



ThinkSystem SR650 V2 Setup Guide



Machine Types: 7Z72 and 7Z73

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:

http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html

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

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

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Chapter 1. ThinkSystem SR650 V2 (7Z72 and 7Z73)

The ThinkSystem™ SR650 V2 server (7Z72 and 7Z73) is a 2-socket 2U server for small businesses up to large enterprises that need industry-leading reliability, management, and security, as well as maximizing performance and flexibility for future growth. The SR650 V2 server supports the third-generation Intel® Xeon® Scalable Processors and offers high scalability with up to 32 memory modules, up to 8 x PCIe slots, and up to 20 x 3.5-inch/40 x 2.5-inch drive bays.

Performance, ease of use, reliability, and expansion capabilities were key considerations in the design of the 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.

The server comes with a limited warranty. For details about the warranty, see: <https://support.lenovo.com/us/en/solutions/ht503310>

For details about your specific warranty, see: <http://datacentersupport.lenovo.com/warrantylookup>

Identifying your server

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

The machine type and serial number are on the ID label on the right rack latch in the front of the server.

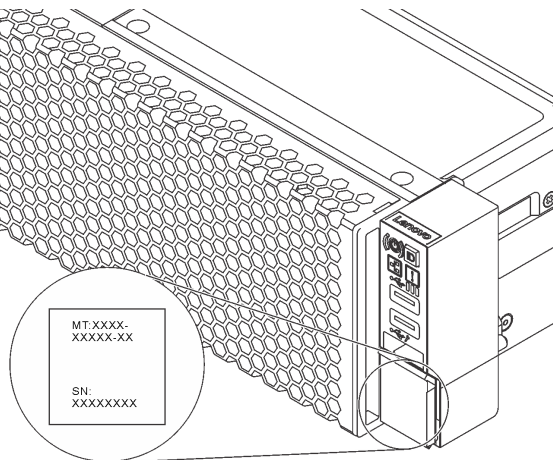


Figure 1. Location of the ID label

XCC network access label

The Lenovo XClarity Controller (XCC) network access label is attached to the pull-out information tab on the front of the server. The label provides the default host name and default IPv6 link local address of the XCC. After you get the server, peel the network access label away and store it in a safe place.

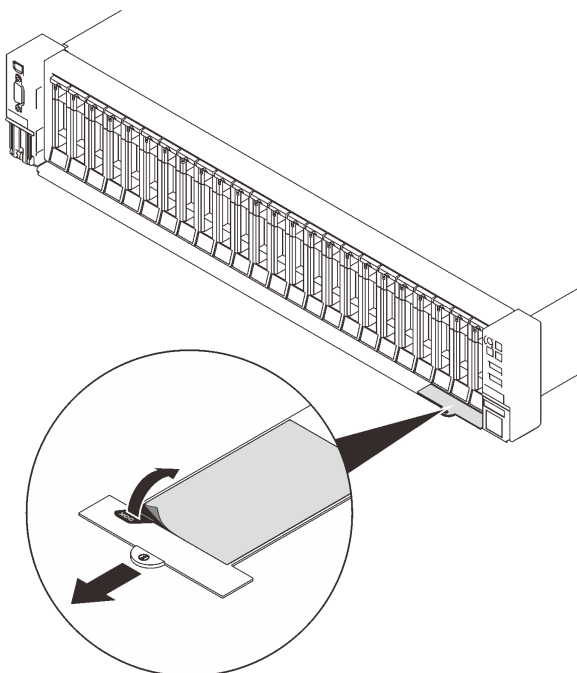


Figure 2. Location of the XCC network access label

Quick response code

The system service label, which is on the top cover, provides a quick response (QR) code for mobile access to service information. Scan the QR code with a mobile device and a QR code reader application to get quick access to the Lenovo Service Web site for this server. The Lenovo Service Information Web site provides additional information for parts installation and replacement videos, and error codes for server support.

The following illustration shows the QR code:

<https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v2>

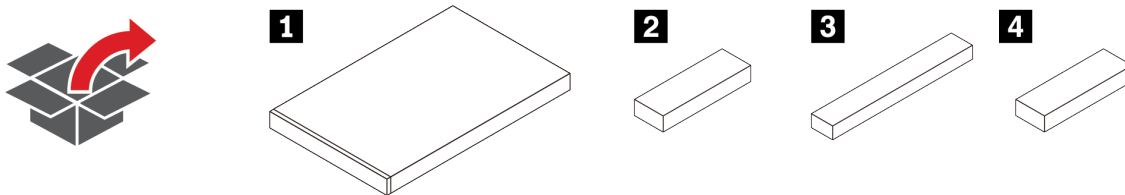


Figure 3. QR code

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:



- 1 Server
- 2 Material box, including items such as accessory kit, power cords* and documentation
- 3 Rail kit*
- 4 Cable management arm*

Note: Items marked with asterisk (*) are available on some models only.

Features

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

This server implements the following features and technologies:

- **Features on Demand**

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

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

- **Lenovo XClarity Controller (XCC)**

The Lenovo XClarity Controller is the common management controller for Lenovo ThinkSystem server hardware. The Lenovo XClarity Controller consolidates multiple management functions in a single chip on the server system board.

Some of the features that are unique to the Lenovo XClarity Controller are enhanced performance, higher-resolution remote video, and expanded security options. For additional information about the Lenovo XClarity Controller, refer to the XCC documentation compatible with your server at:

https://sysmgmt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html

Important: Lenovo XClarity Controller (XCC) supported version varies by product. All versions of Lenovo XClarity Controller are referred to as Lenovo XClarity Controller and XCC in this document, unless specified otherwise. To see the XCC version supported by your server, go to https://sysmgmt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.

- **UEFI-compliant server firmware**

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

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

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

- **Large system-memory capacity**

The server has 32 DIMM slots and supports RDIMMs, 3DS RDIMM, and Intel® Optane™ Persistent Memory (PMEM). For more information about the specific types and maximum amount of memory, see “Specifications” on page 7.

- **Integrated Trusted Platform Module (TPM)**

This integrated security chip performs cryptographic functions and stores private and public secure keys. It provides the hardware support for the Trusted Computing Group (TCG) specification. You can download the software to support the TCG specification when the software is available.

Note: For customers in Chinese Mainland, a Lenovo-qualified TPM adapter (sometimes called a daughter card) may be pre-installed.

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

The server models support front, middle, and rear drive bays, scalable up to twenty 3.5-inch hot-swap drives or forty 2.5-inch hot-swap drives.

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

- **Light path diagnostics**

Light path diagnostics provides LEDs to help you diagnose problems. For more information about the light path diagnostics, see:

- “Front IO assembly” on page 27
- “LCD diagnostics panel” on page 29
- “Rear view LEDs” on page 50
- “System board LEDs” on page 54

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

The server comes with a QR code on the system service label, which is on the cover of the server, that you can scan with 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, ThinkServer and ThinkSystem servers, and improve energy efficiency with 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 and optional power capabilities**

The server supports a maximum of two hot-swap power supplies and six hot-swap fans, which provide redundancy for a typical configuration. The redundant cooling by the fans in the server enables continued operation if one of the fans fails.

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.</p> <p>Interface</p> <ul style="list-style-type: none"> • Web GUI interface • CLI application • Mobile application • REST API <p>Usage and downloads</p> <p>https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html</p>
Lenovo XClarity Administrator	<p>Centralized interface for multi-server management.</p> <p>Interface</p> <ul style="list-style-type: none"> • Web GUI interface • Mobile application • REST API <p>Usage and downloads</p> <p>http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/aug_product_page.html</p>
Lenovo XClarity Essentials toolset	<p>Portable and light toolset for server configuration, data collection, and firmware updates. Suitable both for single-server or multi-server management contexts.</p> <p>Interface</p> <ul style="list-style-type: none"> • OneCLI: CLI application • Bootable Media Creator: CLI application, GUI application • UpdateXpress: GUI application <p>Usage and downloads</p> <p>http://sysmgt.lenovofiles.com/help/topic/xclarity_essentials/overview.html</p>

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

Functions

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

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 firmware, 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.

Specifications

The following sections contain information about the technical specifications and environmental specifications of the system.

- “Technical specifications” on page 8
- “Environmental specifications” on page 13

Technical specifications

Table 1. Technical specifications

Specification	Description
Dimension	<ul style="list-style-type: none">• 2U• Height: 86.5 mm (3.4 inches)• Width:<ul style="list-style-type: none">– With rack latches: 482.1 mm (19.0 inches)– Without rack latches: 445.0 mm (17.5 inches)• Depth: 763.7 mm (30.1 inches) <p>Note: The depth is measured with rack latches installed, but without the security bezel installed.</p>
Weight	Up to 38.8 kg (85.5 lb), depending on the server configuration
Processor (depending on the model)	<ul style="list-style-type: none">• Up to two 3rd Gen Intel Xeon scalable processors• Designed for Land Grid Array (LGA) 4189 socket• Up to 40 cores per socket• Supports 3 Intel Ultra Path Interconnect (UPI) links at 11.2 GT/s• Thermal Design Power (TDP): up to 270 watts <p>For a list of supported processors, see https://static.lenovo.com/us/en/serverproven/index.shtml.</p>

Table 1. Technical specifications (continued)

Specification	Description
Memory	<ul style="list-style-type: none"> • Memory slots: 32 DIMM slots that support up to: <ul style="list-style-type: none"> – 32 DRAM DIMMs – 16 DRAM DIMMs and 16 Intel Optane Persistent Memory (PMEMs) • Memory module types: <ul style="list-style-type: none"> – TruDDR4 3200, dual-rank, 16 GB/32 GB/64 GB RDIMM – TruDDR4 3200, quad-rank, 128 GB 3DS RDIMM – TruDDR4 2933, octal-rank, 256 GB 3DS RDIMM – TruDDR4 3200, 128 GB/256 GB/512 GB PMEM • Minimum memory: <ul style="list-style-type: none"> – 16 GB using RDIMMs – 128 GB using 3DS RDIMMs • Maximum memory: <ul style="list-style-type: none"> – Without PMEMs: <ul style="list-style-type: none"> – 2 TB using 32 x 64 GB RDIMMs – 8 TB using 32 x 256 GB 3DS RDIMMs – With PMEMs: <ul style="list-style-type: none"> – 10 TB: 16 x 128 GB 3DS RDIMMs + 16 x 512 GB PMEMs (Memory Mode) Total 10 TB installed memory capacity, of which 8 TB (PMEMs) is used as system memory and 2 TB (3DS RDIMMs) is used as cache. – 12 TB: 16 x 256 GB 3DS RDIMMs + 16 x 512 GB PMEMs (App Direct Mode) Total 12 TB installed memory capacity, of which 4 TB (3DS RDIMMs) is used as system memory and 8 TB (PMEMs) is used as persistent memory for storage. <p>Note: The operating speed and total memory capacity depend on the processor model and UEFI settings.</p> <p>See “Memory module installation rules and order” on page 216 for detailed information about memory configuration and setup.</p> <p>For a list of supported memory options, see https://static.lenovo.com/us/en/serverproven/index.shtml.</p>
Operating systems	<p>Supported and certified operating systems:</p> <ul style="list-style-type: none"> • Microsoft Windows Server • Red Hat Enterprise Linux • SUSE Linux Enterprise Server • VMware ESXi • Canonical Ubuntu <p>Complete list of operating systems: https://lenovopress.com/osig</p> <p>OS deployment instructions:</p> <p>“Deploy the operating system” on page 330</p>

Table 1. Technical specifications (continued)

Specification	Description
Internal drives	<ul style="list-style-type: none"> • Front drive bays: <ul style="list-style-type: none"> – Up to 24 x 2.5-inch hot-swap SAS/SATA/NVMe drives – Up to 12 x 3.5-inch hot-swap SAS/SATA/NVMe drives • Middle drive bays: <ul style="list-style-type: none"> – 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: <ul style="list-style-type: none"> – 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 two 7mm drives • Up to two internal M.2 drives <p>For detailed about supported internal storage, see https://lenovopress.com/lp1392-thinksystem-sr650-v2-server#internal-storage</p> <p>For thermal information about server models with middle or rear drive bays, see “Server models with middle/rear drive bays” on page 237.</p>
Expansion slots	<ul style="list-style-type: none"> • Up to eight PCIe slots • One OCP adapter slot <p>PCIe slot availability is based on riser selection and rear drive bay selection. See “Rear view” on page 42 and “PCIe slots and PCIe adapters” on page 231.</p>
Input/Output (I/O) features	<ul style="list-style-type: none"> • Front: <ul style="list-style-type: none"> – One VGA connector (optional) – One USB 3.2 Gen 1 (5 Gbps) connector – One USB 2.0 connector with XClarity Controller management – One external diagnostics connector – One LCD diagnostics panel (optional) • Rear: <ul style="list-style-type: none"> – One VGA connector – Three USB 3.2 Gen 1 (5 Gbps) connectors – One XClarity Controller network connector – Two or four Ethernet connectors on the OCP 3.0 Ethernet adapter (optional) – One serial port (optional)

Table 1. Technical specifications (continued)

Specification	Description
Storage controller	<ul style="list-style-type: none"> • Onboard SATA ports with software RAID support (Intel VROC SATA RAID, formerly known as Intel RSTe) • Onboard NVMe ports with software RAID support (Intel VROC NVMe RAID) <ul style="list-style-type: none"> – VROC Intel-SSD-Only (also known as Intel VROC standard): supports RAID levels 0, 1, 5, and 10 with Intel NVMe drives only – VROC Premium: requires a Feature on Demand (FoD) license and supports RAID levels 0, 1, 5, and 10 with Intel and non-Intel NVMe drives • SAS/SATA HBA adapters <ul style="list-style-type: none"> – ThinkSystem 430-8i SAS/SATA 12Gb HBA – ThinkSystem 430-16i SAS/SATA 12Gb HBA – ThinkSystem 430-8e SAS/SATA 12Gb HBA – ThinkSystem 430-16e SAS/SATA 12Gb HBA – 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 440-16e SAS/SATA PCIe Gen4 12Gb HBA • SAS/SATA RAID adapters <ul style="list-style-type: none"> – ThinkSystem RAID 530-8i PCIe 12Gb Adapter – ThinkSystem RAID 540-8i PCIe Gen4 12Gb Adapter – ThinkSystem RAID 5350-8i PCIe 12Gb Adapter – ThinkSystem RAID 530-16i PCIe 12Gb Adapter – ThinkSystem RAID 540-16i PCIe Gen4 12Gb Adapter – ThinkSystem RAID 930-8i 2GB Flash PCIe 12Gb Adapter – ThinkSystem RAID 9350-8i 2GB Flash PCIe 12Gb Adapter – ThinkSystem RAID 9350-8i 2GB Flash PCIe 12Gb Internal Adapter* – ThinkSystem RAID 930-8e 4GB Flash PCIe 12Gb Adapter – ThinkSystem RAID 930-16i 4GB Flash PCIe 12Gb 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 940-8i 8GB 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 • NVMe adapters <ul style="list-style-type: none"> – ThinkSystem RAID 940-8i 4GB Flash PCIe Gen4 12Gb Adapter for U.3 (Trimode) – ThinkSystem RAID 940-8i 8GB Flash PCIe Gen4 12Gb Adapter for U.3 (Trimode) – ThinkSystem RAID 940-16i 4GB Flash PCIe Gen4 12Gb Adapter for U.3 (Trimode)

Table 1. Technical specifications (continued)

Specification	Description
	<ul style="list-style-type: none"> – ThinkSystem RAID 940-16i 8GB Flash PCIe Gen4 12Gb Adapter for U.3 (Trimode) – ThinkSystem 4-Port PCIe Gen4 NVMe Retimer Adapter – ThinkSystem 1611-8P PCIe Gen4 Switch Adapter • Expander: ThinkSystem 48 port 12Gb Internal Expander* <p>Notes:</p> <ul style="list-style-type: none"> • *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 https://lenovopress.com/lp1288-thinksystem-raid-adapter-and-hba-reference.
Graphics processing unit (GPU)	<p>Your server supports the following GPUs:</p> <ul style="list-style-type: none"> • Full length, full height, double-wide: NVIDIA® V100S, A100, A40, A30, A16, RTX 6000, A6000 • Full length, full height, single-wide: NVIDIA A10 • Half length, low profile, single-wide: NVIDIA T4, P620 <p>For GPU supporting matrix, see “Server models with GPUs” on page 238.</p>
System fans	<ul style="list-style-type: none"> • Supported fan types: <ul style="list-style-type: none"> – Standard fan 6038 (single-rotor 17000 RPM) – Performance fan 6056 (dual-rotor 19000 RPM) • Fan redundancy: N+1 redundancy, one redundant fan rotor <ul style="list-style-type: none"> – One CPU: five hot-swap system fans (4+1 redundancy, one redundant fan rotor) – Two CPUs: six hot-swap system fans (5+1 redundancy, one redundant fan rotor) <p>Note: Single-rotor hot-swap fans cannot be mixed with dual-rotor hot-swap fans.</p>

Table 1. Technical specifications (continued)

Specification	Description																																			
Electrical input	The server supports up to two power supplies for redundancy.																																			
	<i>Table 2. Electrical input for power supplies</i>																																			
	<table border="1"> <thead> <tr> <th>Power supply</th> <th>100–127 V ac</th> <th>200–240 V ac</th> <th>240 V dc</th> <th>-48 V dc</th> </tr> </thead> <tbody> <tr> <td>500-watt 80 PLUS Platinum</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>750-watt 80 PLUS Platinum</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>750-watt 80 PLUS Titanium</td> <td></td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>1100-watt 80 PLUS Platinum</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>1100-watt 80 PLUS Platinum</td> <td></td> <td></td> <td></td> <td>√</td> </tr> <tr> <td>1800-watt 80 PLUS Platinum</td> <td></td> <td>√</td> <td>√</td> <td></td> </tr> </tbody> </table>	Power supply	100–127 V ac	200–240 V ac	240 V dc	-48 V dc	500-watt 80 PLUS Platinum	√	√	√		750-watt 80 PLUS Platinum	√	√	√		750-watt 80 PLUS Titanium		√	√		1100-watt 80 PLUS Platinum	√	√	√		1100-watt 80 PLUS Platinum				√	1800-watt 80 PLUS Platinum		√	√	
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1100-watt 80 PLUS Platinum				√																																
1800-watt 80 PLUS Platinum		√	√																																	
<p>CAUTION:</p> <ul style="list-style-type: none"> • 240 V dc input (input range: 180-300 V dc) is supported in Chinese Mainland ONLY. • Power supply with 240 V dc input cannot support hot plugging power cord function. Before removing the power supply with dc input, please turn off server or disconnect dc power sources at the breaker panel or by turning off the power source. Then, remove the power cord. 																																				
Minimal configuration for debugging	<ul style="list-style-type: none"> • One processor in socket 1 • One DIMM in slot 3 • One power supply • One HDD/SSD drive, one M.2 drive, or one 7mm drive (if OS is needed for debugging) • Five system fans 																																			

Environmental specifications

- “Ambient temperature/altitude/humidity” on page 13
- “Vibration and shock” on page 14
- “Acoustic noise emissions” on page 14
- “Particulate contamination” on page 15

Ambient temperature/altitude/humidity

The server is designed for standard data center environment and is recommended to be placed in industrial data center. Depending on hardware configurations, the server complies with ASHRAE Class A2, ASHRAE Class A3, or Class A4 specifications with certain thermal restrictions. For detailed thermal information, see “Thermal rules” on page 236. System performance may be impacted when operating temperature is outside permitted conditions.

Ambient temperature	<ul style="list-style-type: none"> • Operating <ul style="list-style-type: none"> – 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	3050 m (10 000 ft)
Relative humidity (non-condensing)	<ul style="list-style-type: none"> • Operating: <ul style="list-style-type: none"> – 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%–90%

Vibration and shock

The server has the following vibration and shock limits:

- Vibration
 - Operating: 0.21 G rms at 5 Hz to 500 Hz for 15 minutes across 3 axes
 - Non-operating: 1.04 G rms at 2 Hz to 200 Hz for 15 minutes across 6 surfaces
- Shock
 - Operating: 15 G for 3 milliseconds in each direction (positive and negative X, Y, and Z axes)
 - Non-operating:
 - 23-31 kg: 35 G for 152 in./sec velocity change across 6 surfaces
 - 32 kg - 68 kg: 35 G for 136 in./sec velocity change across 6 surfaces

Acoustic noise emissions

The server has the following acoustic noise emissions declaration.

Configuration	Sound power levels (L _{WA,d})	Sound pressure level (L _{pAm})
Typical	<ul style="list-style-type: none"> • Idling: 5.9 Bel • Operating: 6.2 Bel 	<ul style="list-style-type: none"> • Idling: 42.6 dBA • Operating: 45.8dBA
Storage	<ul style="list-style-type: none"> • Idling: 7.6 Bel • Operating: 7.6 Bel 	<ul style="list-style-type: none"> • Idling: 60 dBA • Operating: 60.3 dBA
GPU	<ul style="list-style-type: none"> • Idling: 7.2 Bel • Operating: 8.5 Bel 	<ul style="list-style-type: none"> • Idling: 56.3 dBA • Operating: 68.5 dBA

The declared sound levels are based on the following configurations, which may change depending on configurations/conditions, for example high-power processors and GPUs, and high-power network adapters such as the Mellanox ConnectX-6 HDR/200GbE QSFP56 PCIe Adapters or the Broadcom 57454 10GBASE-T 4-port OCP Ethernet Adapter.

Configuration	Processor	Memory	Drive	RAID adapter	OCP card	Power supply	GPU adapter
Typical	2 x 165W CPUs	8 x 64G DIMMs	8 x 2.4 TB SAS HDDs	RAID 940-8i	Intel X710-T2L 10GBASE-T 2-port OCP	2 x 750W PSUs	No
Storage	2 x 165W CPUs	16 x 64G DIMMs	20 x 14 TB SAS HDDs	RAID 940-8i		2 x 1100W PSUs	No
GPU	2 x 205W CPUs	32 x 64G DIMMs	16 x 2.4 TB SAS HDDs	RAID 940-8i		2 x 1800W PSUs	3 x V100S GPUs

Notes:

- These sound levels were measured in controlled acoustical environments according to procedures specified by ISO7779 and are reported in accordance with ISO 9296.
- 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.

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 3. Limits for particulates and gases

Contaminant	Limits
Reactive gases	<p>Severity level G1 as per ANSI/ISA 71.04-1985¹:</p> <ul style="list-style-type: none"> • The copper reactivity level shall be less than 300 Angstroms per month ($\text{\AA}/\text{month} \approx 0.0039 \mu\text{g}/\text{cm}^2\text{-hour}$ weight gain).² • The silver reactivity level shall be less than 200 $\text{\AA}/\text{month}$ ($\text{\AA}/\text{month} \approx 0.0035 \mu\text{g}/\text{cm}^2\text{-hour}$ weight gain).³ • The reactive monitoring of gaseous corrosivity must be conducted approximately 5 cm (2 in.) in front of the rack on the air inlet side at one-quarter and three-quarter frame height off the floor or where the air velocity is much higher.
Airborne particulates	<p>Data centers must meet the cleanliness level of ISO 14644-1 class 8.</p> <p>For data centers without airside economizer, the ISO 14644-1 class 8 cleanliness might be met by choosing one of the following filtration methods:</p> <ul style="list-style-type: none"> • The room air might be continuously filtered with MERV 8 filters. • Air entering a data center might be filtered with MERV 11 or preferably MERV 13 filters. <p>For data centers with airside economizers, the choice of filters to achieve ISO class 8 cleanliness depends on the specific conditions present at that data center.</p> <ul style="list-style-type: none"> • The deliquescent relative humidity of the particulate contamination should be more than 60% RH.⁴ • Data centers must be free of zinc whiskers.⁵
<p>¹ ANSI/ISA-71.04-1985. <i>Environmental conditions for process measurement and control systems: Airborne contaminants</i>. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.</p> <p>² The derivation of the equivalence between the rate of copper corrosion growth in the thickness of the corrosion product in $\text{\AA}/\text{month}$ and the rate of weight gain assumes that Cu_2S and Cu_2O grow in equal proportions.</p> <p>³ The derivation of the equivalence between the rate of silver corrosion growth in the thickness of the corrosion product in $\text{\AA}/\text{month}$ and the rate of weight gain assumes that Ag_2S is the only corrosion product.</p> <p>⁴ The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.</p> <p>⁵ Surface debris is randomly collected from 10 areas of the data center on a 1.5 cm diameter disk of sticky electrically conductive tape on a metal stub. If examination of the sticky tape in a scanning electron microscope reveals no zinc whiskers, the data center is considered free of zinc whiskers.</p>	

Chapter 2. Server components

This section provides information to help you locate your server components.

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 18
- “Front view with eight 2.5-inch front drive bays (model 2)” on page 19
- “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 twenty-four 2.5-inch front drive bays” on page 22
- “Front view with 2.5-inch front drive bays (backplane-less)” on page 23
- “Front view with eight 3.5-inch front drive bays” on page 24
- “Front view with twelve 3.5-inch front drive bays” on page 25
- “Front view with 3.5-inch front drive bays (backplane-less)” on page 26

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

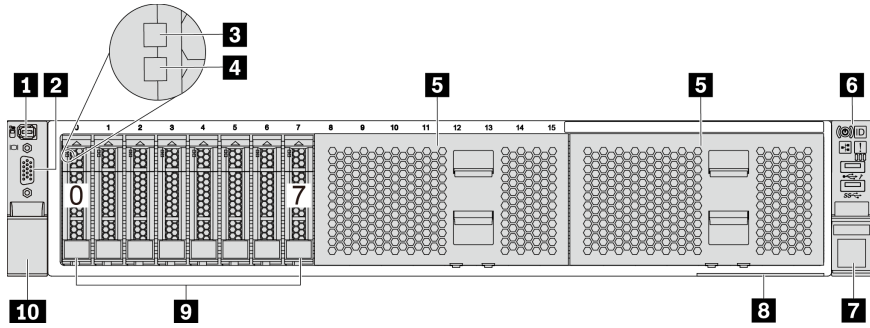


Figure 4. Front view with eight 2.5-inch front drive bays (model 1)

Table 4. Components on the front of the server

Callout	Callout
1 “External diagnostics connector” on page 36	2 “VGA connector (optional)” on page 49
3 “Drive activity LED” on page 48	4 “Drive status LED” on page 48
5 Drive bay fillers (2)	6 “Front I/O assembly (on rack latch)” on page 27
7 Rack latch (right)	8 “Pull-out information tab” on page 1
9 Drive bays (8)	10 Rack latch (left)

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

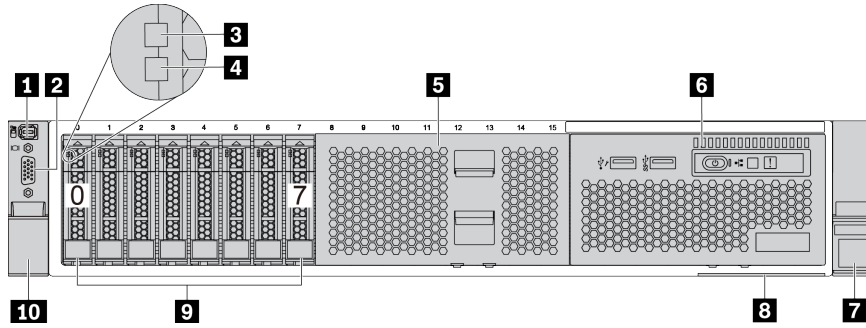


Table 5. Components on the front of the server

Callout	Callout
1 “External diagnostics connector” on page 36	2 “VGA connector (optional)” on page 49
3 “Drive activity LED” on page 48	4 “Drive status LED” on page 48
5 Drive bay filler	6 “Front I/O assembly (on media bay)” on page 27
7 Rack latch (right)	8 “Pull-out information tab” on page 1
9 Drive bays (8)	10 Rack latch (left)

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

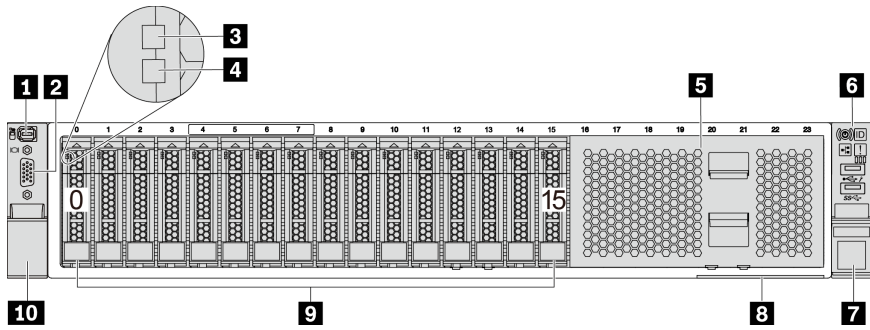


Table 6. Components on the front of server models

Callout	Callout
1 “External diagnostics connector” on page 36	2 “VGA connector (optional)” on page 49
3 “Drive activity LED” on page 48	4 “Drive status LED” on page 48
5 Drive bay filler	6 “Front I/O assembly (on rack latch)” on page 27
7 Rack latch (right)	8 “Pull-out information tab” on page 1
9 Drive bays (16)	10 Rack latch (left)

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

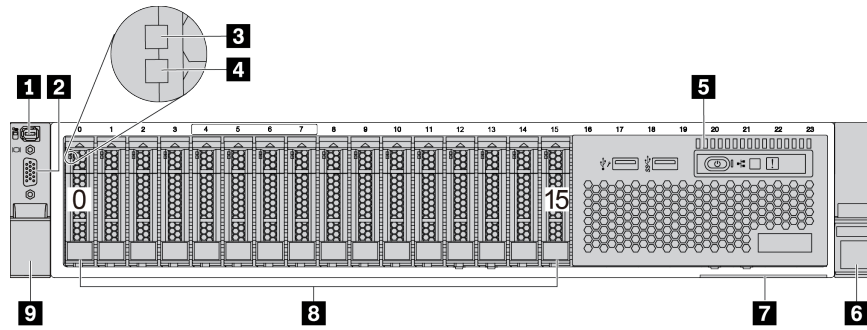


Table 7. Components on the front of the server

Callout	Callout
1 “External diagnostics connector” on page 36	2 “VGA connector (optional)” on page 49
3 “Drive activity LED” on page 48	4 “Drive status LED” on page 48
5 “Front I/O assembly (on media bay)” on page 27	6 Rack latch (right)
7 “Pull-out information tab” on page 1	8 Drive bays (16)
9 Rack latch (left)	

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

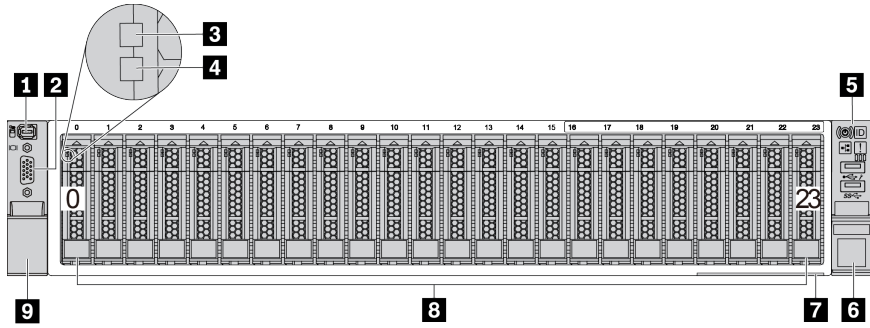


Table 8. Components on the front of server models

Callout	Callout
1 “External diagnostics connector” on page 36	2 “VGA connector (optional)” on page 49
3 “Drive activity LED” on page 48	4 “Drive status LED” on page 48
5 “Front I/O assembly (on rack latch)” on page 27	6 Rack latch (right)
7 “Pull-out information tab” on page 1	8 Drive bays (24)
9 Rack latch (left)	

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

The following illustration shows the front view of server models with 2.5-inch front drive bays (backplane-less).

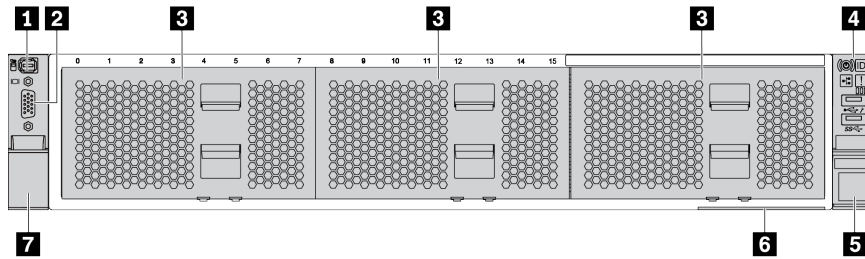


Table 9. Components on the front of server models

Callout	Callout
1 “External diagnostics connector” on page 36	2 “VGA connector (optional)” on page 49
3 Drive bay fillers(3)	4 “Front I/O assembly (on rack latch)” on page 27
5 Rack latch (right)	6 “Pull-out information tab” on page 1
7 Rack latch (left)	

Front view with eight 3.5-inch front drive bays

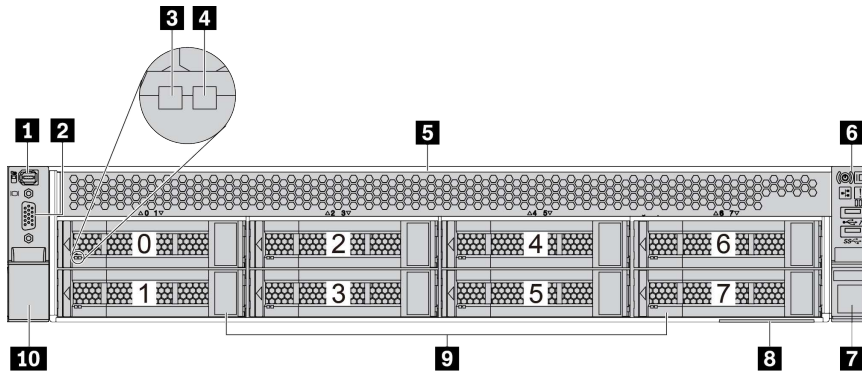


Table 10. Components on the front of server models

Callout	Callout
1 “External diagnostics connector” on page 36	2 “VGA connector (optional)” on page 49
3 “Drive activity LED” on page 48	4 “Drive status LED” on page 48
5 Drive bay filler	6 “Front I/O assembly (on rack latch)” on page 27
7 Rack latch (right)	8 “Pull-out information tab” on page 1
9 Drive bays (8)	10 Rack latch (left)

Front view with twelve 3.5-inch front drive bays

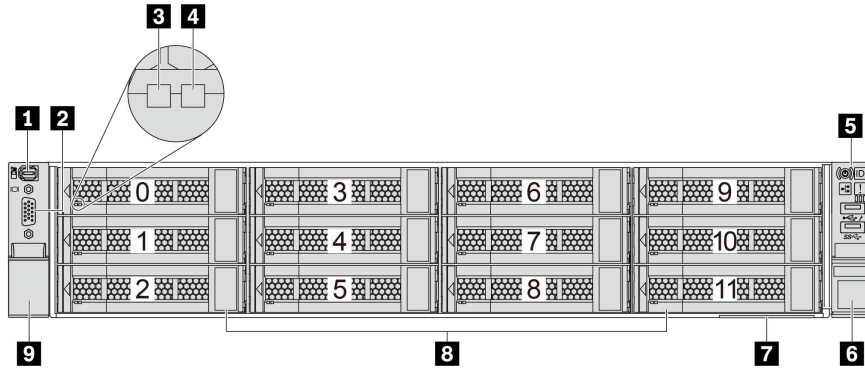


Table 11. Components on the front of server models

Callout	Callout
1 “External diagnostics connector” on page 36	2 “VGA connector (optional)” on page 49
3 “Drive activity LED” on page 48	4 “Drive status LED” on page 48
5 “Front I/O assembly (on rack latch)” on page 27	6 Rack latch (right)
7 “Pull-out information tab” on page 1	8 Drive bays (12)
9 Rack latch (left)	

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

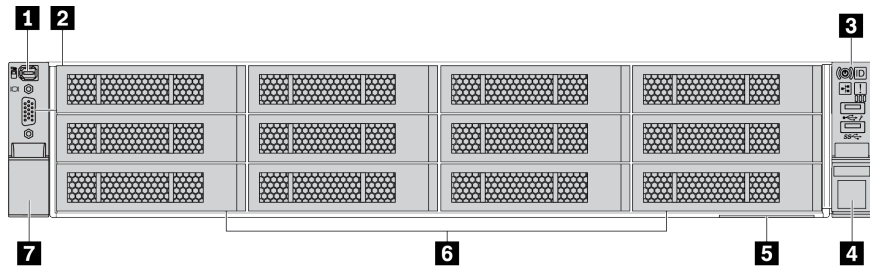
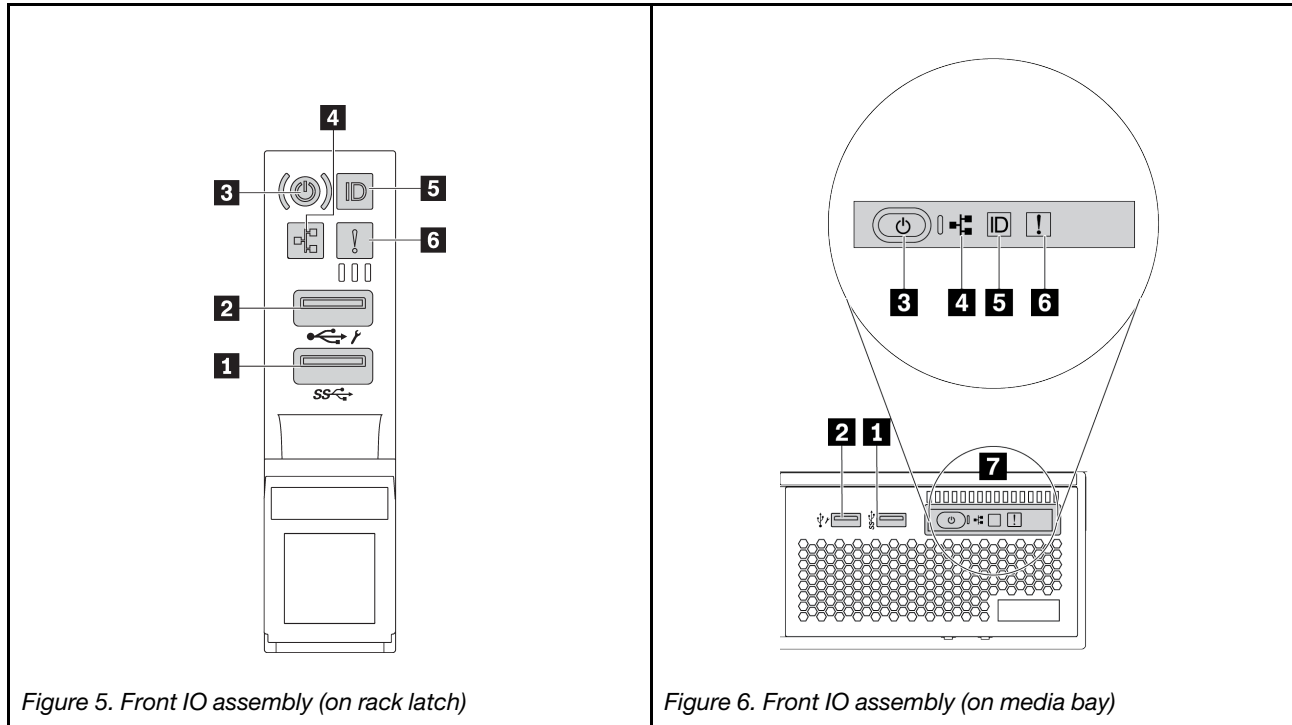


Table 12. Components on the front of server models

Callout	Callout
1 “External diagnostics connector” on page 36	2 “VGA connector (optional)” on page 49
3 “Front I/O assembly (on rack latch)” on page 27	4 Rack latch (right)
5 “Pull-out information tab” on page 1	6 Drive bay fillers (12)
7 Rack latch (left)	

Front IO assembly

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



Note: The LCD diagnostic panel **7** on media bay 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 “LCD diagnostics panel” on page 29.

Table 13. Components on the front I/O assembly

Callout	Callout
1 USB 3 (5 Gbps) connector	2 USB 2.0 connector with XClarity Controller management
3 Power button with power status LED	4 Network activity LED (for OCP 3.0 Ethernet adapter)
5 System ID button with system ID LED	6 System error LED

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.

- 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 http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/lxca_usemobileapp.html

- 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	The server is off, but the XClarity Controller is initializing, and the server is not ready to be powered on.
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 3.0 Ethernet adapter	Support
PCIe NIC adapter	Not support

When an OCP 3.0 Ethernet adapter is installed, the network activity LED on the front I/O assembly helps you identify the network connectivity and activity. If no OCP 3.0 Ethernet adapter 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. Note: If the network activity LED is off when an OCP 3.0 Ethernet adapter is installed, check the network ports in the rear of your server to determine which port is disconnected.

System ID button with system ID LED

Use this system ID button and the blue system ID LED to visually locate the server. A system ID LED is also located on the rear of the server. Each time you press the system ID button, the state of both the system ID LEDs changes. The LEDs can be changed to on, blinking, or off.

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.

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.

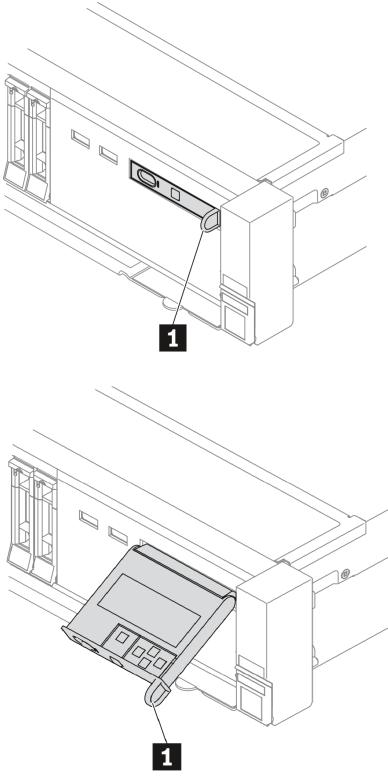
Status	Color	Description	Action
On	Yellow	An error has been detected on the server. Causes might include but are not limited to the following errors: <ul style="list-style-type: none">• A fan failure• A memory error• A storage failure• A PCIe device failure• A power supply failure• A CPU error• A system board error	Check the event log to determine the exact cause of the error. Alternatively, follow the light path diagnostics to determine if additional LEDs are lit that will direct you to identify the cause of the error. For information about light path diagnostics, see <i>Maintenance Manual</i> for your server.
Off	None	The server is off, or the server is on and is working correctly.	None.

LCD diagnostics panel

The LCD 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.

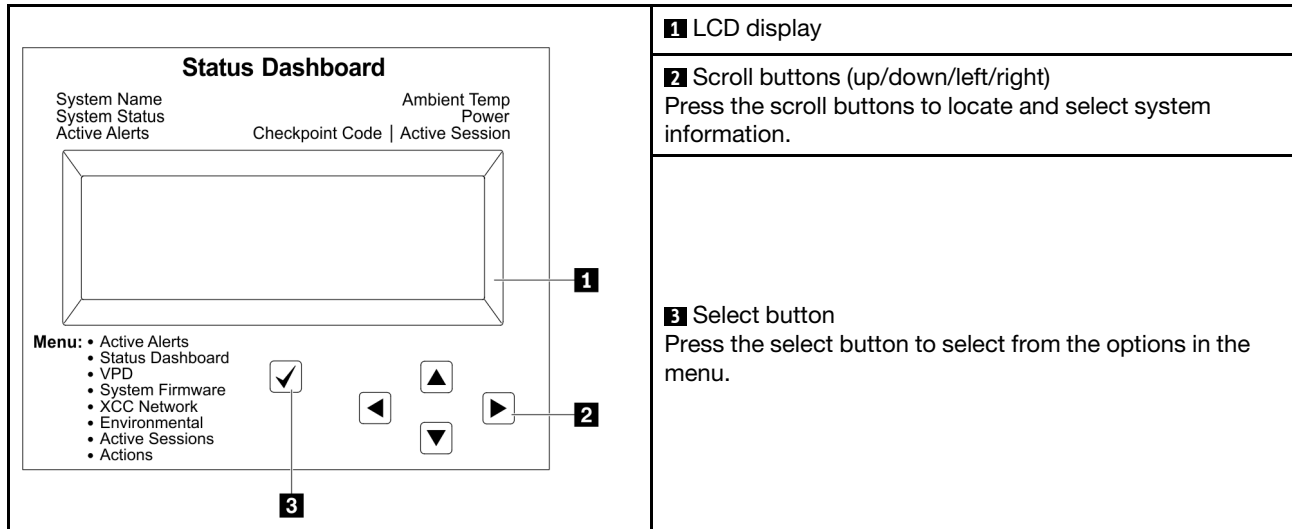
- “LCD diagnostics panel location” on page 30
- “LCD diagnostics panel overview” on page 31
- “Options flow diagram” on page 31
- “Full menu list” on page 32

LCD diagnostics panel location

<p>Location</p>	<p>The LCD diagnostics panel is attached to the front of the server.</p> 
<p>Callout</p>	<p>1 The handle with which the panel can be pulled out and inserted into the server.</p> <p>Notes:</p> <ul style="list-style-type: none">• The panel can be inserted or pulled out regardless of the system status.• When pulling out the panel, carefully hold it by the handle and avoid any hard pulling.

Display panel overview

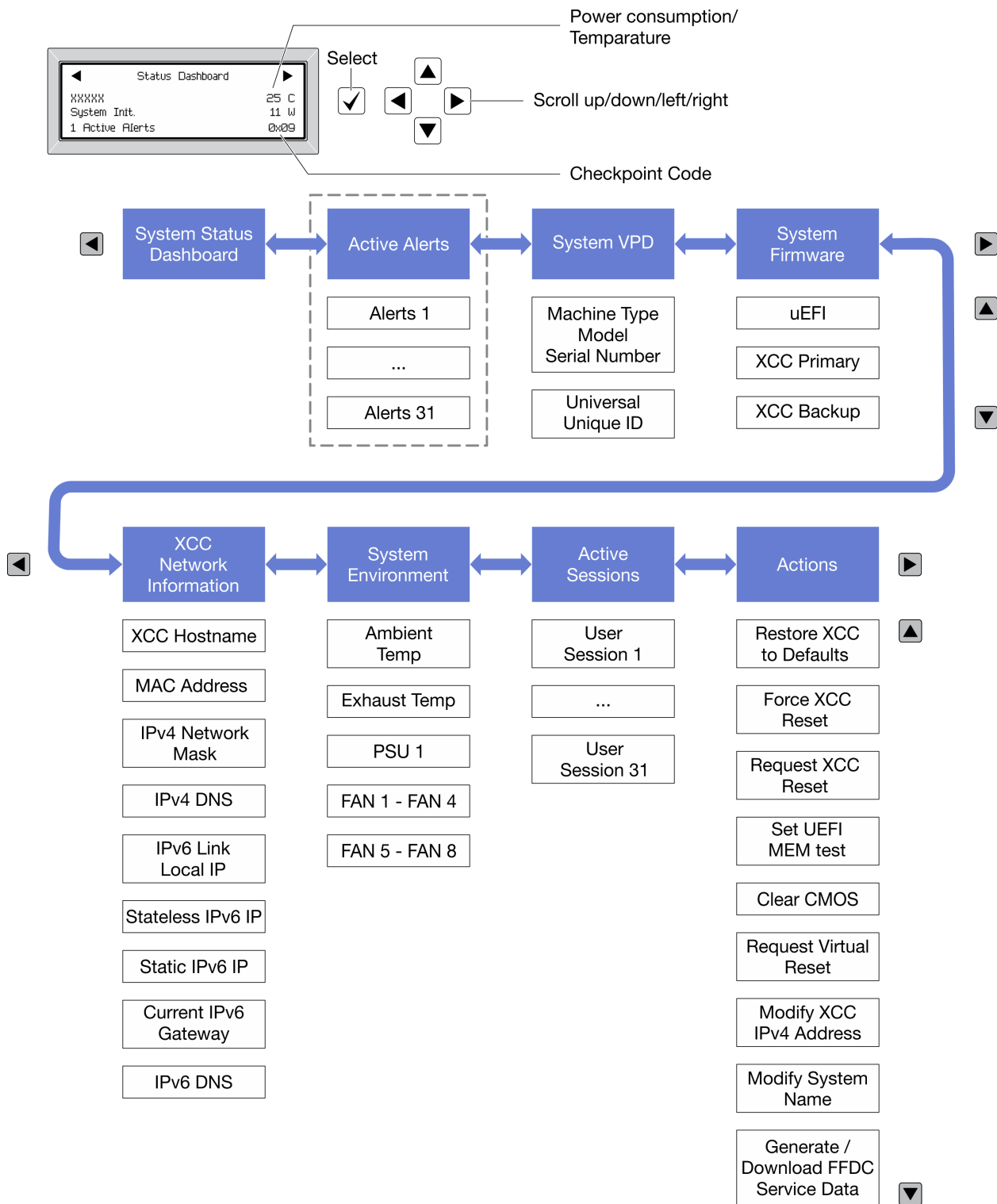
The diagnostics device consists of an LCD display and 5 navigation buttons.



Options flow diagram

The LCD diagnostics panel/handset 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 LCD diagnostics panel/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"> 1 System name 2 System status 3 Active alert quantity 4 Temperature 5 Power consumption 6 Checkpoint code 	<pre> Status Dashboard ----- 1 xxxxxx 25 C 4 2 System Init. 11 W 5 3 1 Active Alerts 0x09 6 </pre>

Active Alerts

Sub Menu	Example
Home screen: Active error quantity Note: The “Active Alerts” menu displays only the quantity of active errors. If no errors occur, the “Active Alerts” menu will not be available during navigation.	<pre>1 Active Alerts</pre>
Details screen: <ul style="list-style-type: none"> • Error message ID (Type: Error/Warning/Information) • Occurrence time • Possible sources of the error 	<pre>Active Alerts: 1 Press ▼ to view alert details FQXSPPU009N(Error) 04/07/2020 02:37:39 PM CPU 1 Status: Configuration Error</pre>

System VPD Information

Sub Menu	Example
<ul style="list-style-type: none"> • Machine type and serial number • Universal Unique ID (UUID) 	<pre>Machine Type: xxxx Serial Num: xxxxxx Universal Unique ID: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx</pre>

System Firmware

Sub Menu	Example
UEFI <ul style="list-style-type: none"> Firmware level (status) Build ID Version number Release date 	UEFI (Inactive) Build: D0E101P Version: 1.00 Date: 2019-12-26
XCC Primary <ul style="list-style-type: none"> Firmware level (status) Build ID Version number Release date 	XCC Primary (Active) Build: DVI399T Version: 4.07 Date: 2020-04-07
XCC Backup <ul style="list-style-type: none"> Firmware level (status) Build ID Version number Release date 	XCC Backup (Active) Build: D8BT05I Version: 1.00 Date: 2019-12-30

XCC Network Information

Sub Menu	Example
<ul style="list-style-type: none"> XCC hostname MAC address IPv4 Network Mask IPv4 DNS IPv6 Link Local IP Stateless IPv6 IP Static IPv6 IP Current IPv6 Gateway IPv6 DNS <p>Note: Only the MAC address that is currently in use is displayed (extension or shared).</p>	XCC Network Information XCC Hostname: XCC-xxxx-SN MAC Address: xx:xx:xx:xx:xx:xx IPv4 IP: xx.xx.xx.xx IPv4 Network Mask :x.x.x.x IPv4 Default Gateway : x.x.x.x

System Environmental Information

Sub Menu	Example
<ul style="list-style-type: none"> • Ambient temperature • Exhaust temperature • PSU status • Spinning speed of fans by RPM 	<pre>Ambient Temp: 24 C Exhaust Temp: 30 C PSU1: Vin= 213 w Inlet= 26 C FAN1 Front: 21000 RPM FAN2 Front: 21000 RPM FAN3 Front: 21000 RPM FAN4 Front: 21000 RPM</pre>

Active Sessions

Sub Menu	Example
Quantity of active sessions	Active User Sessions: 1

Actions

Sub Menu	Example
<p>Several quick actions supported for users</p> <ul style="list-style-type: none"> • Restore XCC to Defaults • Force XCC Reset • Request XCC Reset • Set UEFI Memory Test • Clear CMOS • Request Virtual Reseat • Modify XCC Static IPv4 Address/Net mask/ Gateway • Modify System Name • Generate/Download FFDC Service Data 	<pre>Request XCC Reset? This will request the BMC to reboot itself. Hold ✓ for 3 seconds</pre>

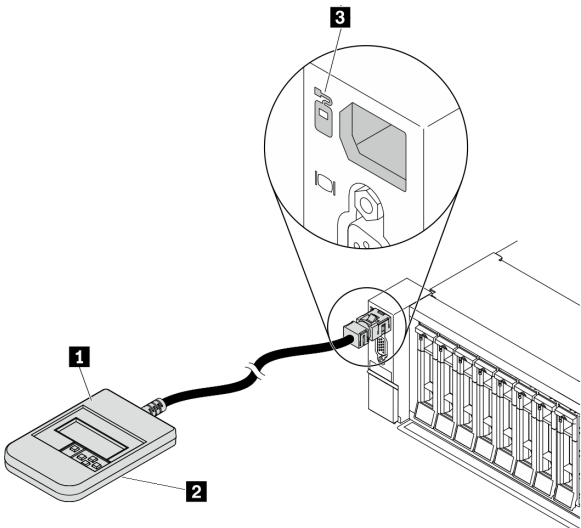
External LCD diagnostics handset

The external LCD 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.

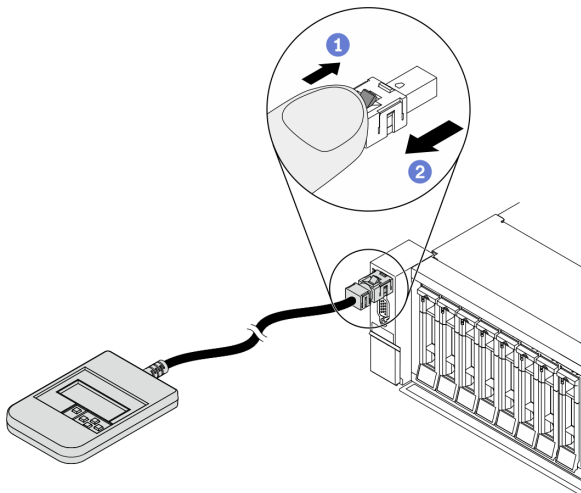
Note: The external LCD diagnostics handset is an optional part that needs to be purchased separately.

- “Location of the external LCD diagnostics handset” on page 36
- “LCD diagnostics panel overview” on page 37
- “Options flow diagram” on page 38
- “Full menu list” on page 39

Location of the external LCD diagnostics handset

Location	Description
<p>The external LCD diagnostics handset is connected to the server with an external cable.</p> 	<p>1 External LCD diagnostics handset</p>
	<p>2 Magnetic bottom With this component, the diagnostic handset can be attached to the top or side of the rack with hands spared for service tasks.</p>
	<p>3 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:

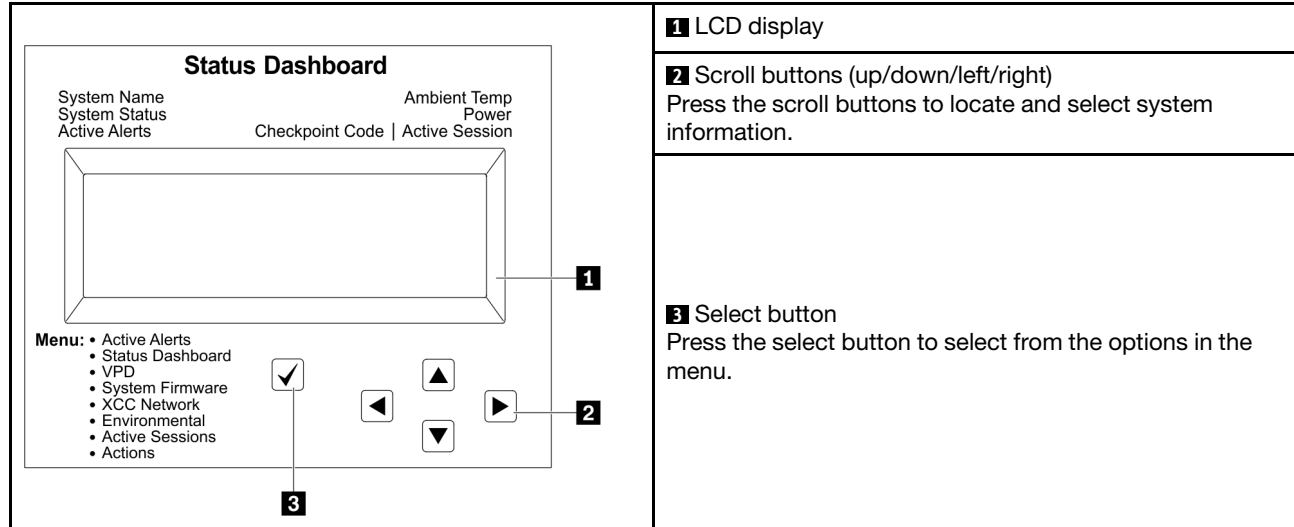


Step 1. Press the plastic clip on the plug in the shown direction.

Step 2. Gently pull out the cable from the connector while keeping the clip pressed down.

Display panel overview

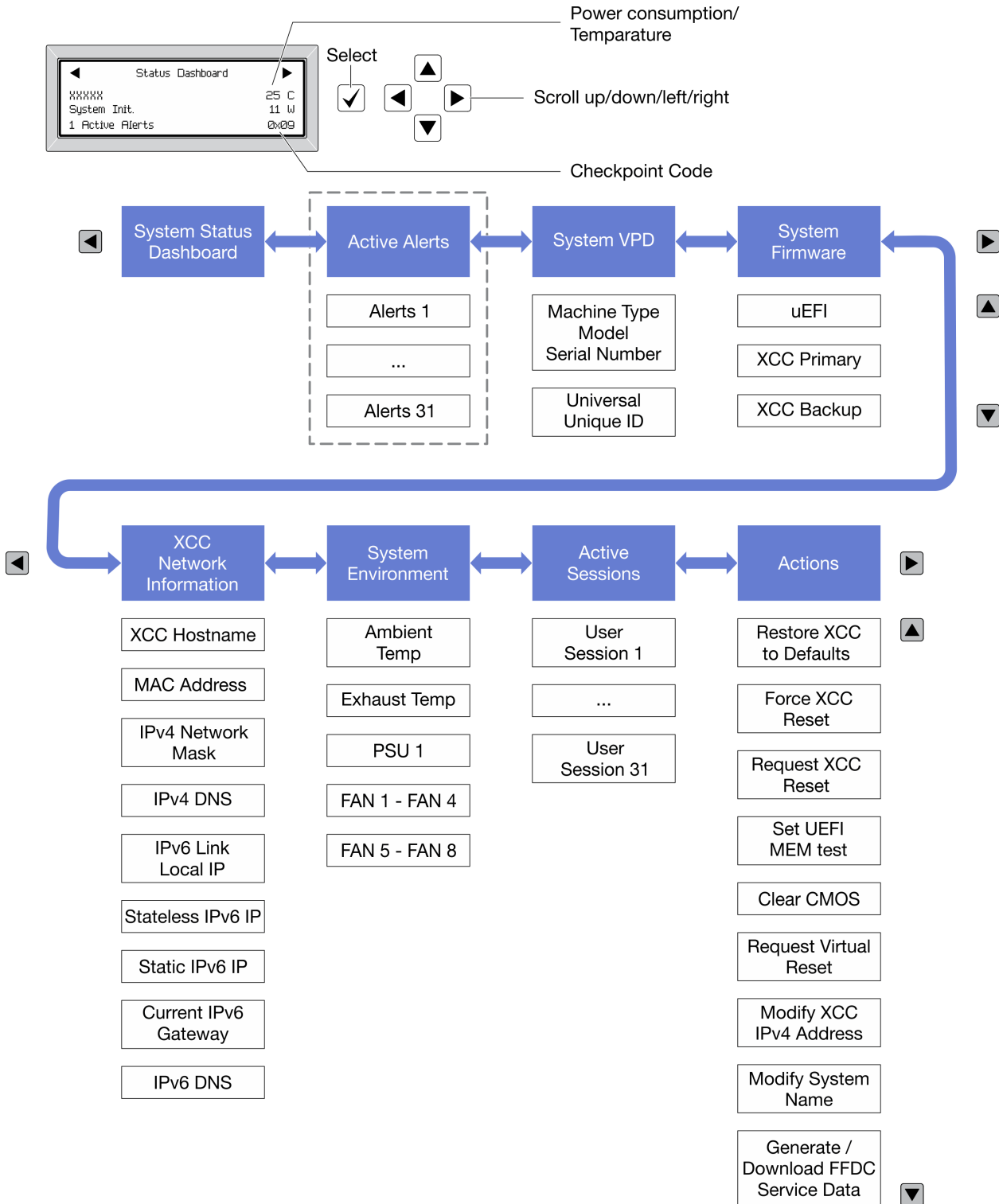
The diagnostics device consists of an LCD display and 5 navigation buttons.



Options flow diagram

The LCD diagnostics panel/handset 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 LCD diagnostics panel/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"> 1 System name 2 System status 3 Active alert quantity 4 Temperature 5 Power consumption 6 Checkpoint code 	<p>The screenshot shows a 'Status Dashboard' with the following information: <ul style="list-style-type: none"> 1: System name (represented by 'xxxxxx') 2: System status ('System Init.') 3: Active alert quantity ('1 Active Alerts') 4: Temperature ('25 C') 5: Power consumption ('11 W') 6: Checkpoint code ('0x09') </p>

Active Alerts

Sub Menu	Example
Home screen: Active error quantity Note: The “Active Alerts” menu displays only the quantity of active errors. If no errors occur, the “Active Alerts” menu will not be available during navigation.	1 Active Alerts
Details screen: <ul style="list-style-type: none"> • Error message ID (Type: Error/Warning/Information) • Occurrence time • Possible sources of the error 	Active Alerts: 1 Press ▼ to view alert details FQXSPPU009N(Error) 04/07/2020 02:37:39 PM CPU 1 Status: Configuration Error

System VPD Information

Sub Menu	Example
<ul style="list-style-type: none"> • Machine type and serial number • Universal Unique ID (UUID) 	Machine Type: xxxx Serial Num: xxxxxx Universal Unique ID: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

System Firmware

Sub Menu	Example
UEFI <ul style="list-style-type: none"> Firmware level (status) Build ID Version number Release date 	UEFI (Inactive) Build: D0E101P Version: 1.00 Date: 2019-12-26
XCC Primary <ul style="list-style-type: none"> Firmware level (status) Build ID Version number Release date 	XCC Primary (Active) Build: DVI399T Version: 4.07 Date: 2020-04-07
XCC Backup <ul style="list-style-type: none"> Firmware level (status) Build ID Version number Release date 	XCC Backup (Active) Build: D8BT05I Version: 1.00 Date: 2019-12-30

XCC Network Information

Sub Menu	Example
<ul style="list-style-type: none"> XCC hostname MAC address IPv4 Network Mask IPv4 DNS IPv6 Link Local IP Stateless IPv6 IP Static IPv6 IP Current IPv6 Gateway IPv6 DNS <p>Note: Only the MAC address that is currently in use is displayed (extension or shared).</p>	XCC Network Information XCC Hostname: XCC-xxxx-SN MAC Address: xx:xx:xx:xx:xx:xx IPv4 IP: xx.xx.xx.xx IPv4 Network Mask :x.x.x.x IPv4 Default Gateway : x.x.x.x

System Environmental Information

Sub Menu	Example
<ul style="list-style-type: none"> • Ambient temperature • Exhaust temperature • PSU status • Spinning speed of fans by RPM 	<pre>Ambient Temp: 24 C Exhaust Temp: 30 C PSU1: Vin= 213 w Inlet= 26 C FAN1 Front: 21000 RPM FAN2 Front: 21000 RPM FAN3 Front: 21000 RPM FAN4 Front: 21000 RPM</pre>

Active Sessions

Sub Menu	Example
Quantity of active sessions	Active User Sessions: 1

Actions

Sub Menu	Example
<p>Several quick actions supported for users</p> <ul style="list-style-type: none"> • Restore XCC to Defaults • Force XCC Reset • Request XCC Reset • Set UEFI Memory Test • Clear CMOS • Request Virtual Reseat • Modify XCC Static IPv4 Address/Net mask/Gateway • Modify System Name • Generate/Download FFDC Service Data 	<pre>Request XCC Reset? This will request the BMC to reboot itself. Hold ✓ for 3 seconds</pre>

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 43
- “Rear view with four 2.5-inch rear drive bays and six PCIe slots” on page 44
- “Rear view with eight 2.5-inch rear drive bays and four PCIe slots” on page 45
- “Rear view with two 3.5-inch rear drive bays and four PCIe slots” on page 46
- “Rear view with four 3.5-inch rear drive bays and two PCIe slots” on page 47

Rear view with eight PCIe slots

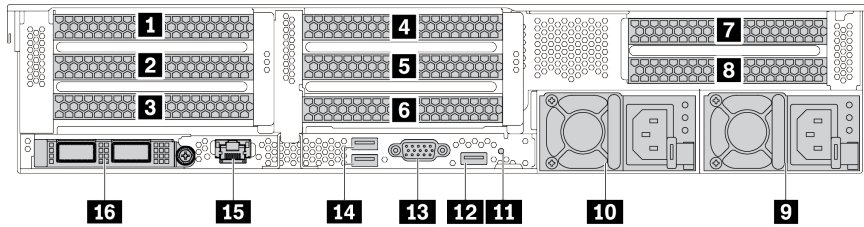


Table 14. Components on the rear of the server

Callout	Callout
1 PCIe slot 1 (on riser 1 assembly)	2 PCIe slot 2 (on riser 1 assembly)
3 PCIe slot 3 (on riser 1 assembly)	4 PCIe slot 4 (on riser 2 assembly)
5 PCIe slot 5 (on riser 2 assembly)	6 PCIe slot 6 (on riser 2 assembly)
7 PCIe slot 7 (on riser 3 assembly)	8 PCIe slot 8 (on riser 3 assembly)
9 Power supply 1	10 Power supply 2 (optional)
11 NMI button	12 USB 3 (5 Gbps) connector (DCI)
13 VGA connector	14 USB 3 (5 Gbps) connectors (DCIs)
15 XClarity Controller network connector	16 Ethernet connectors on OCP 3.0 Ethernet adapter (optional)

Note: For more information about each component, see “Rear components overview” on page 48.

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

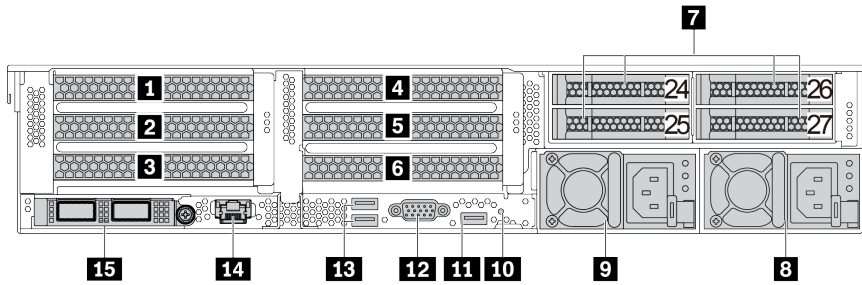


Table 15. Components on the rear of the server

Callout	Callout
1 PCIe slot 1 (on riser 1 assembly)	2 PCIe slot 2 (on riser 1 assembly)
3 PCIe slot 3 (on riser 1 assembly)	4 PCIe slot 4 (on riser 2 assembly)
5 PCIe slot 5 (on riser 2 assembly)	6 PCIe slot 6 (on riser 2 assembly)
7 2.5-inch rear drive bays (4)	8 Power supply 1
9 Power supply 2 (optional)	10 NMI button
11 USB 3 (5 Gbps) connector (DCI)	12 VGA connector
13 USB 3 (5 Gbps) connectors (DCIs)	14 XClarity Controller network connector
15 Ethernet connectors on OCP 3.0 Ethernet adapter (optional)	

Note: For more information about each component, see “Rear components overview” on page 48.

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

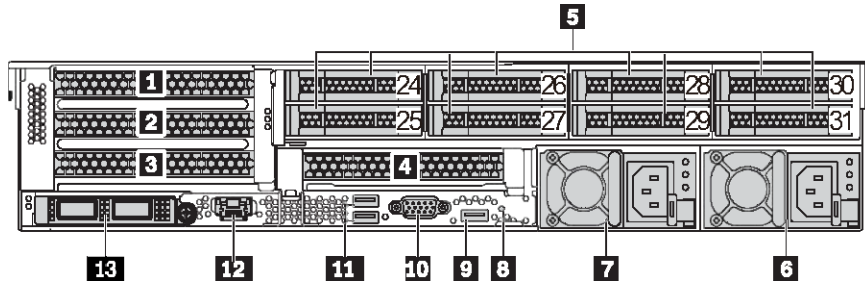


Table 16. Components on the rear of the server

Callout	Callout
1 PCIe slot 1 (on riser 1 assembly)	2 PCIe slot 2 (on riser 1 assembly)
3 PCIe slot 3 (on riser 1 assembly)	4 PCIe slot 6 (on riser 2 assembly)
5 2.5-inch rear drive bays (8)	6 Power supply 1
7 Power supply 2 (optional)	8 NMI button
9 USB 3 (5 Gbps) connector (DCI)	10 VGA connector
11 USB 3 (5 Gbps) connectors (DCIs)	12 XClarity Controller Network connector
13 Ethernet connectors on OCP 3.0 Ethernet adapter (optional)	

Note: For more information about each component, see “Rear components overview” on page 48.

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

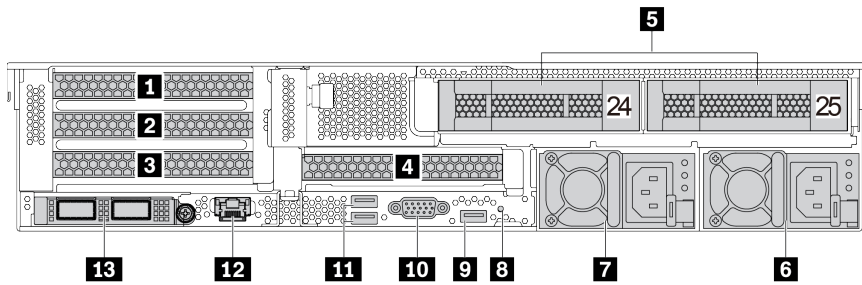


Table 17. Components on the rear of the server

Callout	Callout
1 PCIe slot 1 (on riser 1 assembly)	2 PCIe slot 2 (on riser 1 assembly)
3 PCIe slot 3 (on riser 1 assembly)	4 PCIe slot 6 (on riser 2 assembly)
5 3.5-inch rear drive bays (2)	6 Power supply 1
7 Power supply 2 (optional)	8 NMI button
9 USB 3 (5 Gbps) connector (DCI)	10 VGA connector
11 USB 3 (5 Gbps) connectors (DCIs)	12 XClarity Controller Network connector
13 Ethernet connectors on OCP 3.0 Ethernet adapter (optional)	

Note: For more information about each component, see “Rear components overview” on page 48.

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

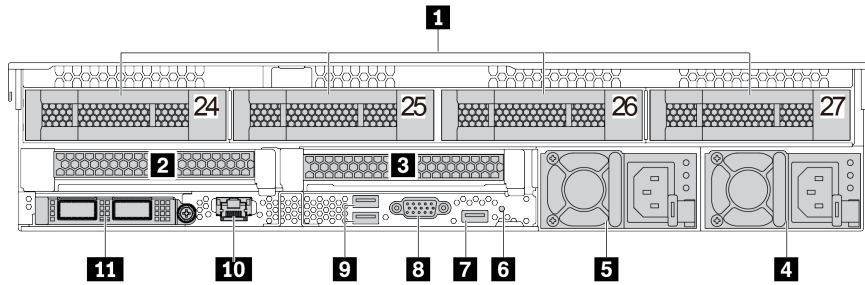


Table 18. Components on the rear of the server

Callout	Callout
1 3.5-inch rear drive bays (4)	2 PCIe slot 3 (on riser 1 assembly)
3 PCIe slot 6 (on riser 2 assembly)	4 Power supply 1
5 Power supply 2 (optional)	6 NMI button
7 USB 3 (5 Gbps) connector (DCI)	8 VGA connector
9 USB 3 (5 Gbps) connectors (DCIs)	10 XClarity Controller Network connector
11 Ethernet connectors on OCP 3.0 Ethernet adapter (optional)	

Note: For more information about each component, see “Rear components overview” on page 48.

Rear components overview

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.

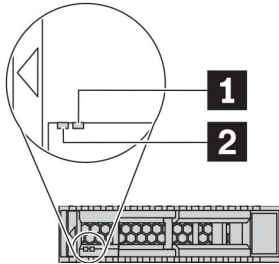


Figure 7. Drive LEDs

Drive LED	Status	Description
1 Drive status LED (right)	Solid yellow	The drive has an error.
	Blinking yellow (blinking slowly, about one flash per second)	The drive is being rebuilt.
	Blinking yellow (blinking rapidly, about four flashes per second)	The RAID adapter is locating the drive.
2 Drive activity LED (left)	Solid green	The drive is powered but not active.
	Blinking green	The drive is active.

Ethernet connectors



Figure 8. OCP 3.0 Ethernet adapter (two connectors, seen from the rear)



Figure 9. Ports on the OCP 3.0 Ethernet adapter (four connectors, seen from the rear)

The OCP 3.0 Ethernet adapter provides two or four extra Ethernet connectors for network connections.

By default, Ethernet connector 1 (the first port starting from the left in the rear server view) on the OCP 3.0 Ethernet adapter can also function as a management connector using the shared management capacity. If the shared management connector fails, traffic can automatically switch over to another connector on the adapter.

Hot-swap drives and drive bays

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

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

NMI button

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.

PCIe slots

The PCIe slots are on the rear of the server and your server supports up to eight PCIe slots on riser 1, 2, and 3 assemblies. For more information, see “PCIe slots and PCIe adapters” on page 231.

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 “Rear view LEDs” on page 50.

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.

XClarity Controller network connector

The XClarity Controller network connector can be used to attach an Ethernet cable to manage the baseboard management controller (BMC).

Rear view LEDs

The illustration in this section shows the LEDs on the rear of the server.

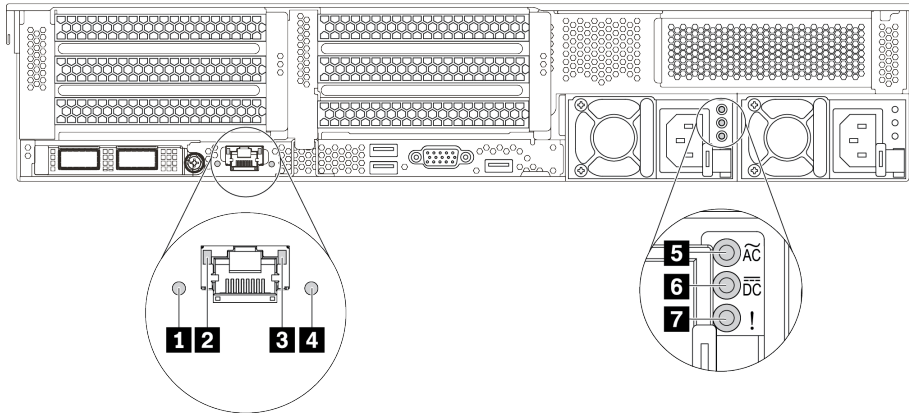


Figure 10. Rear view LEDs of the server

Table 19. LEDs on the rear of the server

Callout	Callout
1 System ID LED	2 Ethernet link LED
3 Ethernet activity LED	4 System error LED
5 Power input LED	6 Power output LED
7 Power supply error LED	

1 System ID LED

The blue system ID LED helps you to visually locate the server. A system ID LED is also located on the front of the server. Each time you press the system ID button, the state of both the system ID LEDs changes. The LEDs can be changed to on, blinking, or off.

2 3 Ethernet status LEDs

The BMC management connector has two status LEDs.

Ethernet status LED	Color	Status	Description
2 Ethernet link LED	Green	On	Network link is established.
	None	Off	Network link is disconnected.
3 Ethernet activity LED	Green	Blinking	Network link is connected and active.
	None	Off	The server is disconnected from a LAN.

4 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. For more information, see “Front IO assembly” on page 27.

5 6 7 Power supply LEDs

Each hot-swap power supply has three status LEDs.

LED	Description
5 Power input LED	<ul style="list-style-type: none">• Green: The power supply is connected to the ac power source.• Off: The power supply is disconnected from the ac power source or a power problem occurs.
6 Power output LED	<ul style="list-style-type: none">• Green: The server is on and the power supply is working normally.• 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. To disable zero-output mode, log in to the Lenovo XClarity Controller web interface, choose Server Configuration → Power Policy, disable Zero Output Mode, and then click Apply. If you disable zero-output mode, both power supplies will be in the active state.• 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.
7 Power supply error LED	<ul style="list-style-type: none">• Yellow: The power supply has failed. To resolve the issue, replace the power supply.• Off: The power supply is working normally.

System board components

The illustration in this section shows the component locations on the system board.

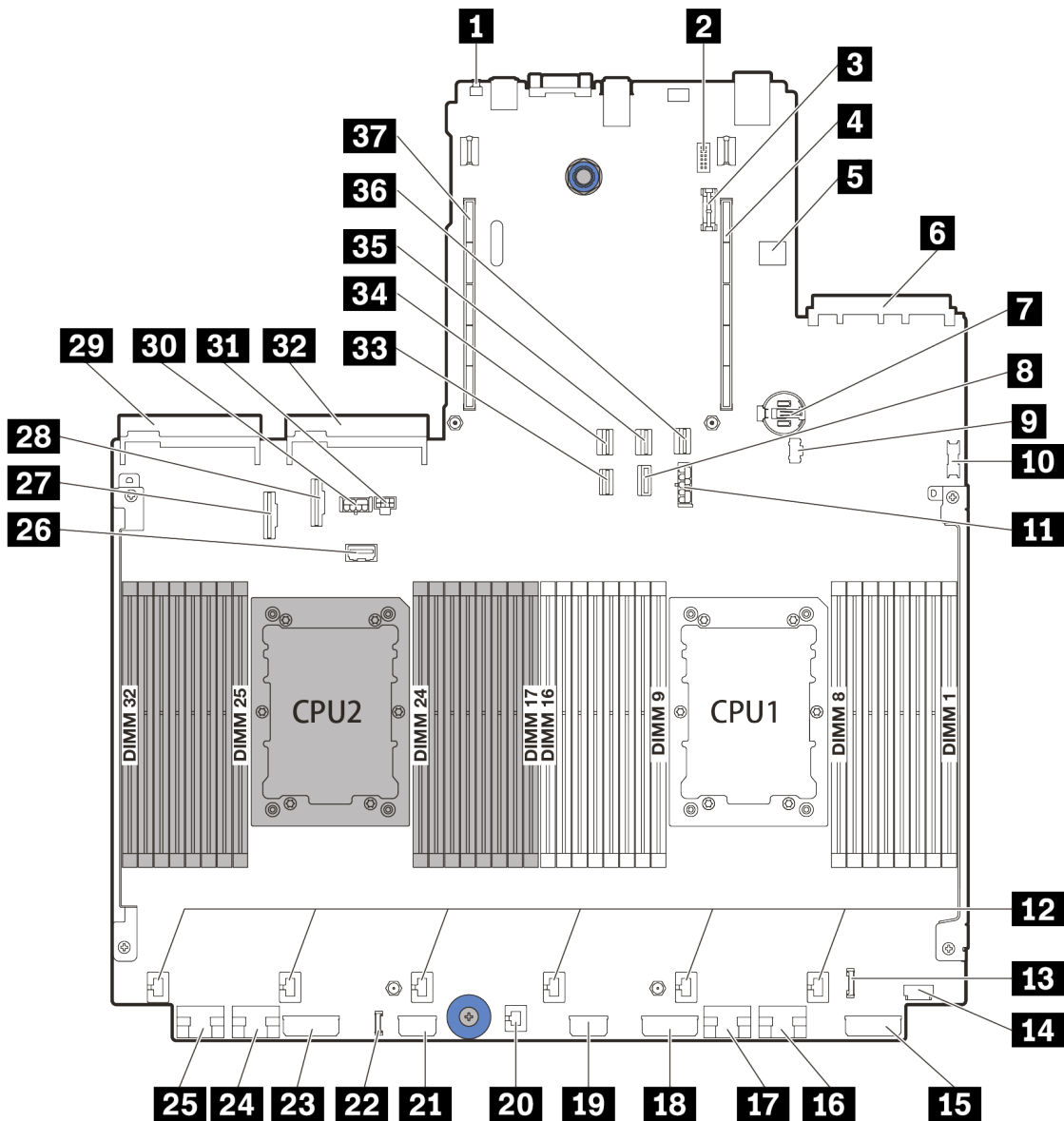


Figure 11. System board components

1 NMI button	2 Serial port module connector
3 TPM module connector	4 Riser 1 slot
5 Internal USB connector	6 OCP 3.0 Ethernet adapter connector
7 CMOS battery (CR2032)	8 7mm backplane signal connector
9 M.2 power connector	10 Front USB connector
11 7mm backplane power connector	12 Fan connectors
13 Front I/O connector	14 Front VGA connector
15 Backplane 3 power connector	16 PCIe connector 1
17 PCIe connector 2	18 Backplane 2 power connector

19 CFF expander power connector	20 Intrusion switch connector
21 CFF RAID/HBA power connector	22 External LCD connector
23 Backplane 1 power connector	24 PCIe connector 3
25 PCIe connector 4	26 Riser 3 Sideband Connector
27 PCIe connector 5	28 PCIe connector 6
29 Power supply 1 connector	30 GPU power connector
31 Riser 3 power connector	32 Power supply 2 connector
33 M.2/Rear backplane signal connector	34 SATA connector 2
35 SATA connector 0	36 SATA connector 1
37 Riser 2 slot	

System board LEDs

The illustration in this section shows the LEDs on the system board.

