBay (Gen 5) configuration with one 8i/16i RAID/HBA adapter.

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

SAS/SATA cable routing

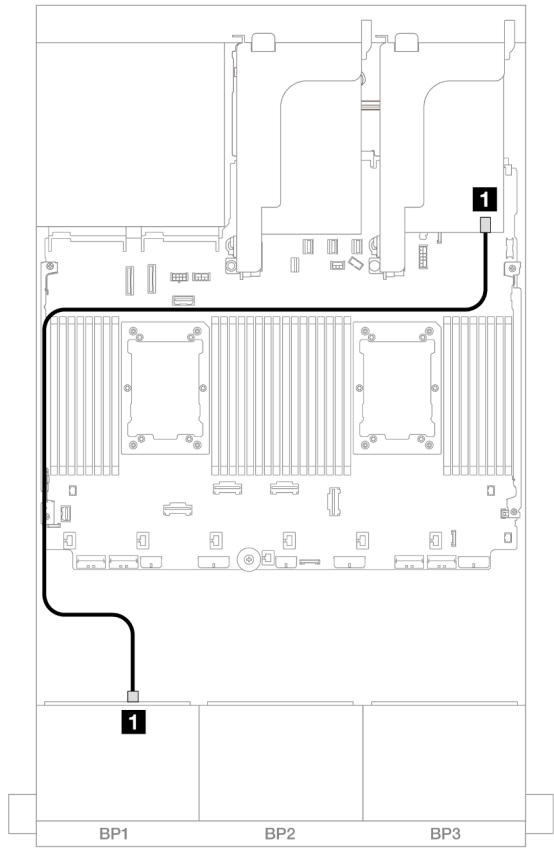


Figure 408. SAS/SATA cable routing to 8i/16i RAID/HBA adapter

From	To
1 Backplane 1: SAS	8i/16i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>

NVMe cable routing

Cable routing when two processors installed



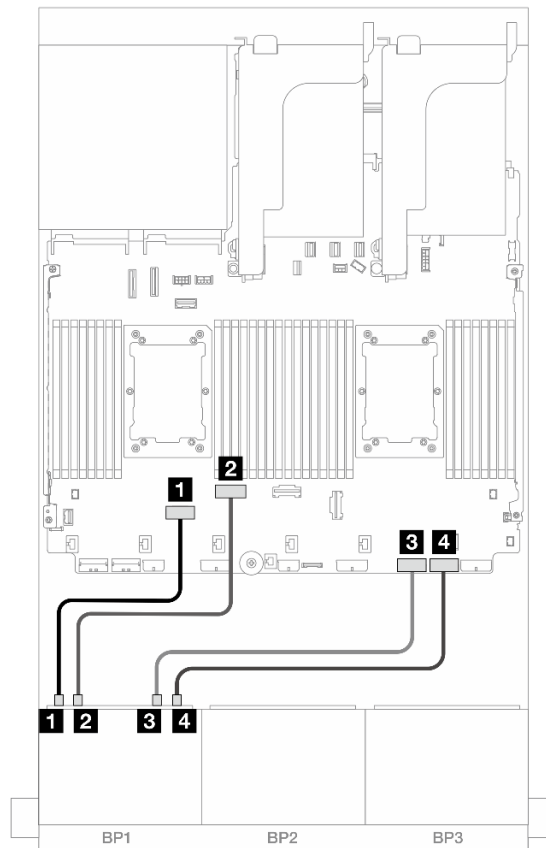


Figure 409. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 6
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 5
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 2
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 1

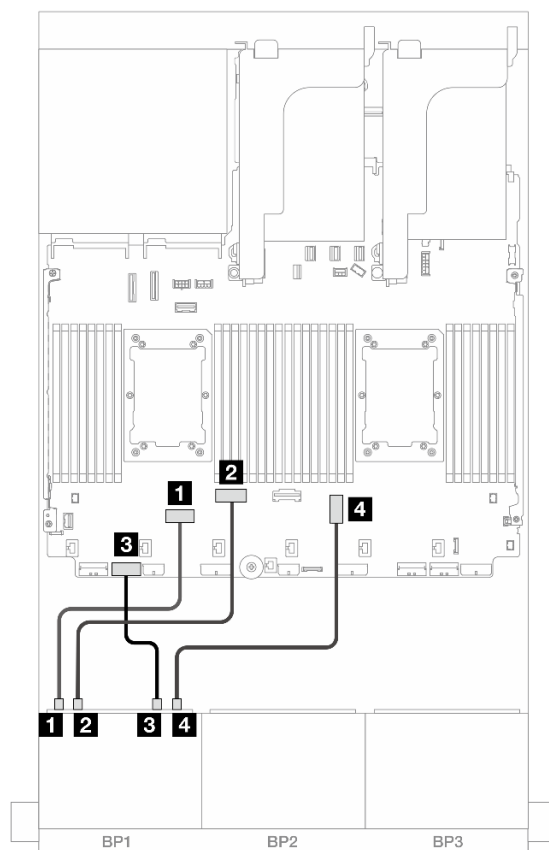


Figure 410. Cable routing when two Platinum series processors installed with x16/x16 riser card

From	To
1 Backplane 1: NVMe 0-1	Onboard: PCIe 6
2 Backplane 1: NVMe 2-3	Onboard: PCIe 5
3 Backplane 1: NVMe 4-5	Onboard: PCIe 7
4 Backplane 1: NVMe 6-7	Onboard: PCIe 3

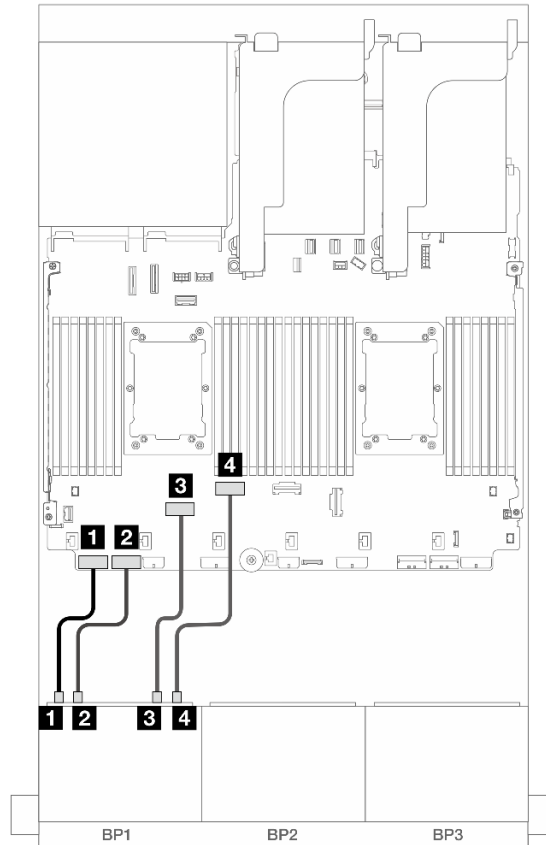


Figure 411. Cable routing in other scenarios

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5

#### Cable routing when one processor installed

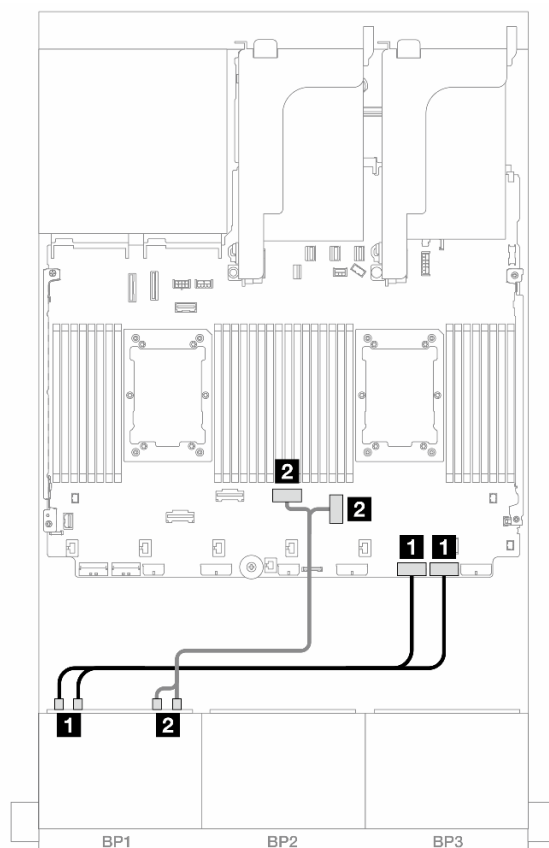


Figure 412. Cable routing when one processor installed

From	To
1 Backplane 1: NVMe 0-1, 2-3	Onboard: PCIe 2, 1
2 Backplane 1: NVMe 4-5, 6-7	Onboard: PCIe 3, 4

### CFF 8i/16i RAID/HBA adapter

The following shows the cable connections for the 8 x 2.5-inch AnyBay (Gen 5) configuration with one CFF 8i/16i RAID/HBA adapter.

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

## SAS/SATA cable routing

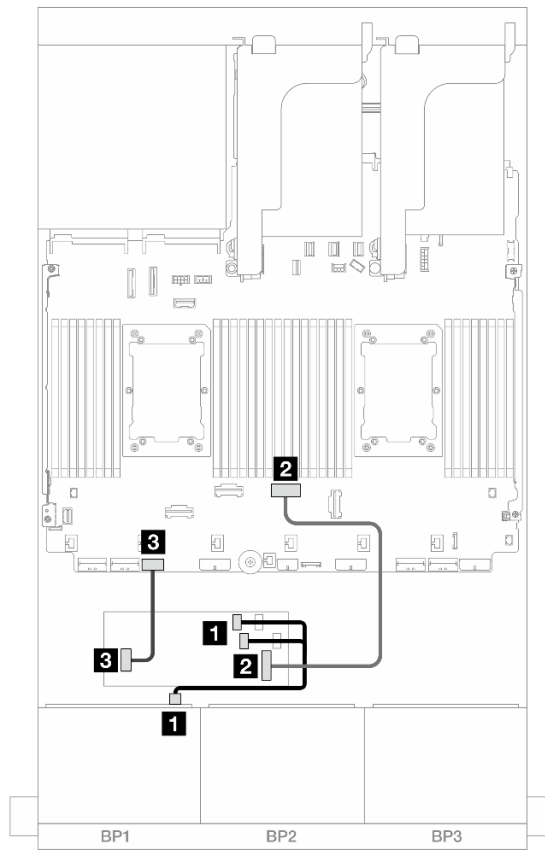


Figure 413. SAS/SATA cable routing to CFF RAID/HBA adapter

From	To
<b>1</b> Backplane 1: SAS	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>2</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4
<b>3</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR

## NVMe cable routing

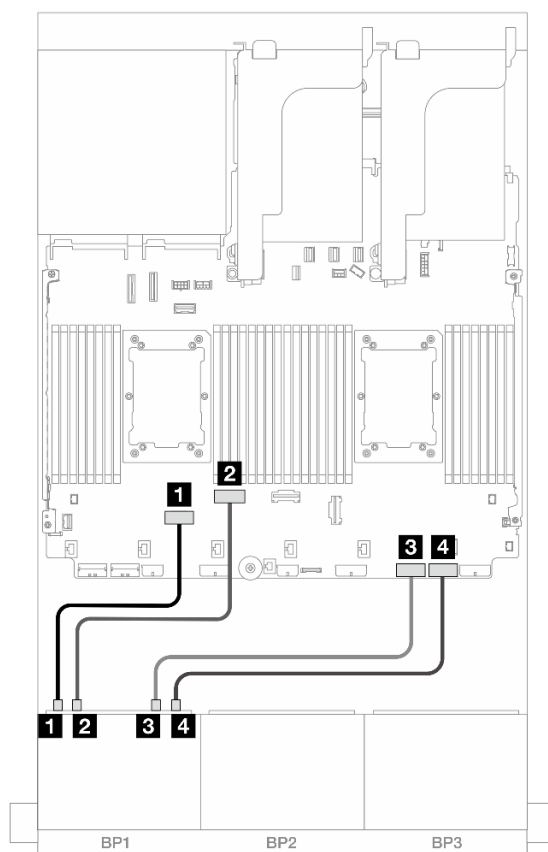


Figure 414. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 6
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 5
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 2
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 1

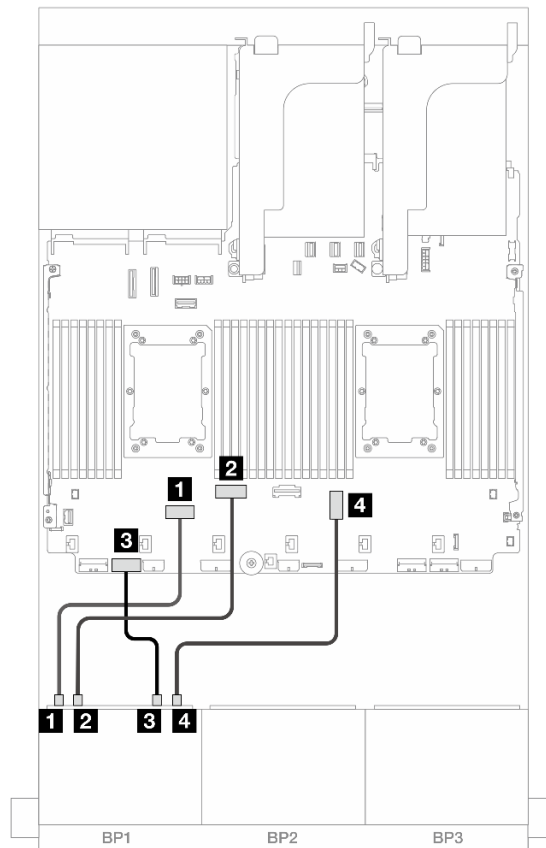


Figure 415. Cable routing when two Platinum series processors installed with x16/x16 riser card

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 6
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 5
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 7
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 3

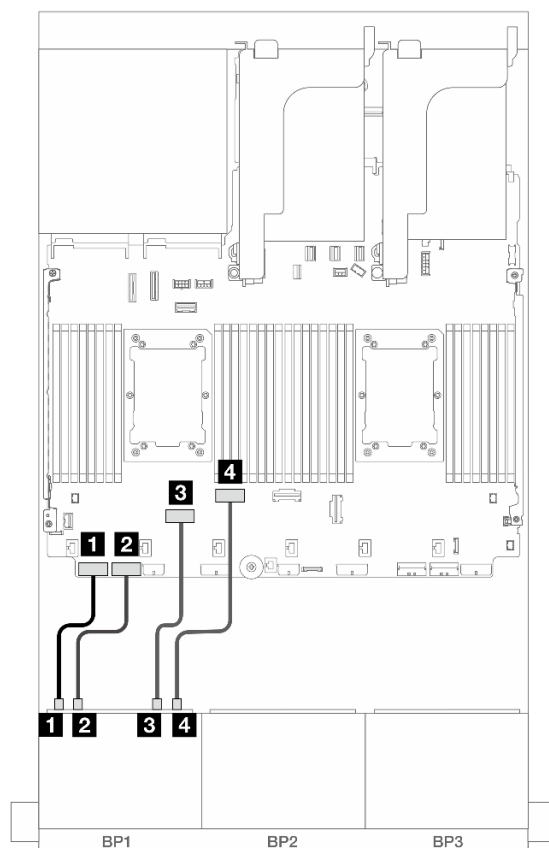


Figure 416. Cable routing in other scenarios

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5

### Trimode 8i RAID/HBA adapter

The following shows the cable connections for the 8 x 2.5-inch AnyBay (Gen 5) configuration with one Trimode 8i RAID/HBA adapter.

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



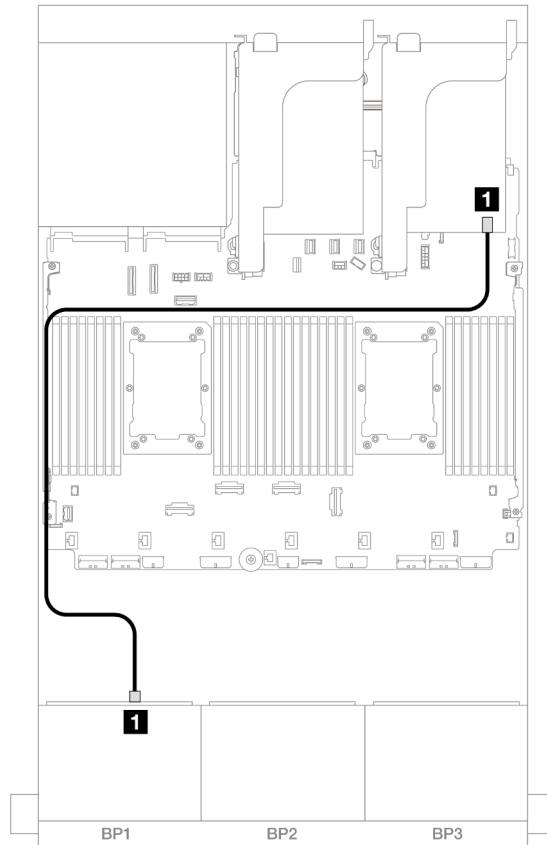


Figure 417. Backplane cable routing

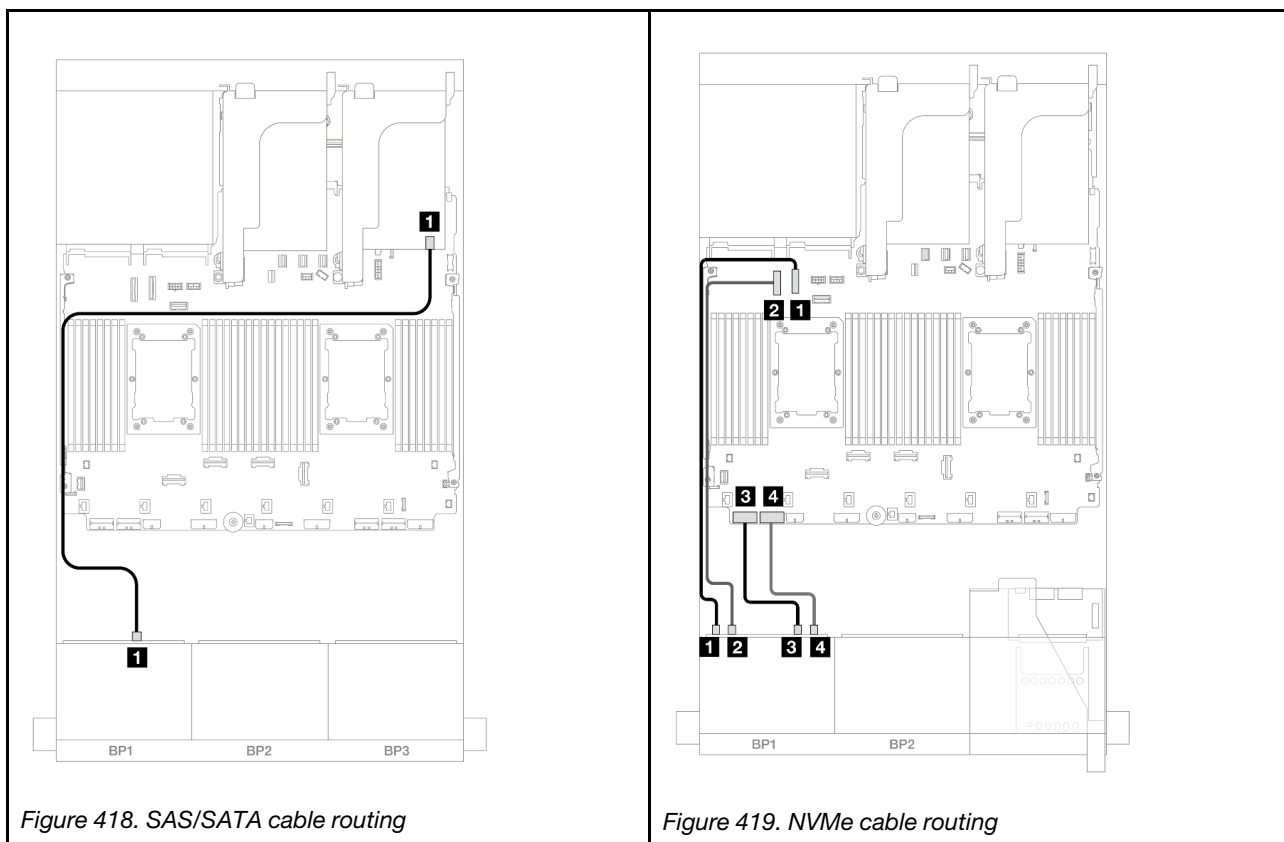
From	To
1 Backplane 1: SAS	8i adapter: C0

### Riser 5 + OCP interposer cards + 8i/16i RAID/HBA adapter

The following shows the cable connections for the 8 x 2.5-inch AnyBay configuration with riser 5, front and rear OCP interposer cards, and one 8i/16i RAID/HBA adapter.

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n



From	To	From	To
<b>1</b> Backplane 1: SAS	8i/16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>	<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
		<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
		<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
		<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7

## One 8 x NVMe backplane (Gen 4)

This section provides cable routing information for the server model with one 8 x 2.5-inch NVMe front drive backplane (Gen 4).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

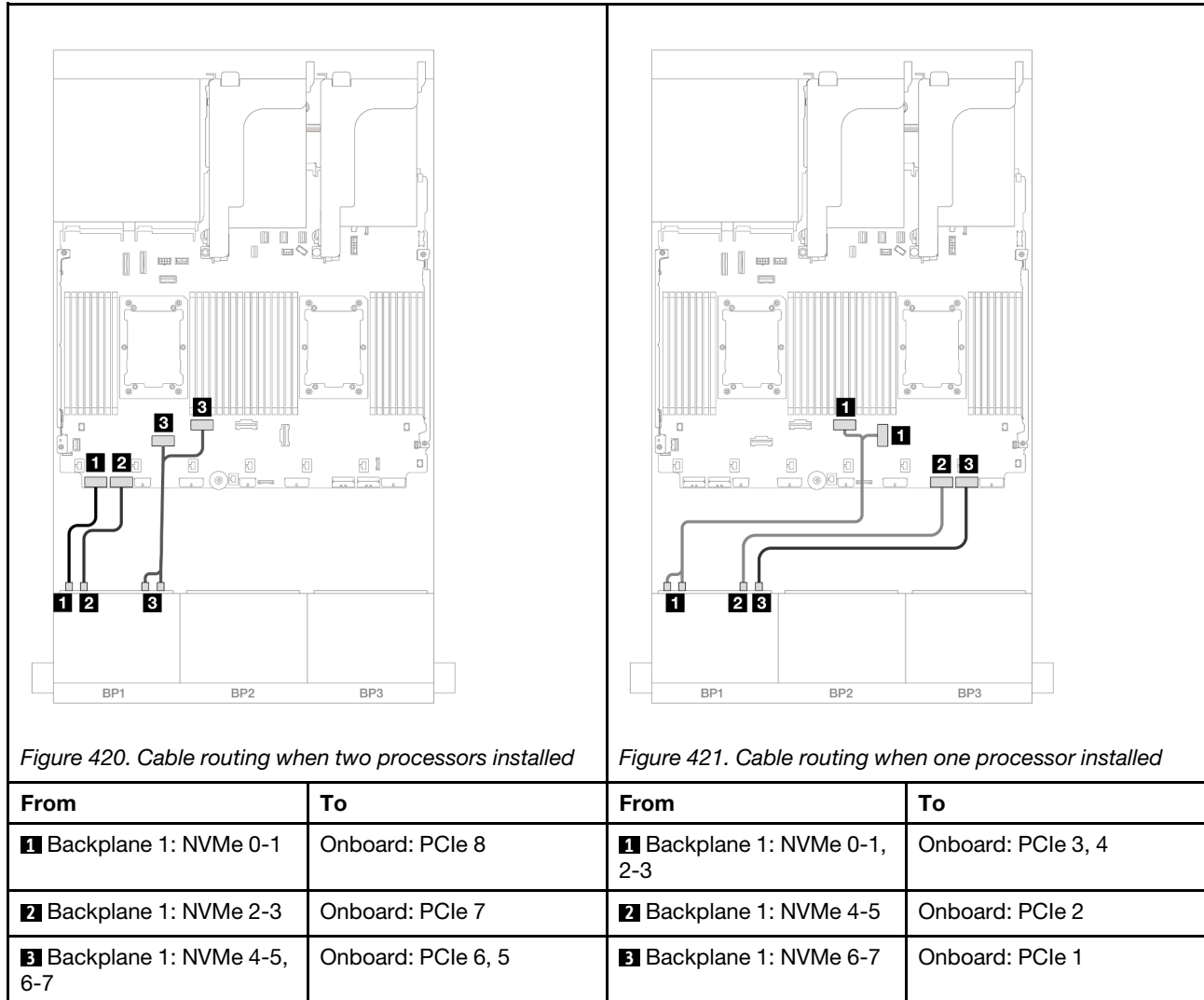
- [“Onboard connectors” on page 442](#)
- [“Onboard connectors + Riser 5 + OCP interposer cards” on page 443](#)

### Onboard connectors

The following shows the cable connections for the 8 x 2.5-inch NVMe (Gen4) configuration with onboard connectors.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

### NVMe cable routing to onboard PCIe connectors



### Onboard connectors + Riser 5 + OCP interposer cards

The following shows the cable connections for the 8 x 2.5-inch NVMe configuration with onboard connectors, riser 5, and OCP interposer cards.

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

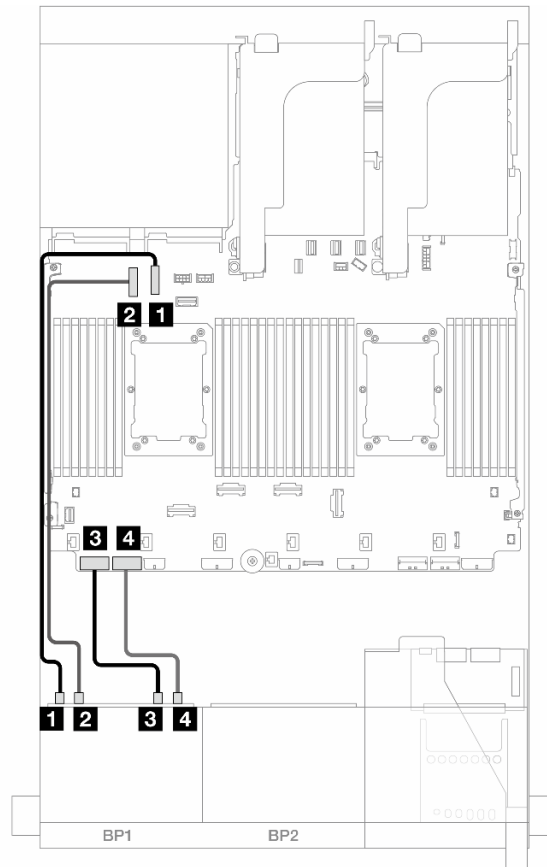


Figure 422. NVMe cable routing

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7

## One 8 x NVMe backplane (Gen 5)

This section provides cable routing information for the server model with one 8 x 2.5-inch NVMe front drive backplane (Gen 5).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“Onboard connectors” on page 445](#)
- [“Onboard connectors + Riser 5 + OCP interposer cards” on page 443](#)

## Onboard connectors

The following shows the cable connections for the 8 x 2.5-inch NVMe (Gen5) configuration with onboard connectors.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

### Cable routing when two processors installed

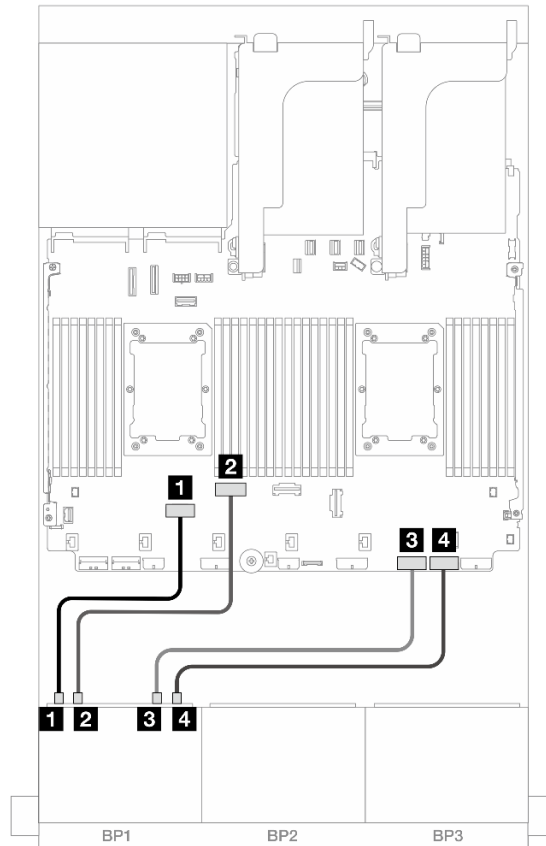


Figure 423. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 6
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 5
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 2
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 1

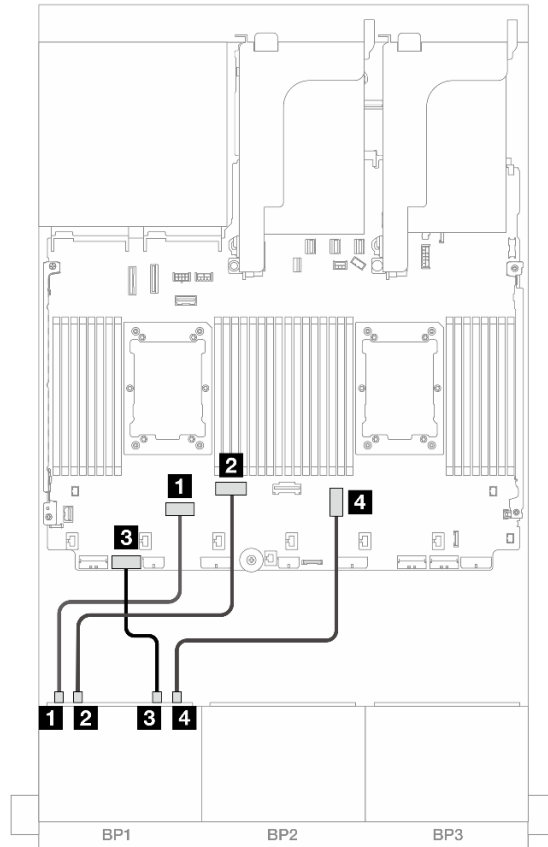


Figure 424. Cable routing when two Platinum series processors installed with x16/x16 riser card

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 6
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 5
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 7
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 3

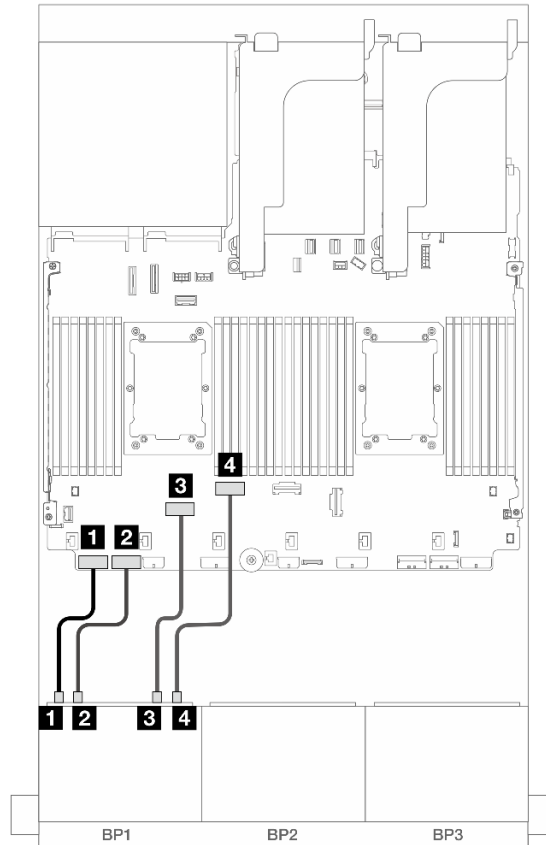


Figure 425. Cable routing in other scenarios

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5

Cable routing when one processor installed

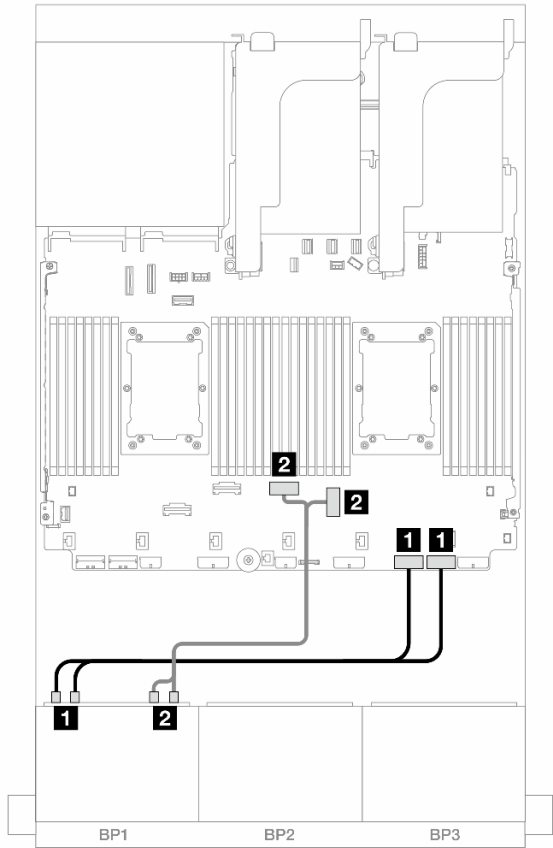


Figure 426. Cable routing when one processor installed

From	To
<b>1</b> Backplane 1: NVMe 0-1, 2-3	Onboard: PCIe 2, 1
<b>2</b> Backplane 1: NVMe 4-5, 6-7	Onboard: PCIe 3, 4

Onboard connectors + Riser 5 + OCP interposer cards

The following shows the cable connections for the 8 x 2.5-inch NVMe configuration with onboard connectors, riser 5, and OCP interposer cards.

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



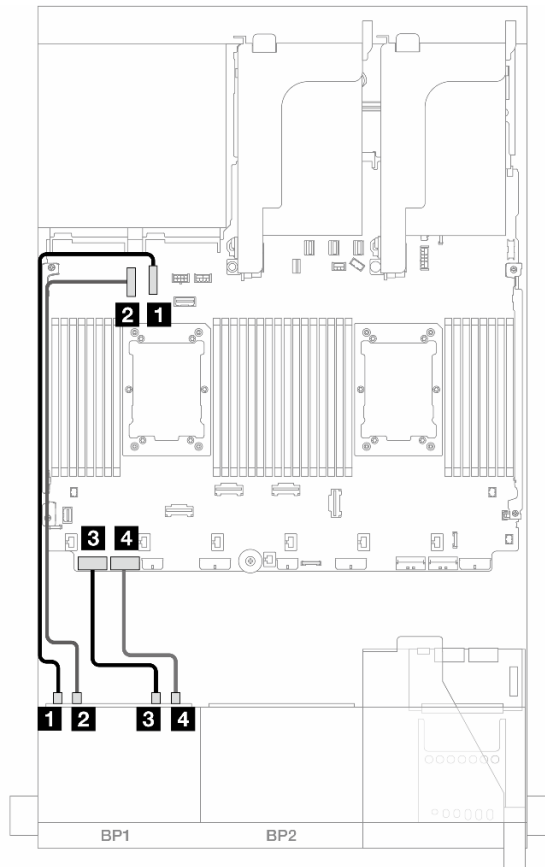


Figure 427. NVMe cable routing

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7

## Two 8 x SAS/SATA backplanes

This section provides cable routing information for the server model with two 8 x 2.5-inch SAS/SATA front drive backplanes.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“16 x SAS/SATA” on page 449](#)
- [“14 x SAS/SATA” on page 453](#)

### 16 x SAS/SATA

This topic provides cable routing information for the configuration with 16 SAS/SATA front drive bays.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“Onboard connectors” on page 424](#)
- [“8i/16i RAID/HBA adapter” on page 425](#)
- [“CFF 8i/16i RAID/HBA adapter” on page 426](#)
- [“Riser 5 + OCP interposer cards + 8i/16i RAID/HBA adapter” on page 452](#)

**Onboard connectors + 8i RAID/HBA adapter**

The following shows the cable connections for the 16 x 2.5-inch SAS/SATA configuration with onboard connectors and one 8i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

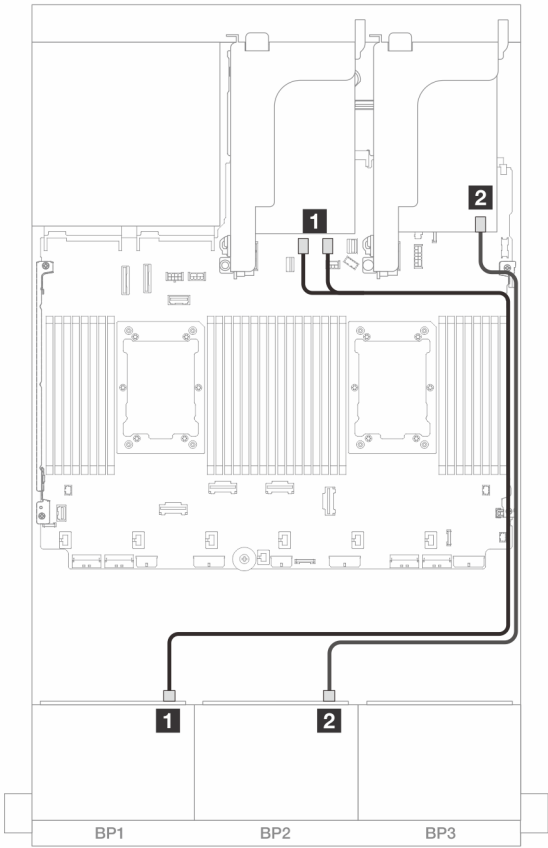


Figure 428. SAS/SATA cable routing to onboard SATA connectors and 8i adapter

From	To
<b>1</b> Backplane 1: SAS	Onboard: SATA 0, SATA 1
<b>2</b> Backplane 2: SAS	8i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>

### 8i/16i RAID/HBA adapter

The following shows the cable connections for the 16 x 2.5-inch SAS/SATA configuration with two 8i RAID/HBA adapters or one 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

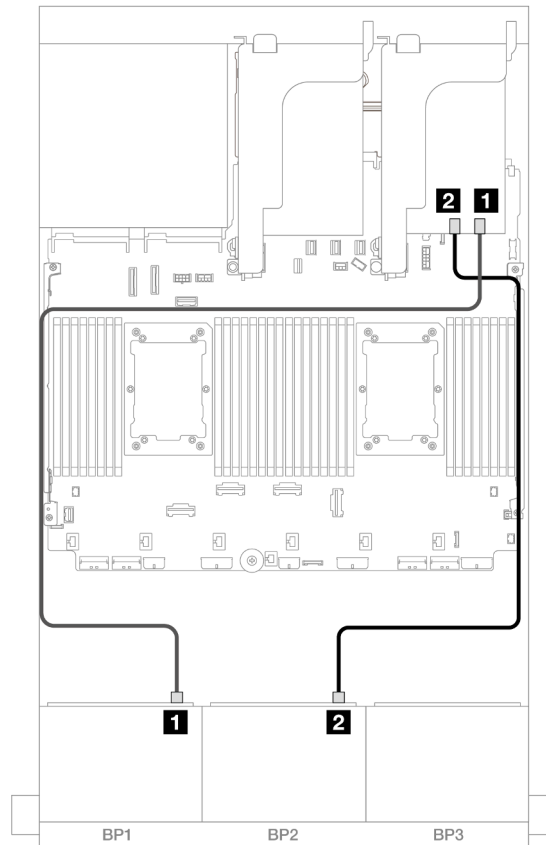


Figure 429. SAS/SATA cable routing to 8i/16i RAID/HBA adapter

From	To	
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>	16i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>
<b>2</b> Backplane 2: SAS	8i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>	<ul style="list-style-type: none"><li>• Gen 4: C1</li><li>• Gen 3: C2C3</li></ul>

### CFF 16i RAID/HBA adapter

The following shows the cable connections for the 16 x 2.5-inch SAS/SATA configuration with one internal CFF 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

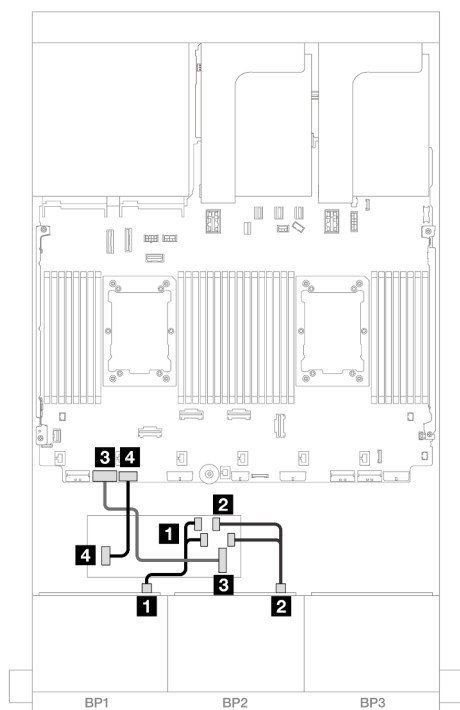


Figure 430. Cable routing when two processors installed

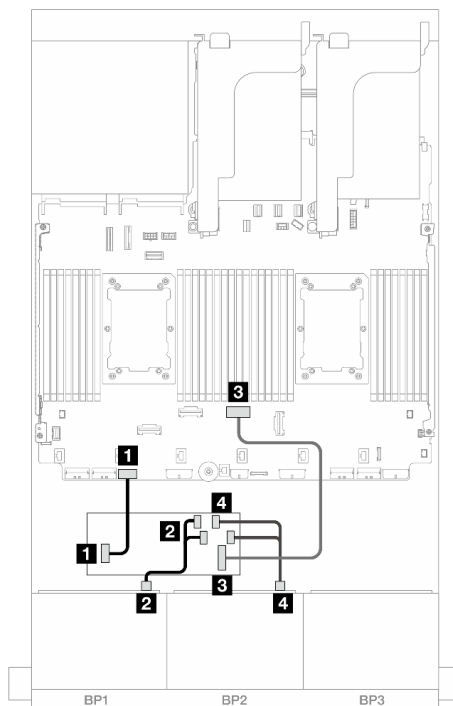


Figure 431. Cable routing when one processor installed

From	To	From	To
<b>1</b> Backplane 1: SAS	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>	<b>1</b> Backplane 1: SAS	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>2</b> Backplane 2: SAS	CFF adapter <ul style="list-style-type: none"> <li>• C2</li> <li>• C3</li> </ul>	<b>2</b> Backplane 2: SAS	CFF adapter <ul style="list-style-type: none"> <li>• C2</li> <li>• C3</li> </ul>
<b>3</b> CFF adapter: MB (CFF input)	Onboard: PCIe 7	<b>3</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4
<b>4</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR	<b>4</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR

### Riser 5 + OCP interposer cards + 8i/16i RAID/HBA adapter

The following shows the cable connections for the 16 x 2.5-inch SAS/SATA configuration with riser 5, front and rear OCP interposer cards, and two 8i RAID/HBA adapters or one 16i RAID/HBA adapter.

To connect riser 3/4 cables, see [“Riser 3/4 cage” on page 416](#).

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

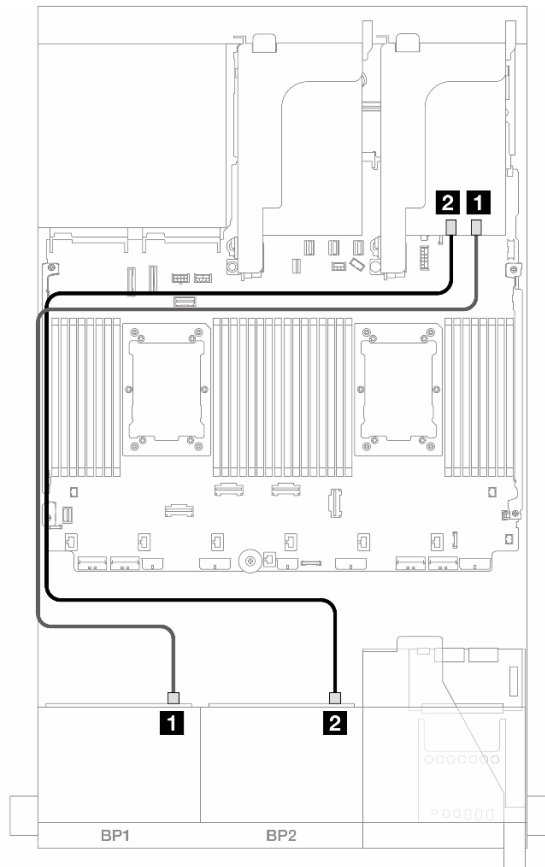


Figure 432. Backplane cable routing

From	To	
<b>1</b> Backplane 1: SAS	8i adapter	16i adapter
	<ul style="list-style-type: none"> <li>Gen 4: C0</li> <li>Gen 3: C0C1</li> </ul>	<ul style="list-style-type: none"> <li>Gen 4: C0</li> <li>Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 2: SAS	8i adapter	
	<ul style="list-style-type: none"> <li>Gen 4: C0</li> <li>Gen 3: C0C1</li> </ul>	<ul style="list-style-type: none"> <li>Gen 4: C1</li> <li>Gen 3: C2C3</li> </ul>

## 14 x SAS/SATA

This topic provides cable routing information for the configuration with 14 x SAS/SATA front drives using two 8 x SAS/SATA front backplanes.

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

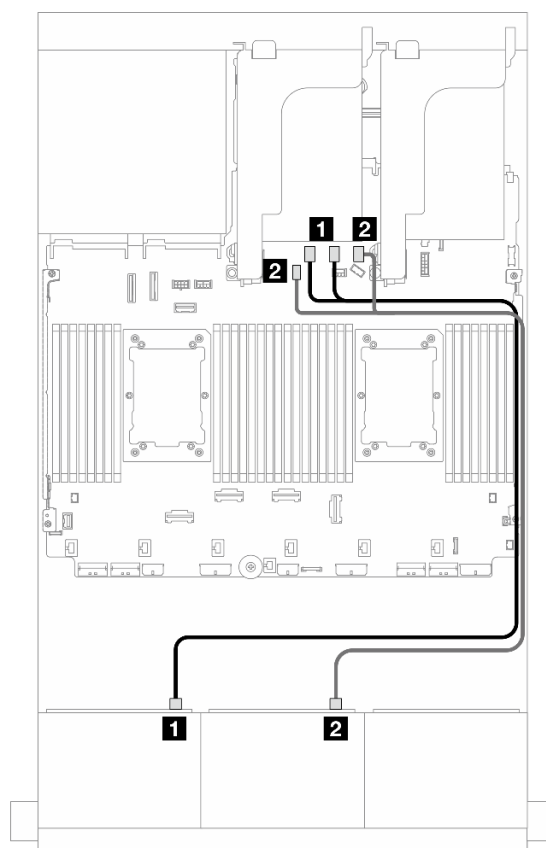


Figure 433. SAS/SATA cable routing to onboard connectors

From	To
<b>1</b> Backplane 1: SAS	Onboard: SATA 0, SATA 1
<b>2</b> Backplane 2: SAS	Onboard: SATA 2, M.2 signal connector

## Two 8 x AnyBay backplanes (Gen 4)

This section provides cable routing information for the server model with two 8 x 2.5-inch AnyBay front drive backplanes (Gen 4).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“Onboard connectors + 16i RAID/HBA adapter” on page 455](#)
- [“Trimode 8i RAID adapter” on page 456](#)
- [“Trimode 16i RAID adapter” on page 457](#)

## 16 x AnyBay

This topic provides cable routing information for the 16 x AnyBay (Gen 4) configuration.

- [“Onboard connectors + 16i RAID/HBA adapter” on page 455](#)

- “Trimode 8i RAID adapter” on page 456
- “Trimode 16i RAID adapter” on page 457

### Onboard connectors + 16i RAID/HBA adapter

The following shows the cable connections for the 16 x 2.5-inch AnyBay (Gen 4) configuration with one 16i RAID/HBA adapter.

### SAS/SATA cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

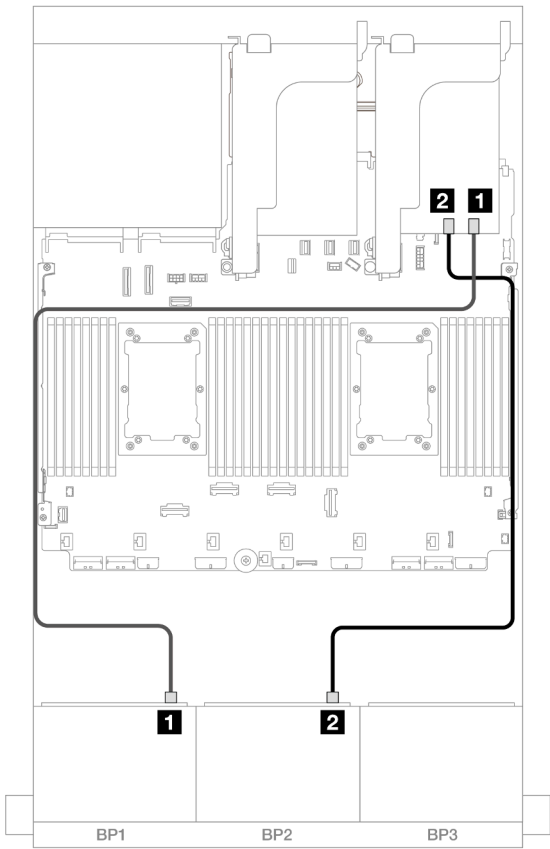


Figure 434. SAS/SATA cable routing to 16i adapter

From	To
<b>1</b> Backplane 1: SAS	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2C3</li> </ul>

### NVMe cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

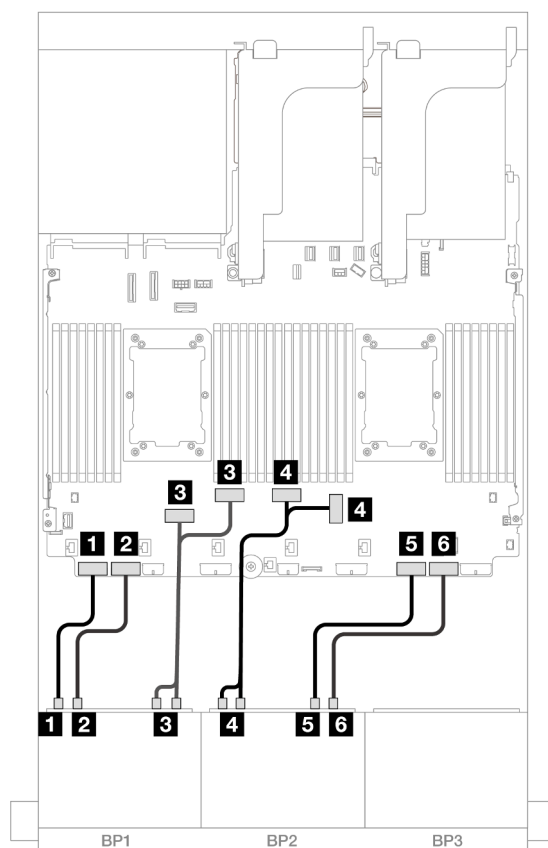


Figure 435. NVMe cable routing to onboard PCIe connectors

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 1: NVMe 4-5, 6-7	Onboard: PCIe 6, 5
<b>4</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>5</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2
<b>6</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1

### Trimode 8i RAID adapter

The following shows the cable connections for the 16 x 2.5-inch AnyBay (Gen 4) configuration with two Trimode 8i RAID adapters.

To connect riser 3/4 cables, see [“Riser 3/4 cage” on page 416](#).

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



## Signal cable routing

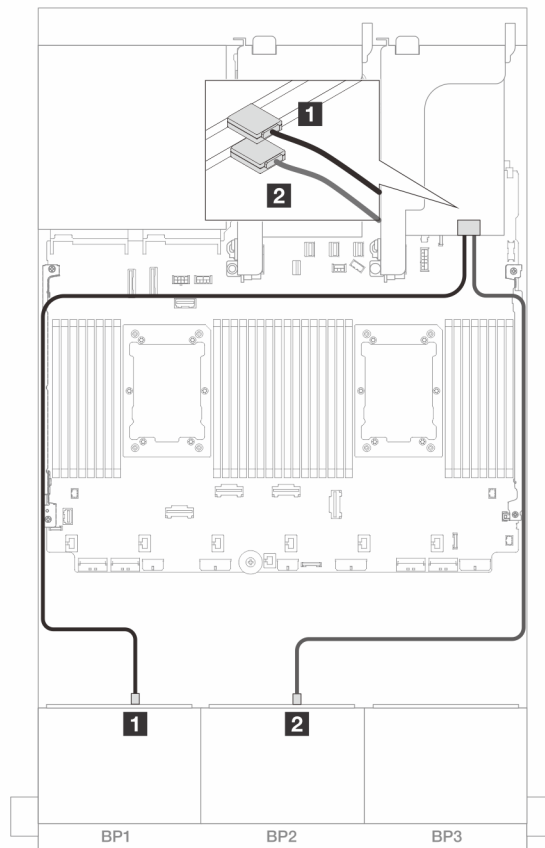


Figure 436. Signal cable routing to Trimode 8i adapters

From	To
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"><li>• C0</li></ul>
<b>2</b> Backplane 2: SAS	8i adapter <ul style="list-style-type: none"><li>• C0</li></ul>

### Trimode 16i RAID adapter

The following shows the cable connections for the 16 x 2.5-inch AnyBay (Gen 4) configuration with one Trimode 16i RAID adapter.

To connect riser 3/4 cables, see [“Riser 3/4 cage” on page 416](#).

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

Signal cable routing

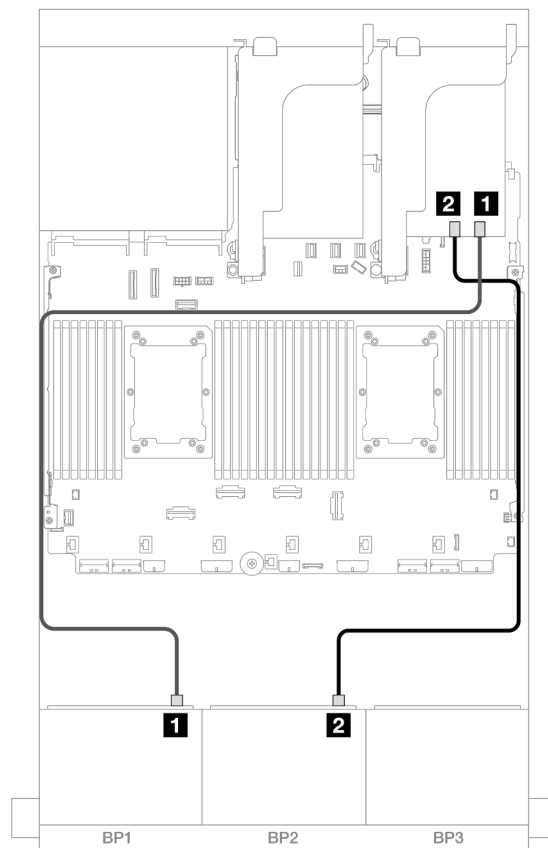


Figure 437. Signal cable routing to Trimode 16i adapter

From	To
1 Backplane 1: SAS	16i adapter <ul style="list-style-type: none"><li>C0</li></ul>
2 Backplane 2: SAS	<ul style="list-style-type: none"><li>C1</li></ul>

Two 8 x AnyBay backplanes (Gen 5)

This section provides cable routing information for the server model with two 8 x 2.5-inch AnyBay front drive backplanes (Gen 5).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- “16 x AnyBay” on page 458
- “12 x AnyBay + 4 x SAS/SATA” on page 465

16 x AnyBay

This topic provides cable routing information for the 16 x AnyBay (Gen 5) configuration.

- “Onboard connectors + 8i/16i RAID/HBA adapter” on page 459
- “Onboard connectors + 16i RAID/HBA adapter + Retimer card” on page 462
- “Trimode 8i/16i RAID/HBA adapter” on page 464

### Onboard connectors + 8i/16i RAID/HBA adapter

The following shows the cable connections for the 16 x 2.5-inch AnyBay (Gen 5) configuration with one 8i/16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

### SAS/SATA cable routing

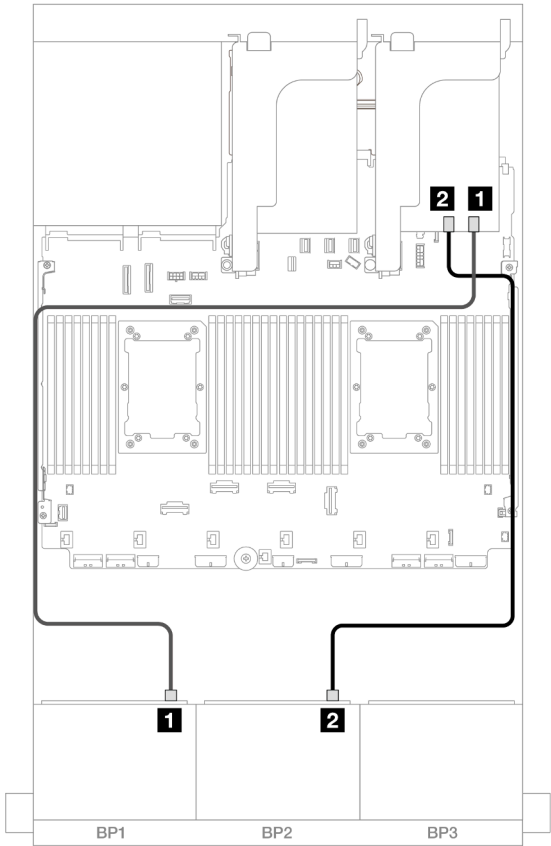


Figure 438. SAS/SATA cable routing to 8i/16i adapter

From	To
<b>1</b> Backplane 1: SAS	8i/16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2C3</li> </ul>

## NVMe cable routing

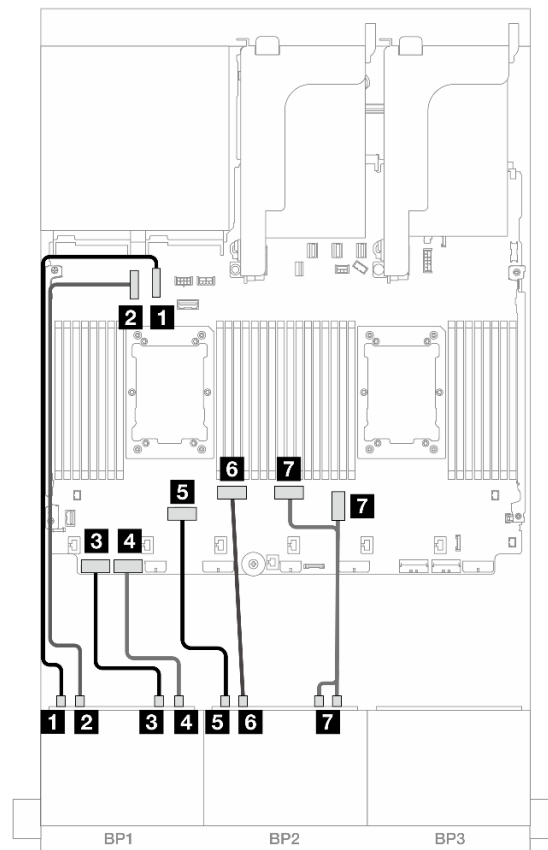


Figure 439. Cable routing when x16/x16 riser card installed

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 6
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 5
<b>7</b> Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, 4

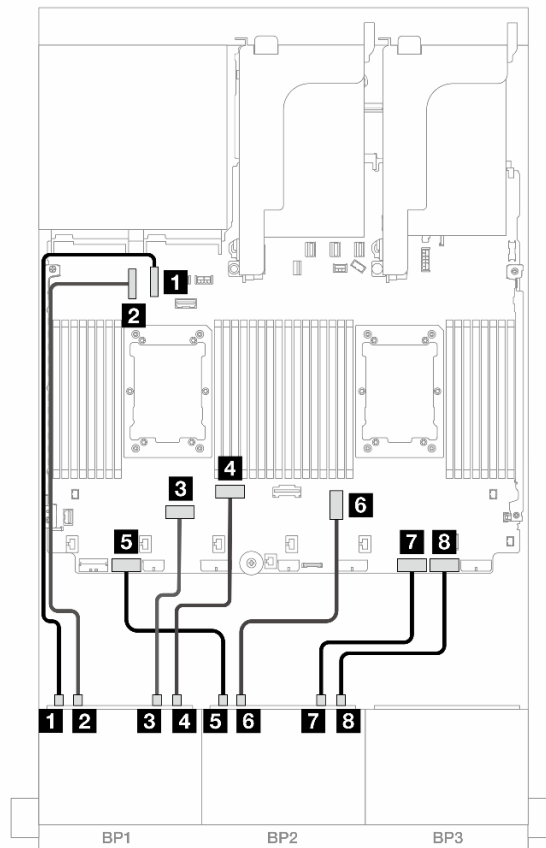


Figure 440. Cable routing when two Platinum series processors installed with no riser 3

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 7
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 3
<b>7</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2
<b>8</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1

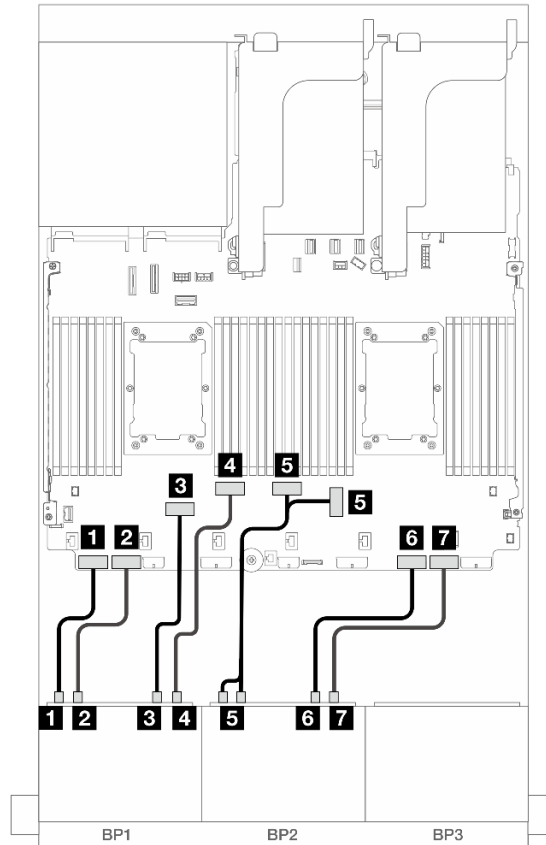


Figure 441. Cable routing in other scenarios

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5
<b>5</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>6</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2
<b>7</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1

#### Onboard connectors + 16i RAID/HBA adapter + Retimer card

The following shows the cable connections for the 16 x 2.5-inch AnyBay (Gen 5) configuration with one 16i RAID/HBA adapter and one retimer card.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

## SAS/SATA cable routing

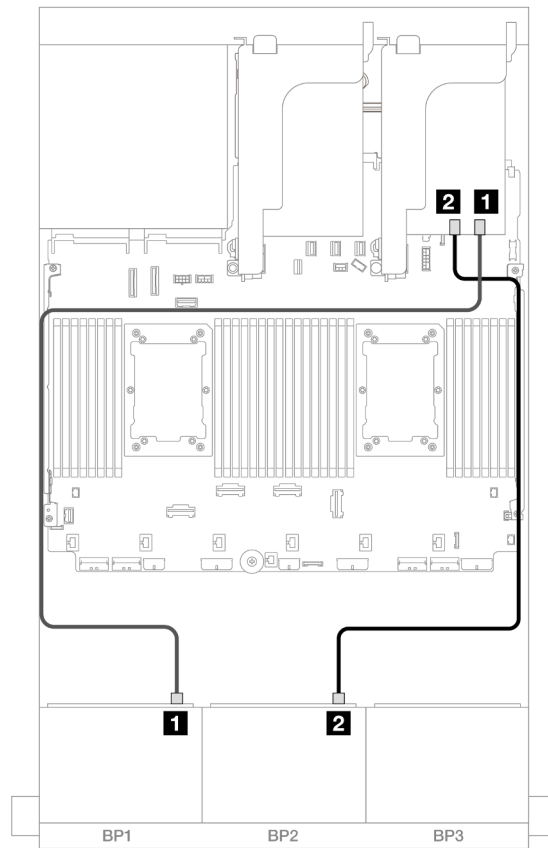


Figure 442. SAS/SATA cable routing to 16i adapter

From	To
<b>1</b> Backplane 1: SAS	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2C3</li> </ul>

## NVMe cable routing

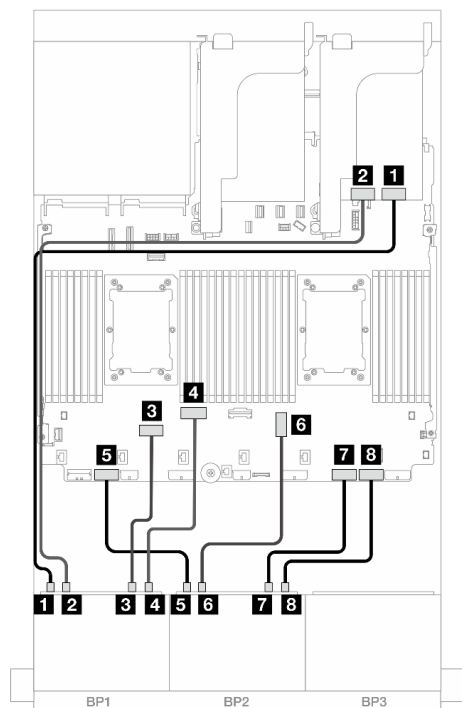


Figure 443. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card

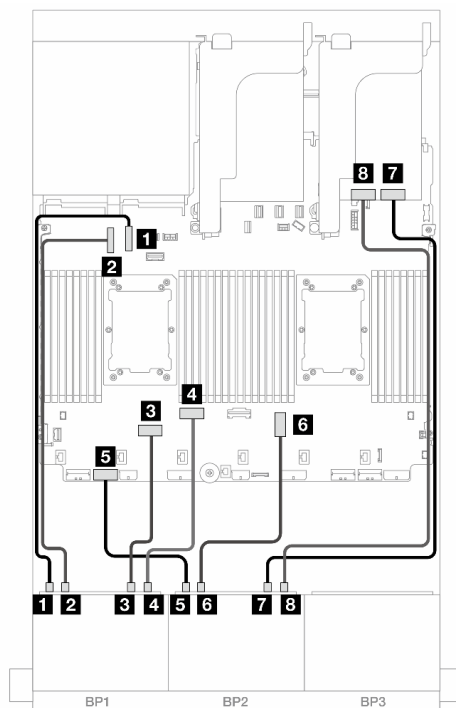


Figure 444. Cable routing when two Platinum series processors installed with x16/x16 riser card (only slot 7)

From	To	From	To
<b>1</b> Backplane 1: NVMe 0-1	Retimer: C0	<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Retimer: C1	<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6	<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5	<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 7	<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 7
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 3	<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 3
<b>7</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2	<b>7</b> Backplane 2: NVMe 4-5	Retimer: C0
<b>8</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1	<b>8</b> Backplane 2: NVMe 6-7	Retimer: C1

### Trimode 8i/16i RAID/HBA adapter

The following shows the cable connections for the 16 x 2.5-inch AnyBay (Gen 5) configuration with one Trimode 8i/16i RAID/HBA adapter.

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



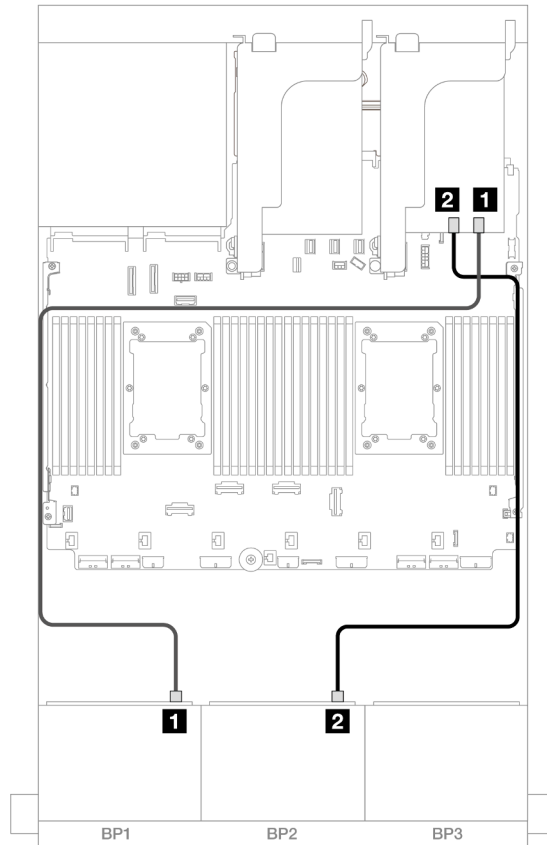


Figure 445. Backplane cable routing

From	To
1 Backplane 1: SAS	8i/16i adapter: C0
2 Backplane 2: SAS	8i/16i adapter: C1

## 12 x AnyBay + 4 x SAS/SATA

This topic provides cable routing information for the 12 x AnyBay + 4 x SAS/SATA configuration using two 8 x AnyBay front backplanes (Gen 5).

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

SAS/SATA cable routing

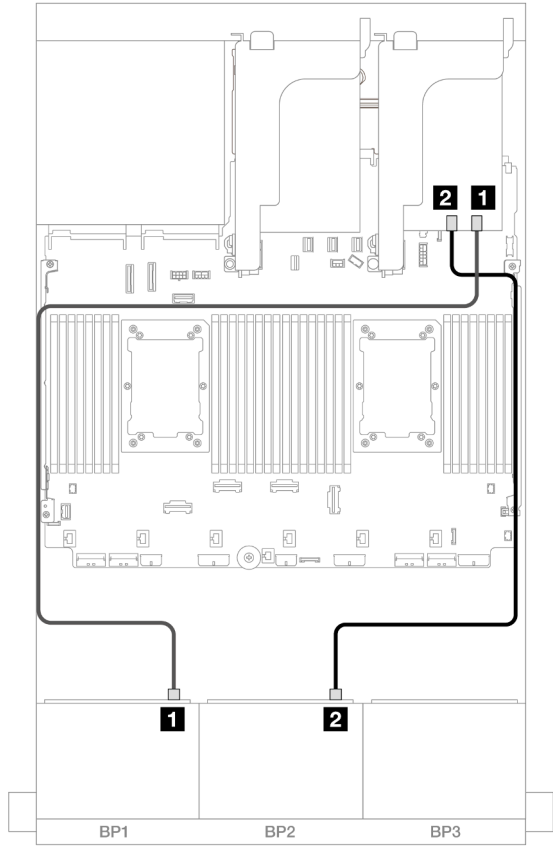


Figure 446. SAS/SATA cable routing to 16i adapter

From	To
<b>1</b> Backplane 1: SAS	16i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"><li>• Gen 4: C1</li><li>• Gen 3: C2C3</li></ul>

## NVMe cable routing

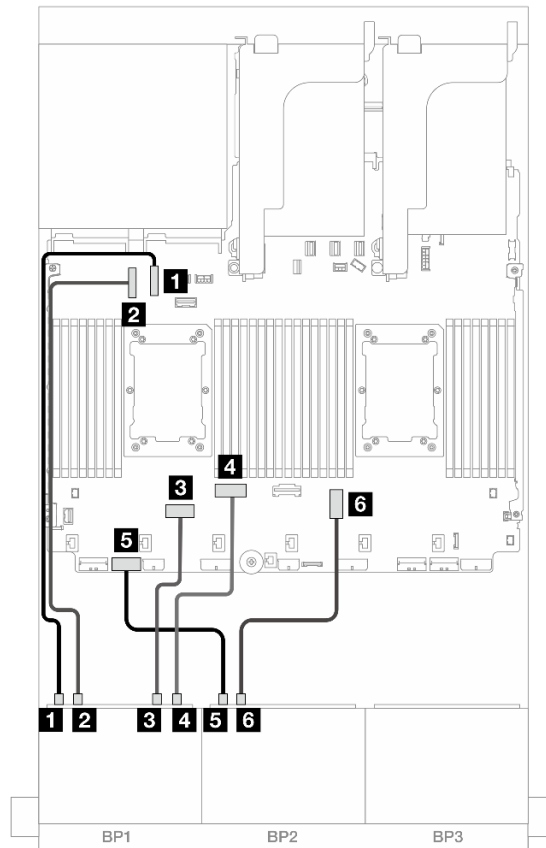


Figure 447. NVMe cable routing to onboard connectors

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 7
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 3

## Two 8 x NVMe backplanes (Gen 4)

This section provides cable routing information for the server model with two 8 x 2.5-inch NVMe front drive backplanes (Gen 4).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“16 x NVMe” on page 468](#)

- [“12 x NVMe” on page 470](#)

### 16 x NVMe

This topic provides cable routing information for the configuration with 16 x NVMe front drives using two 8 x NVMe front backplanes (Gen 4).

- [“Onboard connectors” on page 468](#)
- [“Riser 5 + OCP interposer cards + Retimer cards” on page 469](#)

#### Onboard connectors

The following shows the cable connections for the 16 x 2.5-inch NVMe (Gen 4) configuration with onboard connectors.

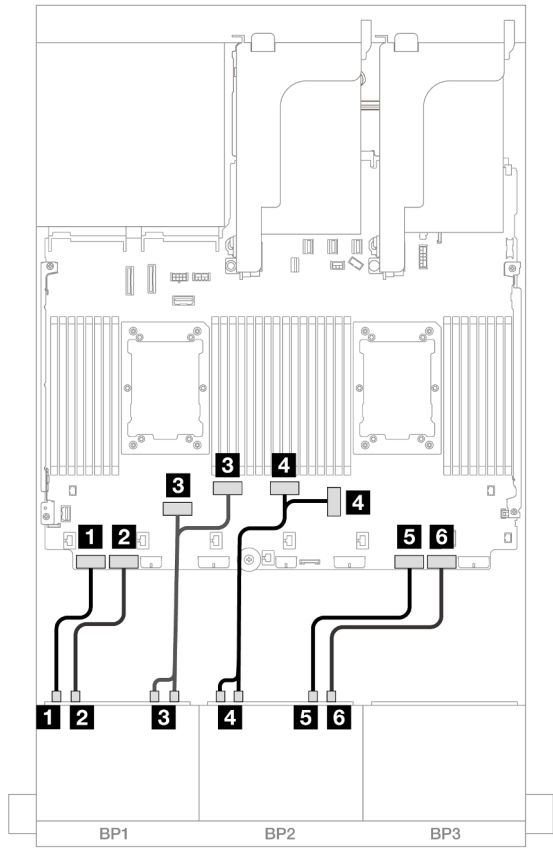


Figure 448. NVMe cable routing to onboard PCIe connectors

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 1: NVMe 4-5, 6-7	Onboard: PCIe 6, 5
<b>4</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>5</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2
<b>6</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1

### Riser 5 + OCP interposer cards + Retimer cards

The following shows the cable connections for the 16 x 2.5-inch NVMe (Gen 4) configuration with riser 5, front and rear OCP interposer cards, and two retimer cards.

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

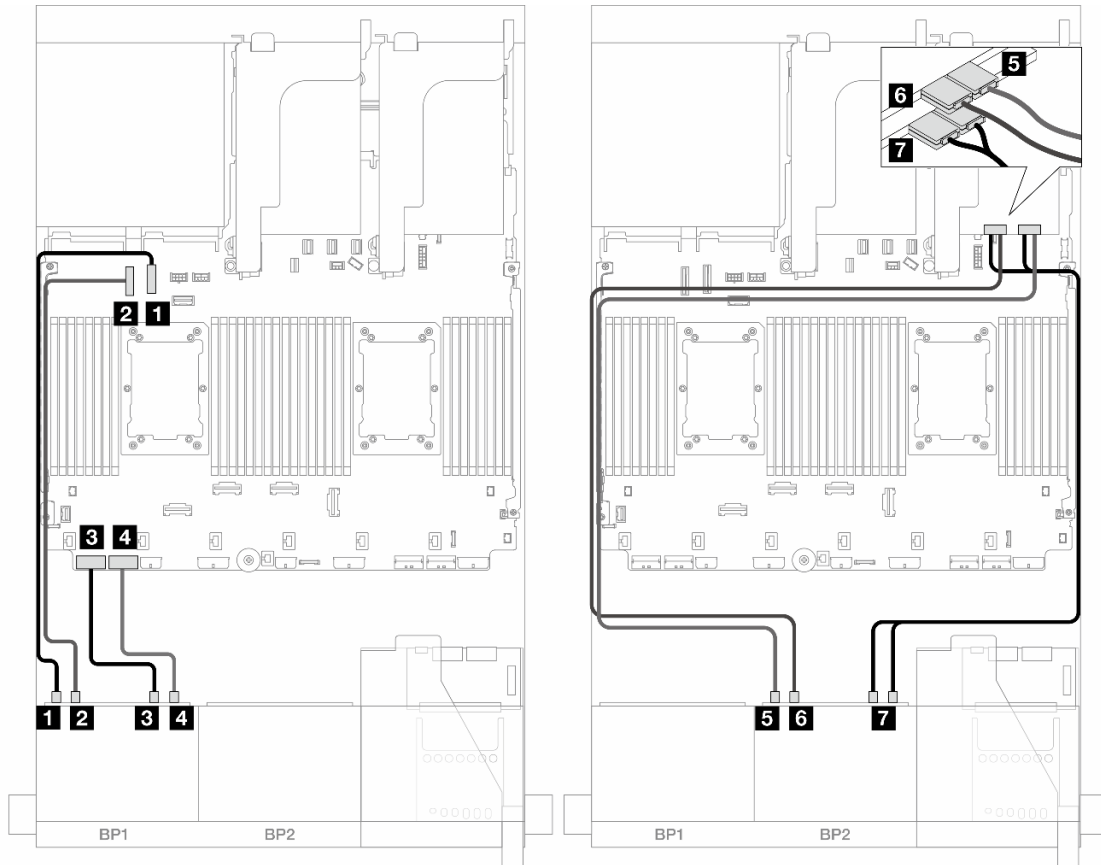


Figure 449. Backplane cable routing

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7
<b>5</b> Backplane 2: NVMe 0-1	Retimer: C0
<b>6</b> Backplane 2: NVMe 2-3	Retimer: C1
<b>7</b> Backplane 2: NVMe 4-5, 6-7	Retimer: C0, C1

## 12 x NVMe

This topic provides cable routing information for the configuration with 12 x NVMe front drives using two 8 x NVMe front backplanes (Gen 4).

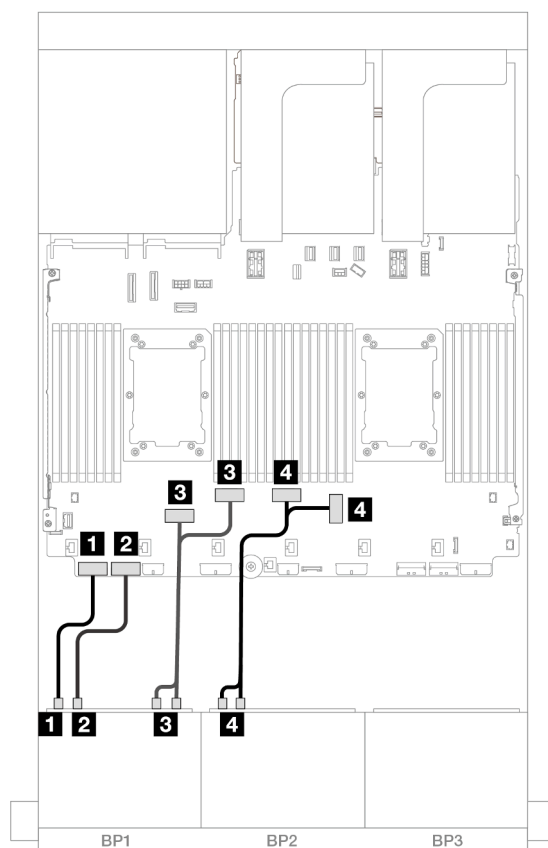


Figure 450. NVMe cable routing to onboard connectors

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 1: NVMe 4-5, 6-7	Onboard: PCIe 6, 5
<b>4</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 3, 4

## Two 8 x NVMe backplanes (Gen 5)

This section provides cable routing information for the server model with two 8 x 2.5-inch NVMe front drive backplanes (Gen 5).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“16 x NVMe” on page 471](#)

- [“12 x NVMe” on page 474](#)

### 16 x NVMe

This topic provides cable routing information for the configuration with 16 x NVMe front drives using two 8 x NVMe front backplanes (Gen 5).

- [“Onboard connectors” on page 471](#)
- [“Onboard connectors + Retimer card” on page 472](#)
- [“Riser 5 + OCP interposer cards + Retimer cards” on page 473](#)

#### Onboard connectors

The following shows the cable connections for the 16 x 2.5-inch NVMe (Gen 5) configuration.

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

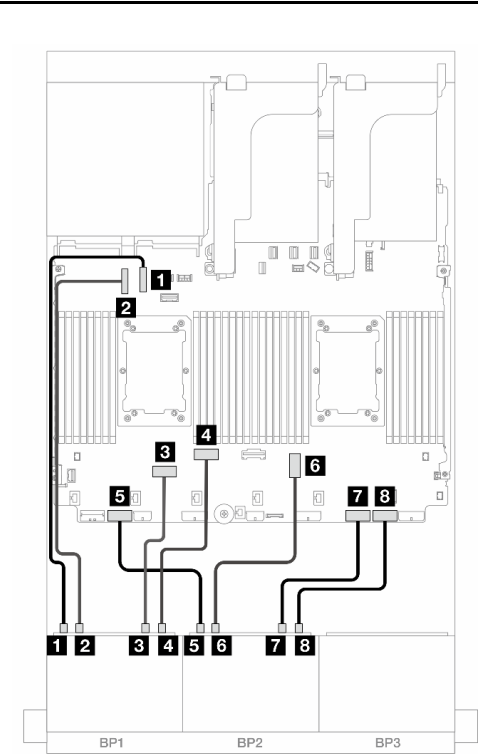


Figure 451. Cable routing when two Platinum series processors installed with no riser 3

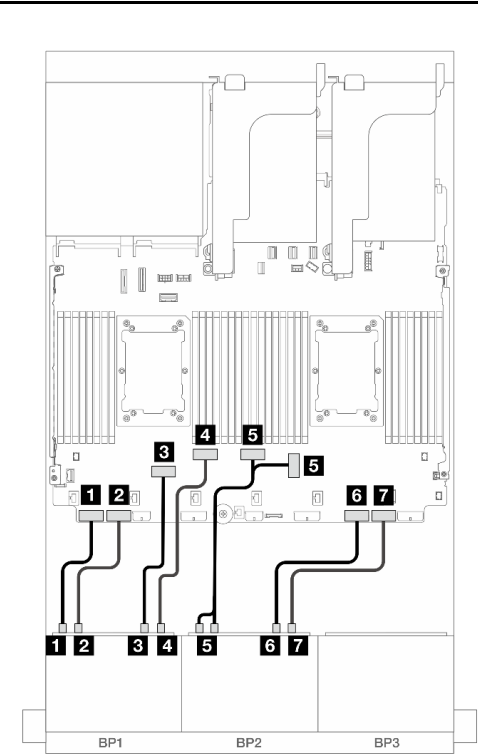


Figure 452. Cable routing in other scenarios

From	To	From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10	<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9	<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6	<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5	<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 7	<b>5</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 3	<b>6</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2

<b>7</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2	<b>7</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1
<b>8</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1		

### Onboard connectors + Retimer card

The following shows the cable connections for the 16 x 2.5-inch NVMe (Gen 5) configuration with one retimer card.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

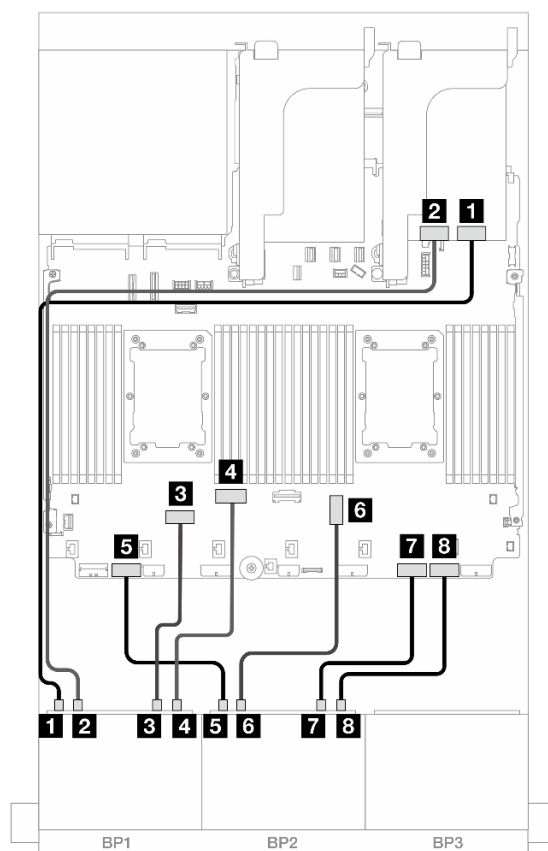


Figure 453. NVMe cable routing to onboard connectors and retimer card

From	To
<b>1</b> Backplane 1: NVMe 0-1	Retimer: C0
<b>2</b> Backplane 1: NVMe 2-3	Retimer: C1
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 7
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 3
<b>7</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2
<b>8</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1



### Riser 5 + OCP interposer cards + Retimer cards

The following shows the cable connections for the 16 x 2.5-inch NVMe (Gen 5) configuration with riser 5, front and rear OCP interposer cards, and two retimer cards.

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

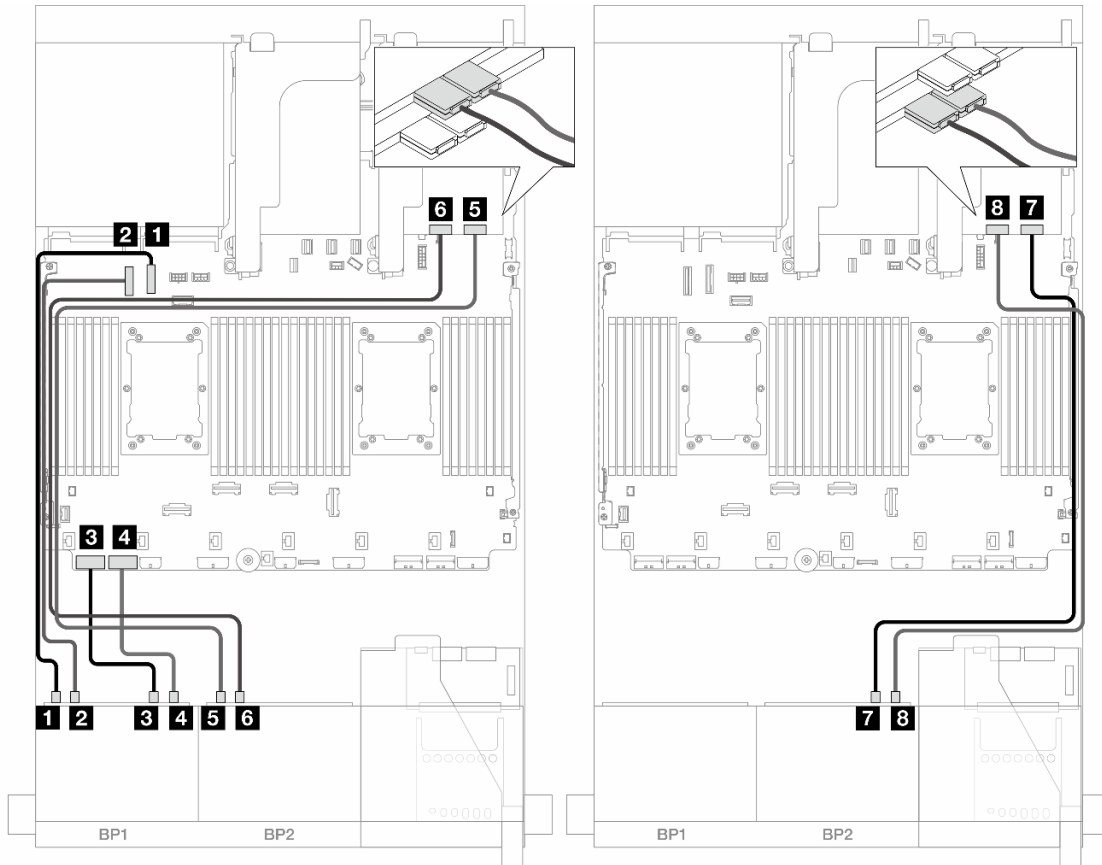


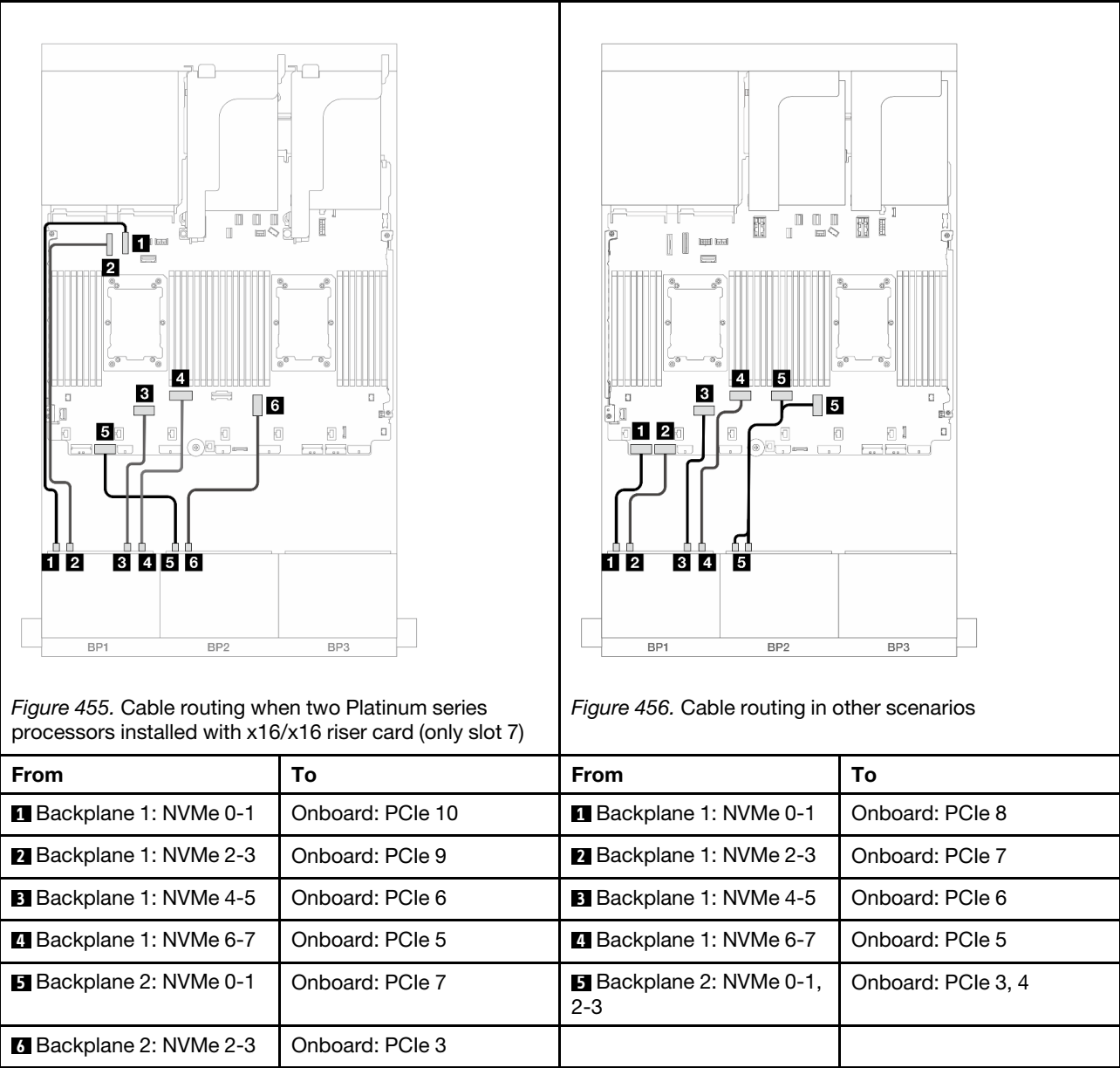
Figure 454. Backplane cable routing

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7
<b>5</b> Backplane 2: NVMe 0-1	Retimer: C0
<b>6</b> Backplane 2: NVMe 2-3	Retimer: C1
<b>7</b> Backplane 2: NVMe 4-5	Retimer: C0
<b>8</b> Backplane 2: NVMe 6-7	Retimer: C1

# 12 x NVMe

This topic provides cable routing information for the configuration with 12 x NVMe front drives using two 8 x NVMe front backplanes (Gen 5).