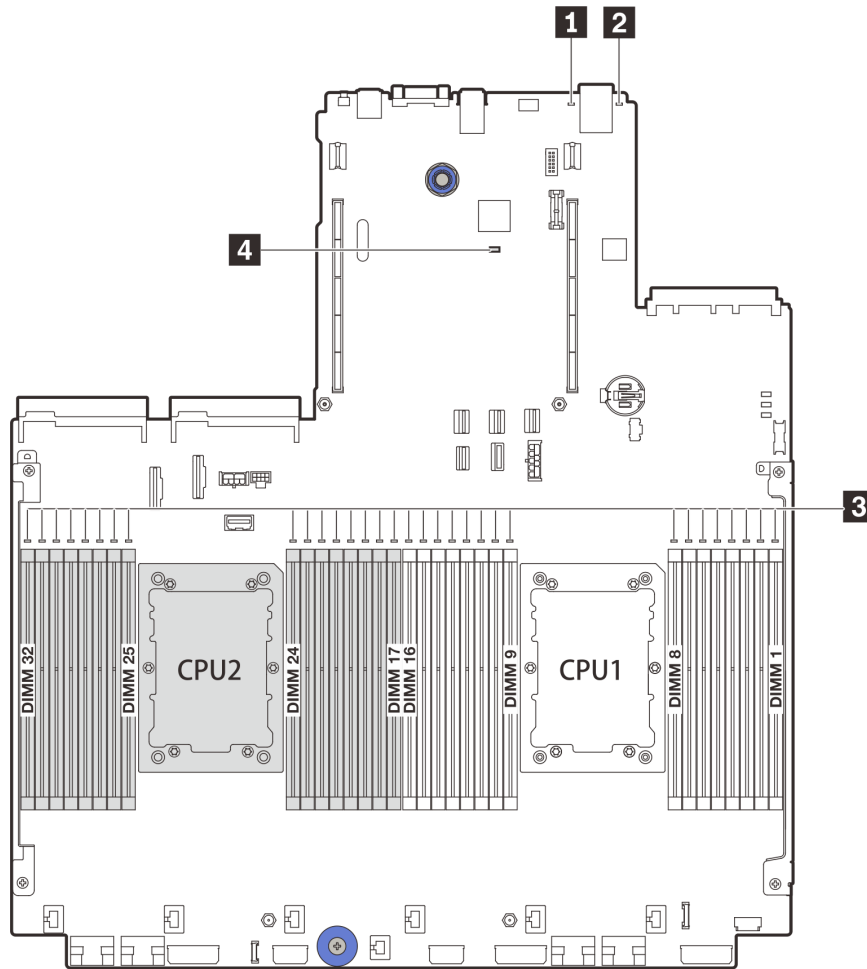


Figure 12. System board LEDs

Table 20. LEDs on the system board

Callout	Callout
1 System error LED	2 System ID LED
3 DIMM error LEDs (available on some models)	4 BMC heartbeat LED

1 System error LED

When this yellow LED is lit, one or more LEDs elsewhere in the server might also be lit to direct you to the source of the error. For more information, see “Front IO assembly” on page 27.

2 System ID LED

The blue system ID LED helps you to visually locate the server. A system ID LED is also located on the front of the server. Each time you press the system ID button, the state of both the system ID LEDs changes. The LEDs can be changed to on, blinking, or off.

3 DIMM error LEDs

When a DIMM error LED is lit, it indicates that the corresponding memory module has failed.

4 BMC heartbeat LED

The BMC heartbeat LED helps you identify the BMC status.

Status	Color	Description
On	Green	The BMC is not alive.
Blinking	Green	The BMC is alive.
Off	None	The BMC is not alive.

Parts list

Use the parts list section to identify each of the components that are available for your server.

- “2.5-inch drive bay chassis” on page 56
- “3.5-inch drive bay chassis” on page 61

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 the parts shown in Figure 13 “Server components (2.5-inch drive bay chassis)” on page 57:

<https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v2/parts>

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.

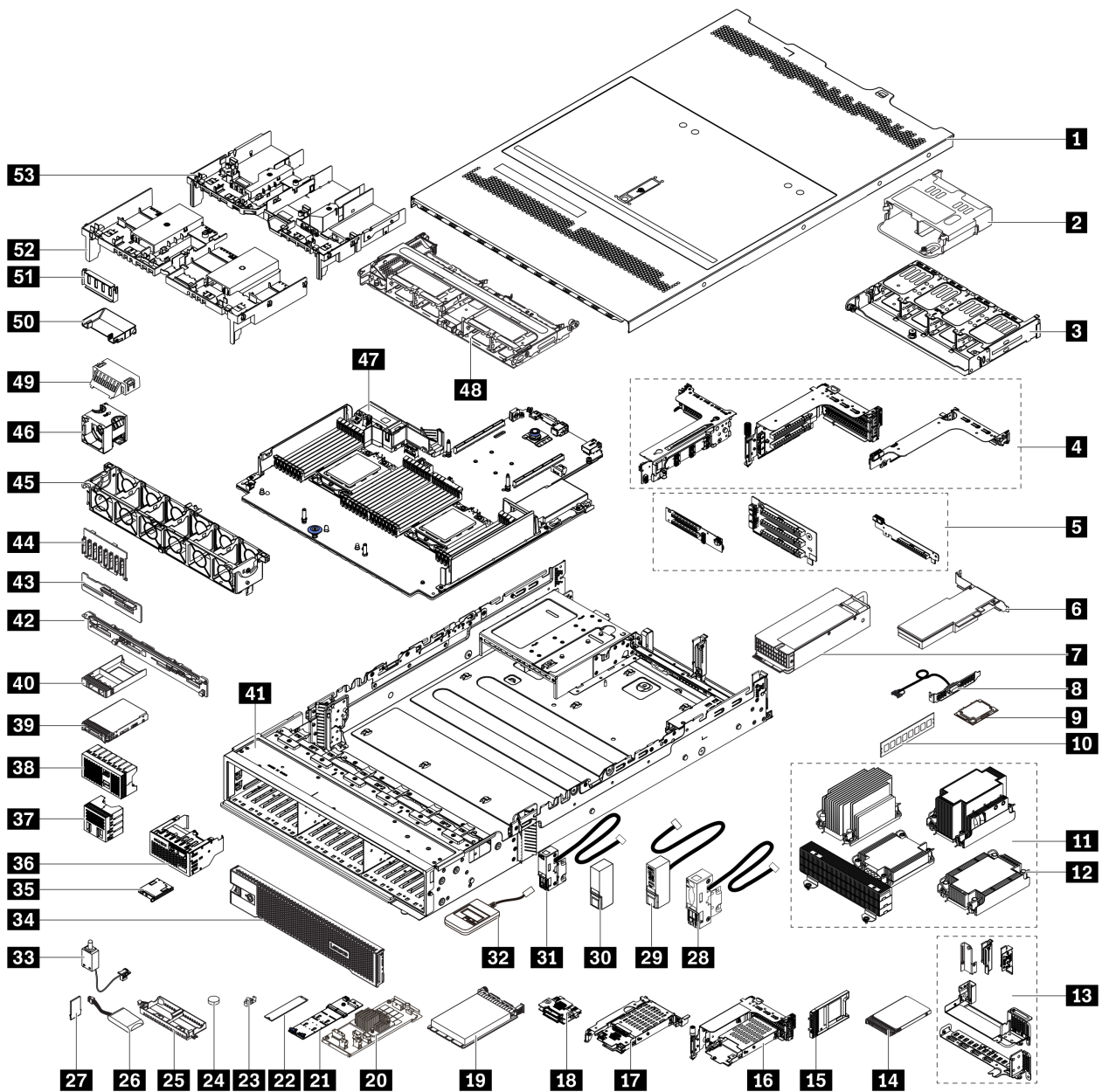


Figure 13. Server components (2.5-inch drive bay chassis)

The parts are identified as one of the following:

- **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.
- **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.
- **Field replaceable unit (FRU):** FRUs must be installed only by trained service technicians.
- **Consumable and structural parts:** Purchase and replacement of consumable and structural parts is your responsibility. If Lenovo acquires or installs a structural component at your request, you will be charged for the service.

Table 21. Parts list

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and structural parts
1	Top cover	√			
2	Rear 4 x 2.5-inch drive cage	√			
3	Rear 8 x 2.5-inch drive cage	√			
4	Riser cages: <ul style="list-style-type: none"> • Riser 1 or riser 2 cage (3FH) • Riser 3 cage (2FH) • 1U riser cage (LP) 	√			
5	Riser cards: <ul style="list-style-type: none"> • Riser 1 • Riser 2 	√			
	<ul style="list-style-type: none"> • Riser 3 		√		
6	PCIe adapter	√			
7	Power supply	√			
8	Serial port module	√			
9	Processor			√	
10	Memory module	√			
11	Heat sinks <ul style="list-style-type: none"> • 2U entry heat sink • 2U standard heat sink • High performance T-shape heat sink • 1U heat sink 			√	
12	Heat sink PEEK nut		√		
13	Rear wall brackets				√
14	7mm drive	√			
15	7mm drive bay filler				√
16	7mm drive cage (2FH + 7mm)	√			
17	7mm drive cage (1U)	√			
18	7mm drive backplanes		√		
19	OCP 3.0 Ethernet adapter	√			
20	CFF RAID adapter/expander		√		
21	M.2 drive backplane	√			
22	M.2 drive	√			
23	M.2 retainer clip	√			

Table 21. Parts list (continued)

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and structural parts
24	CMOS battery (CR2032)				√
25	RAID flash power module holder				√
26	RAID flash power module	√			
27	TPM adapter (for Chinese Mainland only)		√		
28	Left rack latch with VGA and external diagnostic connector	√			
29	Right rack latch with front I/O assembly	√			
30	Standard right rack latch				√
31	Standard left rack latch				√
32	External diagnostic handset	√			
33	Intrusion switch	√			
34	Security bezel	√			
35	LCD diagnostics panel	√			
36	Front I/O assembly with LCD diagnostics panel	√			
37	4 x 2.5-inch drive filler				√
38	8 x 2.5-inch drive filler				√
39	2.5-inch drive	√			
40	2.5-inch drive filler				√
41	Chassis			√	
42	Rear 8 x 2.5-inch drive backplane	√			
43	Middle/Rear 4 x 2.5-inch drive backplane	√			
44	Front 8 x 2.5-inch drive backplane	√			
45	Fan cage	√			
46	Fan module <ul style="list-style-type: none"> • Standard fan • Performance fan 	√			
47	System board			√	
48	Middle 8 x 2.5-inch drive cage	√			
49	Air baffle filler (for standard air baffle)				√

Table 21. Parts list (continued)

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and structural parts
50	Add-on air baffle (for GPU air baffle)	√			
51	Air baffle filler (for GPU air baffle)				√
52	Standard air baffle	√			
53	GPU air baffle	√			

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 the parts shown in Figure 14 “Server components (3.5-inch drive bay chassis)” on page 62:

<https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v2/parts>

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.

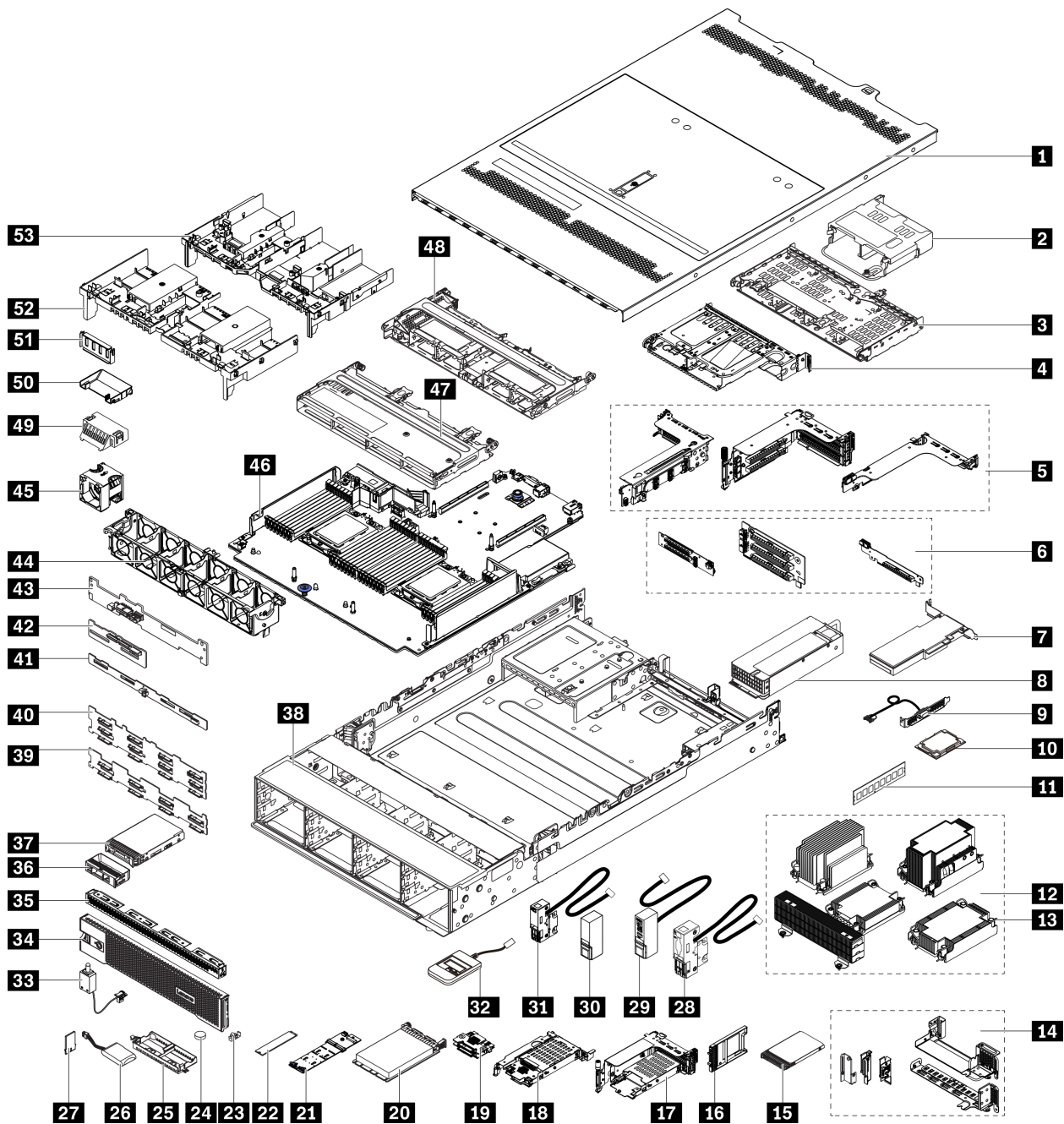


Figure 14. Server components (3.5-inch drive bay chassis)

The parts are identified as one of the following:

- **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.
- **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.
- **Field replaceable unit (FRU):** FRUs must be installed only by trained service technicians.
- **Consumable and structural parts:** Purchase and replacement of consumable and structural parts is your responsibility. If Lenovo acquires or installs a structural component at your request, you will be charged for the service.

Table 22. Parts list

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and structural parts
1	Top cover	√			
2	Rear 4 x 2.5-inch drive cage	√			
3	Rear 4 x 3.5-inch drive cage	√			
4	Rear 2 x 3.5-inch drive cage	√			
5	Riser cages: <ul style="list-style-type: none"> • Riser 1 or riser 2 cage (3FH) • Riser 3 cage (2FH) • 1U riser cage (LP) 	√			
6	Riser cards: <ul style="list-style-type: none"> • Riser 1 • Riser 2 	√			
	• Riser 3		√		
7	PCIe adapter	√			
8	Power supply	√			
9	Serial port module	√			
10	Processor			√	
11	Memory module	√			
12	Heat sinks <ul style="list-style-type: none"> • 2U entry heat sink • 2U standard heat sink • High performance T-shape heat sink • 1U heat sink 			√	
13	Heat sink PEEK nut		√		
14	Rear wall brackets				√
15	7mm drive	√			
16	7mm drive bay filler				√
17	7mm drive cage (2FH + 7mm)	√			
18	7mm drive cage (1U)	√			
19	7mm drive backplanes		√		
20	OCP 3.0 Ethernet adapter	√			
21	M.2 drive backplane	√			
22	M.2 drive	√			
23	M.2 retainer clip	√			

Table 22. Parts list (continued)

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and structural parts
24	CMOS battery (CR2032)				√
25	RAID flash power module holder				√
26	RAID flash power module	√			
27	TPM adapter (for Chinese Mainland only)		√		
28	Left rack latch with VGA and external diagnostic connector	√			
29	Right rack latch with front I/O assembly	√			
30	Standard right rack latch				√
31	Standard left rack latch				√
32	External diagnostic handset	√			
33	Intrusion switch	√			
34	Security bezel	√			
35	4 x 3.5-inch drive filler				√
36	3.5-inch drive filler				√
37	3.5-inch drive	√			
38	Chassis			√	
39	Front 8 x 3.5-inch drive backplane	√			
40	Front 12 x 3.5-inch drive backplane	√			
41	Middle/Rear 4 x 3.5-inch drive backplane	√			
42	Middle/Rear 4 x 2.5-inch drive backplane	√			
43	Rear 2 x 3.5-inch drive backplane	√			
44	Fan cage	√			
45	Fan module <ul style="list-style-type: none"> • Standard fan • Performance fan 	√			
46	System board			√	
47	Middle 4 x 3.5-inch drive cage	√			
48	Middle 8 x 2.5-inch drive cage	√			
49	Air baffle filler (for standard air baffle)				√

Table 22. Parts list (continued)

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and structural parts
50	Add-on air baffle (for GPU air baffle)	√			
51	Air baffle filler (for GPU air baffle)				√
52	Standard air baffle	√			
53	GPU air baffle filler	√			

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 of 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 of 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.
- For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.
- Power cords for a specific country or region are usually available only in that country or region.

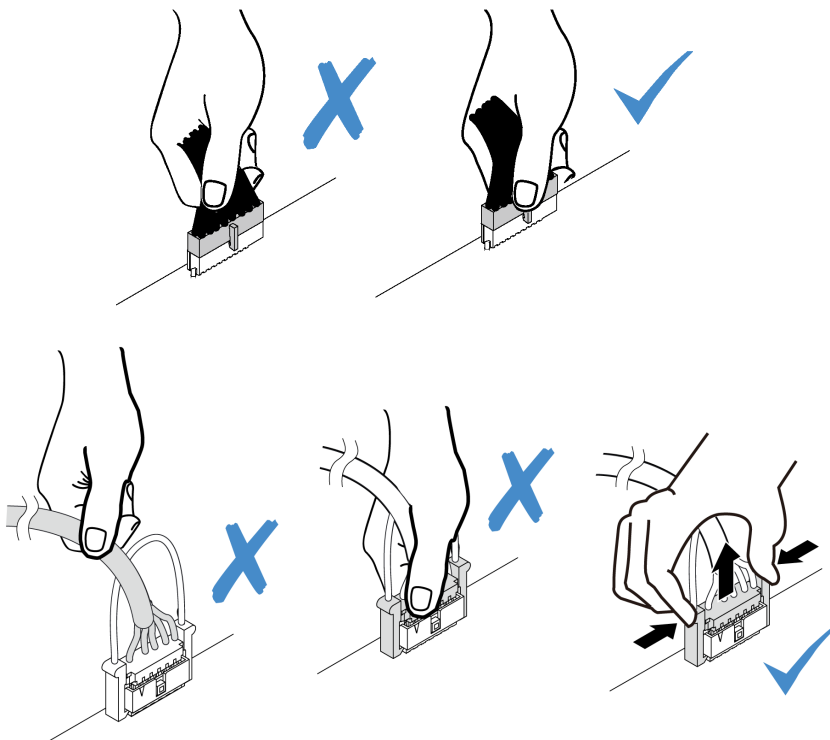
Chapter 3. Internal cable routing

Some of the components in the server have internal cables and cable connectors.

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.
- 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. Failing to release them before removing the cables will damage the cable sockets on the system board, which are fragile. Any damage to the cable sockets might require replacing the system board.



Front I/O assembly

Use the section to understand the cable routing for the front I/O assembly.

Notes:

- The front I/O assembly varies by model. The illustration shows the cabling scenario for the front I/O assembly on the right rack latch. The cable connection for the front I/O assembly on the front media bay is the same.

- When routing the front I/O assembly cable, ensure that it is fixed on the upper frame of the cable retainer. For details, refer to “Install the rack latches” in Maintenance Guide.

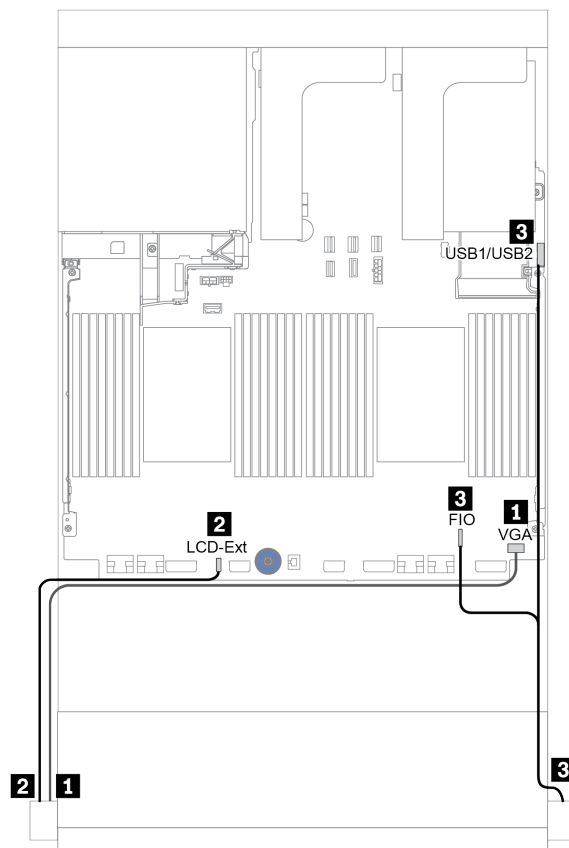


Figure 15. VGA connector and front I/O assembly cable routing

From	To
1 VGA cable on the left rack latch	VGA connector on the system board
2 External diagnostics cable on the left rack latch	External LCD connector on the system board
3 Front panel and front USB cable on the right rack latch	Front I/O and front USB connectors on the system board

GPUs

Use this section to understand the routing for GPUs.

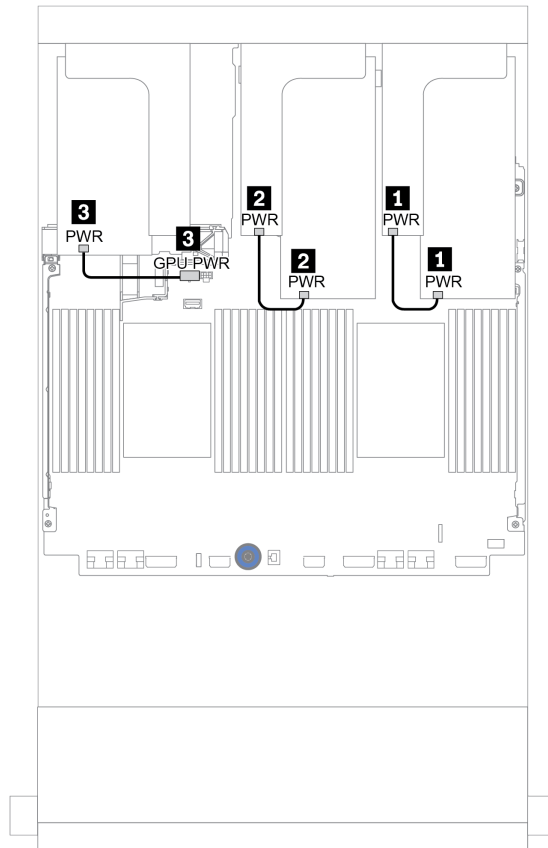


Figure 16. Cable routing for single-wide or double-wide GPU

From	To
1 GPU power cable	Power connector (2x4 PWR) on the riser 1
2 GPU power cable	Power connector (2x4 PWR) on the riser 2
3 GPU power cable	GPU power connector on the system board

Riser cards

Use this section to understand the cable routing for riser cards.

The server supports up to three riser cards: riser card 1, riser card 2, and riser card 3. Riser card 1 or 2 is installed directly on the system board, while riser card 3 needs to be connected to system board.

- “Riser card 3 power and sideband connection” on page 71
- “Riser card 3 (x8/x8 PCIe) signal cable connection for one processor” on page 72
- “Riser card 3 (x8/x8 PCIe) signal cable connection for two processors” on page 73
- “Riser card 3 (x16/x16 PCIe) signal cable connection for one processor” on page 74
- “Riser card 3 (x16/x16 PCIe) signal cable connection for two processors” on page 75

The riser card types vary by server model. For detailed information, see “PCIe slots and PCIe adapters” on page 231.

Riser card 3 power and sideband connection

The power and sideband connections for x8/x8 PCIe riser card 3 and x16/x16 PCIe riser card 3 are the same.

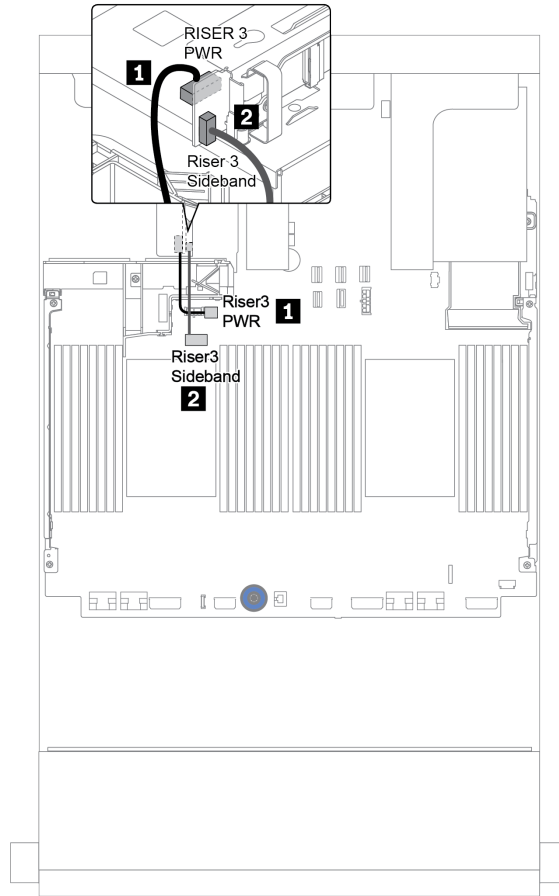


Figure 17. Riser card 3 power and sideband connection

From	To
1 Power connector on the riser card	Riser 3 power connector on the system board
2 Sideband connector on the riser card	Riser 3 sideband on the system board

Riser card 3 (x8/x8 PCIe) signal cable connection for one processor

The following illustration shows the signal cable connections for the x8/x8 PCIe riser card 3 when only one processor is installed.

Notes: The below option kits are needed when you want to add the x8/x8 PCIe riser card 3 if your server comes with only one processor and no riser 3:

- ThinkSystem SR650 V2 PCIe G4 x8/x8 Riser 3 Option Kit
- ThinkSystem SR650 V2 x8/x8 PCIe G4 Riser3 Cable Kit for CPU1

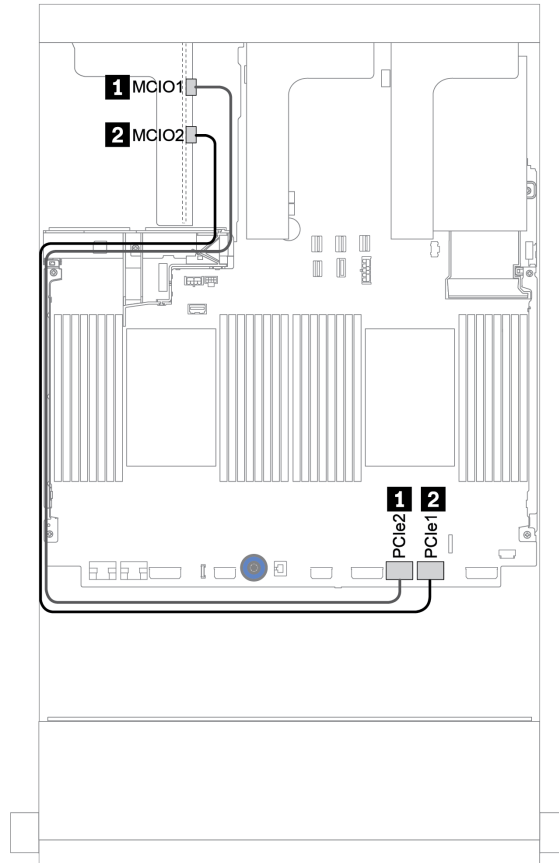


Figure 18. Cable routing for the x8/x8 PCIe riser card 3 (one processor)

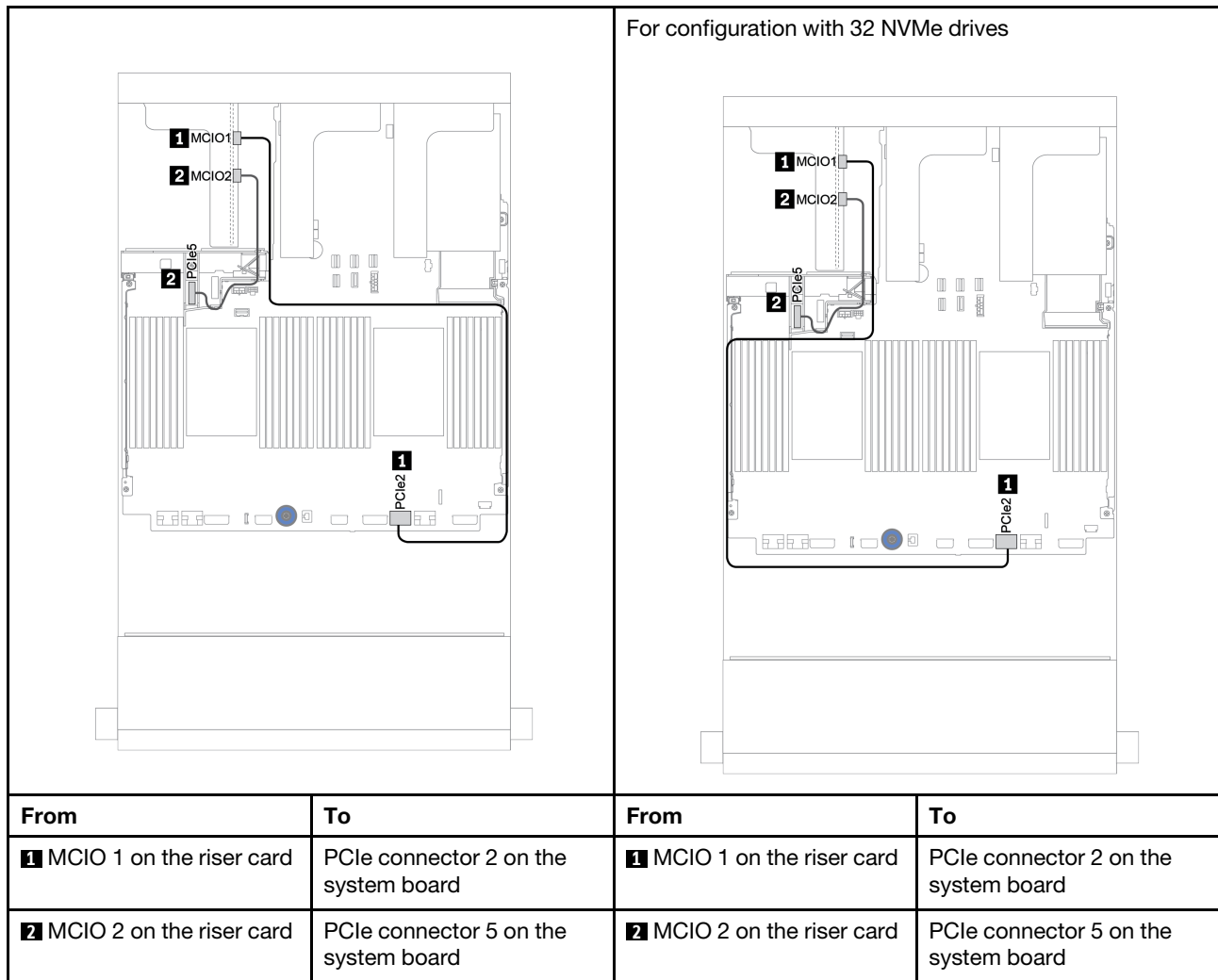
From	To
1 MCI0 1 on the riser card	PCIe connector 2 on the system board
2 MCI0 2 on the riser card	PCIe connector 1 on the system board

Riser card 3 (x8/x8 PCIe) signal cable connection for two processors

The following illustration shows the signal cable connections for the x8/x8 PCIe riser card 3 when two processors are installed.

Notes:

- The below option kit is needed when you want to add the x8/x8 PCIe riser card 3 if your server comes with two processors and no riser 3:
 - ThinkSystem SR650 V2 PCIe G4 x8/x8 Riser 3 Option Kit
- The below option kit is needed when you want to add a second processor if your server comes with one processor and the x8/x8 PCIe riser card 3:
 - ThinkSystem SR650 V2 x8/x8 PCIe G4 Riser3 Cable Kit for CPU1



Riser card 3 (x16/x16 PCIe) signal cable connection for one processor

The following illustration shows the signal cable connections for the x16/x16 PCIe riser card 3 when only one processor is installed.

Notes: The below option kit is needed when you want to add the x16/x16 PCIe riser card 3 if your server comes with only one processor and no riser 3. In this scenario, only PCIe slot 7 is available.

- ThinkSystem SR650 V2 PCIe G4 x16/x16 Riser3 Option Kit

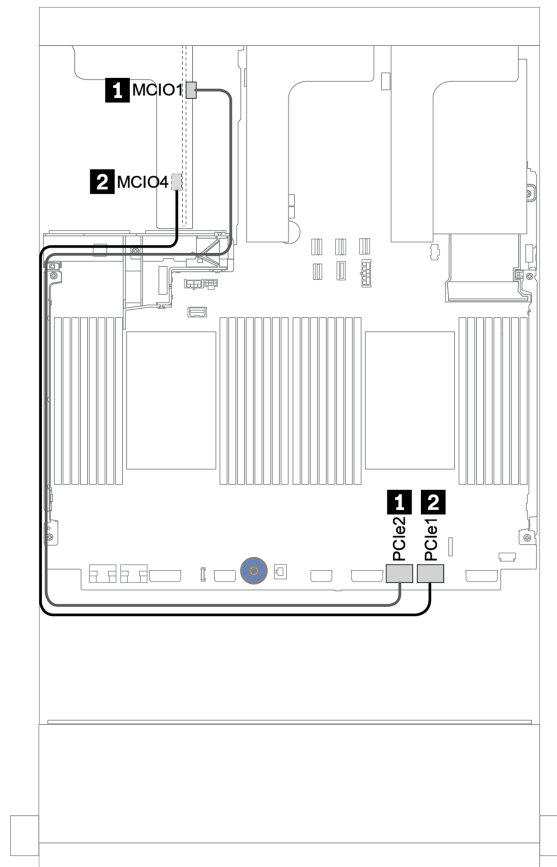


Figure 19. Cable routing for the x16/x16 PCIe riser card 3 (one processor)

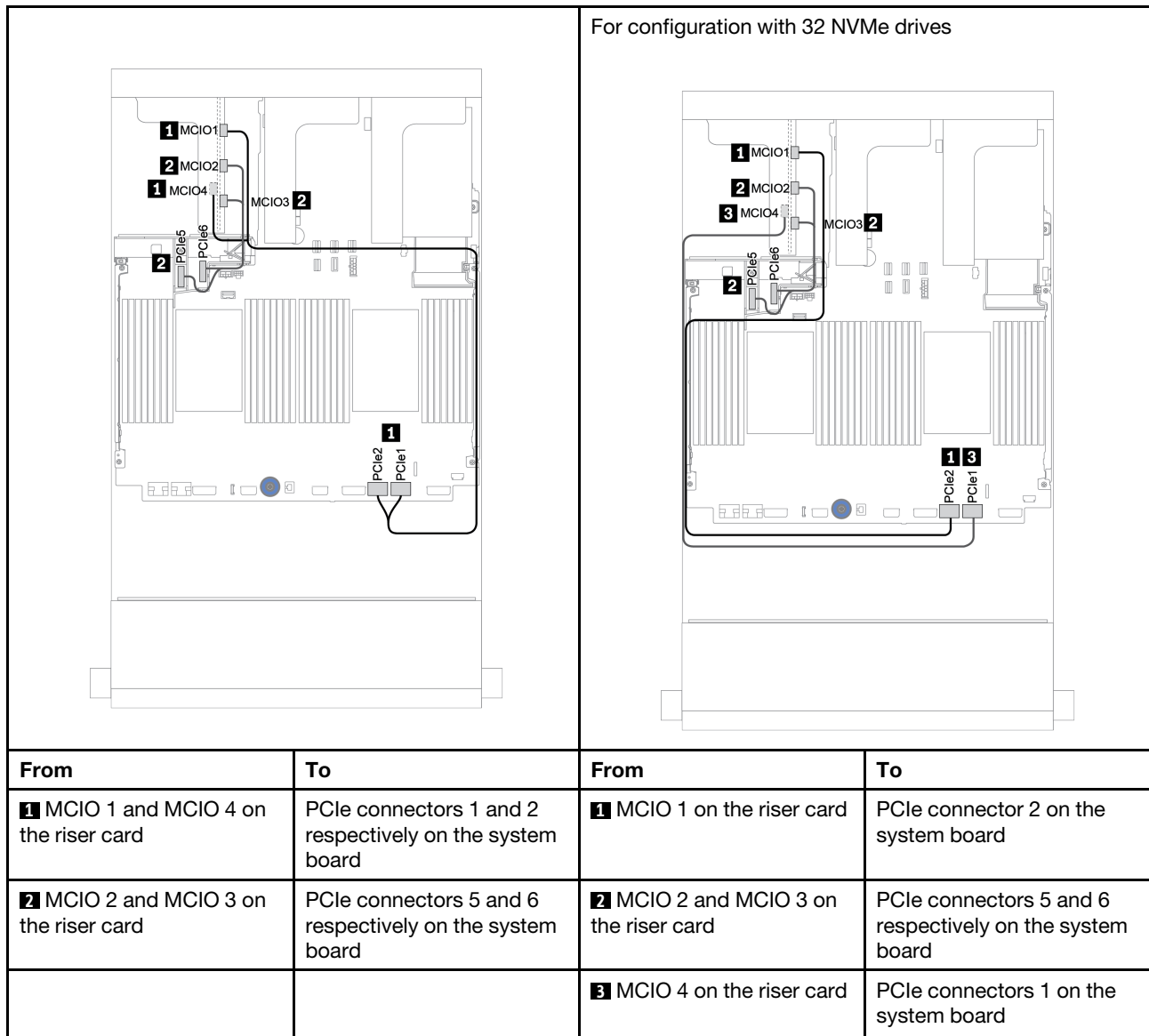
From	To
1 MCI01 on the riser card	PCIe connector 2 on the system board
2 MCI04 on the riser card	PCIe connector 1 on the system board

Riser card 3 (x16/x16 PCIe) signal cable connection for two processors

The following illustration shows the signal cable connections for the x16/x16 PCIe riser card 3 when two processors are installed.

Notes:

- The below option kit is needed when you want to add the x16/x16 PCIe riser card 3 if your server comes with two processors and no riser 3:
 - ThinkSystem SR650 V2 PCIe G4 x16/x16 Riser3 Option Kit
- The below option kit is needed when you want to add a second processor if your server comes with one processor and the x16/x16 PCIe riser card 3:
 - ThinkSystem SR650 V2 x16/x16 PCIe G4 Riser3 Cable Kit for CPU1



RAID flash power module

Use this section to understand the cable routing for RAID flash power modules (also called supercap).

The location of RAID flash power modules varies by the server hardware configurations.

Figure 20. On the chassis

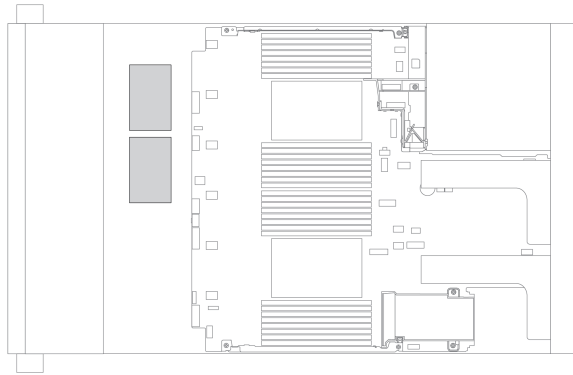


Figure 21. On standard air baffle



Figure 22. On GPU air baffle

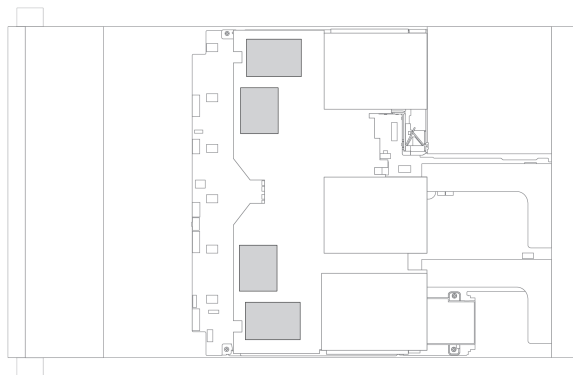
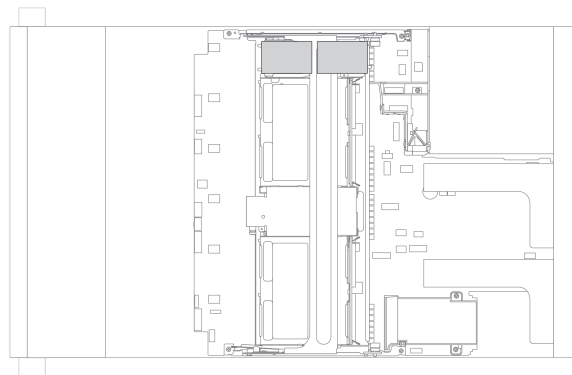


Figure 23. On the 2.5-inch middle drive cage



The following illustration shows the cable connection for a RAID flash power module on the air baffle. It is the same for RAID flash power modules on other locations.

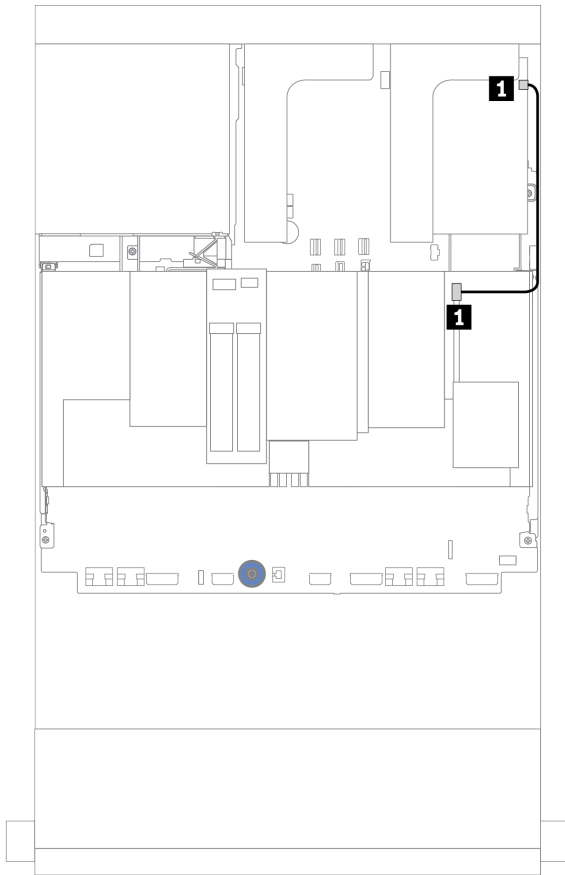
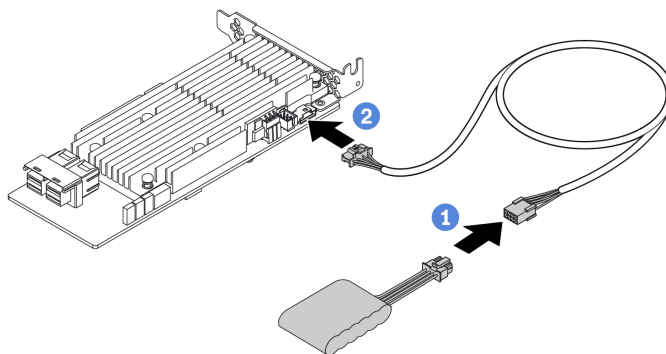


Figure 24. Cable routing for the RAID flash power module on the air baffle

From	To
1 RAID flash power module	Supercap connector on the RAID adapter

Note: 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.



7mm drives

This section provides cable routing information for the 7mm drives.

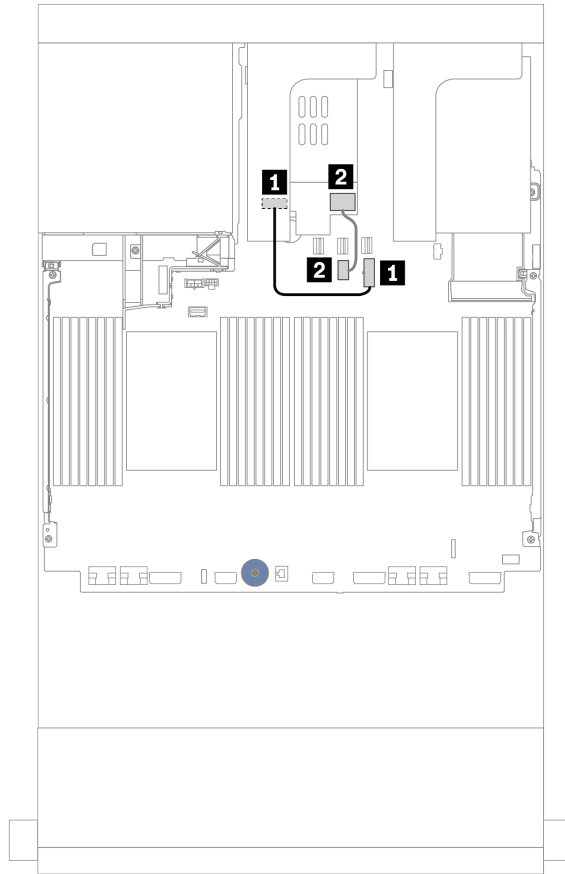


Figure 25. Cable routing for 7mm drives

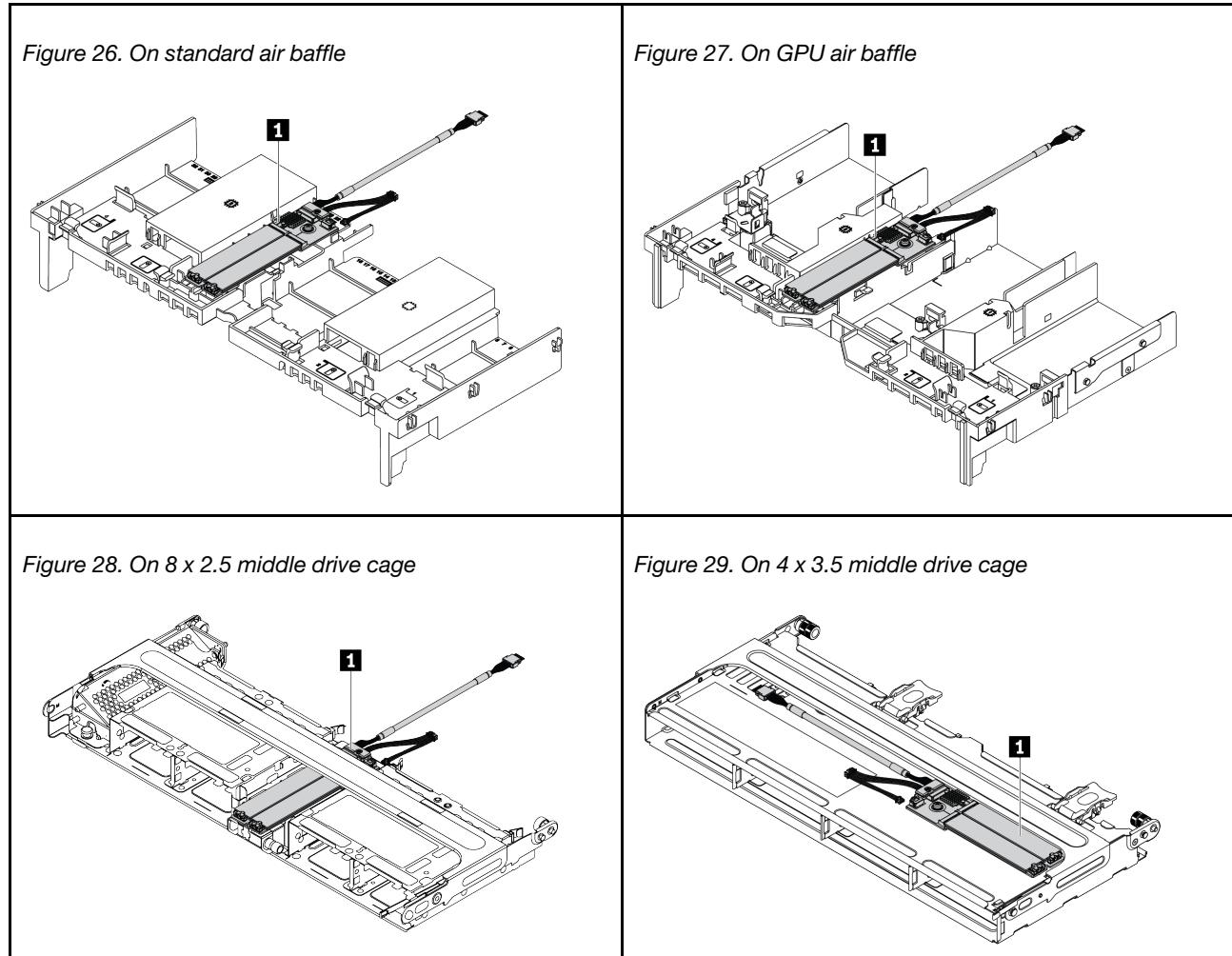
From	To
1 Power connector on the 7mm backplane	7mm power connector on the system board
2 Signal connector on the 7mm backplane	7mm signal connector on the system board

M.2 drives

This section provides cable routing information for the M.2 drives.

The location of the M.2 module **1** varies by the server hardware configurations.

Table 23. M.2 module location



The following illustration shows the cable connection for M.2 module on the air baffle. It is the same for the M.2 module on other locations.

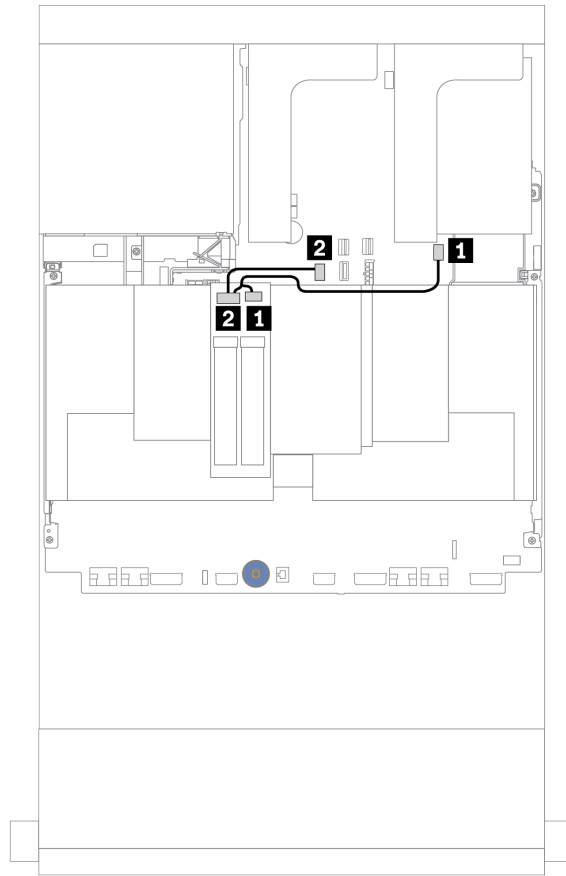


Figure 30. Cable routing for M.2 drives

From	To
1 M.2 power cable	M.2 power connector on the system board
2 M.2 signal cable	M.2 signal connector on the system board

Backplanes: server models with 2.5-inch drive backplanes

This section provides backplane cable connection information for server models with 2.5-inch drive backplanes.

Before you start

Ensure below parts are removed before starting cable routing for front backplanes.

- Top cover (see “Remove the top cover” on page 242)
- Air baffle (see “Remove the air baffle” on page 244)
- Fan cage (see “Remove the system fan cage” on page 247)

Power cable connections

Connect the power cables for the front 2.5-inch drive backplanes as illustrated. Power cable connections are the same for the following 8 x 2.5-inch front drive backplanes.

- 8 x 2.5-inch SAS/SATA backplane
- 8 x 2.5-inch NVMe backplane
- 8 x 2.5-inch AnyBay backplane

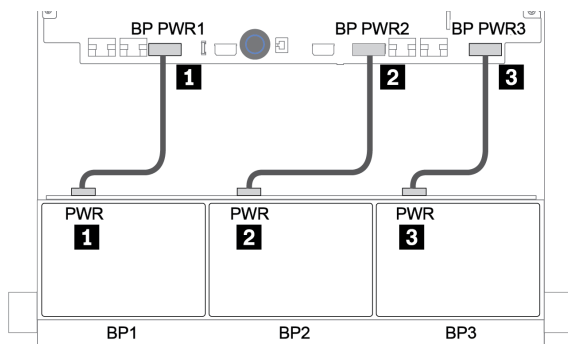


Figure 31. Power cable connections for 8 x 2.5-inch drive backplanes

Signal cable connections

Refer to the specific topic for signal cable connections depending on the backplanes you have installed.

- SAS/SATA:
 - “One 8 x SAS/SATA backplane” on page 85
 - “Two 8 x SAS/SATA backplanes” on page 89
 - “Three 8 x SAS/SATA backplanes” on page 93
- NVMe:
 - “One 8 x NVMe backplane” on page 115
 - “Two 8 x NVMe backplanes” on page 118
 - “Three 8 x NVMe backplanes” on page 119
- AnyBay:
 - “One 8 x AnyBay backplane” on page 122
 - “Two 8 x AnyBay backplanes” on page 127
 - “Three 8 x AnyBay backplanes” on page 128

- SAS/SATA, NVMe, and AnyBay combinations:
 - “One 8 x SAS/SATA and one 8 x NVMe backplanes” on page 129
 - “One 8 x SAS/SATA and one 8 x AnyBay backplanes” on page 135
 - “One 8 x AnyBay and one 8 x NVMe backplanes” on page 142
 - “One 8 x SAS/SATA and two 8 x NVMe backplanes” on page 143
 - “One 8 x SAS/SATA and two 8 x AnyBay backplanes” on page 145
 - “Two 8 x SAS/SATA and one 8 x NVMe backplanes” on page 148
 - “Two 8 x SAS/SATA and one 8 x AnyBay backplanes” on page 152

Controller selections

This section provides controller selection information for configurations with 2.5-inch front drive bays.

The following table lists the supported controller combinations for configurations with 2.5-inch front drive bays. For more information about the controllers, see “Technical specifications” on page 8.

When picking cables for RAID/HBA adapters from cable kits, make sure to choose the cables based on the generation of the adapters that you plan to install:

- **Gen 3 RAID/HBA adapters** (430-8i, 4350-8i, 430-16i, 4350-16i, 530-8i, 5350-8i, 530-16i, 930-8i, 9350-8i, 930-16i, 9350-16i): MiniSAS to Slimline cable
- **Gen 4 RAID/HBA adapters** (440-8i, 440-16i, 540-8i, 540-16i, 940-8i, 940-16i, 940-32i): Slimline cable

Notes:

- The internal customer form factor (CFF) RAID/HBA 16i adapter is supported only when two processors are installed.
- The HBA 4350, RAID 5350, RAID 9350 adapters are used only in below configurations marked with asterisk (*).

S/S: SATA/SAS, Any: AnyBay, OB: onboard, EXP: expander

Front bays			Mid bays		Rear bays		CPUs	Controllers
S/S 2.5"	NVM-e 2.5"	Any 2.5"	S/S 2.5"	NVM-e 2.5"	S/S 2.5"	S/S 3.5"		
8	0	0	0	0	0	0	1 or 2	OB SATA
							1 or 2	1 x RAID/HBA 8i*
							1 or 2	1 x RAID/HBA 16i
							2	CFF RAID/HBA 16i
16	0	0	0	0	0	0	1 or 2	OB SATA + 1 x RAID 8i
							1 or 2	2 x RAID/HBA 8i
							1 or 2	1 x RAID/HBA 16i*
							1 or 2	1 x RAID/HBA 32i
							2	CFF RAID/HBA 16i
24	0	0	0	0	0	0	1 or 2	3 x RAID 8i
							1 or 2	1 x RAID/HBA 32i

Front bays			Mid bays		Rear bays		CPUs	Controllers
S/S 2.5"	NVM-e 2.5"	Any 2.5"	S/S 2.5"	NVM-e 2.5"	S/S 2.5"	S/S 3.5"		
							1 or 2	1 x HBA 16i + 1 x RAID 530-8i
							1 or 2	2 x HBA 8i + 1 x RAID 530-8i
							1 or 2	1 x RAID/HBA 8i + CFF EXP
							2	CFF RAID/HBA 16i + CFF EXP
24	0	0	0	0	4	0	2	4 x RAID 8i
							1 or 2	1 x RAID/HBA 32i
							1 or 2	1 x RAID/HBA 8i + CFF EXP
							2	CFF RAID/HBA 16i + CFF EXP
24	0	0	8	0	4	0	2	1 x RAID/HBA 8i + CFF EXP
							2	CFF RAID/HBA 16i + CFF EXP
24	0	0	8		8		2	CFF RAID/HBA 16i + CFF EXP
0	8	0	0	0	0	0	2	OB NVMe
							1 or 2	OB NVMe + 1 x Retimer
0	16	0	0	0	0	0	2	OB NVMe + 1 x Retimer
	24	0	0	0	0	0	2	OB NVMe + 3 x Retimer
0	24	0	0	8	0	0	2	4 x 1611-8P
8	8	0	0	0	0	0	2	OB SATA + OB NVMe
							2	1 x RAID/HBA 8i + OB NVMe
							2	1 x RAID/HBA 16i + OB NVMe
							2	CFF RAID/HBA 16i + OB NVMe
							1 or 2	OB SATA + OB NVMe + Retimer
							1 or 2	1 x RAID/HBA 8i + OB NVMe + Retimer
							1 or 2	1 x RAID/HBA 16i + OB NVMe + Retimer
16	8	0	0	0	0	0	2	CFF RAID/HBA 16i + OB NVMe
							2	1 x RAID/HBA 8i + CFF EXP + OB NVMe
							1 or 2	1 x RAID/HBA 8i + CFF EXP + Retimer
8	16	0	0	0	0	0	2	1 x RAID/HBA 8i + OB NVMe + Retimer
							2	1 x RAID/HBA 16i + OB NVMe + Retimer
0	0	8	0	0	0	0	2	1 x RAID/HBA 8i + OB NVMe
							2	1 x RAID/HBA 16i + OB NVMe
							2	CFF RAID/HBA 16i + OB NVMe
							1 or 2	1 x RAID/HBA 8i + OB NVMe + Retimer
							1 or 2	1 x RAID/HBA 16i + OB NVMe + Retimer
							1 or 2	1 x RAID 940-8i Trimode
0	0	16	0	0	0	0	1 or 2	2 x RAID 940-8i Trimode
0	0	24	0	0	0	0	1 or 2	3 x RAID 940-8i Trimode

Front bays			Mid bays		Rear bays		CPUs	Controllers
S/S 2.5"	NVM-e 2.5"	Any 2.5"	S/S 2.5"	NVM-e 2.5"	S/S 2.5"	S/S 3.5"		
0	8	8	0	0	0	0	2	1 x RAID/HBA 8i + OB NVMe + Retimer
							2	1 x RAID/HBA 16i + OB NVMe + Retimer
8	0	8	0	0	0	0	2	2 x RAID/HBA 8i + OB NVMe
							2	1 x RAID/HBA 16i + OB NVMe
							2	1 x RAID/HBA 32i + OB NVMe
							2	CFF RAID/HBA 16i + OB NVMe
							1 or 2	2 x RAID/HBA 8i + OB NVMe + Retimer
							1 or 2	1 x RAID/HBA 16i + OB NVMe + Retimer
							1 or 2	OB SATA + 1 x RAID 940-8i Trimode
							1 or 2	1 x RAID/HBA 8i + 1 x RAID 940-8i Trimode
							1 or 2	1 x RAID/HBA 16i + 1 x RAID 940-8i Trimode
							1 or 2	CFF RAID/HBA 16i + 1 x RAID 940-8i Trimode
8	0	16	0	0	0	0	1 or 2	1x RAID/HBA 8i + 2 x RAID 940-8i Trimode
							1 or 2	1 x RAID/HBA 16i + 2 x RAID 940-8i Trimode
							1 or 2	1 x RAID/HBA 8i + 1 x RAID 940-16i Trimode
							1 or 2	1 x RAID/HBA 16i + 1 x RAID 940-16i Trimode
16	0	8	0	0	0	0	2	3 x RAID/HBA 8i + OB NVMe
							2	1 x RAID/HBA 32i + OB NVMe
							2	CFF EXP + 1 x RAID/HBA 8i + OB NVMe
							2	CFF RAID/HBA 16i + CFF EXP + OB NVMe
							1 or 2	1 x RAID/HBA 32i + OB NVMe + Retimer
							1 or 2	CFF EXP + 1 x RAID/HBA 8i + OB NVMe + Retimer
16	0	8	0	0	4	0	2	4 x RAID/HBA 8i + OB NVMe
							2	1 x RAID/HBA 32i + OB NVMe
							2	CFF EXP + 1 x RAID/HBA 8i + OB NVMe
							2	CFF RAID/HBA 16i + CFF EXP + OB NVMe
							1 or 2	1 x RAID/HBA 32i + OB NVMe + Retimer
							1 or 2	CFF EXP + 1 x RAID/HBA 8i + OB NVMe + Retimer

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 drive backplanes” on page 81.

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 86
- “8i/16i RAID/HBA adapter” on page 87
- “CFF 16i RAID/HBA adapter” on page 88

Onboard connectors

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA configuration with onboard connectors.

From	To
Backplane 1: SAS	Onboard: SATA 0, SATA 1

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

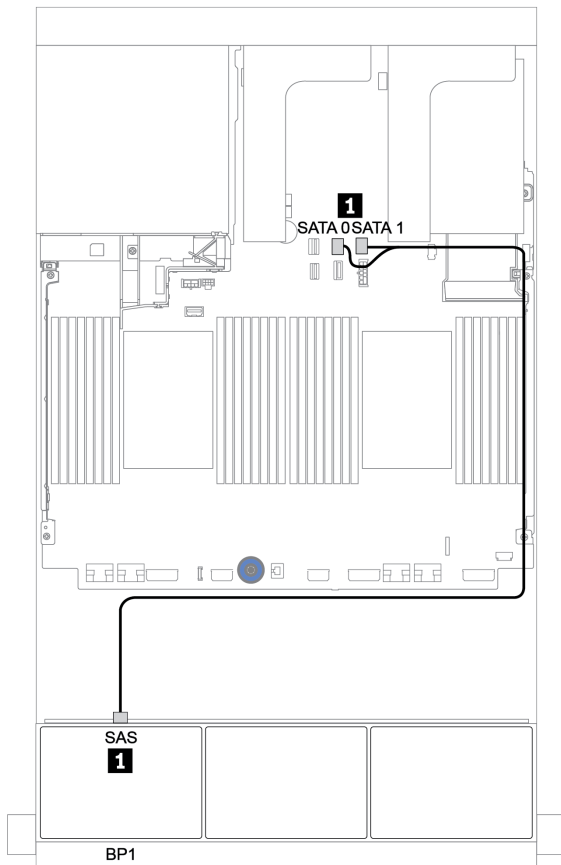


Figure 32. Cable routing for the 8 x 2.5-inch SAS/SATA configuration with onboard connectors

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.

From	To
Backplane 1: SAS	8i/16i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none">• Gen 3: C0C1• Gen 4: C0

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

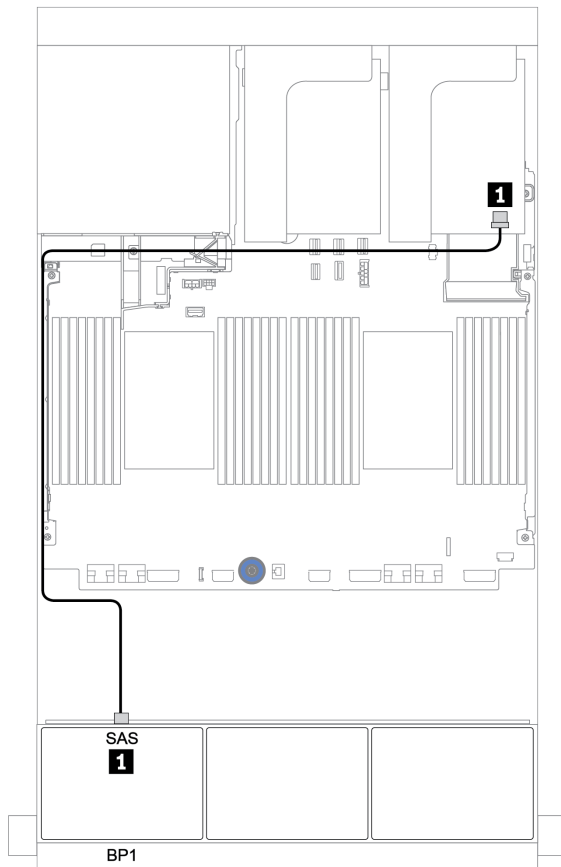


Figure 33. Cable routing for the 8 x 2.5-inch SAS/SATA configuration with one 8i/16i RAID/HBA adapter

CFF 16i RAID/HBA adapter

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA configuration with one CFF 16i RAID/HBA adapter.

From	To
Backplane 1: SAS	CFF 16i RAID/HBA adapter: C0, C1
CFF 16i RAID/HBA adapter: MB	Onboard: PCIe 3
CFF 16i RAID/HBA adapter: PWR	Onboard: RAID PWR

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

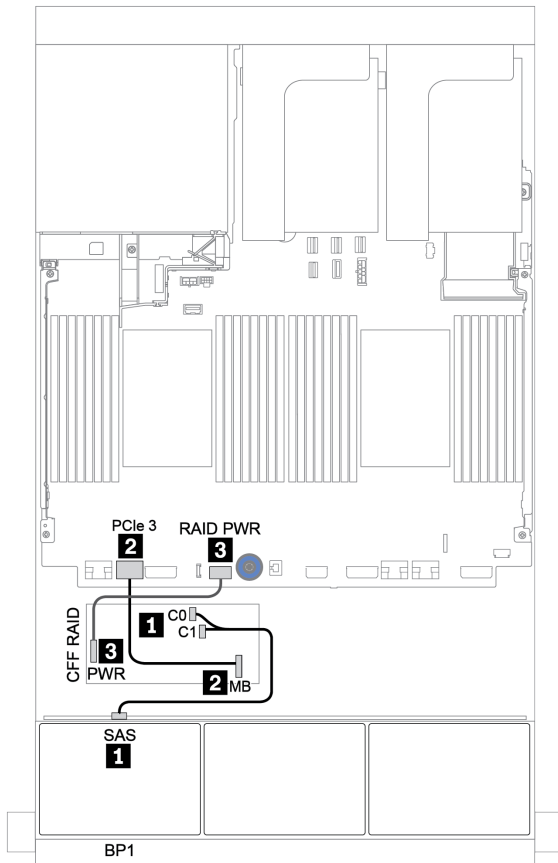


Figure 34. Cable routing for the 8 x 2.5-inch SAS/SATA configuration with one CFF 16i RAID/HBA adapter

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 drive backplanes” on page 81.

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration:

- “8i/16i/32i RAID/HBA adapter” on page 91
- “CFF 16i RAID/HBA adapter” on page 92

Onboard connectors + 8i RAID adapter

The following shows the cable connections for the 16 x 2.5-inch SAS/SATA configuration with one 8i RAID adapter.

From	To
Backplane 1: SAS	Onboard: SATA 0, SATA 1
Backplane 2: SAS	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

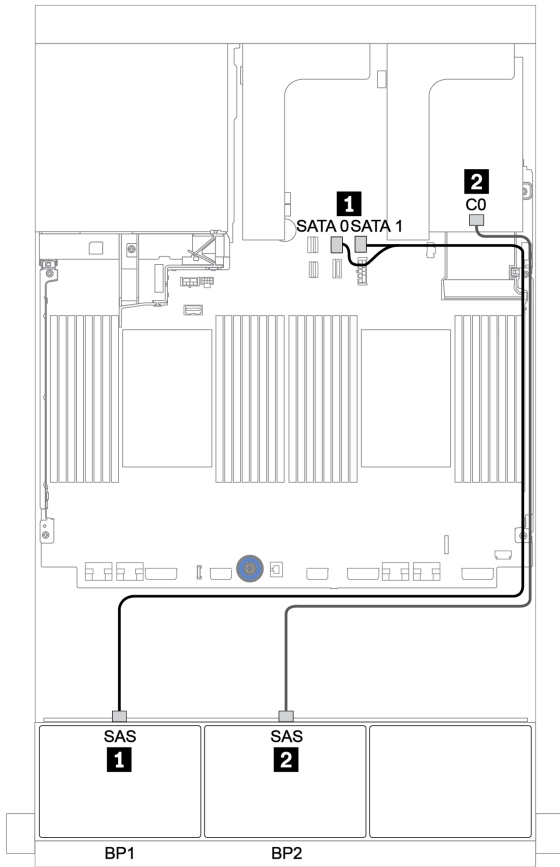


Figure 35. Cable routing for the 16 x 2.5-inch SAS/SATA configuration with one 8i RAID adapter

8i/16i/32i 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/32i RAID/HBA adapter.

From	To		
Backplane 1: SAS	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0 	16i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0 	32i RAID adapter on PCIe slot 2: C0
Backplane 2: SAS	8i RAID/HBA adapter on PCIe slot 3: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0 	16i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C2C3 • Gen 4: C1 	32i RAID adapter on PCIe slot 2: C1

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

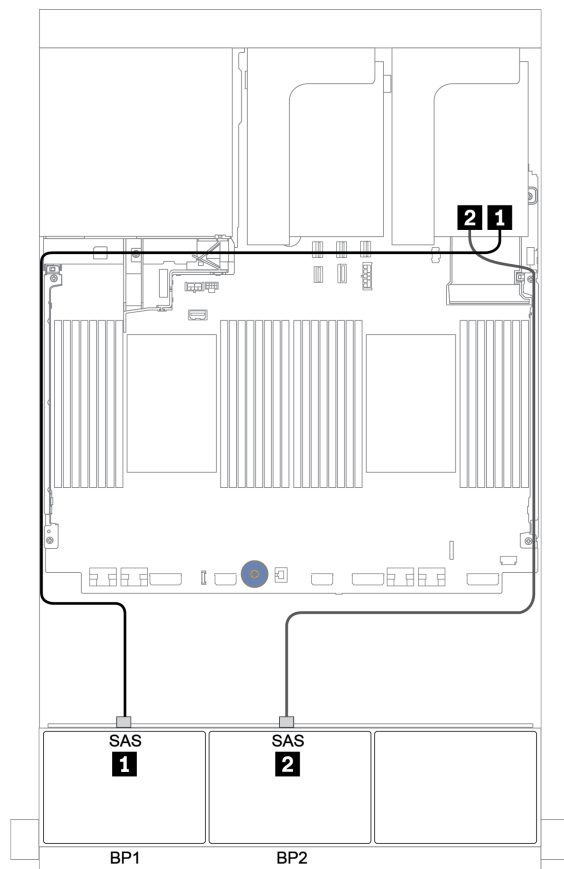


Figure 36. Cable routing for the 16 x 2.5-inch SAS/SATA configuration with two 8i RAID/HBA adapters or one 16i/32i RAID/HBA adapter

CFF 16i RAID/HBA adapter

The following shows the cable connections for the 16 x 2.5-inch SAS/SATA configuration with one CFF 16i RAID/HBA adapter.

From	To
Backplane 1: SAS	CFF 16i RAID/HBA adapter: C0, C1
Backplane 2: SAS	CFF 16i RAID/HBA adapter: C2, C3
CFF 16i RAID/HBA adapter: MB	Onboard: PCIe 3
CFF 16i RAID/HBA adapter: PWR	Onboard: RAID PWR

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

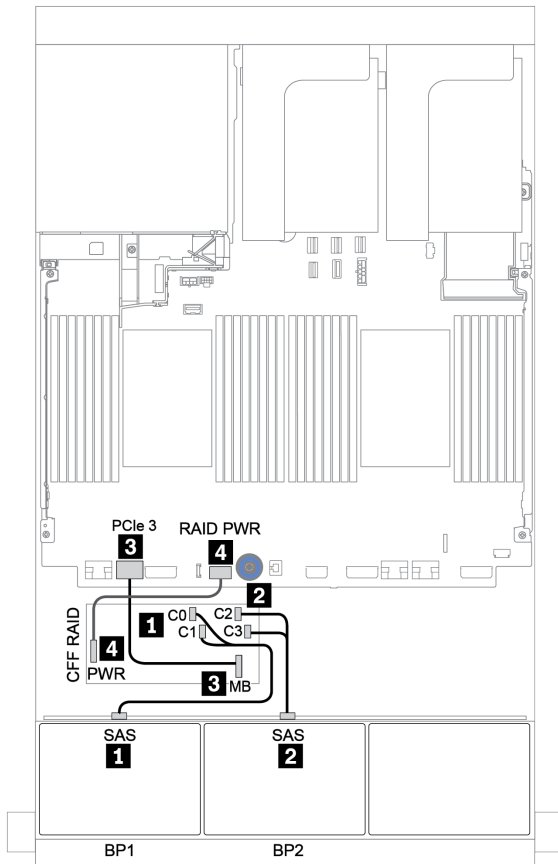


Figure 37. Cable routing for 16 x 2.5-inch SAS/SATA configuration with one CFF 16i RAID/HBA adapter

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.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 2.5-inch drive backplanes” on page 81.

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 SAS/SATA” on page 93
- “Front + rear backplanes: 24 x SAS/SATA + 4 x SAS/SATA” on page 99
- “Front + middle + rear backplanes: 24 x SAS/SATA + 8 x SAS/SATA + 4 x SAS/SATA” on page 108
- “Front + middle + rear backplanes: 24 x SAS/SATA + 8 x SAS/SATA + 8 x SAS/SATA” on page 113

Front backplanes: 24 x SAS/SATA

- “3 x 8i RAID/HBA adapters” on page 94
- “32i RAID/HBA adapter” on page 95
- “16i HBA adapter + 8i RAID adapter” on page 96
- “CFF expander + 8i RAID/HBA adapter” on page 97
- “CFF 16i RAID/HBA adapter + CFF expander” on page 98

3 x 8i RAID/HBA adapters

Front backplanes: 24 x 2.5-inch SAS/SATA

From	To
Backplane 1: SAS	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 2: SAS	8i RAID/HBA adapter on PCIe slot 3: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 3: SAS	8i RAID/HBA adapter on PCIe slot 5: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

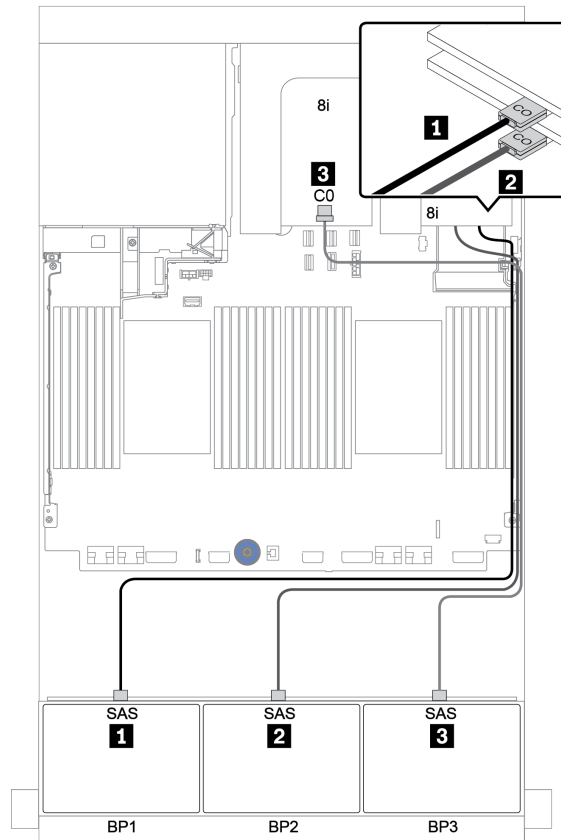


Figure 38. Cable routing for the 24 x 2.5-inch SAS/SATA configuration with three 8i RAID/HBA adapters

32i RAID/HBA adapter

Front backplanes: 24 x 2.5-inch SAS/SATA

From	To
Backplane 1: SAS	32i RAID adapter on PCIe slot 2: C0
Backplane 2: SAS	32i RAID adapter on PCIe slot 2: C1
Backplane 3: SAS	32i RAID adapter on PCIe slot 2: C2

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

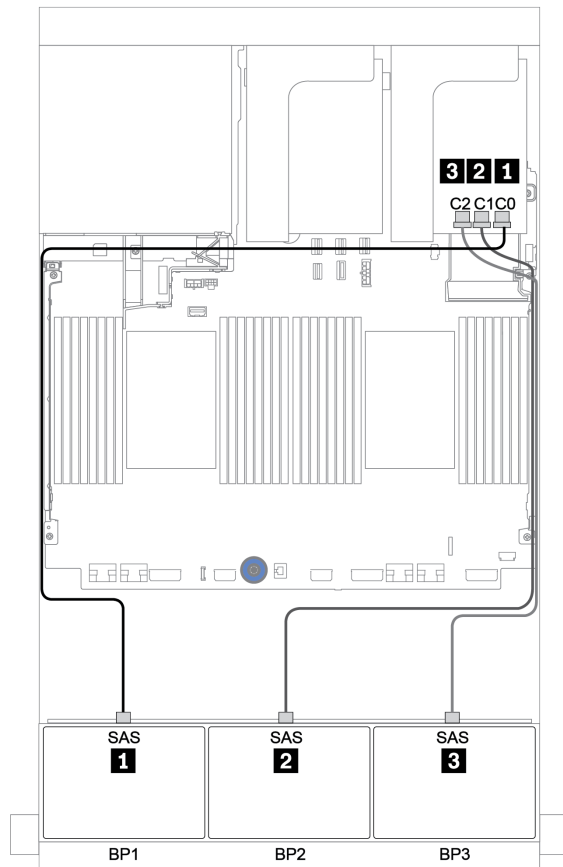


Figure 39. Cable routing for the 24 x 2.5-inch SAS/SATA configuration with one 32i RAID/HBA adapter

16i HBA adapter + 8i RAID adapter

Front backplanes: 24 x 2.5-inch SAS/SATA

From	To
Backplane 1: SAS	16i HBA adapter on PCIe slot 2: C0C1
Backplane 2: SAS	16i HBA adapter on PCIe slot 2: C2C3
Backplane 3: SAS	8i RAID adapter on PCIe slot 3: C0C1

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

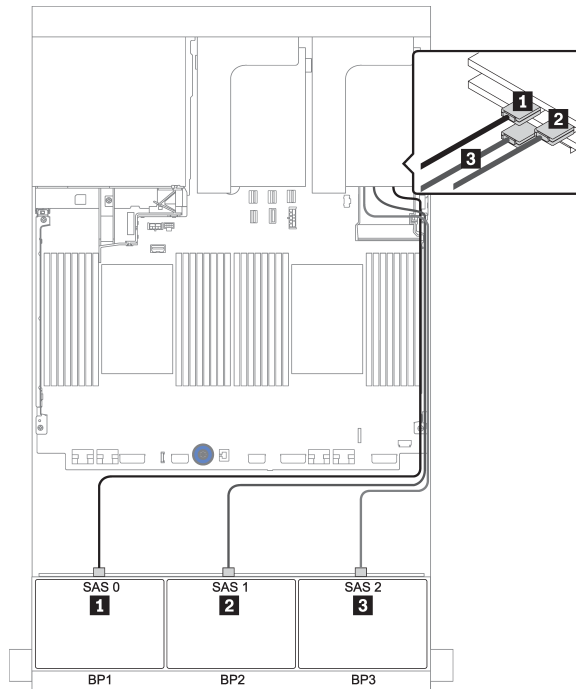


Figure 40. Cable routing for the 24 x 2.5-inch SAS/SATA configuration with one 16i HBA adapter and one 8i RAID adapter

CFF expander + 8i RAID/HBA adapter

Front backplanes: 24 x 2.5-inch SAS/SATA

From	To
Backplane 1: SAS	CFF expander: C0
Backplane 2: SAS	CFF expander: C1
Backplane 3: SAS	CFF expander: C2
CFF expander: RAID/HBA	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
CFF expander: PWR	Onboard: EXP PWR

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

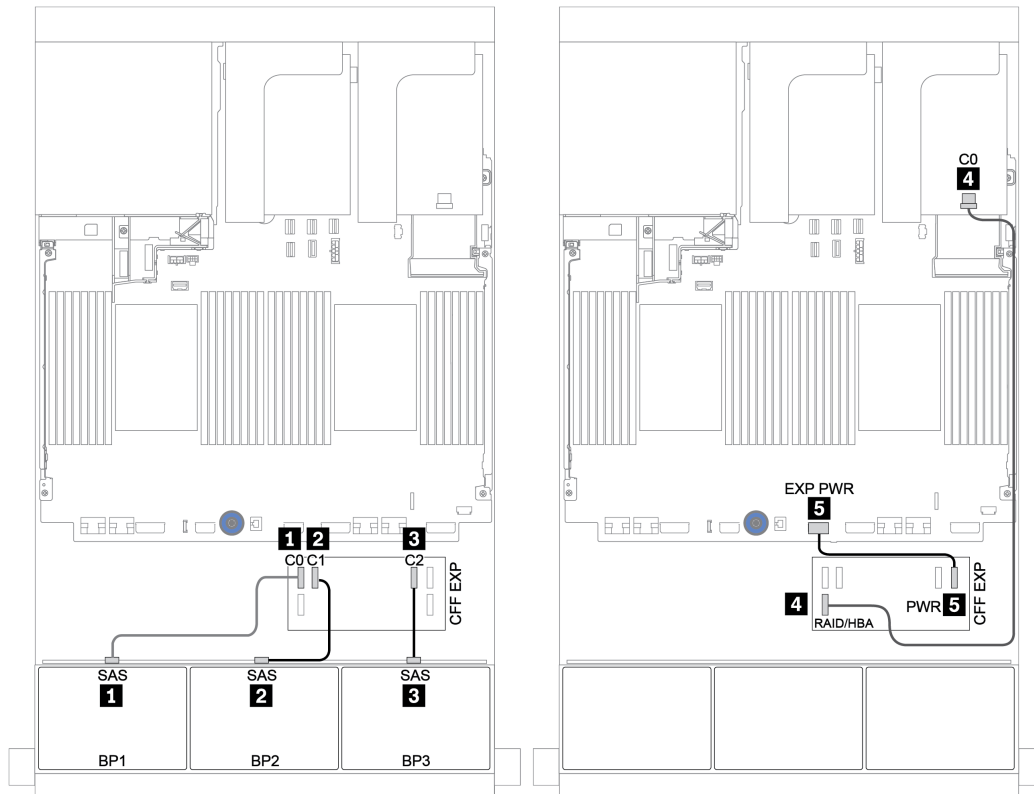


Figure 41. Cable routing for the 24 x 2.5-inch SAS/SATA configuration with one CFF expander and one 8i RAID/HBA adapter

CFF 16i RAID/HBA adapter + CFF expander

Front backplanes: 24 x 2.5-inch SAS/SATA

From	To
Backplane 1: SAS	CFF expander: C0
Backplane 2: SAS	CFF expander: C1
Backplane 3: SAS	CFF expander: C2
CFF expander: RAID/HBA	CFF 16i RAID/HBA adapter: C0, C1
CFF 16i RAID/HBA adapter: MB	Onboard: PCIe 3
CFF 16i RAID/HBA adapter: PWR	Onboard: RAID PWR
CFF expander: PWR	Onboard: EXP PWR

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

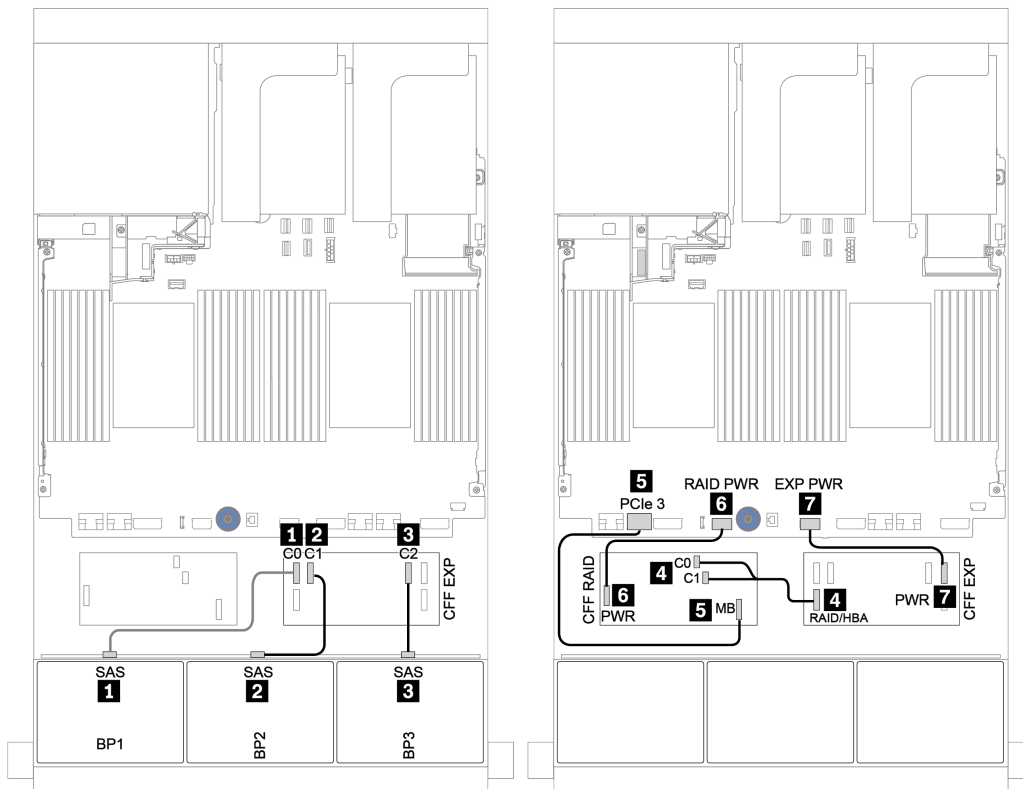


Figure 42. Cable routing for the 24 x 2.5-inch SAS/SATA configuration with one CFF 16i RAID/HBA adapter and one CFF expander

Front + rear backplanes: 24 x SAS/SATA + 4 x SAS/SATA

- “4 x 8i RAID/HBA adapters” on page 100
- “32i RAID/HBA adapter” on page 102
- “CFF expander + 8i RAID/HBA adapter” on page 104
- “CFF 16i RAID/HBA adapter + CFF expander” on page 106

4 x 8i RAID/HBA adapters

Front backplanes: 24 x 2.5-inch SAS/SATA

From	To
Backplane 1: SAS	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 2: SAS	8i RAID/HBA adapter on PCIe slot 3: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 3: SAS	8i RAID/HBA adapter on PCIe slot 5: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

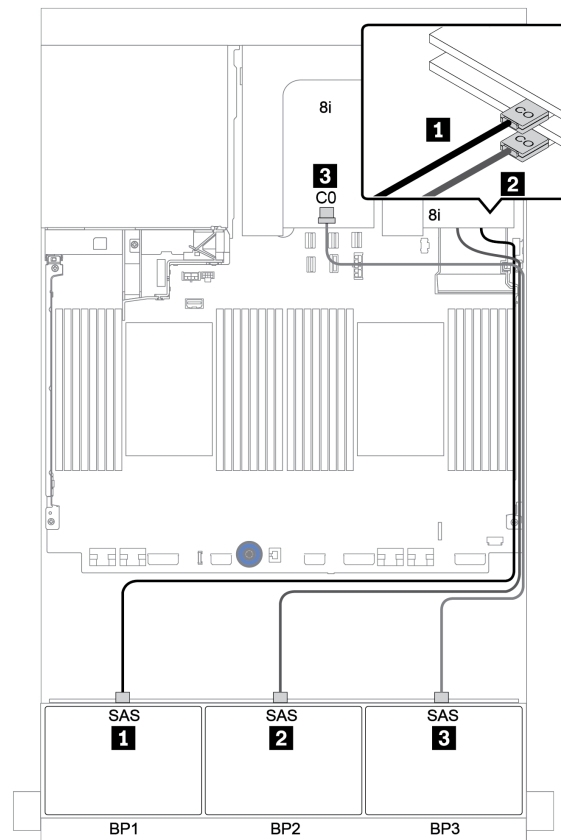


Figure 43. Cable routing for the 24 x 2.5-inch SAS/SATA configuration with three 8i RAID/HBA adapters

Rear backplane: 4 x 2.5-inch SAS/SATA

The following shows the cable connections for the rear 4 x 2.5-inch SAS/SATA backplane if installed.