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



## One 8 x SAS/SATA and one 8 x AnyBay (Gen 4) backplanes

This section provides cable routing information for the server model with one 8 x 2.5-inch SAS/SATA backplane and one 8 x 2.5-inch AnyBay backplane (Gen 4).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- “Onboard connectors + 8i RAID/HBA adapter” on page 475
- “Onboard connectors + 16i RAID/HBA adapter” on page 476
- “Onboard connectors + CFF 16i RAID/HBA adapter” on page 478
- “Riser 5 + OCP interposer cards + 8i/16i RAID/HBA adapter” on page 480

### Onboard connectors + 8i RAID/HBA adapter

The following shows the cable connections for the 8 SAS/SATA + 8 AnyBay (Gen 4) configuration with two 8i RAID/HBA adapters.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

### SAS/SATA cable routing

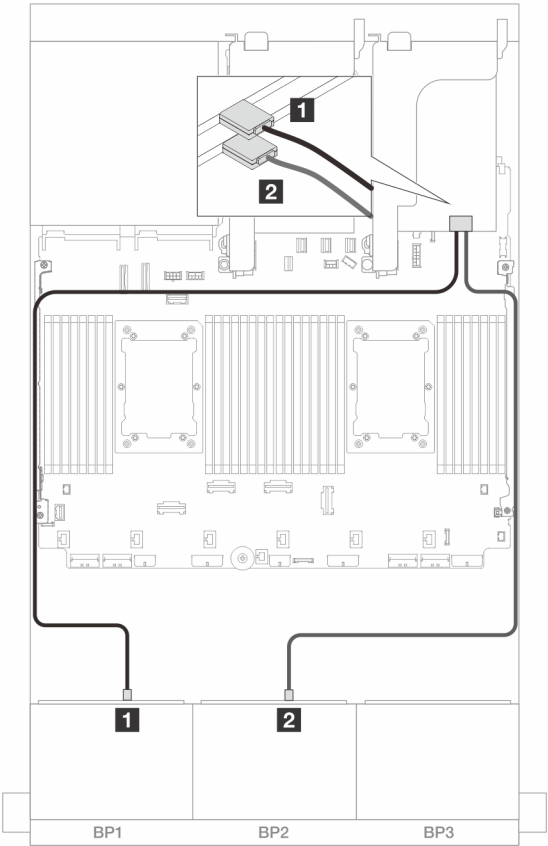
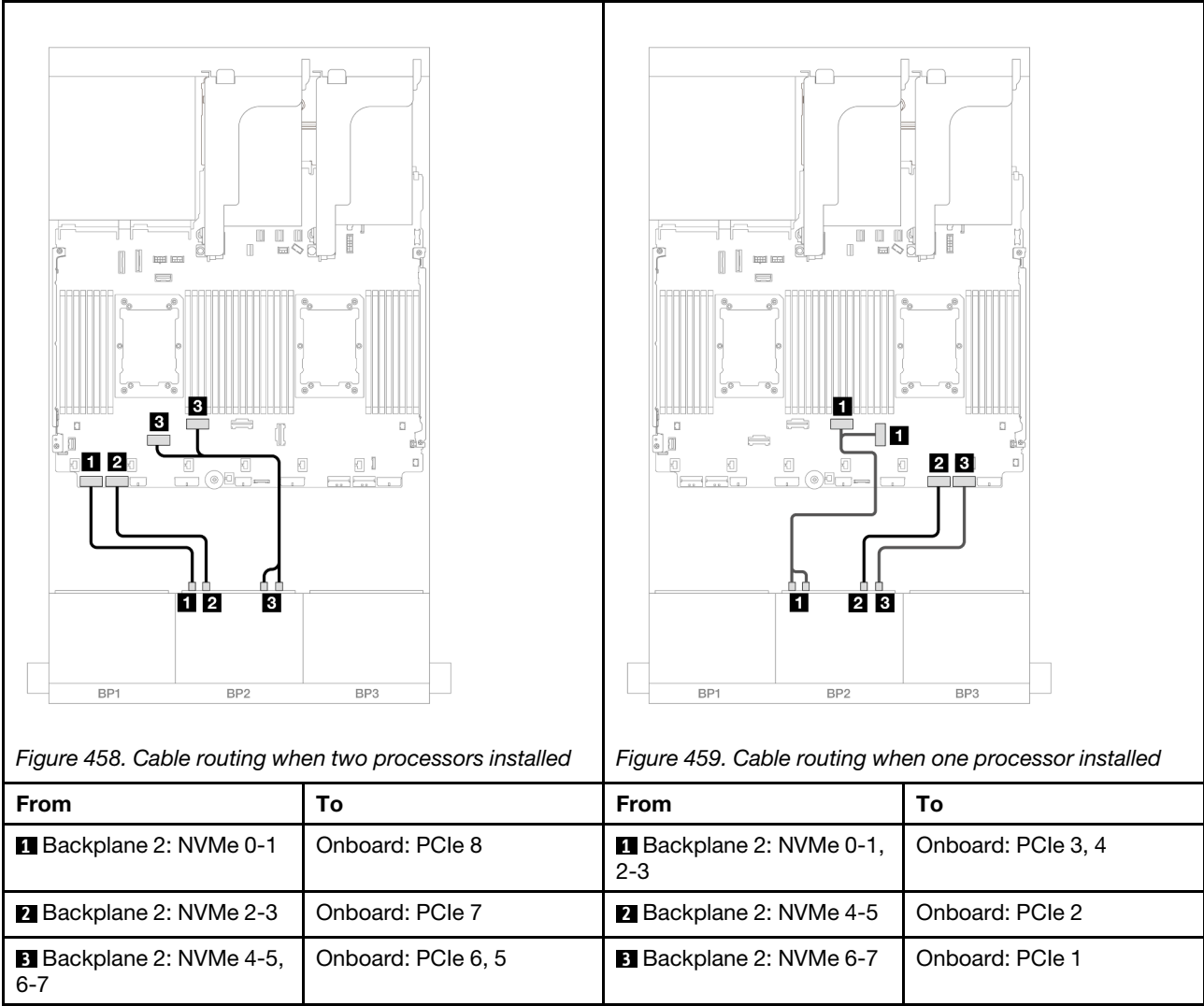


Figure 457. SAS/SATA cable routing to 8i adapters

From	To
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 2: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>

NVMe cable routing



Onboard connectors + 16i RAID/HBA adapter

The following shows the cable connections for the 8 SAS/SATA + 8 AnyBay (Gen 4) configuration with one 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

## SAS/SATA cable routing

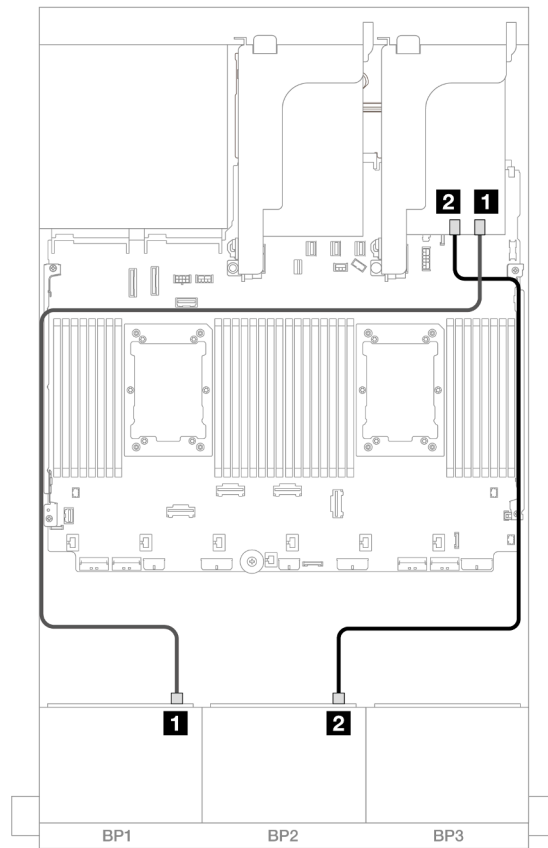
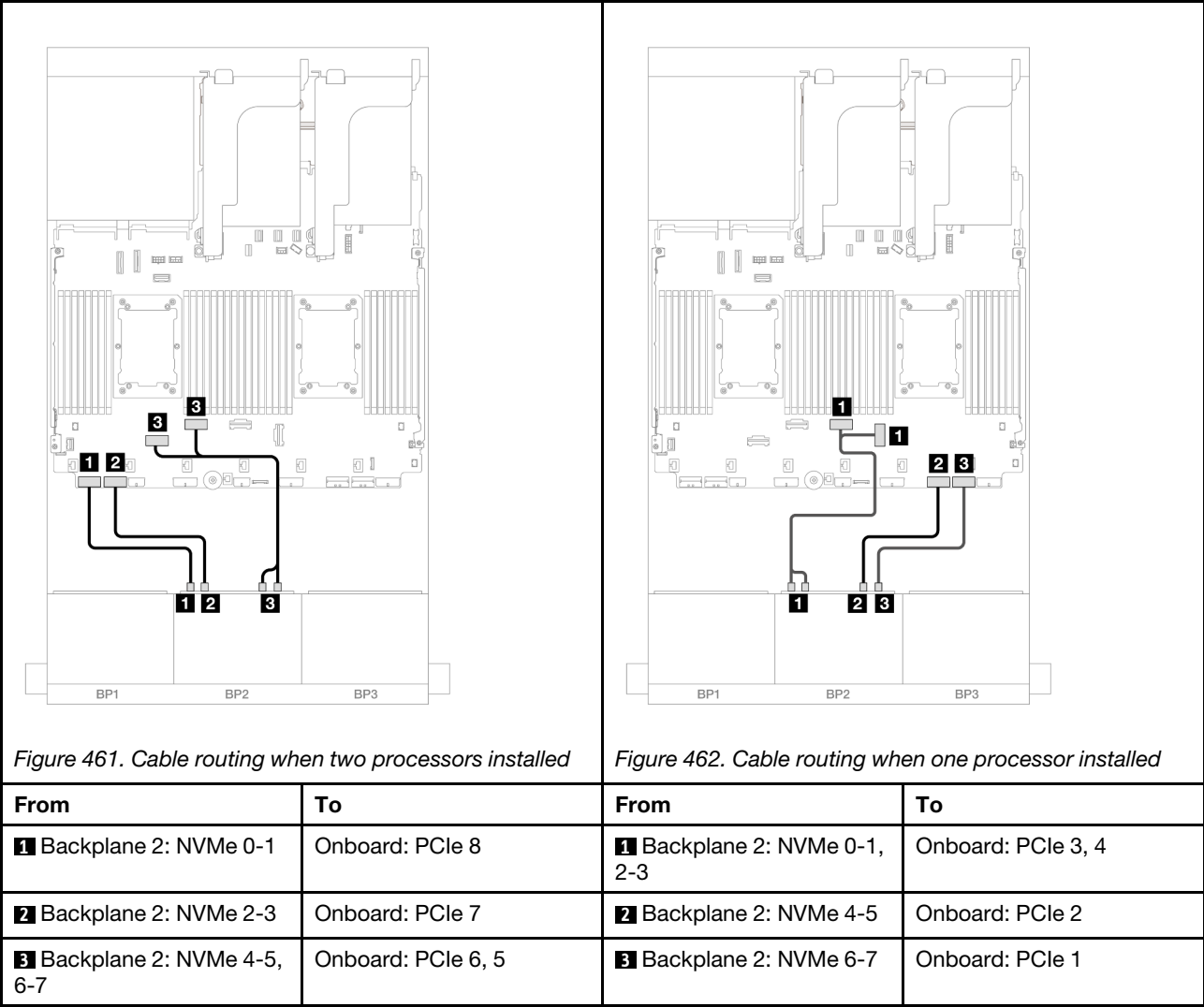


Figure 460. SAS/SATA cable routing to 16i adapter

From	To
<b>1</b> Backplane 1: SAS	16i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"><li>• Gen 4: C1</li><li>• Gen 3: C2C3</li></ul>

NVMe cable routing



Onboard connectors + CFF 16i RAID/HBA adapter

The following shows the cable connections for the 8 SAS/SATA + 8 AnyBay (Gen 4) configuration with one internal CFF 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

## SAS/SATA cable routing

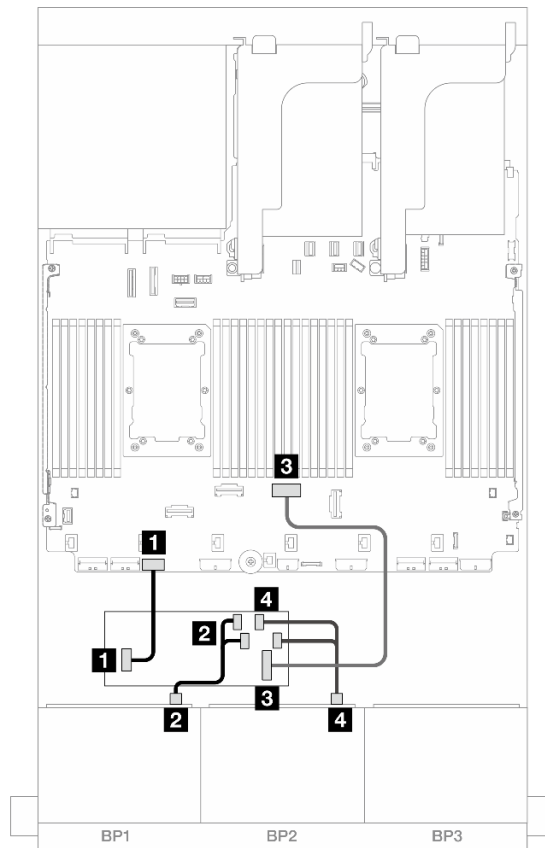


Figure 463. SAS/SATA cable routing to CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>2</b> Backplane 2: SAS	CFF adapter <ul style="list-style-type: none"> <li>• C2</li> <li>• C3</li> </ul>
<b>3</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4
<b>4</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR

NVMe cable routing

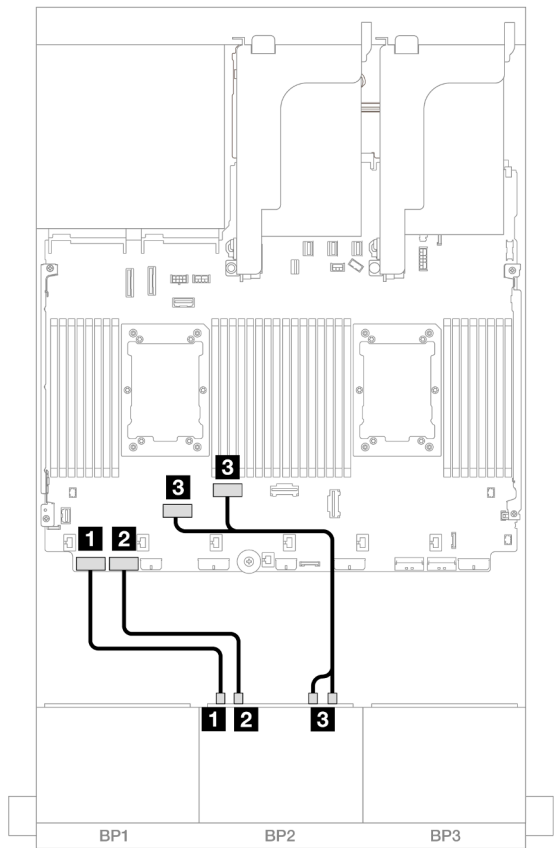


Figure 464. NVMe cable routing to onboard PCIe connectors

From	To
1 Backplane 2: NVMe 0-1	Onboard: PCIe 8
2 Backplane 2: NVMe 2-3	Onboard: PCIe 7
3 Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 6, 5

Riser 5 + OCP interposer cards + 8i/16i RAID/HBA adapter

The following shows the cable connections for the 8 SAS/SATA + 8 AnyBay (Gen 4) configuration with riser 5, front and rear OCP interposer cards, and two 8i RAID/HBA adapters or one 16i RAID/HBA adapter.

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n



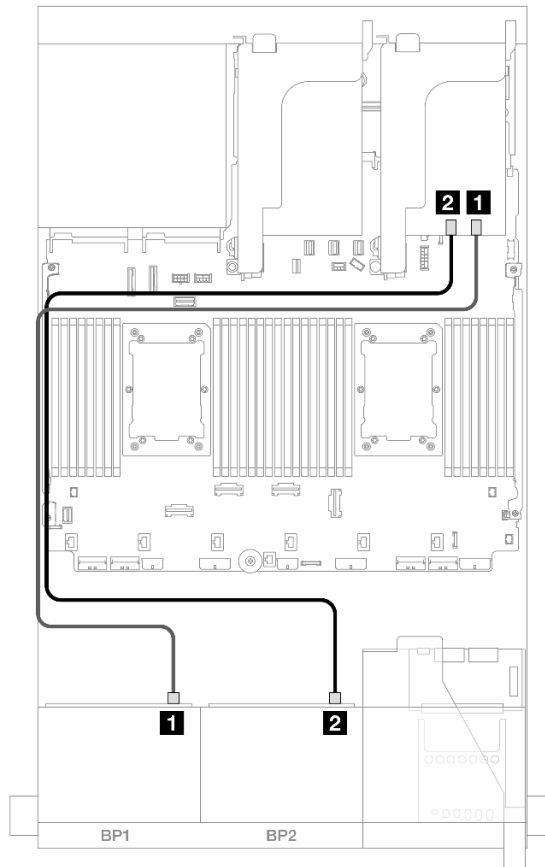


Figure 465. SAS/SATA cable routing

From	To	
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 2: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>	<ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2C3</li> </ul>

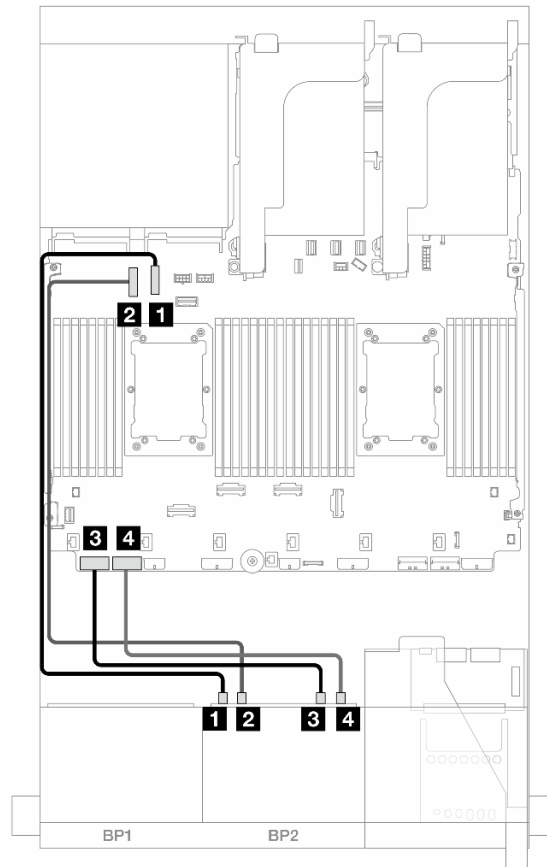


Figure 466. NVMe cable routing

From	To
<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 8
<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 7

## One 8 x SAS/SATA and one 8 x AnyBay (Gen 5) backplanes

This section provides cable routing information for the server model with one 8 x 2.5-inch SAS/SATA backplane and one 8 x 2.5-inch AnyBay backplane (Gen 5).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“Onboard connectors + 8i RAID/HBA adapter” on page 483](#)
- [“Onboard connectors + 16i RAID/HBA adapter” on page 485](#)
- [“Onboard connectors + CFF 16i RAID/HBA adapter” on page 488](#)

## Onboard connectors + 8i RAID/HBA adapter

The following shows the cable connections for the 8 SAS/SATA + 8 AnyBay (Gen 5) configuration with two 8i RAID/HBA adapters.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

### SAS/SATA cable routing

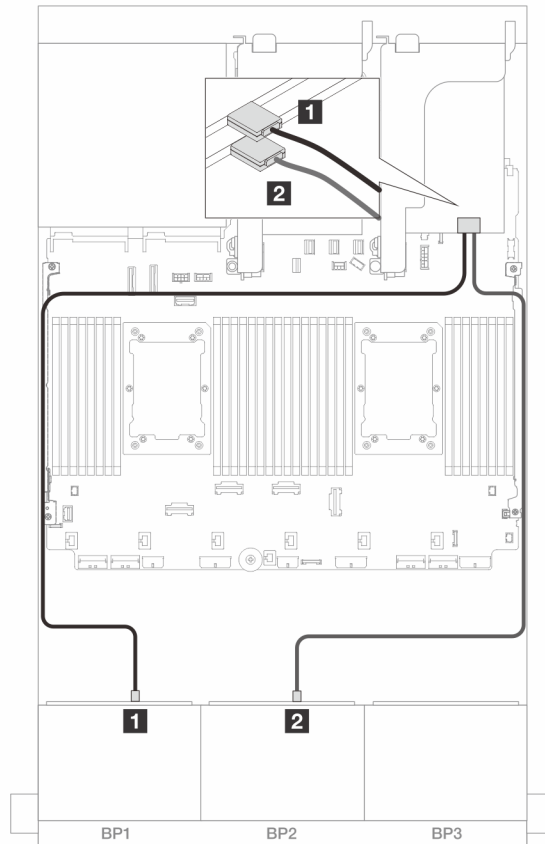
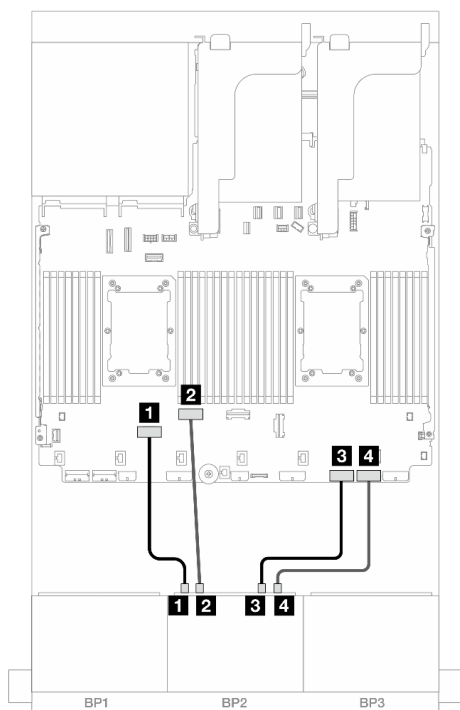


Figure 467. SAS/SATA cable routing to 8i adapters

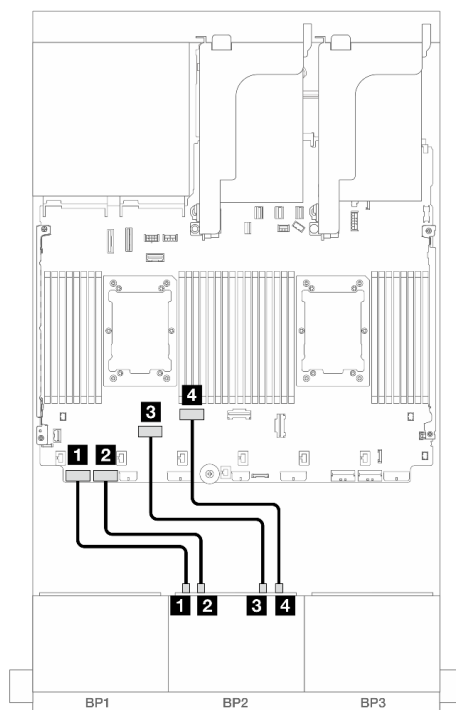
From	To
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>
<b>2</b> Backplane 2: SAS	8i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>

### NVMe cable routing

#### Cable routing when two processors installed



*Figure 468. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card*



*Figure 469. Cable routing in other scenarios*

From	To	From	To
<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 6	<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 5	<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2	<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1	<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 5

#### Cable routing when one processor installed

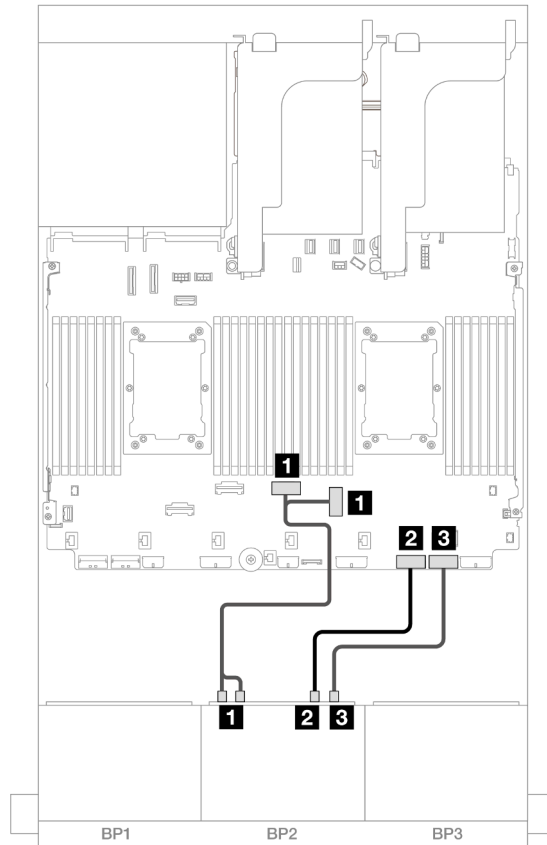


Figure 470. Cable routing when one processor installed

From	To
<b>1</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>2</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2
<b>3</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1

### Onboard connectors + 16i RAID/HBA adapter

The following shows the cable connections for the 8 SAS/SATA + 8 AnyBay (Gen 5) configuration with one 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

SAS/SATA cable routing

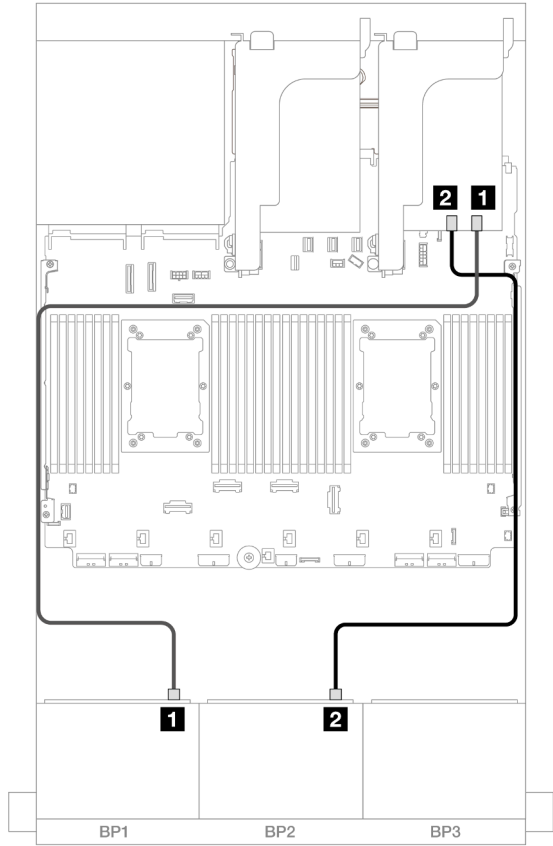
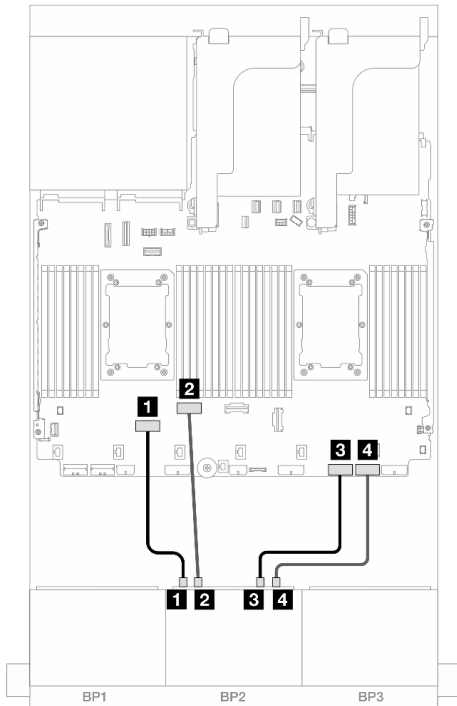


Figure 471. SAS/SATA cable routing to 16i adapter

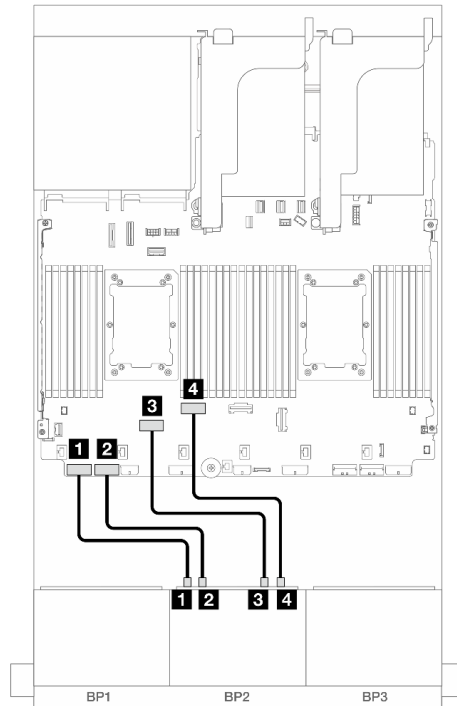
From	To
1 Backplane 1: SAS	16i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>
2 Backplane 2: SAS	<ul style="list-style-type: none"><li>• Gen 4: C1</li><li>• Gen 3: C2C3</li></ul>

NVMe cable routing

Cable routing when two processors installed



*Figure 472. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card*



*Figure 473. Cable routing in other scenarios*

From	To	From	To
<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 6	<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 5	<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2	<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1	<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 5

#### Cable routing when one processor installed

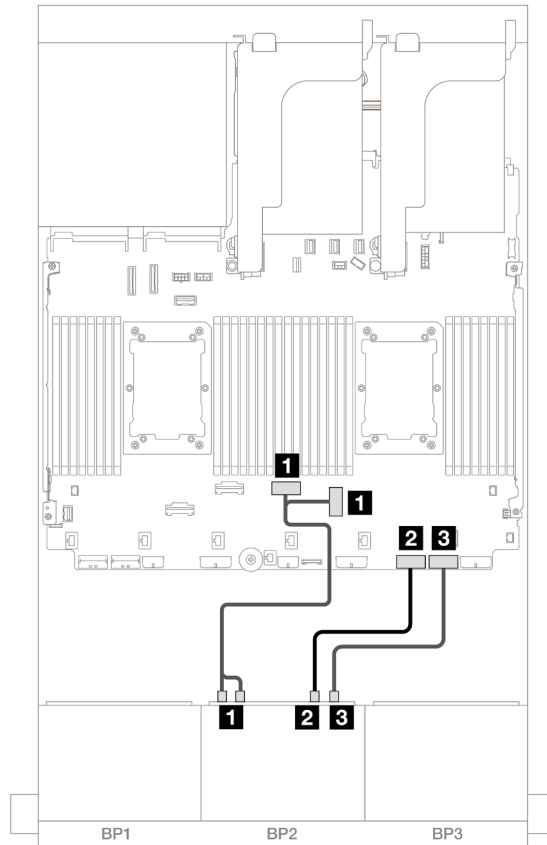


Figure 474. Cable routing when one processor installed

From	To
<b>1</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>2</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2
<b>3</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1

### Onboard connectors + CFF 16i RAID/HBA adapter

The following shows the cable connections for the 8 SAS/SATA + 8 AnyBay (Gen 5) configuration with one internal CFF 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



## SAS/SATA cable routing

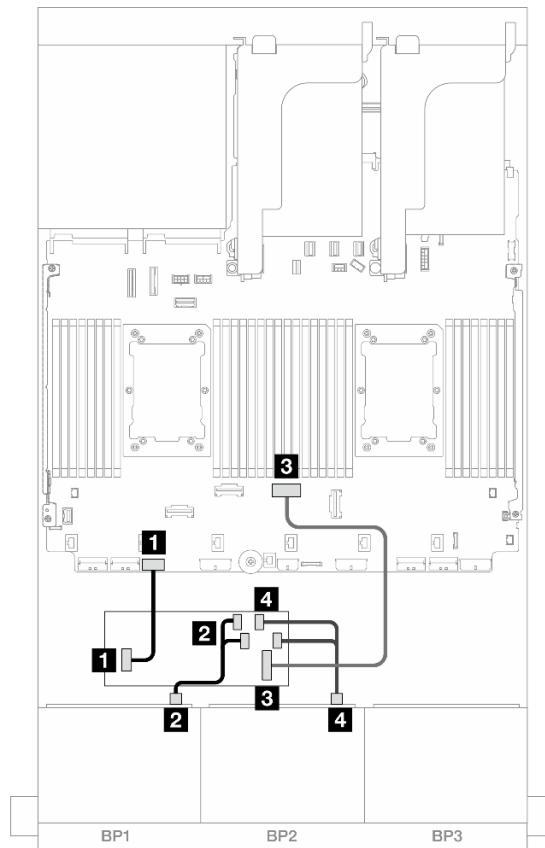


Figure 475. SAS/SATA cable routing to CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>2</b> Backplane 2: SAS	CFF adapter <ul style="list-style-type: none"> <li>• C2</li> <li>• C3</li> </ul>
<b>3</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4
<b>4</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR

## NVMe cable routing

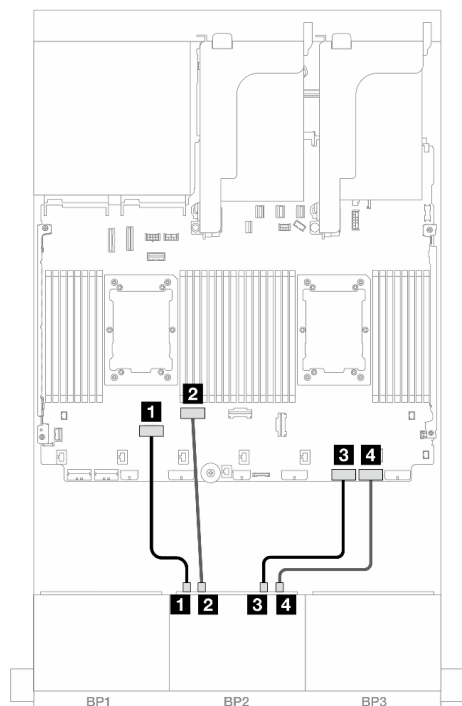


Figure 476. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card

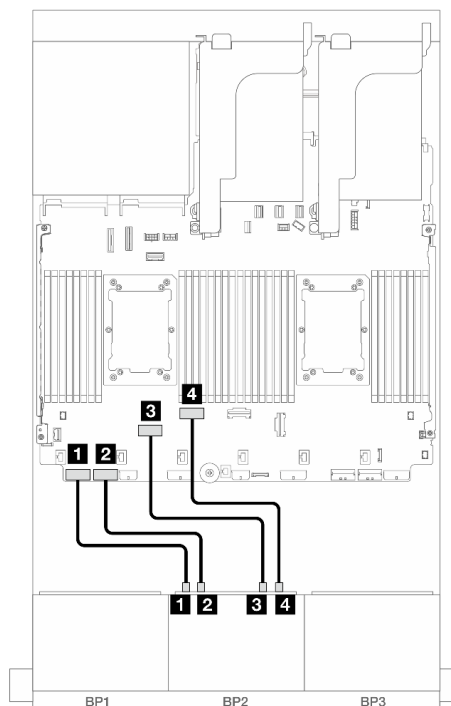


Figure 477. Cable routing in other scenarios

From	To	From	To
<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 6	<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 5	<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2	<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1	<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 5

## One 8 x SAS/SATA and one 8 x NVMe (Gen 4) backplanes

This section provides cable routing information for the server model with one 8 x 2.5-inch SAS/SATA backplane and one 8 x 2.5-inch NVMe backplane (Gen 4).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“Onboard connectors” on page 491](#)
- [“Onboard connectors + 8i RAID/HBA adapter” on page 492](#)
- [“Onboard connectors + CFF 16i RAID/HBA adapter” on page 494](#)
- [“Onboard connectors + Riser 5 + OCP interposer cards” on page 496](#)
- [“Onboard connectors + Riser 5 + OCP interposer cards + 8i RAID/HBA adapter” on page 497](#)

Onboard connectors

This topic provides cable routing information for the 8 SAS/SATA + 8 NVMe (Gen 4) configuration with onboard connectors.

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

SAS/SATA cable routing

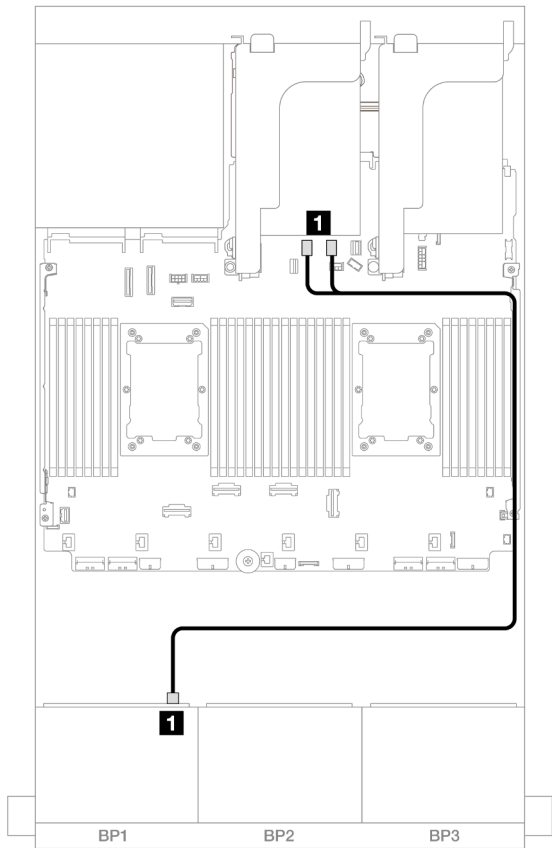
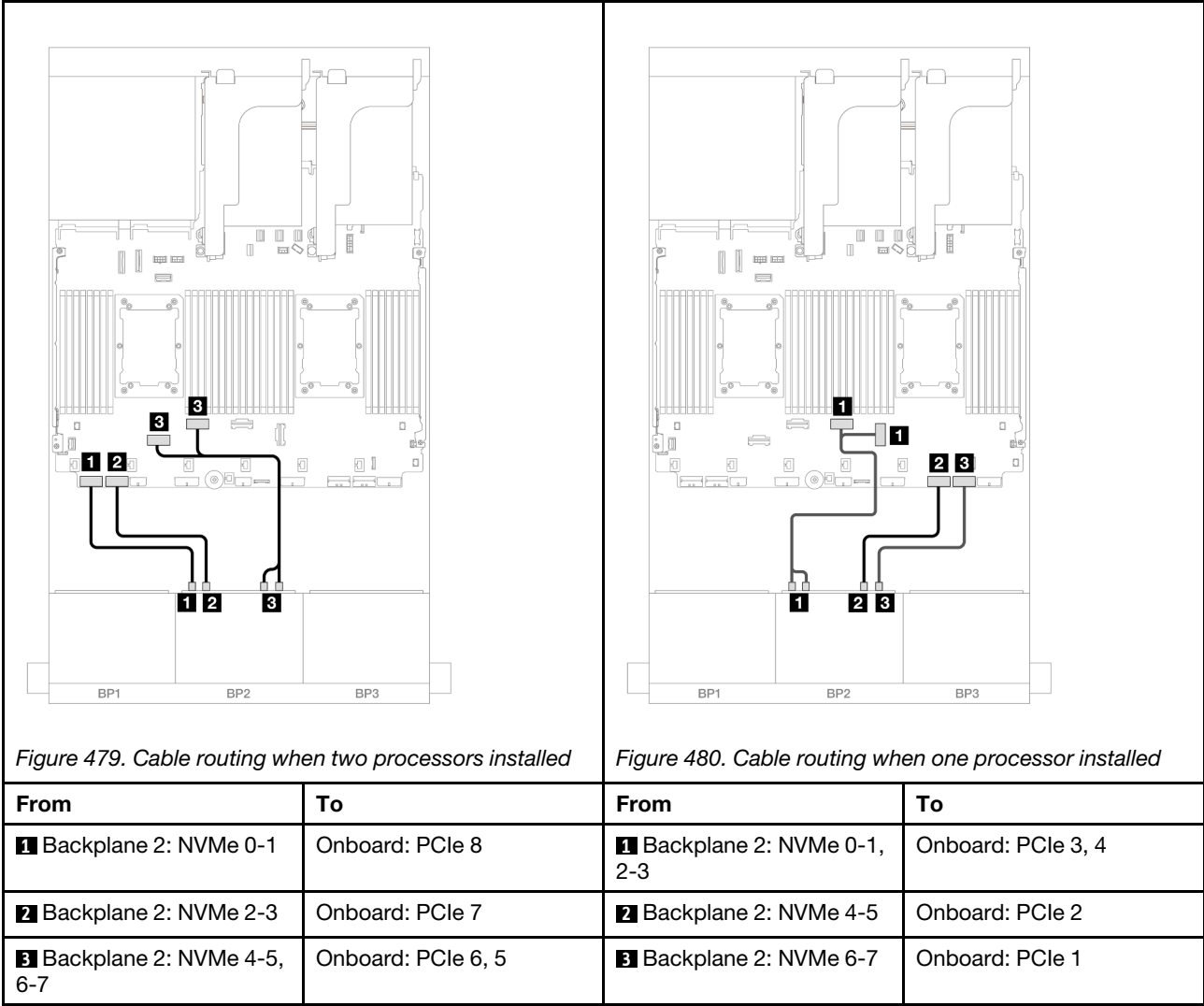


Figure 478. SAS/SATA cable routing to onboard SATA connectors

From	To
1 Backplane 1: SAS	Onboard: SATA 0, SATA 1

NVMe cable routing



Onboard connectors + 8i RAID/HBA adapter

This topic provides cable routing information for the 8 SAS/SATA + 8 NVMe (Gen 4) configuration with one 8i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

SAS/SATA cable routing

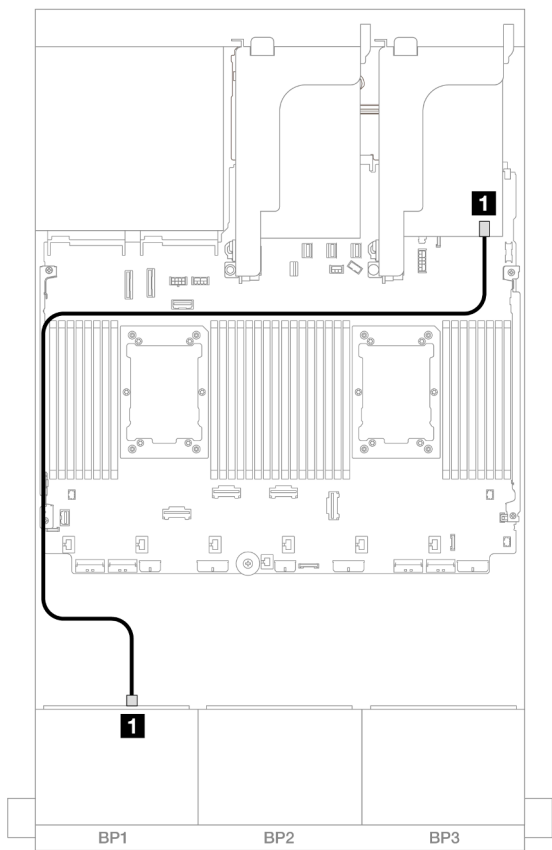
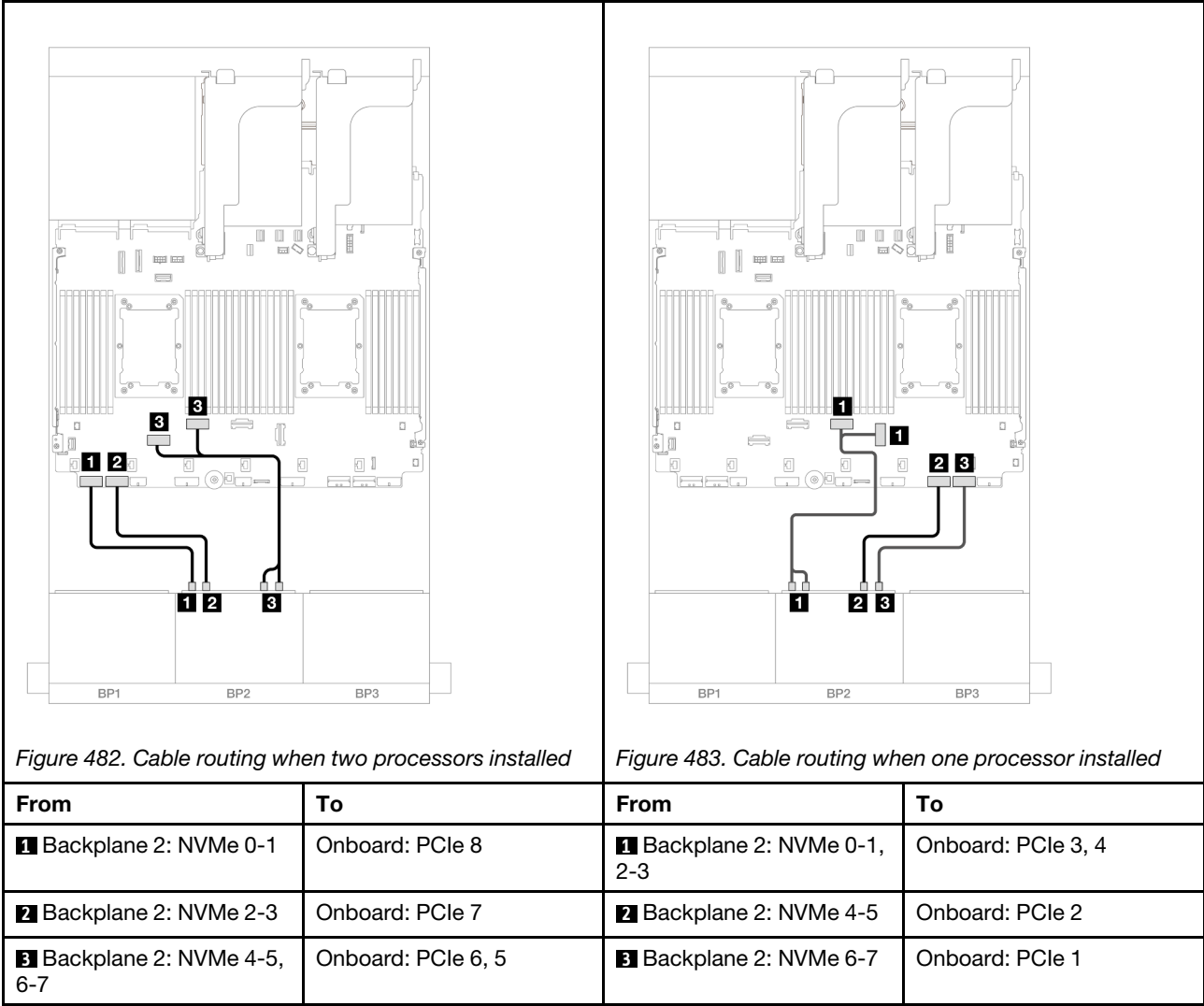


Figure 481. SAS/SATA cable routing to 8i adapter

From	To
1 Backplane 1: SAS	8i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>

NVMe cable routing



Onboard connectors + CFF 16i RAID/HBA adapter

This topic provides cable routing information for the 8 SAS/SATA + 8 NVMe (Gen 4) configuration with one internal CFF 16i RAID/HBA adapter.

SAS/SATA cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

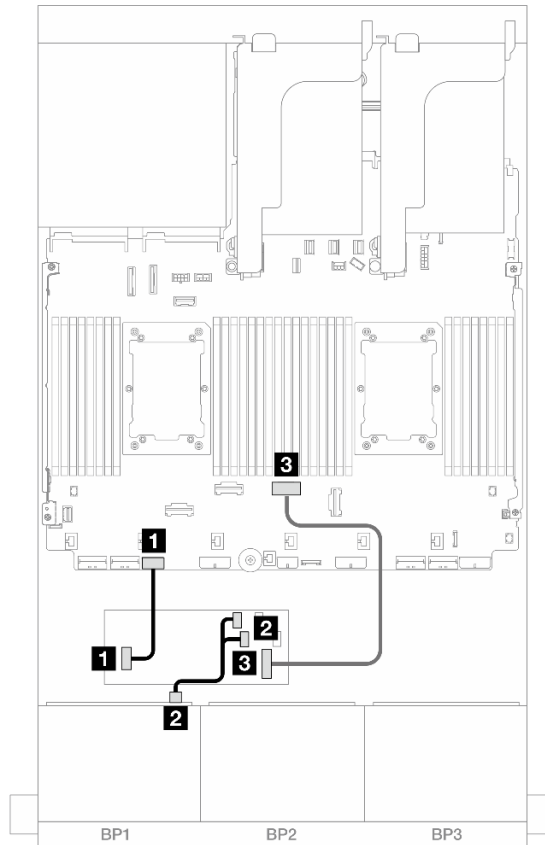


Figure 484. SAS/SATA cable routing to CFF 16i adapter

From	To
<b>1</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>2</b> Backplane 1: SAS	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>3</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4

### NVMe cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

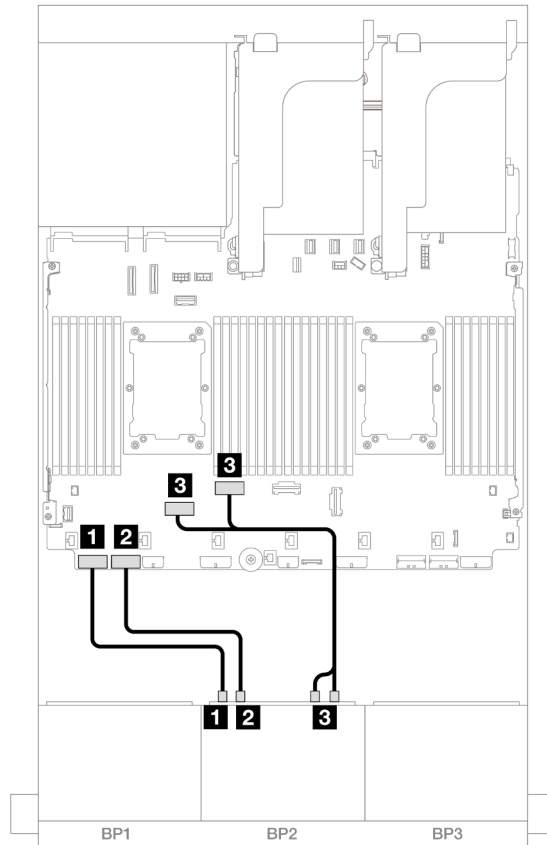


Figure 485. NVMe cable routing to onboard PCIe connectors

From	To
<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 6, 5

### Onboard connectors + Riser 5 + OCP interposer cards

The following shows the cable connections for the 8 SAS/SATA + 8 NVMe (Gen 4) configuration with onboard connectors, riser 5, and OCP interposer cards.

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



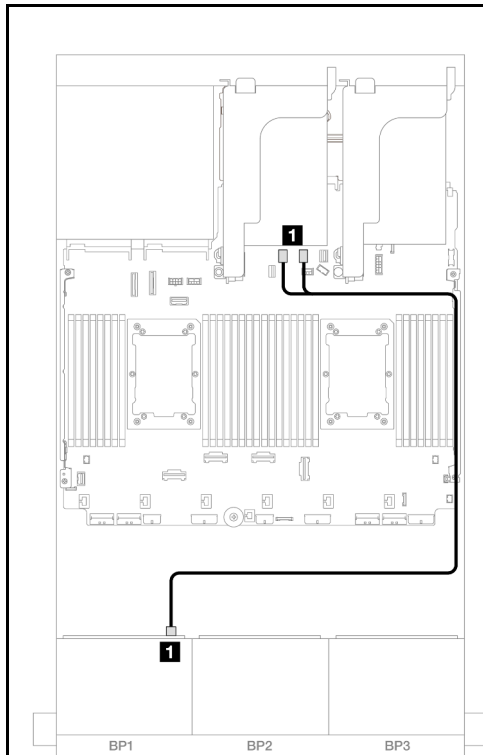


Figure 486. SAS/SATA cable routing

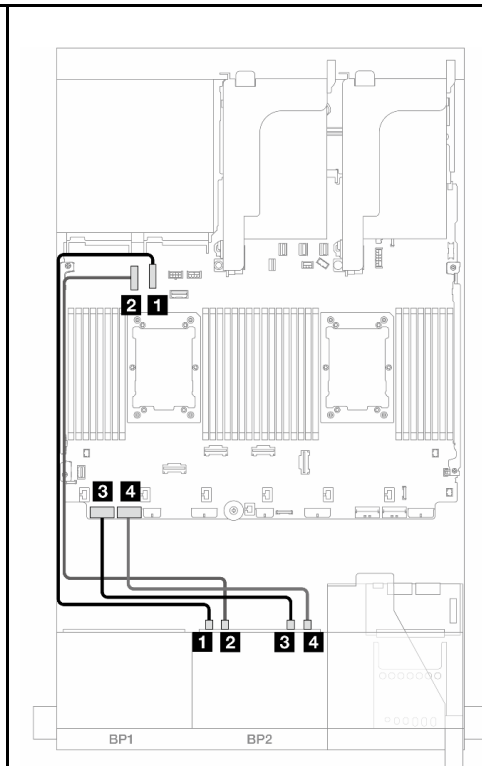


Figure 487. NVMe cable routing

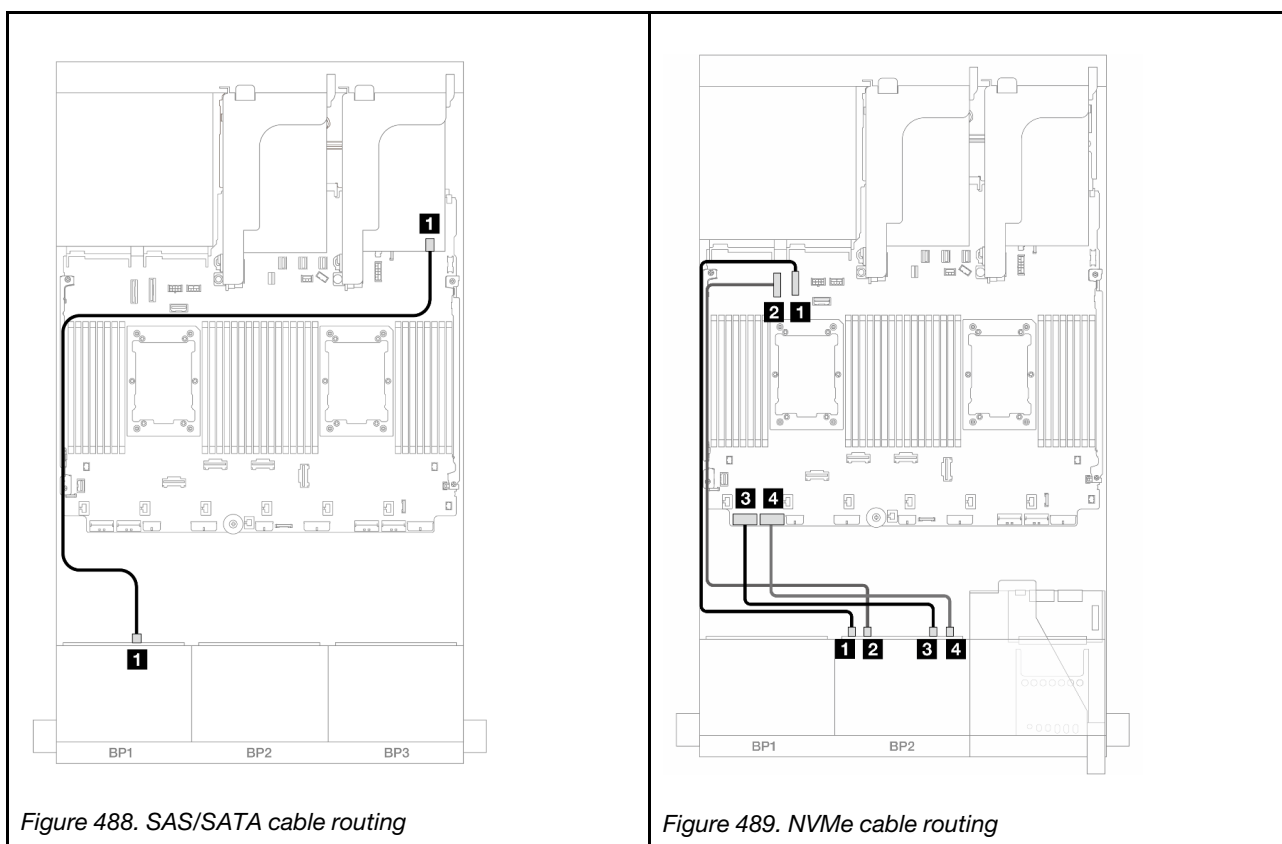
From	To	From	To
<b>1</b> Backplane 1: SAS	Onboard: SATA 0, SATA 1	<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 10
		<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 9
		<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 8
		<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 7

## Onboard connectors + Riser 5 + OCP interposer cards + 8i RAID/HBA adapter

This topic provides cable routing information for the 8 SAS/SATA + 8 NVMe (Gen 4) configuration with riser 5, front and rear OCP interposer cards, and one 8i RAID/HBA adapter.

To connect cables to the riser 5 card and OCP interposer cards, see [“Riser 5 card + OCP interposer cards” on page 420](#).

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



From	To	From	To
<b>1</b> Backplane 1: SAS	8i/16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>	<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 10
		<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 9
		<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 8
		<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 7

## One 8 x SAS/SATA and one 8 x NVMe (Gen 5) backplanes

This section provides cable routing information for the server model with one 8 x 2.5-inch SAS/SATA backplane and one 8 x 2.5-inch NVMe backplane (Gen 5).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“Onboard connectors” on page 498](#)
- [“Onboard connectors + 8i RAID/HBA adapter” on page 501](#)
- [“Onboard connectors + CFF 16i RAID/HBA adapter” on page 504](#)

### Onboard connectors

This topic provides cable routing information for the 8 SAS/SATA + 8 NVMe (Gen 5) configuration with onboard connectors.

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

SAS/SATA cable routing

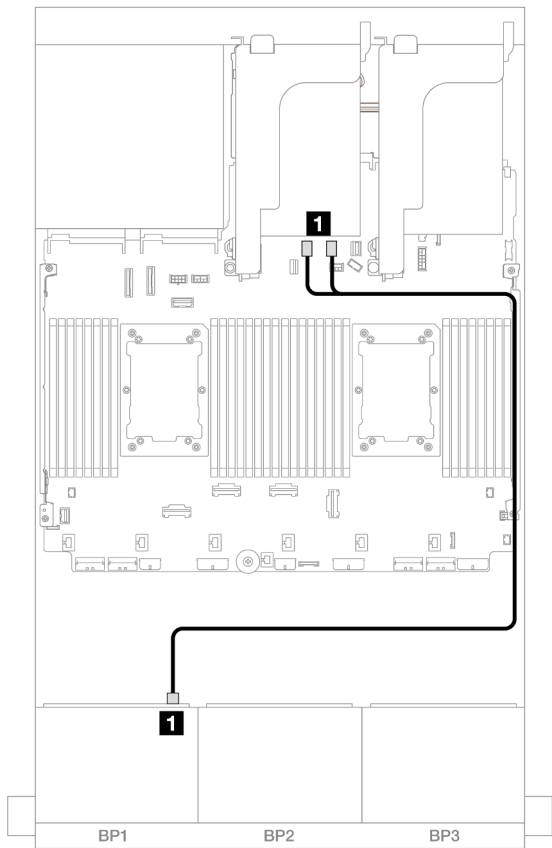


Figure 490. SAS/SATA cable routing to onboard SATA connectors

From	To
<b>1</b> Backplane 1: SAS	Onboard: SATA 0, SATA 1

NVMe cable routing

Cable routing when two processors installed

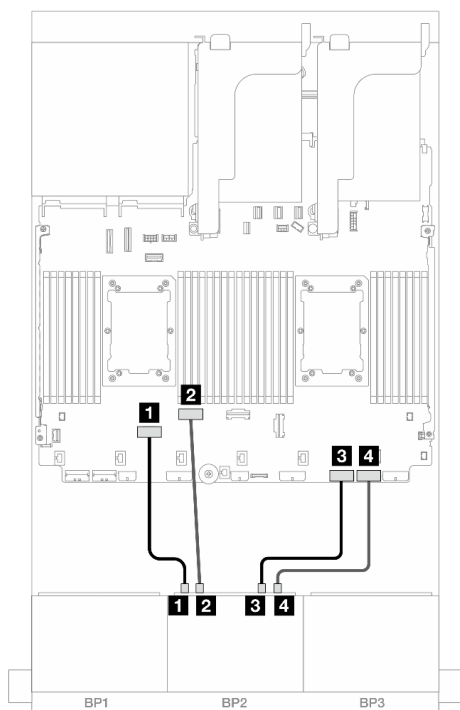


Figure 491. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card

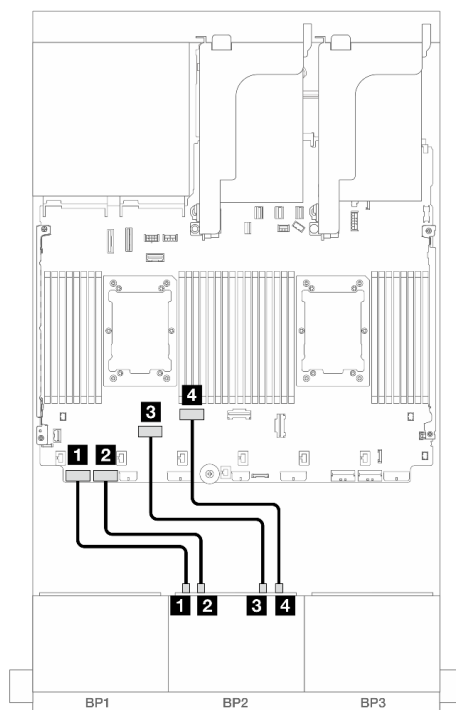


Figure 492. Cable routing in other scenarios

From	To	From	To
<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 6	<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 5	<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2	<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1	<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 5

### Cable routing when one processor installed

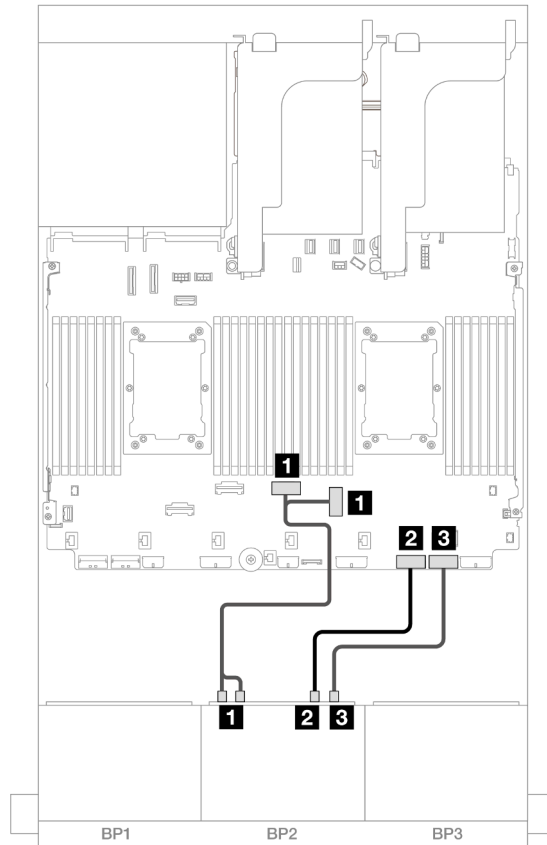


Figure 493. Cable routing when one processor installed

From	To
<b>1</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>2</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2
<b>3</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1

### Onboard connectors + 8i RAID/HBA adapter

This topic provides cable routing information for the 8 SAS/SATA + 8 NVMe (Gen 5) configuration with one 8i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

SAS/SATA cable routing

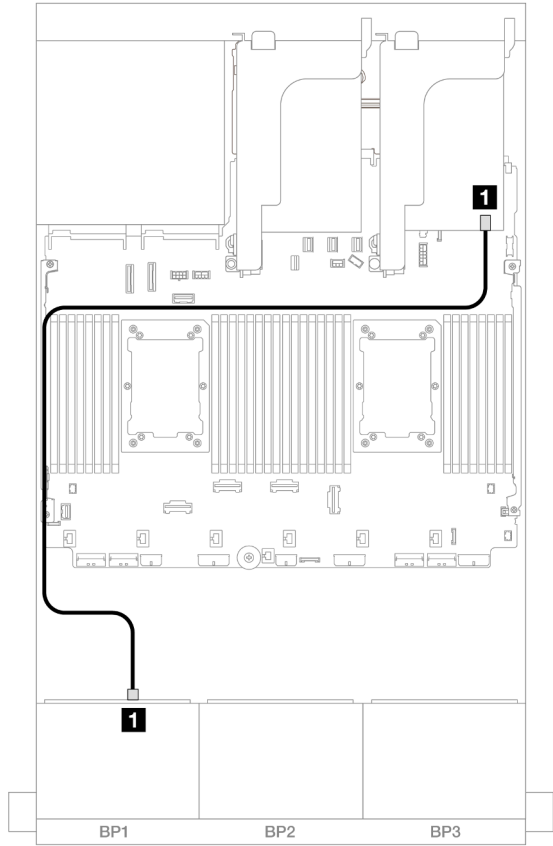
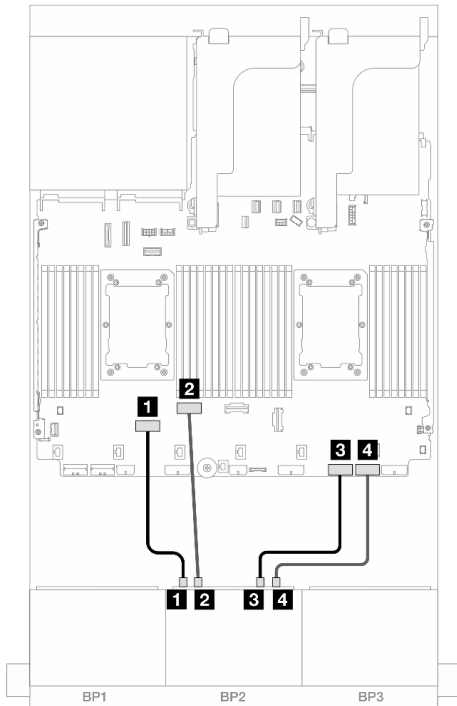


Figure 494. SAS/SATA cable routing to 8i adapter

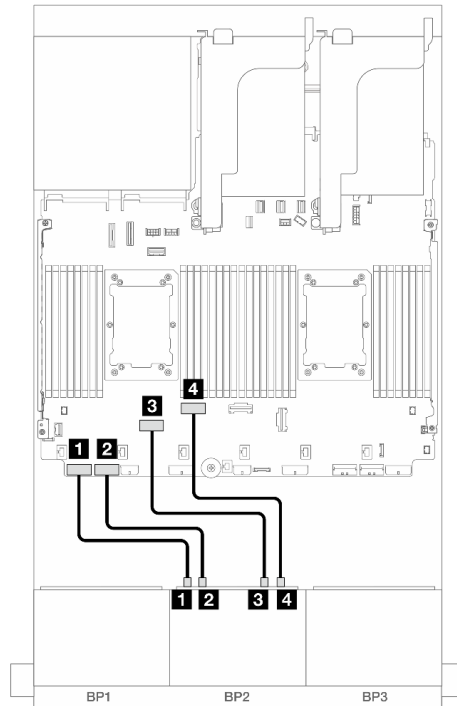
From	To
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>

NVMe cable routing

Cable routing when two processors installed



*Figure 495. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card*



*Figure 496. Cable routing in other scenarios*

From	To	From	To
<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 6	<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 5	<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2	<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1	<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 5

### Cable routing when one processor installed

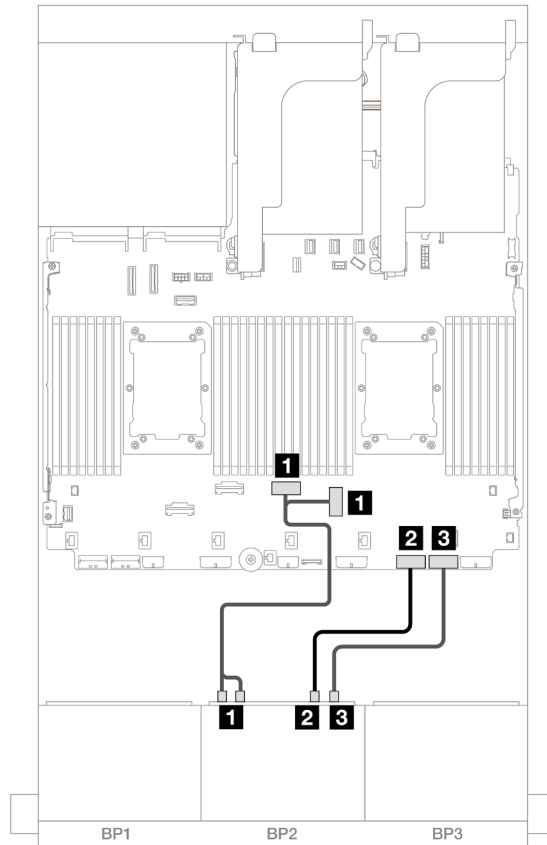


Figure 497. Cable routing when one processor installed

From	To
<b>1</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>2</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2
<b>3</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1

### Onboard connectors + CFF 16i RAID/HBA adapter

This topic provides cable routing information for the 8 SAS/SATA + 8 NVMe (Gen 5) configuration with one internal CFF 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



## SAS/SATA cable routing

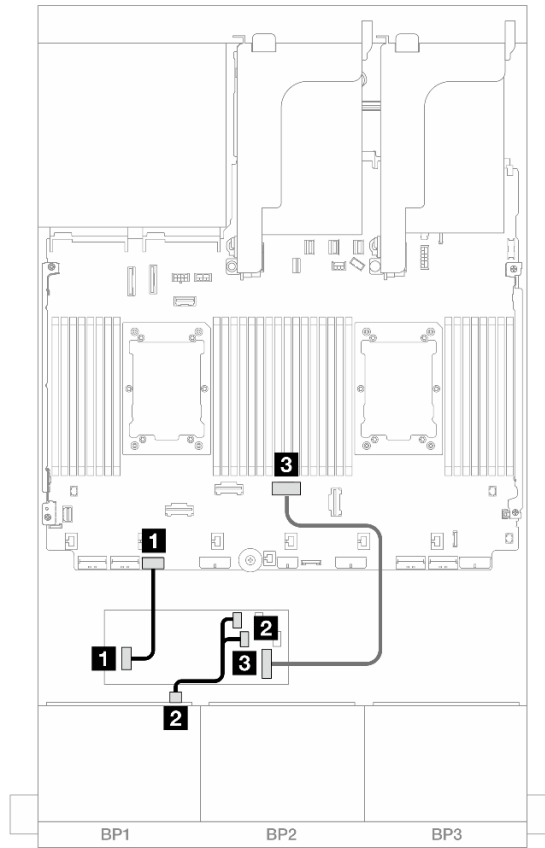


Figure 498. SAS/SATA cable routing to CFF 16i adapter

From	To
<b>1</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>2</b> Backplane 1: SAS	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>3</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4

## NVMe cable routing

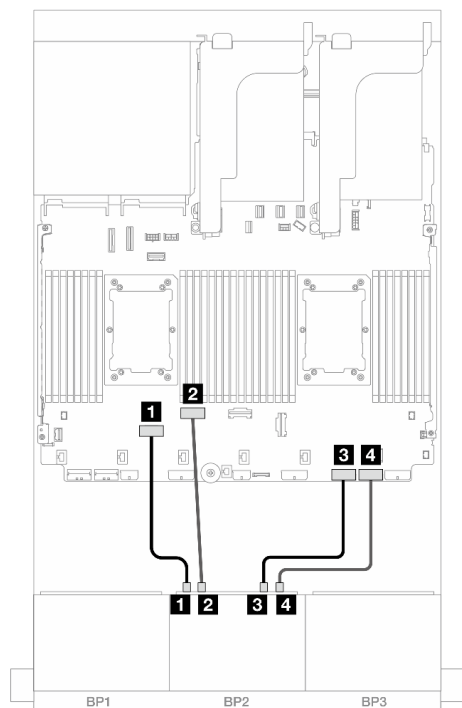


Figure 499. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card

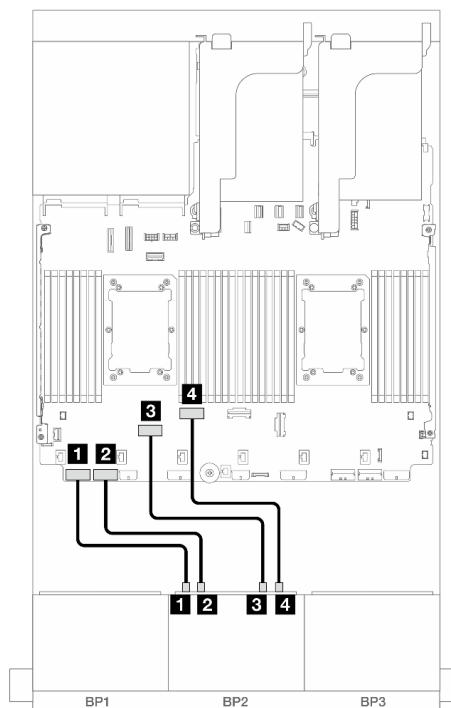


Figure 500. Cable routing in other scenarios

From	To	From	To
<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 6	<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 5	<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2	<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1	<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 5

## One 8 x AnyBay and one 8 x NVMe backplanes (Gen 4)

This section provides cable routing information for the server model with one 8 x 2.5-inch AnyBay and one 8 x 2.5-inch NVMe backplanes (Gen 4).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“Onboard connectors + 8i RAID/HBA adapter” on page 506](#)
- [“Onboard connectors + CFF 16i RAID/HBA adapter” on page 508](#)

### Onboard connectors + 8i RAID/HBA adapter

The following shows the cable connections for the 8 AnyBay + 8 NVMe configuration (Gen 4) with one 8i RAID/HBA adapter.

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

SAS/SATA cable routing

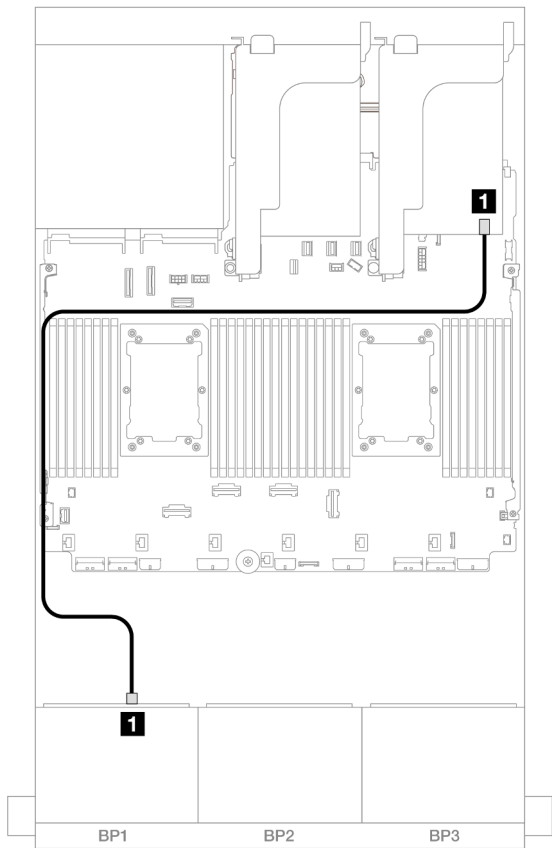


Figure 501. SAS/SATA cable routing to 8i adapter

From	To
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>

NVMe cable routing

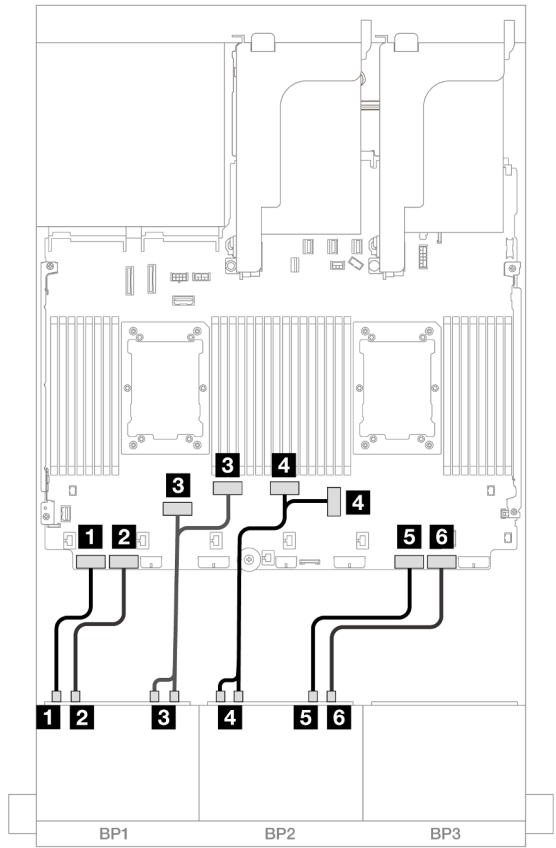


Figure 502. NVMe cable routing to onboard PCIe connectors

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 1: NVMe 4-5, 6-7	Onboard: PCIe 6, 5
<b>4</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>5</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2
<b>6</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1

Onboard connectors + CFF 16i RAID/HBA adapter

The following shows the cable connections for the 8 AnyBay + 8 NVMe configuration (Gen 4) with one internal CFF 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

## SAS/SATA cable routing

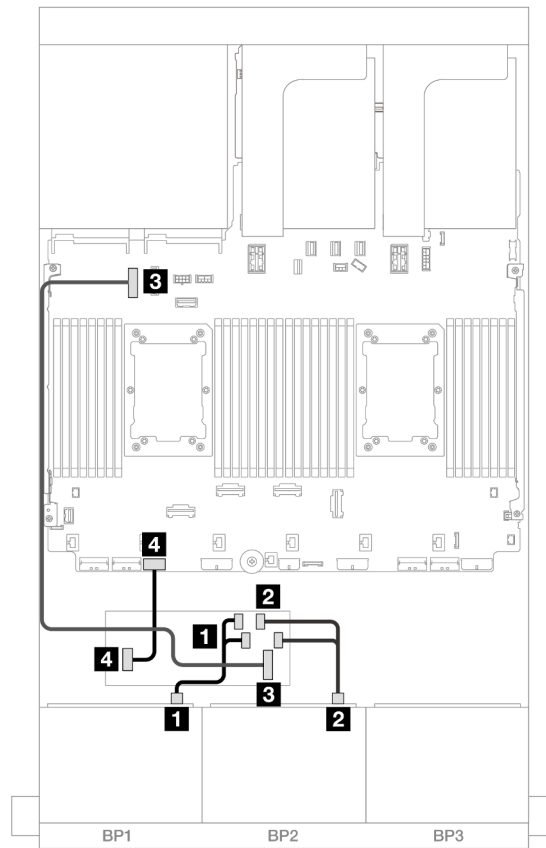


Figure 503. SAS/SATA cable routing to CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>2</b> CFF adapter: MB (CFF input)	Onboard: PCIe 9
<b>3</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR

## NVMe cable routing

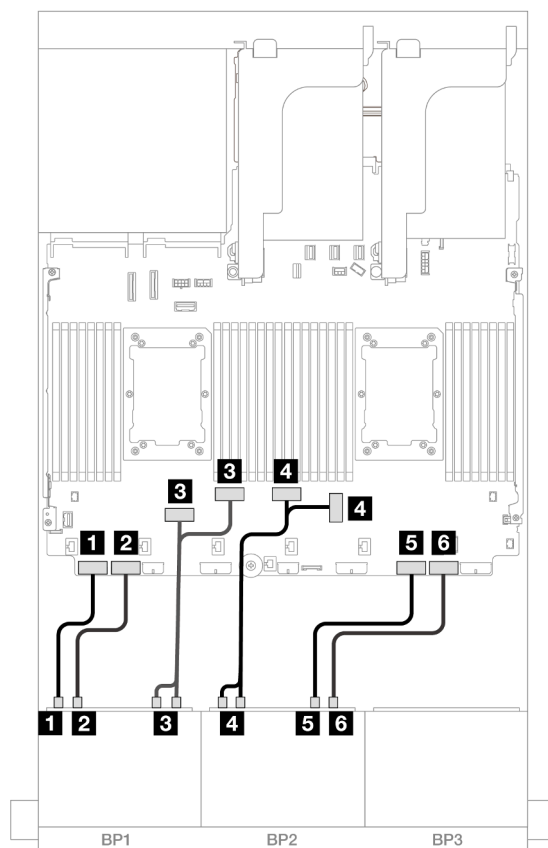


Figure 504. NVMe cable routing to onboard PCIe connectors

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 1: NVMe 4-5, 6-7	Onboard: PCIe 6, 5
<b>4</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>5</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2
<b>6</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1

## One 8 x AnyBay and one 8 x NVMe backplanes (Gen 5)

This section provides cable routing information for the server model with one 8 x 2.5-inch AnyBay and one 8 x 2.5-inch NVMe backplanes (Gen 5).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“Onboard connectors + 8i RAID/HBA adapter” on page 511](#)

- “Onboard connectors + CFF 8i/16i RAID/HBA adapter” on page 512
- “Onboard connectors + 8i RAID/HBA adapter + Retimer card” on page 514

### Onboard connectors + 8i RAID/HBA adapter

The following shows the cable connections for the 8 AnyBay + 8 NVMe configuration (Gen 5) with one 8i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

### SAS/SATA cable routing

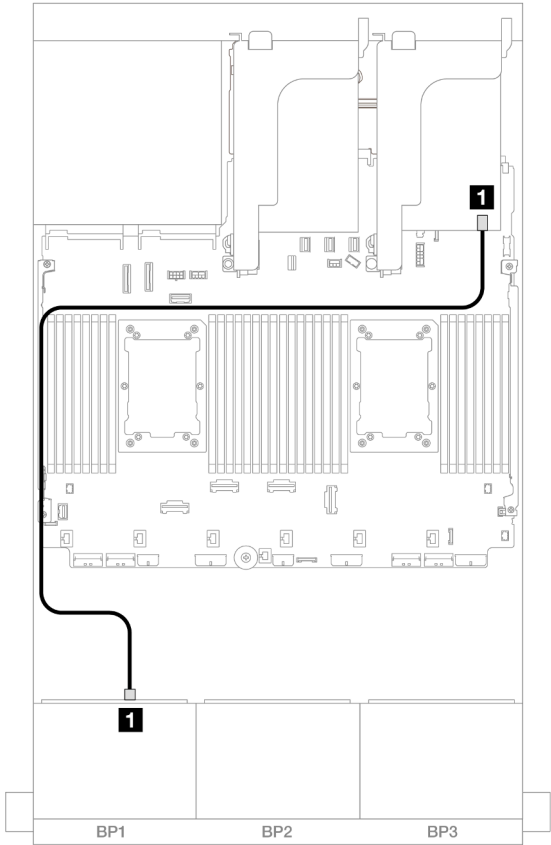


Figure 505. SAS/SATA cable routing to 8i adapter

From	To
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>

## NVMe cable routing

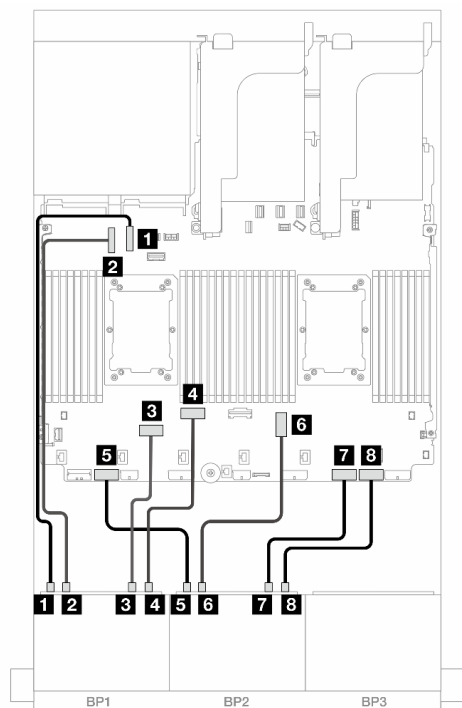


Figure 506. Cable routing when two Platinum series processors installed with no riser 3

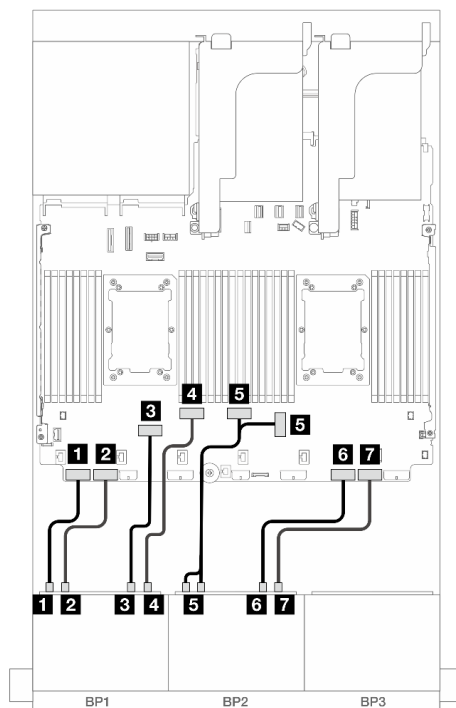


Figure 507. Cable routing in other scenarios

From	To	From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10	<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9	<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6	<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5	<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 7	<b>5</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 3	<b>6</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2
<b>7</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2	<b>7</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1
<b>8</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1		

## Onboard connectors + CFF 8i/16i RAID/HBA adapter

The following shows the cable connections for the 8 AnyBay + 8 NVMe (Gen 5) configuration with one internal CFF 8i/16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



## CFF adapter cable routing

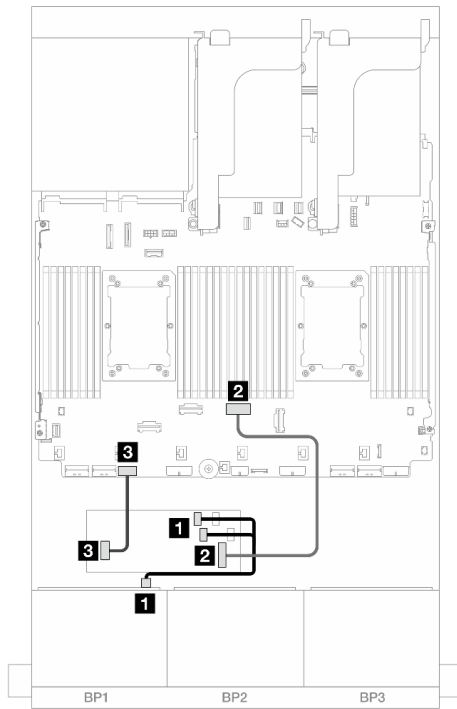


Figure 508. Cable routing when two Platinum series processors installed with no riser 3

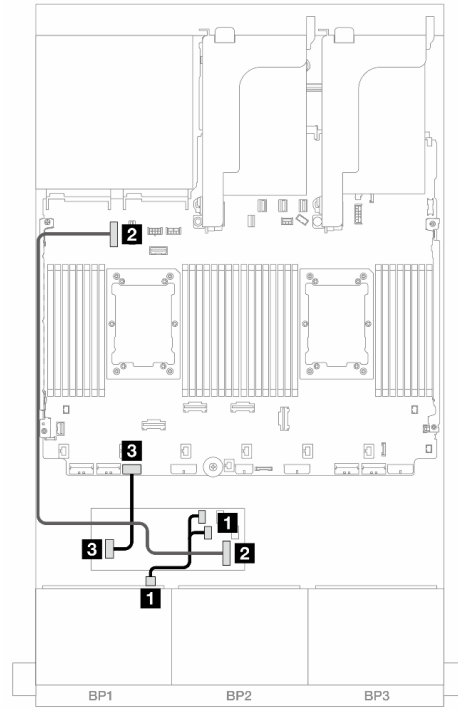


Figure 509. Cable routing in other scenarios

From	To	From	To
<b>1</b> Backplane 1: SAS	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>	<b>1</b> Backplane 1: SAS	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>2</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4	<b>2</b> CFF adapter: MB (CFF input)	Onboard: PCIe 9
<b>3</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR	<b>3</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR

# NVMe cable routing

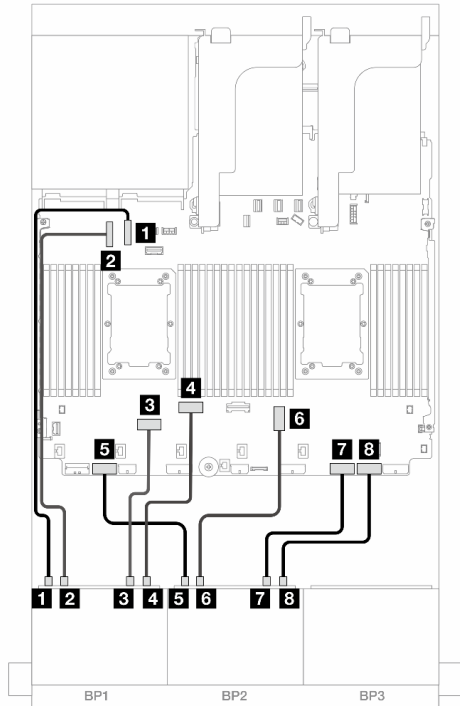


Figure 510. Cable routing when two Platinum series processors installed with no riser 3

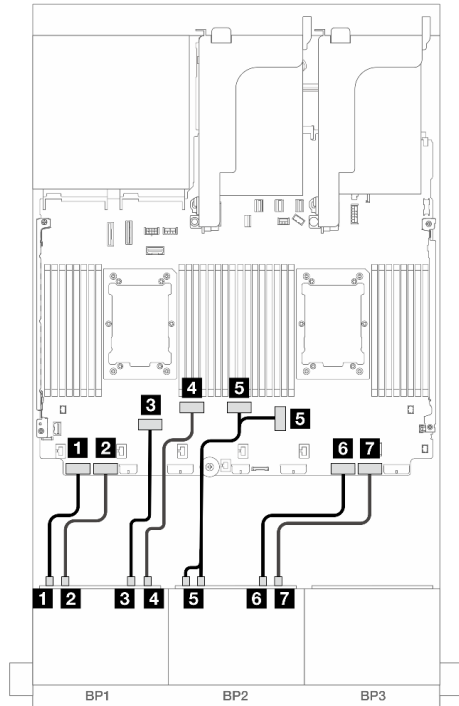


Figure 511. Cable routing in other scenarios

From	To	From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10	<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9	<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6	<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5	<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 7	<b>5</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 3	<b>6</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2
<b>7</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2	<b>7</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1
<b>8</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1		

## Onboard connectors + 8i RAID/HBA adapter + Retimer card

The following shows the cable connections for the 8 AnyBay + 8 NVMe configuration (Gen 5) with one 8i RAID/HBA adapter and one retimer card when two Platinum series processors are installed.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

SAS/SATA cable routing

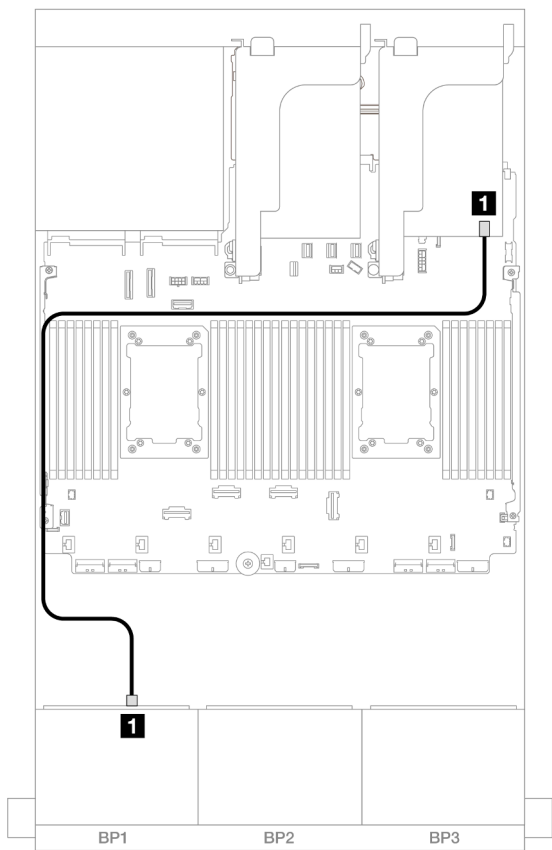


Figure 512. SAS/SATA cable routing to 8i adapter

From	To
1 Backplane 1: SAS	8i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>

## NVMe cable routing

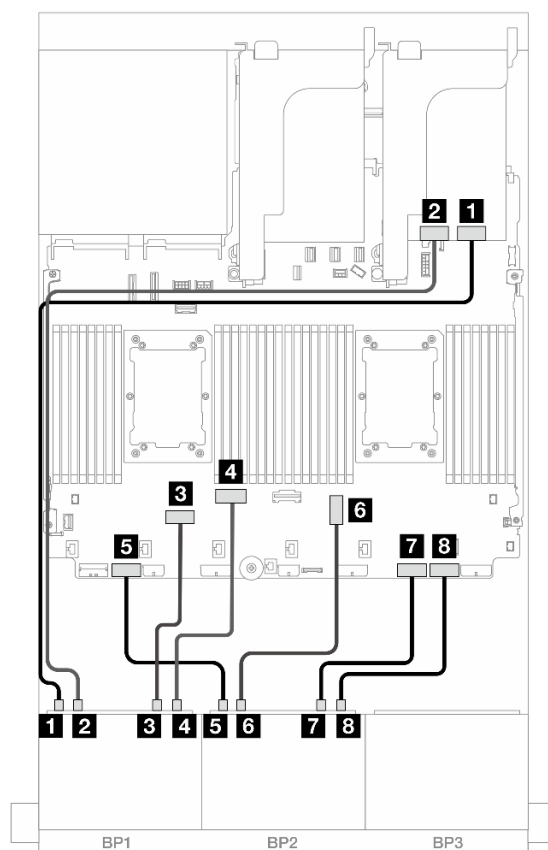


Figure 513. NVMe cable routing to onboard connectors and retimer card

From	To
<b>1</b> Backplane 1: NVMe 0-1	Retimer: C0
<b>2</b> Backplane 1: NVMe 2-3	Retimer: C1
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 5
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 7
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 3
<b>7</b> Backplane 2: NVMe 4-5	Onboard: PCIe 2
<b>8</b> Backplane 2: NVMe 6-7	Onboard: PCIe 1

## Three 8 x SAS/SATA backplanes

This section provides cable routing information for the server model with three 8 x 2.5-inch SAS/SATA front drive backplanes.