From	To
Backplane 4: SAS	8i RAID/HBA adapter on PCIe slot 6: <ul style="list-style-type: none">• Gen 3: C0C1• Gen 4: C0
Backplane 4: PWR	Riser 1: PWR1, PWR2

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

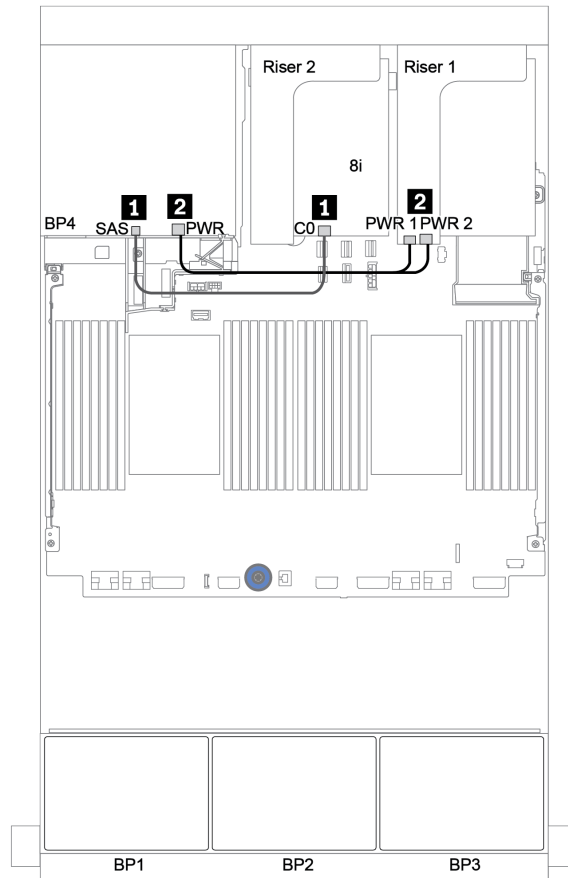


Figure 44. Cable routing for the rear 4 x 2.5-inch SAS/SATA backplane

32i RAID/HBA adapter

Front backplanes: 24 x 2.5-inch SAS/SATA

From	To
Backplane 1: SAS	32i RAID adapter on PCIe slot 2: C0
Backplane 2: SAS	32i RAID adapter on PCIe slot 2: C1
Backplane 3: SAS	32i RAID adapter on PCIe slot 2: C2

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

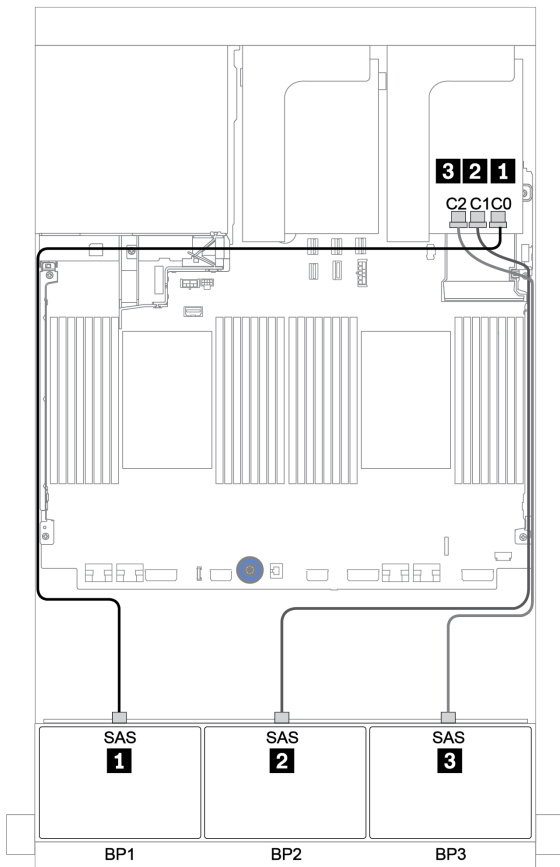


Figure 45. Cable routing for the 24 x 2.5-inch SAS/SATA configuration with one 32i RAID/HBA adapter

Rear backplane: 4 x 2.5-inch SAS/SATA

The following shows the cable connections for the rear 4 x 2.5-inch SAS/SATA backplane if installed.

From	To
Backplane 4: SAS	32i RAID adapter on PCIe slot 2: C3
Backplane 4: PWR	Riser 1: PWR1, PWR2

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

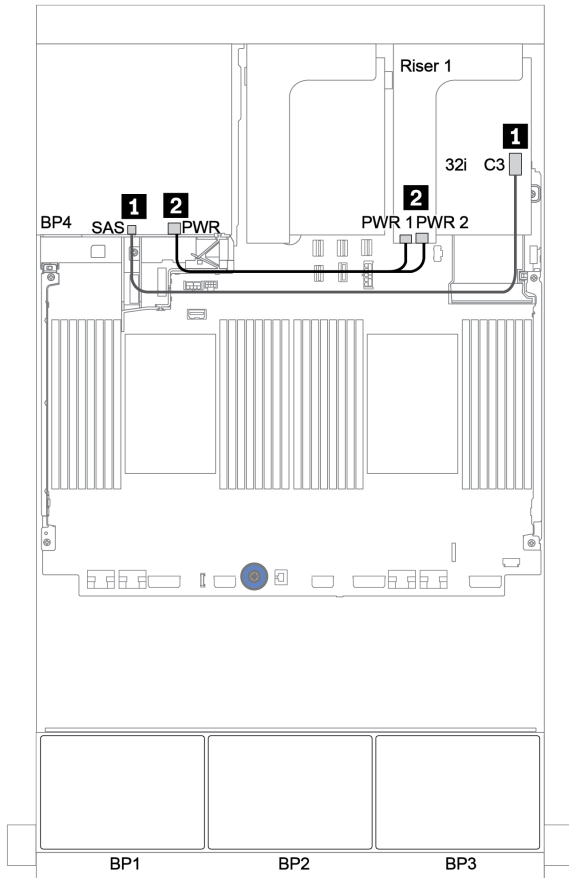


Figure 46. Cable routing for the rear 4 x 2.5 SAS/SATA backplane

CFF expander + 8i RAID/HBA adapter

Front backplanes: 24 x 2.5-inch SAS/SATA

From	To
Backplane 1: SAS	CFF expander: C0
Backplane 2: SAS	CFF expander: C1
Backplane 3: SAS	CFF expander: C2
CFF expander: RAID/HBA	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
CFF expander: PWR	Onboard: EXP PWR

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

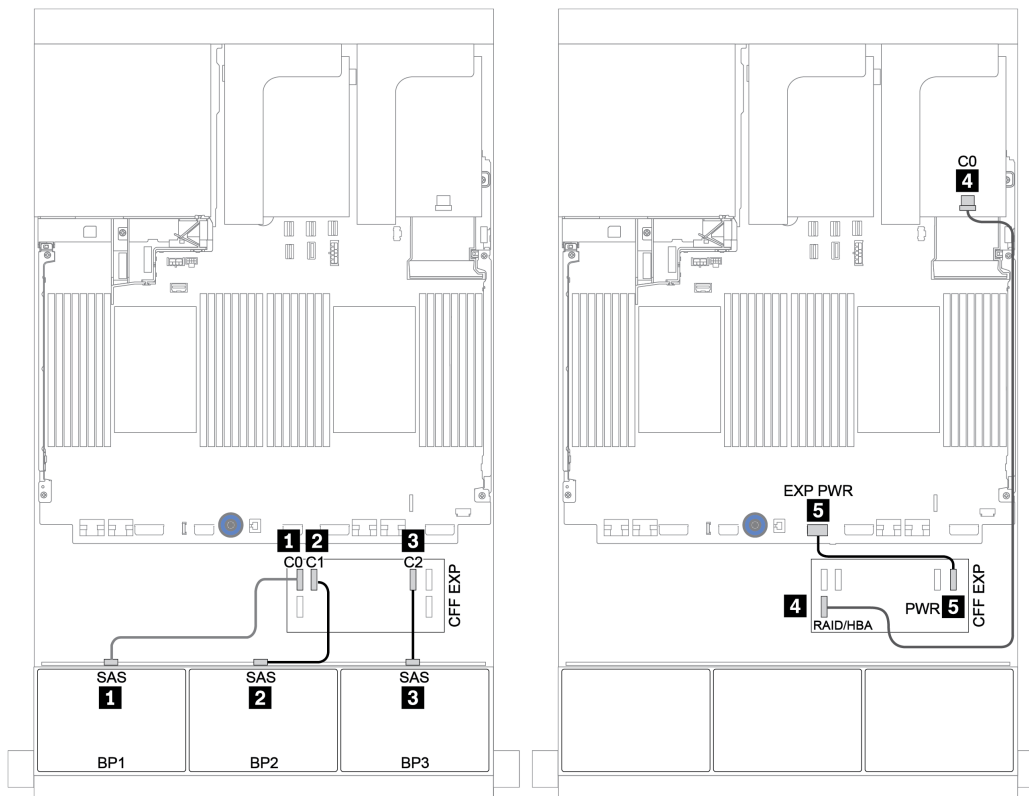


Figure 47. Cable routing for the 24 x 2.5-inch SAS/SATA configuration with one CFF expander and one 8i RAID/HBA adapter

Rear backplane: 4 x 2.5-inch SAS/SATA

The following shows the cable connections for the 4 x 2.5-inch SAS/SATA rear backplane.

From	To
Backplane 4: SAS	CFF expander: C3
Backplane 4: PWR	Riser 1: PWR1, PWR2

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

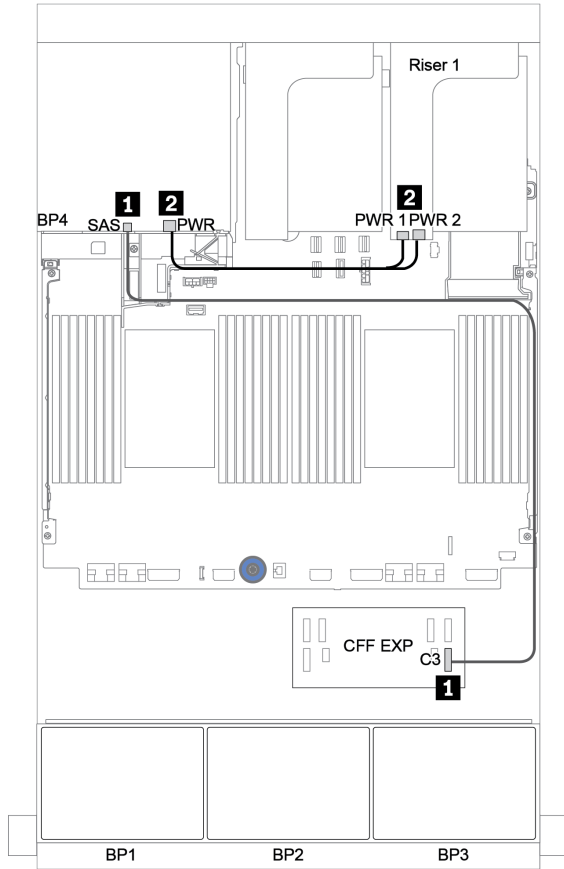


Figure 48. Cable routing for the 4 x 2.5-inch SAS/SATA rear backplane

CFF 16i RAID/HBA adapter + CFF expander

Front backplanes: 24 x 2.5-inch SAS/SATA

From	To
Backplane 1: SAS	CFF expander: C0
Backplane 2: SAS	CFF expander: C1
Backplane 3: SAS	CFF expander: C2
CFF expander: RAID/HBA	CFF 16i RAID/HBA adapter: C0, C1
CFF 16i RAID/HBA adapter: MB	Onboard: PCIe 3
CFF 16i RAID/HBA adapter: PWR	Onboard: RAID PWR
CFF expander: PWR	Onboard: EXP PWR

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

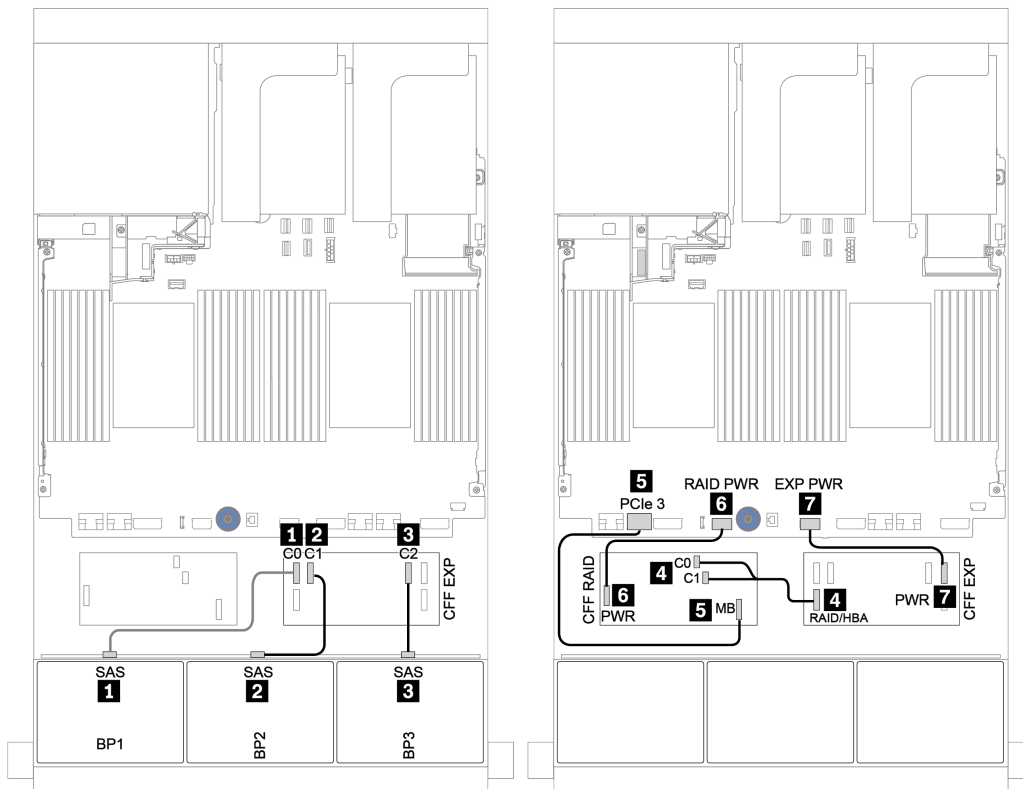


Figure 49. Cable routing for the 24 x 2.5-inch SAS/SATA configuration with one CFF 16i RAID/HBA adapter and one CFF expander

Rear backplane: 4 x 2.5-inch SAS/SATA

The following shows the cable connections for the 4 x 2.5-inch SAS/SATA rear backplane if installed.

From	To
Backplane 4: SAS	CFF expander: C3
Backplane 4: PWR	Riser 1: PWR1, PWR2

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

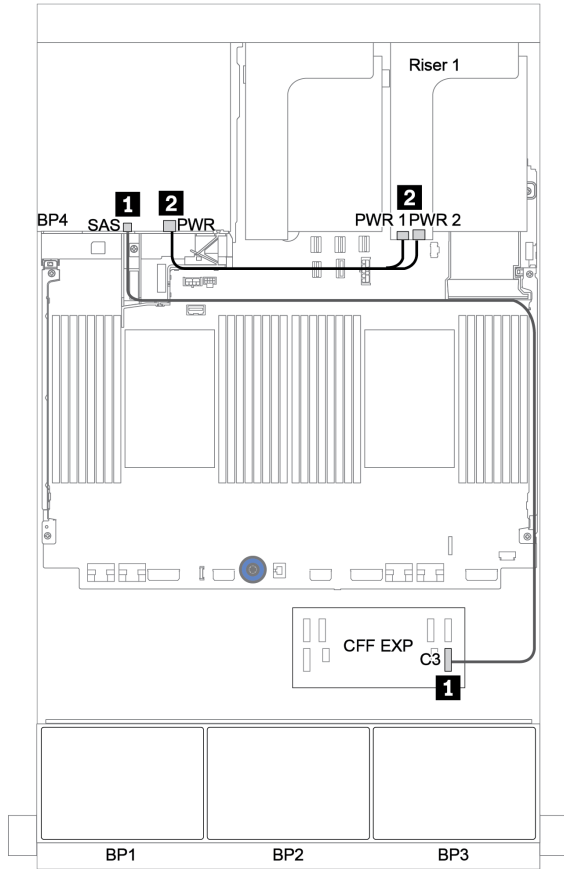


Figure 50. Cable routing for the 4 x 2.5-inch SAS/SATA rear backplane

Front + middle + rear backplanes: 24 x SAS/SATA + 8 x SAS/SATA + 4 x SAS/SATA

- “CFF expander + 8i RAID/HBA adapter” on page 109
- “CFF 16i RAID/HBA adapter + CFF expander” on page 111

CFF expander + 8i RAID/HBA adapter

Front backplanes: 24 x 2.5-inch SAS/SATA

From	To
Backplane 1: SAS	CFF expander: C0
Backplane 2: SAS	CFF expander: C1
Backplane 3: SAS	CFF expander: C2
CFF expander: RAID/HBA	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
CFF expander: PWR	Onboard: EXP PWR

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

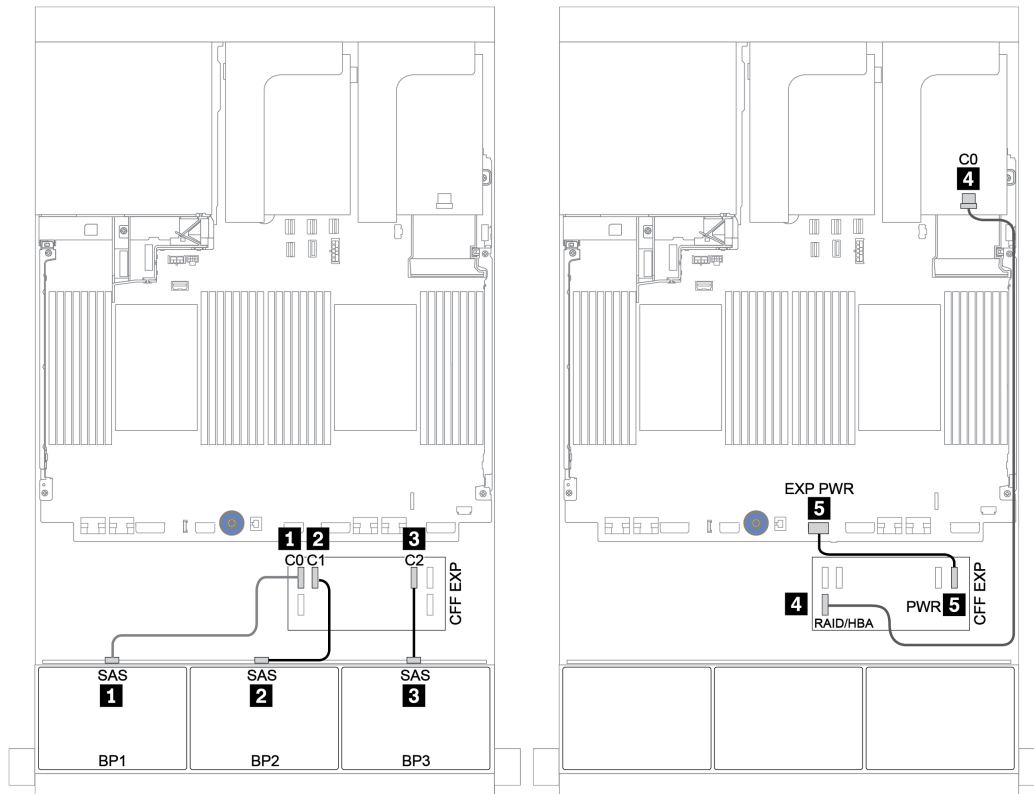


Figure 51. Cable routing for the 24 x 2.5-inch SAS/SATA configuration with one CFF expander and one 8i RAID/HBA adapter

Middle and rear backplanes: 8 x 2.5-inch SAS/SATA + 4 x 2.5-inch SAS/SATA

From	To
Backplane 4: SAS	CFF expander: C3
Backplane 5: SAS	
Backplane 6: SAS	CFF expander: C4
Backplane 4: PWR	Riser 1: PWR1, PWR2
Backplane 5: PWR	Riser 2: PWR1, PWR2
Backplane 6: PWR	

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

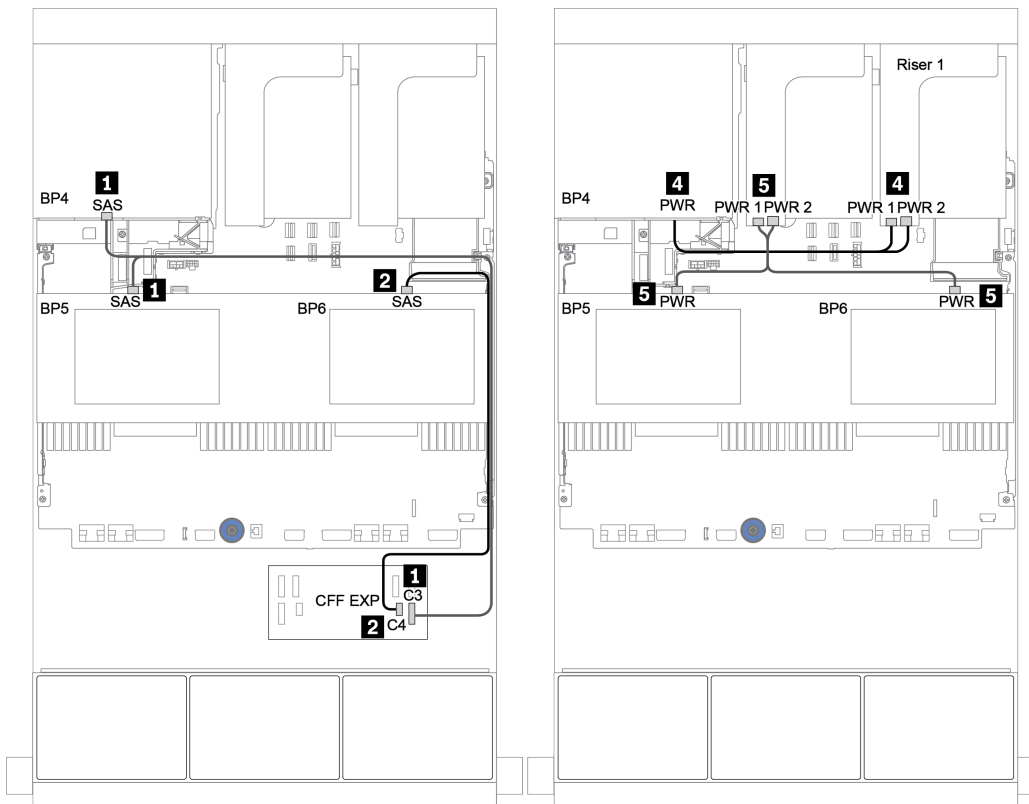


Figure 52. Cable routing for the two 4 x 2.5-inch SAS/SATA middle backplanes and one 4 x 2.5-inch SAS/SATA rear backplane

CFF 16i RAID/HBA adapter + CFF expander

Front backplanes: 24 x 2.5-inch SAS/SATA

From	To
Backplane 1: SAS	CFF expander: C0
Backplane 2: SAS	CFF expander: C1
Backplane 3: SAS	CFF expander: C2
CFF expander: RAID/HBA	CFF 16i RAID/HBA adapter: C0, C1
CFF 16i RAID/HBA adapter: MB	Onboard: PCIe 3
CFF 16i RAID/HBA adapter: PWR	Onboard: RAID PWR
CFF expander: PWR	Onboard: EXP PWR

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

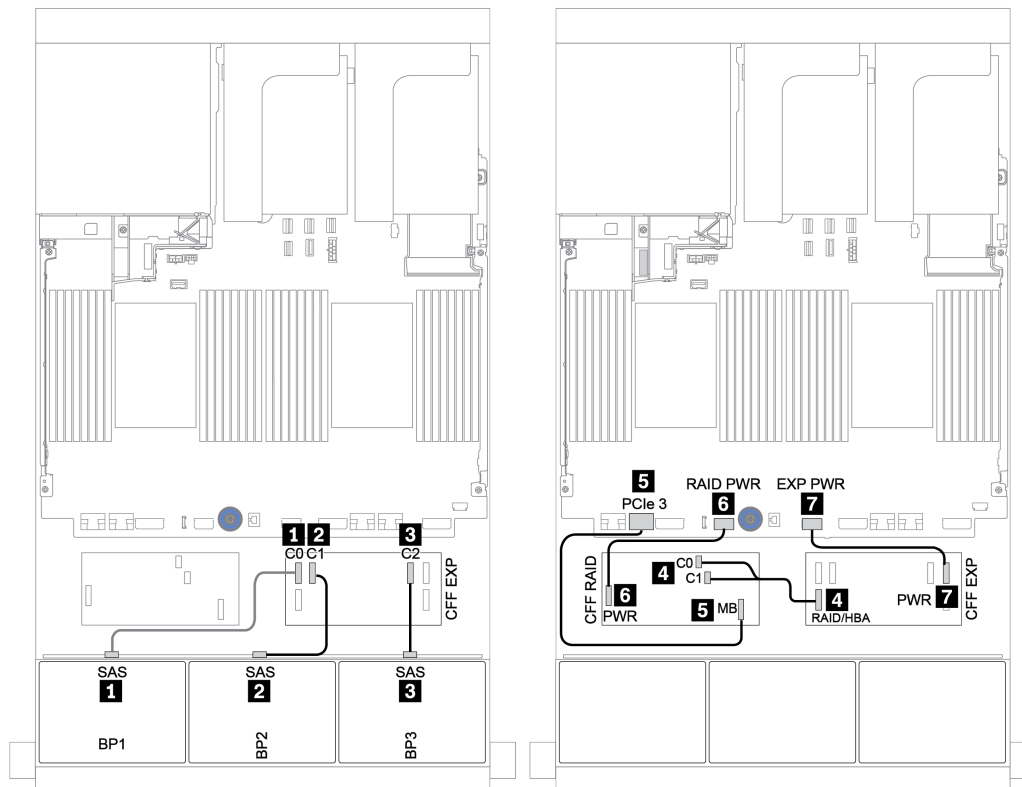


Figure 53. Cable routing for the 24 x 2.5-inch SAS/SATA configuration with one CFF 16i RAID/HBA adapter and one CFF expander

Middle and rear backplanes: 8 x 2.5-inch SAS/SATA + 4 x 2.5-inch SAS/SATA

From	To
Backplane 4: SAS	CFF expander: C3
Backplane 5: SAS	
Backplane 6: SAS	CFF expander: C4
Backplane 4: PWR	Riser 1: PWR1, PWR2
Backplane 5: PWR	Riser 2: PWR1, PWR2
Backplane 6: PWR	

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

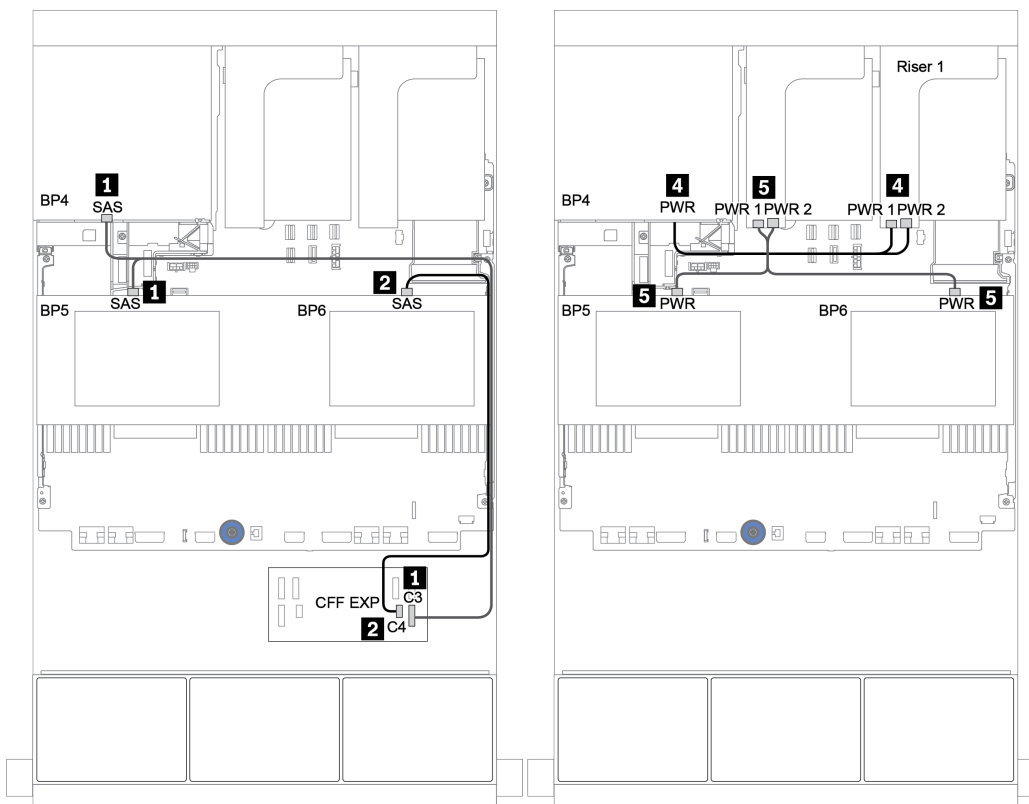


Figure 54. Cable routing for the 4 x 2.5-inch SAS/SATA middle backplanes and 4 x 2.5 SAS/SATA rear backplane

Front + middle + rear backplanes: 24 x SAS/SATA + 8 x SAS/SATA + 8 x SAS/SATA
CFF 16i RAID/HBA adapter + CFF expander

Front backplanes: 24 x 2.5-inch SAS/SATA

From	To
Backplane 1: SAS	CFF expander: C0
Backplane 2: SAS	CFF expander: C1
Backplane 3: SAS	CFF expander: C2
CFF expander: RAID/HBA	CFF 16i RAID/HBA adapter: C0, C1
CFF 16i RAID/HBA adapter: MB	Onboard: PCIe 3
CFF 16i RAID/HBA adapter: PWR	Onboard: RAID PWR
CFF expander: PWR	Onboard: EXP PWR

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

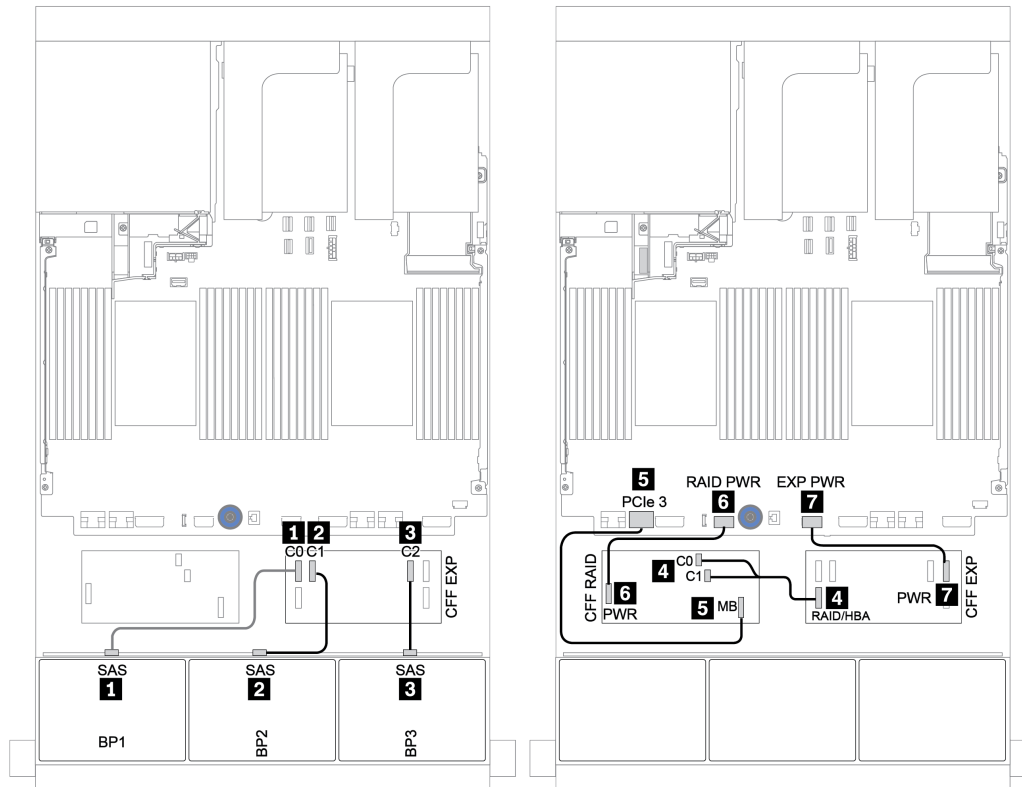


Figure 55. Cable routing for the 24 x 2.5-inch SAS/SATA configuration with one CFF 16i RAID/HBA adapter and one CFF expander

Middle and rear backplanes: 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch SAS/SATA

From	To
Backplane 4: SAS 0	CFF 16i RAID/HBA adapter: C2
Backplane 4: SAS 1	CFF 16i RAID/HBA adapter: C3
Backplane 5: SAS	CFF expander: C3
Backplane 6: SAS	
Backplane 4: PWR	Riser 1: PWR1, PWR2
Backplane 5: PWR	Riser 2: PWR1, PWR2
Backplane 6: PWR	

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

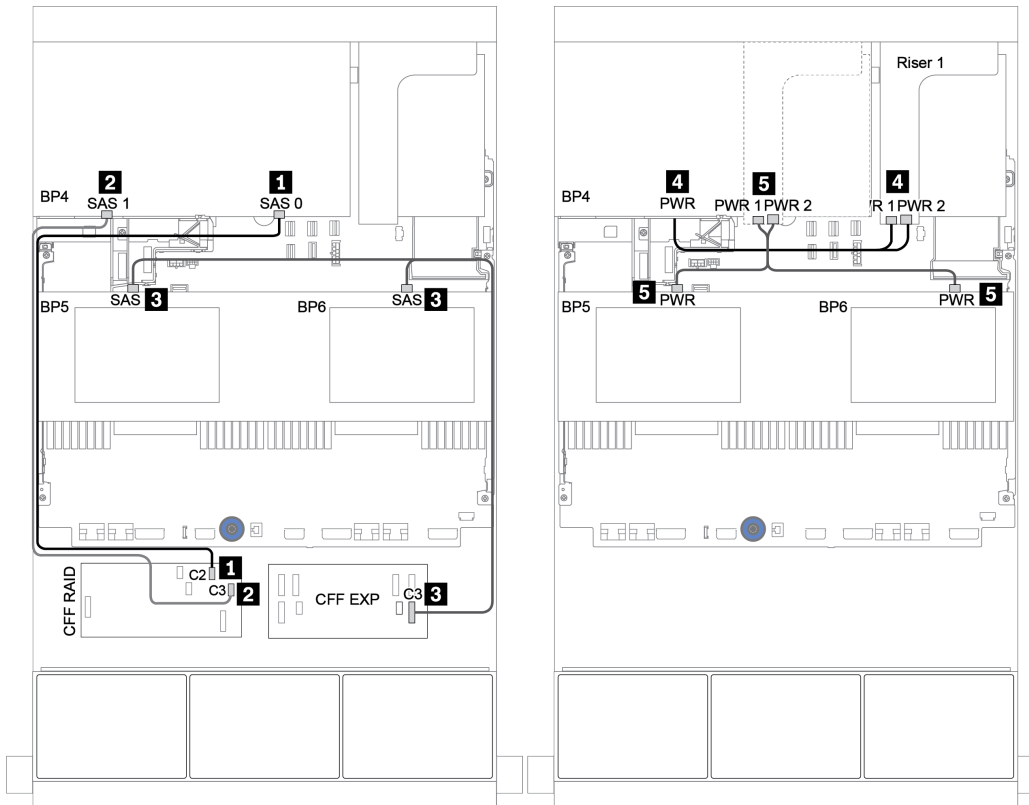


Figure 56. Cable routing for middle 4 x 2.5 SAS/SATA backplanes and rear 8 x 2.5 SAS/SATA backplane

One 8 x NVMe backplane

This section provides cable routing information for the server model with 8 x 2.5-inch NVMe front drive backplane.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 2.5-inch drive backplanes” on page 81.

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration:

- “Retimer card” on page 117
- “Onboard connectors” on page 116

Onboard connectors

The following shows the cable connections for the 8 x 2.5-inch NVMe configuration with onboard connectors.

From	To
Backplane 1: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 1: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

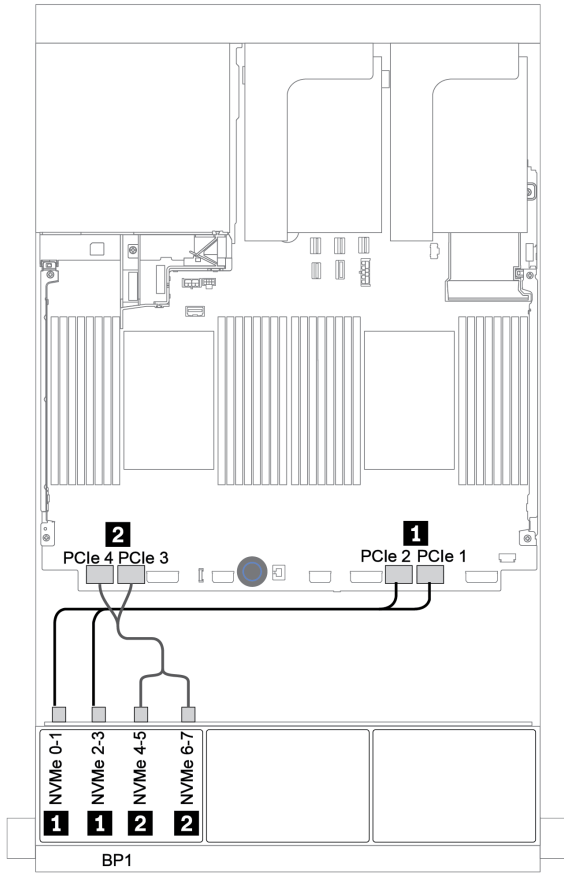


Figure 57. Cable routing for the 8 x 2.5-inch NVMe configuration with onboard connectors

Retimer card

The following shows the cable connections for the 8 x 2.5-inch NVMe configuration with one retimer card.

From	To
Backplane 1: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 1: NVMe 4-5, 6-7	Retimer card on PCIe slot 1: C0, C1

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

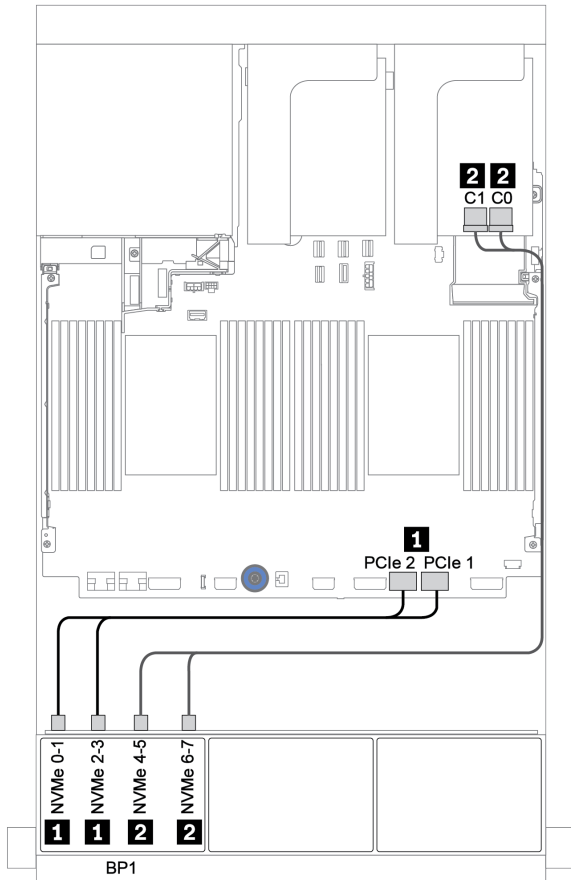


Figure 58. Cable routing for the 8 x 2.5-inch NVMe configuration with one retimer card

Two 8 x NVMe backplanes

This section provides cable routing information for the server model with two 8 x 2.5-inch NVMe front drive backplanes.

Onboard connectors + retimer card

The following shows the signal cable connections for the 16 x 2.5-inch NVMe configuration with onboard connectors and one retimer card.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 2.5-inch drive backplanes” on page 81.

From	To
Backplane 1: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 1: NVMe 4-5, 6-7	Retimer card on PCIe slot 1: C0, C1
Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 3, PCIe 4
Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 5, PCIe 6

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

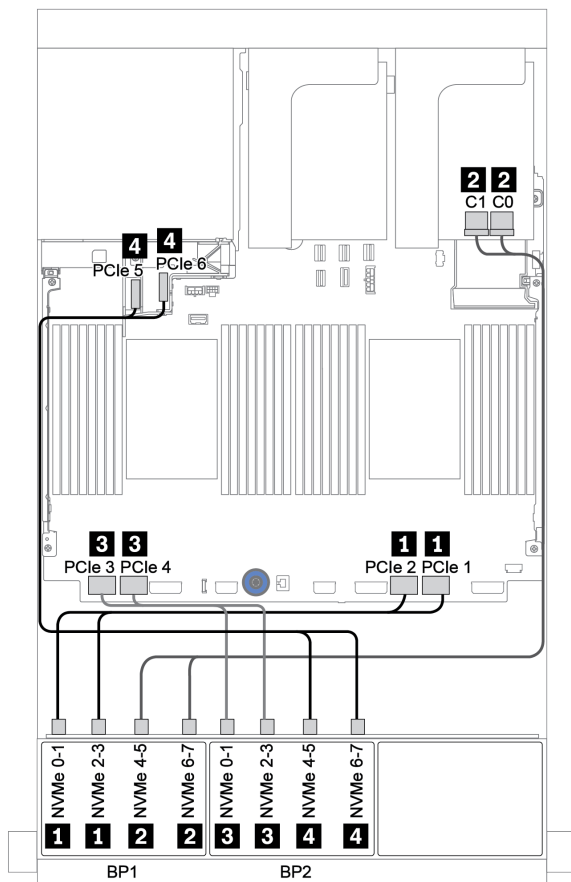


Figure 59. Cable routing for 16 x 2.5-inch NVMe configuration with one retimer card

Three 8 x NVMe backplanes

This section provides cable routing information for the server model with three 8 x 2.5-inch NVMe front drive backplanes.

To connect power cables for the 8 x 2.5-inch NVMe backplanes, refer to “Backplanes: server models with 2.5-inch drive backplanes” on page 81.

To connect signal cables for the 8 x 2.5-inch NVMe backplanes, refer to the following cable routing scenarios depending on your server configuration:

- “Retimer cards (24 x NVMe)” on page 120
- “Switch cards (32 x NVMe)” on page 121

Retimer cards (24 x NVMe)

The following shows the cable connections for the 24 x 2.5-inch NVMe configuration with three retimer cards.

From	To
Backplane 1: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 1: NVMe 4-5, 6-7	Retimer card on PCIe slot 1: C0, C1
Backplane 2: NVMe 0-1, 2-3	Retimer card on PCIe slot 2: C0, C1
Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4
Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 5, PCIe 6
Backplane 3: NVMe 4-5, 6-7	Retimer card on PCIe slot 4: C0, C1

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

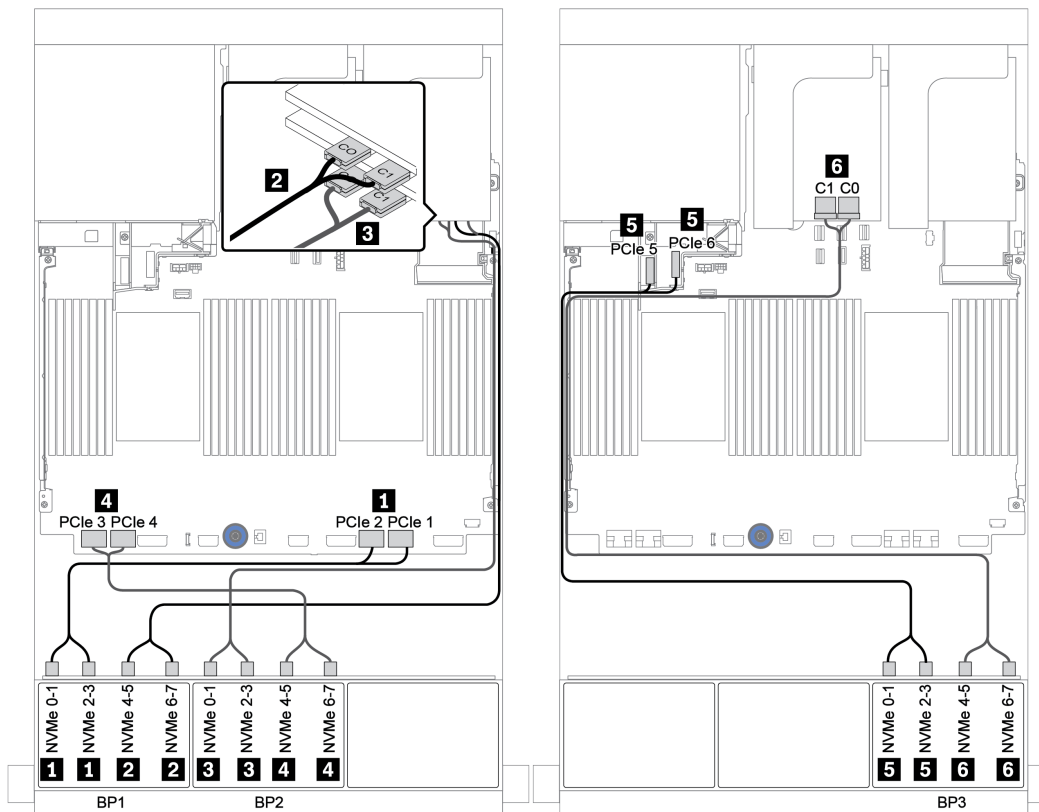


Figure 60. Cable routing for the 24 x 2.5-inch NVMe configuration with three retimer cards

Switch cards (32 x NVMe)

The following shows the cable connections for the 32 x 2.5-inch NVMe configuration with four switch cards.

From	To
Backplane 1: NVMe 0-1, 2-3, 4-5, 6-7	Switch card on PCIe slot 1: C0, C1, C2, C3
Backplane 2: NVMe 0-1, 2-3, 4-5, 6-7	Switch card on PCIe slot 2: C0, C1, C2, C3
Backplane 3: NVMe 0-1, 2-3, 4-5, 6-7	Switch card on PCIe slot 4: C0, C1, C2, C3
Backplane 5: NVMe 0-1, 2-3	Switch card on PCIe slot 5: C0, C1
Backplane 6: NVMe 0-1, 2-3	Switch card on PCIe slot 5: C2, C3

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

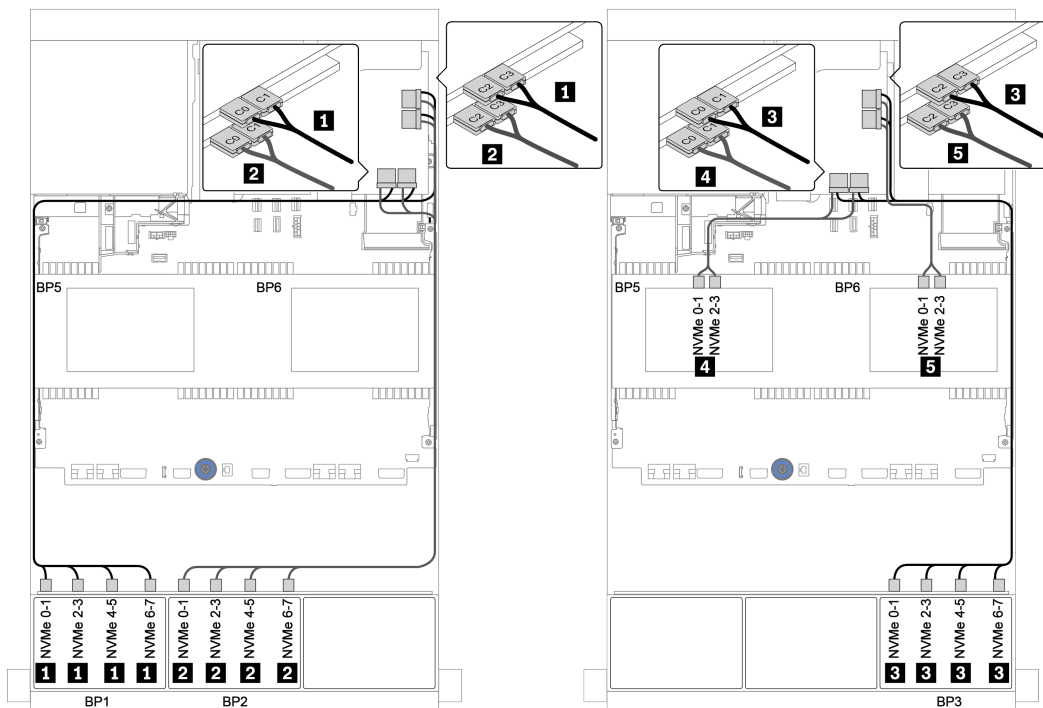


Figure 61. Cable routing for the 32 x 2.5-inch NVMe configuration with four switch cards

One 8 x AnyBay backplane

This section provides cable routing information for the server model with one 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 drive backplanes” on page 81.

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration:

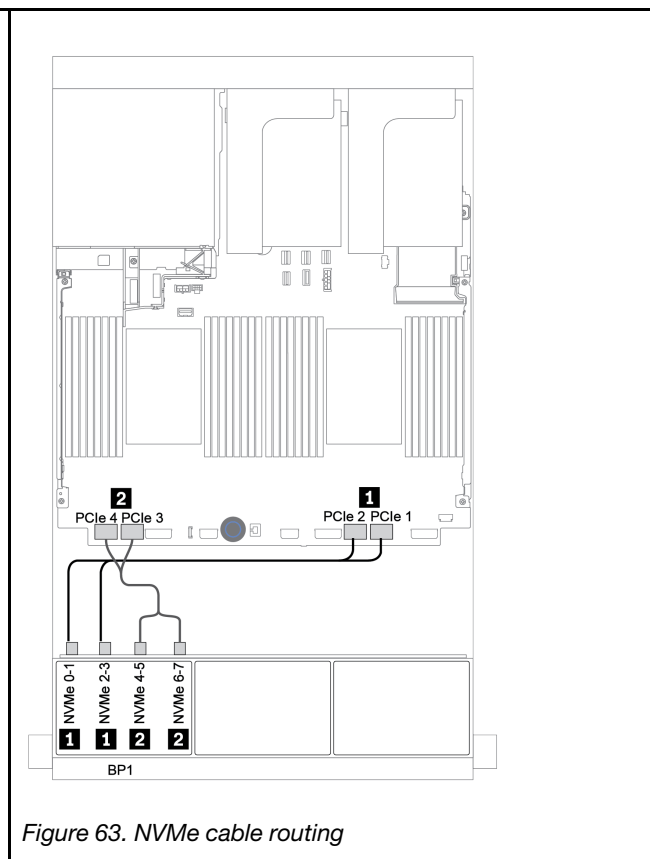
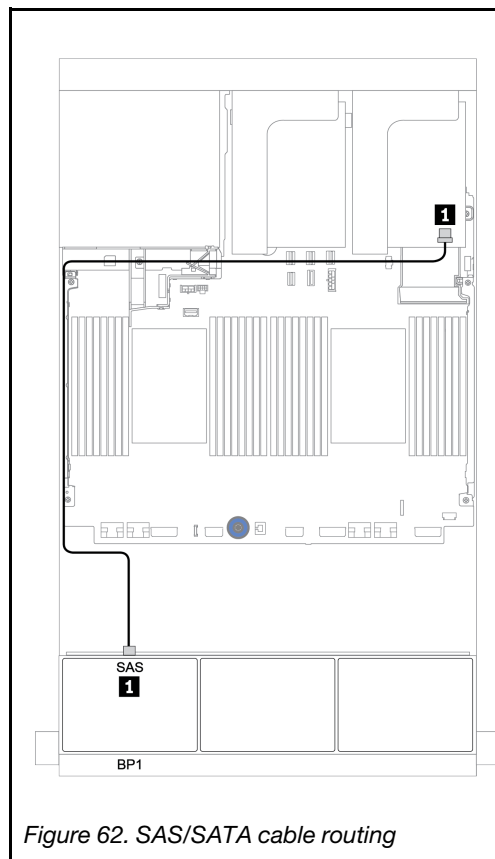
- “8i/16i RAID/HBA adapter + retimer card” on page 125
- “8i/16i RAID/HBA adapter + onboard connectors” on page 123
- “CFF 16i RAID/HBA adapter + onboard connectors” on page 124
- “8i RAID adapter (Trimode)” on page 126

8i/16i RAID/HBA adapter + onboard connectors

The following shows the cable connections for the 8 x 2.5-inch AnyBay configuration with one 8i/16i RAID/HBA adapter and onboard connectors.

From	To
Backplane 1: SAS	8i/16i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 1: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 1: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



CFF 16i RAID/HBA adapter + onboard connectors

The following shows the cable connections for the 8 x 2.5-inch AnyBay configuration with one CFF 16i RAID/HBA adapter and onboard connectors.

From	To
Backplane 1: SAS	CFF 16i RAID/HBA adapter: C0, C1
CFF 16i RAID/HBA adapter: MB	Onboard: PCIe 5
CFF 16i RAID/HBA adapter: PWR	Onboard: RAID PWR
Backplane 1: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 1: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

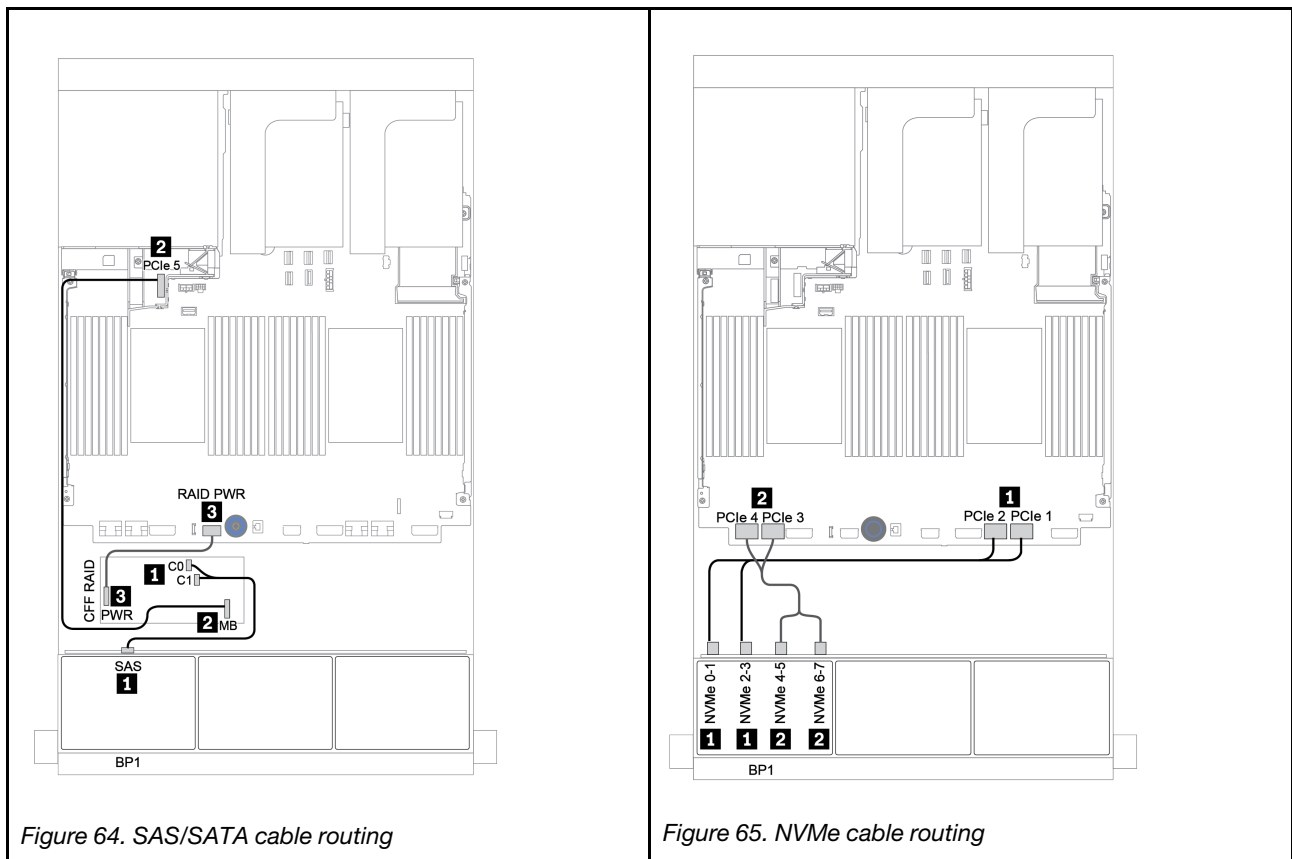


Figure 64. SAS/SATA cable routing

Figure 65. NVMe cable routing

8i/16i RAID/HBA adapter + retimer card

The following shows the cable connections for the 8 x 2.5-inch AnyBay configuration with one 8i/16i RAID/HBA and one retimer card.

From	To
Backplane 1: SAS	8i/16i* RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 1: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 1: NVMe 4-5, 6-7	Retimer card on PCIe slot 1: C0, C1

Note: *If a 16i RAID adapter is used, SAS cable **1** has an extra dummy connector (not shown in below illustration) to connect to the other connector of the 16i RAID adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

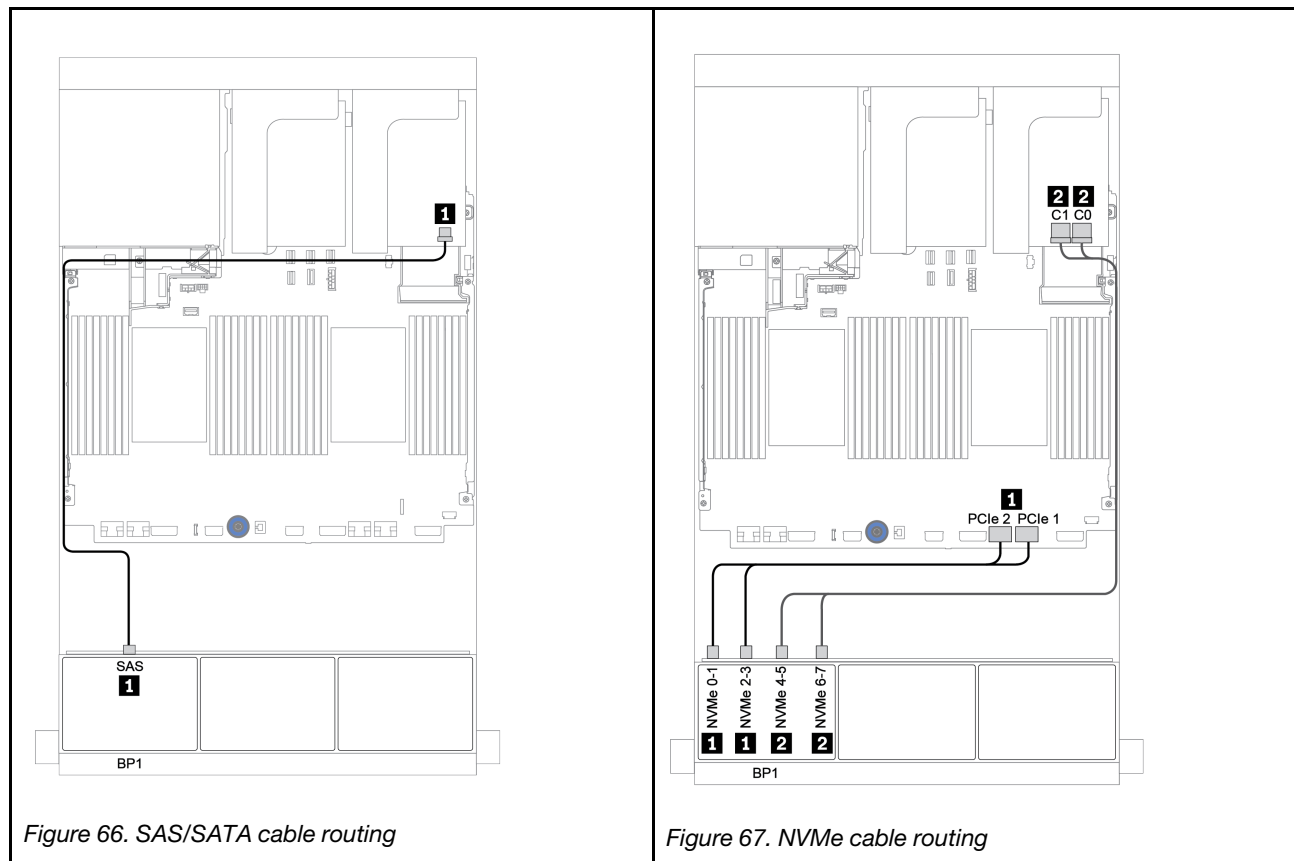


Figure 66. SAS/SATA cable routing

Figure 67. NVMe cable routing

8i RAID adapter (Trimode)

The following shows the cable connections for the 8 x 2.5-inch AnyBay configuration with one Trimode 8i RAID adapter for U.3 drives.

From	To
Backplane 1: SAS	Trimode 8i RAID adapter on PCIe slot 2: C0

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

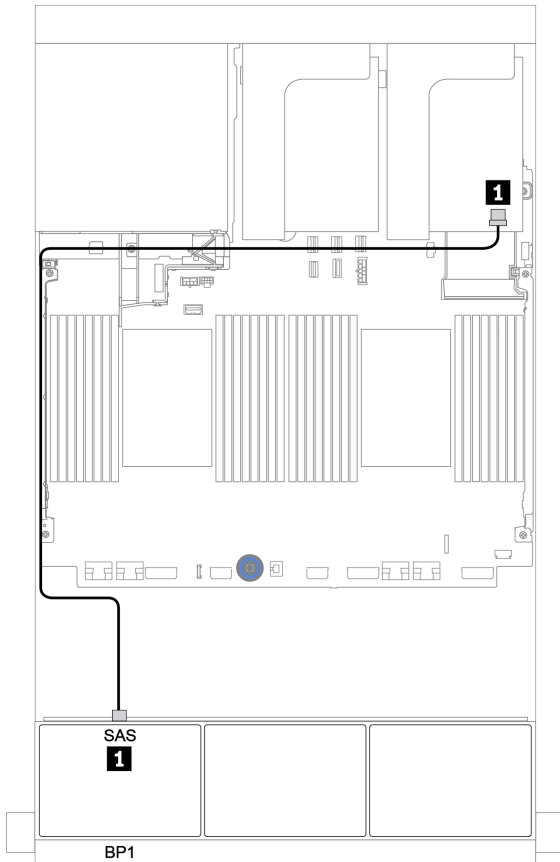


Figure 68. Cable routing for the 8 x 2.5-inch AnyBay configuration with one Trimode 8i RAID adapter

Two 8 x AnyBay backplanes

This section provides cable routing information for the server model with two 8 x 2.5-inch AnyBay front drive backplanes.

8i RAID adapters (Trimode)

The following shows the signal cable connections for the 16 x 2.5-inch AnyBay configuration with two Trimode 8i RAID adapters for U.3 drives.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 2.5-inch drive backplanes” on page 81.

From	To
Backplane 1: SAS	Trimode 8i RAID adapter on PCIe slot 2: C0
Backplane 2: SAS	Trimode 8i RAID adapter on PCIe slot 3: C0

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

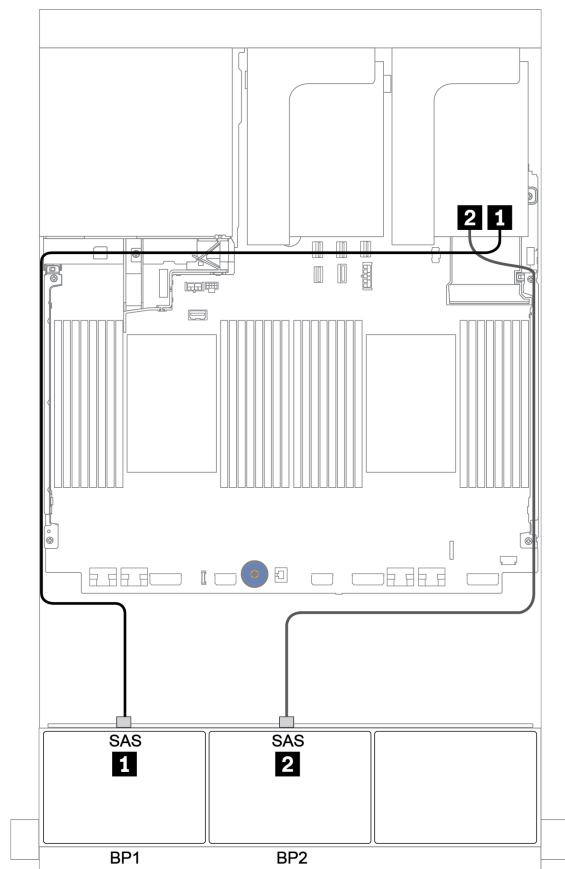


Figure 69. Cable routing for the 16 x 2.5-inch AnyBay configuration with two Trimode 8i RAID adapters

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.

8i RAID adapters (Trimode)

The following shows the signal cable connections for the 24 x 2.5-inch AnyBay configuration with three Trimode 8i RAID adapters for U.3 drives.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 2.5-inch drive backplanes” on page 81.

From	To
Backplane 1: SAS	Trimode 8i RAID adapter on PCIe slot 2: C0
Backplane 2: SAS	Trimode 8i RAID adapter on PCIe slot 3: C0
Backplane 3: SAS	Trimode 8i RAID adapter on PCIe slot 5: C0

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

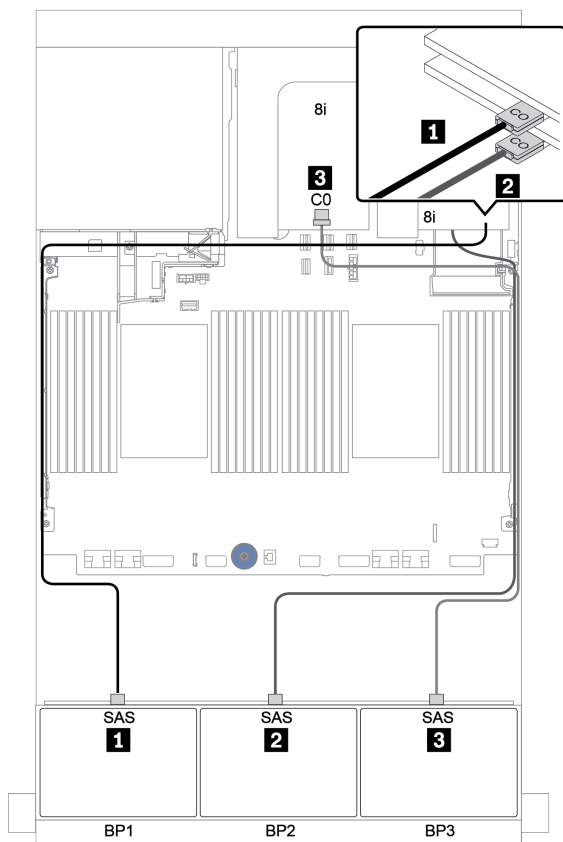


Figure 70. Cable routing for the 24 x 2.5-inch AnyBay configuration with three Trimode 8i RAID adapters

One 8 x SAS/SATA and one 8 x NVMe backplanes

This section provides cable routing information for the server model with one 8 x SAS/SATA front drive backplane and one 8 x NVMe front drive backplane.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 2.5-inch drive backplanes” on page 81.

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration:

- “Onboard connectors + retimer card” on page 133
- “8i/16i RAID/HBA adapter + retimer card” on page 134
- “Onboard connectors” on page 130
- “8i/16i RAID/HBA adapter + onboard connectors” on page 131
- “CFF 16i RAID/HBA adapter + onboard connectors” on page 132

Onboard connectors

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch NVMe configuration with onboard connectors.

From	To
Backplane 1: SAS	Onboard: SATA 0, SATA 1
Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

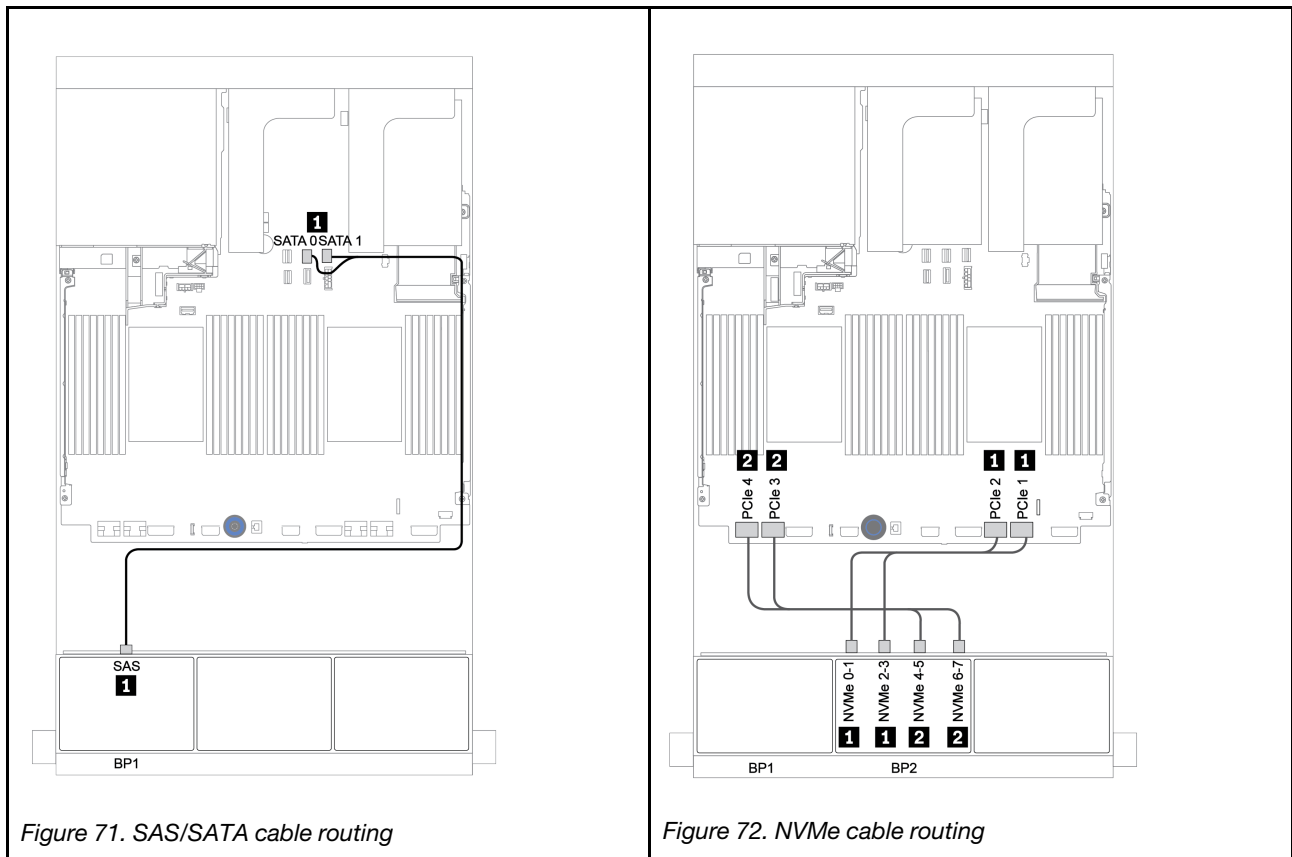


Figure 71. SAS/SATA cable routing

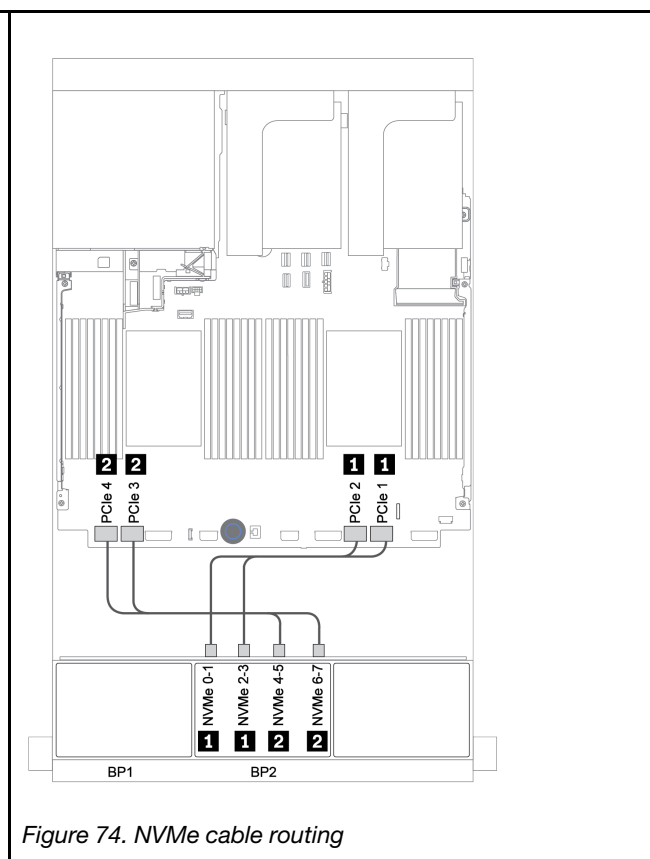
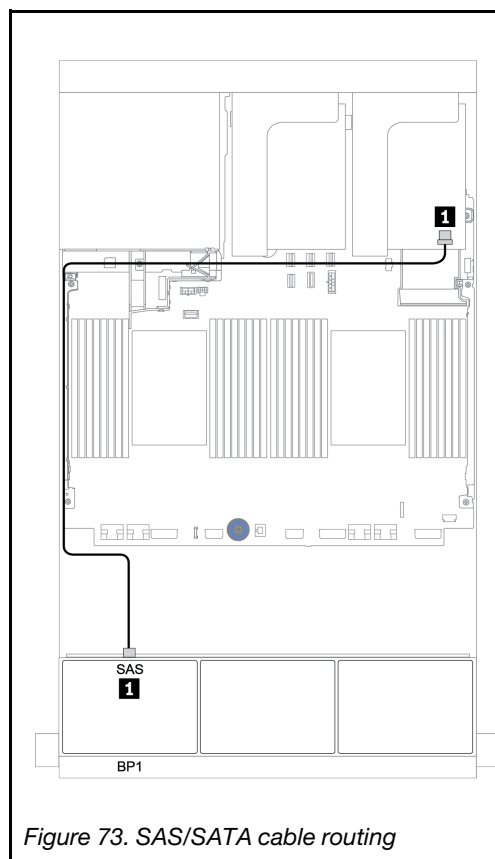
Figure 72. NVMe cable routing

8i/16i RAID/HBA adapter + onboard connectors

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch NVMe configuration with one 8i/16i RAID/HBA adapter.

From	To
Backplane 1: SAS	8i/16i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



CFF 16i RAID/HBA adapter + onboard connectors

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch NVMe configuration with one CFF 16i RAID/HBA adapter.