- [“Front backplanes: 24 x 2.5" SAS/SATA” on page 517](#)
- [“Front + rear backplanes: 24 x 2.5" SAS/SATA + 4 x 2.5"/8 x 2.5" SAS/SATA/4 x 2.5" AnyBay” on page 522](#)
- [“Front + middle backplanes: 24 x 2.5" SAS/SATA + 4 x 2.5"/8 x 2.5" SAS/SATA” on page 545](#)

- “Front + middle + rear backplanes: 24 x 2.5" SAS/SATA + 8 x 2.5" SAS/SATA+ 4 x 2.5"/8 x 2.5" SAS/SATA” on page 553

## Front backplanes: 24 x 2.5" SAS/SATA

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA configuration.

To connect power cables for the front backplane(s), refer to “[Backplanes: server models with 2.5-inch front drive bays](#)” on page 422.

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- “32i RAID/HBA adapter” on page 517
- “8i RAID/HBA adapters” on page 520
- “8i + 16i RAID/HBA adapters” on page 521
- “CFF expander + 8i/16i RAID/HBA adapter” on page 519
- “CFF 16i RAID/HBA adapter + CFF expander” on page 518

### 32i RAID/HBA adapter

The following shows the cable connections for the 24 x 2.5-inch SAS/SATA configuration with one 32i RAID/HBA adapter.

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

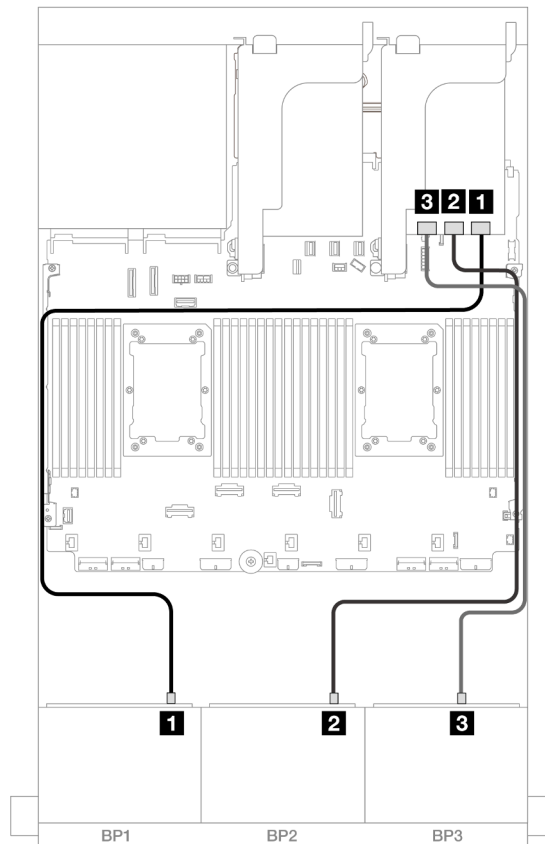


Figure 514. SAS/SATA cable routing to 32i adapter

From	To
<b>1</b> Backplane 1: SAS	32i adapter <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>

### CFF 16i RAID/HBA adapter + CFF expander

The following shows the cable connections for the 24 x 2.5-inch SAS/SATA configuration with one CFF expander and one CFF 16i RAID/HBA adapter.

### Cable routing when two processors installed

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

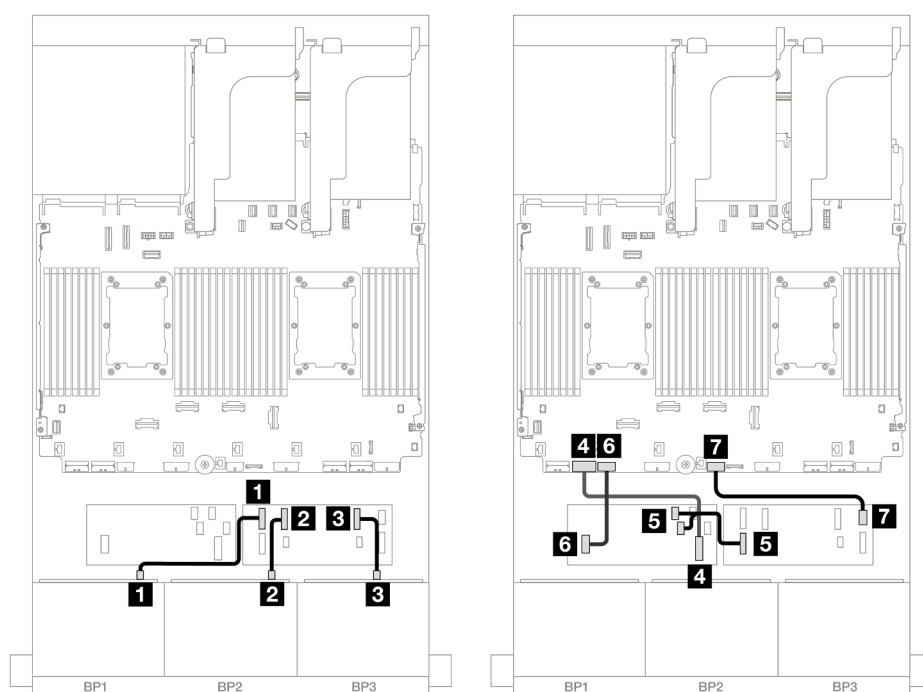


Figure 515. SAS/SATA cable routing to CFF expander and CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 7
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>

From	To
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

### Cable routing when one processor installed

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

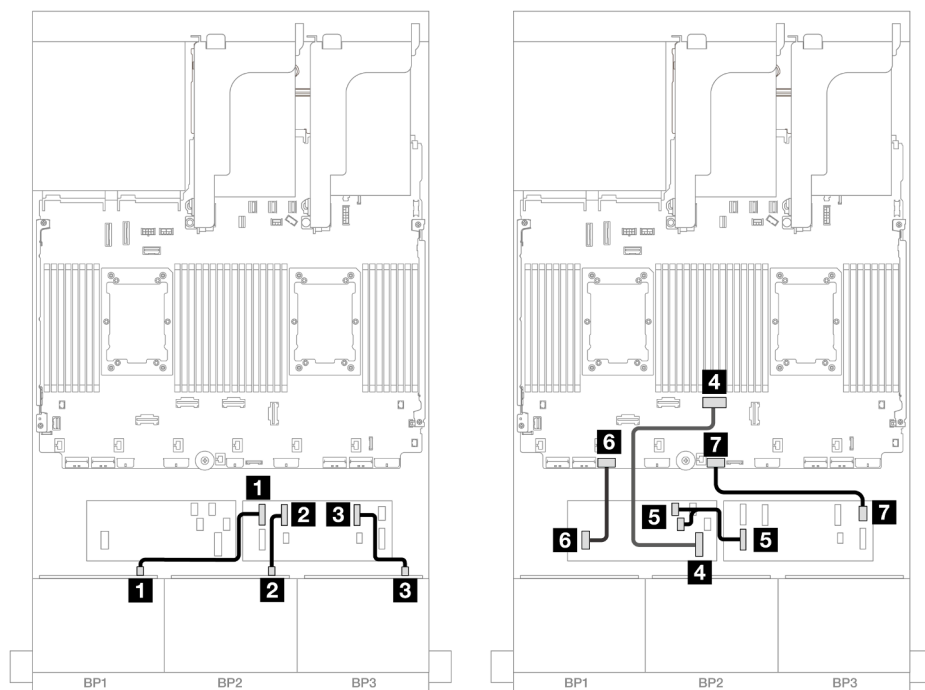


Figure 516. SAS/SATA cable routing to CFF expander and CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

### CFF expander + 8i/16i RAID/HBA adapter

The following shows the cable connections for the 24 x 2.5-inch SAS/SATA configuration with one CFF expander and one 8i/16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

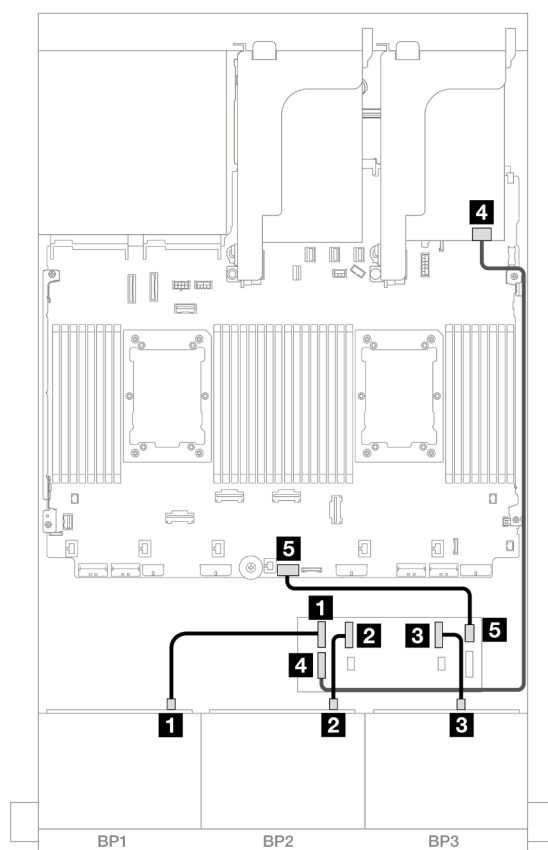


Figure 517. SAS/SATA cable routing to CFF expander and 8i/16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF expander: RAID/HBA	8i/16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>5</b> CFF expander: PWR	Onboard: CFF EXP PWR

### 8i RAID/HBA adapters

The following shows the cable connections for the 24 x 2.5-inch SAS/SATA configuration with three 8i RAID/HBA adapters.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



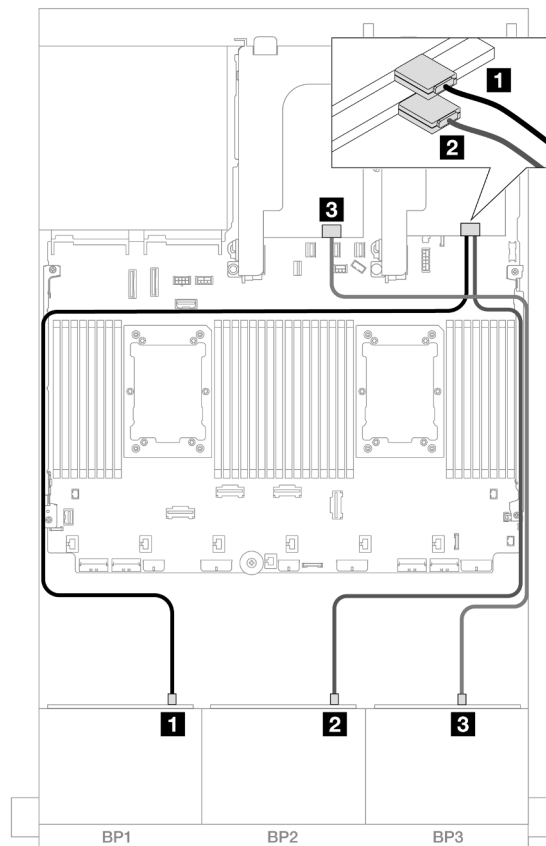


Figure 518. SAS/SATA cable routing to 8i adapters

From	To
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 2: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>3</b> Backplane 3: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>

### 8i + 16i RAID/HBA adapters

The following shows the cable connections for the 24 x 2.5-inch SAS/SATA configuration with one 8i RAID/HBA adapter and one 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

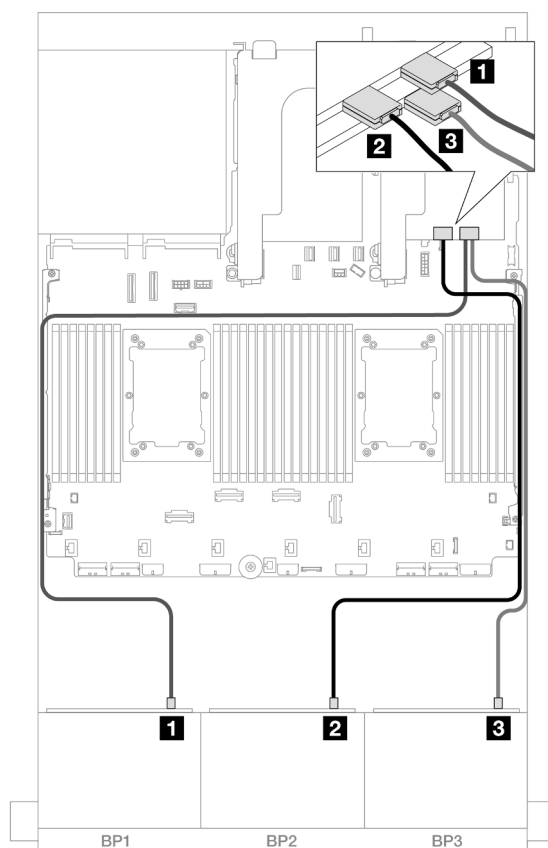


Figure 519. SAS/SATA cable routing to 8i/16i adapters

From	To
<b>1</b> Backplane 1: SAS	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2C3</li> </ul>
<b>3</b> Backplane 3: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>

### Front + rear backplanes: 24 x 2.5" SAS/SATA + 4 x 2.5"/8 x 2.5" SAS/SATA/4 x 2.5" AnyBay

This topic provides cable routing information for the 12 x 3.5-inch SAS/SATA front backplane and a 4 x 2.5-inch/8 x 2.5-inch SAS/SATA/4 x 2.5-inch AnyBay rear backplane.

- [“24 x 2.5" SAS/SATA + 4 x 2.5" SAS/SATA” on page 523](#)
- [“24 x 2.5" SAS/SATA + 4 x 2.5" AnyBay” on page 529](#)
- [“24 x 2.5" SAS/SATA + 8 x 2.5" SAS/SATA” on page 534](#)

## 24 x 2.5" SAS/SATA + 4 x 2.5" SAS/SATA

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA front backplane and a 4 x 2.5-inch SAS/SATA rear backplane.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“32i RAID/HBA adapter” on page 523](#)
- [“CFF expander + 8i/16i RAID/HBA adapter” on page 524](#)
- [“CFF 16i RAID/HBA adapter + CFF expander” on page 526](#)

### 32i RAID/HBA adapter

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 4 x 2.5-inch SAS/SATA configuration with one 32i RAID/HBA adapter.

#### Front backplane cable routing

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

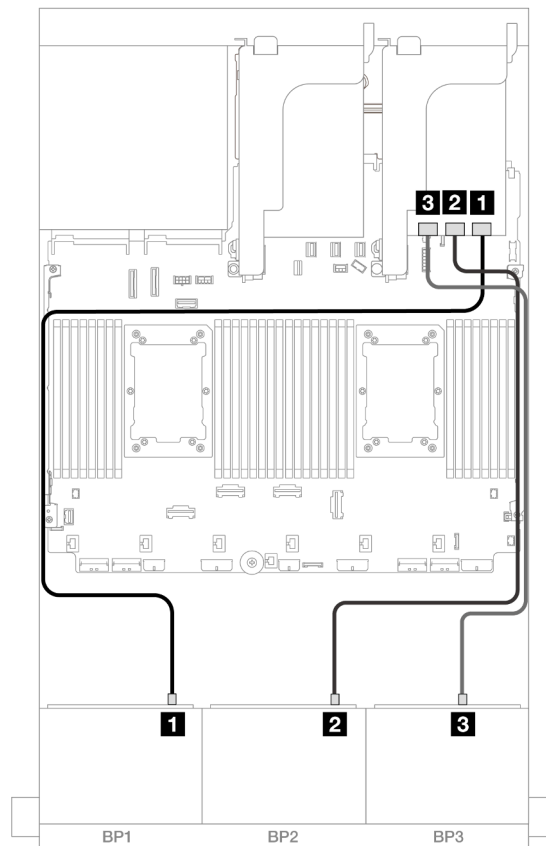


Figure 520. SAS/SATA cable routing to 32i adapter

From	To
<b>1</b> Backplane 1: SAS	32i adapter <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>

### Rear backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

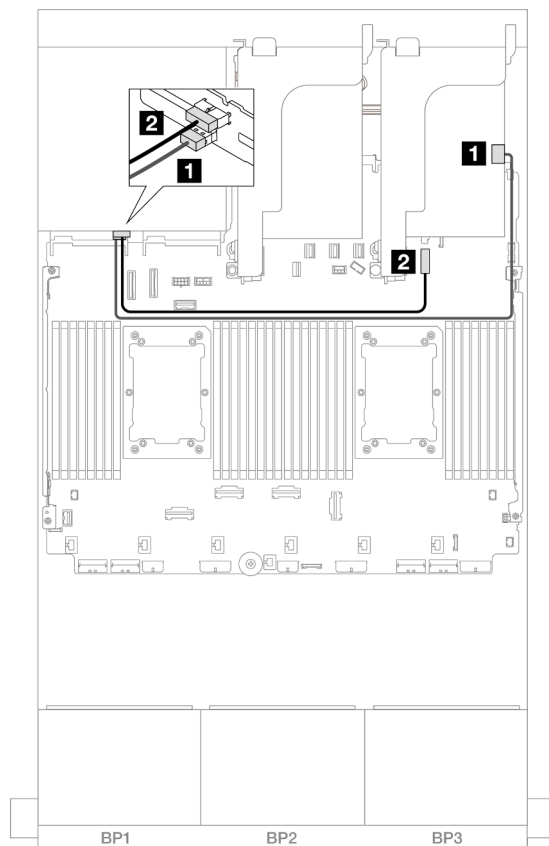


Figure 521. Rear backplane cable routing

From	To
<b>1</b> Backplane 4: SAS	32i adapter <ul style="list-style-type: none"> <li>• C3</li> </ul>
<b>2</b> Backplane 4: PWR	Onboard: 7mm backplane power connector

### CFF expander + 8i/16i RAID/HBA adapter

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 4 x 2.5-inch SAS/SATA configuration with one CFF expander and one 8i/16i RAID/HBA adapter.

## Front backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

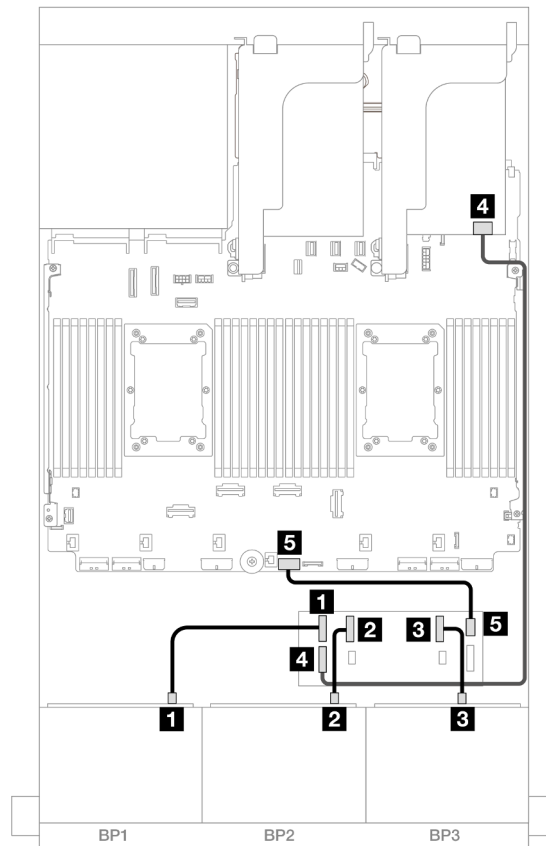


Figure 522. SAS/SATA cable routing to CFF expander and 8i/16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF expander: RAID/HBA	8i/16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>5</b> CFF expander: PWR	Onboard: CFF EXP PWR

## Rear backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

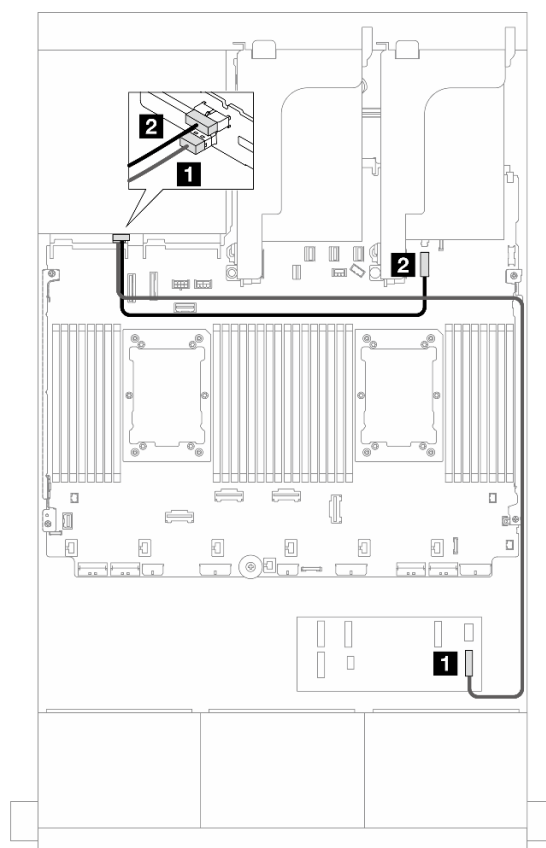


Figure 523. Rear backplane cable routing

From	To
<b>1</b> Backplane 4: SAS	CFF expander <ul style="list-style-type: none"> <li>• C3</li> </ul>
<b>2</b> Backplane 4: PWR	Onboard: 7mm backplane power connector

### CFF 16i RAID/HBA adapter + CFF expander

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 4 x 2.5-inch SAS/SATA configuration with one CFF expander and one CFF 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

### Front backplane cable routing

#### Cable routing when two processors installed

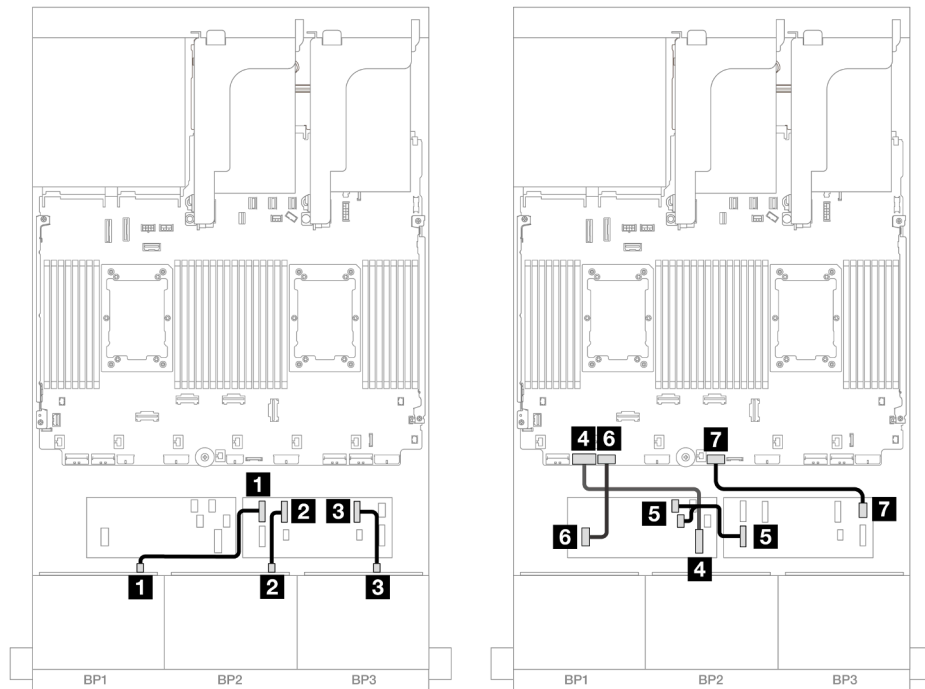


Figure 524. Cable routing to CFF expander and CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 7
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

### Cable routing when one processor installed

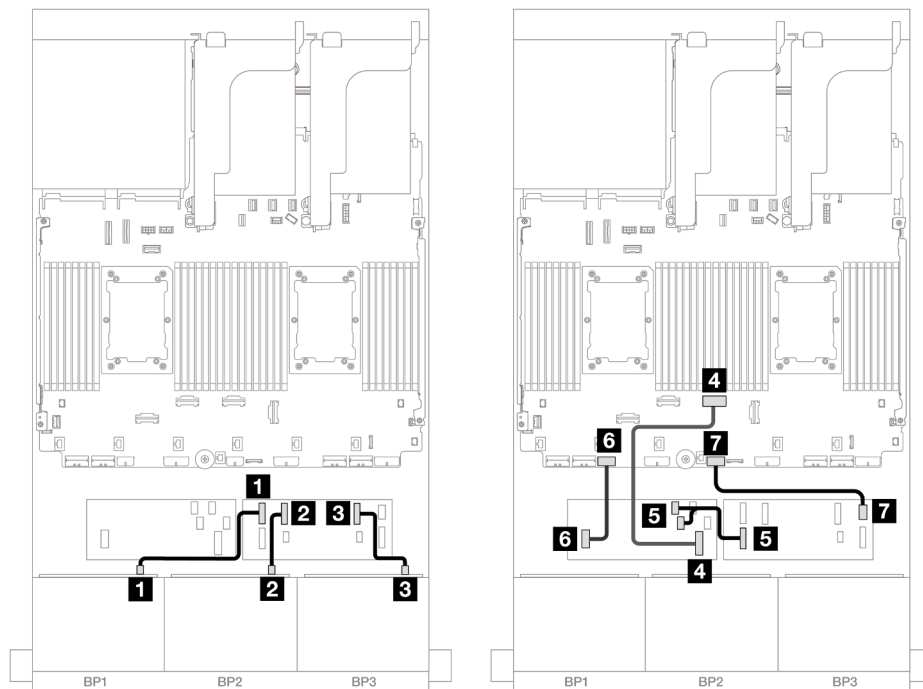


Figure 525. Cable routing to CFF expander and CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR



## Rear backplane cable routing

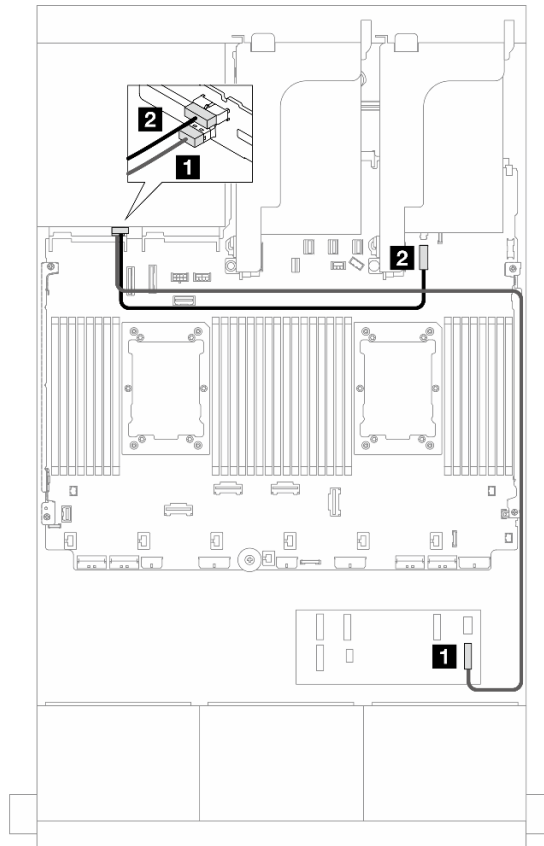


Figure 526. Rear backplane cable routing

From	To
<b>1</b> Backplane 4: SAS	CFF expander <ul style="list-style-type: none"><li>• C3</li></ul>
<b>2</b> Backplane 4: PWR	Onboard: 7mm backplane power connector

### 24 x 2.5" SAS/SATA + 4 x 2.5" AnyBay

This topic provides cable routing information for the server model with three 8 x 2.5-inch SAS/SATA front backplanes and one 4 x 2.5-inch AnyBay rear backplane.

- [“32i RAID/HBA adapter” on page 529](#)
- [“CFF expander + 8i/16i RAID/HBA adapter” on page 530](#)
- [“CFF 16i RAID/HBA adapter + CFF expander” on page 531](#)

### 32i RAID/HBA adapter

The following shows the cable connections for the front 24 x 2.5-inch SAS/SATA + rear 4 x 2.5-inch AnyBay configuration with one 32i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

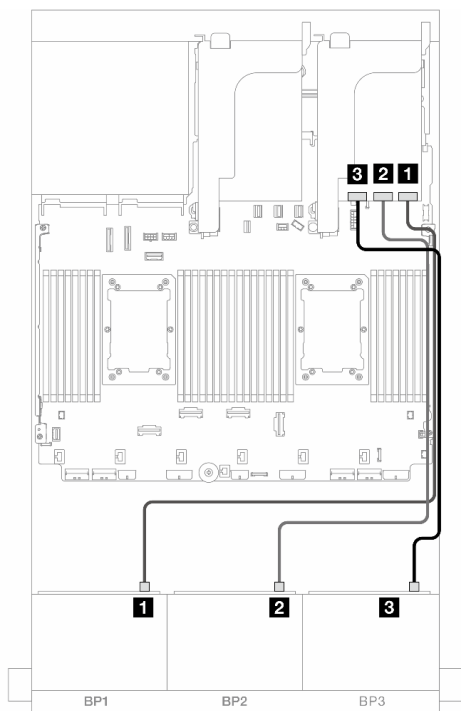


Figure 527. Front backplane cable routing

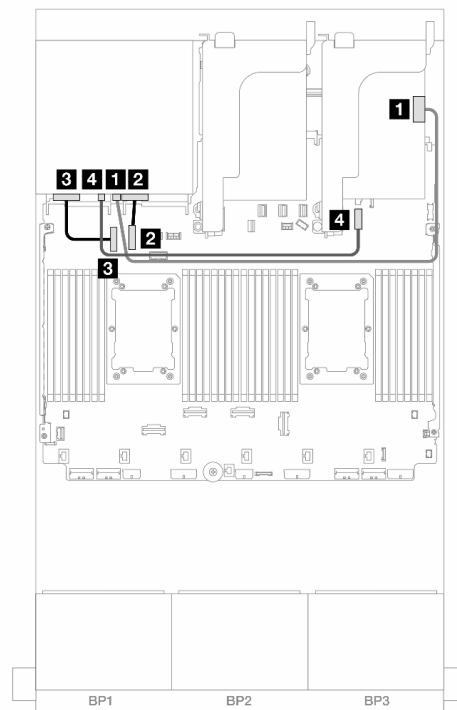


Figure 528. Rear backplane cable routing

From	To	From	To
<b>1</b> Backplane 1: SAS	32i adapter • C0	<b>1</b> Backplane 4: SAS	<b>1</b> 32i adapter • C3
<b>2</b> Backplane 2: SAS	• C1	<b>2</b> Backplane 4: NVMe 0-1	<b>2</b> Onboard: PCIe 10
<b>3</b> Backplane 3: SAS	• C2	<b>3</b> Backplane 4: NVMe 2-3	<b>3</b> Onboard: PCIe 9
		<b>4</b> Backplane 4: PWR	<b>4</b> Onboard: 7mm power connector

### CFF expander + 8i/16i RAID/HBA adapter

The following shows the cable connections for the front 24 x 2.5-inch SAS/SATA + rear 4 x 2.5-inch AnyBay configuration with one CFF expander and one 8i/16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

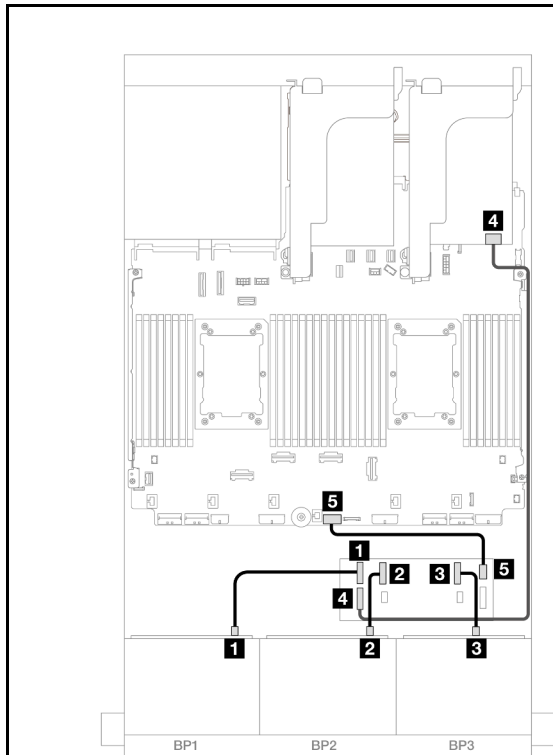


Figure 529. Cable routing to CFF expander and 8i/16i adapter

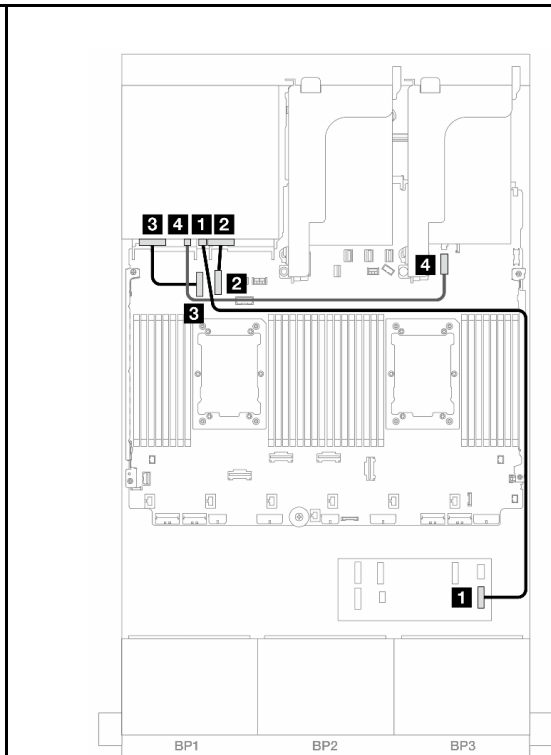


Figure 530. Rear backplane cable routing

From	To	From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>	<b>1</b> Backplane 4: SAS	<b>1</b> CFF expander <ul style="list-style-type: none"> <li>• C3</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>	<b>2</b> Backplane 4: NVMe 0-1	<b>2</b> Onboard: PCIe 10
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>	<b>3</b> Backplane 4: NVMe 2-3	<b>3</b> Onboard: PCIe 9
<b>4</b> CFF expander: RAID/HBA	8i/16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>	<b>4</b> Backplane 4: PWR	<b>4</b> Onboard: 7mm power connector
<b>5</b> CFF expander: PWR	Onboard: CFF EXP PWR		

#### CFF 16i RAID/HBA adapter + CFF expander

The following shows the cable connections for the front 24 x 2.5-inch SAS/SATA + rear 4 x 2.5-inch AnyBay configuration with one CFF expander and one CFF 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

#### Front backplane cable routing

##### Cable routing when two processors installed

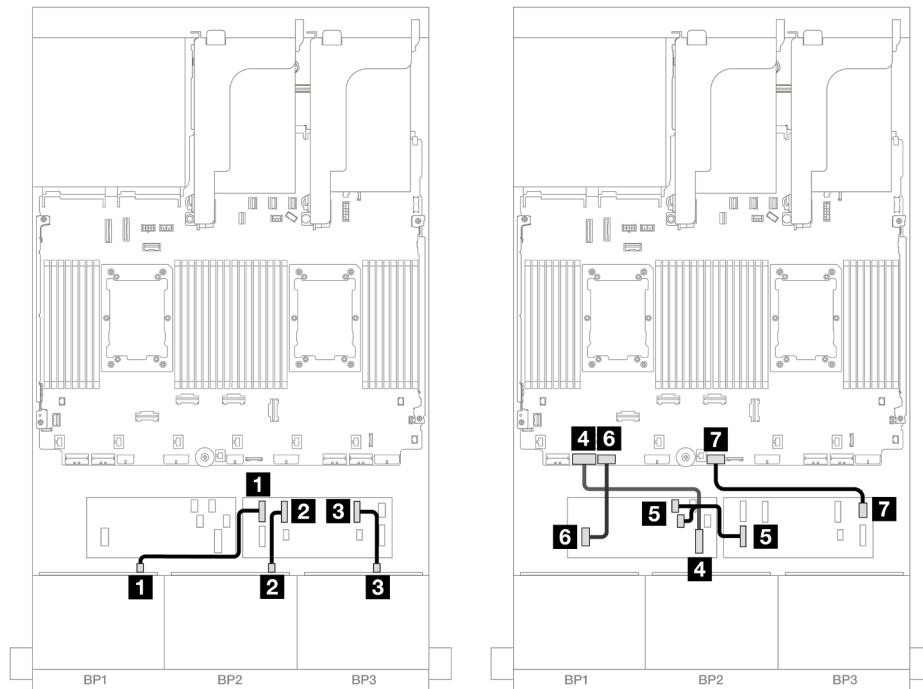


Figure 531. Cable routing to CFF expander and CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 7
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

### Cable routing when one processor installed

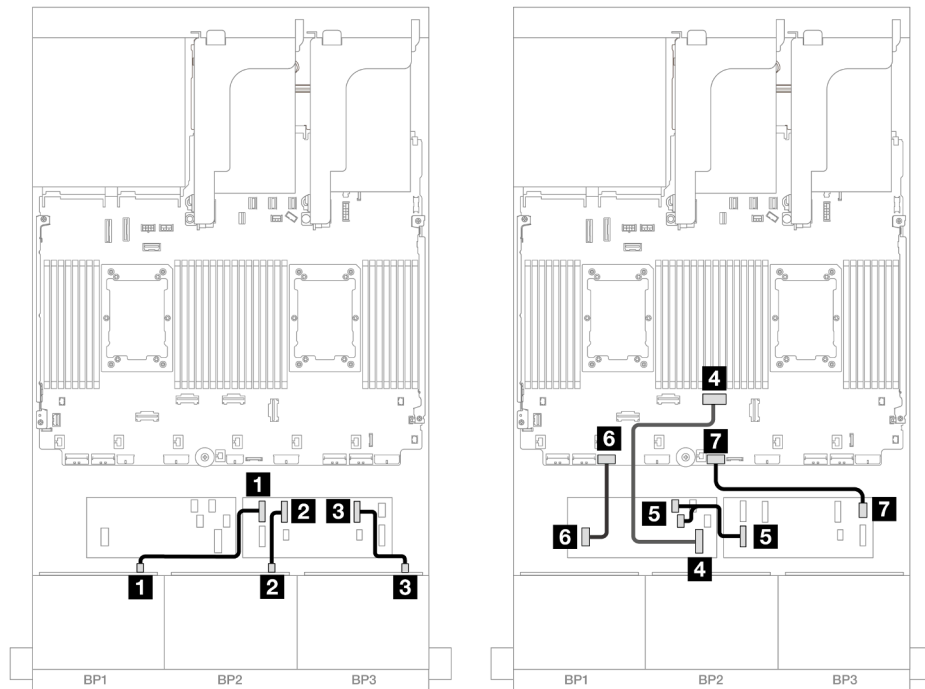


Figure 532. Cable routing to CFF expander and CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

## Rear backplane cable routing

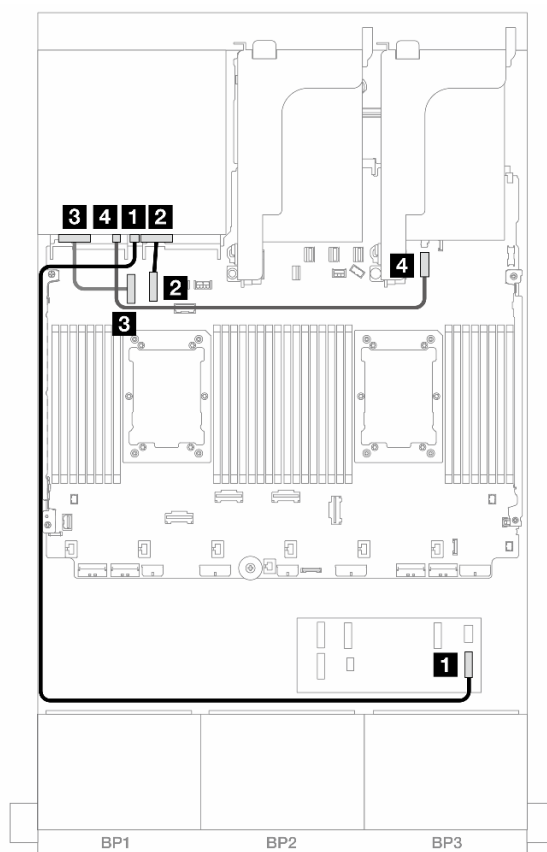


Figure 533. Rear backplane cable routing

From	To
<b>1</b> Backplane 4: SAS	<b>1</b> CFF expander • C3
<b>2</b> Backplane 4: NVMe 0-1	<b>2</b> Onboard: PCIe 10
<b>3</b> Backplane 4: NVMe 2-3	<b>3</b> Onboard: PCIe 9
<b>4</b> Backplane 4: PWR	<b>4</b> Onboard: 7mm power connector

### 24 x 2.5" SAS/SATA + 8 x 2.5" SAS/SATA

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA front backplane and an 8 x 2.5-inch SAS/SATA rear backplane.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“32i RAID/HBA adapter” on page 535](#)
- [“16i RAID/HBA adapters” on page 536](#)
- [“CFF expander + 8i/16i RAID/HBA adapter” on page 540](#)

- “CFF 16i RAID/HBA + SFF 16i RAID/HBA adapters” on page 538
- “CFF 16i RAID/HBA adapter + CFF expander” on page 542

### 32i RAID/HBA adapter

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA configuration with one 32i RAID/HBA adapter.

### Front backplane cable routing

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

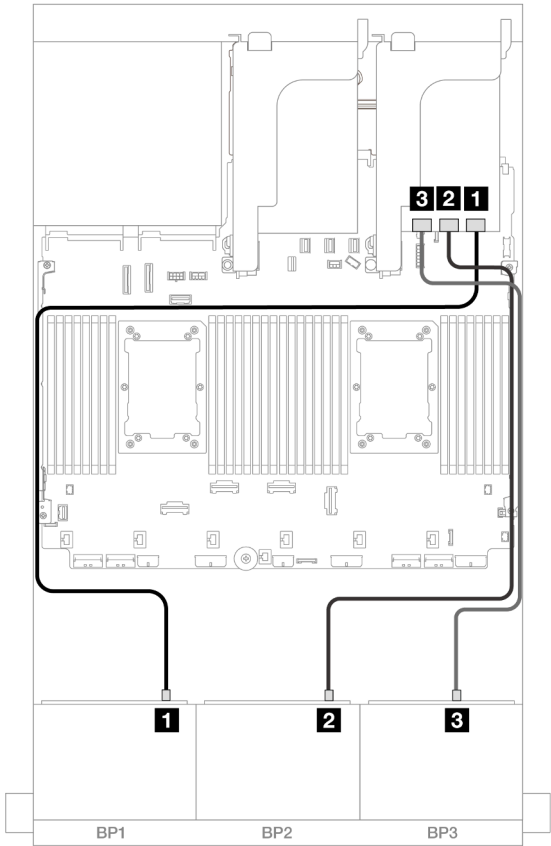


Figure 534. SAS/SATA cable routing to 32i adapter

From	To
<b>1</b> Backplane 1: SAS	32i adapter <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>

### Rear backplane cable routing

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

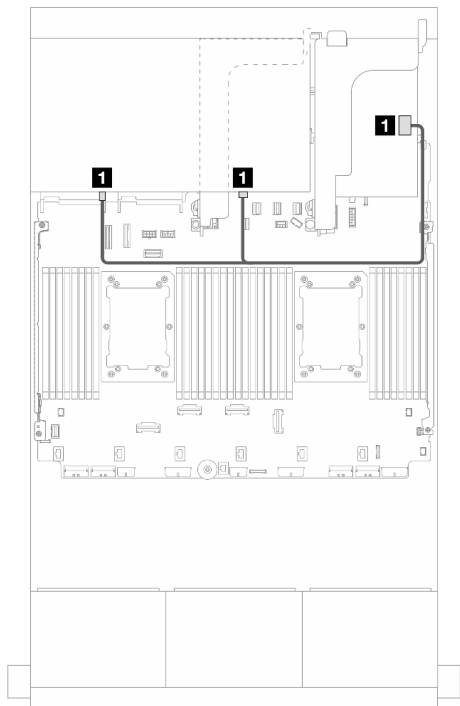


Figure 535. Signal cable routing

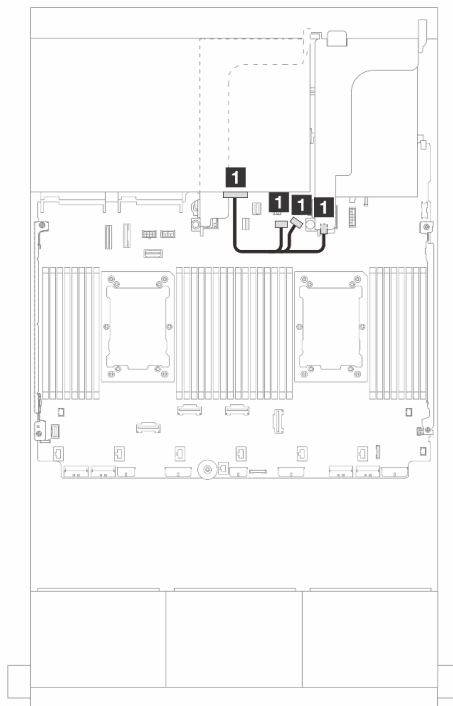


Figure 536. Power cable routing

From	To	From	To
<b>1</b> Backplane 4: SAS 0, SAS 1	32i adapter <ul style="list-style-type: none"> <li>C3</li> </ul>	<b>1</b> Backplane 4: PWR	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>

### 16i RAID/HBA adapters

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA configuration with two 16i RAID/HBA adapters.

### Front backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



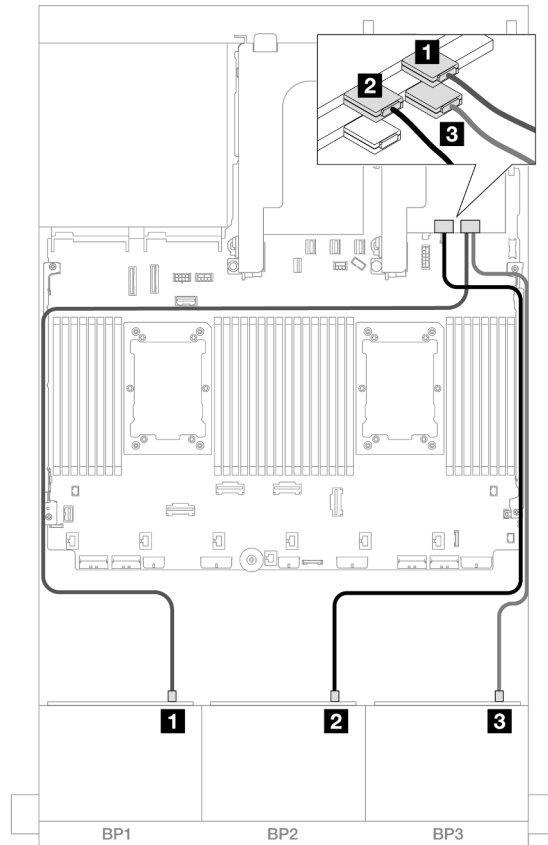


Figure 537. SAS/SATA cable routing to 16i adapters

From	To
<b>1</b> Backplane 1: SAS	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2C3</li> </ul>
<b>3</b> Backplane 3: SAS	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>

### Rear backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

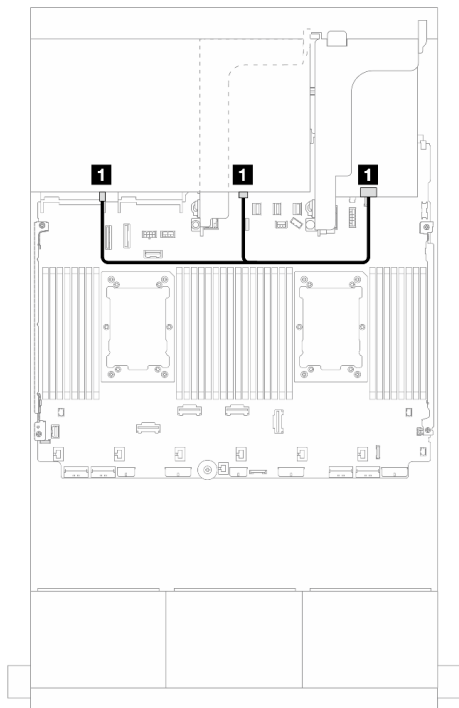


Figure 538. Signal cable routing

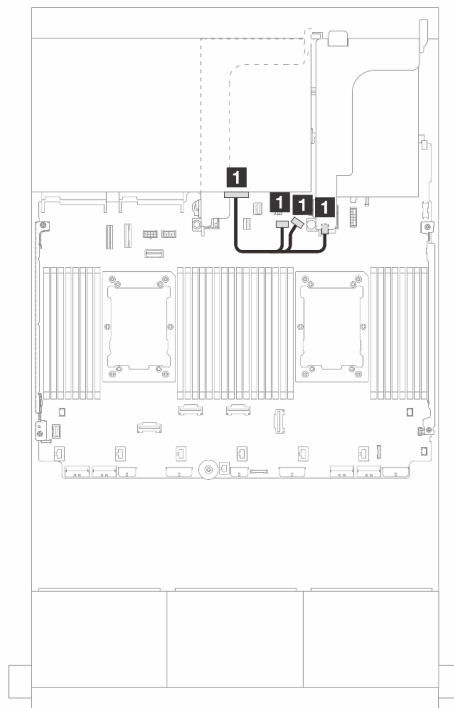


Figure 539. Power cable routing

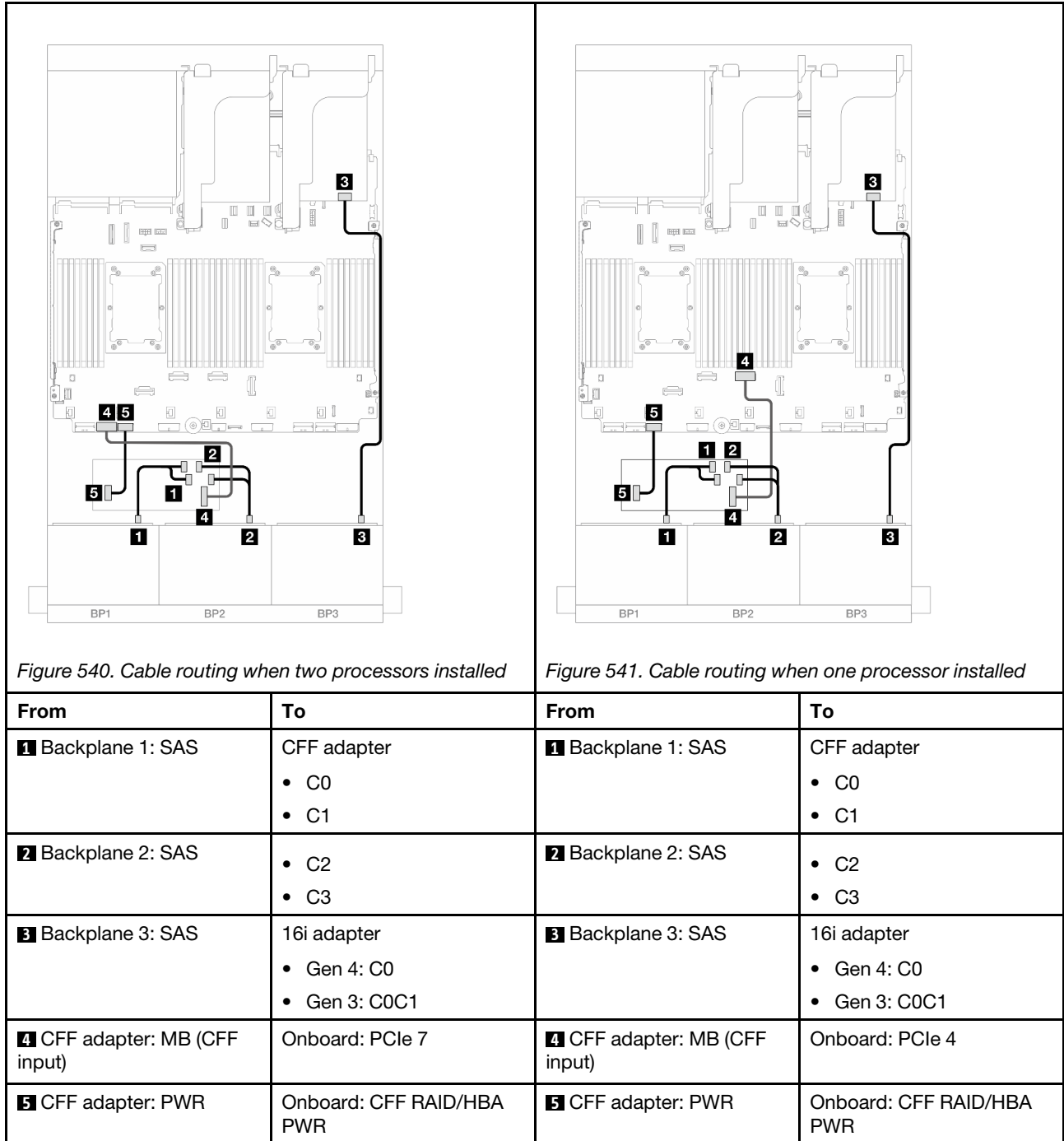
From	To	From	To
<b>1</b> Backplane 4: SAS 0, SAS 1	16i adapter <ul style="list-style-type: none"> <li>Gen 4: C1</li> <li>Gen 3: C2C3</li> </ul>	<b>1</b> Backplane 4: PWR	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>

### CFF 16i RAID/HBA + SFF 16i RAID/HBA adapters

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA configuration with one CFF 16i RAID/HBA adapter and one 16i RAID/HBA adapter.

### Front backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



**Rear backplane cable routing**

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

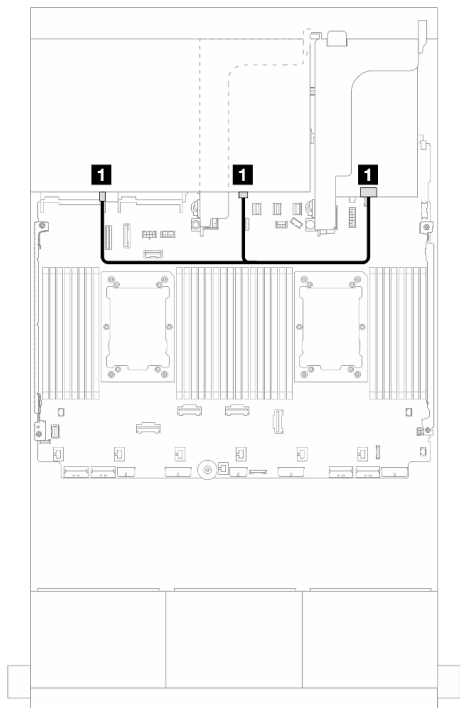


Figure 542. Signal cable routing

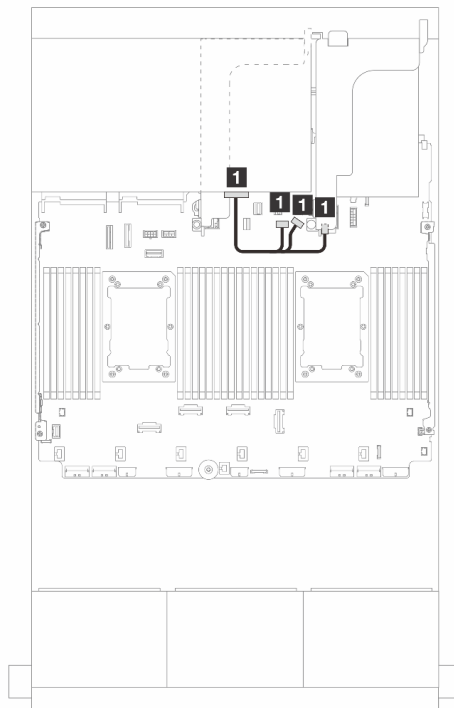


Figure 543. Power cable routing

From	To	From	To
<b>1</b> Backplane 4: SAS 0, SAS 1	16i adapter <ul style="list-style-type: none"> <li>Gen 4: C1</li> <li>Gen 3: C2C3</li> </ul>	<b>1</b> Backplane 4: PWR	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>

### CFF expander + 8i/16i RAID/HBA adapter

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA configuration with one CFF expander and one 8i/16i RAID/HBA adapter.

### Front backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

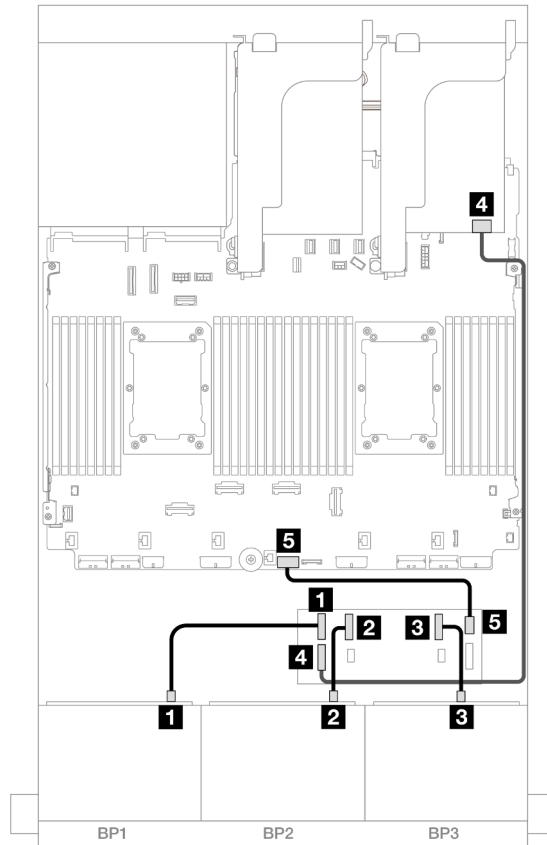


Figure 544. SAS/SATA cable routing to CFF expander and 8i/16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF expander: RAID/HBA	8i/16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>5</b> CFF expander: PWR	Onboard: CFF EXP PWR

### Rear backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

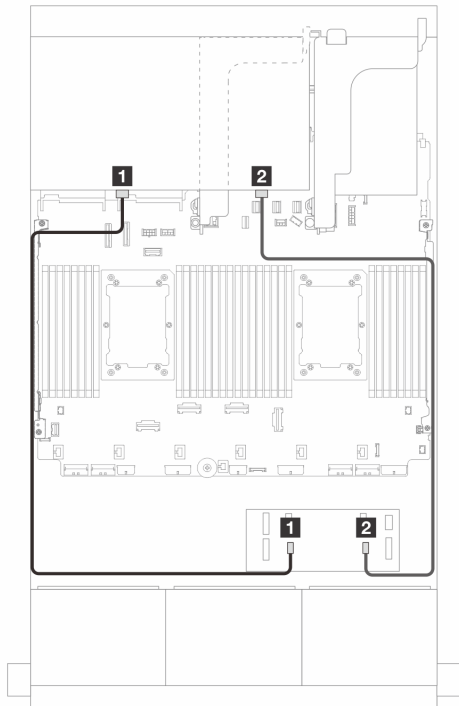


Figure 545. Signal cable routing

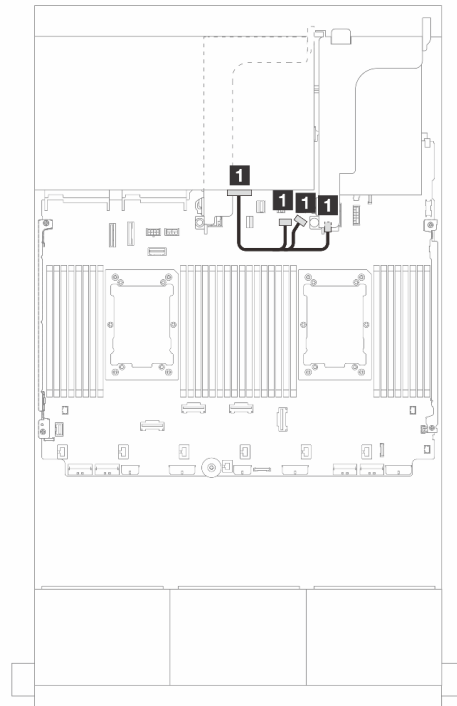


Figure 546. Power cable routing

From	To	From	To
<b>1</b> Backplane 4: SAS 0	CFF expander <ul style="list-style-type: none"> <li>C4</li> </ul>	<b>1</b> Backplane 4: PWR	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>
<b>2</b> Backplane 4: SAS 1	<ul style="list-style-type: none"> <li>C5</li> </ul>		

### CFF 16i RAID/HBA adapter + CFF expander

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA configuration with one CFF expander and one CFF 16i RAID/HBA adapter.

### Front backplane cable routing

#### Cable routing when two processors installed

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

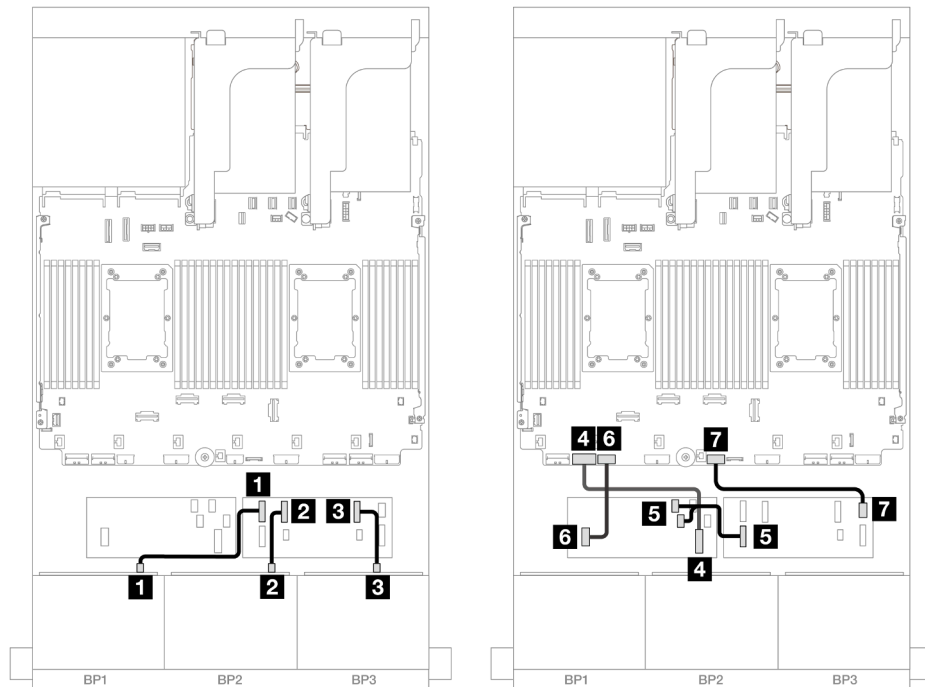


Figure 547. SAS/SATA cable routing to CFF expander and CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 7
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

### Cable routing when one processor installed

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

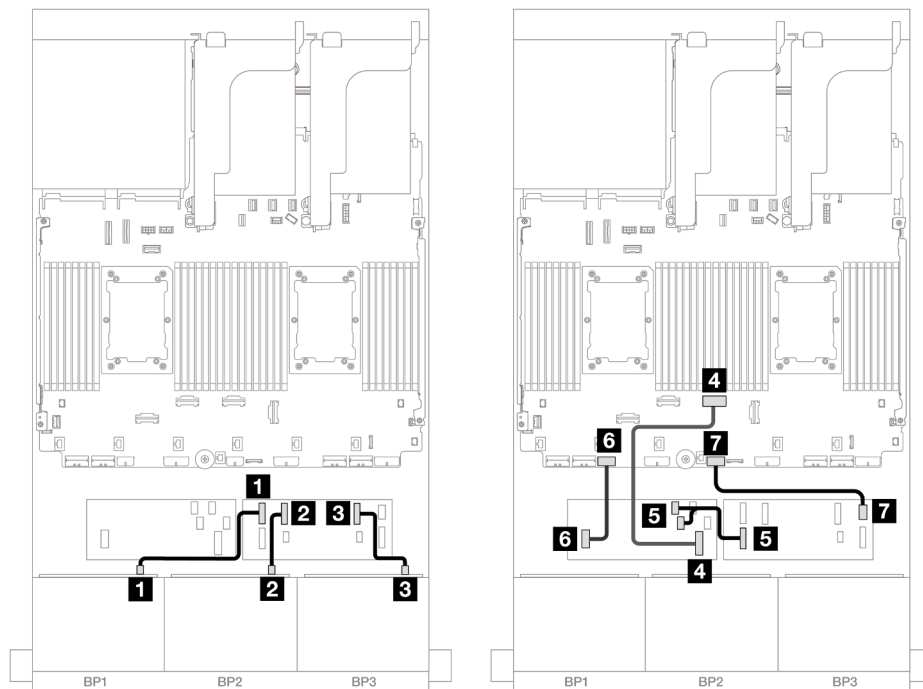


Figure 548. SAS/SATA cable routing to CFF expander and CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

### Rear backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



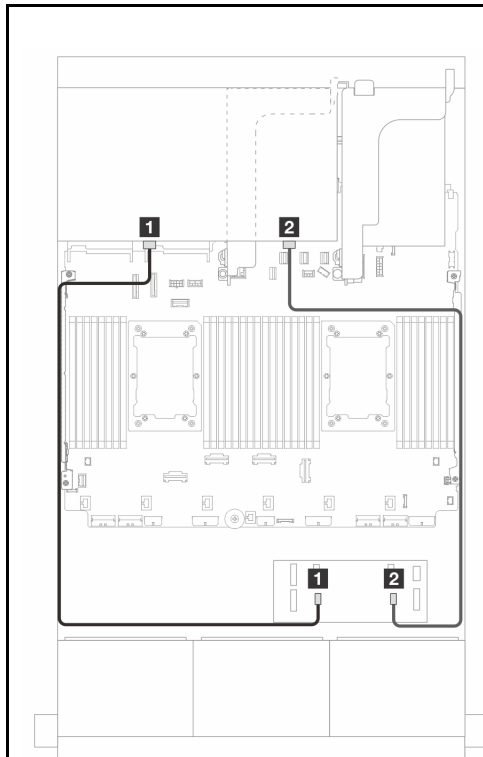


Figure 549. Signal cable routing

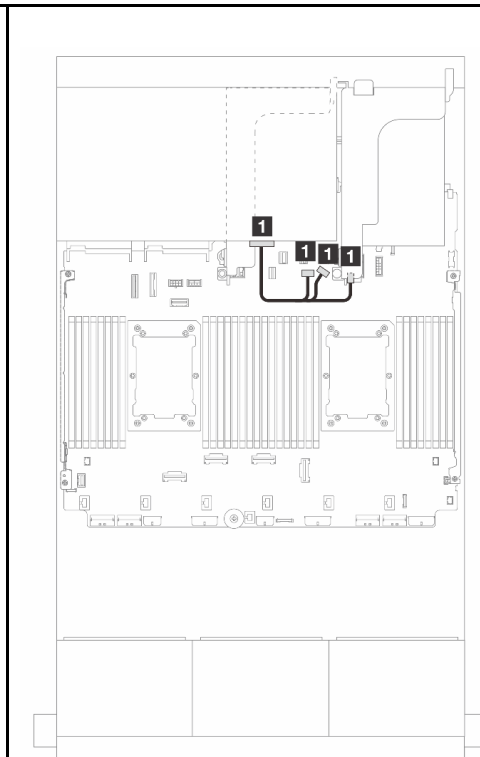


Figure 550. Power cable routing

From	To	From	To
<b>1</b> Backplane 4: SAS 0	CFF expander • C4	<b>1</b> Backplane 4: PWR	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>
<b>2</b> Backplane 4: SAS 1	• C5		

## Front + middle backplanes: 24 x 2.5" SAS/SATA + 4 x 2.5"/8 x 2.5" SAS/SATA

This topic provides cable routing information for the 12 x 3.5-inch SAS/SATA front backplane and one or two 4 x 2.5-inch SAS/SATA rear backplanes.

- [“24 x 2.5" SAS/SATA + 4 x 2.5" SAS/SATA” on page 545](#)
- [“24 x 2.5" SAS/SATA + 8 x 2.5" SAS/SATA” on page 549](#)

## 24 x 2.5" SAS/SATA + 4 x 2.5" SAS/SATA

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA front backplane and one 4 x 2.5-inch SAS/SATA middle backplane.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“32i RAID/HBA adapter” on page 550](#)
- [“16i RAID/HBA adapters” on page 551](#)

**32i RAID/HBA adapter**

The following shows the cable connections for the 24 x 2.5-inch SAS/SATA + 4 x 2.5-inch SAS/SATA configuration with one 32i RAID/HBA adapter.

**Front backplane cable routing**

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

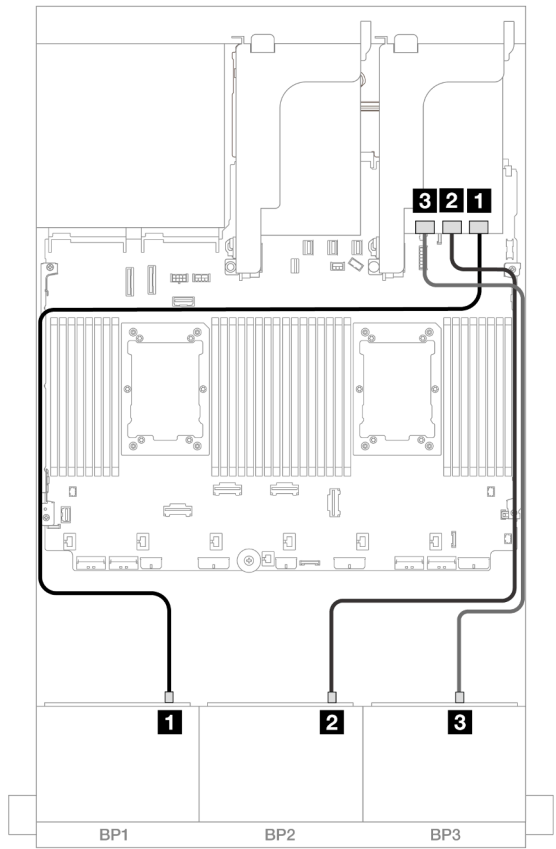


Figure 551. SAS/SATA cable routing to 32i adapter

From	To
<b>1</b> Backplane 1: SAS	32i adapter <ul style="list-style-type: none"><li>• C0</li></ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"><li>• C1</li></ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"><li>• C2</li></ul>

**Middle backplane cable routing**

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

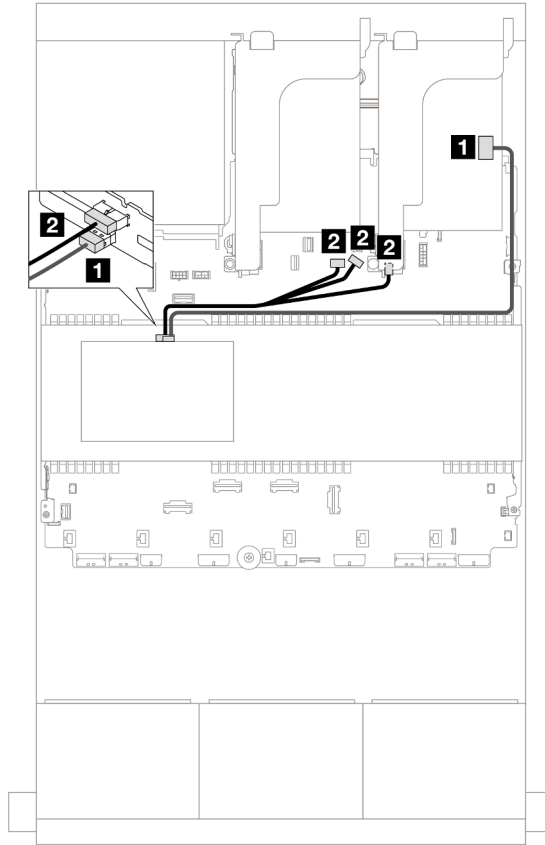


Figure 552. Middle backplane cable routing

From	To
<b>1</b> Backplane 5: SAS	32i adapter <ul style="list-style-type: none"> <li>• C3</li> </ul>
<b>2</b> Backplane 5: PWR	<ul style="list-style-type: none"> <li>• Onboard: backplane power</li> <li>• Onboard: backplane sideband</li> <li>• Riser 1: PWR</li> </ul>

### 16i RAID/HBA adapters

The following shows the cable connections for the 24 x 2.5-inch SAS/SATA + 4 x 2.5-inch SAS/SATA configuration with two 16i RAID/HBA adapters.

### Front backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

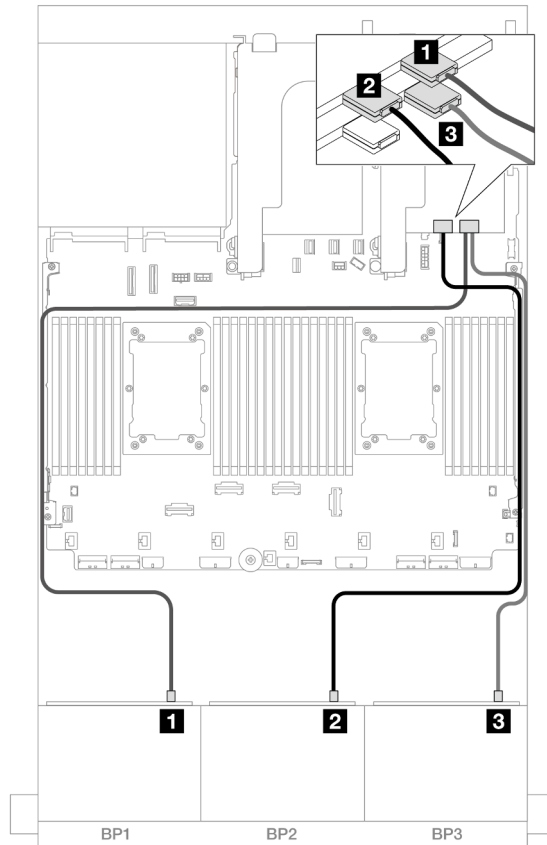


Figure 553. SAS/SATA cable routing to 16i adapters

From	To
<b>1</b> Backplane 1: SAS	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2C3</li> </ul>
<b>3</b> Backplane 3: SAS	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>

### Middle backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

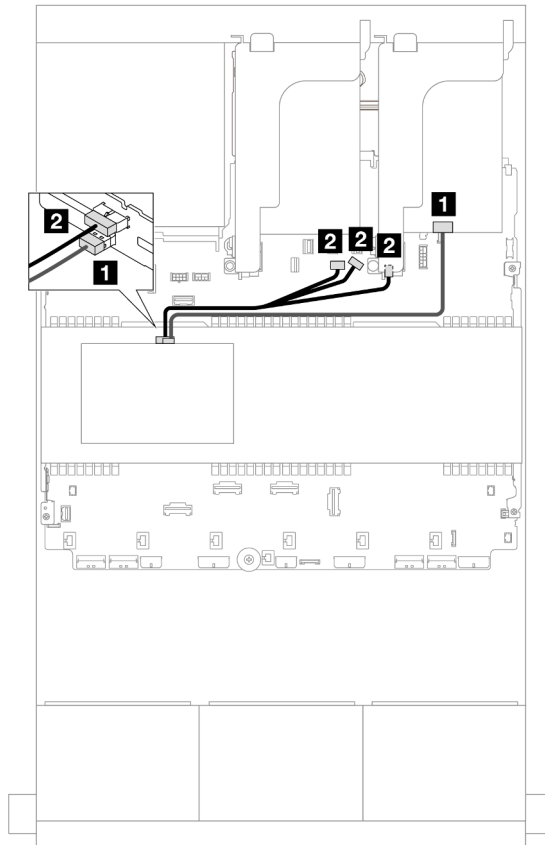


Figure 554. Middle backplane cable routing

From	To
<b>1</b> Backplane 5: SAS	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2</li> </ul>
<b>2</b> Backplane 5: PWR	<ul style="list-style-type: none"> <li>• Onboard: backplane power</li> <li>• Onboard: backplane sideband</li> <li>• Riser 1: PWR</li> </ul>

### 24 x 2.5" SAS/SATA + 8 x 2.5" SAS/SATA

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA front backplane and two 4 x 2.5-inch SAS/SATA middle backplanes.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“32i RAID/HBA adapter” on page 550](#)
- [“16i RAID/HBA adapters” on page 551](#)

32i RAID/HBA adapter

The following shows the cable connections for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA configuration with one 32i RAID/HBA adapter.

Front backplane cable routing

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

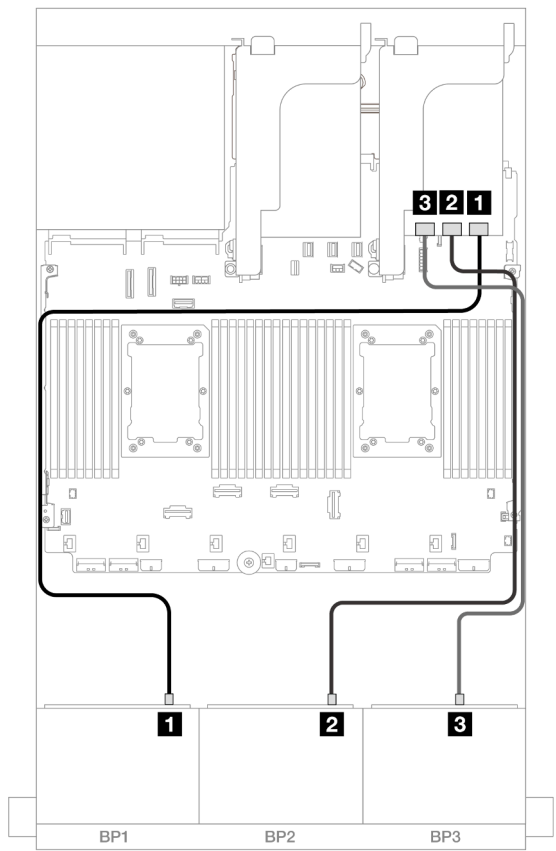


Figure 555. SAS/SATA cable routing to 32i adapter

From	To
1 Backplane 1: SAS	32i adapter <ul style="list-style-type: none"><li>C0</li></ul>
2 Backplane 2: SAS	<ul style="list-style-type: none"><li>C1</li></ul>
3 Backplane 3: SAS	<ul style="list-style-type: none"><li>C2</li></ul>

Middle backplane cable routing

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

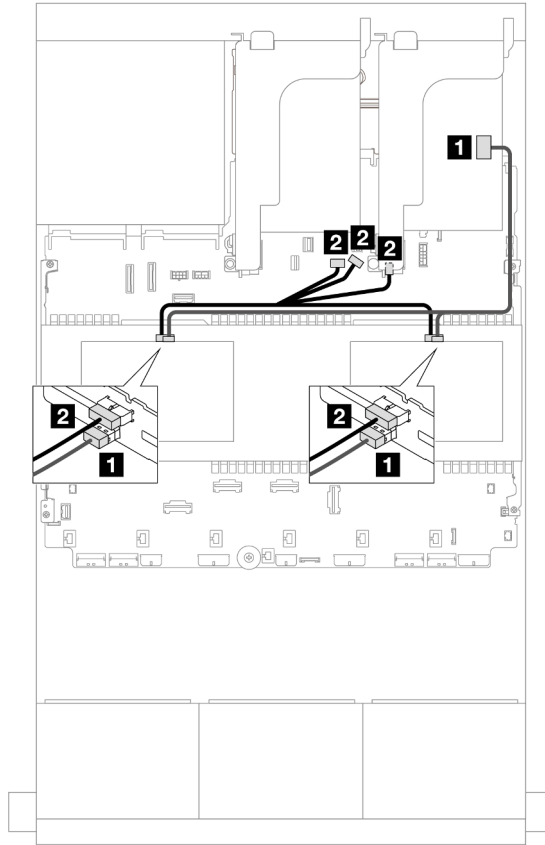


Figure 556. Middle backplane cable routing

From	To
<b>1</b> <ul style="list-style-type: none"> <li>Backplane 5: SAS</li> <li>Backplane 6: SAS</li> </ul>	32i adapter <ul style="list-style-type: none"> <li>C3</li> </ul>
<b>2</b> <ul style="list-style-type: none"> <li>Backplane 5: PWR</li> <li>Backplane 6: PWR</li> </ul>	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>

### 16i RAID/HBA adapters

The following shows the cable connections for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA configuration with two 16i RAID/HBA adapters.

### Front backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

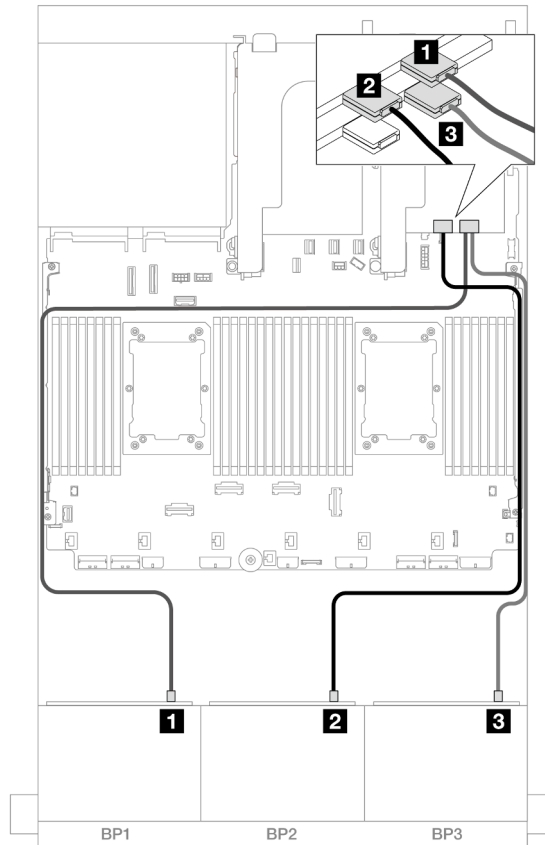


Figure 557. SAS/SATA cable routing to 16i adapters

From	To
<b>1</b> Backplane 1: SAS	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2C3</li> </ul>
<b>3</b> Backplane 3: SAS	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>

### Middle backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



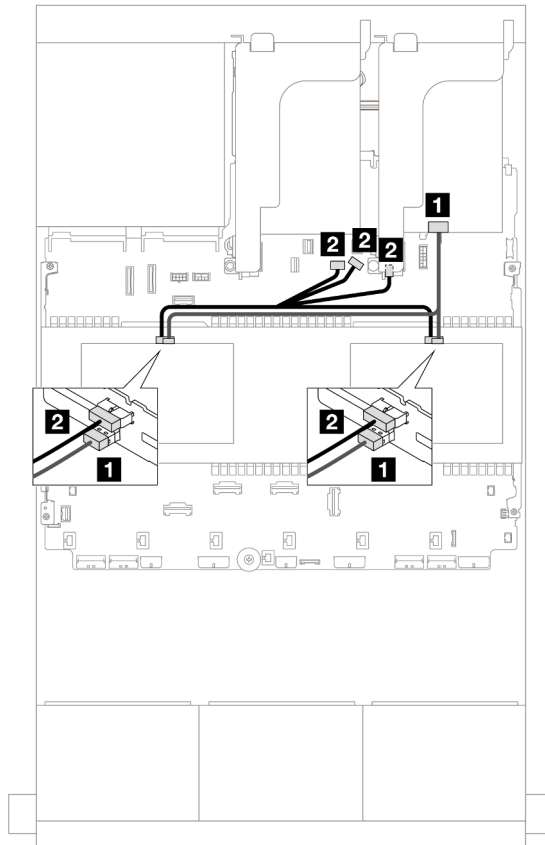


Figure 558. Middle backplane cable routing

From	To
<b>1</b> <ul style="list-style-type: none"> <li>• Backplane 5: SAS</li> <li>• Backplane 6: SAS</li> </ul>	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2C3</li> </ul>
<b>2</b> <ul style="list-style-type: none"> <li>• Backplane 5: PWR</li> <li>• Backplane 6: PWR</li> </ul>	<ul style="list-style-type: none"> <li>• Onboard: backplane power</li> <li>• Onboard: backplane sideband</li> <li>• Riser 1: PWR</li> </ul>

### Front + middle + rear backplanes: 24 x 2.5" SAS/SATA + 8 x 2.5" SAS/SATA+ 4 x 2.5"/8 x 2.5" SAS/SATA

This topic provides cable routing information for the 12 x 3.5-inch SAS/SATA front backplane, two 4 x 2.5-inch SAS/SATA middle backplanes, and one 4 x 2.5-inch/8 x 2.5-inch SAS/SATA rear backplane.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“24 x 2.5" SAS/SATA + 8 x 2.5" SAS/SATA+ 4 x 2.5" SAS/SATA” on page 554](#)
- [“24 x 2.5" SAS/SATA + 8 x 2.5" SAS/SATA+ 8 x 2.5" SAS/SATA” on page 563](#)

## 24 x 2.5" SAS/SATA + 8 x 2.5" SAS/SATA+ 4 x 2.5" SAS/SATA

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA + 4 x 2.5-inch SAS/SATA configuration.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“32i + 8i RAID/HBA adapter” on page 554](#)
- [“CFF expander + 8i/16i RAID/HBA adapter” on page 556](#)
- [“CFF 16i RAID/HBA adapter + CFF expander” on page 559](#)

### 32i + 8i RAID/HBA adapter

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA+ 4 x 2.5-inch SAS/SATA configuration with one 32i RAID adapter and one 8i RAID/HBA adapter.