From	To
Backplane 1: SAS	CFF 16i RAID/HBA adapter: C0, C1
CFF 16i RAID/HBA adapter: MB	Onboard: PCIe 5
CFF 16i RAID/HBA adapter: PWR	Onboard: RAID PWR
Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

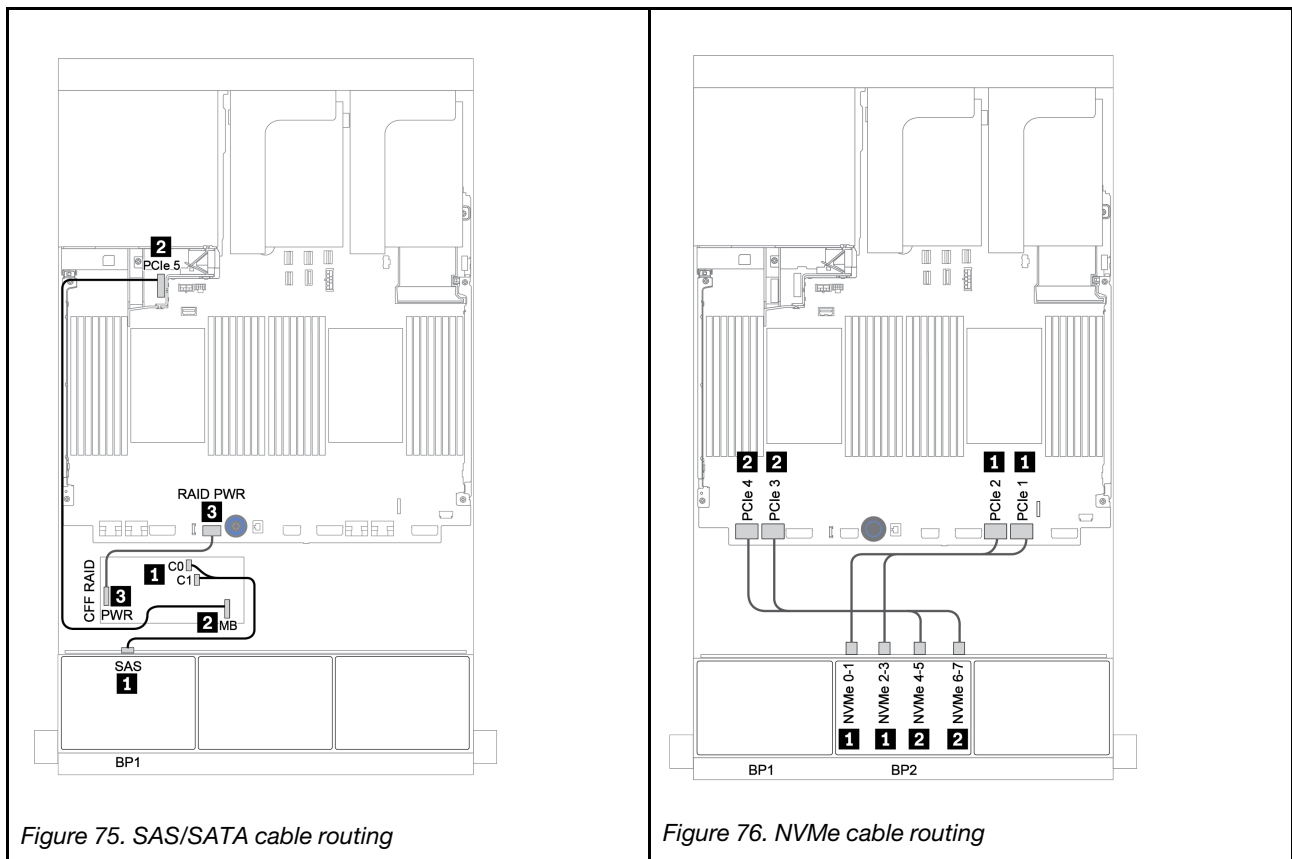


Figure 75. SAS/SATA cable routing

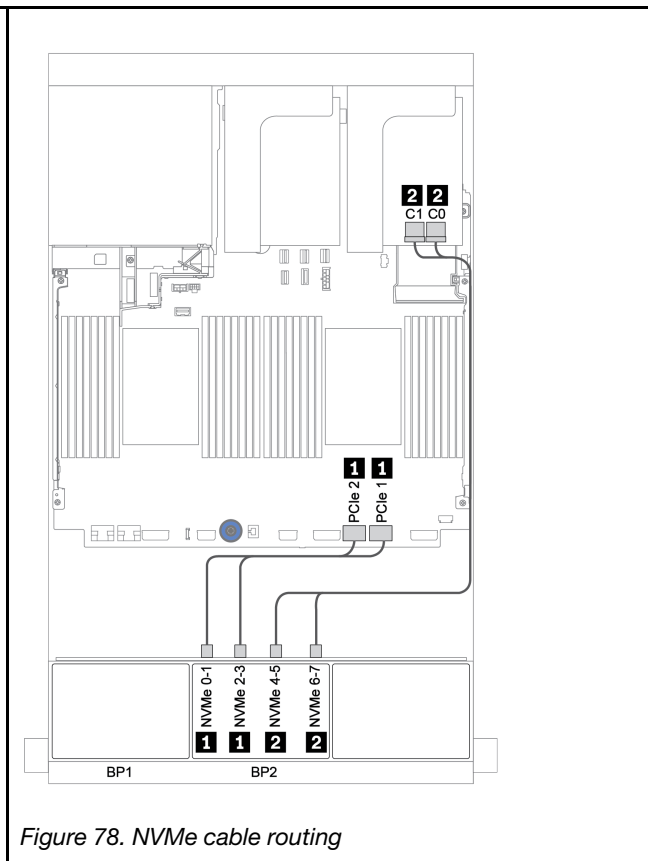
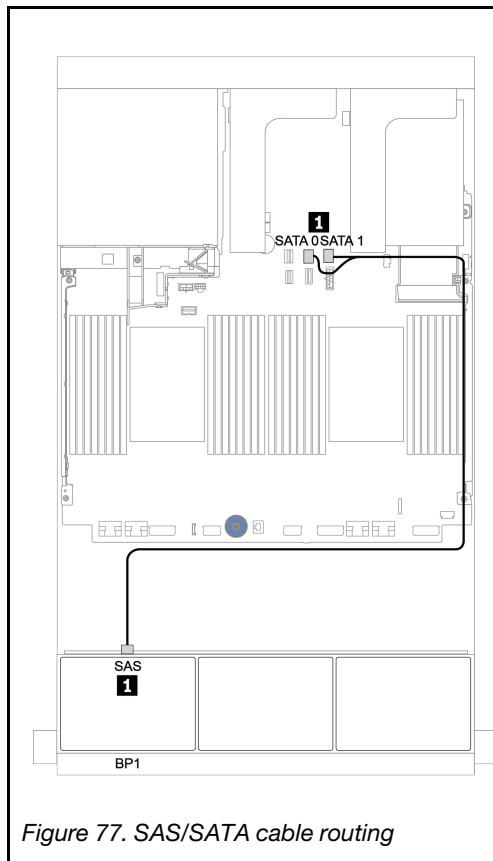
Figure 76. NVMe cable routing

Onboard connectors + retimer card

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch NVMe configuration with one retimer card.

From	To
Backplane 1: SAS	Onboard: SATA 0, SATA 1
Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 2: NVMe 4-5, 6-7	Retimer card on PCIe slot 1: C0, C1

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



8i/16i RAID/HBA adapter + retimer card

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch NVMe configuration with one 8i/16i RAID/HBA adapter and one retimer card.

From	To
Backplane 1: SAS	8i/16i* RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 2: NVMe 4-5, 6-7	Retimer card on PCIe slot 1: C0, C1

Note: *If a 16i RAID adapter is used, SAS cable **1** has an extra dummy connector (not shown in below illustration) to connect to the other connector of the 16i RAID adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

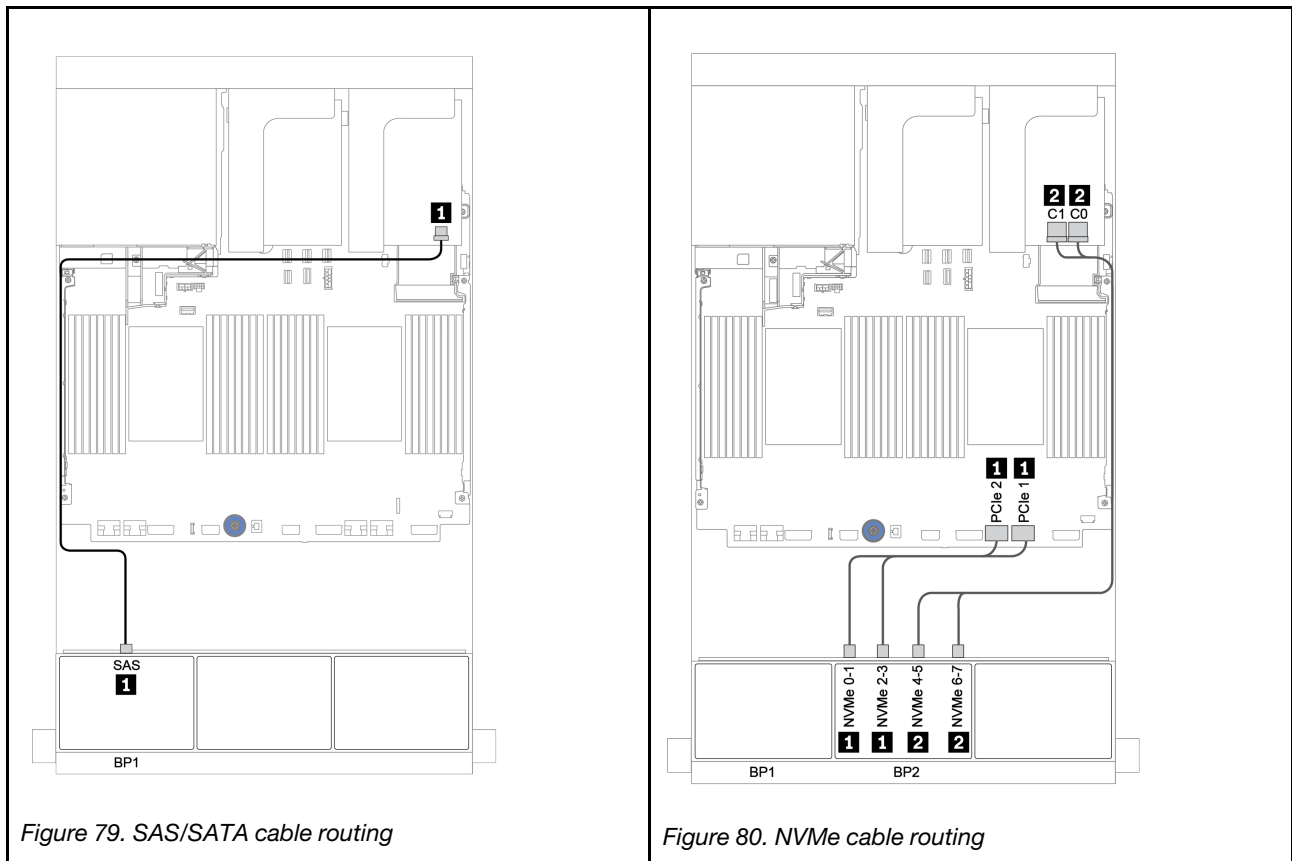


Figure 79. SAS/SATA cable routing

Figure 80. NVMe cable routing

One 8 x SAS/SATA and one 8 x AnyBay backplanes

This section provides cable routing information for the server model with one 8 x SAS/SATA and one 8 x AnyBay front drive backplanes.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 2.5-inch drive backplanes” on page 81.

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration:

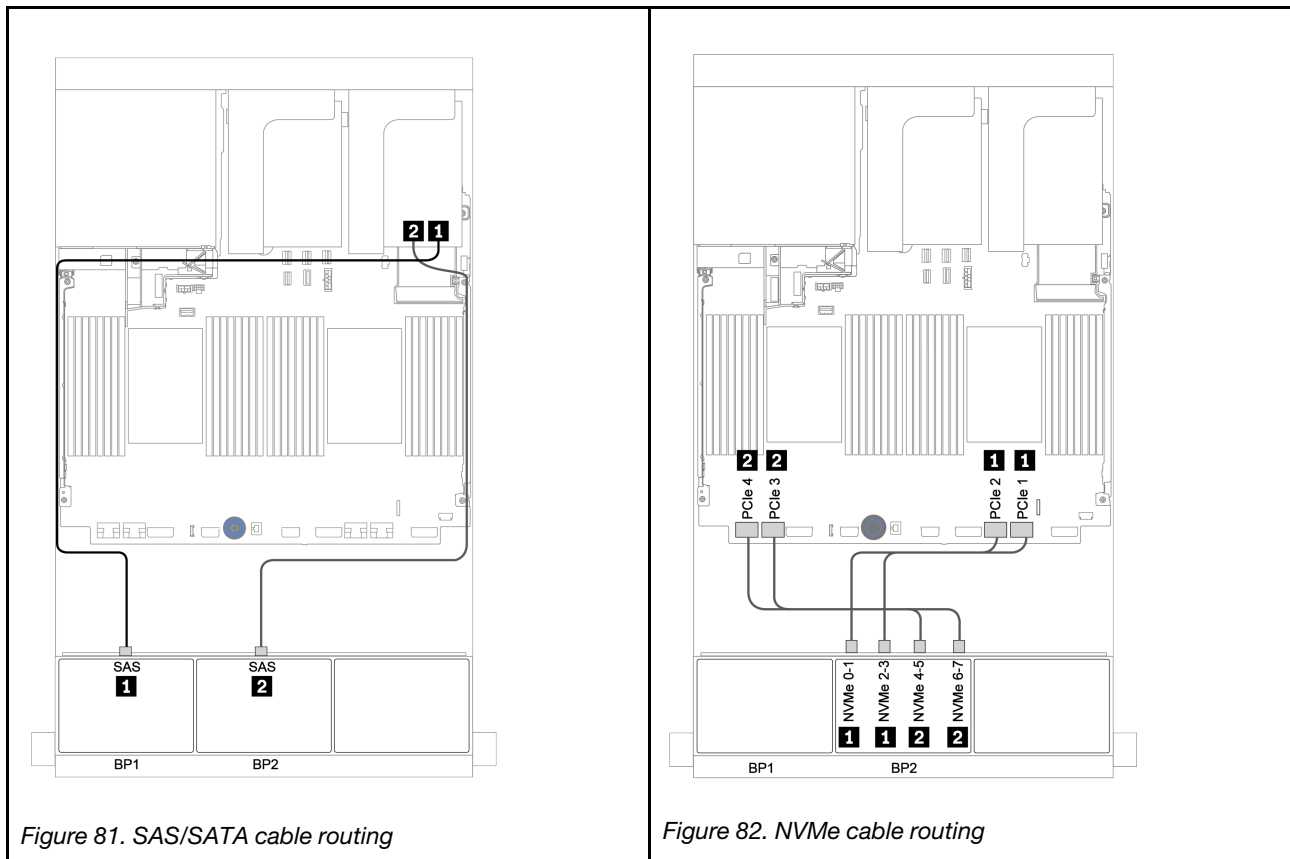
- “8i/16i RAID/HBA adapter + retimer card” on page 138
- “8i/16i/32i RAID/HBA adapter + onboard connectors” on page 136
- “CFF 16i RAID/HBA adapter” on page 137
- “Onboard connectors + 8i RAID adapter (Trimode)” on page 139
- “8i/16i RAID/HBA adapter + 8i RAID adapter (Trimode)” on page 140
- “CFF 16i RAID/HBA adapter + 8i RAID adapter (Trimode)” on page 141

8i/16i/32i RAID/HBA adapter + onboard connectors

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay configuration with two 8i RAID/HBA adapters or one 16i/32i RAID/HBA adapter.

From	To		
Backplane 1: SAS	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> Gen 3: C0C1 Gen 4: C0 	16i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> Gen 3: C0C1 Gen 4: C0 	32i RAID adapter on PCIe slot 2: C0
Backplane 2: SAS	8i RAID/HBA adapter on PCIe slot 3: <ul style="list-style-type: none"> Gen 3: C0C1 Gen 4: C0 	<ul style="list-style-type: none"> Gen 3: C2C3 Gen 4: C1 	32i RAID adapter on PCIe slot 2: C1
Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2		
Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4		

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



CFF 16i RAID/HBA adapter

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay configuration with one CFF 16i RAID/HBA adapter.

From	To
Backplane 1: SAS	CFF 16i RAID/HBA adapter: C0, C1
Backplane 2: SAS	CFF 16i RAID/HBA adapter: C2, C3
CFF 16i RAID/HBA adapter: MB	Onboard: PCIe 5
CFF 16i RAID/HBA adapter: PWR	Onboard: RAID PWR
Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

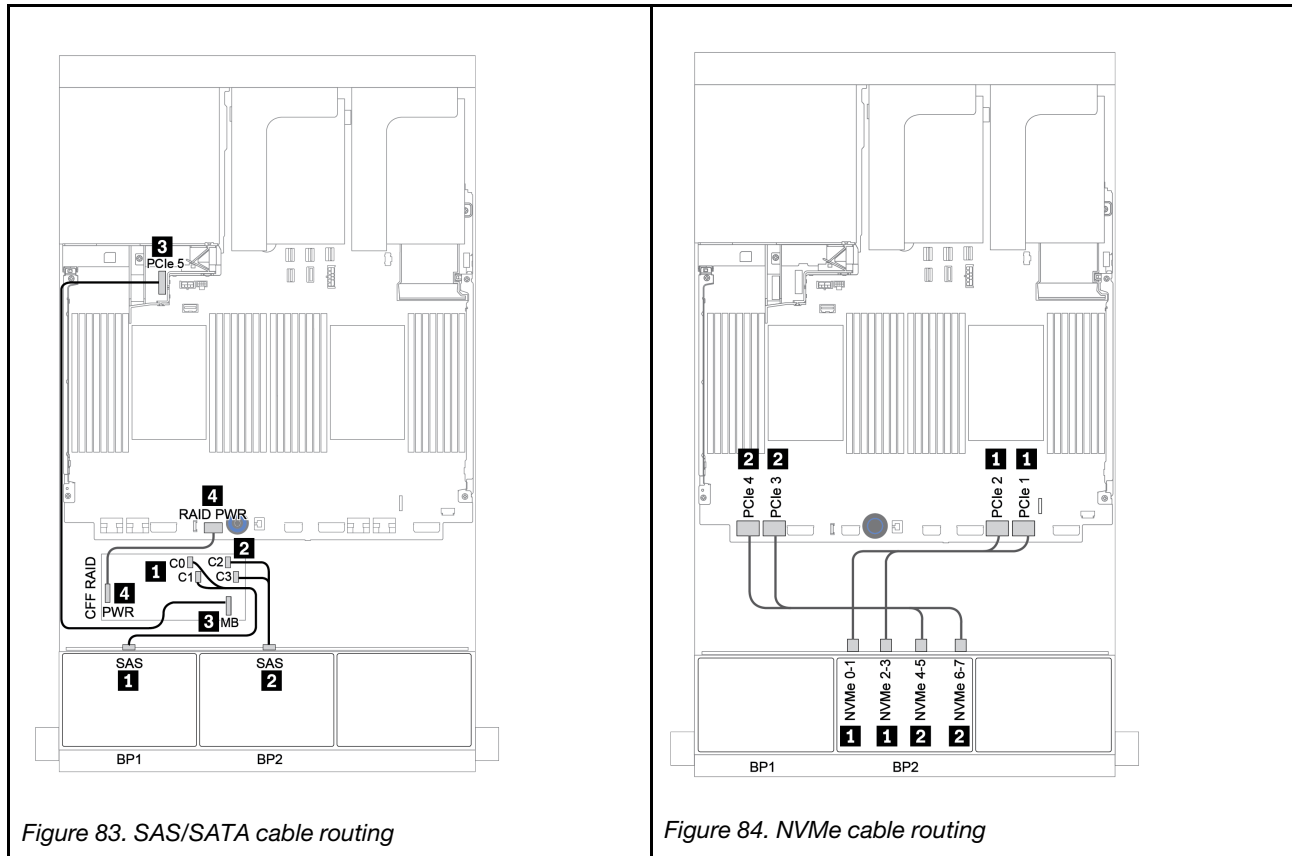


Figure 83. SAS/SATA cable routing

Figure 84. NVMe cable routing

8i/16i RAID/HBA adapter + retimer card

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay configuration with one retimer card and two 8i RAID/HBA adapters or one 16i RAID/HBA adapter

From	To	
Backplane 1: SAS	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> Gen 3: C0C1 Gen 4: C0 	16i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> Gen 3: C0C1 Gen 4: C0
Backplane 2: SAS	8i RAID/HBA adapter on PCIe slot 3: <ul style="list-style-type: none"> Gen 3: C0C1 Gen 4: C0 	<ul style="list-style-type: none"> Gen 3: C2C3 Gen 4: C1
Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2	
Backplane 2: NVMe 4-5, 6-7	Retimer card on PCIe slot 1: C0, C1	

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

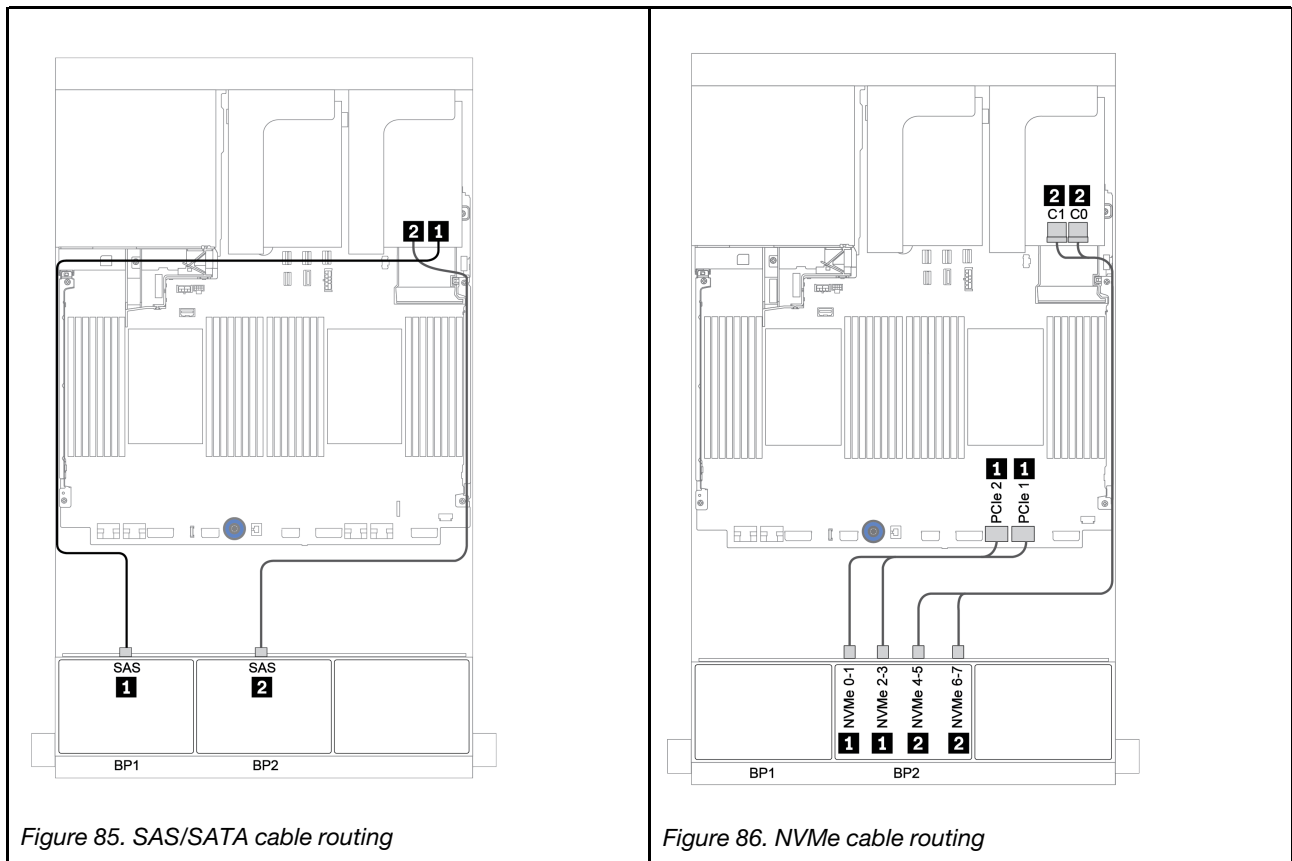


Figure 85. SAS/SATA cable routing

Figure 86. NVMe cable routing

Onboard connectors + 8i RAID adapter (Trimode)

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay configuration with one Trimode 8i RAID adapter for U.3 drives.

From	To
Backplane 1: SAS	Onboard: SATA 0, SATA 1
Backplane 2: SAS	Trimode 8i RAID adapter on PCIe slot 2: C0

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

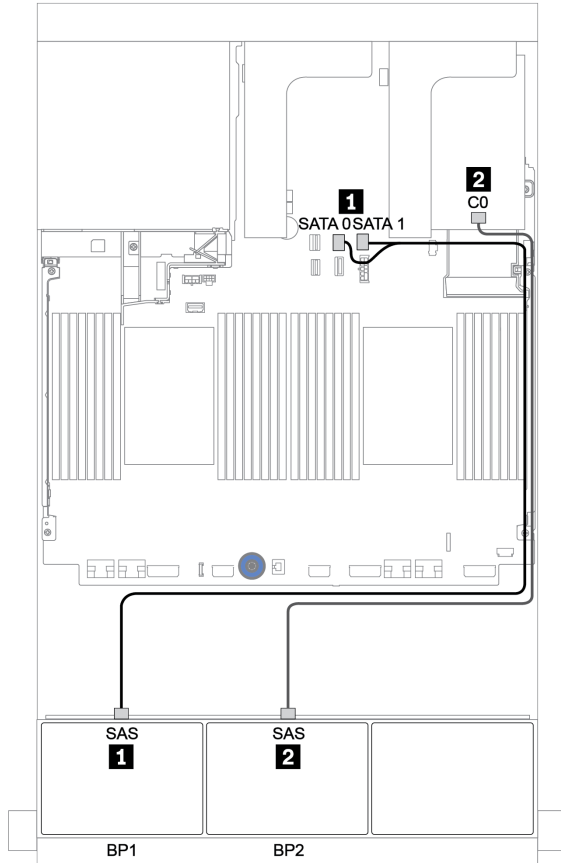


Figure 87. Cable routing for the 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay configuration with one Trimode 8i RAID adapter

8i/16i RAID/HBA adapter + 8i RAID adapter (Trimode)

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay configuration with one 8i/16i RAID/HBA adapter and one Trimode 8i RAID adapter for U.3 drives.

From	To
Backplane 1: SAS	8i/16i* RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 2: SAS	Trimode 8i RAID adapter on PCIe slot 3: C0

Note: *If a 16i RAID adapter is used, SAS cable **1** has an extra dummy connector (not shown in below illustration) to connect to the other connector of the 16i RAID adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

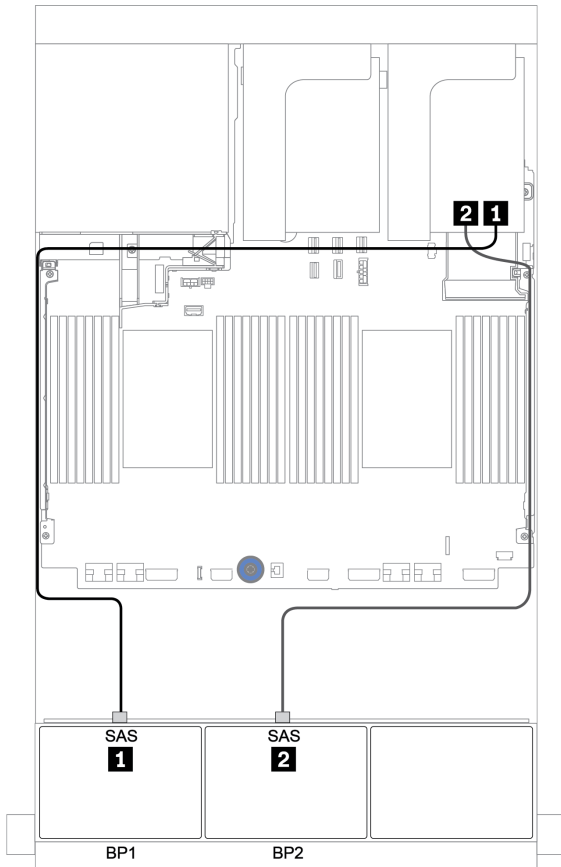


Figure 88. Cable routing for the 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay configuration with one 8i/16i RAID/HBA adapter and one Trimode 8i RAID adapter

CFF 16i RAID/HBA adapter + 8i RAID adapter (Trimode)

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay configuration with one CFF 16i RAID/HBA adapter and one Trimode 8i RAID adapter for U.3 drives.

From	To
Backplane 1: SAS	CFF 16i RAID/HBA adapter: C0, C1
CFF 16i RAID/HBA adapter: MB	Onboard: PCIe 3
CFF 16i RAID/HBA adapter: PWR	Onboard: RAID PWR
Backplane 2: SAS	Trimode 8i RAID adapter on PCIe slot 2: C0

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

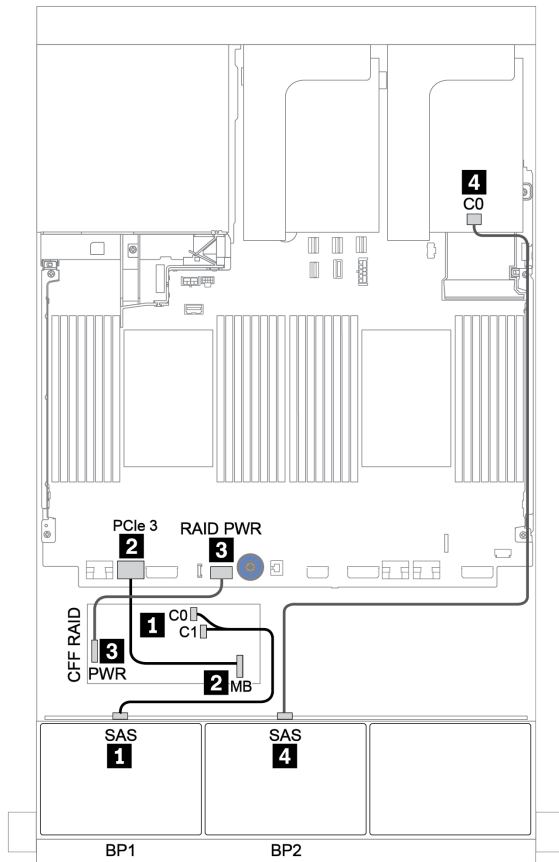


Figure 89. Cable routing for the 8 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay configuration with one CFF 16i RAID/HBA adapter and one Trimode 8i RAID adapter

One 8 x AnyBay and one 8 x NVMe backplanes

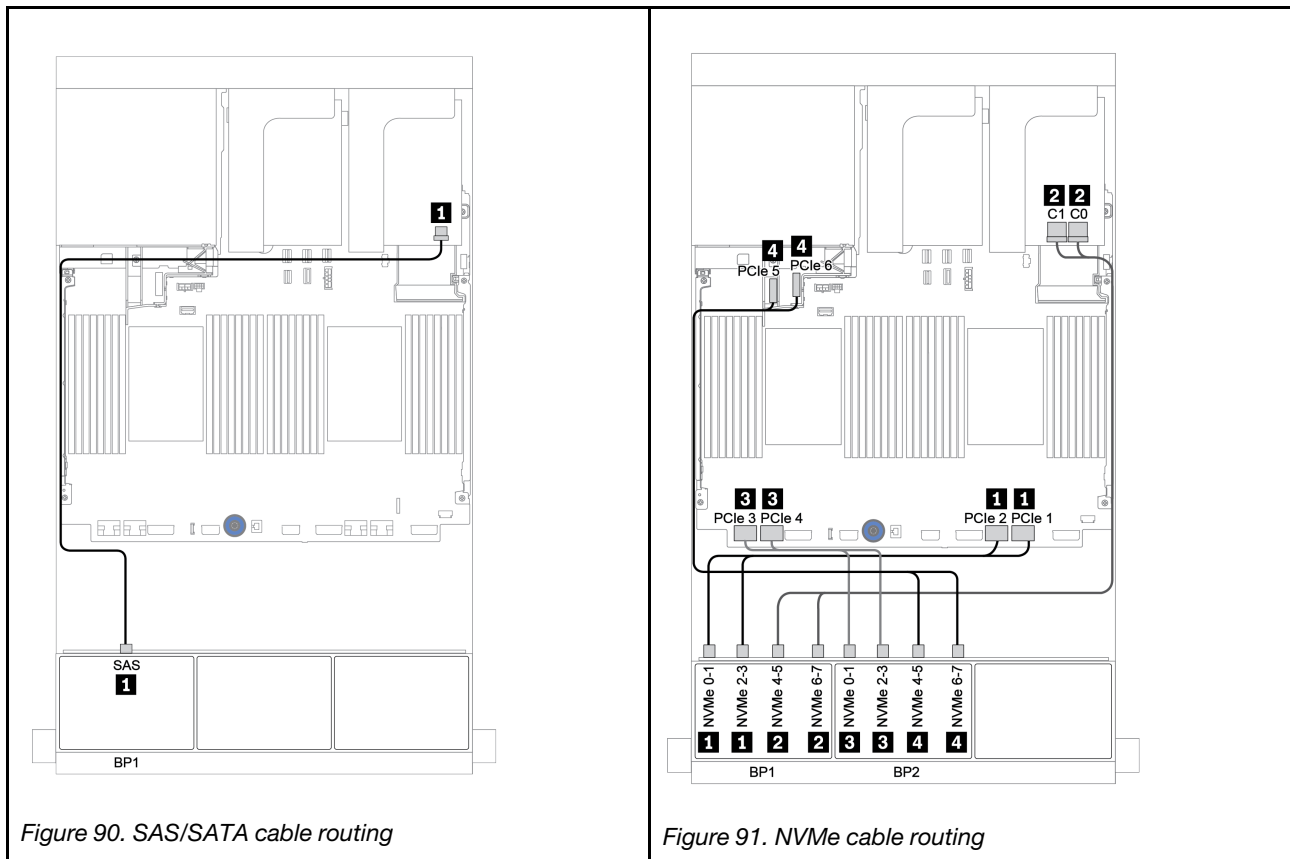
This section provides cable routing information for the server model with one 8 x AnyBay front drive backplane and one 8 x NVMe front drive backplane.

One 8i/16i RAID/HBA adapter + onboard connectors + one retimer card

From	To
Backplane 1: SAS	8i/16i* RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 1: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 1: NVMe 4-5, 6-7	Retimer card on PCIe slot 1: C0, C1
Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 3, PCIe 4
Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 5, PCIe 6

Note: *If a 16i RAID adapter is used, SAS cable **1** has an extra dummy connector (not shown in below illustration) to connect to the other connector of the 16i RAID adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



One 8 x SAS/SATA and two 8 x NVMe backplanes

This section provides cable routing information for the server model with one 8 x SAS/SATA front drive backplane and two 8 x NVMe front drive backplanes.

8i/16i RAID/HBA adapter + retimer card

The following shows the signal cable connections for the 8 x 2.5-inch SAS/SATA + 16 x 2.5-inch NVMe configuration with one 8i/16i RAID/HBA adapter and one retimer card.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 2.5-inch drive backplanes” on page 81.

From	To
Backplane 1: SAS	8i/16i* RAID/HBA adapter on PCIe slot 5: <ul style="list-style-type: none">• Gen 3: C0C1• Gen 4: C0
Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 2: NVMe 4-5, 6-7	Retimer card on PCIe slot 1: C0, C1
Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 3, PCIe 4
Backplane 3: NVMe 4-5, 6-7	Onboard: PCIe 5, PCIe 6

Note: *If a 16i RAID adapter is used, SAS cable **1** has an extra dummy connector (not shown in below illustration) to connect to the other connector of the 16i RAID adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

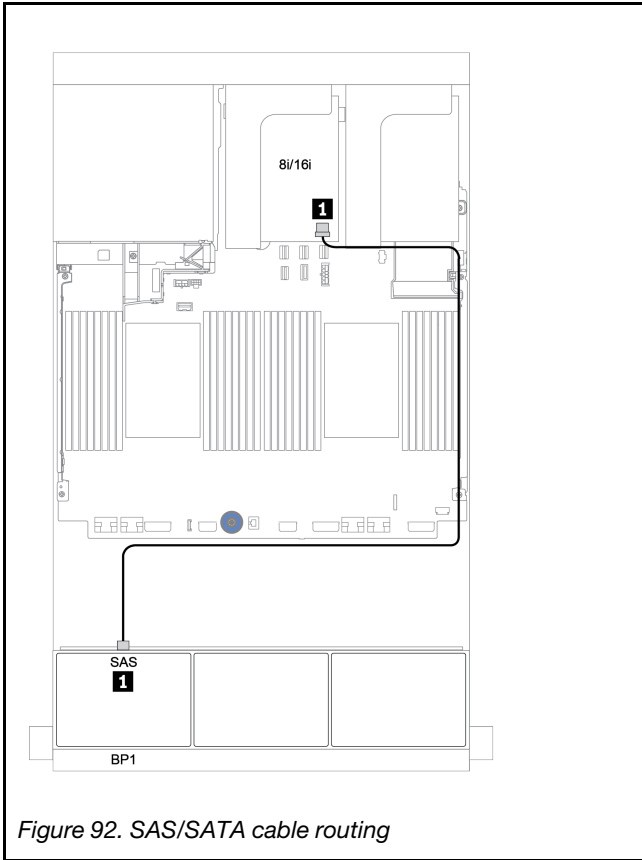


Figure 92. SAS/SATA cable routing

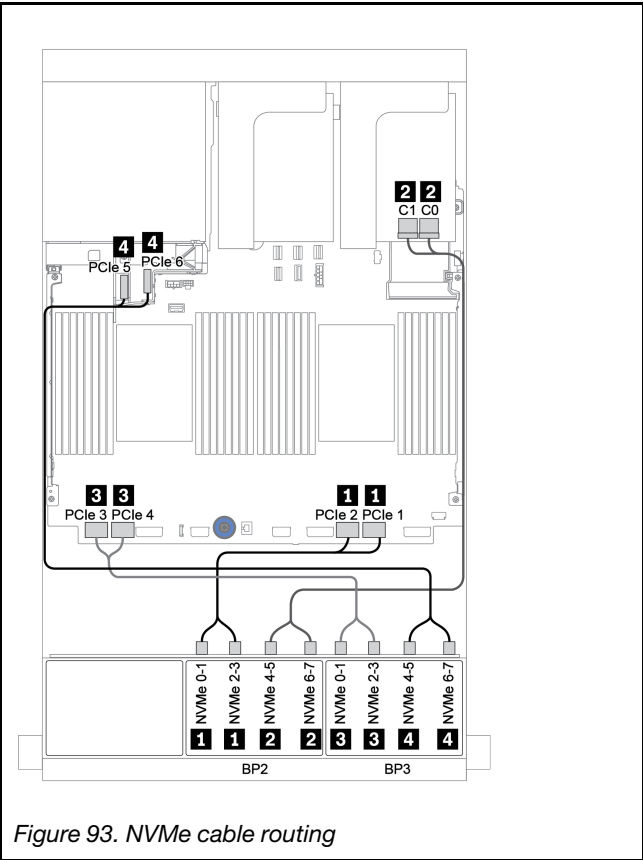


Figure 93. NVMe cable routing

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 SAS/SATA and two 8 x AnyBay front drive backplanes.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 2.5-inch drive backplanes” on page 81.

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 + 8i RAID adapters (Trimode)” on page 146
- “8i/16i RAID/HBA adapter + 16i RAID adapter (Trimode)” on page 147

8i/16i RAID/HBA adapter + 8i RAID adapters (Trimode)

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA + 16 x 2.5-inch AnyBay configuration with one 8i/16i RAID/HBA adapter and two Trimode 8i RAID adapters for U.3 drives.

From	To
Backplane 1: SAS	8i/16i* RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 2: SAS	Trimode 8i RAID adapter on PCIe slot 3: C0
Backplane 2: SAS	Trimode 8i RAID adapter on PCIe slot 5: C0

Note: *If a 16i RAID adapter is used, SAS cable **1** has an extra dummy connector (not shown in below illustration) to connect to the other connector of the 16i RAID adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

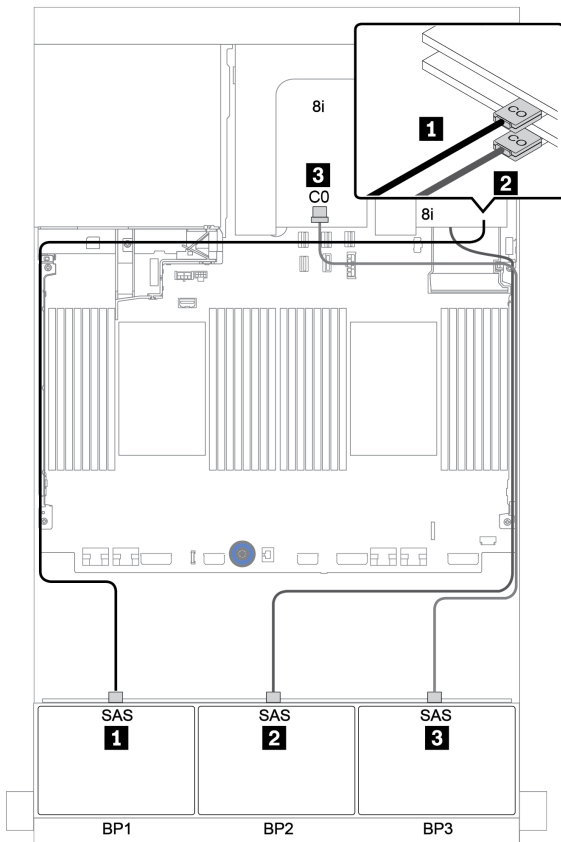


Figure 94. Cable routing for the 8 x 2.5-inch SAS/SATA + 16 x 2.5-inch AnyBay configuration with one 8i/16i RAID/HBA adapter and two Trimode 8i RAID adapters

8i/16i RAID/HBA adapter + 16i RAID adapter (Trimode)

The following shows the cable connections for the 8 x 2.5-inch SAS/SATA + 16 x 2.5-inch AnyBay configuration with one 8i/16i RAID/HBA adapter and one Trimode 16i RAID adapter for U.3 drives.

From	To
Backplane 1: SAS	8i/16i* RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 2: SAS	Trimode 16i RAID adapter on PCIe slot 3: C0
Backplane 2: SAS	Trimode 16i RAID adapter on PCIe slot 3: C1

Note: *If a 16i RAID adapter is used, SAS cable **1** has an extra dummy connector (not shown in below illustration) to connect to the other connector of the 16i RAID adapter.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

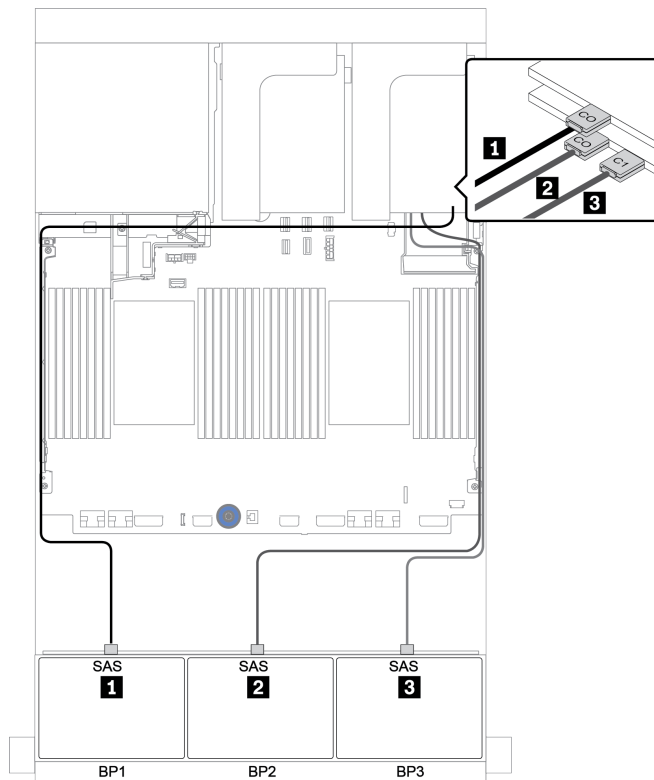


Figure 95. Cable routing for the 8 x 2.5-inch SAS/SATA + 16 x 2.5-inch AnyBay configuration with one 8i/16i RAID/HBA adapter and one Trimode 16i RAID adapter

Two 8 x SAS/SATA and one 8 x NVMe backplanes

This section provides cable routing information for the server model with two 8 x SAS/SATA front drive backplanes and one 8 x NVMe front drive backplane.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 2.5-inch drive backplanes” on page 81.

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration:

- “CFF expander + 8i RAID/HBA adapter + retimer card” on page 151
- “CFF expander + 8i RAID/HBA adapter + onboard connectors” on page 150
- “CFF 16i RAID/HBA adapter + onboard connectors” on page 149

CFF 16i RAID/HBA adapter + onboard connectors

The following shows the cable connections for the 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch NVMe configuration with one CFF 16i RAID/HBA adapter and onboard connectors.

From	To
Backplane 1: SAS	CFF 16i RAID/HBA adapter: C0, C1
Backplane 2: SAS	CFF 16i RAID/HBA adapter: C2, C3
CFF 16i RAID/HBA adapter: MB	Onboard: PCIe 5
CFF 16i RAID/HBA adapter: PWR	Onboard: RAID PWR
Backplane 2: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 2: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

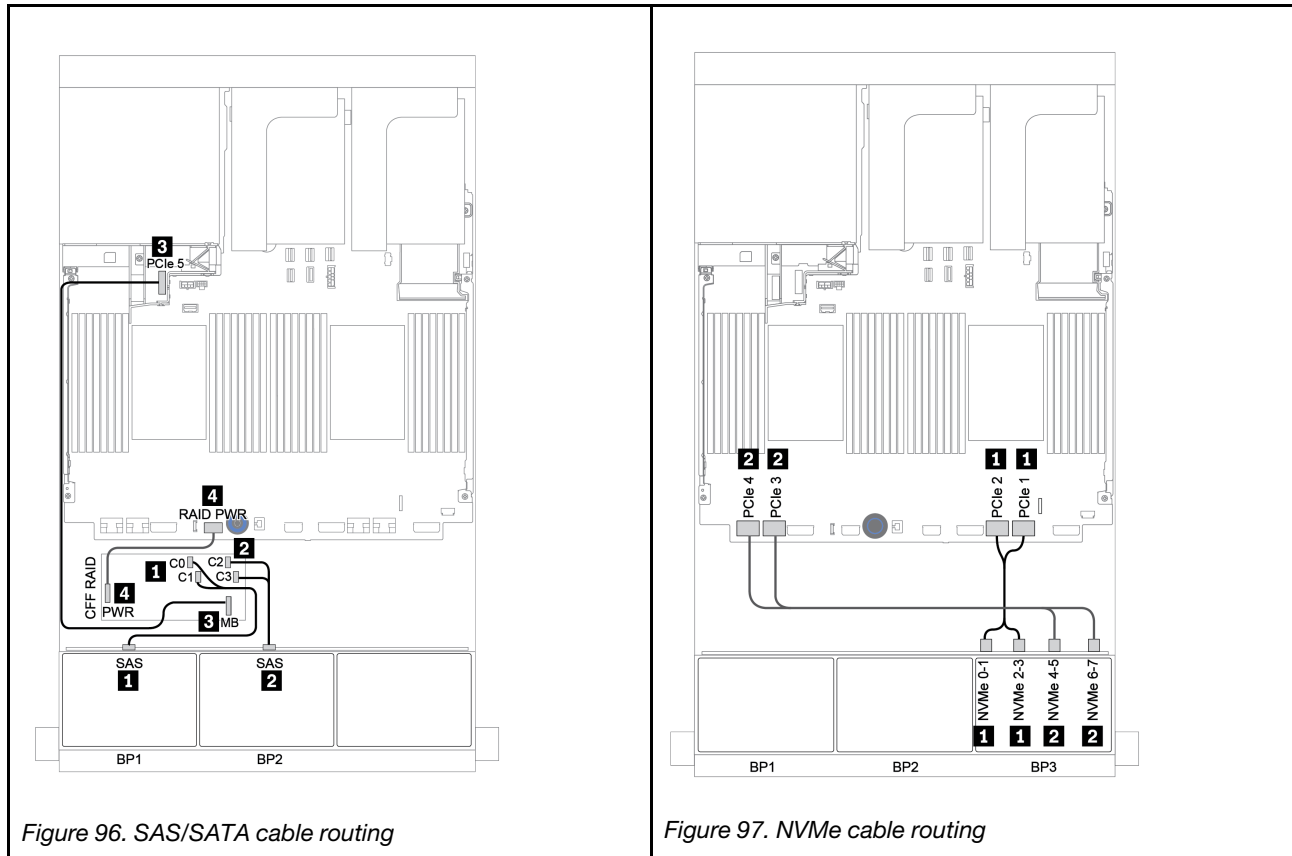


Figure 96. SAS/SATA cable routing

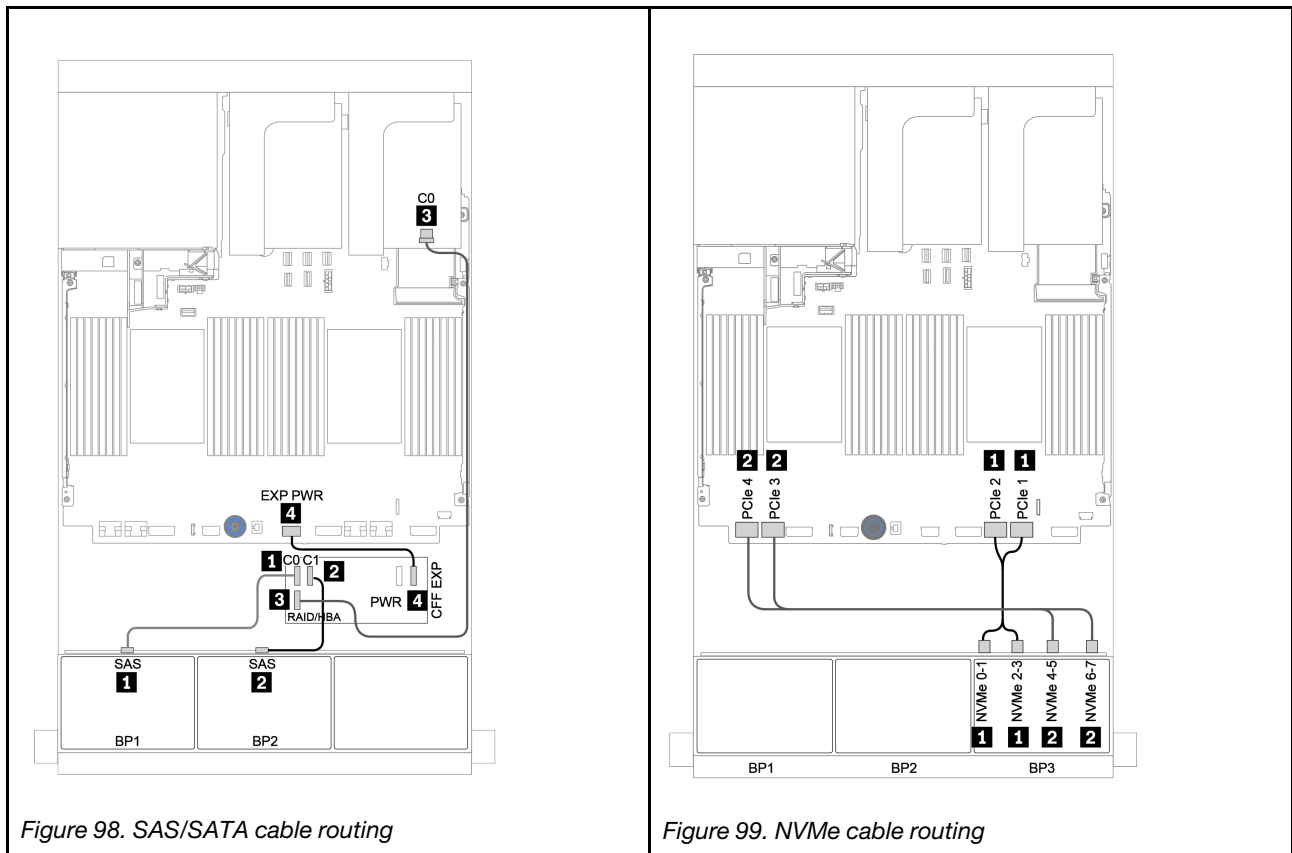
Figure 97. NVMe cable routing

CFF expander + 8i RAID/HBA adapter + onboard connectors

The following shows the cable connections for the 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch NVMe configuration with one CFF expander, one 8i RAID/HBA adapter, and onboard connectors.

From	To
Backplane 1: SAS	CFF expander: C0
Backplane 2: SAS	CFF expander: C1
CFF expander: RAID/HBA	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
CFF expander: PWR	Onboard: EXP PWR
Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 3: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

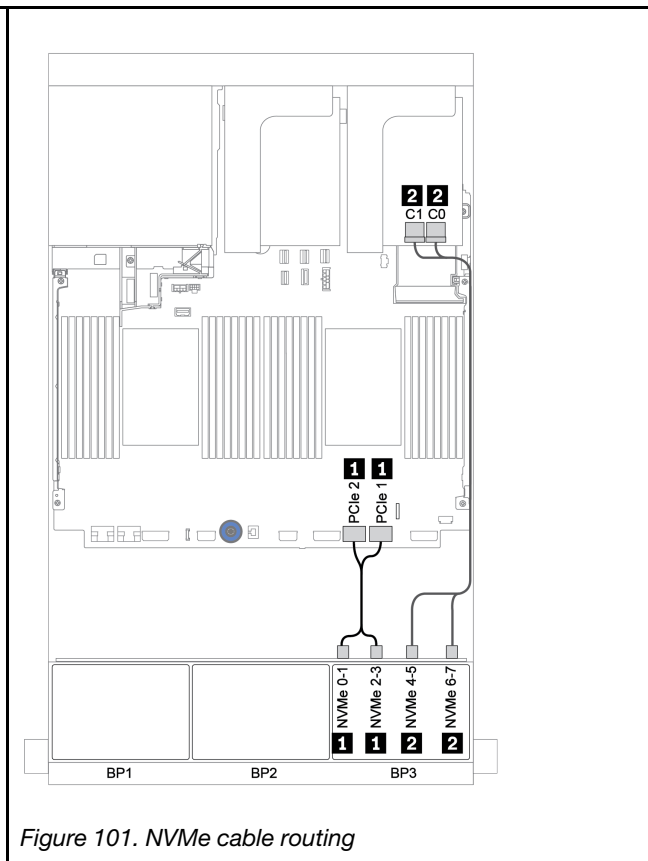
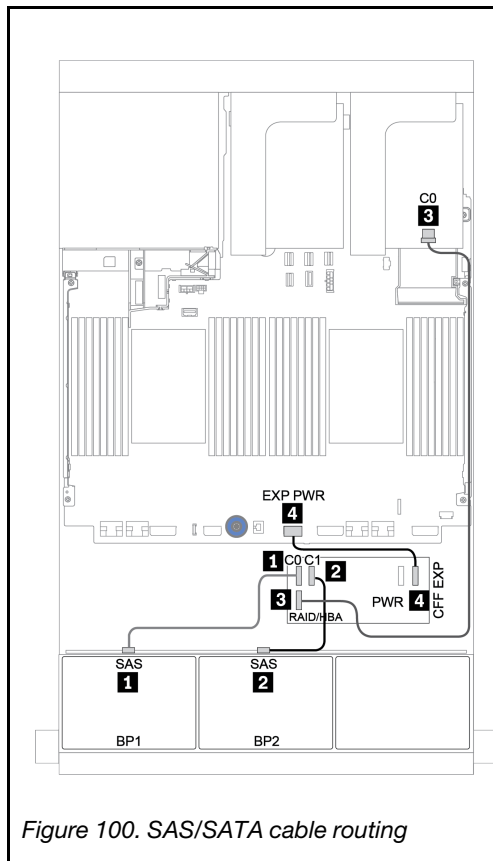


CFF expander + 8i RAID/HBA adapter + retimer card

The following shows the cable connections for the 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch NVMe configuration with one CFF expander, one 8i RAID/HBA adapter, and one retimer card.

From	To
Backplane 1: SAS	CFF expander: C0
Backplane 2: SAS	CFF expander: C1
CFF expander: RAID/HBA	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
CFF expander: PWR	Onboard: EXP PWR
Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 3: NVMe 4-5, 6-7	Retimer card on PCIe slot 1: C0, C1

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



Two 8 x SAS/SATA and one 8 x AnyBay backplanes

This section provides cable routing information for the server model with two 8 x SAS/SATA and one 8 x AnyBay front drive backplanes.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 2.5-inch drive backplanes” on page 81.

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration:

- “Front backplanes: 16 x SAS/SATA + 8 x AnyBay” on page 153
- “Front + rear backplane: 16 x SAS/SATA + 8 x AnyBay + 4 x SAS/SATA” on page 164

Front backplanes: 16 x SAS/SATA + 8 x AnyBay

- “8i RAID/HBA adapters + onboard connectors” on page 154
- “32i RAID/HBA adapter + onboard connectors” on page 156
- “CFF expander + 8i RAID/HBA adapter + onboard connectors” on page 157
- “CFF 16i RAID/HBA adapter + CFF expander + onboard connectors” on page 159
- “32i RAID/HBA adapter + retimer card” on page 161
- “CFF expander + 8i RAID/HBA adapter + retimer card” on page 162

8i RAID/HBA adapters + onboard connectors

Front backplanes: 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay

SAS/SATA cable routing

From	To
Backplane 1: SAS	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 2: SAS	8i RAID/HBA adapter on PCIe slot 3: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 3: SAS	8i RAID/HBA adapter on PCIe slot 5: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

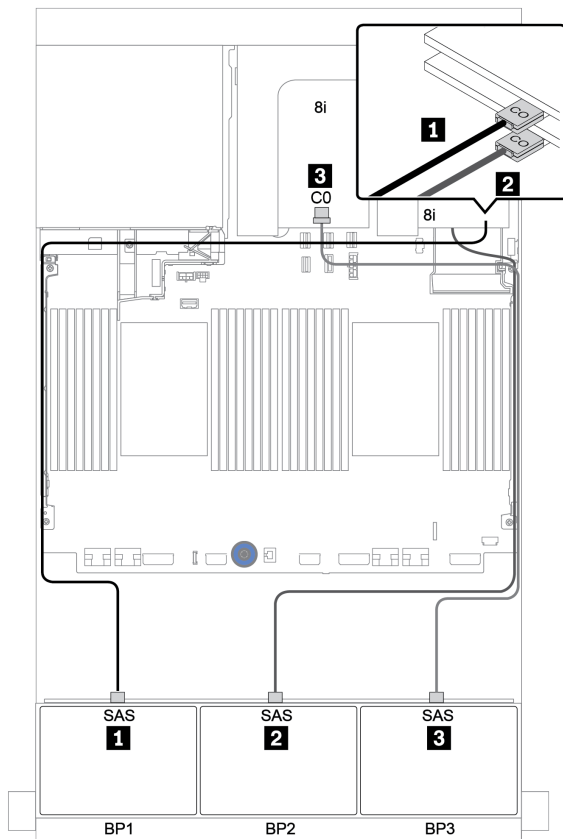


Figure 102. SAS/SATA cable routing

NVMe cable routing

From	To
Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 3: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

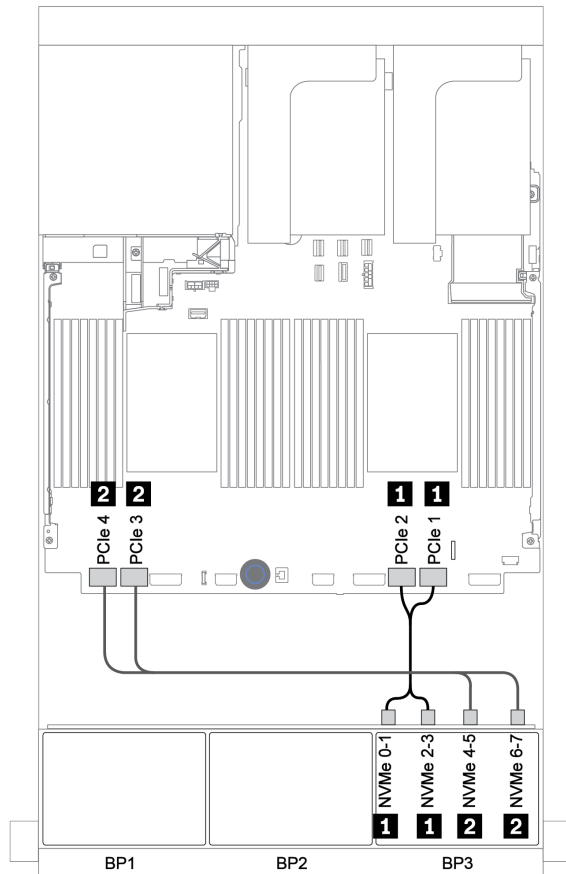


Figure 103. NVMe cable routing (two processors)

32i RAID/HBA adapter + onboard connectors

Front backplanes: 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay

From	To
Backplane 1: SAS	32i RAID adapter on PCIe slot 2: C0
Backplane 2: SAS	32i RAID adapter on PCIe slot 2: C1
Backplane 3: SAS	32i RAID adapter on PCIe slot 2: C2
Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 3: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

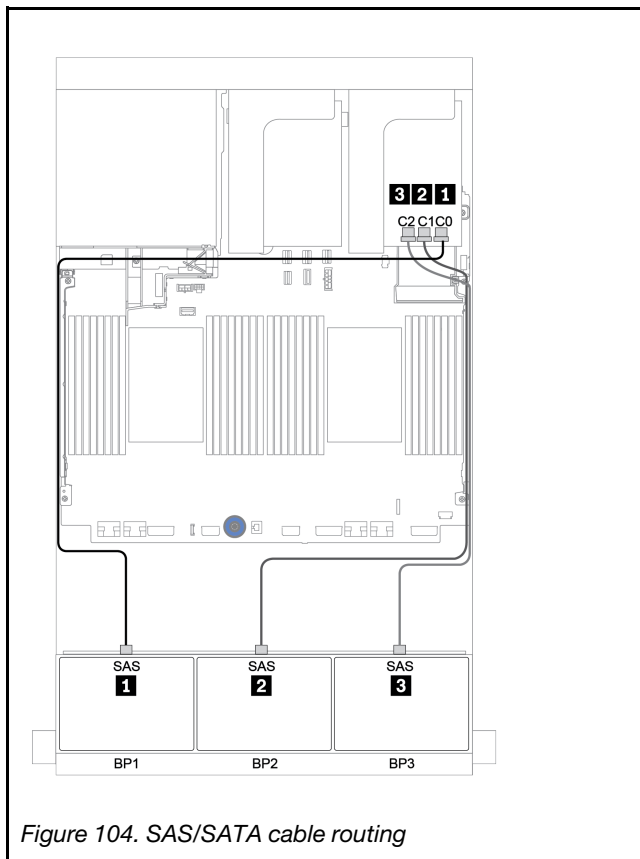


Figure 104. SAS/SATA cable routing

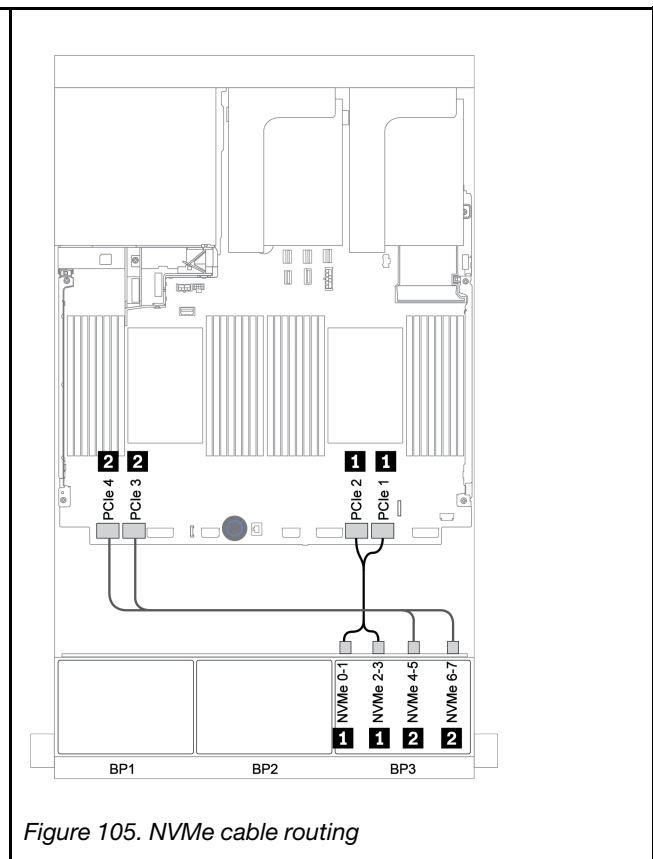


Figure 105. NVMe cable routing

CFF expander + 8i RAID/HBA adapter + onboard connectors

Front backplanes: 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay

SAS/SATA cable routing

From	To
Backplane 1: SAS	CFF expander: C0
Backplane 2: SAS	CFF expander: C1
Backplane 3: SAS	CFF expander: C2
CFF expander: RAID/HBA	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
CFF expander: PWR	Onboard: EXP PWR

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

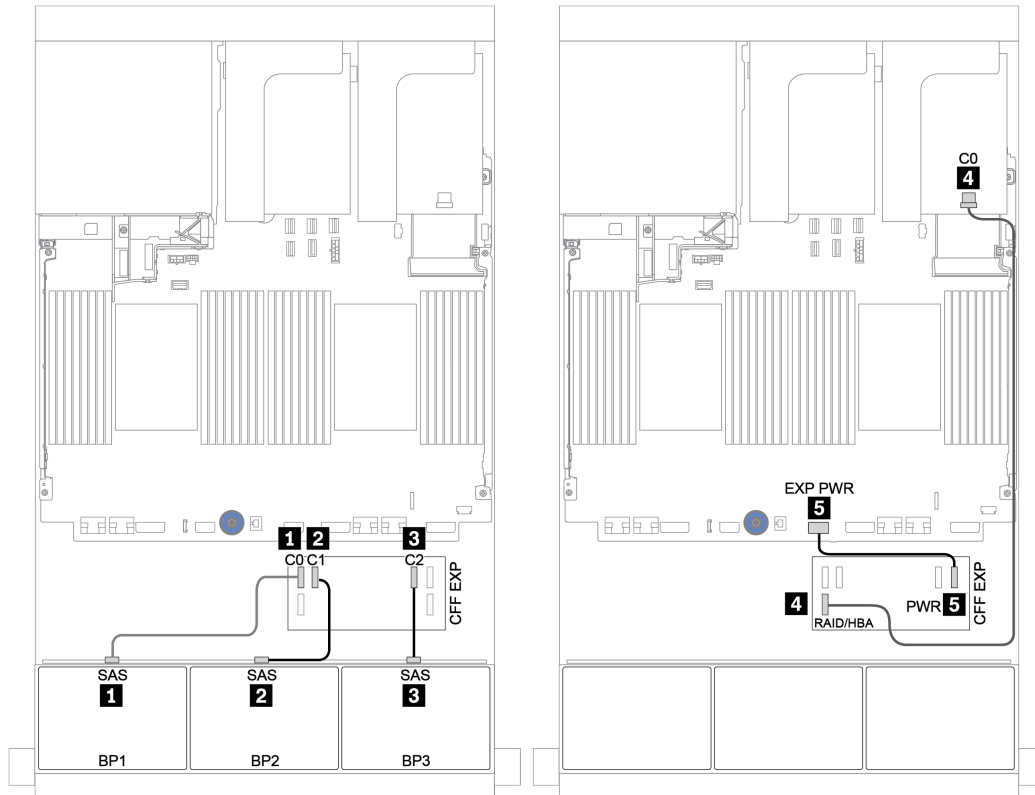


Figure 106. SAS/SATA cable routing

NVMe cable routing

From	To
BP3: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
BP3: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

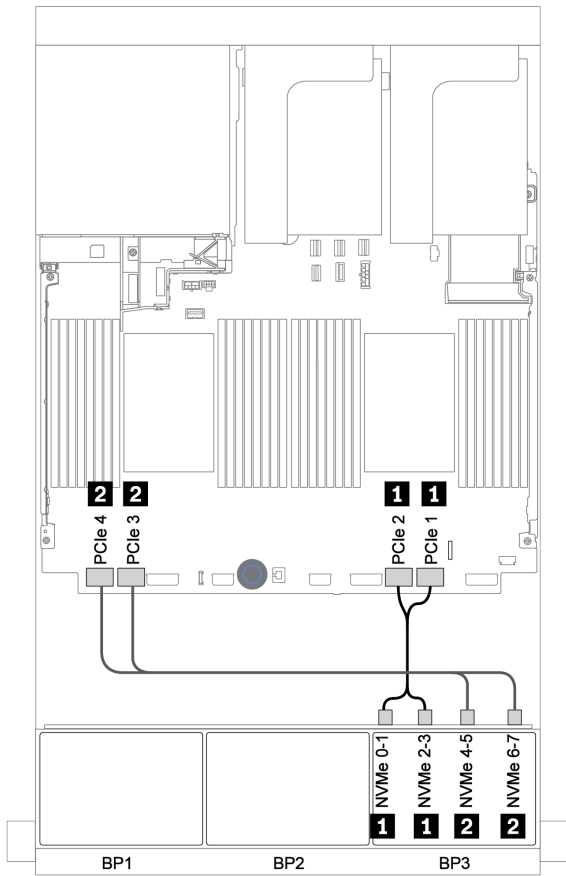


Figure 107. NVMe cable routing (two processors)

CFF 16i RAID/HBA adapter + CFF expander + onboard connectors

Front backplanes: 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay

SAS/SATA cable routing

From	To
Backplane 1: SAS	CFF expander: C0
Backplane 2: SAS	CFF expander: C1
Backplane 3: SAS	CFF expander: C2
CFF expander: RAID/HBA	CFF 16i RAID/HBA adapter: C0, C1
CFF 16i RAID/HBA adapter: MB	Onboard: PCIe 5
CFF 16i RAID/HBA adapter: PWR	Onboard: RAID PWR
CFF expander: PWR	Onboard: EXP PWR

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

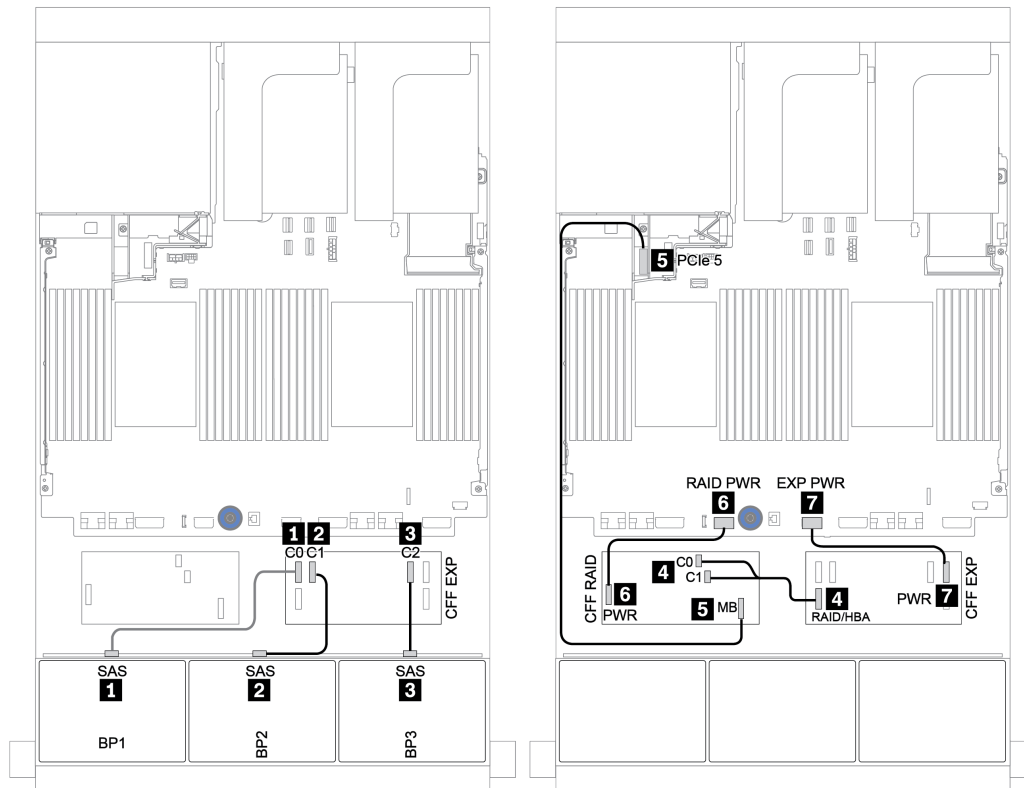


Figure 108. SAS/SATA cable routing

NVMe cable routing

From	To
Backplane 1: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 1: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

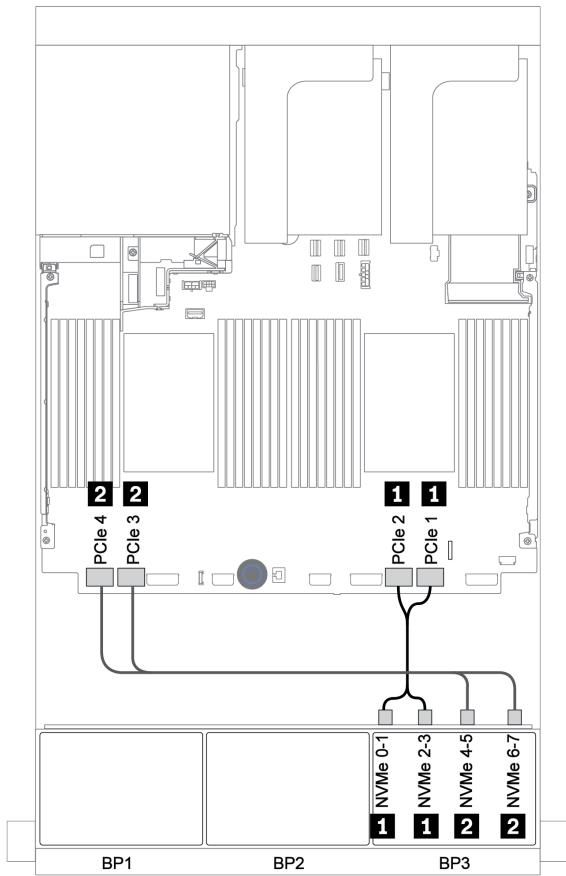


Figure 109. NVMe cable routing

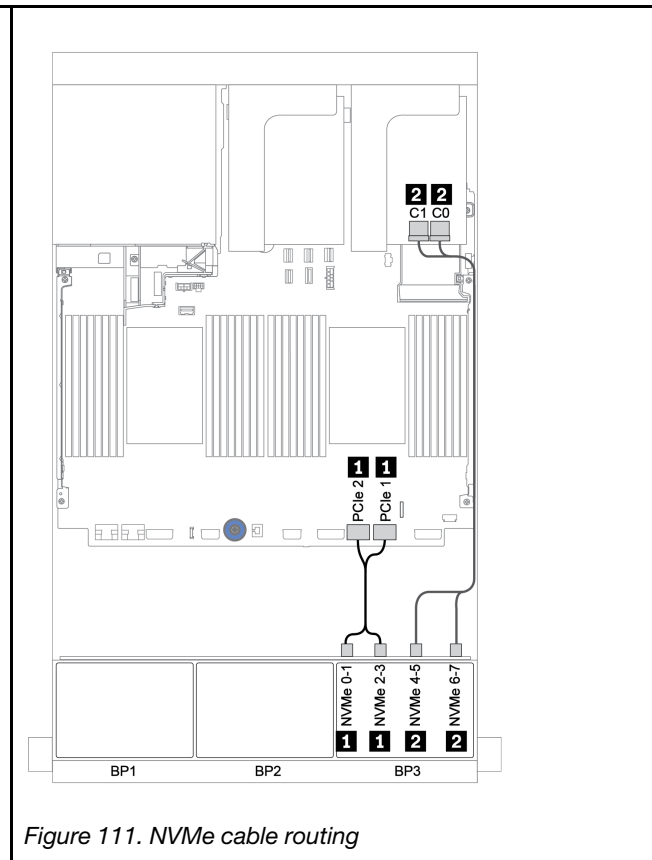
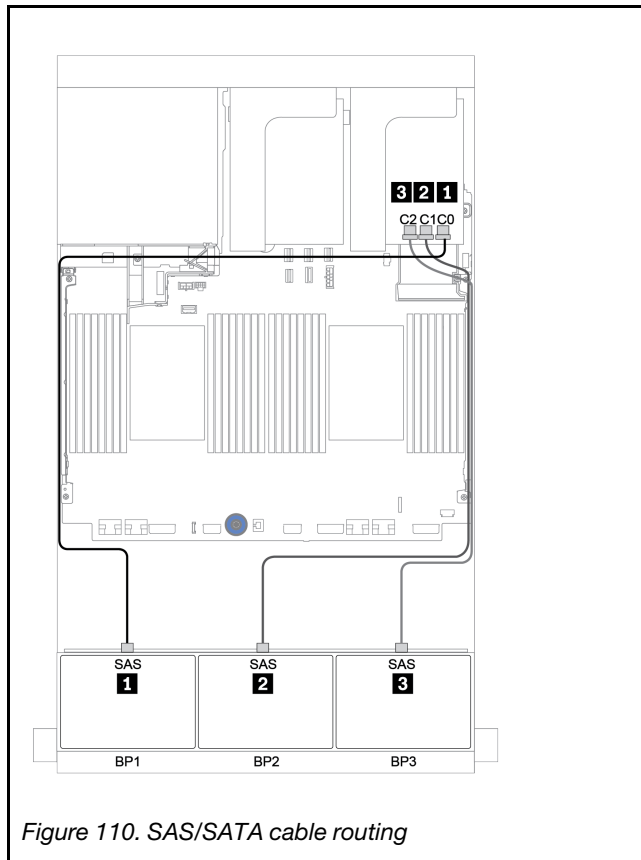
32i RAID/HBA adapter + retimer card

Front backplanes: 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay

The following shows the cable connections for 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay configuration with one 32i RAID/HBA adapter and one retimer card.

From	To
Backplane 1: SAS	32i RAID adapter on PCIe slot 2: C0
Backplane 2: SAS	32i RAID adapter on PCIe slot 2: C1
Backplane 3: SAS	32i RAID adapter on PCIe slot 2: C2
Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 3: NVMe 4-5, 6-7	Retimer card on PCIe slot 1: C0, C1

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



CFF expander + 8i RAID/HBA adapter + retimer card

Front backplanes: 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay

SAS/SATA cable routing

From	To
Backplane 1: SAS	CFF expander: C0
Backplane 2: SAS	CFF expander: C1
Backplane 3: SAS	CFF expander: C2
CFF expander: RAID/HBA	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
CFF expander: PWR	Onboard: EXP PWR

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

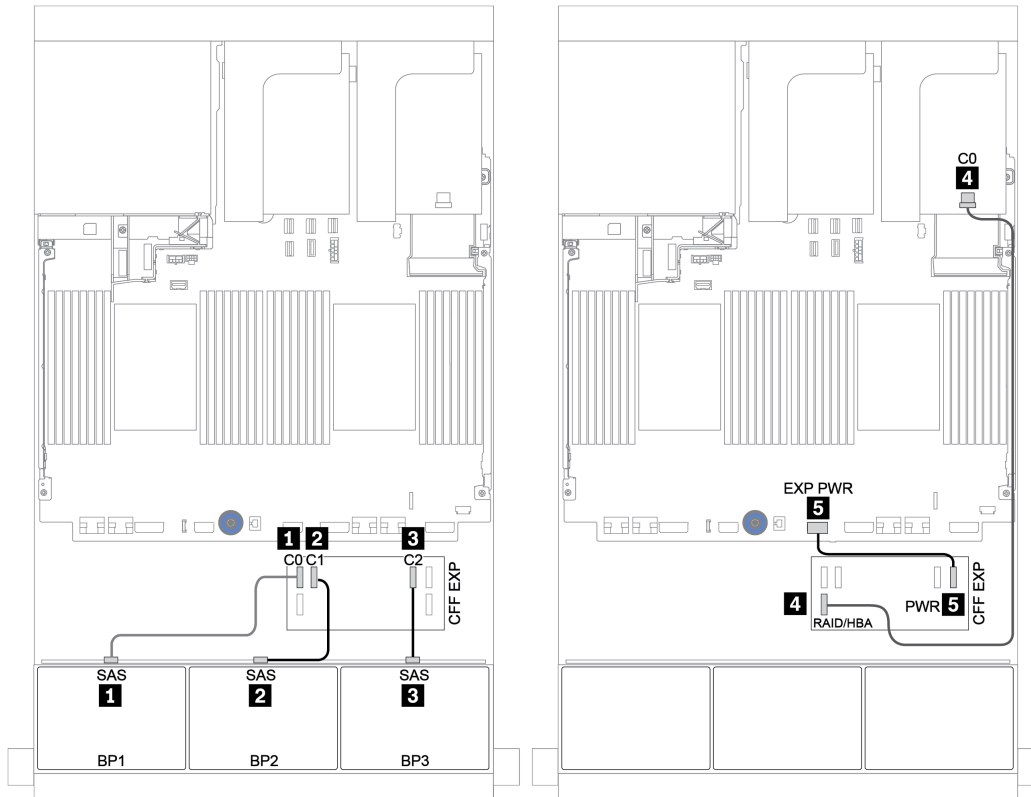


Figure 112. SAS/SATA cable routing

NVMe cable routing

From	To
Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 3: NVMe 4-5, 6-7	Retimer card on PCIe slot 1: C0, C1

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

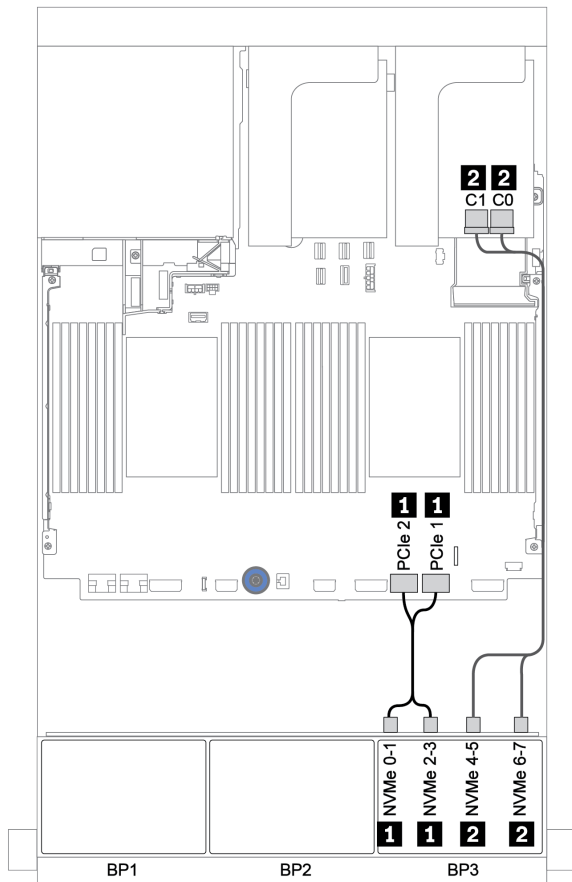


Figure 113. NVMe cable routing (one processor)

Front + rear backplane: 16 x SAS/SATA + 8 x AnyBay + 4 x SAS/SATA

- “8i RAID/HBA adapters + onboard connectors” on page 165
- “32i RAID/HBA adapter + onboard connectors” on page 168
- “CFF expander + 8i RAID/HBA adapter + onboard connectors” on page 170
- “CFF 16i RAID/HBA adapter + CFF expander + onboard connectors” on page 173
- “32i RAID/HBA adapter + retimer card” on page 176
- “CFF expander + 8i RAID/HBA adapter + retimer card” on page 178

8i RAID/HBA adapters + onboard connectors

Front backplanes: 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay

SAS/SATA cable routing

From	To
Backplane 1: SAS	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 2: SAS	8i RAID/HBA adapter on PCIe slot 3: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 3: SAS	8i RAID/HBA adapter on PCIe slot 5: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

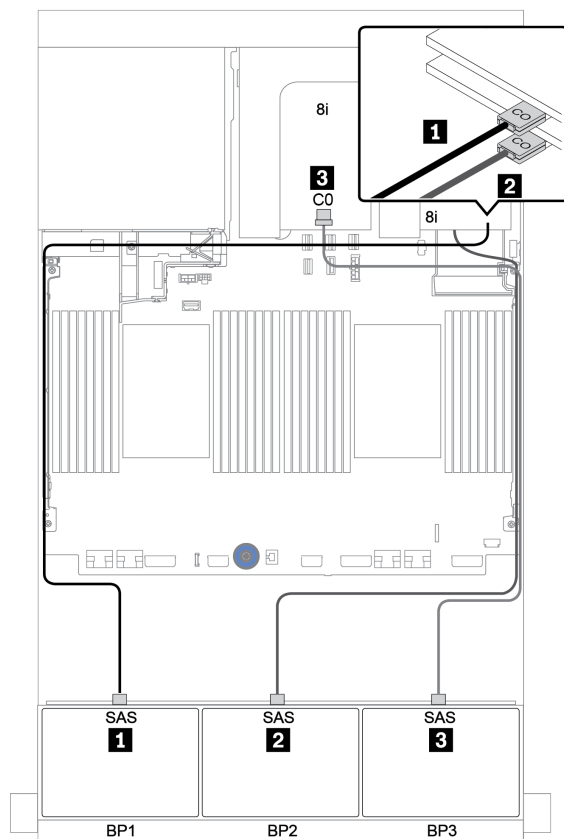


Figure 114. SAS/SATA cable routing

NVMe cable routing

From	To
Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 3: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

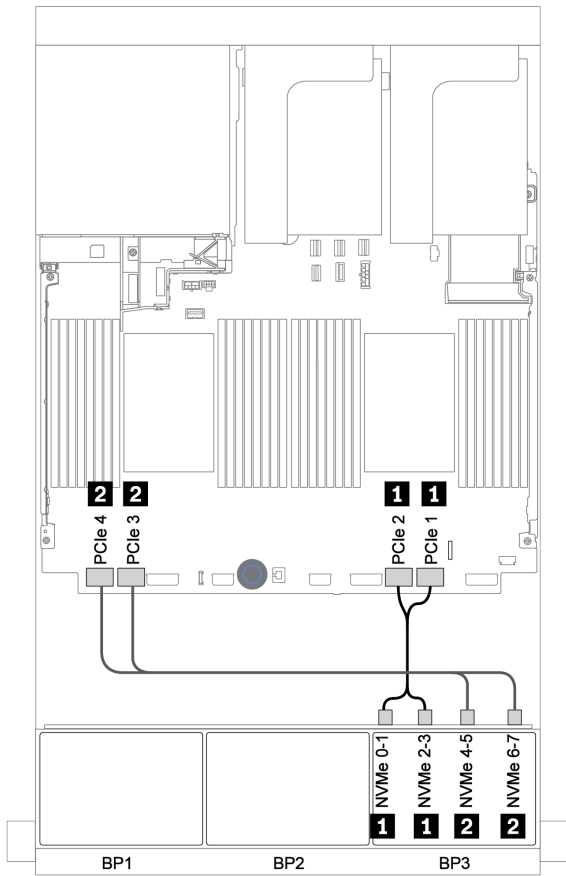


Figure 115. NVMe cable routing (two processors)

Rear backplane: 4 x 2.5-inch SAS/SATA

The following shows the cable connections for a rear 4 x 2.5-inch SAS/SATA backplane if installed.