### Front backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

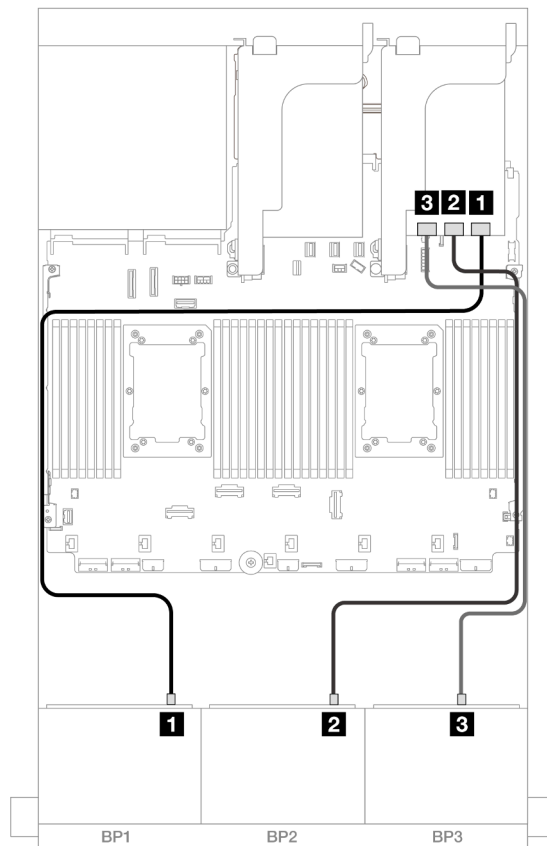


Figure 559. SAS/SATA cable routing to 32i adapter

From	To
<b>1</b> Backplane 1: SAS	32i adapter <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>

### Rear backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

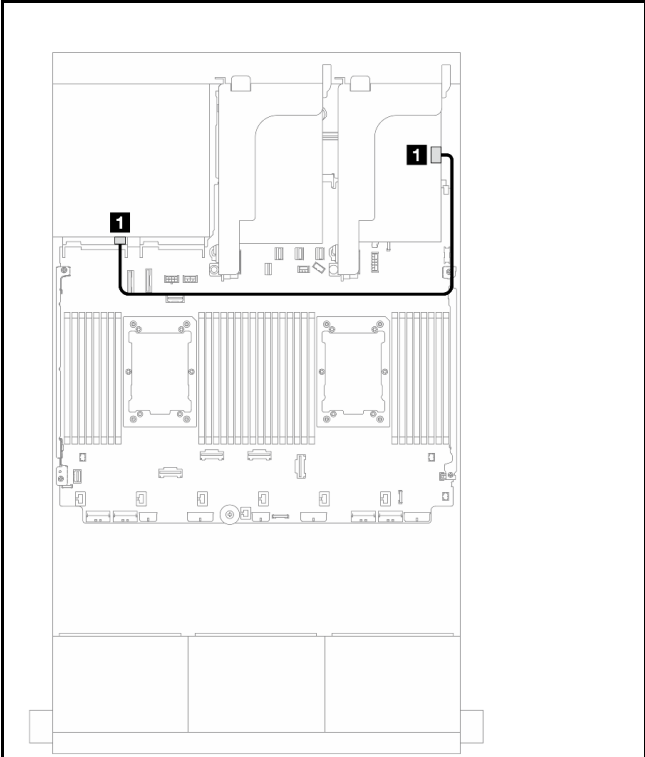


Figure 560. Signal cable routing

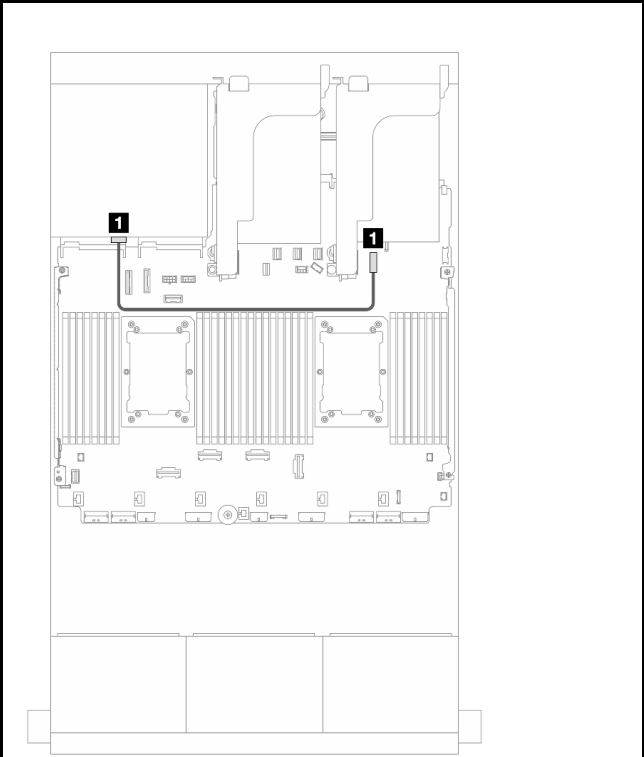


Figure 561. Power cable routing

From	To	From	To
<b>1</b> Backplane 4: SAS	32i adapter <ul style="list-style-type: none"> <li>• C3</li> </ul>	<b>1</b> Backplane 4: PWR	Onboard: 7mm power connector

### Middle backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

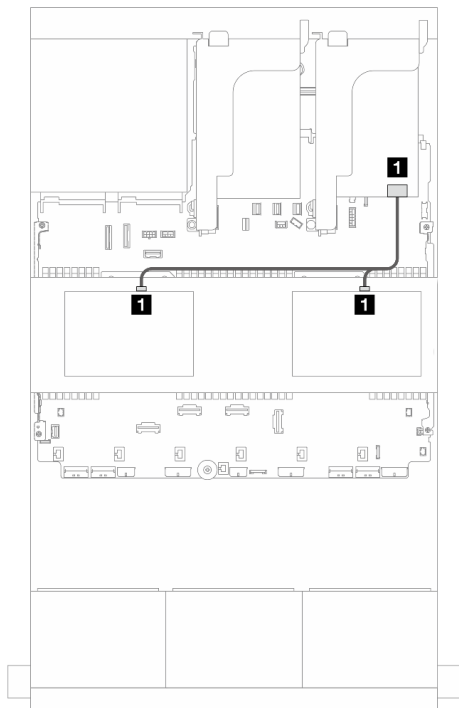


Figure 562. Signal cable routing

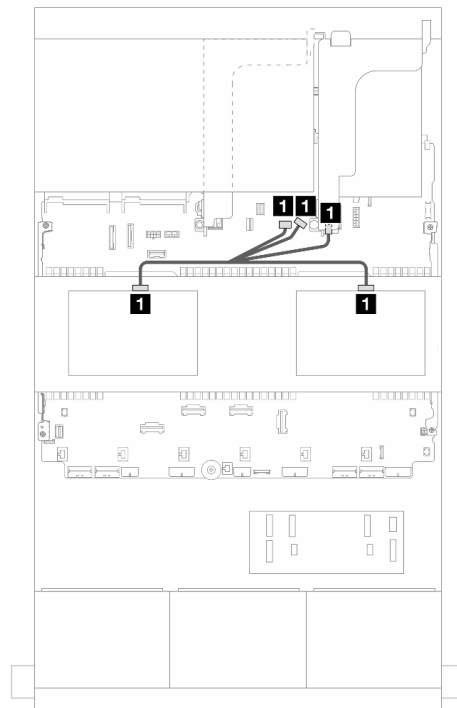


Figure 563. Power cable routing

From	To	From	To
<b>1</b> <ul style="list-style-type: none"> <li>Backplane 5: SAS</li> <li>Backplane 6: SAS</li> </ul>	8i adapter <ul style="list-style-type: none"> <li>C0</li> </ul>	<b>1</b> <ul style="list-style-type: none"> <li>Backplane 5: PWR</li> <li>Backplane 6: PWR</li> </ul>	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>

### CFF expander + 8i/16i RAID/HBA adapter

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA+ 4 x 2.5-inch SAS/SATA configuration with one CFF expander and one 8i/16i RAID/HBA adapter.

### Front backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

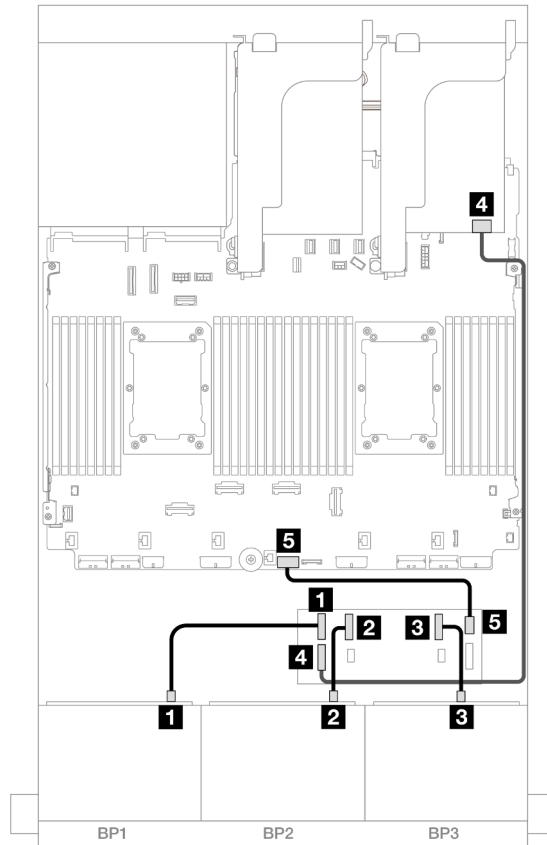


Figure 564. SAS/SATA cable routing to CFF expander and 8i/16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF expander: RAID/HBA	8i/16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>5</b> CFF expander: PWR	Onboard: CFF EXP PWR

### Rear backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

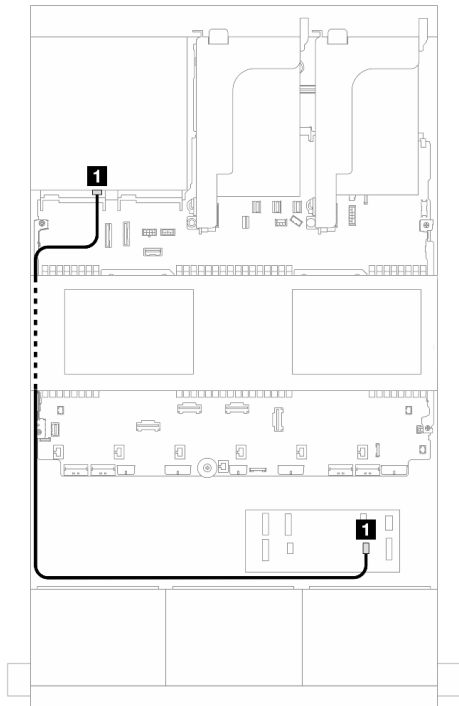


Figure 565. Signal cable routing

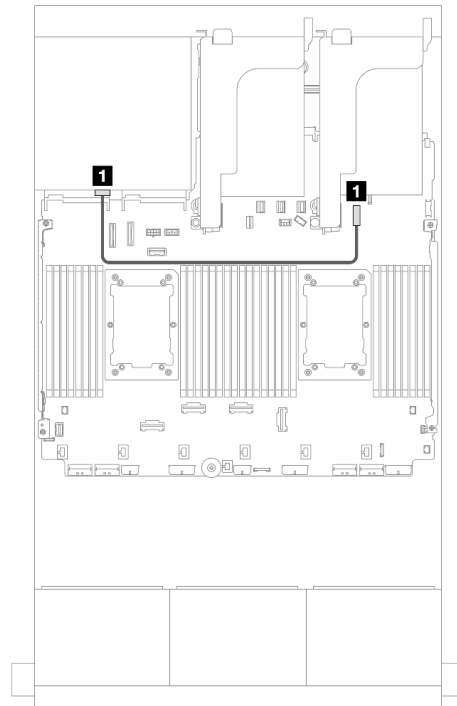
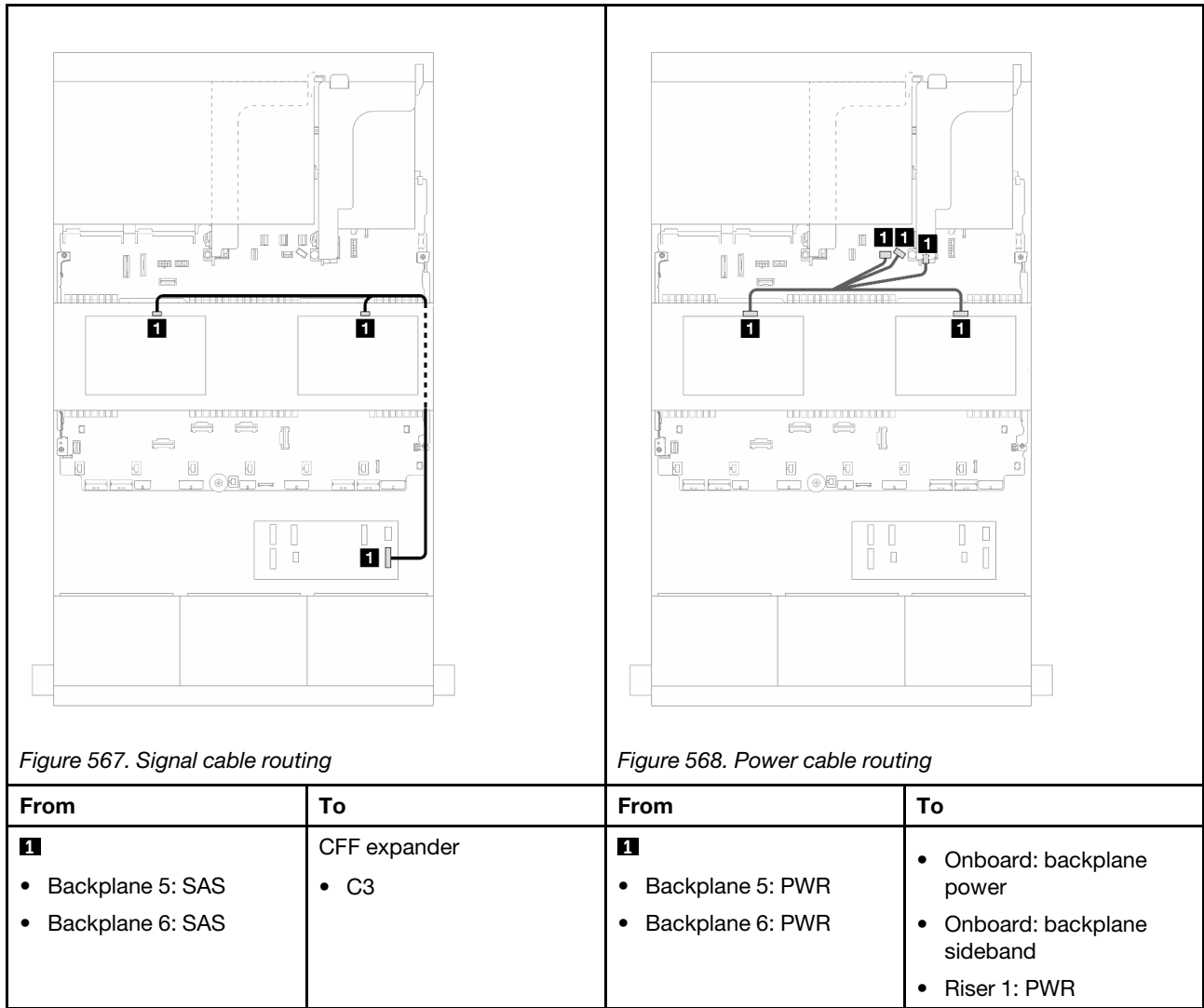


Figure 566. Power cable routing

From	To	From	To
<b>1</b> Backplane 4: SAS	CFF expander • C4	<b>1</b> Backplane 4: PWR	Onboard: 7mm power connector

### Middle backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



**CFF 16i RAID/HBA adapter + CFF expander**

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA + 4 x 2.5-inch SAS/SATA configuration with one CFF expander and one CFF 16i RAID/HBA adapter.

**Front backplane cable routing**

**Cable routing when two processors installed**

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

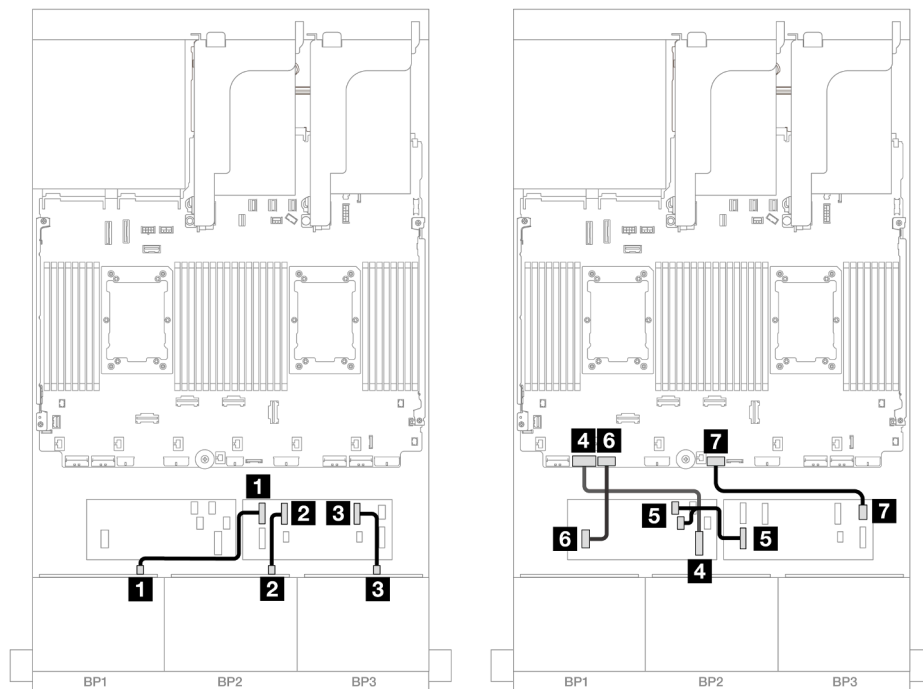


Figure 569. SAS/SATA cable routing to CFF expander and CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 7
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

### Cable routing when one processor installed

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



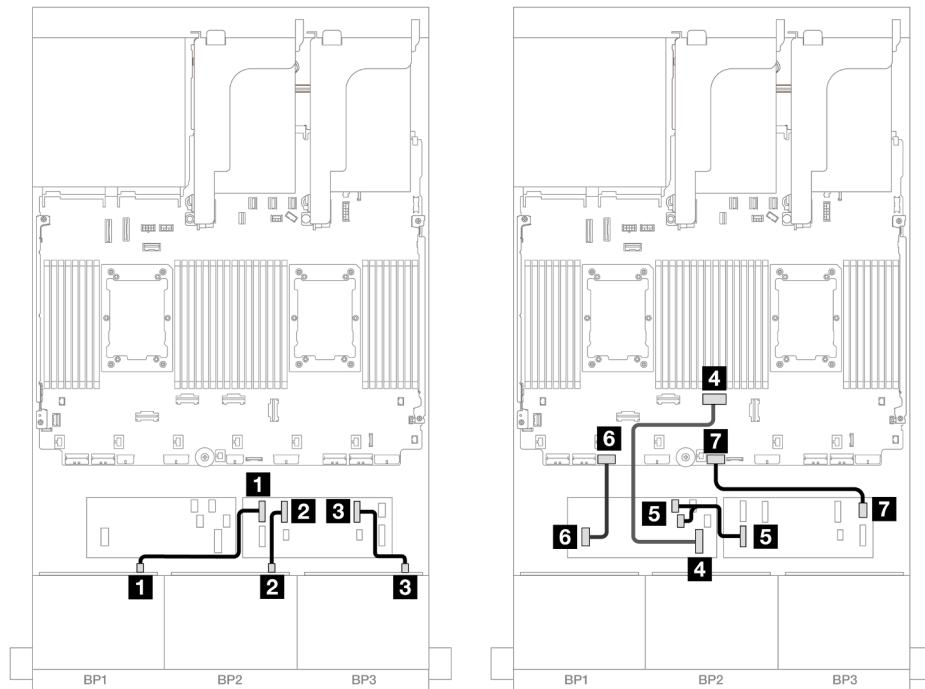


Figure 570. SAS/SATA cable routing to CFF expander and CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

### Rear backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

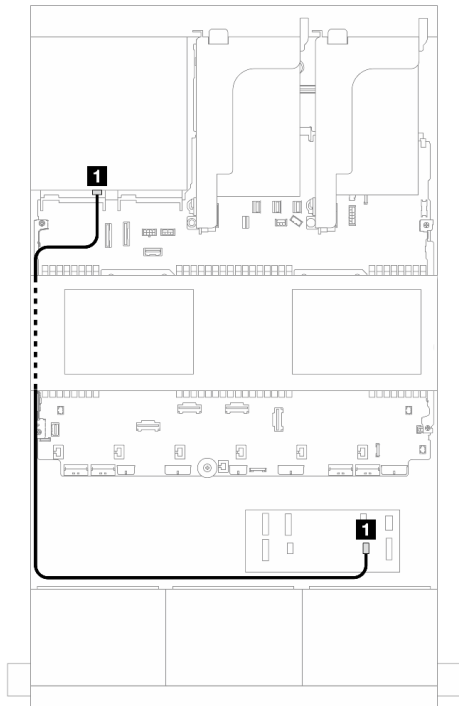


Figure 571. Signal cable routing

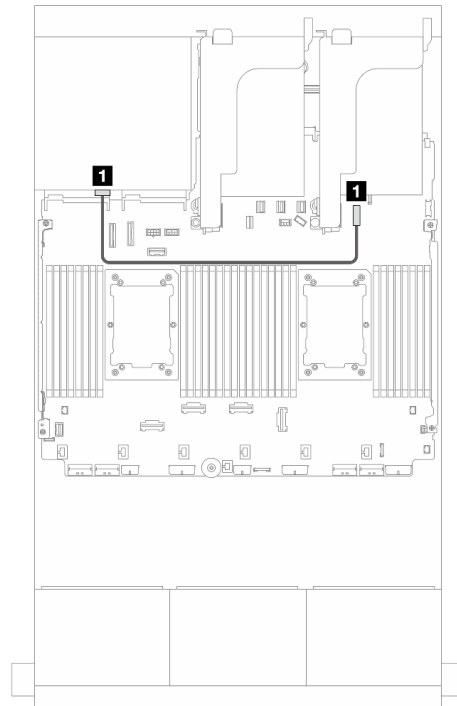


Figure 572. Power cable routing

From	To	From	To
<b>1</b> Backplane 4: SAS	CFF expander • C4	<b>1</b> Backplane 4: PWR	Onboard: 7mm power connector

### Middle backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

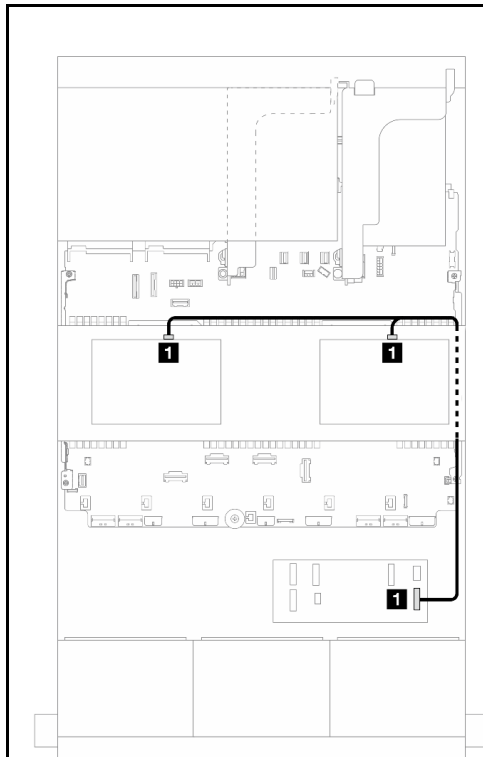


Figure 573. Signal cable routing

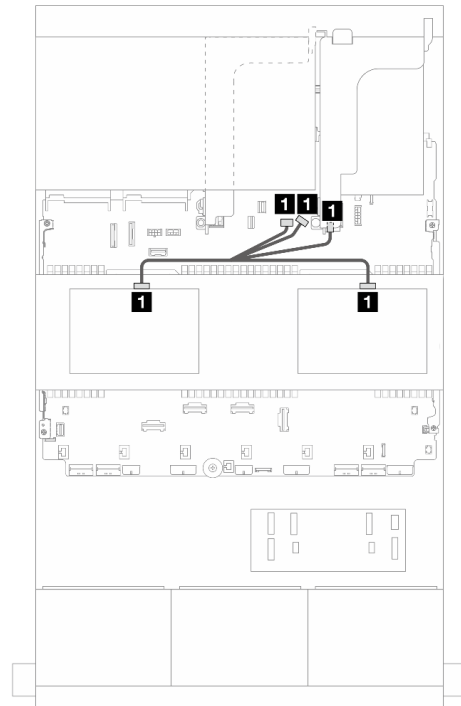


Figure 574. Power cable routing

From	To	From	To
<b>1</b> <ul style="list-style-type: none"> <li>Backplane 5: SAS</li> <li>Backplane 6: SAS</li> </ul>	CFF expander <ul style="list-style-type: none"> <li>C3</li> </ul>	<b>1</b> <ul style="list-style-type: none"> <li>Backplane 5: PWR</li> <li>Backplane 6: PWR</li> </ul>	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>

## 24 x 2.5" SAS/SATA + 8 x 2.5" SAS/SATA+ 8 x 2.5" SAS/SATA

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA configuration.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“CFF expander + 16i RAID/HBA adapter” on page 563](#)
- [“CFF 16i RAID/HBA adapter + CFF expander” on page 566](#)

### CFF expander + 16i RAID/HBA adapter

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA+ 8 x 2.5-inch SAS/SATA configuration with one CFF expander and one 16i RAID/HBA adapter.

### Front backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

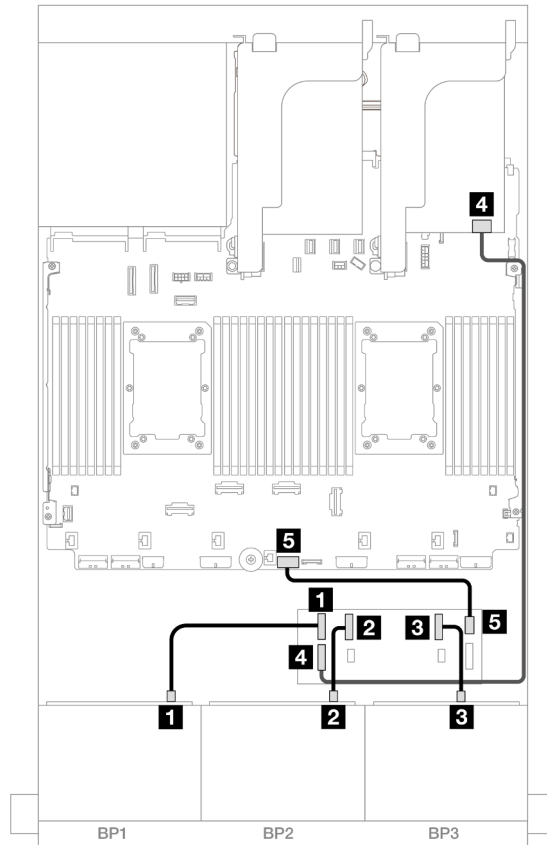
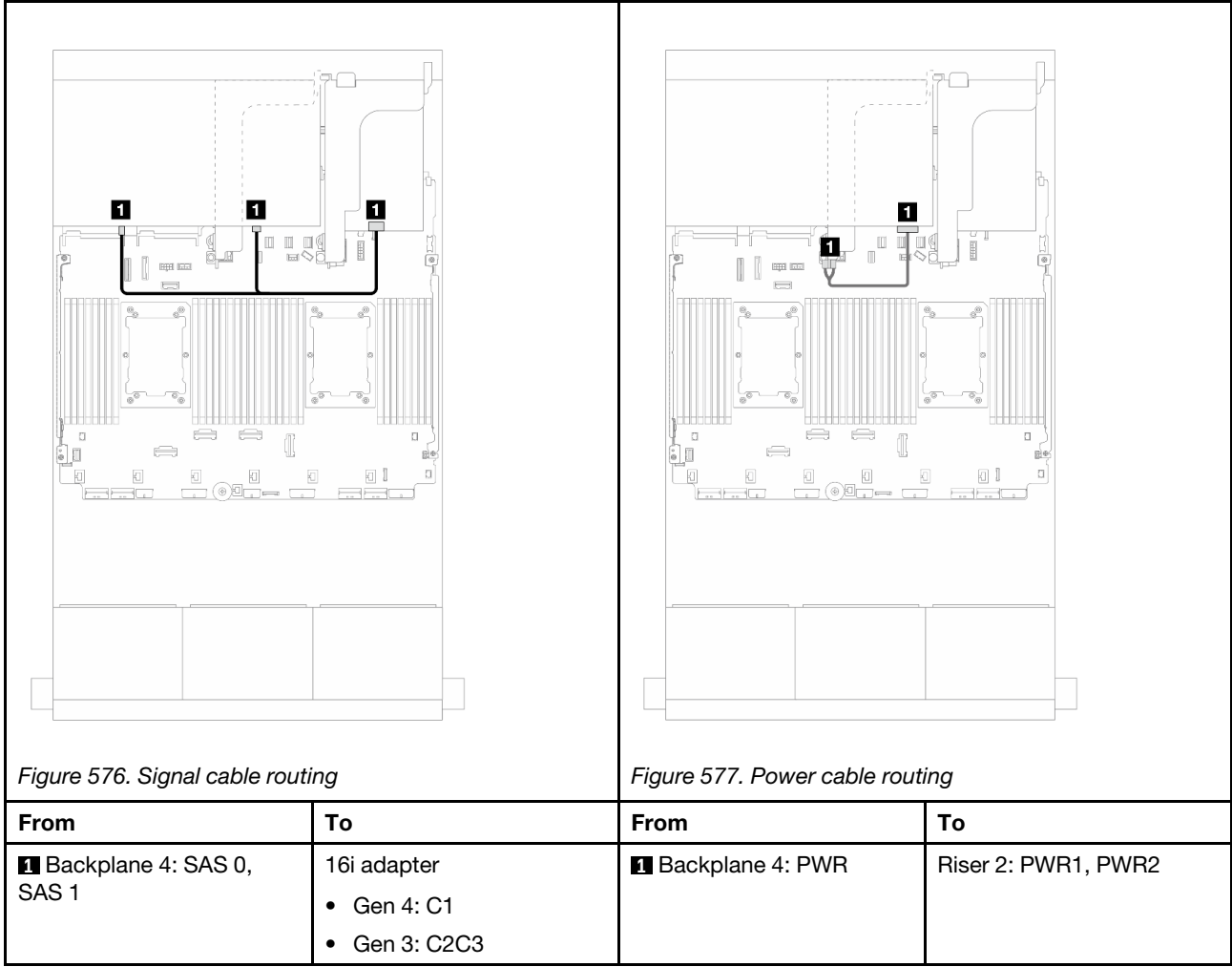


Figure 575. SAS/SATA cable routing to CFF expander and 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF expander: RAID/HBA	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>5</b> CFF expander: PWR	Onboard: CFF EXP PWR

### Rear backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



Middle backplane cable routing

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

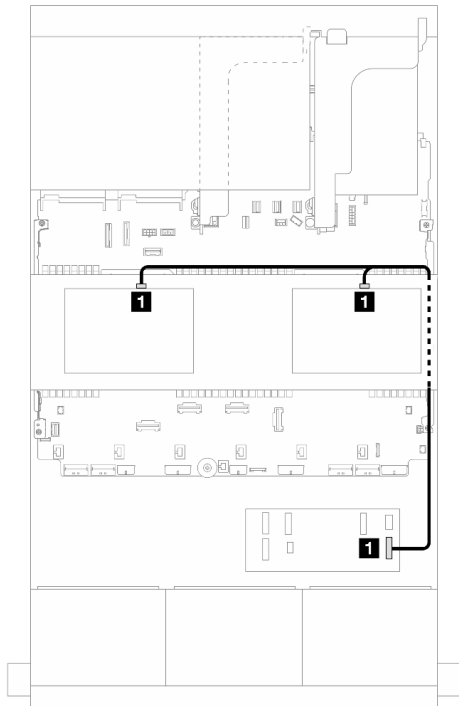


Figure 578. Signal cable routing

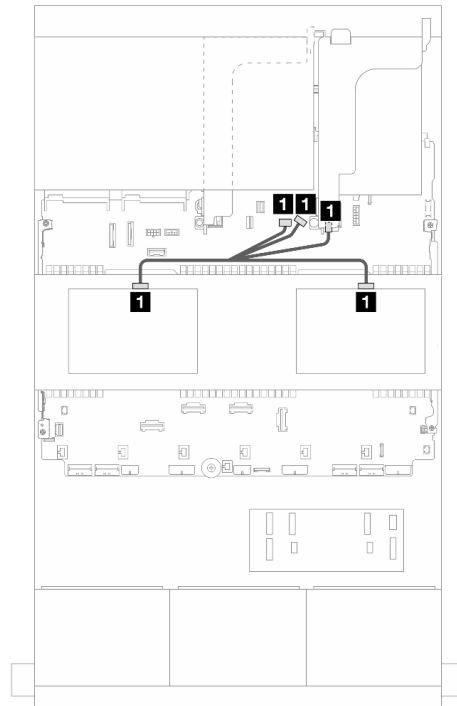


Figure 579. Power cable routing

From	To	From	To
<b>1</b> <ul style="list-style-type: none"> <li>Backplane 5: SAS</li> <li>Backplane 6: SAS</li> </ul>	CFF expander <ul style="list-style-type: none"> <li>C3</li> </ul>	<b>1</b> <ul style="list-style-type: none"> <li>Backplane 5: PWR</li> <li>Backplane 6: PWR</li> </ul>	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>

### CFF 16i RAID/HBA adapter + CFF expander

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA configuration with one CFF expander and one CFF 16i RAID/HBA adapter.

### Front backplane cable routing

#### Cable routing when two processors installed

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

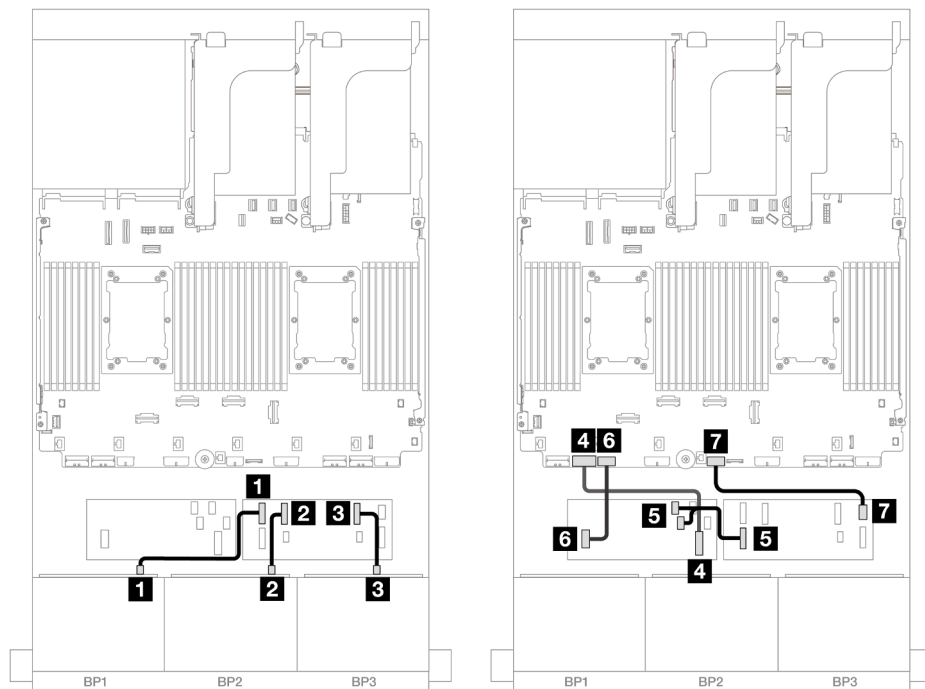


Figure 580. SAS/SATA cable routing to CFF expander and CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 7
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

### Cable routing when one processor installed

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

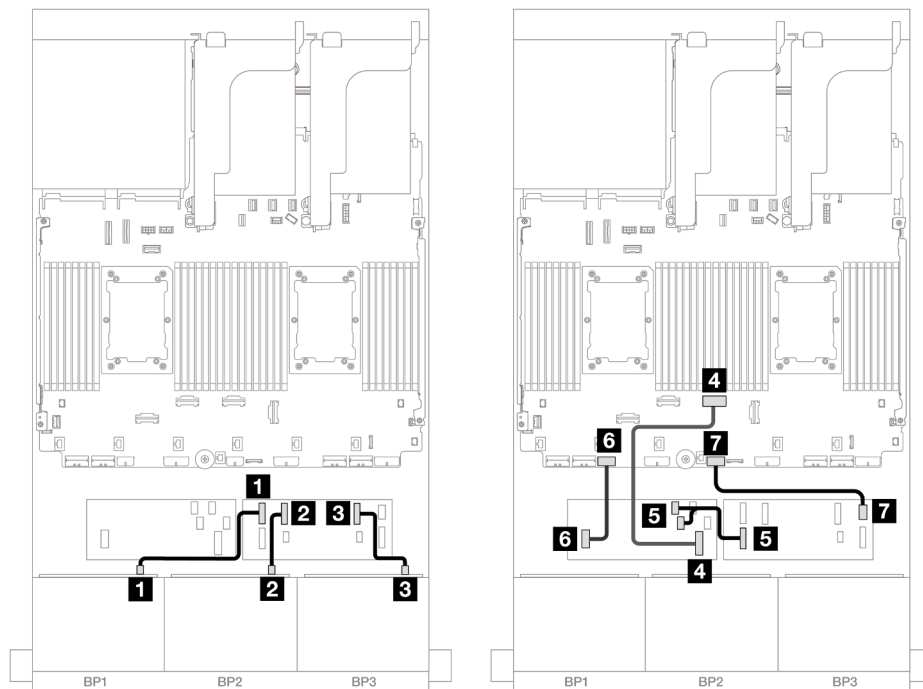


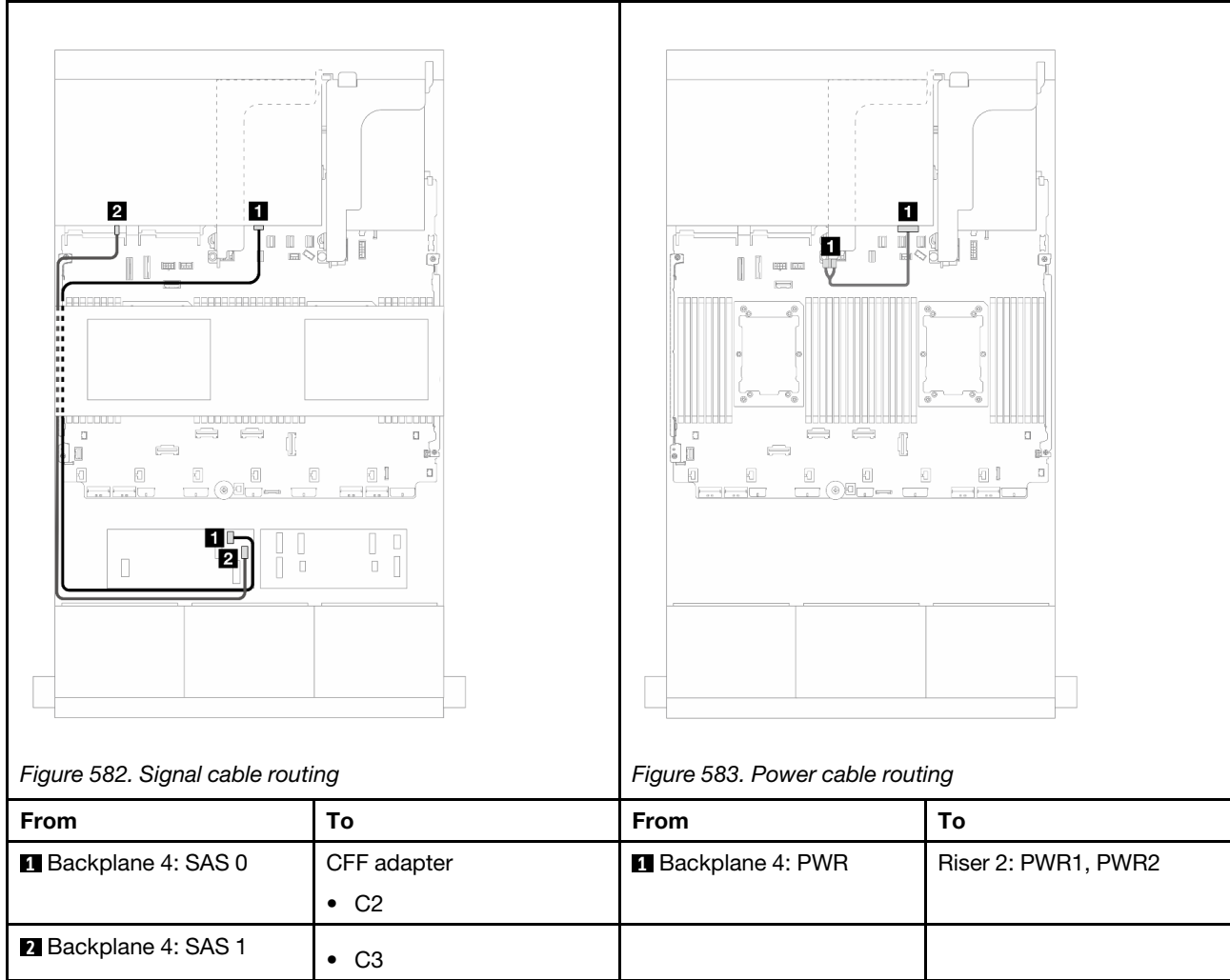
Figure 581. SAS/SATA cable routing to CFF expander and CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

### Rear backplane cable routing

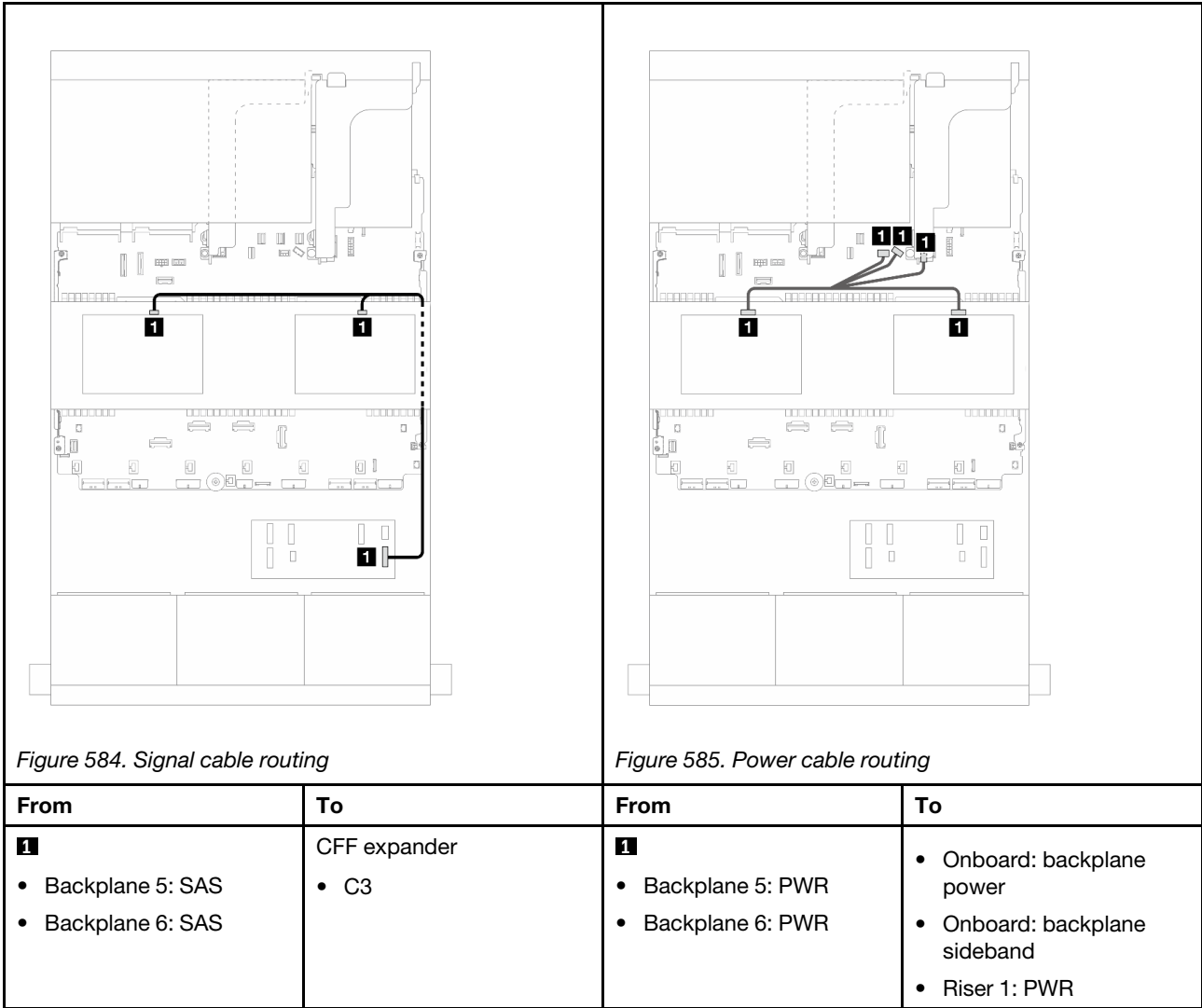
Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**





Middle backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



### Three 8 x AnyBay backplanes

This section provides cable routing information for the server model with three 8 x 2.5-inch AnyBay front drive backplanes.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“8i RAID/HBA Trimode adapters” on page 571](#)
- [“8i + 16i RAID/HBA Trimode adapters” on page 570](#)

#### 8i + 16i RAID/HBA Trimode adapters

The following shows the cable connections for the 24 x 2.5-inch AnyBay configuration with one Trimode 8i RAID/HBA adapter and one Trimode 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

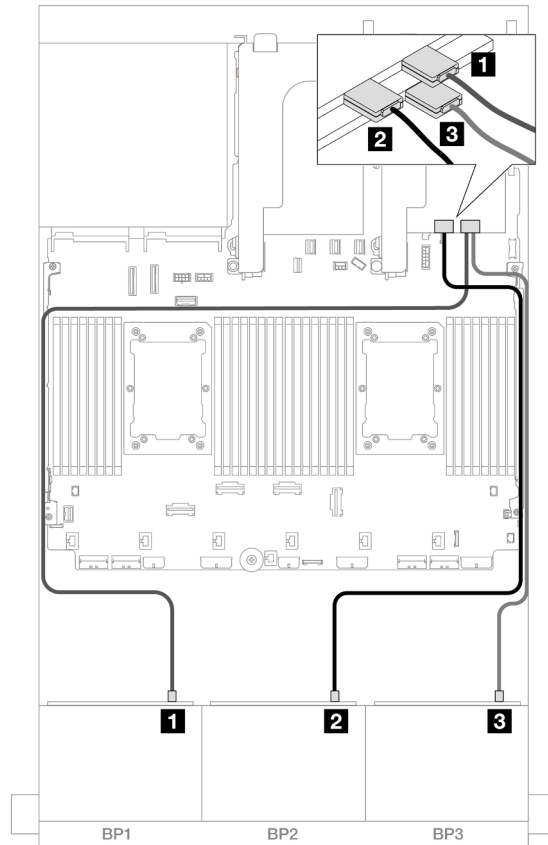


Figure 586. SAS/SATA cable routing to Trimode 8i/16i adapters

From	To
<b>1</b> Backplane 1: SAS	16i adapter <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	8i adapter <ul style="list-style-type: none"> <li>• C0</li> </ul>

## 8i RAID/HBA Trimode adapters

The following shows the cable connections for the 24 x 2.5-inch AnyBay configuration with three 8i Trimode RAID/HBA adapters.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

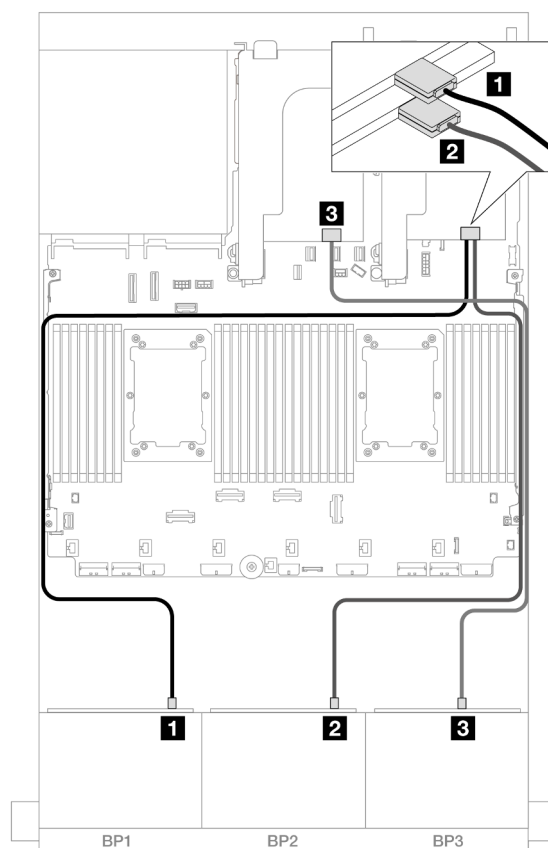


Figure 587. SAS/SATA cable routing to Trimode 8i adapters

From	To
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	8i adapter <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>3</b> Backplane 3: SAS	8i adapter <ul style="list-style-type: none"> <li>• C0</li> </ul>

## Three 8 x NVMe backplanes (Gen 4)

This section provides cable routing information for the server model with three 8 x 2.5-inch NVMe front drive backplanes (Gen 4).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“Front backplanes: 24 x NVMe” on page 573](#)
- [“Front + middle backplanes: 24 x NVMe + 8 x NVMe” on page 574](#)
- [“Front + rear backplanes: 24 x NVMe + 4 x NVMe” on page 575](#)

- “Front + middle + rear backplanes: 24 x NVMe + 8 x NVMe + 4 x NVMe” on page 577

## Front backplanes: 24 x NVMe

This section provides cable routing information for the server model with three 8 x 2.5-inch NVMe front drive backplanes (Gen 4).

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

## Onboard PCIe connectors + Retimer

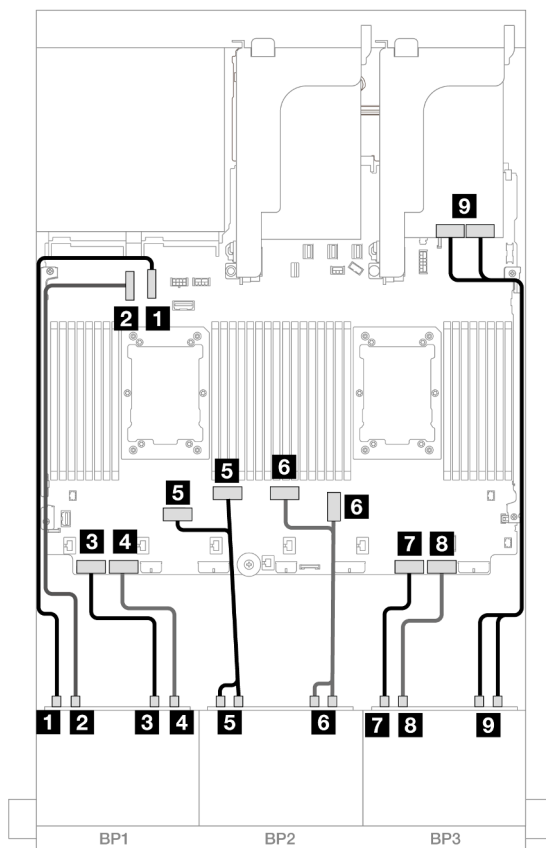


Figure 588. NVMe cable routing to onboard connectors and retimer

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7
<b>5</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 6, 5
<b>6</b> Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, 4
<b>7</b> Backplane 3: NVMe 0-1	Onboard: PCIe 2

From	To
<b>8</b> Backplane 3: NVMe 2-3	Onboard: PCIe 1
<b>9</b> Backplane 3: NVMe 4-5, 6-7	Retimer: C0, C1

### Front + middle backplanes: 24 x NVMe + 8 x NVMe

This section provides cable routing information for the 24 x NVMe (Gen 4) + 8 x NVMe configuration with three retimer cards.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

#### Front backplane cable routing

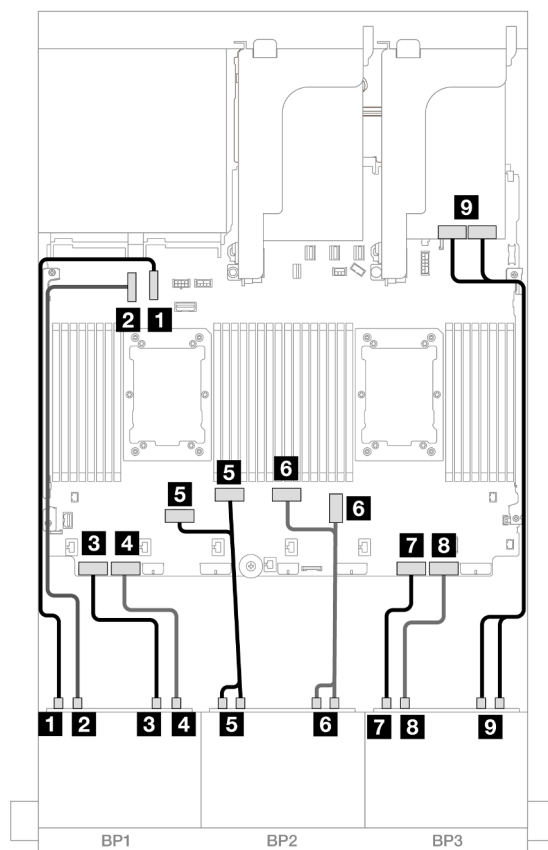


Figure 589. NVMe cable routing to onboard connectors and retimer

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7
<b>5</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 6, 5
<b>6</b> Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, 4

From	To
<b>7</b> Backplane 3: NVMe 0-1	Onboard: PCIe 2
<b>8</b> Backplane 3: NVMe 2-3	Onboard: PCIe 1
<b>9</b> Backplane 3: NVMe 4-5, 6-7	Retimer: C0, C1

### Middle backplane cable routing

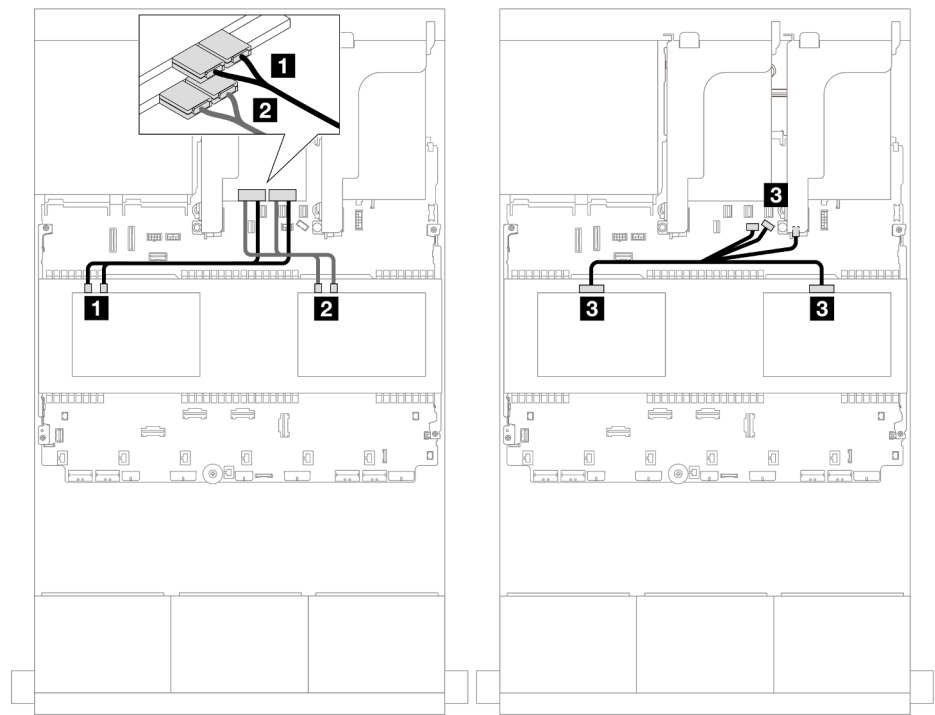


Figure 590. Middle backplane cable routing

From	To
<b>1</b> Backplane 5: NVMe 0-1, 2-3	Retimer: C0, C1
<b>2</b> Backplane 6: NVMe 0-1, 2-3	Retimer: C0, C1
<b>3</b> <ul style="list-style-type: none"> <li>Backplane 5: PWR</li> <li>Backplane 6: PWR</li> </ul>	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>

### Front + rear backplanes: 24 x NVMe + 4 x NVMe

This section provides cable routing information for the 24 x NVMe (Gen 4) + 4 x NVMe configuration with two retimer cards.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

## Front backplane cable routing

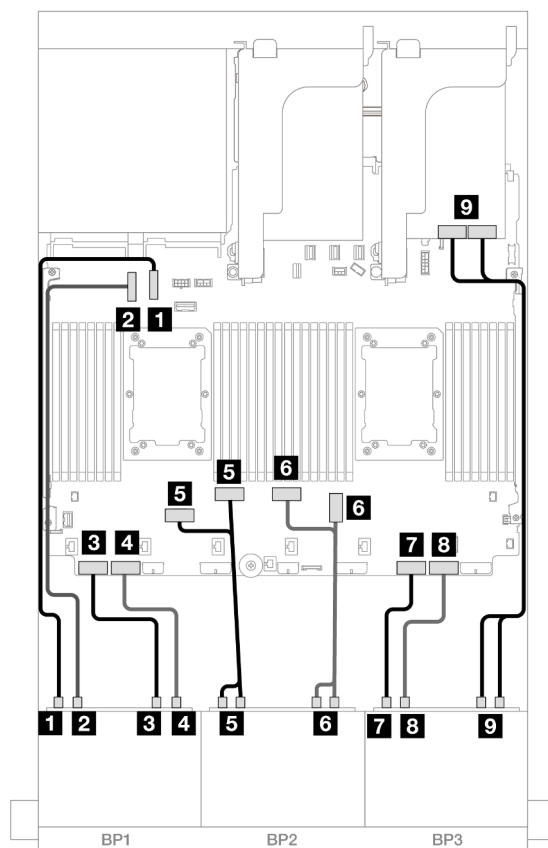


Figure 591. NVMe cable routing to onboard connectors and retimer

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7
<b>5</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 6, 5
<b>6</b> Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, 4
<b>7</b> Backplane 3: NVMe 0-1	Onboard: PCIe 2
<b>8</b> Backplane 3: NVMe 2-3	Onboard: PCIe 1
<b>9</b> Backplane 3: NVMe 4-5, 6-7	Retimer: C0, C1



## Rear backplane cable routing

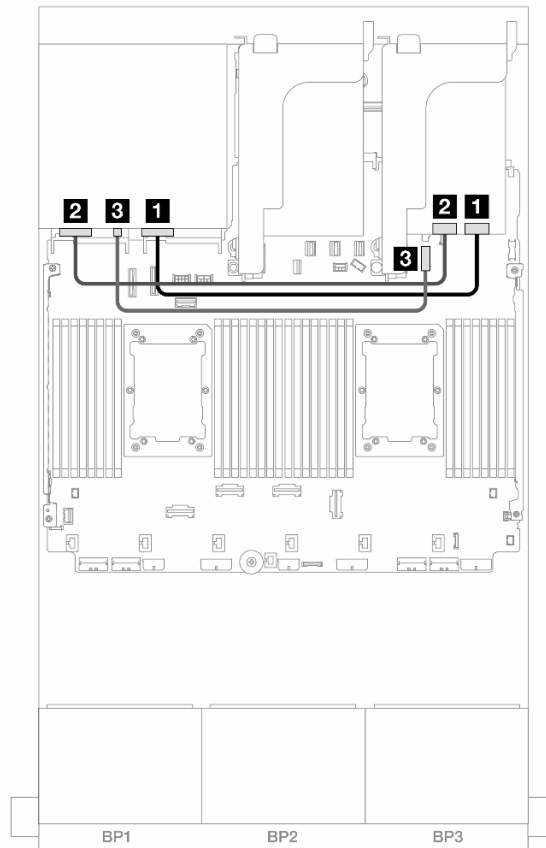


Figure 592. Rear backplane cable routing

From	To
<b>1</b> Backplane 4: NVMe 0-1	Retimer: C0
<b>2</b> Backplane 4: NVMe 2-3	Retimer: C1
<b>3</b> Backplane 4: PWR	<b>4</b> Onboard: 7mm power connector

## Front + middle + rear backplanes: 24 x NVMe + 8 x NVMe + 4 x NVMe

This section provides cable routing information for the 24 x NVMe (Gen 4) + 8 x NVMe + 4 x NVMe configuration with four retimer cards.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

## Front backplane cable routing

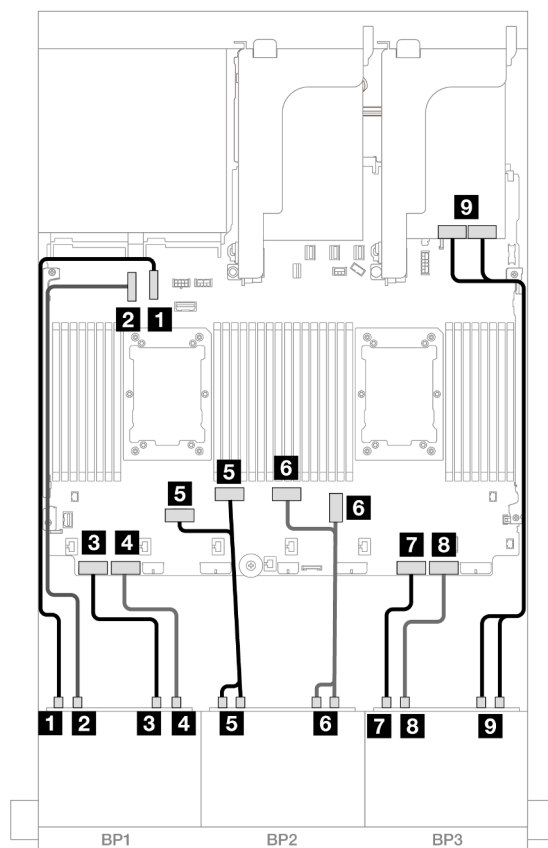


Figure 593. NVMe cable routing to onboard connectors and retimer

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7
<b>5</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 6, 5
<b>6</b> Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, 4
<b>7</b> Backplane 3: NVMe 0-1	Onboard: PCIe 2
<b>8</b> Backplane 3: NVMe 2-3	Onboard: PCIe 1
<b>9</b> Backplane 3: NVMe 4-5, 6-7	Retimer: C0, C1

## Middle/Rear backplane cable routing

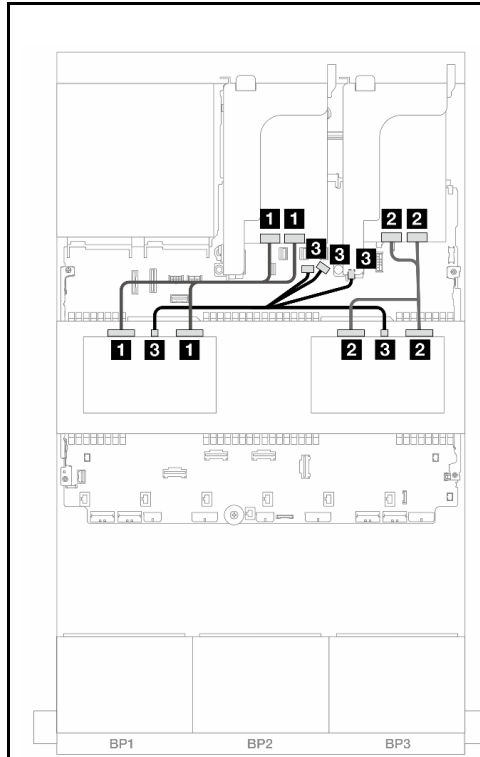


Figure 594. Middle backplane cable routing

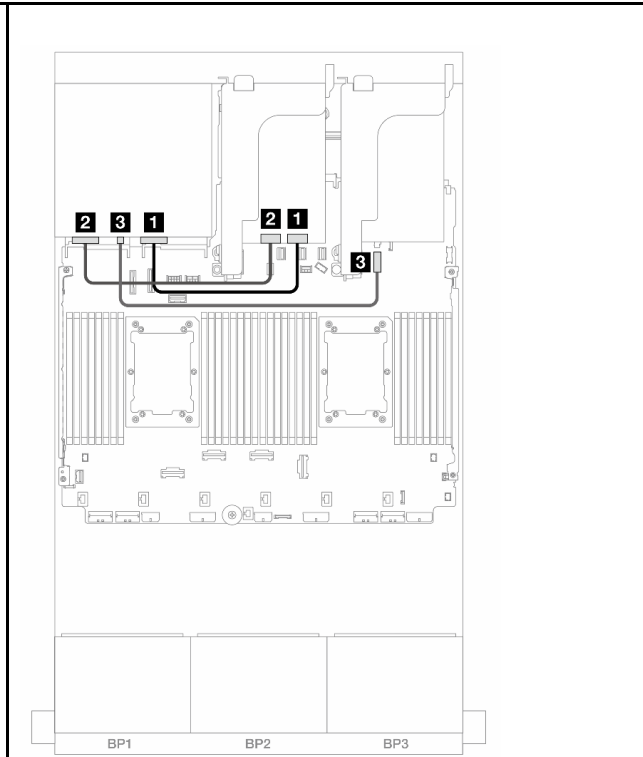


Figure 595. Rear backplane cable routing

From	To	From	To
<b>1</b> Backplane 5: NVMe 0-1, 2-3	Retimer: C0, C1	<b>1</b> Backplane 4: NVMe 0-1	Retimer: C0
<b>2</b> Backplane 6: NVMe 0-1, 2-3	Retimer: C0, C1	<b>2</b> Backplane 4: NVMe 2-3	Retimer: C1
<b>3</b> <ul style="list-style-type: none"> <li>Backplane 5: PWR</li> <li>Backplane 6: PWR</li> </ul>	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>	<b>3</b> Backplane 4: PWR	<b>4</b> Onboard: 7mm power connector

## Three 8 x NVMe backplanes (Gen 5)

This section provides cable routing information for the server model with three 8 x 2.5-inch NVMe front drive backplanes (Gen 5).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“Front backplanes: 24 x NVMe” on page 580](#)
- [“Front + rear backplanes: 24 x NVMe + 4 x NVMe” on page 582](#)
- [“Front + middle backplanes: 24 x NVMe + 8 x NVMe \(two 4 x AnyBay\)” on page 583](#)

- “Front + middle + rear backplanes: 24 x NVMe + 8 x NVMe (two 4 x AnyBay) + 4 x NVMe” on page 585

### Front backplanes: 24 x NVMe

This topic provides cable routing information for the 24 x 2.5" NVMe (Gen 5) configuration with one or two retimer cards.

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

#### Onboard connectors + One retimer card

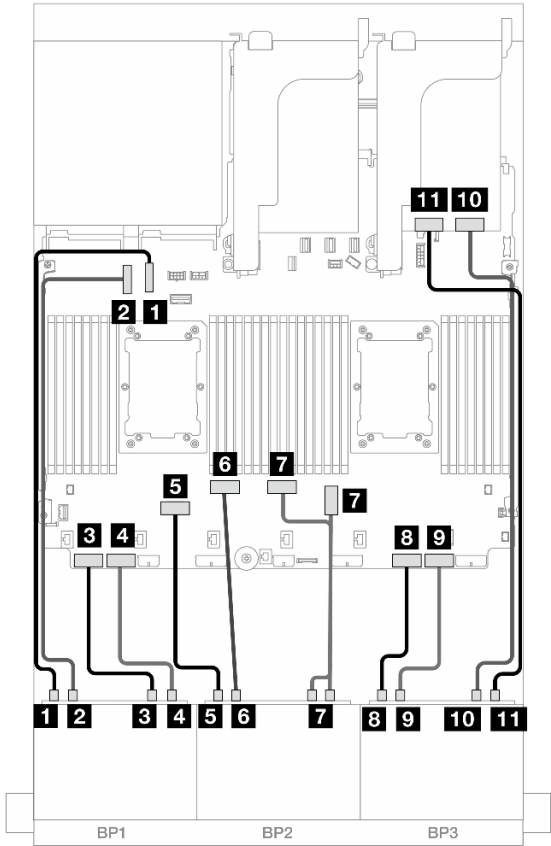


Figure 596. NVMe cable routing to onboard connectors and retimer card

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 6
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 5
<b>7</b> Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, 4
<b>8</b> Backplane 3: NVMe 0-1	Onboard: PCIe 2
<b>9</b> Backplane 3: NVMe 2-3	Onboard: PCIe 1

From	To
<b>10</b> Backplane 3: NVMe 4-5	Retimer: C0
<b>11</b> Backplane 3: NVMe 6-7	Retimer: C1

### Onboard connectors + Two retimer cards

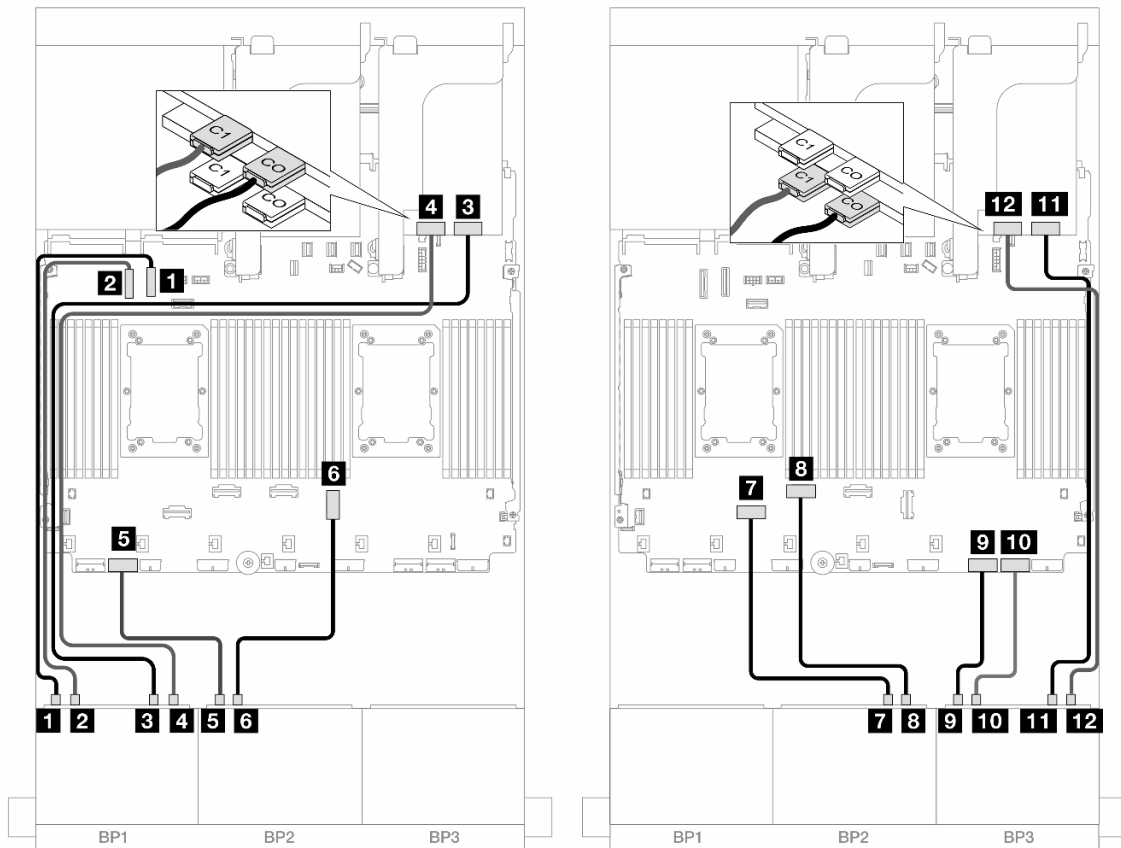


Figure 597. NVMe cable routing to onboard connectors and two retimer cards

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Retimer: C0
<b>4</b> Backplane 1: NVMe 6-7	Retimer: C1
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 7
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 3
<b>7</b> Backplane 2: NVMe 4-5	Onboard: PCIe 6
<b>8</b> Backplane 2: NVMe 6-7	Onboard: PCIe 5
<b>9</b> Backplane 3: NVMe 0-1	Onboard: PCIe 2
<b>10</b> Backplane 3: NVMe 2-3	Onboard: PCIe 1

From	To
<b>11</b> Backplane 3: NVMe 4-5	Retimer: C0
<b>12</b> Backplane 3: NVMe 6-7	Retimer: C1

## Front + rear backplanes: 24 x NVMe + 4 x NVMe

This section provides cable routing information for the 24 x 2.5" NVMe (Gen 5) + 4 x 2.5" NVMe configuration with three retimer cards.

Connections between connectors: **1** ↔ **11**, **2** ↔ **12**, **3** ↔ **3**, ... **n** ↔ **n**

### Front backplane cable routing

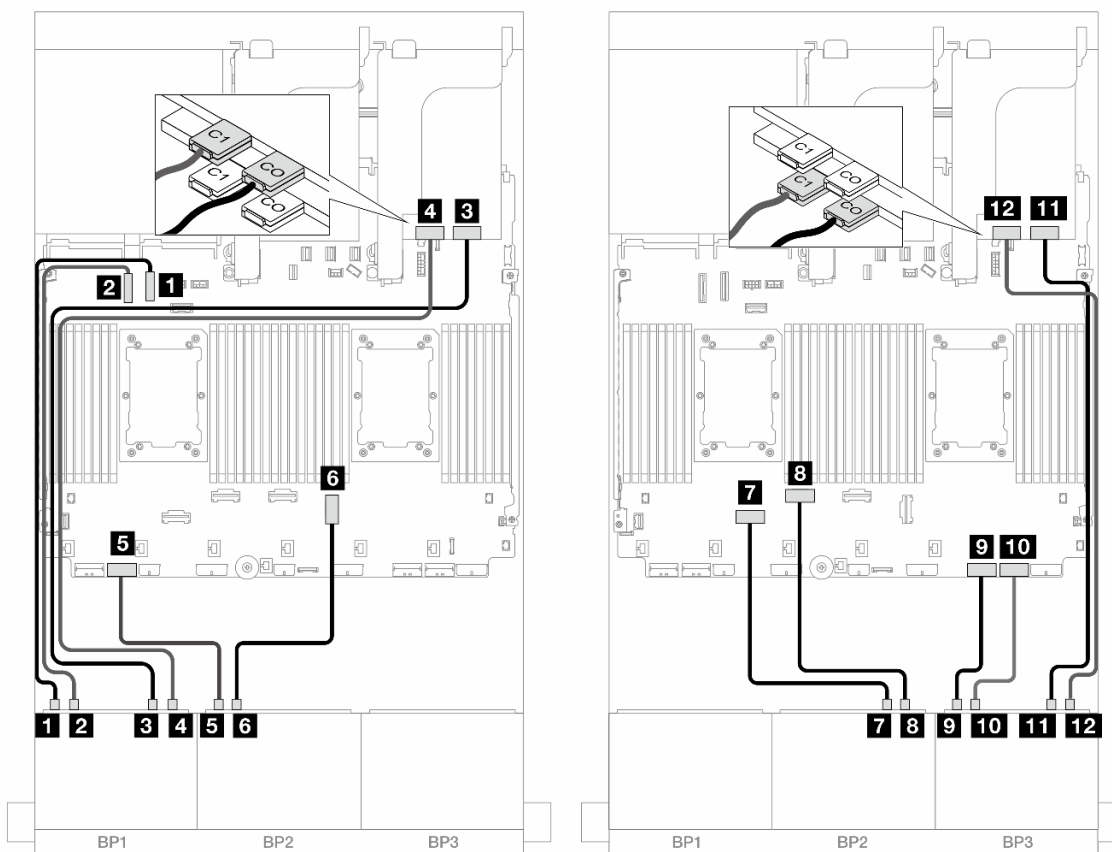


Figure 598. NVMe cable routing to onboard connectors and two retimer cards

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Retimer: C0
<b>4</b> Backplane 1: NVMe 6-7	Retimer: C1
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 7
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 3

From	To
<b>7</b> Backplane 2: NVMe 4-5	Onboard: PCIe 6
<b>8</b> Backplane 2: NVMe 6-7	Onboard: PCIe 5
<b>9</b> Backplane 3: NVMe 0-1	Onboard: PCIe 2
<b>10</b> Backplane 3: NVMe 2-3	Onboard: PCIe 1
<b>11</b> Backplane 3: NVMe 4-5	Retimer: C0
<b>12</b> Backplane 3: NVMe 6-7	Retimer: C1

### Rear backplane cable routing

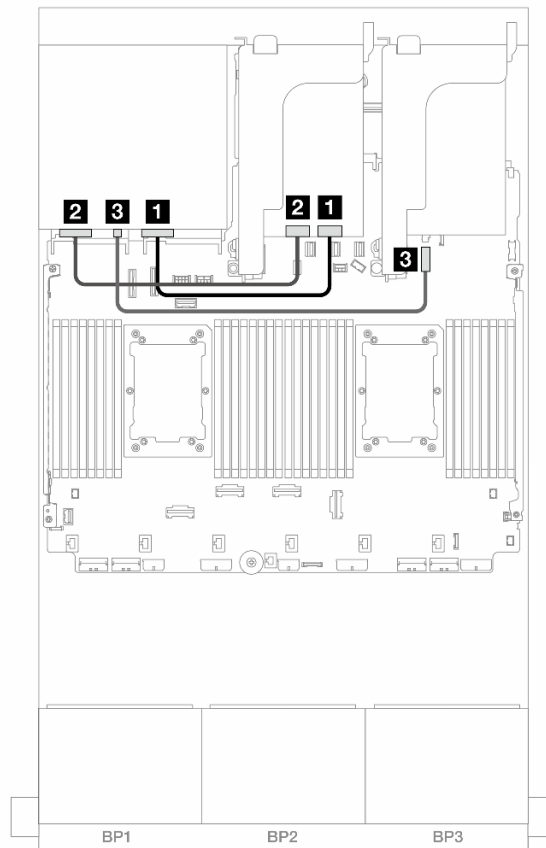


Figure 599. Rear backplane cable routing

From	To
<b>1</b> Backplane 4: NVMe 0-1	Retimer: C0
<b>2</b> Backplane 4: NVMe 2-3	Retimer: C1
<b>3</b> Backplane 4: PWR	<b>4</b> Onboard: 7mm power connector

### Front + middle backplanes: 24 x NVMe + 8 x NVMe (two 4 x AnyBay)

This topic provides cable routing information for the 24 x 2.5" NVMe (Gen 5) + 8 x 2.5" NVMe (using two 4 x 2.5" AnyBay backplanes) configuration with three retimer cards.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

### Front backplane cable routing

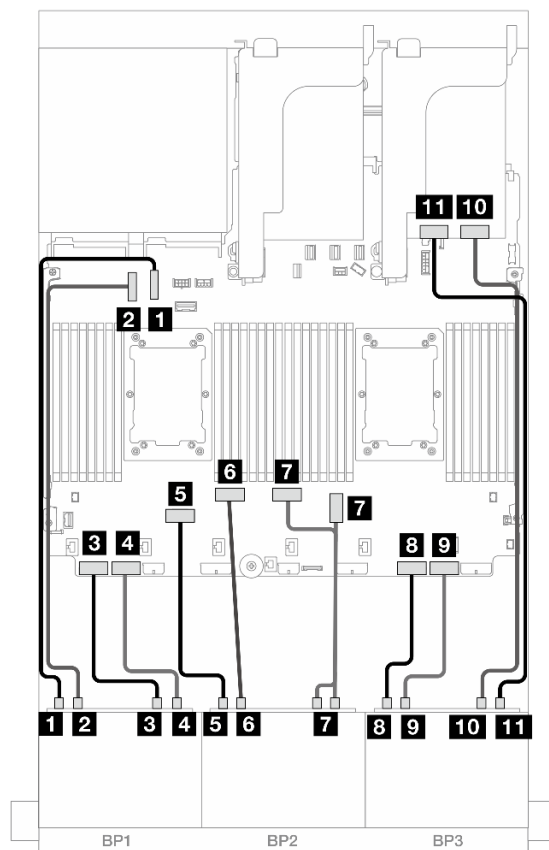


Figure 600. NVMe cable routing to onboard connectors and retimer card

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 6
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 5
<b>7</b> Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, 4
<b>8</b> Backplane 3: NVMe 0-1	Onboard: PCIe 2
<b>9</b> Backplane 3: NVMe 2-3	Onboard: PCIe 1
<b>10</b> Backplane 3: NVMe 4-5	Retimer: C0
<b>11</b> Backplane 3: NVMe 6-7	Retimer: C1



Middle backplane cable routing

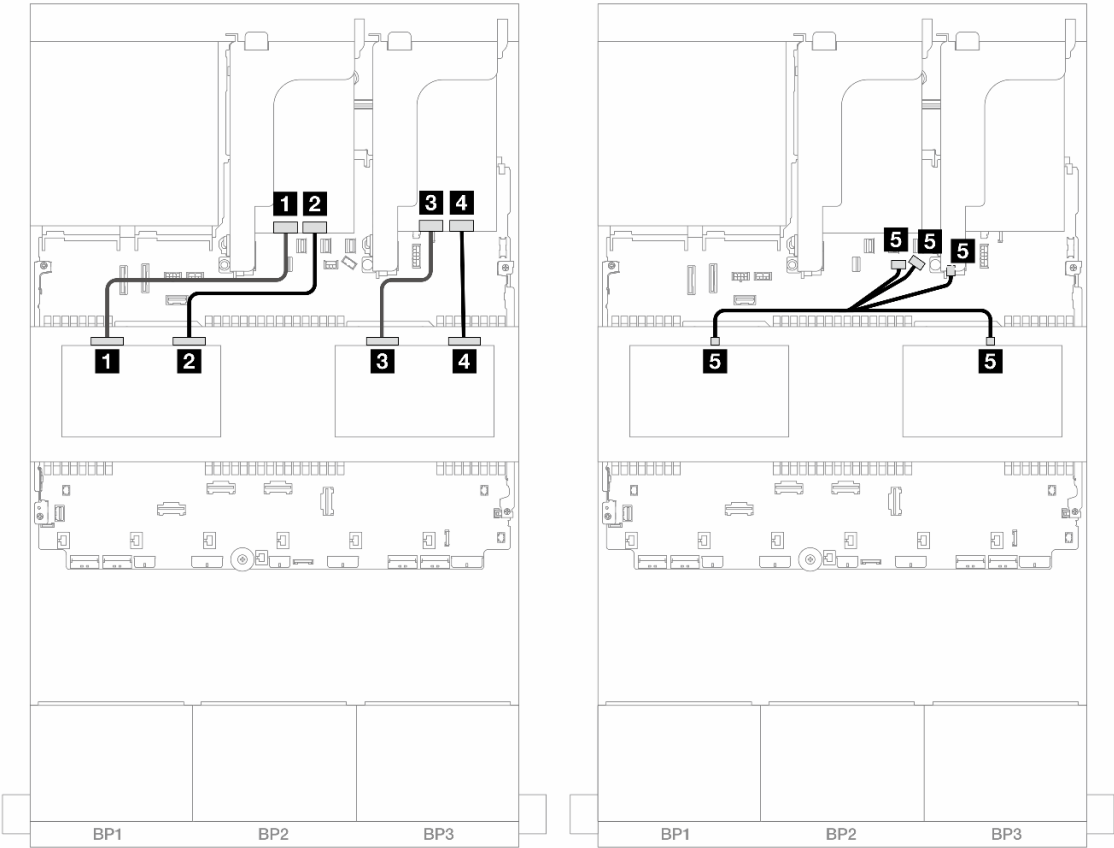


Figure 601. Middle backplane cable routing

From	To
1 Backplane 5: NVMe 0-1	Retimer: C1
2 Backplane 5: NVMe 2-3	Retimer: C0
3 Backplane 6: NVMe 0-1	Retimer: C1
4 Backplane 6: NVMe 2-3	Retimer: C0
5 <ul style="list-style-type: none"><li>Backplane 5: PWR</li><li>Backplane 6: PWR</li></ul>	<ul style="list-style-type: none"><li>Onboard: backplane power</li><li>Onboard: backplane sideband</li><li>Riser 1: PWR</li></ul>

Front + middle + rear backplanes: 24 x NVMe + 8 x NVMe (two 4 x AnyBay) + 4 x NVMe

This section provides cable routing information for the 24 x 2.5" NVMe + 8 x 2.5" NVMe (using two 4 x 2.5" AnyBay backplanes) + 4 x 2.5" NVMe configuration with four retimer cards.