From	To
Backplane 4: SAS	8i RAID/HBA adapter on PCIe slot 6: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 4: PWR	Riser 1: PWR1, PWR2

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

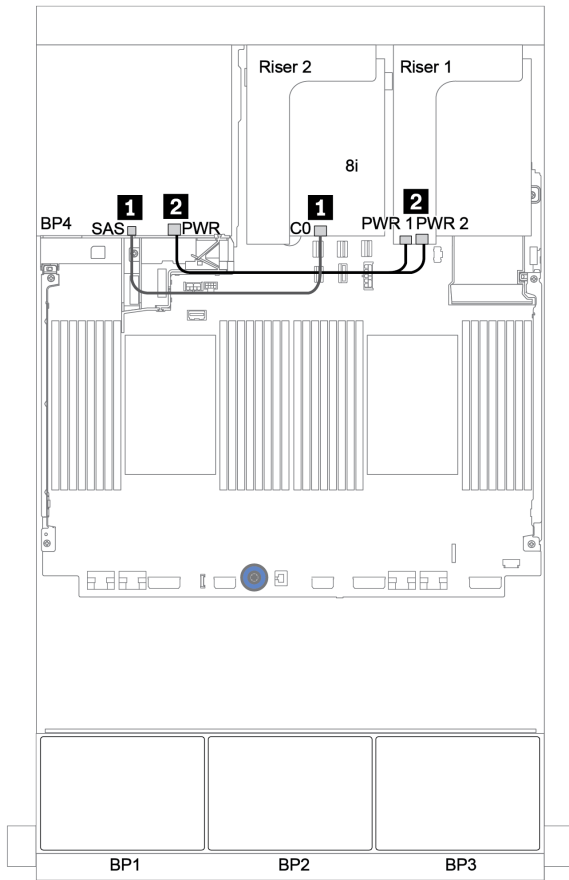


Figure 116. Cable routing for the rear 2.5-inch SAS/SATA backplane

32i RAID/HBA adapter + onboard connectors

Front backplanes: 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay

From	To
Backplane 1: SAS	32i RAID adapter on PCIe slot 2: C0
Backplane 2: SAS	32i RAID adapter on PCIe slot 2: C1
Backplane 3: SAS	32i RAID adapter on PCIe slot 2: C2
Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 3: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

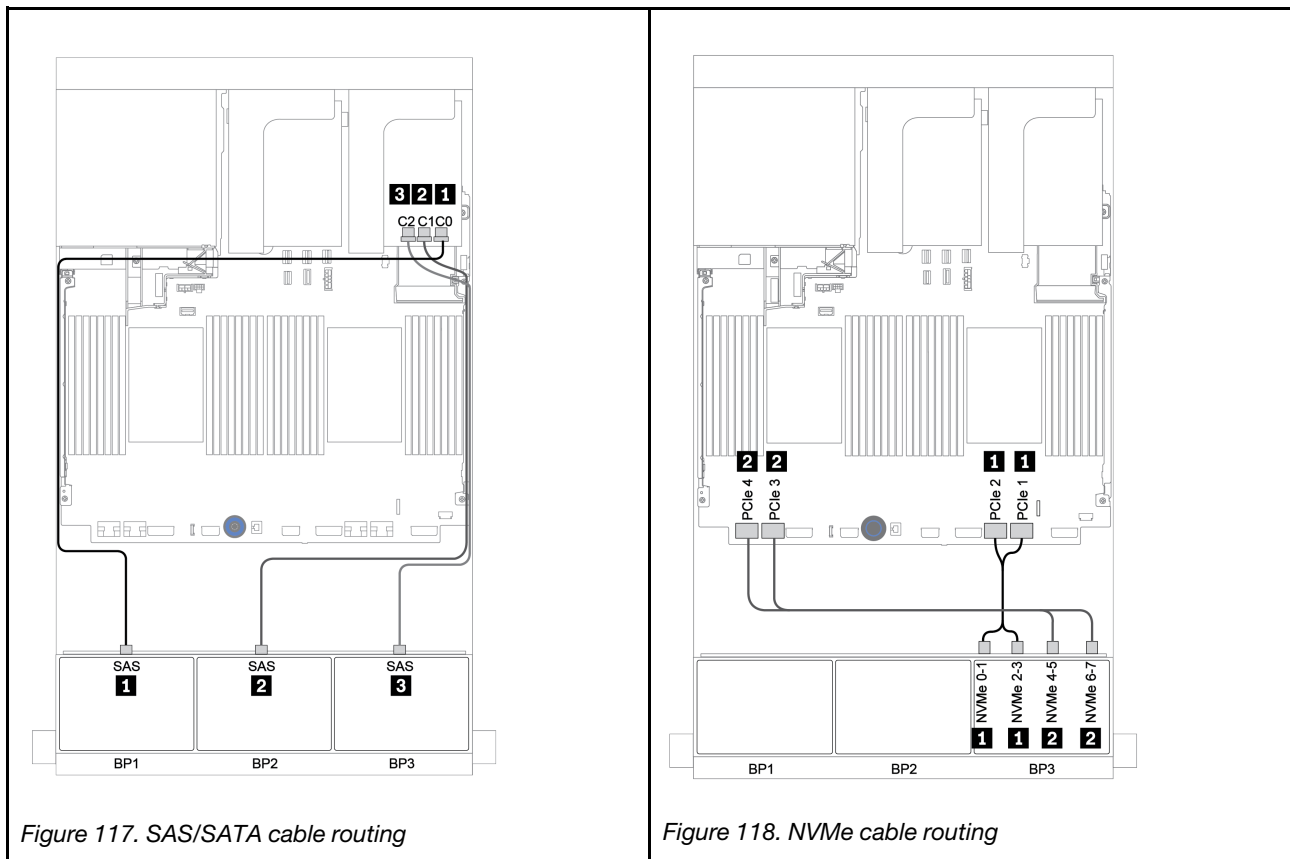


Figure 117. SAS/SATA cable routing

Figure 118. NVMe cable routing

Rear backplane: 4 x 2.5-inch SAS/SATA

The following shows the cable connections for a rear 4 x 2.5-inch SAS/SATA backplane if installed.

From	To
Backplane 4: SAS	32i RAID adapter on PCIe slot 2: C3
Backplane 4: PWR	Riser 1: PWR1, PWR2

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

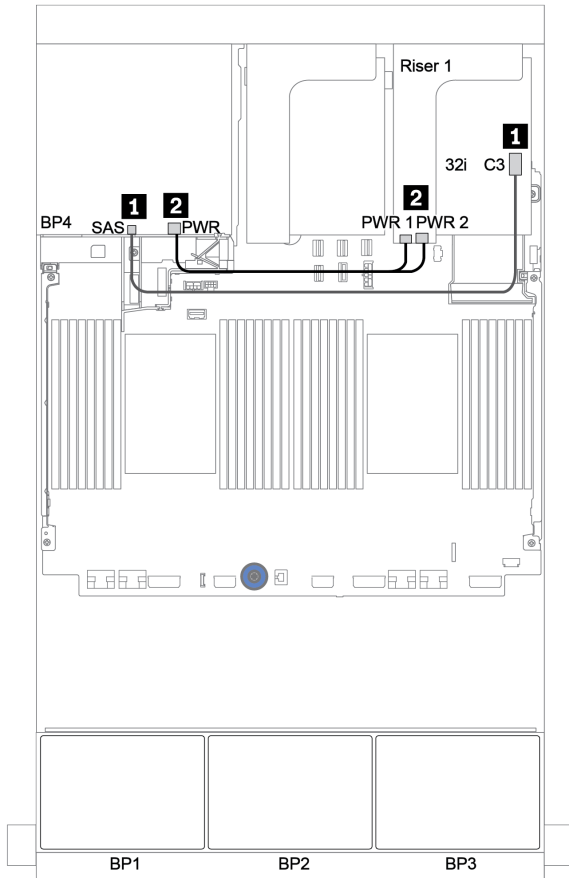


Figure 119. Cable routing for the rear 4 x 2.5-inch SAS/SATA backplane

CFF expander + 8i RAID/HBA adapter + onboard connectors

Front backplanes: 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay

SAS/SATA cable routing

From	To
Backplane 1: SAS	CFF expander: C0
Backplane 2: SAS	CFF expander: C1
Backplane 3: SAS	CFF expander: C2
CFF expander: RAID/HBA	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
CFF expander: PWR	Onboard: EXP PWR

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

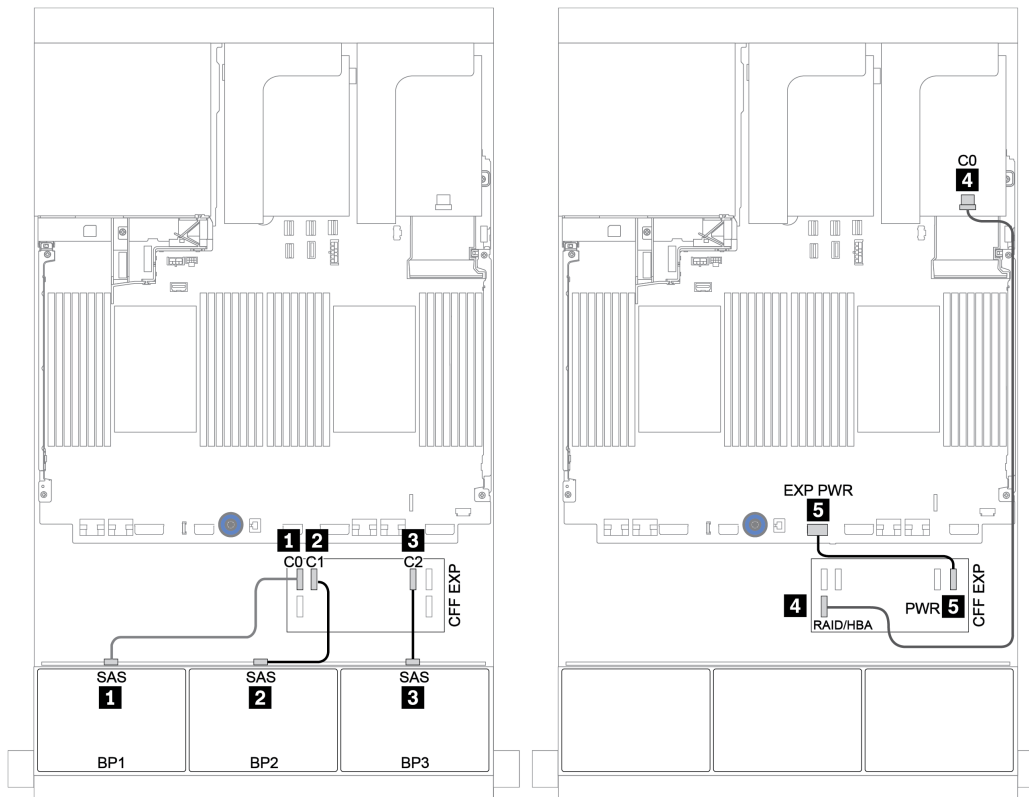


Figure 120. SAS/SATA cable routing

NVMe cable routing

From	To
BP3: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
BP3: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

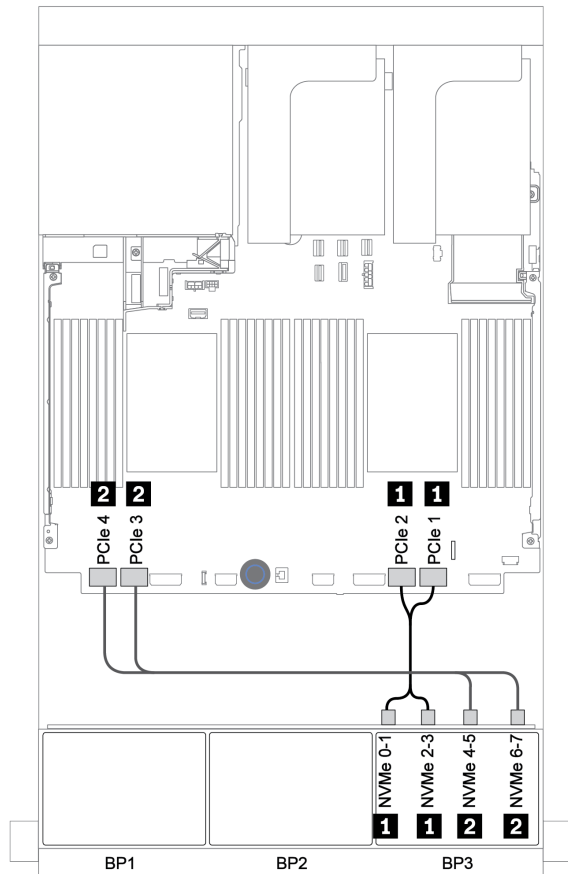


Figure 121. NVMe cable routing (two processors)

Rear backplane: 4 x 2.5-inch SAS/SATA

The following shows the cable connections for a rear 4 x 2.5-inch SAS/SATA backplane if installed.

From	To
Backplane 4: SAS	CFF expander: C3
Backplane 4: PWR	Riser 1: PWR1, PWR2

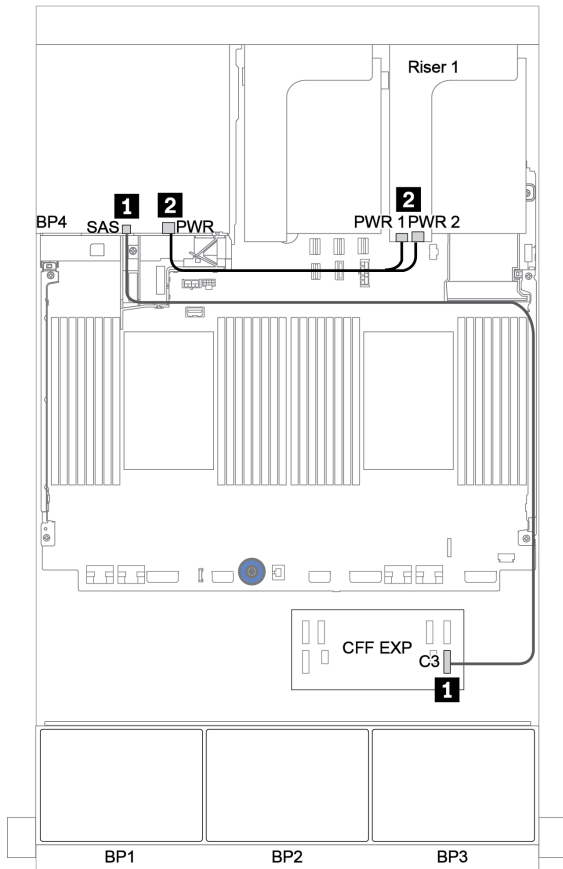


Figure 122. Cable routing for rear 4 x 2.5-inch SAS/SATA backplane

CFF 16i RAID/HBA adapter + CFF expander + onboard connectors

Front backplanes: 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay

SAS/SATA cable routing

From	To
Backplane 1: SAS	CFF expander: C0
Backplane 2: SAS	CFF expander: C1
Backplane 3: SAS	CFF expander: C2
CFF expander: RAID/HBA	CFF 16i RAID/HBA adapter: C0, C1
CFF 16i RAID/HBA adapter: MB	Onboard: PCIe 5
CFF 16i RAID/HBA adapter: PWR	Onboard: RAID PWR
CFF expander: PWR	Onboard: EXP PWR

Connections between connectors: **1 ↔ 1, 2 ↔ 2, 3 ↔ 3, ... n ↔ n**

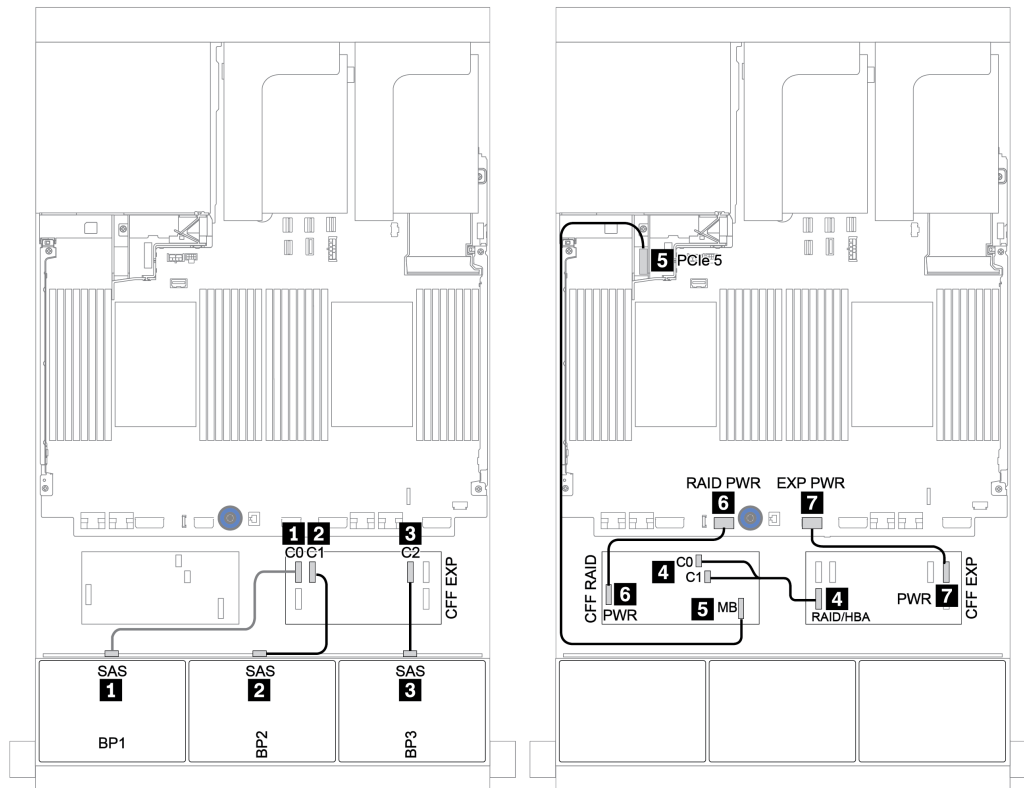


Figure 123. SAS/SATA cable routing

NVMe cable routing

From	To
Backplane 1: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 1: NVMe 4-5, 6-7	Onboard: PCIe 3, PCIe 4

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

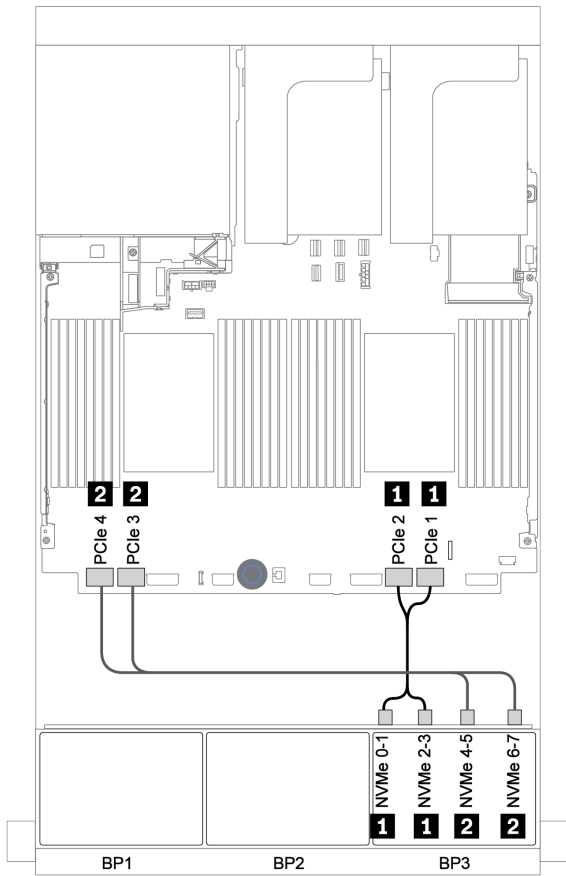


Figure 124. NVMe cable routing

Rear backplane: 4 x 2.5-inch SAS/SATA

The following shows the cable connections for a rear 4 x 2.5-inch SAS/SATA backplane if installed.

From	To
Backplane 4: SAS	CFF expander: C3
Backplane 4: PWR	Riser 1: PWR1, PWR2

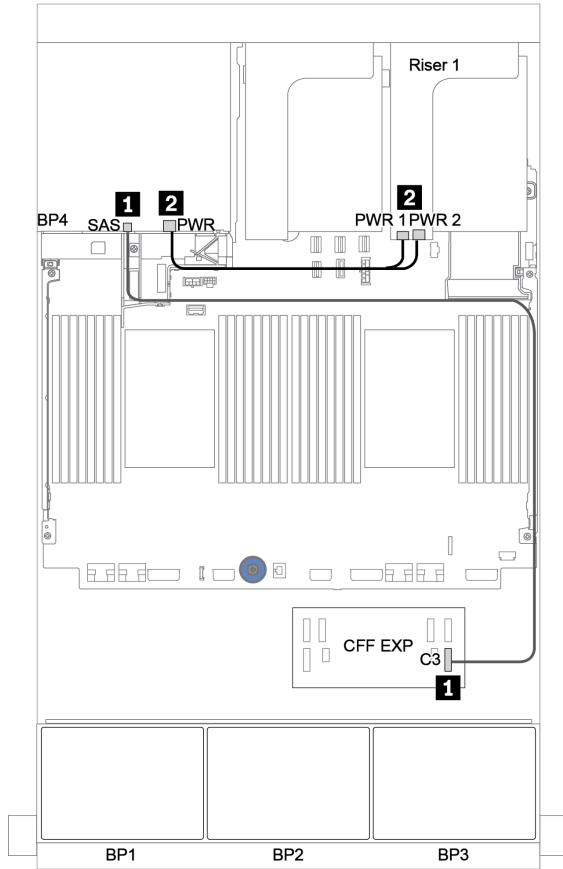


Figure 125. Cable routing for rear 4 x 2.5-inch SAS/SATA backplane

32i RAID/HBA adapter + retimer card

Front backplanes: 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay

The following shows the cable connections for 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay configuration with one 32i RAID/HBA adapter and one retimer card.

From	To
Backplane 1: SAS	32i RAID adapter on PCIe slot 2: C0
Backplane 2: SAS	32i RAID adapter on PCIe slot 2: C1
Backplane 3: SAS	32i RAID adapter on PCIe slot 2: C2
Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 3: NVMe 4-5, 6-7	Retimer card on PCIe slot 1: C0, C1

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

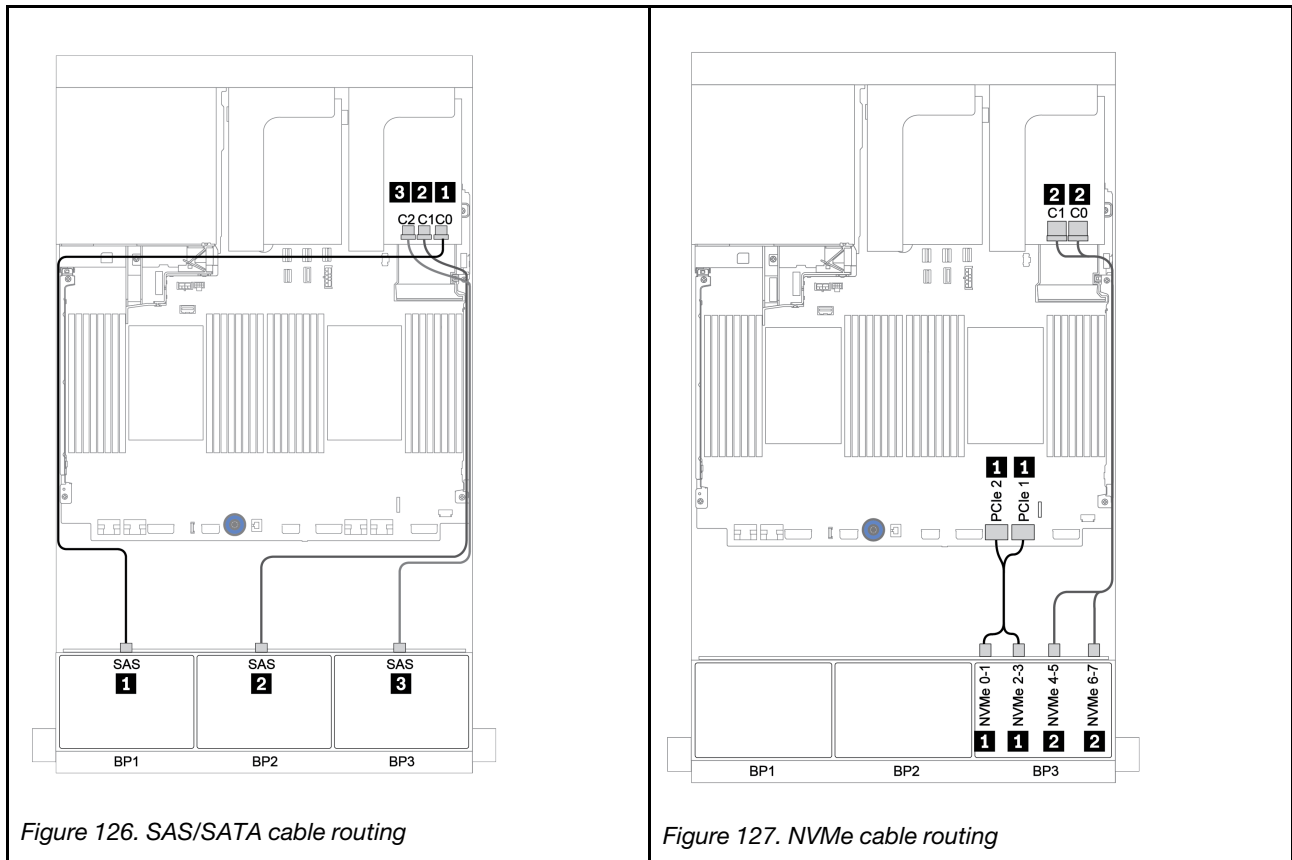


Figure 126. SAS/SATA cable routing

Figure 127. NVMe cable routing

Rear backplane: 4 x 2.5-inch SAS/SATA

The following shows the cable connections for a rear 4 x 2.5-inch SAS/SATA backplane if installed.

From	To
Backplane 4: SAS	32i RAID adapter on PCIe slot 2: C3
Backplane 4: PWR	Riser 1: PWR1, PWR2

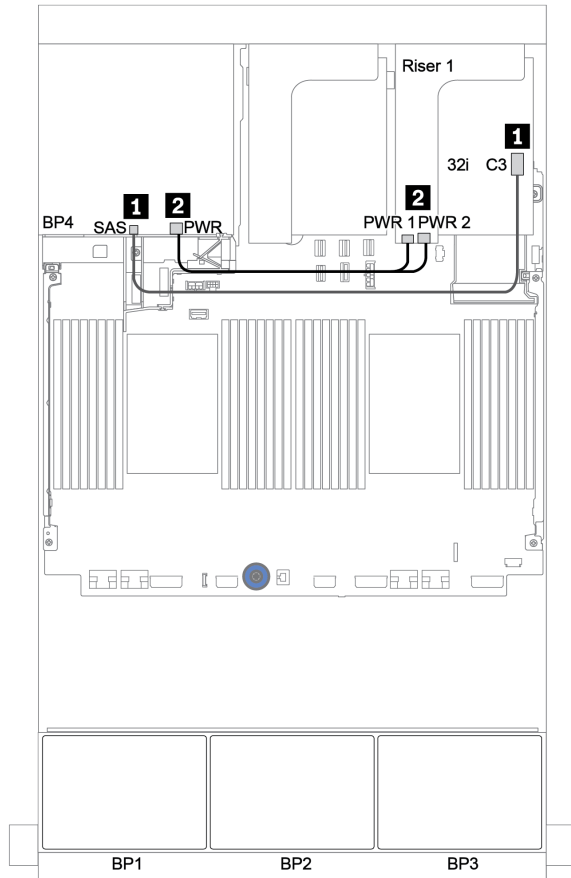


Figure 128. Cable routing for the rear 4 x 2.5-inch SAS/SATA backplane

CFF expander + 8i RAID/HBA adapter + retimer card

Front backplanes: 16 x 2.5-inch SAS/SATA + 8 x 2.5-inch AnyBay

SAS/SATA cable routing

From	To
Backplane 1: SAS	CFF expander: C0
Backplane 2: SAS	CFF expander: C1
Backplane 3: SAS	CFF expander: C2
CFF expander: RAID/HBA	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
CFF expander: PWR	Onboard: EXP PWR

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

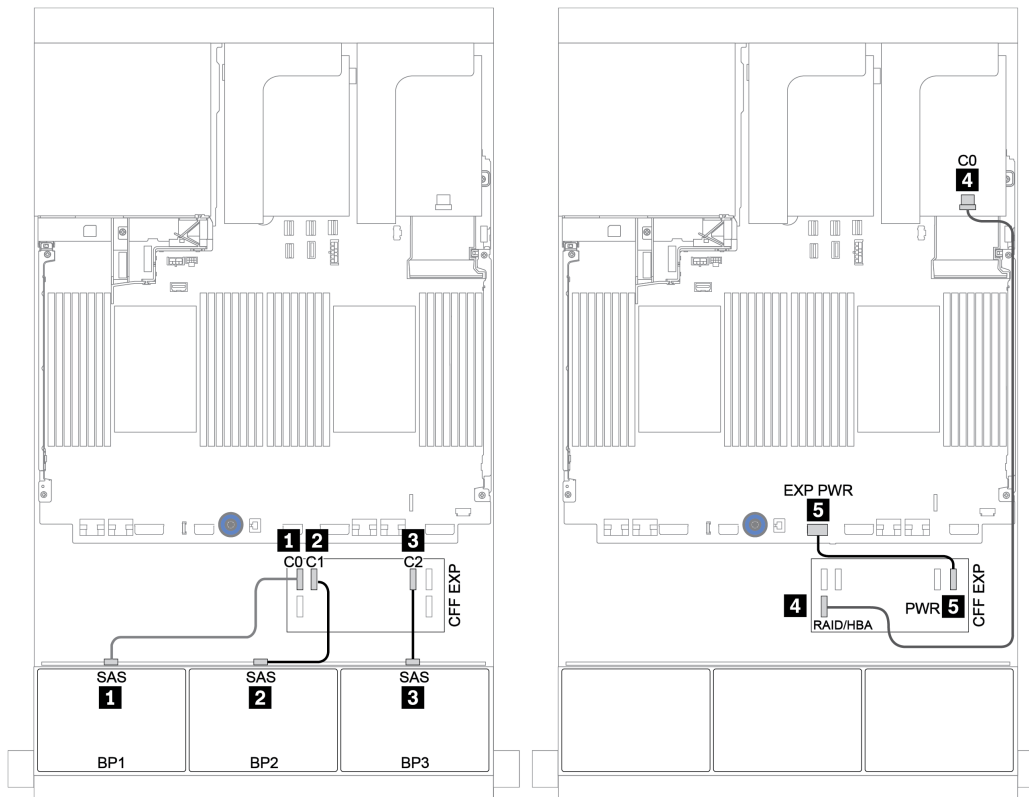


Figure 129. SAS/SATA cable routing

NVMe cable routing

From	To
Backplane 3: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 3: NVMe 4-5, 6-7	Retimer card on PCIe slot 1: C0, C1

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

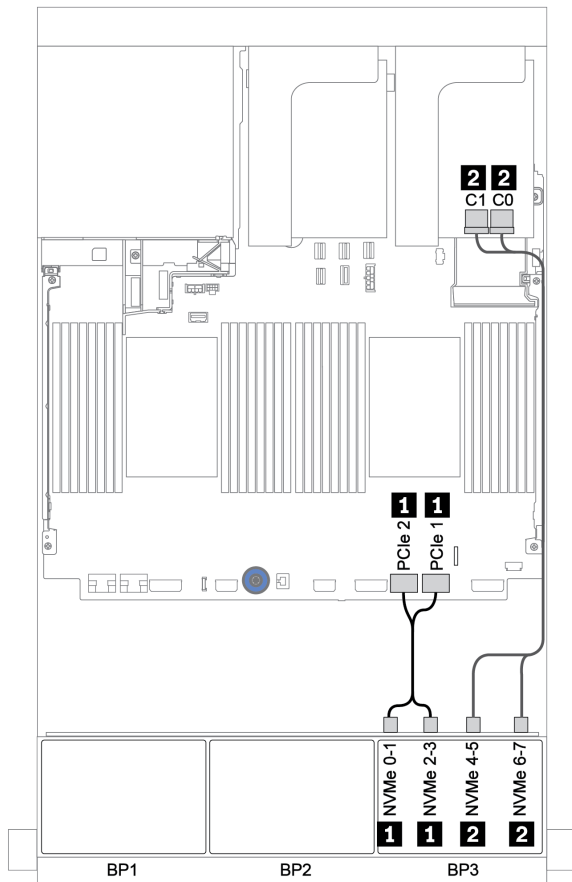


Figure 130. NVMe cable routing (one processor)

Rear backplane: 4 x 2.5-inch SAS/SATA

The following shows the cable connections for a rear 4 x 2.5-inch SAS/SATA backplane if installed.

From	To
Backplane 4: SAS	CFF expander: C3
Backplane 4: PWR	Riser 1: PWR1, PWR2

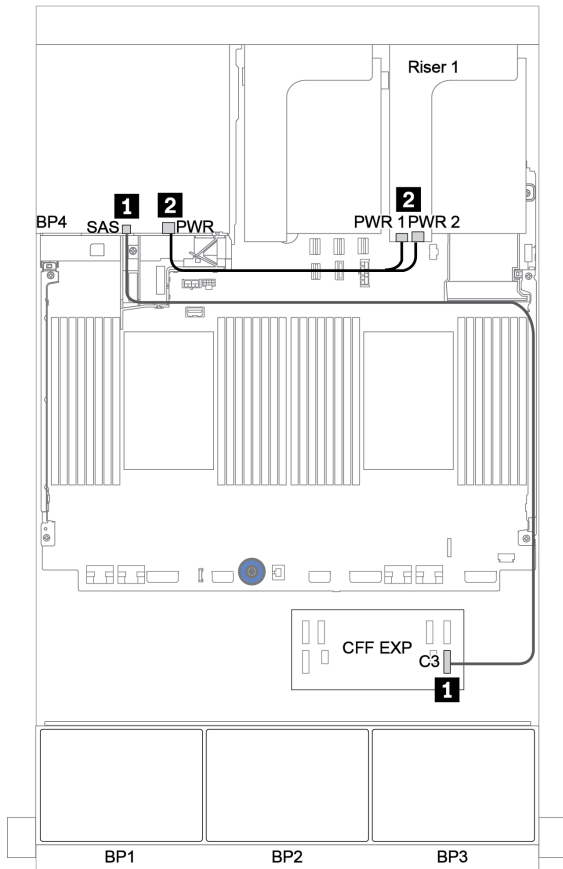


Figure 131. Cable routing for the rear 4 x 2.5-inch SAS/SATA backplane

Backplanes: server models with 3.5-inch drive backplanes

This section provides backplane cable connection information for server models with 3.5-inch drive backplanes.

Before you start

Ensure below parts are removed before starting cable routing for front backplanes.

- Top cover (see “Remove the top cover” on page 242)
- Air baffle (see “Remove the air baffle” on page 244)
- Fan cage (see “Remove the system fan cage” on page 247)

Power cable connections

Connect the power cables for the front 3.5-inch drive backplanes as illustrated.

- **8 x 3.5-inch SAS/SATA front drive backplane**

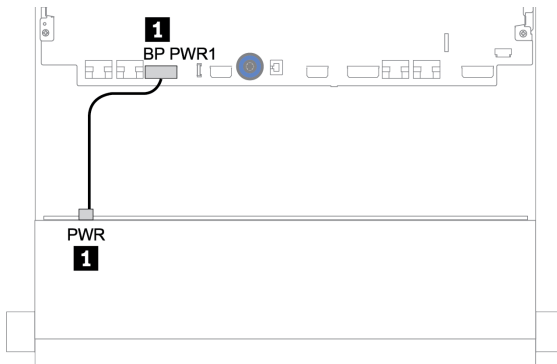


Figure 132. Power cable routing for the 8 x 3.5-inch SAS/SATA drive backplane

- **12 x 3.5-inch front drive backplanes**

Power cable connections for the below front drive backplanes are the same.

- 12 x 3.5-inch SAS/SATA drive backplane
- 12 x 3.5-inch AnyBay drive backplane
- 12 x 3.5-inch SAS/SATA Expander drive backplane
- 12 x 3.5-inch AnyBay Expander drive backplane

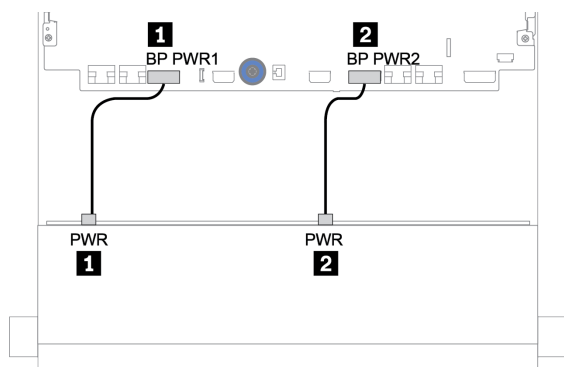


Figure 133. Power cable routing for the 12 x 3.5-inch drive backplane

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 184
- “12 x 3.5-inch SAS/SATA backplane” on page 186
- “12 x 3.5-inch AnyBay backplane” on page 201
- “12 x 3.5-inch SAS/SATA Expander backplane” on page 208
- “12 x 3.5-inch AnyBay Expander backplane” on page 209

Controller selections

This section provides controller selection information for configurations with 3.5-inch front drive bays.

The following table lists the supported controller combinations for configurations with 3.5-inch front drive bays. For more information about the controllers, see “Technical specifications” on page 8.

When picking cables for RAID/HBA adapters from cable kits, make sure to choose the cables based on the generation of the adapters that you plan to install:

- **Gen 3 RAID/HBA adapters** (430-8i, 4350-8i, 430-16i, 4350-16i, 530-8i, 5350-8i, 530-16i, 930-8i, 9350-8i, 930-16i, 9350-16i): MiniSAS to Slimline cable
- **Gen 4 RAID/HBA adapters** (440-8i, 440-16i, 540-8i, 540-16i, 940-8i, 940-16i, 940-32i): Slimline cable

Notes:

- The internal customer form factor (CFF) RAID/HBA 16i adapter is supported only when two processors are installed.
- The HBA 4350, RAID 5350, RAID 9350 adapters are used only in below configurations marked with asterisk (*).

S/S: SATA/SAS, Any: AnyBay, OB: onboard, EXP: expander

Front bays		Mid bays		Rear bays		CPUs	Controllers
S/S 3.5"	Any 3.5"	S/S 3.5"	NVMe 2.5"	S/S 2.5"	S/S 3.5"		
8	0	0	0	0	0	1 or 2	OB SATA
						1 or 2	1 x RAID/HBA 8i*

Front bays		Mid bays		Rear bays		CPUs	Controllers
S/S 3.5"	Any 3.5"	S/S 3.5"	NVMe 2.5"	S/S 2.5"	S/S 3.5"		
12	0	0	0	0	0	1 or 2	OB SATA
						1 or 2	1 x RAID/HBA 16i*
12	0	0	0	0	2	1 or 2	OB SATA + OB SATA
						1 or 2	1 x RAID/HBA 16i*
						1 or 2	1 x RAID/HBA 16i + OB SATA
						1 or 2	1 x RAID/HBA 16i + 1 x RAID/HBA 8i
12	0	0	0	0	4	1 or 2	OB SATA + 1 x RAID/HBA 8i
						1 or 2	1 x RAID/HBA 16i*
						1 or 2	1 x RAID/HBA 16i + OB SATA
						1 or 2	1 x RAID/HBA 16i + 1 x RAID/HBA 8i
12	0	0	0	4	0	1 or 2	OB SATA + 1 x RAID/HBA 8i
						1 or 2	1 x RAID/HBA 16i
						1 or 2	1 x RAID/HBA 16i + OB SATA
						1 or 2	1 x RAID/HBA 16i + 1 x RAID/HBA 8i
12	0	4	0	0	4	2	OB SATA + 1 x RAID/HBA 8i
						2	1 x RAID/HBA 32i
12	0	4	0	4	0	2	OB SATA + 1 x RAID/HBA 8i
						2	1 x RAID/HBA 32i
12	0	0	8	0	0	2	1 x RAID/HBA 16i + OB NVMe
0	12	0	0	0	0	2	OB SATA + OB NVMe
						2	1 x RAID/HBA 16i + OB NVMe
0	12	0	0	0	4	2	1 x RAID/HBA 16i + OB NVMe
						2	1 x RAID/HBA 16i + 1 x RAID 8i + OB NVMe
0	12	4	0	0	4	2	1 x RAID/HBA 32i + OB NVMe
12	0	0	0	0	0	1 or 2	1 x RAID 8i
0	12	0	0	0	0	1 or 2	1 x RAID 8i + OB NVMe

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.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 3.5-inch drive backplanes” on page 181.

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 184
- “8i RAID/HBA adapter” on page 185

Onboard connectors

The following shows the cable connections for the 8 x 3.5-inch SAS/SATA configuration with onboard connectors.

From	To
Backplane 1: SAS 0, SAS 1	Onboard: SATA 0, SATA 1

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

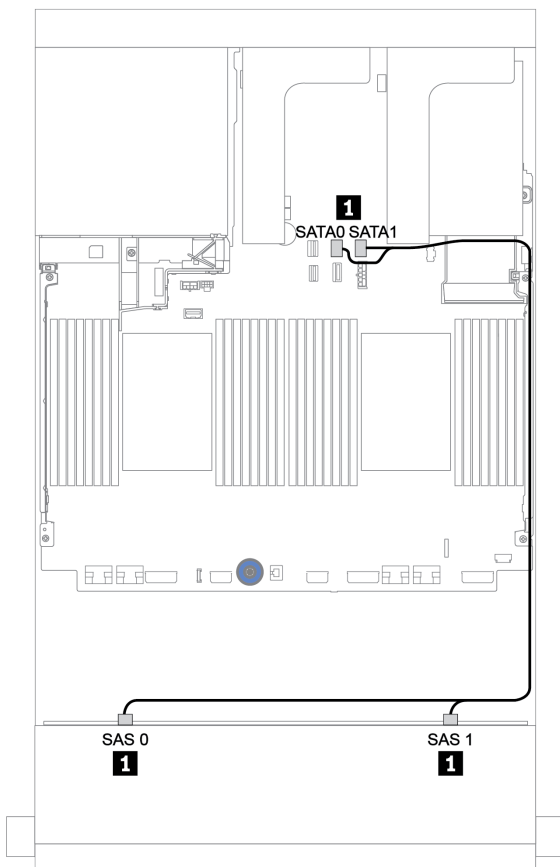


Figure 134. Cable routing for the 8 x 3.5-inch SAS/SATA configuration with onboard connectors

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.

From	To
Backplane 1: SAS 0, SAS 1	8i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none">• Gen 3: C0C1• Gen 4: C0

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

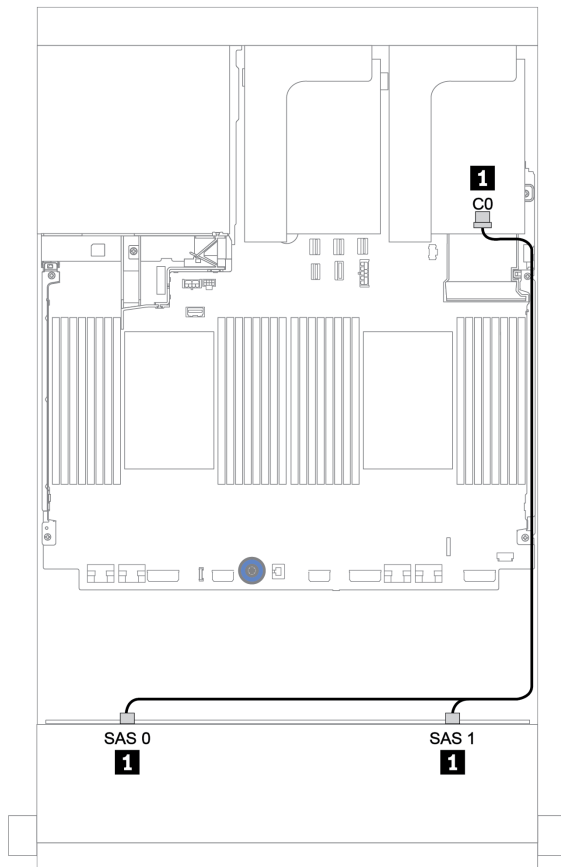


Figure 135. Cable routing for the 8 x 3.5-inch SAS/SATA configuration with one 8i RAID/HBA adapter

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.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 3.5-inch drive backplanes” on page 181.

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration:

- “Front backplane: 12 x 3.5" SAS/SATA” on page 187
- “Front + rear backplanes: 12 x 3.5" SAS/SATA + 4 x 2.5"/2 x 3.5"/4 x 3.5" SAS/SATA” on page 189
- “Front + middle backplanes: 12 x 3.5" SAS/SATA + 8 x 2.5" NVMe” on page 199
- “Front + middle + rear backplanes: 12 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA + 4 x 3.5"/4 x 2.5" SAS/SATA” on page 195

Front backplane: 12 x 3.5" SAS/SATA

This topic provides cable routing information for the server model with 12 x 3.5-inch SAS/SATA front drive backplane.

- “Onboard connectors” on page 187
- “16i RAID/HBA adapter” on page 188

Onboard connectors

The following shows the cable connections for the 12 x 3.5-inch SAS/SATA configuration with onboard connectors.

From	To
Backplane 1: SAS 0, SAS 1	Onboard: SATA 0, SATA 1
Backplane 1: SAS 2	Onboard: SATA 2

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

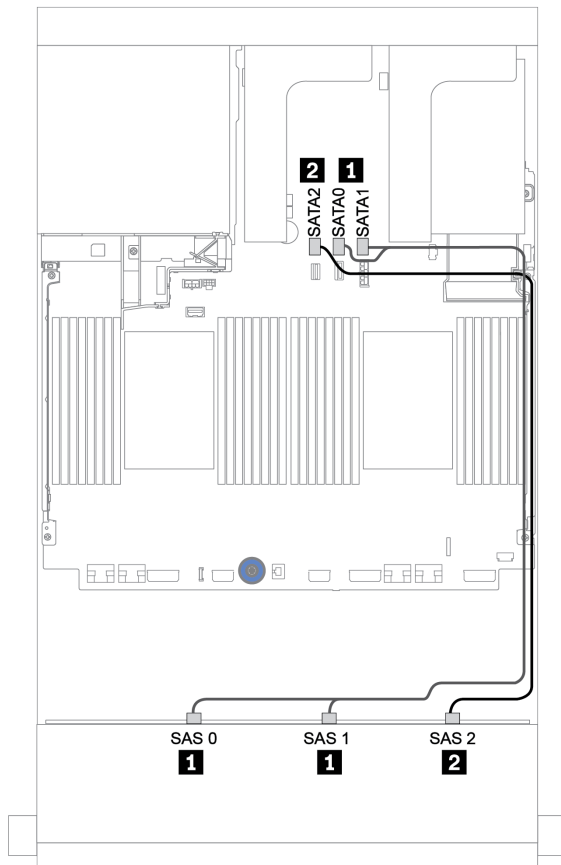


Figure 136. Cable routing for the 12 x 3.5-inch SAS/SATA configuration with onboard connectors

16i RAID/HBA adapter

The following shows the cable connections for the 12 x 3.5-inch SAS/SATA configuration with one 16i RAID/HBA adapter.

From	To
Backplane 1: SAS 0, SAS 1	16i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 1: SAS 2	<ul style="list-style-type: none"> • Gen 3: C2C3 • Gen 4: C1

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

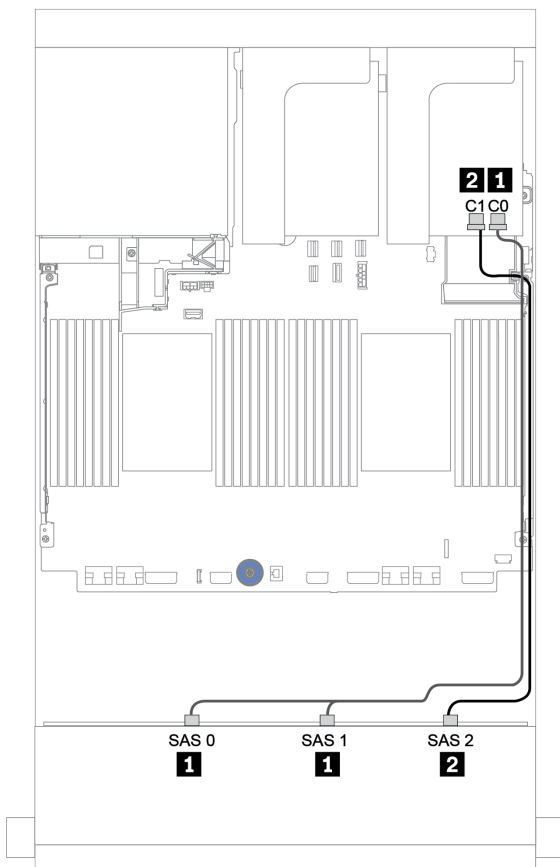


Figure 137. Cable routing for the 12 x 3.5-inch SAS/SATA configuration with one 16i RAID/HBA adapter

Front + rear backplanes: 12 x 3.5" SAS/SATA + 4 x 2.5"/2 x 3.5"/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 2.5-inch/2 x 3.5-inch/4 x 3.5-inch SAS/SATA rear backplane.

Depending on the rear backplane and controller you use, refer to the specific configuration for cable routing information.

Config.	Front backplane	Rear backplane	Front backplane controller	Rear backplane controller
"1" on page 190	12 x 3.5-inch SAS/SATA	2 x 3.5-inch SAS/SATA	Onboard connectors	Onboard connectors
"2" on page 191		4 x 3.5-inch/4 x 2.5-inch SAS/SATA	Onboard connectors	8i RAID/HBA adapter
"3" on page 192		2 x 3.5-inch/4 x 3.5-inch/4 x 2.5-inch SAS/SATA	One shared 16i RAID/HBA adapter	
"4" on page 193		2 x 3.5-inch/4 x 3.5-inch/4 x 2.5-inch SAS/SATA	16i RAID/HBA adapter	Onboard connectors
"5" on page 194		2 x 3.5-inch/4 x 3.5-inch/4 x 2.5-inch SAS/SATA	16i RAID/HBA adapter	8i RAID/HBA adapter

Onboard connectors + onboard connectors

Front + rear backplanes: 12 x 3.5" SAS/SATA + 2 x 3.5" SAS/SATA

From	To
Backplane 1: SAS 0, SAS 1	Onboard: SATA 0, SATA 1
Backplane 1: SAS 2	Onboard: SATA 2
Backplane 4: SAS	Onboard: Rear BP
Backplane 4: PWR	Riser 1: PWR1, PWR2

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

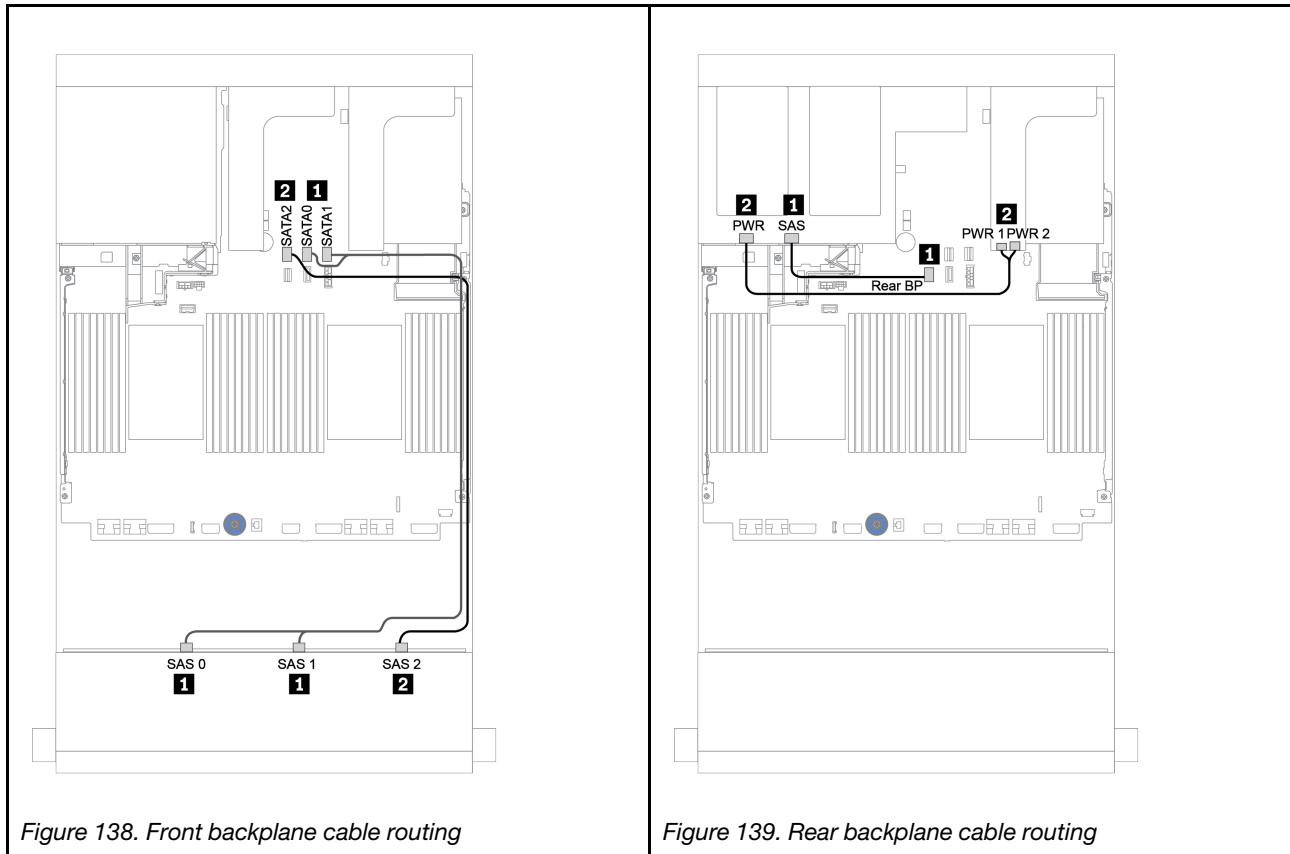


Figure 138. Front backplane cable routing

Figure 139. Rear backplane cable routing

Onboard connectors + 8i RAID/HBA adapter

Front + rear backplanes: 12 x 3.5" SAS/SATA + 4 x 3.5"/4 x 2.5" SAS/SATA

From	To
Backplane 1: SAS 0, SAS 1	Onboard: SATA 0, SATA 1
Backplane 1: SAS 2	Onboard: SATA 2
Backplane 4: SAS	8i RAID/HBA ¹ : C0C1 (Gen 3) or C0 (Gen 4)
Backplane 4: PWR	Riser 1: PWR1, PWR2

Notes:

- For a 4 x 3.5-inch SAS/SATA rear backplane, the 8i adapter¹ is installed on PCIe slot 3.
- For a 4 x 2.5-inch SAS/SATA rear backplane, the 8i adapter¹ is installed on PCIe slot 2.

Below illustration uses the 4 x 3.5-inch SAS/SATA rear backplane as an example for cable routing. Cable routing for the 4 x 2.5-inch SAS/SATA rear backplane is similar.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

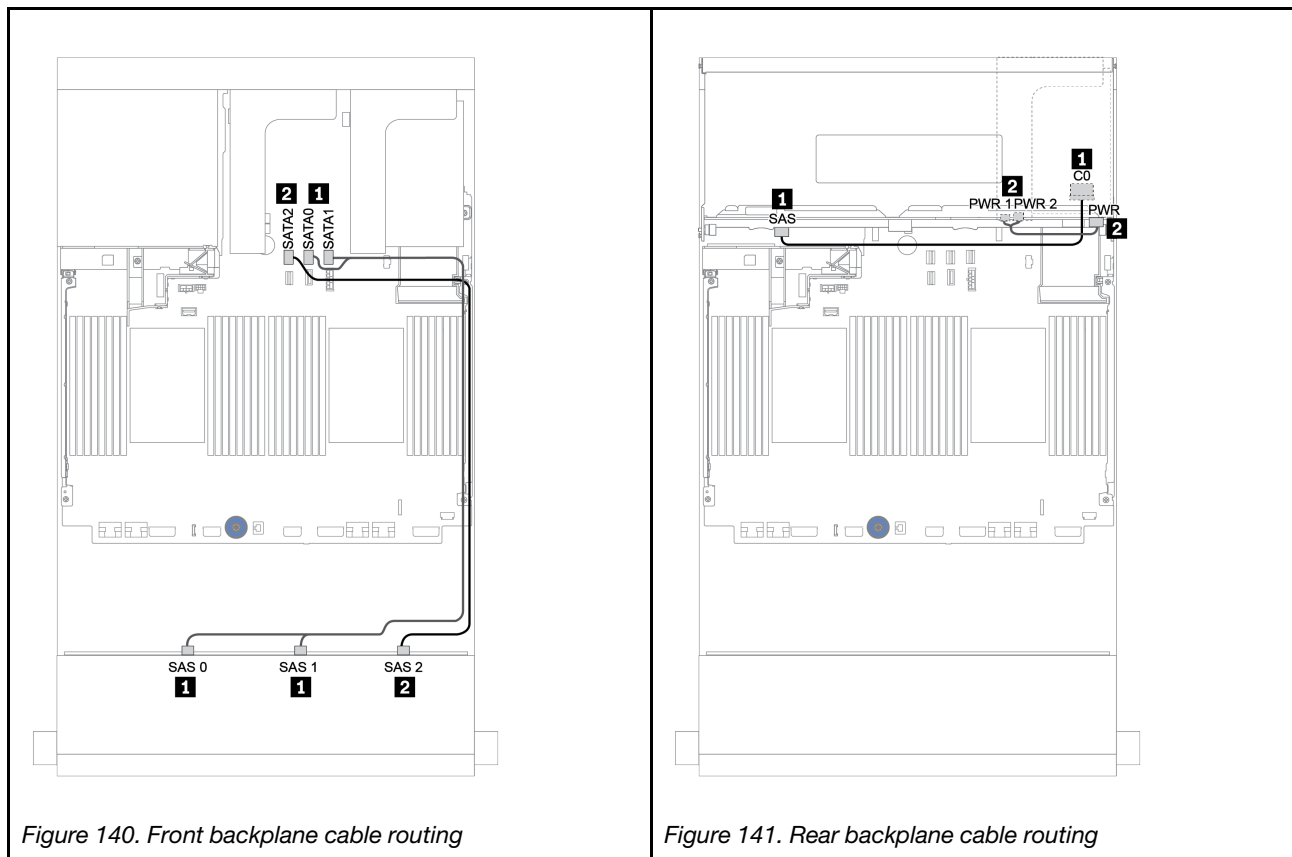


Figure 140. Front backplane cable routing

Figure 141. Rear backplane cable routing

16i RAID/HBA adapter

Front + rear backplanes: 12 x 3.5" SAS/SATA + 2 x 3.5"/4 x 3.5"/4 x 2.5" SAS/SATA

From	To
Backplane 1: SAS 0, SAS 1	16i RAID/HBA 1: C0C1 (Gen 3) or C0 (Gen 4)
Backplane 1: SAS 2	16i RAID/HBA 1: C2C3 (Gen 3) or C1 (Gen 4)
Backplane 4: SAS	
Backplane 4: PWR	Riser 1: PWR1, PWR2

Notes:

- For a 2 x 3.5/4 x 2.5-inch SAS/SATA rear backplane, the 16i adapter¹ is installed on PCIe slot 2.
- For a 4 x 3.5-inch SAS/SATA rear backplane, the 16i adapter¹ is installed on PCIe slot 3.

Below illustration uses the 4 x 3.5-inch SAS/SATA backplane as an example for cable routing. Cable routing for the other backplanes is similar.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

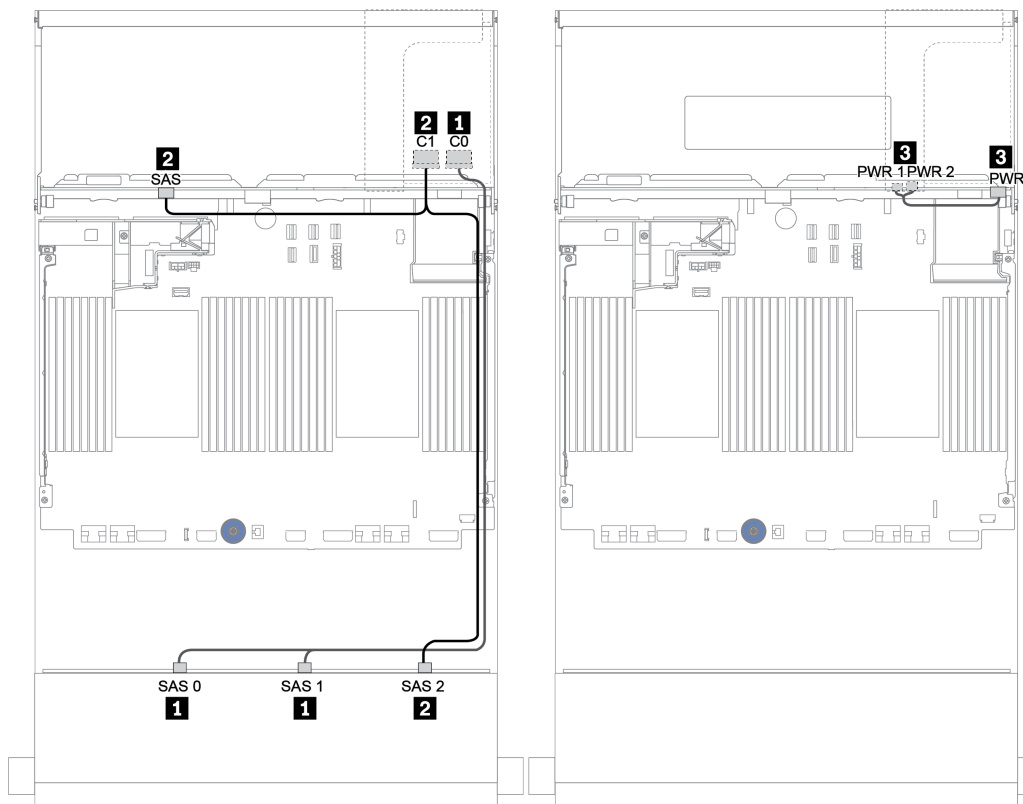


Figure 142. Cable routing for the 12 x 3.5-inch SAS/SATA configuration with a 4 x 3.5-inch SAS/SATA rear backplane

16i RAID/HBA adapter + Onboard connectors

Front + rear backplanes: 12 x 3.5" SAS/SATA + 2 x 3.5"/4 x 3.5"/4 x 2.5" SAS/SATA

From	To
Backplane 1: SAS 0, SAS 1	16i RAID/HBA 1: C0C1 (Gen 3) or C0 (Gen 4)
Backplane 1: SAS 2	16i RAID/HBA 1: C2C3 (Gen 3) or C1 (Gen 4)
Backplane 4: SAS	Onboard: SATA 0
Backplane 4: PWR	Riser 1: PWR1, PWR2

Notes:

- For a 2 x 3.5/4 x 2.5-inch SAS/SATA rear backplane, the 16i adapter¹ is installed on PCIe slot 2.
- For a 4 x 3.5-inch SAS/SATA rear backplane, the 16i adapter¹ is installed on PCIe slot 3.

Below illustration uses the 4 x 3.5-inch SAS/SATA backplane as an example for cable routing. Cable routing for the other backplanes is similar.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

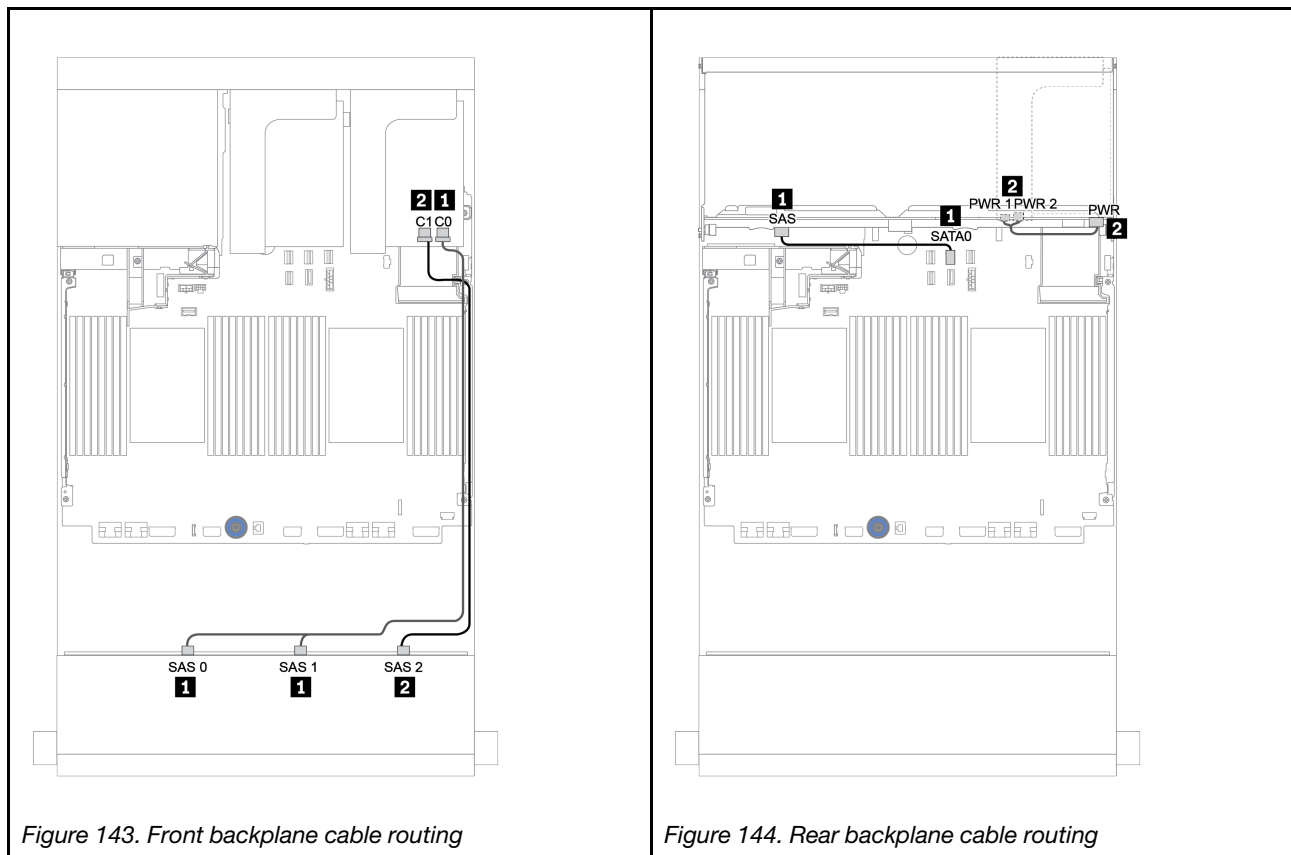


Figure 143. Front backplane cable routing

Figure 144. Rear backplane cable routing

16i RAID/HBA adapter + 8i RAID/HBA adapter

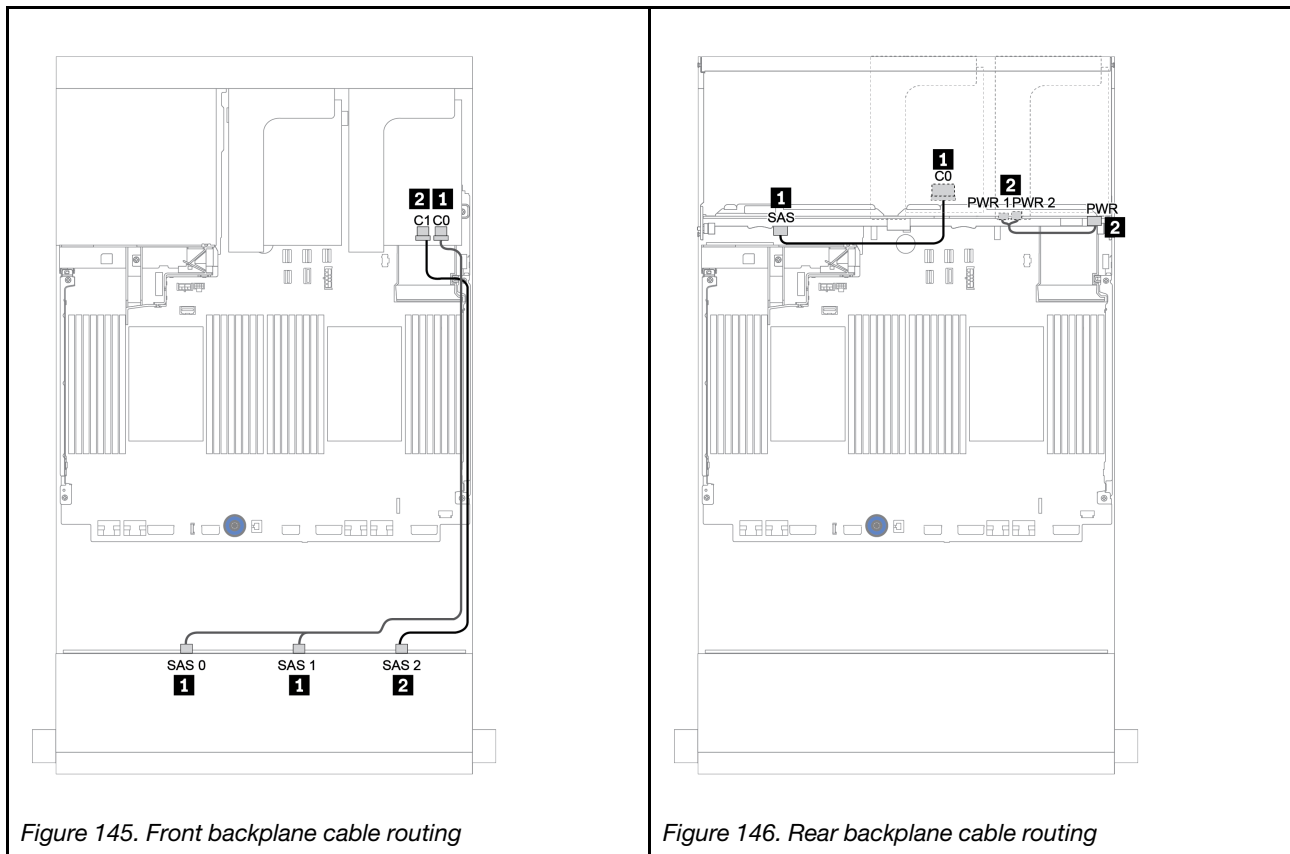
Front + rear backplanes: 12 x 3.5" SAS/SATA + 2 x 3.5"/4 x 3.5"/4 x 2.5" SAS/SATA

From	To
Backplane 1: SAS 0, SAS 1	16i RAID/HBA 1: C0C1 (Gen 3) or C0 (Gen 4)
Backplane 1: SAS 2	16i RAID/HBA 1: C2C3 (Gen 3) or C1 (Gen 4)
Backplane 4: SAS	8i RAID/HBA 2: C0C1 (Gen 3) or C0 (Gen 4)
Backplane 4: PWR	Riser 1: PWR1, PWR2

Notes:

- For a 2 x 3.5-inch/4 x 2.5-inch SAS/SATA rear backplane, the 16i adapter¹ is installed on PCIe slot 2 and the 8i adapter² is installed on and PCIe slot 3.
- For a 4 x 3.5-inch SAS/SATA rear backplane, the 16i adapter¹ is installed on PCIe slot 3 and the 8i adapter² is installed on and PCIe slot 6.

Below illustration uses the 4 x 3.5-inch SAS/SATA backplane as an example for cable routing. Cable routing for the other backplanes is similar. Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



Front + middle + rear backplanes: 12 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA + 4 x 3.5"/4 x 2.5" 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/4 x 2.5-inch SAS/SATA rear backplane.

- “Onboard connectors + 8i RAID/HBA adapter” on page 196
- “32i RAID/HBA adapter” on page 198

Onboard connectors + 8i RAID/HBA adapter

- “Front backplane: 12 x 3.5" SAS/SATA” on page 196
- “Middle and rear backplanes: 4 x 3.5" SAS/SATA + 4 x 3.5"/4 x 2.5" SAS/SATA” on page 197

Front backplane: 12 x 3.5" SAS/SATA

The following shows the cable connections with onboard connectors.

From	To
Backplane 1: SAS 0, SAS 1	Onboard: SATA 0, SATA 1
Backplane 1: SAS 2	Onboard: SATA 2

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

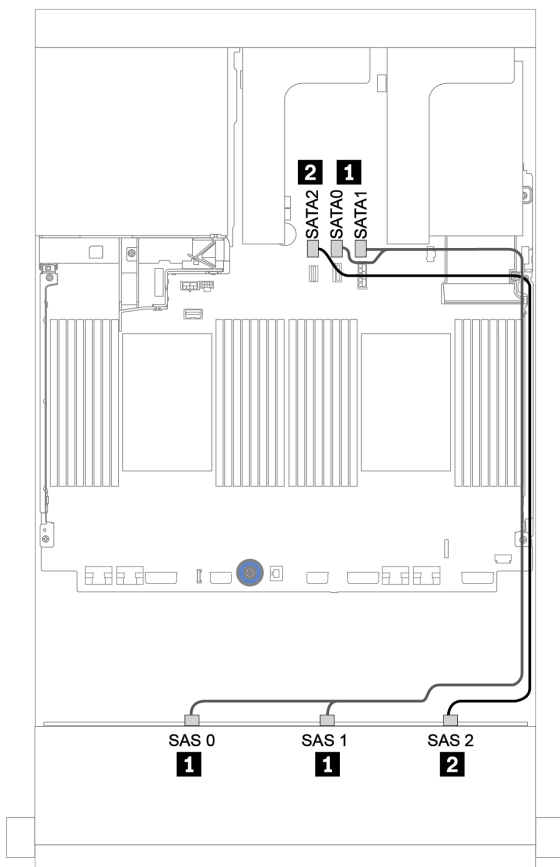


Figure 147. Cable routing for the 12 x 3.5-inch SAS/SATA front backplane with onboard connectors

Middle and rear backplanes: 4 x 3.5" SAS/SATA + 4 x 3.5"/4 x 2.5" SAS/SATA

The following shows the cable connections with one 8i RAID/HBA Gen 3 adapter.

From	To
Backplane 4: SAS	8i RAID/HBA Gen 3 ¹ : C0C1
Backplane 5: SAS	
Backplane 4: PWR	Riser 1: PWR1, PWR2
Backplane 5: PWR	Riser 2: PWR1, PWR2

Notes:

- For a 4 x 3.5-inch SAS/SATA rear backplane, the 8i adapter¹ is installed on PCIe slot 3.
- For a 4 x 2.5-inch SAS/SATA rear backplane, the 8i adapter¹ is installed on PCIe slot 2.

Below illustration uses the 4 x 3.5-inch SAS/SATA rear backplane as an example for cable routing. Cable routing for the 4 x 2.5-inch SAS/SATA rear backplane is similar.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

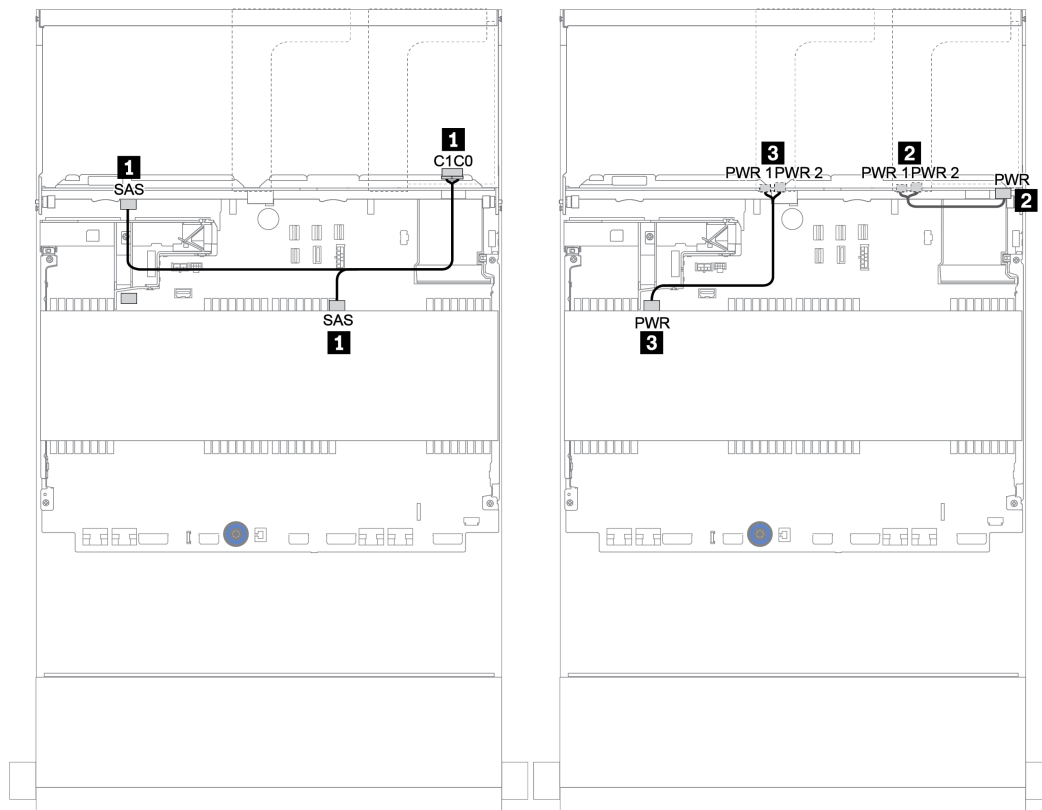


Figure 148. Cable routing for the 4 x 3.5-inch SAS/SATA middle backplane and 4 x 3.5-inch SAS/SATA rear backplane

32i RAID/HBA adapter

Front + middle + rear backplanes: 12 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA + 4 x 3.5"/4 x 2.5" SAS/SATA

From	To
Backplane 1: SAS 0, SAS 1	32i RAID/HBA ¹ : C0
Backplane 1: SAS 2	32i RAID/HBA ¹ : C1
Backplane 4: SAS	
Backplane 5: SAS	32i RAID/HBA ¹ : C2
Backplane 4: PWR	Riser 1: PWR1, PWR2
Backplane 5: PWR	Riser 2: PWR1, PWR2

Notes:

- For a 4 x 3.5-inch SAS/SATA rear backplane, the 32i adapter¹ is installed on PCIe slot 3.
- For a 4 x 2.5-inch SAS/SATA rear backplane, the 32i adapter¹ is installed on PCIe slot 2.

Below illustration uses the 4 x 3.5-inch SAS/SATA rear backplane as an example for cable routing. Cable routing for the 4 x 2.5-inch SAS/SATA rear backplane is similar.