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

## Front backplane cable routing

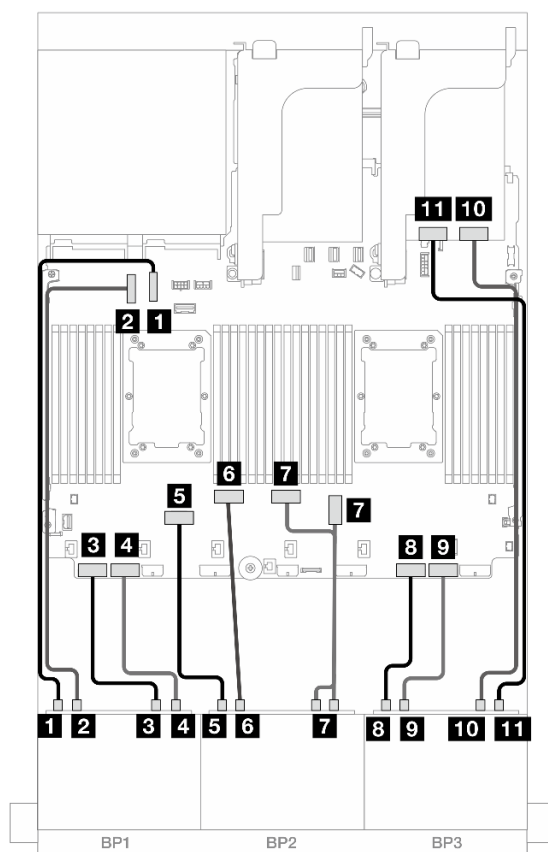


Figure 602. NVMe cable routing to onboard connectors and retimer card

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 6
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 5
<b>7</b> Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, 4
<b>8</b> Backplane 3: NVMe 0-1	Onboard: PCIe 2
<b>9</b> Backplane 3: NVMe 2-3	Onboard: PCIe 1
<b>10</b> Backplane 3: NVMe 4-5	Retimer: C0
<b>11</b> Backplane 3: NVMe 6-7	Retimer: C1

## Middle backplane cable routing

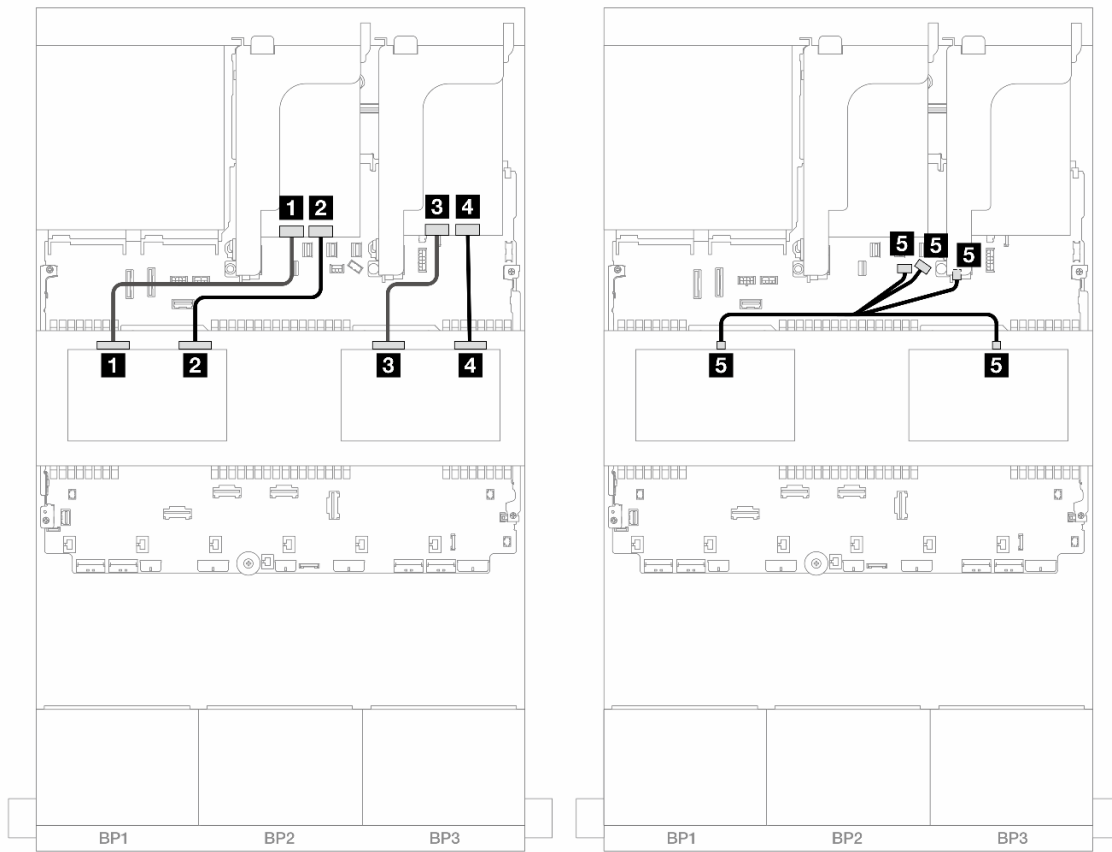


Figure 603. Middle backplane cable routing

From	To
<b>1</b> Backplane 5: NVMe 0-1	Retimer: C1
<b>2</b> Backplane 5: NVMe 2-3	Retimer: C0
<b>3</b> Backplane 6: NVMe 0-1	Retimer: C1
<b>4</b> Backplane 6: NVMe 2-3	Retimer: C0
<b>5</b> <ul style="list-style-type: none"> <li>Backplane 5: PWR</li> <li>Backplane 6: PWR</li> </ul>	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>

Rear backplane cable routing

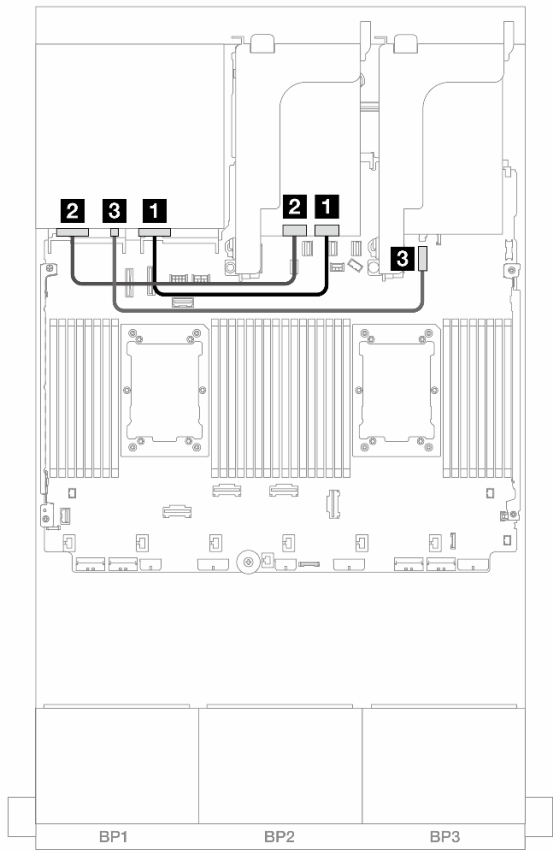


Figure 604. Rear backplane cable routing

From	To
1 Backplane 4: NVMe 0-1	Retimer: C0
2 Backplane 4: NVMe 2-3	Retimer: C1
3 Backplane 4: PWR	4 Onboard: 7mm power connector

One 8 x AnyBay and two 8 x NVMe backplanes (Gen 4)

This section provides cable routing information for the server model with one 8 x 2.5-inch AnyBay and two 8 x 2.5-inch NVMe front drive backplanes (Gen 4).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

SAS/SATA cable routing

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

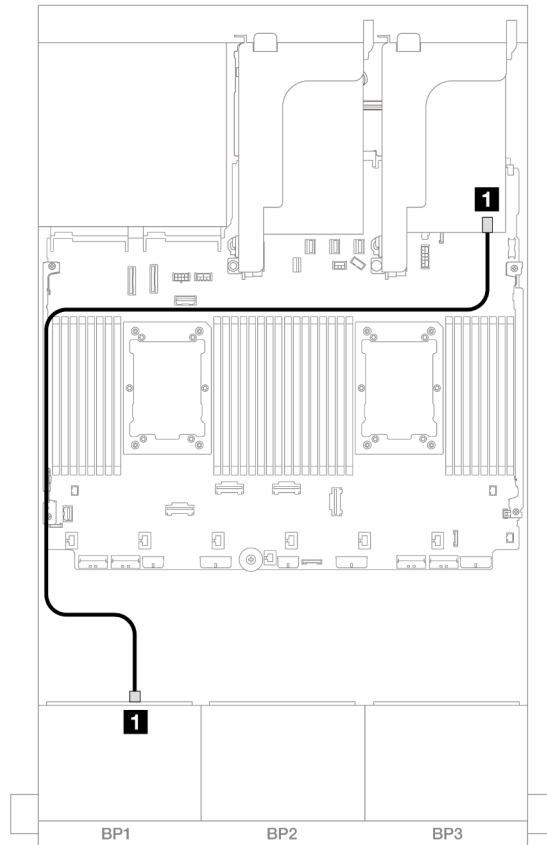


Figure 605. SAS/SATA cable routing to 8i adapter

From	To
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>

### NVMe cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

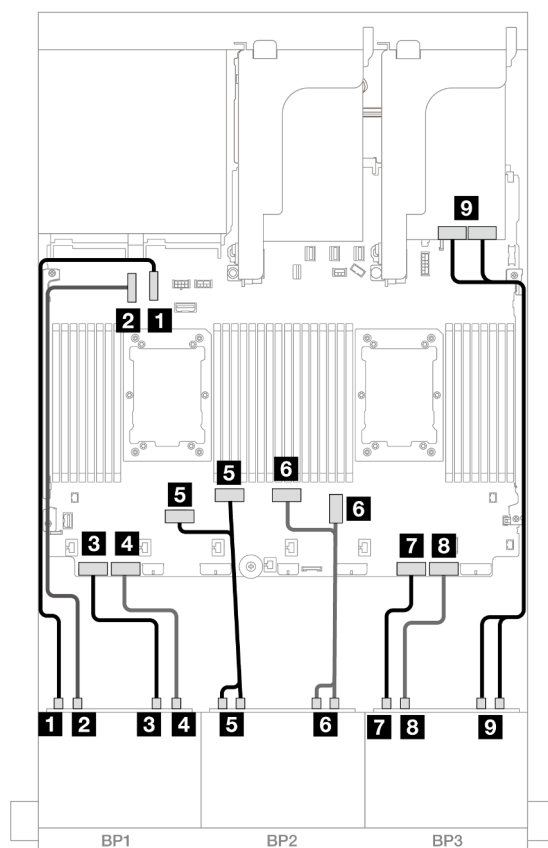


Figure 606. NVMe cable routing to onboard connectors and Retimer card

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7
<b>5</b> Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 6, 5
<b>6</b> Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, 4
<b>7</b> Backplane 3: NVMe 0-1	Onboard: PCIe 2
<b>8</b> Backplane 3: NVMe 2-3	Onboard: PCIe 1
<b>9</b> Backplane 3: NVMe 4-5, 6-7	Retimer: C0, C1

## One 8 x AnyBay and two 8 x NVMe backplanes (Gen 5)

This section provides cable routing information for the server model with one 8 x 2.5-inch AnyBay and two 8 x 2.5-inch NVMe front drive backplanes (Gen 5).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- “8i RAID/HBA adapter + One retimer card” on page 591
- “8i RAID/HBA adapter + Two retimer cards” on page 592

## 8i RAID/HBA adapter + One retimer card

This topic provides cable routing information for the 8 x 2.5-inch AnyBay + 16 x 2.5-inch NVMe configuration (Gen 5) with one 8i RAID/HBA adapter and one retimer card.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

### SAS/SATA cable routing

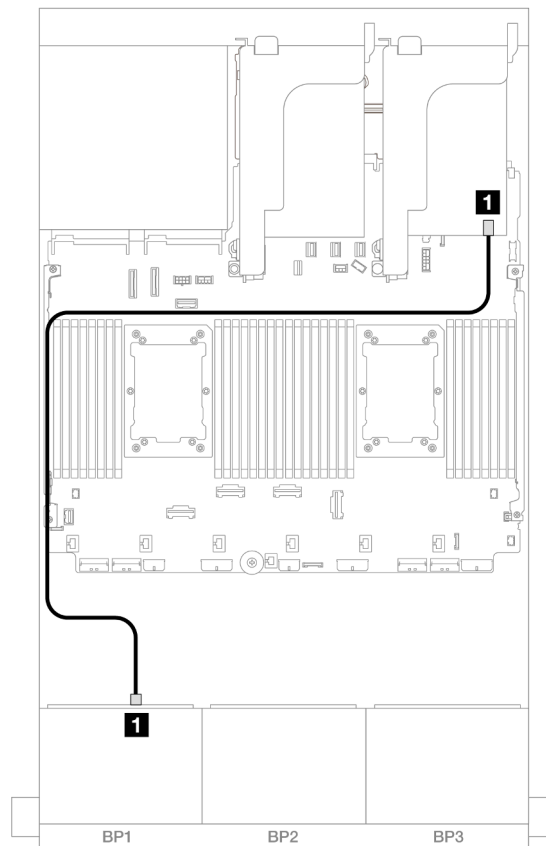


Figure 607. SAS/SATA cable routing to 8i adapter

From	To
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>

## NVMe cable routing

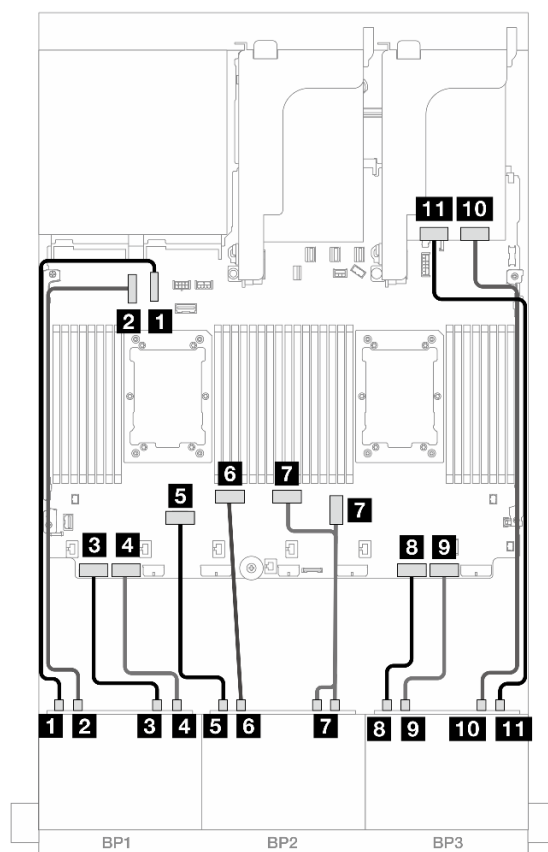


Figure 608. NVMe cable routing to onboard connectors and retimer card

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Onboard: PCIe 8
<b>4</b> Backplane 1: NVMe 6-7	Onboard: PCIe 7
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 6
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 5
<b>7</b> Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, 4
<b>8</b> Backplane 3: NVMe 0-1	Onboard: PCIe 2
<b>9</b> Backplane 3: NVMe 2-3	Onboard: PCIe 1
<b>10</b> Backplane 3: NVMe 4-5	Retimer: C0
<b>11</b> Backplane 3: NVMe 6-7	Retimer: C1

## 8i RAID/HBA adapter + Two retimer cards

This topic provides cable routing information for the 8 x 2.5-inch AnyBay + 16 x 2.5-inch NVMe configuration (Gen 5) with one 8i RAID/HBA adapter and two retimer cards when two Platinum series processors are installed.



Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

### SAS/SATA cable routing

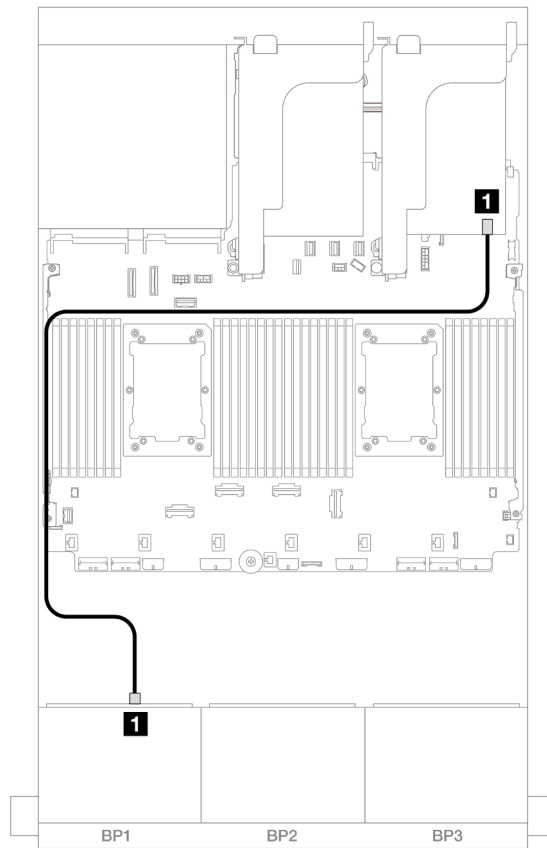


Figure 609. SAS/SATA cable routing to 8i adapter

From	To
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>

## NVMe cable routing

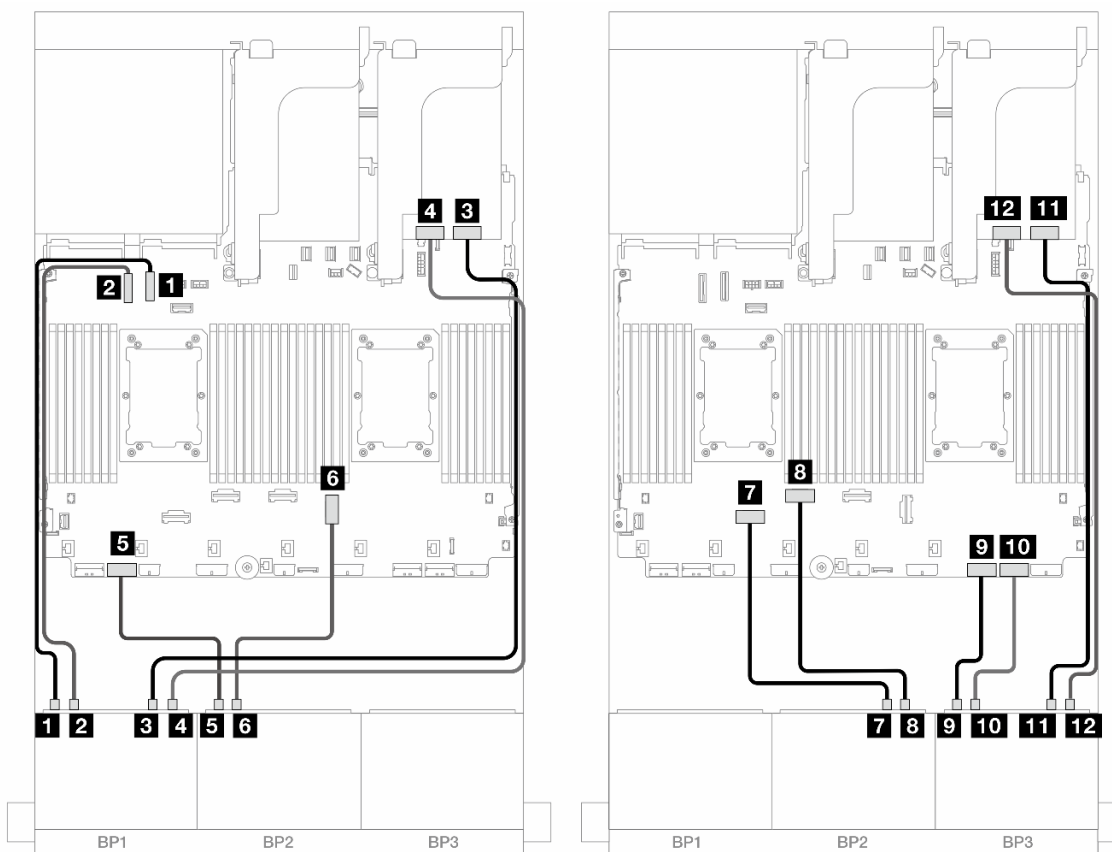


Figure 610. NVMe cable routing to onboard connectors and two retimer cards

From	To
<b>1</b> Backplane 1: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: NVMe 2-3	Onboard: PCIe 9
<b>3</b> Backplane 1: NVMe 4-5	Retimer: C0
<b>4</b> Backplane 1: NVMe 6-7	Retimer: C1
<b>5</b> Backplane 2: NVMe 0-1	Onboard: PCIe 7
<b>6</b> Backplane 2: NVMe 2-3	Onboard: PCIe 3
<b>7</b> Backplane 2: NVMe 4-5	Onboard: PCIe 6
<b>8</b> Backplane 2: NVMe 6-7	Onboard: PCIe 5
<b>9</b> Backplane 3: NVMe 0-1	Onboard: PCIe 2
<b>10</b> Backplane 3: NVMe 2-3	Onboard: PCIe 1
<b>11</b> Backplane 3: NVMe 4-5	Retimer: C0
<b>12</b> Backplane 3: NVMe 6-7	Retimer: C1

# One 8 x SAS/SATA and two 8 x NVMe (Gen 4) backplanes

This section provides cable routing information for the server model with one 8 x 2.5" SAS/SATA front drive backplane and two 8 x 2.5" NVMe front drive backplanes (Gen 4).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422.](#)

## SAS/SATA cable routing

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

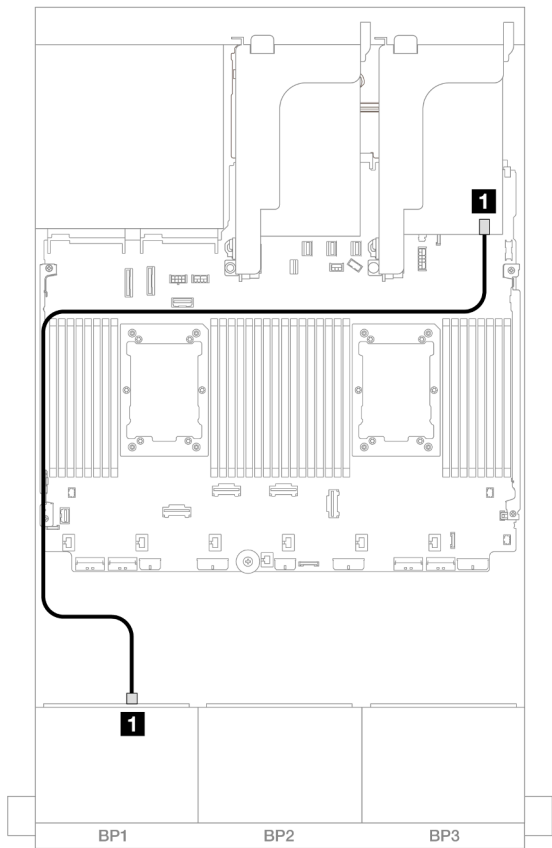


Figure 611. SAS/SATA cable routing to 8i adapter

From	To
1 Backplane 1: SAS	8i adapter <ul style="list-style-type: none"><li>Gen 4: C0</li><li>Gen 3: C0C1</li></ul>

## NVMe cable routing

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

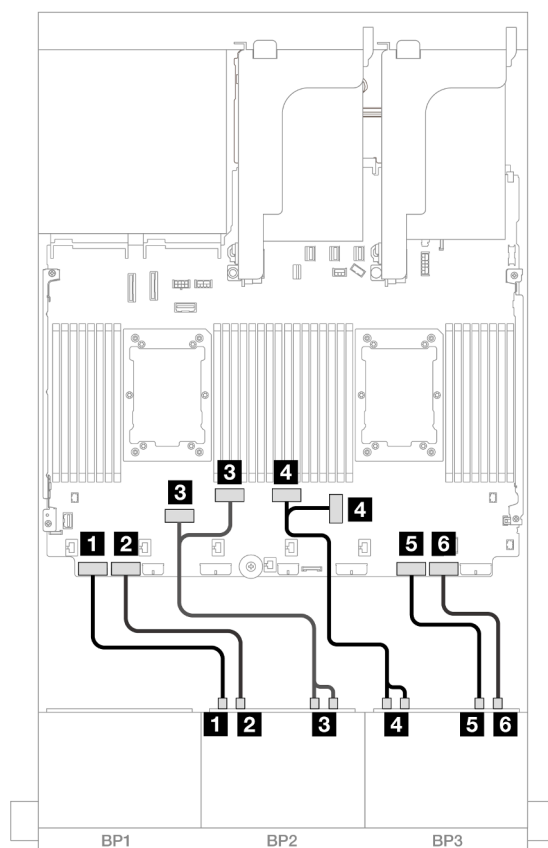


Figure 612. NVMe cable routing

From	To
<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 6, 5
<b>4</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>5</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>6</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1

## One 8 x SAS/SATA and two 8 x NVMe (Gen 5) backplanes

This section provides cable routing information for the server model with one 8 x 2.5" SAS/SATA front drive backplane and two 8 x 2.5" NVMe front drive backplanes (Gen 5).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“Onboard connectors + 8i RAID/HBA adapter” on page 597](#)
- [“Onboard connectors + 8i RAID/HBA adapter + Retimer card” on page 598](#)

Onboard connectors + 8i RAID/HBA adapter

This topic provides cable routing information for the 8 x 2.5" SAS/SATA + 16 x 2.5" NVMe (Gen 5) configuration with one 8i RAID/HBA adapter.

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

SAS/SATA cable routing

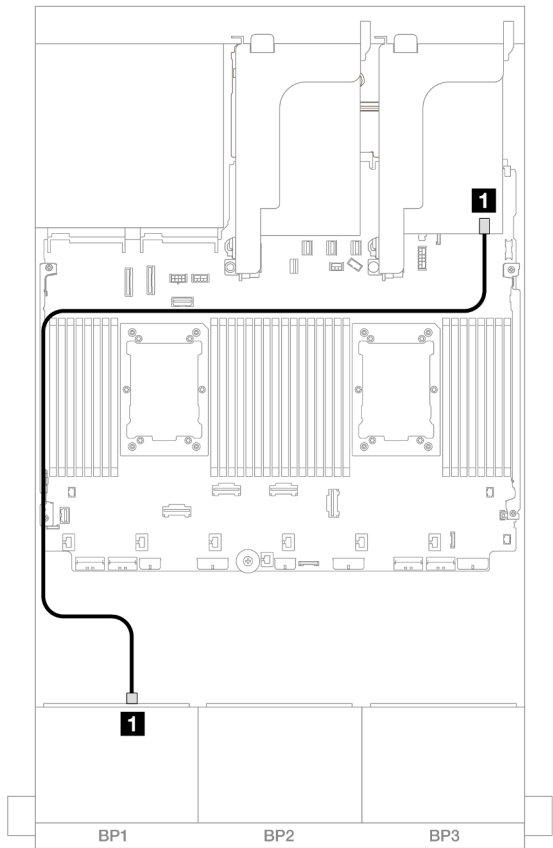


Figure 613. SAS/SATA cable routing to 8i adapter

From	To
1 Backplane 1: SAS	8i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>

NVMe cable routing

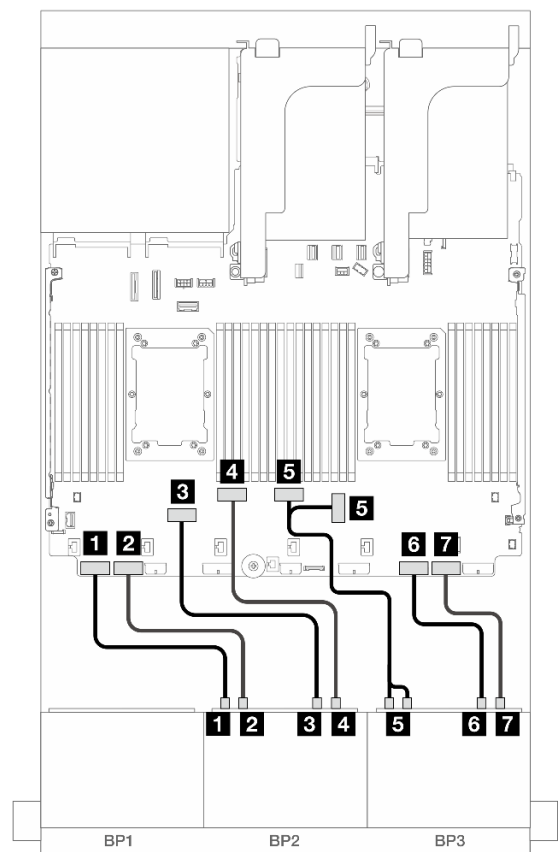


Figure 614. NVMe cable routing to onboard connectors

From	To
<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 2: NVMe 2-3	Onboard: PCIe 7
<b>3</b> Backplane 2: NVMe 4-5	Onboard: PCIe 6
<b>4</b> Backplane 2: NVMe 6-7	Onboard: PCIe 5
<b>5</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 4, 3
<b>6</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>7</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1

Onboard connectors + 8i RAID/HBA adapter + Retimer card

This topic provides cable routing information for the 8 x 2.5" SAS/SATA + 16 x 2.5" NVMe (Gen 5) configuration with one 8i RAID/HBA adapter and one retimer card when two Platinum series processors are installed.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

SAS/SATA cable routing

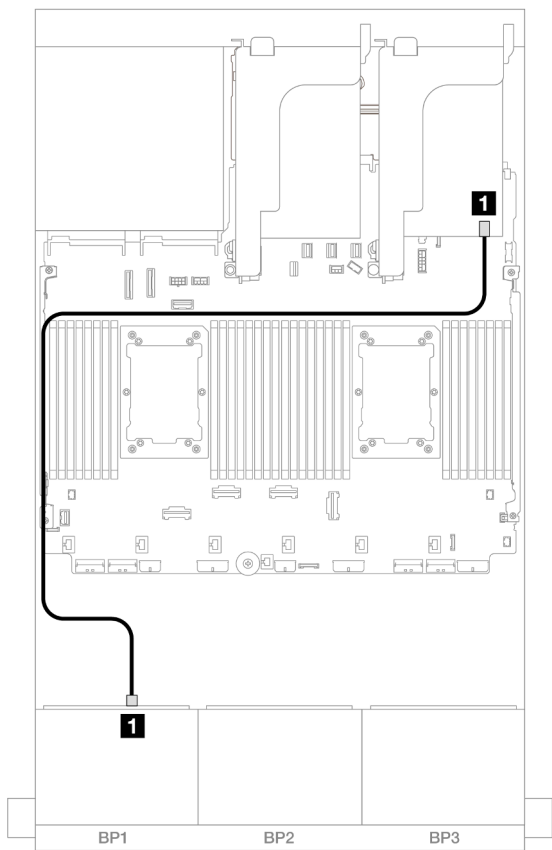


Figure 615. SAS/SATA cable routing to 8i adapter

From	To
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>

## NVMe cable routing

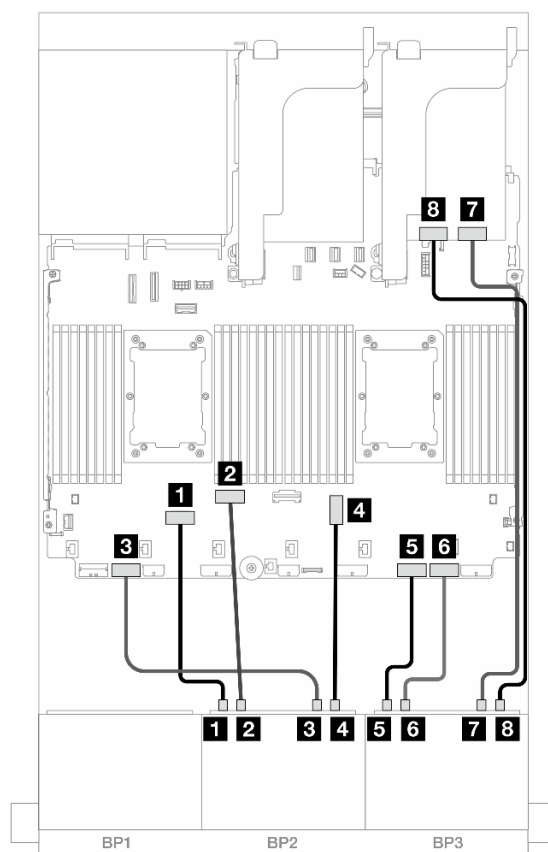


Figure 616. NVMe cable routing to onboard connectors and retimer card

From	To
<b>1</b> Backplane 2: NVMe 0-1	Onboard: PCIe 6
<b>1</b> Backplane 2: NVMe 2-3	Onboard: PCIe 5
<b>2</b> Backplane 2: NVMe 4-5	Onboard: PCIe 7
<b>3</b> Backplane 2: NVMe 6-7	Onboard: PCIe 3
<b>4</b> Backplane 3: NVMe 0-1	Onboard: PCIe 2
<b>5</b> Backplane 3: NVMe 2-3	Onboard: PCIe 1
<b>6</b> Backplane 3: NVMe 4-5	Retimer: C0
<b>7</b> Backplane 3: NVMe 6-7	Retimer: C1

## One 8 x SAS/SATA and two 8 x AnyBay backplanes

This section provides cable routing information for the server model with one 8 x 2.5-inch SAS/SATA and two 8 x 2.5-inch AnyBay front drive backplanes.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).



## 8i RAID/HBA adapter + 16i Trimode RAID adapter

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

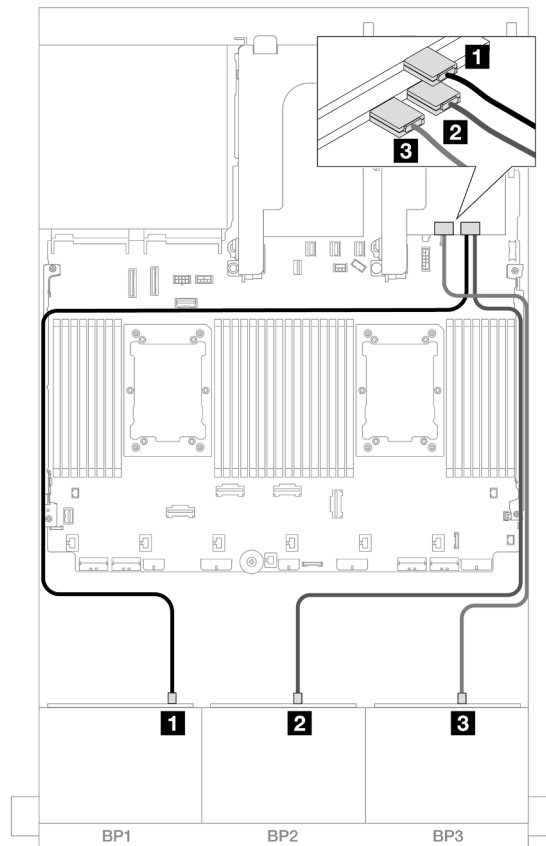


Figure 617. Cable routing to one 8i adapter and one Trimode 16i adapter

From	To
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"><li>• C0</li></ul>
<b>2</b> Backplane 2: SAS	16i adapter <ul style="list-style-type: none"><li>• C0</li></ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"><li>• C1</li></ul>

## Two 8 x SAS/SATA and one 8 x AnyBay (Gen 4) backplanes

This section provides cable routing information for the server model with two 8 x 2.5-inch SAS/SATA and one 8 x 2.5-inch AnyBay (Gen 4) front drive backplanes.

- [“Front backplanes: 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay” on page 601](#)
- [“Front + rear backplanes: \(16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay\) + 4 x 2.5" SAS/SATA” on page 606](#)

### Front backplanes: 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay

This topic provides cable routing information for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 4) configuration.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“32i RAID/HBA adapter” on page 602](#)
- [“8i RAID/HBA adapters” on page 603](#)
- [“CFF expander + 8i RAID/HBA adapter” on page 604](#)

**32i RAID/HBA adapter**

This topic provides cable routing information for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 4) configuration with one 32i RAID/HBA adapter.

**SAS/SATA cable routing**

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

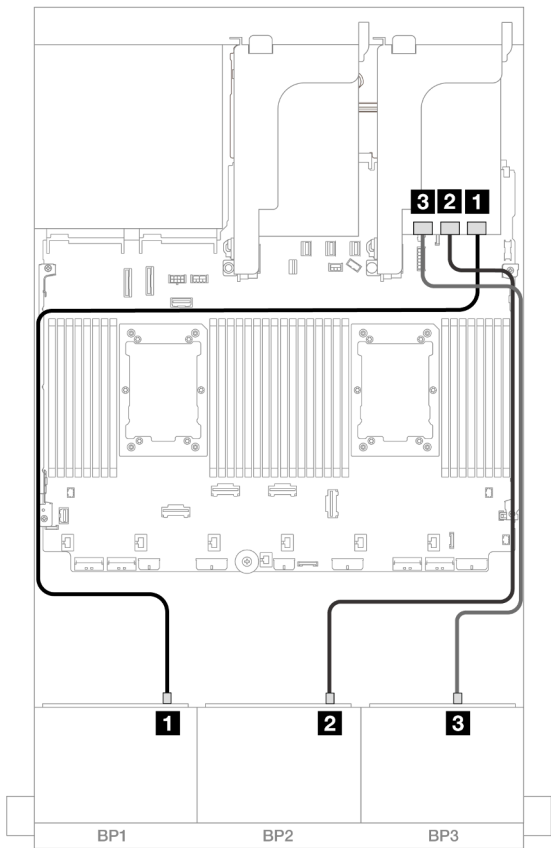


Figure 618. SAS/SATA cable routing

From	To
<b>1</b> Backplane 1: SAS	32i adapter <ul style="list-style-type: none"><li>• C0</li></ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"><li>• C1</li></ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"><li>• C2</li></ul>

## NVMe cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

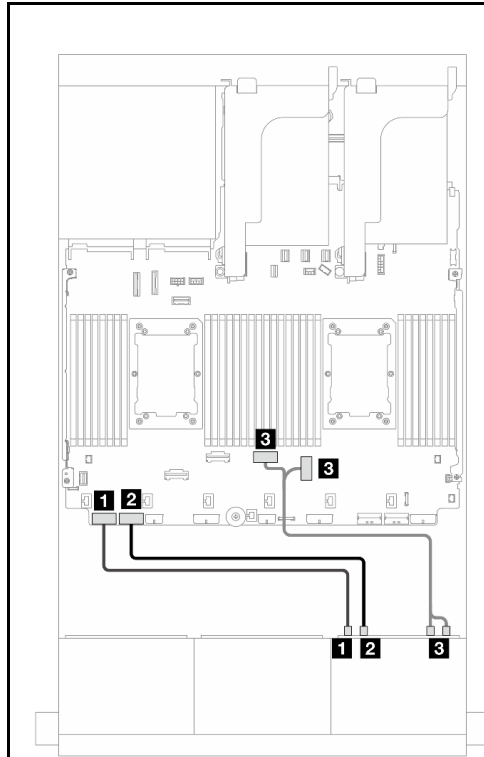


Figure 619. Cable routing when two processors installed

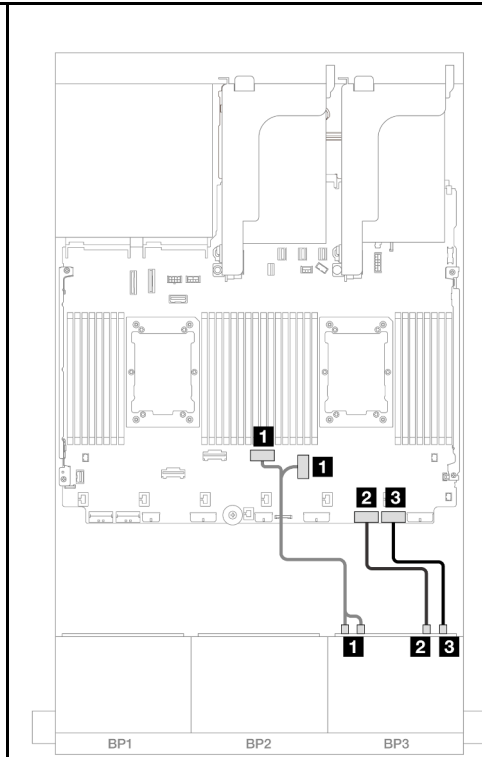


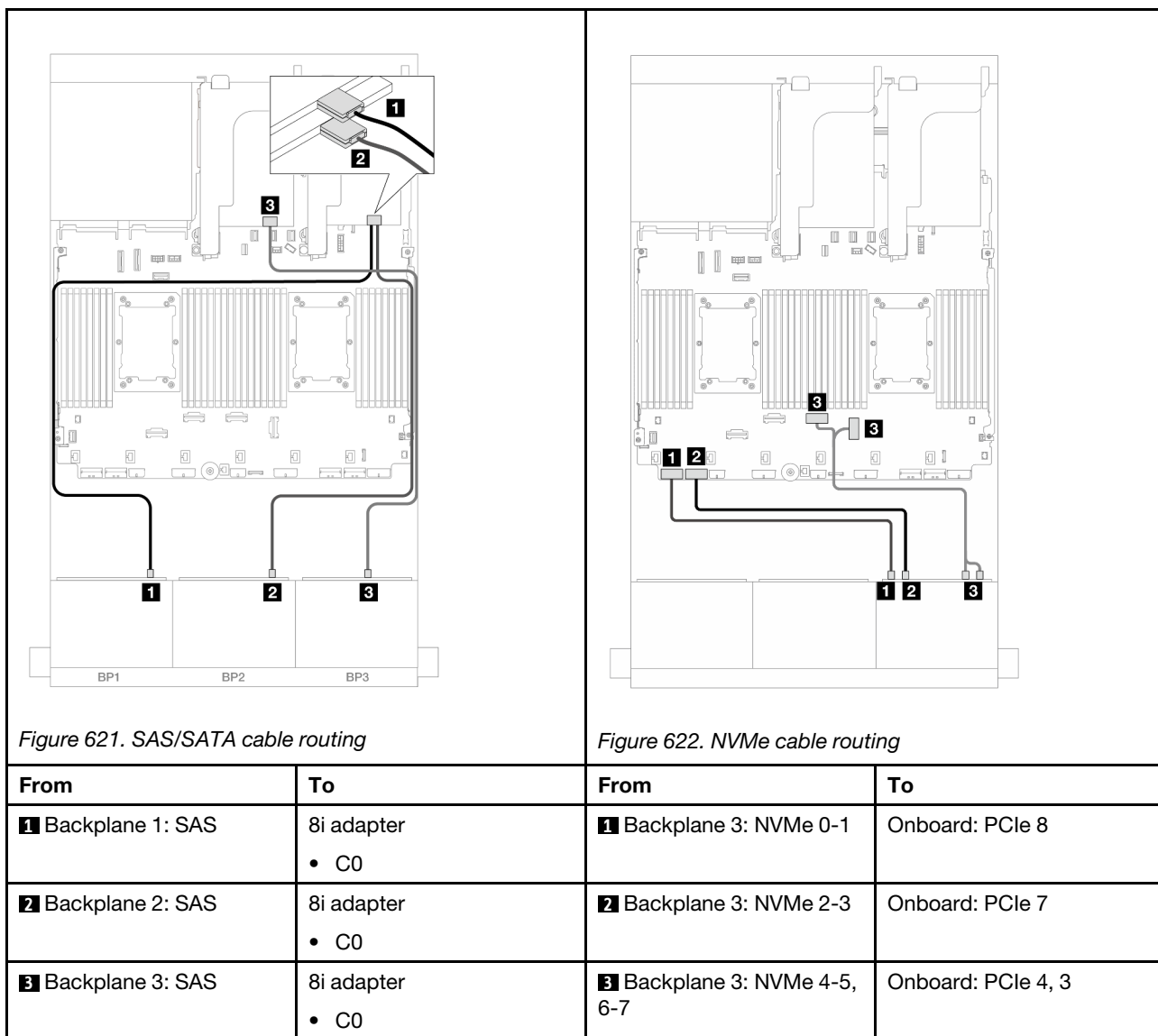
Figure 620. Cable routing when one processor installed

From	To	From	To
<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 8	<b>1</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>2</b> Backplane 3: NVMe 2-3	Onboard: PCIe 7	<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>3</b> Backplane 3: NVMe 4-5, 6-7	Onboard: PCIe 4, 3	<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1

## 8i RAID/HBA adapters

This topic provides cable routing information for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 4) configuration with three 8i RAID/HBA adapters.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



### CFF expander + 8i RAID/HBA adapter

This topic provides cable routing information for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 4) configuration with one CFF expander and one 8i RAID/HBA adapter.

### SAS/SATA cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

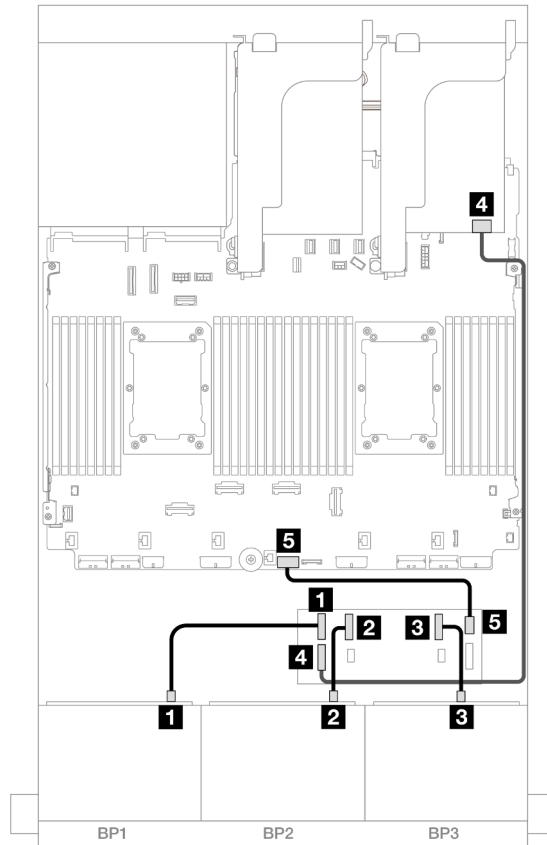


Figure 623. SAS/SATA cable routing

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF expander: RAID/HBA	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>5</b> CFF expander: PWR	Onboard: CFF EXP PWR

### NVMe cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

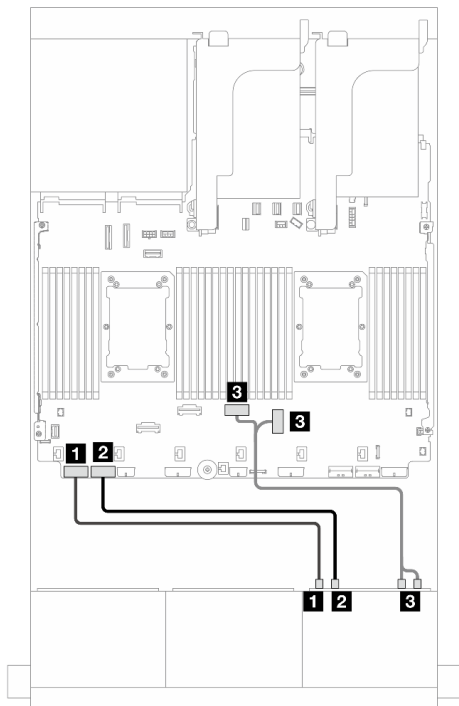


Figure 624. Cable routing when two processors installed

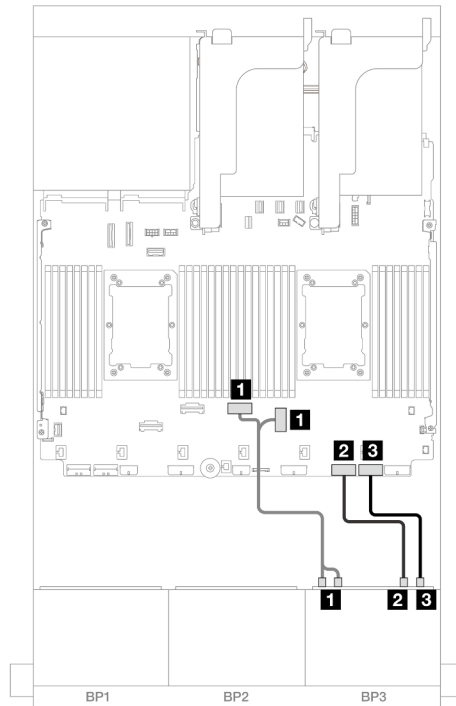


Figure 625. Cable routing when one processor installed

From	To	From	To
<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 8	<b>1</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>2</b> Backplane 3: NVMe 2-3	Onboard: PCIe 7	<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>3</b> Backplane 3: NVMe 4-5, 6-7	Onboard: PCIe 4, 3	<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1

## Front + rear backplanes: (16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay) + 4 x 2.5" SAS/SATA

This topic provides cable routing information for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 4) + 4 x 2.5" SAS/SATA configuration.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“32i RAID/HBA adapter” on page 606](#)
- [“8i RAID/HBA adapters” on page 615](#)
- [“CFF expander + 8i RAID/HBA adapter” on page 609](#)
- [“CFF expander + CFF 16i RAID/HBA adapter” on page 612](#)

### 32i RAID/HBA adapter

This topic provides cable routing information for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 4) + 4 x 2.5" SAS/SATA configuration with one 32i RAID/HBA adapter.

## Front backplane cable routing

### SAS/SATA cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

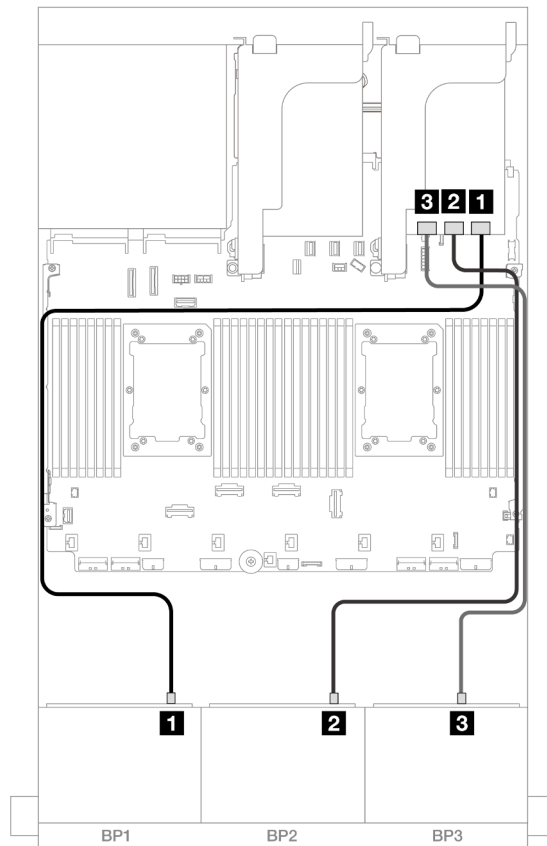


Figure 626. SAS/SATA cable routing

From	To
<b>1</b> Backplane 1: SAS	32i adapter <ul style="list-style-type: none"><li>• C0</li></ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"><li>• C1</li></ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"><li>• C2</li></ul>

### NVMe cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

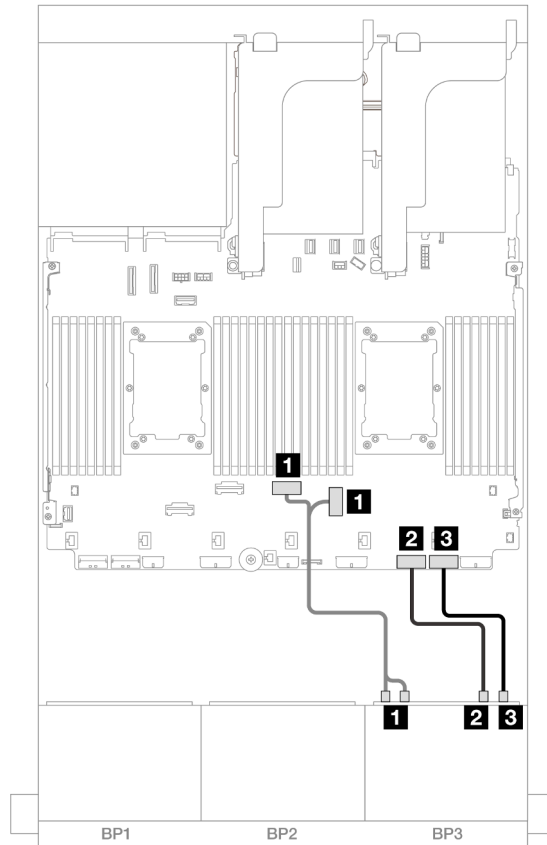


Figure 627. NVMe cable routing

From	To
<b>1</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1

### Rear backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



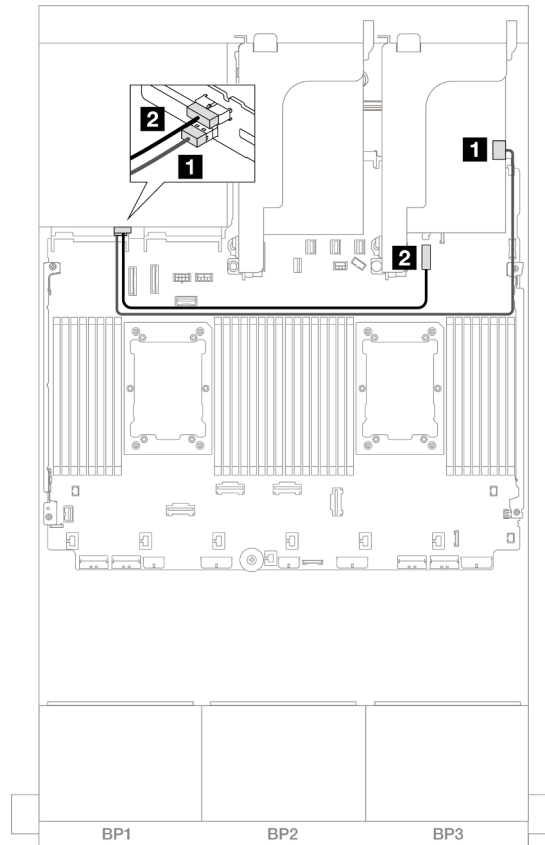


Figure 628. Rear backplane cable routing

From	To
<b>1</b> Backplane 4: SAS	32i adapter <ul style="list-style-type: none"> <li>• C3</li> </ul>
<b>2</b> Backplane 4: PWR	Onboard: 7mm backplane power connector

### CFF expander + 8i RAID/HBA adapter

The topic provides cable routing information for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 4) + rear 4 x 2.5" SAS/SATA configuration with one CFF expander and one 8i RAID/HBA adapter.

### Front backplane cable routing

#### SAS/SATA cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

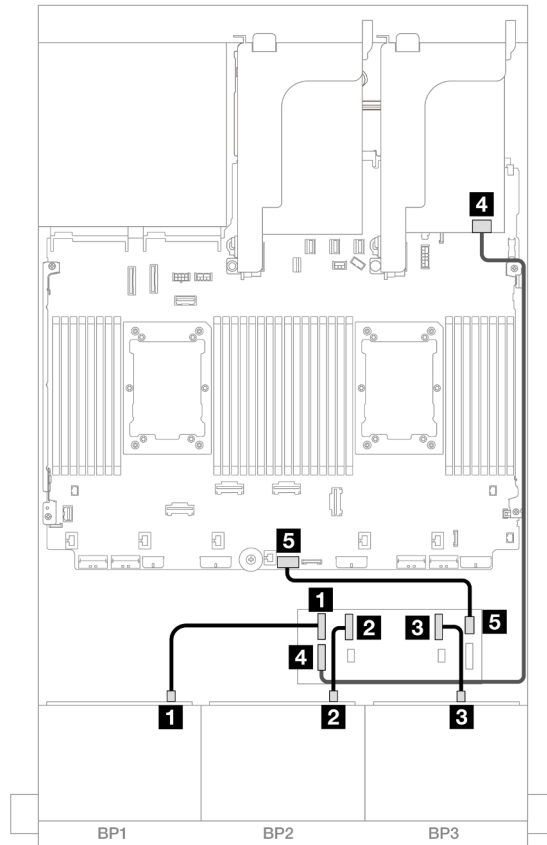


Figure 629. SAS/SATA cable routing

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF expander: RAID/HBA	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>5</b> CFF expander: PWR	Onboard: CFF EXP PWR

## NVMe cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

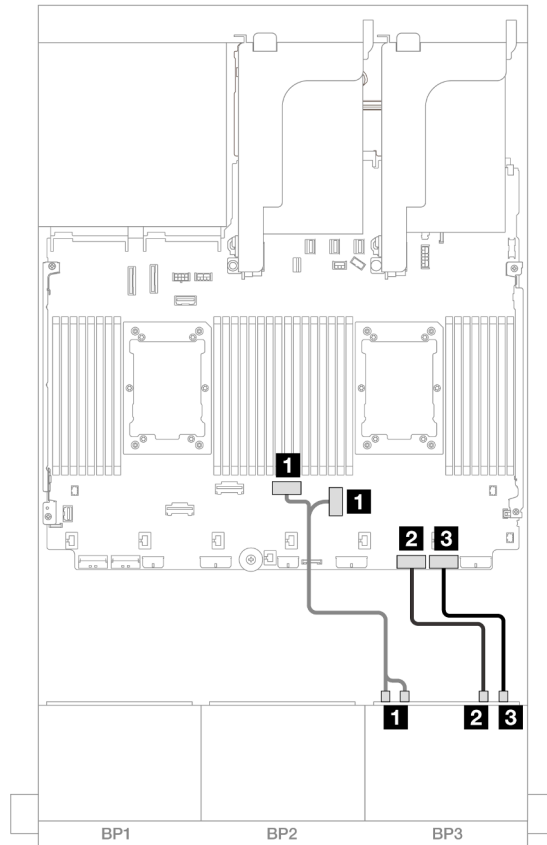


Figure 630. NVMe cable routing

From	To
<b>1</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1

### Rear backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

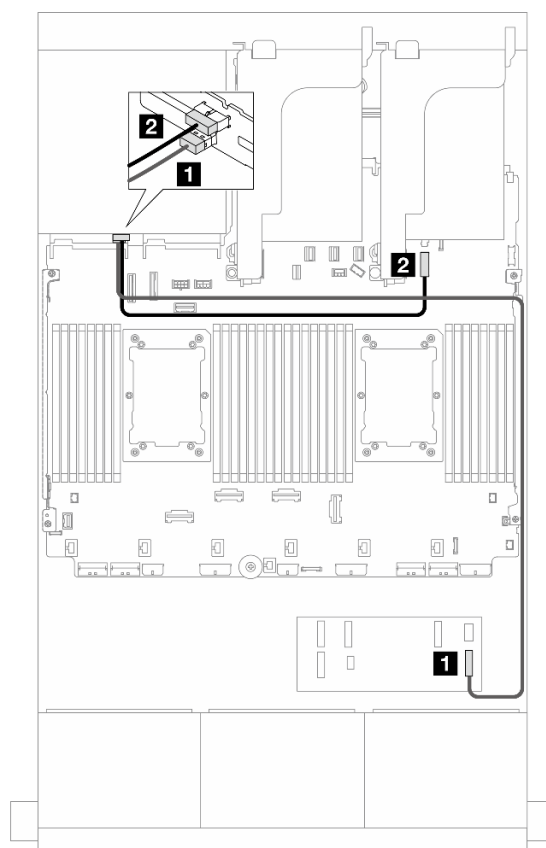


Figure 631. Rear backplane cable routing

From	To
<b>1</b> Backplane 4: SAS	CFF expander <ul style="list-style-type: none"> <li>• C3</li> </ul>
<b>2</b> Backplane 4: PWR	Onboard: 7mm backplane power connector

### CFF expander + CFF 16i RAID/HBA adapter

This topic provides cable routing information for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 4) + 4 x 2.5" SAS/SATA configuration with one CFF expander and one CFF 16i RAID/HBA adapter.

### Front backplane cable routing

#### SAS/SATA cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

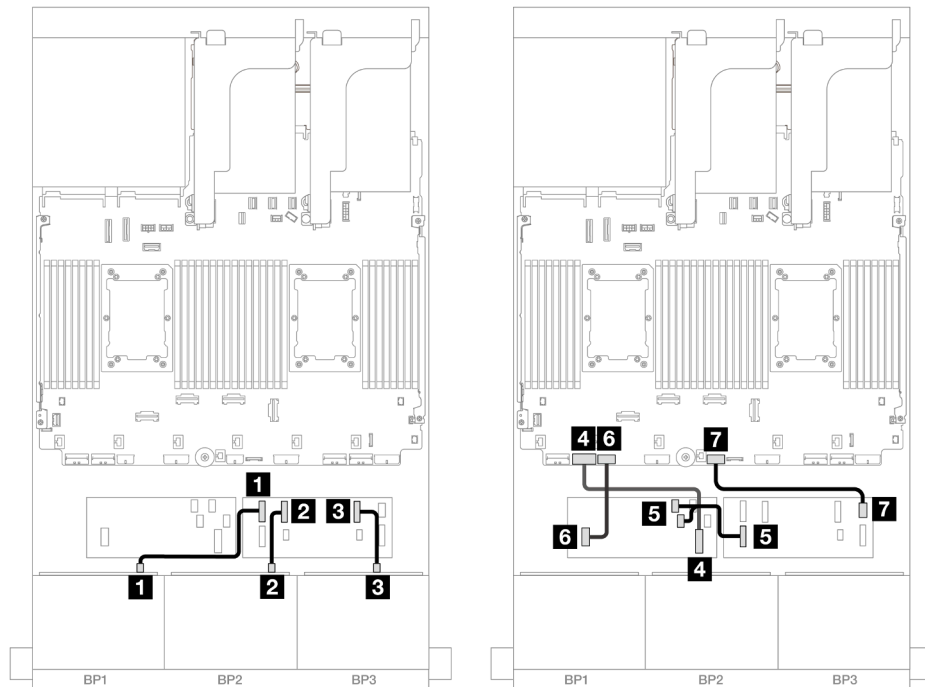


Figure 632. SAS/SATA cable routing to CFF expander and CFF 16i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 7
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

## NVMe cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

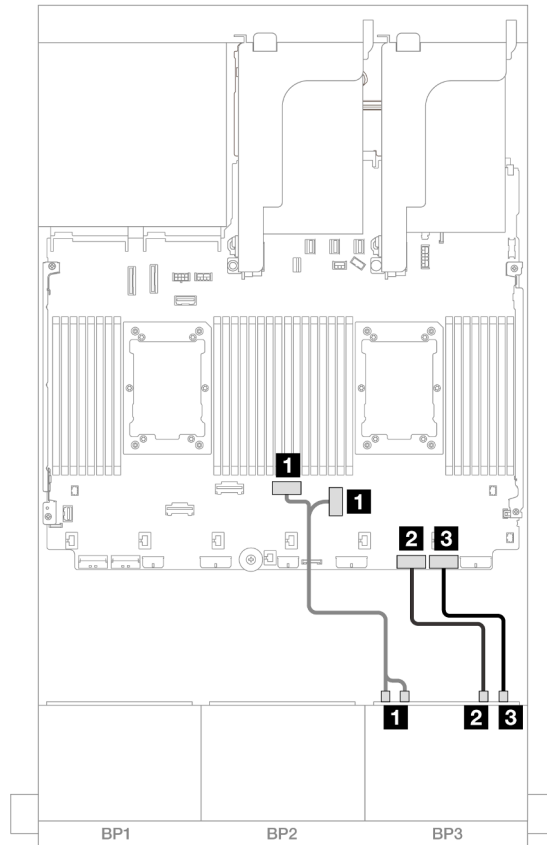


Figure 633. NVMe cable routing to onboard PCIe connectors

From	To
<b>1</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1

### Rear backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

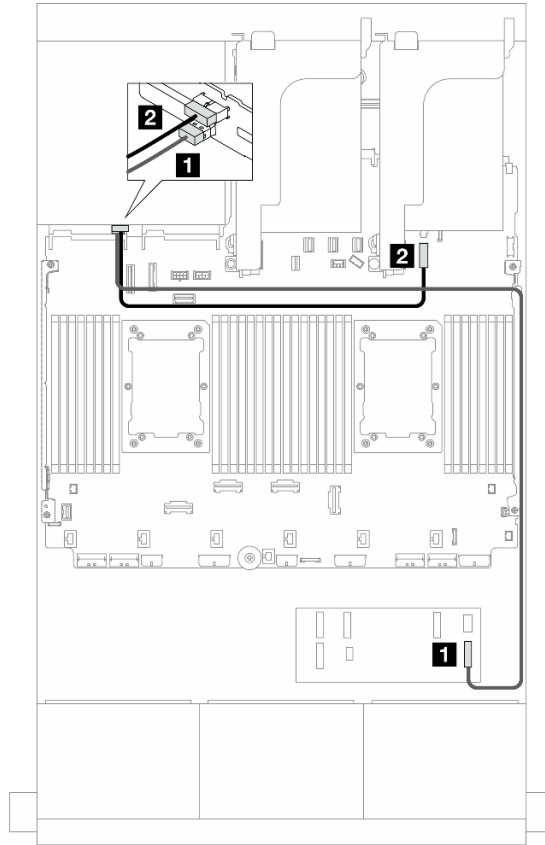


Figure 634. Rear backplane cable routing

From	To
<b>1</b> Backplane 4: SAS	CFF expander <ul style="list-style-type: none"> <li>• C3</li> </ul>
<b>2</b> Backplane 4: PWR	Onboard: 7mm backplane power connector

### 8i RAID/HBA adapters

The following shows the cable connections for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 4) + 4 x 2.5" SAS/SATA configuration with four 8i RAID/HBA adapter.

### Front backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

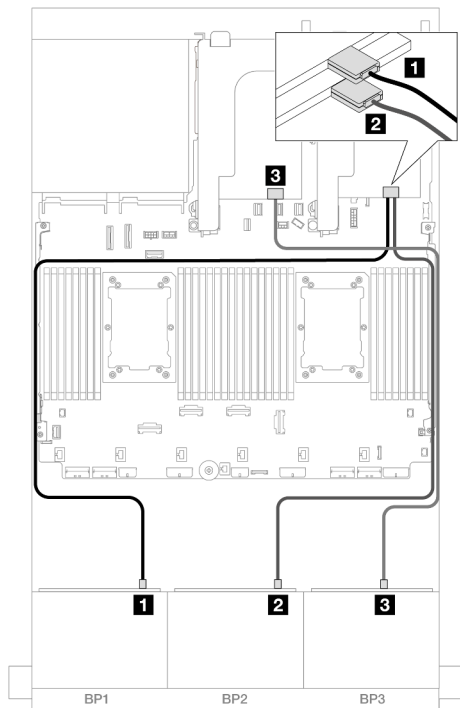


Figure 635. SAS/SATA cable routing

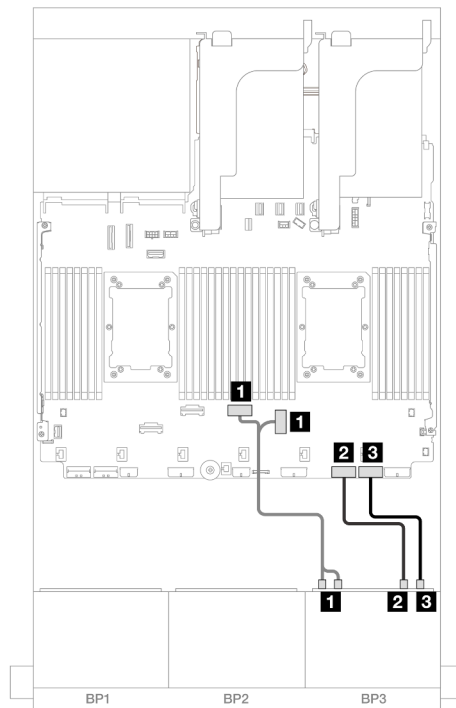


Figure 636. NVMe cable routing

From	To	From	To
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>	<b>1</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>2</b> Backplane 2: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>	<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>3</b> Backplane 3: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>	<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1

### Rear backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



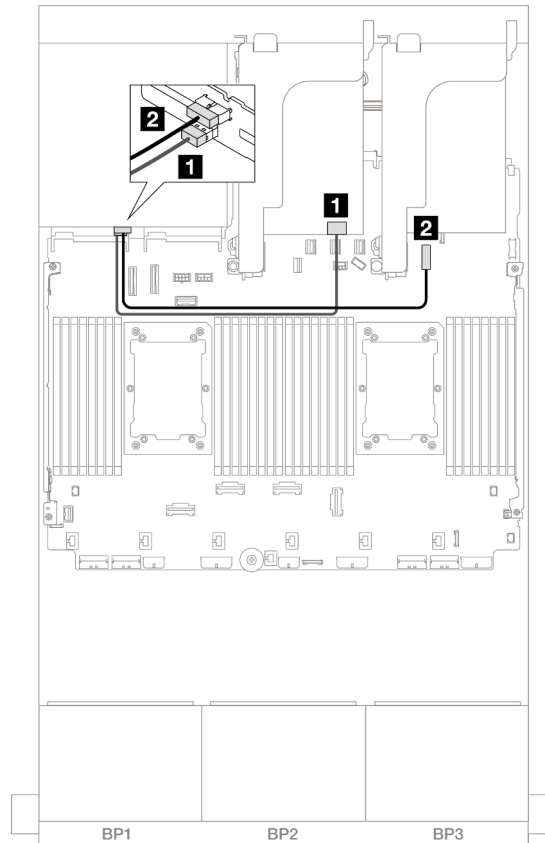


Figure 637. Rear backplane cable routing

From	To
<b>1</b> Backplane 4: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 4: PWR	Onboard: 7mm backplane power connector

## Two 8 x SAS/SATA and one 8 x AnyBay (Gen 5) backplanes

This section provides cable routing information for the server model with two 8 x 2.5-inch SAS/SATA and one 8 x 2.5-inch AnyBay (Gen 5) front drive backplanes.

- [“Front backplanes: 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay” on page 617](#)
- [“Front + rear backplanes: \(16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay\) + 4 x 2.5" SAS/SATA” on page 629](#)

### Front backplanes: 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay

This topic provides cable routing information for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 5) configuration.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- “32i RAID/HBA adapter” on page 618
- “8i RAID/HBA adapters” on page 620
- “CFF expander + 8i RAID/HBA adapter” on page 623
- “CFF expander + CFF 16i RAID/HBA adapter” on page 626

### 32i RAID/HBA adapter

The following shows the cable connections for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 5) configuration with one 32i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

### SAS/SATA cable routing

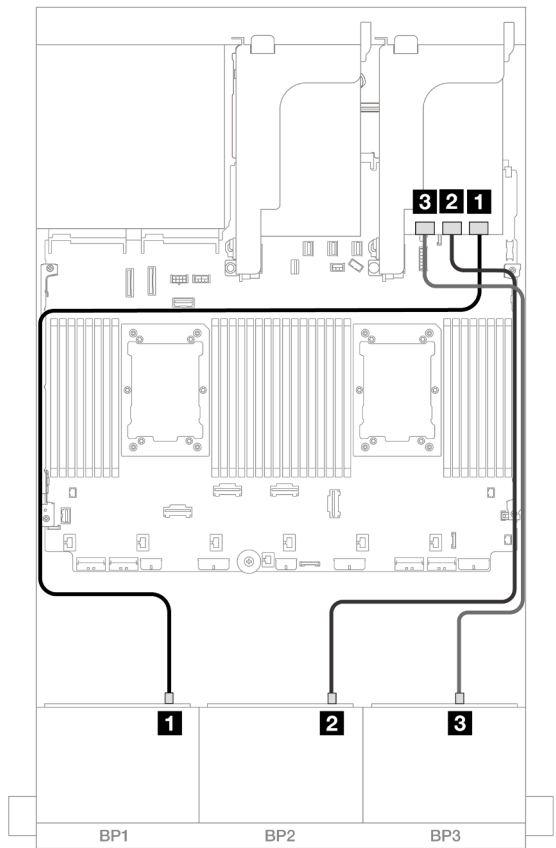


Figure 638. SAS/SATA cable routing

From	To
<b>1</b> Backplane 1: SAS	32i adapter <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>

### NVMe cable routing

#### Cable routing when two processors installed

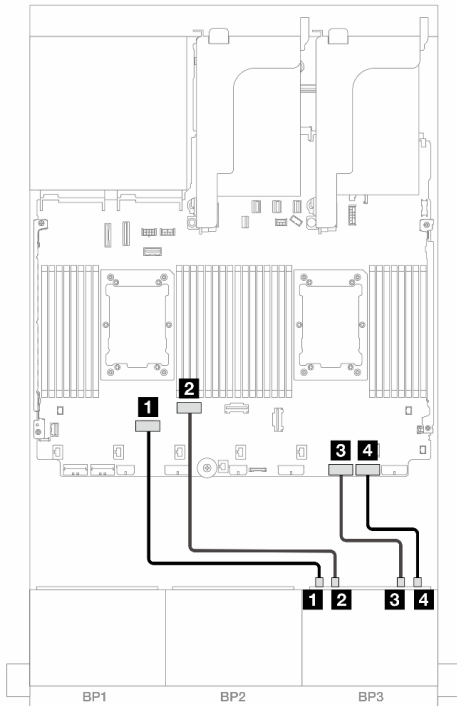


Figure 639. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card

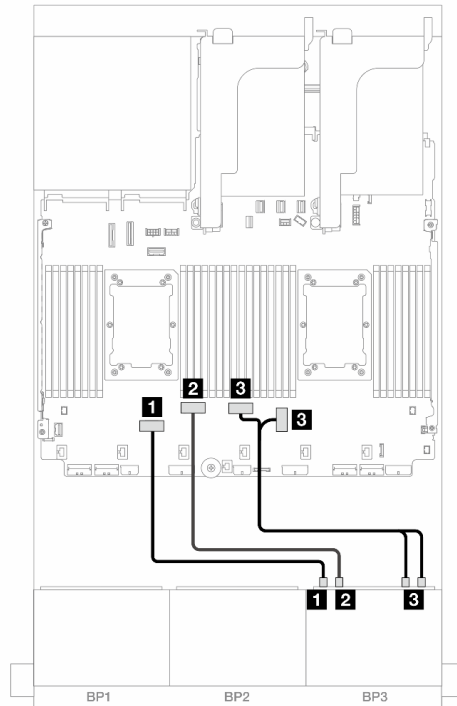


Figure 640. Cable routing in other scenarios

From	To	From	To
<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 6	<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 6
<b>2</b> Backplane 3: NVMe 2-3	Onboard: PCIe 5	<b>2</b> Backplane 3: NVMe 2-3	Onboard: PCIe 5
<b>3</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2	<b>3</b> Backplane 3: NVMe 4-5, 6-7	Onboard: PCIe 4, 3
<b>4</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1		

#### Cable routing when one processor installed

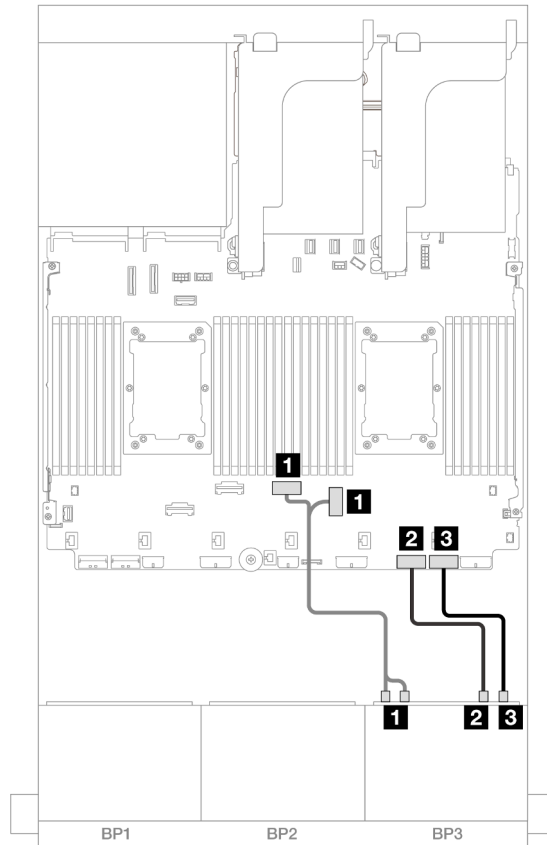


Figure 641. Cable routing when one processor installed

From	To
<b>1</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 4, 3
<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1

### 8i RAID/HBA adapters

The following shows the cable connections for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 5) configuration with three 8i RAID/HBA adapters.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

## SAS/SATA cable routing

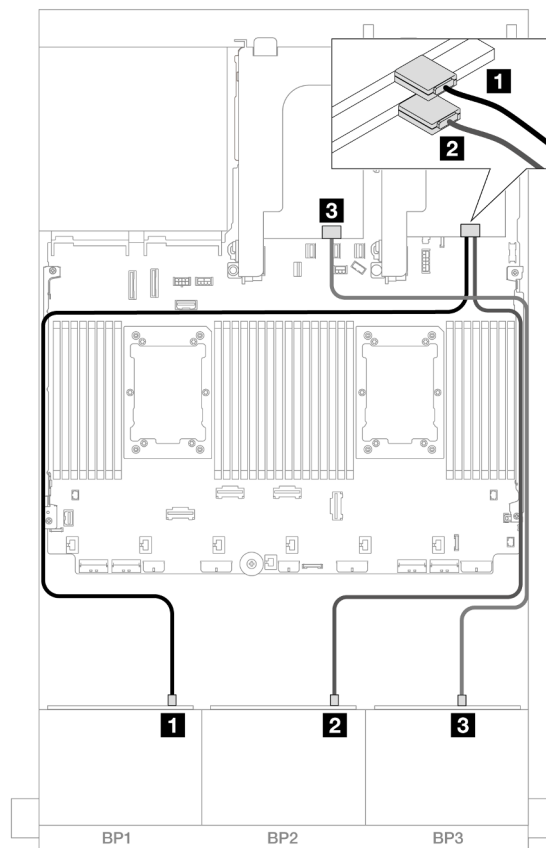


Figure 642. SAS/SATA cable routing

From	To
<b>1</b> Backplane 1: SAS	8i adapter • C0
<b>2</b> Backplane 2: SAS	8i adapter • C0
<b>3</b> Backplane 3: SAS	8i adapter • C0

## NVMe cable routing

### Cable routing when two processors installed

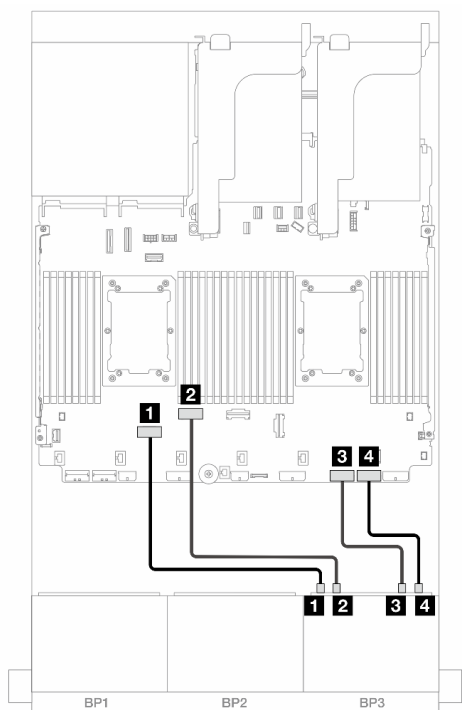


Figure 643. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card

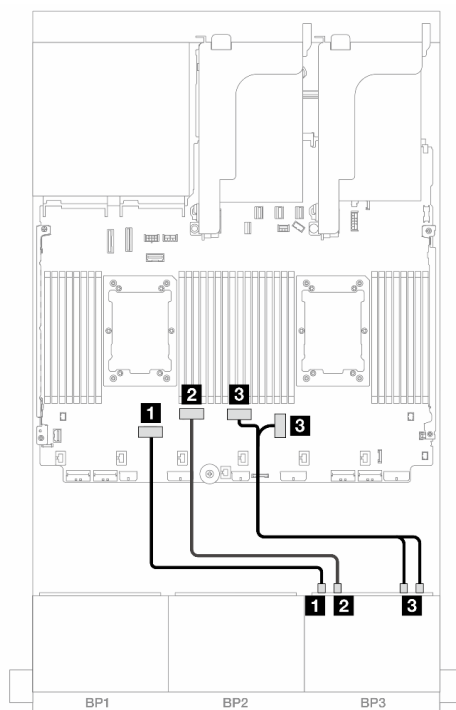


Figure 644. Cable routing in other scenarios

From	To	From	To
<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 6	<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 6
<b>2</b> Backplane 3: NVMe 2-3	Onboard: PCIe 5	<b>2</b> Backplane 3: NVMe 2-3	Onboard: PCIe 5
<b>3</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2	<b>3</b> Backplane 3: NVMe 4-5, 6-7	Onboard: PCIe 4, 3
<b>4</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1		

### Cable routing when one processor installed

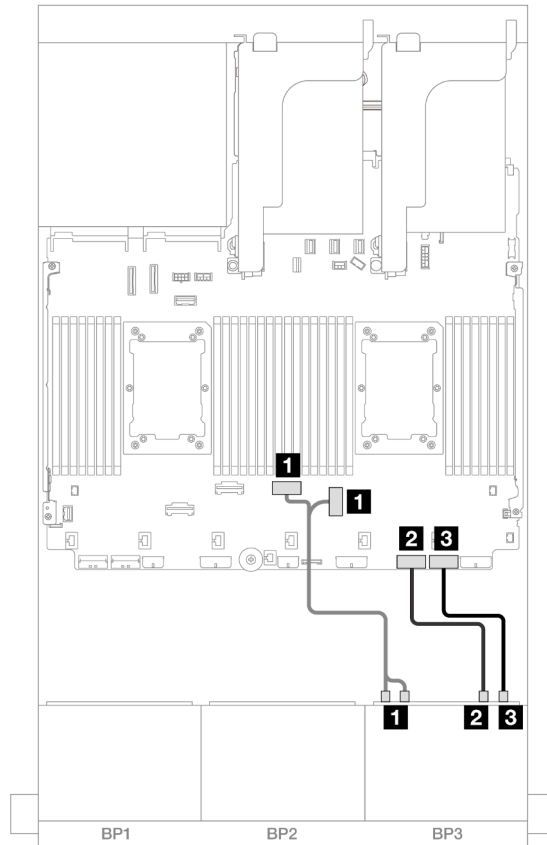


Figure 645. Cable routing when one processor installed

From	To
<b>1</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 4, 3
<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1

### CFF expander + 8i RAID/HBA adapter

The following shows the cable connections for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 5) configuration with one CFF expander and one 8i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

SAS/SATA cable routing

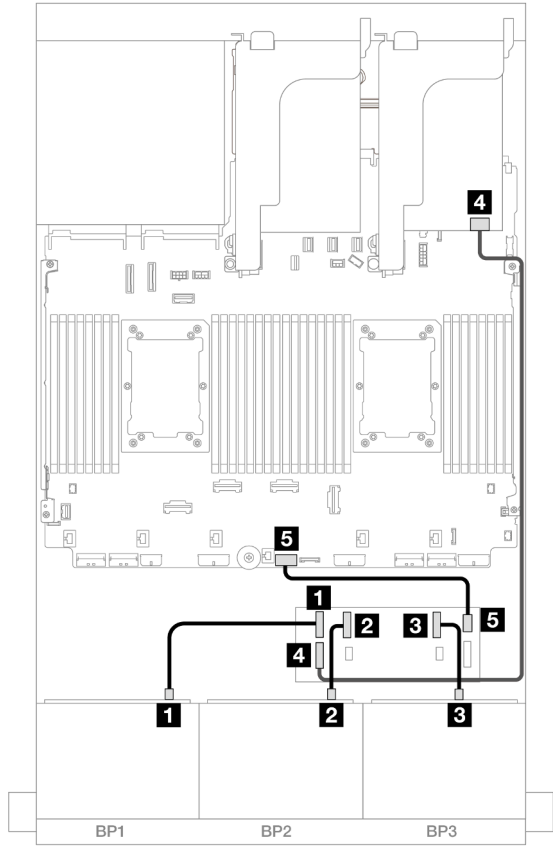


Figure 646. SAS/SATA cable routing

From	To
1 Backplane 1: SAS	CFF expander <ul style="list-style-type: none"><li>C0</li></ul>
2 Backplane 2: SAS	<ul style="list-style-type: none"><li>C1</li></ul>
3 Backplane 3: SAS	<ul style="list-style-type: none"><li>C2</li></ul>
4 CFF expander: RAID/HBA	8i adapter <ul style="list-style-type: none"><li>Gen 4: C0</li><li>Gen 3: C0C1</li></ul>
5 CFF expander: PWR	Onboard: CFF EXP PWR

NVMe cable routing

Cable routing when two processors installed



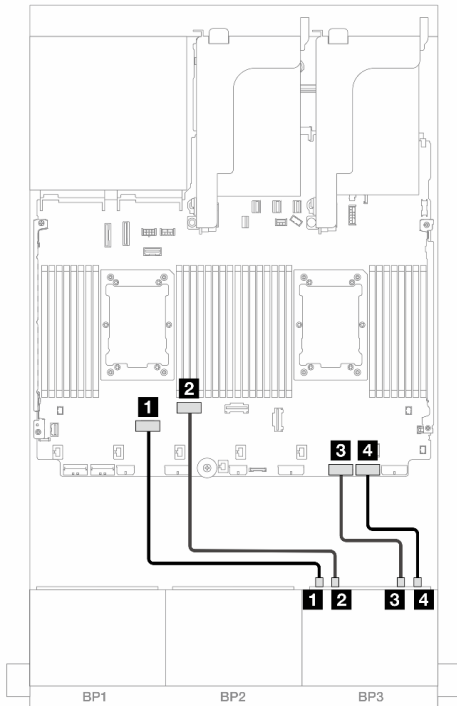


Figure 647. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card

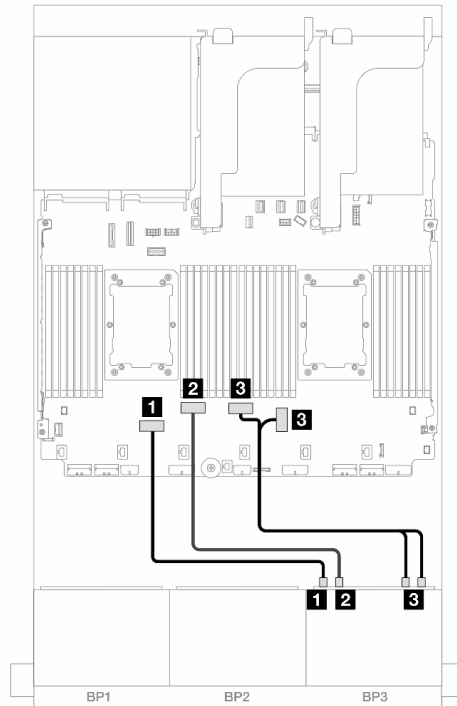


Figure 648. Cable routing in other scenarios

From	To	From	To
<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 6	<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 6
<b>2</b> Backplane 3: NVMe 2-3	Onboard: PCIe 5	<b>2</b> Backplane 3: NVMe 2-3	Onboard: PCIe 5
<b>3</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2	<b>3</b> Backplane 3: NVMe 4-5, 6-7	Onboard: PCIe 4, 3
<b>4</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1		

#### Cable routing when one processor installed

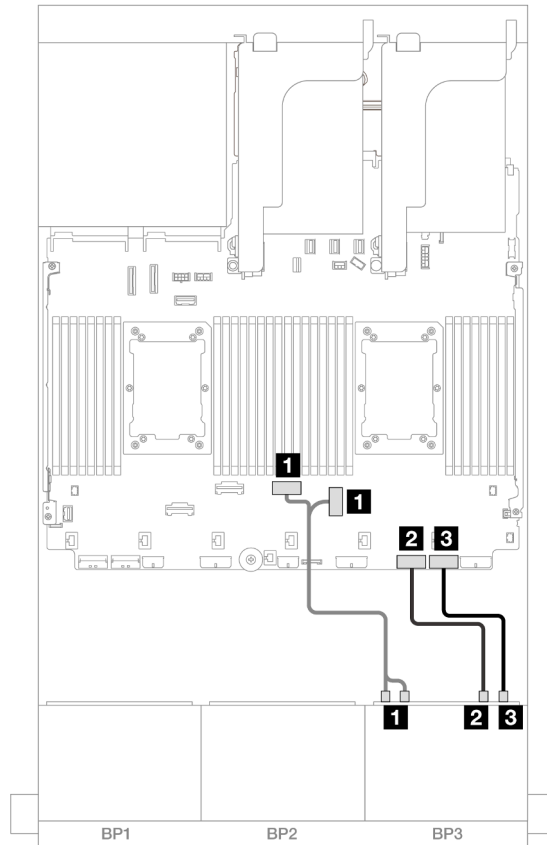


Figure 649. Cable routing when one processor installed

From	To
<b>1</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 4, 3
<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1

#### CFF expander + CFF 16i RAID/HBA adapter

The following shows the cable connections for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 5) configuration with one CFF expander and one CFF 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

## SAS/SATA cable routing

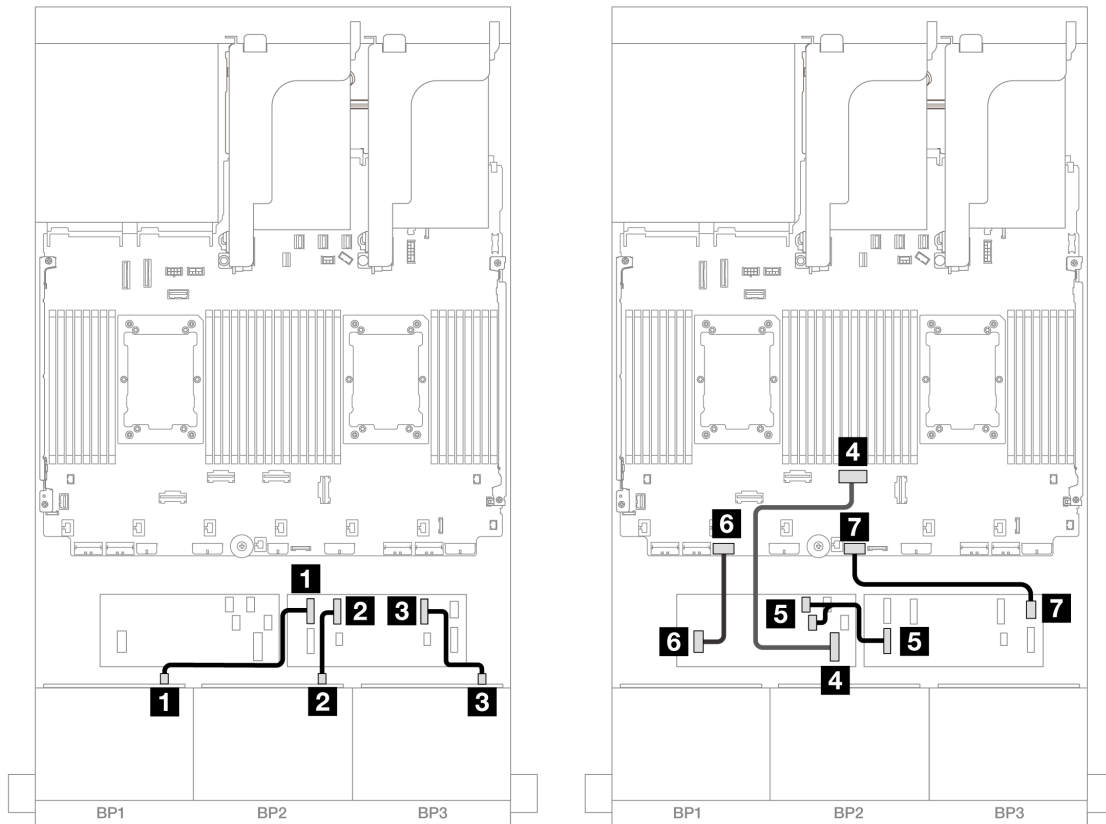


Figure 650. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

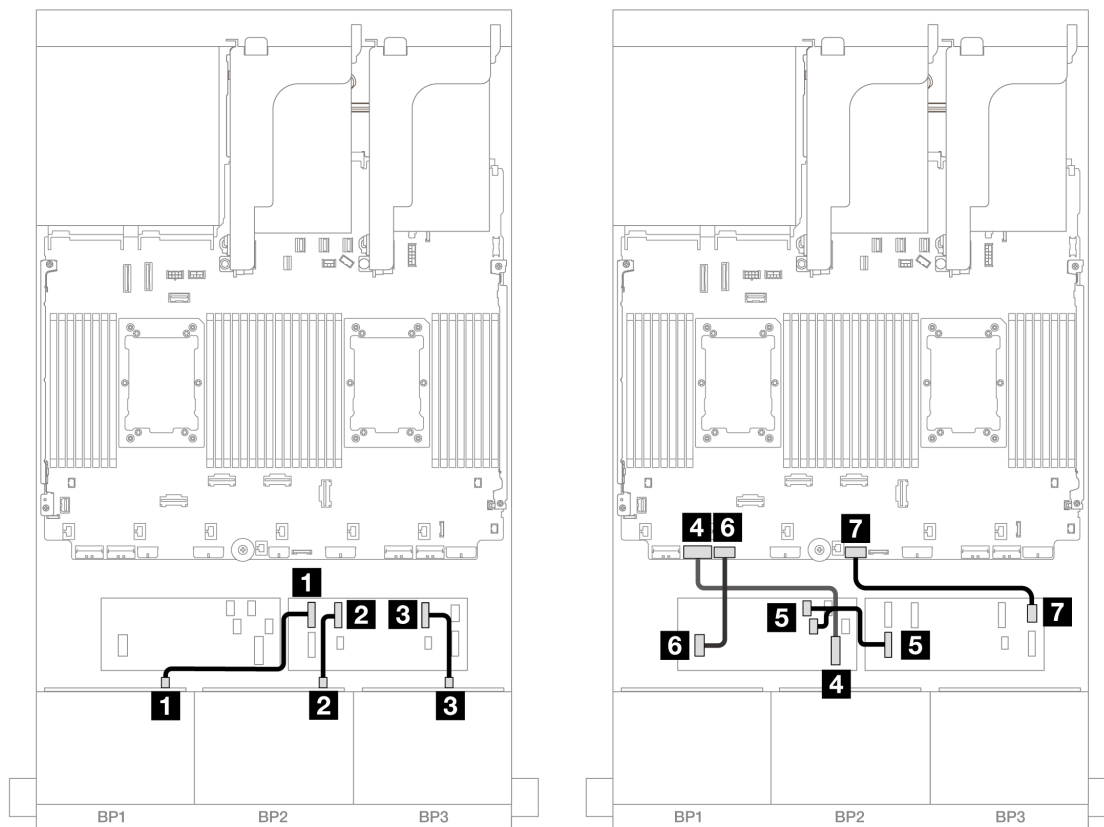
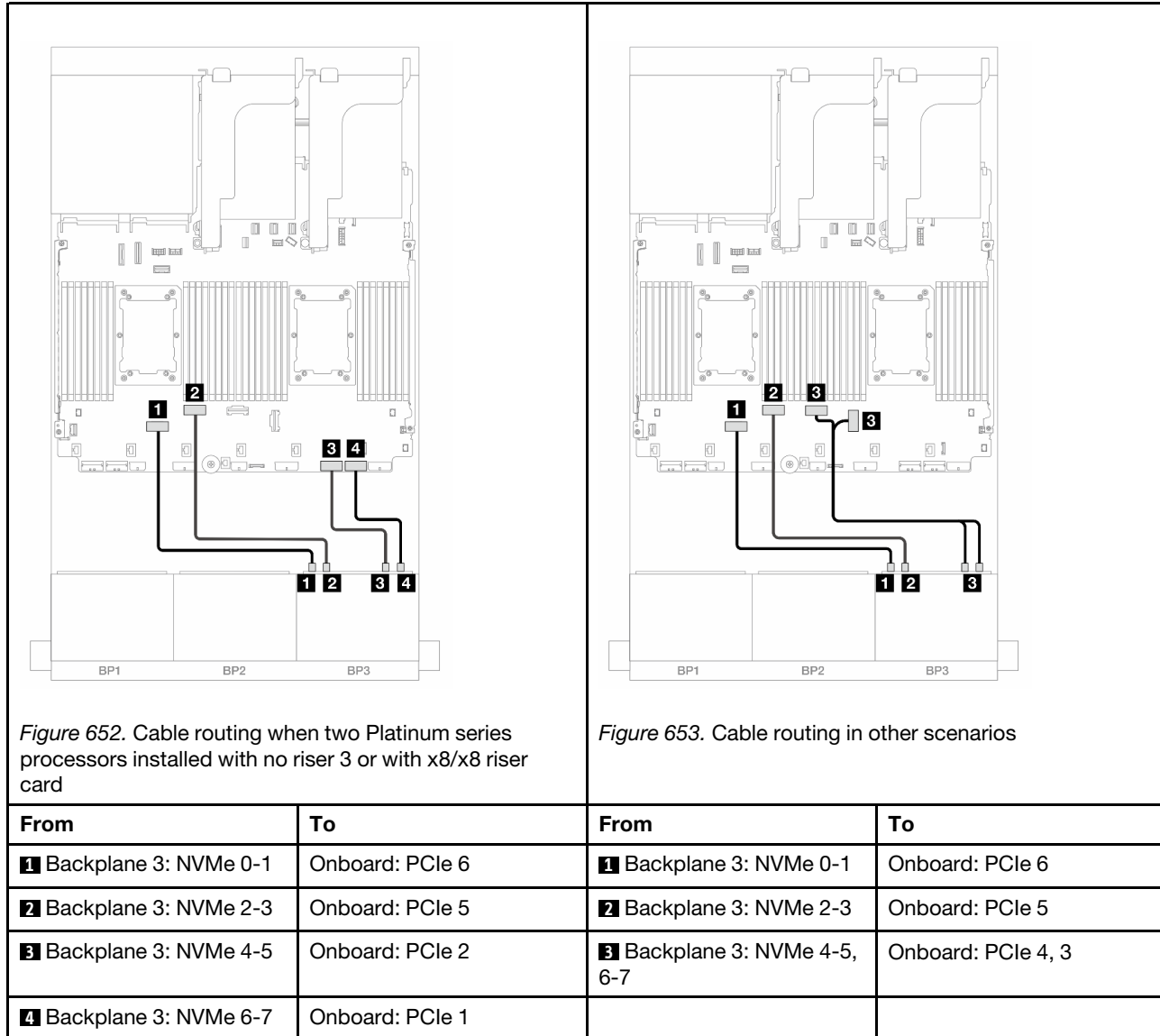


Figure 651. Cable routing in other scenarios

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 7
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

## NVMe cable routing



## Front + rear backplanes: (16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay) + 4 x 2.5" SAS/SATA

This topic provides cable routing information for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 5) + 4 x 2.5" SAS/SATA configuration.

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422.](#)

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“32i RAID/HBA adapter” on page 630](#)
- [“8i RAID/HBA adapters” on page 639](#)
- [“CFF expander + 8i RAID/HBA adapter” on page 632](#)
- [“CFF expander + CFF 16i RAID/HBA adapter” on page 635](#)

**32i RAID/HBA adapter**

The following shows the cable connections for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 5) + 4 x 2.5" SAS/SATA configuration with one 32i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

**Front backplane cable routing**

**SAS/SATA cable routing**

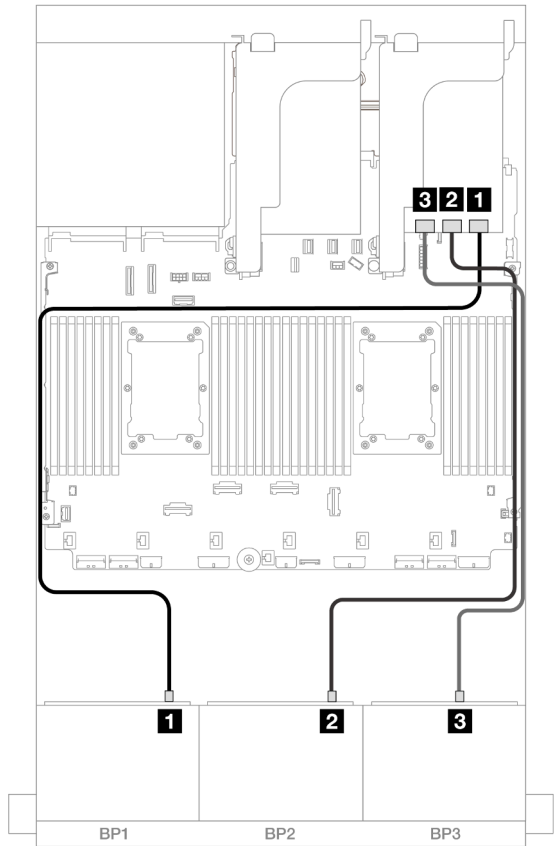


Figure 654. SAS/SATA cable routing

From	To
<b>1</b> Backplane 1: SAS	32i adapter <ul style="list-style-type: none"><li>• C0</li></ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"><li>• C1</li></ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"><li>• C2</li></ul>

**NVMe cable routing**

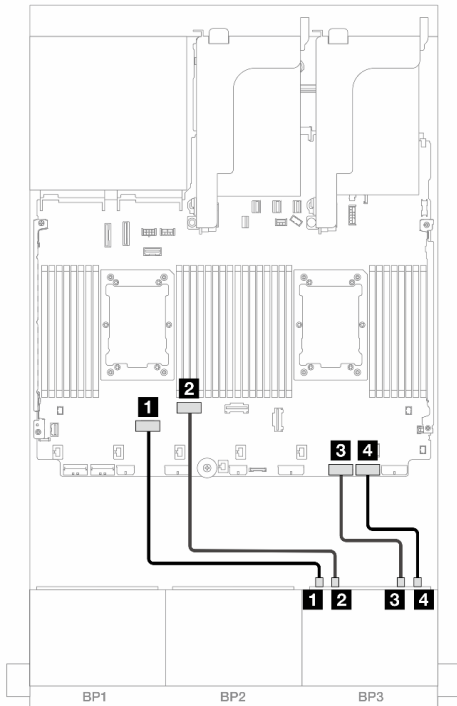


Figure 655. Cable routing when two Platinum series processors installed with no riser 3

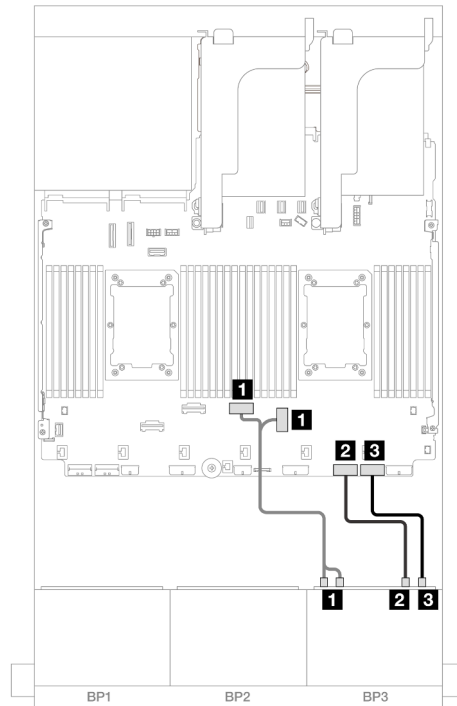


Figure 656. Cable routing in other scenarios

From	To	From	To
<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 6	<b>1</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 4, 3
<b>1</b> Backplane 3: NVMe 2-3	Onboard: PCIe 5	<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2	<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1
<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1		

Rear backplane cable routing

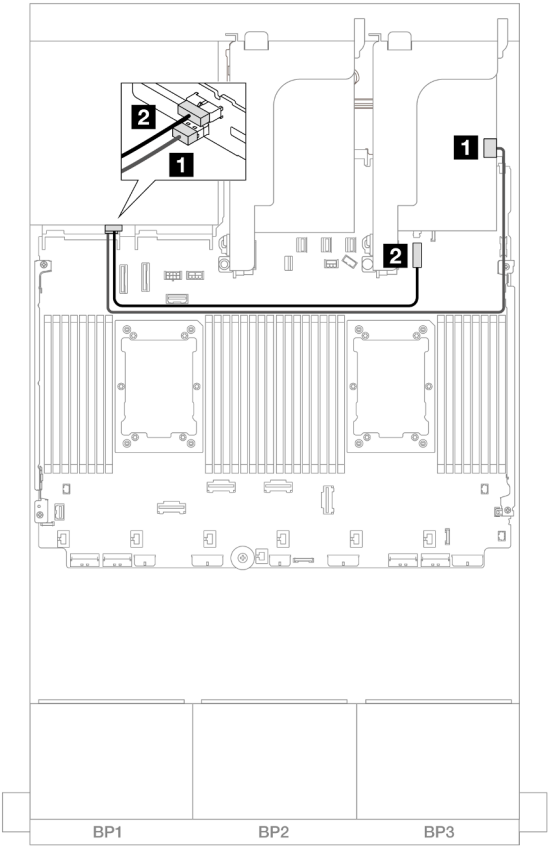


Figure 657. Rear backplane cable routing

From	To
<b>1</b> Backplane 4: SAS	32i adapter <ul style="list-style-type: none"><li>• C3</li></ul>
<b>2</b> Backplane 4: PWR	Onboard: 7mm backplane power connector

CFF expander + 8i RAID/HBA adapter

The following shows the cable connections for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 5) + 4 x 2.5" SAS/SATA configuration with one CFF expander and one 8i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

Front backplane cable routing

SAS/SATA cable routing



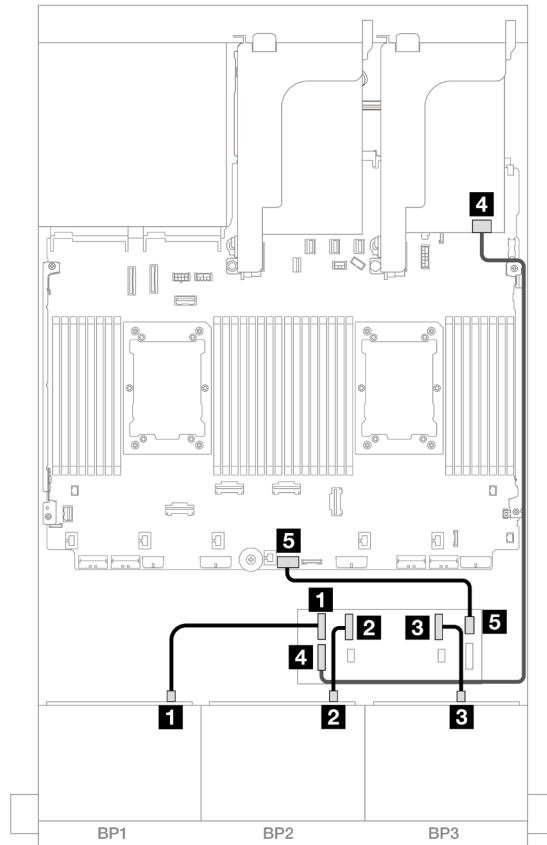


Figure 658. SAS/SATA cable routing

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF expander: RAID/HBA	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>5</b> CFF expander: PWR	Onboard: CFF EXP PWR

## NVMe cable routing

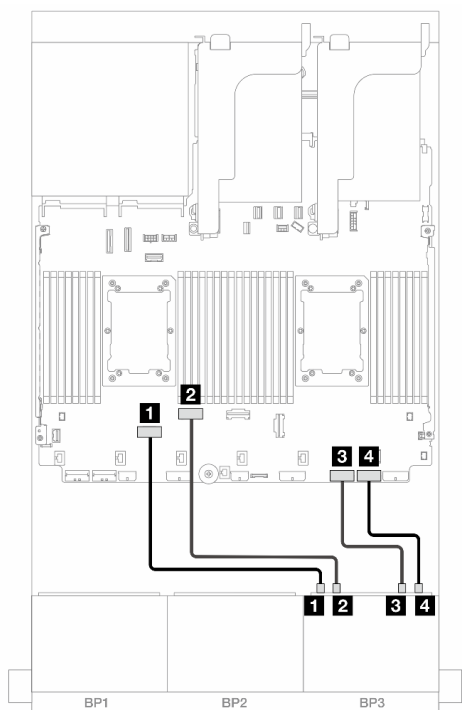


Figure 659. Cable routing when two Platinum series processors installed with no riser 3

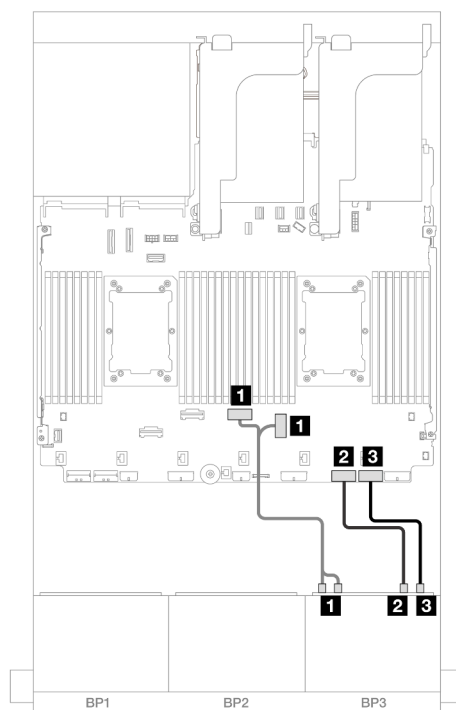


Figure 660. Cable routing in other scenarios

From	To	From	To
<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 6	<b>1</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 4, 3
<b>1</b> Backplane 3: NVMe 2-3	Onboard: PCIe 5	<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2	<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1
<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1		

## Rear backplane cable routing

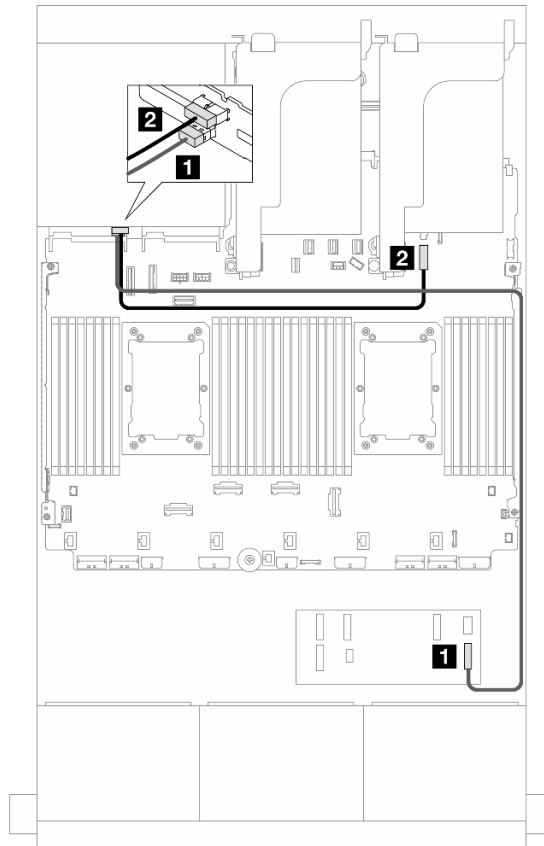


Figure 661. Rear backplane cable routing

From	To
<b>1</b> Backplane 4: SAS	CFF expander <ul style="list-style-type: none"><li>• C3</li></ul>
<b>2</b> Backplane 4: PWR	Onboard: 7mm backplane power connector

### CFF expander + CFF 16i RAID/HBA adapter

The following shows the cable connections for the 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 5) + 4 x 2.5" SAS/SATA configuration with one CFF expander and one CFF 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

## Front backplane cable routing

### SAS/SATA cable routing

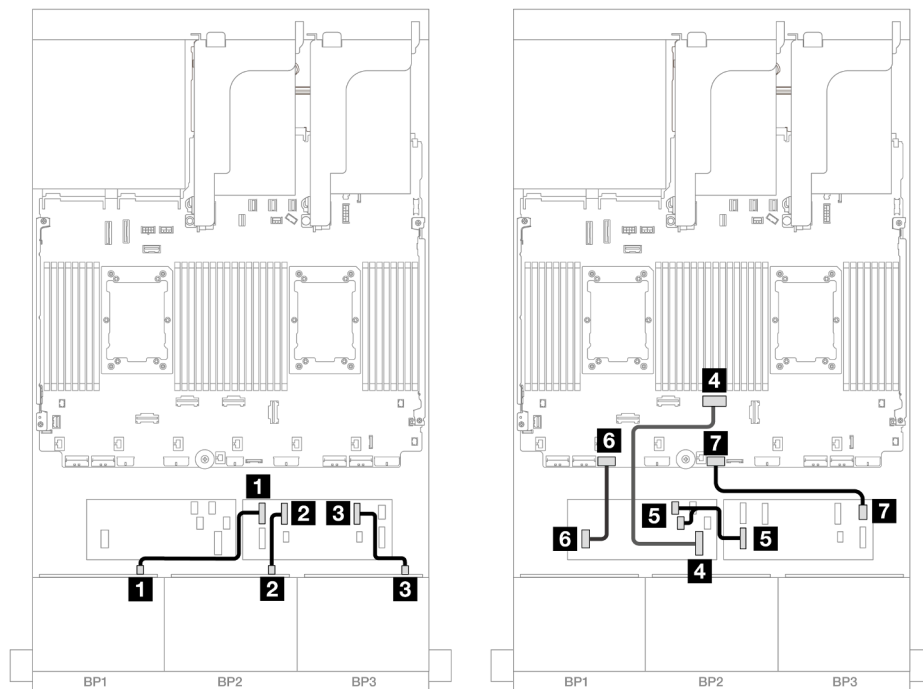


Figure 662. Cable routing when two Platinum series processors installed with no riser 3

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

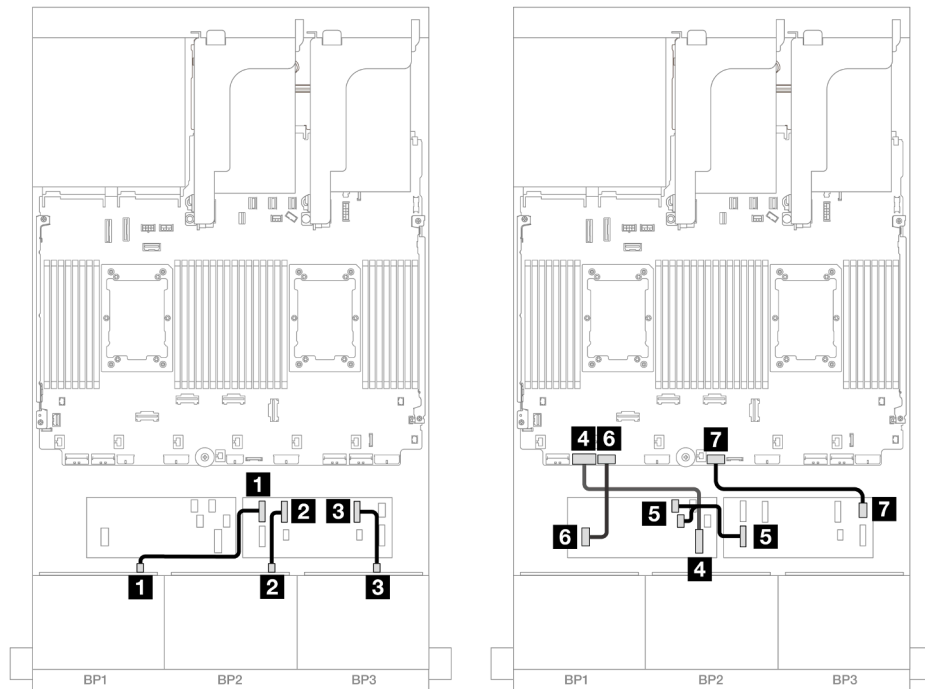


Figure 663. Cable routing in other scenarios

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> Backplane 3: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 7
<b>5</b> CFF expander: RAID/HBA	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>6</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR
<b>7</b> CFF expander: PWR	Onboard: CFF EXP PWR

## NVMe cable routing

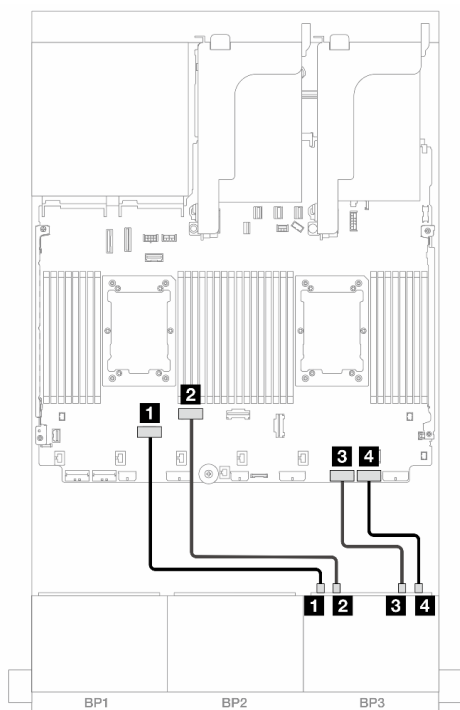


Figure 664. Cable routing when two Platinum series processors installed with no riser 3

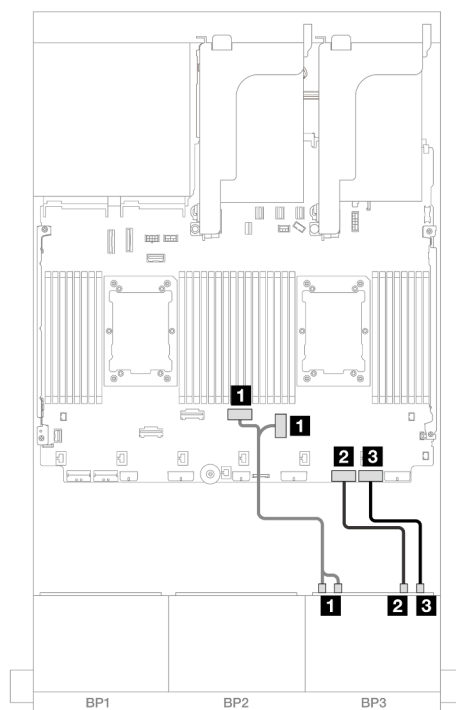


Figure 665. Cable routing in other scenarios

From	To	From	To
<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 6	<b>1</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 4, 3
<b>1</b> Backplane 3: NVMe 2-3	Onboard: PCIe 5	<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2	<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1
<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1		

## Rear backplane cable routing

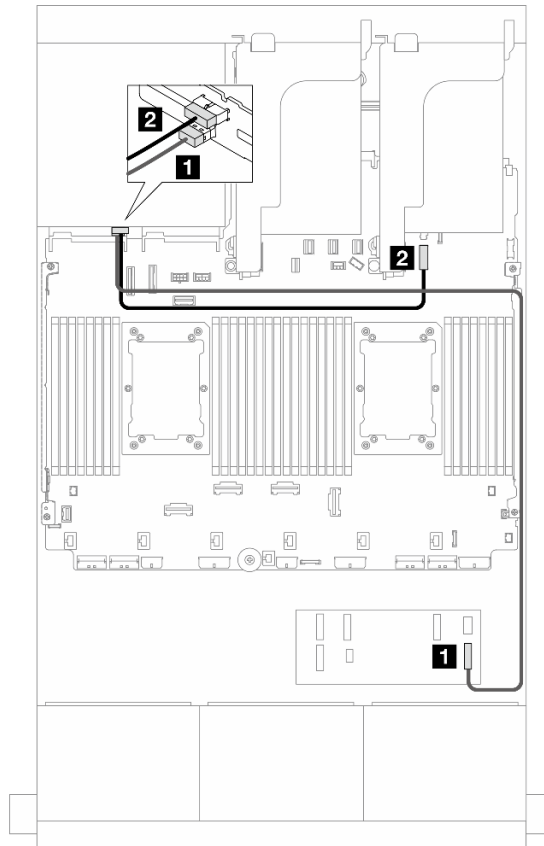


Figure 666. Rear backplane cable routing

From	To
<b>1</b> Backplane 4: SAS	CFF expander • C3
<b>2</b> Backplane 4: PWR	Onboard: 7mm backplane power connector

### 8i RAID/HBA adapters

The following shows the cable connections for the front 16 x 2.5" SAS/SATA + 8 x 2.5" AnyBay (Gen 5) + 4 x 2.5" SAS/SATA configuration with four 8i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

### Front backplane cable routing

#### SAS/SATA cable routing

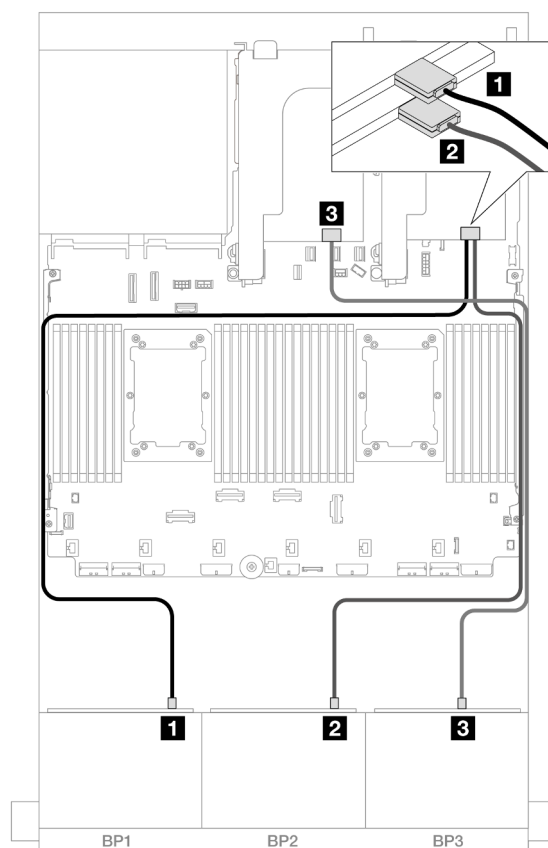


Figure 667. SAS/SATA cable routing

From	To
<b>1</b> Backplane 1: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 2: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>3</b> Backplane 3: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>

## NVMe cable routing



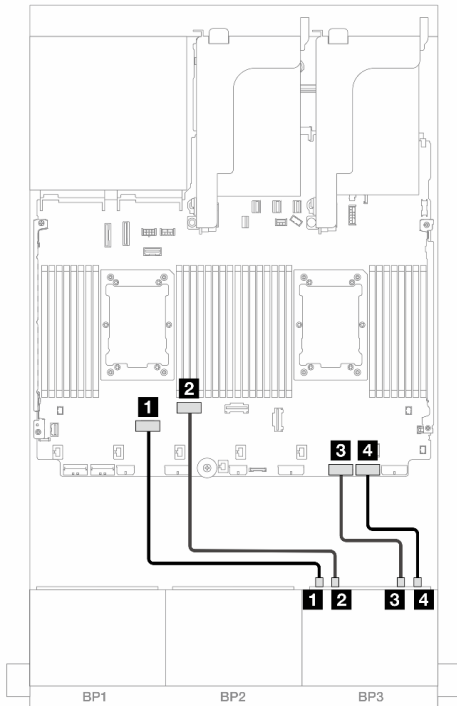


Figure 668. Cable routing when two Platinum series processors installed with no riser 3

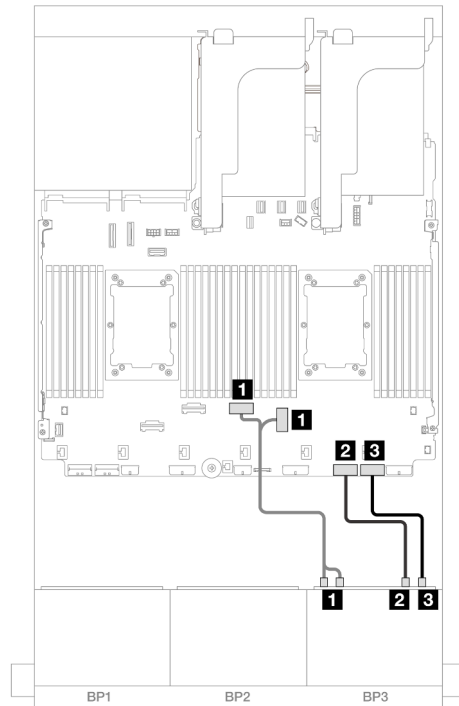


Figure 669. Cable routing in other scenarios

From	To	From	To
<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 6	<b>1</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 4, 3
<b>1</b> Backplane 3: NVMe 2-3	Onboard: PCIe 5	<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2	<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1
<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1		

## Rear backplane cable routing

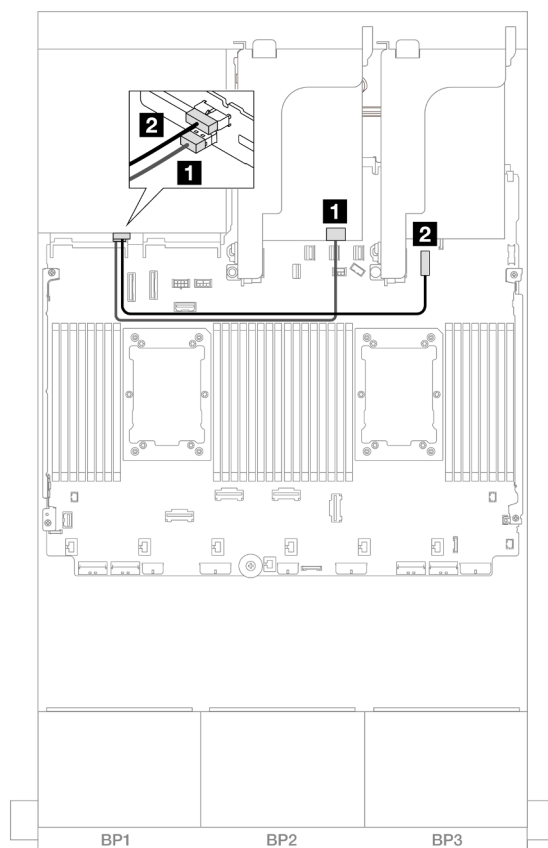


Figure 670. Rear backplane cable routing

From	To
<b>1</b> Backplane 4: SAS	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 4: PWR	Onboard: 7mm backplane power connector

## Two 8 x SAS/SATA and one 8 x NVMe (Gen 4) backplanes

This section provides cable routing information for the server model with two 8 x 2.5" SAS/SATA front drive backplanes and one 8 x 2.5" NVMe front drive backplane (Gen 4).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“16i RAID/HBA adapter” on page 643](#)
- [“CFF expander + 8i RAID/HBA adapter” on page 643](#)

## 16i RAID/HBA adapter

The topic provides cable routing information for the 16 x 2.5" SAS/SATA + 8 x 2.5" NVMe (Gen 4) configuration with one 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

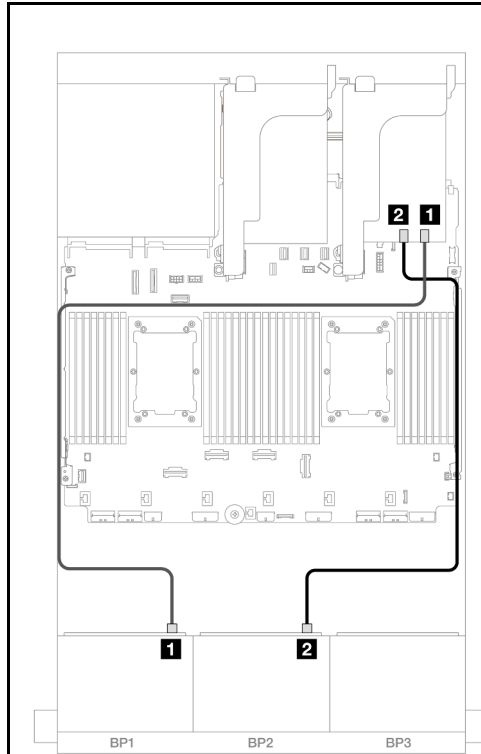


Figure 671. SAS/SATA cable routing

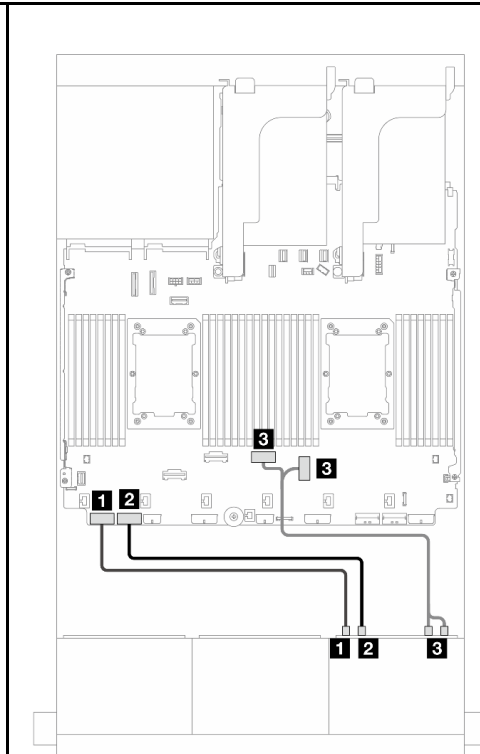


Figure 672. NVMe cable routing

From	To	From	To
<b>1</b> Backplane 1: SAS	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>	<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 8
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2C3</li> </ul>	<b>2</b> Backplane 3: NVMe 2-3	Onboard: PCIe 7
		<b>3</b> Backplane 3: NVMe 4-5, 6-7	Onboard: PCIe 4, 3

## CFF expander + 8i RAID/HBA adapter

The topic provides cable routing information for the 16 x 2.5" SAS/SATA + 8 x 2.5" NVMe (Gen 4) configuration with one CFF expander and one 8i RAID/HBA adapter.

### SAS/SATA cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

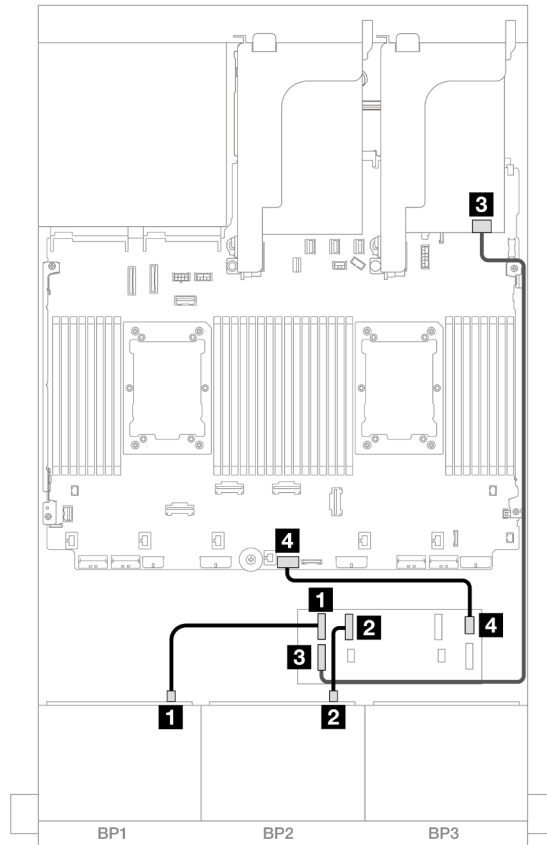


Figure 673. Cable routing to one CFF expander and one 8i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"> <li>• C0</li> </ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"> <li>• C1</li> </ul>
<b>3</b> CFF expander: RAID/HBA	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>4</b> CFF expander: PWR	Onboard: CFF EXP PWR

### NVMe cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

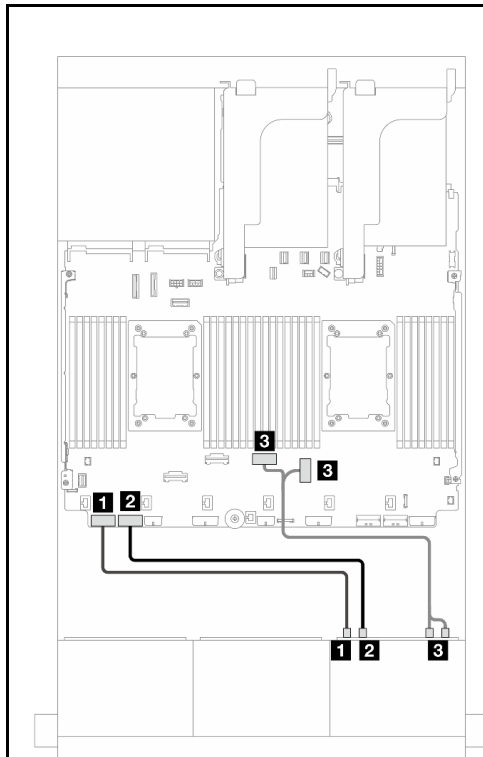


Figure 674. Cable routing when two processors installed

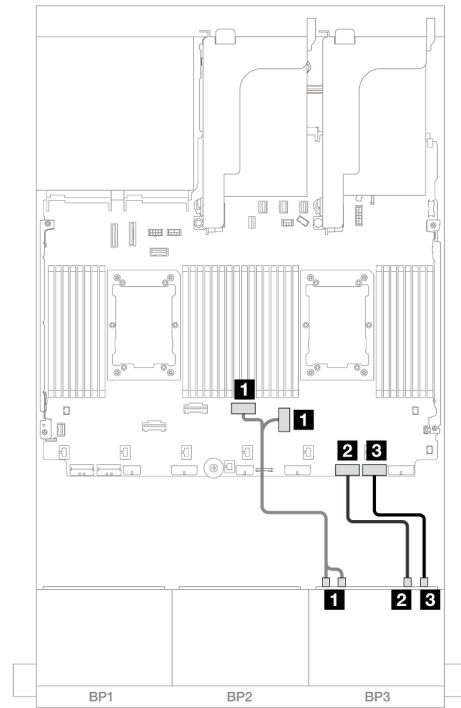


Figure 675. Cable routing when one processor installed

From	To	From	To
<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 8	<b>1</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 3, 4
<b>2</b> Backplane 3: NVMe 2-3	Onboard: PCIe 7	<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>3</b> Backplane 3: NVMe 4-5, 6-7	Onboard: PCIe 4, 3	<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1

## Two 8 x SAS/SATA and one 8 x NVMe (Gen 5) backplanes

This section provides cable routing information for the server model with two 8 x 2.5-inch SAS/SATA front drive backplanes and one 8 x 2.5-inch NVMe front drive backplane (Gen 5).

To connect power cables for the front backplane(s), refer to [“Backplanes: server models with 2.5-inch front drive bays” on page 422](#).

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration.

- [“16i RAID/HBA adapter” on page 645](#)
- [“CFF expander + 8i RAID/HBA adapter” on page 647](#)

### 16i RAID/HBA adapter

The topic provides cable routing information for the 16 x 2.5" SAS/SATA + 8 x 2.5" NVMe (Gen 5) configuration with one 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

## SAS/SATA cable routing

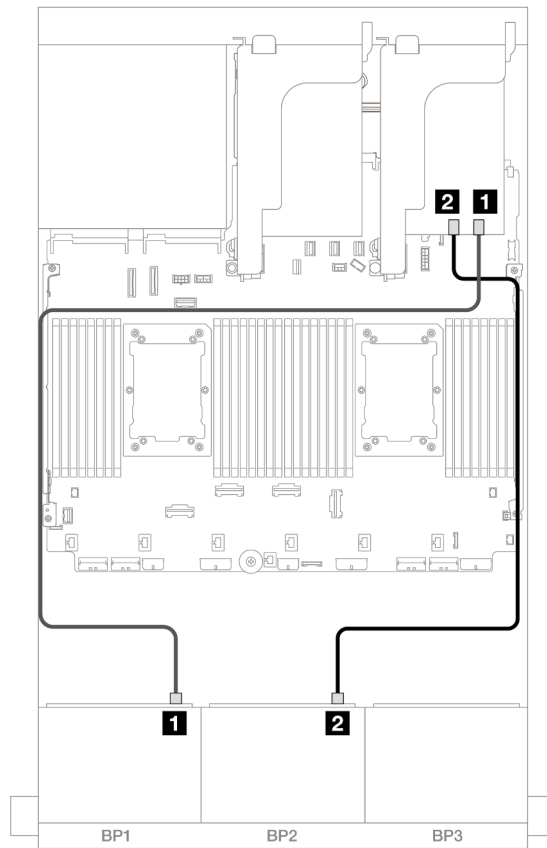


Figure 676. SAS/SATA cable routing

From	To
<b>1</b> Backplane 1: SAS	16i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"><li>• Gen 4: C1</li><li>• Gen 3: C2C3</li></ul>

NVMe cable routing

Figure 677. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card

Figure 678. Cable routing in other scenarios

From	To	From	To
1 Backplane 3: NVMe 0-1	Onboard: PCIe 6	1 Backplane 3: NVMe 0-1	Onboard: PCIe 6
2 Backplane 3: NVMe 2-3	Onboard: PCIe 5	2 Backplane 3: NVMe 2-3	Onboard: PCIe 5
3 Backplane 3: NVMe 4-5	Onboard: PCIe 2	3 Backplane 3: NVMe 4-5, 6-7	Onboard: PCIe 4, 3
4 Backplane 3: NVMe 6-7	Onboard: PCIe 1		

CFF expander + 8i RAID/HBA adapter

The topic provides cable routing information for the 16 x 2.5" SAS/SATA + 8 x 2.5" NVMe (Gen 5) configuration with one CFF expander and one 8i RAID/HBA adapter.

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

SAS/SATA cable routing

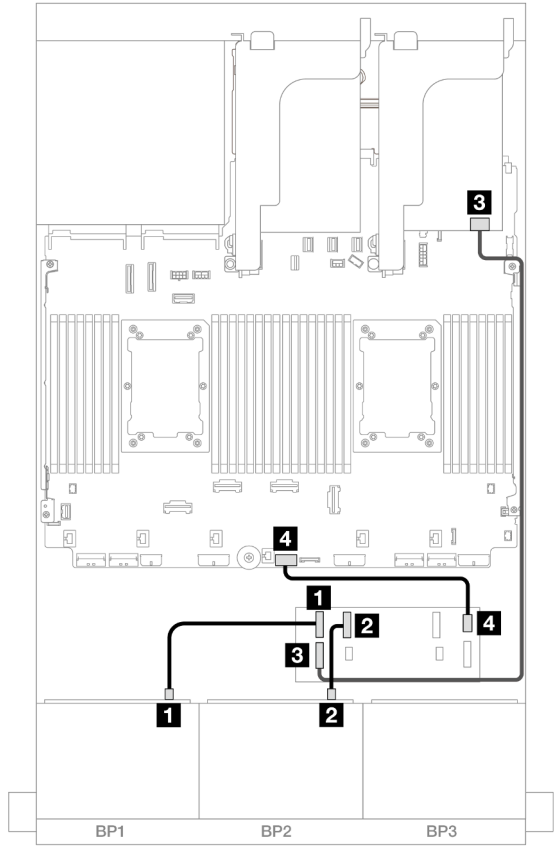


Figure 679. Cable routing to one CFF expander and one 8i adapter

From	To
<b>1</b> Backplane 1: SAS	CFF expander <ul style="list-style-type: none"><li>• C0</li></ul>
<b>2</b> Backplane 2: SAS	<ul style="list-style-type: none"><li>• C1</li></ul>
<b>3</b> CFF expander: RAID/HBA	8i adapter <ul style="list-style-type: none"><li>• Gen 4: C0</li><li>• Gen 3: C0C1</li></ul>
<b>4</b> CFF expander: PWR	Onboard: CFF EXP PWR

NVMe cable routing

Cable routing when two processors installed



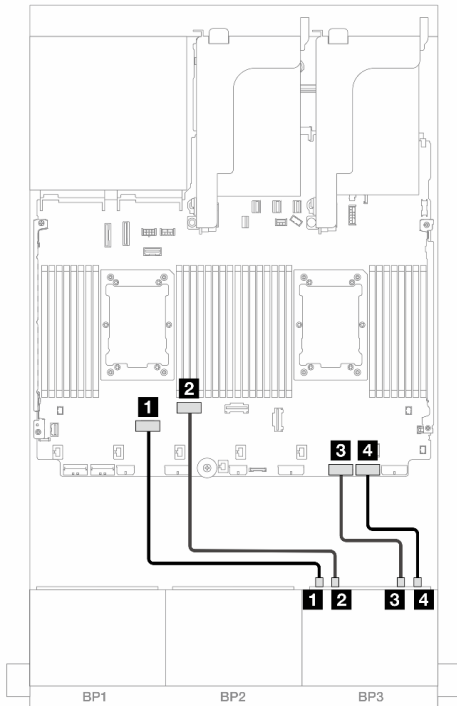


Figure 680. Cable routing when two Platinum series processors installed with no riser 3 or with x8/x8 riser card

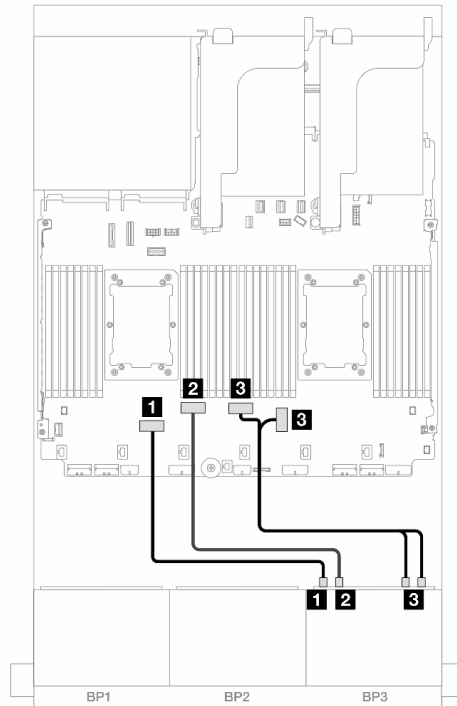


Figure 681. Cable routing in other scenarios

From	To	From	To
<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 6	<b>1</b> Backplane 3: NVMe 0-1	Onboard: PCIe 6
<b>2</b> Backplane 3: NVMe 2-3	Onboard: PCIe 5	<b>2</b> Backplane 3: NVMe 2-3	Onboard: PCIe 5
<b>3</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2	<b>3</b> Backplane 3: NVMe 4-5, 6-7	Onboard: PCIe 4, 3
<b>4</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1		

#### Cable routing when one processor installed

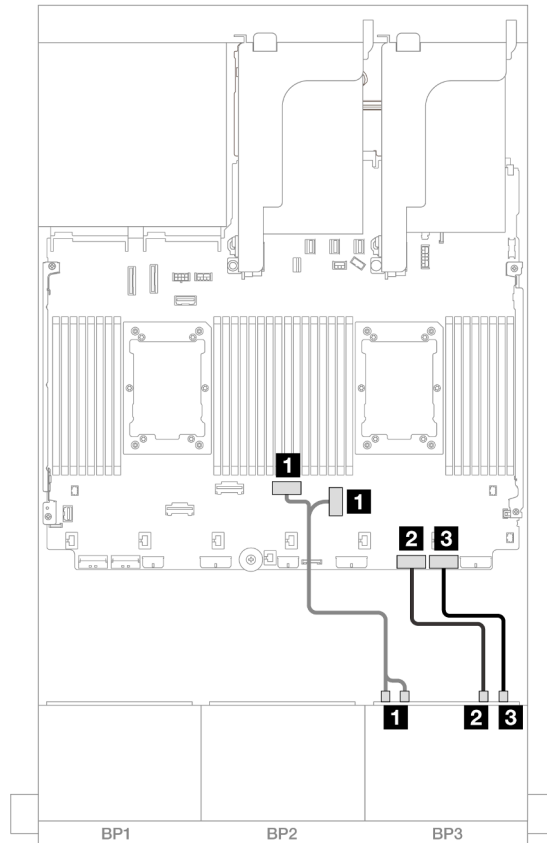


Figure 682. Cable routing when one processor installed

From	To
<b>1</b> Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 4, 3
<b>2</b> Backplane 3: NVMe 4-5	Onboard: PCIe 2
<b>3</b> Backplane 3: NVMe 6-7	Onboard: PCIe 1

## 24 x 2.5" SAS/SATA expander backplane

This section provides cable routing information for the server model with the 24 x 2.5" SAS/SATA expander backplane.

- [“Front backplane: 24 x 2.5" SAS/SATA” on page 650](#)
- [“Front + rear backplanes: 24 x 2.5" SAS/SATA + 4 x 2.5" AnyBay” on page 651](#)
- [“Front + rear backplanes: 24 x 2.5" SAS/SATA + 8 x 2.5" SAS/SATA” on page 652](#)

### Front backplane: 24 x 2.5" SAS/SATA

This topic provides cable routing information for the front 24 x 2.5-inch SAS/SATA expander backplane.

#### 8i adapter

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

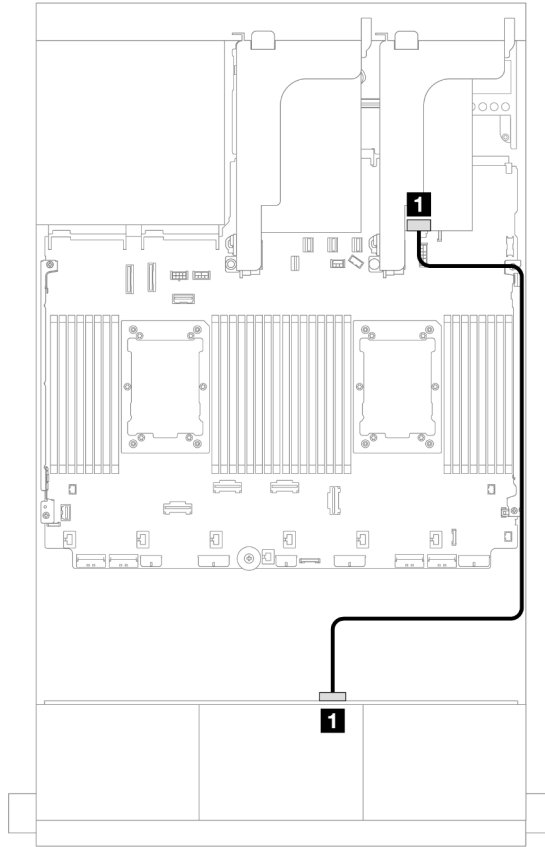


Figure 683. Cable routing to one 8i adapter

From	To
<b>1</b> Backplane 1: SAS 0	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>

### Front + rear backplanes: 24 x 2.5" SAS/SATA + 4 x 2.5" AnyBay

This topic provides cable routing information for the front 24 x 2.5-inch SAS/SATA expander backplane with a 4 x 2.5-inch AnyBay rear drive backplane.

#### 8i adapter

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

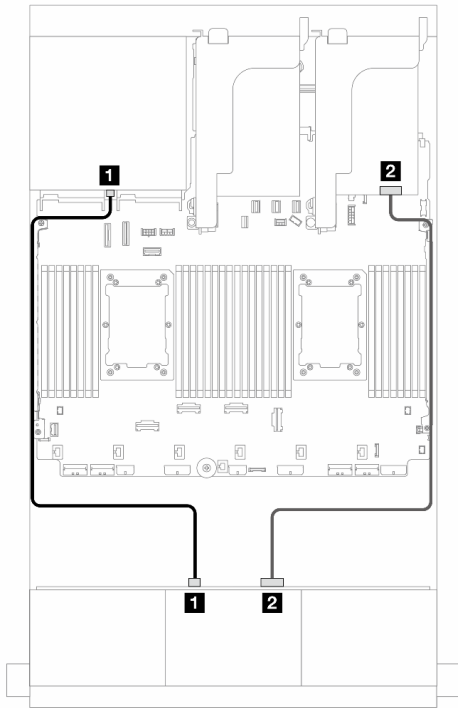


Figure 684. Front backplane cable routing

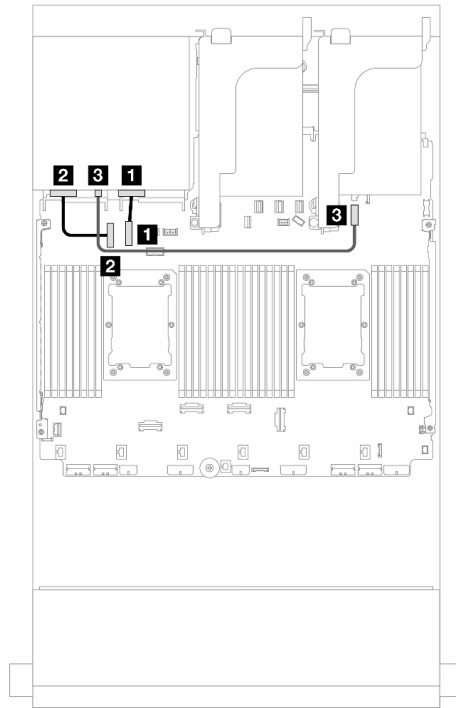


Figure 685. Rear backplane cable routing

From	To	From	To
<b>1</b> Backplane 1: SAS 1	Backplane 4: SAS	<b>1</b> Backplane 4: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: SAS 0	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>	<b>2</b> Backplane 4: NVMe 2-3	Onboard: PCIe 9
		<b>3</b> Backplane 4: PWR	<b>4</b> Onboard: 7mm power connector

## Front + rear backplanes: 24 x 2.5" SAS/SATA + 8 x 2.5" SAS/SATA

This topic provides cable routing information for the front 24 x 2.5-inch SAS/SATA expander backplane with an 8 x 2.5-inch SAS/SATA rear drive backplane.

- [“16i RAID/HBA adapter” on page 652](#)
- [“CFF 16i RAID/HBA adapter” on page 653](#)

### 16i RAID/HBA adapter

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA configuration with one 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

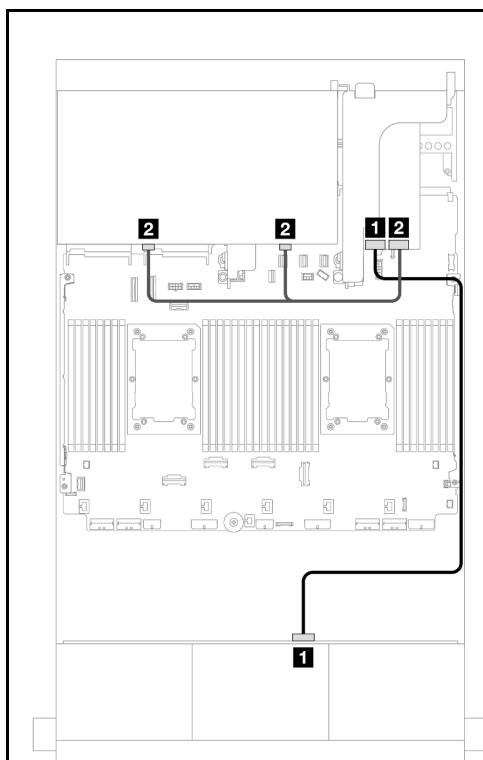


Figure 686. Front/Rear backplane signal cable routing

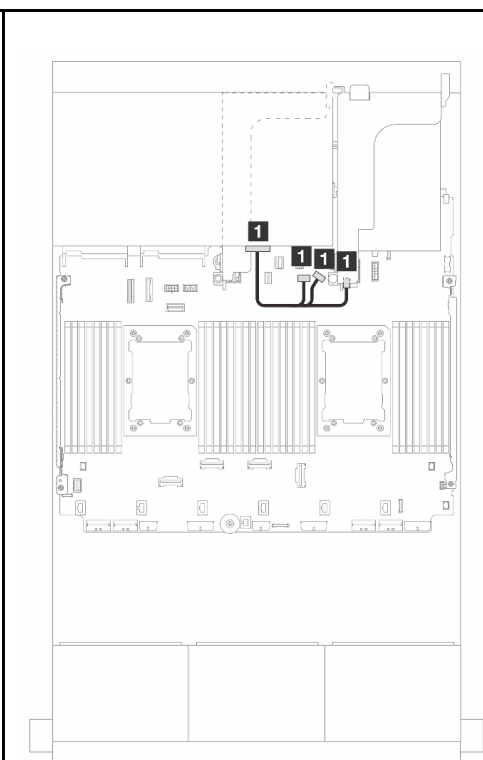


Figure 687. Rear backplane power cable routing

From	To	From	To
<b>1</b> Backplane 1: SAS 0	16i adapter <ul style="list-style-type: none"> <li>Gen 4: C0</li> <li>Gen 3: C0C1</li> </ul>	<b>1</b> Backplane 4: PWR	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>
<b>2</b> Backplane 4: SAS	<ul style="list-style-type: none"> <li>Gen 4: C1</li> <li>Gen 3: C2C3</li> </ul>		

### CFF 16i RAID/HBA adapter

This topic provides cable routing information for the 24 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA configuration with one CFF 16i RAID/HBA adapter.

### Signal cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

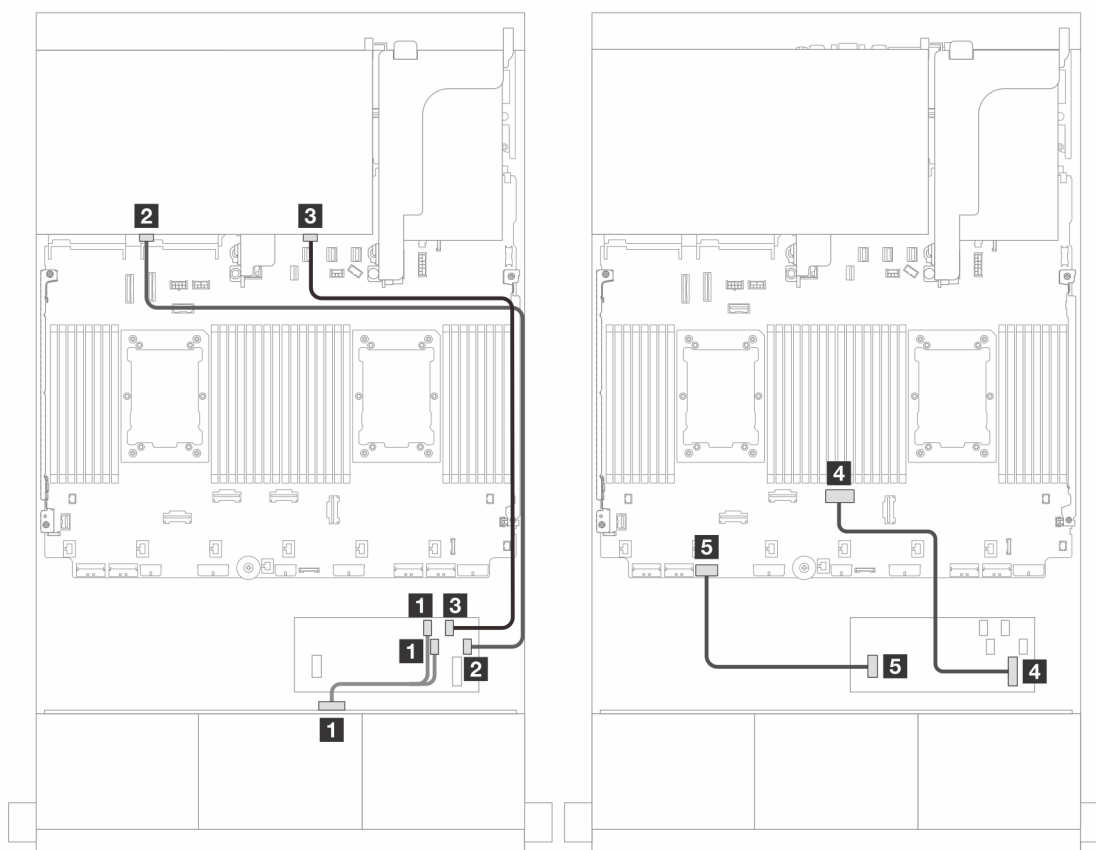


Figure 688. Cable routing to one CFF 16i RAID/HBA adapter

From	To
<b>1</b> Backplane 1: SAS 0	CFF adapter <ul style="list-style-type: none"> <li>• C0</li> <li>• C1</li> </ul>
<b>2</b> Backplane 4: SAS 0	<ul style="list-style-type: none"> <li>• C2</li> </ul>
<b>3</b> Backplane 4: SAS 1	<ul style="list-style-type: none"> <li>• C3</li> </ul>
<b>4</b> CFF adapter: MB (CFF input)	Onboard: PCIe 4
<b>5</b> CFF adapter: PWR	Onboard: CFF RAID/HBA PWR

### Power cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

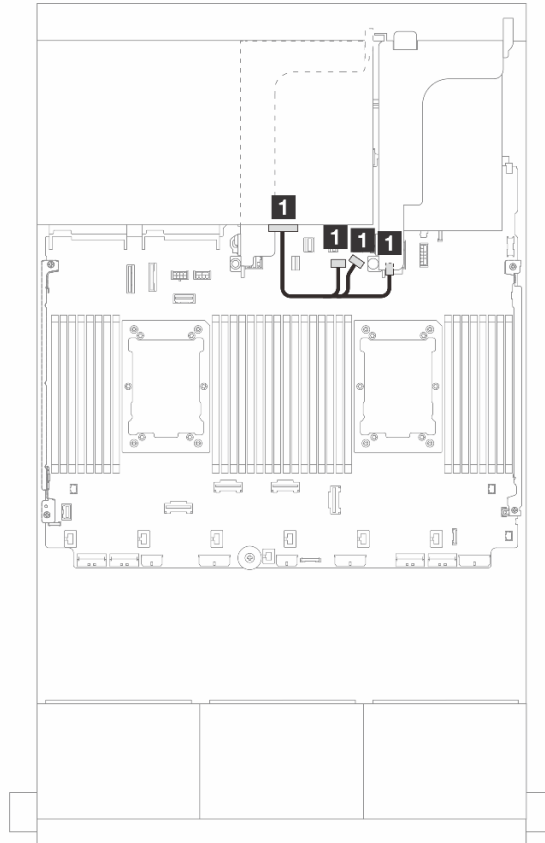


Figure 689. Rear backplane power cable routing

From	To
1 Backplane 4: PWR	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>

# Backplanes: server models with 3.5-inch front drive bays

This section provides backplane cable connection information for server models with 3.5-inch front drive bays.

## Before you start

Ensure below parts are removed before starting cable routing for front backplanes.

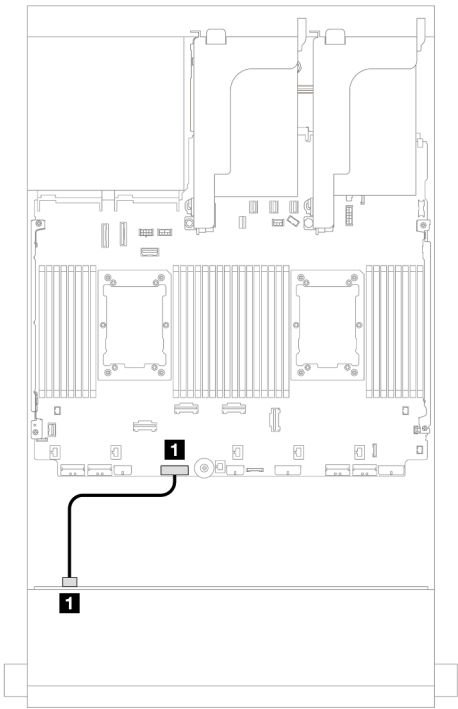
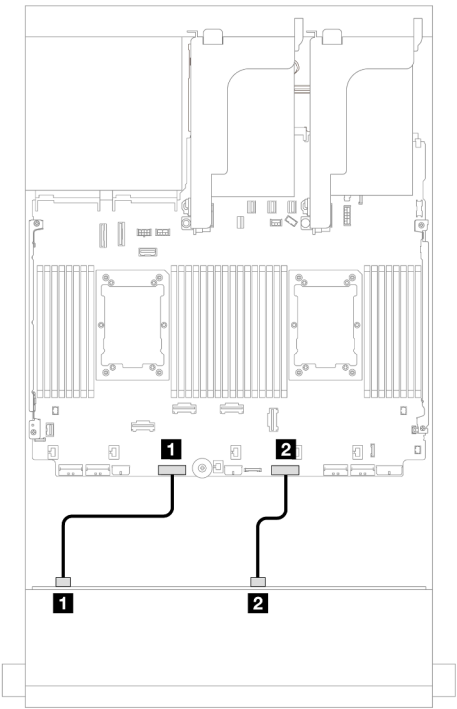
- Top cover (see [“Remove the top cover” on page 381](#))
- Air baffle (see [“Remove the air baffle” on page 99](#))
- Fan cage (see [“Remove the system fan cage” on page 373](#))

## Power cable connections

The server supports the following 3.5-inch drive backplanes:

- 8 x 3.5-inch SAS/SATA backplane
- 12 x 3.5-inch SAS/SATA backplane
- 12 x 3.5-inch AnyBay backplane
- 12 x 3.5-inch SAS/SATA expander backplane

For connectors on each drive backplane, see [“Drive backplane connectors” on page 385](#).

			
<i>Figure 690. Power cable connections for the 8 x 3.5-inch SAS/SATA backplane and 12 x 3.5-inch SAS/SATA expander backplane</i>		<i>Figure 691. Power cable connections for the 12 x 3.5-inch SAS/SATA/AnyBay backplanes</i>	
From	To	From	To



<b>1</b> Power connector on backplane 1	Backplane 1 power connector	<b>1</b> Power connector 1 on backplane	Backplane 1 power connector
		<b>2</b> Power connector 2 on backplane	Backplane 2 power connector

**Notes:** If there is a supercap holder installed between the front backplane and the system board assembly, connect the power cables as below:

- Connect power connector 1 on the backplane to the backplane 2 power connector on the system board assembly
- (For the backplane with two power connectors) Connect power connector 2 on the backplane to the backplane 3 power connector on the system board assembly.

### Signal cable connections

Refer to the specific topic for signal cable connections depending on the backplanes you have installed.

- [“8 x 3.5-inch SAS/SATA backplane” on page 657](#)
- [“12 x 3.5-inch SAS/SATA backplane” on page 659](#)
- [“12 x 3.5-inch AnyBay backplane” on page 677](#)
- [“12 x 3.5-inch SAS/SATA expander backplane” on page 683](#)

## 8 x 3.5-inch SAS/SATA backplane

This section provides cable routing information for the server model with the 8 x 3.5-inch SAS/SATA front drive backplane.

- [“Onboard connectors” on page 657](#)
- [“8i RAID/HBA adapter” on page 658](#)

### Onboard connectors

The following shows the cable connections for the 8 x 3.5-inch SAS/SATA configuration with onboard connectors.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

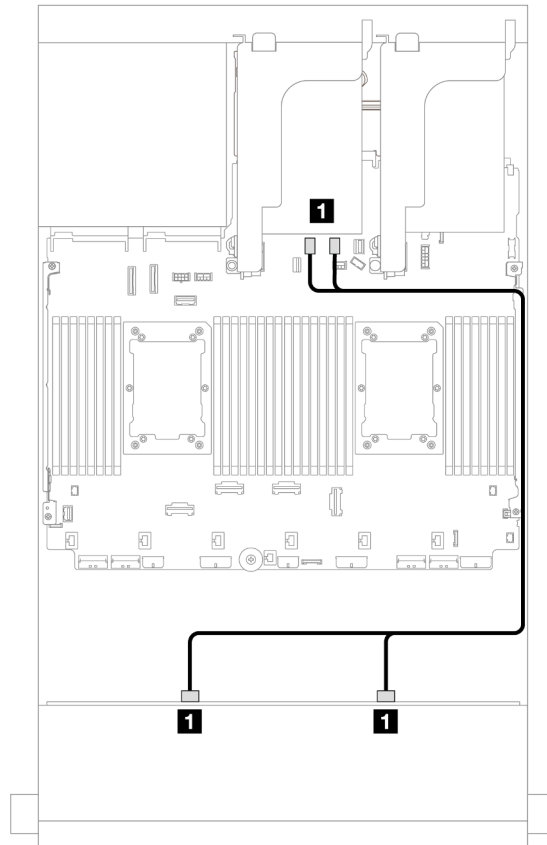


Figure 692. Cable routing to onboard SATA connectors

From	To
1 Backplane 1: SAS 0, SAS 1	Onboard: SATA 0, SATA 1

## 8i RAID/HBA adapter

The following shows the cable connections for the 8 x 3.5-inch SAS/SATA configuration with one 8i RAID/HBA adapter.

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

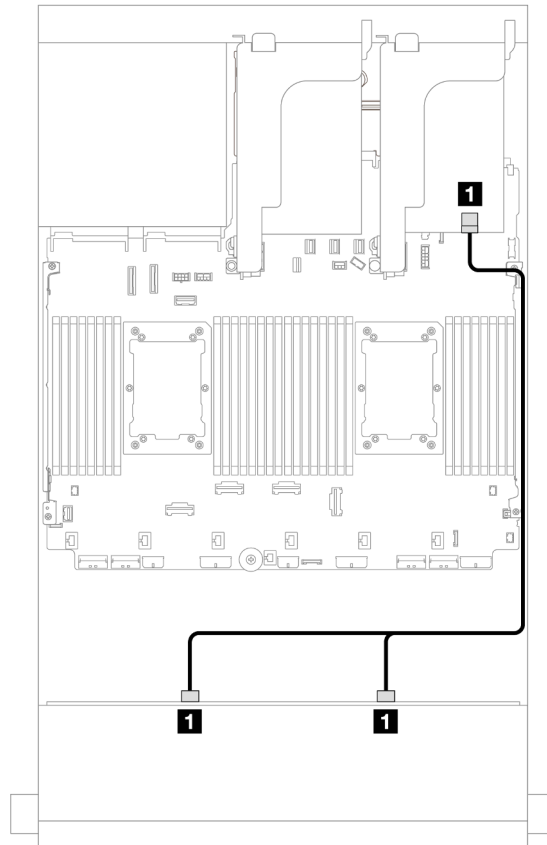


Figure 693. Cable routing to one 8i RAID/HBA adapter

From	To
1 Backplane 1: SAS 0, SAS 1	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>

## 12 x 3.5-inch SAS/SATA backplane

This section provides cable routing information for the server model with the 12 x 3.5-inch SAS/SATA front drive backplane.

- [“Front backplane: 12 x 3.5" SAS/SATA” on page 659](#)
- [“Front + rear backplanes: 12 x 3.5" SAS/SATA + 4 x 2.5"/2 x 3.5"/4 x 3.5" SAS/SATA/4 x 2.5" AnyBay” on page 661](#)
- [“Front + middle backplanes: 12 x 3.5" SAS/SATA + 4 x 3.5"/4 x 2.5" SAS/SATA/8 x 2.5" NVMe” on page 666](#)
- [“Front + middle + rear backplanes: 12 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA” on page 676](#)

### Front backplane: 12 x 3.5" SAS/SATA

This topic provides cable routing information for the server model with the 12 x 3.5-inch SAS/SATA front drive backplane.

- [“Onboard connectors” on page 660](#)

- [“16i RAID/HBA adapter” on page 660](#)

### Onboard connectors

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

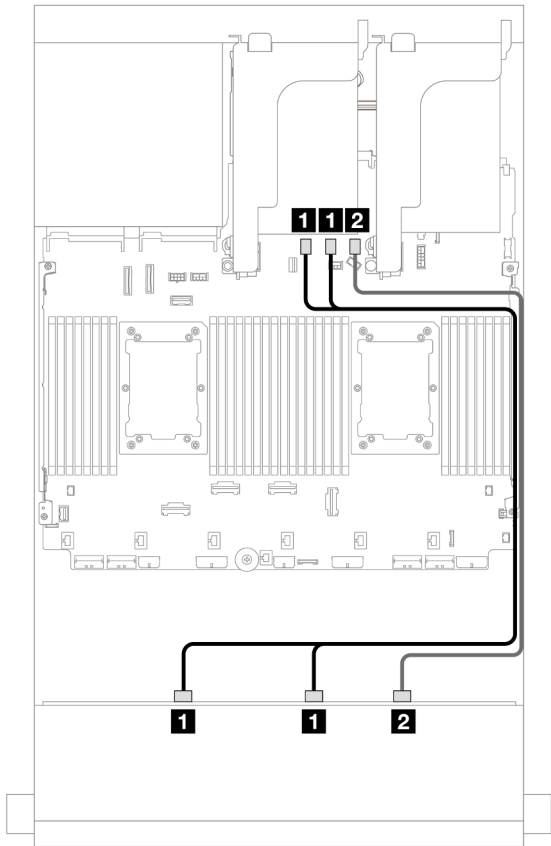


Figure 694. Cable routing to onboard SATA connectors

From	To
<b>1</b> Backplane 1: SAS 0, SAS 1	Onboard: SATA 0, SATA 1
<b>2</b> Backplane 1: SAS 2	Onboard: SATA 2

### 16i RAID/HBA adapter

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

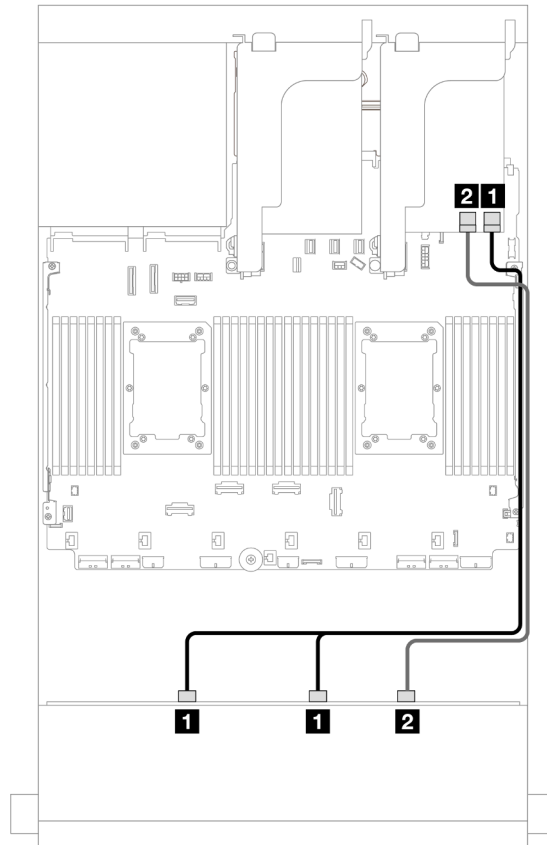


Figure 695. Cable routing to one 16i RAID/HBA adapter

From	To
1 Backplane 1: SAS 0, SAS 1	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
2 Backplane 1: SAS 2	<ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2</li> </ul>

### Front + rear backplanes: 12 x 3.5" SAS/SATA + 4 x 2.5"/2 x 3.5"/4 x 3.5" SAS/SATA/4 x 2.5" AnyBay

This topic provides cable routing information for the 12 x 3.5-inch SAS/SATA front backplane and a 2 x 3.5-inch/4 x 3.5-inch/4 x 2.5-inch SAS/SATA rear backplane or a 4 x 2.5-inch AnyBay rear backplane.

Depending on the rear backplane you use, refer to the specific configuration for cable routing information.

- ["12 x 3.5" SAS/SATA + 2 x 3.5" SAS/SATA" on page 662](#)
- ["12 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA" on page 663](#)
- ["12 x 3.5" SAS/SATA + 4 x 2.5" SAS/SATA" on page 664](#)
- ["12 x 3.5" SAS/SATA + 4 x 2.5" AnyBay" on page 665](#)

**12 x 3.5" SAS/SATA + 2 x 3.5" SAS/SATA**

This topic provides cable routing information for the 12 x 3.5-inch SAS/SATA front backplane and a 2 x 3.5-inch SAS/SATA rear backplane.

- [“Onboard connectors + onboard connectors” on page 662](#)
- [“16i RAID/HBA adapter” on page 662](#)

**Onboard connectors + onboard connectors**

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

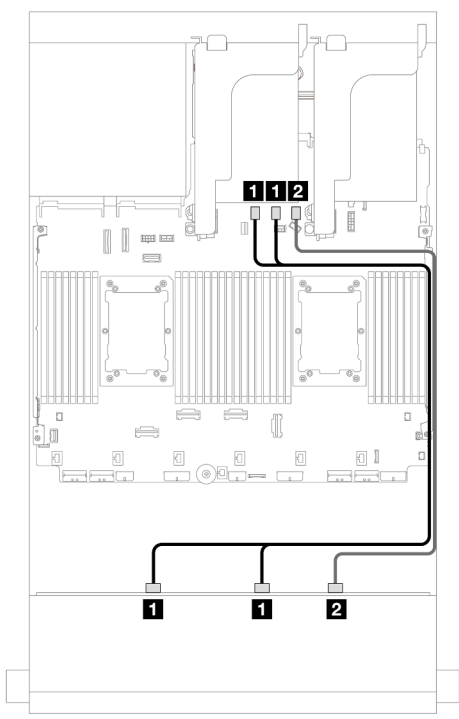


Figure 696 shows the front backplane cable routing. It illustrates the connection between the front backplane (labeled 1 and 2) and the onboard SATA ports (labeled 1 and 2). The diagram shows the physical layout of the backplane and the corresponding onboard connectors.

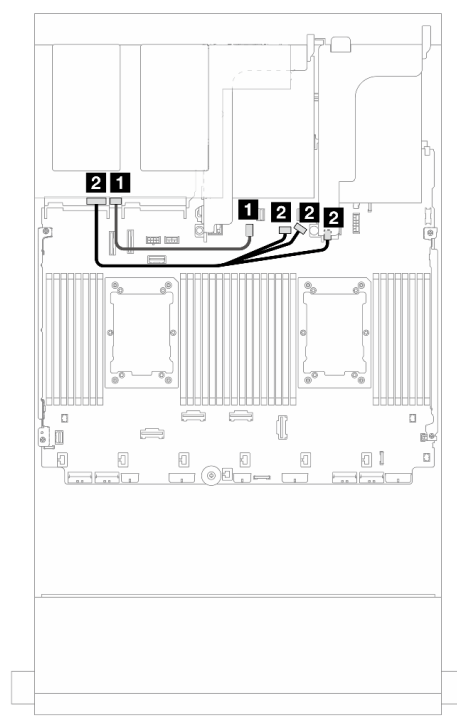
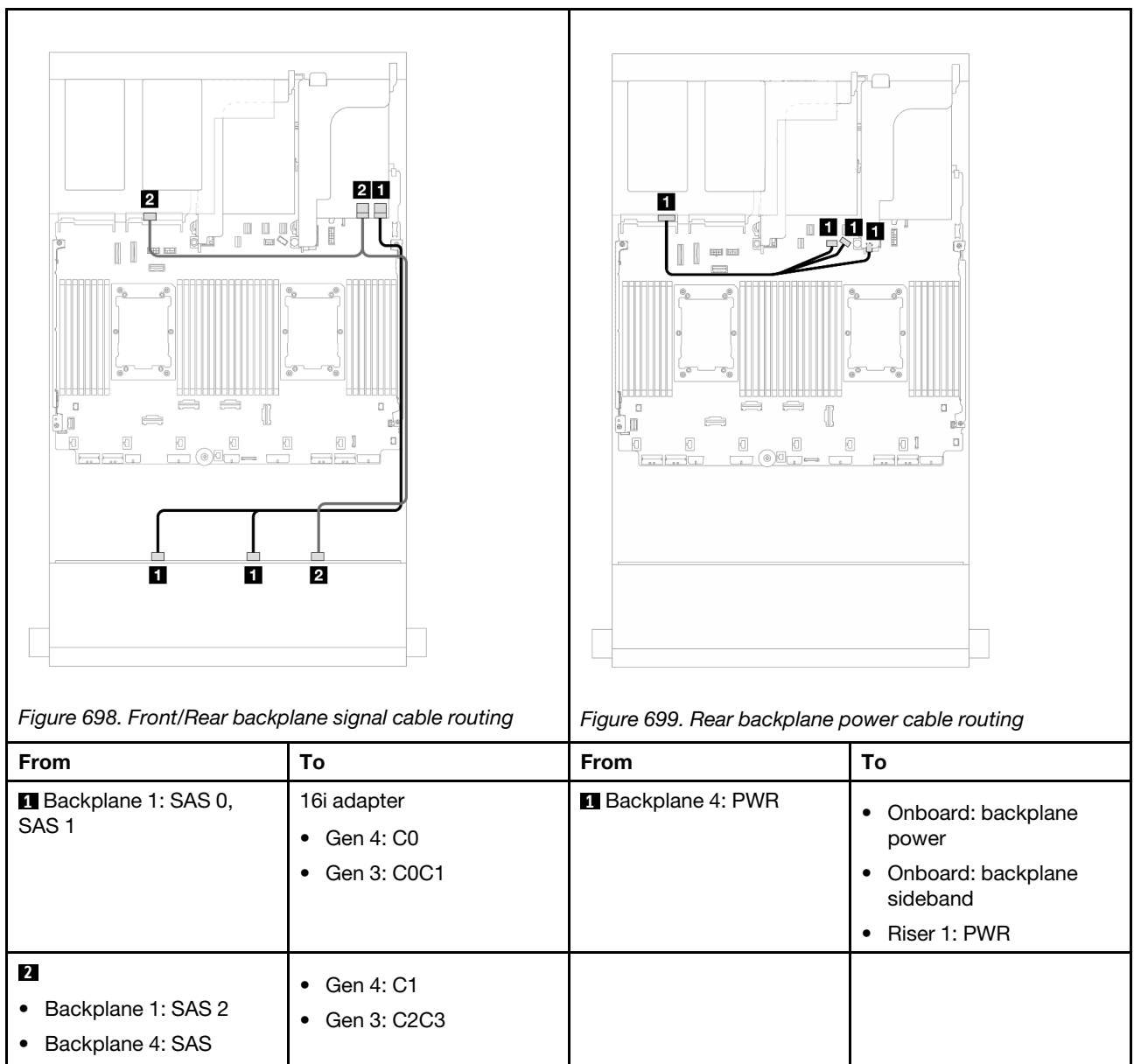


Figure 697 shows the rear backplane cable routing. It illustrates the connection between the rear backplane (labeled 1 and 2) and the onboard M.2/7mm signal connector (labeled 1) and power connectors (labeled 2). The diagram shows the physical layout of the backplane and the corresponding onboard connectors.

From	To	From	To
<b>1</b> Backplane 1: SAS 0, SAS 1	Onboard: SATA 0, SATA 1	<b>1</b> Backplane 4: SAS	Onboard: M.2/7mm signal connector
<b>2</b> Backplane 1: SAS 2	Onboard: SATA 2	<b>2</b> Backplane 4: PWR	<ul style="list-style-type: none"><li>• Onboard: backplane power</li><li>• Onboard: backplane sideband</li><li>• Riser 1: PWR</li></ul>

**16i RAID/HBA adapter**

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



**12 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA**

This topic provides cable routing information for the 12 x 3.5-inch SAS/SATA front backplane and a 4 x 3.5-inch SAS/SATA rear backplane.

**16i RAID/HBA adapter**

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

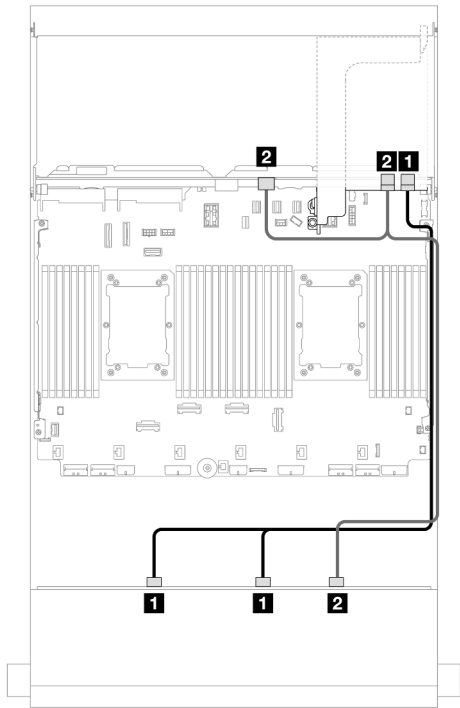


Figure 700. Front/Rear backplane signal cable routing

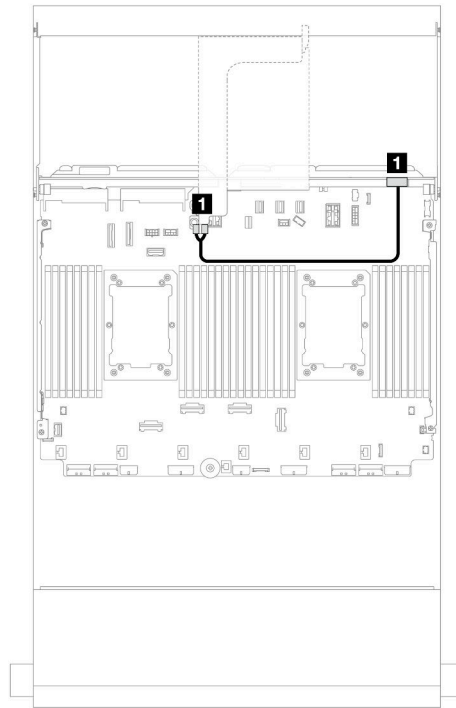


Figure 701. Rear backplane power cable routing

From	To	From	To
<b>1</b> Backplane 1: SAS 0, SAS 1	16i adapter <ul style="list-style-type: none"> <li>Gen 4: C0</li> <li>Gen 3: C0C1</li> </ul>	<b>1</b> Backplane 4: PWR	Riser 2: PWR1, PWR2
<b>2</b> <ul style="list-style-type: none"> <li>Backplane 1: SAS 2</li> <li>Backplane 4: SAS</li> </ul>	<ul style="list-style-type: none"> <li>Gen 4: C1</li> <li>Gen 3: C2C3</li> </ul>		

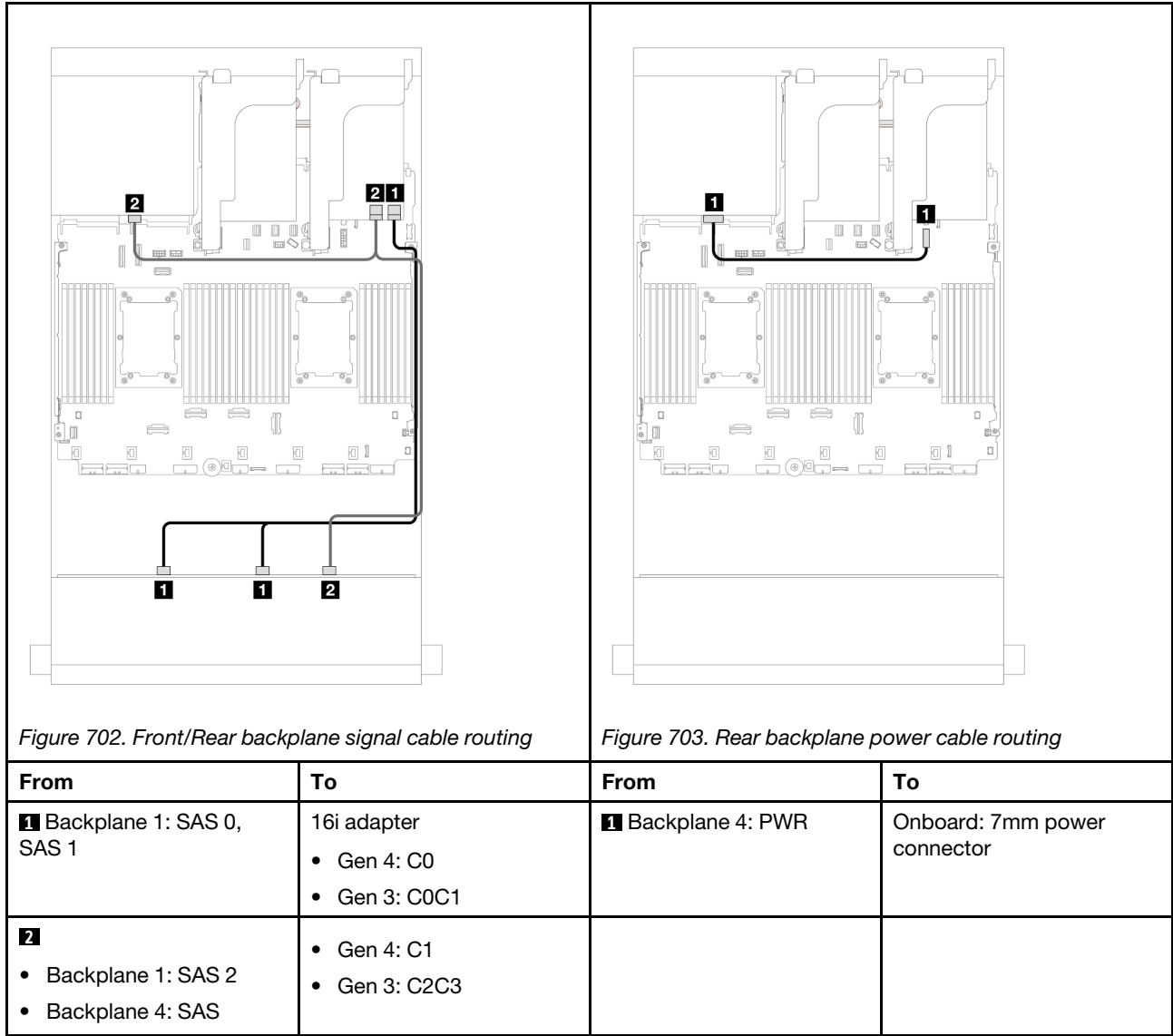
### 12 x 3.5" SAS/SATA + 4 x 2.5" SAS/SATA

This topic provides cable routing information for the 12 x 3.5-inch SAS/SATA front backplane and a 4 x 2.5-inch SAS/SATA rear backplane.