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

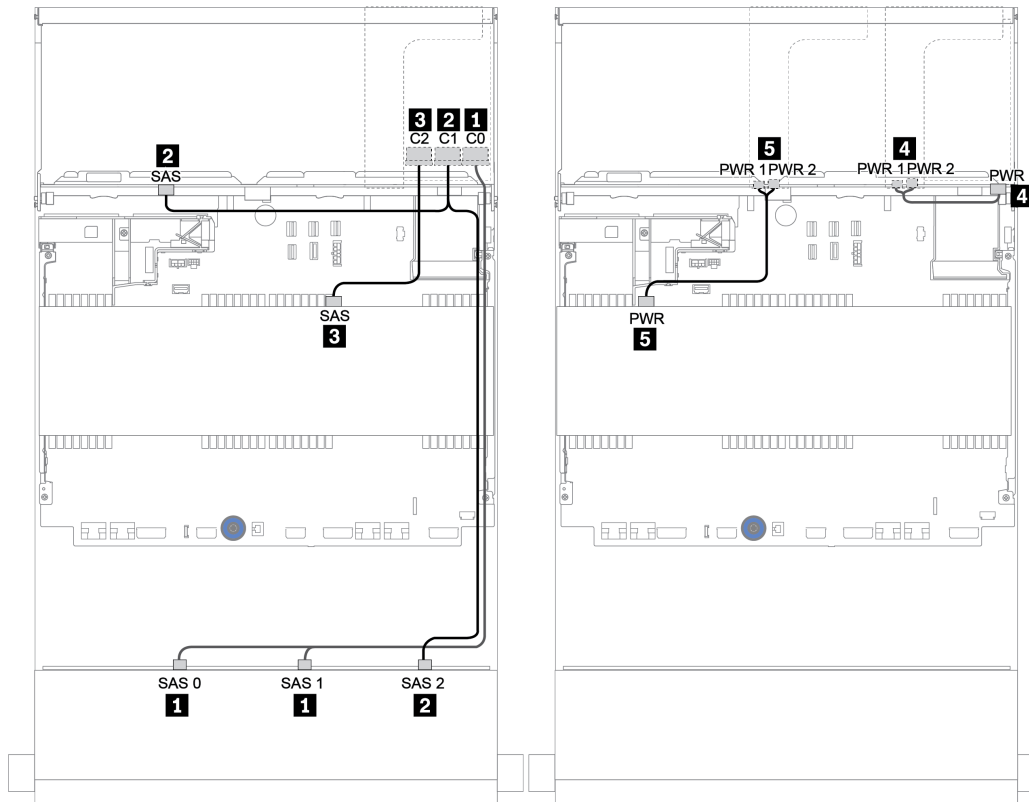


Figure 149. Cable routing for the 12 x 3.5-inch SAS/SATA + 4 x 3.5-inch SAS/SATA + 4 x 3.5-inch SAS/SATA configuration with one 32i RAID/HBA adapter

Front + middle backplanes: 12 x 3.5" SAS/SATA + 8 x 2.5" NVMe

This topic provides cable routing information for the 12 x 3.5-inch SAS/SATA front backplane with two 4 x 2.5-inch NVMe middle backplanes.

- “Front backplane: 12 x 3.5" SAS/SATA” on page 199
- “Middle backplanes: 8 x 2.5" NVMe” on page 200

Front backplane: 12 x 3.5" SAS/SATA

The following shows the cable connections for the 12 x 3.5-inch SAS/SATA front backplane with one 16i RAID/HBA adapter.

From	To
Backplane 1: SAS 0, SAS 1	16i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none">• Gen 3: C0C1• Gen 4: C0
Backplane 1: SAS 2	<ul style="list-style-type: none">• Gen 3: C2C3• Gen 4: C1

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

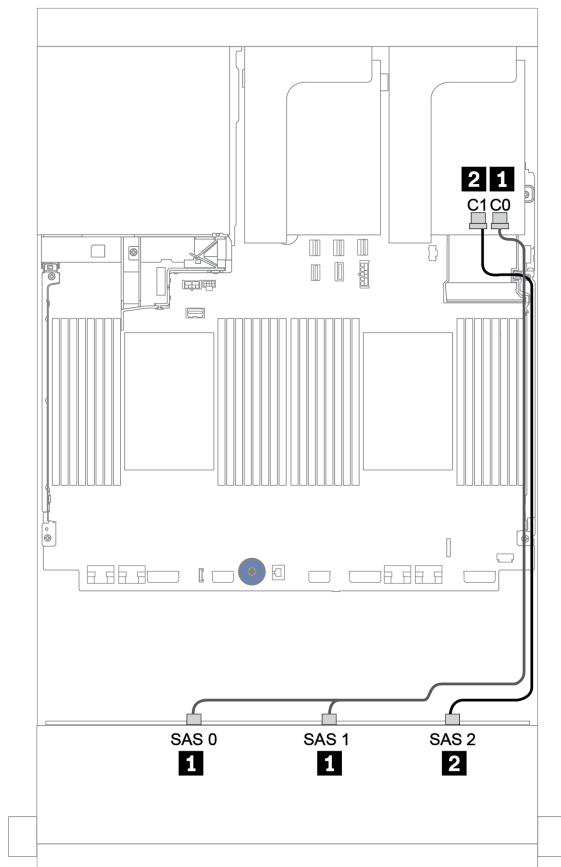


Figure 150. Cable routing for the 12 x 3.5-inch SAS/SATA front backplane with one 16i RAID/HBA adapter

Middle backplanes: 8 x 2.5" NVMe

The following shows the cable connections for the two 4 x 2.5-inch NVMe drive backplanes with onboard connectors.

From	To
Backplane 5: NVMe 0-1, 2-3	Onboard: PCIe 1, PCIe 2
Backplane 6: NVMe 0-1, 2-3	Onboard: PCIe 3, PCIe 4
Backplane 5: PWR	Riser 2: PWR1, PWR2
Backplane 6: PWR	

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

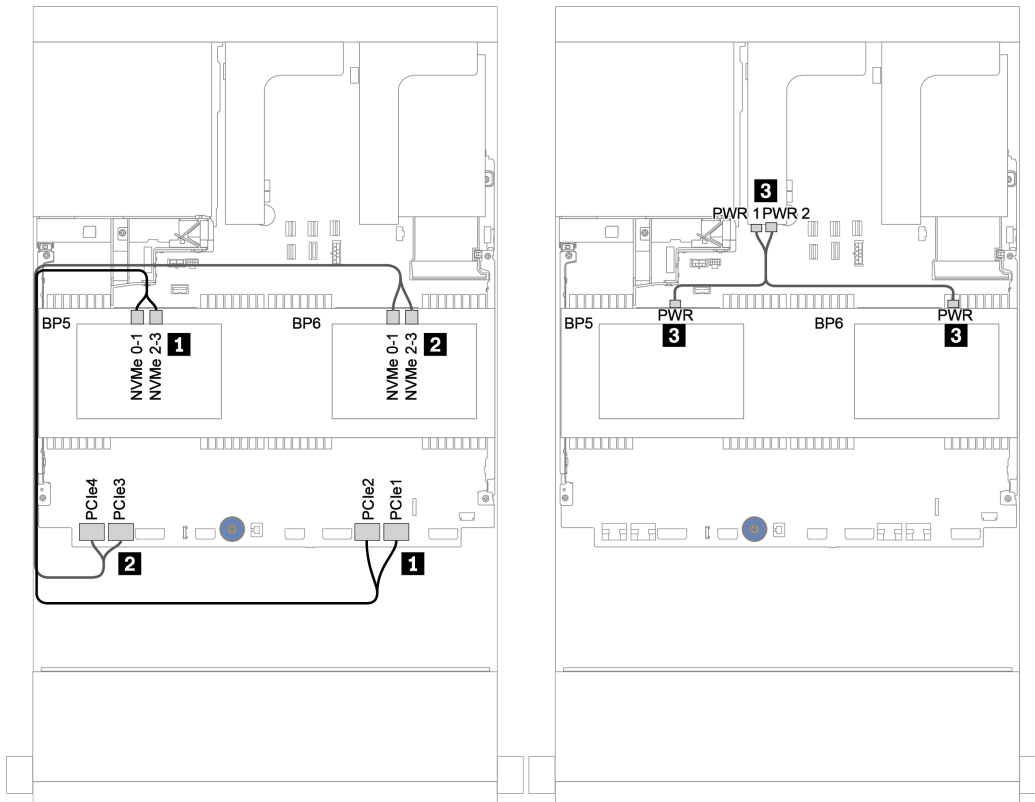


Figure 151. Cable routing for the two 4 x 2.5-inch NVMe middle drive backplanes

12 x 3.5-inch AnyBay backplane

This section provides cable routing information for the server model with 12 x 3.5-inch AnyBay front drive backplane.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 3.5-inch drive backplanes” on page 181.

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration:

- “Front backplane: 12 x 3.5" AnyBay” on page 202
- “Front + rear backplanes: 12 x 3.5" Anybay + 4 x 3.5" SAS/SATA” on page 204
- “Front + middle + rear backplanes: 12 x 3.5" Anybay + 4 x 3.5" SAS/SATA + 4 x 3.5" SAS/SATA” on page 207

Front backplane: 12 x 3.5" AnyBay

This topic provides cable routing information for the server model with 12 x 3.5-inch AnyBay front drive backplane.

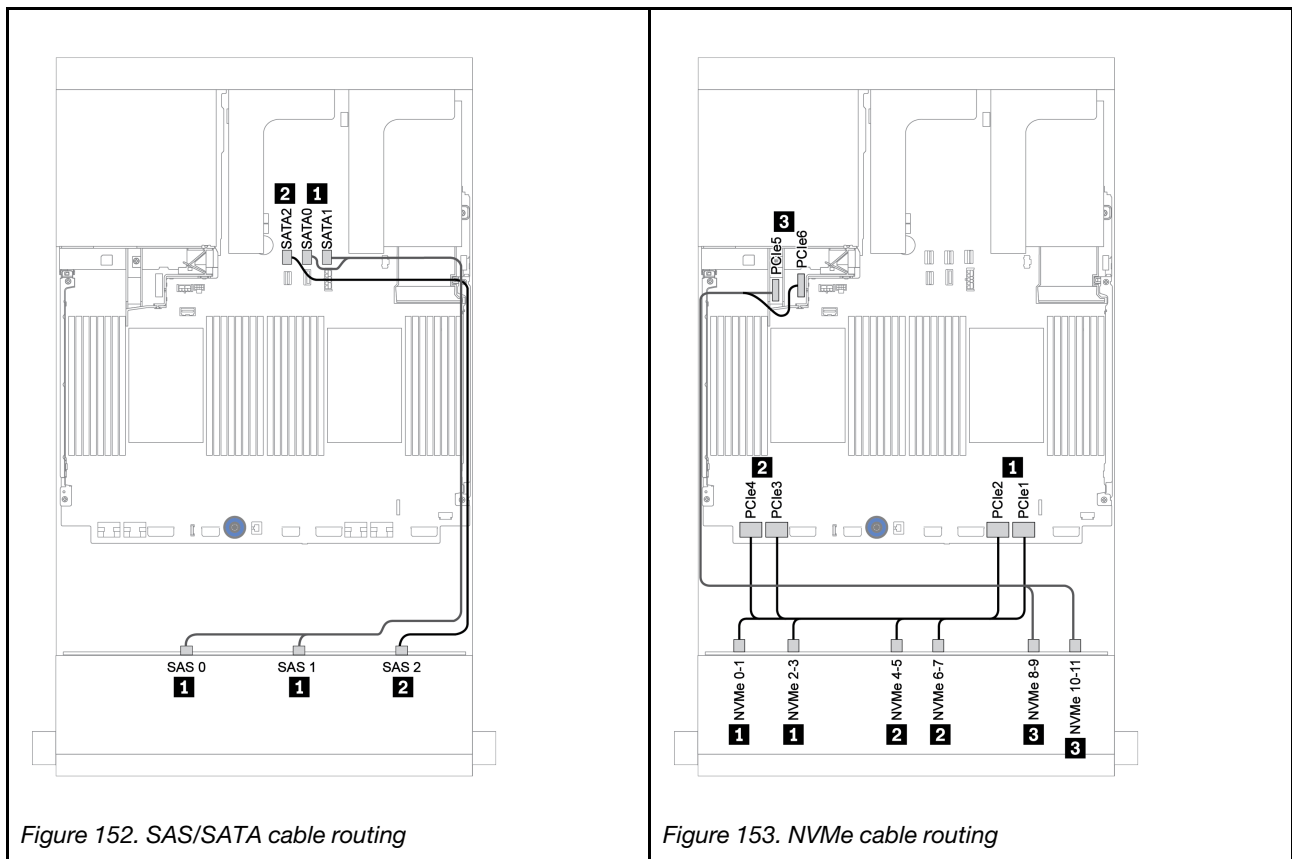
- “Onboard connectors” on page 202
- “16i RAID/HBA adapter + onboard connectors” on page 203

Onboard connectors

The following shows the cable connections for the 12 x 3.5-inch AnyBay front backplane with onboard connectors.

From	To
Backplane 1: SAS 0, SAS 1	Onboard: SATA 0, SATA 1
Backplane 1: SAS 2	Onboard: SATA 2
Backplane 1: NVMe 0-1, 2-3, 4-5, 6-7	Onboard: PCIe 1, 2, 3, 4
Backplane 1: NVMe 8-9, 10-11	Onboard: PCIe 5, PCIe 6

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**



16i RAID/HBA adapter + onboard connectors

The following shows the cable connections for the 12 x 3.5-inch AnyBay front backplane with one 16i RAID/HBA adapter.

From	To
Backplane 1: SAS 0, SAS 1	16i RAID/HBA adapter on PCIe slot 2: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 1: SAS 2	<ul style="list-style-type: none"> • Gen 3: C2C3 • Gen 4: C1
Backplane 1: NVMe 0-1, 2-3, 4-5, 6-7	Onboard: PCIe 1, 2, 3, 4
Backplane 1: NVMe 8-9, 10-11	Onboard: PCIe 5, PCIe 6

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

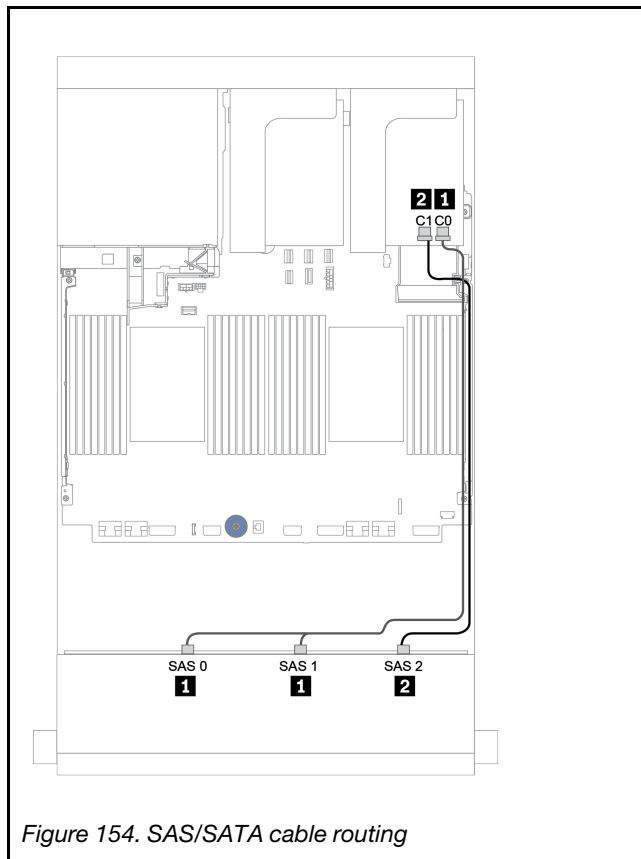


Figure 154. SAS/SATA cable routing

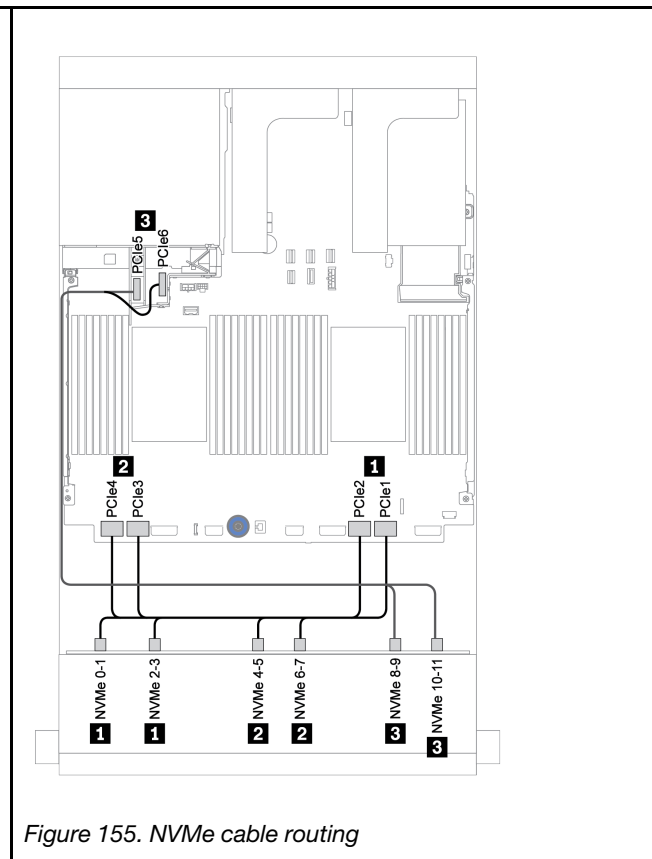


Figure 155. NVMe cable routing

Front + rear backplanes: 12 x 3.5" Anybay + 4 x 3.5" SAS/SATA

This topic provides cable routing information for the 12 x 3.5-inch AnyBay front backplane with a 4 x 3.5-inch SAS/SATA rear backplane.

- “16i RAID/HBA adapter + onboard connectors” on page 205
- “16i RAID/HBA adapter + 8i RAID/HBA adapter + onboard connectors” on page 206

16i RAID/HBA adapter + onboard connectors

The following shows the cable connections for the 12 x 3.5-inch AnyBay front backplane with a 4 x 3.5-inch SAS/SATA rear backplane.

From	To
Backplane 1: SAS 0, SAS 1	16i RAID/HBA adapter on PCIe slot 3: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 1: SAS 2	<ul style="list-style-type: none"> • Gen 3: C2C3 • Gen 4: C1
Backplane 4: SAS	
Backplane 1: NVMe 0-1, 2-3, 4-5, 6-7	Onboard: PCIe 1, 2, 3, 4
Backplane 1: NVMe 8-9, 10-11	Onboard: PCIe 5, PCIe 6

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

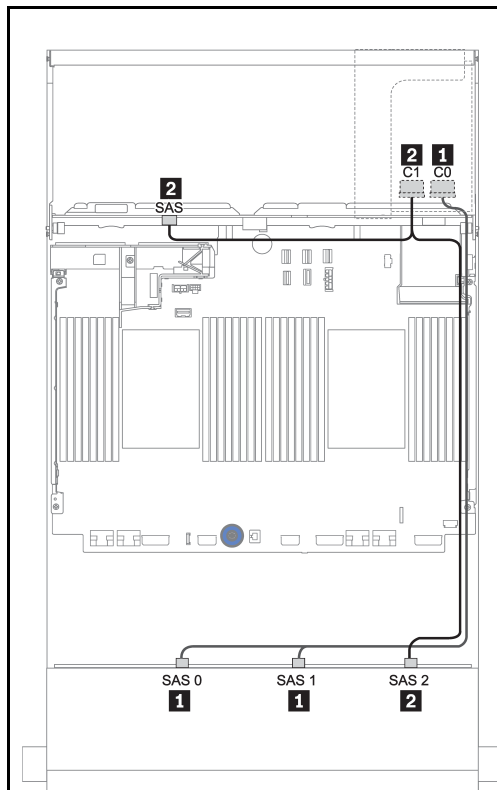


Figure 156. SAS/SATA cable routing

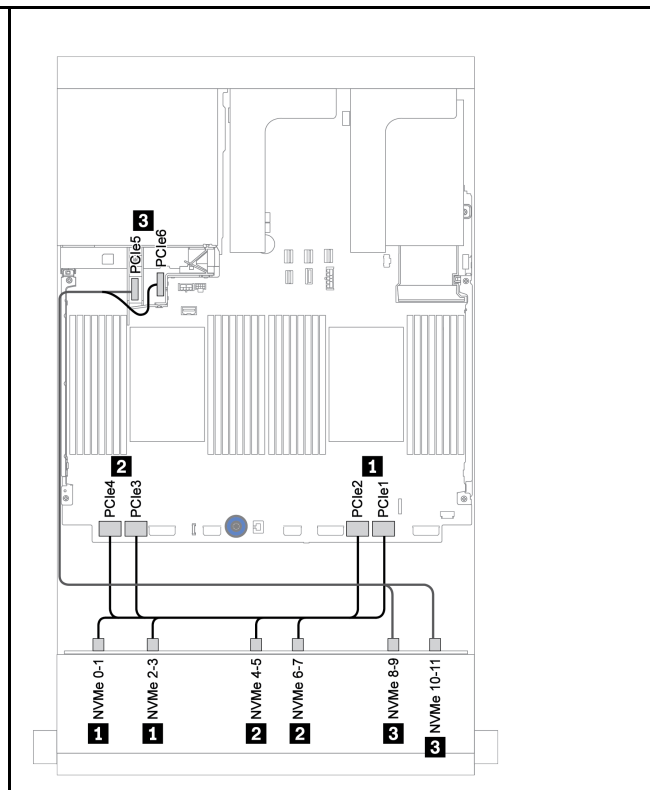


Figure 157. NVMe cable routing

16i RAID/HBA adapter + 8i RAID/HBA adapter + onboard connectors

The following shows the cable connections for the 12 x 3.5-inch AnyBay front backplane with a 4 x 3.5-inch SAS/SATA rear backplane.

From	To
Backplane 1: SAS 0, SAS 1	16i RAID/HBA adapter on PCIe slot 3: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 1: SAS 2	<ul style="list-style-type: none"> • Gen 3: C2C3 • Gen 4: C1
Backplane 4: SAS	8i RAID/HBA adapter on PCIe slot 6: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
Backplane 1: NVMe 0-1, 2-3, 4-5, 6-7	Onboard: PCIe 1, 2, 3, 4
Backplane 1: NVMe 8-9, 10-11	Onboard: PCIe 5, PCIe 6

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

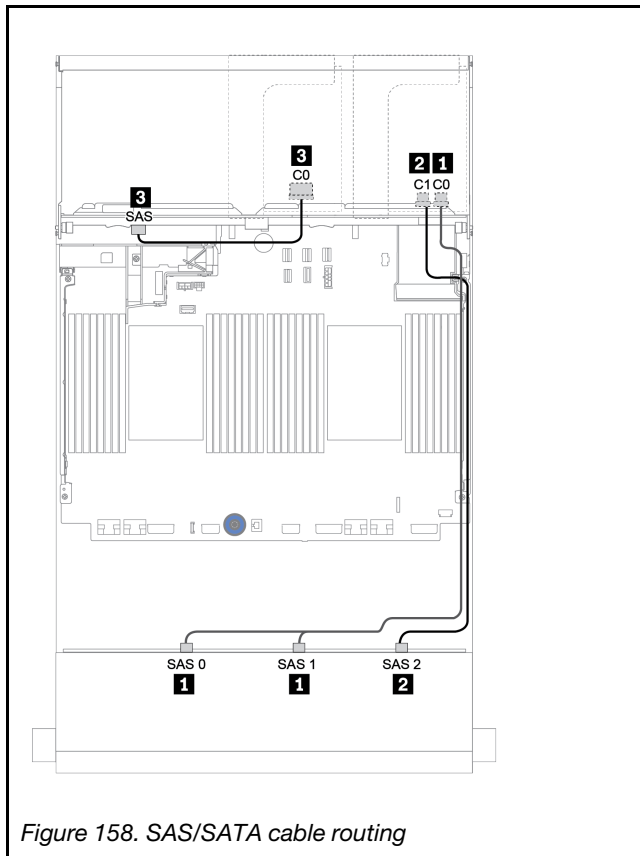


Figure 158. SAS/SATA cable routing

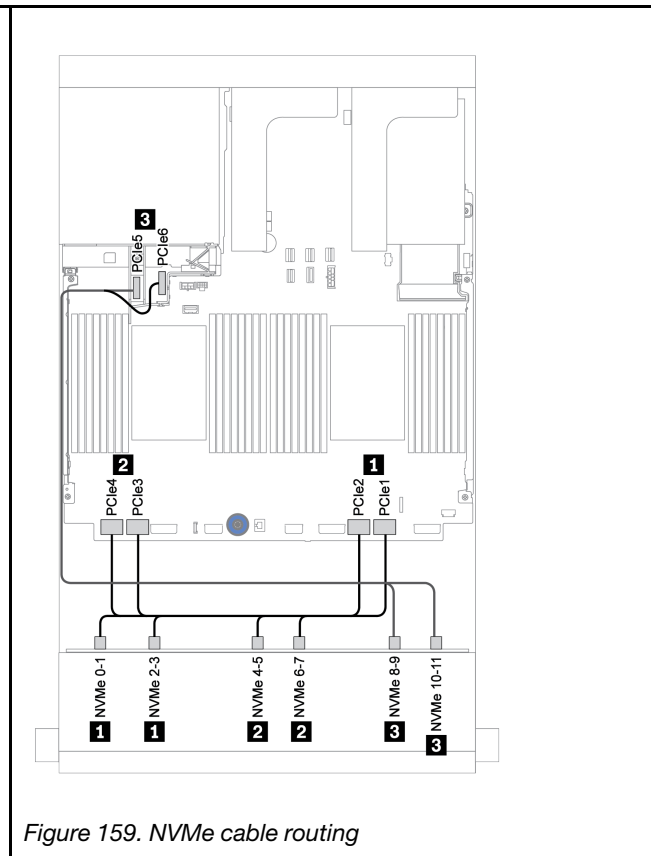


Figure 159. NVMe cable routing

Front + middle + rear backplanes: 12 x 3.5" Anybay + 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 AnyBay front backplane with a 4 x 3.5-inch SAS/SATA middle backplane and a 4 x 3.5-inch SAS/SATA rear backplane.

One 32i RAID/HBA adapter + onboard connectors

From	To
Backplane 1: SAS 0, SAS 1	32i RAID adapter on PCIe slot 3: <ul style="list-style-type: none"> • C0
Backplane 1: SAS 2	<ul style="list-style-type: none"> • C1
Backplane 4: SAS	
Backplane 5: SAS	<ul style="list-style-type: none"> • C2
Backplane 1: NVMe 0-1, 2-3, 4-5, 6-7	Onboard: PCIe 1, 2, 3, 4
Backplane 1: NVMe 8-9, 10-11	Onboard: PCIe 5, PCIe 6

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

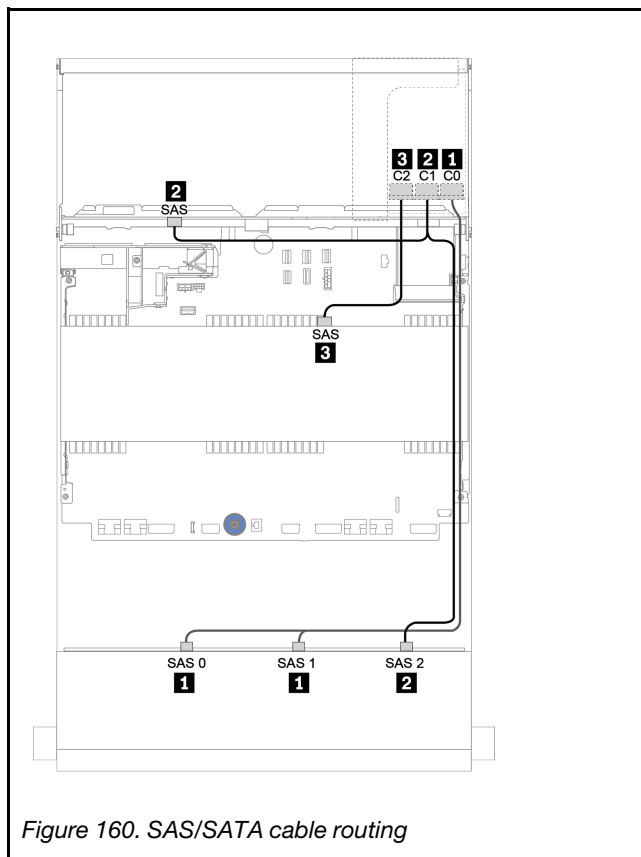


Figure 160. SAS/SATA cable routing

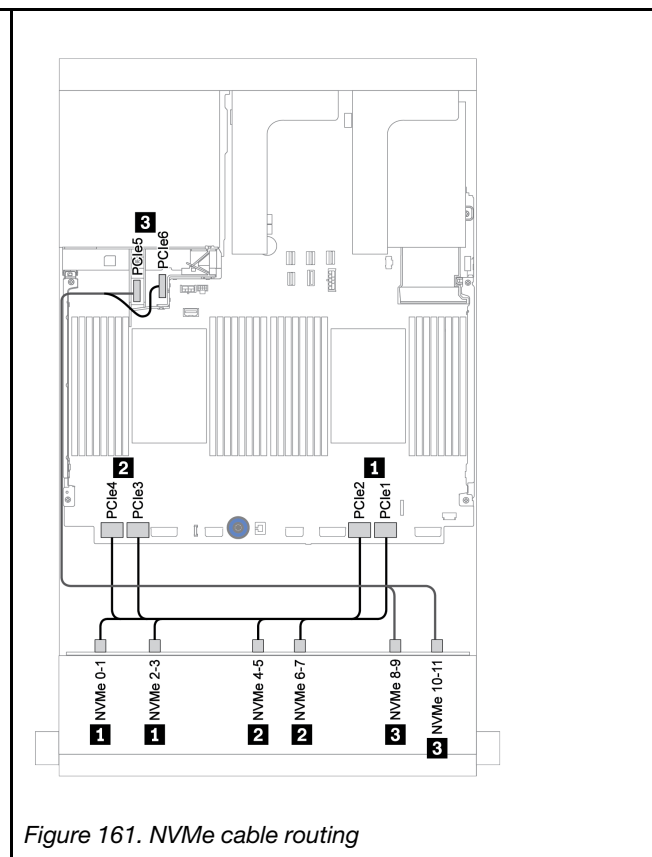


Figure 161. NVMe cable routing

12 x 3.5-inch SAS/SATA Expander backplane

This section provides cable routing information for the configurations with the front 12 x 3.5-inch SAS/SATA Expander backplane.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 3.5-inch drive backplanes” on page 181.

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration:

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**

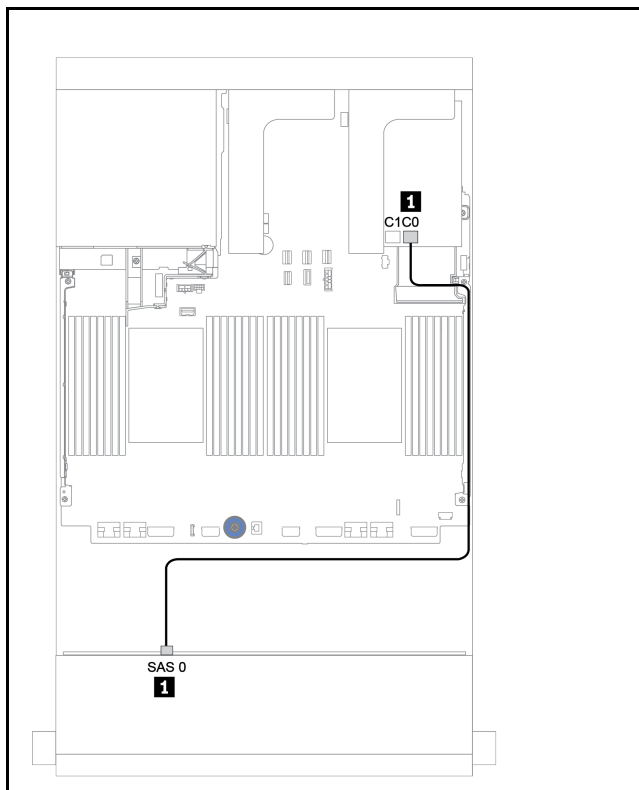


Figure 162. Cable routing with a RAID 530/5350/930/9350-8i adapter

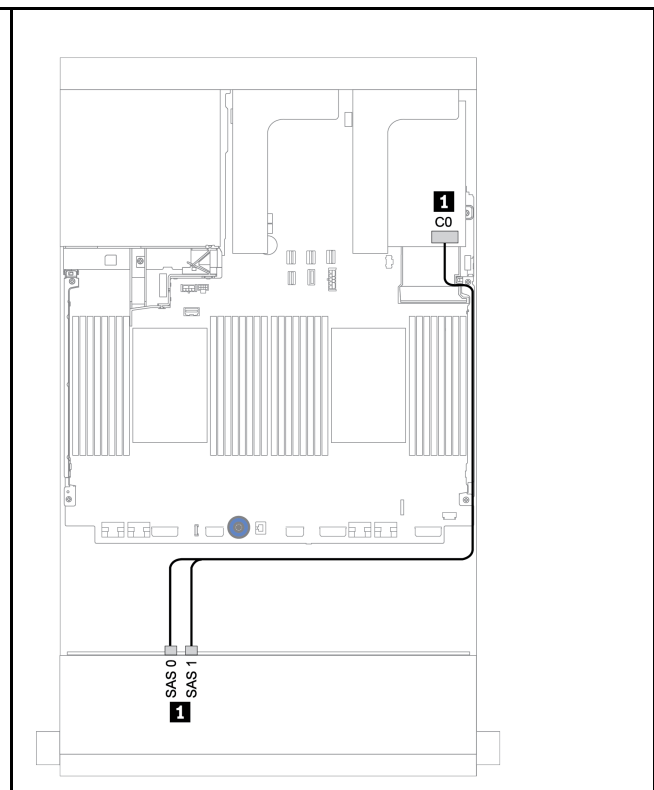


Figure 163. Cable routing with a RAID 940-8i adapter

From	To	From	To
Backplane 1: SAS 0	RAID 8i adapter on riser 1: C0	Backplane 1: SAS 0, SAS 1	RAID 8i adapter on riser 1: C0

12 x 3.5-inch AnyBay Expander backplane

This section provides cable routing information for the configurations with the front 12 x 3.5-inch AnyBay Expander backplane.

To connect power cables for the front backplane(s), refer to “Backplanes: server models with 3.5-inch drive backplanes” on page 181.

To connect signal cables for the front backplane(s), refer to the following cable routing scenarios depending on your server configuration:

Front backplane: 12 x 3.5" AnyBay

This topic provides cable routing information for the front drive backplane, 12 x 3.5-inch AnyBay Expander backplane.

8i adapter

Connections between connectors: **1** ↔ **1**, **2** ↔ **2**, **3** ↔ **3**, ... **n** ↔ **n**

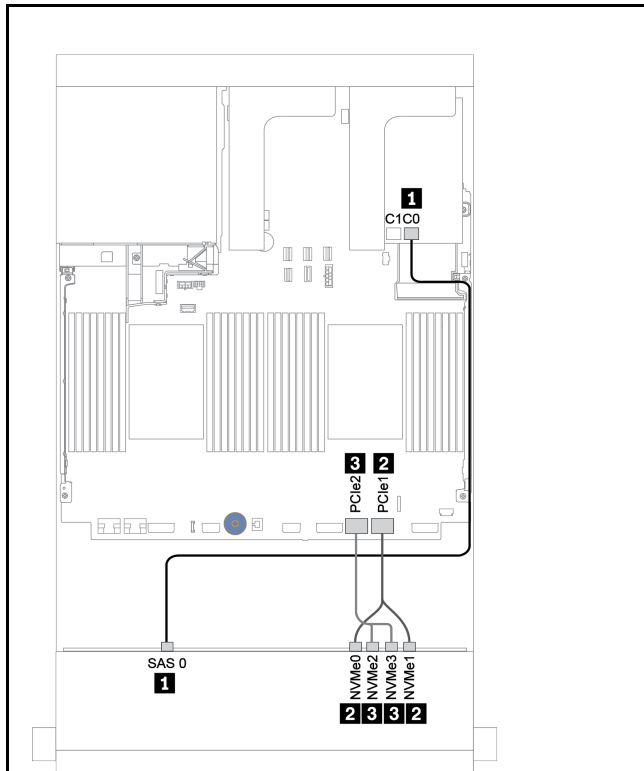


Figure 164. Cable routing with a RAID 530/5350/930/9350-8i adapter

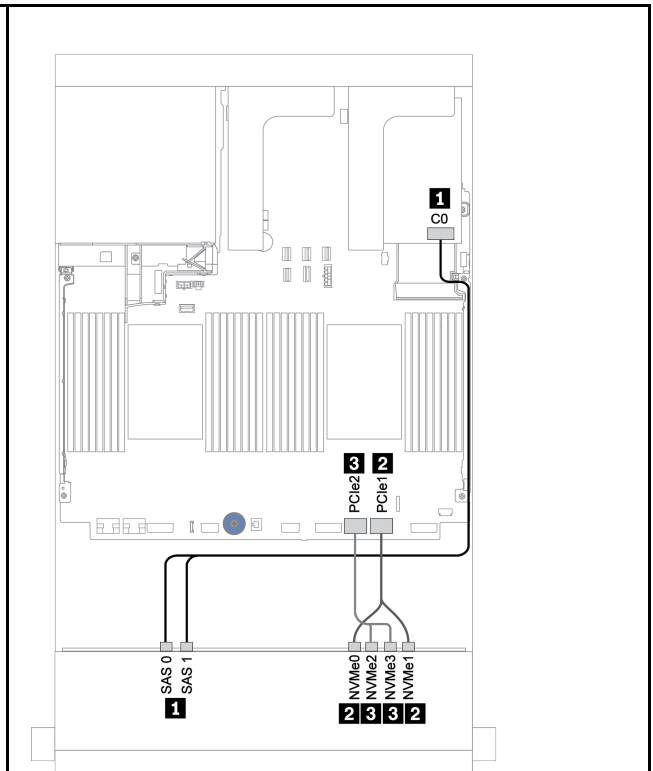


Figure 165. Cable routing with a RAID 940-8i adapter

From	To	From	To
Backplane 1: SAS 0	RAID 8i adapter on riser 1: C0	Backplane 1: SAS 0, SAS 1	RAID 8i adapter on riser 1: C0
Backplane 1: NVMe 0-1	Onboard: PCIe 1	Backplane 1: NVMe 0-1	Onboard: PCIe 1
Backplane 1: NVMe 2-3	Onboard: PCIe 2	Backplane 1: NVMe 2-3	Onboard: PCIe 2

Chapter 4. Server hardware setup

To set up the server, install any options that have been purchased, cable the server, configure and update the firmware, and install the operating system.

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:

1. Unpack the server package. See “Server package contents” on page 2.
2. Set up the server hardware.
 - a. Install any required hardware or server options. See the related topics in “Install server hardware options” on page 239.
 - b. If necessary, install the server into a standard rack cabinet by using the rail kit shipped with the server. See the *Rack Installation Guide* that comes with optional rail kit.
 - c. Connect the Ethernet cables and power cords to the server. See “Rear view” on page 42 to locate the connectors. See “Cable the server” on page 318 for cabling best practices.
 - d. Power on the server. See “Turn on the server” on page 318.

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 version compatible with your server at https://sysmgt.lenovofiles.com/help/topic/ixcc_frontend/ixcc_overview.html.

- e. Validate that the server hardware was set up successfully. See “Validate server setup” on page 319.
3. Configure the system.
 - a. Connect the BMC to the management network. See “Set the network connection for the Lenovo XClarity Controller” on page 321.
 - b. Update the firmware for the server, if necessary. See “Update the firmware” on page 323.
 - c. Configure the firmware for the server. See “Configure the firmware” on page 326.

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>
- d. Install the operating system. See “Deploy the operating system” on page 330.
 - e. Back up the server configuration. See “Back up the server configuration” on page 331.
 - f. Install the applications and programs for which the server is intended to be used.

Installation Guidelines

Use the installation guidelines to install components in your server.

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:
http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html
- Make sure the components you are installing are supported by your server. For a list of supported optional components for the server, see <https://static.lenovo.com/us/en/serverproven/index.shtml>.
- 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 [ThinkSystem SR650 V2 Drivers and Software](#) to download firmware updates for your server.

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

- It is good practice to make sure that the server is working correctly before you install an optional component.
- Keep the working area clean, and place removed components on a flat and smooth surface that does not shake or tilt.
- Do not attempt to lift an object that might be too heavy for you. If you have to lift a heavy object, read the following precautions carefully:
 - Make sure that you can stand steadily without slipping.
 - Distribute the weight of the object equally between your feet.
 - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
 - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Back up all important data before you make changes related to the disk drives.
- Have a small flat-blade screwdriver, a small Phillips screwdriver, and a T8 torx screwdriver available.
- To view the error LEDs on the system board 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, memory, or processor.
- 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.
- 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.

Notes:

- The product is not suitable for use at visual display workplaces according to §2 of the Workplace Regulations.
- 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 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. Make sure that the power is off and the power cord is disconnected.
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

The system reliability guidelines to ensure proper system cooling.

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

Guidelines to work inside the server with the power on.

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

Use this information to handle static-sensitive devices.

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.

Memory module installation rules and order

Memory modules must be installed in a specific order based on the memory configuration that you implement on your server.

Your server has 32 memory slots with 16 channels. For a list of supported memory options, see:

<https://static.lenovo.com/us/en/serverproven/index.shtml>

More information about optimizing memory performance and configuring memory is available at the Lenovo Press Web site:

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

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

http://1config.lenovo.com/#/memory_configuration

The following illustration helps you to locate the memory module slots on the system board.

Note: It is recommended to install memory modules with the same rank in each channel.

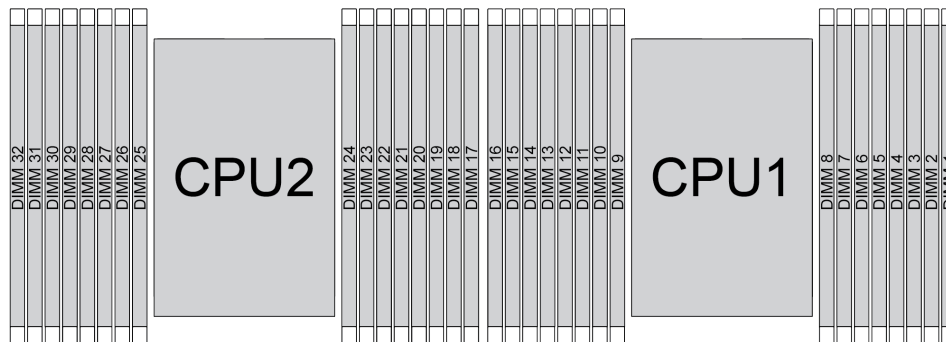


Figure 166. Memory module slots on the system board

Table 24. Memory slot and channel identification

Channel	F0	F1	E0	E1	H0	H1	G0	G1	C1	C0	D1	D0	A1	A0	B1	B0
Slot number	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Memory module installation guideline

- Two types of configurations are supported. Consider corresponding rules and population sequence accordingly:
 - “DRAM DIMM installation order” on page 217 (RDIMMs or 3DS RDIMMs)
 - “PMEM and DRAM DIMM installation order” on page 222
- A label on each DIMM identifies the DIMM type. This information is in the format **xxxxx nRxxx PC4-xxxxx-xx-xx-xxx**. Where **n** indicates if the DIMM is single-rank (n=1) or dual-rank (n=2).
- 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.

Attention:

- Mixing x4 and x8 DIMMs in the same channel is allowed.
- Always populate DIMMs with the maximum number of ranks in the farthest DIMM slot, followed by the nearest DIMM slot.
- Do not mix RDIMMs and 3DS RDIMMs in the same server.
- Mixing 128 GB and 256 GB 3DS RDIMMs is not supported.

DRAM DIMM installation order

For RDIMMs or 3DS RDIMMs, the following memory modes are available:

- “Independent mode” on page 217
- “Mirroring mode” on page 221

Independent mode

In independent memory 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 memory mode provides the highest level of memory performance, but lacks failover protection. The DIMM installation order for independent memory 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:

- All memory modules to be installed must be of the same type. x4 and x8 DIMMs can be mixed in the same channel.
- Memory modules from different vendors are supported.
- There must be at least one DDR4 DIMM per socket.
- In each memory channel, populate slot 0 first.
- If a memory channel has two DIMMs, populate the DIMM with a higher number of ranks in slot 0; if the two DIMMs have the same number of ranks, populate the DIMM with a higher capacity in slot 0.
- A maximum of 8 logical ranks (ranks seen by the host) per channel is allowed.
- A maximum of two different DIMM capacities are supported per system.
 - For channels A, C, E, and G, populated DIMMs must have the same total capacity for each channel.
 - For channels B, D, F, and H, populated DIMMs must have the same total capacity for each channel, which can be different from that of the other set (channels A, C, E, and G).
- If there are more than two DIMMs, populate them in a right-and-left symmetrical manner across a CPU socket.

With one processor

The following table shows the sequence of populating memory modules (with the **same capacity**) for independent mode when only one processor (Processor 1) is installed.

Table 25. Independent mode with one processor (DIMMs with same capacity)

Configura- tion	DIMM slots															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 DIMM			3													
2 DIMMs			3				7									
4 DIMMs ¹			3				7			10				14		
6 DIMMs	1		3				7			10				14		16
8 DIMMs ^{1,2}	1		3		5		7			10		12		14		16
12 DIMMs	1	2	3	4			7	8	9	10			13	14	15	16
16 DIMMs ^{1,2}	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Notes:

1. DIMM configurations that 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. DIMM configurations that support Software Guard Extensions (SGX). See “Enable Software Guard Extensions (SGX)” on page 329 to enable this feature.

The following table shows the sequence of populating memory modules (with **different capacities**) for independent mode when only one processor (Processor 1) is installed.

Table 26. Independent mode with one processor (DIMMs with different capacities)

Configura- tion	DIMM slots															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2 DIMM			3		5											
4 DIMMs			3		5							12		14		
8 DIMMs ^{1,2}	1		3		5		7			10		12		14		16
12 DIMMs ^{1,2}	1		3	4	5		7	8	9	10		12	13	14		16
16 DIMMs ^{1,2}	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Notes:

1. DIMM configurations that 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. DIMM configurations that support Software Guard Extensions (SGX). See “Enable Software Guard Extensions (SGX)” on page 329 to enable this feature.

With two processors

The following table shows the sequence of populating memory modules (with the **same capacity**) for independent mode when two processors (Processor 1 and Processor 2) are installed.

Table 27. Independent mode with two processors (DIMMs with same capacity)

Configura- tion	DIMM slots																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
2 DIMMs			3														
4 DIMMs			3				7										
8 DIMMs ¹			3				7			10				14			
12 DIMMs	1		3				7			10				14		16	
16 DIMMs ^{1,2}	1		3		5		7			10		12		14		16	
24 DIMMs	1	2	3	4			7	8		9	10			13	14	15	16
32 DIMMs ^{1,2}	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16
Configura- tion	DIMM slots																
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
2 DIMMs			19														
4 DIMMs			19				23										
8 DIMMs ¹			19				23			26				30			
12 DIMMs	17		19				23			26				30		32	
16 DIMMs ^{1,2}	17		19		21		23			26		28		30		32	
24 DIMMs	17	18	19	20			23	24		25	26			29	30	31	32
32 DIMMs ^{1,2}	17	18	19	20	21	22	23	24		25	26	27	28	29	30	31	32

Notes:

1. DIMM configurations that 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. DIMM configurations that support Software Guard Extensions (SGX). See “Enable Software Guard Extensions (SGX)” on page 329 to enable this feature.

The following table shows the sequence of populating memory modules (with the **different capacities**) for independent mode when two processors (Processor 1 and Processor 2) are installed.

Table 28. Independent mode with two processors (DIMMs with different capacities)

Configura- tion	DIMM slots															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4 DIMMs			3		5											
8 DIMMs			3		5							12		14		
16 DIMMs ^{1,2}	1		3		5		7			10		12		14		16

Table 28. Independent mode with two processors (DIMMs with different capacities) (continued)

24 DIMMs ^{1,2}	1		3	4	5		7	8	9	10		12	13	14		16
32 DIMMs ^{1,2}	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Configura- tion	DIMM slots															
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
4 DIMMs			19		21											
8 DIMMs			19		21							28		30		
16 DIMMs ^{1,2}	17		19		21		23			26		28		30		32
24 DIMMs ^{1,2}	17		19	20	21		23			26		28	29	30		32
32 DIMMs ^{1,2}	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

Notes:

1. DIMM configurations that 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. DIMM configurations that support Software Guard Extensions (SGX). See “Enable Software Guard Extensions (SGX)” on page 329 to enable this feature.

Mirroring mode

Memory-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 DDR4 memory size of the primary and secondary channels must be the same.

With one processor

The following table shows the memory module population sequence for mirroring mode when only one processor (Processor 1) is installed.

Table 29. Mirroring mode with one processor

Configura- tion	DIMM slots															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
8 DIMMs	1		3		5		7			10		12		14		16
16 DIMMs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Note: DIMM configurations listed in the table 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.

With two processors

The following table shows the memory module population sequence for mirroring mode when two processors (Processor 1 and Processor 2) are installed.

Table 30. Mirroring mode with two processors

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

Note: DIMM configurations listed in the table 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.

PMEM and DRAM DIMM installation order

This section contains information of how to install PMEMs and DRAM DIMMs properly.

When PMEMs and DRAM DIMMs are mixed in the system, the following modes are supported:

- “App Direct Mode” on page 228
- “Memory Mode” on page 230

See the following topics to learn how to set up and configure PMEMs.

- “PMEM rules” on page 222
- “Setting up the system for PMEM for the first time” on page 222
- “PMEM Management options” on page 222
- “Adding or replacing PMEMs in App Direct Mode” on page 227

PMEM rules

Make sure to meet the following requirements when applying PMEMs in the system.

- All the PMEMs that are installed must be of the same part number.
- All the DRAM DIMMs that are installed must be of the same type, rank, and capacity with minimum capacity of 16 GB. It is recommended to use Lenovo DRAM DIMMs with the same part number.

Setting up the system for PMEM for the first time

Complete the following steps when installing PMEMs to the system for the first time.

1. Determine the mode and combination (see “App Direct Mode” on page 228 or “Memory Mode” on page 230).
2. Consider “PMEM rules” on page 222 and acquire the PMEMs and DRAM DIMMs that meet the requirements.
3. Remove all the memory modules that are presently installed (see “Remove a memory module” in *Maintenance Manual*).
4. Follow the adopted combination to install all the PMEMs and DRAM DIMMs (see “Install a memory module” on page 252).
5. Disable security on all the installed PMEMs (see “PMEM Management options” on page 222).
6. Make sure the PMEM firmware is the latest version. If not, update it to the latest version (see https://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/update_fw.html).
7. Configure the PMEMs so that the capacity is available for use (see “PMEM Management options” on page 222).

PMEM Management options

PMEMs can be managed with the following tools:

- Lenovo XClarity Provisioning Manager

To open LXPM, power on the system and press **F1** as soon as the logo screen appears. If a password has been set, enter the password to unlock LXPM.

Go to **UEFI Setup** → **System Settings** → **Intel Optane PMEMs** to configure and manage PMEMs.

For more details, see the “Using Lenovo XClarity Provisioning Manager” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.

Note: If the text-based interface of Setup Utility opens instead of LXPM, go to **System Settings** → <F1> **Start Control** and select **Tool Suite**. Then, reboot the system and press **F1** as soon as the logo screen appears to open LXPM.

- **Setup Utility**

To enter Setup Utility:

1. Power on the system and press **F1** to open LXPM.
2. Go to **UEFI Settings** → **System Settings**, click on the pull-down menu on the upper right corner of the screen, and select **Text Setup**.
3. Reboot the system, and press **F1** as soon as the logo screen appears.

Go to **System Configuration and Boot Management** → **System Settings** → **Intel Optane PMEMs** to configure and manage PMEMs.

- **Lenovo XClarity Essentials OneCLI**

Some management options are available in commands that are executed in the path of Lenovo XClarity Essentials OneCLI in the operating system. See https://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_t_download_use_tcscli.html to learn how to download and use Lenovo XClarity Essentials OneCLI.

Following are the available management options:

- **Intel Optane PMEMs details**

Select this option to view the following details concerning each of the installed PMEMs:

- Number of Intel Optane PMEMs detected
- Total raw capacity
- Total memory capacity
- Total App Direct capacity
- Total unconfigured capacity
- Total inaccessible capacity
- Total reserved capacity

Alternatively, view PMEM details with the following command in OneCLI:

```
OneCli.exe config show IntelOptanePMEM  
--bmc USERID:PASSWORD@10.104.195.86
```

Notes:

- *USERID* stands for XCC user ID.
- *PASSWORD* stands for XCC user password.
- *10.104.195.86* stands for IP address.

- **Goals**

- **Memory Mode [%]**

Select this option to define the percentage of PMEM capacity that is invested in system memory, and hence decide the PMEM mode:

- **0%:** App Direct Mode
- **100%:** Memory Mode

Go to **Goals** → **Memory Mode [%]**, input the memory percentage, and reboot the system.

Notes:

- Before changing from one mode to another:

1. Back up all the data and delete all the created namespaces. Go to **Namespaces → View/Modify/Delete Namespaces** to delete the created namespaces.
 2. Perform secure erase on all the installed PMEMs. Go to **Security → Press to Secure Erase** to perform secure erase.
- Make sure the capacity of installed PMEM and DRAM DIMMs meets system requirements for the new mode (see “App Direct Mode” on page 228 or “Memory Mode” on page 230).
 - After the system is rebooted and the input goal value is applied, the displayed value in **System Configuration and Boot Management → Intel Optane PMEMs → Goals** will go back to the following default selectable options:
 - **Scope:** [Platform]
 - **Memory Mode [%]:** 0
 - **Persistent Memory Type:** [App Direct]
 These values are selectable options for PMEM settings, and do not represent the current PMEM status.

In addition, you can take advantage of a memory configurator, which is available at the following site: http://1config.lenovo.com/#/memory_configuration

Alternatively, set PMEM Goals with the following commands in OneCLI:

- For Memory Mode:

1. Set create goal status.

```
OneCli.exe config set IntelOptanePMEM.CreateGoal Yes
--bmc USERID:PASSWORD@10.104.195.86
```

2. Define the PMEM capacity that is invested in system volatile memory.

```
OneCli.exe config set IntelOptanePMEM.MemoryModePercentage 100
--bmc USERID:PASSWORD@10.104.195.86
```

Where *100* stands for the percentage of capacity that is invested in system volatile memory.

- For App Direct Mode:

1. Set create goal status.

```
OneCli.exe config set IntelOptanePMEM.CreateGoal Yes
--bmc USERID:PASSWORD@10.104.195.86
```

2. Define the PMEM capacity that is invested in system volatile memory.

```
OneCli.exe config set IntelOptanePMEM.MemoryModePercentage 0
--bmc USERID:PASSWORD@10.104.195.86
```

Where *0* stands for the percentage of capacity that is invested in system volatile memory.

3. Set the PMEM mode.

```
OneCli.exe config set IntelOptanePMEM.PersistentMemoryType "App Direct"
--bmc USERID:PASSWORD@10.104.195.86
```

Where *App Direct* stands for the PMEM mode. You can input *App Direct* for App Direct interleaved or *App Direct Not Interleaved* for App Direct not interleaved.

- **Persistent Memory Type**

In App Direct Mode, the PMEMs that are connected to the same processor are by default interleaved (displayed as **App Direct**), while memory banks are used in turns. To set them as not interleaved in the Setup Utility, go to **Intel Optane PMEMs → Goals → Persistent Memory Type [(PMEM mode)]**, select **App Direct Not Interleaved** and reboot the system.

Note: Setting PMEM App Direct capacity to not interleaved will turn the displayed App Direct regions from one region per processor to one region per PMEM.

- **Regions**

After the memory percentage is set and the system is rebooted, regions for the App Direct capacity will be generated automatically. Select this option to view the App Direct regions per processor.

- **Namespaces**

App Direct capacity of PMEMs requires the following steps before it is truly available for applications.

1. Namespaces must be created for region capacity allocation.
2. Filesystem must be created and formatted for the namespaces in the operating system.

Each App Direct region can be allocated into one namespace. Create namespaces in the following operating systems:

- Windows: Use *powershell* command. To create a namespace, use Windows Server 2019 or later versions.
- Linux: Use *ndctl* command.
- VMware: Reboot the system, and VMware will create namespaces automatically.

After creating namespaces for App Direct capacity allocation, make sure to create and format filesystem in the operating system so that the App Direct capacity is accessible for applications.

- **Security**

- Enable Security

Attention: By default, PMEM security is disabled. Before enabling security, make sure all the country or local legal requirements regarding data encryption and trade compliance are met. Violation could cause legal issues.

PMEMs can be secured with passphrases. Two types of passphrase protection scope are available for PMEM:

- **Platform:** Choose this option to run security operation on all the installed PMEM units at once. A platform passphrase is stored and automatically applied to unlock PMEMs before operating system starts running, but the passphrase still has to be disabled manually for secure erase.

Alternatively, enable/disable platform level security with the following commands in OneCLI:

- Enable security:

1. Enable security.

```
OneCli.exe config set IntelOptanePMEM.SecurityOperation "Enable Security"  
--bmc USERID:PASSWORD@10.104.195.86
```

2. Set the security passphrase.

```
OneCli.exe config set IntelOptanePMEM.SecurityPassphrase "123456"  
--bmc USERID:PASSWORD@10.104.195.86
```

Where *123456* stands for the passphrase.

3. Reboot the system.

- Disable security:

1. Disable security.

```
OneCli.exe config set IntelOptanePMEM.SecurityOperation "Disable Security"  
--bmc USERID:PASSWORD@10.104.195.86
```

2. Enter passphrase.

```
OneCli.exe config set IntelOptanePMEM.SecurityPassphrase "123456"  
--bmc USERID:PASSWORD@10.104.195.86
```

3. Reboot the system.

- **Single PMEM:** Choose this option to run security operation on one or more selected PMEM units.

Notes:

- Single PMEM passphrases are not stored in the system, and security of the locked units needs to be disabled before the units are available for access or secure erase.
- Always make sure to keep records of the slot number of locked PMEMs and corresponding passphrases. In the case the passphrases are lost or forgotten, the stored data cannot be backed up or restored, but you can contact Lenovo service for administrative secure erase.
- After three failed unlocking attempts, the corresponding PMEMs enter “exceeded” state with a system warning message, and the PMEM unit can only be unlocked after the system is rebooted.

To enable passphrase, go to **Security → Press to Enable Security**.

- Secure Erase

Notes:

- Password is required to perform Secure Erase when security enabled.
- Before executing secure erase, make sure ARS (Address Range Scrub) is done on all PMEMs or on the specific PMEMs selected. Otherwise, secure erase cannot be started on all PMEMs or the specific PMEM selected, and the following text message will pop out:
The passphrase is incorrect for single or multiple or all Intel Optane PMEMs selected, or maybe there is namespace on the selected PMEMs. Secure erase operation is not done on all Intel Optane PMEMs selected.

Secure erase cleanses all the data that is stored in the PMEM unit, including encrypted data. This data deletion method is recommended before returning or disposing a malfunctioning unit, or changing PMEM mode. To perform secure erase, go to **Security → Press to Secure Erase**.

Alternatively, perform platform level secure erase with the following command in OneCLI:

```
OneCli.exe config set IntelOptanePMEM.SecurityOperation "Secure Erase Without Passphrase"  
--bmc USERID:PASSWORD@10.104.195.86
```

- **PMEM Configuration**

PMEM contains spared internal cells to stand in for the failed ones. When the spared cells are exhausted to 0%, there will be an error message, and it is advised to back up data, collect service log, and contact Lenovo support.

There will also be a warning message when the percentage reaches 1% and a selectable percentage (10% by default). When this message appears, it is advised to back up data and run PMEM diagnostics (see the “Diagnostics” section in the LXPM documentation compatible with your server at https://sysmgmt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html). To adjust the selectable percentage that the warning message requires, go to **Intel Optane PMEMs → PMEM Configuration**, and input the percentage.

Alternatively, change the selectable percentage with the following command in OneCLI:

```
OneCli.exe config set IntelOptanePMEM.PercentageRemainingThresholds 20  
--bmc USERID:PASSWORD@10.104.195.86
```

Where 20 is the selectable percentage.

Adding or replacing PMEMs in App Direct Mode

Complete the following steps before adding or replacing PMEMs in App Direct Mode.

1. Back up stored data in PMEM namespaces.
2. Disable PMEM security with one of the following options:
 - **Lenovo XClarity Provisioning Manager**
Go to **UEFI Setup → System Settings → Intel Optane PMEMs → Security → Press to Disable Security**, and input passphrase to disable security.
 - **Setup Utility**
Go to **System Configuration and Boot Management → System Settings → Intel Optane PMEMs → Security → Press to Disable Security**, and input passphrase to disable security.
3. Delete namespaces with command corresponding to the operating system that is installed:
 - **Linux** command:
`ndctl destroy-namespace all -f`
 - **Windows** Powershell command
`Get-PmemDisk | Remove-PmemDisk`
4. Clear Platform Configuration Data (PCD) and Namespace Label Storage Area (LSA) with the following `ipmctl` command (for both Linux and Windows).
`ipmctl delete -pcd`

Notes: See the following links to learn how to download and use `ipmctl` in different operating systems:
 - Windows: <https://datacentersupport.lenovo.com/us/en/videos/YTV101407>
 - Linux: <https://datacentersupport.lenovo.com/us/en/solutions/HT508642>
5. Reboot the system.

App Direct Mode

In this mode, PMEMs act as independent and persistent memory resources directly accessible by specific applications, and DRAM DIMMs act as system memory. Ensure that the ratio of total DRAM DIMM capacity to total PMEM capacity within a processor is between 1:1 and 1:8.

With one processor

Table 31. Memory population in App Direct Mode with one processor

Configuration	DIMM slots															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 PMEM and 6 DIMMs*	D		D		P		D			D				D		D
1 PMEM and 8 DIMMs*	D		D	P	D		D			D		D		D		D
2 PMEMs and 12 DIMMs	D	D	D	D	P		D	D	D	D		P	D	D	D	D
4 PMEMs and 4 DIMMs	P		D		P		D			D		P		D		P
4 PMEMs and 8 DIMMs	D		D	P	D		D	P	P	D		D	P	D		D
8 PMEMs and 8 DIMMs	D	P	D	P	D	P	D	P	P	D	P	D	P	D	P	D

Note: * Not-interleaved mode only. Does not support 100% interleaved mode.

With two processors

Table 32. Memory population in App Direct Mode with two processors

<ul style="list-style-type: none"> • D: DRAM DIMMs • P: Persistent Memory Module (PMEM) 																
Configura- tion	DIMM slots															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2 PMEM and 12 DIMMs*	D		D		P		D			D				D		D
2 PMEM and 16 DIMMs*	D		D	P	D		D			D		D		D		D
4 PMEMs and 24DIMMs	D	D	D	D	P		D	D	D	D		P	D	D	D	D
8 PMEMs and 8 DIMMs	P		D		P		D			D		P		D		P
8 PMEMs and 16 DIMMs	D		D	P	D		D	P	P	D		D	P	D		D
16 PMEMs and 16 DIMMs	D	P	D	P	D	P	D	P	P	D	P	D	P	D	P	D
Configura- tion	DIMM slots															
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
2 PMEM and 12 DIMMs*	D		D		P		D			D				D		D
2 PMEM and 16 DIMMs*	D		D	P	D		D			D		D		D		D
4 PMEMs and 24DIMMs	D	D	D	D	P		D	D	D	D		P	D	D	D	D
8 PMEMs and 8 DIMMs	P		D		P		D			D		P		D		P
8 PMEMs and 16 DIMMs	D		D	P	D		D	P	P	D		D	P	D		D
16 PMEMs and 16 DIMMs	D	P	D	P	D	P	D	P	P	D	P	D	P	D	P	D

Note: * Not-interleaved mode only. Does not support 100% interleaved mode.

Memory Mode

In this mode, PMEMs act as volatile system memory, while DRAM DIMMs act as cache. Ensure that the ratio of DRAM DIMM capacity to PMEM capacity is between 1:4 and 1:16.

With one processor

Table 33. Memory Mode with one processor

<ul style="list-style-type: none"> D: DRAM DIMMs P: Persistent Memory Module (PMEM) 																
Configuration	DIMM slots															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4 PMEMs and 4 DIMMs	P		D		P		D			D		P		D		P
4 PMEMs and 8 DIMMs	D		D	P	D		D	P	P	D		D	P	D		D
8 PMEMs and 8 DIMMs	D	P	D	P	D	P	D	P	P	D	P	D	P	D	P	D

With two processors

Table 34. Memory Mode with two processors

<ul style="list-style-type: none"> D: DRAM DIMMs P: Persistent Memory Module (PMEM) 																
Configura-tion	DIMM slots															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
8 PMEMs and 8 DIMMs	P		D		P		D			D		P		D		P
8 PMEMs and 16 DIMMs	D		D	P	D		D	P	P	D		D	P	D		D
16 PMEMs and 16 DIMMs	D	P	D	P	D	P	D	P	P	D	P	D	P	D	P	D
Configura-tion	DIMM slots															
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
8 PMEMs and 8 DIMMs	P		D		P		D			D		P		D		P
8 PMEMs and 16 DIMMs	D		D	P	D		D	P	P	D		D	P	D		D
16 PMEMs and 16 DIMMs	D	P	D	P	D	P	D	P	P	D	P	D	P	D	P	D

Technical rules

This topic provides technical rules for the server.

- “PCIe slots and PCIe adapters” on page 231
- “Thermal rules” on page 236

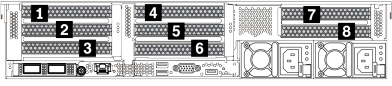
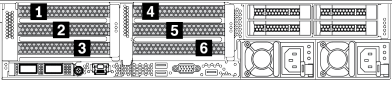
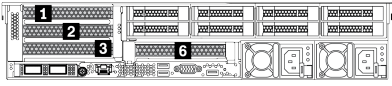
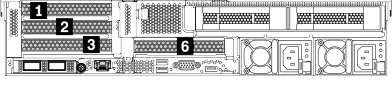
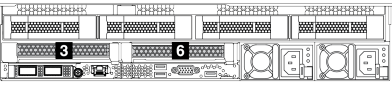
PCIe slots and PCIe adapters

This topic provides installation rules for PCIe adapters.

Slot configurations

Your server supports the following rear configurations with different types of riser cards.

*E: empty

Server rear view	PCIe slots		
	Slots 1–3 on riser 1: <ul style="list-style-type: none"> • Type 1: x16/x8/x8 • Type 2: x16/x16/E • Type 3: E/x16/x16 	Slots 4–6 on riser 2: <ul style="list-style-type: none"> • Type 1: x16/x8/x8 • Type 2: x16/x16/E • Type 3: E/x16/x16 	Slots 7–8 on riser 3: <ul style="list-style-type: none"> • Type 1: x16/x16 • Type 2: x8/x8
	Slots 1–3 on riser 1: <ul style="list-style-type: none"> • Type 1: x16/x8/x8 • Type 2: x16/x16/E • Type 3: E/x16/x16 	Slots 4–6 on riser 2: <ul style="list-style-type: none"> • Type 1: x16/x8/x8 • Type 2: x16/x16/E • Type 3: E/x16/x16 	NA
	Slots 1–3 on riser 1: <ul style="list-style-type: none"> • Type 1: x16/x8/x8 • Type 2: x16/x16/E • Type 3: E/x16/x16 	Slot 6 on riser 2: x16	NA
	Slots 1–3 on riser 1: <ul style="list-style-type: none"> • Type 1: x16/x8/x8 • Type 2: x16/x16/E • Type 3: E/x16/x16 	Slot 6 on riser 2: x16	NA
	Slot 3 on riser 1: x16	Slot 6 on riser 2: x16	NA

Notes:

- **7mm drive cage installation rules:**
 - For server models with 8 PCIe slots or a 4 x 2.5-inch rear drive cage, 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.
- **Serial port module installation rules:**
 - For server models with 8 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 3, then a serial port module can be installed on slot 6.
 - If only one of riser 1 and riser 2 (not both) uses 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 3 or slot 6.
 - 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 3 or slot 6.
 - For server models with a double-wide GPU, the serial port module can be installed only on slot 6.

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
GPU adapter ^{note1 on page 234}		
Double-wide GPU (165W/250W/300W)	3	<ul style="list-style-type: none"> • 1 CPU: 2, 7 • 2 CPUs: 2, 5, 7
Single-wide GPU (40W/75W)	8	<ul style="list-style-type: none"> • 1 CPU: 1, 2, 3, 7, 8 • 2 CPUs: 1, 4, 7, 8, 2, 5, 3, 6
Single-wide GPU (150W)	4	<ul style="list-style-type: none"> • 1 CPU: 1, 2, 7 • 2 CPUs: 1, 4, 5, 7, 8
NVMe switch card		
ThinkSystem 1611-8P PCIe Gen4 Switch Adapter	4	2 CPUs: 1, 2, 4, 5
PCIe retimer card		
ThinkSystem x16 Gen 4.0 Re-timer adapter	3	<ul style="list-style-type: none"> • 1 CPU: 1, 2, 3 • 2 CPUs: 1, 3, 2, 4
Internal CFF RAID/HBA/Expander		

PCIe adapter	Maximum supported	Suggested slot priority
9350-8i, 9350-16i	1	Not installed in PCIe slots. CFF RAID/HBA adapters are supported only in server models with 2.5-inch front drive bays when two processors are installed.
440-16i, 940-16i		
ThinkSystem 36i 12Gb Internal Expander		
Internal SFF RAID/HBA adapter <small>note2 on page 234</small>		
430-8i, 4350-8i, 530-8i, 5350-8i, 930-8i, 9350-8i	4	<ul style="list-style-type: none"> • 1 CPU: 2, 3, 1 • 2 CPUs: <ul style="list-style-type: none"> – Without double-wide GPU: 2, 3, 5, 6, 1, 4 – With double-wide GPU: 2, 3, 6, 5, 1, 4
430-16i, 4350-16i, 530-16i, 930-16i, 9350-16i	2	
440-8i, 540-8i, 540-16i, 940-8i, 940-16i (8GB)	4	
440-16i, 940-16i (4GB)	2	
940-32i	1	
940-8i (Trimode)	3	
940-16i 4GB (Trimode)	2	
940-16i 8GB (Trimode)	4	
External RAID/HBA adapter		
430-8e, 430-16e, 440-16e	8	<ul style="list-style-type: none"> • 1 CPU: 2, 3, 1, 7, 8 • 2 CPUs: 2, 5, 3, 6, 7, 8, 1, 4
930-8e	4	
PCIe SSD adapter		
All supported PCIe SSD adapters	8	<ul style="list-style-type: none"> • 1 CPU: 2, 3, 1, 7, 8 • 2 CPUs: 2, 5, 3, 6, 7, 8, 1, 4
FC HBA adapter		
All supported FC HBA adapters	8	<ul style="list-style-type: none"> • 1 CPU: 2, 3, 1, 7, 8 • 2 CPUs: 2, 5, 3, 6, 7, 8, 1, 4
NIC adapter		
Broadcom 57508 100GbE QSFP56 2-port PCIe 4 Ethernet Adapter	6	<ul style="list-style-type: none"> • 1 CPU: PCIe slot 1, 2, 7 • 2 CPUs: PCIe slot 1, 4, 2, 5, 7, 8
Broadcom 57508 100GbE QSFP56 2-port PCIe 4 Ethernet Adapter v2		
Broadcom 57454 10/25GbE SFP28 4-port PCIe Ethernet Adapter_Refresh	6	<ul style="list-style-type: none"> • 1 CPU: PCIe slot 2, 3, 1, 7 • 2 CPUs: PCIe slot 2, 5, 3, 6, 7, 8, 1, 4
Mellanox ConnectX-6 Lx 100GbE QSFP28 2-port PCIe Ethernet Adapter	6	<ul style="list-style-type: none"> • 1 CPU: PCIe slot 1, 2, 7 • 2 CPUs: PCIe slot 1, 4, 2, 5, 7, 8
Xilinx Alveo U50 ^{note3 on page 234}	6	<ul style="list-style-type: none"> • 1 CPU: PCIe slot 2, 1, 7 • 2 CPUs: PCIe slot 2, 5, 1, 4, 7, 8
All other supported NIC adapters	8	<ul style="list-style-type: none"> • 1 CPU: 2, 3, 1, 7, 8 • 2 CPUs: 2, 5, 3, 6, 7, 8, 1, 4

PCIe adapter	Maximum supported	Suggested slot priority
InfiniBand adapter		
Mellanox ConnectX-6 HDR100 IB/100GbE VPI 1-port x16 PCIe 3.0 HCA w/ Tall Bracket	6	<ul style="list-style-type: none"> • 1 CPU: 1, 2, 7 • 2 CPUs: 1, 4, 2, 5, 7, 8
Mellanox ConnectX-6 HDR100 IB/100GbE VPI 2-port x16 PCIe 3.0 HCA w/ Tall Bracket		
Mellanox ConnectX-6 HDR IB/200GbE Single Port x16 PCIe Adapter w/ Tall Bracket	6	Refer to below note4 on page 234 for detailed installation rules.
Mellanox HDR Auxiliary x16 PCIe 3.0 Connection Card Kit	3	

Notes:

1. Rules for GPU adapters:

- All installed GPU adapters must be identical.
- If a double-wide GPU adapter is installed in slot 5, 7 or 2, the adjacent slot 4, 8, or 1 respectively is not available.
- If a single-wide 150W GPU adapter is installed on PCIe slot 1, 4, or 7, the adjacent slot 2, 5, or 8 respectively cannot be installed with an Ethernet adapter of 100GbE or higher.

2. Rules for the internal standard form factor (SFF) RAID/HBA adapters:

- Mixing of RAID/HBA 430/530/930 adapters (Gen 3) and RAID/HBA 440/940 adapters (Gen 4) in the same system is not allowed.
- RAID/HBA adapters belonged to the same generation (Gen 3 or Gen 4) are allowed to be mixed in the same system.
- The RAID 940-8i or RAID 940-16i adapter supports Trimode. When Trimode is enabled, the server supports up to 24 U.3 NVMe SSD drives (U.2 NVMe SSD not supported).
- The virtual RAID on CPU (VROC) key and Trimode are not supported at the same time.
- RAID 930/940 series or 9350 series adapters require a RAID flash power module.
- HBA 4350, RAID 5350, or RAID 9350 adapters are supported only on certain configurations. For detailed information, see “Controller selections” on page 82 and “Controller selections” on page 182.
- The HBA 4350-8i adapter and the Intel E810-DA2 PCIe Ethernet adapter or Intel E810-DA2 OCP adapter cannot be installed in the same system.

3. To install the Xilinx Alveo U50 adapter, follow the following rules:

- The ambient temperature must be limited to 30°C or lower.
- No fan fails.
- No VMware operating system is installed.
- The Xilinx Alveo U50 adapter is not supported in server models with 24 x 2.5-inch drives or 12 x 3.5-inch drives.

4. If one of the below InfiniBand adapters are installed:

- Primary adapter: Mellanox ConnectX-6 HDR IB/200GbE Single Port x16 PCIe Adapter, up to 6 adapters, can be installed independently.
- Secondary adapter: Mellanox HDR Auxiliary x16 PCIe 3.0 Connection Card Kit, up to 3 adapters, must be installed with the primary adapter.

- If use one primary adapter and one secondary adapter, install the primary adapter on PCIe slot 1 or 2, and install the secondary adapter on PCIe slot 4 or 5.
- If use two primary adapters and two secondary adapters, install the primary adapters on PCIe slots 1 and 2, and install the secondary adapters on PCIe slots 4 and 5.
- If use three primary adapters and three secondary adapters, install the primary adapters on PCIe slots 1, 2, and 7, and install the secondary adapters on PCIe slots 4, 5, and 8.
- If use the primary adapters only, install the adapters on PCIe slots 1, 4, 7, 2, 5, and 8.

Attention:

- When the primary adapter is used with active optical cables (AOC) in the 12 x 3.5-inch or 24 x 2.5-inch configuration, follow “Thermal rules” on page 236 and ensure that the ambient temperature must be limited to 30°C or lower. This configuration might lead to high acoustic noise and is recommended to be placed in industrial data center, not office environment.
- When both the primary adapter and GPU adapters are used at the same time, follow the thermal rules for GPU adapters. For detailed information, see “Server models with GPUs” on page 238.

Thermal rules

This topic provides thermal rules for the server.

- “Server models with front drive bays only” on page 236
- “Server models with middle/rear drive bays” on page 237
- “Server models with GPUs” on page 238

Server models with front drive bays only

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

Front bays	Max. Ambient Temp. (at sea level)	CPU TDP ¹ (watts)	Heat sink	Air baffle	Fan type	Max. DIMM Qty.	
						DRAM ²	PMEM ³
<ul style="list-style-type: none"> • 8 x 2.5" • 16 x 2.5" • 8 x 3.5" 	45°C	105–165	2U (Entry)	Standard	Standard	32	16
	45°C	185–205	2U (Standard)	Standard	Standard	32	16
	35°C	220–240	2U (Standard)	Standard	Standard	32	16
	30°C	250–270	T-shape (Performance)	Standard	Performance	32	16
24 x 2.5"	30°C	105–165	2U (Entry)	Standard	Standard	32	16
	30°C	185–240	2U (Standard)	Standard	Standard	32	16
	30°C	250–270	T-shape (Performance)	Standard	Performance	32	16
12 x 3.5"	30°C	105–165	2U (Entry)	Standard	Standard	32	4
	30°C	185–240	2U (Standard)	Standard	Standard	32	4

Notes:

1. The following processors have below exceptions:
 - The Intel Xeon 6334 HCC 165W processor should use the 2U standard heat sink instead of the 2U entry heat sink.
 - The Intel Xeon 8351N XCC 225W processor should follow rules for processors with TDP ranging from 250 watts to 270 watts.
2. The 256 GB 3DS RDIMMs are supported only in below server models:
 - 8 x 2.5"
 - 16 x 2.5"
 - 8 x 3.5"
3. When a 256 GB 3DS RDIMM or 512 GB PMEM is installed, the ambient temperature must be limited to 30°C or lower.

Server models with middle/rear drive bays

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

S/S: SAS/SATA; Any: AnyBay; E: entry; S: standard; P: performance; NA: none

Front bays	Middle bays	Rear bays	Max. Ambient Temp. (at sea level)	CPU TDP ¹ (watts)	Heat sink	Air baffle	Fan type	Max. DIMM Qty.	
								DRAM ²	PMEM
24 x 2.5" S/S 16 x 2.5" S/S + 8 x Any	NA	4 x 2.5" S/S	30°C	105–165	2U (E)	S	P	32	16
			30°C	185–205	2U (S)	S	P	32	16
24 x 2.5" Any	8 x 2.5" Any	NA	30°C	105–165	1U (S)	NA	P	32	16
			30°C	185–205	T-shape (P)	NA	P	32	16
24 x 2.5" S/S	8 x 2.5" S/S	4 x 2.5" S/S	30°C	105–165	1U (S)	NA	P	32	16
		8 x 2.5" S/S	30°C	185–205	T-shape (P)	NA	P	32	16
12 x 3.5" S/S	NA	2 x 3.5" S/S	30°C	105–165	2U (E)	NA	P	32	4
		4 x 2.5" S/S	30°C	185–205	2U (S)	S	P	32	4
	8 x 2.5" Any	NA	30°C	105–165	1U (S)	NA	P	32	4
			30°C	185–205	T-shape (P)	NA	P	32	4
	4 x 3.5" S/S	4 x 2.5" S/S	30°C	105–165	1U (S)	NA	P	32	4
		4 x 3.5" S/S	30°C	185–205	T-shape (P)	NA	P	32	4
12 x 3.5" Any	NA	4 x 3.5" S/S	30°C	105–165	2U (E)	S	P	32	
			30°C	185–205	2U (S)	S	P	32	4
	4 x 3.5" S/S	4 x 3.5" S/S	30°C	105–165	1U (S)	NA	P	32	4
			30°C	185–205	T-shape (P)	NA	P	32	4

Notes:

1. The Intel Xeon 6334 HCC 165W processor is not included. When this processor is used, middle drive bays or rear drive bays are not supported.
2. The 256 GB 3DS RDIMMs are not supported.

Server models with GPUs

This section provides thermal information for server models with GPUs.

- Single-wide GPU (40 W, 75 W): P620, T4, A4
- Single-wide GPU (150 W): A10
- Double-wide GPU (165 W, 250 W, 300 W): V100S, A100, A40, A30, A6000, A16

E: entry; S: standard; P: performance

Front bays	Max. Ambient Temp. (at sea level)	CPU TDP ¹ (watts)	Heat sink	Air baffle	Fan type	Max. GPU Qty.			Max. DIMM Qty.	
						40W, 75W	150W	165W, 250W, 300W	DRAM ²	PMEM
8 x 2.5" 16 x 2.5" 8 x 3.5"	30°C	105–165	2U (E)	S	P	8			32	16
	30°C	185–205	2U (S)	S	P	8			32	16
			1U (S)	GPU	P		4		32	16
						3	32	16		
	30°C	220–270	T-shape (P)	S	P	8			32	16
				GPU	P		4		32	16
		3	32			16				
24 x 2.5"	30°C ³	105–165	2U (E)	S	P	6			32	4
			1U (S)	GPU	P		4		32	4
								2	32	4
	30°C ³	185–240	T-shape (P)	S	P	6			32	4
				GPU	P		4		32	4
								2	32	4

Notes:

- The following processors have below exceptions:
 - The Intel Xeon 6334 HCC 165W processor should use the 2U standard heat sink instead of the 2U entry heat sink.
 - The Intel Xeon 8351N XCC 225W processor should follow rules for processors with TDP ranging from 250 watts to 270 watts.
- When the 256 GB 3DS RDIMMs are supported only in below server models:
 - 8 x 2.5"
 - 16 x 2.5"
 - 8 x 3.5"
- If a NVIDIA V100S adapter is installed, the maximum ambient temperature must be limited to 25°C or lower.

Install server hardware options

This section includes instructions for performing initial installation of optional hardware. Each component installation procedure references any tasks that need to be performed to gain access to the component being replaced.

Installation procedures are presented in the optimum sequence to minimize work.

Attention: To ensure the components you install work correctly without problems, read the following precautions carefully.

- Make sure the components you are installing are supported by your server. For a list of supported optional components for the server, see <https://static.lenovo.com/us/en/serverproven/index.shtml>.
- Always 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 [ThinkSystem SR650 V2 Drivers and Software](#) to download firmware updates for your server.
- It is good practice to make sure that the server is working correctly before you install an optional component.
- Follow the installation procedures in this section and use appropriate tools. Incorrectly installed components can cause system failure from damaged pins, damaged connectors, loose cabling, or loose components.

Remove the security bezel

Use this information to remove the security bezel.

About this task

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Before you ship the rack with the server installed, reinstall and lock the security bezel into place.

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVpIE36HlvdM_sq_Auw3U.

Procedure

Step 1. Use the key to unlock the security bezel.

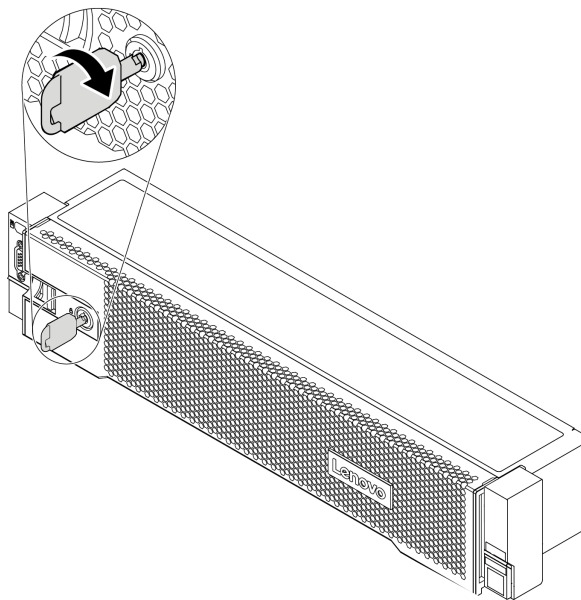


Figure 167. Unlocking the security bezel

Step 2. Press the release latch **1** and rotate the security bezel outward to remove it from the chassis.