### 16i RAID/HBA adapter

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**





**12 x 3.5" SAS/SATA + 4 x 2.5" AnyBay**

This topic provides cable routing information for the 12 x 3.5-inch SAS/SATA front backplane and a 4 x 2.5-inch AnyBay rear backplane.

**16i RAID/HBA adapter**

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

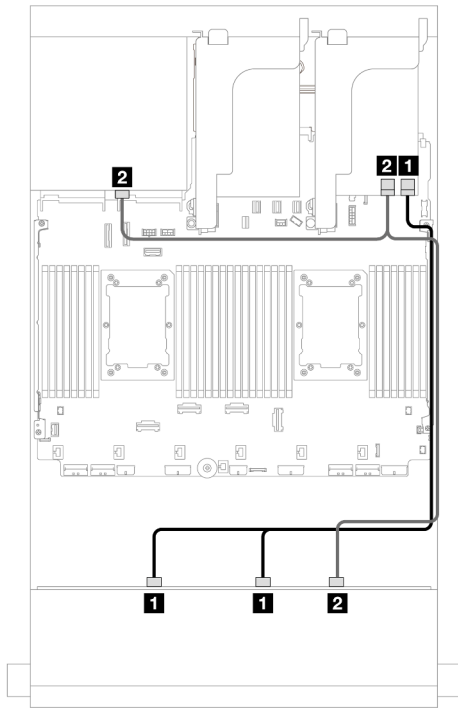


Figure 704. Front backplane cable routing

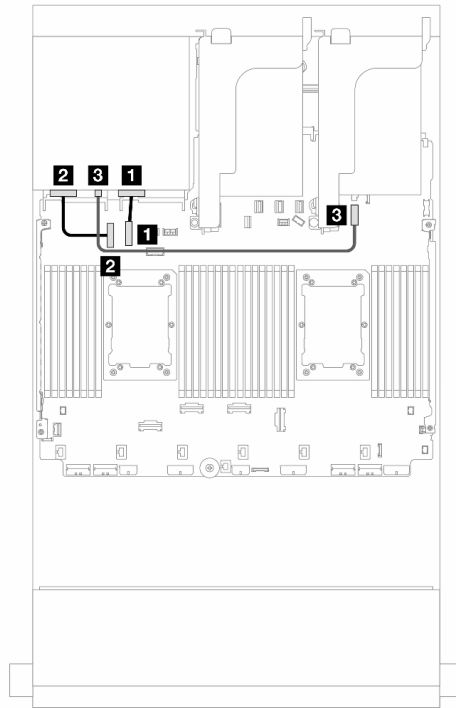


Figure 705. Rear backplane cable routing

From	To	From	To
<b>1</b> Backplane 1: SAS 0, SAS 1	16i adapter <ul style="list-style-type: none"> <li>Gen 4: C0</li> <li>Gen 3: C0C1</li> </ul>	<b>1</b> Backplane 4: NVMe 0-1	Onboard: PCIe 10
<b>2</b> <ul style="list-style-type: none"> <li>Backplane 1: SAS 2</li> <li>Backplane 4: SAS</li> </ul>	<ul style="list-style-type: none"> <li>Gen 4: C1</li> <li>Gen 3: C2C3</li> </ul>	<b>2</b> Backplane 4: NVMe 2-3	Onboard: PCIe 9
		<b>3</b> Backplane 4: PWR	Onboard: 7mm power connector

## Front + middle backplanes: 12 x 3.5" SAS/SATA + 4 x 3.5"/4 x 2.5" SAS/SATA/8 x 2.5" NVMe

This topic provides cable routing information for the 12 x 3.5-inch SAS/SATA front backplane and 4 x 3.5-inch/4 x 2.5-inch SAS/SATA or 4 x 2.5-inch NVMe/AnyBay middle backplanes.

Depending on the rear backplane you use, refer to the specific configuration for cable routing information.

- [“12 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA” on page 666](#)
- [“12 x 3.5" SAS/SATA + 4 x 2.5" SAS/SATA” on page 667](#)
- [“12 x 3.5" SAS/SATA + 8 x 2.5" NVMe \(two 4 x 2.5" NVMe\)” on page 668](#)
- [“12 x 3.5" SAS/SATA + 8 x 2.5" NVMe \(two 4 x 2.5" AnyBay\)” on page 672](#)

## 12 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA

This topic provides cable routing information for the 12 x 3.5-inch SAS/SATA front backplane and a 4 x 3.5-inch SAS/SATA middle backplane.

16i RAID/HBA adapter

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

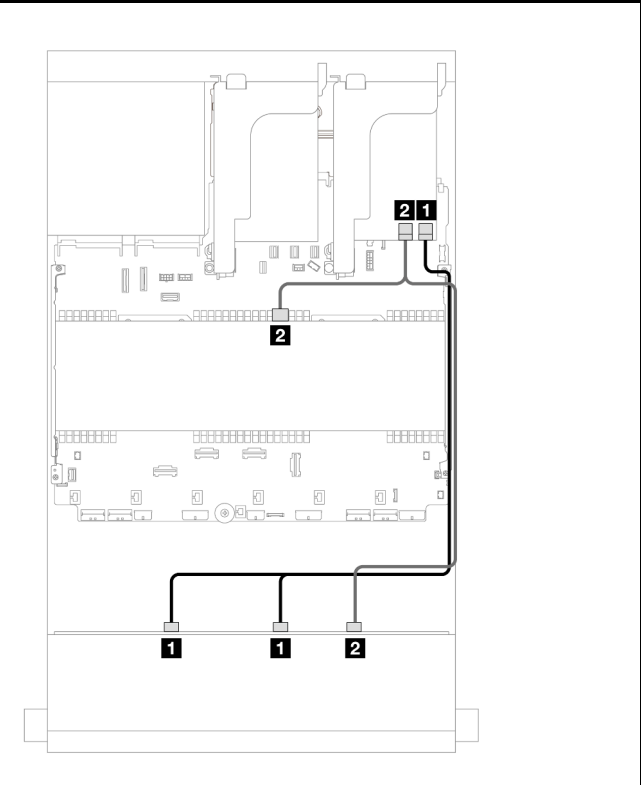


Figure 706. Front/Middle backplane signal cable routing

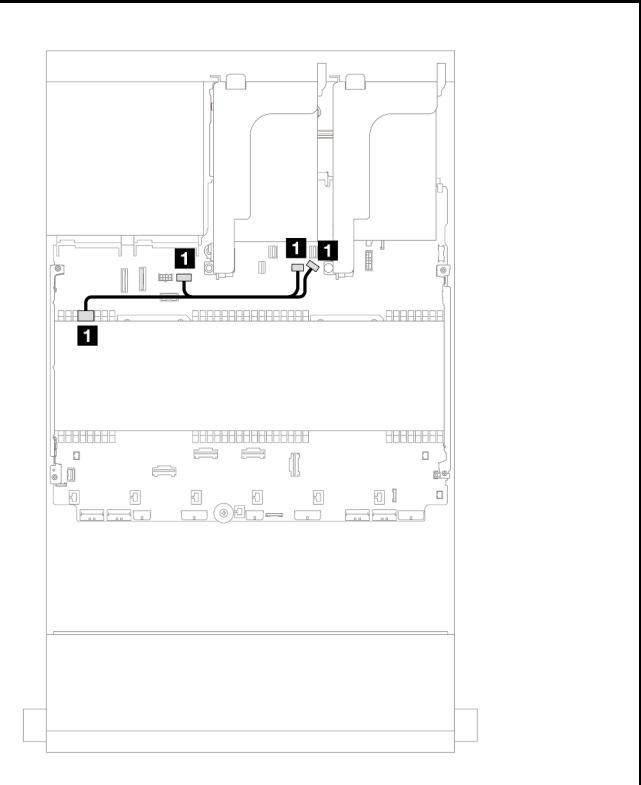


Figure 707. Middle backplane power cable routing

From	To	From	To
1 Backplane 1: SAS 0, SAS 1	16i adapter <ul style="list-style-type: none"><li>Gen 4: C0</li><li>Gen 3: C0C1</li></ul>	1 Backplane 5: PWR	<ul style="list-style-type: none"><li>Onboard: GPU power</li><li>Onboard: backplane power</li><li>Onboard: backplane sideband</li></ul>
2 <ul style="list-style-type: none"><li>Backplane 1: SAS 2</li><li>Backplane 5: SAS</li></ul>	<ul style="list-style-type: none"><li>Gen 4: C1</li><li>Gen 3: C2C3</li></ul>		

12 x 3.5" SAS/SATA + 4 x 2.5" SAS/SATA

This topic provides cable routing information for the 12 x 3.5-inch SAS/SATA front backplane and a 4 x 2.5-inch SAS/SATA middle backplane.

16i RAID/HBA adapter

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n

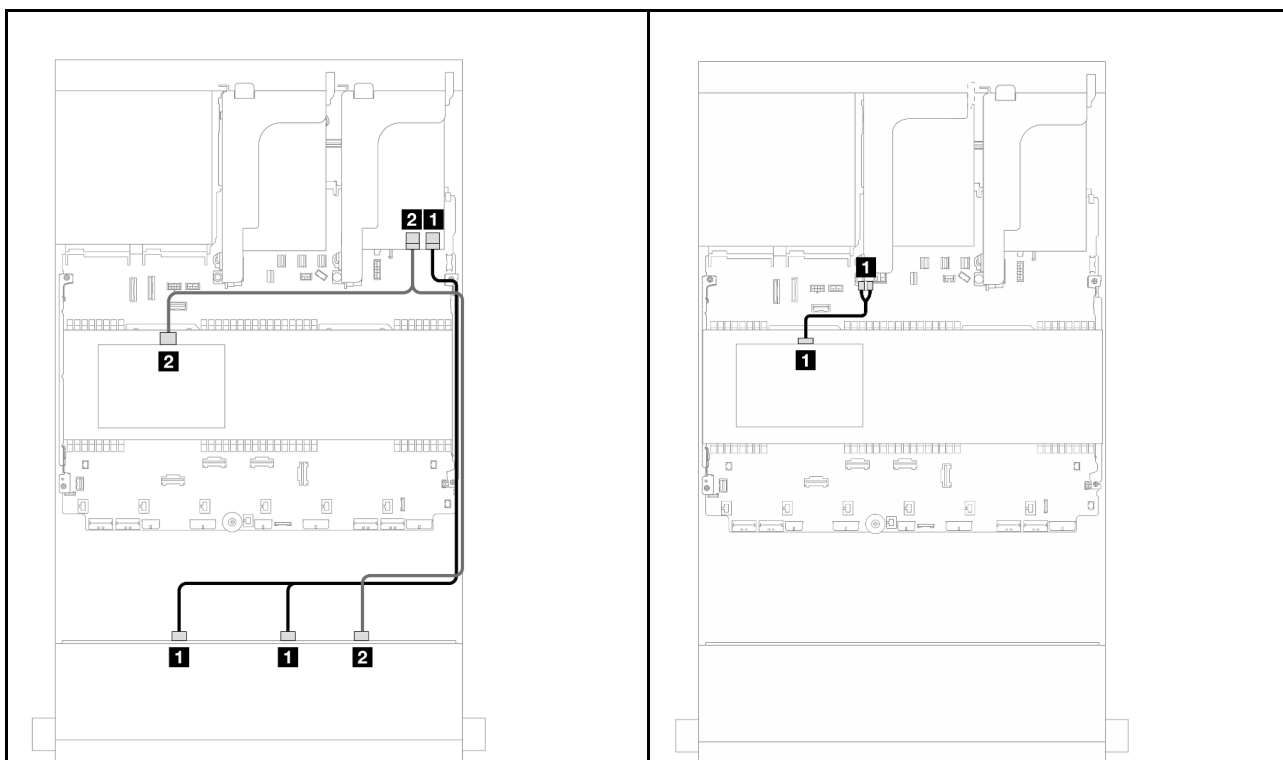


Figure 708. Front/Middle backplane signal cable routing

Figure 709. Middle backplane power cable routing

From	To	From	To
<b>1</b> Backplane 1: SAS 0, SAS 1	16i adapter <ul style="list-style-type: none"> <li>Gen 4: C0</li> <li>Gen 3: C0C1</li> </ul>	<b>1</b> Backplane 5: PWR	Riser 2: PWR1, PWR2
<b>2</b> <ul style="list-style-type: none"> <li>Backplane 1: SAS 2</li> <li>Backplane 5: SAS</li> </ul>	<ul style="list-style-type: none"> <li>Gen 4: C1</li> <li>Gen 3: C2C3</li> </ul>		

### 12 x 3.5" SAS/SATA + 8 x 2.5" NVMe (two 4 x 2.5" NVMe)

This topic provides cable routing information for the 12 x 3.5-inch SAS/SATA front backplane and two 4 x 2.5-inch NVMe middle backplanes.

- [“Onboard connectors” on page 668](#)
- [“16i RAID/HBA adapter” on page 670](#)

#### Onboard connectors

This topic provides cable routing information for the front 12 x 3.5" SAS/SATA + middle 8 x 2.5" NVMe (using two 4 x 2.5" NVMe backplanes) configuration with onboard connectors.

#### Front backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

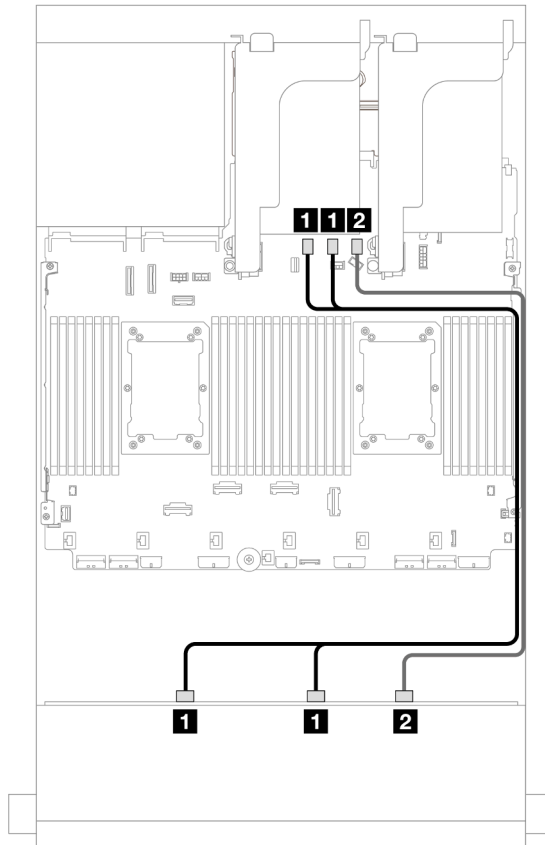


Figure 710. Cable routing to onboard SATA connectors

From	To
<b>1</b> Backplane 1: SAS 0, SAS 1	Onboard: SATA 0, SATA 1
<b>2</b> Backplane 1: SAS 2	Onboard: SATA 2

### Middle backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

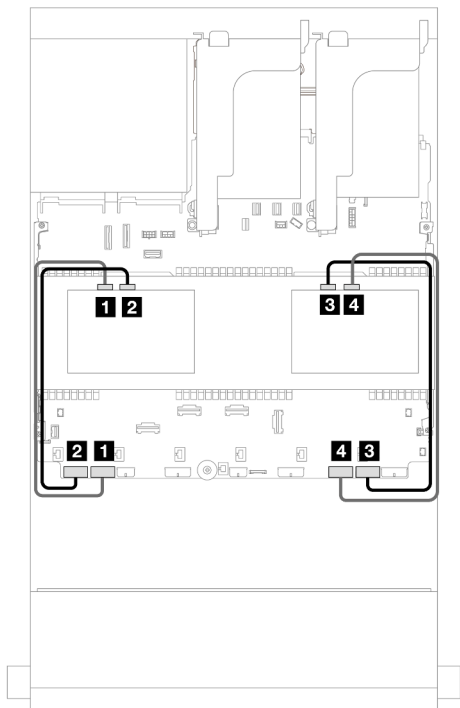


Figure 711. Middle backplane signal cable routing

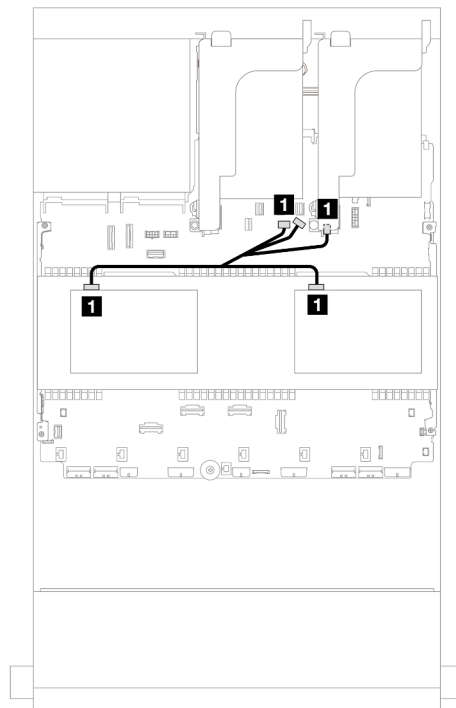


Figure 712. Middle backplane power cable routing

From	To	From	To
<b>1</b> Backplane 5: NVMe 0-1	Onboard: PCIe 7	<b>1</b>	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>
<b>2</b> Backplane 5: NVMe 2-3	Onboard: PCIe 8		
<b>3</b> Backplane 6: NVMe 0-1	Onboard: PCIe 1		
<b>4</b> Backplane 6: NVMe 2-3	Onboard: PCIe 2		

### 16i RAID/HBA adapter

This topic provides cable routing information for the front 12 x 3.5" SAS/SATA + middle 8 x 2.5" NVMe (using two 4 x 2.5" NVMe backplanes) configuration with one 16i RAID/HBA adapter.

### Front backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

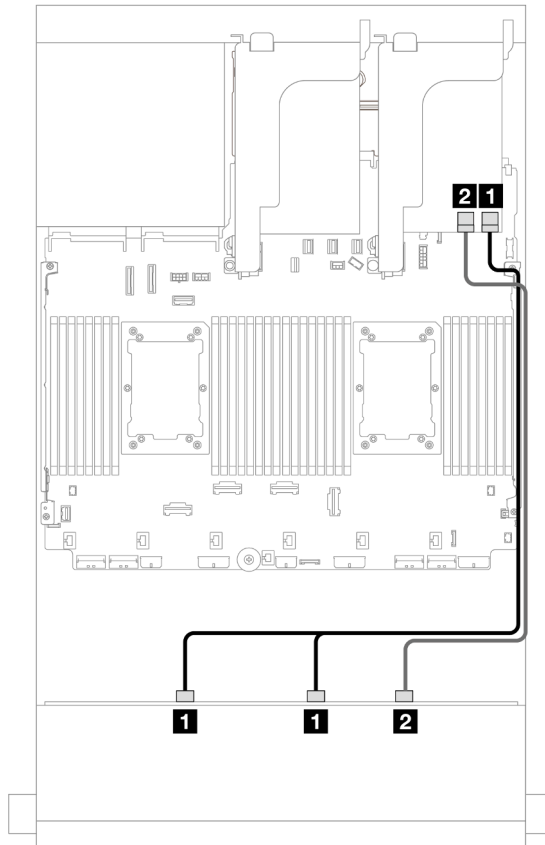


Figure 713. Cable routing to one 16i RAID/HBA adapter

From	To
<b>1</b> Backplane 1: SAS 0, SAS 1	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 1: SAS 2	<ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2C3</li> </ul>

### Middle backplane cable routing

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

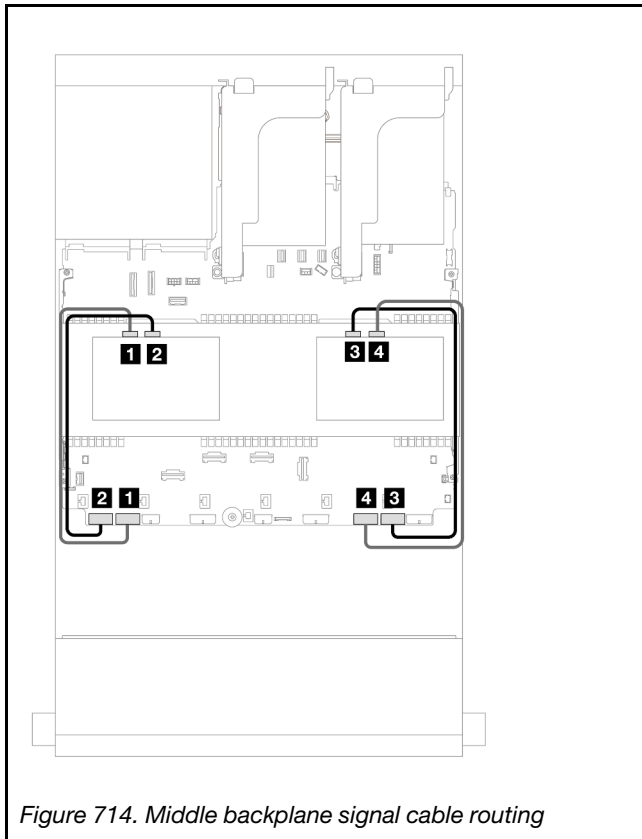


Figure 714. Middle backplane signal cable routing

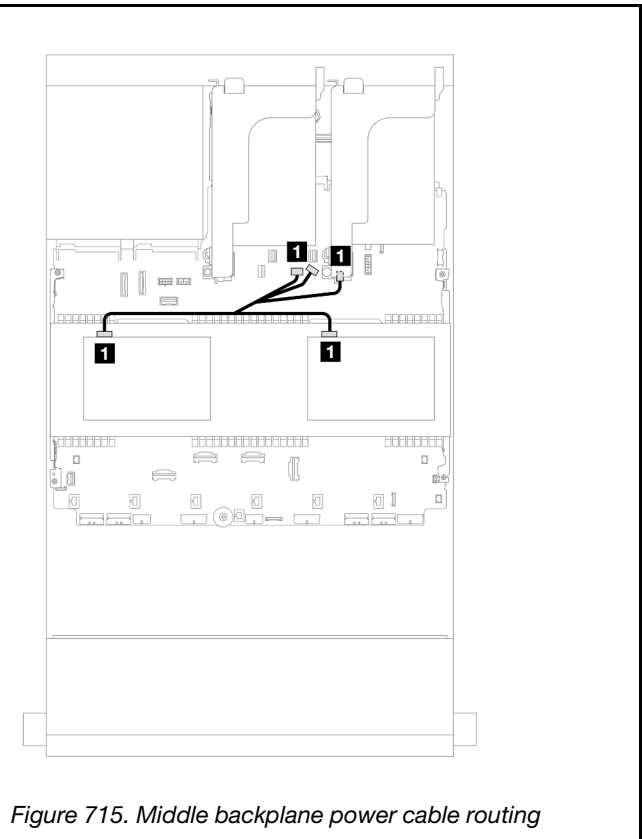


Figure 715. Middle backplane power cable routing

From	To	From	To
<b>1</b> Backplane 5: NVMe 0-1	Onboard: PCIe 7	<b>1</b>	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>
<b>2</b> Backplane 5: NVMe 2-3	Onboard: PCIe 8		
<b>3</b> Backplane 6: NVMe 0-1	Onboard: PCIe 1		
<b>4</b> Backplane 6: NVMe 2-3	Onboard: PCIe 2		

### 12 x 3.5" SAS/SATA + 8 x 2.5" NVMe (two 4 x 2.5" AnyBay)

This topic provides cable routing information for the 12 x 3.5-inch SAS/SATA front backplane and two 4 x 2.5-inch AnyBay middle backplanes.

- [“Onboard connectors” on page 668](#)
- [“16i RAID/HBA adapter” on page 670](#)

#### Onboard connectors

This topic provides cable routing information for the front 12 x 3.5" SAS/SATA + middle 8 x 2.5" NVMe (using two 4 x 2.5" AnyBay backplanes) configuration with onboard connectors.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



Front backplane cable routing

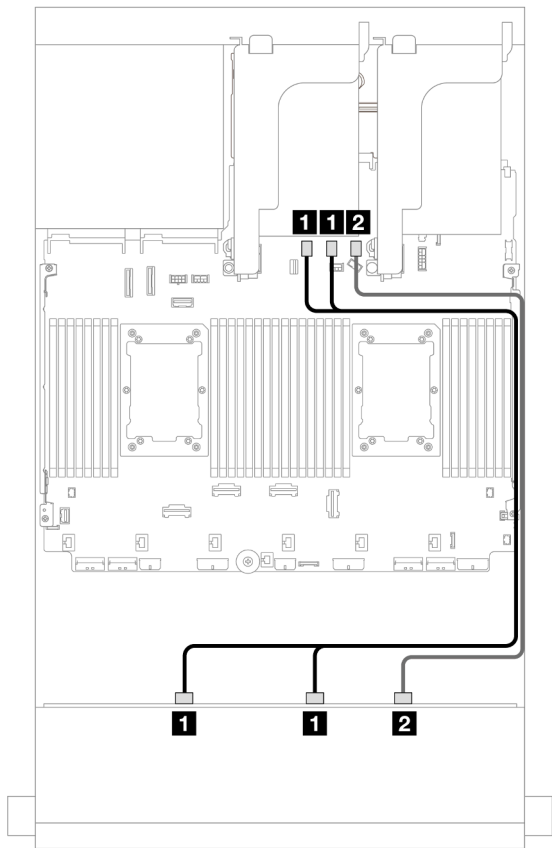


Figure 716. Cable routing to onboard SATA connectors

From	To
<b>1</b> Backplane 1: SAS 0, SAS 1	Onboard: SATA 0, SATA 1
<b>2</b> Backplane 1: SAS 2	Onboard: SATA 2

# Middle backplane cable routing

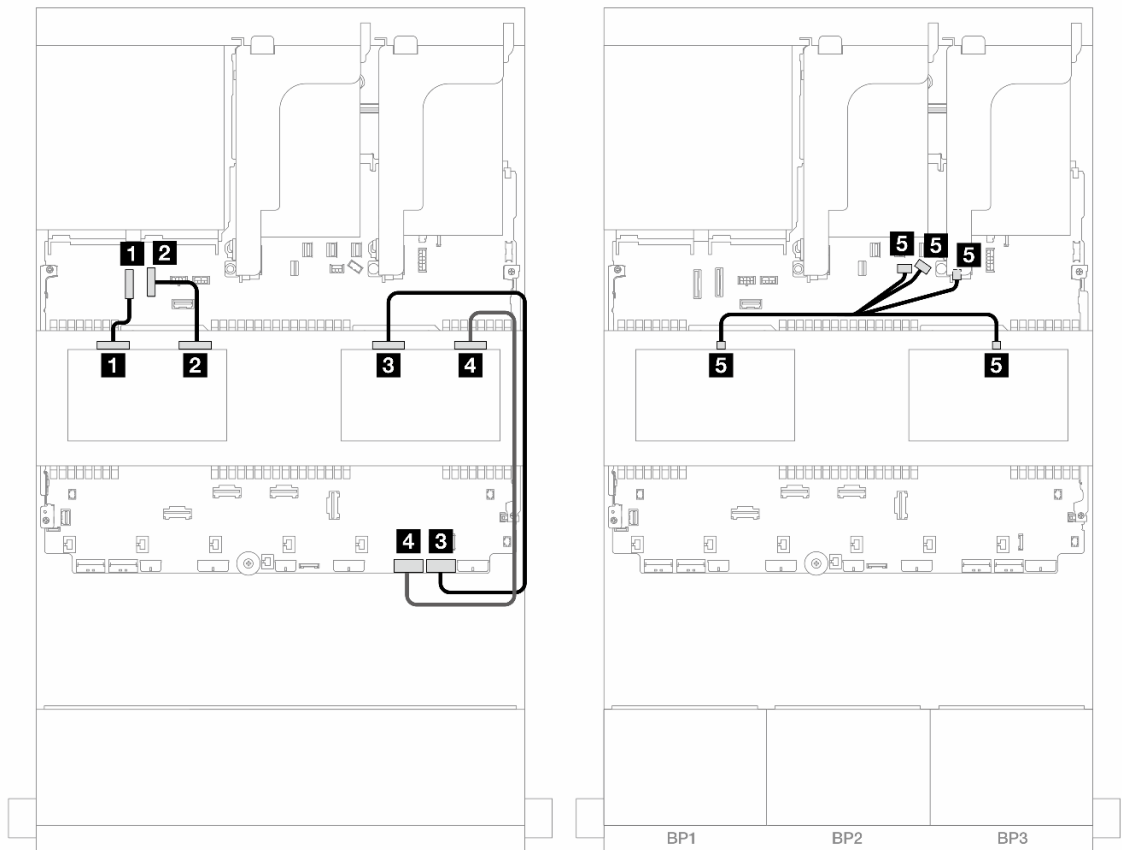


Figure 717. Middle backplane cable routing

From	To
<b>1</b> Backplane 5: NVMe 0-1	Onboard: PCIe 9
<b>2</b> Backplane 5: NVMe 2-3	Onboard: PCIe 10
<b>3</b> Backplane 6: NVMe 0-1	Onboard: PCIe 1
<b>4</b> Backplane 6: NVMe 2-3	Onboard: PCIe 2
<b>5</b> <ul style="list-style-type: none"> <li>Backplane 5: PWR</li> <li>Backplane 6: PWR</li> </ul>	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>

## 16i RAID/HBA adapter

This topic provides cable routing information for the front 12 x 3.5" SAS/SATA + middle 8 x 2.5" NVMe (using two 4 x 2.5" AnyBay backplanes) configuration with one 16i RAID/HBA adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

## Front backplane cable routing

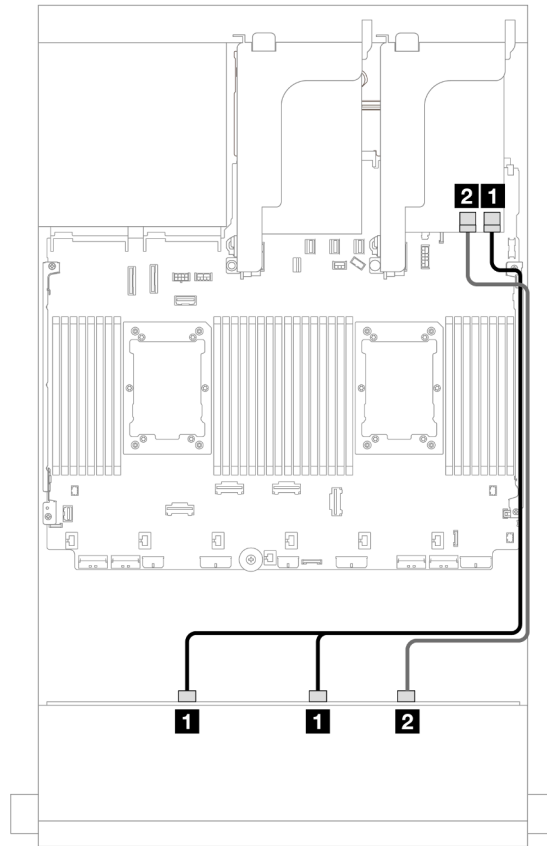


Figure 718. Cable routing to one 16i RAID/HBA adapter

From	To
<b>1</b> Backplane 1: SAS 0, SAS 1	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>
<b>2</b> Backplane 1: SAS 2	<ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2C3</li> </ul>

Middle backplane cable routing

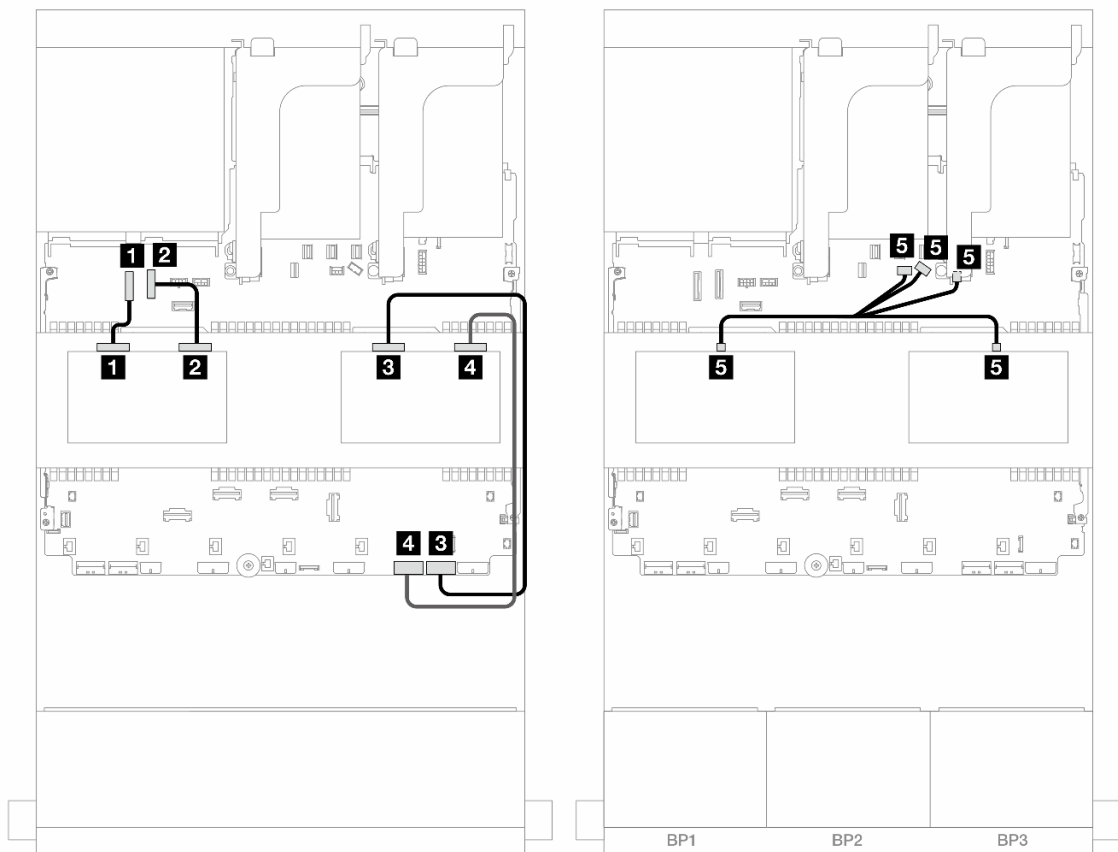


Figure 719. Middle backplane cable routing

From	To
<b>1</b> Backplane 5: NVMe 0-1	Onboard: PCIe 9
<b>2</b> Backplane 5: NVMe 2-3	Onboard: PCIe 10
<b>3</b> Backplane 6: NVMe 0-1	Onboard: PCIe 1
<b>4</b> Backplane 6: NVMe 2-3	Onboard: PCIe 2
<b>5</b> <ul style="list-style-type: none"><li>• Backplane 5: PWR</li><li>• Backplane 6: PWR</li></ul>	<ul style="list-style-type: none"><li>• Onboard: backplane power</li><li>• Onboard: backplane sideband</li><li>• Riser 1: PWR</li></ul>

Front + middle + rear backplanes: 12 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA

This topic provides cable routing information for the 12 x 3.5-inch SAS/SATA front backplane with a 4 x 3.5-inch SAS/SATA middle backplane and a 4 x 3.5-inch SAS/SATA rear backplane.

32i RAID/HBA adapter

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

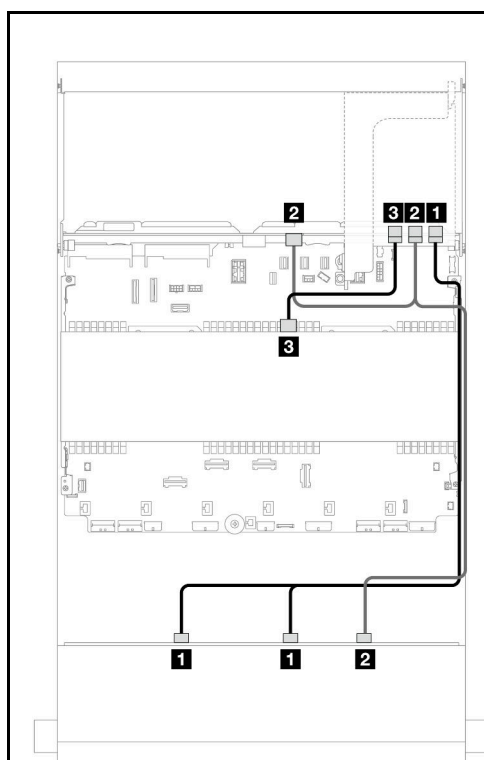


Figure 720. Backplane signal cable routing

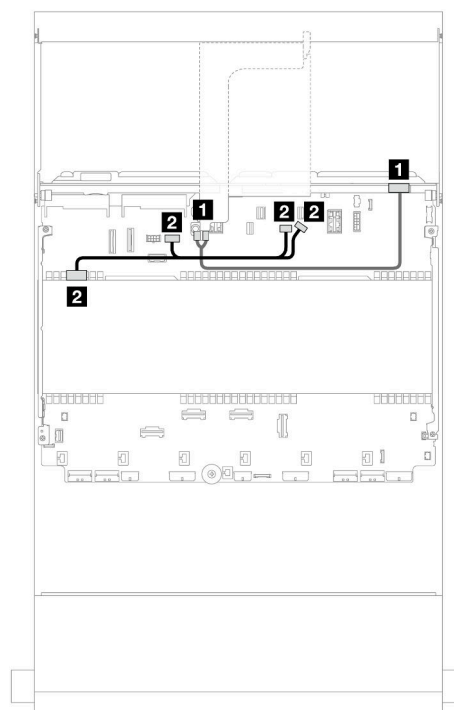


Figure 721. Middle/Rear backplane power cable routing

From	To	From	To
<b>1</b> Backplane 1: SAS 0, SAS 1	32i adapter <ul style="list-style-type: none"> <li>• C0</li> </ul>	<b>1</b> Backplane 4: PWR	Riser 2: PWR1, PWR2
<b>2</b> <ul style="list-style-type: none"> <li>• Backplane 1: SAS 2</li> <li>• Backplane 4: SAS</li> </ul>	<ul style="list-style-type: none"> <li>• C1</li> </ul>	<b>2</b> Backplane 5: PWR	<ul style="list-style-type: none"> <li>• Onboard: GPU power</li> <li>• Onboard: backplane power</li> <li>• Onboard: backplane sideband</li> </ul>
<b>3</b> Backplane 5: SAS	<ul style="list-style-type: none"> <li>• C2</li> </ul>		

## 12 x 3.5-inch AnyBay backplane

This section provides cable routing information for the server model with the 12 x 3.5-inch AnyBay front drive backplane.

- [“Front backplane: 8 SAS/SATA + 4 AnyBay” on page 677](#)
- [“Front + rear backplanes: \(8 SAS/SATA + 4 AnyBay\) + 4 SAS/SATA” on page 679](#)
- [“Front backplane: 8 SAS/SATA + 4 NVMe” on page 680](#)
- [“Front + rear backplanes: \(8 SAS/SATA + 4 NVMe\) + 4 SAS/SATA” on page 682](#)

### Front backplane: 8 SAS/SATA + 4 AnyBay

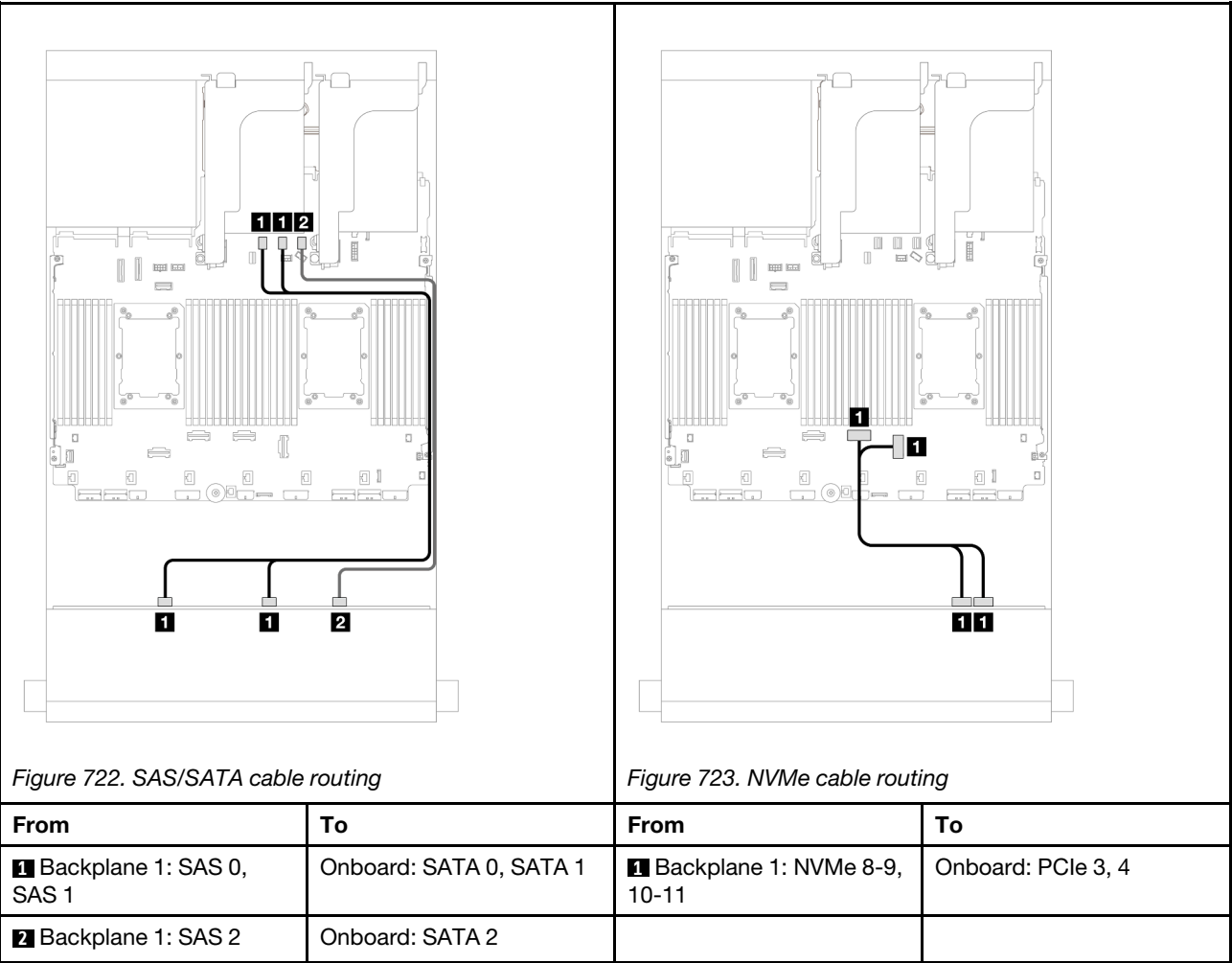
This topic provides cable routing information for the configuration with 8 SAS/SATA + 4 AnyBay front drive bays using the 12 x 3.5-inch AnyBay front backplane.

- [“Onboard connectors” on page 678](#)

- [“16i RAID/HBA adapter” on page 678](#)

### Onboard connectors

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



### 16i RAID/HBA adapter

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

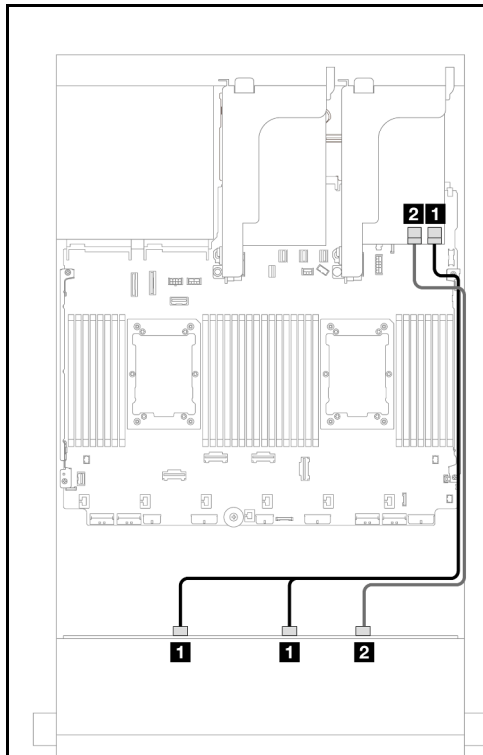


Figure 724. SAS/SATA cable routing

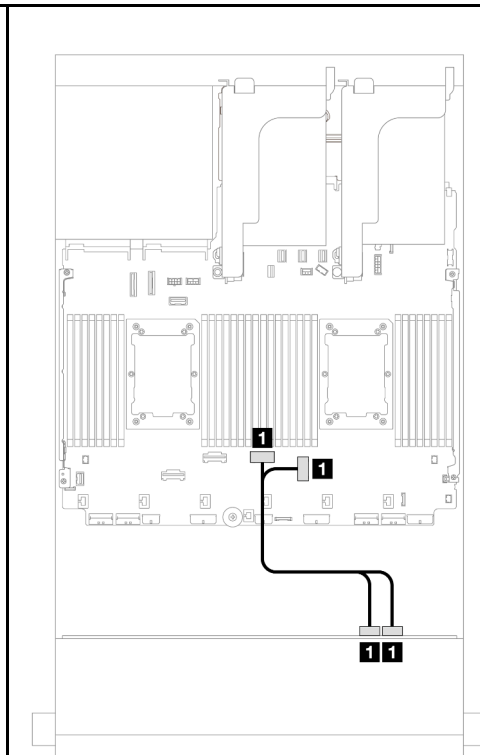


Figure 725. NVMe cable routing

From	To	From	To
<b>1</b> Backplane 1: SAS 0, SAS 1	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>	<b>1</b> Backplane 1: NVMe 8-9, 10-11	Onboard: PCIe 3, 4
<b>2</b> Backplane 1: SAS 2	<ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2</li> </ul>		

## Front + rear backplanes: (8 SAS/SATA + 4 AnyBay) + 4 SAS/SATA

This topic provides cable routing information for the (8 SAS/SATA + 4 AnyBay) + 4 SAS/SATA configuration using the 12 x 3.5-inch AnyBay front backplane and 4 x 3.5-inch SAS/SATA rear backplane.

### 16i RAID/HBA adapter

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

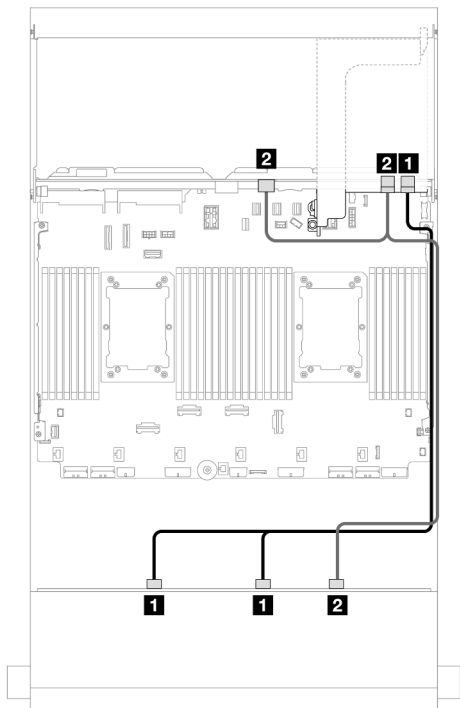


Figure 726. SAS/SATA cable routing

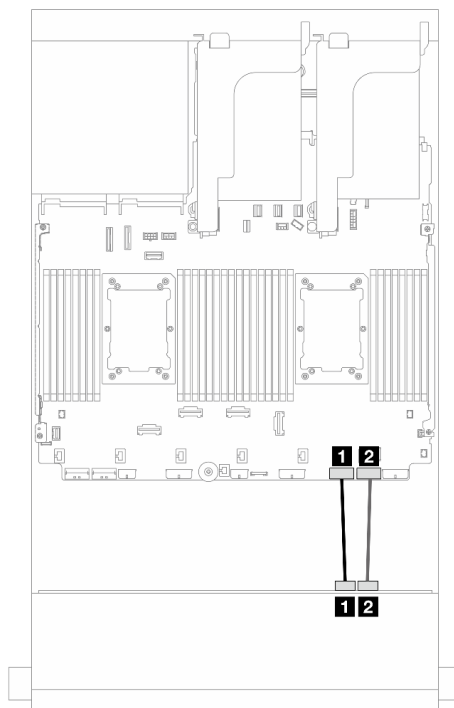


Figure 727. NVMe cable routing

From	To	From	To
<b>1</b> Backplane 1: SAS 0, SAS 1	16i adapter <ul style="list-style-type: none"> <li>Gen 4: C0</li> <li>Gen 3: C0C1</li> </ul>	<b>1</b> Backplane 1: NVMe 8-9	Onboard: PCIe 2
<b>2</b> <ul style="list-style-type: none"> <li>Backplane 1: SAS 2</li> <li>Backplane 4: SAS</li> </ul>	<ul style="list-style-type: none"> <li>Gen 4: C1</li> <li>Gen 3: C2C3</li> </ul>	<b>2</b> Backplane 1: NVMe 10-11	Onboard: PCIe 1

## Front backplane: 8 SAS/SATA + 4 NVMe

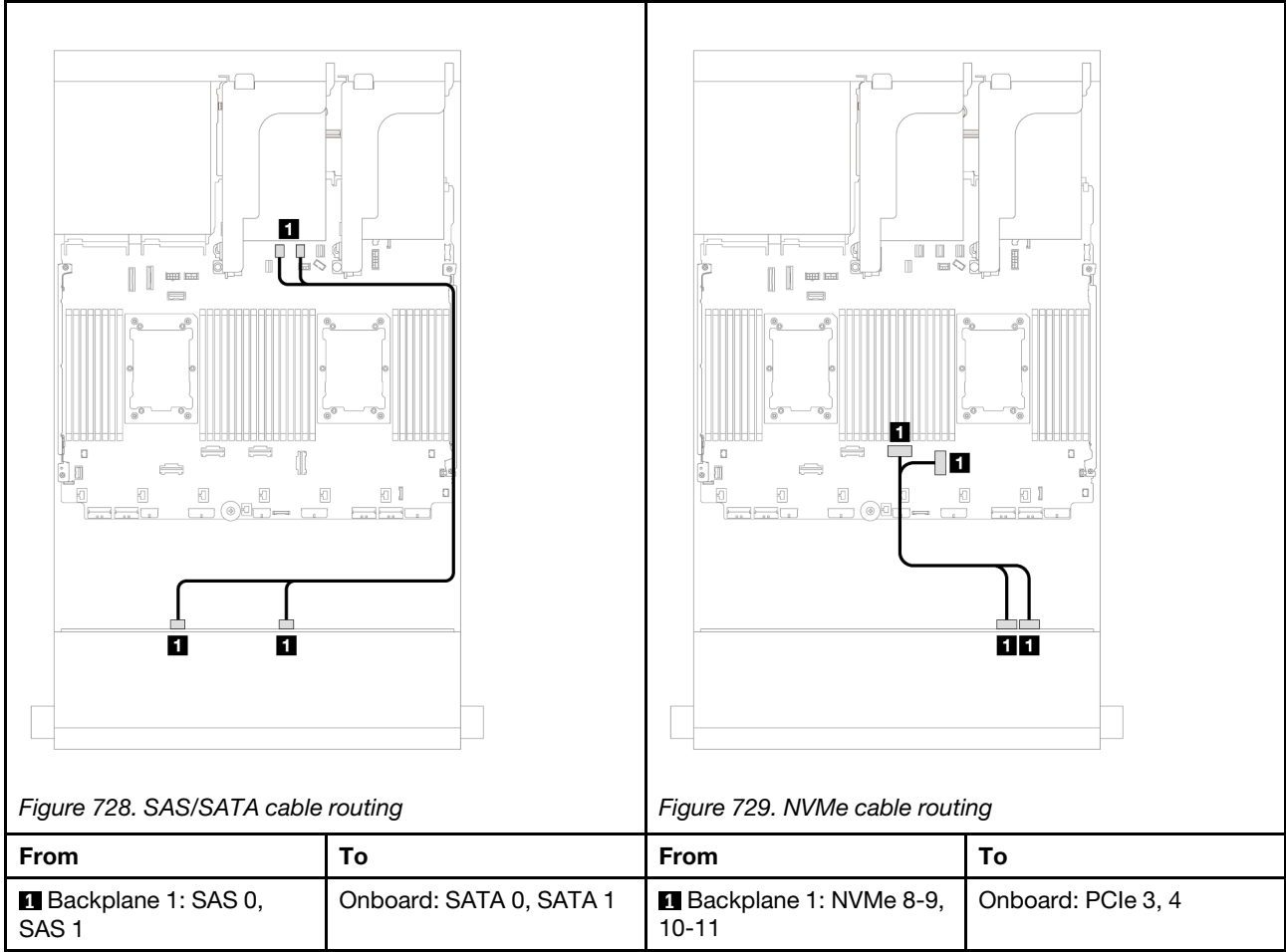
This topic provides cable routing information for the configuration with 8 SAS/SATA + 4 NVMe front drive bays using the 12 x 3.5-inch AnyBay front backplane.

- [“Onboard connectors” on page 680](#)
- [“8i RAID/HBA adapter” on page 681](#)

### Onboard connectors

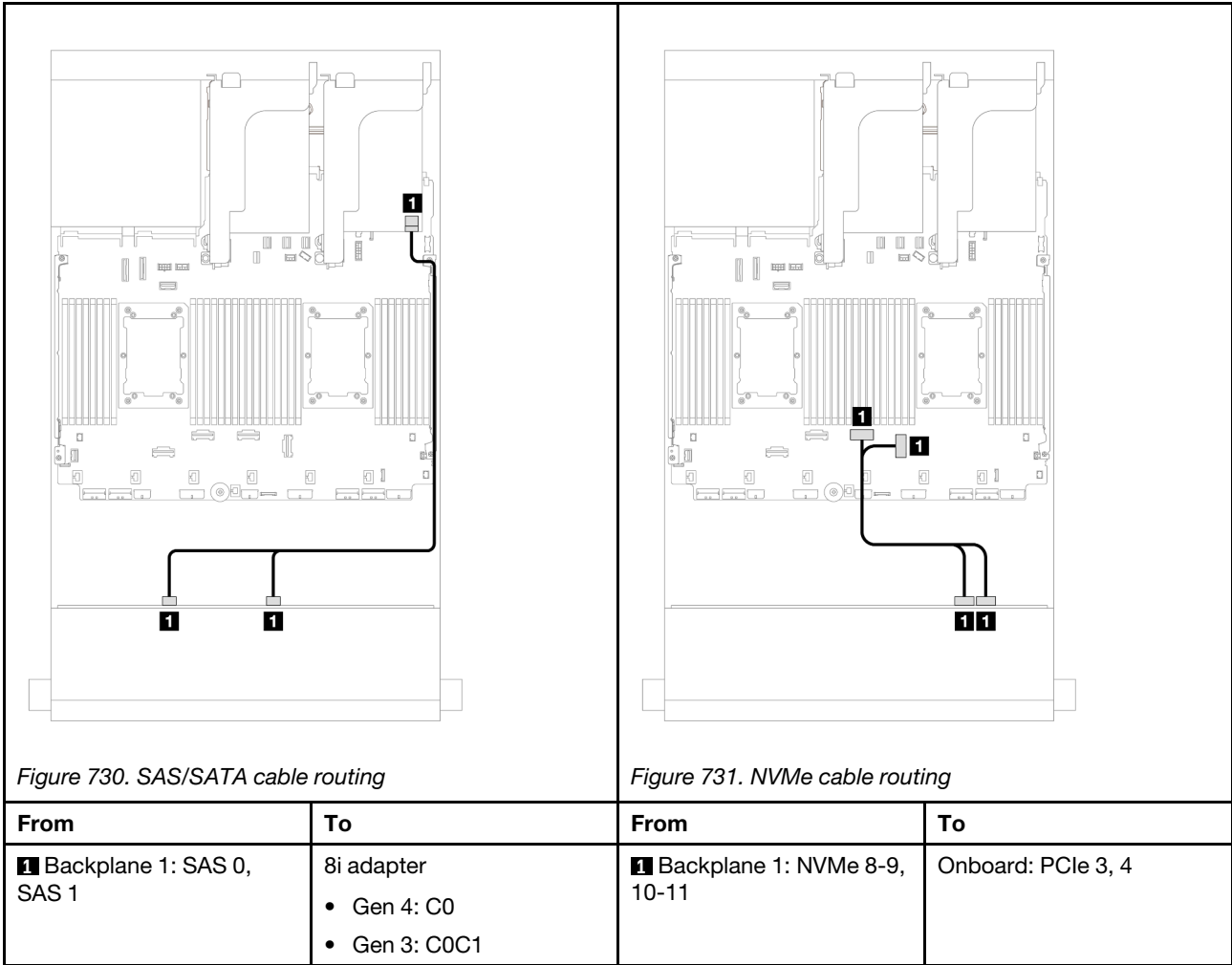
Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**





8i RAID/HBA adapter

Connections between connectors: 1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n



**Front + rear backplanes: (8 SAS/SATA + 4 NVMe) + 4 SAS/SATA**

This topic provides cable routing information for the (8 SAS/SATA + 4 NVMe) + 4 SAS/SATA configuration using the 12 x 3.5-inch AnyBay front backplane and 4 x 3.5-inch SAS/SATA rear backplane.

**16i RAID/HBA adapter**

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

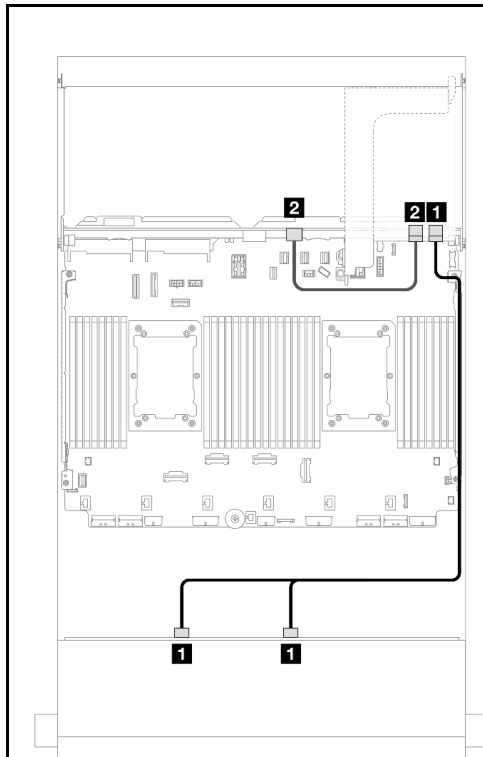


Figure 732. SAS/SATA cable routing

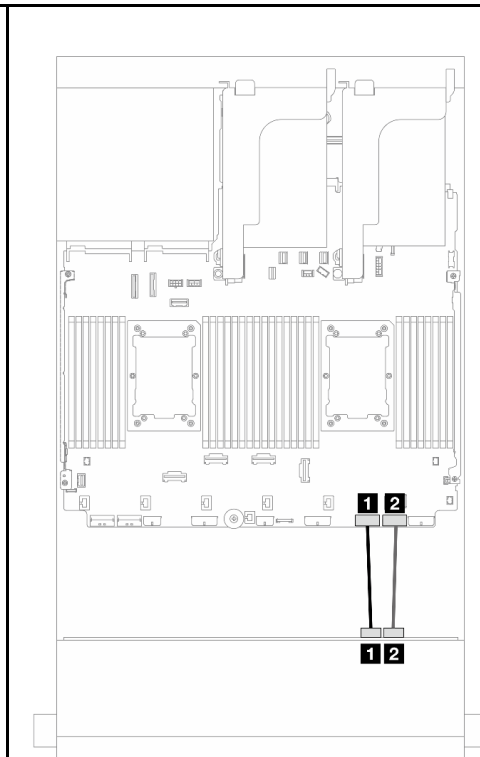


Figure 733. NVMe cable routing

From	To	From	To
<b>1</b> Backplane 1: SAS 0, SAS 1	16i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>	<b>1</b> Backplane 1: NVMe 8-9	Onboard: PCIe 2
<b>2</b> Backplane 4: SAS	<ul style="list-style-type: none"> <li>• Gen 4: C1</li> <li>• Gen 3: C2</li> </ul>	<b>2</b> Backplane 1: NVMe 10-11	Onboard: PCIe 1

## 12 x 3.5-inch SAS/SATA expander backplane

This section provides cable routing information for the server model with the 12 x 3.5-inch SAS/SATA expander backplane.

- “Front backplane: 12 x 3.5" SAS/SATA” on page 683
- “Front + rear backplanes: 12 x 3.5" SAS/SATA + 2 x 3.5"/4 x 3.5" SAS/SATA/4 x 2.5" AnyBay” on page 684
- “Front + middle + rear backplanes: 12 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA+ 4 x 3.5" SAS/SATA” on page 687

### Front backplane: 12 x 3.5" SAS/SATA

This topic provides cable routing information for the front 12 x 3.5-inch SAS/SATA expander backplane.

#### 8i adapter

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

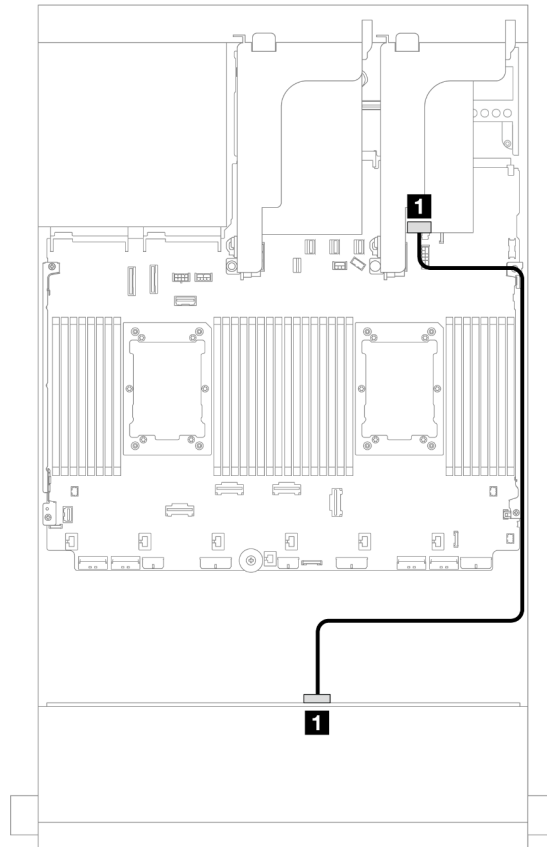


Figure 734. Cable routing to one 8i adapter

From	To
<b>1</b> Backplane 1: SAS 0	8i adapter <ul style="list-style-type: none"> <li>Gen 4: C0</li> <li>Gen 3: C0C1</li> </ul>

## Front + rear backplanes: 12 x 3.5" SAS/SATA + 2 x 3.5"/4 x 3.5" SAS/SATA/4 x 2.5" AnyBay

This topic provides cable routing information for the front 12 x 3.5-inch SAS/SATA expander backplane with a 2 x 3.5-inch/4 x 3.5-inch SAS/SATA or 4 x 2.5-inch AnyBay rear drive backplane.

- “12 x 3.5" SAS/SATA + 2 x 3.5" SAS/SATA” on page 684
- “12 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA” on page 685
- “12 x 3.5" SAS/SATA + 4 x 2.5" AnyBay” on page 686

### 12 x 3.5" SAS/SATA + 2 x 3.5" SAS/SATA

This topic provides cable routing information for the front 12 x 3.5-inch SAS/SATA expander backplane with a 2 x 3.5-inch SAS/SATA rear drive backplane.

### 8i adapter

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

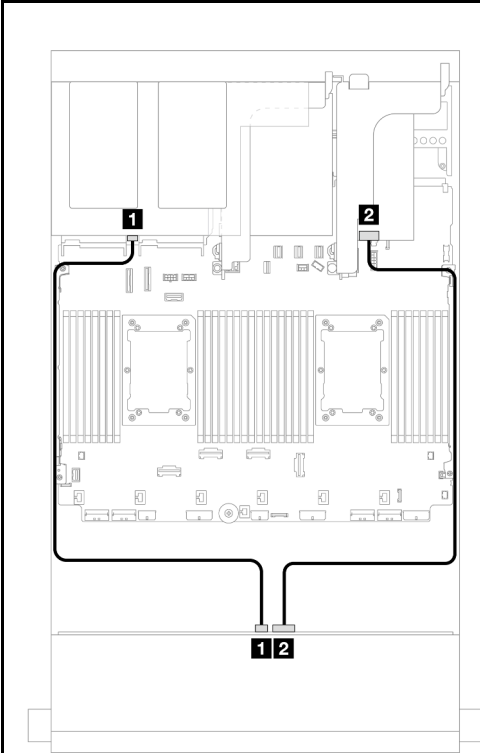


Figure 735. Front/Rear backplane signal cable routing

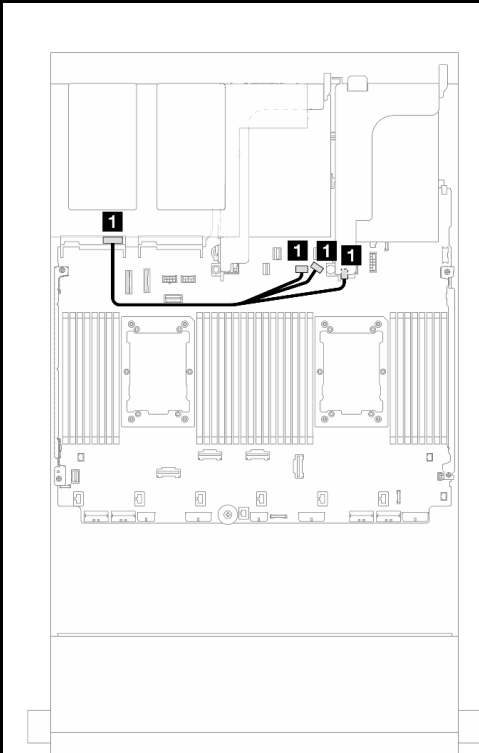


Figure 736. Rear backplane power cable routing

From	To	From	To
<b>1</b> Backplane 4: SAS	Backplane 1: SAS 1	<b>1</b> Backplane 4: PWR	<ul style="list-style-type: none"> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> <li>Riser 1: PWR</li> </ul>
<b>2</b> Backplane 1: SAS 0	8i adapter <ul style="list-style-type: none"> <li>Gen 4: C0</li> <li>Gen 3: C0C1</li> </ul>		

**12 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA**

This topic provides cable routing information for the front 12 x 3.5-inch SAS/SATA expander backplane with a 4 x 3.5-inch SAS/SATA rear drive backplane.

**8i adapter**

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

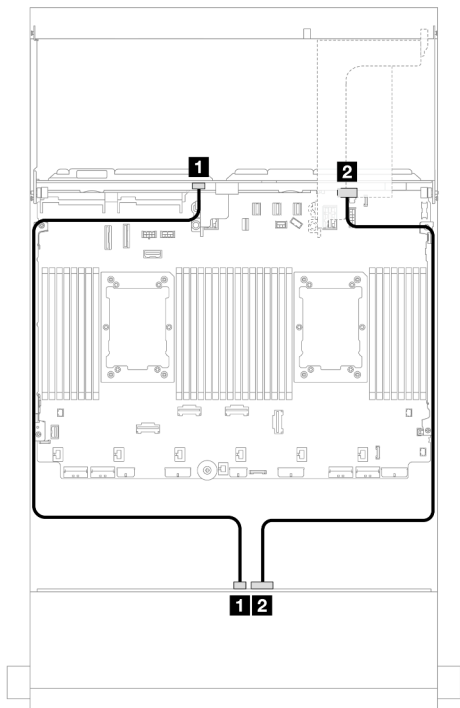


Figure 737. Front/Rear backplane signal cable routing

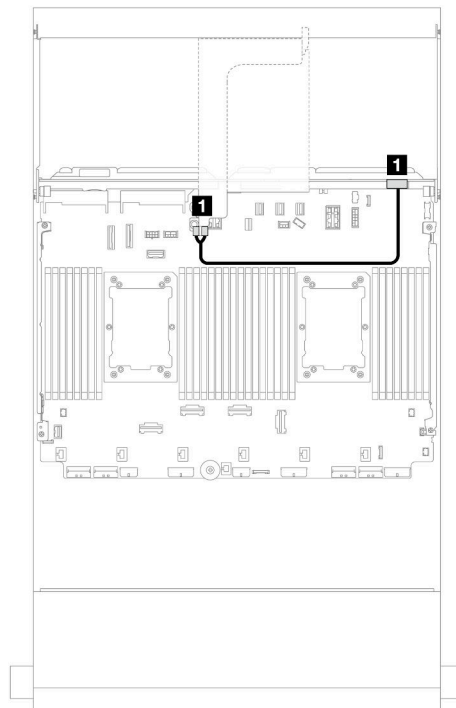


Figure 738. Rear backplane power cable routing

From	To	From	To
<b>1</b> Backplane 4: SAS	Backplane 1: SAS 1	<b>1</b> Backplane 4: PWR	Riser 2: PWR1, PWR2
<b>2</b> Backplane 1: SAS 0	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>		

### 12 x 3.5" SAS/SATA + 4 x 2.5" AnyBay

This topic provides cable routing information for the front 12 x 3.5-inch SAS/SATA expander backplane with a 4 x 2.5-inch AnyBay rear drive backplane.

#### 8i adapter

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

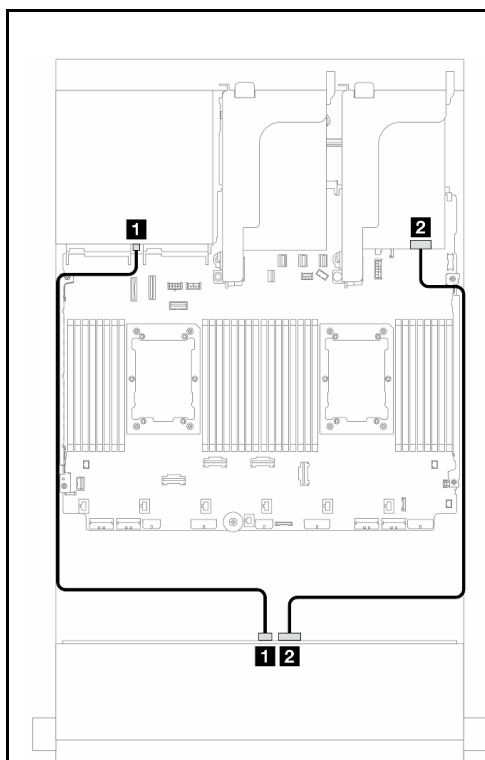


Figure 739. Front backplane cable routing

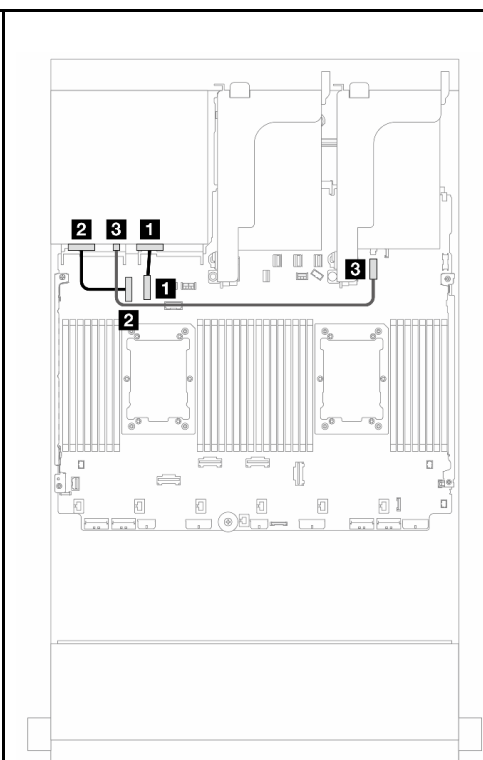


Figure 740. Rear backplane cable routing

From	To	From	To
<b>1</b> Backplane 1: SAS 1	Backplane 4: SAS	<b>1</b> Backplane 4: NVMe 0-1	Onboard: PCIe 10
<b>2</b> Backplane 1: SAS 0	8i adapter <ul style="list-style-type: none"> <li>• Gen 4: C0</li> <li>• Gen 3: C0C1</li> </ul>	<b>2</b> Backplane 4: NVMe 2-3	Onboard: PCIe 9
		<b>3</b> Backplane 4: PWR	Onboard: 7mm power connector

## Front + middle + rear backplanes: 12 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA+ 4 x 3.5" SAS/SATA

This topic provides cable routing information for the front 12 x 3.5-inch SAS/SATA expander backplane with a 4 x 3.5-inch SAS/SATA middle drive backplane and a 4 x 3.5-inch SAS/SATA rear drive backplane.

### 16i adapter

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

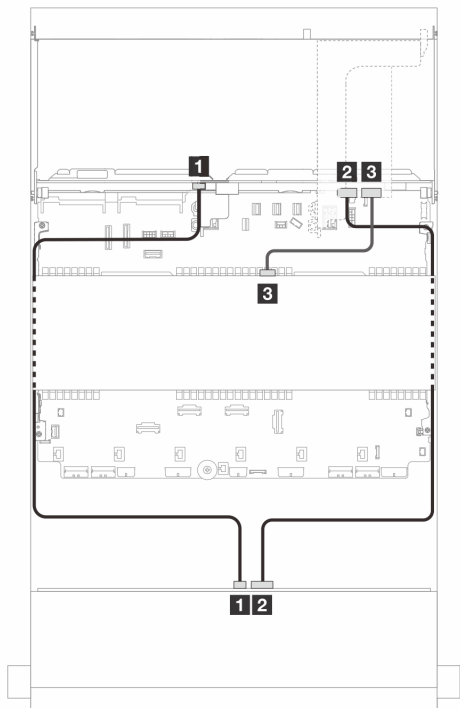


Figure 741. Backplane signal cable routing

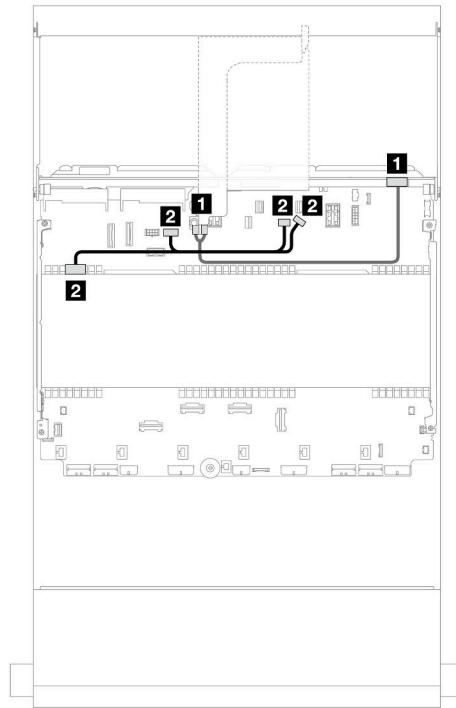


Figure 742. Middle/Rear backplane power cable routing

From	To	From	To
<b>1</b> Backplane 4: SAS	Backplane 1: SAS 1	<b>1</b> Backplane 4: PWR	Riser 2: PWR1, PWR2
<b>2</b> Backplane 1: SAS 0	16i adapter <ul style="list-style-type: none"> <li>Gen 4: C0</li> <li>Gen 3: C0C1</li> </ul>	<b>2</b> Backplane 5: PWR	<ul style="list-style-type: none"> <li>Onboard: GPU power</li> <li>Onboard: backplane power</li> <li>Onboard: backplane sideband</li> </ul>
<b>2</b> Backplane 5: SAS	<ul style="list-style-type: none"> <li>Gen 4: C1</li> <li>Gen 3: C2</li> </ul>		



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## Chapter 7. System configuration

Complete these procedures to configure your system.

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### 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://pubs.lenovo.com/lxpm-overview/>.)
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 PASSW0RD (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 on your server. For the location of the XCC system management port, 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 53](#).

- 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](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 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 second 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://pubs.lenovo.com/lxcc-overview/>.
- 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://pubs.lenovo.com/lxcc-overview/>.

### 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://pubs.lenovo.com/lxcc-overview/>.

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## 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/products/servers/thinksystem/sr650v3/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)
<b>Lenovo XClarity Provisioning Manager (LXPM)</b>	In-band <sup>2</sup> On-Target	✓			✓		
<b>Lenovo XClarity Controller (XCC)</b>	In-band <sup>4</sup> Out-of-band Off-Target	✓	Selected I/O devices	✓ <sup>3</sup>	✓		✓
<b>Lenovo XClarity Essentials OneCLI (OneCLI)</b>	In-band Out-of-band On-Target Off-Target	✓	All I/O devices	✓ <sup>3</sup>		✓	✓
<b>Lenovo XClarity Essentials UpdateXpress (LXCE)</b>	In-band Out-of-band On-Target Off-Target	✓	All I/O devices		✓		✓
<b>Lenovo XClarity Essentials Bootable Media Creator (BoMC)</b>	In-band Out-of-band Off-Target	✓	All I/O devices		✓ (BoMC application)	✓ (BoMC application)	✓
<b>Lenovo XClarity Administrator (LXCA)</b>	In-band <sup>1</sup> Out-of-band <sup>2</sup> Off-Target	✓	All I/O devices		✓		✓
<b>Lenovo XClarity Integrator (LXCI) for VMware vCenter</b>	Out-of-band Off-Target	✓	Selected I/O devices		✓		
<b>Lenovo XClarity Integrator (LXCI) for Microsoft Windows Admin Center</b>	In-band Out-of-band On-Target Off-Target	✓	All 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)
<b>Lenovo XClarity Integrator (LXCI) for Microsoft System Center Configuration Manager</b>	In-band On-Target	✓	All I/O devices		✓		✓
<b>Notes:</b> <ol style="list-style-type: none"> <li>For I/O firmware updates.</li> <li>For BMC and UEFI firmware updates.</li> <li>Drive firmware update is only supported by the tools and methods below: <ul style="list-style-type: none"> <li>XCC Bare Metal Update (BMU): In-band, and requires system reboot.</li> <li>Lenovo XClarity Essentials OneCLI: <ul style="list-style-type: none"> <li>For drives supported by ThinkSystem V2 and V3 products (legacy drives): In-band, and does not require system reboot.</li> <li>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.).</li> </ul> </li> </ul> </li> <li>Bare Metal Update (BMU) only.</li> </ol>							

#### • **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://pubs.lenovo.com/lxpm-overview/>

#### • **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://pubs.lenovo.com/lxcc-overview/>

- 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://pubs.lenovo.com/lxcc-overview/>

- **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:

[https://pubs.lenovo.com/lxce-onecli/onecli\\_c\\_update](https://pubs.lenovo.com/lxce-onecli/onecli_c_update)

- **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/Invo-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/Invo-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](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://pubs.lenovo.com/lxci-overview/>

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## Configure the firmware

Several options are available to install and set up the firmware for the server.

**Important:** Lenovo does not recommend setting option ROMs to **Legacy**, but you can conduct this setting if necessary. Note that this setting prevents UEFI drivers for the slot devices from loading, which may cause negative side effects to Lenovo software, such as LXCA, OneCLI, and XCC. These side effects include but

are not limited to the inability to determine adapter card details, such as model name and firmware levels. For example, "ThinkSystem RAID 930-16i 4GB Flash" may be displayed as "Adapter 06:00:00". In some cases, the functionality on a specific PCIe adapter may not be enabled properly.

- **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://pubs.lenovo.com/lxpm-overview/>
- *UEFI User Guide* at <https://pubs.lenovo.com/uefi-overview/>

- **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:

[https://pubs.lenovo.com/lxce-onecli/onecli\\_c\\_settings\\_info\\_commands](https://pubs.lenovo.com/lxce-onecli/onecli_c_settings_info_commands)

- **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 updating firmware using Lenovo XClarity Administrator are available at:

[https://pubs.lenovo.com/lxca/server\\_configuring](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://pubs.lenovo.com/lxcc-overview/>

---

## 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](https://dcsc.lenovo.com/#/memory_configuration)

---

## Enable Software Guard Extensions (SGX)

Intel® Software Guard Extensions (Intel® SGX) operates under the assumption that the security perimeter includes only the internals of the CPU package, and leaves the DRAM untrusted.

Complete the following steps to enable SGX.

- Step 1. **Make sure** to refer to “[Memory module installation rules and order](#)” on page 61, which specifies whether your server supports SGX and lists the memory module population sequence for SGX configuration. (DIMM configuration must be at least 8 DIMMs per socket to support SGX.)
- Step 2. Restart the system. Before the operating system starts up, press the key specified in the on-screen instructions to enter the Setup Utility. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.)
- Step 3. Go to **System settings → Processors → UMA-Based Clustering** and disable the option.
- Step 4. Go to **System settings → Processors → Total Memory Encryption (TME)** and enable the option.
- Step 5. Save the changes, then go to **System settings → Processors → SW Guard Extension (SGX)** and enable the option.

---

## 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>

### Intel VROC

#### Enabling Intel VROC

Before setting up RAID for NVMe drives, follow the below steps to enable VROC:



1. Restart the system. Before the operating system starts up, press the key specified in the on-screen instructions to enter the Setup Utility. (For more information, see the “Startup” section in the LXPm documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.)
2. Go to **System settings → Devices and I/O Ports → Intel® VMD technology → Enable/Disable Intel® VMD** and enable the option.
3. Save the changes and reboot the system.

## Intel VROC configurations

Intel offers various VROC configurations with different RAID level and SSD support. See the following for more details.

### Notes:

- Supported RAID levels varies by model. For the RAID level supported by SR650 V3, see [Technical specifications](#).
- For more information about acquiring and installing the activation key, see <https://fod.lenovo.com/lkms>.

Intel VROC configurations for PCIe NVMe SSDs	Requirements
Intel VROC Standard	<ul style="list-style-type: none"> <li>• Supports RAID levels 0, 1, and 10</li> <li>• Requires an activation key</li> </ul>
Intel VROC Premium	<ul style="list-style-type: none"> <li>• Supports RAID levels 0, 1, 5, and 10</li> <li>• Requires an activation key</li> </ul>
Bootable RAID	<ul style="list-style-type: none"> <li>• RAID 1 only</li> <li>• 5th Gen Intel® Xeon® Scalable processors (formerly codenamed as Emerald Rapids, EMR)</li> </ul>
Intel VROC configurations for SATA SSDs	Requirements
Intel VROC SATA RAID	<ul style="list-style-type: none"> <li>• Supports RAID levels 0, 1, 5, and 10.</li> </ul>

## Deploy the operating system

Several options are available to deploy an operating system on the server.

### Available operating systems

- Microsoft Windows Server
- Microsoft Windows
- Red Hat Enterprise Linux
- SUSE Linux Enterprise Server
- VMware ESXi
- Canonical Ubuntu

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](https://pubs.lenovo.com/lxca/compute_node_image_deployment)

- Lenovo XClarity Essentials OneCLI

[https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_uxspi\\_proxy\\_tool](https://pubs.lenovo.com/lxce-onecli/onecli_r_uxspi_proxy_tool)

- Lenovo XClarity Integrator deployment pack for SCCM (for Windows operating system only)

[https://pubs.lenovo.com/lxci-deploypack-sccm/dpsccm\\_c\\_endtoend\\_deploy\\_scenario](https://pubs.lenovo.com/lxci-deploypack-sccm/dpsccm_c_endtoend_deploy_scenario)

- **Single-server**

Available tools:

- Lenovo XClarity Provisioning Manager

“OS Installation” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>

- Lenovo XClarity Essentials OneCLI

[https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_uxspi\\_proxy\\_tool](https://pubs.lenovo.com/lxce-onecli/onecli_r_uxspi_proxy_tool)

- Lenovo XClarity Integrator deployment pack for SCCM (for Windows operating system only)

[https://pubs.lenovo.com/lxci-deploypack-sccm/dpsccm\\_c\\_endtoend\\_deploy\\_scenario](https://pubs.lenovo.com/lxci-deploypack-sccm/dpsccm_c_endtoend_deploy_scenario)

## 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://pubs.lenovo.com/lxcc-overview/>.

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:

[https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_save\\_command](https://pubs.lenovo.com/lxce-onecli/onecli_r_save_command)

- **Operating system**

Use your backup methods to back up the operating system and user data for the server.

---

## Enable Intel® On Demand

A processor is equipped with various computing capabilities. Basic capabilities are available at the initial processor installation, while others remain inactivated. As development environment and tasks evolve,

computing demands may accelerate and require leverage of the previously inactivated processor capabilities. In such cases, user can select desired processor capabilities and activate them through Intel On Demand feature—a feature that allows user to customize processor capabilities according to environment and tasks at hand. The following section specifies system hardware and software requirement, Intel On Demand enabling and transferring procedures, and list of processor capabilities.

This documentation includes the following sections:

- “Supported processor” on page 699
- “Installation tool” on page 699
- Procedures for “Enabling Intel On Demand Features” on page 700
- Procedures for “Transferring Intel On Demand Features” on page 701
- XCC and LXCE OneCLI instructions for:
  - “Reading PPIN” on page 701
  - “Installing Intel On Demand to processor” on page 703
  - “Acquiring and uploading Intel On Demand State Report” on page 704
  - “Checking the Intel On Demand features installed in a processor” on page 706

**Note:** Depending on the model, the XCC Web GUI layout may be slightly different from the illustrations in this document.

### Supported processor

Intel On Demand is only supported by Intel On Demand capable processors. For more information on Intel On Demand capable processors supported by SR650 V3, see <https://lenovopress.lenovo.com/lp1601-thinksystem-sr650-v3-server>.

**Note:** All processors in a system must be installed with identical Intel On Demand feature.

### Installation tool

Intel On Demand can be installed via Lenovo XClarity Controller (XCC) and Lenovo XClarity Essentials OneCLI (LXCE OneCLI). After confirming that your processor supports Intel On Demand, you also need to make sure the XCC and LXCE OneCLI installed in your system supports installing Intel On Demand.

1. Check if Lenovo XClarity Controller (XCC) supports installing Intel On Demand (two methods provided):

- **Via XCC WebGUI**

Go to **BMC Configuration → License**, if there is a section named **On Demand Capabilities for Intel CPU** in the page, it indicates that current XCC supports installing Intel On Demand, otherwise you need to update XCC firmware to the latest version to ensure it supports installing Intel On Demand.

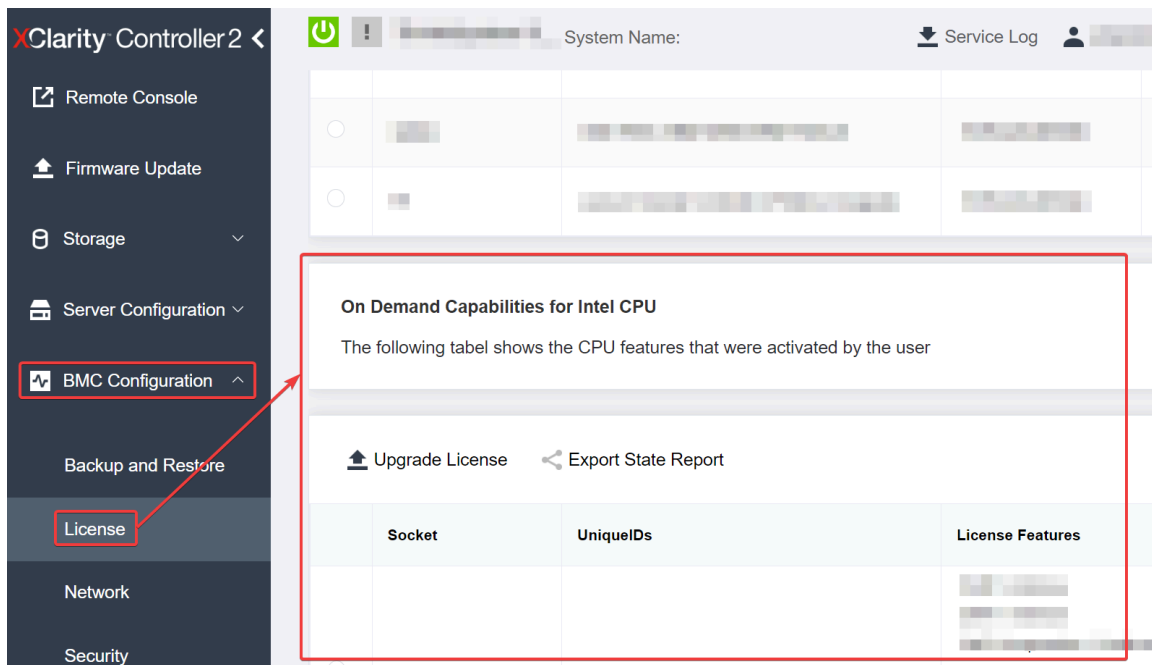


Figure 743. On Demand Capabilities for Intel CPU in XCC Web GUI

- **Via XCC REST API**

- Use the **GET** method with the following Request URL:  
GET [https://bmc\\_ip/redfish/v1/LicenseService/Licenses/](https://bmc_ip/redfish/v1/LicenseService/Licenses/)
- In the response JSON object, the Members field includes the API such as `/redfish/v1/LicenseService/Licenses/CPUX_OnDemandCapability`, where X is the CPU numbering, it indicates that current XCC supports installing Intel On Demand, otherwise you need to update XCC firmware to the latest version to ensure it supports installing Intel On Demand.

For example:

```
"Members": [
  {
    "@odata.id": "/redfish/v1/LicenseService/Licenses/CPU1_OnDemandCapability"
  },
  {
    "@odata.id": "/redfish/v1/LicenseService/Licenses/CPU2_OnDemandCapability"
  },
]
```

- Check if LXCE OneCLI supports installing Intel On Demand

- LXCE OneCLI version must be at 4.2.0 or above.

### Enabling Intel On Demand Features

- Select the Intel On Demand features that meets your workload needs, see [“Intel On Demand Features” on page 707](#).
- After completing ordering the features, you will receive Authorization Code via e-mail.
- PPIN is a mandatory information for enabling the features. Read the PPIN of the processor that is to be installed with the features. See [“Reading PPIN” on page 701](#).
- Go to <https://fod.lenovo.com/lkms> and input the Authorization Code to acquire the Activation Key.
- In the website, input Machine Type, Machine serial number, and PPIN.
- The website will generate the Activation Key. Download the Activation Key.

7. Install the features to the processor with the Activation Key via XCC or LXCE OneCLI. See [“Installing Intel On Demand to processor” on page 703](#).