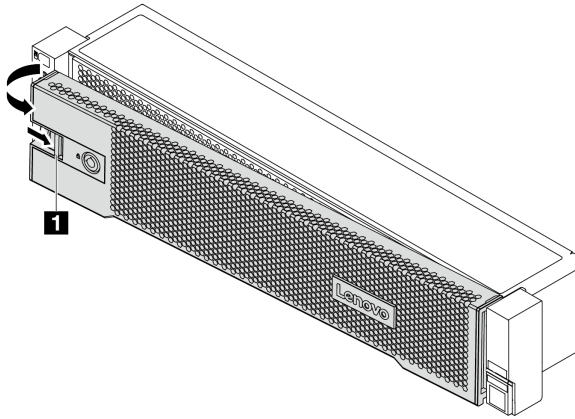


Figure 168. Security bezel removal

Remove the top cover

Use this information to remove the top cover.

About this task

S033



CAUTION:

Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in spattered metal, burns, or both.

S014



CAUTION:

Hazardous voltage, current, and energy levels might be present. Only a qualified service technician is authorized to remove the covers where the label is attached.

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVplE36HlvdM_sq_Auw3U.

Procedure

- Step 1. If the server is installed in a rack, remove the server from the rack. See the Rack Installation Guide that comes with the rail kit for your server.

Step 2. Remove the top cover.

Attention: Handle the top cover carefully. Dropping the top cover with the cover latch open might damage the cover latch.

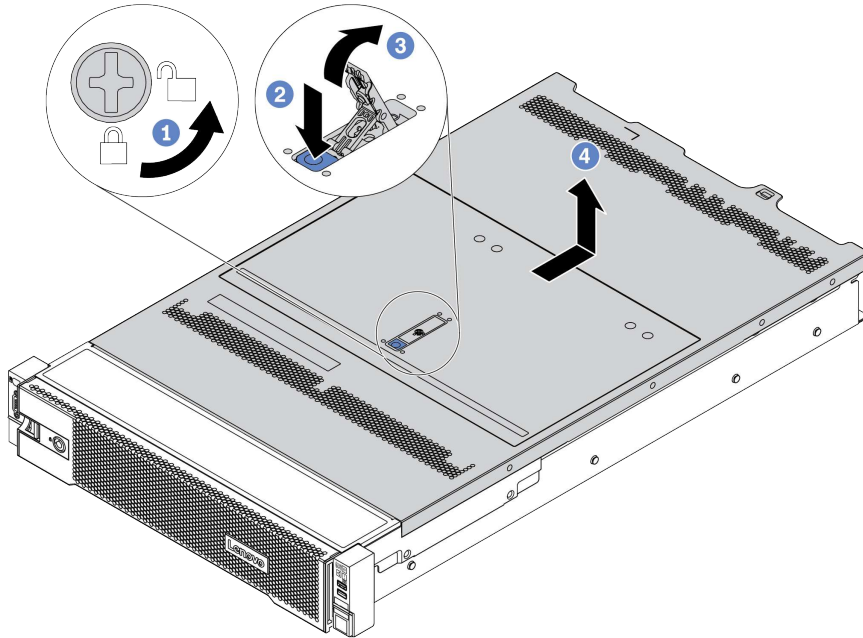


Figure 169. Top cover removal

- a. Use a screwdriver to turn the cover lock to the unlocked position as shown.
- b. Press the release button on the cover latch. The cover latch then gets released to some extent.
- c. Fully open the cover latch as shown.
- d. 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.

Remove the air baffle

Use this information to remove the air baffle. If you intend to install hardware options in the server, you must first remove the air baffle from the server.

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 212 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.
- For proper cooling and airflow, install the air baffle before you turn on the server. Operating the server without the air baffle might damage server components.

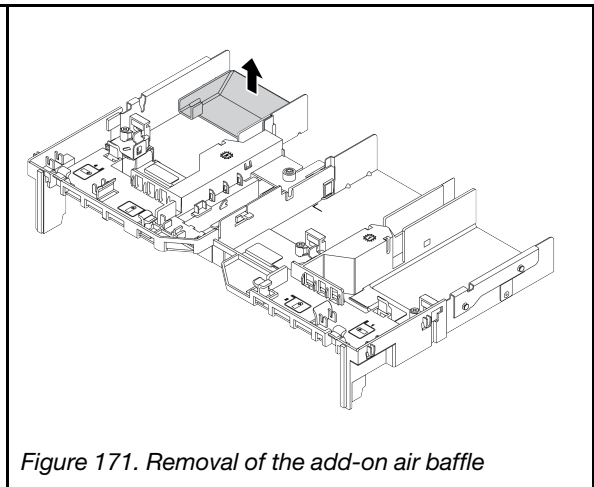
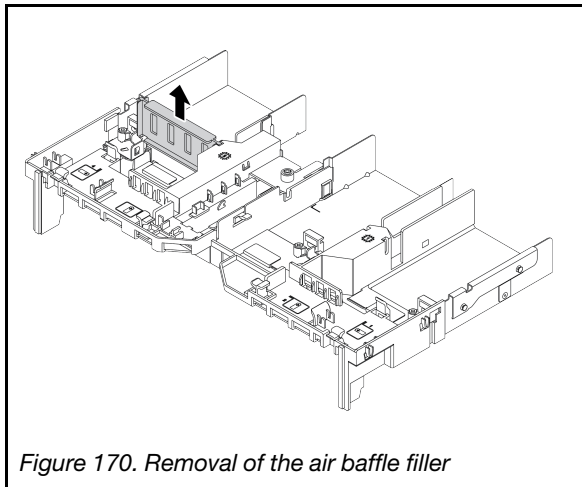
Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVplE36HlvdM_sq_Auw3U.

Procedure

- Step 1. If there is a RAID flash power module installed on the air baffle, disconnect the cable of the RAID flash power module first.
- Step 2. If there is a GPU installed on the air baffle, remove the GPU first.

Step 3. (Only for GPU air baffle) Remove the air baffle fillers or add-on air baffles (if any).



Step 4. Grasp the air baffle and carefully lift it out of the server.

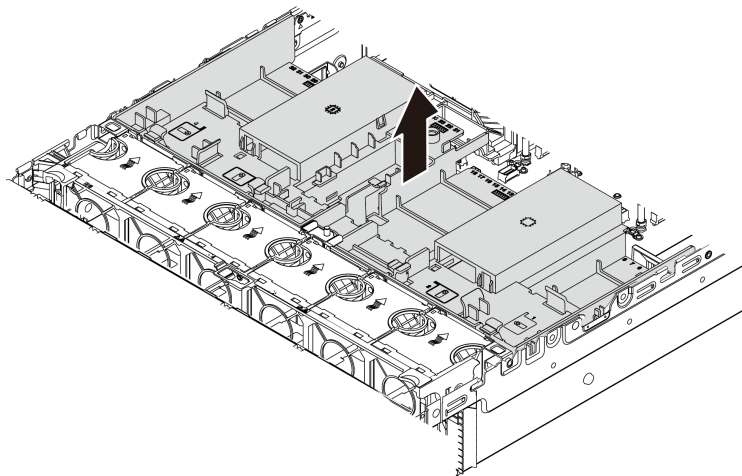


Figure 172. Removal of the standard air baffle

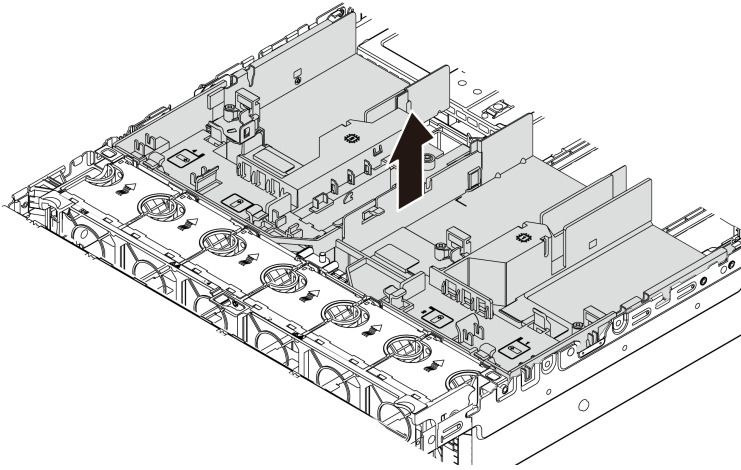


Figure 173. Removal of the GPU air baffle

Remove the system fan cage

Use this information to remove the system fan cage.

About this task

The system fan cage might impede your access to some connectors. You must remove the system fan cage before you route cables.

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- 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-DqVpIE36HlvdM_sq_Auw3U.

Procedure

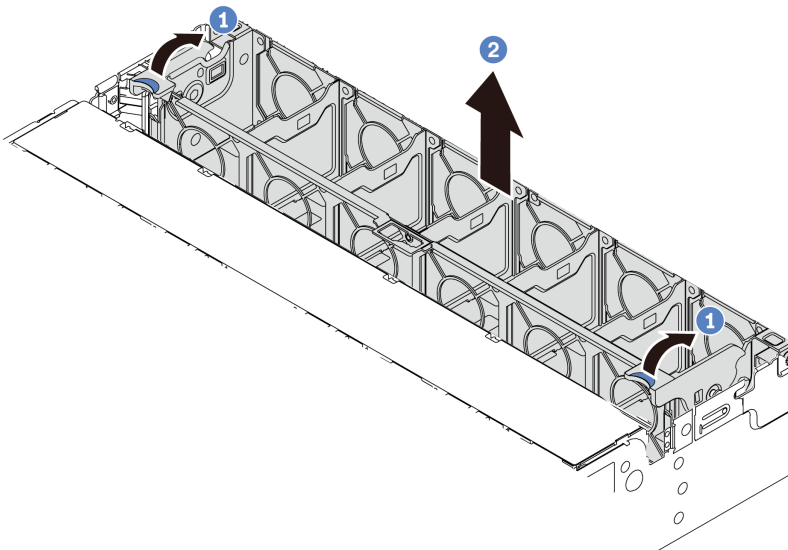


Figure 174. System fan cage removal

- Step 1. Rotate the levers of the system fan cage to the rear of the server.
- Step 2. Lift the system fan cage straight up and out of the chassis.

After you finish

Begin installing any options that you have purchased.

Install a processor-heat-sink module

The processor and heat sink are removed together as part of a processor-heat-sink-module (PHM) assembly. PHM installation requires a Torx T30 driver.

About this task

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- 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 board supports multiple processors, install the PHMs starting with the first processor socket.
- To ensure the best performance, check the manufacturing date on the new heat sink and make sure it does not exceed 2 years. Otherwise, wipe off the existing thermal grease and apply the new grease onto it for optimal thermal performance.

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://static.lenovo.com/us/en/serverproven/index.shtml> for a list of processors supported for your server. All processors on the system board 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 323.
- Installing an additional PHM can change memory requirements for the system. See “Memory module installation rules and order” on page 216 for a list of processor-to-memory relationships.

The following illustration shows the components of the PHM.

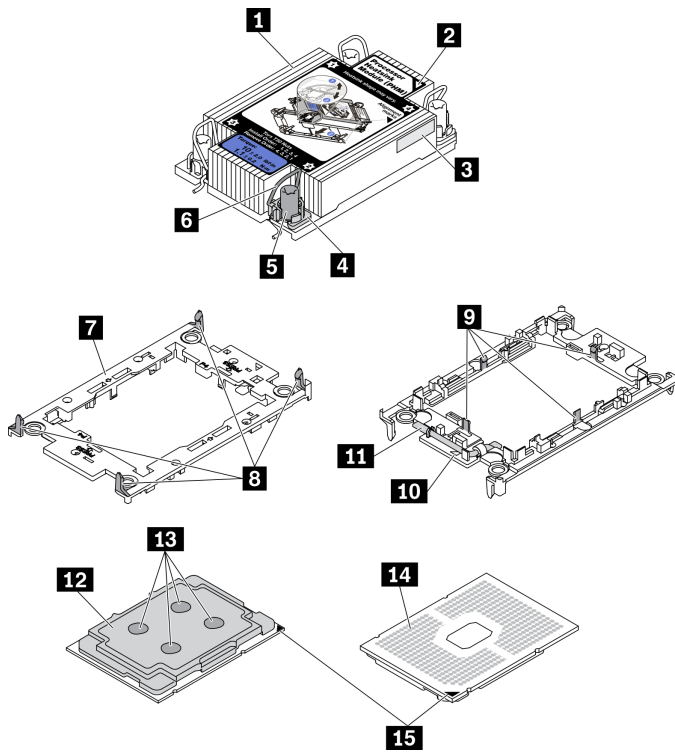


Figure 175. PHM components

1 Heat sink	9 Clips to secure processor in carrier
2 Heat sink triangular mark	10 Carrier triangular mark
3 Processor identification label	11 Processor ejector handle
4 Nut and wire bail retainer	12 Processor heat spreader
5 Torx T30 nut	13 Thermal grease
6 Anti-tilt wire bail	14 Processor contacts
7 Processor carrier	15 Processor triangular mark
8 Clips to secure carrier to heat sink	

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVplE36HlvdM_sq_Auw3U.

Procedure

- Step 1. Remove the processor socket cover, if one is installed on the processor socket, by placing your fingers in the half-circles at each end of the cover and lifting it from the system board.
- Step 2. Install the processor-heat-sink module into the system board socket.

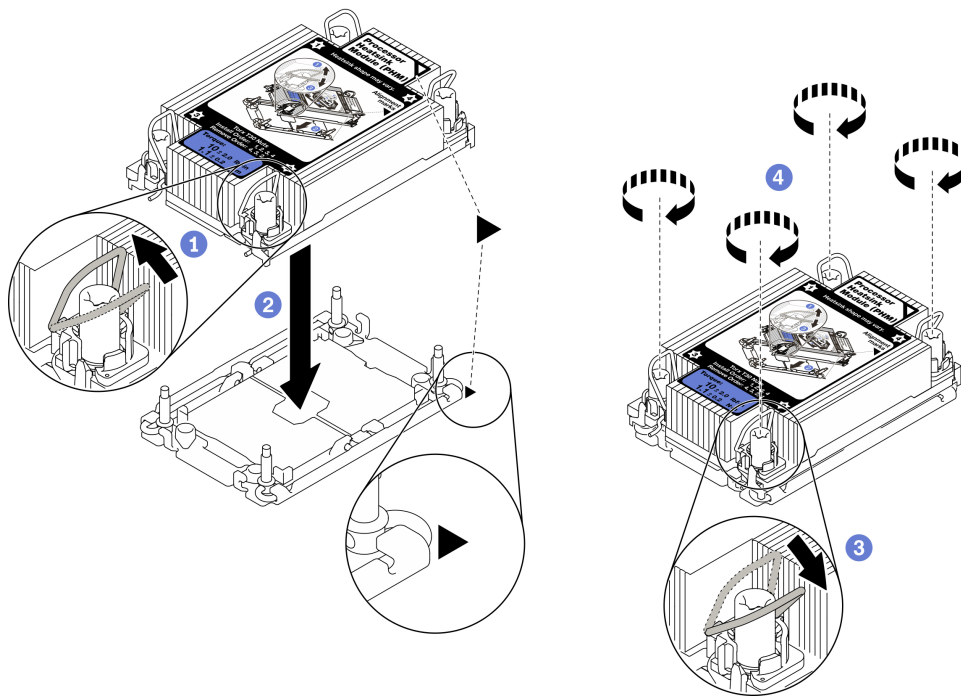


Figure 176. Installing a PHM

1. Rotate the anti-tilt wire bails inward.
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.
3. Rotate the anti-tilt wire bails outward until they engage with the hooks in the socket.
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 1.1 newton-meters, 10 inch-pounds).

Step 3. If the processor comes with a T-shaped heat sink, fully tighten the two heat sink screws as shown. (For reference, the torque required for the fasteners to fully tighten is 1.1 newton-meters, 10 inch-pounds).

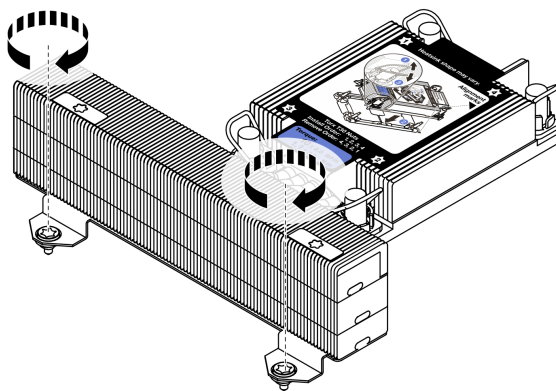


Figure 177. Tightening T-shaped heat sink screws

After you finish

If there are memory modules to install, install them. See “Install a memory module” on page 252.

Install a memory module

Use this information to install a memory module.

About this task

See “Memory module installation rules and order” on page 216 for detailed information about memory configuration and setup, and make sure to adopt a supported configuration.

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Memory modules are sensitive to static discharge and require special handling. Refer to the standard guidelines for “Handling static-sensitive devices” on page 215:
 - 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.

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVplE36HlvdM_sq_Auw3U.

Procedure

- Step 1. Locate the required memory module slot on the system board. Ensure that you observe the installation rules and sequence in “Memory module installation rules and order” on page 216.

Step 2. Install the memory module into the slot.

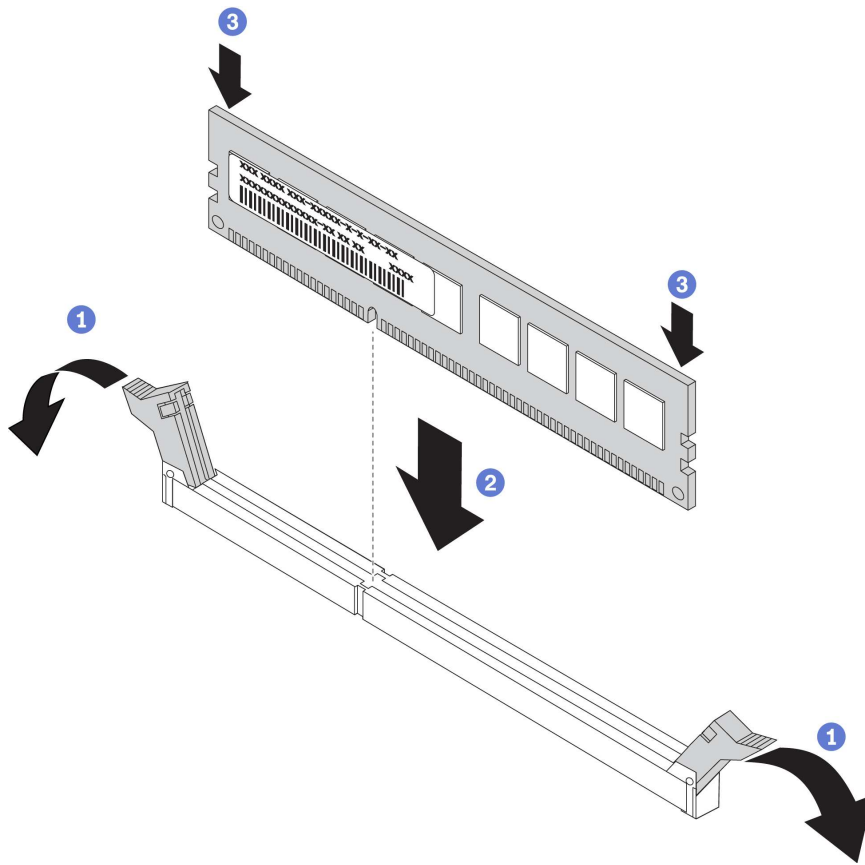


Figure 178. Memory module installation

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

Note: If there is a gap between the memory module and the retaining clips, the memory module has not been correctly inserted. In this case, open the retaining clips, remove the memory module, and then reinsert it.

Install a front 2.5-inch-drive backplane

Use this information to install the front 2.5-inch-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

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.

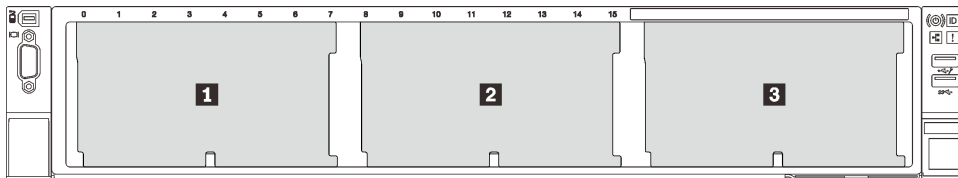


Figure 179. Drive backplane numbering

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

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.

- Power off the server and disconnect all power cords for this task.
- 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-DqVpIE36HlvdM_sq_Auw3U.

Procedure

- Step 1. Touch the static-protective package that contains the new backplane to any unpainted surface on the outside of the server. Then, take the new backplane out of the package and place it on a static-protective surface.
- Step 2. Connect the cables to the backplane. See Chapter 3 “Internal cable routing” on page 67.

Step 3. Install the 2.5-inch drive front backplane.

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

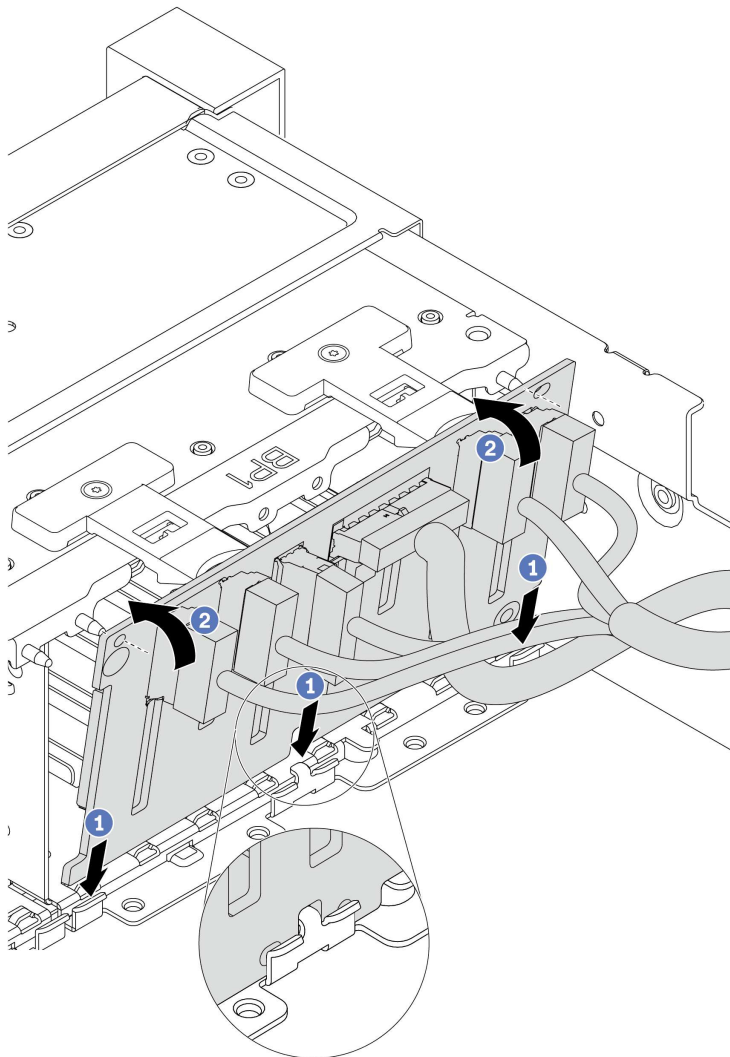


Figure 180. 2.5-inch drive backplane installation

- a. Align the bottom of the backplane with the slots on the chassis.
- b. 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.

Install an internal RAID/HBA/expander adapter

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

About this task

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 “Install a PCIe adapter and riser assembly” on page 269.

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- 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-DqVplE36HlvdM_sq_Auw3U.

Procedure

Step 1. Touch the static-protective package that contains the adapter to any unpainted surface on the outside of the server. Then, take the adapter 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 ± 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.

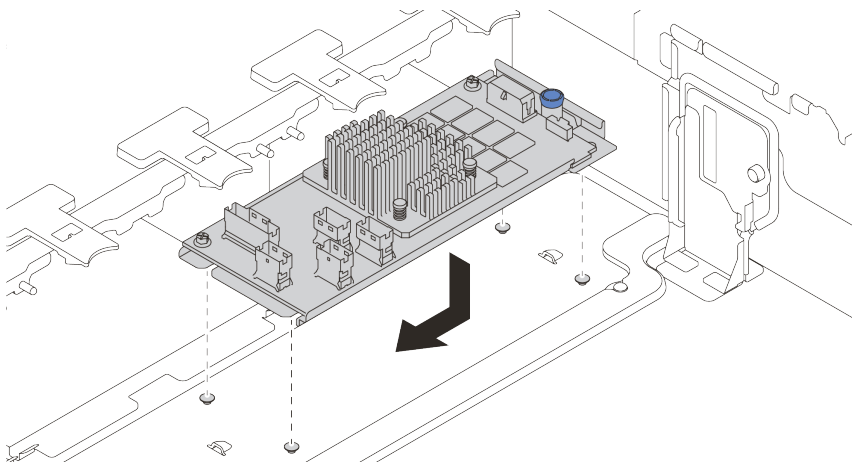


Figure 181. Internal CFF adapter installation

Step 3. Connect cables to the adapter. See Chapter 3 “Internal cable routing” on page 67.

After you finish

If you have installed a RAID adapter:

- Install a RAID flash power module if you have installed a RAID 930 or 940 adapter. See “Install a RAID flash power module” on page 301.
- Use the Lenovo XClarity Provisioning Manager to configure the RAID if necessary. See https://sysmgmt.lenovofiles.com/help/topic/ixpm_frontend/ixpm_product_page.html.

Install the intrusion switch

Use this information to install the intrusion switch.

About this task

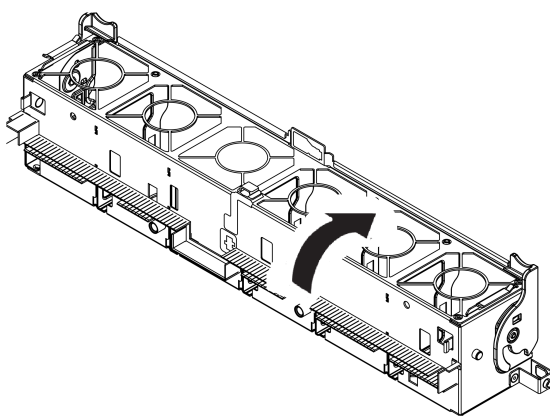
- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Watch the procedure

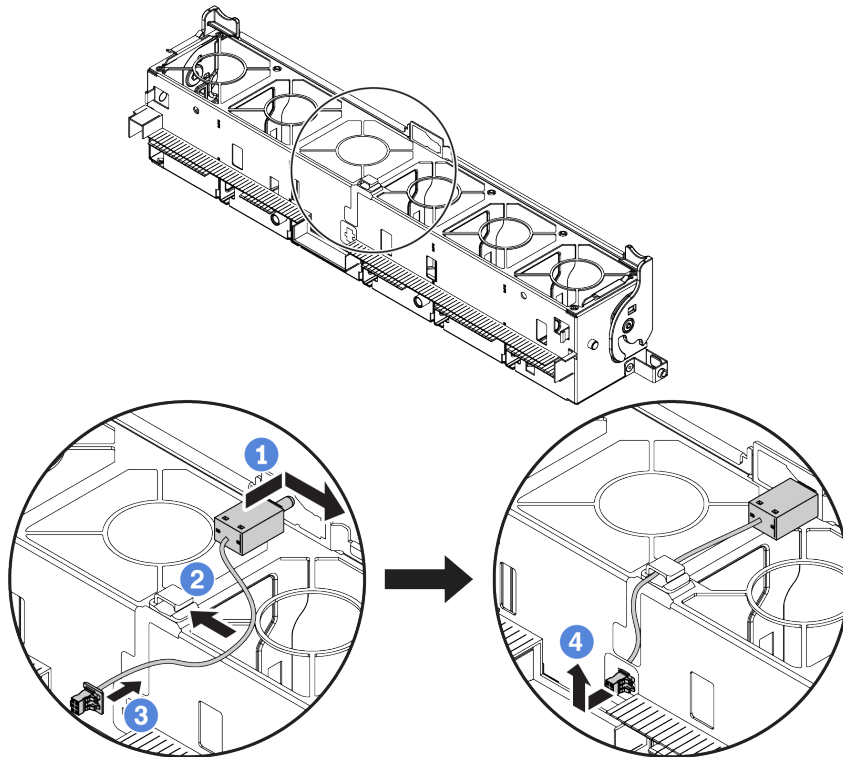
A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVpIE36HlvdM_sq_Auw3U.

Procedure

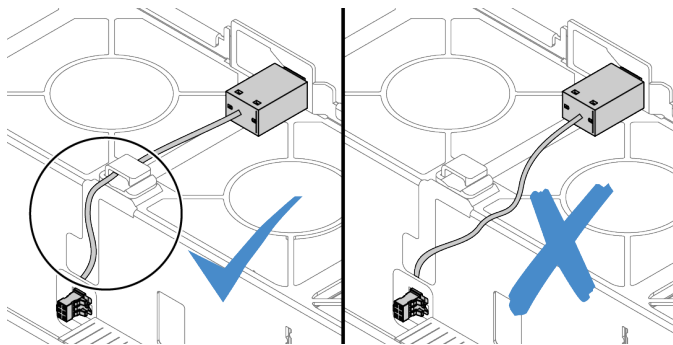
- Step 1. Touch the static-protective package that contains the new intrusion switch to any unpainted surface on the outside of the server. Then, take the new intrusion switch out of the package and place them on a static-protective surface.
- Step 2. Rotate the fan cage by 90 degrees in the direction 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 may get uneven, and the fan connection may get loose.



- a. 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. Fix the intrusion switch cable into the cable clip.
- c. Route the cable into the fan cage through the pre-cut slot on the fan cage bottom.
- d. 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 261.

Step 5. Install system fans into the fan cage. “Install a system fan” on page 262

Install a system fan

Use this information to install a system fan.

About this task

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- 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 installing a system fan, ensure that you have selected the required system fan. See “Technical rules” on page 231.

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.

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVplE36HlvdM_sq_Auw3U.

Procedure

- Step 1. Touch the static-protective package that contains the new system fan to any unpainted surface on the outside of the server. Then, take the new system fan out of the package and place it on a static-protective surface.
- Step 2. If there is a fan dummy, remove it first.

Step 3. 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.

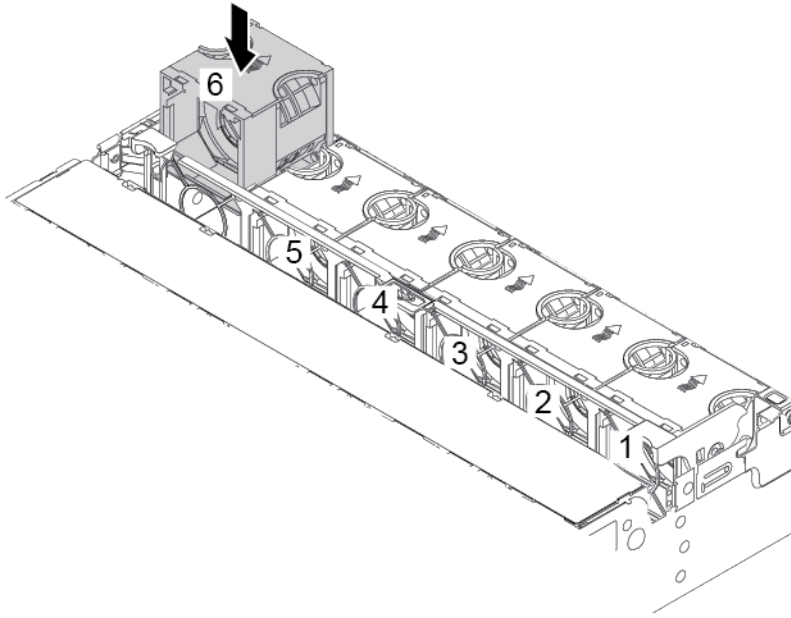


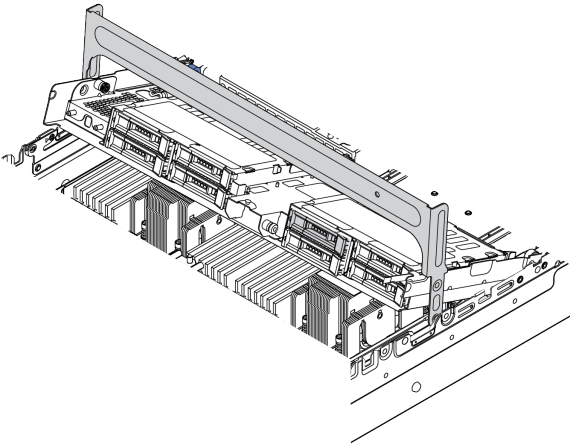
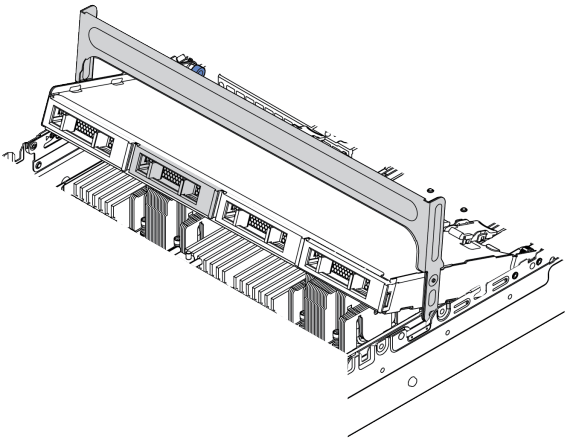
Figure 183. System fan installation

Install a middle drive cage

Use this information to install a middle drive cage.

About this task

Depending on the server configurations, some server models support one of the following middle drive cages.

Drive cage type	Backplane type
<p>Middle 2.5-inch 8-bay drive cage</p>  <p>The diagram shows a perspective view of a drive cage with a metal frame and a top handle. It is designed to hold two rows of drives, with four bays in each row, for a total of eight bays.</p>	<ul style="list-style-type: none">• Two 2.5-inch SAS/SATA 4-bay backplanes• Two 2.5-inch NVMe 4-bay backplanes
<p>Middle 3.5-inch 4-bay drive cage</p>  <p>The diagram shows a perspective view of a drive cage with a metal frame and a top handle. It is designed to hold a single row of four 3.5-inch drives.</p>	<p>One 3.5-inch SAS/SATA 4-bay backplane</p>

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- 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 236 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.

- “Install a processor-heat-sink module” on page 248
- “Install a system fan” on page 262
- If you are upgrading the server to the 32 x 2.5-inch NVMe configuration, replace your cable wall bracket first. See “(For 32 NVMe) Replace cable wall brackets” on page 266.

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVpIE36HlvdM_sq_Auw3U.

Procedure

- Step 1. Connect cables to the backplanes.
- Step 2. Install the backplane onto the middle drive cage.

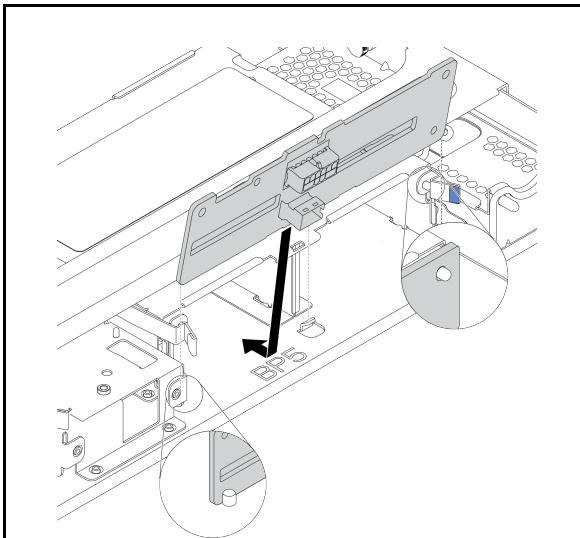


Figure 184. Installing the middle 2.5-inch drive backplane

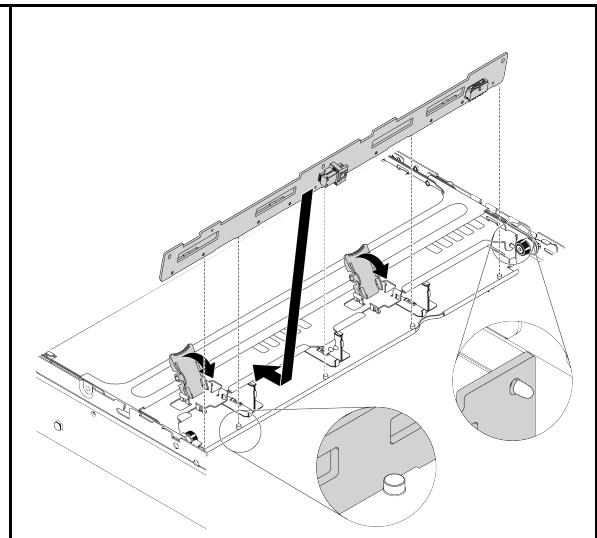


Figure 185. Installing the middle 3.5-inch drive backplane

- Align the bottom of the backplane with the studs at the bottom of the drive cage, and lower the backplane into the drive cage.
- 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.

Step 3. Install the middle drive cage and drives.

Note: The illustration shows installing the middle 2.5-inch drive cage. The procedure is the same for installing the middle 3.5-inch drive cage.

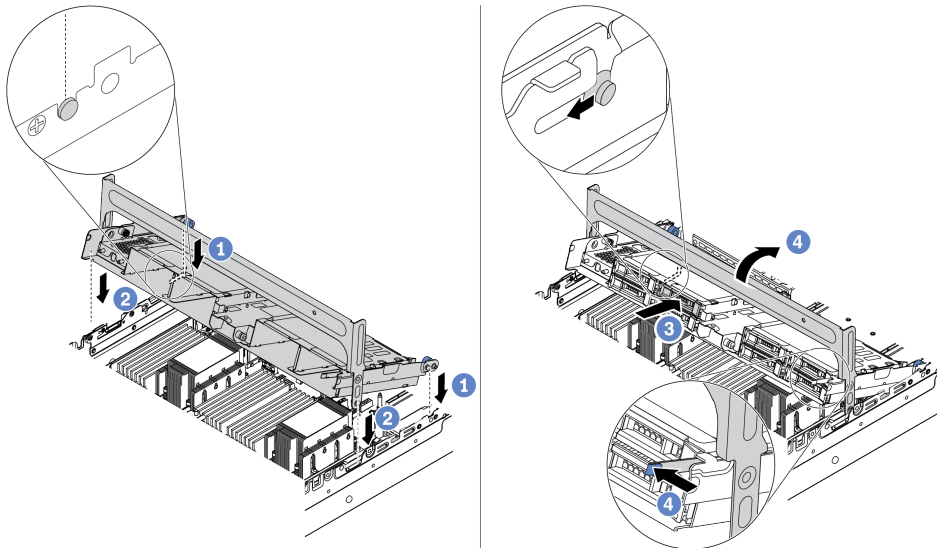


Figure 186. Installing the middle drive cage and drives

- a. Align the pins on the middle cage with the corresponding slots on the chassis.
- b. Lower the drive cage down into place.
- c. Install drives into the middle drive cage. See “Install a hot-swap drive” on page 309.
- d. Rotate the handle to close it.

Step 4. Connect cables from the backplanes to the system board or RAID/HBA adapters. See Chapter 3 “Internal cable routing” on page 67.

(For 32 NVMe) Replace cable wall brackets

Use this information to replace the half-height cable wall brackets with the full-height cable wall brackets.

About this task

For most server models, your server comes with half-height cable wall brackets at both side of the system board. If you need to upgrade your server to 32 NVMe drives, you need to replace the half-height cable wall brackets with full-height cable wall brackets for cable routing. The full-height cable wall brackets come with the 32 NVMe cable kit.

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVplE36HlvdM_sq_Auw3U.

Procedure

Step 1. Remove the half-height cable wall brackets.

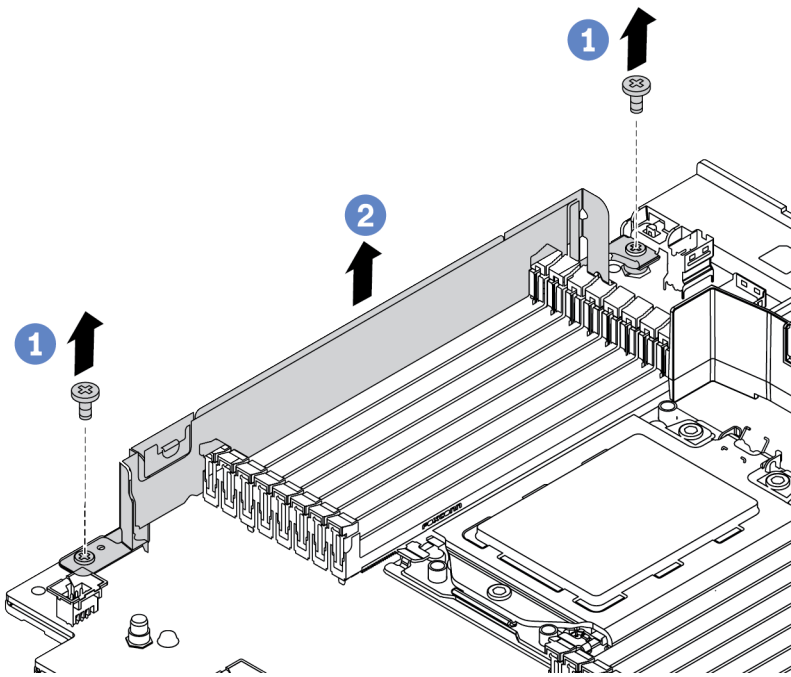


Figure 187. Cable wall bracket removal

Step 2. Install the full-height cable wall brackets.

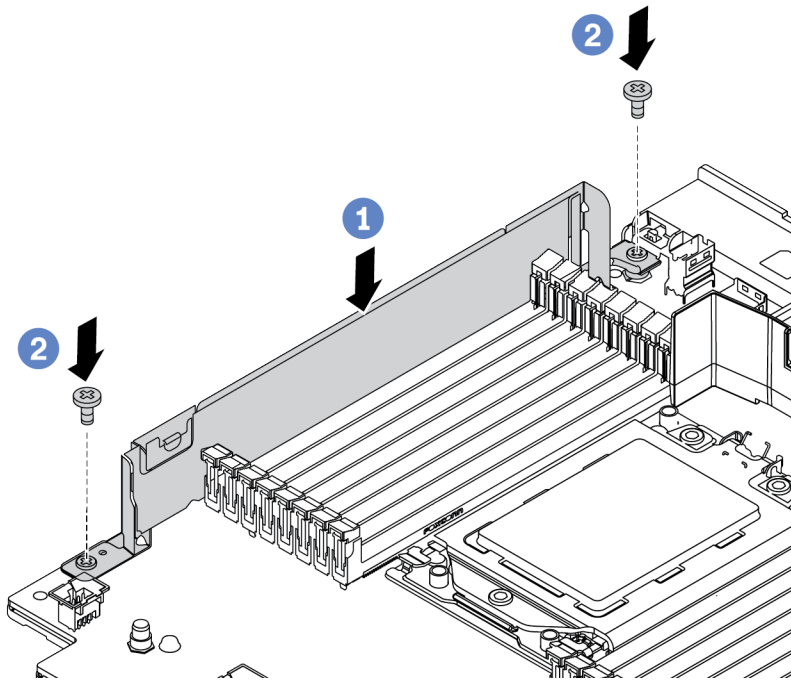


Figure 188. Cable wall bracket installation

- a. Align the cable wall brackets with the two holes on the system board. Install the brackets onto the system board.
- b. Install the two screws to secure the brackets.

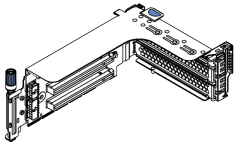
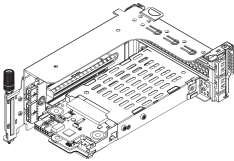
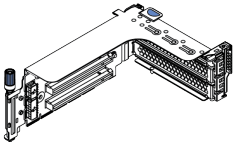
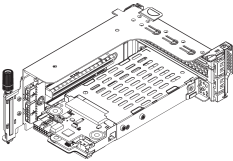
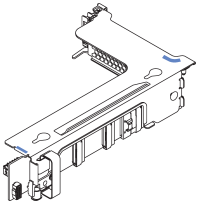
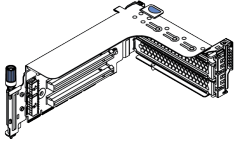
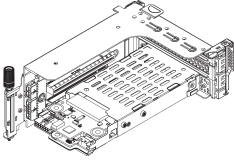
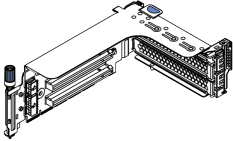
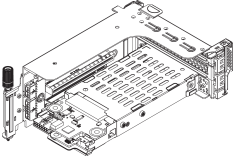
Install a PCIe adapter and riser assembly

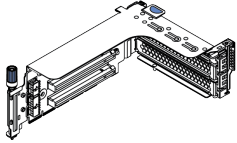
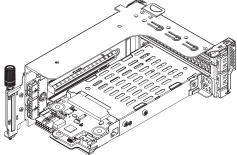
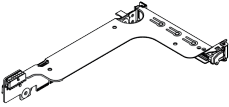
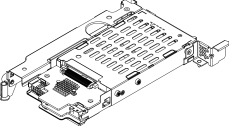
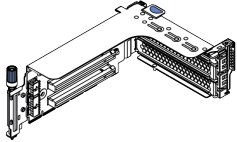
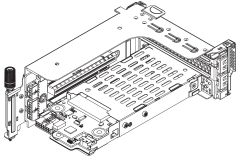
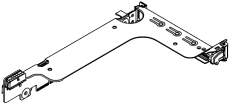
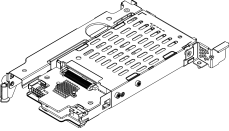
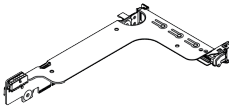
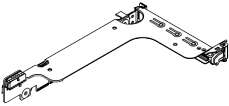
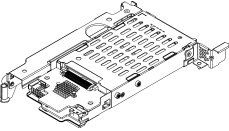
Use this information to install a PCIe adapter and riser assembly. The PCIe adapter can be an Ethernet card, a host bus adapter, a RAID adapter, an add-in PCIe SSD adapter, or any other supported PCIe adapters. PCIe adapters vary by type, but the installation procedure is the same.

About this task

Riser cages vary by server rear configurations. This topic uses the riser 1 cage with three full-height (FH) slots as an example for installation illustration. The installation procedure is the same for other riser cages.

Note: A 7mm drive cage can be installed in PCIe slot 3 or slot 6, but not both at the same time. To install a 7mm drive cage, see “Install the 7mm drive cage” on page 279.

Server rear configuration	Riser 1 cage	Riser 2 cage	Riser 3 cage
Configuration with 8 PCIe slots	<ul style="list-style-type: none"> Type 1: 3FH riser cage  <ul style="list-style-type: none"> Type 2: 2FH + 7mm riser cage 	<ul style="list-style-type: none"> Type 1: 3FH riser cage  <ul style="list-style-type: none"> Type 2: 2FH + 7mm riser cage 	Type 3: 2FH riser cage 
Configuration with a 4 x 2.5-inch rear drive cage	<ul style="list-style-type: none"> Type 1: 3FH riser cage  <ul style="list-style-type: none"> Type 2: 2FH + 7mm riser cage 	<ul style="list-style-type: none"> Type 1: 3FH riser cage  <ul style="list-style-type: none"> Type 2: 2FH + 7mm riser cage 	

Server rear configuration	Riser 1 cage	Riser 2 cage	Riser 3 cage
<p>Configuration with an 8 x 2.5-inch rear drive cage</p>	<ul style="list-style-type: none"> Type 1: 3FH riser cage  <ul style="list-style-type: none"> Type 2: 2FH + 7mm riser cage 	<ul style="list-style-type: none"> Type 3: 1FH riser cage  <ul style="list-style-type: none"> Type 4: 7mm riser cage 	
<p>Configuration with a 2 x 3.5-inch rear drive cage</p>	<ul style="list-style-type: none"> Type 1: 3FH riser cage  <ul style="list-style-type: none"> Type 2: 2FH + 7mm riser cage 	<ul style="list-style-type: none"> Type 3: 1FH riser cage  <ul style="list-style-type: none"> Type 4: 7mm riser cage 	
<p>Configuration with a 4 x 3.5-inch rear drive cage</p>	<p>Type 3: 1FH riser cage</p> 	<ul style="list-style-type: none"> Type 3: 1FH riser cage  <ul style="list-style-type: none"> Type 4: 7mm riser cage 	

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- 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 “Technical rules” on page 231 for PCIe slots to select an appropriate PCIe slot for the PCIe adapter.

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVplE36HlvdM_sq_Auw3U.

Procedure

- Step 1. Touch the static-protective package that contains the new component to any unpainted surface on the outside of the server. Then, take the new component out of the package and place it on a static-protective surface.
- Step 2. Remove the riser assembly.

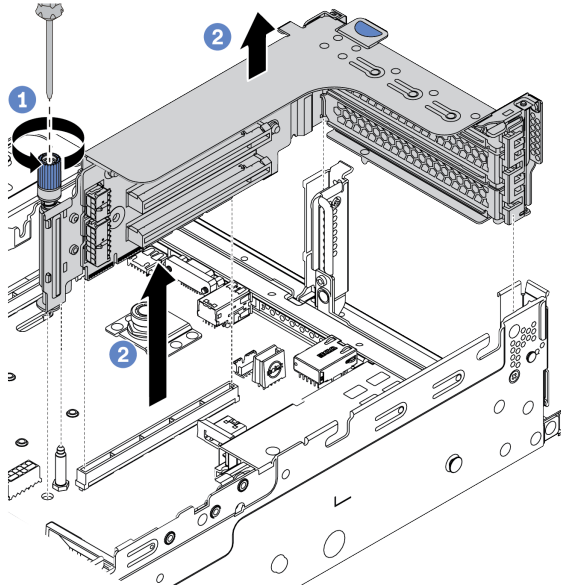


Figure 189. Riser assembly removal

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

Step 3. Install a PCIe adapter.

Note: Carefully handle the PCIe adapter by its edges.

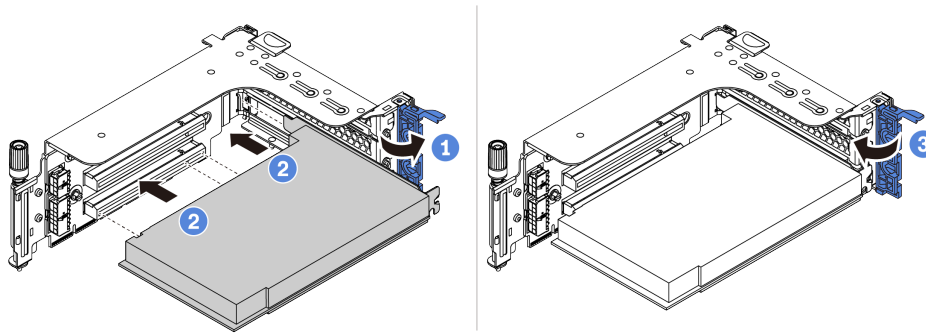


Figure 190. PCIe adapter installation

- 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.
- Rotate the PCIe adapter retention latch to the closed position.

Step 4. Install the riser assembly into chassis.

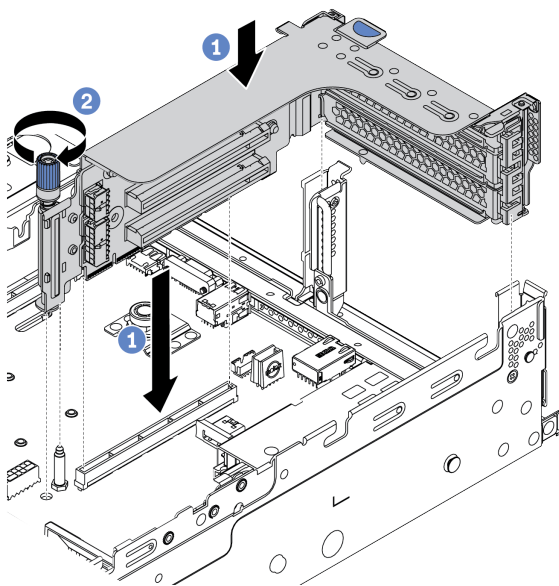


Figure 191. Riser assembly installation

- Align the riser card with the riser slot on the system board. Carefully press the riser card straight into the slot until it is securely seated.
- Tighten the screw to secure the riser cage.

Step 5. Connect cables to the riser card and PCIe adapter. See Chapter 3 “Internal cable routing” on page 67.

After you finish

If you have installed a RAID adapter:

- Install a RAID flash power module if you have installed a RAID 930 or 940 adapter. See “Install a RAID flash power module” on page 301.
- Use the Lenovo XClarity Provisioning Manager to configure the RAID if necessary. See https://sysmgt.lenovofiles.com/help/topic/ixpm_frontend/ixpm_product_page.html.

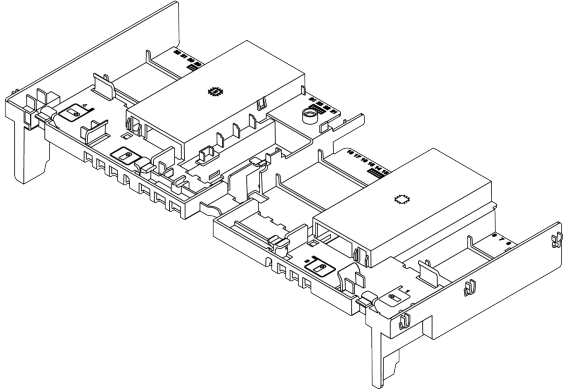
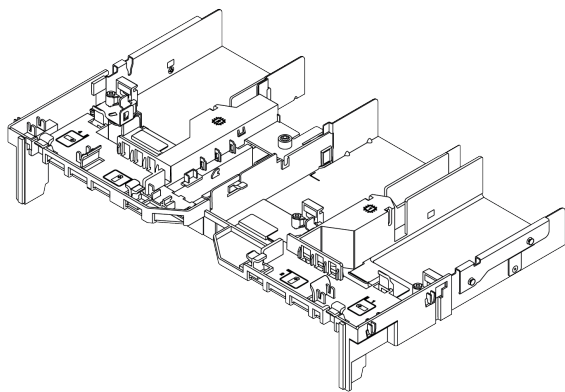
Install a GPU adapter

Use this information to install a GPU adapter.

About this task

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- 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 thermal requirements. See “Thermal rules” on page 236 to ensure that the server is under permitted ambient temperature and the correct air baffle, heat sink, and system fans are used. If needed, replace your heat sink or system fan first.
 - “Install a processor-heat-sink module” on page 248
 - “Install a system fan” on page 262
 - “Install the air baffle” on page 294

Air baffle	Supported GPU adapter
 <p>Figure 192. Standard air baffle</p>	<p>Half length, low profile, single-wide:</p> <ul style="list-style-type: none">• NVIDIA Tesla T4• NVIDIA Quadro P620
 <p>Figure 193. GPU Air baffle</p>	<p>Full length, full height, double-wide:</p> <ul style="list-style-type: none">• NVIDIA Tesla V100S• NVIDIA A100• NVIDIA A30• NVIDIA A40• NVIDIA A16• NVIDIA Quadro RTX 6000• NVIDIA Quadro RTX A6000 <p>Full length, full height, single-wide: NVIDIA A10</p>

Notes:

- All installed GPU adapters must be identical.
- If a double-wide GPU adapter is installed in slot 5, 7 or 2, the adjacent slot 4, 8, or 1 respectively is not available.
- If a single-wide 150W GPU adapter is installed on PCIe slot 1, 4, or 7, the adjacent slot 2, 5, or 8 respectively cannot be installed with an Ethernet adapter of 100GbE or higher.

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVpIE36HlvdM_sq_Auw3U.

Procedure

- Step 1. Locate the appropriate PCIe slot for the GPU adapter. See “PCIe slots and PCIe adapters” on page 231
- Step 2. Install the GPU adapter into the PCIe slot on the riser card.

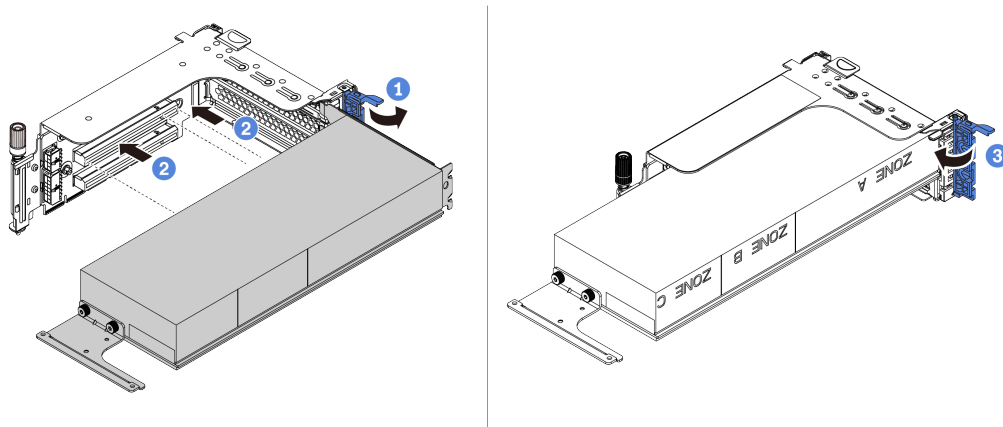


Figure 194. Installing the GPU adapter

- a. Open the blue latch on the riser cage.
 - b. 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. Close the blue latch.
- Step 3. Connect the GPU power cable. See “GPUs” on page 69.
Note: If you are installing the GPU adapter on riser 3 assembly, connect cables from the riser 3 and GPU adapter to the system board. See “Riser cards” on page 70 and “GPUs” on page 69.
 - Step 4. Install the GPU air baffle.

Note: If a single-wide 150W GPU adapter (FHFL) is to be installed but the adjacent slot will be left empty or installed with a half-length adapter, install an add-on air baffle on the GPU air baffle first.

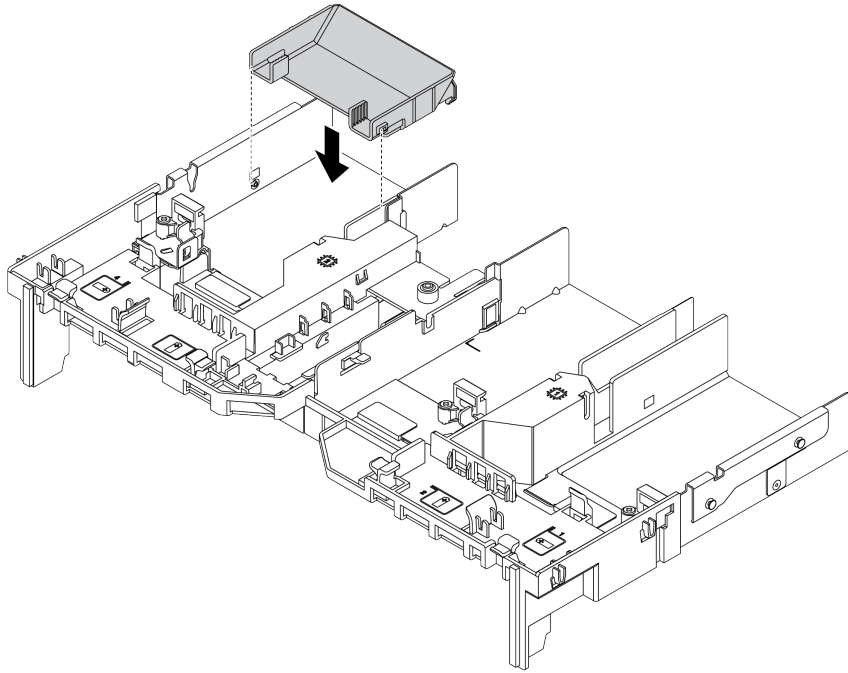


Figure 195. Installing an add-on air baffle

Step 5. Install the riser assembly.

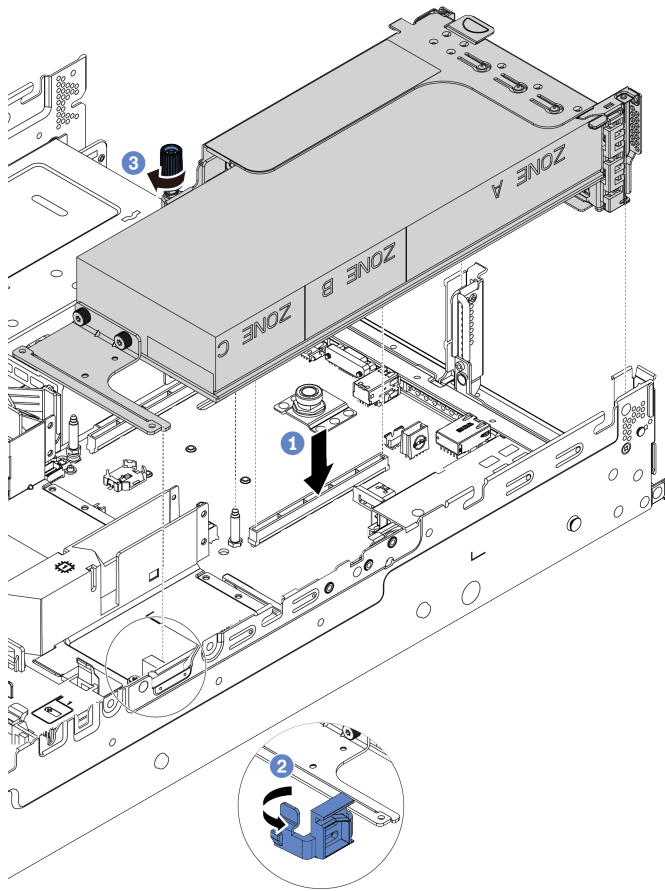


Figure 196. Installing the riser assembly

- a. Align the riser card with the PCIe slot on the system board. Carefully press the riser card straight into the slot until it is securely seated.
- b. If you are installing a full-length GPU adapter, open the blue latch on the GPU air baffle and fix the end of the GPU adapter. Then, close the blue latch.
- c. Tighten the screw to fix the riser cage.

Step 6. (Optional) If a certain slot is not installed with a GPU adapter, install a filler on the GPU air baffle.

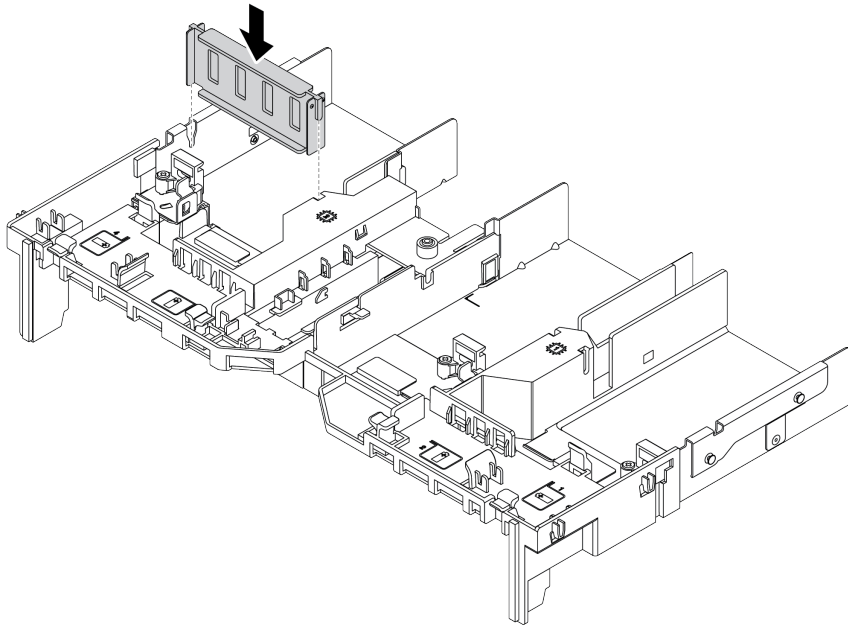


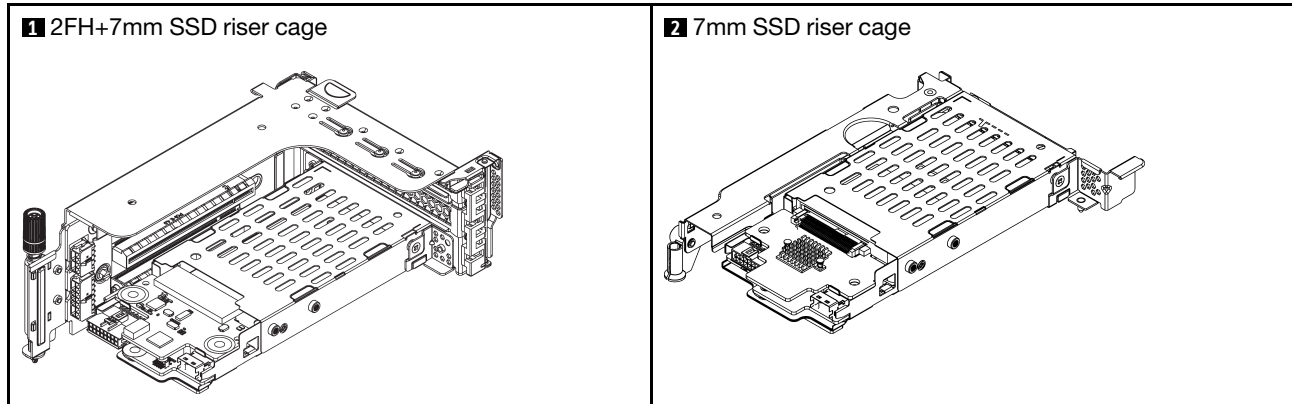
Figure 197. Installing the GPU air baffle filler

Install the 7mm drive cage

Use this information to install the rear 7mm drive cage.

About this task

Depending on server configuration, the server supports one of the following rear 7mm drive cages. This topic uses the 7mm drive cage **1** as an example for installation illustration. The installation procedure for the other one is similar.



Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- 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 “PCIe slots and PCIe adapters” on page 231 to ensure that you follow the installation rules for 7mm drive cages.

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVpIE36HlvdM_sq_Auw3U.

Procedure

- Step 1. Touch the static-protective package that contains the new parts to any unpainted surface on the outside of the server. Then, take them out of the package and place them on a static-protective surface.

Step 2. Install the 7mm drive backplane at the bottom.

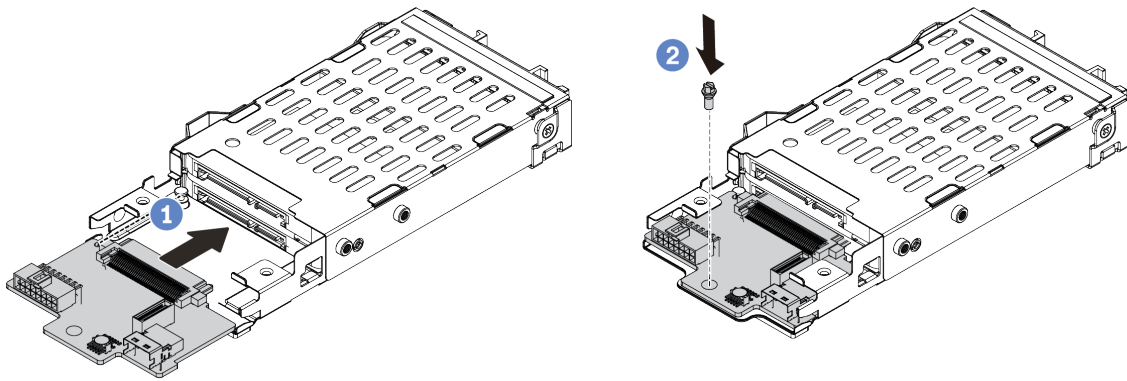


Figure 198. 7mm drive backplane installation (bottom)

- a. 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. Install the screw to secure it.

Step 3. Install the 7mm drive backplane on the top.

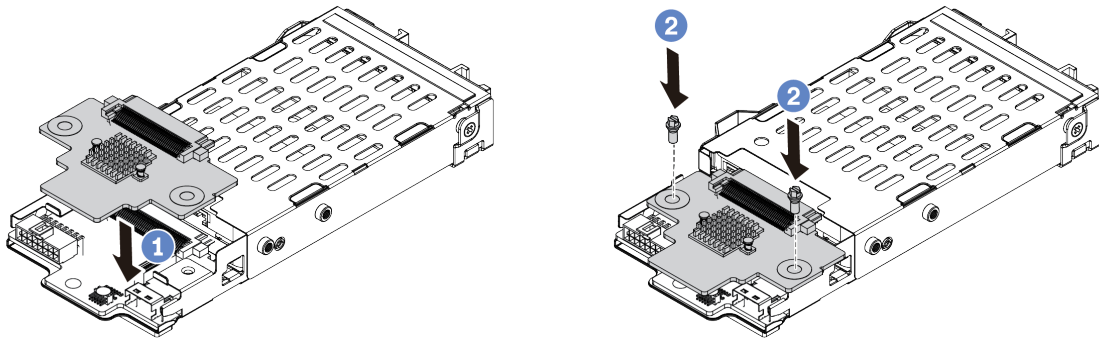


Figure 199. 7mm drive backplane installation (top)

- a. Align the holes in the backplane with the holes on the cage, and put the backplane down onto the cage.
- b. Install the two screws to secure the backplane in place.

Step 4. Connect the cables to the backplanes. See “7mm drives ” on page 78.

Step 5. Hook the securing clip over the riser adapter on the riser cage.

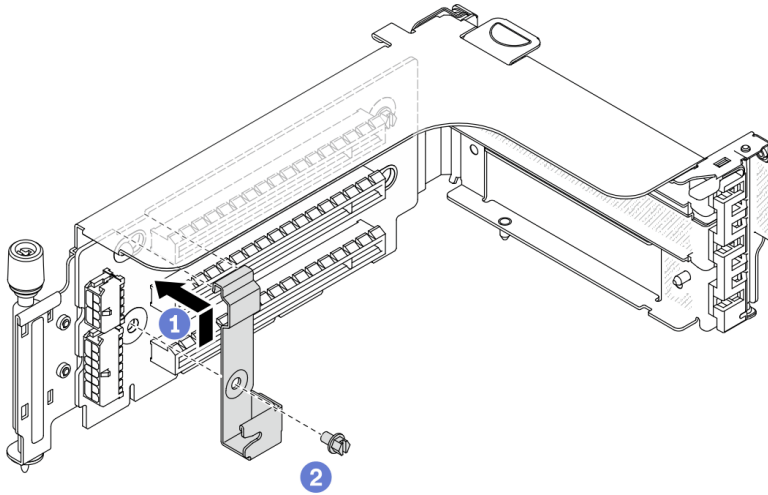


Figure 200. 7mm drive cage securing clip installation

Step 6. Install the 7mm drive cage to the riser cage.

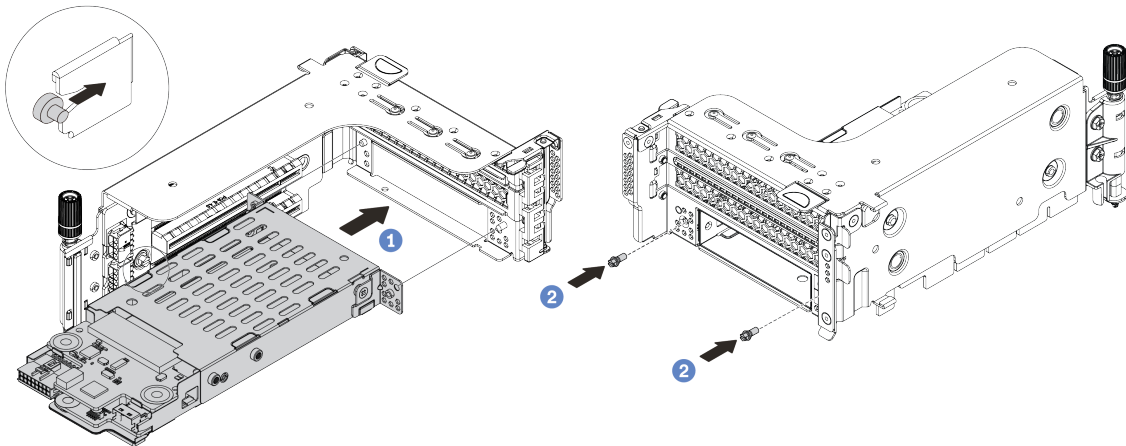


Figure 201. 7mm drive cage installation

- 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.
- Install the two screws to secure the 7mm drive cage in place.

Step 7. Install the 7mm riser assembly to the riser slot on the system board.

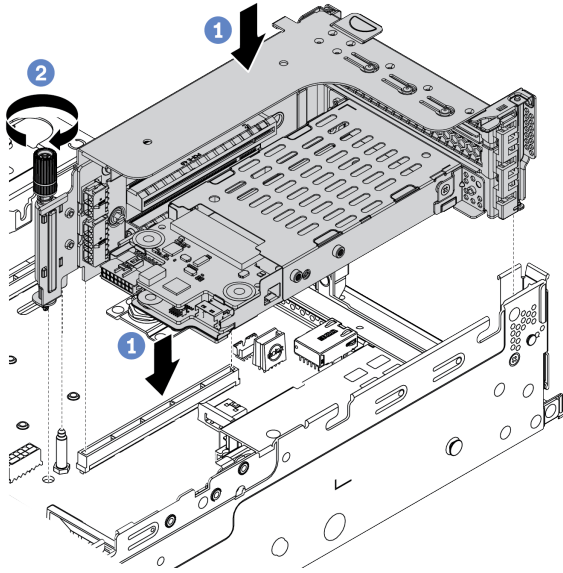


Figure 202. Riser assembly installation

- a. Align the riser assembly with the slot on the system board, lower and insert the riser into the riser slot.
- b. Tighten the screw to secure the riser assembly in place.

Step 8. Connect the cables from the backplanes to the system board. See “7mm drives ” on page 78.

Step 9. Install all the drives and fillers (if any) into the drive bays. See “Install a hot-swap drive” on page 309.

Install a serial port module

Use this information to install a serial port module.

About this task

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- 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 “PCIe slots and PCIe adapters” on page 231 to ensure that you install the serial port module to a correct PCIe slot.

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVpIE36HlvdM_sq_Auw3U.

Procedure

- Step 1. Touch the static-protective package that contains the new component to any unpainted surface on the outside of the server. Then, take the component out of the package and place it on a static-protective surface.
- Step 2. Use a 5 mm wrench to install the serial port cable into the bracket.

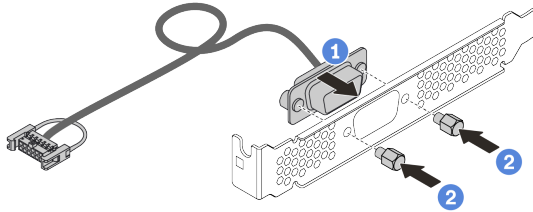


Figure 203. Assembling the serial port module

- Step 3. Remove the riser bracket from the server.

Note: The following uses the 1U riser 1 bracket as an example for illustration. It is the same for the 2U riser bracket.

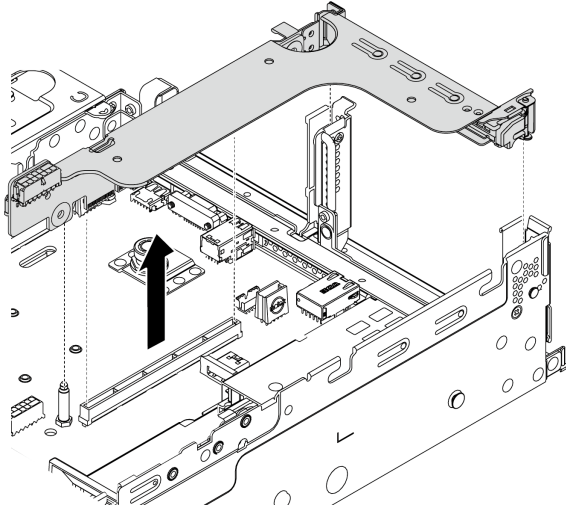


Figure 204. Removing the riser bracket

Step 4. Install the serial port module to the riser bracket.

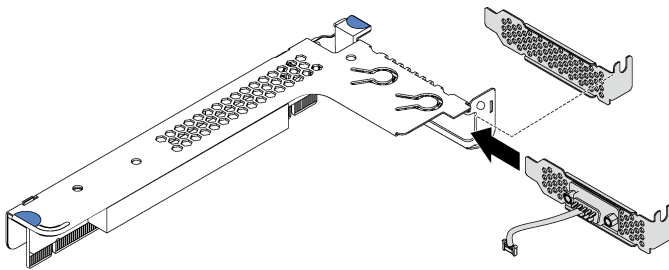


Figure 205. Installing the serial port module

Step 5. Install the riser assembly back to the server.

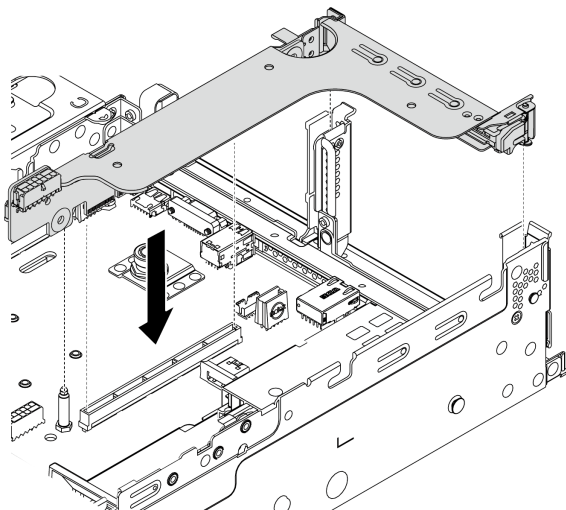


Figure 206. Installing the riser assembly

Step 6. Connect the cable of the serial port module to the serial-port-module connector on the system board. For the location of the serial-port-module connector, refer to “System board components” on page 51.

After you finish

To enable the serial port module, do one of the following according to the installed operating system:

- For Linux operating system:

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 operating system:

1. Open the ipmitool and enter the following command to disable the SOL feature:

```
-I lanplus -H IP -U USERID -P PASSWORD sol deactivate
```

2. Open Windows PowerShell and enter the following command to disable the Emergency Management Services (EMS) feature:

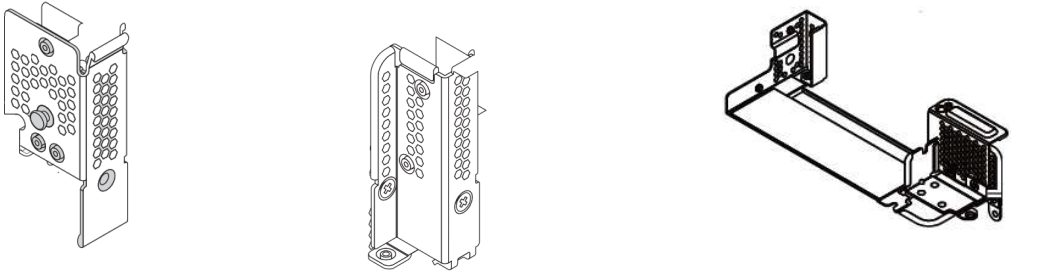
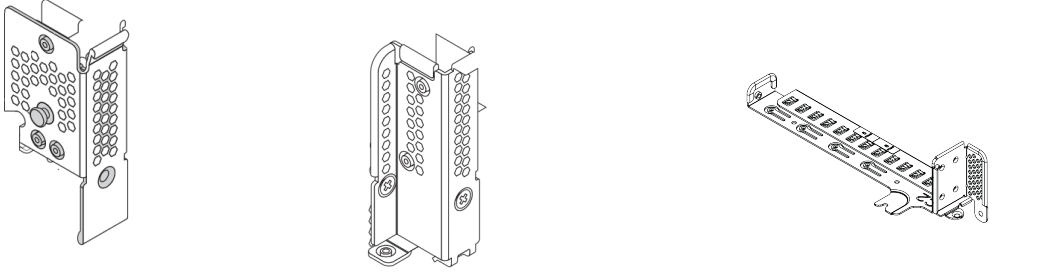
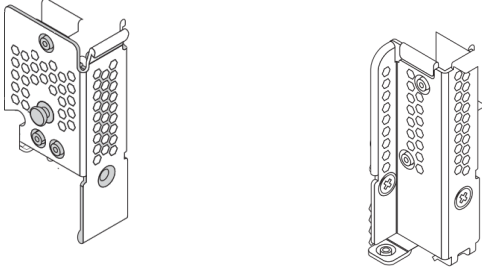
```
Bcdedit /ems no
```

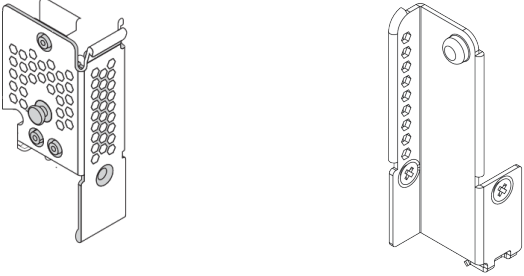
3. Restart the server to ensure that the EMS setting takes effect.

Rearwall bracket combinations matrix

Use this information to remove and install a rearwall bracket.

Rearwall bracket matrix

Server model	Required rearwall brackets
<p>Server model with 8 PCIe slots</p>	<p>The server requires 3 rearwall brackets:</p> <p>A1 rearwall bracket on the left B1 rearwall bracket on the middle C1 rearwall bracket on the right</p> 
<p>Server model with 4 x 2.5-inch rear drives</p>	<p>The server requires 3 rearwall brackets:</p> <p>A1 rearwall bracket on the left B1 rearwall bracket on the middle C2 rearwall bracket on the right</p> 
<p>Server model with 2 x 3.5-inch rear drives</p>	<p>The server requires 2 rearwall brackets:</p> <p>A1 rearwall bracket on the left B1 rearwall bracket on the middle</p> 
<p>Server model with 8 x 2.5-inch rear drives</p>	<p>The server requires 1 rearwall bracket:</p>

Server model	Required rearwall brackets
	<p>A1 rearwall bracket on the left</p> <p>B2 rearwall bracket on the middle</p> 
<p>Server model with 4 x 3.5-inch rear drives</p>	<p>The server requires no rearwall brackets:</p>

Replace a rearwall bracket

Use this information to replace a rearwall bracket.

About this task

Before you add a rear drive cage, you might need remove or replace the existing rearwall bracket with a required rearwall bracket that comes with the rear drive cage.

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- 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-DqVpIE36HlvdM_sq_Auw3U.

Procedure

Step 1. Remove the riser assemblies. The below illustration shows removing the riser 1 assembly. It is similar for removing other riser assemblies.

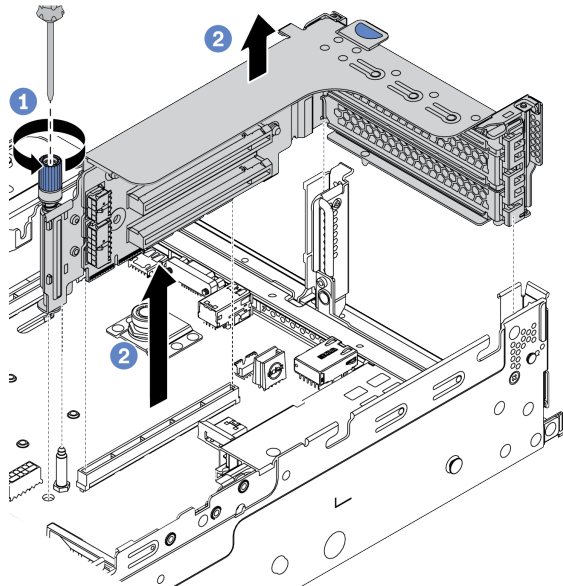
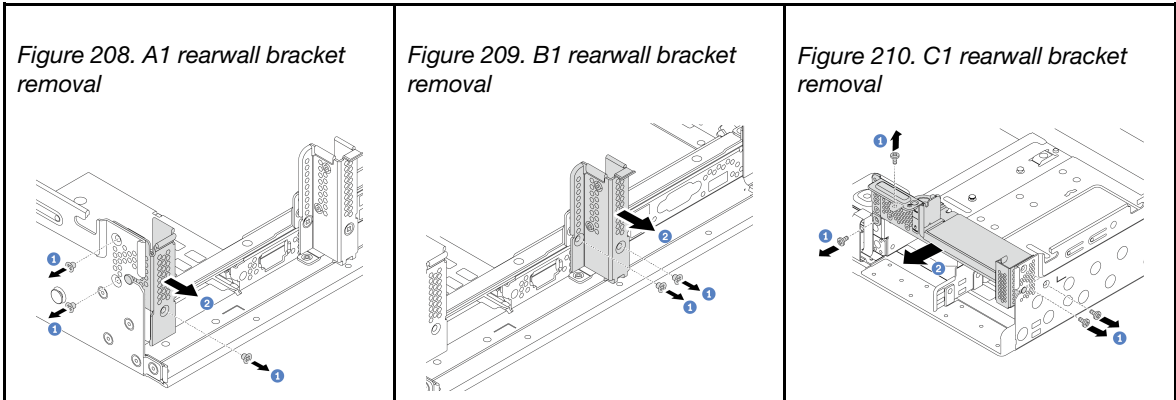


Figure 207. Riser assembly removal

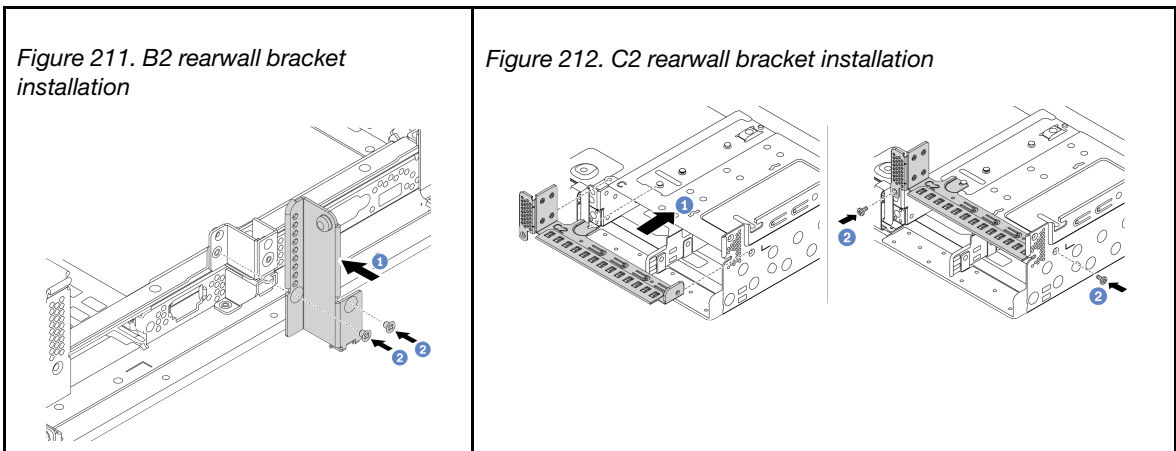
- a. Loosen the screw that secures the riser assembly.
- b. Grasp the riser assembly by its edges and carefully lift it straight up and off the chassis.

Step 2. Remove the existing rearwall bracket. Refer to “Rearwall bracket combinations matrix” on page 286 to determine the bracket to be removed.

Note: The illustrations show removing the A1, B1, and C1 rearwall brackets. The procedure is the same for removing other rearwall brackets.



Step 3. Install the rearwall bracket that comes with the rear drive cage. If you are installing the 4 x 3.5 rear drive cage, skip this step.



Install a rear drive cage

Use this information to install a rear drive cage.

About this task

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- 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 236 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.
 - “Install a processor-heat-sink module” on page 248
 - “Install a system fan” on page 262

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVplE36HlvdM_sq_Auw3U.

Procedure

- Step 1. (Optional) If the existing rearwall bracket is not for the rear drive cage, replace it with the rearwall bracket that comes with the rear drive cage. See “Replace a rearwall bracket” on page 288.
- Step 2. Install the required riser brackets or riser bracket fillers. See “Install a PCIe adapter and riser assembly” on page 269.
- Step 3. Install the backplane to the drive cage.

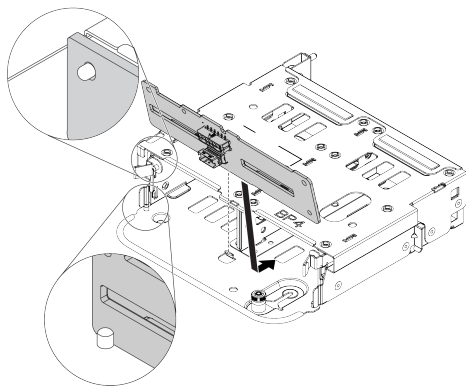


Figure 213. Installing the 4 x 2.5-inch rear drive backplane

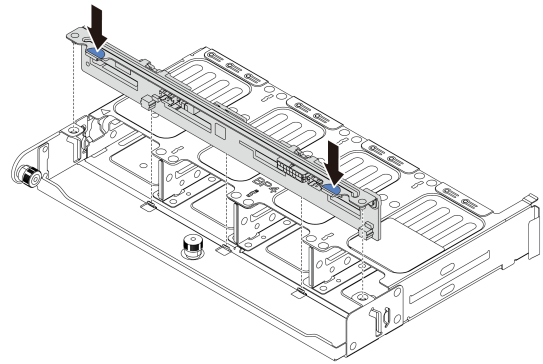


Figure 214. Installing the 8 x 2.5-inch rear drive backplane

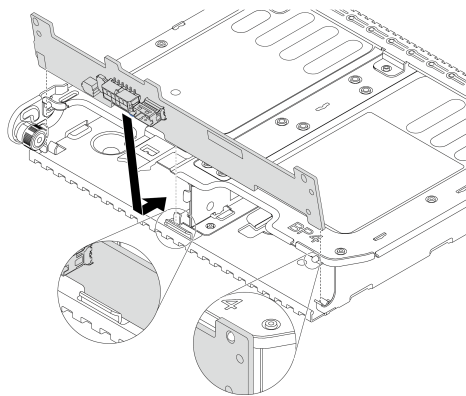


Figure 215. Installing the 2 x 3.5-inch rear drive backplane

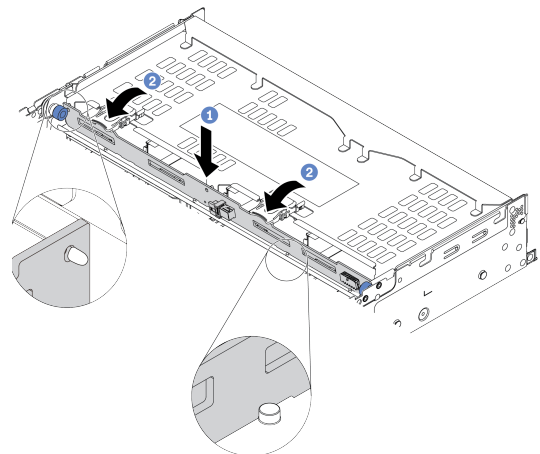


Figure 216. Installing the 4 x 3.5-inch rear drive backplane

Step 4. Install the rear drive cage.

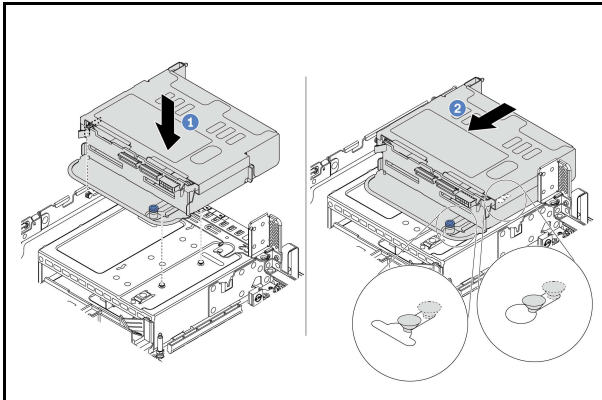


Figure 217. Installing the 4 x 2.5-inch rear drive cage

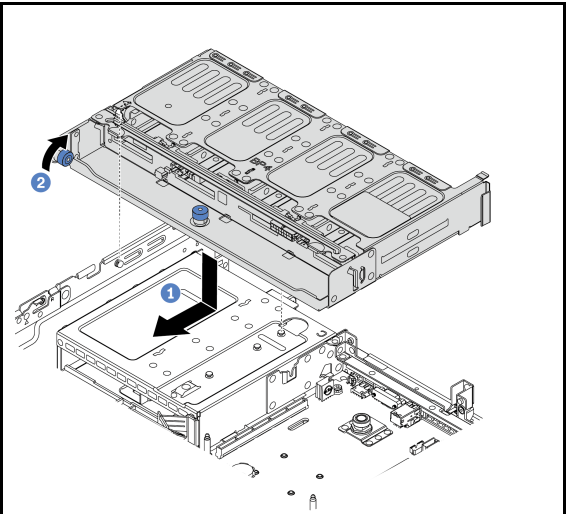


Figure 218. Installing the 8 x 2.5-inch rear drive cage

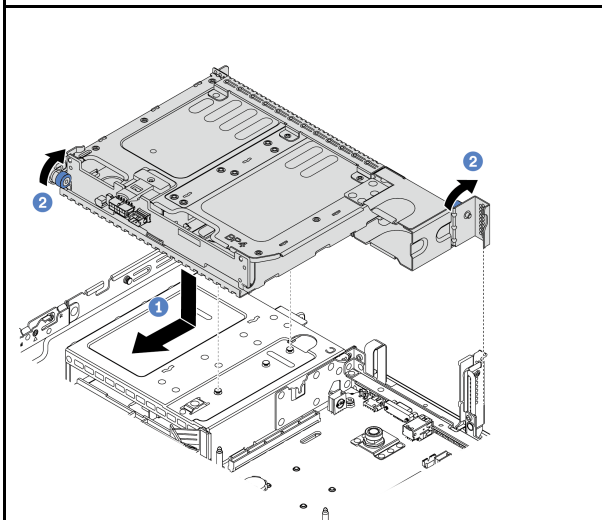


Figure 219. Installing the 2 x 3.5-inch rear drive cage

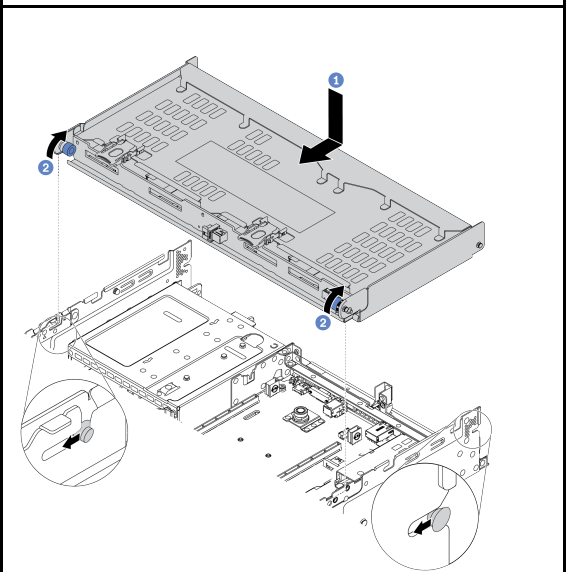


Figure 220. Installing the 4 x 3.5-inch rear drive cage

Step 5. (Optional) If you are installing the 4 x 3.5-inch drive cage, install the top cover support bracket.

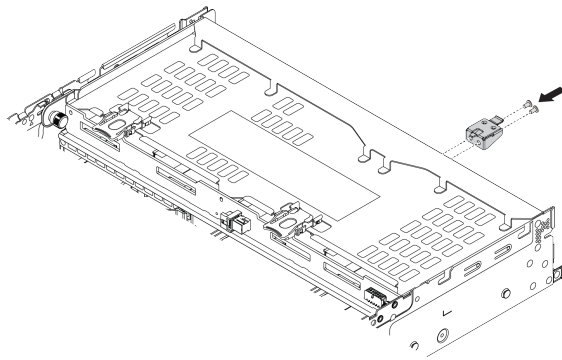


Figure 221. Installing the top cover support bracket

Step 6. Connect cables to the rear drive backplane. See Chapter 3 “Internal cable routing” on page 67.

Step 7. Install drives or drive fillers into the rear drive cage. See “Install a hot-swap drive” on page 309.

Install the air baffle

Use this information 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 212 to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVplE36HlvdM_sq_Auw3U.

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 “Technical rules” on page 231 to select the appropriate air baffle for your server.
- Step 2. (Optional) If 1U standard heat sink 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.

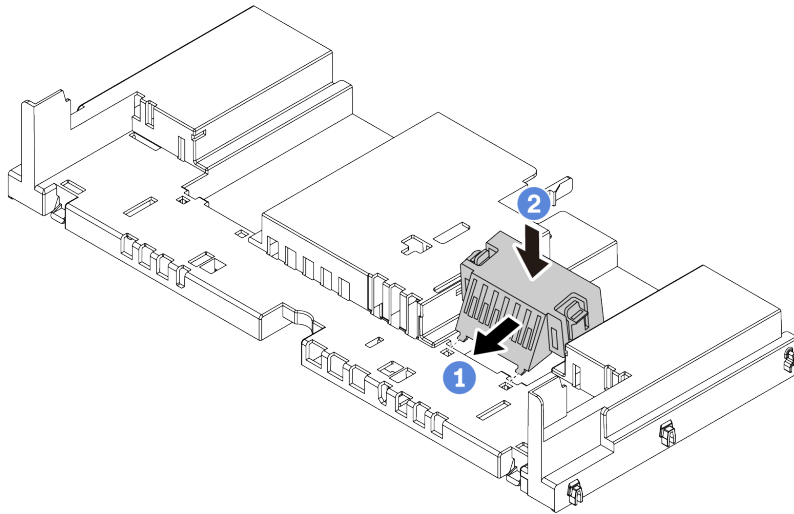


Figure 222. Air baffle filler installation

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.

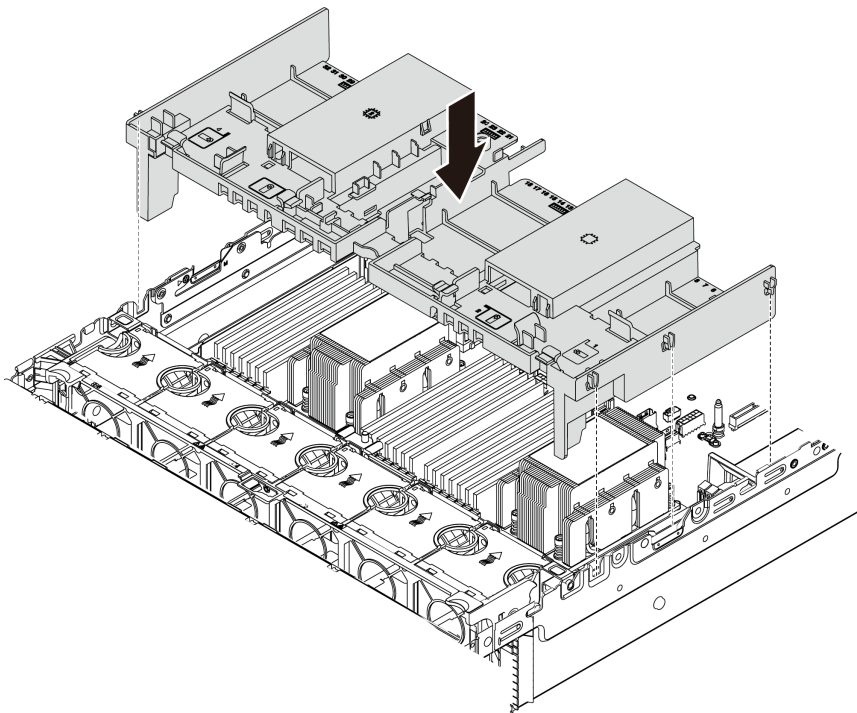


Figure 223. Installation of the standard air baffle

Install an M.2 drive

Use this information to install an M.2 drive.

About this task

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- 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-DqVplE36HlvdM_sq_Auw3U.

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 them 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. See “Adjust the retainer on the M.2 backplane” on page 297.
- 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.

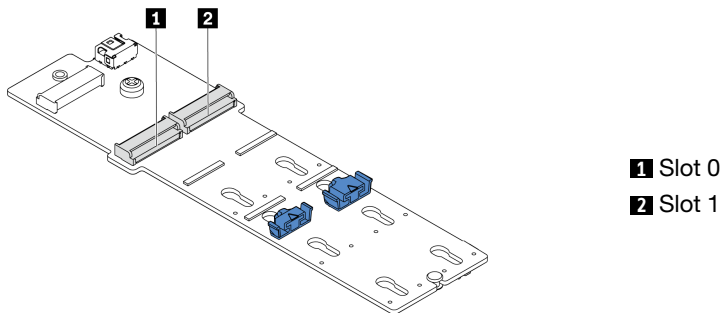


Figure 224. M.2 drive slot

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

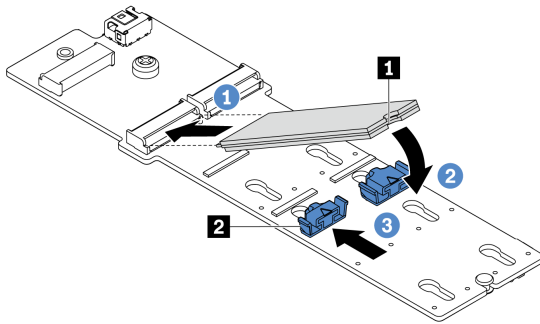


Figure 225. M.2 drive installation

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

Adjust the retainer on the M.2 backplane

Use this information to adjust the retainer on the M.2 backplane.

About this task

Sometimes you need to adjust the M.2 drive retainer to a correct keyhole that can accommodate the particular size of the M.2 drive you wish to install.

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVplE36HlvdM_sq_Auw3U.

Procedure

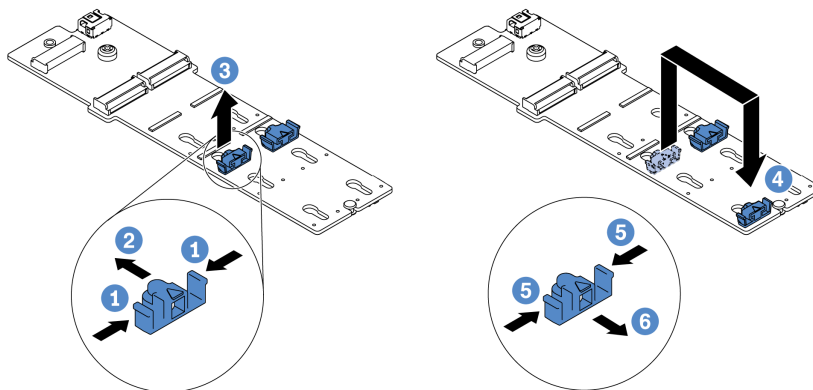


Figure 226. M.2 retainer adjustment

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

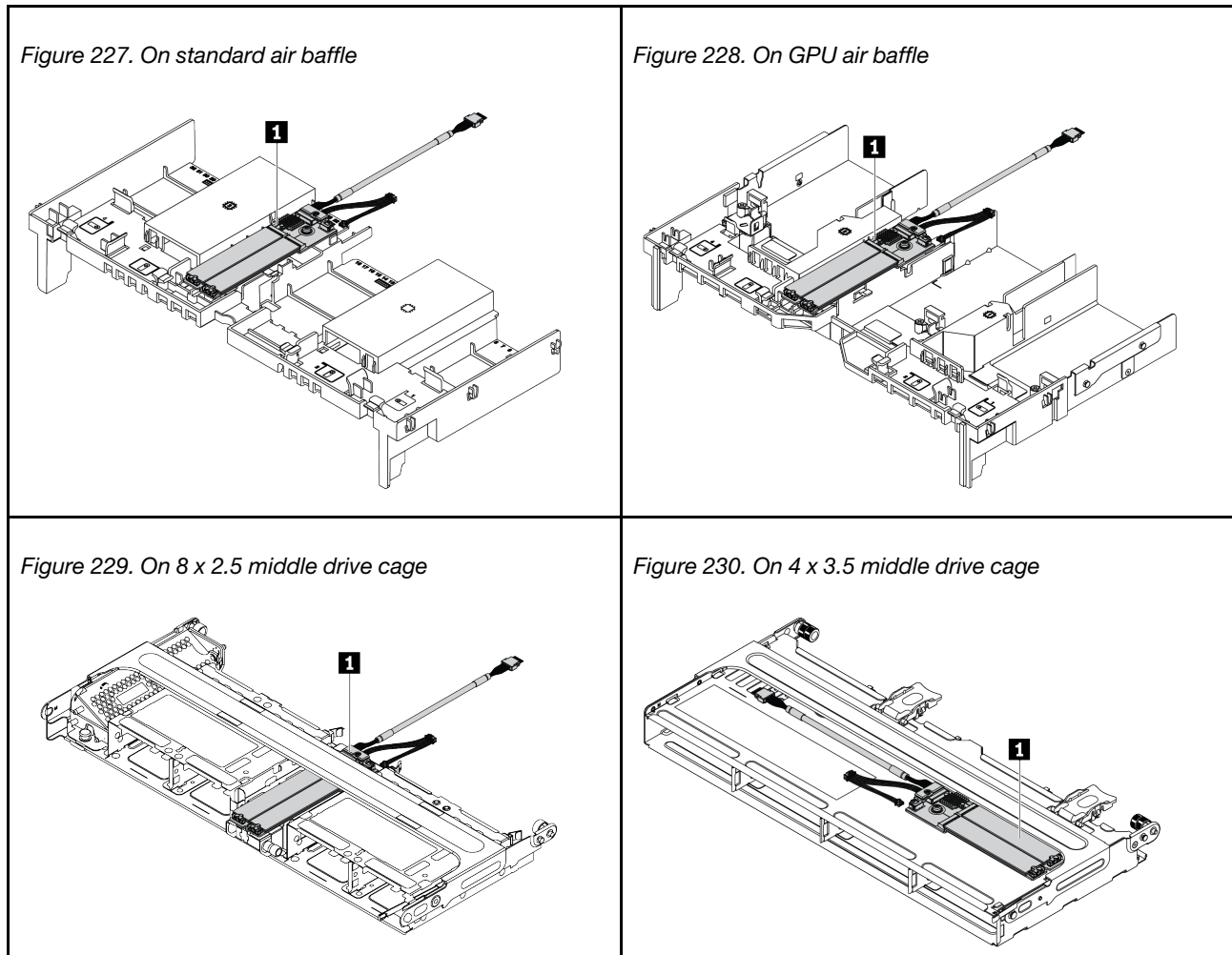
Install the M.2 backplane

Use this information to install the M.2 backplane.

About this task

The position of the M.2 module **1** varies by server hardware configuration. This topic uses the M.2 backplane on the standard air baffle as an example for installation illustration. The installation procedure is the same for the others.

Table 35. M.2 module location



Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- 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-DqVpIE36HlvdM_sq_Auw3U.

Procedure

Note: Your M.2 backplane might look different from the following illustrations, but the installation method is the same.

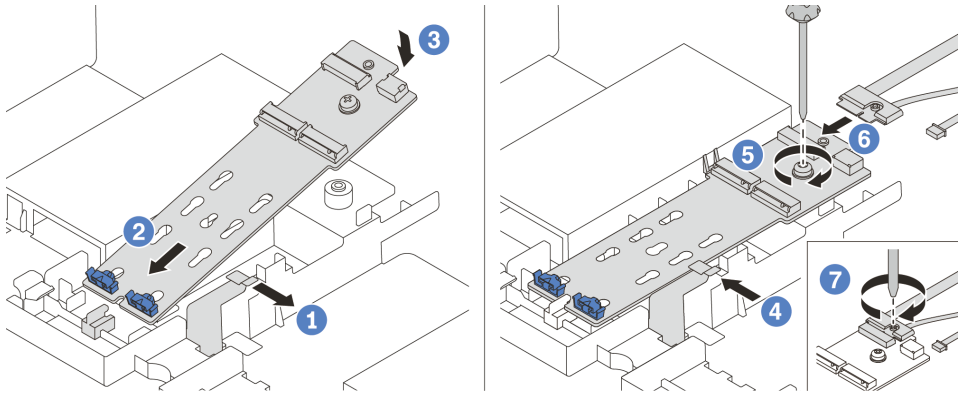


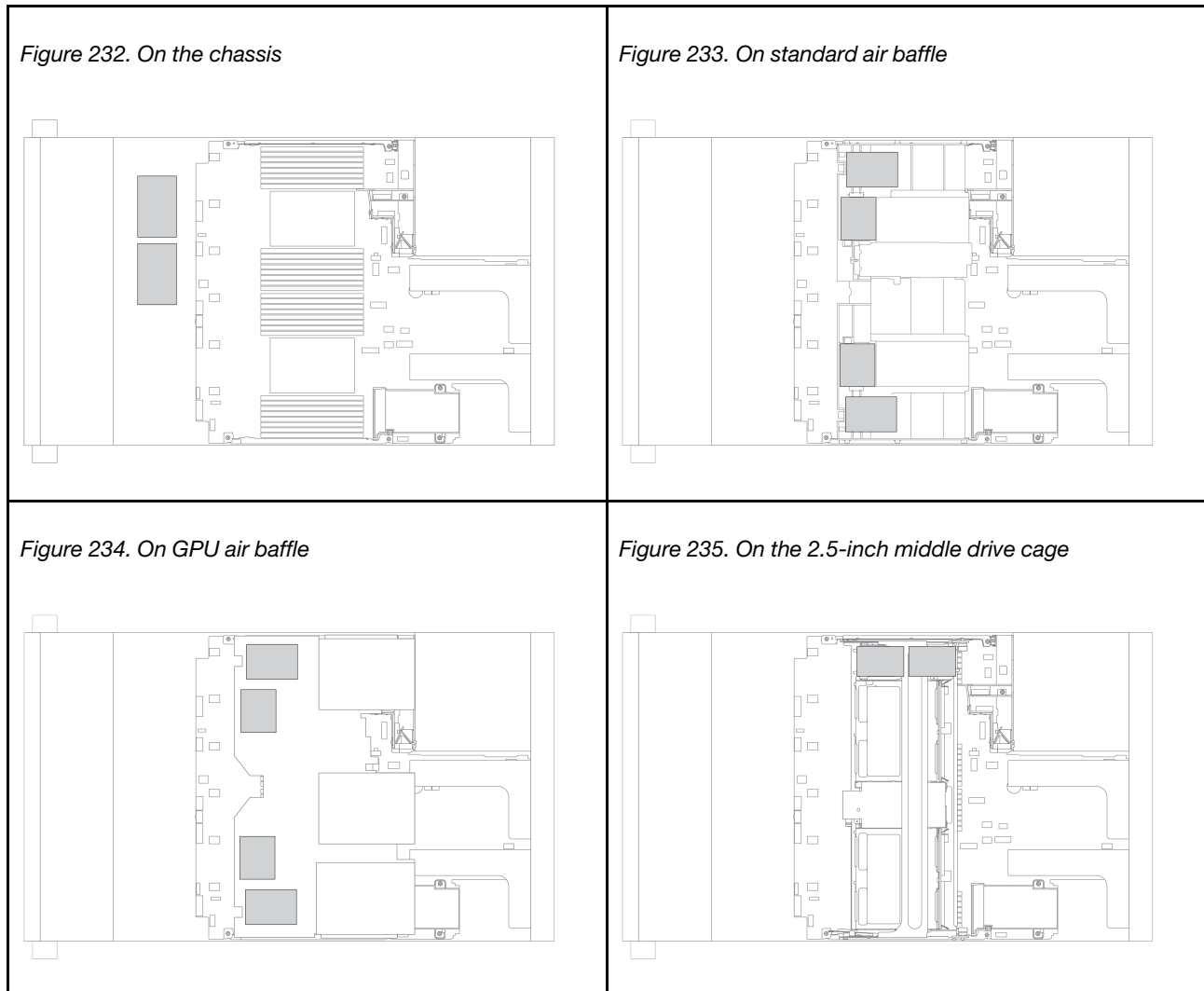
Figure 231. M.2 backplane installation

- Step 1. Open the retention clip on the air baffle.
- Step 2. Insert the M.2 backplane at an angle of approximately 30 degrees into the tray.
- Step 3. Rotate the M.2 backplane downward into place.
- Step 4. Close the retention clip.
- Step 5. Fasten the screw to secure the M.2 backplane.
- Step 6. Connect the cables to the M.2 backplane.
- Step 7. Fasten the screw that secures the M.2 signal cable to the M.2 backplane.
- Step 8. Connect the cables to the system board. See “M.2 drives” on page 79.

Install a RAID flash power module

Use this information to install a RAID flash power module (also called supercap).

The location of RAID flash power modules varies by the server hardware configurations.



Depending on your hardware configuration, refer to the specific topic for the installation procedure.

- “Install a RAID flash power module on the chassis” on page 301
- “Install a RAID flash power module on the air baffle” on page 303
- “Install a RAID flash power module on the middle drive cage” on page 304

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 212 to ensure that you work safely.

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

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVplE36HlvdM_sq_Auw3U.

Procedure

- Step 1. Touch the static-protective package that contains the new RAID flash power module to any unpainted surface on the outside of the server. Then, take the new RAID flash power module out of the package and place it on a static-protective surface.
- Step 2. Install the supercap holder.

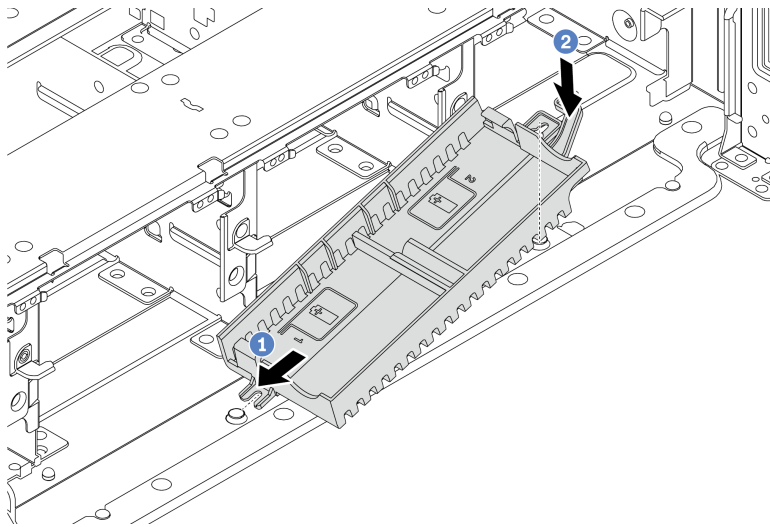


Figure 236. Supercap holder installation

- a. Align the notch on the supercap holder with the pin on the chassis.
- b. Pivot the supercap holder inward until the other side clicks into place.

Step 3. Install the RAID flash power module.

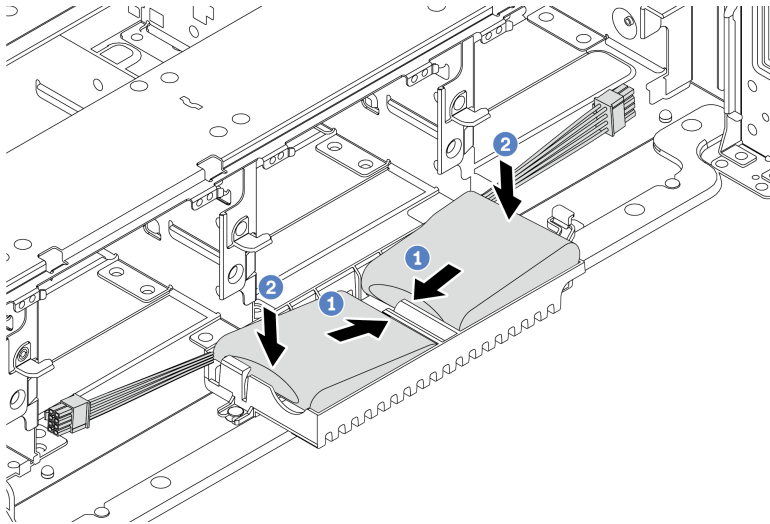


Figure 237. RAID flash power module installation

- a. Insert the RAID flash power module into the retaining clip at one side as shown.
- b. 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 “RAID flash power module” on page 76.

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 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- 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-DqVpIE36HlvdM_sq_Auw3U.

Procedure

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

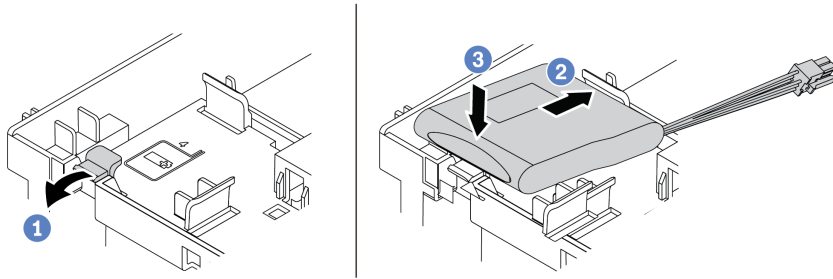


Figure 238. RAID flash power module installation (on the air baffle)

- a. Open the retention clip on the holder.
- b. Put a RAID flash power module into the holder.
- c. 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 “RAID flash power module” on page 76.

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 2.5-inch middle drive cage.

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVpIE36HlvdM_sq_Auw3U.

Procedure

Step 1. Touch the static-protective package that contains the new RAID flash power module to any unpainted surface on the outside of the server. Then, take the new RAID flash power module out of the package and place it on a static-protective surface.

Step 2. Open the drive cage handle.

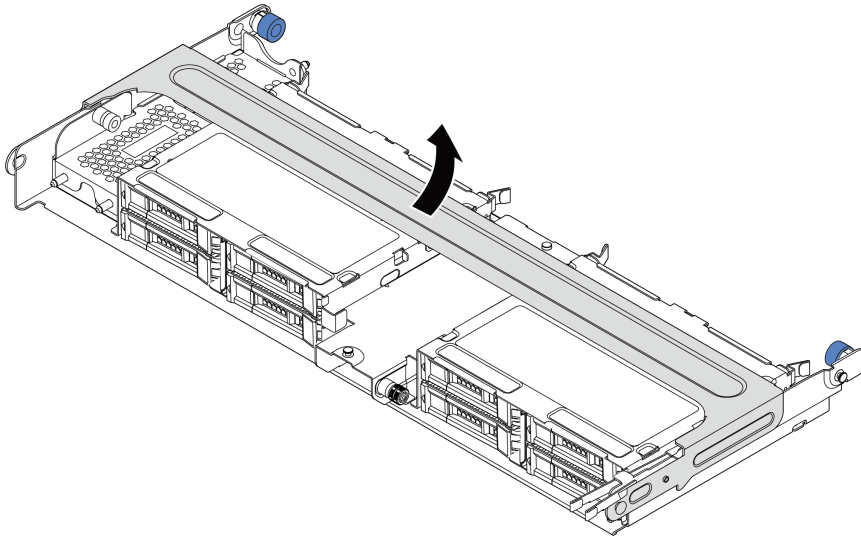


Figure 239. Opening the handle of the middle drive cage

Step 3. Remove the metal cover.

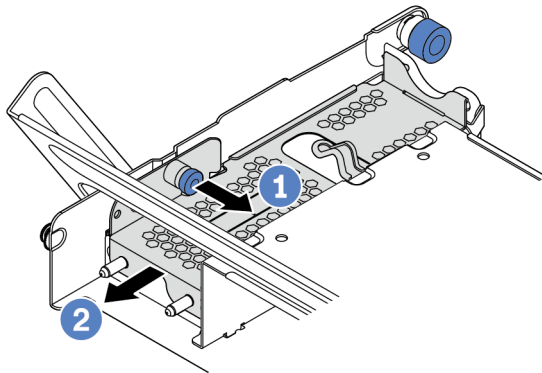


Figure 240. Removing the metal cover

1. Pull out the blue plunger.
2. Slide the metal cover out of the drive cage.

Step 4. Install the RAID flash power module.

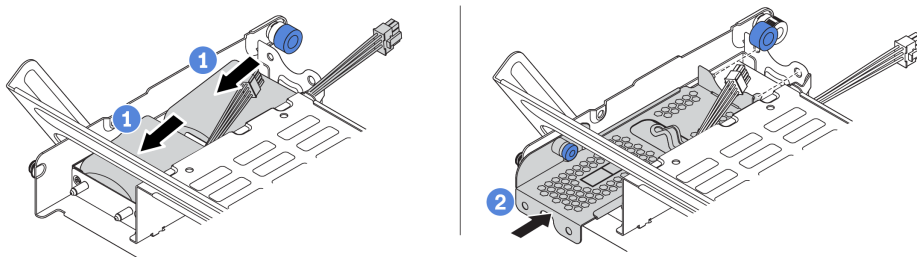


Figure 241. Installing the RAID flash power module

1. Put a RAID flash power module into the holder, and press it down to secure it into the holder.

2. Align the pins on the metal cover with the holes in 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 5. Connect the RAID flash power module to an adapter with the extension cable that comes with the RAID flash power module. See “RAID flash power module” on page 76.

Install the top cover

Use this information to install the top cover.

About this task

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- 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-DqVpIE36HlvdM_sq_Auw3U.

Procedure

Step 1. Check your server and ensure that:

- All components are installed and seated correctly.
- All internal cables are connected and routed correctly. See Chapter 3 “Internal cable routing” on page 67.
- No tools or loose screws are left inside your server.

Step 2. Install the top cover to your server.

Attention: Handle the top cover carefully. Dropping the top cover with the cover latch open might damage the cover latch.

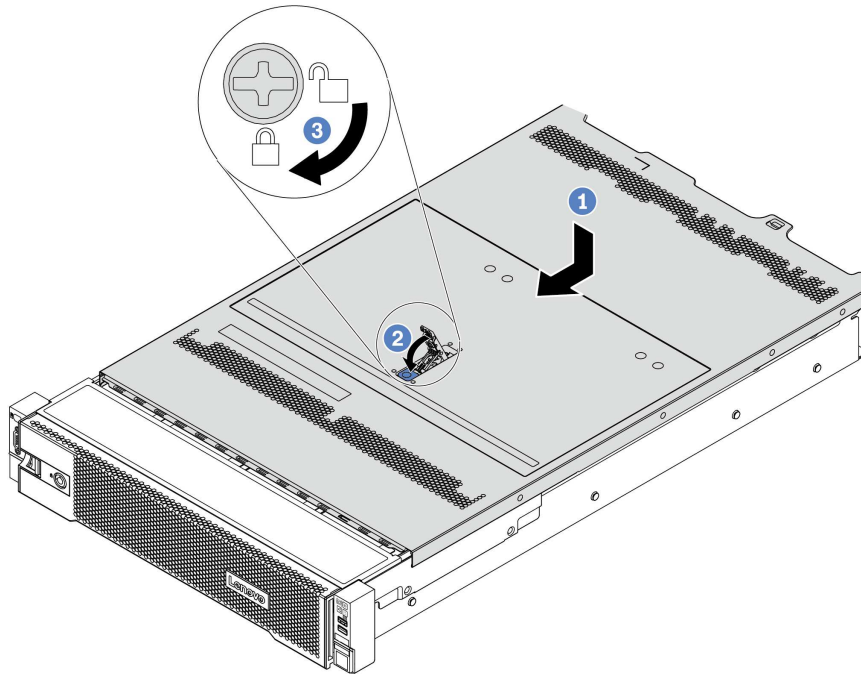


Figure 242. Top cover installation

- a. 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. Rotate the cover latch until the top cover snaps into position. Ensure that the cover latch is completely closed.
- c. Use a screwdriver to turn the cover lock to the locked position.

Install a hot-swap drive

Use this information to install a hot-swap drive.

About this task

Attention:

- Read “Installation Guidelines” on page 212 to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVpIE36HlvdM_sq_Auw3U.

Procedure

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

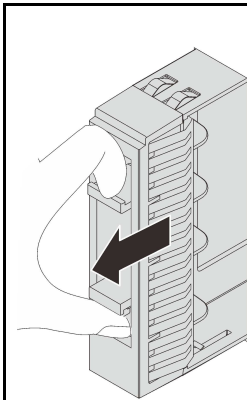


Figure 243. Removing 2.5-inch drive filler

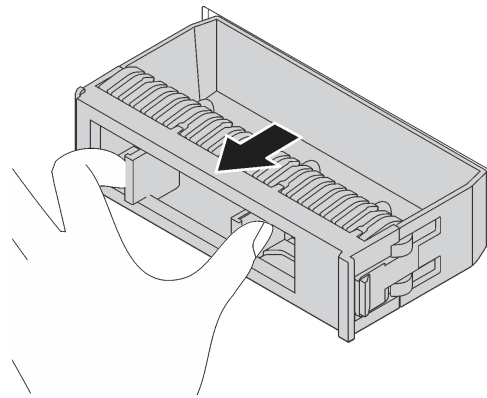
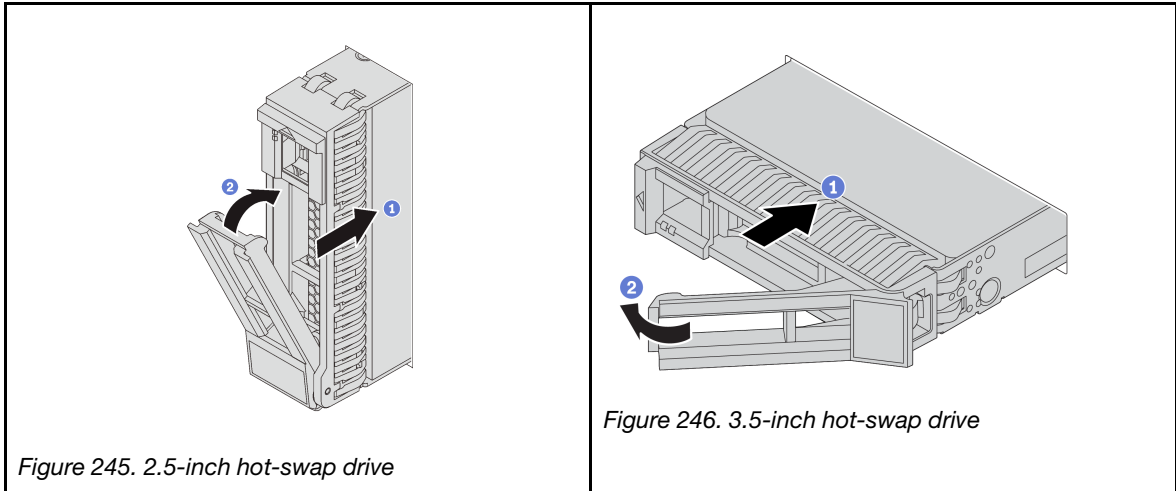


Figure 244. Removing 3.5-inch drive filler

- Step 3. Install the drive in the drive bay.
 - a. Ensure that the drive tray handle is in the open position. Slide the drive into the drive bay until it snaps into position.
 - b. Close the drive tray handle to lock the drive in place.



- Step 4. 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 5. Continue to install additional hot-swap drives if necessary.

After you finish

- Use the Lenovo XClarity Provisioning Manager to configure the RAID if necessary. See https://sysmgt.lenovofiles.com/help/topic/ixpm_frontend/ixpm_product_page.html.

Install the OCP 3.0 Ethernet adapter

Use this information to install the OCP 3.0 Ethernet adapter.

About this task

CAUTION:

Power off the server and disconnect all power cords from their power sources before performing this procedure.

Attention:

- Read “Installation Guidelines” on page 212 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.

Note: If there is an OCP 3.0 Ethernet adapter installed, when the system is powered off but still plugged in to AC power, system fans will continue to spin at a much lower speed. This is the system design to provide proper cooling for the OCP 3.0 Ethernet adapter.

Watch the procedure

A video of this procedure is available at YouTube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-DqVplE36HlvdM_sq_Auw3U.

Procedure

- Step 1. Touch the static-protective package that contains the new adapter to any unpainted surface on the outside of the server. Then, take the adapter out of the package and place it on a static-protective surface.
- Step 2. Remove the OCP 3.0 Ethernet adapter filler if there is.

Step 3. Install the OCP 3.0 Ethernet adapter.

Note: Ensure that the Ethernet adapter is fully seated and the thumbscrew is securely tightened. Otherwise, the OCP 3.0 Ethernet adapter will not get full connection and may not function.

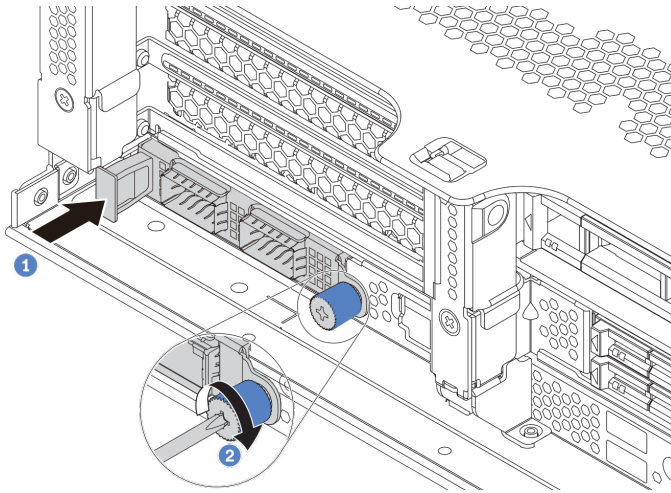


Figure 247. OCP 3.0 Ethernet adapter installation

- a. Push the OCP 3.0 Ethernet adapter into the slot until it is fully seated.
- b. Tighten the thumbscrew to secure the card.

Step 4. Attach the OCP label to the rear of the server.

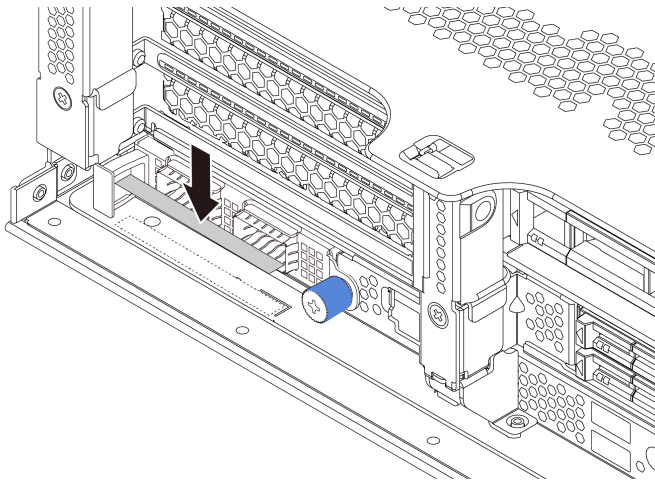


Figure 248. Attaching the OCP label

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-swappable. To support redundancy mode or hot-swap, install an additional hot-swap 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://static.lenovo.com/us/en/serverproven/index.shtml>
- Attach the power information label that comes with this option onto the top cover near the power supply.



Figure 249. Example power supply label on the top cover

Safety precautions for AC power supplies

The following tips describe the information that you must consider when you install 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 install 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 cables is hazardous.
To avoid a shock hazard:

- To connect or disconnect -48V dc power cables 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.

Procedure

- Step 1. Touch the static-protective package that contains the hot-swap power supply to any unpainted surface on the outside of the server. Then, take the hot-swap power supply out of the package and place it on a static-protective surface.
- Step 2. If there is a power-supply filler installed, remove it.

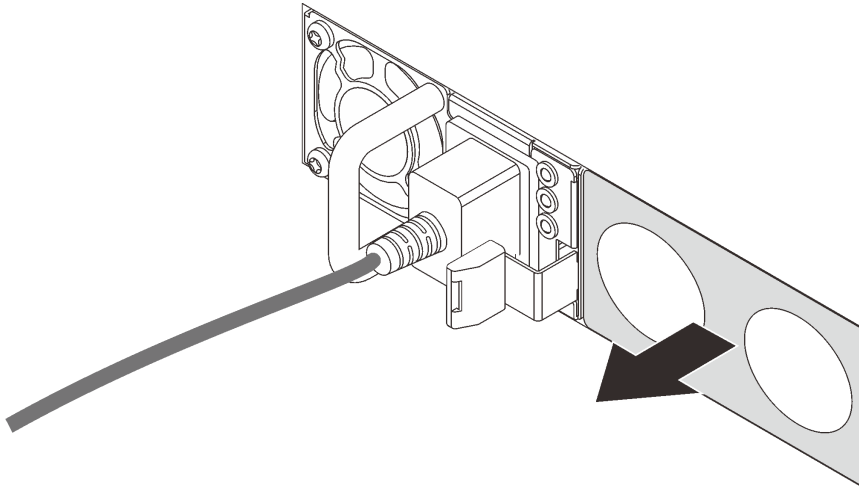


Figure 250. Hot-swap power supply filler removal

Step 3. Slide the new hot-swap power supply into the bay until it snaps into position.

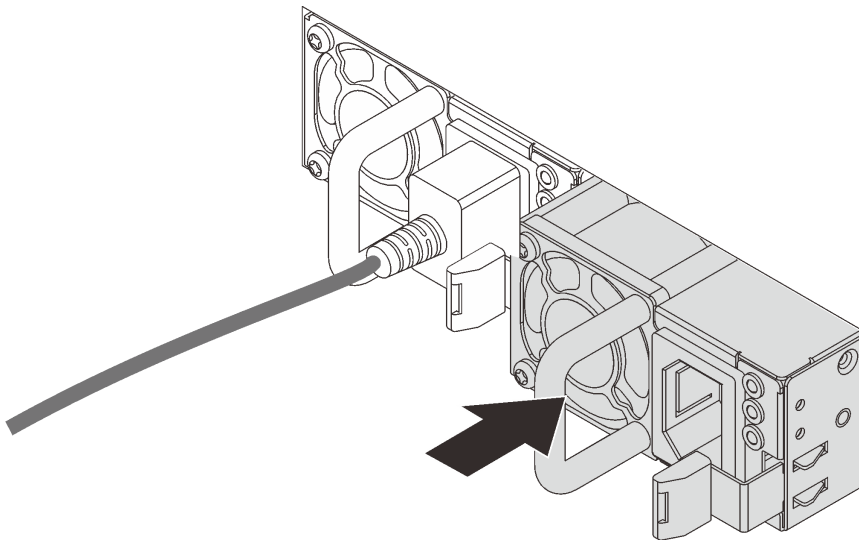



Figure 251. Hot-swap power supply installation

Step 4. 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 5. Route the cables and ensure that they are not blocking access to other chassis components.

Install the server in a rack

To install the server in a rack, follow the instructions that are provided in the Rail Installation Kit for the rails on which the server will be installed.

Cable the server

Attach all external cables to the server. Typically, you will need to connect the server to a power source, to the data network, and to storage. In addition, you will need to connect the server to the management network.

1. Connect the server to power.
2. Connect the server to the network.
3. Connect the server to any storage devices.

Turn on the server

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

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

- You can press the power button.
- The server can respond to remote power-on requests sent to Lenovo XClarity Controller via Lenovo XClarity Essentials OneCLI, IPMItool, or SSH CLI.

For example, run the following command on Lenovo XClarity Essentials OneCLI to power on your server:
`OneCli.exe ospower turnon --bmc USERID:PASSWORD@host`

For more information about running the **ospower** command, see https://sysmgt.lenovofiles.com/help/topic/toolctr_cli_lenovo/onecli_r_ospower_command.html.

If the system UEFI power policy is set to “always on”, the system will be powered on automatically when an AC source is plugged in.

For information about powering off the server, see “Turn off the server” on page 319.

System boot/startup time

The system boot/startup time varies by hardware configurations and may change depending on your server configuration and conditions.

- For typical configurations without PMEM memory modules, it takes about 3 minutes for the system to start up.
Configuration example: 2 x processors, 16 x RDIMMs, 1 x RAID adapter, 1 x NIC adapter
- For configurations with PMEM memory modules installed, it may take up to 15 minutes for the system to start up.
Configuration example: 2 x processors, 16 x RDIMMs, 16 x PMEMs, 1 x RAID adapter, 1 x NIC adapter
- For configurations with PMEM memory modules installed and Intel Volume Management Device (VMD) enabled, it may take about 20 minutes or longer for the system to start up.
Configuration example: 2 x processors, 16 x RDIMMs, 16 x PMEMs, 1 x RAID adapter, 1 x NIC adapter

Validate server setup

After powering up the server, make sure that the LEDs are lit and that they are green.

Turn 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.

Note: If there is an OCP 3.0 Ethernet adapter installed, when the system is powered off but still plugged in to AC power, system fans will continue to spin at a much lower speed. This is the system design to provide proper cooling for the OCP 3.0 Ethernet adapter.

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.
- Send remote power-off commands to Lenovo XClarity Controller via Lenovo XClarity Essentials OneCLI, IPMItool, or SSH CLI.

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 “Turn on the server” on page 318.

Chapter 5. System configuration

Complete these procedures to configure your system.

Set the network connection for the Lenovo XClarity Controller

Before you can access the Lenovo XClarity Controller over your network, you need to specify how Lenovo XClarity Controller will connect to the network. Depending on how the network connection is implemented, you might need to specify a static IP address as well.

The following methods are available to set the network connection for the Lenovo XClarity Controller if you are not using DHCP:

- If a monitor is attached to the server, you can use Lenovo XClarity Provisioning Manager to set the network connection.

Complete the following steps to connect the Lenovo XClarity Controller to the network using the Lenovo XClarity Provisioning Manager.

1. Start the server.
2. When you see <F1> Setup, press F1 to open up the Lenovo XClarity Provisioning Manager.

Note: If the text-based interface for UEFI Setup opens instead of the LXPM, select **Launch Graphical System Setup** on the UEFI page to connect the server to the LXPM.

3. Go to **LXPM → UEFI Setup → BMC Settings** to specify how the Lenovo XClarity Controller will connect to the network.
 - If you choose a static IP connection, make sure that you specify an IPv4 or IPv6 address that is available on the network.
 - If you choose a DHCP connection, make sure that the MAC address for the server has been configured in the DHCP server.
4. Click **OK** to apply the setting and wait for two to three minutes.
5. Use an IPv4 or IPv6 address to connect Lenovo XClarity Controller.

Important: The Lenovo XClarity Controller is set initially with a user name of USERID and password of PASSWORD (with a zero, not the letter O). This default user setting has Supervisor access. It is required to change this user name and password during your initial configuration for enhanced security.

- If no monitor attached to the server, you can set the network connection through the Lenovo XClarity Controller interface. Connect an Ethernet cable from your laptop to Lenovo XClarity Controller connector, which is located at the rear of the server. For the location of the Lenovo XClarity Controller connector, see “Rear view” on page 42.

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.

- 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 front of the server. For the location of the Lenovo XClarity Controller USB connector, see “Front view” on page 17.

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 blue ID button on the front panel for at least 3 seconds until its LED flashes slowly (once every couple of seconds).

To connect using the Lenovo XClarity Administrator Mobile app:

1. Connect the USB cable of your mobile device to the Lenovo XClarity Administrator USB connector on the front panel.
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:

http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/lxca_usemobileapp.html

Set front USB port for Lenovo XClarity Controller connection

Before you can access the Lenovo XClarity Controller through the front 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 front USB port, check one of the following:

- Refer to Chapter 2 “Server components” on page 17.



- If there is a wrench icon on the USB port of your server, you can set the USB port to connect to Lenovo XClarity Controller.

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 17 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://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.
- From the Lenovo XClarity Controller management controller web interface, click **BMC Configuration** → **Network** → **Front Panel USB Port Manager**. 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://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.

Checking USB port current setting

You can also check the current setting of the USB port using the Lenovo XClarity Controller management controller CLI (`usbfp` command) or the Lenovo XClarity Controller management controller web interface (**BMC Configuration** → **Network** → **Front Panel USB Port Manager**). 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://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.

Update the firmware

Several options are available to update the firmware for the server.

You can use the tools listed here to update the most current firmware for your server and the devices that are installed in the server.

- Best practices related to updating firmware is available at the following site:
 - <http://lenovopress.com/LP0656>
- The latest firmware can be found at the following site:
 - <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr650v2/downloads/driver-list>
- You can subscribe to product notification to stay up to date on firmware updates:
 - <https://datacentersupport.lenovo.com/tw/en/solutions/ht509500>

UpdateXpress System Packs (UXSPs)

Lenovo typically releases firmware in bundles called UpdateXpress System Packs (UXSPs). 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 Operating System executing on the server’s operating system.
- **Off-Target update.** The installation or update is initiated from a computing device interacting directly with the server’s Lenovo XClarity Controller.
- **UpdateXpress System Packs (UXSPs).** UXSPs are bundled updates designed and tested to provide the interdependent level of functionality, performance, and compatibility. UXSPs 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 UXSPs 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	Graphical user interface	Command line interface	Supports UXSPs
Lenovo XClarity Provisioning Manager (LXPM)	In-band ² On-Target	√		√		
Lenovo XClarity Controller (XCC)	Out-of-band Off-Target	√	Selected I/O devices	√		
Lenovo XClarity Essentials OneCLI (OneCLI)	In-band Out-of-band On-Target Off-Target	√	All I/O devices		√	√
Lenovo XClarity Essentials UpdateXpress (LXCE)	In-band Out-of-band On-Target Off-Target	√	All I/O devices	√		√
Lenovo XClarity Essentials Bootable Media Creator (BoMC)	In-band Out-of-band Off-Target	√	All I/O devices	√ (BoMC application)	√ (BoMC application)	√
Lenovo XClarity Administrator (LXCA)	In-band ¹ Out-of-band ² Off-Target	√	All I/O devices	√		√
Lenovo XClarity Integrator (LXCI) for VMware vCenter	Out-of-band Off-Target	√	Selected I/O devices	√		

Tool	Update Methods Supported	Core System Firmware Updates	I/O Devices Firmware Updates	Graphical user interface	Command line interface	Supports UXSPs
Lenovo XClarity Integrator (LXCI) for Microsoft Windows Admin Center	In-band Out-of-band On-Target Off-Target	√	All I/O devices	√		√
Lenovo XClarity Integrator (LXCI) for Microsoft System Center Configuration Manager	In-band On-Target	√	All I/O devices	√		√
Notes: 1. For I/O firmware updates. 2. For BMC and UEFI firmware updates.						

- **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 press F1. If you have changed that default to be the text-based system setup, you can bring up the Graphical User Interface from the text-based system setup interface.

For additional information about using Lenovo XClarity Provisioning Manager to update firmware, see:

“Firmware Update” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html

- **Lenovo XClarity Controller**

If you need to install a specific update, you can use the Lenovo XClarity Controller interface for a specific server.

Notes:

- To perform an in-band update through Windows or Linux, the operating system driver must be installed and the Ethernet-over-USB (sometimes called LAN over USB) interface must be enabled.

For additional information about configuring Ethernet over USB, see:

“Configuring Ethernet over USB” section in the XCC documentation version compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html

- If you update firmware through the Lenovo XClarity Controller, make sure that you have downloaded and installed the latest device drivers for the operating system that is running on the server.

For specific details about updating firmware using Lenovo XClarity Controller, see:

“Updating Server Firmware” section in the XCC documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html

- **Lenovo XClarity Essentials OneCLI**

Lenovo XClarity Essentials OneCLI is a collection of command line applications that can be used to manage Lenovo servers. Its update application can be used to update firmware and device drivers for your servers. The update can be performed within the host operating system of the server (in-band) or remotely through the BMC of the server (out-of-band).

For specific details about updating firmware using Lenovo XClarity Essentials OneCLI, see:

http://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_c_update.html

- **Lenovo XClarity Essentials UpdateXpress**

Lenovo XClarity Essentials UpdateXpress provides most of OneCLI update functions through a graphical user interface (GUI). It can be used to acquire and deploy UpdateXpress System Pack (UXSP) update packages and individual updates. UpdateXpress System 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 specific details about updating firmware using Lenovo XClarity Administrator, see:

http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/update_fw.html

- **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 specific details about updating firmware using Lenovo XClarity Integrator offerings, see:

https://sysmgt.lenovofiles.com/help/topic/lxci/lxci_product_page.html

Configure the firmware

Several options are available to install and set up the firmware for the server.

Important: Do not configure option ROMs to be set to **Legacy** unless directed to do so by Lenovo Support. This setting prevents UEFI drivers for the slot devices from loading, which can cause negative side effects for Lenovo software, such as Lenovo XClarity Administrator and Lenovo XClarity Essentials OneCLI, and to the Lenovo XClarity Controller. The side effects include the inability to determine adapter card details, such as model name and firmware levels. When adapter card information is not available, generic information for the

model name, such as "Adapter 06:00:00" instead of the actual model name, such as "ThinkSystem RAID 930-16i 4GB Flash." In some cases, the UEFI boot process might also hang.

- **Lenovo XClarity Provisioning Manager**

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 press F1. To do this, go to **LXPM → UEFI Setup → System Settings → <F1> Start Control → Text Setup**. To start the server with LXPM graphic user interface, select **Auto** or **Tool Suite**.

See the following documentations for more information:

- Search for the LXPM documentation version compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html
- https://thinksystem.lenovofiles.com/help/topic/dcg_uefi/overview_dcg_uefi.html

- **Lenovo XClarity Controller**

You can configure the management processor for the server through the Lenovo XClarity Controller Web interface or through the command-line interface.

For information about configuring the server using Lenovo XClarity Controller, see:

“Configuring the Server” section in the XCC documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html

- **Lenovo XClarity Essentials OneCLI**

You can use the config application and commands to view the current system configuration settings and make changes to Lenovo XClarity Controller and UEFI. The saved configuration information can be used to replicate or restore other systems.

For information about configuring the server using Lenovo XClarity Essentials OneCLI, see:

http://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_c_settings_info_commands.html

- **Lenovo XClarity Administrator**

You can quickly provision and pre-provision all of your servers using a consistent configuration. Configuration settings (such as local storage, I/O adapters, boot settings, firmware, ports, and Lenovo XClarity Controller and UEFI settings) are saved as a server pattern that can be applied to one or more managed servers. When the server patterns are updated, the changes are automatically deployed to the applied servers.

Specific details about updating firmware using Lenovo XClarity Administrator are available at:

http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/server_configuring.html

Configure the memory

Memory performance depends on several variables, such as memory mode, memory speed, memory ranks, memory population and processor.

More information about optimizing memory performance and configuring memory is available at the Lenovo Press Web site:

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

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

http://1config.lenovo.com/#/memory_configuration

For specific information about the required installation order of memory modules in your server based on the system configuration and memory mode that you are implementing, see “Memory module installation rules and order” on page 216.

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.

Note: Make sure you follow the memory module population sequence for SGX configurations in “Independent mode” on page 217.

- Step 1. Restart the system. Before the operating system starts up, press **F1** to enter the Setup Utility.
- Step 2. Go to **System settings** → **Processors** → **UMA-Based Clustering** and disable the option.
- Step 3. Go to **System settings** → **Processors** → **Total Memory Encryption (TME)** and enable the option.
- Step 4. Save the changes, then go to **System settings** → **Processors** → **SW Guard Extension (SGX)** and enable the option.

Configure the RAID arrays

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>

Notes:

- 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 **F1** to enter the Setup Utility.
 2. Go to **System settings** → **Devices and I/O Ports** → **Intel VMD** and enable the option.
 3. Save the changes and reboot the system.
- VROC Intel-SSD-Only supports RAID levels 0, 1, 5, and 10 with Intel NVMe drives.
- VROC Premium requires an activation key and supports RAID levels 0, 1, 5, and 10 with non-Intel NVMe drives. For more information about acquiring and installing the activation key, see <https://fod.lenovo.com/lkms>

Deploy the operating system

Several options are available to deploy an operating system on one or more servers.

Available operating systems

Supported and certified operating systems:

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

Complete list of operating systems: <https://lenovopress.com/osig>

Tool-based deployment

- **Multi-server context**

Available tools:

- Lenovo XClarity Administrator
http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/compute_node_image_deployment.html
- Lenovo XClarity Essentials OneCLI
http://sysmgt.lenovofiles.com/help/topic/toolctr_cli_lenovo/onecli_r_uxspi_proxy_tool.html
- Lenovo XClarity Integrator deployment pack for SCCM (for Windows operating system only)
https://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxci_deploypack_sccm.doc/dpsccm_c_endtoend_deploy_scenario.html

- **Single-server context**

Available tools:

- Lenovo XClarity Provisioning Manager
“OS Installation” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html
- Lenovo XClarity Essentials OneCLI
http://sysmgt.lenovofiles.com/help/topic/toolctr_cli_lenovo/onecli_r_uxspi_proxy_tool.html
- Lenovo XClarity Integrator deployment pack for SCCM (for Windows operating system only)
https://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxci_deploypack_sccm.doc/dpsccm_c_endtoend_deploy_scenario.html

Manual deployment

If you cannot access the above tools, follow the instructions below, download the corresponding OS *Installation Guide*, and deploy the operating system manually by referring to the guide.

1. Go to <https://datacentersupport.lenovo.com/solutions/server-os>.
2. Select an operating system from the navigation pane and click **Resources**.
3. Locate the “OS Install Guides” area and click the installation instructions. Then, follow the instructions to complete the operation system deployment task.

Back up the server configuration

After setting up the server or making changes to the configuration, it is a good practice to make a complete backup of the server configuration.

Make sure that you create backups for the following server components:

- **Management processor**

You can back up the management processor configuration through the Lenovo XClarity Controller interface. For details about backing up the management processor configuration, see:

“Backing up the BMC configuration” section in the XCC documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.

Alternatively, you can use the **save** command from Lenovo XClarity Essentials OneCLI to create a backup of all configuration settings. For more information about the **save** command, see:

http://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_save_command.html

- **Operating system**

Use your backup methods to back up the operating system and user data for the server.

Update the Vital Product Data (VPD)

After initial setup of the system, you can update some Vital Product Data (VPD), such as asset tag and Universal Unique Identifier (UUID).

Update the Universal Unique Identifier (UUID)

Optionally, you can update the Universal Unique Identifier (UUID).

There are two methods available to update the UUID:

- From Lenovo XClarity Provisioning Manager

To update the UUID from Lenovo XClarity Provisioning Manager:

1. Start the server and press F1 to display the Lenovo XClarity Provisioning Manager interface.
2. If the power-on Administrator password is required, enter the password.
3. From the System Summary page, click **Update VPD**.
4. Update the UUID.

- From Lenovo XClarity Essentials OneCLI

Lenovo XClarity Essentials OneCLI sets the UUID in the Lenovo XClarity Controller. Select one of the following methods to access the Lenovo XClarity Controller and set the UUID:

- Operate from the target system, such as LAN or keyboard console style (KCS) access
- Remote access to the target system (TCP/IP based)

To update the UUID 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. Copy and unpack the OneCLI package, which also includes other required files, to the server. Make sure that you unpack the OneCLI and the required files to the same directory.

3. After you have Lenovo XClarity Essentials OneCLI in place, type the following command to set the UUID:

```
onecli config set SYSTEM_PROD_DATA.SysInfoUUID <uuid_value> [access_method]
```

Where:

<uuid_value>

Up to 16-byte hexadecimal value assigned by you.

[access_method]

The access method that you select to use from the following methods:

- Online authenticated LAN access, type the command:

```
[--bmc-username xcc_user_id --bmc-password xcc_password]
```

Where:

xcc_user_id

The BMC/IMM/XCC account name (1 of 12 accounts). The default value is USERID.

xcc_password

The BMC/IMM/XCC account password (1 of 12 accounts).

Example command is as follows:

```
onecli config set SYSTEM_PROD_DATA.SysInfoUUID <uuid_value> --bmc-username xcc_user_id  
--bmc-password xcc_password
```

- Online KCS access (unauthenticated and user restricted):

You do not need to specify a value for *access_method* when you use this access method.

Example command is as follows:

```
onecli config set SYSTEM_PROD_DATA.SysInfoUUID <uuid_value>
```

Note: The KCS access method uses the IPMI/KCS interface, which requires that the IPMI driver be installed.

- Remote LAN access, type the command:

```
[--bmc xcc_user_id:xcc_password@xcc_external_ip]
```

Where:

xcc_external_ip

The BMC/IMM/XCC external IP address. There is no default value. This parameter is required.

xcc_user_id

The BMC/IMM/XCC account name (1 of 12 accounts). The default value is USERID.

xcc_password

The BMC/IMM/XCC account password (1 of 12 accounts).

Note: BMC, IMM, or XCC external IP address, account name, and password are all valid for this command.

Example command is as follows:

```
onecli config set SYSTEM_PROD_DATA.SysInfoUUID <uuid_value>  
--bmc xcc_user_id:xcc_password@xcc_external_ip
```

4. Restart the Lenovo XClarity Controller.
5. Restart the server.

Update the asset tag

Optionally, you can update the asset tag.

There are two methods available to update the asset tag:

- From Lenovo XClarity Provisioning Manager

To update the asset tag from Lenovo XClarity Provisioning Manager:

1. Start the server and press F1 to display the Lenovo XClarity Provisioning Manager interface.
2. If the power-on Administrator password is required, enter the password.
3. From the System Summary page, click **Update VPD**.
4. Update the asset tag information.

- From Lenovo XClarity Essentials OneCLI

Lenovo XClarity Essentials OneCLI sets the asset tag in the Lenovo XClarity Controller. Select one of the following methods to access the Lenovo XClarity Controller and set the asset tag:

- Operate from the target system, such as LAN or keyboard console style (KCS) access
- Remote access to the target system (TCP/IP based)

To update the asset tag 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. Copy and unpack the OneCLI package, which also includes other required files, to the server. Make sure that you unpack the OneCLI and the required files to the same directory.
3. After you have Lenovo XClarity Essentials OneCLI in place, type the following command to set the DMI:

```
onecli config set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag> [access_method]
```

Where:

<asset_tag>

The server asset tag number. Type asset aaaaaaaaaaaaaaaaaaaaaaaaaaaaaa, where aaaaaaaaaaaaaaaaaaaaaaaaaaaaaa is the asset tag number.

[access_method]

The access method that you select to use from the following methods:

- Online authenticated LAN access, type the command:

```
[--bmc-username xcc_user_id --bmc-password xcc_password]
```

Where:

xcc_user_id

The BMC/IMM/XCC account name (1 of 12 accounts). The default value is USERID.

xcc_password

The BMC/IMM/XCC account password (1 of 12 accounts).

Example command is as follows:

```
onecli config set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag> --bmc-username xcc_user_id --bmc-password xcc_password
```

- Online KCS access (unauthenticated and user restricted):

You do not need to specify a value for *access_method* when you use this access method.

Example command is as follows:

```
onecli config set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag>
```

Note: The KCS access method uses the IPMI/KCS interface, which requires that the IPMI driver be installed.

- Remote LAN access, type the command:

```
[--bmc xcc_user_id:xcc_password@xcc_external_ip]
```

Where:

xcc_external_ip

The BMC/IMM/XCC IP address. There is no default value. This parameter is required.

xcc_user_id

The BMC/IMM/XCC account (1 of 12 accounts). The default value is USERID.

xcc_password

The BMC/IMM/XCC account password (1 of 12 accounts).

Note: BMC, IMM, or XCC internal LAN/USB IP address, account name, and password are all valid for this command.

Example command is as follows:

```
onecli config set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag>
```

```
--bmc xcc_user_id:xcc_password@xcc_external_ip
```

4. Reset the Lenovo XClarity Controller to the factory defaults. See “Resetting the BMC to Factory Default” section in the XCC documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.

Chapter 6. Resolving installation issues

Use this information to resolve issues that you might have when setting up your system.

Use the information in this section to diagnose and resolve problems that you might encounter during the initial installation and setup of your server.

- “Server does not power on (no indication that input power is connected to the server)” on page 335
- “The server immediately displays the POST Event Viewer when it is turned on” on page 335
- “Embedded hypervisor is not in the boot list” on page 336
- “Server cannot recognize a hard drive” on page 336
- “Displayed system memory is less than installed physical memory” on page 337
- “A Lenovo optional device that was just installed does not work.” on page 338
- “Voltage planar fault is displayed in the event log” on page 338

Server does not power on (no indication that input power is connected to the server)

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 power LED on the front operator panel.
4. Check the front operator panel LCD display for error indications.
5. Check the power supply LEDs and ensure that the power supplies are functioning:
 - a. Make sure that both power supplies installed in the server are of the same type. Mixing different power supplies in the server will cause a system error.
 - b. Make sure that the power cords are correctly connected to a working electrical outlet. The power source meets the input power requirements for the installed power supplies (see the power supply labels).
 - c. Disconnect and reconnect the input power cords.
 - d. Reseat the power supplies.
 - e. Replace the power supplies one by one, and check the power button function after installing each one.
6. If the problem still cannot be resolved, please collect the failure information with system logs captured to Lenovo support.

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 light path diagnostics LEDs.
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://static.lenovo.com/us/en/serverproven/index.shtml>.

3. (Trained technician only) Make sure that processor 1 is seated correctly
4. (Trained technician only) Remove processor 2 and restart the server.

5. Replace the following components one at a time, in the order shown, restarting the server each time:
 - a. (Trained technician only) Processor
 - b. (Trained technician only) System board

Embedded hypervisor is not in the boot list

Complete the following steps until the problem is solved.

1. Check <https://static.lenovo.com/us/en/serverproven/index.shtml> to validate that the embedded hypervisor device is supported for the server.
2. If the server has been installed, moved, or serviced recently, or if this is the first time the embedded hypervisor is being used, make sure that the device is connected properly and that there is no physical damage to the connectors.
3. Make sure that the embedded hypervisor device is listed in the list of available boot options. From the management controller user interface, click **Server Configuration → Boot Options**.

For information about accessing the management controller user interface, see:

“Accessing the XClarity Controller web interface” section in the XCC documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/ixcc_frontend/ixcc_overview.html.

4. See the documentation that comes with the optional embedded hypervisor flash device to validate that the device is configured correctly.
5. Check <http://datacentersupport.lenovo.com> for any tech tips (service bulletins) related to the embedded hypervisor and the server.
6. Make sure that other software works on the server to ensure that it is working properly.

Server cannot recognize a hard drive

Complete the following steps until the problem is solved.

1. Observe the associated yellow hard disk 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 hard disk drive backplane.
3. Observe the associated green hard disk 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 hard disk drives. When you start a server and press F1, the Lenovo XClarity Provisioning Manager interface is displayed by default. You can perform hard drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → Disk Drive Test**.
 - If the green activity LED is flashing and the yellow status LED is flashing slowly, the drive is recognized by the controller and is rebuilding.
 - If neither LED is lit or flashing, check whether the hard disk 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. If the activity of the LEDs remains the same, go to step Hard disk drive problems. If the activity of the LEDs changes, return to step 1.
4. Make sure that the hard disk 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 hard disk drives. When you start a server and press F1, the Lenovo XClarity Provisioning Manager interface is displayed by default. You can perform hard 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.

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 on the operator information panel.
- No memory module error LEDs are lit on the system 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 “PMEM rules” on page 222 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.
- When PMEMs are installed:
 - a. Refer to “PMEM rules” on page 222 and see if the displayed memory fits the mode description.
 - b. If the memory is set in App Direct Mode, ensure that all the saved data have been backed up, and created namespaces are deleted before any PMEM is replaced or added.
 - c. If PMEMs are recently set in Memory Mode, turn it back to App Direct Mode and examine if there is namespace that has not been deleted.
 - d. Go to the Setup Utility, select **System Configuration and Boot Management → Intel Optane PMEMs → Security**, and make sure security of all the PMEM units is disabled.

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 solution and press F1, the Lenovo XClarity Provisioning Manager interface is displayed by default. You can perform memory diagnostics with this interface. From the Diagnostic page, go to **Run Diagnostic → Memory test** or **PMEM test**.

Notes: When PMEMs are installed, run diagnostics based on the mode that is set presently:

- App Direct Mode:
 - Run Memory Test for DRAM memory modules.
 - Run PMEM Test for PMEMs.

- Memory Mode:
Run both Memory Test and PMEM Test for PMEMs

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.

Note: When PMEMs are installed, only adopt this method in Memory Mode.

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 system board.

A Lenovo optional device that was just installed does not work.

1. Check the XCC event log for any events associated with the device.
2. Make sure that:
 - The device is supported for the server (see <https://static.lenovo.com/us/en/serverproven/index.shtml>).
 - 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 F1 to display the Setup Utility. Whenever memory or any other device is changed, you must update the configuration.
3. Reseat the cable connection and ensure that there is no physical damage to the cable.
4. Reseat the device that you have just installed.
5. Replace the device that you have just installed.

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 7 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 system board.

Appendix A. 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: This section includes references to IBM Web sites and information about obtaining service. IBM is Lenovo's preferred service provider for ThinkSystem.

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 the documentation icon  from the navigation pane.
3. Click **Documentation Type** → **Solution** from the drop-down menu.

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

Security advisories

Lenovo is committed to developing products and services that adhere to the highest security standards in order to protect our customers and their data. When potential vulnerabilities are reported, it is the responsibility of the Lenovo Product Security Incident Response Team (PSIRT) to investigate and provide information to our customers so they may put mitigation plans in place as we work toward providing solutions.

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

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

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 Lenovo product documentation 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:

<http://thinksystem.lenovofiles.com/help/index.jsp>

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. 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.
- If you have installed new hardware or software in your environment, check <https://static.lenovo.com/us/en/serverproven/index.shtml> to make sure that the hardware and software are supported by your product.
- Go to <http://datacentersupport.lenovo.com> and check for information to help you solve the problem.
 - Check the Lenovo forums at https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg to see if someone else has encountered a similar problem.

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 Lenovo product documentation 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.

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)
- Model number
- Serial number
- Current system UEFI and firmware levels
- Other pertinent information such as error messages and logs

As an alternative to calling Lenovo Support, you can go to <https://support.lenovo.com/servicerequest> to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to the service technicians. The Lenovo service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

Collecting service data

To clearly identify the root cause of a server issue or at the request of Lenovo Support, you might need collect service data that can be used for further analysis. Service data includes information such as event logs and hardware inventory.

Service data can be collected through the following tools:

- **Lenovo XClarity Provisioning Manager**

Use the Collect Service Data function of Lenovo XClarity Provisioning Manager to collect system service data. You can collect existing system log data or run a new diagnostic to collect new data.

- **Lenovo XClarity Controller**

You can use the Lenovo XClarity Controller web interface or the CLI to collect service data for the server. The file can be saved and sent to Lenovo Support.

- For more information about using the web interface to collect service data, see the “Downloading service data” section in the XCC documentation version compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.
- For more information about using the CLI to collect service data, see the “ffdc command” section in the XCC documentation version compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.

- **Lenovo XClarity Administrator**

Lenovo XClarity Administrator can be set up to collect and send diagnostic files automatically to Lenovo Support when certain serviceable events occur in Lenovo XClarity Administrator and the managed endpoints. You can choose to send diagnostic files to Lenovo Support using Call Home or to another service provider using SFTP. You can also manually collect diagnostic files, open a problem record, and send diagnostic files to the Lenovo Support Center.

You can find more information about setting up automatic problem notification within the Lenovo XClarity Administrator at http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/admin_setupcallhome.html.

- **Lenovo XClarity Essentials OneCLI**

Lenovo XClarity Essentials OneCLI has inventory application to collect service data. It can run both in-band and out-of-band. When running in-band within the host operating system on the server, OneCLI can collect information about the operating system, such as the operating system event log, in addition to the hardware service data.

To obtain service data, you can run the **getinfor** command. For more information about running the **getinfor**, see http://sysmgt.lenovofiles.com/help/topic/toolctr_cli_lenovo/onecli_r_getinfor_command.html.

Contacting Support

You can contact Support to obtain help for your issue.

You can receive hardware service through a Lenovo Authorized Service Provider. To locate a service provider authorized by Lenovo to provide warranty service, go to <https://datacentersupport.lenovo.com/serviceprovider> and use filter searching for different countries. For Lenovo support telephone numbers, see <https://datacentersupport.lenovo.com/supportphonenumber> for your region support details.

Appendix B. Notices

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area.

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Important notes

Processor speed indicates the internal clock speed of the microprocessor; 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.

Telecommunication regulatory statement

This product may not be certified in your country for connection by any means whatsoever to interfaces of public telecommunications networks. Further certification may be required by law prior to making any such connection. Contact a Lenovo representative or reseller for any questions.

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:

<http://thinksystem.lenovofiles.com/help/index.jsp>

Taiwan BSMI RoHS declaration

單元 Unit	限用物質及其化學符號 Restricted substances and its chemical symbols					
	鉛Lead (PB)	汞Mercury (Hg)	鎘Cadmium (Cd)	六價鉻 Hexavalent chromium (Cr ⁶⁺)	多溴聯苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
機架	○	○	○	○	○	○
外部蓋板	○	○	○	○	○	○
機械組零件	-	○	○	○	○	○
空氣傳動設備	-	○	○	○	○	○
冷卻組零件	-	○	○	○	○	○
內存模組	-	○	○	○	○	○
處理器模組	-	○	○	○	○	○
電纜組零件	-	○	○	○	○	○
電源供應器	-	○	○	○	○	○
儲備設備	-	○	○	○	○	○
印刷電路板	-	○	○	○	○	○

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。
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.

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。
Note2: “○”indicates that the percentage content of the restricted substance does not exceed the percentage of reference value of presence.

備考3. “-”係指該項限用物質為排除項目。
Note3: The “-” indicates that the restricted substance corresponds to the exemption.

Taiwan import and export contact information

Contacts are available for Taiwan import and export information.

委製商/進口商名稱: 台灣聯想環球科技股份有限公司
進口商地址: 台北市南港區三重路 66 號 8 樓
進口商電話: 0800-000-702

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