**Note:** If more than one Activation Keys are acquired, it is mandatory to install them in the sequential order they were acquired. For example, start with installing the first acquired key, and proceed with the second acquired key, and so on.

8. AC cycle the server.
9. (Optional) Upload Intel On Demand State Report. See [“Acquiring and uploading Intel On Demand State Report” on page 704](#).

The State Report represents the current configuration state of the Intel On Demand capable processors. Lenovo accepts State Reports from customers to calibrate the current state of the Intel On Demand capable processors.

10. To see the features installed in a processor, see [“Checking the Intel On Demand features installed in a processor” on page 706](#).

For reference, see [https://pubs.lenovo.com/lenovo\\_fod](https://pubs.lenovo.com/lenovo_fod).

### Transferring Intel On Demand Features

After replacing a processor, you may need to transfer the features from the defective processor to the new processor. Complete the following steps to transfer features to new processor.

1. Before removing the defective processor from the system, read the PPIN of the defective processor. See [“Reading PPIN” on page 701](#).
2. After installing the new processor, read the PPIN of the new processor. See [“Reading PPIN” on page 701](#).
3. Go to <https://fod.lenovo.com/lkms> and input the PPIN of the defective processor. (Input PPIN in the UID section.)
4. Select the features to be transferred.
5. Input the PPIN of the new processor.
6. The website will generate the new Activation Key. Download the new Activation Key. See [“Installing Intel On Demand to processor” on page 703](#).
7. Install the features to the new processor with the new Activation Key via XCC or LXCE OneCLI.
8. AC cycle the server.
9. (Optional) Upload Intel On Demand State Report. See [“Acquiring and uploading Intel On Demand State Report” on page 704](#).

The State Report represents the current configuration state of the Intel On Demand capable processors. Lenovo accepts State Reports from customers to calibrate the current state of the Intel On Demand capable processors.

10. To see the features installed in a processor, see [“Checking the Intel On Demand features installed in a processor” on page 706](#).

For reference, see [https://pubs.lenovo.com/lenovo\\_fod](https://pubs.lenovo.com/lenovo_fod).

### Reading PPIN

Protected Processor Inventory Number, or PPIN, is a mandatory information for enabling Intel On Demand. PPIN can be read via XCC Web GUI, XCC REST API, and LXCE OneCLI. See the following for more information.

#### Reading PPIN via XCC Web GUI

Open XCC Web GUI, go to **Inventory page → CPU tab → Expand → PPIN**

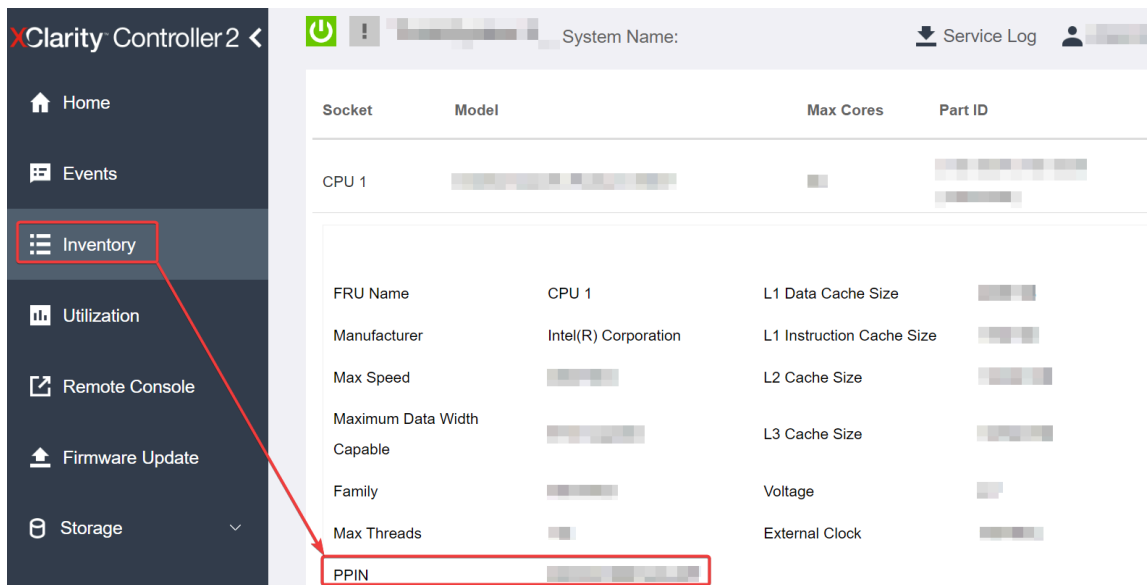


Figure 744. Reading PPIN via XCC Web GUI

### Reading PPIN via XCC REST API

1. Use the **GET** method with the following Request URL:  
GET https://bmc\_ip/redfish/v1/Systems/1/Processors  
For example:  
GET https://bmc\_ip/redfish/v1/Systems/1/Processors
2. In the response JSON object, the Members field shows reference link to an element of processor resource.  
  
For example:  

```
"Members":[
{
@odata.id: "/redfish/v1/Systems/1/Processors/1"
},
{
@odata.id: "/redfish/v1/Systems/1/Processors/2"
}
],
```
3. Select the processor you need to read the PPIN from. Use the **GET** method with the following Request URL, where x is the CPU numbering:  
GET https://bmc\_ip/redfish/v1/Systems/1/Processors/x  
For example, to read Processor 1 PPIN, see the following:  
GET https://bmc\_ip/redfish/v1/Systems/1/Processors/1
4. In the response JSON object, the ProcessorId field shows the ProtectedIdentificationNumber field, which is the PPIN info of the requested CPU.

For example:

```
"ProcessorId":{
  "ProtectedIdentificationNumber":"1234567890xxxxyy"
},
```

### Reading PPIN via LXCE OneCLI

Input the following command:

```
OneCli.exe fod showppin -b XCC_USER:XCC_PASSWORD@XCC_HOST
```

The output shows PPIN information. For example:

Machine Type: 7D75

Serail Number: 7D75012345

FoD PPIN result:

```
=====
| Socket ID |          PPIN          |
| Processor 1 | 1234567890xxxyyy |
| Processor 2 | 9876543210zzzyyy |
=====
```

## Installing Intel On Demand to processor

Install Intel On Demand features to the processor with the Activation Key downloaded from the <https://fod.lenovo.com/lkms> via XCC Web GUI, XCC REST API or LXCE OneCLI.

### Use XCC Web GUI to install Intel On Demand

1. Open XCC Web GUI, go to **BMC Configuration → License → On Demand Capabilities for Intel CPU → Upgrade License → Browse → Import** to upload the Activation Key

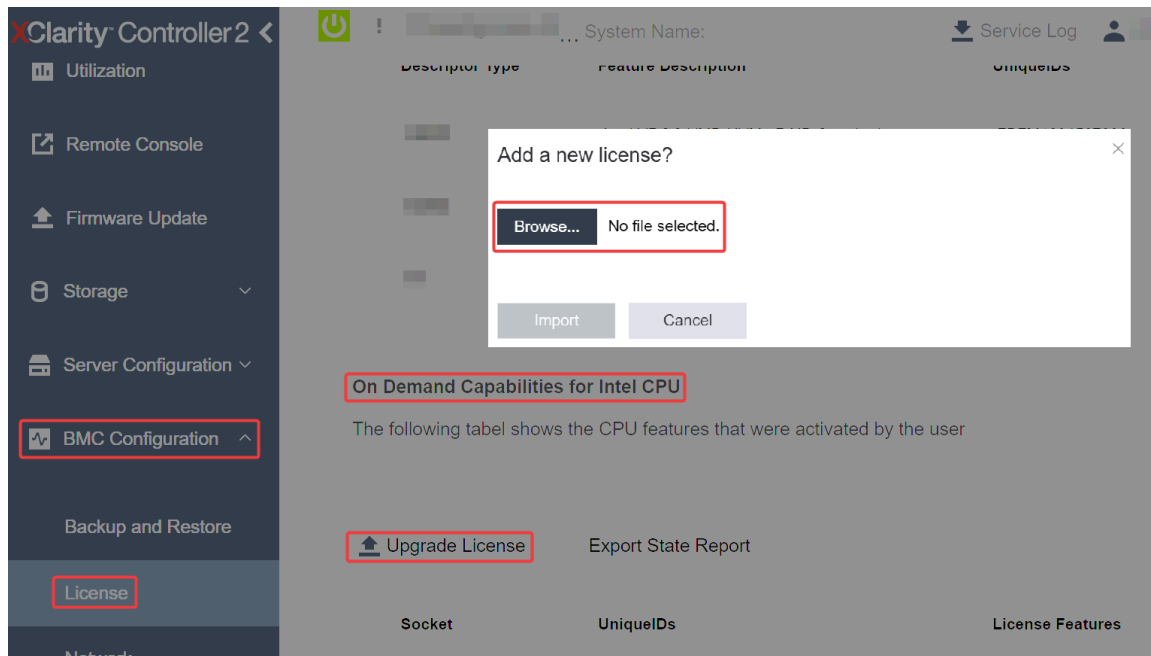


Figure 745. Uploading Activation Key via XCC Web GUI

2. If the installation is successful, the Web GUI will show a pop-up window with the message “License key upgraded successfully. The features will be activated on the processor after system power cycle”.

Otherwise, see “[Enable Intel® On Demand Troubleshooting](#)” on page 708.

### Use XCC REST API to install Intel On Demand

1. Use the **POST** method with the following Request URL:  
POST [https://bmc\\_ip/redfish/v1/LicenseService/Licenses](https://bmc_ip/redfish/v1/LicenseService/Licenses)
2. Transfer Activation Key to base64 string at first and fill it into the LicenseString field as POST data.

```
{
  "LicenseString": ""
}
```

3. If the installation is successful, XCC REST API show the message “License key upgraded successfully. The features will be activated on the processor after system power cycle”.

Otherwise, see “[Enable Intel® On Demand Troubleshooting](#)” on page 708.

### Use LXCE OneCLI to install Intel On Demand

Input the following command, where <key\_file> specifies the Activation Key:

```
OneCli.exe fod install --keyfile <key_file>
```

If successfully installed, the response will show:

```
Successfully install key
```

Call Lenovo support if the response shows the following:

```
Failed to install key
```

### Acquiring and uploading Intel On Demand State Report

After completing enabling or transferring Intel On Demand, acquire and upload the State Report via XCC Web GUI, XCC REST API, and LXCE OneCLI. See the following for more information.

### Use XCC Web GUI to upload State Report

1. Open XCC Web GUI, go to **BMC Configuration → License → On Demand Capabilities for Intel CPU → Choose CPU → Export State Report**

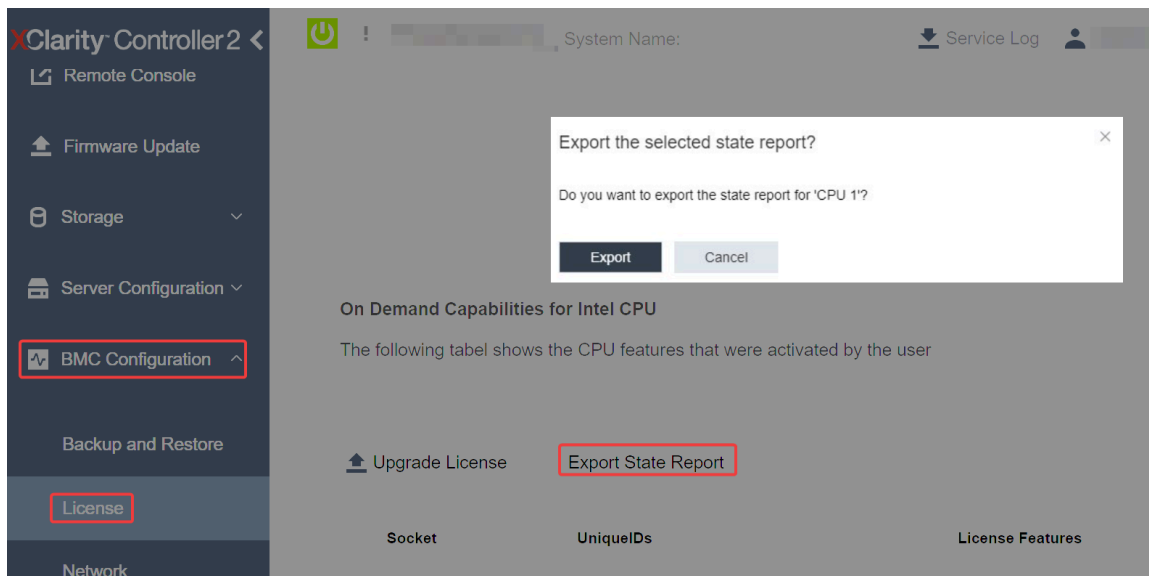


Figure 746. Export State Report via XCC Web GUI

2. Upload State Report via “On Demand Feedback” section in <https://fod.lenovo.com/lkms>.

### Use XCC REST API to upload State Report

1. Use the **GET** method with the following Request URL to retrieve CPU State Report API, where X is the CPU numbering:  
GET [https://bmc\\_ip/redfish/v1/LicenseService/Licenses/CPUX\\_OnDemandCapability](https://bmc_ip/redfish/v1/LicenseService/Licenses/CPUX_OnDemandCapability)  
For example, to retrieve CPU 1 State Report API, see the following:  
GET [https://bmc\\_ip/redfish/v1/LicenseService/Licenses/CPU1\\_OnDemandCapability](https://bmc_ip/redfish/v1/LicenseService/Licenses/CPU1_OnDemandCapability)
2. In the response JSON object, the response of the target field of the `LenovoLicense.ExportStateReport` field is the CPU State Report API, where X is the CPU numbering:



```

"Actions": {
  "Oem": {
    "#LenovoLicense.ExportStateReport": {
      "title": "ExportStateReport",
      "target": "/redfish/v1/LicenseService/Licenses/CPUX_OnDemandCapability/Actions/Oem/LenovoLicense.ExportStateReport"
    }
  }
},

```

In the following example, the response of the target field is the CPU 1 State Report API. Copy the CPU 1 State Report API.

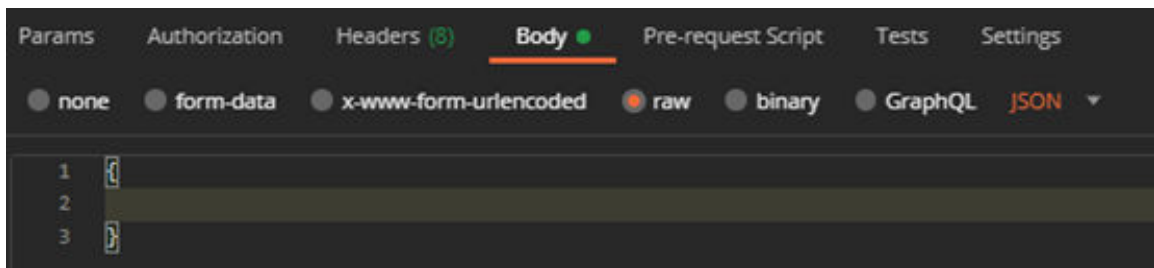
```

"Actions": {
  "Oem": {
    "#LenovoLicense.ExportStateReport": {
      "title": "ExportStateReport",
      "target": "/redfish/v1/LicenseService/Licenses/CPU1_OnDemandCapability/Actions/Oem/LenovoLicense.ExportStateReport"
    }
  }
},

```

### 3. Retrieve the State Report.

- Use the **POST** method with the following Request URL with CPU State Report API to retrieve the State Report, where X is the CPU numbering:  
 POST `https://bmc_ip/redfish/v1/LicenseService/Licenses/CPUX_OnDemandCapability/Actions/Oem/LenovoLicense.ExportStateReport`  
 For example, to retrieve CPU 1 State Report, see the following:  
 POST `https://bmc_ip/redfish/v1/LicenseService/Licenses/CPU1_OnDemandCapability/Actions/Oem/LenovoLicense.ExportStateReport`
- Use an empty JSON object as POST data. When using API tool such as Postman, fill an empty JSON object in **Body** → **Raw** → **JSON**, fill a NULL object '{}' in a JSON file.



### 4. In the response, retrieve the State Report in the stateReports field.

```

{
  "stateReports": [
    {
      "syntaxVersion": "1.0",
      "timestamp": "",
      "objectId": "",
      "hardwareComponentData": [
        {
          "hardwareId": {
            "type": "PPIN",
            "value": ""
          },
          "stateCertificate": {
            "pendingCapabilityActivationPayloadCount": ,
            "value": ""
          },
          "hardwareType": "CPU"
        }
      ]
    }
  ]
}

```

```

    }
  ]
}

```

5. Upload State Report via “On Demand Feedback” section in <https://fod.lenovo.com/lkms>.

### Use LXCE OneCLI to upload State Report

1. Acquire State Report with the following command:  
`OneCli.exe fod exportreport -b XCC_USER:XCC_PASSWORD@XCC_HOST`
2. Upload State Report with the following command:  
`OneCli.exe fod uploadreport --file CPU1_XXXXXX_StateReport.json --kmsid KMS_USER:KMS_PASSWORD`  
 Where:  
  
`CPU1_XXXXXX_StateReport.json` is the file name downloaded from the **fod exportreport** command in Step 1.  
  
`KMS_USER` and `KMS_PASSWORD` are your ID and password on the <https://fod.lenovo.com/lkms>.

### Checking the Intel On Demand features installed in a processor

You can check the Intel On Demand features installed in a processor via XCC Web GUI, XCC REST API, and LXCE OneCLI. See the following for more information.

**Note:** If the processor has not been installed with any license, it would not appear in the **On Demand Capabilities for Intel CPU** section in XCC Web GUI.

### Use XCC Web GUI to check the Intel On Demand features installed in a processor

Go to **BMC Configuration → License → On Demand Capabilities for Intel CPU → Choose CPU → License Features**, where the installed features are listed.

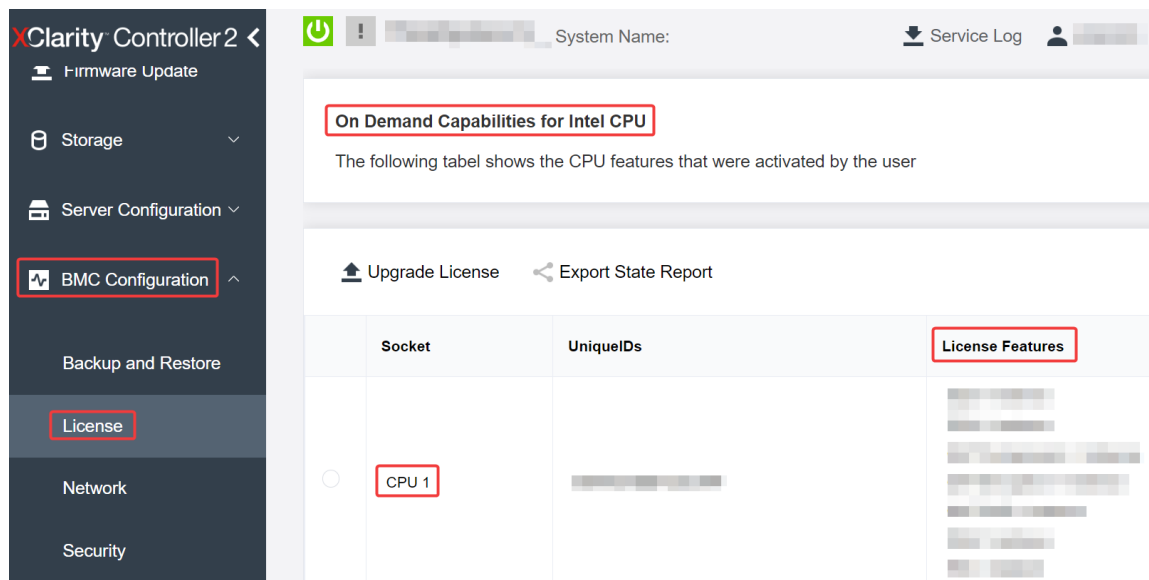


Figure 747. Checking the Intel On Demand features installed in a processor in XCC Web GUI

### Use XCC REST API to check the Intel On Demand features installed in a processor

1. Use the **GET** method with the following Request URL to retrieve Intel On Demand features installed on CPU X, where X is the CPU numbering:  
`GET https://bmc_ip/redfish/v1/LicenseService/Licenses/CPUX_OnDemandCapability`  
 For example, to retrieve Intel On Demand features installed on CPU 1, see the following:

GET https://bmc\_ip/redfish/v1/LicenseService/Licenses/CPU1\_OnDemandCapability

2. In the response JSON object, the FeatureList field contains the Intel On Demand features installed in this processor.

```
"Oem": {
  "Lenovo": {
    "FeatureList": []
    "@odata.type": ""
  }
},
```

### Use LXCE OneCLI to check the Intel On Demand features installed in a processor

1. Check installed features with the following command:  
OneCli.exe fod report -b XCC\_USER:XCC\_PASSWORD@XCC\_HOST
2. The output shows all license, including Intel On Demand features. For example:

FoD Reports result:						
Feature Type	Key ID	Status	Description Feature List	User Reminding	Expired Date	
N/A	CPU1_OnDemandCapability	StandbyOffline	DSA 4 instances, IAA 4 instances	N/A	N/A	
N/A	CPU2_OnDemandCapability	Enabled	DSA 4 instances, IAA 4 instances	N/A	N/A	
004a	XCC2_Platinum	Enabled	Lenovo XClarity Controller 2 Platinum Upgrade	N/A	N/A	

Succeed.

### Intel On Demand Features

Intel On Demand features are listed below. Supported features vary by product, for more information, see <https://lenovopress.lenovo.com/lp1601-thinksystem-sr650-v3-server>.

#### Features

- **Intel Quick Assist Technology (Intel QAT)<sup>1</sup>**

Intel® QAT which helps free up processor cores by offloading encryption, decryption, and compression so systems can serve a larger number of clients or use less power. With Intel QAT, 4th gen Intel Xeon Scalable processors are the highest performance CPUs that can compress and encrypt in a single data flow.

- **Intel Dynamic Load Balancer (Intel DLB)<sup>2</sup>**

Intel DLB is a hardware managed system of queues and arbiters connecting producers and consumers. It is a PCI device envisaged to live in the server CPU uncore and can interact with software running on cores, and potentially with other devices.

- **Intel Data Streaming Accelerator (Intel DSA)<sup>1</sup>**

Intel DSA drives high performance for storage, networking, and data-intensive workloads by improving streaming data movement and transformation operations. Designed to offload the most common data movement tasks that cause overhead in data center-scale deployments, Intel DSA helps speed up data movement across the CPU, memory, caches, all attached memory, storage, and network devices.

- **Intel In Memory Accelerator (Intel IAA)<sup>1</sup>**

Intel IAA helps run database and analytics workloads faster, with potentially greater power efficiency. This built-in accelerator increases query throughput and decreases the memory footprint for in-memory database and big data analytics workloads. Intel IAA is ideal for in-memory databases, and source databases.

- **Intel Software Guard Extensions (Intel SGX) 512 GB<sup>3</sup>**

Intel® SGX offers hardware-based memory encryption that isolates specific application code and data in memory. Intel SGX allows user-level code to allocate private regions of memory, called enclaves, which are designed to be protected from processes running at higher privilege levels.

#### References

- <sup>1</sup>*Achieve Performance Advantage with Intel oneAPI, AI Tools, and 4th Gen Intel® Xeon® Scalable Processors Featuring Built-in Accelerator Engines*, (n.d.). Intel. <https://www.intel.com/content/www/us/en/developer/articles/technical/performance-advantage-with-xeon-and-oneapi-tools.html>
- <sup>2</sup>*Intel® Dynamic Load Balancer*, (2023, May 23) Intel. <https://www.intel.com/content/www/us/en/download/686372/intel-dynamic-load-balancer.html>
- <sup>3</sup>*Intel® Software Guard Extensions (Intel® SGX)*, (n.d.) Intel. <https://www.intel.com/content/www/us/en/architecture-and-technology/software-guard-extensions.html>

## Enable Intel® On Demand Troubleshooting

Refer to the table below for Intel On Demand installation error messages and user actions.

Table 42. Intel On Demand installation messages and user actions

Message	User Action
License key upgraded successfully. The features will be activated on the processor after system power cycle.	You can activate Intel On Demand after performing one system power cycle.
The activation key format is invalid	Check if you have uploaded the correct Activation Key file. If the error persists, contact Lenovo support.
Invalid processor PPIN in Activation key	Contact Lenovo support.
The license was installed in the processor already	You have already installed this activation key. Check if the activation key you uploaded is correct.
Not enough NMRAM space in the processor	Contact Lenovo support.
Internal error	Contact Lenovo support.
Cold reset needed before next provisioning	If you want to continue installing an activation key, perform a system power cycle at first.
Unable to provision LAC due to FEH error	Contact Lenovo support.
Unable to import license in shutdown state, please try again after power on.	Power on the system before installing Intel On Demand.
Unable to import license due to On Demand Capabilities information is in progress. Please try again later.	If you want to continue installing an activation key, try again later.

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## 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 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 navigate to the support page for your server.
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](https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg) to see if someone else has encountered a similar problem.

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## 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 Controller or by the Lenovo XClarity Administrator, alerts are automatically forwarded to those management applications.

**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://pubs.lenovo.com/sr650-v3/pdf\\_files](https://pubs.lenovo.com/sr650-v3/pdf_files).

### 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, 7:48:07 AM	Chassis114:...	Node Node 08 device	Chassis	Jan 30, 20
Warning	Support	Jan 30, 2017, 7:48:07 AM	Chassis114:...	Node Node 02 device	Chassis	Jan 30, 20
Warning	User	Jan 30, 2017, 7:48:07 AM	Chassis114:...	I/O module IO Module	Chassis	Jan 30, 20
Warning	User	Jan 30, 2017, 7:48:07 AM	Chassis114:...	Node Node 08 incom	Chassis	Jan 30, 20

Figure 748. Lenovo XClarity Administrator event log

For more information about working with events from XClarity Administrator, see:

[https://pubs.lenovo.com/lxca/events\\_vieweventlog](https://pubs.lenovo.com/lxca/events_vieweventlog)

## 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.

Severity	Source	Event ID	Message	Date
Error	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM
Warning	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM
Info	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM
Info	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM

Figure 749. 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://pubs.lenovo.com/lxcc-overview/>

## Troubleshooting by system LEDs and diagnostics display

See the following section for information on available system LEDs and diagnostics display

- “Drive LEDs” on page 711
- “Front operator panel LEDs” on page 711
- “Integrated diagnostics panel” on page 713
- “External diagnostics handset” on page 718
- “Rear system LEDs” on page 724
- “XCC system management port LEDs” on page 725
- “Power supply LEDs” on page 725
- “System-board-assembly LEDs” on page 726
- “LEDs on the firmware and RoT security module” on page 729

### Drive LEDs

This topic provides information on drive LEDs.

Each hot-swap drive comes with an activity LED and status LED and the signals are controlled by the backplanes. Different colors and speeds indicate different activities or status of the drive. The following illustration shows the LEDs on a hard disk drive or solid-state drive.

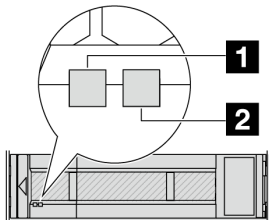


Figure 750. Drive LEDs

Drive LED	Status	Description
1 Drive activity LED (left)	Solid green	The drive is powered but not active.
	Blinking green	The drive is active.
2 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 drive is being identified.

### Front operator panel LEDs

This topic provides information on the front operator panel LEDs.

Depending on the server model, the server comes with the front operator panel without LCD display or front operator with LCD display (integrated diagnostics panel). For information about the integrated diagnostics panel with LCD display, see [“Integrated diagnostics panel” on page 713](#).

The following illustration shows the front operator panel on the media bay. For some server models, the front operator panel is integrated on the rack latch. See [“Front I/O module” on page 26](#).

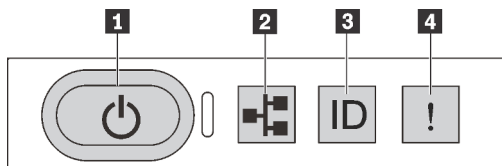


Figure 751. Front operator panel LEDs

<b>1</b> Power button with power status LED (green)	<b>2</b> Network activity LED (green)
<b>3</b> System ID button with system ID LED (blue)	<b>4</b> System Error LED (yellow)

#### **1 Power button with power status LED (green)**

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 states of the power LED are as follows:

Status	Color	Description
Off	None	Power is not present, or the power supply has failed.
Fast blinking (about four flashes per second)	Green	<ul style="list-style-type: none"> <li>The server is off, but the XClarity Controller is initializing, and the server is not ready to be powered on.</li> <li>System-board-assembly power has failed.</li> </ul>
Slow blinking (about one flash per second)	Green	The server is off and is ready to be powered on (standby state).
Solid on	Green	The server is on and running.

#### **2 Network activity LED (green)**

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	The server is disconnected from the network. <b>Note:</b> If the network activity LED is off when an OCP module is installed, check the network ports in the rear of your server to determine which port is disconnected.

### 3 System ID button with system ID LED (blue)

Use this system ID button and the blue system ID LED to visually locate the server. Each time you press the system ID button, the state of the system ID LED changes. The LED 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 LED 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 (yellow)

The system error LED helps you to determine if there are any system errors.

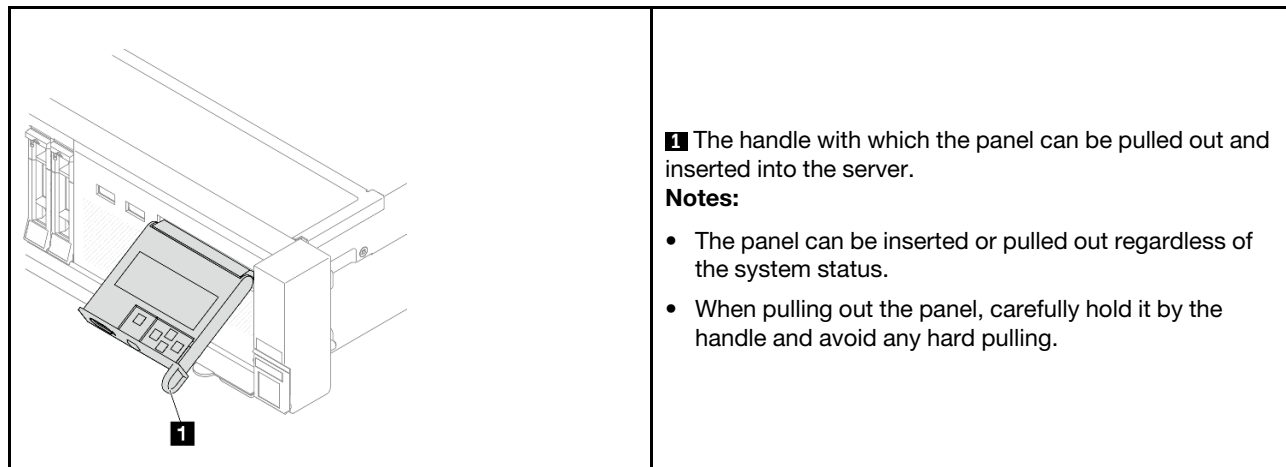
Status	Color	Description	Action
On	Yellow	An error has been detected on the server. Causes might include but are not limited to the following errors: <ul style="list-style-type: none"> <li>• A fan failure</li> <li>• A memory error</li> <li>• A storage failure</li> <li>• A PCIe device failure</li> <li>• A power supply failure</li> <li>• A processor error</li> <li>• A system I/O board or processor board error</li> </ul>	<ul style="list-style-type: none"> <li>• Check the Lenovo XClarity Controller event log and the system event log to determine the exact cause of the error.</li> <li>• Check if additional LEDs elsewhere in the server are also lit that will direct you to the source of the error. See <a href="#">“Troubleshooting by system LEDs and diagnostics display” on page 711</a>.</li> <li>• Save the log if necessary.</li> </ul>
Off	None	The server is off, or the server is on and is working correctly.	None.

## 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.

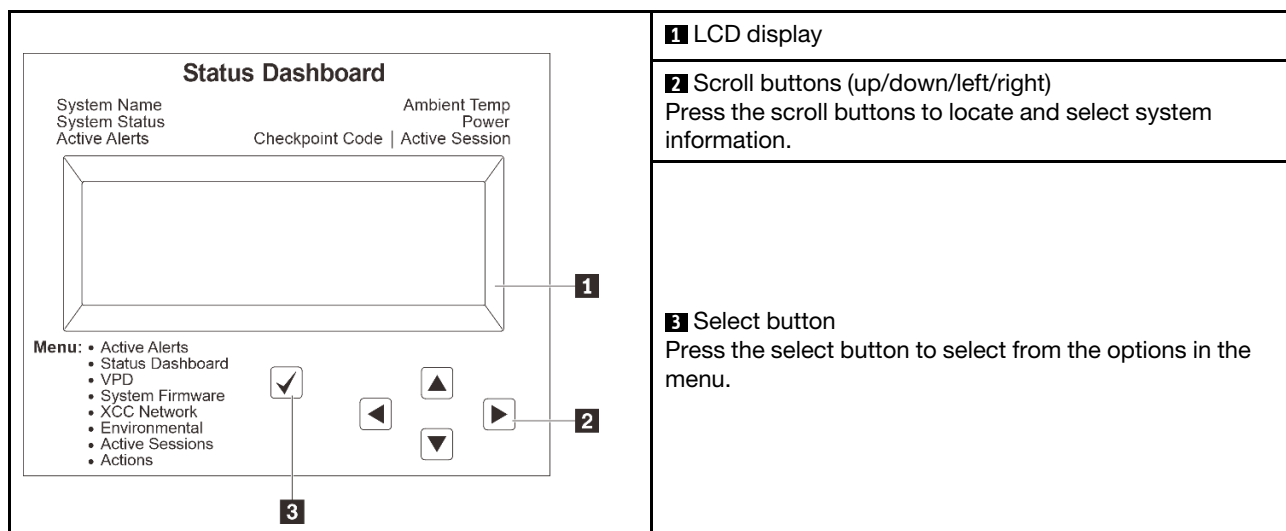
- [“Diagnostics panel location” on page 714](#)
- [“Diagnostics panel overview” on page 714](#)
- [“Options flow diagram” on page 714](#)
- [“Full menu list” on page 715](#)

## Diagnostics panel location



## Diagnostics panel overview

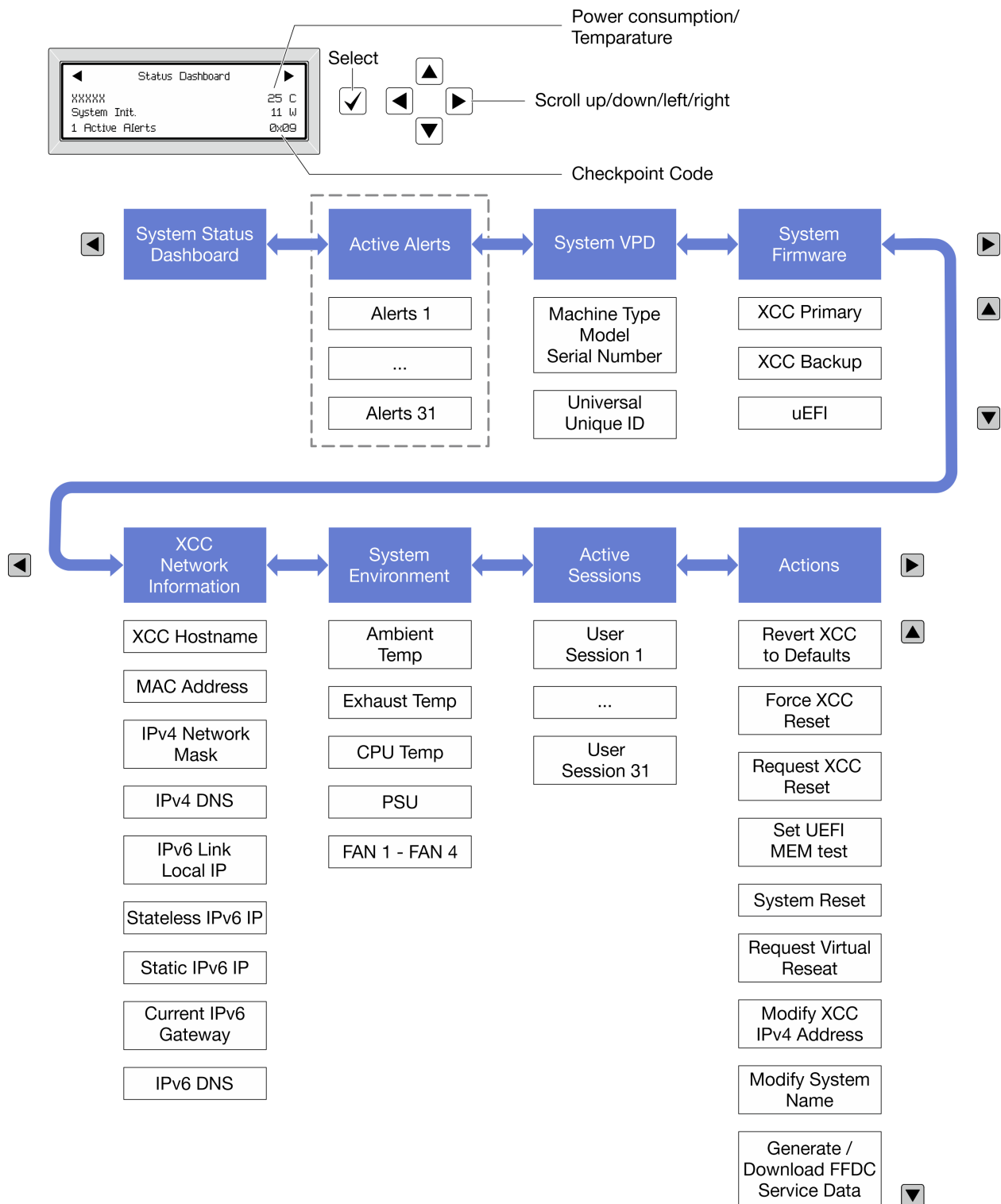
The diagnostics device consists of an LCD display and 5 navigation buttons.



## Options flow diagram

The LCD panel shows 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.

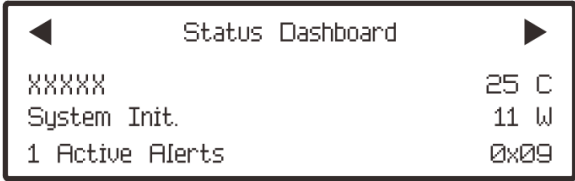


### Full menu list

Following is the list of options available on the diagnostics panel or handset. 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
<ol style="list-style-type: none"> <li>1 System name</li> <li>2 System status</li> <li>3 Active alert quantity</li> <li>4 Temperature</li> <li>5 Power consumption</li> <li>6 Checkpoint code</li> </ol>	

## Active Alerts

Sub Menu	Example
<p>Home screen: Active error quantity</p> <p><b>Note:</b> 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.</p>	<p>1 Active Alerts</p>
<p>Details screen:</p> <ul style="list-style-type: none"> <li>• Error message ID (Type: Error/Warning/Information)</li> <li>• Occurrence time</li> <li>• Possible sources of the error</li> </ul>	<p>Active Alerts: 1</p> <p>Press ▼ to view alert details</p> <p>FQXSPPU009N(Error)</p> <p>04/07/2020 02:37:39 PM</p> <p>CPU 1 Status:</p> <p>Configuration Error</p>

## System VPD Information

Sub Menu	Example
<ul style="list-style-type: none"> <li>• Machine type and serial number</li> <li>• Universal Unique ID (UUID)</li> </ul>	<p>Machine Type: xxxx</p> <p>Serial Num: xxxxxx</p> <p>Universal Unique ID:</p> <p>xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx</p>

## System Firmware

Sub Menu	Example
XCC Primary <ul style="list-style-type: none"><li>Firmware level (status)</li><li>Build ID</li><li>Version number</li><li>Release date</li></ul>	XCC Primary (Active) Build: DVI399T Version: 4.07 Date: 2020-04-07
XCC Backup <ul style="list-style-type: none"><li>Firmware level (status)</li><li>Build ID</li><li>Version number</li><li>Release date</li></ul>	XCC Backup (Active) Build: D8BT05I Version: 1.00 Date: 2019-12-30
UEFI <ul style="list-style-type: none"><li>Firmware level (status)</li><li>Build ID</li><li>Version number</li><li>Release date</li></ul>	UEFI (Inactive) Build: D0E101P Version: 1.00 Date: 2019-12-26

## XCC Network Information

Sub Menu	Example
<ul style="list-style-type: none"><li>XCC hostname</li><li>MAC address</li><li>IPv4 Network Mask</li><li>IPv4 DNS</li><li>IPv6 Link Local IP</li><li>Stateless IPv6 IP</li><li>Static IPv6 IP</li><li>Current IPv6 Gateway</li><li>IPv6 DNS</li></ul> <p><b>Note:</b> 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"><li>• Ambient temperature</li><li>• Exhaust temperature</li><li>• CPU temperature</li><li>• PSU status</li><li>• Spinning speed of fans by RPM</li></ul>	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 supported for users <ul style="list-style-type: none"><li>• Revert XCC to Defaults</li><li>• Force XCC Reset</li><li>• Request XCC Reset</li><li>• Set UEFI Memory Test</li><li>• Request Virtual Reseat</li><li>• Modify XCC Static IPv4 Address/Net mask/Gateway</li><li>• Modify System Name</li><li>• Generate/Download FFDC Service Data</li></ul>	Request XCC Reset? This will request the BMC to reboot itself. Hold ✓ for 3 seconds

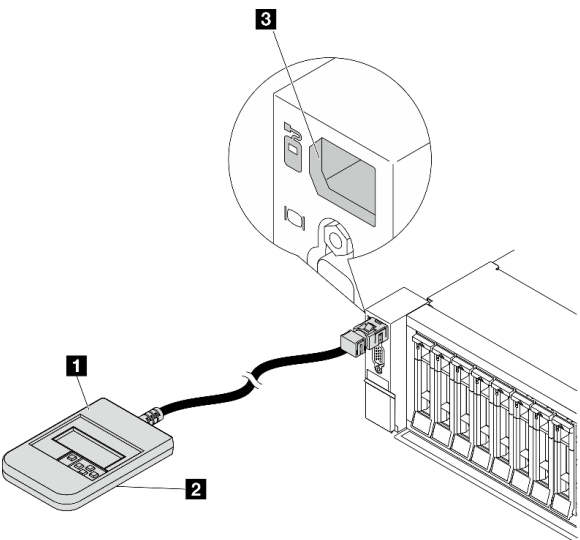
## External diagnostics handset

The external diagnostics handset is an external device that can be 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.

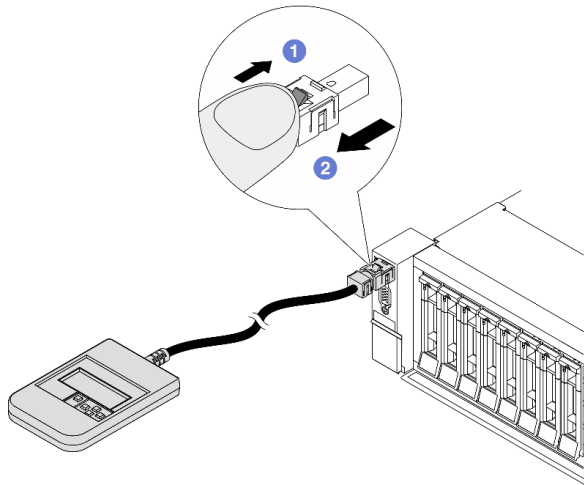
**Note:** The External Diagnostics Handset is an optional part that needs to be purchased separately.

- [“Location of the External Diagnostics Handset” on page 719](#)
- [“Diagnostics panel overview” on page 719](#)
- [“Options flow diagram” on page 721](#)
- [“Full menu list” on page 722](#)

## Location of the External Diagnostics Handset

Location	Description
<p>The External Diagnostics Handset is connected to the server with an external cable.</p> 	<p><b>1</b> External Diagnostics Handset</p>
	<p><b>2</b> 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.</p>
	<p><b>3</b> External diagnostics connector This connector is located on the front of the server and is used to connect an external LCD diagnostics handset.</p>

**Note:** Pay attention to the following steps when unplugging the external handset:

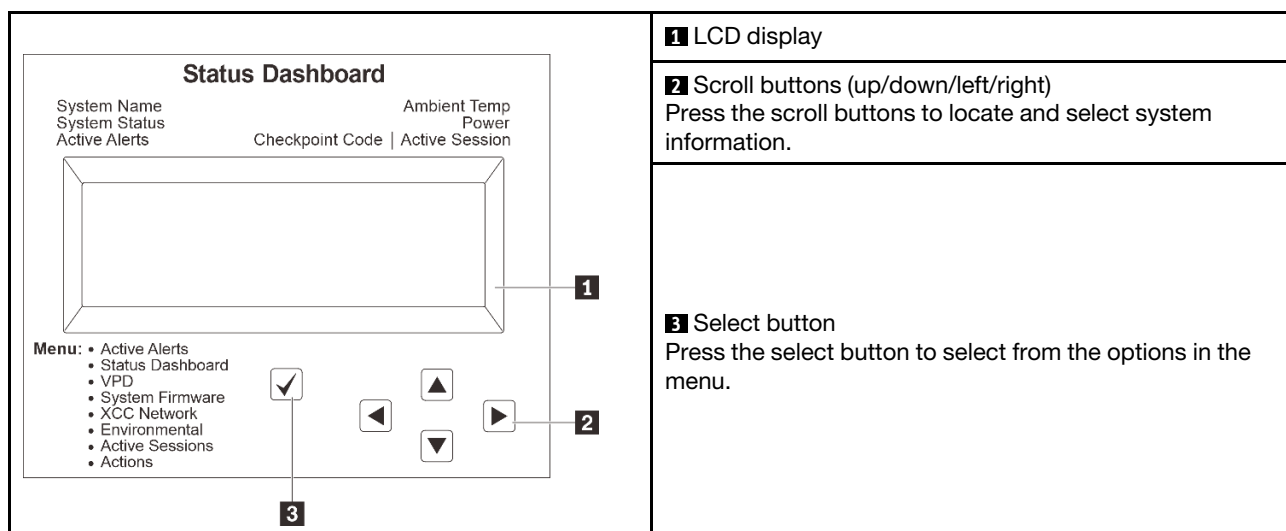


Step 1. Press the plastic clip on the plug in the shown direction.

Step 2. Gently pull out the cable from the connector while keeping the clip pressed down.

### Diagnostics panel overview

The diagnostics device consists of an LCD display and 5 navigation buttons.



**1** LCD display

**2** Scroll buttons (up/down/left/right)  
Press the scroll buttons to locate and select system information.

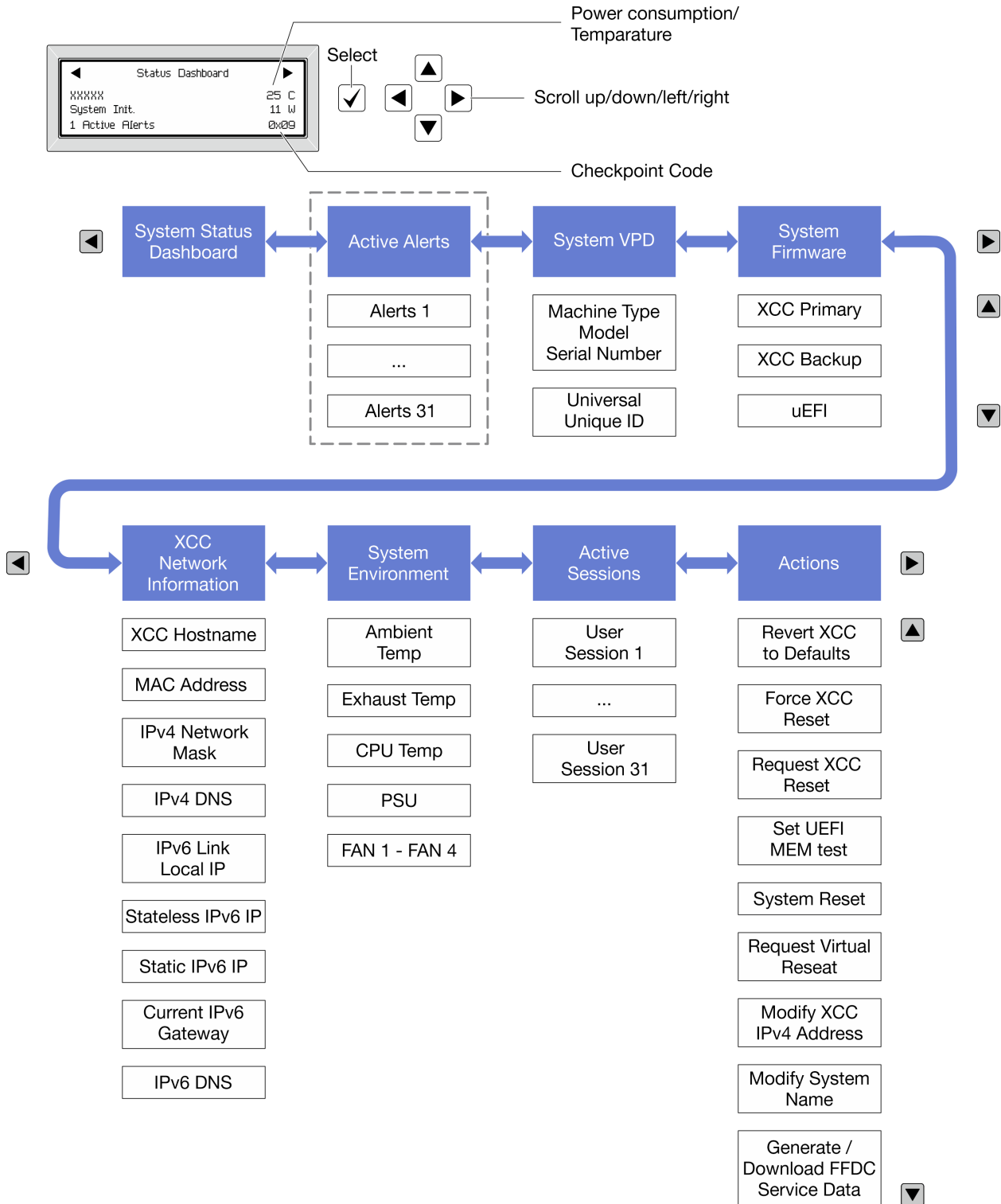
**3** Select button  
Press the select button to select from the options in the menu.



## Options flow diagram

The LCD panel shows 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.

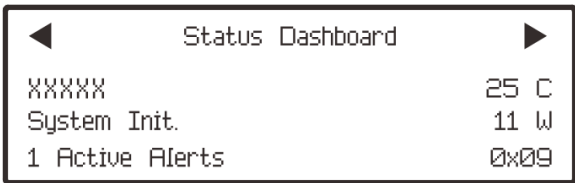


## Full menu list

Following is the list of options available on the diagnostics panel or handset. 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
<ul style="list-style-type: none"><li>❶ System name</li><li>❷ System status</li><li>❸ Active alert quantity</li><li>❹ Temperature</li><li>❺ Power consumption</li><li>❻ Checkpoint code</li></ul>	 <p>The screenshot shows a menu titled "Status Dashboard" with left and right arrow navigation buttons. The menu displays the following information: "XXXXXX" (likely system name), "25 C" (temperature), "System Init." (power consumption), "11 W" (temperature), and "1 Active Alerts" (active alert quantity) with a "0x09" (checkpoint code) at the bottom right.</p>

### Active Alerts

Sub Menu	Example
Home screen: Active error quantity <b>Note:</b> 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"><li>• Error message ID (Type: Error/Warning/Information)</li><li>• Occurrence time</li><li>• Possible sources of the error</li></ul>	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"><li>• Machine type and serial number</li><li>• Universal Unique ID (UUID)</li></ul>	Machine Type: xxxx Serial Num: xxxxxx Universal Unique ID: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

## System Firmware

Sub Menu	Example
XCC Primary <ul style="list-style-type: none"><li>Firmware level (status)</li><li>Build ID</li><li>Version number</li><li>Release date</li></ul>	XCC Primary (Active) Build: DVI399T Version: 4.07 Date: 2020-04-07
XCC Backup <ul style="list-style-type: none"><li>Firmware level (status)</li><li>Build ID</li><li>Version number</li><li>Release date</li></ul>	XCC Backup (Active) Build: D8BT05I Version: 1.00 Date: 2019-12-30
UEFI <ul style="list-style-type: none"><li>Firmware level (status)</li><li>Build ID</li><li>Version number</li><li>Release date</li></ul>	UEFI (Inactive) Build: D0E101P Version: 1.00 Date: 2019-12-26

## XCC Network Information

Sub Menu	Example
<ul style="list-style-type: none"><li>XCC hostname</li><li>MAC address</li><li>IPv4 Network Mask</li><li>IPv4 DNS</li><li>IPv6 Link Local IP</li><li>Stateless IPv6 IP</li><li>Static IPv6 IP</li><li>Current IPv6 Gateway</li><li>IPv6 DNS</li></ul> <p><b>Note:</b> 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"><li>• Ambient temperature</li><li>• Exhaust temperature</li><li>• CPU temperature</li><li>• PSU status</li><li>• Spinning speed of fans by RPM</li></ul>	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 supported for users <ul style="list-style-type: none"><li>• Revert XCC to Defaults</li><li>• Force XCC Reset</li><li>• Request XCC Reset</li><li>• Set UEFI Memory Test</li><li>• Request Virtual Reseat</li><li>• Modify XCC Static IPv4 Address/Net mask/ Gateway</li><li>• Modify System Name</li><li>• Generate/Download FFDC Service Data</li></ul>	Request XCC Reset? This will request the BMC to reboot itself. Hold ✓ for 3 seconds

## Rear system LEDs

This topic provides information on the system ID LED and the system error LED on the rear of the server.

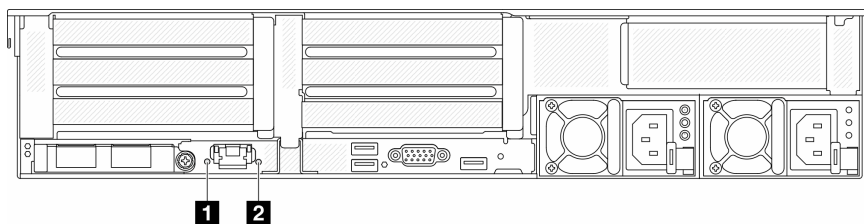


Figure 752. Rear system LEDs

LED	Description	Action
<b>1</b> System ID LED (blue)	This LED helps you to visually locate the server.	A system ID button with LED is also located on the front of the server. You can press the system ID button to turn on/off or blink the front and rear ID LEDs.
<b>2</b> System error LED (yellow)	LED on: an error has occurred.	Check system logs or internal error LEDs to identify the failed part. For more information, see <a href="#">“System error LED” on page .</a>

## XCC system management port LEDs

This topic provides information on LEDs of XCC system management port.

The following table describes the problems that are indicated by LEDs on XCC system management port.

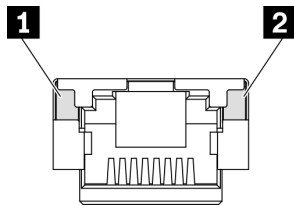


Figure 753. XCC system management port LEDs

LED	Description
<b>1</b> Ethernet port link LED	Use this green LED to distinguish the network connectivity status: <ul style="list-style-type: none"> <li>Off: The network link is disconnected.</li> <li>Green: The network link is established.</li> </ul>
<b>2</b> Ethernet port activity LED	Use this green LED to distinguish the network activity status: <ul style="list-style-type: none"> <li>Off: The server is disconnected from a LAN.</li> <li>Green: The network is connected and active.</li> </ul>

## Power supply LEDs

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

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.

**Note:** Depending on the power supply type, your power supply might look slightly different from the following illustration.

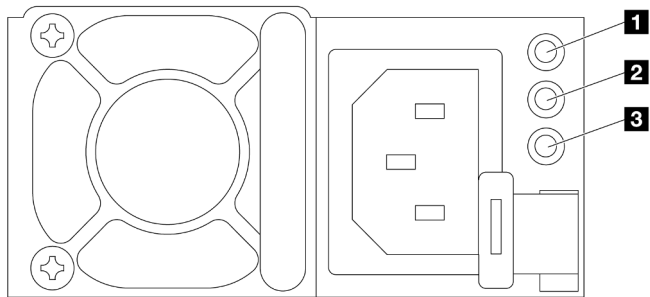


Figure 754. Power supply LEDs

LED	Description
<b>1</b> Input status	<p>The input status LED can be in one of the following states:</p> <ul style="list-style-type: none"> <li>Green: The power supply is connected to the input power source.</li> <li>Off: The power supply is disconnected from the input power source.</li> </ul>
<b>2</b> Output status	<p>The output status LED can be in one of the following states:</p> <ul style="list-style-type: none"> <li>Off: The server is powered off, or the power supply is not working properly. If the server is powered on but the power output LED is off, replace the power supply.</li> <li>Green: The server is on and the power supply is working normally.</li> <li>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.</li> </ul> <p>Zero-output mode can be disabled via Setup utility or 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"> <li>Start the Setup utility, go to <b>System Settings → Power → Zero Output</b> and select <b>Disable</b>.</li> <li>Log in to the Lenovo XClarity Controller web interface, choose <b>Server Configuration → Power Policy</b>, disable <b>Zero Output Mode</b>, and then click <b>Apply</b>.</li> </ul>
<b>3</b> Power supply error LED	<ul style="list-style-type: none"> <li>Off: The power supply is working normally</li> <li>Yellow: Dump the FFDC log from affected systems and escalate to next level for PSU data log reviewing.</li> </ul>

## System-board-assembly LEDs

The following illustrations show the light-emitting diodes (LEDs) on the system-board-assembly which contains the system I/O board and processor board.

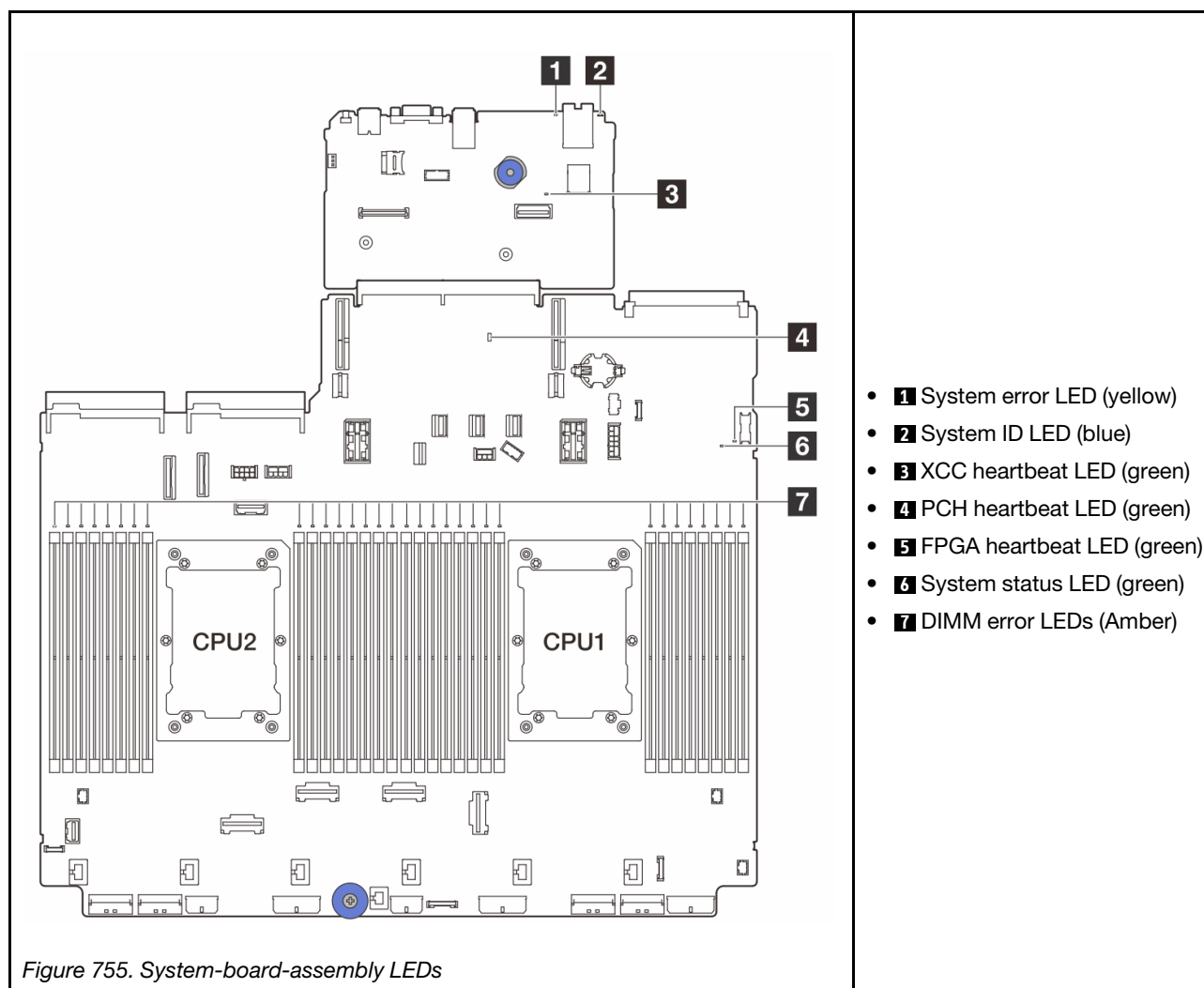


Table 43. System-board-assembly LEDs

LED	Description	Action
<b>1</b> System error LED (yellow)	LED on: an error has occurred.	Check system logs or internal error LEDs to identify the failed part. For more information, see <a href="#">“System error LED” on page</a> .
<b>2</b> System ID LED (blue)	This LED helps you to visually locate the server.	A system ID button with LED is also located on the front of the server. You can press the system ID button to turn on/off or blink the front and rear ID LEDs.

Table 43. System-board-assembly LEDs (continued)

LED	Description	Action
<b>3</b> XCC heartbeat LED (green)	<p>The XCC heartbeat LED helps you identify the XCC status.</p> <ul style="list-style-type: none"> <li>Blinking (about one flash per second) : XCC is working normally.</li> <li>Blinking at other speeds or always on: XCC is at the initial phase or is working abnormally.</li> <li>Off: XCC is not working.</li> </ul>	<ul style="list-style-type: none"> <li>If the XCC heartbeat LED is always off or always on, do the following: <ul style="list-style-type: none"> <li>If XCC cannot be access: <ol style="list-style-type: none"> <li>Re-plug the power cord.</li> <li>Check and ensure that the system I/O board and the firmware and RoT security module are installed correctly. (Trained technician only) Reinstall them if needed.</li> <li>(Trained technician only) Replace the firmware and RoT security module.</li> <li>(Trained technician only) Replace the system I/O board.</li> </ol> </li> <li>If XCC can be access, replace the system I/O board.</li> </ul> </li> <li>If the XCC heartbeat LED is always blinking fast over 5 minutes, do the following: <ol style="list-style-type: none"> <li>Re-plug the power cord.</li> <li>Check and ensure that the system I/O board and the firmware and RoT security module are installed correctly. (Trained technician only) Reinstall them if needed.</li> <li>(Trained technician only) Replace the firmware and RoT security module.</li> <li>(Trained technician only) Replace the system I/O board.</li> </ol> </li> <li>If the XCC heartbeat LED is always blinking slow over 5 minutes, do the following: <ol style="list-style-type: none"> <li>Re-plug the power cord.</li> <li>Check and ensure that the system I/O board and the firmware and RoT security module are installed correctly. (Trained technician only) Reinstall them if needed.</li> <li>If the problem remains, contact Lenovo Support.</li> </ol> </li> </ul>
<b>4</b> PCH heartbeat LED (green)	<p>The PCH heartbeat LED helps you identify the PCH status.</p> <ul style="list-style-type: none"> <li>Blinking (about one flash per second): system ME is working normally.</li> <li>Off: system ME is not working.</li> </ul>	<p>If the PCH heartbeat LED is always off or always on, do the following:</p> <ol style="list-style-type: none"> <li>Check and ensure that the system I/O board and the firmware and RoT security module are installed correctly. (Trained technician only) Reinstall them if needed.</li> <li>Make sure the UEFI firmware has been flashed to the corresponding platform version.</li> <li>Update UEFI and XCC firmware to latest version.</li> <li>Check if there is ME error event triggered in system event log. If yes, and the above actions are done, replace the firmware and RoT security module.</li> <li>(Trained technician only) If it is still not working, replace the processor board.</li> </ol>



Table 43. System-board-assembly LEDs (continued)

LED	Description	Action
<b>5</b> FPGA heartbeat LED (green)	The FPGA heartbeat LED helps you identify the FPGA status. <ul style="list-style-type: none"> <li>Blinking (about one flash per second): FPGA is working normally.</li> <li>On or off: FPGA is not working.</li> </ul>	If FPGA heartbeat LED is always off or always on, do the following: <ol style="list-style-type: none"> <li>Replace the processor board.</li> <li>If the problem remains, contact Lenovo Support.</li> </ol>
<b>6</b> System status LED (green)	The system status LED indicates the working status of the system. <ul style="list-style-type: none"> <li>Fast blinking (about four flashes per second): Power fault or is waiting for XCC power permission ready.</li> <li>Slow blinking (about one flash per second): Power off and is ready to be powered on (standby state).</li> <li>ON: Power on</li> </ul>	<ul style="list-style-type: none"> <li>If the system status LED is blinking fast over 5 minutes and cannot power on, check the XCC heartbeat LED and follow the <a href="#">actions for the XCC heartbeat LED</a>.</li> <li>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"> <li>Re-plug the power cord.</li> <li>Remove installed adapters/devices, one at a time, until you reach the minimal configuration for debugging.</li> <li>(Trained technician only) If the problem remains, capture FFDC log, and replace the processor board.</li> <li>If the problem still remains, contact Lenovo Support.</li> </ol> </li> </ul>
<b>7</b> DIMM error LEDs (Amber)	LED on: an error has occurred to the DIMM the LED represents.	For more information, see <a href="#">“Memory problems” on page 738</a> .

## 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).

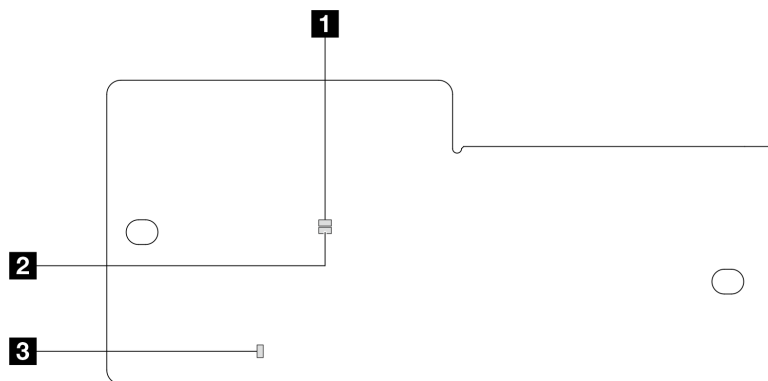


Figure 756. LEDs on the firmware and RoT security module

<b>1</b> AP0 LED (Green)	<b>2</b> AP1 LED (Green)	<b>3</b> Fatal Error LED (Amber)
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Table 44. LEDs description

Scenario	AP0 LED	AP1 LED	Fatal Error LED	FPGA heart-beat LED	XCC heart-beat LED	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.
	Blink	N/A	On	On	N/A	Replace the firmware and RoT security module.
No system power (FPGA heartbeat LED off)	Off	Off	Off	Off	Off	<p>If the AC power is on, but the system board assembly does not have power, then:</p> <ol style="list-style-type: none"> <li>1. Check the power supply unit (PSU) or power interposer board (PIB) if any. If the PSU or PIB has any error, replace it.</li> <li>2. If the PSU or PIB is good, do the following: <ol style="list-style-type: none"> <li>a. Replace the system I/O board.</li> <li>b. Replace the processor board.</li> </ol> </li> </ol>
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	On	Information only. No action is required.

**Note:** For locations of the FPGA LED and XCC heartbeat LED, see [“System-board-assembly LEDs” on page 726](#).

## LED on the liquid detection sensor module

This topic provides information about the LED on the liquid detection sensor module.

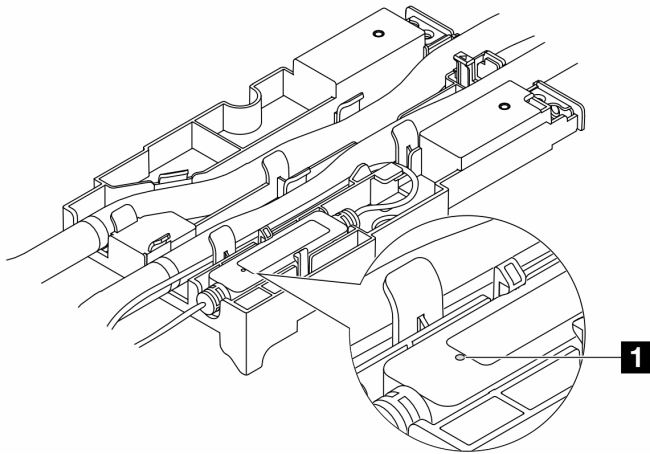


Figure 757. LED on the liquid detection sensor module

1 LED on the liquid detection sensor module	
Description	<ul style="list-style-type: none"> <li>• Solid green: No coolant leakage detected.</li> <li>• Blinking green: Abnormal status detected.</li> </ul>
Action	See <a href="#">“Coolant leak problems (Direct Water Cooling Module)” on page 733</a> .

## 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 709](#).

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, which come with the server 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.
- If you set the Ethernet controller to operate at 100 Mbps or 1000 Mbps, you must use Category 5 cabling.

Step 3. Determine whether the hub supports auto-negotiation. If it does not, try configuring the integrated Ethernet controller manually to match the speed and duplex mode of the hub.

Step 4. Check the Ethernet controller LEDs on the server. These LEDs indicate whether there is a problem with the connector, cable, or hub.

Ethernet controller LED locations are specified in [“Troubleshooting by system LEDs and diagnostics display” on page 711](#).

- The Ethernet link status LED is lit when the Ethernet controller receives a link pulse from the hub. If the LED is off, there might be a defective connector or cable or a problem with the hub.
- 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 711](#).

- 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 709](#)).

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 759](#)).

## 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 733](#)
- [“Steps to resolve coolant leaks” on page 734](#)

### 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 [“Front operator panel LEDs” on page 711](#) and [“LED on the liquid detection sensor module” on page 730](#) 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 88](#).
4. Remove the top cover. See [“Remove the top cover” on page 381](#).
5. Check for coolant leaks around the outlet and inlet hoses, system board assembly, and under the cold plate covers:

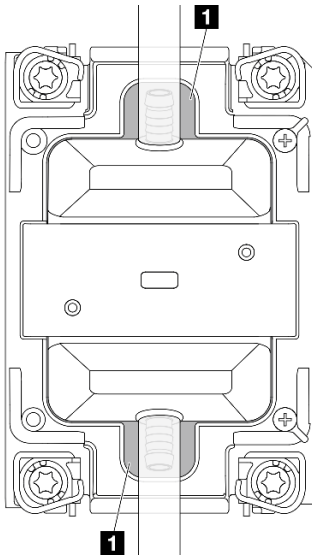


Figure 758. Leak-prone areas

**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 247](#).

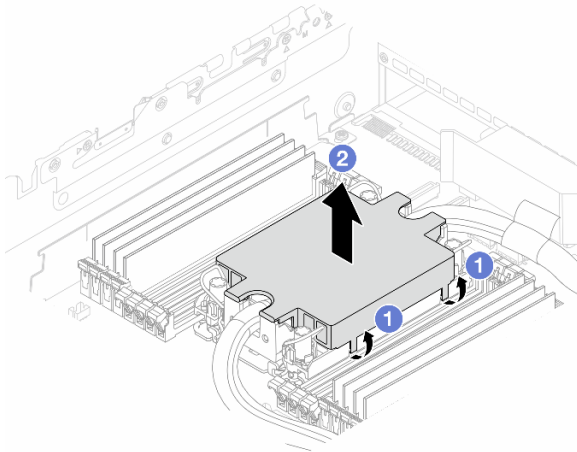


Figure 759. Removing the cold plate cover

- a) **1** Open the clips.
- b) **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.

## Intermittent problems

Use this information to solve intermittent problems.

- “Intermittent external device problems” on page 736
- “Intermittent KVM problems” on page 736
- “Intermittent unexpected reboots” on page 736

### 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://pubs.lenovo.com/lxpm-overview/>.) 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 compute node. 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 compute node.
3. Test the console breakout cable on a working compute node 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 correctable 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://pubs.lenovo.com/lxpm-overview/>.) Then, click **BMC Settings → POST Watchdog Timer**.



2. If the reset occurs after the operating system starts, 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`
3. See the management controller event log to check for an event code that indicates a reboot. See [“Event logs” on page 709](#) for information about viewing the event log. If you are using Linux base operating system, then 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 737](#)
- [“Mouse does not work” on page 737](#)
- [“KVM switch problems” on page 737](#)
- [“USB-device does not work” on page 737](#)

### 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://pubs.lenovo.com/lxpm-overview/>.) 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 assembly. See [Chapter 6 “Internal cable routing” on page 385](#)
    - 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.

- [“Multiple memory modules in a channel identified as failing” on page 738](#)
- [“Displayed system memory is less than installed physical memory” on page 739](#)
- [“Invalid memory population detected” on page 739](#)

### Multiple memory modules in a channel identified as failing

**Note:** Each time you install or remove a memory module, you must disconnect the server from the power source; then, wait 10 seconds before restarting the server.

Complete the following procedure to solve the problem.

1. Reseat the memory modules; then, restart the server.
2. Remove the highest-numbered memory module of those that are identified and replace it with an identical known good memory module; then, restart the server. Repeat as necessary. If the failures continue after all identified memory modules are replaced, go to step 4.
3. Return the removed memory modules, one at a time, to their original connectors, restarting the server after each memory module, until a memory module fails. Replace each failing memory module with an identical known good memory module, restarting the server after each memory module replacement. Repeat step 3 until you have tested all removed memory modules.
4. Replace the highest-numbered memory module of those identified; then, restart the server. Repeat as necessary.
5. Reverse the memory modules between the channels (of the same processor), and then restart the server. If the problem is related to a memory module, replace the failing memory module.
6. (Trained technician only) Install the failing memory module into a memory module connector for processor 2 (if installed) to verify that the problem is not the processor or the memory module connector.
7. (Trained technician only) Replace the processor board.

## 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; then, wait 10 seconds before restarting the server.

1. Make sure that:

- No error LEDs are lit. See [“Troubleshooting by system LEDs and diagnostics display” on page 711](#).
- No memory module error LEDs are lit on the processor board.
- Memory mirrored channel does not account for the discrepancy.
- The memory modules are seated correctly.
- You have installed the correct type of memory module (see [“Memory module installation rules and order” on page 61](#) for requirements).
- After changing or replacing a memory module, memory configuration is updated accordingly in the Setup Utility.
- All banks of memory are enabled. The server might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled.
- There is no memory mismatch when the server is at the minimum memory configuration.

2. Reseat the memory modules, and then restart the server.

3. Check the POST error log:

- If a memory module was disabled by a systems-management interrupt (SMI), replace the memory module.
- If a memory module was disabled by the user or by POST, reseat the memory module; then, run the Setup Utility and enable the memory module.

4. Run memory diagnostics. When you start a server and press the key according to the on-screen instructions, the LXPM interface is displayed by default. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.) You can perform memory diagnostics with this interface. From the Diagnostic page, go to **Run Diagnostic → Memory Test → Advanced Memory Test**.

5. Reverse the modules between the channels (of the same processor), and then restart the server. If the problem is related to a memory module, replace the failing memory module.

6. Re-enable all memory modules using the Setup Utility, and then restart the server.

7. (Trained technician only) Install the failing memory module into a memory module connector for processor 2 (if installed) to verify that the problem is not the processor or the memory module connector.

8. (Trained technician only) Replace the processor board.

## 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 61](#) 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.

## Monitor and video problems

Use this information to solve problems related to a monitor or video.

- [“Incorrect characters are displayed” on page 740](#)
- [“Screen is blank” on page 740](#)
- [“Screen goes blank when you start some application programs” on page 740](#)
- [“The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted” on page 740](#)
- [“The wrong characters appear on the screen” on page 741](#)
- [“Monitor display fails when connected to the VGA connector of the server” on page 741](#)

### 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 691](#).

### Screen is blank

**Note:** Make sure that the expected boot mode has not been changed from the UEFI to Legacy or vice versa.

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 691](#).
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
4. If the problem remains, contact Lenovo Support.

**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 691](#).

**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 assembly. See [Chapter 6 “Internal cable routing” on page 385](#)
    - b. Replace the left rack latch with VGA. See [“Rack latches replacement” on page 284](#).
    - 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.

- [“Server hangs during the UEFI boot process” on page 742](#)
- [“The server immediately displays the POST Event Viewer when it is turned on” on page 742](#)
- [“Server is unresponsive \(POST is complete and operating system is running\)” on page 742](#)
- [“Server is unresponsive \(POST failed and cannot start System Setup\)” on page 743](#)
- [“Voltage planar fault is displayed in the event log” on page 743](#)
- [“Unusual smell” on page 743](#)
- [“Server seems to be running hot” on page 744](#)

- “Cannot enter legacy mode after installing a new adapter” on page 744
- “Cracked parts or cracked chassis” on page 744

### Server hangs during the UEFI boot process

If the system hangs during the UEFI boot process with the message UEFI: DXE INIT on the display, make sure that Option ROMs were not configured with a setting of **Legacy**. You can remotely view the current settings for Option ROMs by running the following command using the Lenovo XClarity Essentials OneCLI:

```
onecli config show EnableDisableAdapterOptionROMSupport --bmc xcc_userid:xcc_password@xcc_ipaddress
```

To recover a system that hangs during the boot process with Legacy Option ROM settings, see the following Tech Tip:

<https://datacentersupport.lenovo.com/solutions/ht506118>

If legacy Option ROMs must be used, do not set slot Option ROMs to **Legacy** on the Devices and I/O Ports menu. Instead, set slot Option ROMs to **Auto** (the default setting), and set the System Boot Mode to **Legacy Mode**. Legacy option ROMs will be invoked shortly before the system boots.

### 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) Processor board

### 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 compute node, 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 compute node and verify that all applications are running (no applications are hung).
  3. Restart the compute node.
  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 compute node 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 compute node from a command line.
  - a. If you are unable to get a response during a ping test, attempt to ping another compute node in the enclosure to determine whether it is a connection problem or compute node 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 compute node 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.

### **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 compute nodes 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 57](#) 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 IPMI raw command.

6. Check the management processor event log for rising temperature events. If there are no events, the compute node is running within normal operating temperatures. Note that you can expect some variation in temperature.

### **Cannot enter legacy mode after installing a new adapter**

Complete the following procedure to solve the problem.

1. Go to **UEFI Setup → Devices and I/O Ports → Set Option ROM Execution Order**.
2. Move the RAID adapter with operation system installed to the top of the list.
3. Select **Save**.
4. Reboot the system and auto boot to operation system.

### **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 744](#)
- [“PCIe adapter is not recognized or is not functioning” on page 745](#)
- [“A Lenovo optional device that worked previously does not work now” on page 746](#)
- [“A Lenovo optional device that was just installed does not work.” on page 745](#)
- [“A Lenovo optional device that worked previously does not work now” on page 746](#)

### **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 compute node. 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. Resolve any resource conflicts if running legacy mode (UEFI). Check legacy ROM boot orders and modify the UEFI setting for MM config base.

**Note:** Ensure that you modify the ROM boot order associated with the PCIe adapter to the first execution order.

7. Check <http://datacentersupport.lenovo.com> for any tech tips (also known as retain tips or service bulletins) that might be related to the adapter.
8. Ensure any adapter external connections are correct and that the connectors are not physically damaged.
9. 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 → MM Config Base**; then, modify the setting to increase the device resources. For example, modify 3 GB to 2 GB or modify 2 GB to 1 GB.
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. If the Boot Device does not support MMIO above 4GB for Legacy Boot, use UEFI Boot Mode or remove/disable some PCIe devices.
9. DC cycle the system and ensure the system is enter UEFI boot menu or the operating system; then, capture the FFDC log.
10. 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://pubs.lenovo.com/lxpm-overview/>.) 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 damages, 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 746](#)
- [“Operating system performance” on page 746](#)

### **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 task manager or resource manager.
2. Check for traffic congestion on the network.
3. Update the NIC device driver, 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 compute node (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 compute node might be throttled to help with cooling. If it is throttled, reduce the workload on the compute node 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 747](#)
- [“Server does not power on” on page 747](#)
- [“Server does not power off” on page 748](#)

### 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 lights up and flash slowly.
  - The push force is enough and with button force response.
3. If the power button LED is not lighting up or is not flashing correctly, reseat all the power supplies and make sure the AC LEDs on the PSU rear side light up.
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 lighting up, implement the minimum configuration to check whether any specific components lock the power permission. Replace each power supply and check the power button function after installing 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 flashing amber.
3. Check the LEDs on the system board assembly. See [“System-board-assembly LEDs” on page 726](#).
4. Check if AC power LED lights up or the amber LED lights up at the PSU rear side.
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 (one processor, one DIMM and one PSU without any adapter and any drive installed).
9. Reseat all power supplies and make sure that the AC LEDs on the PSU rear side light up.

10. Replace each power supply and check the power button function after installing 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, and 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 748](#)
- [“Serial device does not work” on page 748](#)

### **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 40](#)).
2. Reseat the following components:
    - a. Failing serial device.
    - b. Serial cable.
  3. Replace the following components:
    - a. Failing serial device.
    - b. Serial cable.
  4. If the problem remains, contact Lenovo Support.

## 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 749](#)
- [“Multiple drives fail” on page 750](#)
- [“Multiple drives are offline” on page 750](#)
- [“A replacement drive does not rebuild” on page 751](#)
- [“Green drive activity LED does not represent actual state of associated drive” on page 751](#)
- [“Yellow drive status LED does not represent actual state of associated drive” on page 751](#)
- [“U.3 NVMe drive can be detected in NVMe connection, but cannot be detected in Tri-mode” on page 751](#)

### 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 interface is displayed by default. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.) You can perform drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → HDD 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 interface is displayed by default. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.) 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 interface is displayed by default. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.) You can perform drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → HDD 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.

### **U.3 NVMe drive can be detected in NVMe connection, but cannot be detected in Tri-mode**

In Tri-mode, NVMe drives are connected via a PCIe x1 link to the controller. To support Tri-mode with U.3 NVMe drives, **U.3 x1 mode** must be enabled for the selected drive slots on the backplane through the XCC Web GUI. By default, the backplane setting is **U.2 x4 mode**.

Complete the following steps to enable **U.3 x1 mode**:

1. Log into the XCC Web GUI, and choose **Storage → Detail** from the navigation tree on the left.
2. In the window that is displayed, click the icon  next to **Backplane**.
3. In the dialog box that is displayed, select the target drive slots and click **Apply**.
4. Do a DC power cycle to make the setting take effect.





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## Appendix A. Hardware disassembling for recycle

Follow the instructions in this section to recycle components with compliance with local laws or regulations.

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### Disassemble the system board assembly for recycle

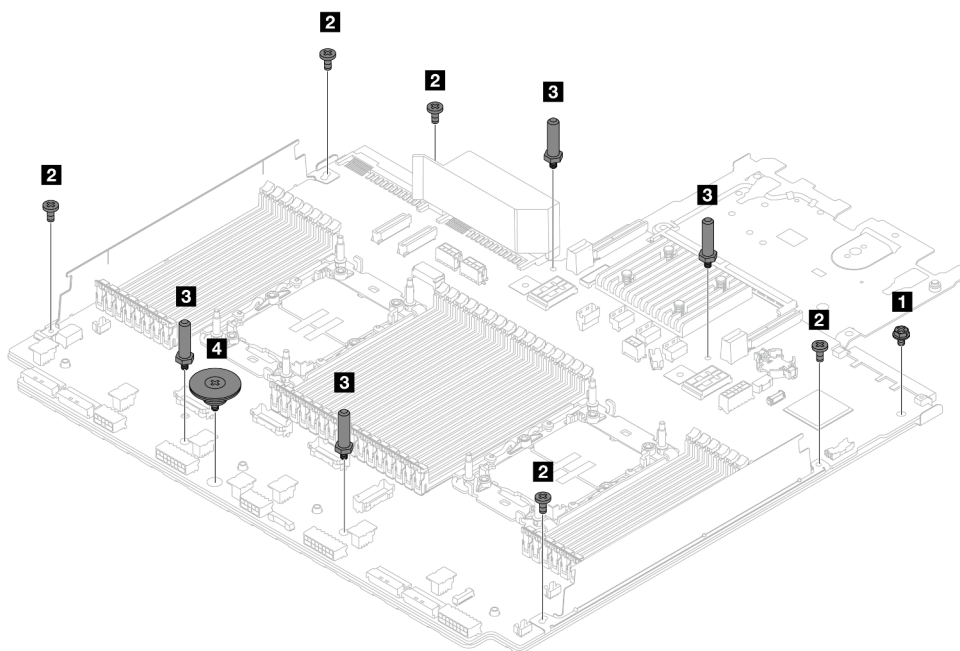
Follow the instructions in this section to disassemble the system board assembly before recycling.

#### About this task

The system board assembly contains the system I/O board and processor board. Before recycling each unit, you need to disassemble the system board assembly.

#### Procedure

- Step 1. Remove the firmware and RoT security module from the system I/O board. See [“Remove the firmware and RoT security module” on page 355](#).
- Step 2. Remove the system board assembly from the server, and separate the system I/O board from the processor board. See [“Remove the system I/O board or processor board” on page 361](#).
- Step 3. Remove the screws as illustrated from the processor board.







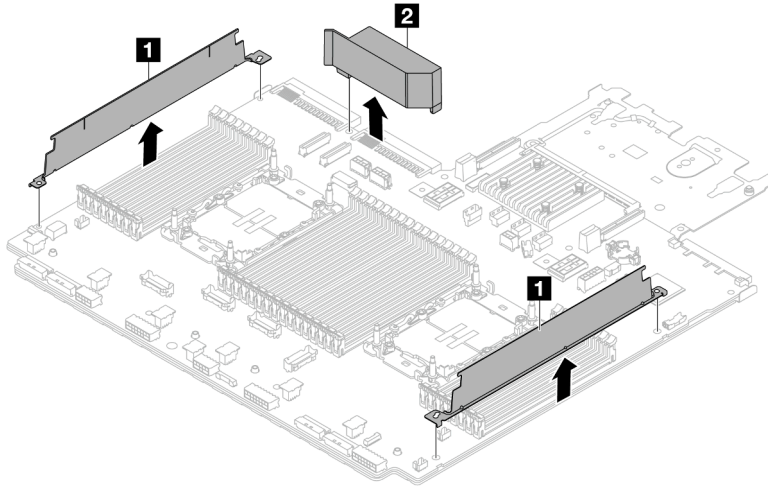
Screw	Quantity	Tools
<b>1</b> 	1	PH2 screwdriver
<b>2</b> 	5	PH2 screwdriver
<b>3</b> 	4	Hex wrench
<b>4</b> 	1	PH2 screwdriver

Figure 760. Removing screws from the processor board

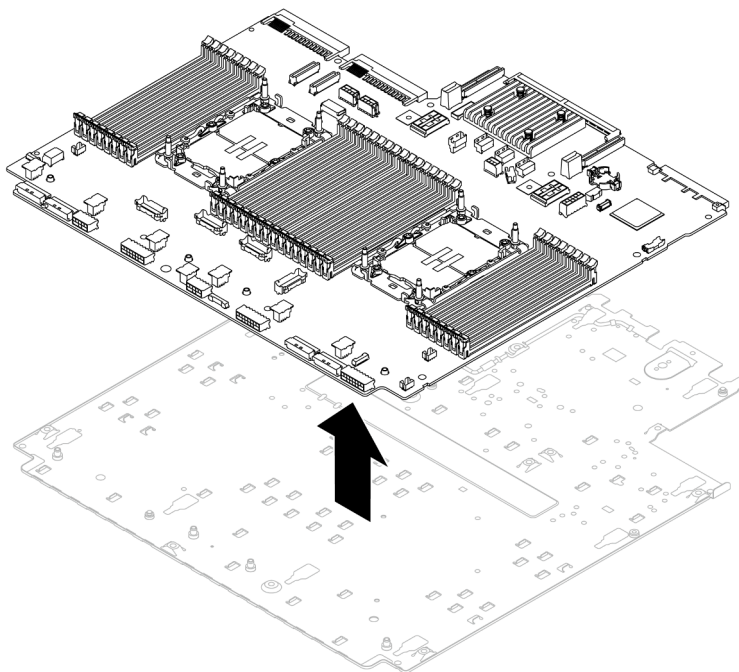
Step 4. Remove the following components from the processor board.

- **1** Cable wall brackets
- **2** PSU air baffle: The PSU air baffle is available on some models.



*Figure 761. Removing components from the processor board*

Step 5. Separate the processor board from the supporting sheet metal.



*Figure 762. Separating the processor board from the supporting sheet metal*

## **After you finish**

After disassembling the system board assembly, recycle the units in compliance with local regulations.



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## 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.

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### 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/products/servers/thinksystem/sr650v3/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 709](#) 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 navigate to the support page for your server.
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](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 53.
- 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.

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## 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://pubs.lenovo.com/lxcc-overview/>.

- 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://pubs.lenovo.com/lxcc-overview/>.

- **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](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 [https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_getinfor\\_command](https://pubs.lenovo.com/lxce-onecli/onecli_r_getinfor_command).

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## 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/supportphonenumberlist> for your region support details.





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## Appendix C. Documents and supports

This section provides handy documents, driver and firmware downloads, and support resources.

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### Documents download

This section provides introduction and download link for handy documents.

#### Documents

Download the following product documentations at:

[https://pubs.lenovo.com/sr650-v3/pdf\\_files](https://pubs.lenovo.com/sr650-v3/pdf_files)

- **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:** SR650 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 [ThinkSystem Heavy Duty Full Depth Rack Cabinets User Guide](#).

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### Support websites

This section provides driver and firmware downloads and support resources.

#### Support and downloads

- Drivers and Software download website for ThinkSystem SR650 V3
  - <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v3/downloads/driver-list/>
- Lenovo Data Center Forum
  - [https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv\\_eg](https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg)
- Lenovo Data Center Support for ThinkSystem SR650 V3
  - <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v3>
- 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](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>

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## 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.

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## 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:

[https://pubs.lenovo.com/important\\_notices/](https://pubs.lenovo.com/important_notices/)

## 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 <sup>6+</sup> )	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  
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